# CENTRAL TEXAS WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO WATER SYSTEM

**SPONSOR:** 

**TEXAS WATER DEVELOPMENT BOARD** 



# **STUDY PARTICIPANTS:**











PREPARED BY:



OCTOBER 2005

# CENTRAL TEXAS WATER TREATMENT PLANT TO SERVE CITY OF AUSTIN AND SAN ANTONIO WATER SYSTEM

# Prepared for:

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OCTOBER 2005

# Central Texas Regional Water Treatment Plant to serve City of Austin and San Antonio Water System

# **Executive Summary**

The Lower Colorado River Authority contracted with K Friese & Associates, Inc. to conduct a feasibility study of a Central Texas water treatment plant to serve Austin and San Antonio. Texas Water Development Board and study participants funded the study. Participants include LCRA, the Guadalupe-Blanco River Authority, the San Antonio River Authority, the City of Austin and the San Antonio Water System. The source of Texas Water Development funding is a 50% matching funds grant to conduct regional water facility planning.

The purpose of this engineering study was to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the cities of Austin and San Antonio, instead of the two separate facilities currently under consideration in the Texas Water Development Board Region L and K plans. Most water utility managers recognize the compelling economies of scale offered by large regional water treatment facilities, which offer lower construction, operation and maintenance costs, while typically delivering higher quality water. This study developed the information necessary to examine the feasibility and economics of this proposed single large plant alternative versus the currently planned separate facilities, one in Austin and one in San Antonio.

The City of Austin and the San Antonio Water System are planning to develop large surface water transfer and treatment facilities using Colorado River water to meet future water demand. The City of Austin has a site under evaluation for Water Treatment Plant No. 4, which would treat water drawn from Lake Travis. However, the intake site and route for the raw water transmission main has not yet been decided. In addition, the city is considering decommissioning the Green Water Treatment plant on Town Lake.

SAWS is working with LCRA to develop surface water supplies. The LCRA-SAWS Water Project is in the study phase and will involve the development of off-channel storage in Colorado, Wharton or Matagorda counties near the Colorado River. The water captured in this storage would be transferred via pipeline to a location near San Antonio where a new or expanded water treatment plant would be located. The specific location of these facilities has not yet been determined.

This feasibility study examined the idea of developing a single water treatment plant located between the cities of Austin and San Antonio that could provide additional capacity to meet the demands of these two cities.

In addition to studying a source of future treated water for Austin and San Antonio, the study also determined the water demands of the other study participants that could be satisfied by this facility.

The study was not prepared in the traditional way studies of this type are normally done. This study was accomplished using an interactive format in which all of the study participants were actively involved in the actual development of the parameters of the scope, the assumptions, analysis and findings of the investigation. This was accomplished by frequent meetings with the participants in which technical memorandums describing the results to date of the investigation were presented and



discussed. Based on these interactive meetings the study team made refinements in the original scope to adjust the emphasis and detail that were needed to better answer the basic feasibility question that the study was to address.

By performing the study in this manner, participants were able to steer the investigations in a way that would produce the most beneficial findings and allow each of them to evaluate the feasibility of their participation in a regional facility. As the study progressed more alternatives were identified and analyzed than was anticipated in the original scope. The end results included findings that addressed the feasibility question of a regional facility.

Technical Memorandums were drafted as the study progressed and were assembled at the end of the study to form the completed report. Each of the memorandums generally addressed one or more of the tasks identified in the original scope. By performing the study in this manner the final report is not as readable as it might be if the study had been performed in a more traditional manner. However, the analysis and findings are presented in much greater detail and are more useable to the study participants.

The study determined at the end of the planning period in year 2065, there would be a total average day demand of 271 million gallons a day (mgd) of water, which could be met by the proposed regional facility. Both average annual and maximum day demands estimated by the participants are summarized below:

# Projected Average Day Demand (acre-feet/year)

| Year           | 2015   | 2020    | 2030    | 2040    | 2050    | 2060    | 2065    |
|----------------|--------|---------|---------|---------|---------|---------|---------|
| City of Austin | 0      | 0       | 16,802  | 22,403  | 33,604  | 33,604  | 33,604  |
| SAWS           | 73,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 |
| GBRA           | 0      | 0       | 6,000   | 8,000   | 10,000  | 12,300  | 12,300  |
| SARA           | 20,550 | 23,406  | 28,433  | 31,393  | 34,411  | 37,530  | 41,128  |
| LCRA           | 0      | 0       | 5,600   | 11,200  | 11,200  | 11,200  | 11,200  |
| Total          | 93,550 | 228,406 | 261,835 | 277,996 | 294,215 | 299,634 | 303,232 |



# Projected Maximum Delivery Rate (MGD)

| Year           | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|----------------|------|------|------|------|------|------|------|
| City of Austin | 0    | 0    | 25   | 35   | 50   | 50   | 50   |
| SAWS           | 85   | 238  | 238  | 238  | 238  | 238  | 238  |
| GBRA           | 0    | 0    | 11   | 14   | 18   | 22   | 22   |
| SARA           | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| LCRA           | 0    | 0    | 10   | 20   | 20   | 20   | 20   |
| Total          | 109  | 265  | 317  | 344  | 366  | 373  | 378  |

SAWS also provided a second, "delayed demand scenario." The first scenario uses the full amount of water supply available with phasing based on an estimation of when the necessary infrastructure can be in place. The second scenario delays 66,000 acre-feet/year of demand from 2020 to 2030.

# Projected Average Day Demand "Delayed Demand Scenario" (acre-feet/year)

| Year           | 2015   | 2020    | 2030    | 2040    | 2050    | 2060    | 2065    |
|----------------|--------|---------|---------|---------|---------|---------|---------|
| City of Austin | 0      | 0       | 16,802  | 22,403  | 33,604  | 33,604  | 33,604  |
| SAWS           | 73,000 | 139,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 |
| GBRA           | 0      | 0       | 6,000   | 8,000   | 10,000  | 12,300  | 12,300  |
| SARA           | 20,550 | 23,406  | 28,433  | 31,393  | 34,411  | 37,530  | 41,128  |
| LCRA           | 0      | 0       | 5,600   | 11,200  | 11,200  | 11,200  | 11,200  |
| Total          | 93,550 | 162,406 | 261,835 | 277,996 | 294,215 | 299,634 | 303,232 |

# Projected Maximum Delivery Rate "Delayed Demand Scenario" (MGD)

| Year           | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|----------------|------|------|------|------|------|------|------|
| City of Austin | 0    | 0    | 25   | 35   | 50   | 50   | 50   |
| SAWS           | 85   | 161  | 238  | 238  | 238  | 238  | 238  |
| GBRA           | 0    | 0    | 11   | 14   | 18   | 22   | 22   |
| SARA           | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| LCRA           | 0    | 0    | 10   | 20   | 20   | 20   | 20   |
| Total          | 109  | 188  | 317  | 344  | 366  | 373  | 378  |

Several potential alternative diversion points for raw water were identified. One location consisted of a series of intakes located in Matagorda, Wharton, and/or Colorado counties along the lower reaches of the Colorado River. A second location considered for an intake was in the segment of the Colorado River from the City of Austin (Town Lake) downstream of the City of Bastrop. Groundwater from the Simsboro Aquifer was also considered. Three general sites for the location of the regional facility were identified and included in the analysis. The three sites considered were: one east of San Antonio near Interstate 10, one east of San Marcos and one in the northern corner of



Caldwell County. The treatment plant evaluated for the facility consisted of a split process water treatment plant. This process approach recognizes that some of the participants require soft water and some do not. In this approach raw water is split at a distribution box and routed through separate processes. Part of the water would be softened using lime. Part of the water would be treated using a so-called conventional water treatment process. Both waters would be filtered separately through microfiltration membranes. This split process would accommodate separate disinfection approaches to better match the existing practices of the participant to avoid compatibility problems. Points for connecting treated water from a regional facility were identified by each participant.

The initial analysis of the first three alternatives of varying the location of the plant indicated a rather small percentage difference in the cost, the least costly being the location east of San Marcos. Four additional alternatives were developed and analyzed for a more complete understanding of the potential regional scenarios. The results showed a greater reduction in the present value of these four new alternatives compared to the lowest present value of the first three alternatives. However, it was determined that the lower costs were either not comparable or that the changes to the basic scenario included in the alternative scenario were not realistic and could not be implemented. The alternatives considered are summarized below:

| Alternative | Description                                    | Total NPV in<br>Millions of Dollars |
|-------------|--|-------------------------------------|
| 1A          | WTP located east of San Antonio.               | \$3,896                             |
| 2A          | WTP located east of San Marcos.                | \$3,852                             |
| 3A          | WTP located in northern corner of Caldwell     | \$3,895                             |
|             | County.  |                                     |
| 1B          | Similar to 1A, with the WTP located 10 miles   | \$3,790                             |
|             | closer to San Antonio.                         |                                     |
| 1C          | Similar to Alt 1B, with Simsboro gravity line  | \$3,758                             |
|             | alternative.                                   |                                     |
| 3B          | Similar to Alt 3A, uses the "Delayed Demands". | \$3,379                             |
| 1D          | Similar to Alt 1A, with no Bastrop intake and  | \$3,580                             |
|             | groundwater treatment plant near Elgin.        |                                     |

One final alternative was evaluated. In this alternative, the plant was changed to a base load plant for San Antonio, SARA and GBRA, thereby reducing the size of the plant and treated water transmission mains. Other adjustments were made to help make the regional facility comparable to the other separate alternatives available to the participants. These adjustments included resizing the raw water intake in Matagorda County per the LCRA-SAWS Water Project Viability Assessment. In addition, an assumption was made that scalping withdrawals would not be required for the Bastrop raw water facilities. Next, for comparison purposes, the present value cost was converted to a cost per acrefoot. This was done by dividing the total cost of the project by the acre-foot capacity. The resulting cost was \$794 per acre-foot for treated water at the water treatment plant, without consideration of the potable water transmission mains. When the potable water transmission mains are considered, the average cost would be \$1,039 per acre-foot delivered to the participant's delivery points. The latter figure is in the upper range of costs that have been developed for the LCRA-SAWS Water Project. Those costs range from \$970 to \$1,103.



| Alternative  | Description   | Total NPV in Millions of Dollars |
|--------------|---|----------------------------------|
| 2A - Special | Similar to 2A, with plant and lines sized for SAWS, | \$3,451                          |
|              | SARA, and GBRA average day demands                  | $per\ ac\ -ft = 1,039$           |

While the cost per acre-foot for a regional facility may be at least marginally reasonable for San Antonio and SARA, it is not for the other participants because of the cost of transmission facilities the other participants would have to build compared to their separate alternatives.

An alternative that was not included in the scope of this study but would appear to be worthy of additional analysis is a sub-regional facility located between Austin and Bastrop on or near the Colorado River. That facility could meet the demands of Austin, LCRA and possibly GBRA in a more cost effective manner. A very preliminary cost estimate for such a facility using similar costing data in this study appears to be in the \$741 per acre-foot range not including potable water transmission mains and \$848 per acre-foot including transmission mains to the participant's delivery points.





# **TECHNICAL MEMORANDUM**

**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 1 – Data Collection

**DATE:** February 8, 2005

#### **Works Consulted**

- Alan R. Dutton. <u>Groundwater Availability in the Carrizo-Wilcox Aquifer in Central Texas Numerical Simulations of 2003 through 2050 Withdrawal Projections</u>. Bureau of Economic Geology, 1999.
- Alan Plummer Associates, Inc. <u>Proposed Surface Water Treatment Plant Source Water Quality Study</u>. LCRA, 2000.
- Bennett & Williams Environmental Consultants, Inc. <u>An Evaluation of Alternative Sources of Water at the Berdoll Properties</u>, Austin, Texas. LCRA, 2000.
- CDM. Section 5 Regional Water Treatment Facility Alternatives. LCRA, ND.
- CDM. Ozone/Membrane Pilot Study. City of Austin, 1999.
- City of Austin. Methods for Assessing the Effects of pH Reduction on Lime Softening Distribution Systems. City of Austin, 2000.
- HDR Engineering, Inc. <u>Assessment of Groundwater Availability on CPS Property in Bastrop and Lee</u> Counties, Texas. SAWS, 1999.
- HDR Engineering, Inc. <u>Preliminary Feasibility of Options to Deliver ALCOA/CPS Groundwater to Bexar</u> County. SAWS, 2000.
- HDR Engineering, Inc. Concept Development Report Section 3 Groundwater Quality. SAWS, ND.
- HDR Engineering, Inc. Concept Delivery Study. SAWS, June 2004.
- Hunter Associates. <u>IH-35 Water Transmission Main Preliminary Engineering Feasibility Report</u>. GBRA, 2003.
- Lower Colorado River Authority. LCRA SAWS Water Project Viability Assessment. LCRA, ND.
- Lower Colorado Regional Water Planning Group. <u>Adopted Regional Water Supply Plan for the Lower Colorado Regional Water Planning Group (Region K)</u>. TWDB, 2000.
- Metcalf & Eddy. Water Treatment Plant No. 4 and Associated Intake Facilities Feasibility Report. LCRA, 1997.

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South Central Texas Regional Water Planning Group. <u>South Central Texas Regional Water Planning Area Regional Water Plan</u>. TWDB, 2001.

Texas Water Development Board. Water for Texas – 2002. TWDB, 2002.

U.S. Environmental Protection Agency. <u>Bridging Pilot-Scale Testing to Full Scale Design of UV Disinfection Systems</u>. USEPA, 2004.



# **TECHNICAL MEMORANDUM**

**PROJECT:** Central Texas Regional Water Treatment Plant

**Subject:** Task 2 - Demand Projections

**DATE:** February 8, 2005

The purpose of this study is to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the Cities of Austin and San Antonio. Although various raw water sources have been included in the analysis (specifically the LCRA-SAWS Water Project, groundwater from the Simsboro Aquifer, and the Bastrop/Colorado River diversion point), no attempt has been made to evaluate these sources. The sole focus is defining the benefits of regional treatment – not defining the issues surrounding sources of raw water.

The purpose of this task is to establish the projected demands for the potential service area and to develop the projected size of the water treatment plant over the planning horizon. A 50-year planning horizon is used, beginning in 2015 and continuing to 2065. Projected average day demands and maximum delivery rate peaking factors were obtained from each study participant. The projected size of the water treatment plant is based on the maximum delivery rate and is more fully discussed in the technical memorandum for Task 8 – Facility Phasing.

The methodology used by each participant in establishing projected average day demands for the study period is summarized below:

- 1. City of Austin The City of Austin maintains a system model for use in determining future needs and planning improvements. The demands in the model were developed in coordination with the TWDB for consistency with the State Water Plan and the City's demands for the Central Texas Regional Water Treatment Plant (CTRWTP) project were derived from the model.
- 2. SAWS –SAWS is evaluating several potential sources of water including surface water from the Colorado River diverted from the Bastrop area (18,000 acre-feet/year) and from the Matagorda/Wharton County area (132,000 acre-feet/year) as part of the LCRA-SAWS Water Project, and Simsboro groundwater from the Aluminum Company of America and the City Public Service Board of San Antonio (ALCOA/CPS) sites in Milam, Lee, and Bastrop Counties (55,000 acre-feet/year) near the Bastrop surface water diversion point. The projected SAWS demands are based on these available water sources.
- 3. GBRA GBRA demands were developed by subtracting available water supply from the TWDB projected demands for the GBRA service area.
- 4. SARA SARA demands were developed by subtracting the CTRWTP SAWS demands from the TWDB projected water supply deficit for Bexar County.
- 5. LCRA LCRA demands are based on potential water supply to an area in south east Travis County currently known as the Creedmore Maha Water Supply Corporation and the Winfield Municipal Utility District. Demands are based on residential and commercial utility service to approximately 2,400 acres of currently undeveloped land. Maximum day demands were calculated based on a projection of approximately 6,900 connections in 2030 and 13,900 connections in 2040. Next, an average day demand factor of two was applied to the maximum day demands to obtain the projected average day demand.

**Table 2-1**Projected Average Day Demand
(acre-feet/year)

| Year           | 2015   | 2020    | 2030    | 2040    | 2050    | 2060    | 2065    |
|----------------|--------|---------|---------|---------|---------|---------|---------|
| City of Austin | 0      | 0       | 16,802  | 22,403  | 33,604  | 33,604  | 33,604  |
| SAWS           | 73,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 |
| GBRA           | 0      | 0       | 6,000   | 8,000   | 10,000  | 12,300  | 12,300  |
| SARA           | 20,550 | 23,406  | 28,433  | 31,393  | 34,411  | 37,530  | 41,128  |
| LCRA           | 0      | 0       | 5,600   | 11,200  | 11,200  | 11,200  | 11,200  |
| Total          | 93,550 | 228,406 | 261,835 | 277,996 | 294,215 | 299,634 | 303,232 |

The maximum projected delivery rate is derived by applying standard peaking factors used in long-range planning by each participant to the average day demand. These factors are:

- 1. City of Austin = 1.67 x average day demand
- 2. SAWS = 1.3 x average day demand
- 3. GBRA = 2.0 x average day demand
- 4. SARA = 1.3 x average day demand
- 5. LCRA = 2.0 x average day demand

**Table 2-2**Projected Maximum Delivery Rate (MGD)

| Year           | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|----------------|------|------|------|------|------|------|------|
| City of Austin | 0    | 0    | 25   | 35   | 50   | 50   | 50   |
| SAWS           | 85   | 238  | 238  | 238  | 238  | 238  | 238  |
| GBRA           | 0    | 0    | 11   | 14   | 18   | 22   | 22   |
| SARA           | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| LCRA           | 0    | 0    | 10   | 20   | 20   | 20   | 20   |
| Total          | 109  | 265  | 317  | 344  | 366  | 373  | 378  |

SAWS also provided a second, "delayed demand scenario". The first scenario uses the full amount of water supply available with phasing based on an estimation of when the necessary infrastructure can be in place. The second scenario delays 66,000 acre-feet/year of demand from 2020 to 2030. The second scenario is to be considered if delaying the raw water transmission main from the Matagorda/Wharton County intake location results in a more economically feasible project. SAWS will temporarily obtain the 66,000 acre-feet/year supply from another source until the Matagorda/Wharton County intake is in place. The following tables summarize the "delayed demand scenario".

**Table 2-3**Projected Average Day Demand "Delayed Demand Scenario" (acre-feet/year)

| Year           | 2015   | 2020    | 2030    | 2040    | 2050    | 2060    | 2065    |
|----------------|--------|---------|---------|---------|---------|---------|---------|
| City of Austin | 0      | 0       | 16,802  | 22,403  | 33,604  | 33,604  | 33,604  |
| SAWS           | 73,000 | 139,000 | 205,000 | 205,000 | 205,000 | 205,000 | 205,000 |
| GBRA           | 0      | 0       | 6,000   | 8,000   | 10,000  | 12,300  | 12,300  |
| SARA           | 20,550 | 23,406  | 28,433  | 31,393  | 34,411  | 37,530  | 41,128  |
| LCRA           | 0      | 0       | 5,600   | 11,200  | 11,200  | 11,200  | 11,200  |
| Total          | 93,550 | 162,406 | 261,835 | 277,996 | 294,215 | 299,634 | 303,232 |

Table 2-4
Projected Maximum Delivery Rate
"Delayed Demand Scenario"
(MGD)

| Year           | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|----------------|------|------|------|------|------|------|------|
| City of Austin | 0    | 0    | 25   | 35   | 50   | 50   | 50   |
| SAWS           | 85   | 161  | 238  | 238  | 238  | 238  | 238  |
| GBRA           | 0    | 0    | 11   | 14   | 18   | 22   | 22   |
| SARA           | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| LCRA           | 0    | 0    | 10   | 20   | 20   | 20   | 20   |
| Total          | 109  | 188  | 317  | 344  | 366  | 373  | 378  |



# **TECHNICAL MEMORANDUM**

**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 4 - Water Treatment Process

**DATE:** February 8, 2005

# **Background**

The Central Texas Regional Water Treatment Plant would be one of the largest water treatment facilities in the State of Texas. As such, it is expected that this facility would take advantage of state of the art technology in order to produce a high quality potable water.

The selection of a water treatment process is dependent upon three issues. The first is the source water quality, both surface and groundwater. The second is the State and Federal regulations known currently and anticipated to be in place during the life of the treatment works, and third the finished water quality desired by the customers.

The purpose of this study is to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the Cities of Austin and San Antonio.

Although various raw water sources have been included in the analysis (specifically the LCRA-SAWS Water Project, groundwater from the Simsboro Aquifer, and the Bastrop/Colorado River diversion point), no attempt has been made to evaluate these sources. The sole focus is defining the benefits of regional treatment – not defining the issues surrounding sources of raw water.

It is anticipated that the raw water would be derived from at least three sources (See Figure 4.1). As of this writing it is not known where raw water for GBRA and SARA would come from. The largest of the three would be from the Colorado River in the vicinity of Matagorda County near the Gulf of Mexico, the diversion point for the LCRA-SAWS Water Project. It is expected that 132,000 acre-feet/year of surface water would be diverted from this segment of the Colorado River. Another source would be the Colorado River further upstream near the City of Bastrop. It is expected that approximately 18,000 acre-feet/year would be diverted at this location. Also, it is likely that raw water for the City of Austin and LCRA would be withdrawn from the Bastrop location. It is also expected that 55,000 acre-feet/year of groundwater from well fields in Milam, Lee and Bastrop Counties will be introduced into the regional water system at some point during the transmission/treatment system.

As a Public Water System, these facilities must comply with both the State of Texas and Federal drinking water regulations. The State rules are administered by the Texas Commission on Environmental Quality (TCEQ) and are codified in Title 30 Texas Administrative Code Chapter 290 Subchapters D and F. Current and anticipated Federal rules are described later in this section.

Our review of water treatment processes is preliminary based on existing water quality data about the Colorado River and the ALCOA/CPS groundwater and discussions with the various participants as to their individual finished water requirements. Our purpose is not to absolutely establish a water treatment process but to establish a level of appropriate technology that can be used as the basis of cost estimating. We all realize that very involved and detailed water treatability studies will be necessary before the final process is established. Recognize that this study is a comparative analysis of several regional treatment and piping arrangements to see which is more cost effective to implement.

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#### **ALCOA/CPS Groundwater**

SAWS has entered into agreements with the ALCOA/CPS for the use of groundwater in Milam, Lee and Bastrop Counties (see Figure 4.2). Preliminary water availability studies of the ALCOA/CPS proposed well field areas indicate that the following quantities of groundwater, shown in Table 4-1, are available on a long-term basis.

Table 4-1
Available Groundwater
(acre-feet/year)

| Source       | Quantity |
|--------------|----------|
| CPS Property | 15,000   |
| ALCOA        | 40,000   |
| Total        | 55,000   |

The quality of the water from the ALCOA/CPS property is considered suitable for public water supplies recognizing that treatment and/or blending with other water to reduce elevated concentrations of iron and manganese will be required (see Table 4-2). It is also reported that certain wells in the Simsboro formation produce high temperature water. The following table generally describes the water quality of the Wilcox Group of the Carrizo-Wilcox Aquifer System which underlie the ALCOA/CPS properties and from where the groundwater would be derived. The Wilcox Group consists of the Hooper, Simsboro and Calvert Bluff formations.

Table 4-2
Statistical Summary of Water Quality Data for Hooper, Simsboro and Calvert Bluff Formations
Source – HDR, Assessment of Groundwater Availability on CPS Property in Bastrop and Lee Counties, Texas, SAWS, July 1999

|                         |        | Hooper |       | S      | imsboro |       | Ca           | lvert Blu | ff     |
|-------------------------|--------|--------|-------|--------|---------|-------|--------------|-----------|--------|
| Water Ouality           | Median | Ra     | nge   | Median | Range   |       | Median Range |           | nge    |
| Temperature (°C)        | 23     | 21     | 25    | 26     | 21      | 76    | 23           | 21        | 27     |
| Silica (mg/l)           | 35.0   | 12.0   | 53.0  | 30.0   | 5.0     | 62.0  | 29.0         | 14.0      | 69.0   |
| Calcium (mg/l)          | 70.4   | 4.4    | 222.0 | 66.0   | 2.4     | 130.0 | 72.5         | 12.0      | 474.0  |
| Magnesium (mg/l)        | 12.3   | 6.8    | 68.0  | 11.0   | 1.9     | 43.0  | 17.0         | 2.2       | 103.0  |
| Sodium (mg/l)           | 62.0   | 24.0   | 258.0 | 33.0   | 18.0    | 258.0 | 65.5         | 27.0      | 1670.0 |
| Potassium (mg/l)        | 2.70   | -      | -     | 3.70   | 1.50    | 10.00 | 4.90         | 4.00      | 6.00   |
| Iron (mg/l)             | -      | -      | -     | 0.47   | 0.00    | 13.00 | -            | -         | -      |
| Manganese (mg/l)        | -      | -      | -     | 0.18   | 0.00    | 0.72  | -            | -         | -      |
| Carbonate (mg/l)        | 0.0    | 0.0    | 7.2   | 0.0    | 0.0     | 0.0   | 0.0          | 0.0       | 0.0    |
| Bicarbonate (mg/l)      | 237    | 120    | 422   | 226    | 7       | 568   | 218          | 46        | 804    |
| Sulfate (mg/l)          | 28     | 15     | 213   | 61     | 10      | 199   | 133          | 23        | 879    |
| Chloride (mg/l)         | 74     | 42     | 550   | 53     | 19      | 205   | 52           | 18        | 3480   |
| Fluoride (mg/l)         | 0.20   | 0.10   | 0.50  | 0.20   | 0.00    | 1.10  | 0.30         | 0.00      | 0.70   |
| Nitrate (mg/l as N)     | 0.18   | 0.00   | 21.00 | 0.20   | 0.00    | 20.40 | 0.40         | 0.00      | 70.00  |
| рН                      | 7.40   | 6.40   | 8.50  | 7.20   | 5.50    | 8.50  | 7.40         | 6.2       | 8.30   |
| Total Alkalinity (mg/l) | 194    | 98     | 346   | 162    | 6       | 256   | 179          | 38        | 659    |
| Total Hardness as CaCO3 | 226    | 72     | 726   | 223    | 14      | 488   | 255          | 39        | 1606   |
| TDS (mg/l)              | 361    | 271    | 1411  | 369    | 121     | 850   | 436          | 227       | 2187   |
| Specific Conductance    | 556    | 462    | 2470  | 586    | 192     | 1400  | 776          | 370       | 11200  |

SAWS has had numerous studies prepared by other consulting engineers to evaluate the quality and quantity of this specific groundwater source as well as several delivery schemes. The most promising of the delivery schemes calls for transmission piping from the well field over a 107 mile route through Caldwell and Guadalupe Counties terminating at a water treatment plant in eastern Bexar County. This option has a total project cost in excess of \$400,000,000.00. When you examine annual costs and project yield, the cost of this water is calculated at \$864 per acre-feet or \$2.65 per 1000 gallons. This includes the cost of the raw water, well field, transmission facilities including a 107 mile transmission line to a point in eastern Bexar County, and a water treatment plant (51.6 MGD) to remove iron and manganese. Costs do not include integration into the SAWS distribution system.

# **Water Quality**

Let us first understand the source of the surface water considered in this study - The Colorado River. LCRA built several dams on the Colorado River from 1935 to 1951 to create Lakes Buchanan, Inks, Marble Falls, Travis, and Austin. They operate the dams and regulate water releases from the lakes to manage floods and provide water for municipal and industrial water supply, irrigation, mining, hydropower generation, and recreation. Town Lake is impounded by Longhorn Dam which is owned and operated by the City of Austin.

The headwaters of the Colorado River occur in eastern New Mexico and flow to the southeast across Texas approximately 600 miles, discharging into Matagorda Bay and the Gulf of Mexico. According to the "Texas Commission on Environmental Quality's 2002 The State of Texas Water Quality Inventory", the Colorado River has good water quality and fully supports public water supply use for the reaches of the river where water intake facilities are being considered in this study.

Water quality data for three locations in the Colorado River Basin (Figure 4.3) are summarized in Table 4-3. This data describes water that is relatively consistent and typical of the Colorado River. The water is hard with high alkalinity. It is expected that turbidity levels will fluctuate when storm events occur within the river's watershed. It is reported that concentrations of aluminum, iron and manganese may occasionally exceed the secondary contaminant limits. All of these constituents are quite manageable by a modern water treatment facility.

**Table 4-3**Colorado River Water Quality

|                                    | Ton    | n Lake     | Who    | ırton    | Bay     | v Citv    |
|------------------------------------|--------|------------|--------|----------|---------|-----------|
|                                    | Median | Range      | Median | Range    | Median  | Range     |
| Alkalinity (mg/L as CaCO3)         | 174    | 117-235    | 182    | 73-286   | 200     | 69-256    |
| Total Organic Carbon (mg/L)        | 3      | 1-5.1      | 4      | 2.0-16.0 | 5       | 1.0-11.0  |
| Nitrate/Nitrite N (mg/L)           | 0.26   | 0.02-0.72  | 1.12   | 0.02-3.8 | 0.02    | .01099    |
| TKN (mg/L as N)                    | 0.447  | 0.03-2.68  | 0.873  | 0.02-5.6 | 0.72    | .08-3.45  |
| pH (mg/L)                          | 7.8    | 7.2-8.3    | 8.11   | 6.94-9.4 | 8.11    | 6.76-8.8  |
| Total Phosphorous (mg/L)           | 0.04   | 0.01-0.269 | 0.374  | 0.07-    | 0.26    | .005-1.04 |
|                                    |        |            |        | 2.16     |         |           |
| Sulfate (mg/L)                     | 38     | 14.8-99    | 40.2   | 12-220   | 39.5    | 0.42-220  |
| Temp (Degrees Centigrade)          | 21.5   | 10.7-31.15 | 22.4   | 7.2-33.7 | 22.3    | 6.5-32.9  |
| Calcium                            | 50.6   | 48.8-50.6  | 59.8   | 59.8     | 44.6    | 44.6      |
| Hardness, Total (mg/L CaCO3)       | 209    | 188-213    | 235    | 220-238  | 200     | 134-243   |
| Chlorophyll-A, Phytoplanktonug (L) | 2      | .2-73.3    | 4      | .2-136   | .8-83.4 | 5.9       |
| Magnesium, Dissolved (mg/L)        | 21     | 21-21.2    | 21.6   | 21.6     | 21.5    | 21.5      |

Notes: Town Lake near City of Austin, Wharton and Bay City near Gulf of Mexico approximately 100 miles down river of Austin

# **Surface Water Treatability**

Information on treating the water in the Colorado River near the City of Austin has been largely derived from the City of Austin's own treatment experience. The City of Austin operates three water treatment plants, two on Lake Austin and one on Town Lake. Table 4-4 identifies the three water treatment facilities.

Table 4-4
City of Austin Treatment Process
(MGD)

| Water Treatment<br>Plant | Process   | Capacity | Disinfection         | Source            |
|--------------------------|-----------|----------|----------------------|-------------------|
|                          | Lime      |          |                      | Lake Austin       |
| Davis                    | Softening | 118      | Chlorine/Chloramines | Colorado<br>River |
|                          | Lime      |          |                      | Lake Austin       |
| Ullrich                  | Softening | 100      | Chlorine/Chloramines | Colorado<br>River |
|                          | Lime      |          |                      | Town Lake         |
| Green                    | Softening | 42       | Chlorine/Chloramines | Colorado<br>River |

The City of Austin has more experience in treating the waters of the Colorado than anyone else. It is important to examine their historical experience in developing our proposed process selections.

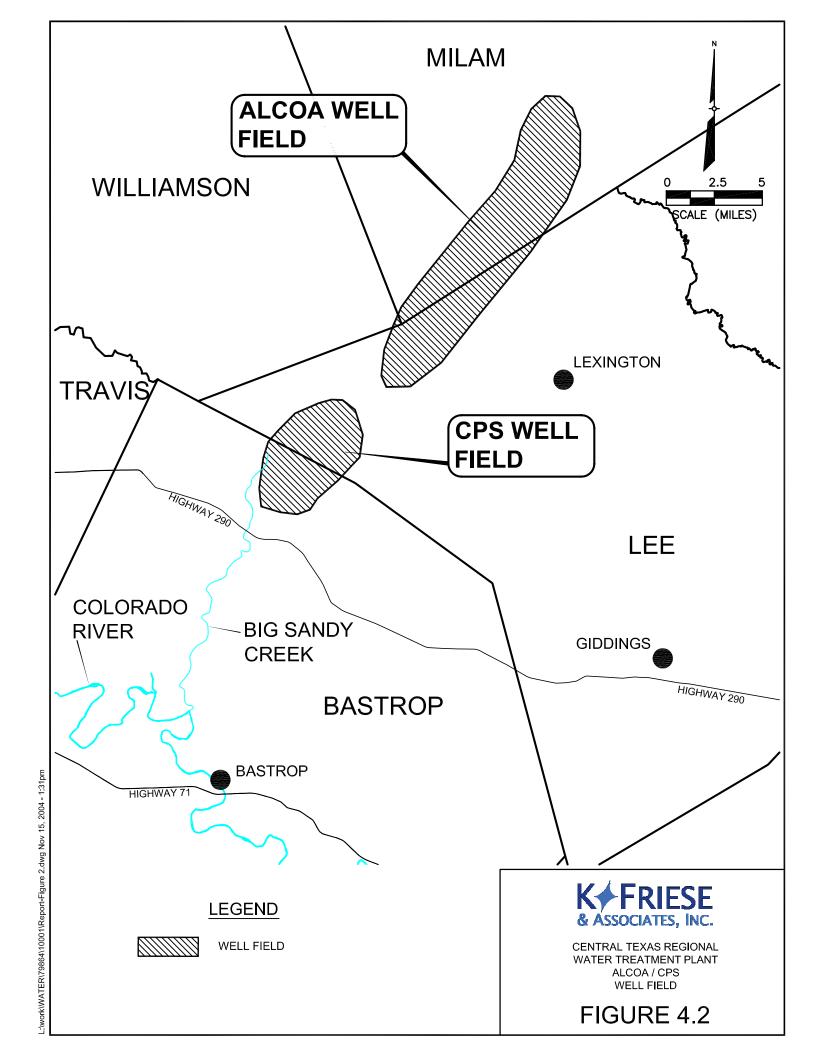
The Green, Davis and Ullrich Water Treatment Plants are lime-softening plants. The Green and Davis WTPs are conventional lime softening plants with rapid mix basins, flocculation, sedimentation and filtration. The softening process at the Ullrich WTP is performed in upflow solids contact basins. As a result of the lime softening process the pH of the water is increased from approximately 8 to 10 or greater.

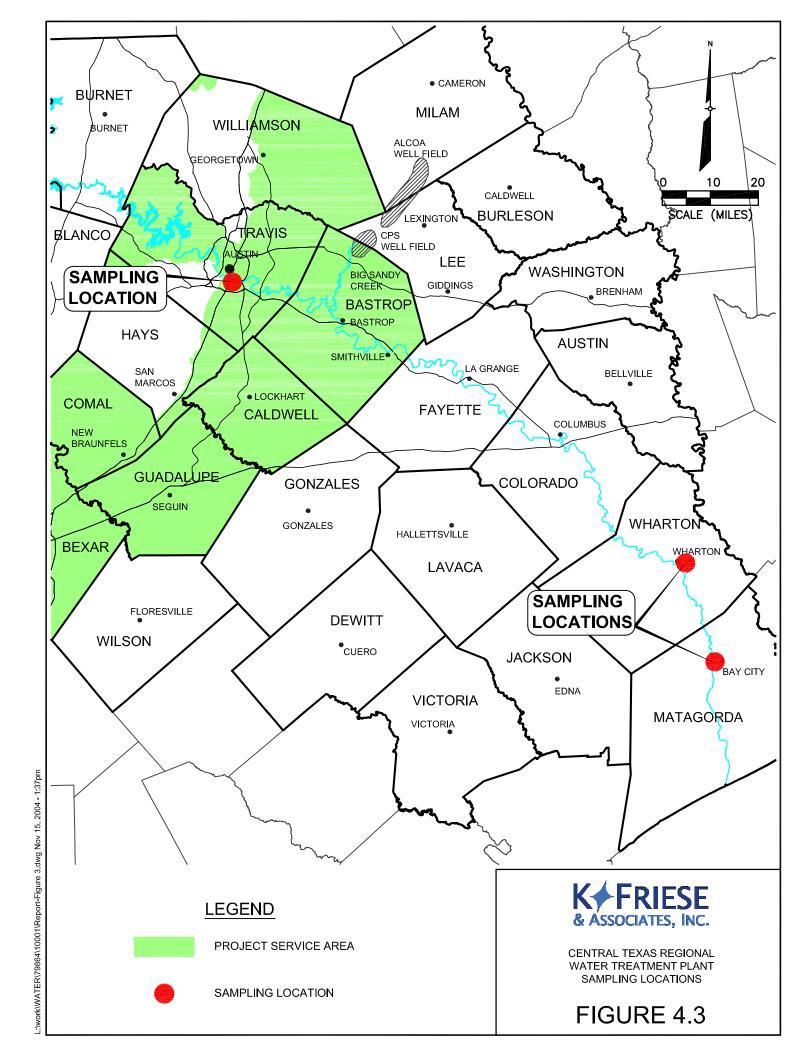
Currently gaseous chlorine is used for primary disinfection. After an appropriate contact time ammonia is added to form chloramines.

Ferric sulfate is used at all three plants as a coagulant. Fluoride is added to the water to promote dental health. Powdered activated carbon (PAC) is used as needed for taste and odor control.

In recent years Davis and Ullrich began recarbonation to reduce the pH and scaling potential in the filters and distribution system.

It is important that we examine this approach for possible consideration for a new water treatment plant.





# **Regulatory Framework**

Water treatment regulations have evolved significantly since the advent of the Safe Drinking Water Act in 1974. A major challenge for water suppliers is how to balance the risks from microbial pathogens and disinfection byproducts. It is important to provide protection from these microbial pathogens while simultaneously ensuring decreasing health risks to the population from disinfection byproducts (DBPs). The Federal regulations that need to be considered include the following:

- 1. Safe Drinking Water Act (Primary Drinking Water Standards)
- 2. Surface Water Treatment Rule
- 3. Lead and Copper Rule
- 4. Total Coliform Rule
- 5. Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule
- 6. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- 7. Long-Term Enhanced Surface Water Treatment Rule (LT1ESWTR)
- 8. Filter Backwash Rule
- 9. Arsenic Rule
- 10. Radionuclides Rule
- 11. Unregulated Contaminant Monitoring Rule (UCMR)
- 12. Pharmaceutical and Personal Care Products (PPCPs) (Future)
- 13. Secondary Drinking Water Regulation
- 14. Total Coliform Rule and Distribution System Rule (Future)

The U.S. Environmental Protection Agency (EPA) is in the process of issuing two additional regulations, the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 D/DBPR.

The LT2ESWTR includes the following provisions:

- 1. Source water monitoring for Cryptosporidium
- 2. Additional Cryptosporidium treatment techniques for filtered systems based on source water Cryptosporidium concentrations
- 3. Inactivation of Cryptosporidium for all unfiltered systems
- 4. Disinfection profiling and benchmarking to assure continued levels of microbial protection while PWs take the necessary steps to comply with new DBP standards
- 5. Covering, treating or implementing a risk management plan for uncovered finished water reservoirs

The expected requirements for the Stage 2 D/DBPR are:

- -80 ug/L TTHM (Total Trihalomethanes)
- -60 ug/L HAA5 (Haloacetic Acid)

It will be required that each system conduct an Initial Distribution System Evaluation (IDSE) and compliance with each MCL will be determined based on a Locational Running Annual Average.

It is expected that Federal Regulations will continue to put emphasis on better filter performance and control of disinfection byproducts.

## **Softening**

Hard water can cause scaling problems in water heaters as well as other appliances where the temperature of the

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water is increased and soap does not lather well in hard water. "Hardness" in water is primarily the result of concentrations of naturally occurring calcium and magnesium ions that are dissolved in the water. Because of these issues some water utilities choose to soften water during the treatment process.

Hardness in water is derived from contact with soil and rock formations, which in the case of Central Texas is contact with limestone formations. The water in the Colorado River is relatively hard with calcium carbonate hardness in the range of 220 mg/L. In general the degree of hardness is classified as follows:

Table 4-5
Hardness Classification
(mg/L)

| Hardness  | CaCO <sub>3</sub> |
|-----------|-------------------|
| Soft      | 0 to 75           |
| Moderate  | 75 to 150         |
| Hard      | 150 to 300        |
| Very Hard | Above 300         |

Source: Water Treatment Plant Design, 1998.

For most applications, total hardness of 80-120 mg/L appears to be a typical design target for softening facilities.

In the lime softening process, the soluble hardness constituents are converted to insoluble precipitates that are removed by settling and filtration. Softening is usually accomplished by adding chemical lime (CaO) to the water to increase its pH. Elevating the pH of the water to about 10.3 precipitates the ferrous, manganous, and calcium ions out of the water. Raising the pH further begins to precipitate magnesium ions as well. Softening to remove only the calcium hardness is called lime softening, while softening to remove calcium and magnesium hardness is called excess lime softening.

Finished water quality data for both the City of Austin and the City of San Antonio are presented in Tables 4-6 and 4-7. It is evident from this information that the characteristics of the drinking water in these two communities is somewhat different. First San Antonio is used to a relatively hard water which is softened using home softeners at the individual customer's location. Austin Water Utility provides softened water.

Also the disinfection practice of these two communities is different with San Antonio using free chlorine and Austin using a combination of chlorine and chloramine disinfection. Both communities fluoridate.

**Table 4-6** Finished Water Quality Data - City of Austin

# **CITY OF AUSTIN** WATER QUALITY SUMMARY 1st Quarter Averages (January 1, 2004 to March 31, 2004) **Preface**

|   | DWTP  | GWTP  | UWTP  | DWTP  | <b>GWTP</b> | UWTP  | SDWA Tap   |
|---|-------|-------|-------|-------|-------------|-------|------------|
| CONSTITUENT (mg/L)                        | Raw   | Raw   | Raw   | Тар   | Тар         | Тар   | MCL/[SMCL] |
| Total Ammonia (as N)                      | 0.05  | 0.05  | 0.05  | 0.49  | 0.49        | 0.51  |            |
| Free Ammonia (as N)                       |       |       |       | 0.10  | 0.12        | 0.13  |            |
| Calcium                                   | 46    | 54    | 46    | 12    | 16          | 14    |            |
| Chlorine Residual                         |       |       |       | 2.27  | 2.20        | 2.23  |            |
| Fluoride                                  | 0.22  | 0.23  | 0.22  | 0.92  | 0.81        | 0.88  | 4/[2]      |
| Magnesium                                 | 20    | 20    | 20    | 18    | 18          | 16    |            |
| Sulfate                                   | 30.5  | 32.6  | 31.1  | 37.0  | 37.4        | 35.9  | [250]      |
| Total Phosphate                           | 0.03  | 0.04  | 0.03  | 0.91  | 1.11        | 1.01  |            |
| Total Hardness (as CaCO <sub>3</sub> )    | 198   | 220   | 199   | 104   | 114         | 100   |            |
| pH (units)                                | 8.2   | 8.0   | 8.2   | 9.8   | 9.8         | 9.6   | [>7.0]     |
| Conductivity (umhos/cm)                   | 484   | 516   | 484   | 328   | 344         | 325   |            |
| Total Alkalinity (as CaCO <sub>3</sub> )  | 168   | 184   | 168   | 68    | 77          | 65    |            |
| Phenol Alkalinity (as CaCO <sub>3</sub> ) | 0     | 0     | 0     | 20    | 23          | 16    |            |
| Total Solids                              | 298   | 319   | 294   | 198   | 208         | 199   | [500]      |
| Threshold Odor (TON)                      | 4     | 4     | 4     | 0     | 0           | 0     | [3]        |
| Total Organic Carbon                      | 3.16  | 2.77  | 3.10  | 2.23  | 2.09        | 2.11  |            |
| Turbidity (NTU)                           | 4.09  | 2.91  | 3.81  | 0.06  | 0.06        | 0.04  | 0.3        |
| Silica                                    | 8.0   | 8.1   | 7.9   | 7.6   | 8.3         | 7.6   |            |
| UV254 (cm <sup>-1</sup> )                 | 0.060 | 0.050 | 0.060 | 0.050 | 0.040       | 0.040 |            |
| Total Coliform (Col/100ml)                | 106   | 586   | 158   | <1    | <1          | <1    |            |
| E.Coli (Col/100ml)                        | 13    | 114   | 14    | <1    | <1          | <1    |            |

Parameters listed below were analyzed by the Texas Department of Health for compliance with the Safe Drinking Water Act.

|                    | DWTP | GWTP | UWTP | DWTP     | GWTP     | UWTP     | SDWA Tap     |
|--------------------|------|------|------|----------|----------|----------|--------------|
| CONSTITUENT (mg/L) | Raw  | Raw  | Raw  | Тар      | Тар      | Тар      | MCL/[SMCL]   |
| Nitrate (as N)     | &    | &    | &    | 0.0133   | 0.218    | <0.0100  | 10           |
| Chloride           | &    | &    | &    | 36.9     | 37.1     | 36.6     | [250]        |
| Trihalomethane     | &    | &    | &    | 0.0219   | 0.0236   | 0.0168   | 0.080        |
| Sodium             | &    | &    | &    | 18.9     | 19.0     | 19.1     |              |
| Aluminum           | &    | &    | &    | 0.017    | 0.020    | 0.008    | [0.05 - 0.2] |
| Arsenic            | &    | &    | &    | < 0.002  | < 0.002  | < 0.002  | 0.01         |
| Barium             | &    | &    | &    | 0.007    | 0.006    | 0.010    | 2            |
| Cadmium            | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.005        |
| Chromium           | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.1          |
| Copper             | &    | &    | &    | < 0.001  | 0.003    | < 0.001  | 1.3 **       |
| Iron               | &    | &    | &    | < 0.05   | < 0.05   | < 0.05   | [0.3]        |
| Lead               | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.015 **     |
| Manganese          | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | [0.05]       |
| Mercury            | &    | &    | &    | < 0.0002 | < 0.0002 | < 0.0002 | 0.002        |
| Nickel             | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | [0.10]       |
| Selenium           | &    | &    | &    | < 0.004  | < 0.004  | < 0.004  | 0.05         |
| Silver             | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.1          |
| Antimony           | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.006        |
| Beryllium          | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.004        |
| Thallium           | &    | &    | &    | < 0.001  | < 0.001  | < 0.001  | 0.002        |
| Zinc               | &    | &    | &    | < 0.004  | < 0.004  | < 0.004  | [5.0]        |
| Endrin             | &    | &    | &    | < 0.0002 | < 0.0002 | < 0.0002 | 0.002        |
| Lindane            | &    | &    | &    | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002       |
| Methoxychlor       | &    | &    | &    | < 0.0002 | < 0.0002 | < 0.0002 | 0.04         |

SDWA MCL = Safe Drinking Water Act Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level standard recommended by TCEQ for aesthetic quality
\*\* = Action Levels

<sup>&</sup>lt; = Symbol indicates levels are below detection limits of the instrumentation or method

<sup>&</sup>amp; = No data available

**Table 4-7** Finished Water Quality Data - City of San Antonio

| Substance                               | Highest<br>Concentration found<br>in Water | Concentration<br>Range found in<br>Water | MCL | MCLG | Possible Source   |
|---|--|--|-----|------|---|
| Nitrate (ppm)<br>2003                   | 2.12                                       | .06-2.12                                 | 10  | 10   | Erosion of natural deposits;<br>Runoff from fertilizer use;<br>Leaching from septic tanks,<br>sewage. |
| Barium (ppm)<br>2003                    | 0.0516                                     | 0.0487-0.0516                            | 2   | 2    | Erosion of natural deposits;<br>Discharge of drilling wastes;<br>Discharge from metal refineries.     |
| Fluoride* (ppm)<br>2003                 | 1.1  | 0.5 – 1.1                                | 4   | 4    | Erosion of natural deposits;<br>Discharge from fertilizer and<br>aluminum factories.                  |
| Nitrite (ppm)<br>2003                   | 0.01                                       | ND- 0.01                                 | 10  | 10   | Erosion of natural deposits;<br>Runoff from fertilizer use;<br>Leaching from septic tanks,<br>sewage. |
| Tetrachloroethylene<br>(ppb)<br>2003    | 0.9  | ND - 0.9                                 | 5   | 0    | Leaching by PVC pipes;<br>discharge from factories and dry<br>cleaners.                               |
| Di-(2-ethyllhexyl)<br>phthalate (ppb)** | 4.19                                       | ND - 4.19                                | 6   | 0    | Discharge from rubber and<br>chemical factories.  |
| Gross alpha adjusted<br>(pCi/l)<br>2003 | 4.7  | ND - 4.7                                 | 15  | 0    | Erosion of natural deposits   |

Fibroride in the form of hydrofluorosilic acid (H2SiF6) was added to SAWS drinking water as of August 2002.

\*\* Phthalate contamination was unavoidable in the process of analyzing the sample for this substance, therefore this concentration may not have been reliable.

#### Other Substances (2003)

| Substance              | Concentration Range (ppm) | Avg. Concentration (ppm) | MCL (ppm)     |
|------------------------|---------------------------|--------------------------|---------------|
| Calcium                | 71 - 91                   | 81                       | Not regulated |
| Chloride               | 20                        | 20                       | 250           |
| Copper                 | 0.005 - 0.007             | 0.006                    | 1             |
| Magnesium              | 16 - 29                   | 23                       | Not regulated |
| Sodium                 | 6 - 9                     | 8                        | Not regulated |
| Sulfate                | 17 - 20                   | 19                       | 250           |
| Total Hardness a       | 240 - 343                 | 292                      | Not regulated |
| Total Alkalinity a     | 209 - 319                 | 264                      | Not regulated |
| Total Dissolved Solids | 283 - 358                 | 321                      | 500           |
| Zinc                   | 0.0336 - 0.129            | 0.08                     | 5             |

a As Calcium Carbonate

# Required Monitoring - No MCLs <sup>d</sup> (2003)

| Substance <sup>e</sup> | Range<br>Detected<br>(ppb) | Average Concentration (ppb) | Reasons for Monitoring                               |
|------------------------|----------------------------|-----------------------------|--|
| Chloroform             | ND                         | ND                          | <sup>d</sup> These values are from points of entry.  |
| Bromodichloromethane   | ND - 2.4                   | 1.1                         | e Unregulated contaminants<br>monitored helps EPA to |
| Dibromochloromethane   | ND - 2.9                   |                             | determine where certain contaminants occur and       |
| Bromoform              | ND - 1.3                   | 1.1                         | whether EPA needs to<br>regulate those contaminants. |

#### Lead and Copper Results f (2001)

| Substance       | 90 <sup>th</sup><br>Percentile | Action<br>Level | Number of residences<br>exceeding Action Level | Possible Source    |
|-----------------|--------------------------------|-----------------|--|--------------------|
| Lead (ppb)      | 4.9                            | 15              | 0  | Corrosion of       |
| Copper<br>(ppm) | 0.215                          | 1.3             | 0  | household plumbing |

f: These two metals get into the water because of corrosion of household plumbing. Many older homes have copper pipes that were put together with lead-based solder. The 90th percentile means that 90 percent of the homes measured had less than that.

A total of 50 residences were monitored.

#### Microbiological Contaminants Monitoring (2003)

| Substance                    | MCL Amount Found |   | Source                                  |
|------------------------------|------------------|---|---|
| Total Coliform<br>(presence) |                  | Highest monthly % of positive samples was 3.24% | Naturally present in the<br>environment |
| Fecal Coliform (presence)    | **               | 0   | Human and animal waste                  |

<sup>\*</sup>presence of coliform bacteria in 5% or more of the monthly samples

\*\*A routine sample and a repeat sample are total coliform positive and one is also fecal coliform or E. coli positive

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#### **Process Alternatives**

Selection of the water treatment process is made to accomplish the following objectives;

- 1. Produce water safe for human consumption meeting all regulations
- 2. Achieve consumer satisfaction
- 3. Produce water at a reasonable capital and operating cost

The water treatment plant will be designed to remove and/or deactivate certain characteristics such as turbidity, color, taste, odor as well as microbial and bacteriological contaminants and other chemical constituents. The typical processes utilized to accomplish this include the addition of coagulation chemicals to the raw water, clarification, filtration and disinfection.

Presented in Figure 4.4 is a proposed conventional lime softening water treatment facility with granular filtration. This is fairly similar to what the City of Austin currently utilizes with the exception that we have substituted Ultraviolet light for disinfection. We present this level of technology for costing purposes if we were to consider the current state of drinking water regulations.

Figure 4.5 presents more advanced technology utilizing lime softening. In this case the granular media filtration system is replaced with filtration membranes. This technology anticipates more stringent regulations which are sure to develop over the life of this water treatment facility and develops the multiple barrier approach that is considered very desirable to minimize the penetration of microbial pathogens.

Figure 4.6 presents a split process water treatment facility. This process approach recognizes that some of the participants require soft water and some do not. In this approach raw water is split at a distribution box and routed through separate processes. Part of the water would be lime softened. Part of the water would be treated using a so-called conventional water treatment process. Both waters would be filtered separately through microfiltration membranes. This split process would accommodate separate disinfection approaches to better match the existing practices of the participant to avoid compatibility problems.

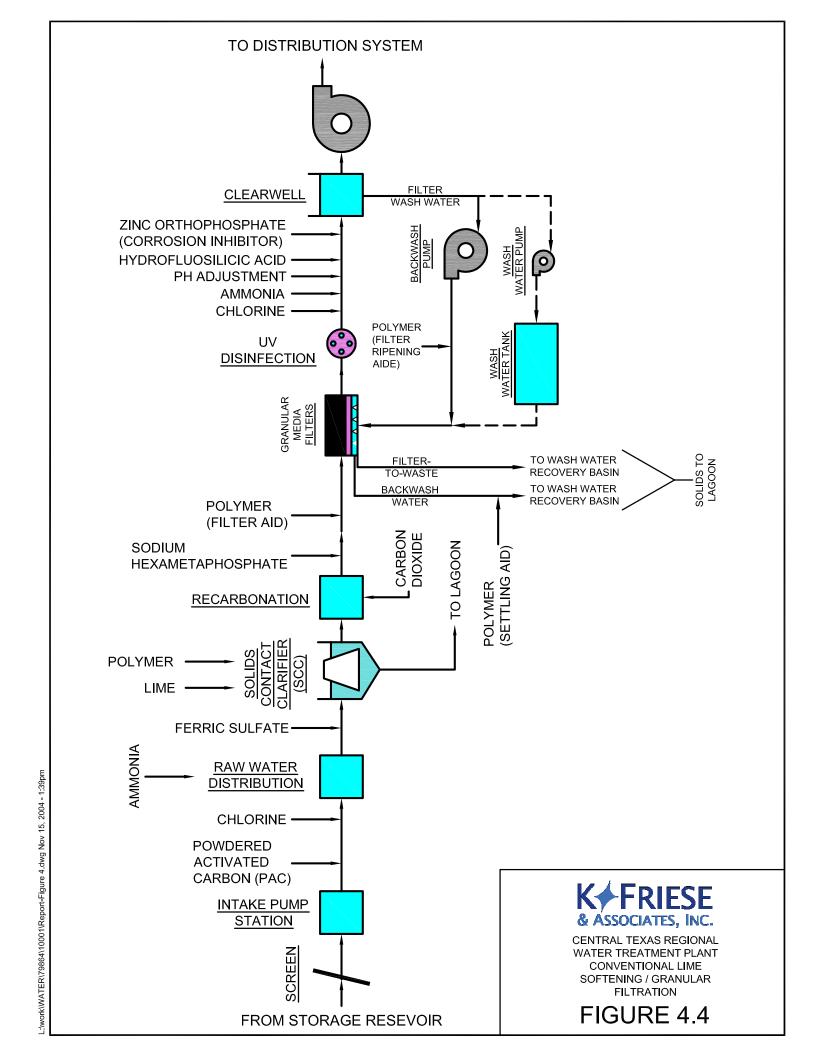
For purposes of this study we will develop costing around the concept of the split process.

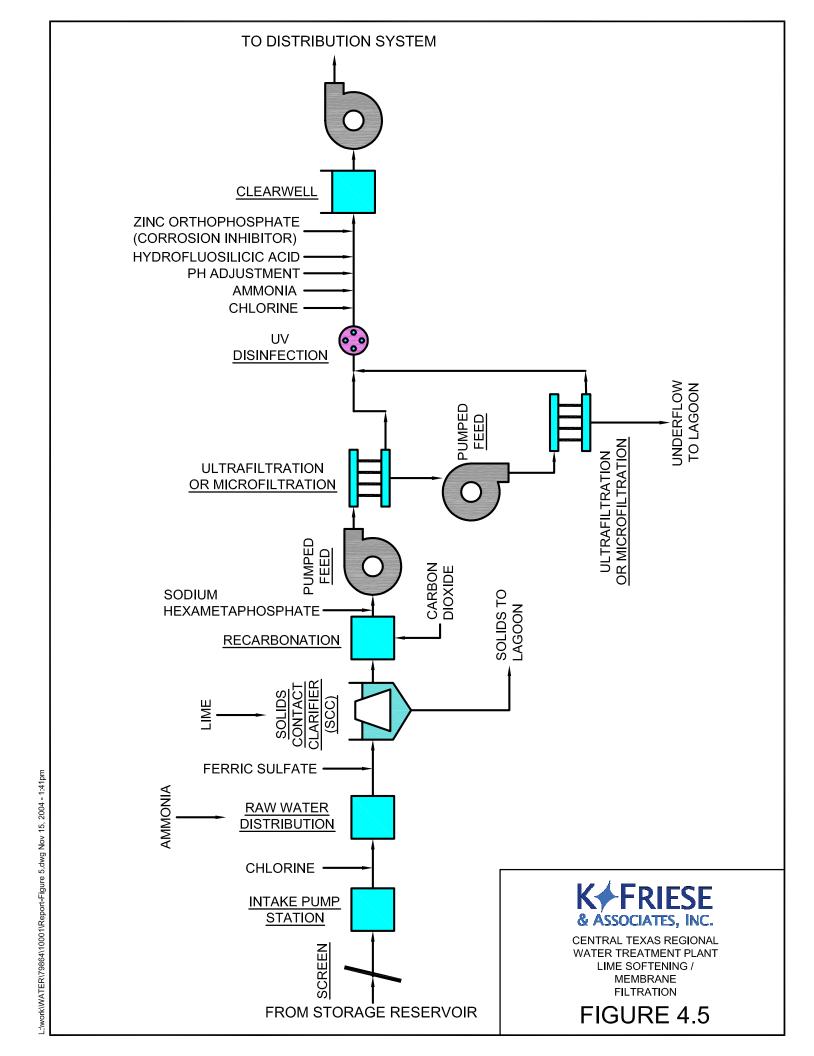
# **Compatibility Issues**

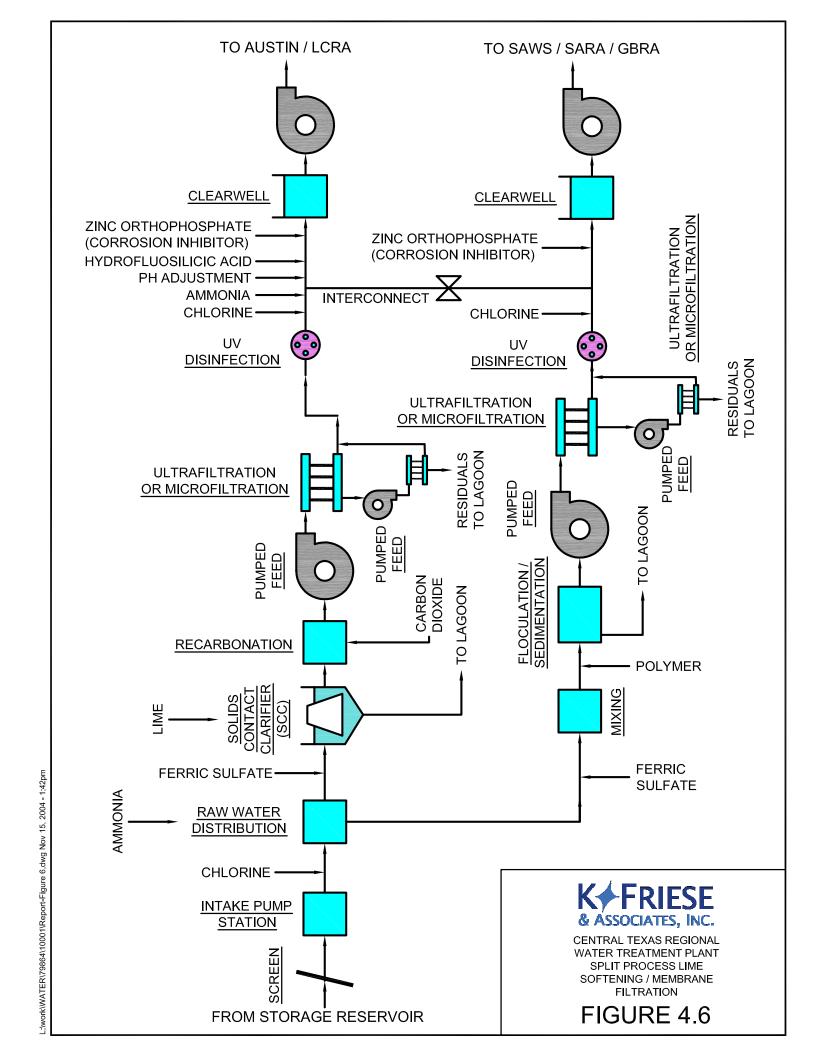
Finished water from this water treatment facility will be distributed to five retail water systems, who in some cases already receive groundwater or surface water from another source, for distribution to their customers. Blending of waters from different sources and treatment plants can have a significant impact on pH stability and distribution system water quality. It will be important to examine these compatibility issues in the process selection. In some cases polishing facilities will be necessary to match the outgoing finished water to the existing water quality. The following compatibility issues should be examined in the future.

Water pH is a major factor in the solubility of pipe materials and films that form from corrosion by-products. Mixing waters with different pH's can result in distribution system instability, colored water and aesthetic water quality issues.

There is also a concern relative to blending waters that have different chlorine-based disinfectants, which can happen when water that is disinfected with chloramines is mixed with water that is disinfected with free chlorine. The concern here is the breakpoint reaction that results in residual depletion. Taste and odor problems develop in the blending zone where conditions might allow the formation of di- and tri-chloramines.







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Using a split process approach will help in minimizing many of the compatibility issues and allow the treatment facility to better match the participant's existing water.

# **Residuals Disposal**

Residuals management will be an important part of the water treatment facility. This section of the report will describe what will be done with those constituents that are removed from the water during the treatment process. This can include the sludge from a conventional water treatment process, the lime sludge produced during the softening process as well as the concentrate from a membrane facility.

For purposes of this study we have assumed that the location of the water treatment plant will be such that we have sufficient land available so we can fully develop lagoons for disposal of residuals. The residuals that need to be considered include the disposal of settled solids from the chemical coagulation process as well as the lime softening sludge. Other options include various thickening and dewatering techniques where adequate land is not available, although these are typically more expensive and maintenance intensive.

The concentrate from a microfiltration or ultrafiltration plant consists only of particulates which were removed from the water. We propose that this also be placed into the lagoon system. This also can be disposed of in a sanitary sewer if one is available nearby, but this is more expensive.

### **Raw Water Storage**

Since the raw water delivery facilities will be designed for average demands, it will be necessary to store raw water at the treatment plant site to allow the facility to meet peak day requirements. Given the extended periods of dry/hot weather that can be experienced in Central Texas, there is a tendency to experience several peak days in succession.

We recommend that the water treatment plant be designed to have the capacity for 30 peak days in succession and that the raw water storage reservoir be sized for the greater of peak requirement less the average day requirement over a continuous 30-day period and 15 days at average day demand.

# **Cost Estimates**

It is recognized in the water industry that the unit capital cost of a water treatment plant varies inversely to the size of the plant, in other words the bigger the plant the smaller the per gallon unit price is. This is one of the reasons that many communities look to participate in larger regional water treatment facilities.

The following cost information for water treatment plants has been developed based on cost experience throughout the region adjusted for current Engineering News Record (ENR) indices to the 3<sup>rd</sup> Quarter of 2004. For purposes of this study we have selected the split process using both conventional water treatment as well as lime softening as shown in Figure 4.6. We will treat each section of the split process as a separate plant for costing purposes. The cost tables are presented in graphical form in Figure 4.7.

Operation and maintenance (O&M) costs were developed as a percentage of capital cost. Cost curves for O&M costs are presented as Figure 4.8. The O&M costs include labor, materials, replacement of equipment, process energy, building energy, chemicals, and pumping energy.

The Capital and O&M costs associated with groundwater treatment facilities has been derived from a letter report developed by HDR Engineering dated August 24, 2004 entitled "Work Item #9 SAWS Simsboro Project: Updates of Delivery Options 1 and 2".

Figure 4.7
Water Treatment Plant Unit Costs
Capital Costs

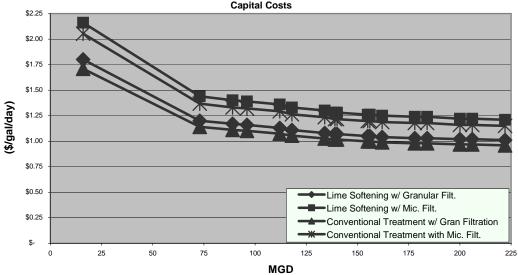
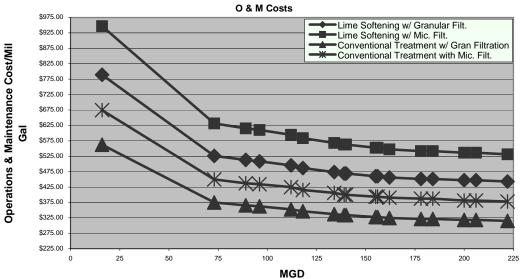


Figure 4.8
Water Treatment Plant Unit Costs





# **TECHNICAL MEMORANDUM**

**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 5 – Establish Potential Take Points (Diversions of Raw Water)

**DATE:** February 8, 2005

# **Background**

The purpose of this study is to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the Cities of Austin and San Antonio. Although various raw water sources have been included in the analysis (specifically the LCRA-SAWS Water Project, groundwater from the Simsboro Aquifer, and the Bastrop/Colorado River diversion point), no attempt has been made to evaluate these sources. The sole focus is defining the benefits of regional treatment – not defining the issues surrounding sources of raw water.

The purpose of this task is to establish potential take points and delivery routes for raw water. In addition to potential sites in Colorado, Wharton and Matagorda Counties, consideration is given to additional surface water diversions in Bastrop County and in Travis County, and to groundwater from the Simsboro Aquifer.

## **Raw Water Intake Locations**

Two general locations were considered for the regional system's raw water intakes. The first location would consist of a series of intakes located in Matagorda, Wharton, and/or Colorado Counties along the lower reaches of the Colorado River. The second general location for an intake or intakes was in the segment of the Colorado River from the City of Austin (Town Lake) downstream to the City of Bastrop.

The lower Colorado intakes would be in the same locations as the intakes contemplated for the LCRA-SAWS Water Project that is currently in the planning phase. It is beyond the scope of this study to select the best specific location for these intakes. The specific siting of these intakes is being done as part of the LCRA-SAWS Water Project planning study. Unfortunately, the LCRA-SAWS Water Project planning study has not yet identified the best location for these intakes. For the purpose of this study, it was assumed that the location of the lower Colorado intakes would be in Matagorda County (just downstream of the Wharton/Matagorda county line) and this location was used for all alternatives considered. This location was chosen as the most conservative in terms of both water rights and cost. That is, it is a location that is most likely to have the available water rights needed for the project and is the farthest from the service area. If the lower Colorado intakes can be located further upstream, overall transmission main costs will be reduced but it is assumed that all alternatives would be affected almost equally.

For the river segment between Austin and Bastrop, the alternative analysis considered intakes on Town Lake at Austin and just upstream of Bastrop. The Town Lake intake was considered because the City of Austin has rights to withdraw water at this location. Furthermore, raw water pumped from this location would have lower energy costs associated with it compared with allowing this water to flow down to Matagorda County and having to pump it to the water treatment plant and then back to Austin.

An intake at Bastrop was considered initially because of diversion of 18,000 acre-feet/year at Bastrop is contemplated in the State Water Plan. As the alternative analysis process developed, it also became apparent that a Bastrop intake and raw water transmission main to the water treatment plant might also be used to reduce costs to

Central Texas Regional Water Treatment Plant – Task 5 – Establish Potential Take Points (Diversions of Raw Water) February 8, 2005
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deliver ground water from the ALCOA/CPS well fields to San Antonio.

While it is conceivable that all the raw water available to SAWS, LCRA, and the City of Austin could be diverted at the lower Colorado intake(s) in Matagorda County, it was considered that a second intake up-river might lower the overall project costs. Having an intake upriver could reduce the overall operational costs, since during high river flow periods, raw water that would have been diverted downstream, could be diverted upriver through the Town Lake or Bastrop intakes. This would reduce the overall pumping costs for both intakes without significantly affecting Colorado River flows.

A sole intake at Town Lake or Bastrop is not feasible because there are not sufficient water rights available in the Colorado River to meet the participant's demands. Thus, the Matagorda intakes are necessary under all scenarios.

While up-river intakes at both Town Lake and Bastrop are possible from technical and water rights points of view, the economics do not appear viable. The cost of two intakes and two raw water transmission mains increase the overall project costs over alternatives that have only one intake. An intake at Town Lake the advantage of the existing Longhorn Dam facilitating the diversion

However, the Town Lake intake could not be used to withdraw the 18,000 acre-feet of Colorado River water that may be available at Bastrop, nor could the Town Lake intake offer synergies with the transmission of ALCOA/CPS groundwater to the water treatment plant. The initial screening of the alternatives also indicated that a water treatment plant location southeast of Austin and an intake near Bastrop would offer a lower overall project cost compared with an intake on Town Lake.

For these reasons, the alternatives evaluated in this study considered intakes in Matagorda County and just upstream of Bastrop. Because of the general nature of the intake, off-channel reservoir, and treatment plant sites; delivery routes for raw water were taken to be a straight line between the assumed location of each of these facilities.

#### Matagorda County Raw Water Intake Facilities and Off-Channel Reservoirs (RWI-A)

In accordance with the planning for the LCRA-SAWS Water Project, the lower Colorado River intake system in Matagorda County will involve a low head dam across the river and four to six intake structures that would pump river water to four to six large off-channel reservoirs near the Colorado River. Depending on the location of the intakes, the low head dam may or may not be necessary. For the purpose of this study, it has been assumed that there would be four low head dams of the inflatable type, four raw water intakes, and four reservoirs (except for alternatives 1D and 2A - Special).

According to the Project Viability Assessment (PVA) for the LCRA-SAWS Water Project, the lower Colorado intakes would be designed to withdraw 4000 to 6000 cfs from the river during peak flow events. A peak withdrawal of 4,000 cfs has been assumed in this analysis. The average withdrawal would be 132,000 acrefeet/year (equivalent to 182 cfs). Thus, each of the four intakes would be sized to "scalp" up to 1000 cfs during periods of high river flow.

Each intake would pump raw water through a raw water main to an off-channel reservoir. Thus, there would be a total of four raw water mains, each designed for a peak flow of 1,000 cfs and having a length of one mile and a diameter of 120 inches. Each of the four off-channel reservoirs would have a storage capacity of 25,000 acre feet and a surface area of 1,340 acres.

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# Raw Water Transmission Main and Pump Stations (RWTM-A)

The raw water stored in the four off-channel reservoirs in Matagorda County would be pumped via a high head pumping station(s) into a raw water transmission main (RWTM) that would deliver the raw water to the water treatment plant. Although the distances between the off-channel reservoirs may, and probably would, dictate the need for more than one high head pumping station at the upstream end of the RWTM, this alternative analysis has assumed all four off-channel reservoirs would feed to a single high head pumping station.

In all of the alternatives, RWTM-A would be over 120 miles in length. Due to this length and the elevation difference between Matagorda County and the alternative WTP sites, at least two additional booster pumping stations would be necessary along the route to avoid pipeline pressures above 150 psi. Each of the booster stations would also include a balancing reservoir with a capacity of about 5 million gallons, which would represent about 60 minutes of storage at the design pumping rate of about 82,000 gpm. The purpose of the balancing reservoirs along the RWTM would be to facilitate operation of the booster pumps, which would take suction from the balancing tank. The balancing tanks are not intended to provide maximum demand versus average demand balancing.

# **ALCOA/CPS Groundwater**

As mentioned in an earlier chapter, SAWS has agreements to obtain as much as 55,000 acre-feet of groundwater from well fields in the Simsboro Aquifer in Bastrop, Lee and Milam Counties. SAWS is considering a separate pipeline to transport this groundwater to San Antonio. However, since this pipeline would cross and parallel the raw water transmission main for a regional facility, the transportation of this groundwater to San Antonio has been considered in the alternatives analyzed in this project. Of particular interest is whether or not this groundwater, together with limited water rights in the Colorado River at Bastrop, could be used to delay the construction of the lower Colorado intakes, off-channel reservoirs and RWTM-A.

Several possibilities were identified for integrating the ALCOA/CPS groundwater into a regional water supply plan. These are as follows:

- 1. Groundwater could be piped to the off-channel reservoir near the Bastrop intake and combined with surface water, then pumped to the water treatment plant in a common raw water transmission main (RWTM-B).
- 2. The groundwater could be discharged to Big Sandy Creek at Hwy 290 and allowed to flow to the Colorado River where it would mix with surface water. This would allow the diversion of an equal amount of raw water from the Colorado River either at the Bastrop intake (RWI-B) or at the Matagorda intake downstream (RWI-A). This additional raw water would then be pumped into the off-channel reservoirs near RWI-A or RWI-B and then pumped to the WTP via RWTM-A or RWTM-B.
- 3. The groundwater from the well fields could be treated separately (for iron and manganese removal). The treated water would then be pumped into the potable water transmission system downstream of the WTP that would treat the raw water from the Colorado River.

Option 3 takes advantage of the quality of the groundwater and would result in lower treatment costs for the 55,000 acre-feet/year available from the ALCOA/CPS well fields. However, overall transmission costs could be higher since a separate groundwater transmission main (GWTM) would be required from the well fields and the groundwater treatment plant to the interconnection with the potable water transmission main.

Central Texas Regional Water Treatment Plant – Task 5 – Establish Potential Take Points (Diversions of Raw Water) February 8, 2005
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Transmission main costs would be lower in Option 1 but the groundwater would be treated in the surface water treatment system along with the surface water from the Colorado River. Part of the additional treatment costs could be offset by constructing wells as "non-potable" wells; savings of about \$17 million for the 120 wells anticipated. (San Antonio Water System Preliminary Feasibility of Options to Deliver ALCOA/CPS Ground Water to Bexar County, HDR, Jan 2000; and HDR Update Memo of August 24, 2004).

Transmission costs could be reduced even lower using Option 2, since there would be no need for a GWTM from the well fields to the Colorado River. Since Big Sandy Creek discharges to the Colorado River just upstream of the proposed Bastrop intake (RWI-B), there would be no impact on water rights if an additional 55,000 acre-feet were diverted just downstream at the Bastrop intake.

In the alternative analysis that follows, each of these options is considered in order to estimate the relative savings that could be realized from one option to the next. This information could then be used to judge whether each option should be pursued in more detail in the event a regional system is attractive to the participants.

# **Bastrop Raw Water Intake Facilities and Off-Channel Reservoir (RWI-B)**

As with the Matagorda intakes, the Bastrop intake system will involve low head dams across the river, intake structures with low head pump stations, and off-channel reservoirs near the Colorado River. However, since the diversion at this point would be less, it has been assumed that there would be two low head dams, two raw water intakes, and four reservoirs.

The average yearly withdrawal would be 18,000 acre-feet/year for SAWS plus the withdrawals to meet the LCRA and COA demands (11,200 acre-feet/year and 33604 acre-feet/year in 2065, respectively). In 2065, the total average withdrawal would be 62,804 acre-feet/year, which is equivalent to 87 cfs. The Bastrop intake would be designed to withdraw up to 2000 cfs from the river during peak flow events. The peak withdrawal rate is based on the same ratio of peak withdrawal rate to average withdrawal rate that was determined by LCRA for the Matagorda intake. LCRA would need to undertake a similar analysis to verify this assumed peak withdrawal rate in the event a regional system is pursued.

If the ALCOA/CPS groundwater is discharged to Big Sandy Creek (see Option 2 above under <u>ALCOA/CPS Groundwater</u> section of this memorandum) then RWI-B would be sized to withdraw an additional 55,000 acrefeet/year from the Colorado River. Since the groundwater would be discharged to Big Sandy Creek at an average rate of 55,000 acre-feet/year, the additional withdrawal rate at RWI-B would also be 55,000 acre-feet/year. Thus, no peak withdrawal factor would need to be applied to this volume.

The Bastrop intakes would pump raw water through four raw water mains to four 15,000 acre-foot off-channel reservoirs. Each raw water main would be designed for a peak flow of 224,000 gpm and would have a diameter of 120 inches and a length of two miles. It was assumed that the off channel reservoirs would need to be smaller and possibly farther away from the river near Bastrop (when compared to Matagorda County). Thus, 15,000 acre-foot reservoirs were assumed (instead of 25,000 acre-feet) and two mile raw water mains were used (instead of one mile mains as assumed for the intakes in Matagorda County).

# **Raw Water Transmission Main and Pump Stations (RWTM-B)**

The raw water stored in the off-channel reservoir near the Bastrop intake (RWI-B) would be pumped via a high head pumping station(s) into a raw water transmission main that would deliver the water to the water treatment plant.

Central Texas Regional Water Treatment Plant – Task 5 – Establish Potential Take Points (Diversions of Raw Water) February 8, 2005
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As in the case of RWTM-A, additional booster pumping stations may be necessary along the RWTM-B route to avoid pipeline pressures above 150 psi. Each of the booster stations would also include a balancing reservoir which would have a capacity equivalent to about 60 minutes of storage at the design pumping rate for the raw water transmission main. The balancing tanks would be used to facilitate operation of the booster pumps and are not intended to impact the design basis of RWTM-B, which is the average demand for raw water from the Bastrop intake system.



# **TECHNICAL MEMORANDUM**

**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 6 – Potential Plant Sites and Potable Water Transmission Main Routes

**DATE:** February 8, 2005

# **Background**

The purpose of this study is to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the Cities of Austin and San Antonio. Although various raw water sources have been included in the analysis (specifically the LCRA-SAWS Water Project, groundwater from the Simsboro Aquifer, and the Bastrop/Colorado River diversion point), no attempt has been made to evaluate these sources. The sole focus is defining the benefits of regional treatment – not defining the issues surrounding sources of raw water.

The purpose of this task is to examine potential plant sites and treated water pipeline corridors between Austin and San Antonio.

# **Regional Water Treatment Plant Alternative Sites**

The selection of the treatment process and the factors used in that evaluation are discussed in detail in other sections. This section only discusses the potential sites.

It was anticipated that the siting of the regional water treatment plant would have a major impact on the raw water and finished water transmission routes and pipeline lengths and thus, on both capital and operating costs. In the initial analysis, three sites were considered:

- 1. Alternative 1A: East of San Antonio (just south of I-10 approximately 5 miles east of I-410 Loop)
- 2. Alternative 2A: East of San Marcos (approximately 1 mile northeast of Martindale)
- 3. Alternative 3A: In the northern corner of Caldwell County about 2 miles east of the intersection of Hwys 183 and 21

The selection of specific sites for each of these alternatives was beyond the scope of this study but the sites described above are generally rural and were defined for the purpose of estimating transmission main lengths and for estimating the elevation of the water treatment plant facilities. The objective in choosing these water treatment plant locations roughly parallel to the I-35 corridor was to identify the general location that resulted in the lowest present value. Then, adjustments to that location could be analyzed to find the location with the least overall cost. The results of the evaluation and the adjustments made to the initially selected alternatives are discussed in the technical memorandum for Tasks 3 and 10 (a combined memorandum). Because of the general nature of the treatment plant sites and the additional economical analyses performed under Tasks 3 and 10, treated water pipeline corridors were taken to be a straight line between the assumed location of the plant and each delivery point.

Central Texas Regional Water Treatment Plant – Task 6 - Potential Plant Sites and PWTM Routes February 8, 2005 Page 2 of 6

#### **Potable Water Transmission Mains (PWTMs)**

Each of the participants provided descriptions of the points where they wanted the deliveries of finished water to their distribution system, flow to each connection point, and the hydraulic grade elevation (HGL) at each connection point. This information is used in the alternatives analysis for transmission main length and sizing.

Connection point information coordinated with the participants is summarized below:

- 1. City of Austin The City of Austin has specified the Pilot Knob Reservoir as the connection point. The Pilot Knob Reservoir has an overflow elevation of 720 and 100% of the City's maximum delivery rate will be delivered to this location.
- 2. SAWS SAWS has specified two connection points:
  - a. Northeastern connection point of the Green Mountain Pump Station. The Green Mountain Pump Station has an HGL of 1125 and 40% of the SAWS maximum delivery rate will be delivered to this location.
  - b. The remaining 60% of the SAWS maximum delivery rate will be delivered to the northwestern delivery point, the Culebra Pump Station. The Culebra Pump Station has an HGL of 1080.
- 3. GBRA GBRA connection point is assumed to be located approximately 5 miles south of San Marcos along Highway 123. Based on area topography, an HGL of 740 is used.
- 4. SARA SARA will be using the SAWS Northeastern connection point, the Green Mountain Pump Station, as the delivery point.
- 5. LCRA LCRA connection point is assumed to be located approximately 7 miles south of the City of Austin's Pilot Knob Pump Station. Based on area topography, an HGL of 790 is used.

Connection point HGL and flow data is summarized below in Table 6-1. It should be noted that for each SAWS connection point there are two delivery rates tabulated. SAWS provided two demand scenarios for analysis. These scenarios are further detailed in Task 7 – Connection Points.

**Table 6-1**Connection Point Data

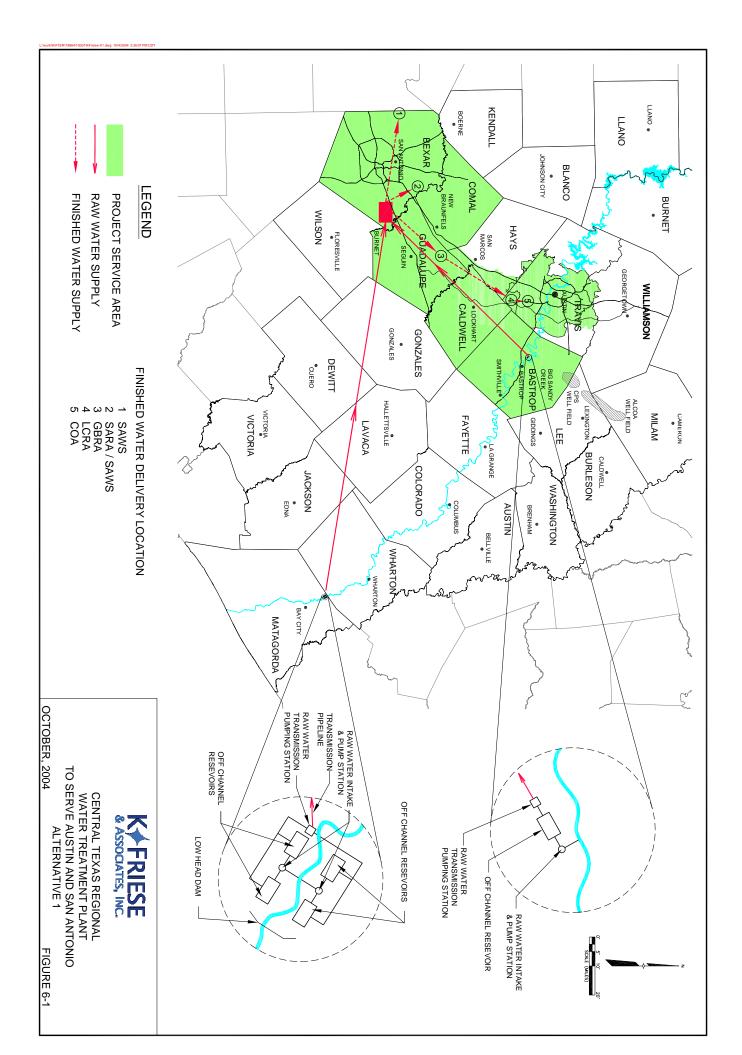
|   | HGL<br>(feet) | 2015<br>Flow<br>(MGD) | 2020<br>Flow<br>(MGD) | 2030<br>Flow<br>(MGD) | 2040<br>Flow<br>(MGD) | 2050<br>Flow<br>(MGD) | 2060<br>Flow<br>(MGD) | 2065<br>Flow<br>(MGD) |
|---|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| City of Austin<br>Pilot Knob<br>Reservoir | 720           | 0                     | 0                     | 25                    | 35                    | 50                    | 50                    | 50                    |
| SAWS<br>Green Mtn.                        | 1125          | 34                    | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  |
| Pump Station                              |               | 34                    | 64.4                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  |
| SAWS<br>Culebra Pump                      | 1080          | 51                    | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 |
| Station                                   | 1000          | 51                    | 96.6                  | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 |
| GBRA                                      | 740           | 0                     | 0                     | 11                    | 14                    | 18                    | 22                    | 22                    |
| SARA<br>Green Mtn.<br>Pump Station        | 1125          | 24                    | 27                    | 33                    | 36                    | 40                    | 44                    | 48                    |
| LCRA                                      | 790           | 0                     | 0                     | 10                    | 20                    | 20                    | 20                    | 20                    |

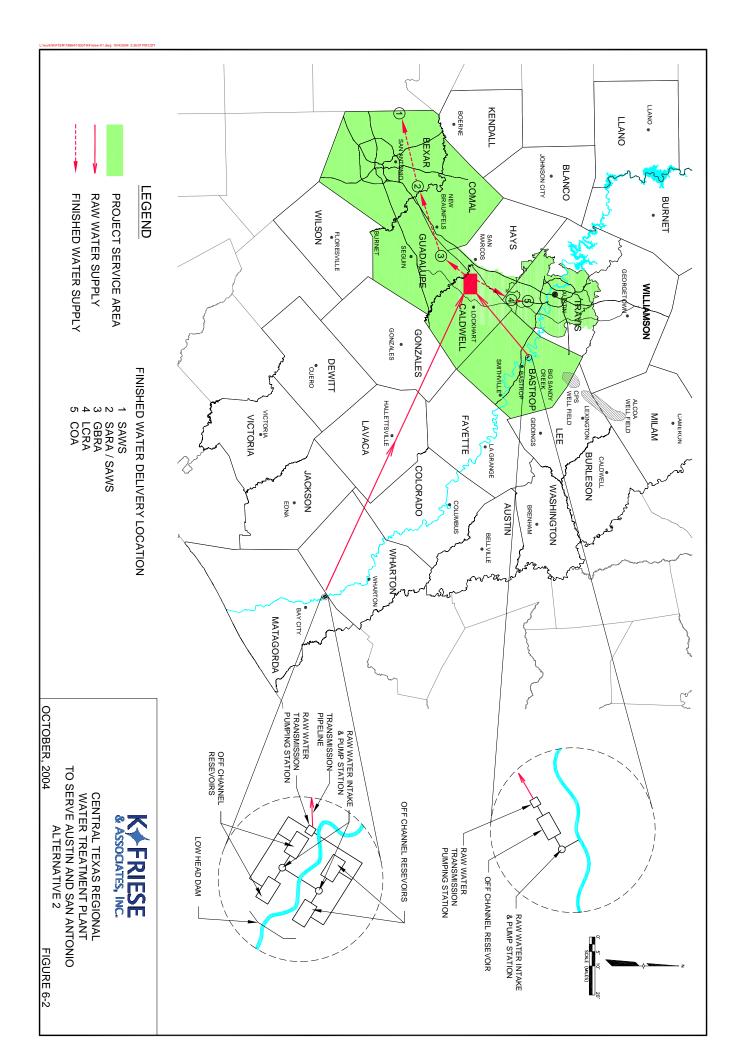
Each system component was then sized based on the assumptions provided in Table 6-2. Based on the participants' delivery points and the water treatment plant locations in each alternative, general routes for the PWTMs were selected. The routes also had to take into account that SAWS, SARA and GBRA required un-softened water while LCRA and the COA required softened water.

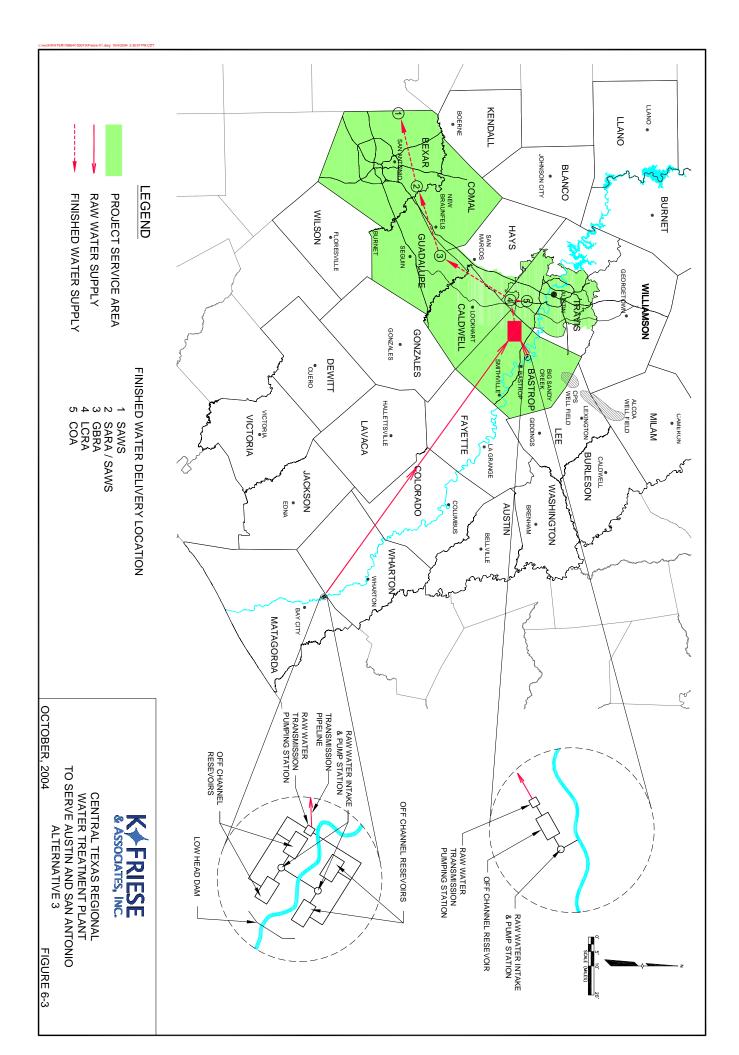
Schematics of the PWTM layouts are shown in Figures 6-1, 6-2, and 6-3.

**Table 6-2**Summary of Design Basis for Each Facility

| Facility              | Design Basis  |
|-----------------------|---|
| RWI-A                 | Peak withdrawal rate from Colorado River at Matagorda |
| RWTM-A                | Average delivery rate to WTP                          |
| ALCOA/CPS Well Fields | Average groundwater extraction rate of 55,000 acre-   |
|                       | feet/year   |
| RWI-B                 | Peak withdrawal rate from Colorado River at Bastrop   |
| RWTM-B                | Average delivery rate to WTP                          |
| WTP                   | Sum of Maximum Day Demands of Participants            |
| PWTM's                | Sum of Connection Point Maximum Day Demands           |









**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 7 - Connection Points

**DATE:** February 8, 2005

Although the purpose of this task is to present the connection points to the study participant's distribution system, flow to each connection point, and the hydraulic grade elevation (HGL) at each connection point; this information was used in the alternatives analysis for transmission main length and sizing which was presented in Task 6. The following text then focuses on connection points, but reiterates much of the information presented in Task 6.

Connection point information coordinated with the participants is summarized below:

- 1. City of Austin The City of Austin has specified the Pilot Knob Reservoir as the connection point. The Pilot Knob Reservoir has an overflow elevation of 720 and 100% of the City's maximum delivery rate will be delivered to this location.
- 2. SAWS SAWS has specified two connection points:
  - a. Northeastern connection point of the Green Mountain Pump Station. The Green Mountain Pump Station has an HGL of 1125 and 40% of the SAWS maximum delivery rate will be delivered to this location.
  - b. The remaining 60% of the SAWS maximum delivery rate will be delivered to the northwestern delivery point, the Culebra Pump Station. The Culebra Pump Station has an HGL of 1080.
- 3. GBRA GBRA connection point is assumed to be located approximately 5 miles south of San Marcos along Highway 123. Based on area topography, an HGL of 740 is used.
- 4. SARA SARA will be using the SAWS Northeastern connection point, the Green Mountain Pump Station, as the delivery point.
- 5. LCRA LCRA connection point is assumed to be located approximately 7 miles south of the City of Austin's Pilot Knob Reservoir. Based on area topography, an HGL of 790 is used.

Connection point HGL and flow data is summarized in Table 7-1. SAWS also provided a second, "delayed demand scenario". The first scenario uses the full amount of water supply available with phasing based on an estimation of when the necessary infrastructure can be in place. The second scenario delays 66,000 acre-feet/year of demand from 2020 to 2030. The second scenario is to be considered if delaying the raw water transmission main from the Matagorda/Wharton County intake location results in a more economically feasible project. SAWS will temporarily obtain the 66,000 acre-feet/year supply from another source until the Matagorda/Wharton County intake is in place. Table 7-2 summarizes the "delayed demand scenario".

**Table 7-1**Connection Point Data

|                                     | HGL<br>(feet) | 2015<br>Flow<br>(MGD) | 2020<br>Flow<br>(MGD) | 2030<br>Flow<br>(MGD) | 2040<br>Flow<br>(MGD) | 2050<br>Flow<br>(MGD) | 2060<br>Flow<br>(MGD) | 2065<br>Flow<br>(MGD) |
|-------------------------------------|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| City of Austin Pilot Knob Reservoir | 720           | 0                     | 0                     | 25                    | 35                    | 50                    | 50                    | 50                    |
| SAWS<br>Green Mtn.<br>Pump Station  | 1125          | 34                    | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  |
| SAWS<br>Culebra<br>Pump Station     | 1080          | 51                    | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 |
| GBRA                                | 740           | 0                     | 0                     | 11                    | 14                    | 18                    | 22                    | 22                    |
| SARA<br>Green Mtn.<br>Pump Station  | 1125          | 24                    | 27                    | 33                    | 36                    | 40                    | 44                    | 48                    |
| LCRA                                | 790           | 0                     | 0                     | 10                    | 20                    | 20                    | 20                    | 20                    |

**Table 7-2**Connection Point Data
Delayed Demand Scenario

|   | HGL<br>(feet) | 2015<br>Flow<br>(MGD) | 2020<br>Flow<br>(MGD) | 2030<br>Flow<br>(MGD) | 2040<br>Flow<br>(MGD) | 2050<br>Flow<br>(MGD) | 2060<br>Flow<br>(MGD) | 2065<br>Flow<br>(MGD) |
|---|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| City of Austin<br>Pilot Knob<br>Reservoir | 720           | 0                     | 0                     | 25                    | 35                    | 50                    | 50                    | 50                    |
| SAWS<br>Green Mtn.<br>Pump Station        | 1125          | 34                    | 64.4                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  | 95.2                  |
| SAWS<br>Culebra Pump<br>Station           | 1080          | 51                    | 96.6                  | 142.8                 | 142.8                 | 142.8                 | 142.8                 | 142.8                 |
| GBRA                                      | 740           | 0                     | 0                     | 11                    | 14                    | 18                    | 22                    | 22                    |
| SARA<br>Green Mtn.<br>Pump Station        | 1125          | 24                    | 27                    | 33                    | 36                    | 40                    | 44                    | 48                    |
| LCRA                                      | 790           | 0                     | 0                     | 10                    | 20                    | 20                    | 20                    | 20                    |



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 8 - Phasing Potential

**DATE:** May 7, 2005

# **Background**

The purpose of this task is to examine the phasing potential of the facilities and the effect of phasing on unit costs. Since a key economic incentive for a regional treatment plant is to realize the economies of scale associated with a larger plant, the construction phasing has to be carefully considered. Building the plant in numerous phases will minimize unused capacity but erode the economies of scale advantage.

# **Phasing Potential**

Facility phasing is determined by two primary factors, capacity required and least cost net present value (NPV). Table 8-1 is a schedule of the projected maximum delivery rate for each participant categorized as softened or non-softened demand.

**Table 8-1**Projected Maximum Delivery Rate (MGD)

| Year           | 2015                | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
|----------------|---------------------|------|------|------|------|------|------|--|--|--|
| Softened Demai | Softened Demand     |      |      |      |      |      |      |  |  |  |
| City of Austin | 0                   | 0    | 25   | 35   | 50   | 50   | 50   |  |  |  |
| LCRA           | 0                   | 0    | 10   | 20   | 20   | 20   | 20   |  |  |  |
| Sub-Total      | 0                   | 0    | 35   | 55   | 70   | 70   | 70   |  |  |  |
| Non-Softened D | Non-Softened Demand |      |      |      |      |      |      |  |  |  |
| SAWS           | 85                  | 238  | 238  | 238  | 238  | 238  | 238  |  |  |  |
| GBRA           | 0                   | 0    | 11   | 14   | 18   | 22   | 22   |  |  |  |
| SARA           | 24                  | 27   | 33   | 36   | 40   | 44   | 48   |  |  |  |
| Sub-Total      | 109                 | 265  | 282  | 288  | 296  | 304  | 308  |  |  |  |
| Total          | 109                 | 265  | 317  | 343  | 366  | 374  | 378  |  |  |  |

SAWS also provided a second, "delayed demand scenario". The first scenario uses the full amount of water supply available with phasing based on an estimation of when the necessary infrastructure can be in place. The second scenario delays 66,000 acre-feet/year of SAWS demand from 2020 to 2030 and delays all of the SARA demand until 2030. The second scenario is to be considered if delaying the raw water transmission main from the Matagorda/Wharton County intake location results in a more economically feasible project. SAWS will temporarily obtain the 66,000 acre-feet/year supply from another source until the Matagorda/Wharton County intake is in place. The following table summarizes the "delayed demand scenario".

Table 8-2
Projected Maximum Delivery Rate
"Delayed Demand Scenario"
(MGD)

| Year           | 2015            | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
|----------------|-----------------|------|------|------|------|------|------|--|--|
| Softened Demai | Softened Demand |      |      |      |      |      |      |  |  |
| City of Austin | 0               | 0    | 25   | 35   | 50   | 50   | 50   |  |  |
| LCRA           | 0               | 0    | 10   | 20   | 20   | 20   | 20   |  |  |
| Sub-Total      | 0               | 0    | 35   | 55   | 70   | 70   | 70   |  |  |
| Non-Softened D | emand           |      |      |      |      |      |      |  |  |
| SAWS           | 85              | 161  | 238  | 238  | 238  | 238  | 238  |  |  |
| GBRA           | 0               | 0    | 11   | 14   | 18   | 22   | 22   |  |  |
| SARA           | 0               | 0    | 33   | 36   | 40   | 44   | 48   |  |  |
| Sub-Total      | 85              | 161  | 282  | 288  | 296  | 304  | 308  |  |  |
| Total          | 109             | 161  | 317  | 343  | 366  | 374  | 378  |  |  |

Seven alternative regional systems were evaluated. The seven alternatives are more fully described under Tasks 3 and 10, Economic Analysis. The main variables in the alternatives analysis are treatment plant location, treatment plant phasing, and raw water facilities phasing. The following Table 8-3 shows the location and timing of these variables. The results of the economic analysis are discussed in the Technical Memorandum for Tasks 3 and 10.

Table 8-3 Facilities Phasing

| Case | WTP Location    | Phasing Scenario                    | Facility               | 2015  | 2020  | 2030  | 2040 | 2050 | 2060 | 2065 |
|------|-----------------|-------------------------------------|------------------------|-------|-------|-------|------|------|------|------|
| 1A   | East of San     | RWTM B &                            | RWI & TM               | RWI B | RWI A |       |      |      |      |      |
|      | Antonio         | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      |                 | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      |                 | in 2020                             | Total WTP (MGD)        | 200   | 300   | 350   | 370  | 370  | 370  | 370  |
| 2A   | East of San     | RWTM B &                            | RWI & TM               | RWI B | RWI A |       |      |      |      |      |
|      | Marcos          | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      |                 | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      |                 | in 2020                             | Total WTP (MGD)        | 200   | 300   | 350   | 370  | 370  | 370  | 370  |
| 3A   | Northern Corner | RWTM B &                            | RWI & TM               | RWI B | RWI A |       |      |      |      |      |
|      | of Caldwell     | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      | County          | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      |                 | in 2020                             | Total WTP (MGD)        | 200   | 300   | 350   | 370  | 370  | 370  | 370  |
| 1B   | East of San     | RWTM B &                            | RWI & RWTM             | RWI B | RWI A |       |      |      |      |      |
|      | Antonio         | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      |                 | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      |                 | in 2020                             | Total WTP (MGD)        | 200   | 300   | 350   | 370  | 370  | 370  | 370  |
| 1C   | East of San     | RWTM B &                            | RWI & TM               | RWI B | RWI A |       |      |      |      |      |
|      | Antonio         | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      |                 | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      |                 | in 2020                             | Total WTP (MGD)        | 200   | 300   | 350   | 370  | 370  | 370  | 370  |
| 3B   | Northern Corner | RWTM B &                            | RWI & TM               | RWI B |       | RWI A |      |      |      |      |
|      | of Caldwell     | ALCOA/CPS built by                  | Softened WTP (MGD)     |       |       | 50    | 20   |      |      |      |
|      | County          | 2015; RWTM A Built                  | Non-Softened WTP (MGD) | 100   | 100   | 100   |      |      |      |      |
|      |                 | in 2030, Reduced<br>Demand Scenario | Total WTP (MGD)        | 100   | 200   | 350   | 370  | 370  | 370  | 370  |
| 1D   | WTP for         | 2015 – Build                        | RWI & TM               |       | RWI A |       |      |      |      |      |
| עוו  | ALCOA/CPS       | ALCOA/CPS System                    | Softened WTP (MGD)     |       | KWIA  |       |      |      |      |      |
|      | East of Elgin;  | with PWTM's to San                  | Non-Softened WTP (MGD) | 200   | 100   |       |      |      |      |      |
|      | Main Surface    | Antonio; 2020 – Build               | Total WTP (MGD)        | 200   | 300   | 300   | 300  | 300  | 300  | 300  |
|      | WTP East of San | RWI A and Surface                   | Total with (MOD)       | 200   | 300   | 300   | 300  | 300  | 300  | 300  |
|      | Antonio         | WTP                                 |                        |       |       |       |      |      |      |      |



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 9 – Develop Treatment Plant Layout

**DATE:** May 9, 2005

# **Background**

The purpose of this task is to determine the land area requirements for a regional facility of this size and to identify the phasing of the units so that adequate space is available for future expansion. This task is also to identify any additional treatment units and land needs required by future changes in drinking water regulations. This information was used to estimate the cost of the plant site and to determine general areas where the facility could be located. The identification of a definitive size and location of specific plant sites is beyond the scope of this task.

### **Area required for Plant Site**

In Task 2 – Demand Projections, the average day ultimate capacity for this facility was determined to be 303,232 acre-feet/year or 271 MGD. A peak or maximum day rate of 378 MGD was also determined based on peaking factors established by each of the participants. Alternatives were developed for each of these plant sizes. In Task 4 – Water Treatment Process, a split process consisting of two treatment trains was proposed. One of the trains would use a conventional process and the other would be lime softened. Both trains would use microfiltration membranes for filtration. Task 4 also proposed a raw water storage reservoir at or near the plant site. The reservoir would be used to provide raw water in the event that maintenance was required on the raw water transmission main or pump stations. The reservoir was sized at 12,000 acre-feet and would provide approximately 15 days of storage at average flow. At this planning level, a nominal 100 acre plant site is proposed for both plant sizes. An additional 528 acres is proposed for the raw water reservoir based on an assumed depth of 25 feet.

# **Phasing**

Various options for phasing of the facilities were considered based on when capacity was needed, economy of scale in building larger units and the time value of money. Because the SAWS demand comes on so quickly it was determined that the ultimate size facility of 220 MGD for the non-soften train should be constructed initially with no phasing. For the soften train an initial size of 50 MGD should be constructed in 2030 with a 20 MGD expansion in 2040. Both of these expansions were considered to be fairly normal in their space requirements so no additional area was required for this factor. It should be noted that the total soften capacity of 70 MGD is a maximum day capacity while the 220 MGD for the non-soften capacity is an average day capacity.

### **Future Regulations**

Since membranes were proposed for filtration on both treatment trains, it was assumed that no major additional treatment units that could effect the size requirements of the plant site would be needed in the future. Hence no additional land was proposed for this factor.

Central Texas Regional Water Treatment Plant – Task 9 - Develop Treatment Plant Layout May 7, 2005 Page 2 of 3

# **Conclusions**

A plant site of 100 acres is proposed for the regional facility. An additional 528 acre site adjacent to or near the plant site for a raw water storage reservoir is also proposed. A process flow diagram for the proposed facility is shown in Figure 9.1. The required treatments units are identified for both treatment trains. A more detailed plant layout is dependent on the specifics of the actual plant site selected.



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Tasks 3 and 10 – Economic Analysis

**DATE:** February 8, 2005

# **Background**

The purpose of this study is to evaluate the feasibility and comparative costs of developing a large regional water treatment facility to provide potable water for both the Cities of Austin and San Antonio. Although various raw water sources have been included in the analysis (specifically the LCRA-SAWS Water Project, groundwater from the Simsboro Aquifer, and the Bastrop/Colorado River diversion point), no attempt has been made to evaluate these sources. The sole focus is defining the benefits of regional treatment – not defining the issues surrounding sources of raw water.

# Methodology

The economic analysis was undertaken in two steps: first, an initial analysis of three regional system configurations with the main difference being the location of the water treatment plant, and second, the development and analysis of additional alternatives based on the results of the initial analysis.

# **Initial Analysis of Alternatives**

The purpose of the initial analysis was two-fold: First, to identify the principal factors that are likely to affect the costs of the regional system and, second, to screen alternative regional systems in order to determine which water treatment plant locations are most likely to result in the lowest overall cost. The steps taken to accomplish this task were as follows:

- 1. Estimate the size of the intakes, pumping stations, reservoirs, and water treatment plants and assign unit construction costs to each cost item, then calculate capital costs including contingencies; engineering, legal and administrative costs; environmental and surveying costs; land or easement acquisition costs; and other miscellaneous costs
- 2. Prepare operation and maintenance cost estimates
- 3. Calculate present values using a discount rate of 5% for both capital cost expenditures and operation and maintenance costs over the 50 year planning period
- 4. Compare the present values for each alternative and identify the most economical alternatives

# **Unit Costs**

The unit costs used in the analysis were gathered from the LCRA-SAWS Water Project PVA, 2004. The unit costs from the PVA were used because the facilities in both projects were of a similar nature and their use added a sense of consistency between the two projects.

The unit costs in the 2004 PVA were presented in a series of tables and these are included in Appendix 1. Each of

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the unit cost tables was graphed, and using the trendline feature of Excel, a best-fit equation was determined. The best-fit equation was then used in the alternative analysis spreadsheets to estimate costs.

After most of the analysis was complete and the results had been presented to the project participants, the LCRA-SAWS Water Project PVA was revised. One alternative presented in this report (Alternative 2A – Special) was updated to the revised PVA assumptions and costs. This final alternative was based on the revised PVA assumptions and costs, so the reader may note some inconsistencies between Alternative 2A - Special and the others.

# **Initial Analysis Results**

As mentioned previously, the initial analysis evaluated three alternative water treatment plant sites, which were as follows:

- 1. Alternative 1A: East of San Antonio
- 2. Alternative 2A: East of San Marcos
- 3. Alternative 3A: In the northern corner of Caldwell County

The results of the initial analysis are shown in Table 10-1. Although the location of the water treatment plant had a major impact on the orientation of the raw water and potable water transmission mains, there was only a 1.1% difference in the present values between the highest and lowest. Alternative 2A, with the water treatment plant located east of San Marcos, had the least present value. A review of the capital and O&M estimates indicated that while locating the water treatment plant closer to the Bastrop intake and the ALCOA/CPS well fields lowered the cost of the raw water transmission mains, the cost of the potable water transmission mains were increased. In particular, the power costs associated with the potable water transmission mains increased. This result can be explained by the fact that the largest demands are at the southernmost delivery points (those for SAWS and SARA), and by the fact that potable water transmission mains must be designed for maximum daily demands while raw water transmission mains are designed for average daily demands. As the water treatment plant is moved to the northeast, more potable water must be pumped south through the potable water transmission main running parallel to I-35. The potable water transmission main segments between the water treatment plant and the SAWS delivery points must be sized for these large flows.

For Alternatives 1A, 2A, and 3A, the PWTMs represent a sizable percentage of the overall costs of the project over the 50-year analysis period: 20% to 31% of the present value of both capital and O&M costs. The size of the PWTMs range from 54 inches in diameter, for the mains serving the City of Austin on the north end of the project, to 120 inches in diameter for the line serving GBRA, SAWS and SARA on the south end in Alternative 3A.

Since SAWS' maximum daily demand accounts for almost 63% of the total, the PWTMs serving the SAWS delivery points require the largest investments.

Based on the analysis of Alternatives 1A, 2A and 3A, the following observations were made:

- 1. The location of the water treatment plant had a lower impact than expected on overall present values. In fact, although a 1.1% difference represents over \$40 million, a 1.1% difference is not significant given the accuracy of these feasibility level cost estimates.
- 2. The least cost alternative was Alternative 2A, which located the water treatment plant east of San Marcos. The cost of Alternative 1A and Alternative 3A were essentially the same.

Table 10-1
Summary of Alternatives 1A, 2A and 3A (Initial Alternatives)

| WTP Location                                | Case | Phasing Scenario  | Total NPVs in<br>Millions of \$ | RWI A & OCRs<br>(Matagorda County)      | RWTM A (Including Pump<br>Stations)   | ALCOA/CPS  | RWI B & OCR (just upstream of Bastrop)  | RWTM B (Including Pump<br>Station)   | WTP & RW Storage at<br>Plant   | PWTMs (Including<br>Pump Stations)  |
|---|------|---|---------------------------------|---|---|--|---|--|--|---|
| East of San<br>Antonio                      | 1A   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020. |                                 |   | 150 miles of 96-inch diameter pipe sized to deliver 132,000 ac flyear on a continuous basis; includes 3 pumping stations w/ balancing reservoirs along route  | Non-Public wells;<br>Transmission of 55,000 ac-<br>ftyear to the OCR at RWI B<br>via 15 miles of 54" gravity<br>pipeline from Hwy 290 east<br>of Elgin | Sized for 2000 cfs to<br>scalp water; 2 intakes; 8<br>miles of 120-inch raw<br>water mains and 4<br>OCRs at 15,000 ac-<br>ft/each | Sized for 117,804 ac-ft/yr; 77<br>miles of 84* pipeline with two<br>pumping stations and<br>balancing reservoirs |  | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,366                        | \$ 191                                  | \$ 534  | \$ 135   | \$ 204  | \$ 297   | \$ 585   | \$ 420  |
|   |      | NPV of O&M Costs  | \$ 1,530                        | \$ 49                                   | \$ 288  | \$ 142   | \$ 40   | \$ 160   | \$ 499   | \$ 352  |
|   |      | Total NPV of Capital & O&M                                    | \$ 3,896                        | \$ 240                                  | \$ 822  | \$ 277   | \$ 244  | \$ 457   | \$ 1,084   | \$ 772  |
| East of San<br>Marcos                       | 2A   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020. |                                 |   | 126 miles of 96-inch diameter pipe sized to deliver 132,000 ac flyear on a continuous basis; includes 3 pumping stations w/ balancing reservoirs along route  | Non-Public wells;<br>Transmission of 55,000 ac-<br>ftyear to the OCR at RWI B<br>via 15 miles of 54" gravity<br>pipeline from Hwy 290 east<br>of Elgin |   | Sized for 117,804 ac-ft/yr; 36 miles of 96° pipeline with one pumping station and balancing reservoir            | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,306                        | \$ 191                                  | \$ 451  | \$ 135   | \$ 204  | \$ 168   | \$ 572   | \$ 585  |
|   |      | NPV of O&M Costs  | \$ 1,546                        | \$ 49                                   | \$ 250  | \$ 142   | \$ 40   | \$ 93  | \$ 502   | \$ 470  |
|   |      | Total NPV of Capital & O&M                                    | \$ 3,852                        | \$ 240                                  | \$ 701  | \$ 277   | \$ 244  | \$ 261   | \$ 1,074   | \$ 1,055  |
| Northern<br>Corner of<br>Caldwell<br>County | 3A   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020. |                                 | 4 miles of 120-inch raw water mains & 4 | 126 miles of 96-inch diameter pipe sized to deliver 132,000 ac flyyear on a continuous basis; includes 3 pumping stations w/ balancing reservoirs along route | ft/year to the OCR at RWI B via 15 miles of 54" gravity  | Sized for 2000 cfs to<br>scalp water; 2 intakes; 8<br>miles of 120-inch raw<br>water mains and 4<br>OCRs at 15,000 ac-<br>ft/each | Sized for 117,804 ac-ft/yr; 20<br>miles of 84* pipeline with<br>one pumping station and<br>balancing reservoir   | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,333                        | \$ 191                                  | \$ 451  | \$ 135   | \$ 204  | \$ 86  | \$ 572   | \$ 694  |
|   |      | NPV of O&M Costs  | \$ 1,562                        | \$ 49                                   | \$ 250  | \$ 142   | \$ 40   | \$ 83  | \$ 502   | \$ 496  |
|   |      | Total NPV of Capital & O&M                                    | \$ 3,895                        | \$ 240                                  | \$ 701  | \$ 277   | \$ 244  | \$ 169   | \$ 1,074   | \$ 1,190  |

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3. The raw water transmission mains, potable water transmission mains and the water treatment plant were the principal cost drivers.

# Analysis Results for Alternates 1B, 1C, 1D, and 3B

Taking these observations into account, four additional alternatives were developed and analyzed for a more complete understanding of the potential regional scenarios (see Table 10-2).

In Alternative 1B, the water treatment plant was located about 10 miles northwest of the location shown in Alternative 1A. This alternative was developed to test if a plant site in the San Antonio area, even closer to the SAWS & SARA delivery points, could yield a present value for the San Antonio plant site lower than the San Marcos site. The water treatment plant is still about 8 miles east of Delivery Point #2, but finding a site for the water treatment plant west of this point may be difficult. Otherwise, no other changes were made compared to Alternative 1A. This change lowered the present value by about \$106 million (about 2.7%). Alternative 1B represents the least cost alternative of the four alternate water treatment plant locations considered, and it is about \$62 million lower than the San Marcos location represented by Alternative 2A.

Given that the water treatment plant location did not have a major impact on present values, changes to the basic scenario were tested to determine if other adjustments could be made to lower the overall cost.

In Alternative 1C, the financial impact of discharging the ALCOA/CPS groundwater to Big Sandy Creek was analyzed. Alternative 1B was used as the base case and the ALCOA/CPS costs were revised to show the elimination of a ground water transmission main from the well fields to the Off-Channel Reservoir (OCR) near the Bastrop intake (RWI-B). However, the O&M costs for this intake were increased to account for the withdrawal of an additional 55,000 acre-feet/year. The overall present value for Alternative 1C was about \$32 million less than Alternative 1B.

Alternate 3B analyzes the impact of delaying a portion of SAWS's 2020 demand to 2030. It also assumes that all of SARA's demands would be delayed until 2030. This alternative is also predicated on the negotiation of an agreement for SAWS to temporarily withdraw LCRA's raw water (11,200 acre-feet/year), the City of Austin's raw water (33,604 acre-feet/year), and an additional 21,196 acre-feet/year of raw water at the Bastrop intake (RWI-A), in addition to the 18,000 acre-feet/year that has been used in the previous alternatives. This agreement would not be necessary after 2030.

Alternative 3B seeks to determine the impact of delaying the costly RWTM-A and the Matagorda intake. Its present value has been estimated at about \$516 million (about 13 %) less than Alternative 3A, to which it is equivalent in all other respects. Had Alternatives 1A or 2A been used as the comparison basis, the savings would have been similar. However, in this case, using present values as the basis for comparison is misleading, since over the project's 50 year life, approximately 9.6% less treated water is delivered to the participants in Alternative 3B compared to 3A as well as all of the other alternatives. Taking this into account, Alternative 3B offers a 3.7% reduction in overall costs compared to 3A.

Alternative 1D represents a more significant change in the basic scenario used in all of the alternatives thus far described. In 1D, the Bastrop intake (RWI-B) and its raw water transmission main (RWTM-B) are eliminated. The ALCOA/CPS well fields would be developed in 2015 and a groundwater treatment plant would be built near Elgin. Treated ground water would be pumped to the SAWS delivery points via a potable water transmission main, but this main would be routed to pass close to the City of Austin, LCRA and GBRA delivery points.

Table 10-2
Summary of Additional Alternatives Analyzed

| WTP Location  | Case | Phasing Scenario  | Total NPVs in<br>Millions of \$  | RWI A & OCRs<br>(Matagorda County)   | RWTM A (Including Pump<br>Stations)  | ALCOA/CPS  | RWI B & OCR (just upstream of Bastrop)   | RWTM B (Including Pump<br>Station)   | WTP & RW Storage at<br>Plant   | PWTMs (Including<br>Pump Stations)  |
|---|------|---|--|--|--|--|--|--|--|---|
| East of San<br>Antonio  | 1B   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020.   |  | Sized for 4000 cfs to<br>scalp water; 4 intakes,<br>4 miles of 120-inch<br>raw water mains & 4<br>OCRs at 25,000 ac-ft<br>each | 142 miles of 96-inch diameter<br>pipe sized to deliver 132,000 ass<br>tityear on a continuous basis<br>includes 3 pumping stations w<br>balancing reservoirs along<br>route          | Non-public wells;<br>Transmission of 55,000 ac-<br>ft/year to the OCR at RWI B<br>via 15 miles of 54* gravity<br>pipeline from Hwy 290 east<br>of Elgin          | Sized for 2000 cfs to<br>scalp water; 2 intakes; 8<br>miles of 120-inch raw<br>water mains and 4<br>OCRs at 15,000 ac-<br>tr/each  | Sized for 117,804 ac-ft/yr; 68 miles of 84* pipeline with two pumping stations and balancing reservoirs          | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,286   | \$ 191   | \$ 507   | \$ 135   | \$ 204   | \$ 265   | \$ 572   | \$ 412  |
|   |      | NPV of O&M Costs  | \$ 1,504   | \$ 49  | \$ 280   | \$ 142   | \$ 40  | \$ 148   | \$ 502   | \$ 343  |
|   |      | Total NPV of Capital & O&M  | \$ 3,790   | \$ 240   | \$ 787   | \$ 277   | \$ 244   | \$ 413   | \$ 1,074   | \$ 755  |
| East of San<br>Antonio  | 1C   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020.   |  | Sized for 4000 cfs to<br>scalp water; 4 intakes,<br>4 miles of 120-inch<br>raw water mains & 4<br>OCRs at 25,000 ac-ft<br>each | 142 miles of 96-inch diameter pipe sized to deliver 132,000 ac ft/year on a continuous basis; includes 3 pumping stations w/balancing reservoirs along route                         | Non-public wells; Discharge<br>of 55,000 ac-th/year to Big<br>Sandy Creek near Hwy 290<br>east of Elgin with flow to<br>Colorado River Just<br>upstream of RWI-B | Sized for 2000 cfs (2 intakes) to scalp surface water plus an additional 76 cfs (55,000 ac-t/yr) equivalent to groundwater released to Big Sandy Creek; 8 miles of 120-inch pipe; 4 OCRs at 15,000 ac-t/each | Sized for 117,804 ac-ft/yr; 68<br>miles of 84" pipeline with two<br>pumping stations and<br>balancing reservoirs | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,249   | \$ 191   | \$ 507   | \$ 98  | \$ 204   | \$ 265   | \$ 572   | \$ 412  |
|   |      | NPV of O&M Costs  | \$ 1,509   | \$ 49  | \$ 280   | \$ 138   | \$ 49  | \$ 148   | \$ 502   | \$ 343  |
|   |      | Total NPV of Capital & O&M  | \$ 3,758   | \$ 240   | \$ 787   | \$ 236   | \$ 253   | \$ 413   | \$ 1,074   | \$ 755  |
| Northern<br>Corner of<br>Caldwell<br>County   | 3B   | Reduced SAWS demand in<br>2020 by 66,000 ac-ft/yr (&<br>SARA to 0 demand);<br>RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2030. | Note: This<br>Alternative<br>delivers 9.6%<br>less water to<br>participants<br>over 50 years<br>than the other<br>Alternatives | Sized for 4000 cfs to<br>scalp water; 4 intakes,<br>4 miles of 120-inch<br>raw water mains & 4<br>OCRs at 25,000 ac-ft<br>each | 126 miles of 96-inch diameter<br>pipe sized to deliver 132,000 ac<br>ft/year on a continuous basis;<br>includes 3 pumping stations w<br>balancing reservoirs along<br>route          | Non-Public wells;<br>Transmission of 55,000 ac-<br>ft/year to the OCR at RWI B<br>via 15 miles of 54* gravity<br>pipeline from Hwy 290 east<br>of Elgin          | Sized for 2000 cfs to<br>scalp water; 2 intakes; 8<br>miles of 120-inch raw<br>water mains and 4<br>OCRs at 15,000 ac-<br>ft/each  | Sized for 117,804 ac-ft/yr; 20<br>miles of 84* pipeline with<br>one pumping station and<br>balancing reservoir   | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,039   | \$ 170   | \$ 277   | \$ 135   | \$ 204   | \$ 86  | \$ 524   | \$ 643  |
|   |      | NPV of O&M Costs  | \$ 1,340   | \$ 39  | \$ 142   | \$ 142   | \$ 40  | \$ 87  | \$ 427   | \$ 463  |
|   |      | Total NPV of Capital & O&M  | \$ 3,379   | \$ 209   | \$ 419   | \$ 277   | \$ 244   | \$ 173   | \$ 951   | \$ 1,106  |
| WTP for<br>ALCOA/CPS<br>groundwater<br>east of Elgin;<br>Main suface<br>WTP east of<br>San Antonio. | 1D   | 2015: Construct ALCOA/CPS system with PWTM's to San Antonio; 2020: Construct RWI & RWTM A with main suface WTP east of San Antonio.         |  | Sized for 6000 cfs to<br>scalp water; 6 intakes<br>& 6 OCRs at 25,000<br>ac-ft each  | 142 miles of 108-inch diameter<br>pipe sized to deliver an ultimate<br>average flow of 194,800 ac-<br>ft/year; includes 3 pumping<br>stations w/ balancing reservoirs<br>along route | Public wells; Treat 55,000<br>ac-tr/year in<br>iron/manganese removal<br>WTP near Hwy 290 east of<br>Elgin   | None req'd   | None req'd   | Raw water reservoir w/ 12,000 ac-ft capacity;<br>Conventional settling with<br>membrane filtration for<br>SAWS, SARA & GBRA  | Each PWTM sized for<br>maximum daily<br>demand (See PWTM<br>Summary Sheet in the<br>Appendices) |
|   |      | NPV of Capital Costs  | \$ 2,074   | \$ 284   | \$ 610   | \$ 143   |  |  | \$ 496   | \$ 541  |
|   |      | NPV of Capital Costs  | \$ 2,074   | -  | \$ 421   | \$ 145   |  |  | \$ 445   | *   |
|   |      | Total NPV of Capital & O&M  | \$ 3,580   | •  | \$ 1,031   | \$ 339   | \$ -   | \$ -   | \$ 941   |   |

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The Matagorda intake (RWI-A) and RWTM-A would be built in 2020 and would be sized to withdraw, store and transport up to 194,804 acre-feet/year to a water treatment plant located just northeast of San Antonio. Beginning in

2030, potable water from the Elgin groundwater treatment plant would be diverted to the City of Austin, LCRA and GBRA while more and more of SAWS's potable water would come from the surface water treatment plant.

The present value for Alternative 1D is about \$210 million (about 5.5%) less than the present value of Alternative 1B, the least cost alternative of the first 4 alternatives evaluated. However, by including a separate treatment plant for the ALCOA/CPS groundwater, Alternative 1D takes advantage of the lower treatment costs for this water. This alternative offers SAWS a way of avoiding a long groundwater transmission main from the ALCOA/CPS fields and the potential for sharing in the cost of the potable water transmission main. As in the other alternatives, this regional potable water transmission main (at least 60-inches in diameter) running parallel to IH-35 could be used to service the anticipated growth along the I-35 corridor and to provide an emergency connection between the large public water systems at either end.

However, implementation of Alternative 1D would be predicated on the following:

- 1. The City of Austin would need to verify that treated groundwater from the ALCOA/CPS well fields would be compatible with its treated water from other sources, and that its treatment would be less expensive than the treatment of surface water from the Colorado River in its own treatment plant.
- 2. The City of Austin, LCRA, and SAWS would need to negotiate a water rights transfer that would give SAWS access to 44,804 acre-feet/year (11,200 from LCRA and 33604 from the City of Austin) of Colorado River water in return for the same amount from the ALCOA/CPS well fields.
- 3. SARA would have to meet its water demands from 2015 to 2020 using treated water from some other source and treatment plant since there would be no water treatment plant near San Antonio until after 2020.

# Final Alternative Analysis (Alternative 2A – Special)

After the presentation of the aforementioned results to the participants in a meeting held on March 7, 2005, the project team was requested to analyze one more alternative (Alternative 2A – Special). This alternative was to be similar to Alternative 2A (WTP located east of San Marcos) with the following exceptions:

- 1. The non-softening side of the water treatment plant would be sized to meet the average day demands of SAWS, SARA and GBRA. Demands exceeding the average day demands would have to be met by using water from other sources. For SAWS, it was anticipated that wells in the Edwards Aquifer could be used to make up the difference.
- 2. Potable water transmission mains, leading to the demand points for SAWS, SARA and GBRA would also be sized for average day demands rather than for maximum day demands.
- 3. The raw water facilities in Matagorda County (RWI-A) would be sized in accordance with the latest information in the LCRA-SAWS Water Project PVA, that is, for a maximum withdrawal of 6000 cfs.
- 4. The raw water facilities at the Bastrop intake (RWI-B) would be sized for 90 cfs, which is based on the assumption that "scalping" withdrawals would not be required.

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5. Unit costs used were to be in accordance with the latest unit costs used in the LCRA-SAWS Water Project PVA.

The net present value of capital costs and O&M for this Alternative 2A-Special was about 10% less than the cost for Alternative 2A, but a direct comparison is misleading since some unit costs and design assumptions were changed. The purpose of Alternative 2A–Special was not to compare against the previously mentioned alternatives, but to compare against other water supply alternatives the participants are considering. For this reason, additional calculations were prepared for this special alternative and these are shown in Table 10-3.

Using the same methodology that was used in the LCRA-SAWS Water Project PVA, potable water would cost about \$794 per acre-foot produced at the water treatment plant site (based on 2050 production and expressed in 2005 dollars). If the capital and operating costs of the potable water transmission mains are included, the average cost would be \$1039 per acre-foot delivered to each customer's delivery point.

Table 10-3 CTRWTP - Alternate 2A Special - WTP East of San Marcos

| VTP Location          | Alter-<br>nate  | Phasing Scenario  | Total NPVs in<br>Millions of \$ | RWI A & OCRs  | RWTM A (Including<br>Pump Stations)   | ALCOA/CPS  | RWI B & OCR                           | RWTM B (Including<br>Pump Stations)  | WTP & RW Storage<br>at Plant  | PWT<br>Pur   |
|-----------------------|-----------------|---|---------------------------------|---|---|--|---------------------------------------|--|---|--|
| East of San<br>Marcos | 2A -<br>Special | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020; Assumes base<br>loaded non-softening plant<br>and PWTMs for SAWS,<br>SARA and GBRA; max day<br>demand softening plant and<br>PWTMs for LCRA and COA |                                 | Sized for 6000 cfs<br>to scalp water; 1<br>low head dam; 6<br>intakes, 6 miles of<br>120-inch raw<br>water mains & 4<br>OCRs at 33,000<br>ac-ft each (Total<br>of 132,000 acre<br>feet) | 126 miles of 96-inch<br>diameter pipe sized to<br>deliver 132,000 ac-<br>ft/year on a continuous<br>basis; includes 3<br>pumping stations w/<br>balancing reservoirs<br>along route | Non-Public wells;<br>Transmission of 55,000<br>ac-ft/year to the<br>balancing tank at RWI<br>B via 15 miles of 54"<br>gravity pipeline from<br>Hwy 290 east of Elgin | miles of 60-inch<br>raw water main, 1 | Sized for 117,804 ac-<br>ft/yr; 36 miles of 96"<br>pipeline with one<br>pumping station and<br>balancing reservoir | Raw water reservoir w/11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA and GBRA; Lime softening with membrane filtration for COA and LCRA | PWTN<br>SARA<br>sized 1<br>daily d<br>loadec<br>PWTN<br>LCRA<br>day de<br>PWTN<br>Sheet<br>Appen |
|                       |                 | Construction Costs  | \$ 1,624                        | \$ 169  | \$ 408  | \$ 83  | \$ 7                                  | \$ 119   | \$ 462  | \$   |
|                       |                 | Capital Costs   | \$ 2,246                        | \$ 261  | \$ 552  | \$ 131   | \$ 10                                 | \$ 161   | \$ 627  | \$   |
|                       |                 | NPV of Capital Costs  | \$ 1,938                        | \$ 205  | \$ 432  | \$ 131   | \$ 10                                 | \$ 161   | \$ 526  | \$   |
|                       |                 | NPV of O&M Costs  | \$ 1,513                        | \$ 56   | \$ 253  | \$ 142   | \$ 9                                  | \$ 94  | \$ 497  | \$   |
|                       |                 | Total NPV of Capital & O&M  | \$ 3,451                        | \$ 260  | \$ 685  | \$ 273   | \$ 19                                 | \$ 255   | \$ 1,023  | \$   |

2005 \$

| Unit Cost Calculations:                 |                      | Millior | s of \$            |   |                                     |    |
|---|----------------------|---------|--------------------|---|-------------------------------------|----|
|   | Not includi<br>PWTMs | _       | Including<br>PWTMs |   | Interest rate                       | 6% |
| Capital cost                            |                      | 1.2     |                    |   | Total loan period (years)           | 30 |
| Interest accrued during construction    | \$ 30                | 9.4     | \$ 399.1           | 4 | Number of years for construction    | 3  |
| Interest earned during construc.        | \$ (7                | 4.4)    | \$ (95.9)          | • | Interest earned during construction | 4% |
|   |                      |         |                    |   | Number of years for construction    | 3  |
| Total project cost                      | \$ 1,97              | 6.2     | \$ 2,549.3         |   |                                     |    |
| Annual Costs:                           |                      |         |                    |   |                                     |    |
| Debt service - principal and interest   | \$ 14                | 3.6     | 185.2              | ← | Interest rate on loan               | 6% |
| Adjustment for "Committed Purchase Fee" | \$                   | 8.8     | 8.8                |   | Number of payments                  | 30 |
| Subtotal                                | \$ 15                | 2.4     | 194.0              |   | <u></u>                             |    |
| O&M and Power                           | \$ 7                 | 3.4     | 103.9              |   | Basis = Year 2050                   |    |
| Total annual cost                       | \$ 22                | 5.8     | \$ 298.0           |   |                                     |    |
| Ag and Gw                               | \$                   | 7.8     | 7.8                |   |                                     |    |
| Total                                   | 233                  | .56     | 305.76             |   |                                     |    |
| Acre-feet produced (annual average)     | 294,2                | 215     | 294,215            |   | Basis = Year 2050                   |    |
| \$ per acre feet produced               | \$                   | 794     | \$ 1,039           |   |                                     |    |

E of SMarcos\_Alt2A\_spec2;Table 3 9/23/2005



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 11 – Identify Other Potential Customers and Participants

**DATE:** May 9, 2005

# **Background**

The purpose of this task is to identify other potential water customers or participants, at a conceptual level, that may be benefited by this facility. In Task 2 – Demand Projections, the water demand for each of the study participants was determined. A total average day demand of 303,232 acre-feet/year was projected for the study area. It is believed that amount represents the total demand of the study area. The five study participants are expected to serve all of the potential customers within this area either as wholesale or retail customers. Because of the high level nature of this study, those entities within the service area but not participating in the study will be identified and contacted by the individual study participants expected to serve the entity and thus will not be further discussed in this study.

#### **Other Potential Customers**

No potential customers outside of the study area have been identified. If additional customers are identified in the future, additional water sources will also have to be identified before they can be served.



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 12 - Institutional Considerations

**DATE:** May 7, 2005

# **Background**

The purpose of this task is to investigate several potential institutional approaches to develop the proposed water treatment plant. These could include the creation of a development corporation, a regional water authority or other corporate entity to own and operate the facilities. This task also includes examining various procurement tools to facilitate the development of the water treatment plant.

# **Institutional Considerations**

Tasks 3 and 10 – Economic Analysis, discusses the various alternatives evaluated and the resulting net present value of the facilities. For the final alternative considered, the plant was changed to a base load plant for San Antonio, SARA and GBRA thereby reducing the size of the plant and treated water transmission main. Other adjustments were made to help make the regional facility comparable to the other separate alternatives available to the participants. The present value cost was converted to a cost per acre-foot also for comparison purposes. This was done by dividing the total cost by the acre-foot capacity and would be the same for all participants. That cost was \$794 per acre-foot for treated water at the water treatment plant. When the potable water transmission mains are considered, the average cost would be \$1039 per acre-foot delivered to the participants delivery points. The latter figure is in the upper range of costs that have been developed for the LCRA-SAWS Water Project. While the cost per acre-foot for a regional facility appear to be somewhat reasonable for San Antonio and SARA it is not for the other participants because of the cost of transmission facilities that the other participants would not have compared to their separate alternatives. The conclusion appears fairly clear that a regional facility is not feasible based on the alternatives and demand included in this analysis.

Institutional considerations and procurement tools were not further evaluated since it appears from this analysis that a regional facility is not feasible.



**PROJECT:** Central Texas Regional Water Treatment Plant

**SUBJECT:** Task 13 - Identify Necessary Permits

**DATE:** May 7, 2005

# **Background**

The purpose of this task is to review the project components and locations and to identify the permitting entities and permits that will be required to implement a regional water treatment plant. The permitting requirements for a similar sized facility were analyzed in the recently completed LCRA-SAWS Water Project PVA. It was determined the following primary permits may be required:

| Name                                    | Granting Agency                           |
|---|---|
| Section 404 Permit                      | United States Army Corps of Engineers     |
| Section 10 Permit                       | United States Army Corps of Engineers     |
| Water Rights                            | Texas Commission on Environmental Quality |
| Public Drinking Water Supplies          | Texas Commission on Environmental Quality |
| Safe Drinking Water Act                 | Texas Commission on Environmental Quality |
| Section 401 Water Quality Certification | Texas Commission on Environmental Quality |
| TPDES Industrial Storm Water Permits    | Texas Commission on Environmental Quality |
| Dam and Reservoir Safety                | Texas Commission on Environmental Quality |
| Cultural Resources                      | Texas Historical Commission               |

# Approvals, Consultations, and Permits

The following is the complete List of Possibly Required Local, State, and Federal Permits and Approvals from the LCRA-SAWS Water Project PVA. This detailed list has been included since the LCRA-SAWS Water Project is of similar scope, scale, and geographical location as the CTRWTP facilities evaluated herein.

# POSSIBLE FEDERAL APPROVALS, CONSULTATIONS, AND PERMITS NECESSARY FOR THE LCRA-SAWS WATER PROJECT

| Name   | Granting Agency  |
|--|--|
| Agricultural Issues Consultation   | U.S. Department of Agriculture (USDA)  |
| Bridge Permit (Section 8 Review  | U.S. Coast Guard   |
| Conditional Letter of map Revision (CLOMR)/Letter of Map Revision (LOMR) | Federal Emergency Management Agency (FEMA)   |
| Environmental Justice  | U.S. Environmental Protection Agency   |
| Federal Endangered or Threatened Species (Section 7 or 10 Review)        | U.S. Fish and Wildlife Service (USFWS)   |
| Fishery Impacts  | National Marine Fisheries Service (NMFS)   |
| Prime Farmlands  | Natural Resources Conservation Service (NRCS)                                      |
| Section 4(f) Review  | Bureau of Reclamation and U.S. Fish and Wildlife Service                           |
| Section 404 Permit   | United States Army Corps of Engineers (USACE) (Fort Worth and Galveston Districts) |
| Section 10 Permit  | United States Army Corps of Engineers (USACE) (Fort Worth and Galveston Districts) |
| Section 10 of the Rivers and Harbors Act of 1899                         | U.S. EPA   |
| Wildlife Management Areas  | USFWS  |

# POSSIBLE STATE AND DISTRICT APPROVALS, CONSULTATIONS, AND PERMITS NECESSARY FOR THE LCRA-SAWS WATER PROJECT

| Name   | Granting Agency  |
|--|--|
| Coastal Management Zone (Dredging Permits)   | Texas General Land Office (GLO)                                      |
| Coastal Natural Resources Area   | TGLO, Coastal Coordination Council (CCC)                             |
| Agricultural Issues  | TX Department of Agriculture   |
| Cultural Resources (SHPO/Section 106 Review)   | Texas Historical Commission (THC)                                    |
| Dam and Reservoir Safety (Chapter 299)   | Texas Commission on Environmental Quality (TCEQ)                     |
| Edwards Aquifer Regulations  | Edwards Aquifer Conservation District and TCEQ                       |
| State Endangered or Threatened Species and Species of Concern (sometimes referred to as Section 7 Review | TPWD   |
| Groundwater Protection   | Groundwater Conservation Districts                                   |
| Water Rights (Water Code Chapter 11, Tex. Admin. Code Chapters 228, 295, 297)                            | TCEQ And Various Agencies  |
| LCRA Act Section 28  | LCRA   |
| Public Drinking Water Supplies (Chapter 290)   | TCEQ   |
| Right of Way and Transportation Access   | Texas Department of Transportation (TxDOT)                           |
| Regional Water Planning Coordination   | Water Development Board  |
| Safe Drinking Water Act  | TCEQ   |
| Sand and Gravel Permit   | TPWD   |
| Section 10 of the Rivers and Harbors Act of 1899   | TCEQ and U.S. EPA  |
| Section 4(f) Review  | Varies, Bureau of Reclamation , U.S. Fish and Wildlife Service, TPWD |
| Section 401 Water Quality Certification  | TCEQ   |
| Section 404 Permit   | USACE (Fort Worth and Galveston Districts)                           |
| TPDES Industrial Storm Water Permits   | TCEQ   |
| TPDES Storm Water Permits for Activities Associated with Construction                                    | TCEQ   |
| Water Quality (Chapter 307) and TPDES For Other Discharges   | TCEQ   |
| Wildlife Management Areas  | TPWD   |

Central Texas Regional Water Treatment Plant – Task 13 - Identify Necessary Permits May 9, 2005 Page 4 of 4

# POSSIBLE LOCAL APPROVALS, CONSULTATIONS, AND PERMITS NECESSARY FOR THE LCRA-SAWS WATER PROJECT

| Name                        | Granting Agency         |
|-----------------------------|-------------------------|
| Local Regulatory Floodplain | Affected Municipalities |
| Local Zoning                | Affected Municipalities |



**PROJECT:** Central Texas Regional Water Treatment Plant **SUBJECT:** Task 14 – Conclusions and Major Project Issues

**DATE:** May 9, 2005

# **Background**

The Technical Memorandums for Tasks 1 through 13 present the body of the study. Each of Technical Memoranda discusses a specific aspect of the study; which together address the scope of work contained in the funding grant from the Texas Water Development Board to the Lower Colorado River Authority. The purpose of the study was to evaluate the feasibility and comparative costs of developing a regional water treatment facility to provide potable water for the Cities of Austin and San Antonio.

The study determined that at the end of the planning period, 2065, there was a total average day demand of 271 MGD that could be met by a regional facility. The treatment plant evaluated for the facility consisted of a split process water treatment plant. Part of the water would be lime softened. The other part would use a conventional water treatment process. Both waters would be filtered separately through microfiltration membranes. This split process would accommodate separate disinfection approaches to better match the existing practices of the participant to avoid compatibility problems.

Several potential alternative diversion points for raw water were identified. One location consisted of a series of intakes located in Matagorda, Wharton, and/or Colorado Counties along the lower reaches of the Colorado River. A second location considered for an intake was in the segment of the Colorado River from the City of Austin (Town Lake) downstream to the City of Bastrop. Ground water from the Simsboro Aquifer was also considered.

Three general sites for the location of the regional facility were identified and included in the analysis. The three sites considered were: one east of San Antonio near I-10, one east of San Marcos and one in the northern corner of Caldwell County. Points for connecting treated water from a regional facility were identified by each participant.

Pipelines and pump stations were sized and located to tie the alternative intake and plant locations to the connection points. A series of alternatives were developed and construction cost estimates were prepared for each. Both construction cost and O&M cost were identified for each alternative.

The initial analysis of the first three alternatives of varying the location of the plant indicated a rather small percentage difference in the cost, the least costly being the location east of San Marcos. Four additional alternatives were developed and analyzed for a more complete understanding of the potential regional scenarios. In one of these alternatives a fourth plant location closer to San Antonio was analyzed. The other three alternatives tested changes to the basic scenario to determine if other adjustments could be made to lower the overall costs.

The results showed a greater reduction in the present value of these four new alternatives compared to the lowest present value of the first three alternatives. However, it was determined that the lower costs were either not comparable or that the changes to the basic scenario included in the alternative scenario were not realistic and/or could not be implemented.

Central Texas Regional Water Treatment Plant – Task 14 - Conclusions and Major Project Issues May 7, 2005 Page 2 of 2

One final alternative was evaluated. In this alternative, the plant was changed to a base load plant for San Antonio, SARA and GBRA thereby reducing the size of the plant and treated water transmission main. Other adjustments were made to help make the regional facility comparable to the other separate alternatives available to the participants. The present value cost was converted to a cost per acre-foot also for comparison purposes. This was done by dividing the total cost by the acre-foot capacity and would be the same for all participants. That cost was \$794 per acre-foot for treated water at the water treatment plant. When the potable water transmission mains are considered, the average cost would be \$1039 per acre-foot delivered to the participant's delivery points. The latter figure is in the upper range of costs that have been developed for the LCRA-SAWS Water Project. Those costs range from \$970 to \$1,103.

#### Conclusions

While the cost per acre-foot for a regional facility appear to be somewhat reasonable for San Antonio and SARA it is not for the other participants because of the cost of transmission facilities that the other participants would not have compared to their separate alternatives. The conclusion appears fairly clear that a regional facility is not feasible based on the alternatives and demand included in this analysis.

An alternative that was not included in the scope of this study but would appear to be worthy of additional analysis is a sub-regional facility located between Austin and Bastrop on or near the Colorado River. That facility could meet the demands of Austin, LCRA and possibly GBRA in a more cost effective manner. A very preliminary cost estimate for such a facility using similar costing data in this study appears to be in the \$741 per acre-foot range (not including PWTMs) and \$848 per acre-foot (including PWTMs to the delivery points).

# APPENDIX 1

# CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO WATER SYSTEM

**ECONOMIC ANALYSIS AND UNIT PRICES** 

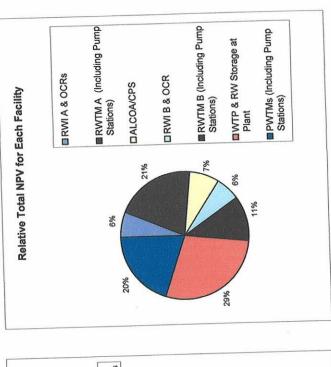
# APPENDIX 1

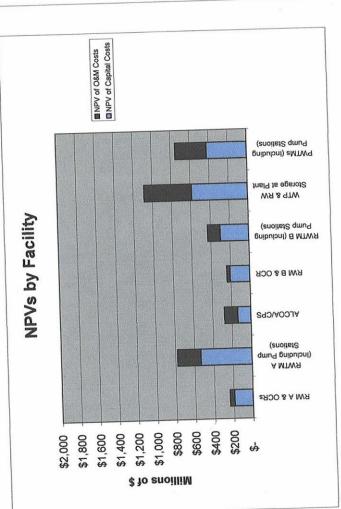
# CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO WATER SYSTEM

**ECONOMIC ANALYSIS AND UNIT PRICES** 

Page 1

| WTP Location nate Phasing S                 | T Scenario T  | Total NPVs in  |   |   |  |             | aniford of the second   | RWTM B (Including   WTP & RW Storage   PWTMs (Including   | PWTMs (Including  |
|---|---|----------------|---|---|--|-------------|---|---|---|
|   |   | Millions of \$ | RWI A & OCRs  | RWTM A (Including<br>Pump Stations)   | ALCOA/CPS  | RWI B & OCR | RWTM B (including<br>Pump Stations)   | at Plant  | Pump Stations)  |
|   |   |                |   |   |  |             |   | Raw water reservoir   |   |
| East of San 1A built by 2015; Antonio in 20 | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020. |                | Sized for 4000 cfs to scalp water; 4 intakes, 4 miles of 120-inch raw water mains & 4 OCRs at 25,000 ac-ft each | Sized for 4000 cfs diameter pipe sized to to scalp water, 4 deliver 132,000 acriticates, 4 miles of 100 acriticates, 4 OCRs at pumping stations w/ 25,000 acrit each balancing reservoirs along route | Non-Public wells; Transmission of 55,000 to scalp water; 2 ac-fl/year to the OCR intakes; 8 miles of at RVM B via 15 miles 120-inch raw water from Hwy 290 east of at 15,000 ac-fleach Eigin |             | Sized for 117,804 ac-<br>Sized for 117,804 ac-<br>sipeline with two<br>oumping stations and<br>balancing reservoirs | W/ 11,000 accit<br>capacity;<br>Conventional settling<br>with membrane<br>filtration for SAWS,<br>SARA & GBRA: Lime<br>softening with<br>membrane filtration<br>for COA & LCRA<br>water | Each PWTM sized for maximum daily demand (See PWTM Summary Sheet in the Appendices) |
|   |   |                |   | Š   | 135  | 204         | \$ 297  | \$ 585  | \$ 420  |
| o VQN                                       | NPV of Capital Costs \$                                       | \$ 2,366 \$    | -   | s   |  |             | \$ 130  | \$ 499  | \$ 329  |
| VQN   | NPV of O&M Costs \$   | \$ 1,423 \$    | \$ 47   | s   |  |             | \$ 428  | \$ 1,084  | \$ 748  |
| Total NPV of                                | Fotal NPV of Capital & O&M                                    | \$ 3,789 \$    | \$ 238  | 8//   | 0  | ,           |   |   |   |





O&M Cost Calculations RWI A - Matagorda Co. River Intakes, and Storage CTRWTP - Alternate 1A - WTP East of San Antonio

| RWI A - Matagorda Co. River Intakes, an<br>CTRWTP - Alternate 1A - WTP East of St |                             |                            |                       |                                    |   |   |                                     |
|---|-----------------------------|----------------------------|-----------------------|------------------------------------|---|---|-------------------------------------|
| Initial year of analysis period<br>Interest rate                                  | 2015<br>5%                  |                            |                       | Engineering.                       | Contingency =<br>Legal, Admin. =        |   |                                     |
| Evaluation period   |                             | years                      |                       | ental & Archae                     | ology Studies &                         |   |                                     |
| Unit cost of energy   | \$ 0.07                     | per kwh                    | Mitigation, Si        | urveying, and l                    | Land Acquisition<br>or ≃                |   | per mile<br>per acre                |
| Inflatable Rubber Low Head Dam  |                             |                            |                       |                                    | Total                                   |   |                                     |
|   | Quantity                    | Units                      | Size                  | Unit Constr.<br>Cost<br>(millions) | Estimated<br>Constr. Cost<br>(millions) | Contigency,<br>Eng., etc.<br>(millions) | Total Capital<br>Cost<br>(millions) |
| Inflatable Rubber Low Head Dam  | 4                           | each                       | 10 ft high            | \$ 2.25                            | \$ 9.00                                 | \$ 3.42                                 | \$ 12.42                            |
| Estimated inflatable dam cost as<br>Value of inflatable dam                       | % of total                  | 509<br>S 4.50              | 6<br>million          |                                    |   |   |                                     |
| Assumed life of inflatable dam  |                             | 10                         | years                 |                                    |   |   |                                     |
| Estimated maintenance/replacem  | ent cost                    | \$ 0.45                    | million/year          |                                    |   |   |                                     |
| Year built  |                             | 2020                       |                       |                                    |   |   |                                     |
| NPV of O&M Costs<br>NPV of Capital Costs  |                             |                            | million<br>million    |                                    |   |   |                                     |
| Total NPV of Capital and O&M Co   | osts                        |                            | million               |                                    |   |   |                                     |
| Raw Water Intake, Pumping Station, and  | d RWTM (In                  | take to Res                | servoir)              |                                    |   |   |                                     |
| Average withdrawal  |                             |                            |                       | ac-ft/year                         |   |   |                                     |
|   |                             |                            |                       | cfs                                | 21.9                                    | Ratio of desig                          | gn withdrawal rate                  |
| Total intake design withdrawal rat  | te (for scalpi              | ing high flov              | /s 4,000<br>1,795,200 |                                    |   |   | e design withdrawal rate            |
| No. of Intakes  |                             |                            | 1,750,250             | e ab                               |   |   |                                     |
| Design withdrawal rate per intake   |                             |                            | 1,000                 |                                    |   |   |                                     |
|   |                             |                            | 448,800               |                                    |   |   |                                     |
| No. of reservoirs  Design flow to each reservoir                                  |                             |                            | 448,800               |                                    |   |   |                                     |
| Inside diameter of each RWTM  |                             |                            |                       | in.                                |   |   |                                     |
| Area<br>Average length of each RWTM   |                             |                            | 78.54                 | sf<br>miles                        | 4.0                                     | miles for all f                         | RWTMs                               |
|   |                             |                            | 5,280                 |                                    | 21,120                                  |   |                                     |
| Estimated construction cost for R   | WTM                         |                            | \$ 793                | per LF                             |   | \$ 1,254                                |                                     |
| Total construction cost in millions<br>Contingencies                              |                             |                            | \$ 16.8<br>\$ 3.4     |                                    |   |   |                                     |
| Subtotal  |                             |                            | \$ 20.1               | _                                  |   |   |                                     |
| Engineering, Legal & Administrati<br>Subtotal                                     | ive                         |                            | \$ 3.0                | -                                  |   |   |                                     |
| Envir & Arch Studies & Mitigation<br>Total Capital Cost for                       |                             |                            | \$ 0.4                | million                            |   |   |                                     |
| Unit maintenance cost/year-mile   |                             | milotio                    |                       | \$/year-mile                       | \$ 0.040                                | Million \$/vea                          | (all RWTMs to Reservoirs)           |
|   | - DIACTAGE                  | maina out                  |                       |                                    | \$ 0.040                                | willion wyea                            | (all Nev rins to Nesdi volls)       |
| Note: Assume each intake has tw   |                             |                            |                       |                                    |   |   |                                     |
| Design flow rate for each RWTM<br>Pumping rate (one pump)                         |                             |                            | 448,800<br>50,000     |                                    |   |   |                                     |
| No. of pumps (not counting spare<br>Peak flow rate into each RWTM (               | e) pumping i<br>all pumps e | nto each RV<br>xcept spare | V 9<br>450,000        | gpm                                |   |   |                                     |
| Velocity at peak flow rate  |                             |                            | 12.77                 |                                    |   |   |                                     |
| C factor  |                             |                            | 120                   |                                    |   |   | 16                                  |
| Head loss per foot  |                             |                            | 0.0032<br>17.25       | f/mile                             | h <sub>l</sub> =                        | 3.552*Q 1.6                             | 19                                  |
| Head loss at peak flow rate   |                             |                            | 17                    | 7 ft                               |   |   |                                     |
| Allowance for minor losses  | 30%                         |                            | 5                     | n<br>2 ft                          |   | Elev of disch<br>Water surface          | arge at reservoir                   |
| Total estimated losses<br>Average static head                                     |                             |                            | 40                    | 0 ft                               |   | tt                                      | a diay iii tiyai                    |
| Total estimated dynamic head  |                             |                            |                       | 2 ft<br>7 psi                      |   |   |                                     |
| Assumed pump efficiency   |                             |                            | 859                   |                                    |   |   |                                     |
| Assumed motor efficiency<br>Estimated Hp required per pump                        |                             |                            | 1,030                 | hp/pump                            |   |   |                                     |
|   |                             |                            | 769                   | kw/pump                            |   |   |                                     |
| Total hp pumping into each RWT<br>Total hp at each intake (not coun               |                             | ung sparé)                 | 9,272                 | hp/RWTM<br>hp/intake               |   |   |                                     |
| Total hp all intakes (not counting<br>Total kw all intakes (not counting          | spares)                     |                            | 37,089<br>27,668      |                                    |   |   |                                     |
| Unit construction cost for each pu<br>Construction cost per intake/pum            | ump station                 | (from cost of              | cui \$ 889<br>8.2     | per firm hp o                      | of pump station                         | \$ 1,180                                |                                     |
| No. of intakes from above   |                             |                            |                       | each                               |   |   |                                     |
| Total construction cost in millions<br>Contigency, Eng., etc. in millions         |                             |                            |                       | million<br>million                 |   |   |                                     |
| Total capital cost in millions  |                             |                            | \$ 45.5               | million                            |   |   |                                     |
| Total construction cost for pump  | stations                    |                            |                       | million                            | 4000                                    | Estimated -                             | quip cost as % of total constr cost |
| Value of equipment<br>Assumed life of equip                                       |                             |                            | 20                    | million<br>years                   | 40%                                     | Estimated ed                            | quip cost as % or total constr cost |
| Estimated maintenan   |                             | nent cost                  |                       | million/year                       |   |   |                                     |

| Year           | Flow pun<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used   |    | Energ    | y cos | t                    | cost | er O&M<br>s - Pump<br>tations | c  | Intenance<br>osts -<br>RWTM | Tot  | tal O&M<br>cost      | Ne | et prese<br>value |
|----------------|-----------------|-----|--------------------------|------------------|----|----------|-------|----------------------|------|-------------------------------|----|-----------------------------|------|----------------------|----|-------------------|
| and the second | ac-ft/yr        | mgd | operating<br>/day        | (kwh/day)        |    | (\$/day) |       | fillion \$<br>/year) |      | lillion \$<br>'year)          | () | Million \$<br>/year)        |      | tillion \$<br>/year) |    | (\$)              |
| 2015           |                 |     |                          | -                | \$ |          | \$    | •                    |      |                               |    |                             | \$   |                      | \$ | -                 |
| 2016           | *               |     | -                        |                  | \$ |          | \$    |                      |      |                               |    |                             | S    |                      | \$ |                   |
| 2017           |                 | -   | -                        | -                | \$ | -        | \$    |                      |      |                               |    |                             | \$   | -                    | \$ | -                 |
| 2018           |                 | -   | -                        | -                | \$ |          | \$    | •                    |      |                               |    |                             | \$   |                      | \$ |                   |
| 2019           |                 |     | -                        | -                | \$ | -        | \$    |                      |      |                               |    |                             | \$   |                      | \$ |                   |
| 2020           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 1.                |
| 2021           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 1.                |
| 2022           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | - 1.              |
| 2023           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 1.                |
| 2024           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0.                |
| 2025           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0.                |
| 2026           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0.                |
| 2027           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0.                |
| 2028           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2029           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | s    | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2030           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2031           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2032           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2033           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2034           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2035           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2036           | 132,000         | 118 | 1,64                     | 30,188           | \$ | 2,113    | s     | 0.77                 | \$   | 0.66                          | s  | 0.040                       | s    | 1.47                 | S  | 0                 |
| 2037           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | S     | 0.77                 | S    | 0.66                          | s  | 0.040                       | S    | 1.47                 | \$ | 0                 |
| 2038           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | 5  | 0                 |
| 2039           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | S     | 0.77                 | S    | 0.66                          | s  | 0.040                       | S    | 1.47                 | s  | 0                 |
| 2040           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | s     | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | s    | 1.47                 | s  | 0                 |
| 2041           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | s     | 0.77                 | s    | 0.66                          | s  | 0.040                       | s    | 1.47                 | \$ | 0                 |
| 2042           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | s     | 0.77                 | \$   | 0.66                          | s  | 0.040                       | s    | 1.47                 | s  | 0                 |
| 2043           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | š     | 0.77                 | s    | 0.66                          | š  | 0.040                       | Š    | 1.47                 | Š  | ō                 |
| 2044           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | Š     | 0.77                 | Š    | 0.66                          | Š  | 0.040                       | s    | 1.47                 | \$ | ō                 |
| 2045           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2.113    | s     | 0.77                 | s    | 0.66                          | š  | 0.040                       | Š    | 1.47                 | š  | 0                 |
| 2046           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | Š     | 0.77                 | š    | 0.66                          | š  | 0.040                       | Š    | 1.47                 | š  | 0                 |
| 2047           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | Š     | 0.77                 | \$   | 0.66                          | s  | 0.040                       | \$   | 1.47                 | Š  | ő                 |
| 2048           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | š     | 0.77                 | s    | 0.66                          | Š  | 0.040                       | Š    | 1.47                 | Š  | 0                 |
| 2049           | 132,000         | 118 | 1.64                     | 30,188           | Š  | 2,113    | Š     | 0.77                 | \$   | 0.66                          | Š  | 0.040                       | \$   | 1.47                 | Š  | ő                 |
| 2050           | 132,000         | 118 | 1.64                     | 30,188           | Š  | 2,113    | s     | 0.77                 | Š    | 0.66                          | Š  | 0.040                       | Š    | 1.47                 | Š  | o                 |
| 2051           | 132,000         | 118 | 1.64                     | 30,188           | Š  | 2,113    | \$    | 0.77                 | Š    | 0.66                          | Š  | 0.040                       | \$   | 1.47                 | s  | ő                 |
| 2052           | 132,000         | 118 | 1.64                     | 30,188           | S  | 2,113    | 5     | 0.77                 | S    | 0.66                          | Š  | 0.040                       | S    | 1.47                 | \$ | ő                 |
| 2052           | 132,000         | 118 | 1.64                     | 30,188           | Š  | 2,113    | \$    | 0.77                 | Š    | 0.66                          | Š  | 0.040                       | S    | 1.47                 | \$ | 0                 |
| 2054           |                 | 118 | 1.64                     | 30,188           | Š  | 2,113    | Š     | 0.77                 | Š    | 0.66                          | Š  | 0.040                       | \$   | 1.47                 | Š  | ő                 |
| 2055           | 132,000         | 118 | 1.64                     | 30,188           | š  | 2,113    | Š     | 0.77                 | Š    | 0.66                          | ŝ  | 0.040                       | S    | 1.47                 | Š  | ő                 |
| 2056           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | S     | 0.77                 | s    | 0.66                          | S  | 0.040                       | S    | 1.47                 | s  | 0                 |
| 2056           | 132,000         | 118 | 1.64                     |                  | S  | 2,113    | S     | 0.77                 | S    | 0.66                          | S  | 0.040                       | S    | 1.47                 | S  | 0                 |
|                | 132,000         |     |                          | 30,188           |    |          |       |                      | \$   | 0.66                          | s  |                             |      | 1.47                 | \$ | 0                 |
| 2058           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | s    | 0.66                          | s  | 0.040                       | \$   | 1.47                 | s  | 0                 |
| 2059           | 132,000         | 118 | 1.64                     | 30,188           | S  | 2,113    | \$    | 0.77                 | S    | 0.66                          | s  | 0.040                       |      |                      | s  | 0                 |
| 2060           | 132,000         | 118 | 1.64                     | 30,188           | s  | 2,113    | S     | 0.77                 |      |                               |    | 0.040                       | \$   | 1.47                 |    |                   |
| 2061           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | S     | 0.77                 | S    | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2062           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2063           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2064           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
| 2065           | 132,000         | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$    | 0.77                 | \$   | 0.66                          | \$ | 0.040                       | \$   | 1.47                 | \$ | 0                 |
|                |                 |     |                          |                  |    |          |       |                      |      |                               | 1  | Total NPV                   | of O | &M Costs             | \$ | 2                 |
|                |                 |     | Capital Cos              | ts in million \$ |    | noire    | s     | 23.5                 |      | r built                       |    |                             |      |                      |    | S 1               |
|                |                 |     |                          | WALLES IN        |    |          |       |                      |      | E-020                         |    |                             |      |                      |    |                   |

.5 2020 \$ 18.6 .5 2020 \$ 35.6 Total NPV of Capital Costs \$ 54.7

Total NPV of Capital and O&M Costs in millions \$

#### Reservoirs

|                                       | Quantity |    | Units | Volume/each<br>(acre-feet) |      | t Cost<br>ac-ft)) | Con    | Total<br>estruction<br>Cost in<br>nillions |          | ligency,<br>g., etc. | otal in     |
|---------------------------------------|----------|----|-------|----------------------------|------|-------------------|--------|--|----------|----------------------|-------------|
| Reservoirs                            | 4        |    | each  | 25000                      | \$   | 974<br>909        | \$     | 97.4                                       | \$       | 37.0                 | \$<br>134.4 |
| Estimated average depth of reservo    | oir      |    | 20    | ft                         |      |                   |        |  |          |                      |             |
| Surface area of reservoir             |          |    | 5000  | acres                      |      |                   |        |  |          |                      |             |
| Ratio of total land area reqd to surf | ace area |    | 1.1   |                            |      |                   | Er     | ovir & Arch                                | naeolo   | ay, Surv.            |             |
| Total land area regd for reservoirs   |          |    | 5500  | acres                      |      |                   |        |  |          | nd Acq =             | 27.5        |
|                                       |          |    |       |                            |      | T                 | otal c | apital cost                                | t in mil | lions =              | \$<br>161.9 |
| Assumed life of reservoir             |          |    | 100   | years                      |      |                   |        |  |          |                      |             |
| Estimated replacement cost            |          | \$ | 0.97  | million/year               |      |                   |        |  |          |                      |             |
| Estimated maintenance                 |          |    | 0.4   | million/year               | Mowi | ng, mair          | tainin | g fences,                                  | etc.     |                      |             |
| Total                                 |          | \$ | 1.37  | million/year               |      |                   |        |  |          |                      |             |
| Year built                            |          |    | 2020  |                            |      |                   |        |  |          |                      |             |
| NPV of O&M costs                      |          | \$ | 19.1  | million                    |      |                   |        |  |          |                      |             |
| NPV of Capital costs                  |          | \$ | 126.8 | million                    |      |                   |        |  |          |                      |             |
| Total NPV of Canital and OSM Cos      | te       | •  | 145.9 | million                    |      |                   |        |  |          |                      |             |

| Summary   |    | IPV of<br>tal Costs |    | IPV of O&M<br>Costs | Ca | al NPV of<br>pital and<br>M Costs |
|---|----|---------------------|----|---------------------|----|-----------------------------------|
| Inflatable Rubber Low Head Dam                                    | \$ | 9.7                 | \$ | 6.3                 | \$ | 16.0                              |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$ | 54.1                | \$ | 21.6                | \$ | 75.7                              |
| Reservoirs  | \$ | 126.8               | \$ | 19.1                | \$ | 145.9                             |
| Total for RWI A   | s  | 190.6               | s  | 47.0                | \$ | 237.6                             |

#### O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 1A - WTP East of San Antonio

Initial year of analysis period Contingency = 20% Engineering, Legal, Admin. = 15% Interest rate 5% 50 years Environmental & Archaeology Studies & Evaluation period Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Unit cost of energy 0.07 per kwh Raw Water Transmission Main - A 96 in. 50.27 sf Inside diameter of pipe Length of RWTM 150 miles 792 000 feet Estimated unit construction cost for RWTM 567 per LF 865 Total construction cost in millions 449 Contingencies 90 Subtotal Engineering, Legal & Administrative Subtotal 620 Envir & Arch Studies & Mitigation, Surveying, & Land Acq \$ Total Capital Cost for PWTM in millions 635 million Unit maintenance cost/year-mile 10,000 \$/year-mile \$ 1.500 Million \$/year 132,000 ac-ft/year Design flow rate (after 100% buildout) 118 mgd 81,829 gpm Pumping rate (one pump) 16,400 No. of pumps (not counting spare)
Peak flow rate (all pumps except spare) 82,000 gpm 3.63 fps Velocity at peak flow rate C factor 120 hr= | 3.552\*Q|1.85 0.00041 ft/ft Head loss per foot 2 19 ft/mile | C\*(d)2.63 Head loss at peak flow rate 328 ft 600 Elev. At San Antonio East WTP Allowance for minor losses 10% 33 ft 361 ft Total estimated losses 90 Elev. At Matagorda OCRs 510 ft Average static head Total estimated dynamic head 510 ft 871 ft 378 psi No of pumping stations req'd along route No. of pumping stations used in cost estimate 2.52 150 psi (assumed max pressure in pipe) 3.0 Average head per pump station 290 ft Assumed pump efficiency 85% 90% Assumed motor efficiency Estimated Hp required per pump 1,572 hp/pump 1,173 kw/pump Total hp per pump station (not counting spare) 4,717 kw/pump set (one pump at each station) Total kw per pump set (set=pumps in series along route) Unit constr. cost for each pump station (from cost curve) 1,315 per firm hp of pump station 10.33 million \$ Construction cost per pump station 0.75 million 11.08 million Balancing reservoir 60 min. of storage at avg pumping rate Total construction cost per pump station 5.0 mg 0.15 per gal for open top reservoir 3.0 each No. of pump stations from above 33.3 million Total construction cost in millions Contigency, Eng., etc. in millions 12.64 million 45.9 million Total capital cost in millions Total construction cost for pump stations \$ 33.3 million 40% Estimated equipment cost as % of total 13.3 million Value of equipment Assumed life of equipment Estimated maintenance/replacement cost 20 years 0.67 million/year

### O&M Costs

| Year         | Flow pum<br>yea |            | No. of<br>pump<br>"sets"<br>operating | Energy<br>used |      | Energy   |    |                   | cos | her O&M<br>its - Pump<br>Stations | c    | intenance<br>costs -<br>RWTM |      | otal O&M<br>cost      | Ne | et preser<br>value |
|--------------|-----------------|------------|---------------------------------------|----------------|------|----------|----|-------------------|-----|-----------------------------------|------|------------------------------|------|-----------------------|----|--------------------|
|              | ac-ft/yr        | mgd        | /day                                  | (kwh/day)      |      | (\$/day) | (1 | Million \$ /year) | (1  | Million \$<br>/year)              | (    | Million \$ /year)            |      | (Million \$<br>/year) | -  | (\$)               |
| 2015         |                 | -          | -                                     | -              | \$   | •        | \$ | *                 |     |                                   | -02- |                              | \$   |                       | \$ | -                  |
| 2016         |                 | •          | -                                     | -              | \$   | -        | \$ | *                 |     |                                   |      |                              | \$   | *                     | \$ | -                  |
| 2017         | -               |            | -                                     | -              | \$   |          | \$ |                   |     |                                   |      |                              | \$   | -                     | \$ |                    |
| 2018         | -               | -          | -                                     |                | \$   | -        | \$ |                   |     |                                   |      |                              | \$   | -                     | \$ |                    |
| 2019         | -               | •          | •                                     | •              | \$   |          | \$ | •                 |     |                                   |      |                              | \$   | •                     | \$ | -                  |
| 2020         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 13.0               |
| 2021         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16,60                 | \$ | 12.3               |
| 2022         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 11.                |
| 2023         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 11.                |
| 2024         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 10.                |
| 2025         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 10.                |
| 2026         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 9.                 |
| 2027         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 9.3                |
| 2028         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 8.8                |
| 2029         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 8.                 |
| 2030         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 7.                 |
| 2031         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 7.                 |
| 2032         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16,60                 | \$ | 7.                 |
| 2033         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1,500                        | \$   | 16.60                 | \$ | 6.                 |
| 2034         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1,500                        | \$   | 16.60                 | \$ | 6.                 |
| 2035         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | s  | 14.43             | s   | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 6.                 |
| 2036         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | s  | 5.                 |
| 2037         | 132,000         | 118        | 4.99                                  | 564,822        | Š    | 39,538   | Š  | 14.43             | Š   | 0.67                              | Š    | 1.500                        | \$   | 16.60                 | \$ | 5                  |
| 2038         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | Š  | 5                  |
| 2039         | 132,000         | 118        | 4.99                                  | 564,822        | Š    | 39,538   | Š  | 14.43             | Š   | 0.67                              | Š    | 1.500                        | Š    | 16.60                 | Š  | 5.                 |
| 2040         | 132,000         | 118        | 4.99                                  | 564,822        | Š    | 39,538   | Š  | 14.43             | s   | 0.67                              | Š    | 1.500                        | Š    | 16.60                 | Š  | 4.                 |
| 2041         | 132,000         | 118        | 4.99                                  | 564,822        | Š    | 39,538   | \$ | 14.43             | Š   | 0.67                              | Š    | 1.500                        | š    | 16.60                 | Š  | 4                  |
| 2042         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | Š    | 1.500                        | s    | 16.60                 | Š  | 4                  |
|              |                 | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | 5    | 1.500                        | \$   | 16.60                 | \$ | 4.                 |
| 2043<br>2044 | 132,000         | 118        | 4.99                                  | 564,822        | Š    | 39,538   | Š  | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 4                  |
|              | 132,000         |            | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | S  | 3.                 |
| 2045<br>2046 | 132,000         | 118<br>118 | 4.99                                  |                | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | s  | 3.                 |
|              | 132,000         |            |                                       | 564,822        | \$   |          | \$ | 14.43             | S   | 0.67                              | \$   | 1.500                        | S    | 16.60                 | Š  | 3.                 |
| 2047         | 132,000         | 118        | 4.99                                  | 564,822        |      | 39,538   |    |                   |     |                                   | 5    | 1.500                        | \$   | 16.60                 | \$ | 3.                 |
| 2048         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              |      |                              |      | 16.60                 | S  | 3                  |
| 2049         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   |                       |    |                    |
| 2050         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 3                  |
| 2051         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2052         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2053         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2054         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2055         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2056         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2057         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2058         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 2                  |
| 2059         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1,500                        | \$   | 16.60                 | \$ | 1                  |
| 2060         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
| 2061         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
| 2062         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
| 2063         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
| 2064         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
| 2065         | 132,000         | 118        | 4.99                                  | 564,822        | \$   | 39,538   | \$ | 14.43             | \$  | 0.67                              | \$   | 1.500                        | \$   | 16.60                 | \$ | 1                  |
|              |                 |            |                                       |                |      |          |    |                   |     |                                   | 1    | Total NPV                    | of C | 0&M Costs             | \$ |                    |
|              |                 |            | Capital Cos                           | ts in million  | \$:  |          |    |                   | 2   | Yr built                          |      |                              |      |                       |    |                    |
|              |                 |            | 25                                    | RWTM           |      |          | \$ | 635               |     | 2020                              |      |                              |      |                       | \$ | 4                  |
|              |                 |            |                                       | Pumping St     | atio | ns       | \$ | 46                |     | 2020                              |      |                              |      |                       | \$ |                    |
|              |                 |            |                                       |                |      |          |    |                   |     |                                   |      |                              |      | pital Costs           | \$ | - 1                |

#### NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 1A - WTP East of San Antonio

Initial year of analysis period 2015 Contingency = 20% Interest rate 5% Engineering, Legal, Admin. = 15% Evaluation period 50 years Environmental & Archaeology Studies & Unit cost of energy \$ 0.07 per kwh Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

|  | ALCOA | CPS   | Total |
|--|-------|-------|-------|
| Year built   | 2015  | 2015  |       |
| Estimated Construction Cost in Millions                  |       |       |       |
| Wells (Based on Non-Public Water Supply Wells)           | 20.92 | 7.94  | 28.86 |
| Pipeline   | 13.03 | 5.94  | 18.97 |
| Pump Stations & Storage                                  | 8.51  | 0     | 8.5   |
| Subtotal   | 42.46 | 13.88 | 56.34 |
| Contingency  | 8.49  | 2.78  | 11.2  |
| Subtotal   | 50.95 | 16.66 | 67.6  |
| Engineering, Legal & Administrative                      | 6.37  | 2.08  | 8.45  |
| Subtotal   | 57.32 | 18.74 | 76.00 |
| Environmental & Archaeology Studies & Mitigation         | 0.63  | 0.2   | 0.8   |
| Land Acquisition & Surveying                             | 0     | 0     | 0.0   |
| Groundwater Purchase                                     | 0     | 5.64  | 5.64  |
| ALCOA Construction Program Management Fee                | 5.45  | 0     | 5.4   |
| Interest During Construction (2 years, 6% int., 4% ret.) | 5.89  | 2.44  | 8.3   |
| Total Capital Cost                                       | 69.29 | 27.02 | 96.3  |
| Estimated Annual O&M Costs                               |       |       |       |
| O&M  | 0.67  | 0.18  | 0.8   |
| Pumping Energy   | 2.41  | 0.52  | 2.9   |

| Total Annual Cost             | 6.36 | 1.06 | 7.42 |
|-------------------------------|------|------|------|
| Mitigation Reserves           | 0.28 | 0.11 | 0.39 |
| Groundwater District Fees     | 0.65 | 0.25 | 0.90 |
| Purchase of Groundwater       | 2.00 | 0.00 | 2.00 |
| ALCOA Project Management Fees | 0.35 | 0.00 | 0.35 |
| Pumping Energy                | 2.41 | 0.52 | 2.93 |
| O&M                           | 0.67 | 0.18 | 0.85 |
| Estimated Annual O&M Costs    |      |      |      |

 NPV of O&M Costs
 \$
 116
 \$
 19
 \$
 135 million million

 NPV of Capital Costs
 \$
 69
 \$
 27
 \$
 96 million

 Total NPV of Capital and O&M Costs for Well Fields
 \$
 185
 \$
 46
 \$
 232
 million

#### Cooling of Well Water

| Total number of wells in both fields                 | 120 wells | Approximate capacity per wel | 300    | gpm        |
|--|-----------|------------------------------|--------|------------|
| Percentage of wells with temperatures > than degrees | 5%        |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees | 6.0       | Rough check                  | 58,072 | ac-ft/year |

#### Estimated Capital Costs

| Year built  |     | 2015    |         |
|---|-----|---------|---------|
| Number of Packaged Cooling Towers (300 gpm capacity/each) | 6.0 |         |         |
| Equipment cost (cooling towers and fans)                  | \$  | 60,000  |         |
| Installation and contractors mark-up                      | \$  | 50,000  |         |
| Structural slab   | \$  | 30,000  |         |
| Electrical  | \$  | 50,000  |         |
| Estimated Unit Construction Cost                          | \$  | 190,000 | Each    |
| Total construction cost                                   | \$  | 1.14    | million |
| Contingencies   | \$  | 0.23    |         |
| Subtotal  | \$  | 1.37    |         |
| Engineering, Legal and Admin                              | \$  | 0.21    |         |
| Total Estimated Capital Cost                              | \$  | 1.57    | -       |
| NPV of Canital Costs                                      | S   | 1 57    | million |

#### Estimated O&M Costs

| Value of equipment  | \$<br>0.4   | million                          |  |
|---|-------------|----------------------------------|--|
| Assumed life of equipment   | 10          | years                            |  |
| Estimated maintenance/replacement cost                                    | \$<br>0.04  | million/year                     |  |
| Blower Hp per cooling tower   | 10          | Нр                               |  |
|   | 7           | kw                               |  |
| Hours of operation  | 24          | hours                            |  |
| Power consumption per cooling tower                                       | 179         | kwh per day                      |  |
| C. 1943 : 1 10. 12 19. 인 전 시간 전 1. 10 10 10 10 10 10 10 10 10 10 10 10 10 | 65,350      | kwh per year                     |  |
| Power cost per cooling tower  | \$<br>4,574 | per year                         |  |
| Total power cost for all cooling towers in millions                       | \$<br>0.03  | million per year                 |  |
| Regular operational checks and routine maintenance                        | \$<br>6,000 | per month for all cooling towers |  |
|   | \$<br>0.07  | per year                         |  |

Estimated O&M Cost \$ 0.14 million \$ per year NPV of O&M costs \$ 2.47 million \$

#### Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

54 in.

| Area                                    |                   | 15.90        | -            |               |                                       |
|---|-------------------|--------------|--------------|---------------|---------------------------------------|
| Length of Ground Water TM               |                   |              | miles        |               |                                       |
|   |                   | 79,200       | feet         |               |                                       |
| Estimated construction cost for GWTM    |                   | \$<br>327    | per LF       |               |                                       |
| Total construction cost in millions     |                   | \$<br>25.9   |              |               |                                       |
| Contingencies                           |                   | \$<br>5.2    |              |               |                                       |
| Subtotal                                |                   | \$<br>31.1   |              |               |                                       |
| Engineering, Legal & Administrative     |                   | \$<br>4.7    |              |               |                                       |
| Subtotal                                |                   | \$<br>35.8   |              |               |                                       |
| Envir & Arch Studies & Mitigation, Surv | eying, & Land Acq | \$<br>1.5    |              |               |                                       |
| Total Capital Cost for PWT              |                   | \$<br>37.3   | million      |               |                                       |
| Unit maintenance cost/year-mile         |                   | \$<br>10,000 | \$/year-mile | \$ 0.15       | 50 Million \$/year                    |
| Design flow rate                        |                   | 55,000       | ac-ft/year   |               |                                       |
|   |                   | 49           | mgd          |               |                                       |
|   |                   | 34,095       | gpm          |               |                                       |
| Velocity at peak flow rate              |                   | 4.78         | fps          |               |                                       |
| C factor                                |                   | 120          |              |               |                                       |
| Head loss per foot                      |                   | 0.00134      | ft/ft        | 1             | n=   3.552*Q  <sup>1.85</sup>         |
|   |                   | 7.10         | ft/mile      |               | C*(d) <sup>2.63</sup>                 |
| Head loss at peak flow rate             |                   | 106          | ft           |               |                                       |
| Allowance for minor losses              | 10%               | 11           | ft           | 4             | 00 Elev. At RWI-B                     |
| Total estimated losses                  |                   | <br>117      | ft           | 5             | 50 minus Elev Storage Tank at Hwy 290 |
| Average static head                     |                   | -150         | ft           | -1            | 50 ft                                 |
| Total estimated dynamic head            |                   | -33          | ft           | (intake is lo | wer than tank at Hwy 290)             |
|   |                   | -14          | psi          | 8             |                                       |

#### Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

|                              |     |       |          |                            | Mi | illion \$                                |
|------------------------------|-----|-------|----------|----------------------------|----|--|
| Annual O&M Cost in million   | \$: |       | Yr built |                            |    | 77 1 2 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |
| GWTM                         | \$  | 0.150 | 2015     |                            |    |  |
|                              |     |       |          | Total NPV of O&M Costs     | \$ | 2.7                                      |
| Capital Costs in million \$: |     |       | Yr built |                            |    |  |
| GWTM                         | \$  | 37.3  | 2015     |                            | \$ | 37.3                                     |
|                              |     |       |          | Total NPV of Capital Costs | S  | 37.3                                     |

#### Summary

Well Fields and Collection Lines (including tank and pump station at Hwy 290)
Cooling Towers for Selected High Temperature Wells
Ground Water Transmission Main and Pumping Station
Total for ALCOA-CPS

|    | IPV of<br>tal Costs | NF | V of O&M<br>Costs | Capital and<br>O&M Costs |       |  |  |  |
|----|---------------------|----|-------------------|--------------------------|-------|--|--|--|
| \$ | 96.3                | \$ | 135.5             | \$                       | 231.8 |  |  |  |
| \$ | 1.6                 | \$ | 2.5               | \$                       | 4.0   |  |  |  |
| \$ | 37.3                | \$ | 2.7               | \$                       | 40.0  |  |  |  |
| •  | 135 1               | \$ | 140.7             | 9                        | 275 8 |  |  |  |

#### O&M Cost Calculations RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir CTRWTP - Alternate 1A - WTP East of San Antonio

Contingency = 20% Engineering, Legal, Admin. = 15% Initial year of analysis period 5% 40 years Interest rate Environmental & Archaeology Studies &

Mittgation, Surveying, and Land Acquisition = \$ 100,000 per mile

or = \$ 5,000 per acre Evaluation period Unit cost of energy \$ 0.07 per kwh Inflatable Rubber Low Head Dam Total Contigency, Total Capital Eng., etc. Cost (millions) (millions) Unit Constr. Estimated Constr. Cost Quantity Units Size Cost (millions) (millions) 10 ft high 2.25 \$ 1.71 \$ Inflatable Rubber Low Head Dam 2 each 4.50 \$ 50% 2.25 million Estimated inflatable dam cost as % of total Value of inflatable dam
Assumed life of inflatable dam
Estimated maintenance/replacement cost 10 years 0.23 million/year Year built 2015 NPV of O&M Costs NPV of Capital Costs 3.86 million 6.21 million Total NPV of Capital and O&M Costs \$ 10.07 million

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

#### Summary of withdrawals in acre-feet/year:

| Year                          | 2015                    | 2020          | 2030          | 2040         |       | 2050             | 2060              | 2065             |   |
|-------------------------------|-------------------------|---------------|---------------|--------------|-------|------------------|-------------------|------------------|---|
| For SAWS                      | 18000                   | 18000         | 18000         | 18000        |       | 18000            | 18000             | 18000            |   |
| LCRA                          |                         |               | 5600          | 11200        |       | 11200            | 11200             | 11200            |   |
| COA _                         |                         |               | 16802         | 22403        |       | 33604            | 33604             | 33604            |   |
| Total                         | 18000                   | 18000         | 40402         | 51603        |       | 62804            | 62804             | 62804            |   |
| Ultimate (Y2                  | 065) avera              | age design v  | vithdrawal ra | ate          |       |                  | ac-ft/year<br>cfs |                  |   |
|                               |                         |               |               |              |       |                  |                   | 23.1             | Ratio of design withdrawal rate                     |
| Total intake                  | design with             | hdrawal rate  | (for scalpin  | g high flows | )     | 2,000<br>897,600 |                   |                  | to Total intake design withdrawal rate              |
| No. of Intake                 |                         |               |               |              |       | 2                |                   |                  |   |
| Design with                   |                         | ner intake    |               |              |       | 1,000            | cfe               |                  |   |
| Design with                   | Jiawai iato             | per ilitake   |               |              |       | 448,800          |                   |                  |   |
|                               |                         |               |               |              |       |                  |                   |                  |   |
| No. of resen<br>Design flow   |                         | servoir       |               |              |       | 224,400          |                   |                  |   |
| Dough non                     | to oddir ro             | 3011011       |               |              |       | 221,100          | ab                |                  |   |
| Inside diame                  | eter of each            | h RWTM        |               |              |       | 120              | in.               |                  |   |
| Area                          |                         |               |               |              |       | 78.54            |                   |                  |   |
| Average len                   | gth of each             | RWTM          |               |              |       |                  | miles             |                  | miles for all RWTMs                                 |
|                               |                         |               |               |              |       | 10,560           | feet              | 42,240           | feet  |
| Estimated co                  | onstruction             | cost for RV   | VTMs          |              | \$    | 793              | per LF            |                  | \$ 1,254  |
| Total constr                  |                         | in millions   |               |              | \$    | 33.5             |                   |                  |   |
| Contingencie                  |                         |               |               |              | \$    | 6.7              |                   |                  |   |
|                               | Subtotal                |               |               |              | \$    | 40.2             |                   |                  |   |
| Engineering                   | , Legal & A<br>Subtotal | dministrativ  | е             |              | \$    | 6.0<br>46.2      | -                 |                  |   |
| Envir & Arch                  |                         | Mitigation    | Surveying 8   | & Land Aca   | \$    | 0.8              |                   |                  |   |
|                               |                         | al Cost for F |               |              | \$    | 47.0             | •                 |                  |   |
| Unit mainter                  | nance cost              | /year-mile    |               |              | \$    | 10,000           | \$/year-mile      | \$ 0.080         | Million \$/year (all RWTMs to Reservoirs            |
| Note: Assun                   | ne intake h             | as one RW     | TM pumping    | to the reser | voir. |                  |                   |                  |   |
| Design flow                   | rate for ea             | ch RWTM (     | from above)   |              |       | 224,400          | gpm               |                  |   |
| Pumping rat                   |                         |               |               |              |       | 40,000           | gpm               | 1                |   |
| No. of pump<br>Peak flow ra   |                         |               |               |              | Γ.    | 240,000          | gpm               |                  |   |
| Velocity at p                 | eak flow ra             | ate           |               |              |       | 6.81             | fps               |                  |   |
| C factor                      |                         |               |               |              |       | 0.00102          | 0/0               | h                | . 0 55000185  |
| Head loss p                   | er toot                 |               |               |              |       |                  | ft/mile           | n <sub>t</sub> = | 3.552*Q  <sup>1.85</sup><br>  C*(d) <sup>2.63</sup> |
|                               |                         |               |               |              |       |                  |                   |                  | 10 (4)  |
| Head loss a                   |                         |               | 2004          |              |       | 11               |                   | 400              | Disabassa at assault                                |
| Allowance for<br>Total estima |                         |               | 30%           |              | _     |                  | -ft<br>ft         |                  | Discharge at reservoir Water surface elev in river  |
| Average sta                   |                         |               |               |              |       | 80               |                   | 80               |   |
| Total estima                  |                         | ic head       |               |              | _     | 94               | ft                |                  |   |
|                               |                         |               |               |              |       | 41               | psi               |                  |   |
| Assumed pu                    |                         |               |               |              |       | 85%              |                   |                  |   |
| Assumed m                     |                         |               |               |              |       | 90%              |                   |                  |   |
| Estimated H                   | p required              | per pump      |               |              |       |                  | hp/pump           |                  |   |

926 kw/pump

| Total hp pumping into each RWTM (not counting spare)         |    | 7,448  | hp/RWTM                    |     |           |                                |
|--|----|--------|----------------------------|-----|-----------|--------------------------------|
| Total hp at each intake (not counting spare)                 |    | 14,897 | hp/intake                  |     |           |                                |
| Total hp all intakes (not counting spares)                   |    | 29,793 | hp                         |     |           |                                |
| Total kw all intakes (not counting spares)                   |    | 22,226 | kw                         |     |           |                                |
| Unit construction cost for each pump station (from cost cur- | \$ | 889    | per firm hp of pump statio | n   | s         | 830                            |
| Construction cost per intake/pump station                    |    | 13.2   | million                    |     |           |                                |
| No. of intakes from above                                    |    | 2      | each                       |     |           |                                |
| Total construction cost in millions                          | \$ | 26.5   | million                    |     |           |                                |
| Contigency, Eng., etc. in millions                           | \$ | 10.06  | million                    |     |           |                                |
| Total capital cost in millions                               | \$ | 36.6   | million                    |     |           |                                |
| Total construction cost for pump stations                    | \$ | 26.5   | million                    | 10% | Estimated | d equipment cost as % of total |
| Value of equipment   | \$ | 10.6   | million                    |     |           | 20.0                           |
| Assumed life of equipment                                    |    | 20     | years                      |     |           |                                |
| Estimated maintenance/replacement cost                       | S  | 0.53   | million/year               |     |           |                                |

O&M Costs:

| Year         | Flow pum         |          | No. of pump "sets" | Energy<br>used   |     | Energ          | у с | ost                |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Т  | otal O&M<br>cost  | N  | et present<br>value |
|--------------|------------------|----------|--------------------|------------------|-----|----------------|-----|--------------------|----|--------------------------------------|----|-------------------------------|----|-------------------|----|---------------------|
|              | ac-ft/yr         | mgd      | operating<br>/day  | (kwh/day)        |     | (\$/day)       |     | (Million \$ /year) |    | (Million \$ /year)                   | )  | (Million \$<br>/year)         | (  | Million \$ /year) |    | (\$)                |
| 2015         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.77                |
| 2016         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.73                |
| 2017         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.70                |
| 2018         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.66                |
| 2019         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.63                |
| 2020         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.60                |
| 2021         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.57                |
| 2022         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.55                |
| 2023         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.52                |
| 2024         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.50                |
| 2025         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.47                |
| 2026         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.45                |
| 2027         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.43                |
| 2028         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.41                |
| 2029         | 18,000           | 16       | 0.28               | 6,200            | \$  | 434            | \$  | 0.16               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.77              | \$ | 0.39                |
| 2030         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.46                |
| 2031         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.44                |
| 2032         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.42                |
| 2033         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.40                |
| 2034         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.38                |
| 2035         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.36                |
| 2036         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.35                |
| 2037         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.33                |
| 2038         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.31                |
| 2039         | 40,402           | 36       | 0.63               | 13,917           | \$  | 974            | \$  | 0.36               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 0.97              | \$ | 0.30                |
| 2040<br>2041 | 51,603           | 46<br>46 | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 1.06              | \$ | 0.31                |
| 2041         | 51,603           | 46       | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 1.06              | \$ | 0.30                |
| 2042         | 51,603<br>51,603 | 46       | 0.80<br>0.80       | 17,775           | 200 | 1,244<br>1,244 | \$  | 0.45<br>0.45       | \$ | 0.53                                 | \$ | 0.080                         | \$ | 1.06              |    | 0.28                |
| 2043         | 51,603           | 46       | 0.80               | 17,775<br>17,775 | \$  | 1,244          | \$  | 0.45               | \$ | 0.53<br>0.53                         | \$ | 0.080                         | \$ | 1.06<br>1.06      | \$ | 0.27<br>0.26        |
| 2045         | 51,603           | 46       | 0.80               | 17,775           | S   | 1,244          | \$  | 0.45               | S  | 0.53                                 | \$ | 0.080                         | S  | 1.06              | S  | 0.25                |
| 2045         | 51,603           | 46       | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | S  | 0.53                                 | \$ | 0.080                         | S  | 1.06              | S  | 0.23                |
| 2047         | 51,603           | 46       | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | \$ | 0.53                                 | \$ | 0.080                         | S  | 1.06              | \$ | 0.23                |
| 2048         | 51,603           | 46       | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | \$ | 0.53                                 | \$ | 0.080                         | \$ | 1.06              | \$ | 0.22                |
| 2049         | 51,603           | 46       | 0.80               | 17,775           | \$  | 1,244          | \$  | 0.45               | \$ | 0.53                                 | \$ | 0.080                         | S  | 1.06              | \$ | 0.20                |
| 2050         | 62,804           | 56       | 0.00               | 21,633           | \$  | 1,514          | \$  | 0.45               | S  | 0.53                                 | \$ | 0.080                         | \$ | 1.16              | S  | 0.21                |
| 2051         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | \$  | 0.55               | Š  | 0.53                                 | Š  | 0.080                         | Š  | 1.16              | Š  | 0.20                |
| 2052         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | Š   | 0.55               | Š  | 0.53                                 | š  | 0.080                         | Š  | 1.16              | Š  | 0.19                |
| 2053         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | s   | 0.55               | Š  | 0.53                                 | S  | 0.000                         | Š  | 1.16              | Š  | 0.18                |
| 2054         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | Š   | 0.55               | Š  | 0.53                                 | Š  | 0.000                         | Š  | 1.16              | Š  | 0.17                |
| 2055         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | \$  | 0.55               | Š  | 0.53                                 | Š  | 0.080                         | Š  | 1.16              | Š  | 0.17                |
| 2056         | 62,804           | 56       | 0.97               | 21,633           | \$  | 1,514          | Š   | 0.55               | S  | 0.53                                 | s  | 0.080                         | Š  | 1.16              | Š  | 0.16                |
| 2057         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | Š   | 0.55               | Š  | 0.53                                 | š  | 0.080                         | Š  | 1.16              | S  | 0.15                |
| 2058         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | Š   | 0.55               | Š  | 0.53                                 | Š  | 0.080                         | Š  | 1.16              | Š  | 0.14                |
| 2059         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1,514          | Š   | 0.55               | Š  | 0.53                                 | Š  | 0.000                         | Š  | 1.16              | S  | 0.14                |
| 2060         | 62,804           | 56       | 0.97               | 21,633           | Š   | 1.514          | Š   | 0.55               | \$ | 0.53                                 | š  | 0.080                         | Š  | 1.16              | š  | 0.13                |
| 2061         | 62,804           | 56       | 0.97               | 21,633           | \$  | 1,514          | \$  | 0.55               | \$ | 0.53                                 | Š  | 0.080                         | \$ | 1.16              | Š  | 0.12                |
| 2062         | 62,804           | 56       | 0.97               | 21,633           | S   | 1,514          | Š   | 0.55               | \$ | 0.53                                 | \$ | 0.080                         | Š  | 1.16              | Š  | 0.12                |
| 2063         | 62,804           | 56       | 0.97               | 21,633           | \$  | 1,514          | \$  | 0.55               | s  | 0.53                                 | Š  | 0.080                         | \$ | 1.16              | Š  | 0.11                |
| 2064         | 62,804           | 56       | 0.97               | 21,633           | s   | 1,514          | Š   | 0.55               | \$ | 0.53                                 | \$ | 0.080                         | Š  | 1.16              | S  | 0.11                |
| 2065         | 62,804           | 56       | 0.97               | 21,633           | \$  | 1,514          | \$  | 0.55               | \$ | 0.53                                 | \$ | 0.080                         | Š  | 1.16              | Š  | 0.10                |
|              |                  |          |                    |                  | 1   |                | -   |                    | 1  |                                      |    |                               |    |                   |    |                     |

Total NPV of O&M Costs \$ 17.1

 Capital Costs in million \$:
 Yr built

 RWTM to Reservoir Intake/Pumping Stations
 \$ 47.0
 2015
 \$ 47.0
 \$ 36.6

 2015
 Total NPV of Capital Costs
 \$ 36.6

Total NPV of Capital and O&M Costs in millions \$ 100.7

#### Reservoirs

|                                   | Quantity | Units | Volume/each<br>(acre-feet) | nit Cost<br>\$/ac-ft) | Con   | Total<br>struction<br>ost in<br>illions | tigency,<br>g., etc. | otal in<br>illions |
|-----------------------------------|----------|-------|----------------------------|-----------------------|-------|---|----------------------|--------------------|
| Reservoirs                        | 4        | each  | 15000                      | \$<br>1,180           | \$    | 70.8                                    | \$<br>26.9           | \$<br>97.7         |
|                                   |          |       |                            | \$<br>0.004           | per g | allon                                   |                      |                    |
| Estimated average depth of reserv | voir     | 20    | ft                         |                       | 0 0   |   |                      |                    |

| Surface area of reservoir                     | 3000        | acres        |                                     |       |
|---|-------------|--------------|-------------------------------------|-------|
| Ratio of total land area reqd to surface area |             |              |                                     |       |
| of reservoir                                  | 1.1         |              | Envir & Archaeology, Surv,          |       |
| Total land area regd for reservoirs           | 3300        | acres        | and Land Acq =                      | 16.5  |
|   |             |              | Total capital cost in millions = \$ | 114.2 |
| Assumed life of reservoir                     | 100         | years        |                                     |       |
| Estimated replacement cost                    | \$<br>0.71  | million/year |                                     |       |
| Estimated maintenance                         | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.    |       |
| Total   | \$<br>0.75  | million/year |                                     |       |
| Year built                                    | 2015        |              |                                     |       |
| NPV of O&M costs                              | \$<br>12.8  | million      |                                     |       |
| NPV of Capital costs                          | \$<br>114.2 | million      |                                     |       |
| Total NPV of Capital and O&M Costs            | \$<br>127.0 | million      |                                     |       |

| Summary   | -  | PV of<br>tal Costs | PV of O&M<br>Costs | Ca | pital and |
|---|----|--------------------|--------------------|----|-----------|
| Inflatable Rubber Low Head Dam                                    | \$ | 6.2                | \$<br>3.9          | \$ | 10.1      |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$ | 83.6               | \$<br>17.1         | \$ | 100.7     |
| Off Channel Reservoir   | \$ | 114.2              | \$<br>12.8         | \$ | 127.0     |
| Total for RWI A   | \$ | 204.0              | \$<br>33.8         | \$ | 237.8     |

# O&M Cost Calculations RWTM B - RWI B near Bastrop to WTP CTRWTP - Alternate 1A - WTP East of San Antonio

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate Evaluation period Unit cost of energy 5% 40 years \$ 0.07 per kwh

| Surface Water  |       |       |       |        |        |        |        |
|----------------|-------|-------|-------|--------|--------|--------|--------|
| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS       | 18000 | 18000 | 18000 | 18000  | 18000  | 18000  | 18000  |
| LCRA           |       |       | 5600  | 11200  | 11200  | 11200  | 11200  |
| COA            |       |       | 16802 | 22403  | 33604  | 33604  | 33604  |
| Subtotal       | 18000 | 18000 | 40402 | 51603  | 62804  | 62804  | 62804  |
| Groundwater    |       |       |       |        |        |        |        |
| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS       | 55000 | 55000 | 55000 | 55000  | 55000  | 55000  | 55000  |
| Suface & groun | 73000 | 73000 | 95402 | 106603 | 117804 | 117804 | 117804 |

| Ultimate (Y206                   | 5) average design pumping rate                 | - John   | 117,804       | ac-ft/year        |        |             |         |                  |   |          |
|----------------------------------|--|--|---------------|-------------------|--------|-------------|---------|------------------|---|----------|
| Sizing of Raw Water Tr           | ansmission Main B & Pump Stations              |  |               |                   |        |             |         |                  |   |          |
| Inside diameter                  | r of RWTM                                      | 040  | 84<br>38.48   |                   |        |             |         |                  |   |          |
| Length of RWT                    | М  |  |               | miles             |        |             |         |                  |   |          |
| Estimated unit                   | construction cost for RWTM                     | \$   | 467           | per LF            |        |             | \$      | 417              |   |          |
| Total construct<br>Contingencies | ion cost in millions                           | \$   | 190.0<br>38.0 |                   |        |             |         |                  |   |          |
|                                  | btotal   | \$   | 228.0         |                   |        |             |         |                  |   |          |
|                                  | egal & Administrative                          | \$   | 34.2          |                   |        |             |         |                  |   |          |
|                                  | btotal   | \$   | 262.2         |                   |        |             |         |                  |   |          |
| Envir & Arch St                  | tudies & Mitigation, Surveying, & Land Acq     | \$   | 7.7           |                   |        |             |         |                  |   |          |
|                                  | tal Capital Cost for PWTM in millions          | \$   | 269.9         | million           |        |             |         |                  |   |          |
| Unit maintenan                   | ce cost/year-mile                              | \$   | 5,000         | \$/year-mile      | \$     | 0.385       | Million | s/year           |   |          |
| Design flow rat                  | e (from table above)                           |  |               | ac-ft/year<br>mgd |        |             |         |                  |   |          |
|                                  |  |  | 73,029        | gpm               |        |             |         |                  |   |          |
| Pumping rate (                   | one numn)                                      | MINES OF THE PARTY | 15,000        |                   |        |             |         |                  |   |          |
|                                  | not counting spare)                            | 11/2/16  | 5             | apin              |        |             |         |                  |   |          |
|                                  | (all pumps except spare)                       | I A STATE OF   | 75,000        | gpm               |        |             |         |                  |   |          |
| Velocity at pea<br>C factor      | k flow rate                                    |  | 4.34          | fps               |        |             |         |                  |   |          |
| Head loss per                    | loot   |  | 0.00067       | 6/6               |        | h=          | 10 55   | 1.8              | 5                                       |          |
| riead loss per                   | 661  |  |               | ft/mile           |        | III-        | 1 C*(d  | 2*Q 1.8<br>,2.63 |   |          |
|                                  |  |  | 0.00          | TOTTING           |        |             | 1 C-(a  | ) 1              |   |          |
| Head loss at pe                  | eak flow rate                                  |  | 274           | ft                |        |             |         |                  |   |          |
| Allowance for r                  |  |  | 27            |                   |        | 650         | Elev    | At WTP           | )                                       |          |
| Total estimated                  |  | -  | 301           |                   |        |             |         |                  | in Bastrop reservoi                     | r        |
| Average static                   |  |  | 250           |                   | -      | 250         |         |                  |   |          |
|                                  | d dynamic head                                 |  | 551           | ft                |        |             |         |                  |   |          |
|                                  | © por # to proceed the potential proced in 10. |  | 239           | psi               |        |             |         |                  |   |          |
|                                  | ended pumping stations along route             |  | 1.59          |                   |        | 150         |         |                  | I max pressure                          |          |
|                                  | stations used in cost estimate                 |  | 2.0           |                   |        |             | in pip  | e)               |   |          |
| Average head                     | per pump station                               |  | 276           | ft                |        |             |         |                  |   |          |
| Assumed pump                     |  |  | 85%           |                   |        |             |         |                  |   |          |
| Assumed motor                    |  |  | 90%           | G as              |        |             |         |                  |   |          |
| Estimated Hp r                   | equired per pump                               |  |               | hp/pump           |        |             |         |                  |   |          |
|                                  |  |  |               | kw/pump           |        |             |         |                  |   |          |
|                                  | imp station (not counting spare)               |  |               | hp/station        | /a     |             | b       | tation           |   |          |
| i otal kw per pi                 | ump set (set=pumps in series along route)      |  | 2,729         | kw/pump set       | (one p | ump at      | each s  | tation)          |   |          |
|                                  | ost for each pump station (from cost curve)    | \$   |               | per firm hp o     | f pump | station     |         |                  |   |          |
| Construction of                  | ost per pump station                           |  |               | million           | 100    |             |         |                  |   |          |
| Balancing rese                   |  | \$   |               | million           |        |             |         | of storag        | ge at avg pumping i                     | rate     |
| To                               | tal construction cost per pump station         | \$   | 9.95          | million           | s      | 5.0<br>0.15 |         | al for on        | en top reservoir                        |          |
| No. of pump st                   | ations from above                              |  | 2.0           | each              | - 50   |             | , - 0   |                  | • · · · · · · · · · · · · · · · · · · · |          |
| Total construct                  | ion cost in millions                           | \$   | 19.9          | million           |        |             |         |                  |   |          |
|                                  | ing., etc. in millions                         | \$   |               | million           |        |             |         |                  |   |          |
| Total capital co                 |  | \$   |               | million           |        |             |         |                  |   |          |
| Total construct                  | ion cost for pump stations                     | \$   | 19.9          | million           |        |             |         |                  |   |          |
|                                  | lue of equipment                               | \$   |               | million           |        | 40%         | Estim   | ated eq          | uipment cost as %                       | of total |
|                                  | sumed life of equipment                        |  | 20            | years             |        |             |         |                  | 6060                                    |          |
|                                  | timated maintenance/replacement cost           | \$   |               | million/year      |        |             |         |                  |   |          |
|                                  |  |  |               |                   |        |             |         |                  |   |          |

#### O&M Costs

| Υ | 'ear | Flow pun |          | No. of<br>pump<br>"sets" | Energy<br>used     |            | Energy           | y co | st                   | co | ther O&M<br>sts - Pump<br>Stations |      | intenance<br>costs -<br>RWTM | Т    | otal O&M<br>cost   | Ne | et present<br>value |
|---|------|----------|----------|--------------------------|--------------------|------------|------------------|------|----------------------|----|------------------------------------|------|------------------------------|------|--------------------|----|---------------------|
| 4 |      | ac-ft/yr | mgd      | operating<br>/day        | (kwh/day)          |            | (\$/day)         | (    | Million \$<br>/year) | (  | (Million \$<br>/year)              | (    | Million \$ /year)            | (    | (Million \$ /year) |    | (\$)                |
| 2 | 015  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 5.83                |
| 2 | 016  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 5.55                |
|   | 017  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 5.29                |
| 2 | 018  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 5.04                |
| 2 | 019  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 4.80                |
|   | 020  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 4.57                |
| 2 | 021  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 4.35                |
| 2 | 022  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 4.14                |
|   | 023  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.95                |
|   | 024  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.76                |
|   | 025  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.58                |
|   | 026  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.41                |
|   | 027  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.25                |
|   | 028  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 3.09                |
|   | 029  | 73,000   | 65       | 3.02                     | 197,574            | \$         | 13,830           | \$   | 5.05                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 5.83               | \$ | 2.95                |
|   | 030  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 3.55                |
|   | 031  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 3.38                |
|   | 032  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 3.22                |
|   | 033  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 3.07                |
|   | 034  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 2.92                |
|   | 035  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 2.78                |
|   | 036  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 2.65                |
|   | 037  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 2.52                |
|   | 038  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 7.38               | \$ | 2.40                |
|   | 039  | 95,402   | 85       | 3.94                     | 258,205            | \$         | 18,074           | \$   | 6.60                 | \$ | 0.40                               | \$   | 0.385                        | 5    | 7.38<br>8.15       | \$ | 2.29                |
|   | 040  | 106,603  | 95       | 4.41                     | 288,521            | \$         | 20,196           | \$   | 7.37<br>7.37         | \$ | 0.40                               | \$   | 0.385                        |      | 8.15               | \$ | 2.41                |
|   | 041  | 106,603  | 95<br>95 | 4.41                     | 288,521            | \$         | 20,196           | \$   | 7.37                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.15               | S  | 2.18                |
|   | 042  | 106,603  | 95       | 4.41<br>4.41             | 288,521            | \$         | 20,196<br>20,196 | \$   | 7.37                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.15               | \$ | 2.08                |
|   | 043  | 106,603  | 95       | 4.41                     | 288,521<br>288,521 | \$         | 20,196           | \$   | 7.37                 | S  | 0.40                               | \$   | 0.385                        | \$   | 8.15               | \$ | 1.98                |
|   | 045  | 106,603  | 95       | 4.41                     | 288,521            | S          | 20,196           | \$   | 7.37                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.15               | S  | 1.89                |
|   | 046  | 106,603  | 95       | 4.41                     | 288,521            | \$         | 20,196           | \$   | 7.37                 | S  | 0.40                               | \$   | 0.385                        | \$   | 8.15               | \$ | 1.80                |
|   | 047  | 106,603  | 95       | 4.41                     | 288,521            | \$         | 20,196           | \$   | 7.37                 | s  | 0.40                               | \$   | 0.385                        | \$   | 8.15               | \$ | 1.71                |
|   | 048  | 106,603  | 95       | 4.41                     | 288,521            | Š          | 20,196           | \$   | 7.37                 | \$ | 0.40                               | Š    | 0.385                        | \$   | 8.15               | S  | 1.63                |
|   | 049  | 106,603  | 95       | 4.41                     | 288,521            | Š          | 20,196           | Š    | 7.37                 | Š  | 0.40                               | Š    | 0.385                        | Š    | 8.15               | S  | 1.55                |
|   | 050  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | Š    | 8.15                 | Š  | 0.40                               | \$   | 0.385                        | Š    | 8.93               | S  | 1.62                |
|   | 051  | 117,804  | 105      | 4.87                     | 318,836            | Š          | 22,319           | Š    | 8.15                 | s  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.54                |
|   | 052  | 117,804  | 105      | 4.87                     | 318,836            | Š          | 22,319           | \$   | 8.15                 | s  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | Š  | 1.47                |
|   | 053  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | S    | 8.15                 | Š  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.40                |
|   | 054  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | \$   | 8.15                 | Š  | 0.40                               | \$   | 0.385                        | s    | 8.93               | \$ | 1.33                |
|   | 055  | 117,804  | 105      | 4.87                     | 318,836            | Š          | 22,319           | Š    | 8.15                 | \$ | 0.40                               | Š    | 0.385                        | Š    | 8.93               | \$ | 1.27                |
|   | 056  | 117,804  | 105      | 4.87                     | 318,836            | Š          | 22,319           | \$   | 8.15                 | Š  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.21                |
|   | 057  | 117,804  | 105      | 4.87                     | 318,836            | s          | 22,319           | \$   | 8.15                 | Š  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.15                |
|   | 058  | 117,804  | 105      | 4.87                     | 318,836            | s          | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.10                |
|   | 059  | 117,804  | 105      | 4.87                     | 318,836            | s          | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 1.04                |
|   | 060  | 117,804  | 105      | 4.87                     | 318,836            | s          | 22,319           | \$   | 8.15                 | s  | 0.40                               | \$   | 0.385                        | \$   | 8.93               | s  | 0.99                |
|   | 061  | 117,804  | 105      | 4.87                     | 318,836            | s          | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 0.95                |
|   | 062  | 117,804  | 105      | 4.87                     | 318,836            | S          | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 0.90                |
|   | 063  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 0.86                |
|   | 064  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 0.82                |
|   | 065  | 117,804  | 105      | 4.87                     | 318,836            | \$         | 22,319           | \$   | 8.15                 | \$ | 0.40                               | \$   | 0.385                        | \$   | 8.93               | \$ | 0.78                |
|   |      |          |          |                          |                    |            |                  |      |                      |    |                                    |      | Total NPV                    | of ( | D&M Costs          | \$ | 130.3               |
|   |      |          |          | Capital Cos              | ts in million \$   | <b>3</b> : |                  |      |                      | _  | Yr built                           |      |                              |      |                    |    |                     |
|   |      |          |          |                          | RWTM               |            |                  | \$   | 269.9                |    | 2015                               |      |                              |      |                    | \$ | 269.9               |
|   |      |          |          |                          | Pumping Sta        | ation      | าร               | \$   | 27.5                 |    | 2015                               | 12.7 |                              |      |                    | \$ | 27.5                |
|   |      |          |          |                          |                    |            |                  |      |                      |    |                                    | Т    | otal NPV of                  | f Ca | pital Costs        | \$ | 297.4               |

Total NPV of Capital and O&M Costs in millions \$

427.7

East of SA\_Alt1A;RWTM B

## O&M Cost Calculations WTP and Raw Water Storage Reservoir at WTP CTRWTP - Alternate 1A - WTP East of San Antonio

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

2015 Contingency = 20%
5% Engineering, Legal, Admin. = 15%
50 years Environmental & Archaeology Studies &
\$ 0.07 per kwh Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

#### Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

|  |   | Year =  | 2015  | 2020  | 2030  | 2040   | 2050   | 2060           | 2065 |
|--|---|---|---|---|---|--|--|----------------|------|
| Softened water demand:   | <u>82</u>   | Units   |   |   |   |  |  |                |      |
| Average yearly demands:  | _   |   |   |   |   |  |  |                |      |
| City of Austin<br>LCRA   |   | ac-ft/yr<br>ac-ft/yr                                | 0   | 0   | 16802<br>5600   | 22403<br>11200   | 33604<br>11200   | 33604<br>11200 | 33   |
| Totals   |   | ac-ft/yr  | - 0   | 0   | 22402   | 33603  | 44804  | 44804          | 44   |
| Totals   |   | mgd   | 0   | ő   |   | 30   | 40   | 40             | -    |
| Max day demands:<br>City of Austin   |   | mgd   | 0   | 0   | 25  | 35   | 50   | 50             |      |
| LCRA   |   | mgd   | 0   | 0   | 10  | 20   | 20   | 20             |      |
| Totals   |   | mgd   | 0   | 0   | 35  | 55   | 70   | 70             |      |
|  |   | Year =  | 2015  | 2020  | 2030  | 2040   | 2050   | 2060           | 2065 |
| Non-softened water demands:  |   | Units   |   |   |   |  |  |                |      |
| Average yearly demands:  | \$1 8 <del>10</del>   | Oliks   |   |   |   |  |  |                |      |
| SAWS   |   | ac-ft/yr  | 73000   | 205000  | 205000  | 205000   | 205000   | 205000         | 205  |
| SARA   |   | ac-ft/yr  | 20550   | 23406   | 28433   | 31393  | 34411  | 37530<br>12300 | 41   |
| GBRA Totals  | -   | ac-ft/yr  | 93550   | 228406  | 239433  | 244393   | 10000<br>249411  | 254830         | 258  |
| Totals   |   | mgd   | 84  | 204   | 239433  | 244393   | 249411   | 234630         | 250  |
| Max day demands:   |   |   |   |   |   |  |  |                |      |
| SAWS<br>SARA   |   | mgd   | 85  | 238   | 238   | 238  | 238  | 238            |      |
| GBRA   |   | mgd<br>mgd  | 24  | 27  | 33  | 36   | 40   | 44             |      |
| Totals   |   | mgd   | 109   | 265   | 282   | 288  | 296  | 304            |      |
|  |   |   |   |   |   |  |  |                |      |
| otal: softened and non-softened water d<br>Average yearly demand   | lemands   | ac-ft/yr  | 93550   | 228406  | 261835  | 277996   | 294215   | 299634         | 30   |
|  |   | mgd   | 84  | 204   | 234   | 248  | 263  | 267            |      |
| Max day demand   |   | mgd   | 109   | 265   | 317   | 343  | 366  | 374            |      |
|  |   |   |   |   |   |  |  |                |      |
| Water Reservoir  |   |   |   |   |   |  |  |                |      |
| Sizing for ultimate conditions:  |   |   |   |   |   |  |  |                |      |
| Sizing for ultimate conditions:<br>Assumed number of days of consecut  |   |   |   | days  |   |  |  |                |      |
| Sizing for ultimate conditions:  |   |   |   | days<br>mgd   | Aublah la alaa a  |  |  |                |      |
| Sizing for ultimate conditions:<br>Assumed number of days of consecut  | uction req'd in mg  |   | 378   |   | (which is also e  |  | ground and raw   | water that     |      |
| Sizing for ultimate conditions:<br>Assumed number of days of consecut<br>Design (Max. Day) treated water prod  | uction req'd in mg  |   | 378<br>271  | mgd   |   |  | ground and raw   | water that     |      |
| Sizing for ultimate conditions: Assumed number of days of consecul Design (Max. Day) treated water prod Average treated water production in r  | uction req'd in mg<br>mgd<br>w water)                       |   | 378<br>271<br>107<br>3,219  | mgd<br>mgd<br>mgd<br>mg   |   |  | ground and raw   | water that     |      |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of rav Required storage reservoir for raw wa Add safety factor   | uction req'd in mg<br>mgd<br>w water)                       |   | 378<br>271<br>107<br>3,219<br>9,880<br>2,470  | mgd<br>mgd<br>mgd<br>mg<br>ac-ft<br>ac-ft   |   |  | ground and raw   | water that     |      |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa   | uction req'd in mg<br>mgd<br>w water)<br>ster               |   | 378<br>271<br>107<br>3,219<br>9,880   | mgd<br>mgd<br>mgd<br>mg<br>ac-ft  | can be pumped   | to the WTP)  | e day demand   |                |      |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa Add safety factor Total storage required  | uction req'd in mg<br>mgd<br>w water)<br>ster               |   | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350  | mgd<br>mgd<br>mgd<br>mg<br>ac-ft<br>ac-ft<br>ac-ft  | Note: No. of  | to the WTP)  | e day demand   | water that     | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa Add safety factor Total storage required  | uction req'd in mg<br>mgd<br>w water)<br>ster               |   | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350  | mgd<br>mgd<br>mgd<br>mg<br>ac-ft<br>ac-ft<br>ac-ft  | Note: No. of (for exam  | to the WTP)  | e day demand   |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of rav Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  | uction req'd in mg<br>mgd<br>w water)<br>ater<br>25%        | d   | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each   | mgd mgd mgd mg mg ac-ft ac-ft ac-ft Unit Cost   | Note: No. of (for exam  Total  Construction Cost                      | days at averagingle, for repair of   | e day demand<br>of RWTM A) =<br>Total Capital                    |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  | uction req'd in mg mgd w water) ster 25%  Quantity          | Units each  | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each<br>(acre-feet)                                    | mgd mgd mgd mg ac-ft ac-ft ac-ft Unit Cost (\$/ac-ft))  | Note: No. of (for exam  Total  Construction Cost                      | days at averagingle, for repair of   | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost            |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of rav Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Reservoirs Estimated average depth of reservoir Surface area of reservoir   | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units each 25 480                                   | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each<br>(acre-feet)                                    | mgd mgd mgd mg ac-ft ac-ft ac-ft Unit Cost (\$/ac-ft))  | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at average ple, for repair of Contigency, Eng., etc.  | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost            |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa Add safety factor Total storage required Total storage recommended  Reservoirs Estimated average depth of reservoir Surface area of reservoir   | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units each  | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each<br>(acre-feet)                                    | mgd mgd mgd mg ac-ft ac-ft ac-ft Unit Cost (\$/ac-ft))  | Note: No. of (for exem  Total Construction Cost \$ 15.4  Envir & Arch | days at averagingle, for repair of   | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost            |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Reservoirs  Estimated average depth of reservoir Surface area of reservoir Ratio of total land area reqd to surface of reservoir  | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units  each 25 480 1.10                             | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each<br>(acre-feet)<br>12,000<br>ft                    | mgd mgd mgd mg ac-ft ac-ft ac-ft ac-ft (\$/ac-ft)) \$ 1,283   | Note: No. of (for exem  Total Construction Cost \$ 15.4  Envir & Arch | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv., nd Land Acq =                 | e day demand of RWTM A) =  Total Capital Cost \$ 21.3            |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Reservoirs  Estimated average depth of reservoir Surface area of reservoir Ratio of total land area reqd to surface of reservoir  | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units each 25 480 1.10 528                          | 378<br>271<br>107<br>3,219<br>9,880<br>2,470<br>12,350<br>12,000<br>Volume/each<br>(acre-feet)<br>12,000<br>ft                    | mgd mgd mgd mg ac-ft ac-ft ac-ft ac-ft (\$/ac-ft)) \$ 1,283   | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv., nd Land Acq =                 | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of rav Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Reservoirs Estimated average depth of reservoir Ratio of total land area reqd to surface of reservoir Total land area reqd for reservoirs  Assumed life of reservoir  | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units each 25 480 1.10 528                          | 378 271 107 3,219 9,880 2,470 12,350 12,000  Volume/each (acre-feet) 12,000 ft acres acres  | mgd mgd mgd mg ac-ft ac-ft ac-ft ac-ft (\$/ac-ft)) \$ 1,283   | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv., nd Land Acq =                 | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa Add safety factor Total storage required Total storage recommended  Reservoirs Estimated average depth of reservoir Ratio of total land area reqd to surface of reservoir   | uction reg'd in mg mgd w water) ster 25%  Quantity 1        | Units each 25 480 1.10 528 100 0.15                 | 378 271 107 3,219 9,880 2,470 12,350 12,000 Volume/each (acre-feet) 12,000 ft acres acres years million/year                      | mgd mgd mgd mg ac-ft ac-ft ac-ft c-ft sc-ft | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv, and Land Acq = 1 in millions = | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of rav Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Reservoirs  Estimated average depth of reservoir Surface area of reservoir Ratio of total land area reqd to surface of reservoir Total land area reqd for reservoirs  Assumed life of reservoir Estimated replacement cost Estimated replacement cost Estimated maintenance                 | uction reg'd in mg mgd w water) ster 25%  Quantity 1 e area | Units each 25 480 1.10 528 100 0.15                 | 378 271 107 3,219 9,880 2,470 12,350 12,000  Volume/each (acre-feet) 12,000 ft acres acres years million/year                     | mgd mgd mgd mg ac-ft ac-ft ac-ft c-ft sc-ft | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv, and Land Acq = 1 in millions = | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for ray wa Add safety factor Total storage required Total storage recommended  Reservoirs Estimated average depth of reservoir Surface area of reservoir Ratio of total land area read to surface of reservoir Total land area read for reservoirs  Assumed life of reservoir Estimated replacement cost Estimated replacement cost Estimated maintenance Total Year built | uction req'd in mg mgd w water) ster 25%  Quantity 1        | Units each 25 480 1.10 528 100 0.15 0.04 0.19 2015  | 378 271 107 3,219 9,880 2,470 12,350 12,000  Volume/each (acre-feet) 12,000 ft acres acres million/year million/year million/year | mgd mgd mgd mg ac-ft ac-ft ac-ft c-ft sc-ft | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv, and Land Acq = 1 in millions = | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |
| Sizing for ultimate conditions: Assumed number of days of consecut Design (Max. Day) treated water prod Average treated water production in r Difference (shortfall of ray Required storage reservoir for raw wa Add safety factor Total storage required Total storage recommended  Estimated average depth of reservoir Surface area of reservoir Tatlo of total land area reqd to surface of reservoir Assumed life of reservoir Estimated replacement cost Estimated replacement cost Estimated maintenance Total  | uction reg'd in mg mgd w water) ster 25%  Quantity 1 e area | Units  each 25 480 1.10 528 100 0.15 0.04 0.19 2015 | 378 271 107 3,219 9,880 2,470 12,350 12,000 Volume/each (acre-feet) 12,000 ft acres acres years million/year                      | mgd mgd mgd mg ac-ft ac-ft ac-ft c-ft sc-ft | Note: No. of (for exam Total Construction Cost \$ 15.4                | days at averagiple, for repair of Contigency, Eng., etc. \$ 5.9  aeology, Surv, and Land Acq = 1 in millions = | e day demand<br>of RWTM A) =<br>Total Capital<br>Cost<br>\$ 21.3 |                | ays  |

#### WTP

#### Plant Phasing and Capital Costs;

| Softening Treatment Trains                                      |      |       |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
|---|------|-------|------|----------|---------------------|---------|----|---------|----|-----|-----|------|-----|-----|------|------|
| Year =  |      | 2015  |      | 2020     |                     | 2030    |    | 2040    |    | 205 |     |      | 206 |     |      | 2065 |
| Average treated water production in mgd                         |      | 0     |      | 0        |                     | 20      |    | 30      |    |     | 40  |      |     | 40  |      | 40   |
| Design (Max. Day) treated water production req'd in mgd         |      | 0     |      | 0        |                     | 35      |    | 55      |    |     | 70  |      |     | 70  |      | 70   |
| Initial/additional Max day capacity built (mgd)                 |      |       |      |          |                     | 50      |    | 20      |    |     |     |      |     |     |      |      |
| Total capacity on line (must exceed Design Max Day Req'd)       |      | 0     |      | 0        |                     | 50      |    | 70      |    |     | 70  |      |     | 70  |      | 70   |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   |      |       |      |          | \$                  | 1.78    | \$ | 2.14    |    |     |     |      |     |     |      |      |
| Estimated construction cost of expansion in \$millions          | \$   |       | \$   | *        | \$                  | 89.0    | \$ | 42.8    | \$ |     | -   | \$   |     |     | \$   | -    |
| Non-softening Treatment Trains                                  |      |       |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
| Year =  | 2    | 2015  |      | 2020     |                     | 2030    |    | 2040    |    | 205 |     |      | 206 |     |      | 2065 |
| Average treated water production in mgd                         |      | 84    |      | 204      |                     | 214     |    | 218     |    |     | 223 |      |     | 227 |      | 231  |
| Design (Max. Day) treated water production req'd in mgd         |      | 109   |      | 265      |                     | 282     |    | 288     |    |     | 296 |      |     | 304 |      | 308  |
| Additional Max day capacity built (mgd)                         |      | 210   |      | 100      |                     |         |    |         |    |     |     |      |     |     |      |      |
| Total capacity on line (must exceed Design Max Day Req'd)       |      | 210   |      | 310      |                     | 310     |    | 310     |    |     | 310 |      |     | 310 |      | 310  |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   | \$   | 1.14  | \$   | 1.32     |                     |         |    |         |    |     |     |      |     |     |      |      |
| Estimated construction cost of expansion in \$millions          | \$   | 238.7 | \$   | 131.5    | \$                  |         | \$ |         | \$ |     | -   | \$   |     | ÷   | \$   | B    |
| Totals (Softening + Non-softening Trains)                       |      |       |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
| Year =  | 2    | 2015  |      | 2020     |                     | 2030    |    | 2040    |    | 205 | 0   |      | 206 | 0   |      | 2065 |
| Total construction cost for both trains                         | \$   | 238.7 | \$   | 131.5    | S                   | 89.0    | \$ |         | S  |     |     | \$   |     | -   | \$   |      |
| Contingencies   | 1023 | 47.7  |      | 26.3     | 275                 | 17.8    |    | 8.6     |    |     |     | 1000 |     |     | 1070 |      |
| Subtotal  | S    | 286.5 | S    | 157.8    | \$                  | 106.8   | S  | 51.3    | \$ |     | -   | \$   |     |     | \$   | -    |
| Engineering, Legal, & Administrative                            | 1370 | 43.0  |      | 23.7     | 10 <del>5</del> 17. | 16.0    |    | 7.7     |    |     |     | 1020 |     |     | 0.70 |      |
| Subtotal  |      | 329.4 |      | 181.5    |                     | 122.8   |    | 59.0    |    |     | -   |      |     | -   |      |      |
| Environmental & Archaelogy Studies and Mitigation & Land        |      |       |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
| Acquisition and Surveying (see Note below)                      |      | 2.5   |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
| Total estimated capital cost                                    | \$   | 331.9 | \$   | 181.5    | \$                  | 122.8   | \$ | 59.0    | \$ | -   |     | \$   |     | -   | \$   | -    |
| NPV of capital cost   | \$   | 331.9 |      | \$ 142.2 |                     | \$ 59.1 |    | \$ 17.4 |    | \$  | v   |      | \$  |     |      | \$ - |
| Total NPV of WTP initial construction & expansions              | \$   | 551   |      |          |                     |         |    |         |    |     |     |      |     |     |      |      |
| Note: Assumed land requirement for WTP (not including reservoir |      | 100   | acre | s        |                     |         |    |         |    |     |     |      |     |     |      |      |

#### O&M Costs for Softening Trains:

#### O&M Costs for Non-Softening Trains:

| Year | Plant<br>Capacity in<br>service | Estimated<br>treated<br>water<br>production | Est | imated O<br>unit co |    |                 | N  | et present<br>value | Year | Plant Capacity in service | Estimated<br>treated water<br>production | Es | timated O<br>unit co |     |              |    | ot prese<br>value |
|------|---------------------------------|---|-----|---------------------|----|-----------------|----|---------------------|------|---------------------------|--|----|----------------------|-----|--------------|----|-------------------|
|      | mgd of<br>capacity              | mgd<br>produced                             |     | per mg<br>reated    |    | million<br>Year |    | (\$)                |      | mgd of<br>capacity        | mgd<br>produced                          |    | per mg<br>treated    | \$m | illion /year |    | (\$)              |
| 2015 |                                 |   |     |                     | \$ | -               | \$ | -                   | 2015 | 210                       | 84                                       | \$ | 370                  | \$  | 11.29        | \$ | 11.               |
| 2016 |                                 | -   |     |                     | \$ |                 | \$ |                     | 2016 | 210                       | 84                                       | \$ | 370                  | \$  | 11.29        | \$ | 10.               |
| 2017 | -                               | -   |     |                     | \$ |                 | \$ | -                   | 2017 | 210                       | 84                                       | \$ | 370                  | \$  | 11.29        | \$ | 10.               |
| 2018 | -                               | -   |     |                     | S  |                 | \$ | -                   | 2018 | 210                       | 84                                       | \$ | 370                  | \$  | 11.29        | \$ | 9.                |
| 2019 | -                               | -   |     |                     | s  |                 | \$ | -                   | 2019 | 210                       | 84                                       | \$ | 370                  | \$  | 11.29        | \$ | 9.                |
| 2020 |                                 |   |     |                     | Š  | -               | \$ | -                   | 2020 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ | 19.               |
| 2021 |                                 | _   |     |                     | Š  |                 | Š  | -                   | 2021 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ | 18                |
| 2022 |                                 | -   |     |                     | Š  |                 | Š  | -                   | 2022 | 310                       | 204                                      | Š  | 340                  | \$  | 25.32        | \$ | 17.               |
| 2023 |                                 | 2   |     |                     | Š  |                 | Š  | 21                  | 2023 | 310                       | 204                                      | Š  | 340                  | Š   | 25.32        | Š  | 17                |
| 2023 | -                               |   |     |                     | Š  | - 5             | Š  | - 5                 | 2024 | 310                       | 204                                      | Š  | 340                  | \$  | 25.32        | Š  | 16                |
| 2024 | •                               | •   |     |                     | Š  |                 | \$ |                     | 2025 | 310                       | 204                                      | Š  | 340                  | Š   | 25.32        | Š  | 15.               |
|      | -                               |   |     |                     |    | -               |    |                     |      |                           |  |    |                      |     |              |    | 14.               |
| 2026 |                                 | -   |     |                     | \$ |                 | \$ | (**)                | 2026 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ |                   |
| 2027 |                                 | -   |     |                     | \$ |                 | \$ | -                   | 2027 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ | 14                |
| 2028 |                                 | -   |     |                     | \$ | -               | \$ |                     | 2028 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ | 13                |
| 2029 | •                               | -   |     |                     | \$ | -               | \$ | -                   | 2029 | 310                       | 204                                      | \$ | 340                  | \$  | 25.32        | \$ | 12                |
| 2030 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 2.50                | 2030 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 12                |
| 2031 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 2.38                | 2031 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 12                |
| 2032 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 2.27                | 2032 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 11                |
| 2033 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 2.16                | 2033 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 11                |
| 2034 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 2.06                | 2034 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 10                |
| 2035 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 1.96                | 2035 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 10                |
| 2036 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 1.87                | 2036 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 9                 |
| 2037 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 1.78                | 2037 | 310                       | 214                                      | S  | 340                  | \$  | 26.54        | 5  | 9                 |
| 2038 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 1.69                | 2038 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | \$ | 8                 |
| 2039 | 50                              | 20  | \$  | 712                 | \$ | 5.20            | \$ | 1.61                | 2039 | 310                       | 214                                      | \$ | 340                  | \$  | 26.54        | S  | 8                 |
| 2040 | 70                              | 30  | \$  | 661                 | s  | 7.24            | \$ | 2.14                | 2040 | 310                       | 218                                      | s  | 340                  | \$  | 27.09        | \$ | 8                 |
| 2041 | 70                              | 30  | Š   | 661                 | š  | 7.24            | \$ | 2.04                | 2041 | 310                       | 218                                      | Š  | 340                  | s   | 27.09        | Š  | 7                 |
| 2042 | 70                              | 30  | \$  | 661                 | Š  | 7.24            | Š  | 1.94                | 2042 | 310                       | 218                                      | Š  | 340                  | s   | 27.09        | \$ | 7                 |
| 2043 | 70                              | 30  | \$  | 661                 | š  | 7.24            | Š  | 1.85                | 2043 | 310                       | 218                                      | Š  | 340                  | \$  | 27.09        | \$ | 6                 |
| 2043 | 70                              | 30  | \$  | 661                 | Š  | 7.24            | \$ | 1.76                | 2044 | 310                       | 218                                      | Š  | 340                  | \$  | 27.09        | Š  | 6                 |
| 2044 | 70                              | 30  | \$  | 661                 | Š  | 7.24            | \$ | 1.68                | 2045 | 310                       | 218                                      | \$ | 340                  | \$  | 27.09        | \$ | 6                 |
|      |                                 | 30  |     |                     |    |                 |    |                     |      |                           | 218                                      |    | 340                  | \$  | 27.09        | S  | 5                 |
| 2046 | 70                              |   | \$  | 661                 | \$ | 7.24            | \$ | 1.60                | 2046 | 310                       |  | \$ | 340                  | 5   | 27.09        |    | 5                 |
| 2047 | 70                              | 30  | \$  | 661                 | \$ | 7.24            | \$ | 1.52                | 2047 | 310                       | 218                                      | \$ |                      |     |              | \$ |                   |
| 2048 | 70                              | 30  | \$  | 661                 | \$ | 7.24            | \$ | 1.45                | 2048 | 310                       | 218                                      | \$ | 340                  | \$  | 27.09        | \$ | 5                 |
| 2049 | 70                              | 30  | \$  | 661                 | \$ | 7.24            | \$ | 1.38                | 2049 | 310                       | 218                                      | \$ | 340                  | \$  | 27.09        | \$ | 5                 |
| 2050 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.75                | 2050 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 5                 |
| 2051 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.67                | 2051 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 4                 |
| 2052 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.59                | 2052 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 4                 |
| 2053 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.51                | 2053 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 4                 |
| 2054 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.44                | 2054 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 4                 |
| 2055 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.37                | 2055 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 3                 |
| 2056 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.31                | 2056 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 3                 |
| 2057 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.24                | 2057 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 3                 |
| 2058 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.18                | 2058 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 3                 |
| 2059 | 70                              | 40  | \$  | 661                 | \$ | 9.65            | \$ | 1.13                | 2059 | 310                       | 223                                      | \$ | 340                  | \$  | 27.64        | \$ | 3                 |
| 2060 | 70                              | 40  | \$  | 661                 | s  | 9.65            | \$ | 1.07                | 2060 | 310                       | 227                                      | \$ | 340                  | \$  | 28.24        | \$ | 3                 |
| 2061 | 70                              | 40  | \$  | 661                 | s  | 9.65            | \$ | 1.02                | 2061 | 310                       | 227                                      | \$ | 340                  | 5   | 28.24        | \$ | 2                 |
| 2062 | 70                              | 40  | Š   | 661                 | Š  | 9.65            | Š  | 0.97                | 2062 | 310                       | 227                                      | Š  | 340                  | S   | 28.24        | S  | 2                 |
| 2063 | 70                              | 40  | Š   | 661                 | Š  | 9.65            | Š  | 0.93                | 2063 | 310                       | 227                                      | Š  | 340                  | Š   | 28.24        | Š  | 2                 |
| 2064 | 70                              | 40  | \$  | 661                 | Š  | 9.65            | Š  | 0.88                | 2064 | 310                       | 227                                      | š  | 340                  | \$  | 28.24        | š  | 2                 |
| 2065 | 70                              | 40  | \$  | 661                 | š  | 9.65            | Š  | 0.84                | 2065 | 310                       | 231                                      | Š  | 340                  | Š   | 28.64        | š  | 2                 |
|      |                                 |   |     |                     |    |                 |    |                     |      |                           |  |    |                      |     |              |    |                   |

| NPV Totals for O&M: | Softening trains | Softening trains | Non-softening Trains | 438 | 495 |

Raw Water Reservoir Water Treatment Plant Totals

 NPV of Capital Costs
 NPV of OSM Costs
 Total NPV of Opital and OSM Costs

 \$ 34
 \$ 3.5
 \$ 38

 \$ 551
 \$ 495
 \$ 1,046

 \$ 585
 \$ 499
 \$ 1,084

#### Capital and O&M Cost Calculations Potable Water Transmission Mains CTRWTP - Alternate 1A - WTP East of San Antonio

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

2015 5% 50 years 0.07 per kwh Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

#### **Summary of Demands**

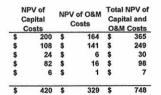
#### Average demands to be delivered in each segment

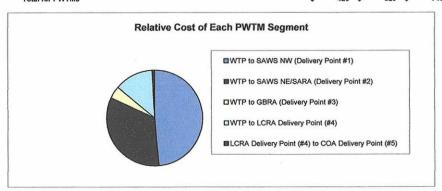
|          |       |        | in acre-feet/ye | ar     |        |        |        |   |
|----------|-------|--------|-----------------|--------|--------|--------|--------|---|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |   |
| SAWS NW  | 43800 | 123000 | 123000          | 123000 | 123000 | 123000 | 123000 |   |
| SAWS NE  | 29200 | 82000  | 82000           | 82000  | 82000  | 82000  | 82000  |   |
| Subtotal | 73000 | 205000 | 205000          | 205000 | 205000 | 205000 | 205000 | ١ |
| SARA     | 20550 | 23406  | 28433           | 31393  | 34411  | 37530  | 41128  |   |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |   |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |   |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |   |
| Total    | 93550 | 228406 | 261835          | 277996 | 294215 | 299634 | 303232 | ١ |

#### Summary

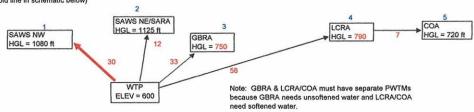
WTP to SAWS NW (Delivery Point #1)
WTP to SAWS NE/SARA (Delivery Point #2)
WTP to GBRA (Delivery Point #3)
WTP to LCRA Delivery Point (#4)
LCRA Delivery Point (#4)

Total for PWTMs





#### WTP to SAWS NW (Delivery Point #1) (Bold line in schematic below)



#### Demands for this pipe segment

|         |      | Average dem | ands to be deli | vered in each s | segment in mgd | 1    |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 39   | 110         | 110             | 110             | 110            | 110  | 110  |
| Total - | 39   | 110         | 110             | 110             | 110            | 110  | 110  |

Max d/Avg d

|         |      | Max day dem | ands to be deli | ivered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 143         | 143             | 143              | 143            | 143  | 143  |
| Total - | 51   | 143         | 143             | 143              | 143            | 143  | 143  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 143    | mgd |  |
|---|--------|-----|--|
|   | 99,125 | gpm |  |
| Pumping capacity of one pump            | 16,500 | gpm |  |
| No. of pumps (not counting spare)       | 6      |     |  |
| Peak flow rate (all pumps except spare) | 99,000 | gpm |  |
| Inside diameter of PWTM                 | 96     | in. |  |
| Area                                    | 50.27  | sf  |  |
|   |        |     |  |

Area 50.27 sf
Length of PWTM 30 miles
158,400 feet

(linked to mileage in schematic above)

| stimated unit cost by condition: | % of length | LE      | Un | it cost | Cost        |         |
|----------------------------------|-------------|---------|----|---------|-------------|---------|
| Rural - soil                     | 25%         | 39,600  | \$ | 557     | \$<br>22.1  | million |
| Rural - rock                     | 25%         | 39,600  | \$ | 750     | \$<br>29.7  |         |
| Urban - rock                     | 50%         | 79,200  | \$ | 843     | \$<br>66.7  |         |
|                                  |             | 158,400 |    |         | \$<br>118.5 | million |

| Total construction cost in millions                      | \$ | 118.5 | million |
|--|----|-------|---------|
| Contingencies  | \$ | 23.7  |         |
| Subtotal   | \$ | 142.2 | -       |
| Engineering, Legal & Administrative                      | \$ | 21.3  |         |
| Subtotal   | \$ | 163.5 |         |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 3.0   |         |
| Total Capital Cost for DIATTA in millions                | •  | 166 E | -       |

| rotal capital cost for t vv this in millions | *  | 100.0  |              |             |                 |  |
|--|----|--------|--------------|-------------|-----------------|--|
| Unit maintenance cost/year-mile              | \$ | 10,000 | \$/year-mile | \$<br>0.300 | Million \$/year |  |
| Velocity at peak flow rate                   |    | 4.39   | fps          |             |                 |  |

| C factor                    |     | 120     | ipa     |   |  |
|-----------------------------|-----|---------|---------|---|--|
| Head loss per foot          |     | 0.00059 | ft/ft   | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |  |
| riedu ioss per ioot         |     |         | ft/mile | C*(d) <sup>2.63</sup>                       |  |
|                             |     | 3.10    | Intille | [C*(d)]                                     |  |
| Head loss at peak flow rate |     | 93      | ft      |   |  |
| Allowance for minor losses  | 20% | 19      | ft      | 1080 Desired HGL At Delivery Point          |  |
| Total estimated losses      |     | 112     | ft      | 600 Elev. At WTP                            |  |
|                             |     |         |         |   |  |

| Total estimated losses                         | 112 ft  | 600 Elev. At WTP              |
|--|---------|-------------------------------|
| Average static head                            | 480 ft  | 480 ft                        |
| Total estimated dynamic head                   | 592 ft  |                               |
|  | 256 psi |                               |
| No of recommended pumping stations along route | 1.71    | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 2       | in pipe)                      |
| Average head per pump station                  | 296 ft  | waters:                       |
|  |         |                               |

| No. of pumping stations used in cost estimate             | 2          |               | in pipe)                   |  |
|---|------------|---------------|----------------------------|--|
| Average head per pump station                             | 296 ft     | t:            |                            |  |
| Assumed pump efficiency                                   | 85%        |               |                            |  |
| Assumed motor efficiency                                  | 90%        |               |                            |  |
| Estimated Hp required per pump                            | 1,611 h    | p/pump        |                            |  |
|   | 1,202 kg   | w/pump        |                            |  |
| Total hp per pump station (not counting spare)            | 9,668 h    | p/station     |                            |  |
| Total kw per pump set (set=pumps in series along route)   | 3,223 k    | w/pump set    | (one pump at each station) |  |
|   |            |               |                            |  |
| Unit capital cost for each pump station (from cost curve) | \$ 1,264 p | er firm hp of | pump station               |  |
|   |            |               |                            |  |

| Unit capital cost for each pump station (from cost curve) | \$<br>1,264 | per firm hp of pump statio |
|---|-------------|----------------------------|
| Construction cost per pump station                        | 12.2        | million                    |

| Construction Cook per partip clarici      | 1818 1111110 |     |   |               |
|---|--------------|-----|---|---------------|
| Total construction cost for pump stations | 24.4         | for | 2 | pump stations |
| Contingencies                             | \$<br>4.9    | -   |   |               |
| Subtotal                                  | \$<br>29.3   |     |   |               |
| Engineering, Legal & Administrative       | \$<br>4.4    |     |   |               |
|   |              |     |   |               |

Total capital cost for pump stations

\$ 33.7 million

40% Estimated equipment cost as % of total

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 10 million 20 years \$ 0.49 million/year

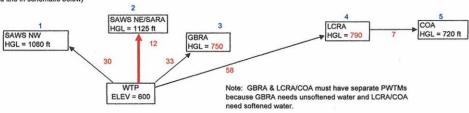
O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used       |     | Energ            | y cost | ı                  | cos | her O&M<br>its - Pump<br>Stations | 0  | intenance<br>costs -<br>PWTM | То   | tal O&M<br>cost      | Ne | et present<br>value |
|------|---|--|----------------------|-----|------------------|--------|--------------------|-----|-----------------------------------|----|------------------------------|------|----------------------|----|---------------------|
|      | mgd   |  | (kwh/day)            |     | (\$/day)         |        | illion \$<br>year) |     | Million \$<br>/year)              | (  | Million \$ /year)            |      | /illion \$<br>/year) |    | (\$)                |
| 2015 | 39  | 1.65                                       | 127,279              | \$  | 8,910            | \$     | 3.25               | \$  | 0.49                              | \$ | 0.300                        | \$   | 4.04                 | \$ | 4.04                |
| 2016 | 39  | 1.65                                       | 127,279              | \$  | 8,910            | \$     | 3.25               | \$  | 0.49                              | \$ | 0.300                        | \$   | 4.04                 | \$ | 3.85                |
| 2017 | 39  | 1.65                                       | 127,279              | \$  | 8,910            | \$     | 3.25               | \$  | 0.49                              | \$ | 0.300                        | \$   | 4.04                 | \$ | 3.67                |
| 2018 | 39  | 1.65                                       | 127,279              | \$  | 8,910            | \$     | 3.25               | \$  | 0.49                              | \$ | 0.300                        | \$   | 4.04                 | \$ | 3.49                |
| 2019 | 39  | 1.65                                       | 127,279              | \$  | 8,910            | \$     | 3.25               | \$  | 0.49                              | \$ | 0.300                        | \$   | 4.04                 | \$ | 3.32                |
| 2020 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 7.77                |
| 2021 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 7.40                |
| 2022 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 7.05                |
| 2023 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 6.72                |
| 2024 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ |                     |
| 2025 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92<br>9.92         | \$ | 6.09<br>5.80        |
| 2026 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 2017/2010            | \$ | 27,000              |
| 2027 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13<br>9.13       | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92<br>9.92         | \$ | 5.52<br>5.26        |
| 2028 | 110<br>110  | 4.62<br>4.62                               | 357,427<br>357,427   | \$  | 25,020<br>25,020 | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 5.20                |
| 2029 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | S      | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | S  | 4.77                |
| 2030 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | Š      | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 4.54                |
| 2032 | 110   | 4.62                                       | 357,427              | S   | 25,020           | S      | 9.13               | Š   | 0.49                              | S  | 0.300                        | Š    | 9.92                 | S  | 4.33                |
| 2033 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | Š      | 9.13               | Š   | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | Š  | 4.12                |
| 2034 | 110   | 4.62                                       | 357,427              | Š   | 25,020           | Š      | 9.13               | s   | 0.49                              | Š  | 0.300                        | S    | 9.92                 | \$ | 3.93                |
| 2035 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 3.74                |
| 2036 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | Š      | 9.13               | Š   | 0.49                              | Š  | 0.300                        | \$   | 9.92                 | \$ | 3.56                |
| 2037 | 110   | 4.62                                       | 357,427              | š   | 25,020           | Š      | 9.13               | Š   | 0.49                              | Š  | 0.300                        | s    | 9.92                 | S  | 3.39                |
| 2038 | 110   | 4.62                                       | 357,427              | s   | 25,020           | \$     | 9.13               | S   | 0.49                              | \$ | 0.300                        | s    | 9.92                 | \$ | 3.23                |
| 2039 | 110   | 4.62                                       | 357,427              | s   | 25,020           | S      | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 3.08                |
| 2040 | 110   | 4.62                                       | 357,427              | s   | 25,020           | S      | 9.13               | \$  | 0.49                              | \$ | 0.300                        | S    | 9.92                 | \$ | 2.93                |
| 2041 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.79                |
| 2042 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.66                |
| 2043 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.53                |
| 2044 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.41                |
| 2045 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.30                |
| 2046 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.19                |
| 2047 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 2.08                |
| 2048 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.98                |
| 2049 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.89                |
| 2050 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.80                |
| 2051 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.71                |
| 2052 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.63                |
| 2053 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.55                |
| 2054 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.48                |
| 2055 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.41                |
| 2056 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.34                |
| 2057 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92<br>9.92         | \$ | 1.28                |
| 2058 | 110<br>110  | 4.62<br>4.62                               | 357,427<br>357,427   | \$  | 25,020<br>25,020 | \$     | 9.13<br>9.13       | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.16                |
| 2059 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | S      | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 1.10                |
| 2060 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | S      | 9.13               | \$  | 0.49                              | 5  | 0.300                        | \$   | 9.92                 | \$ | 1.05                |
| 2062 | 110   | 4.62                                       | 357,427              | S   | 25,020           | Š      | 9.13               | Š   | 0.49                              | S  | 0.300                        | S    | 9.92                 | \$ | 1.00                |
| 2062 | 110   | 4.62                                       | 357,427              | S   | 25,020           | S      | 9.13               | \$  | 0.49                              | S  | 0.300                        | \$   | 9.92                 | \$ | 0.95                |
| 2064 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 0.91                |
| 2065 | 110   | 4.62                                       | 357,427              | \$  | 25,020           | \$     | 9.13               | \$  | 0.49                              | \$ | 0.300                        | \$   | 9.92                 | \$ | 0.87                |
|      |   |  |                      |     |                  |        |                    |     |                                   |    | Total NPV                    | of O | &M Costs             | \$ | 164                 |
|      |   | Capital Costs                              |                      |     |                  |        | 407                |     | Yr built                          |    |                              |      |                      |    | 407                 |
|      |   |  | PWTM<br>Pumping Stat | in- |                  | \$     | 167<br>34          |     | 2015<br>2015                      |    |                              |      |                      | \$ | 167                 |
|      |   |  | Pumping Stat         | HOU | 8                | 3      | 34                 |     | 2015                              |    |                              |      |                      | 3  | 34                  |

Total NPV of Capital and O&M Costs in millions \$ 365 WTP to SAWS NW (Delivery Point #1)

### WTP to SAWS NE/SARA (Delivery Point #2) (Bold line in schematic below)





Max d/Avg d 1.3

#### Demands for this pipe segment

| De |  |  |
|----|--|--|
|    |  |  |

|         |      | Average dem | ands to be del | ivered in each s | segment in mgd |      |      |
|---------|------|-------------|----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 |
| SAWS NE | 26   | 73          | 73             | 73               | 73             | 73   | 73   |
| SARA    | 18   | 21          | 25             | 28               | 31             | 34   | 37   |
| Total   | 44   | 94          | 99             | 101              | 104            | 107  | 110  |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |
|--|------|------|------|------|------|------|------|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |
| SAWS NE  | 34   | 95   | 95   | 95   | 95   | 95   | 95   |  |
| SARA   | 24   | 27   | 33   | 36   | 40   | 44   | 48   |  |
| Total  | 58   | 122  | 128  | 132  | 135  | 139  | 143  |  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065   | 143     | mgd   |  |
|--|---------|-------|--|
|  | 99,228  | gpm   |  |
| Pumping capacity of one pump   | 19,000  | gpm   |  |
| No. of pumps (not counting spare)  | 6       |       |  |
| Peak flow rate (all pumps except spare)  | 114,000 | gpm   |  |
| Inside diameter of PWTM  | 108     | in.   |  |
| Area   | 63.62   | sf    |  |
| Length of PWTM   | 12      | miles | (linked to mileage in schematic above) |
|  | 63,360  | feet  |  |
| The Control of the Co |         |       |  |

| Estimated unit cost by condition: | % of length | LF     | U  | nit cost |    | Cost |         |
|-----------------------------------|-------------|--------|----|----------|----|------|---------|
| Rural - soil                      | 50%         | 31,680 | \$ | 666      | \$ | 21.1 | million |
| Rural - rock                      | 25%         | 15,840 | \$ | 894      | \$ | 14.2 |         |
| Urban - rock                      | 25%         | 15,840 | \$ | 1,007    | \$ | 16.0 |         |
|                                   |             | 63,360 |    |          | S  | 51.2 | million |

| Total construction cost in millions                      | \$ | 51.2 |
|--|----|------|
| Contingencies  | \$ | 10.2 |
| Subtotal   | \$ | 61.4 |
| Engineering, Legal & Administrative                      | \$ | 9.2  |
| Subtotal   | \$ | 70.7 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 1.2  |
| Total Capital Cost for PWTM in millions                  | S  | 71.9 |

| Total Capital Cost for PWTM in millions | \$<br>71.9   |              |             |                 |
|---|--------------|--------------|-------------|-----------------|
| Unit maintenance cost/year-mile         | \$<br>10,000 | \$/year-mile | \$<br>0.120 | Million \$/year |
| Velocity at peak flow rate              | 3.99         | fps          |             |                 |
| C factor                                | 120          |              |             |                 |
|   |              |              |             |                 |

| Ciacion                      |     | 120     |         |   |
|------------------------------|-----|---------|---------|---|
| Head loss per foot           |     | 0.00043 | ft/ft   | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |
|                              |     | 2.27    | ft/mile | C*(d) <sup>2.63</sup>                       |
| Head loss at peak flow rate  |     | 27      | ft      |   |
| Allowance for minor losses   | 20% | 5       | ft      | 1125 Desired HGL At Delivery Point          |
| Total estimated losses       |     | 33      | ft      | 600 Elev. At WTP                            |
| Average static head          |     | 525     | ft      | 525 ft                                      |
| Total estimated dynamic head |     | 558     | ft      |   |

| <b>J</b>                                       | 242 psi |                               |
|--|---------|-------------------------------|
| No of recommended pumping stations along route | 1.61    | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 2       | in pipe)                      |
| Average head per pump station                  | 279 ft  |                               |
| Assumed ours officiancy                        | 85%     |                               |

| Assumed pump efficiency                                 | 85%  |
|---|--|
| Assumed motor efficiency                                | 90%  |
| Estimated Hp required per pump                          | 1,749 hp/pump                                |
|   | 1,305 kw/pump                                |
| Total hp per pump station (not counting spare)          | 10,493 firm hp/station                       |
| Total kw per pump set (set=pumps in series along route) | 3,498 kw/pump set (one pump at each station) |

| Unit construction cost for each pump station (from cost curve) | • | 1 244 | per firm hp of pump station |
|--|---|-------|-----------------------------|
| Construction cost per pump station                             | 4 |       | million                     |

| Total construction cost for pump stations |     | 26.1 | for | 2 | pump stations |
|---|-----|------|-----|---|---------------|
| Contingencies                             |     | 5.2  |     |   |               |
| Subtotal                                  | - 3 | 31.3 |     |   |               |

Engineering, Legal & Administrative
Total capital cost for pump stations in millions

\$ 4.7 \$ 36.0 million

40% Equip cost as % of constr cost

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 10 million 20 years \$ 0.52 million/year

O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used         |     | Energ    | y co | ost         |    | other O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | To   | tal O&M<br>cost | Ne | et preser<br>value |
|------|---|--|------------------------|-----|----------|------|-------------|----|-------------------------------------|----|-------------------------------|------|-----------------|----|--------------------|
|      | mgd   |  | (kwh/day)              |     | (\$/day) | (    | (Million \$ |    | (Million \$                         | (  | (Million \$                   | (1   | /illion \$      |    | (\$)               |
| 2015 | 44  | 1.62                                       | 136,264                | \$  | 9,538    | \$   | 3.48        | \$ | 0.52                                | \$ | 0.120                         | \$   | 4.12            | \$ | 4.1                |
| 2016 | 44  | 1.62                                       | 136,264                | s   | 9,538    | S    | 3.48        | s  | 0.52                                | s  | 0.120                         | s    | 4.12            | \$ | 3.9                |
| 2017 | 44  | 1.62                                       | 136,264                | Š   | 9,538    | \$   | 3.48        | s  | 0.52                                | \$ | 0.120                         | s    | 4.12            | S  | 3.7                |
| 2017 | 44  | 1.62                                       |                        | S   | 9,538    | \$   | 3.48        | Š  | 0.52                                | \$ | 0.120                         | S    | 4.12            | S  | 3.5                |
|      |   |  | 136,264                |     |          |      |             |    |                                     |    |                               | S    |                 | \$ | 3.3                |
| 2019 | 44  | 1.62                                       | 136,264                | \$  | 9,538    | \$   | 3.48        | \$ | 0.52                                | \$ | 0.120                         |      | 4.12            |    |                    |
| 2020 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 6.2                |
| 2021 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 5.9                |
| 2022 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 5.7                |
| 2023 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 5.4                |
| 2024 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 5.                 |
| 2025 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 4.9                |
| 2026 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 4.6                |
| 2027 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 4.4                |
| 2028 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | Š  | 0.52                                | \$ | 0.120                         | s    | 8.02            | \$ | 4.3                |
| 2029 | 94  | 3.44                                       | 288,705                | \$  | 20,209   | \$   | 7.38        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.02            | \$ | 4.                 |
| 2030 | 99  | 3.60                                       | 302,474                | Š   | 21,173   | \$   | 7.73        | Š  | 0.52                                | Š  | 0.120                         | \$   | 8.37            | S  | 4.0                |
|      | 99  |  |                        | Š   |          |      | 7.73        | Š  | 0.52                                | S  | 0.120                         | Š    | 8.37            | Š  | 3.                 |
| 2031 |   | 3.60                                       | 302,474                |     | 21,173   | \$   |             |    |                                     |    |                               |      |                 |    |                    |
| 2032 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 3.0                |
| 2033 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 3.                 |
| 2034 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 3.                 |
| 2035 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 3.                 |
| 2036 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 3.                 |
| 2037 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 2.                 |
| 2038 | 99  | 3.60                                       | 302,474                | S   | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | \$ | 2.                 |
| 2039 | 99  | 3.60                                       | 302,474                | \$  | 21,173   | \$   | 7.73        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.37            | S  | 2.                 |
| 2040 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 2.                 |
| 2041 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | Š  | 0.52                                | \$ | 0.120                         | Š    | 8.58            | \$ | 2.                 |
|      |   |  |                        |     |          |      |             | S  |                                     | Š  | 0.120                         | \$   | 8.58            | \$ | 2.                 |
| 2042 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        |    | 0.52                                |    |                               |      |                 |    |                    |
| 2043 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 2.                 |
| 2044 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 2.0                |
| 2045 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 1.5                |
| 2046 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 1.                 |
| 2047 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 1.                 |
| 2048 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 1.                 |
| 2049 | 101   | 3.70                                       | 310,581                | \$  | 21,741   | \$   | 7.94        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.58            | \$ | 1.                 |
| 2050 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2051 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | S  | 1.                 |
| 2052 | 104   | 3.80                                       | 318,847                | Š   | 22,319   | Š    | 8.15        | Š  | 0.52                                | š  | 0.120                         | S    | 8.79            | S  | 1.                 |
| 2052 | 104   | 3.80                                       | 318,847                | Š   | 22,319   | Š    | 8.15        | Š  | 0.52                                | Š  | 0.120                         | Š    | 8.79            | Š  | 1.                 |
|      | 104   | 3.80                                       |                        | Š   |          | Š    | 8.15        | S  | 0.52                                | S  | 0.120                         | Š    | 8.79            | S  | 1.                 |
| 2054 |   |  | 318,847                |     | 22,319   |      |             |    |                                     |    |                               |      |                 |    |                    |
| 2055 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2056 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2057 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2058 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2059 | 104   | 3.80                                       | 318,847                | \$  | 22,319   | \$   | 8.15        | \$ | 0.52                                | \$ | 0.120                         | \$   | 8.79            | \$ | 1.                 |
| 2060 | 107   | 3.90                                       | 327,390                | \$  | 22,917   | \$   | 8.36        | \$ | 0.52                                | \$ | 0.120                         | \$   | 9.01            | \$ | 1.                 |
| 2061 | 107   | 3.90                                       | 327,390                | \$  | 22,917   | \$   | 8.36        | \$ | 0.52                                | \$ | 0.120                         | \$   | 9.01            | \$ | 0.                 |
| 2062 | 107   | 3.90                                       | 327,390                | Š   | 22,917   | Š    | 8.36        | \$ | 0.52                                | Š  | 0.120                         | Š    | 9.01            | S  | 0.                 |
| 2063 | 107   | 3.90                                       | 327,390                | \$  | 22,917   | Š    | 8.36        | Š  | 0.52                                | s  | 0.120                         | Š    | 9.01            | S  | 0.                 |
| 2064 | 107   | 3.90                                       | 327,390                | Š   | 22,917   | S    | 8.36        | S  | 0.52                                | \$ | 0.120                         | \$   | 9.01            | S  | 0.                 |
|      | 110   | 4.02                                       |                        |     |          | S    | 8.62        | \$ | 0.52                                | \$ | 0.120                         | S    | 9.26            | \$ | 0.                 |
| 2065 | 110   | 4.02                                       | 337,245                | \$  | 23,607   | ٩    | 0.02        | ٠  | 0.52                                | Þ  |                               |      |                 |    |                    |
|      |   |  |                        |     |          |      |             |    |                                     |    | Total NPV                     | of C | &M Costs        | \$ | 141                |
|      |   | Capital Costs                              | in million \$:<br>PWTM |     |          | s    | 71.9        |    | Yr built<br>2015                    |    |                               |      |                 | \$ | 71                 |
|      |   |  | Pumping Stati          | 000 |          | \$   | 36.0        |    | 2015                                |    |                               |      |                 | \$ | 36                 |
|      |   |  | Fumning Stati          |     |          |      |             |    |                                     |    |                               |      |                 |    |                    |

Total NPV of Capital and O&M Costs in millions \$ WTP to SAWS NE/SARA (Delivery Point #2)





#### Demands for this pipe segment

| Demands |  |
|---------|--|
|         |  |

|         |      | Average dem | ands to be deli | vered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| GBRA    | 0    | 0           | 5               | 7               | 9              | 11   | 11   |
| Total - | 0    | 0           | 5               | 7               | 9              | 11   | 11   |

Max d/Avg d 2.0

|         |      | Max day dem | ands to be deli | vered in each : | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| GBRA    | 0    | 0           | 11              | 14              | 18             | 22   | 22   |
| Total - | 0    | 0           | 11              | 14              | 18             | 22   | 22   |

#### **PWTM and Pump Station Costs**

|   | 174,240 | feet  |  |
|---|---------|-------|--|
| Length of RWTM                          |         | miles | (linked to mileage in schematic above) |
| Area                                    | 9.62    | sf    |  |
| Inside diameter of PWTM                 |         | in.   |  |
| Peak flow rate (all pumps except spare) | 15,300  | gpm   |  |
| No. of pumps (not counting spare)       | 3       |       |  |
| Pumping capacity of one pump            | 5,100   | gpm   |  |
|   | 15,250  | gpm   |  |
| Design flow rate - year 2065            |         | mga   |  |

| Estimated unit cost by condition: | % of length | LE      | Ur              | it cost | Cost       |         |
|-----------------------------------|-------------|---------|-----------------|---------|------------|---------|
| Rural - soil                      | 100%        | 174,240 | \$              | 174     | \$<br>30.3 | million |
| Rural - rock                      | 0%          |         | \$              | 244     | \$         |         |
| Urban - rock                      | 0%          |         | \$              | 263     | \$         |         |
|                                   |             | 174,240 | VIEW CONTRACTOR |         | \$<br>30.3 | million |

| Total construction cost in millions                      | \$<br>30.3 |
|--|------------|
| Contingencies  | \$<br>6.1  |
| Subtotal   | \$<br>36.3 |
| Engineering, Legal & Administrative                      | \$<br>5.4  |
| Subtotal   | \$<br>41.8 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>3.3  |
| Total Capital Cost for PWTM in millions                  | \$<br>45.1 |

| Unit maintenance cost/year-mile | \$ 1 | 10,000 | \$/year-mile | \$<br>0.330 | Million \$/year |  |
|---------------------------------|------|--------|--------------|-------------|-----------------|--|
| Velocity at peak flow rate      |      | 3.54   | fps          |             |                 |  |
| C factor                        |      | 120    |              |             |                 |  |

| Clactor  |             | 120     |         |                  |                               |
|--|-------------|---------|---------|------------------|-------------------------------|
| Head loss per foot   |             | 0.00104 | ft/ft   | h <sub>f</sub> = | 3.552*Q 1.85                  |
|  |             | 5.47    | ft/mile |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate  |             | 181     | ft      |                  |                               |
| Allowance for minor losses   | 20%         | 36      | ft      | 740              | Desired HGL At Delivery Point |
| Total estimated losses   |             | 217     | ft      | 600              | Elev. At WTP                  |
| Average static head  |             | 140     | ft      | 140              | ft                            |
| Total estimated dynamic head   |             | 357     | ft      |                  |                               |
| The deviction of control to the control of the cont |             | 155     | psi     |                  |                               |
| No of recommended pumping stations a   | along route | 1.03    |         | 150              | psi (assumed max pressure     |
| No. 16 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1   | Marrata.    | 4       |         |                  | In alask                      |

| No of recommended pumping stations along route  | 1.03        | 150 psi (assumed max pressure |
|---|-------------|-------------------------------|
| No. of pumping stations used in cost estimate   | 1           | in pipe)                      |
| Average head per pump station   | 357 ft      |                               |
| Assumed pump efficiency   | 85%         |                               |
| Assumed motor efficiency  | 90%         |                               |
| Estimated Hp required per pump  | 601 hp/pump |                               |
| TO JOST A CHARLES TO SEE MADELLES AND SET AND | 448 kw/pump |                               |
|   |             |                               |

| Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route) |          | hp/station<br>kw/pump set | (one pump at each station) |
|--|----------|---------------------------|----------------------------|
| Unit construction cost for each pump station (from cost curve)   | \$ 1,674 | per firm hp of            | pump station               |

| 3.0 million    |                  |        |                               |
|----------------|------------------|--------|-------------------------------|
| 3.0            | for              | 1      | pump stations                 |
| \$<br>0.6      |                  |        |                               |
| \$<br>3.6      |                  |        |                               |
| \$<br>0.5      |                  |        |                               |
| \$<br>\$<br>\$ | \$ 0.6<br>\$ 3.6 | \$ 0.6 | 3.0 for 1<br>\$ 0.6<br>\$ 3.6 |

Total capital cost for pump stations

\$ 4.2 million

40% Equip cost as % of constr cost

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

\$

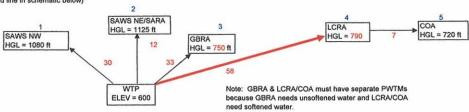
1.2 million 20 years 0.06 million/year

#### O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used      |       | Energ    | у сс | ost                   | co | ther O&M<br>sts - Pump<br>Stations | C  | ntenance<br>osts -<br>PWTM |      | al O&M<br>cost     | Ne | t presen<br>value |
|------|---|--|---------------------|-------|----------|------|-----------------------|----|------------------------------------|----|----------------------------|------|--------------------|----|-------------------|
|      | mgd   |  | (kwh/day)           |       | (\$/day) | (    | (Million \$<br>/year) | (  | (Million \$<br>/year)              |    | Million \$<br>/year)       |      | illion \$<br>year) |    | (\$)              |
| 2015 |   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | -                 |
| 2016 |   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   |                    | \$ |                   |
| 2017 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | *                  | \$ |                   |
| 2018 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ |                   |
| 2019 |   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ |                   |
| 2020 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | -                 |
| 2021 | •   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | *                  | \$ |                   |
| 2022 | •   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | -                 |
| 2023 |   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | *                  | \$ | -                 |
| 2024 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | 5.                 | \$ |                   |
| 2025 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | *                  | \$ | (e)               |
| 2026 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | -                 |
| 2027 |   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   |                    | \$ |                   |
| 2028 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | *                 |
| 2029 | -   |  |                     |       |          |      |                       |    |                                    |    |                            | \$   | -                  | \$ | -                 |
| 2030 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.3               |
| 2031 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.3               |
| 2032 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2033 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2034 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2035 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2036 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2037 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2038 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2039 | 5   | 0.73                                       | 10,513              | \$    | 736      | \$   | 0.27                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.66               | \$ | 0.2               |
| 2040 | 7   | 0.97                                       | 14,017              | s     | 981      | s    | 0.36                  | \$ | 0.06                               | S  | 0.330                      | \$   | 0.75               | \$ | 0.2               |
| 2041 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | S  | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.2               |
| 2042 | 7   | 0.97                                       | 14,017              | s     | 981      | S    | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.2               |
| 2043 | 7   | 0.97                                       | 14,017              | s     | 981      | \$   | 0.36                  | \$ | 0.06                               | S  | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2044 | 7   | 0.97                                       | 14,017              | S     | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2045 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2046 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2047 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2048 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2049 | 7   | 0.97                                       | 14,017              | \$    | 981      | \$   | 0.36                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.75               | \$ | 0.1               |
| 2050 | 9   | 1.22                                       | 17,521              | \$    | 1,226    | \$   | 0.45                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2051 | 9   | 1.22                                       | 17,521              | \$    | 1,226    | \$   | 0.45                  | \$ | 0.06                               | S  | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2052 | 9   | 1.22                                       | 17,521              | Š     | 1,226    | \$   | 0.45                  | \$ | 0.06                               | \$ | 0.330                      | S    | 0.84               | \$ | 0.1               |
| 2053 | 9   | 1.22                                       | 17,521              | \$    | 1,226    | \$   | 0.45                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2054 | 9   | 1.22                                       | 17,521              | s     | 1,226    | \$   | 0.45                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2055 | 9   | 1.22                                       | 17,521              | s     | 1,226    | \$   | 0.45                  | s  | 0.06                               | \$ | 0.330                      | s    | 0.84               | \$ | 0.1               |
| 2056 | 9   | 1.22                                       | 17,521              | Š     | 1,226    | \$   | 0.45                  | \$ | 0.06                               | Š  | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2057 | 9   | 1.22                                       | 17,521              | Š     | 1,226    | Š    | 0.45                  | Š  | 0.06                               | \$ | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2058 | 9   | 1.22                                       | 17,521              | Š     | 1,226    | Š    | 0.45                  | Š  | 0.06                               | \$ | 0.330                      | \$   | 0.84               | \$ | 0.1               |
| 2059 | 9   | 1.22                                       | 17,521              | š     | 1,226    | \$   | 0.45                  | Š  | 0.06                               | \$ | 0.330                      | Š    | 0.84               | \$ | 0.1               |
| 2060 | 11  | 1.50                                       | 21,551              | Š     | 1,509    | š    | 0.55                  | Š  | 0.06                               | Š  | 0.330                      | Š    | 0.94               | \$ | 0.1               |
| 2061 | 11  | 1.50                                       | 21,551              | \$    | 1,509    | \$   | 0.55                  | \$ | 0.06                               | Š  | 0.330                      | \$   | 0.94               | \$ | 0.1               |
| 2062 | 11  | 1.50                                       | 21,551              | š     | 1,509    | Š    | 0.55                  | Š  | 0.06                               | Š  | 0.330                      | s    | 0.94               | Š  | 0.0               |
| 2063 | 11  | 1.50                                       | 21,551              | Š     | 1,509    | \$   | 0.55                  | Š  | 0.06                               | Š  | 0.330                      | Š    | 0.94               | \$ | 0.0               |
| 2064 | 11  | 1.50                                       | 21,551              | Š     | 1,509    | Š    | 0.55                  | \$ | 0.06                               | Š  | 0.330                      | Š    | 0.94               | \$ | 0.0               |
| 2065 | 11  | 1.50                                       | 21,551              | \$    | 1,509    | \$   | 0.55                  | \$ | 0.06                               | \$ | 0.330                      | \$   | 0.94               | \$ | 0.0               |
|      |   |  |                     |       |          |      |                       |    |                                    |    | Total NPV                  | of O | &M Costs           | \$ | 6                 |
|      |   | Capital Costs                              | in million \$:      |       |          |      |                       |    | Yr built                           |    |                            |      |                    |    |                   |
|      |   |  | PWTM                |       |          | \$   | 45                    |    | 2030                               |    |                            |      |                    | \$ | 21                |
|      |   |  | <b>Pumping Stat</b> | tions | 3        | \$   | 4                     |    | 2030                               |    |                            |      |                    | \$ | 2                 |

Total NPV of Capital and O&M Costs in millions \$ WTP to GBRA (Delivery Point #3) 29.8

#### WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



### Demands for this pipe segment

| De |  |  |  |
|----|--|--|--|
|    |  |  |  |
|    |  |  |  |

|       |      | Average ucin | arius to be der | ivered in cacin | segment in my |      |      |
|-------|------|--------------|-----------------|-----------------|---------------|------|------|
| Year  | 2015 | 2020         | 2030            | 2040            | 2050          | 2060 | 2065 |
| LCRA  | 0    | 0            | 5               | 10              | 10            | 10   | 10   |
| COA   | 0    | 0            | 15              | 20              | 30            | 30   | 30   |
| Total | 0    | 0            | 20              | 30              | 40            | 40   | 40   |

Max d/Avg d 2.0 1.68

|       |      | Max day dem | ands to be del | ivered in each | segment in mgd |      |      |
|-------|------|-------------|----------------|----------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030           | 2040           | 2050           | 2060 | 2065 |
| LCRA  | 0    | 0           | 10             | 20             | 20             | 20   | 20   |
| COA   | 0    | 0           | 25             | 34             | 50             | 50   | 50   |
| Total | 0    | 0           | 35             | 54             | 70             | 70   | 70   |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 70      | mgd   |  |
|---|---------|-------|--|
|   | 48,883  | gpm   |  |
| Pumping capacity of one pump            | 10,000  | gpm   |  |
| No. of pumps (not counting spare)       | 5       |       |  |
| Peak flow rate (all pumps except spare) | 50,000  | gpm   |  |
| Inside diameter of PWTM                 | 72      | in.   |  |
| Area                                    | 28.27   | sf    |  |
| Length of RWTM                          | 58      | miles | (linked to mileage in schematic above) |
| -                                       | 306,240 | feet  |  |
|   |         |       |  |

| Rural - soil<br>Rural - rock | 100% | 306,240          | \$<br>365 | \$<br>111.9    | million |
|------------------------------|------|------------------|-----------|----------------|---------|
| Rural - rock                 | 0.07 |                  |           |                |         |
|                              | 070  | the same that is | \$<br>498 | \$             |         |
| Urban - rock                 | 0%   |                  | \$<br>552 | \$<br>THE WALL |         |
|                              |      | 306,240          |           | \$<br>111.9    | million |

| Total construction cost in millions                      | \$ | 111.9 |
|--|----|-------|
| Contingencies  | \$ | 22.4  |
| Subtotal   | \$ | 134.3 |
| Engineering, Legal & Administrative                      | \$ | 20.1  |
| Subtotal   | \$ | 154.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 5.8   |
| Total Capital Cost for PWTM in millions                  | S  | 160.2 |

| Unit maintenance cost/ | year-mile | \$<br>10,000 | \$/year-mile | \$<br>0.580 | Million \$/year |
|------------------------|-----------|--------------|--------------|-------------|-----------------|

| Olit mantenance costyear-mile                  |                    | \$ 10,000   | wydai-iiiio     | <b>0.000</b>     | Willion Gryodi                |
|--|--------------------|-------------|-----------------|------------------|-------------------------------|
| Velocity at peak flow rate<br>C factor         |                    | 3.94<br>120 | fps             |                  |                               |
| Head loss per foot                             |                    | 0.00067     | ft/ft           | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>      |
| Johnston Control Control Technology Technology |                    | 3.55        | ft/mile         |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate                    |                    | 206         | ft              |                  |                               |
| Allowance for minor losses                     | 20%                | 41          |                 | 790              | Desired HGL At Delivery Point |
| Total estimated losses                         |                    | 247         | ft              | 720              | Elev. At Delivery Point 3     |
| Average static head                            |                    |             | ft              | 70               | ft                            |
| Total estimated dynamic head                   |                    | 317         | ft              |                  |                               |
|  |                    | 138         | psi             |                  |                               |
| No of recommended pumping stations a           | along route        | 0.92        |                 | 150              | psi (assumed max pressure     |
| No. of pumping stations used in cost es        | timate             | 1           |                 |                  | in pipe)                      |
| Average head per pump station                  |                    | 317         | ft              |                  |                               |
| Assumed pump efficiency                        |                    | 85%         |                 |                  |                               |
| Assumed motor efficiency                       |                    | 90%         |                 |                  |                               |
| Estimated Hp required per pump                 |                    | 1,048       | hp/pump         |                  |                               |
| 1000 1000 1000 1000 1000 1000 1000 100         |                    | 782         | kw/pump         |                  |                               |
| Total hp per pump station (not counting        | spare)             | 5,238       | firm hp/station | 1                |                               |
| Total kw per pump set (set=pumps in s          | eries along route) | 1,048       | kw/pump set     | (one pump at     | each station)                 |
|  |                    |             |                 |                  |                               |

|  | 102         | kw/pump                     |
|--|-------------|-----------------------------|
| Total hp per pump station (not counting spare)                 | 5,238       | firm hp/station             |
| Total kw per pump set (set=pumps in series along route)        | 1,048       | kw/pump set (one pump at    |
| Unit construction cost for each pump station (from cost curve) | \$<br>1,414 | per firm hp of pump station |
| Construction cost per pump station                             | 7.4         | million                     |

| Construction cost per pump station        | 7.4 1111110 |     |   |              |
|---|-------------|-----|---|--------------|
| Total construction cost for pump stations | 7.4         | for | 1 | pump station |
| Contingencies                             | \$<br>1.5   |     |   |              |
| Subtotal                                  | \$<br>8.9   |     |   |              |
| Engineering, Legal & Administrative       | \$<br>1.3   |     |   |              |
|   |             |     |   |              |

Total capital cost for pump stations

10.2 million \$

40% Equip cost as % of constr cost

\$

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

3.0 million 20 years 0.15 million/year

#### O&M Costs

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |       | Energ    | у с | ost                   | co | ther O&M<br>sts - Pump<br>Stations | c  | intenance<br>costs -<br>PWTM | To              | otal O&M<br>cost     | Ne | et presen<br>value |
|--------------|---|--|----------------|-------|----------|-----|-----------------------|----|------------------------------------|----|------------------------------|-----------------|----------------------|----|--------------------|
|              | mgd   |  | (kwh/day)      |       | (\$/day) |     | (Million \$<br>/year) | (  | (Million \$<br>/year)              | (  | Million \$<br>/year)         |                 | Million \$<br>/year) |    | (\$)               |
| 2015<br>2016 |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | -                    | \$ |                    |
| 2017         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | -                    | \$ | _                  |
| 2018         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | \$ | -                  |
| 2019         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | \$ |                    |
| 2020         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | \$ |                    |
| 2021         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | s  |                    |
| 2022         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | 2                    | \$ | -                  |
| 2023         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | \$ | 2.                 |
| 2024         |   |  |                |       |          |     |                       |    |                                    |    |                              | s               |                      | \$ |                    |
| 2025         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | 2                    | \$ | -                  |
| 2026         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | -                    | \$ |                    |
| 2027         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              | -                    | \$ |                    |
| 2028         |   |  |                |       |          |     |                       |    |                                    |    |                              | Š               |                      | \$ | -                  |
| 2029         |   |  |                |       |          |     |                       |    |                                    |    |                              | \$              |                      | \$ |                    |
| 2030         | 20  | 1.39                                       | 34,919         | \$    | 2,444    | \$  | 0.89                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 1.62                 | \$ | 0.7                |
| 2031         | 20  | 1.39                                       | 34,919         | \$    | 2,444    | \$  | 0.89                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 1.62                 | \$ | 0.7                |
| 2032         | 20  | 1.39                                       | 34,919         | s     | 2,444    | \$  | 0.89                  | Š  | 0.15                               | S  | 0.580                        | \$              | 1.62                 | \$ | 0.7                |
| 2033         | 20  | 1.39                                       | 34,919         | \$    | 2,444    | \$  | 0.89                  | s  | 0.15                               | S  | 0.580                        | \$              | 1.62                 | s  | 0.6                |
| 2034         | 20  | 1.39                                       | 34,919         | s     | 2,444    | S   | 0.89                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 1.62                 | \$ | 0.6                |
| 2035         | 20  | 1.39                                       | 34,919         | \$    | 2,444    | \$  | 0.89                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 1.62                 | \$ | 0.6                |
| 2036         | 20  | 1.39                                       | 34,919         | Š     | 2,444    | Š   | 0.89                  | Š  | 0.15                               | \$ | 0.580                        | \$              | 1.62                 | \$ | 0.5                |
| 2037         | 20  | 1.39                                       | 34,919         | Š     | 2,444    | Š   | 0.89                  | \$ | 0.15                               | \$ | 0.580                        | Š               | 1.62                 | S  | 0.5                |
| 2038         | 20  | 1.39                                       | 34,919         | Š     | 2,444    | \$  | 0.89                  | \$ | 0.15                               | s  | 0.580                        | \$              | 1.62                 | \$ | 0.5                |
| 2039         | 20  | 1.39                                       | 34,919         | š     | 2,444    | Š   | 0.89                  | Š  | 0.15                               | s  | 0.580                        | s               | 1.62                 | s  | 0.5                |
| 2040         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | Š   | 1.34                  | Š  | 0.15                               | \$ | 0.580                        | \$              | 2.07                 | \$ | 0.6                |
| 2041         | 30  | 2.08                                       | 52,379         | š     | 3,667    | Š   | 1.34                  | Š  | 0.15                               | Š  | 0.580                        | Š               | 2.07                 | \$ | 0.5                |
| 2042         | 30  | 2.08                                       | 52,379         | \$    | 3,667    | Š   | 1.34                  | Š  | 0.15                               | Š  | 0.580                        | \$              | 2.07                 | \$ | 0.5                |
| 2043         | 30  | 2.08                                       | 52,379         | \$    | 3,667    | Š   | 1.34                  | Š  | 0.15                               | Š  | 0.580                        | Š               | 2.07                 | \$ | 0.5                |
| 2043         | 30  | 2.08                                       | 52,379         | š     | 3,667    | \$  | 1.34                  | \$ | 0.15                               | Š  | 0.580                        | \$              | 2.07                 | \$ | 0.5                |
| 2045         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | Š   | 1.34                  | Š  | 0.15                               | Š  | 0.580                        | Š               | 2.07                 | \$ | 0.4                |
| 2046         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | \$  | 1.34                  | \$ | 0.15                               | Š  | 0.580                        | \$              | 2.07                 | \$ | 0.4                |
| 2047         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | s   | 1.34                  | Š  | 0.15                               | s  | 0.580                        | \$              | 2.07                 | \$ | 0.4                |
| 2048         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | \$  | 1.34                  | \$ | 0.15                               | \$ | 0.580                        | S               | 2.07                 | Š  | 0.4                |
| 2049         | 30  | 2.08                                       | 52,379         | Š     | 3,667    | s   | 1.34                  | Š  | 0.15                               | Š  | 0.580                        | Š               | 2.07                 | \$ | 0.3                |
| 2050         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | \$ | 0.15                               | Š  | 0.580                        | Š               | 2.51                 | \$ | 0.4                |
| 2051         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | \$ | 0.15                               | Š  | 0.580                        | \$              | 2.51                 | \$ | 0.4                |
| 2052         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | \$ | 0.15                               | S  | 0.580                        | \$              | 2.51                 | \$ | 0.4                |
| 2052         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | \$ | 0.15                               | S  | 0.580                        | Š               | 2.51                 | \$ | 0.3                |
| 2054         | 40  | 2.78                                       | 69,838         | Š     | 4,889    | \$  | 1.78                  | Š  | 0.15                               | S  | 0.580                        | Š               | 2.51                 | \$ | 0.3                |
| 2055         | 40  | 2.78                                       | 69,838         | Š     | 4,889    | \$  | 1.78                  | S  | 0.15                               | Š  | 0.580                        | \$              | 2.51                 | Š  | 0.3                |
| 2056         | 40  | 2.78                                       | 69,838         | Š     | 4,889    | Š   | 1.78                  | Š  | 0.15                               | Š  | 0.580                        | Š               | 2.51                 | Š  | 0.3                |
| 2050         | 40  | 2.78                                       | 69,838         | S     | 4,889    | S   | 1.78                  | Š  | 0.15                               | \$ | 0.580                        | Š               | 2.51                 | \$ | 0.3                |
| 2058         | 40  | 2.78                                       | 69,838         | Š     | 4,889    | S   | 1.78                  | Š  | 0.15                               | S  | 0.580                        | S               | 2.51                 | Š  | 0.3                |
| 2059         | 40  | 2.78                                       | 69,838         | Š     | 4,889    | S   | 1.78                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 2.51                 | Š  | 0.2                |
| 2060         | 40  | 2.78                                       | 69,838         | S     | 4,889    | S   | 1.78                  | S  | 0.15                               | S  | 0.580                        | S               | 2.51                 | Š  | 0.2                |
| 2060         | 40  | 2.78                                       | 69,838         | 5     | 4,889    | \$  | 1.78                  | \$ | 0.15                               | 5  | 0.580                        | S               | 2.51                 | \$ | 0.2                |
| 2062         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | S   | 1.78                  | Š  | 0.15                               | S  | 0.580                        | S               | 2.51                 | \$ | 0.2                |
| 2062         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | \$ | 0.15                               | S  | 0.580                        | \$              | 2.51                 | S  | 0.2                |
| 2063         | 40  | 2.78                                       | 69,838         | S     | 4,889    | \$  | 1.78                  | \$ | 0.15                               | \$ | 0.580                        | \$              | 2.51                 | \$ | 0.2                |
| 2065         | 40  | 2.78                                       | 69,838         | \$    | 4,889    | \$  | 1.78                  | S  | 0.15                               | \$ | 0.580                        | s               | 2.51                 | \$ | 0.2                |
| 2003         | 40  | 2.70                                       | 09,030         | 4     | 4,005    | •   | 1.70                  | •  | 0.10                               | •  |                              |                 | D&M Costs            |    | 16                 |
|              |   | 011-1 0                                    | I 101          |       |          |     |                       |    | Va h                               |    | TOTAL INPV                   | 01 0            | JOHN CUSTS           | φ  | 10                 |
|              |   | Capital Costs                              |                |       |          |     | 400.5                 |    | Yr built                           |    |                              |                 |                      | •  | ***                |
|              |   |  | PWTM           |       |          | \$  | 160.2                 |    | 2030                               |    |                              |                 |                      | \$ | 77                 |
|              |   |  | Pumping Stat   | tions |          | \$  | 10.2                  |    | 2030                               |    |                              | Q = 1, Q = 1, 1 | pital Costs          | \$ | 82                 |

Total NPV of Capital and O&M Costs in millions \$ WTP to LCRA Delivery Point (#4) 98

### LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)





#### Demands for this pipe segment

Demands

|       |      | Average dem | ands to be deli | ivered in each : | segment in mgd |      |      |
|-------|------|-------------|-----------------|------------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| COA   | 0    | 0           | 15              | 20               | 30             | 30   | 30   |
| Total | 0    | 0           | 15              | 20               | 30             | 30   | 30   |

Max d/Avg d

|         |      | Max day dem | ands to be deli | vered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| COA     | 0    | 0           | 25              | 34              | 50             | 50   | 50   |
| Total - | 0    | 0           | 25              | 34              | 50             | 50   | 50   |

#### **PWTM and Pump Station Costs**

Design flow rate - year 2065 50 mgd 34,997 gpm

54 in. 15.90 sf 7 miles 36,960 feet Inside diameter of PWTM Area Length of PWTM

(linked to mileage in schematic above)

| Estimated unit cost by condition: | % of length         | LE     | Un        | it cost | Cost      |         |
|-----------------------------------|---------------------|--------|-----------|---------|-----------|---------|
| Rural - soil                      | 100%                | 36,960 | \$        | 244     | \$<br>9.0 | million |
| Rural - rock                      | 0%                  |        | \$        | 337     | \$        |         |
| Urban - rock                      | 0%                  |        | \$        | 369     | \$<br>    |         |
|                                   | and the same of the | 36,960 | William ! |         | \$<br>9.0 | million |

| Total construction cost in millions                      | \$<br>9.0  |
|--|------------|
| Contingencies  | \$<br>1.8  |
| Subtotal   | \$<br>10.8 |
| Engineering, Legal & Administrative                      | \$<br>1.6  |
| Subtotal   | \$<br>12.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.0  |
| Total Capital Cost for PWTM in millions                  | \$<br>12.4 |

Unit maintenance cost/year-mile 10,000 \$/year-mile 0.070 Million \$/year Velocity at peak flow rate 4.90 fps

C factor 120  $h_i = |3.552*Q|^{1.85}$  $|C^*(d)^{2.63}|$ 0.00141 ft/ft Head loss per foot 7.45 ft/mile

Head loss at peak flow rate 52 ft 720 Desired HGL At Delivery Point 790 Elev. At Delivery Point 4 -70 ft Allowance for minor losses Total estimated losses 20% 10 ft 63 ft Average static head Total estimated dynamic head -70 ft -7 ft -3 psi

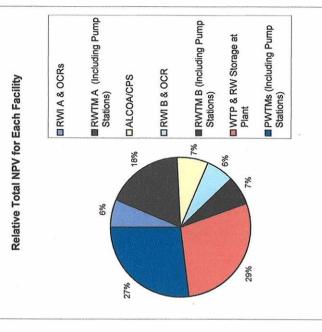
Negative indicates gravity flow from #4 to #5; no pumping necessary.

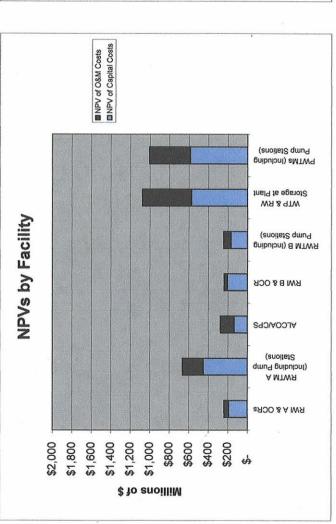
Million \$ Annual O&M Cost in million \$: Yr built 0.070 \$0.55 Total NPV of O&M Costs Capital Costs in million \$: Yr built Total NPV of Capital Costs \$

> Total NPV of Capital and O&M Costs in millions \$ LCRA Delivery Point (#4) to COA Delivery Point (#5) 6.5

CTRWTP - Alternate 2A - WTP East of San Marcos

| ing<br>(s  | D NE E   | 585                  | 419                 | 1,004                         |
|--|--|----------------------|---------------------|-------------------------------|
| PWTMs (Including<br>Pump Stations)   | Each PWTM sized for maximum daily demand (See PWTM Summary Sheet in the Appendices)  | 69                   | 69                  | 3,1                           |
| RWTM B (Including   WTP & RW Storage   PWTMs (Including Pump Stations) at Plant   Pump Stations) | Raw water reservoir  W 11,000 ac-ft capacity; Sized for 117,804 ac. Conventional settling for maximum daily pipeline with one filtration for SAWS, demand (See PWT pumping station and softening with membrane Summary Sheet in softening with membrane filtration for SAWS, demand (See PWT station and softening with membrane filtration for COA & LCRA water | \$ 572               | \$ 502              | \$ 1,075                      |
| RWTM B (Including<br>Pump Stations)  | Sized for 117,804 ac-<br>fuyr, 36 miles of 96"<br>pipeline with one<br>pumping station and<br>balancing reservoir  | \$ 168               | \$ 75               | \$ 243                        |
| RWI B & OCR  | Sized for 2000 cfs to scalp water; 2 intakes; 8 miles of 120-inch raw water mains and 4 OCRs at 15,000 ac-ft/each  | \$ 204               | \$ 34               | \$ 238                        |
| ALCOA/CPS  | Non-Public wells; Transmission of 55,000 to scalp water; 2 ac-ft/year to the OCR at intakes; 8 miles of pipeline with one 54'9 gravity pipeline from mains and 4 OCRs balanding reservoir Hwy 290 east of Eigin at 15,000 ac-ft/each   | \$ 135               | \$ 141              | \$ 276                        |
| RWTM A (Including<br>Pump Stations)  | Sized for 4000 cfs 126 miles of 96-inch to scalp water, 4 deliver 132,000 ac- 120-inch raw water mains & 4 pumping stations w/ ac-ft each along route  | \$ 451               | \$ 213              | \$ 664                        |
| RWI A & OCRs   | Sized for 4000 cfs<br>to scalp water, 4<br>intakes, 4 miles of<br>120-inch raw<br>water mains & 4<br>OCRs at 25,000<br>ac-ft each  | \$ 191               | \$ 47               | \$ 238                        |
| Total NPVs in<br>Millions of \$  |  | \$ 2,306 \$          | \$ 1,432            | \$ 3,737 \$                   |
| Phasing Scenario   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020.  | NPV of Capital Costs | NPV of O&M Costs \$ | Total NPV of Capital & O&M \$ |
| Alter-<br>nate   | 2A   |                      |                     |                               |
| WTP Location   | East of San<br>Marcos  |                      |                     |                               |





#### O&M Cost Calculations RWI A - Matagorda Co. River Intakes, and Storage CTRWTP - Alternate 2A - WTP East of San Marcos

| Initial year of analysis period  | 2015       |        |         |               |          |                             | Conti | ngency =                                  | 209 | 6                                     |       |                               |
|----------------------------------|------------|--------|---------|---------------|----------|-----------------------------|-------|---|-----|---------------------------------------|-------|-------------------------------|
| Interest rate                    | 5%         |        |         |               | Engir    | neering, L                  | egal, | Admin. =                                  | 159 | 6                                     |       |                               |
| Evaluation period                | 50         | year   | s       | Environn      | nental a | & Archae                    | ology | Studies &                                 |     |                                       |       |                               |
| Unit cost of energy              | \$ 0.07    | per    | kwh     | Mitigation, S | Surveyin | ng, and L                   | and A | cquisition                                | 5   | 100,000                               | per n | nile                          |
| •                                |            | ****** |         |               |          |                             |       | or =                                      | \$  | 5,000                                 | per a | cre                           |
| Inflatable Rubber Low Head Dam   |            |        |         |               |          |                             |       |   |     |                                       |       |                               |
|                                  | Quantity   |        | Jnits   | Size          |          | Constr.<br>Cost<br>illions) | Con   | Total<br>timated<br>str. Cost<br>illions) | E   | ontigency,<br>ing., etc.<br>millions) | (     | l Capital<br>Cost<br>Illions) |
| Inflatable Rubber Low Head Dam   | 4          | eac    | 1       | 10 ft high    | \$       | 2.25                        | \$    | 9.00                                      | \$  | 3.42                                  | \$    | 12.42                         |
| Estimated inflatable dam cost as | % of total |        | 50%     |               |          |                             |       |   |     |                                       |       |                               |
| Value of inflatable dam          |            | \$     | 4.50    | million       |          |                             |       |   |     |                                       |       |                               |
| Assumed life of inflatable dam   |            |        | 10      | years         |          |                             |       |   |     |                                       |       |                               |
| Estimated maintenance/replacen   | nent cost  | \$     | 0.45    | million/year  |          |                             |       |   |     |                                       |       |                               |
| Year built                       |            |        | 2020    |               |          |                             |       |   |     |                                       |       |                               |
| NPV of O&M Costs                 |            |        | \$6.27  | million       |          |                             |       |   |     |                                       |       |                               |
| NPV of Capital Costs             |            | \$     | 9.73    | million       |          |                             |       |   |     |                                       |       |                               |
| Total NPV of Capital and O&M C   | nete       | -      | \$16.00 | million       |          |                             |       |   |     |                                       |       |                               |

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

| Average withdrawal  |  |   |
|---|--|---|
| Total intake design withdrawal rate (for scalping high flows  | 4,000<br>1,795,200                     |   |
| No. of Intakes<br>Design withdrawal rate per intake   | 1,000<br>448,800                       |   |
| No. of reservoirs<br>Design flow to each reservoir  | 448,800                                | gpm   |
| Inside diameter of each RWTM<br>Area  | 120<br>78.54                           |   |
| Average length of each RWTM   | 5,280                                  | miles 4.0 miles for all RWTMs<br>feet 21,120 feet                                     |
| Estimated construction cost for RWTM  | \$ 793                                 | per LF  |
| Total construction cost in millions<br>Contingencies<br>Subtotal<br>Engineering, Legal & Administrative   | \$ 16.8<br>\$ 3.4<br>\$ 20.1<br>\$ 3.0 | -   |
| Subtotal  Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions  | \$ 23.1<br>\$ 0.4<br>\$ 23.5           | million   |
| Unit maintenance cost/year-mile   | \$ 10,000                              | \$/year-mile \$ 0.040 Million \$/year (all RWTMs to Reservoirs)                       |
| Note: Assume each intake has two RWTMs pumping out of   | of it, one to each                     | h reservoir.  |
| Design flow rate for each RWTM (from above) Pumping rate (one pump) No. of pumps (not counting spare) pumping into each RW  |  | gpm   |
| Peak flow rate into each RWTM (all pumps except spare)  | 450,000                                |   |
| Velocity at peak flow rate<br>C factor  | 12.77                                  | fps   |
| Head loss per foot  | 0.00327<br>17.25                       | ft/ft h <sub>f</sub> =   3.552°Q  <sup>1.85</sup><br>ft/mile   C°(a) <sup>2.63</sup>  |
| Head loss at peak flow rate Allowance for minor losses Total estimated losses Average static head Total estimated dynamic head  | 5<br>22<br>40<br>62                    | ft 90 Elev of discharge at reservoir ft 50 Water surface elev in river ft 40 ft psi   |
| Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump   | 85%<br>90%<br>1,030<br>769             | hp/pump   |
| Total hp pumping into each RWTM (not counting spare) Total hp at each intake (not counting spare) Total hp all intakes (not counting spares) Total kw all intakes (not counting spares) | 9,272                                  | hp/RWTM<br>hp/intake<br>hp  |
| Unit construction cost for each pump station (from cost cu<br>Construction cost per intake/pump station<br>No. of intakes from above  |  | per firm hp of pump station million each  |
| Total construction cost in millions<br>Contigency, Eng., etc. in millions<br>Total capital cost in millions   | \$ 12.53                               | million<br>million<br>million   |
| Total construction cost for pump stations<br>Value of equipment<br>Assumed life of equipment<br>Estimated maintenance/replacement cost  | \$ 13.2<br>20                          | million million 40% Estimated equip cost as % of total constr cost years million/year |

| Year | Flow purr<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used   |    | Energ    | y co | ost                  | co | other O&M<br>sts - Pump<br>Stations |    | intenance<br>costs -<br>RWTM | То | tal O&M<br>cost      | N  | et present<br>value |
|------|------------------|-----|--------------------------|------------------|----|----------|------|----------------------|----|-------------------------------------|----|------------------------------|----|----------------------|----|---------------------|
|      | ac-ft/yr         | mgd | operating<br>/day        | (kwh/day)        |    | (\$/day) |      | Million \$<br>/year) |    | (Million \$<br>/year)               |    | Million \$<br>/year)         |    | Million \$<br>/year) |    | (\$)                |
| 2015 | -                | -   | -                        | -                | \$ | -        | \$   |                      |    |                                     |    |                              | \$ |                      | \$ |                     |
| 2016 | -                | -   |                          |                  | \$ |          | \$   |                      |    |                                     |    |                              | \$ | *                    | \$ | * 1                 |
| 2017 | -                | -   |                          | -                | \$ |          | \$   |                      |    |                                     |    |                              | \$ |                      | \$ |                     |
| 2018 | -                |     | -                        | 38               | \$ | -        | \$   |                      |    |                                     |    |                              | \$ |                      | \$ | *                   |
| 2019 |                  |     | -                        |                  | \$ |          | \$   |                      |    |                                     |    |                              | \$ |                      | \$ |                     |
| 2020 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 1.15                |
| 2021 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 1.10                |
| 2022 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 1.05                |
| 2023 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 1.00                |
| 2024 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.95                |
| 2025 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.90                |
| 2026 | 132,000          | 118 | 1.64                     | 30,188           | S  | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.86                |
| 2027 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | S  | 1.47                 | \$ | 0.82                |
| 2028 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.78                |
| 2029 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.68                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.74                |
| 2030 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   | 0.77                 | \$ | 0.66                                | s  | 0.040                        | \$ | 1.47                 | \$ | 0.7                 |
| 2031 | 132,000          | 118 | 1.64                     | 30,188           | S  | 2,113    | \$   | 0.77                 | 5  | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | S  | 0.67                |
| 2032 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | s    | 0.77                 | \$ | 0.66                                | s  | 0.040                        | s  | 1.47                 | \$ | 0.64                |
| 2033 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | s    | 0.77                 | s  | 0.66                                | s  | 0.040                        | S  | 1.47                 | s  | 0.61                |
| 2034 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | s    | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | S  | 0.5                 |
| 2035 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | s    | 0.77                 | Š  | 0.66                                | Š  | 0.040                        | s  | 1.47                 | š  | 0.5                 |
| 2036 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   | 0.77                 | S  | 0.66                                | s  | 0.040                        | s  | 1.47                 | \$ | 0.53                |
| 2037 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | s  | 1.47                 | s  | 0.50                |
| 2038 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | s    | 0.77                 | \$ | 0.66                                | Š  | 0.040                        | s  | 1.47                 | Š  | 0.48                |
| 2039 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | Š    | 0.77                 | s  | 0.66                                | s  | 0.040                        | s  | 1.47                 | s  | 0.46                |
| 2040 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | s    | 0.77                 | \$ | 0.66                                | s  | 0.040                        | s  | 1.47                 | s  | 0.43                |
| 2041 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | Š    | 0.77                 | s  | 0.66                                | s  | 0.040                        | Š  | 1.47                 | \$ | 0.4                 |
| 2042 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | Š    | 0.77                 | \$ | 0.66                                | Š  | 0.040                        | s  | 1.47                 | s  | 0.39                |
| 2043 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | \$   | 0.77                 | S  | 0.66                                | š  | 0.040                        | \$ | 1.47                 | Š  | 0.38                |
| 2044 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | Š    | 0.77                 | \$ | 0.66                                | š  | 0.040                        | \$ | 1.47                 | Š  | 0.36                |
| 2045 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | Š    | 0.77                 | Š  | 0.66                                | s  | 0.040                        | Š  | 1.47                 | s  | 0.3                 |
| 2046 | 132,000          | 118 | 1.64                     | 30,188           | š  | 2,113    | \$   | 0.77                 | Š  | 0.66                                | š  | 0.040                        | Š  | 1.47                 | Š  | 0.3                 |
| 2047 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | \$   | 0.77                 | š  | 0.66                                | Š  | 0.040                        | s  | 1.47                 | Š  | 0.3                 |
| 2048 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | s    | 0.77                 | Š  | 0.66                                | Š  | 0.040                        | Š  | 1.47                 | Š  | 0.2                 |
| 2049 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | Š    | 0.77                 | Š  | 0.66                                | Š  | 0.040                        | Š  | 1.47                 | š  | 0.2                 |
| 2049 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | Š    | 0.77                 | s  | 0.66                                | \$ | 0.040                        | Š  | 1.47                 | š  | 0.2                 |
| 2050 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | \$   | 0.77                 | s  | 0.66                                | s  | 0.040                        | Š  | 1.47                 | Š  | 0.2                 |
| 2052 |                  | 118 | 1.64                     | 30,188           | s  | 2,113    | s    | 0.77                 | s  | 0.66                                | S  | 0.040                        | s  | 1.47                 | Š  | 0.2                 |
| 2052 | 132,000          | 118 | 1.64                     | 30,188           | Š  | 2,113    | s    | 0.77                 | Š  | 0.66                                | s  | 0.040                        | Š  | 1.47                 | Š  | 0.2                 |
|      | 132,000          |     | 1.64                     |                  | s  | 2,113    | Š    | 0.77                 | Š  | 0.66                                | Š  | 0.040                        | Š  | 1.47                 | Š  | 0.2                 |
| 2054 | 132,000          | 118 | 1.64                     | 30,188<br>30,188 | S  | 2,113    | S    | 0.77                 | \$ | 0.66                                | 5  | 0.040                        | s  | 1.47                 | Š  | 0.2                 |
| 2055 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | S    | 0.77                 | s  | 0.66                                | S  | 0.040                        | S  | 1.47                 | Š  | 0.2                 |
| 2056 | 132,000          |     | 1.64                     |                  | S  | 2,113    | 5    | 0.77                 | S  | 0.66                                | S  | 0.040                        | S  | 1.47                 | 5  | 0.2                 |
| 2057 | 132,000          | 118 |                          | 30,188           |    |          | \$   | 0.77                 | 5  | 0.66                                | S  | 0.040                        | \$ | 1.47                 | s  | 0.1                 |
| 2058 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    |      | 0.77                 | S  |                                     | S  | 0.040                        | Š  | 1.47                 | s  | 0.1                 |
| 2059 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                |    | 0.040                        |    | 1.47                 | s  | 0.1                 |
| 2060 | 132,000          | 118 | 1.64                     | 30,188           | s  | 2,113    | \$   |                      |    | 0.66                                | \$ |                              | \$ |                      |    |                     |
| 2061 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.1                 |
| 2062 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.1                 |
| 2063 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.1                 |
| 2064 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.1                 |
| 2065 | 132,000          | 118 | 1.64                     | 30,188           | \$ | 2,113    | \$   | 0.77                 | \$ | 0.66                                | \$ | 0.040                        | \$ | 1.47                 | \$ | 0.1                 |

Total NPV of O&M Costs \$ 21.6

 Capital Costs in million \$:
 Yr built
 18.4

 RWTM to Reservoirs
 \$ 23.5
 2020
 \$ 35.6

 Intake/Pumping Stations
 \$ 45.5
 2020
 Total NPV of Capital Costs
 \$ 35.6

 Total NPV of Capital Costs
 \$ 54.1
 35.6
 35.6
 35.6

Total NPV of Capital and O&M Costs in millions \$ 75.

#### Reservoirs

|                                     | Quantity                                    |    | Units      | Volume/each<br>(acre-feet) | Unit Cost<br>(\$/ac-ft)) |          |        | Total<br>nstruction<br>Cost in<br>millions |         | tigency,<br>g., etc. | otal in<br>nillions |
|-------------------------------------|---|----|------------|----------------------------|--------------------------|----------|--------|--|---------|----------------------|---------------------|
| Reservoirs                          | 4   |    | each       | 25000                      | \$                       | 974      | \$     | 97.4                                       | \$      | 37.0                 | \$<br>134.4         |
| Estimated average depth of reservor |   |    | 20<br>5000 | ft<br>acres                |                          |          |        |  |         |                      |                     |
| of reservoir                        | total land area reqd to surface area ervoir |    | 1.1        |                            |                          |          | E      | nvir & Arch                                | naeolo  | gy, Surv,            |                     |
| Total land area reqd for reservoirs |   |    | 5500       | acres                      |                          | _        |        |  |         | nd Acq =             | 27.5                |
| Assumed life of reservoir           |   |    | 100        | years                      |                          | 1        | otal   | capital cos                                | t in mi | llions =             | \$<br>161.9         |
| Estimated replacement cost          |   | \$ | 0.97       | million/year               |                          |          |        |  |         |                      |                     |
| Estimated maintenance               |   |    | 0.4        | million/year               | Mowi                     | ng, mair | ntaini | ng fences,                                 | etc.    |                      |                     |
| Total                               |   | \$ | 1.37       | million/year               |                          |          |        |  |         |                      |                     |
| Year built                          |   |    | 2020       |                            |                          |          |        |  |         |                      |                     |
| NPV of O&M costs                    |   | \$ | 19.1       | million                    |                          |          |        |  |         |                      |                     |
| NPV of Capital costs                |   | \$ | 126.8      | million                    |                          |          |        |  |         |                      |                     |
| Total NPV of Capital and O&M Cos    | its   | s  | 145.9      | million                    |                          |          |        |  |         |                      |                     |

| umi | mary  | 127 282 11 | IPV of<br>tal Costs | PV of O&M<br>Costs | Caj | al NPV of<br>pital and<br>M Costs |
|-----|---|------------|---------------------|--------------------|-----|-----------------------------------|
|     | Inflatable Rubber Low Head Dam Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) Reservoirs Total for RWI & | \$         | 9.7                 | \$<br>6.3          | \$  | 16.0                              |
|     | Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)   | \$         | 54.1                | \$<br>21.6         | \$  | 75.7                              |
|     | Reservoirs  | \$         | 126.8               | \$<br>19.1         | \$  | 145.9                             |
|     | Total for PWI A   | •          | 190 6               | 47.0               | \$  | 237 B                             |

#### O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 2A - WTP East of San Marcos

Initial year of analysis period Interest rate 5% Engineering, Legal, Admin. = 15%

Evaluation period 50 years Environmental & Archaeology Studies & Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

#### Raw Water Transmission Main - A

| ater Transmission Main - A                                  |      |             |                |        |                  |  |
|---|------|-------------|----------------|--------|------------------|--|
| Inside diameter of pipe Area                                |      | 96<br>50.27 | in.            |        |                  |  |
| Length of RWTM  |      |             | miles          |        |                  |  |
| Longin of North   |      | 665,280     |                |        |                  |  |
| Estimated unit construction cost for RWTM                   | \$   | 567         | per LF         |        |                  |  |
| Total construction cost in millions                         | \$   | 378         |                |        |                  |  |
| Contingencies Subtotal                                      | \$   | 76<br>453   |                |        |                  |  |
| Engineering, Legal & Administrative                         | \$   | 68          |                |        |                  |  |
| Subtotal  | \$   | 521         | •              |        |                  |  |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq    | \$   | 13          |                |        |                  |  |
| Total Capital Cost for PWTM in millions                     | \$   |             | million        |        |                  |  |
| Unit maintenance cost/year-mile                             | \$   | 10,000      | \$/year-mile   | \$     | 1.260            | Million \$/year                        |
| Design flow rate (after 100% buildout)                      |      | 132,000     | ac-ft/year     |        |                  |  |
|   |      |             | mgd            |        |                  |  |
|   |      | 81,829      |                |        |                  |  |
| Pumping rate (one pump)                                     |      | 16,400      | gpm            |        |                  |  |
| No. of pumps (not counting spare)                           |      | 5           |                |        |                  |  |
| Peak flow rate (all pumps except spare)                     |      | 82,000      | gpm            |        |                  |  |
| Velocity at peak flow rate                                  |      | 3.63        | fps            |        |                  |  |
| C factor  |      | 120         |                |        |                  |  |
| Head loss per foot  |      | 0.00041     | ft/ft          |        | h <sub>f</sub> = | [3.552*Q] <sup>1.85</sup>              |
|   |      | 2.19        | ft/mile        |        |                  | C*(d) <sup>2.63</sup>                  |
| Head loss at peak flow rate                                 |      | 276         | ft             |        |                  |  |
| Allowance for minor losses 10%                              |      | 28          | ft             |        | 550              | Elev. At San Antonio East WTP          |
| Total estimated losses                                      |      | 303         | ft             |        | 90               | Elev. At Matagorda OCRs                |
| Average static head   |      | 460         | ft             |        | 460              |  |
| Total estimated dynamic head                                |      | 763         | ft             |        |                  |  |
|   |      | 331         | psi            |        |                  |  |
| No of pumping stations req'd along route                    |      | 2.21        |                |        | 150              | psi (assumed max pressure              |
| No. of pumping stations used in cost estimate               |      | 3.0         |                |        |                  | in pipe)                               |
| Average head per pump station                               |      | 254         | ft             |        |                  |  |
| Assumed pump efficiency                                     |      | 85%         |                |        |                  |  |
| Assumed motor efficiency                                    |      | 90%         |                |        |                  |  |
| Estimated Hp required per pump                              |      |             | hp/pump        |        |                  |  |
| 724 W. 25   |      | 1,028       |                |        |                  |  |
| Total hp per pump station (not counting spare)              |      |             | hp/station     |        |                  |  |
| Total kw per pump set (set≃pumps in series along route)     |      | 4,133       | kw/pump set    | (one p | oump at          | each station)                          |
| Unit construction cost for each pump station (from cost cur | v \$ |             | per firm hp of | fpump  | station          |  |
| Construction cost per pump station                          |      | 9.3         | million        |        |                  |  |
| Balancing reservoir   | \$   |             | million _      |        |                  | min. of storage at avg pumping rate    |
| Total construction cost per pump station                    | \$   | 10.03       | million        |        | 5.0              |  |
|   |      |             | . 1            | \$     | 0.15             | per gal for open top reservoir         |
| No. of pump stations from above                             |      | 3.0         | each           |        |                  |  |
| Total construction cost in millions                         | \$   |             | million        |        |                  |  |
| Contigency, Eng., etc. in millions                          | \$   |             | million        |        |                  |  |
| Total capital cost in millions                              | \$   | 41.5        | million        |        |                  |  |
| Total construction cost for pump stations                   | \$   | 30.1        | million        |        |                  |  |
| Value of equipment  | \$   |             | million        |        | 40%              | Estimated equipment cost as % of total |
| Assumed life of equipment                                   |      | 20          |                |        |                  |  |
| Estimated maintenance/replacement cost                      | \$   | 0.60        | million/year   |        |                  |  |
|   |      |             |                |        |                  |  |

#### O&M Costs

|   | Year         | Flow pun<br>yea    |            | No. of<br>pump<br>"sets" | Energy<br>used      |     | Energy           | y co | ost                   | co | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Т            | otal O&M<br>cost      | Ne | et present<br>value |
|---|--------------|--------------------|------------|--------------------------|---------------------|-----|------------------|------|-----------------------|----|------------------------------------|----|-------------------------------|--------------|-----------------------|----|---------------------|
|   |              | ac-ft/yr           | mgd        | operating<br>/day        | (kwh/day)           |     | (\$/day)         |      | (Million \$<br>/year) | (  | (Million \$<br>/year)              |    | (Million \$<br>/year)         |              | (Million \$<br>/year) |    | (\$)                |
| 0 | 2015         | -                  |            |                          |                     | \$  | -                | \$   |                       |    |                                    |    | 17.7                          | \$           |                       | \$ |                     |
|   | 2016         | -                  | *          | -                        | -                   | \$  | -                | \$   |                       |    |                                    |    |                               | \$           |                       | \$ |                     |
|   | 2017         | -                  |            | -                        |                     | \$  | -                | \$   | -                     |    |                                    |    |                               | \$           | •                     | \$ | •                   |
|   | 2018         | -                  | -          | -                        | -                   | \$  | -                | \$   |                       |    |                                    |    |                               | \$           |                       | \$ |                     |
|   | 2019         |                    |            |                          | van Ša              | \$  |                  | \$   |                       |    | 200                                | 0  |                               | \$           |                       | \$ |                     |
|   | 2020         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 11.37               |
|   | 2021         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 10.83               |
|   | 2022         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 10.31               |
|   | 2023         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 9.82                |
|   | 2024         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 9.35                |
|   | 2025         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 8.91                |
|   | 2026         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 8.48                |
|   | 2027         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 8.08                |
|   | 2028         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 7.69                |
|   | 2029         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 7.33                |
|   | 2030         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 6.98                |
|   | 2031         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 6.65                |
|   | 2032         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 6.33                |
|   | 2033         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 6.03                |
|   | 2034         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 5.74                |
|   | 2035         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 5.47                |
|   | 2036         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 5.21                |
|   | 2037         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 4.96                |
|   | 2038         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 4.72                |
|   | 2039         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 4.50                |
|   | 2040         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 4.28                |
|   | 2041         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 4.08                |
|   | 2042         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 3.89                |
|   | 2043         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 3.70                |
|   | 2044         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 3.52                |
|   | 2045         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 3.36                |
|   | 2046         | 132,000            | 118        | 4.99                     | 494,936             | 5   | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 3.20                |
|   | 2047         | 132,000            | 118        | 4.99                     | 494,936             |     | 34,646           |      |                       |    | 0.60                               | \$ | 1.260                         |              | 14.51                 |    | 3.04                |
|   | 2048<br>2049 | 132,000            | 118<br>118 | 4.99<br>4.99             | 494,936             | \$  | 34,646           | \$   | 12.65<br>12.65        | \$ | 0.60                               | \$ | 1.260<br>1.260                | \$           | 14.51<br>14.51        | \$ | 2.90<br>2.76        |
|   |              | 132,000            |            | 4.99                     | 494,936             | \$  | 34,646           | 5    |                       |    |                                    | \$ |                               | \$           |                       | \$ |                     |
|   | 2050         | 132,000            | 118<br>118 |                          | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 2.63                |
|   | 2051         | 132,000            | 20007      | 4.99                     | 494,936             | 5   | 34,646           | \$   |                       | \$ | 0.60                               |    | 1.260                         | \$           | 14.51                 | \$ | 2.50                |
|   | 2052         | 132,000            | 118        | 4.99                     | 494,936             | 5   | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         |              | 14.51                 | \$ | 2.39                |
|   | 2053<br>2054 | 132,000            | 118<br>118 | 4.99<br>4.99             | 494,936             | \$  | 34,646           | \$   | 12.65<br>12.65        | \$ | 0.60                               | \$ | 1.260<br>1.260                | \$           | 14.51                 | \$ | 2.27                |
|   | 2054         | 132,000<br>132,000 | 118        | 4.99                     | 494,936<br>494,936  | \$  | 34,646<br>34,646 | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51<br>14.51        | S  | 2.16<br>2.06        |
|   | 2056         | 132,000            | 118        | 4.99                     | 494,936             | 5   | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 1.96                |
|   | 2057         | 132,000            | 118        | 4.99                     |                     | \$  | 34,646           | 5    | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 1.87                |
|   | 2057         | 132,000            | 118        | 4.99                     | 494,936<br>494,936  | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | S  | 1.78                |
|   |              |                    |            | 4.99                     |                     | \$  |                  | \$   |                       | S  |                                    |    |                               | \$           |                       | \$ | 1.70                |
|   | 2059<br>2060 | 132,000<br>132,000 | 118<br>118 | 4.99                     | 494,936<br>494,936  | 5   | 34,646<br>34,646 | 5    |                       | S  | 0.60                               | \$ | 1.260<br>1.260                | \$           | 14.51<br>14.51        | \$ | 1.70                |
|   | 2061         |                    | 118        | 4.99                     |                     | \$  |                  | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 1.54                |
|   | 2062         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   |                       | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 1.54                |
|   | 2062         | 132,000<br>132,000 | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | 5  | 1.260                         | \$           | 14.51                 | \$ | 1.46                |
|   | 2063         | 132,000            | 118        | 4.99                     | 494,936<br>494,936  | 5   | 34,646<br>34,646 | \$   |                       | 5  | 0.60                               | 5  | 1.260                         | \$           | 14.51                 | \$ | 1.39                |
|   | 2065         | 132,000            | 118        | 4.99                     | 494,936             | \$  | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                         | \$           | 14.51                 | \$ | 1.27                |
|   |              |                    |            |                          |                     |     |                  |      |                       |    |                                    |    | Total NPV                     | of O&M Costs |                       | \$ | 213                 |
|   |              |                    |            | Capital Cost             | ts in million \$:   |     |                  |      |                       |    | Yr built                           |    |                               |              |                       |    |                     |
|   |              |                    |            |                          | RWTM                |     |                  | \$   | 534                   | -  | 2020                               | •  |                               |              |                       | \$ | 418                 |
|   |              |                    |            |                          |                     |     |                  |      |                       |    |                                    |    |                               |              |                       |    |                     |
|   |              |                    |            |                          | <b>Pumping Stat</b> | ıon | S                | \$   | 42                    |    | 2020                               |    |                               |              |                       | \$ | 33                  |

Total NPV of Capital and O&M Costs in millions \$

664

East of SMarcos\_Alt2A;RWTM A

### NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 2A - WTP East of San Marcos

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate 2015 5% 50 years 0.07 per kwh Evaluation period Unit cost of energy

|  | ALCOA | CPS   | Total |
|--|-------|-------|-------|
| Year built   | 2015  | 2015  |       |
| Estimated Construction Cost in Millions                  |       |       |       |
| Wells (Based on Non-Public Water Supply Wells)           | 20.92 | 7.94  | 28.8  |
| Pipeline   | 13.03 | 5.94  | 18.9  |
| Pump Stations & Storage                                  | 8.51  | 0     | 8.5   |
| Subtotal   | 42.46 | 13.88 | 56.3  |
| Contingency  | 8.49  | 2.78  | 11.2  |
| Subtotal   | 50.95 | 16.66 | 67.6  |
| Engineering, Legal & Administrative                      | 6.37  | 2.08  | 8.4   |
| Subtotal   | 57.32 | 18.74 | 76.0  |
| Environmental & Archaeology Studies & Mitigation         | 0.63  | 0.2   | 0.8   |
| Land Acquisition & Surveying                             | 0     | 0     | 0.0   |
| Groundwater Purchase                                     | 0     | 5.64  | 5.6   |
| ALCOA Construction Program Management Fee                | 5.45  | 0     | 5.4   |
| Interest During Construction (2 years, 6% int., 4% ret.) | 5.89  | 2.44  | 8.3   |
| Total Capital Cost                                       | 69.29 | 27.02 | 96.3  |
| Estimated Annual O&M Costs                               |       |       |       |
| M&O  | 0.67  | 0.18  | 0.8   |
| Pumping Energy   | 2.41  | 0.52  | 2.9   |
| ALCOA Project Management Fees                            | 0.35  | 0.00  | 0.3   |
| Purchase of Groundwater                                  | 2.00  | 0.00  | 2.0   |
| Groundwater District Fees                                | 0.65  | 0.25  | 0.9   |
| Mitigation Reserves                                      | 0.28  | 0.11  | 0.3   |
| Total Annual Cost  | 6.36  | 1.06  | 7.4   |

#### Cooling of Well Water

NPV of O&M Costs

**NPV of Capital Costs** 

Total NPV of Capital and O&M Costs for Well Fields

| Total number of wells in both fields                      | 120           | wells   | Approximate capacity per wel            | 300    | gpm        |
|---|---------------|---------|---|--------|------------|
| Percentage of wells with temperatures > than degrees      | 5%            |         | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees      | 6.0           |         | Rough check                             | 58,072 | ac-ft/year |
| Estimated Capital Costs                                   |               |         |   |        |            |
| Year built  | 2015          |         |   |        |            |
| Number of Packaged Cooling Towers (300 gpm capacity/each) | 6.0           |         |   |        |            |
| Equipment cost (cooling towers and fans)                  | \$<br>60,000  |         |   |        |            |
| Installation and contractors mark-up                      | \$<br>50,000  |         |   |        |            |
| Structural slab   | \$<br>30,000  |         |   |        |            |
| Electrical  | \$<br>50,000  |         |   |        |            |
| Estimated Unit Construction Cost                          | \$<br>190,000 | Each    |   |        |            |
| Total construction cost                                   | \$<br>1.14    | million |   |        |            |
| Contingencies   | \$<br>0.23    |         |   |        |            |
| Subtotal  | \$<br>1.37    | •       |   |        |            |
| Engineering, Legal and Admin                              | \$<br>0.21    |         |   |        |            |
| Total Estimated Capital Cost                              | \$<br>1.57    |         |   |        |            |
| NPV of Capital Costs                                      | \$<br>1.57    | million |   |        |            |

116 \$

69 \$

185 \$

\$

19 \$ 27 \$

46 \$

135 million 96 million

232 million

#### Estimated O&M Costs

| Value of equipment                                  | \$<br>0.4   | million                          |
|---|-------------|----------------------------------|
| Assumed life of equipment                           | 10          | years                            |
| Estimated maintenance/replacement cost              | \$<br>0.04  | million/year                     |
| Blower Hp per cooling tower                         | 10          | Нр                               |
|   | 7           | kw                               |
| Hours of operation                                  | 24          | hours                            |
| Power consumption per cooling tower                 | 179         | kwh per day                      |
|   | 65,350      | kwh per year                     |
| Power cost per cooling tower                        | \$<br>4,574 |                                  |
| Total power cost for all cooling towers in millions | \$<br>0.03  | million per year                 |
| Regular operational checks and routine maintenance  | \$<br>6,000 | per month for all cooling towers |
|   | \$<br>0.07  | per year                         |
| Estimated O&M Cost                                  | \$<br>0.14  | million \$ per year              |
| NPV of O&M costs                                    | \$<br>2.47  | million \$                       |

Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

54 in.

| Area                                      |                  |    | 15.90   | sf           |         |                  |                                |     |
|---|------------------|----|---------|--------------|---------|------------------|--------------------------------|-----|
| Length of Ground Water TM                 |                  |    | 15      | miles        |         |                  |                                |     |
|   |                  |    | 79,200  | feet         |         |                  |                                |     |
| Estimated construction cost for GWTM      |                  | \$ | 327     | per LF       |         |                  |                                |     |
| Total construction cost in millions       |                  | \$ | 25.9    |              |         |                  |                                |     |
| Contingencies                             |                  | \$ | 5.2     |              |         |                  |                                |     |
| Subtotal                                  |                  | \$ | 31.1    |              |         |                  |                                |     |
| Engineering, Legal & Administrative       |                  | \$ | 4.7     |              |         |                  |                                |     |
| Subtotal                                  |                  | \$ | 35.8    |              |         |                  |                                |     |
| Envir & Arch Studies & Mitigation, Survey | ring, & Land Acq | \$ | 1.5     |              |         |                  |                                |     |
| Total Capital Cost for PWTM               | in millions      | \$ | 37.3    | million      |         |                  |                                |     |
| Unit maintenance cost/year-mile           |                  | \$ | 10,000  | \$/year-mile | \$      | 0.150            | Million \$/year                |     |
| Design flow rate                          |                  |    | 55,000  | ac-ft/year   |         |                  |                                |     |
|   |                  |    | 49      | mgd          |         |                  |                                |     |
|   |                  |    | 34,095  | gpm          |         |                  |                                |     |
| Velocity at peak flow rate                |                  |    | 4.78    | fps          |         |                  |                                |     |
| C factor                                  |                  |    | 120     | 1150         |         |                  |                                |     |
| Head loss per foot                        |                  |    | 0.00134 | ft/ft        |         | h <sub>f</sub> = | 3.552*Q 1.85                   |     |
|   |                  |    | 7.10    | ft/mile      |         | -50              | C*(d) <sup>2.63</sup>          |     |
| Head loss at peak flow rate               |                  |    | 106     | ft           |         |                  |                                |     |
| Allowance for minor losses                | 10%              |    | 11      |              |         | 400              | Elev. At RWI-B                 |     |
| Total estimated losses                    |                  | -  | 117     |              |         |                  | minus Elev Storage Tank at Hwy | 290 |
| Average static head                       |                  |    | -150    |              | -       | -150             |                                |     |
| Total estimated dynamic head              |                  | -  | -33     |              | (intake | is lowe          | r than tank at Hwy 290)        |     |
|   |                  |    | -14     | psi          | 2000000 |                  |                                |     |
|   |                  |    |         |              |         |                  |                                |     |

#### Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

| Annual O&M Cost in million \$: |    |       | Yr built |                            | М  | illion \$ |
|--------------------------------|----|-------|----------|----------------------------|----|-----------|
| GWTM                           | s  | 0.150 | 2015     | -                          |    |           |
|                                | •  | 0.100 | 2010     | Total NPV of O&M Costs     | \$ | 2.7       |
| Capital Costs in million \$:   |    |       | Yr built |                            |    |           |
| GWTM                           | \$ | 37.3  | 2015     | •                          | \$ | 37.3      |
|                                |    |       |          | Total NPV of Capital Costs | •  | 37.3      |

#### Summary

Well Fields and Collection Lines (including tank and pump station at Hwy 290)
Cooling Towers for Selected High Temperature Wells
Ground Water Transmission Main and Pumping Station
Total for ALCOA-CPS

| NPV of<br>Capital Costs |       | NP | V of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |  |  |  |
|-------------------------|-------|----|-------------------|--|-------|--|--|--|
| \$                      | 96.3  | \$ | 135.5             | \$                                       | 231.8 |  |  |  |
| \$                      | 1.6   | \$ | 2.5               | \$                                       | 4.0   |  |  |  |
| \$                      | 37.3  | \$ | 2.7               | \$                                       | 40.0  |  |  |  |
| \$                      | 135.1 | S  | 140.7             | S  | 275.8 |  |  |  |

#### O&M Cost Calculations RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir CTRWTP - Alternate 2A - WTP East of San Marcos

Initial year of analysis period Interest rate 2015 Contingency = 20% Engineering, Legal, Admin. = 15% 5% 40 years \$ 0.07 per kwh Evaluation period Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 100,000 per mile
or = \$ 5,000 per acre Unit cost of energy Inflatable Rubber Low Head Dam Total Contigency, Total Capital Eng., etc. Cost (millions) (millions) Unit Constr. Estimated Constr. Cost Quantity Size Cost Units (millions) (millions) 1.71 Inflatable Rubber Low Head Dam 10 ft high 2.25 4.50 Estimated inflatable dam cost as % of total 50% Value of inflatable dam Assumed life of inflatable dam 2.25 million 10 years 0.23 million/year Estimated maintenance/replacement cost 2015 NPV of O&M Costs 3.86 million NPV of Capital Costs 6.21 million \$ 10.07 million Total NPV of Capital and O&M Costs

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

#### Summary of withdrawals in acre-feet/year:

| Year                        | 2015                    | 2020           | 2030          | 2040           | 205   |        | 2060         | 2065             |   |
|-----------------------------|-------------------------|----------------|---------------|----------------|-------|--------|--------------|------------------|---|
| For SAWS                    | 18000                   | 18000          | 18000         | 18000          | 180   |        | 18000        | 18000            | 7   |
| LCRA                        |                         |                | 5600          | 11200          | 112   |        | 11200        | 11200            |   |
| COA _                       | 10000                   | 10000          | 16802         | 22403          | 336   |        | 33604        | 33604            | -   |
| Total                       | 18000                   | 18000          | 40402         | 51603          | 628   | 04     | 62804        | 62804            |   |
| Ultimate (Y2                | 065) avera              | age design v   | vithdrawal ra | ate            | 6     | 2,804  | ac-ft/year   |                  |   |
|                             |                         |                |               |                |       | 87     | cfs          |                  | 20.77   |
| Tatal latalia               | desire                  | halanii anta   | . Mas analais | a biah flavor  |       | 2,000  | ofo          | 23.1             | Ratio of design withdrawal rate<br>to Total intake design withdrawal rate |
| i otal intake               | design wit              | ndrawai rate   | (for scalpin  | ng high flows) |       | 7,600  |              |                  | to Total Intake design withdrawarrate                                     |
| No. of Intake               | 98                      |                |               |                |       | 2      |              |                  |   |
| Design with                 |                         | per intake     |               |                |       | 1,000  | cfs          |                  |   |
| z co.g                      |                         | 1.00           |               |                |       | 8,800  |              |                  |   |
| Nf                          |                         |                |               |                |       |        |              |                  |   |
| No. of reser<br>Design flow |                         | servoir        |               |                | 22    | 4,400  | anm          |                  |   |
| Design now                  | to each re              | 3014011        |               |                |       | 1,100  | gp           |                  |   |
| Inside diame                | eter of eac             | h RWTM         |               |                |       | 120    |              |                  |   |
| Area                        |                         |                |               |                |       | 78.54  |              |                  |   |
| Average len                 | gth of eacl             | h RWTM         |               |                |       |        | miles        |                  | miles for all RWTMs   |
|                             |                         |                |               |                | 1     | 0,560  | feet         | 42,240           | feet  |
| Estimated co                | onstruction             | cost for RV    | VTMs          |                | \$    | 793    | per LF       |                  |   |
| Total constr                | uction cos              | t in millions  |               |                | \$    | 33.5   |              |                  |   |
| Contingenci                 | es                      |                |               |                | \$    | 6.7    |              |                  |   |
|                             | Subtotal                |                |               |                | \$    | 40.2   |              |                  |   |
| Engineering                 | , Legal & /<br>Subtotal | Administrativ  | re            |                | \$    | 46.2   |              |                  |   |
| Envir & Arch                |                         | Mitigation,    | Surveying,    | & Land Acq     | Š     | 0.8    |              |                  |   |
|                             |                         | tal Cost for I |               |                | \$    | 47.0   |              |                  |   |
| Unit mainter                | nance cost              | /year-mile     |               |                | \$ 1  | 0,000  | \$/year-mile | \$ 0.080         | Million \$/year (all RWTMs to Reservoirs)                                 |
| Note: Assur                 | me intake h             | nas one RW     | TM pumping    | to the reser   | voir. |        |              |                  |   |
| Design flow                 | rate for ea             | ch RWTM (      | from above    | ,              | 22    | 4,400  | gpm          |                  |   |
| Pumping rat                 |                         |                |               |                |       | 0,000  |              |                  |   |
|                             |                         |                |               | to each RWI    |       | 6      |              |                  |   |
| Peak flow ra                | ate into ead            | ch RWIM (a     | ill pumps ex  | cept spare)    | 24    | 0,000  | gpm          |                  |   |
| Velocity at p               | eak flow r              | ate            |               |                |       | 6.81   | fps          |                  |   |
| C factor                    |                         |                |               |                |       | 120    | 1.00         |                  |   |
| Head loss p                 | er foot                 |                |               |                | 0.    | .00102 | ft/ft        | h <sub>f</sub> = | 1 3.552*QI <sup>1.85</sup>  |
|                             |                         |                |               |                |       | 5.39   | ft/mile      |                  | C*(d) <sup>263</sup>  |
| Head loss a                 | t peak flov             | v rate         |               |                |       | 11     | ft           |                  |   |
| Allowance for               |                         |                | 30%           |                |       |        | ft           | 400              | Discharge at reservoir  |
| Total estima                |                         |                |               |                |       | 14     | ft           | 320              | Water surface elev in river   |
| Average sta                 |                         |                |               |                |       | 80     |              | 80               | ) ft  |
| Total estima                | ated dynan              | nic head       |               |                |       | 94     |              |                  |   |
|                             |                         |                |               |                |       | 41     | psi          |                  |   |
| Assumed pu                  |                         |                |               |                |       | 85%    |              |                  |   |
| Assumed m                   |                         |                |               |                |       | 90%    |              |                  |   |
| Estimated F                 | p required              | per pump       |               |                |       |        | hp/pump      |                  |   |
|                             |                         |                |               |                |       | 926    | kw/pump      |                  |   |

Total hp pumping into each RWTM (not counting spare)
Total hp at each intake (not counting spare)
Total hp all intakes (not counting spares)
Total kw all intakes (not counting spares)
Total construction cost for each pump station (from cost cur Construction cost per intake/pump station
No. of intakes from above

Total construction cost in millions
Contigency, Eng., etc. in millions
Total capital cost in millions
Value of equipment
Assumed life of equipment
Estimated maintenance/replacement cost

Assumed life of equipment
Estimated maintenance/replacement cost

Total hp pumping into each RWTM (not counting spare)
Total construction cost for pump station (from cost cur \$ 29,793 hp
Total construction cost in millions

Total construction cost in millions

Total construction cost for pump stations
Solon
Million

Total construction cost for pump station
Million

Total construction cost for pump station
Million

Total construction cost for pump station
Million

Total construction cost for pump station (from cost cur smillion deach pump station million
Million

40% Estimated equipment cost as % of total million million

Million

Million

Total construction cost for pump station (from cost cur smillion deach pump station million deach pump station pump station million deach pump station pump station deach pump station pump station pump station million deach pump s

O&M Costs:

| Year | Flow pun         |          | No. of pump "sets" | Energy<br>used   | 500000000000000000000000000000000000000 |                |    |                       | other O&M<br>osts - Pump<br>Stations |                       | aintenance<br>costs -<br>RWTM | T                     | otal O&M<br>cost | Ne                | et present<br>value |      |
|------|------------------|----------|--------------------|------------------|---|----------------|----|-----------------------|--------------------------------------|-----------------------|-------------------------------|-----------------------|------------------|-------------------|---------------------|------|
|      | ac-ft/yr         | mgd      | operating<br>/day  | (kwh/day)        |   | (\$/day)       |    | (Million \$<br>/year) |                                      | (Million \$<br>/year) | 1                             | (Million \$<br>/year) | (                | Million \$ /year) |                     | (\$) |
| 2015 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.77 |
| 2016 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.73 |
| 2017 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.70 |
| 2018 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.66 |
| 2019 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.63 |
| 2020 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.60 |
| 2021 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.57 |
| 2022 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.55 |
| 2023 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.52 |
| 2024 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.50 |
| 2025 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.47 |
| 2026 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.45 |
| 2027 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.43 |
| 2028 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.41 |
| 2029 | 18,000           | 16       | 0.28               | 6,200            | \$                                      | 434            | \$ | 0.16                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.77              | \$                  | 0.39 |
| 2030 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.46 |
| 2031 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.44 |
| 2032 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | S                             | 0.080                 | \$               | 0.97              | \$                  | 0.42 |
| 2033 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.40 |
| 2034 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.38 |
| 2035 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.36 |
| 2036 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.35 |
| 2037 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.33 |
| 2038 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.31 |
| 2039 | 40,402           | 36       | 0.63               | 13,917           | \$                                      | 974            | \$ | 0.36                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 0.97              | \$                  | 0.30 |
| 2040 | 51,603           | 46       | 0.80               | 17,775           | \$                                      | 1,244          | \$ | 0.45                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 1.06              | \$                  | 0.31 |
| 2041 | 51,603           | 46       | 0.80               | 17,775           | \$                                      | 1,244          | \$ | 0.45                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 1.06              | \$                  | 0.30 |
| 2042 | 51,603           | 46       | 0.80               | 17,775           | \$                                      | 1,244          | \$ | 0.45                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 1.06              | \$                  | 0.28 |
| 2043 | 51,603           | 46<br>46 | 0.80<br>0.80       | 17,775<br>17,775 | \$                                      | 1,244          | S  | 0.45<br>0.45          | \$                                   | 0.53<br>0.53          | \$                            | 0.080                 | S                | 1.06<br>1.06      | \$                  | 0.27 |
| 2044 | 51,603           | 46       | 0.80               | 17,775           | S                                       | 1,244          | \$ | 0.45                  | S                                    | 0.53                  | S                             | 0.080                 | S                | 1.06              | S                   | 0.25 |
| 2045 | 51,603           | 46       | 0.80               |                  | S                                       |                | \$ | 0.45                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 1.06              | \$                  | 0.23 |
| 2046 | 51,603<br>51,603 | 46       | 0.80               | 17,775<br>17,775 | S                                       | 1,244<br>1,244 | S  | 0.45                  | \$                                   | 0.53                  | \$                            | 0.080                 | S                | 1.06              | S                   | 0.23 |
| 2047 | 51,603           | 46       | 0.80               | 17,775           | \$                                      | 1,244          | S  | 0.45                  | S                                    | 0.53                  | S                             | 0.080                 | \$               | 1.06              | S                   | 0.22 |
| 2049 | 51,603           | 46       | 0.80               | 17,775           | \$                                      | 1,244          | \$ | 0.45                  | \$                                   | 0.53                  | S                             | 0.080                 | \$               | 1.06              | \$                  | 0.20 |
| 2050 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | \$ | 0.45                  | s                                    | 0.53                  | S                             | 0.080                 | \$               | 1.16              | \$                  | 0.20 |
| 2051 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | S  | 0.55                  | S                                    | 0.53                  | \$                            | 0.080                 | Š                | 1.16              | Š                   | 0.20 |
| 2052 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | \$ | 0.55                  | s                                    | 0.53                  | S                             | 0.080                 | 5                | 1.16              | Š                   | 0.19 |
| 2052 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | 5  | 0.55                  | \$                                   | 0.53                  | S                             | 0.080                 | S                | 1.16              | S                   | 0.19 |
| 2054 | 62,804           | 56       | 0.97               | 21,633           | s                                       | 1,514          | Š  | 0.55                  | S                                    | 0.53                  | s                             | 0.080                 | Š                | 1.16              | Š                   | 0.17 |
| 2055 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | S  | 0.55                  | š                                    | 0.53                  | \$                            | 0.080                 | Š                | 1.16              | Š                   | 0.17 |
| 2056 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | š  | 0.55                  | š                                    | 0.53                  | š                             | 0.080                 | Š                | 1.16              | \$                  | 0.16 |
| 2057 | 62,804           | 56       | 0.97               | 21,633           | Š                                       | 1,514          | Š  | 0.55                  | Š                                    | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | Š                   | 0.15 |
| 2058 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | \$ | 0.55                  | \$                                   | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | Š                   | 0.14 |
| 2059 | 62,804           | 56       | 0.97               | 21,633           | S                                       | 1,514          | Š  | 0.55                  | Š                                    | 0.53                  | S                             | 0.080                 | Š                | 1.16              | Š                   | 0.14 |
| 2060 | 62,804           | 56       | 0.97               | 21,633           | Š                                       | 1,514          | \$ | 0.55                  | \$                                   | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | Š                   | 0.13 |
| 2061 | 62,804           | 56       | 0.97               | 21,633           | S                                       | 1,514          | \$ | 0.55                  | \$                                   | 0.53                  | \$                            | 0.080                 | Š                | 1.16              | \$                  | 0.12 |
| 2062 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | s  | 0.55                  | Š                                    | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | \$                  | 0.12 |
| 2063 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | Š  | 0.55                  | \$                                   | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | Š                   | 0.12 |
| 2064 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | \$ | 0.55                  | \$                                   | 0.53                  | \$                            | 0.080                 | \$               | 1.16              | \$                  | 0.11 |
| 2065 | 62,804           | 56       | 0.97               | 21,633           | \$                                      | 1,514          | Š  | 0.55                  | Š                                    | 0.53                  | Š                             | 0.080                 | Š                | 1.16              | s                   | 0.10 |
|      | 52,554           | 50       | 5.51               | 21,000           | •                                       | 1,014          | •  | 5.50                  | ~                                    | 0.50                  | •                             | Tatal NOV             |                  |                   | -                   | 47.4 |

Total NPV of O&M Costs \$ 17.

 Capital Costs in million \$:
 Yr built
 47.0 built
 2015
 \$ 47.0
 2015
 \$ 36.6
 2015
 \$ 36.6
 Total NPV of Capital Costs
 \$ 83.6

Total NPV of Capital and O&M Costs in millions \$ 100.7

#### Reservoirs

|                                    | Quantity | Units | Volume/each (acre-feet) | 500 | nit Cost<br>8/ac-ft)) | Const  | otal<br>truction<br>est in<br>lions | ntigency,<br>ig., etc. | otal in<br>nillions |
|------------------------------------|----------|-------|-------------------------|-----|-----------------------|--------|-------------------------------------|------------------------|---------------------|
| Reservoirs                         | 4        | each  | 15000                   | \$  | 1,180                 | \$     | 70.8                                | \$<br>26.9             | \$<br>97.7          |
|                                    |          |       |                         | \$  | 0.004                 | per ga | llon                                |                        |                     |
| Estimated average depth of reserve | oir      | 20    | ft                      |     |                       |        |                                     |                        |                     |

| Surface area of reservoir                     | 3000        | acres        |                                     |       |
|---|-------------|--------------|-------------------------------------|-------|
| Ratio of total land area reqd to surface area |             |              |                                     |       |
| of reservoir                                  | 1.1         |              | Envir & Archaeology, Surv,          |       |
| Total land area regd for reservoirs           | 3300        | acres        | and Land Acq =                      | 16.5  |
|   |             |              | Total capital cost in millions = \$ | 114.2 |
| Assumed life of reservoir                     | 100         | years        |                                     |       |
| Estimated replacement cost                    | \$<br>0.71  | million/year |                                     |       |
| Estimated maintenance                         | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.    |       |
| Total   | \$<br>0.75  | million/year |                                     |       |
| Year built                                    | 2015        |              |                                     |       |
| NPV of O&M costs                              | \$<br>12.8  | million      |                                     |       |
| NPV of Capital costs                          | \$<br>114.2 | million      |                                     |       |
| Total NPV of Capital and O&M Costs            | \$<br>127.0 | million      |                                     |       |

| Summary   | IPV of<br>tal Costs | <br>IPV of O&M<br>Costs | Ca | pital and |
|---|---------------------|-------------------------|----|-----------|
| Inflatable Rubber Low Head Dam                                    | \$<br>6.2           | \$<br>3.9               | \$ | 10.1      |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>83.6          | \$<br>17.1              | \$ | 100.7     |
| Off Channel Reservoir   | \$<br>114.2         | \$<br>12.8              | \$ | 127.0     |
| Total for RWI A   | \$<br>204.0         | \$<br>33.8              | \$ | 237.8     |

# O&M Cost Calculations RWTM B - RWI B near Bastrop to WTP CTRWTP - Alternate 2A - WTP East of San Marcos

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate Evaluation period Unit cost of energy 2015 5% 40 years \$ 0.07 per kwh

| Suface Water   |       |       |       | 2010   | 0050   | 0000   | 0005   |
|----------------|-------|-------|-------|--------|--------|--------|--------|
| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS       | 18000 | 18000 | 18000 | 18000  | 18000  | 18000  | 18000  |
| LCRA           |       |       | 5600  | 11200  | 11200  | 11200  | 11200  |
| COA            |       |       | 16802 | 22403  | 33604  | 33604  | 33604  |
| Subtotal       | 18000 | 18000 | 40402 | 51603  | 62804  | 62804  | 62804  |
| Groundwater    |       |       |       |        |        |        |        |
| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS       | 55000 | 55000 | 55000 | 55000  | 55000  | 55000  | 55000  |
| Suface & grour | 73000 | 73000 | 95402 | 106603 | 117804 | 117804 | 117804 |

#### Sizing o

| FRaw Water Transmission Main B & Pump Stations   |    |  |                    |        |                  |  |
|--|----|--|--------------------|--------|------------------|--|
| Inside diameter of RWTM  |    | 96   |                    |        |                  |  |
| Area   |    | 50.27  |                    |        |                  |  |
| Length of RWTM   |    |  | miles              |        |                  |  |
|  |    | 190,080  | feet               |        |                  |  |
| Estimated unit construction cost for RWTM  | \$ | 567  | per LF             |        |                  |  |
| Total construction cost in millions  | \$ | 107.9  |                    |        |                  |  |
| Contingencies  | \$ | 21.6   |                    |        |                  |  |
| Subtotal   | \$ | 129.4  |                    |        |                  |  |
| Engineering, Legal & Administrative  | \$ | 19.4   | •)?                |        |                  |  |
| Subtotal   | \$ | 148.9  |                    |        |                  |  |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq                                     | \$ | 3.6  |                    |        |                  |  |
| Total Capital Cost for PWTM in millions  | >  | 152.5  | million            |        |                  |  |
| Unit maintenance cost/year-mile  | \$ | 5,000  | \$/year-mile       | \$     | 0.180            | Million \$/year                                  |
| Design flow rate (after 100% buildout)   |    |  | ac-ft/year         |        |                  |  |
|  |    |  | mgd                |        |                  |  |
|  |    | 73,029   |                    |        |                  |  |
| Pumping rate (one pump)  |    | 15,000   | gpm                |        |                  |  |
| No. of pumps (not counting spare)  |    | A CONTRACTOR OF THE PARTY OF TH | anm                |        |                  |  |
| Peak flow rate (all pumps except spare)  |    | 75,000   | gpitt              |        |                  |  |
| Velocity at peak flow rate   |    | 3.32   | fps                |        |                  |  |
| C factor   |    | 120  |                    |        |                  |  |
| Head loss per foot   |    | 0.00035  | ft/ft              |        | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>                         |
|  |    | 1.86   | ft/mile            |        |                  | C*(d) <sup>2.63</sup>                            |
| and the second   |    |  |                    |        |                  |  |
| Head loss at peak flow rate  |    | 67   |                    |        | CEO              | Class ALMED                                      |
| Allowance for minor losses 10%   | _  | 74   | ft                 |        |                  | Elev. At WTP<br>Elev of WSE in Bastrop reservoir |
| Total estimated losses   |    | 250  |                    |        | 250              |  |
| Average static head Total estimated dynamic head   | _  | 324  |                    |        | 230              | IL.  |
| Total estimated dynamic nead   |    | 140  |                    |        |                  |  |
| No of recommended number stations along route  |    | 0.93   |                    |        | 160              | psi (assumed max pressure                        |
| No of recommended pumping stations along route No. of pumping stations used in cost estimate |    | 1.0  |                    |        | 150              | in pipe)   |
| Average head per pump station  |    | 324  |                    |        |                  | iii pipe)  |
| Average nead per pump station  |    | 024  | **                 |        |                  |  |
| Assumed pump efficiency  |    | 85%  |                    |        |                  |  |
| Assumed motor efficiency   |    | 90%  |                    |        |                  |  |
| Estimated Hp required per pump   |    |  | hp/pump            |        |                  |  |
| 200 000 0 000 0 10 00 00 00 00 00 00 00 0  |    |  | kw/pump            |        |                  |  |
| Total hp per pump station (not counting spare)   |    |  | hp/station         |        |                  | sach station)                                    |
| Total kw per pump set (set=pumps in series along route)                                      |    | 1,602  | kw/pump set        | (one l | pump at          | each station)                                    |
| Unit construction cost for each pump station (from cost cur                                  | \$ | 1,310  | per firm hp o      | f pump | station          |  |
| Construction cost per pump station   |    |  | million            |        |                  |  |
| Balancing reservoir  | \$ |  | million            |        |                  | min. of storage at avg pumping rate              |
| Total construction cost per pump station   | \$ | 11.24  | million            | 9      | 5.0              |  |
| No. of pump stations from above  |    | 1.0  | each               | \$     | 0.15             | per gal for open top reservoir                   |
| Total construction cost in millions  | \$ | 44.0   | million            |        |                  |  |
|  | \$ |  | million            |        |                  |  |
|  | \$ |  | million            |        |                  |  |
| Contingency, Eng., etc. in millions Total capital cost in millions                           |    | 10.0   |                    |        |                  |  |
| Total capital cost in millions   | *  |  |                    |        |                  |  |
|  | \$ | 11.2   | million            |        |                  |  |
| Total capital cost in millions   |    |  | million<br>million |        | 40%              | Estimated equipment cost as % of total           |
| Total capital cost in millions  Total construction cost for pump stations                    | \$ | 4.5  |                    |        | 40%              | Estimated equipment cost as % of total           |

#### O&M Costs

| 2015 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2017 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2018 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2018 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2019 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2019 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2020 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2025 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2020 \$ 0.5402 \$ 85 3.04 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 \$ 0.5402 \$ 85 3.04 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 \$ 0.5402 \$ 85 3.04 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 \$ 0.5402 \$ 85 3.04 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 \$ 0.5402 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$ 0.50 \$  | e                                     | ar | Flow pur |     | No. of pump "sets"                      | Energy<br>used |      | Energy   | y co | st   | CO | other O&M<br>ests - Pump<br>Stations |   | aintenance<br>costs -<br>RWTM | 7    | Total O&M<br>cost     | Ne      | et present<br>value |
|--|---------------------------------------|----|----------|-----|---|----------------|------|----------|------|------|----|--------------------------------------|---|-------------------------------|------|-----------------------|---------|---------------------|
| 2016 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2019 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2019 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2025 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,884 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2020 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0  |                                       |    | ac-ft/yr | mgd | operating<br>/day                       | (kwh/day)      |      | (\$/day) | (    |      |    |                                      | 9 |                               | 1    | (Million \$<br>/year) | on acad | (\$)                |
| 2017 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2020 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2025 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,000 65 3.04 115,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,002 85 3.94 151,677 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.  | 01                                    | 15 | 73,000   |     | 3.02                                    | 115,984        |      |          |      |      |    |                                      | - |                               | - 70 | 3.37                  | \$      | 3.37                |
| 2018   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 3.21                |
| 2019 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2022 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2023 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2025 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 3.06                |
| 2020   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.91                |
| 2021 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.180 \$ 0.2 |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.77                |
| 2022   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.64                |
| 2023   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.51                |
| 2024 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.39                |
| 2025 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2032 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | -    | 3.37                  | \$      | 2.28                |
| 2026 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2032 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,3  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.17                |
| 2027 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2029 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,37  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 2.07                |
| 2028 73,000 65 3.02 115,984 \$ 8,119 \$ 2.96 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2032 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 1.97                |
| 2029 73,000 65 3,02 115,984 \$ 8,119 \$ 2,96 \$ 0,22 \$ 0,180 \$ 2031 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2031 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2033 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2033 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2034 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2035 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2036 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2036 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2036 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2036 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2039 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2039 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2039 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2039 95,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2039 15,402 85 3,94 151,577 \$ 10,610 \$ 3,87 \$ 0,22 \$ 0,180 \$ 2040 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2041 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2041 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2042 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2044 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2045 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2046 106,603 95 441 169,373 \$ 11,856 \$ 4,33 \$ 0,22 \$ 0,180 \$ 2050 117,804 105 4,87 187,170 \$ 13,102 \$ 4,78 \$ 0,22 \$ 0,180 \$ 2050 117,804 105 4,87 187,170 \$  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 1.88                |
| 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2032 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2030 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 1.79                |
| 2031 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 9  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 3.37                  | \$      | 1.70                |
| 2032 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | \$      | 2.06                |
| 2033 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2040 106,603 9  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | \$      | 1.96                |
| 2034 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 205  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28<br>4.28          | 5       | 1.87<br>1.78        |
| 2035 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | - 7  | 4.28                  | \$      | 1.69                |
| 2036 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0   |                                       |    |          |     |   |                |      |          | - 7  |      |    |                                      |   |                               |      | 4.28                  | \$      | 1.61                |
| 2037 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | S       |                     |
| 2038 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | \$      | 1.54                |
| 2039 95,402 85 3.94 151,577 \$ 10,610 \$ 3.87 \$ 0.22 \$ 0.180 \$ 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2043 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | 5       | 1.39                |
| 2040 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2043 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2043 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.7   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.28                  | S       | 1.33                |
| 2041 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2043 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.   |                                       |    |          |     | 100000000000000000000000000000000000000 |                |      |          |      |      |    |                                      |   |                               |      | 4.20                  | \$      | 1.40                |
| 2042 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | 100  | 4.73                  | \$      | 1.33                |
| 2043 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | \$      | 1.27                |
| 2044 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2046 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,10  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | \$      | 1.21                |
| 2045 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | Š       | 1.15                |
| 2046 108,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | 0.74 | 4.73                  | \$      | 1.09                |
| 2047 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 1  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | Š       | 1.04                |
| 2048 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2060 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | S       | 0.99                |
| 2049 106,603 95 4.41 169,373 \$ 11,856 \$ 4.33 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | Š       | 0.95                |
| 2050   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 4.73                  | S       | 0.90                |
| 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2060 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | S       | 0.94                |
| 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.90                |
| 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | S       | 0.85                |
| 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 17,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 17,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.81                |
| 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 1   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | - 7  | 5.19                  | \$      | 0.77                |
| 2056 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2060 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 10.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20 \$ 0.20   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | Š       | 0.74                |
| 2057 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2050 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,170 \$ 13,102 \$ 4.78 187,1  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.70                |
| 2058 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2051 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2052 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2053 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2054 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2055 117,804 10  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               | 0.5  | 5.19                  | Š       | 0.67                |
| 2059 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2060 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 107,107,107,107,107,107,107,107,107,107,  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.64                |
| 2080 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2061 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2062 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 105 105 105 105 105 105 105 105 105   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.61                |
| 2081 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2082 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2084 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2084 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2084 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2084 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2085 117,804 107,804 107,804 107,804 107,804 107,804 107,804 107,804 107,804 107,804 107,8   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.58                |
| 2082 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 2065 117,804 105 105 105 105 105 105 105 105 105 105   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 0.5000000             | \$      | 0.55                |
| 2063 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2064 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ Total NPV of O8 Capital Costs in million \$:  RWTM \$ 152.5 2015   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      |                       | \$      | 0.52                |
| 2084 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$ Total NPV of OX Capital Costs in million \$:  RWTM \$ 152.5 2015   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.50                |
| 2065 117,804 105 4.87 187,170 \$ 13,102 \$ 4.78 \$ 0.22 \$ 0.180 \$  Total NPV of OX  Capital Costs in million \$:  RWTM \$ 152.5 2015   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.47                |
| Capital Costs in million \$: Yr built  RWTM \$ 152.5   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      | 5.19                  | \$      | 0.45                |
| RWTM \$ 152.5 2015   |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   | Total NPV                     | of   | O&M Costs             | \$      | 75.4                |
| RWTM \$ 152.5 2015   | Capital Costs in million \$: Yr built |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      |                       |         |                     |
|  |                                       |    |          |     |   |                |      |          |      |      |    |                                      |   |                               |      |                       |         |                     |
| Pumping Stations \$ 15.5 2015  |                                       |    |          |     |   |                | atio | ns       |      |      |    |                                      |   |                               |      |                       | \$      | 15.5                |
| Total NPV of Cap   |                                       |    |          |     |   | , unipling of  | unit |          | 9    | 10.0 |    | 2010                                 | 7 | Total NPV of                  | C    | anital Costs          |         | 168.0               |

Total NPV of Capital and O&M Costs in millions \$

243.4

East of SMarcos\_Alt2A;RWTM B

## O&M Cost Calculations WTP and Raw Water Storage Reservoir at WTP CTRWTP - Alternate 2A - WTP East of San Marcos

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

2015 5% 50 years \$ 0.07 per kwh

Treated Water Production by Treatment Type (from Demand Chart)

| CRA   ac-Rtyr   0   0   5600   11200   11200   11200  |  |          | Year =   | 2015         | 2020         | 2030              | 2040            | 2050           | 2060       | 2065         |
|---|--|----------|----------|--------------|--------------|-------------------|-----------------|----------------|------------|--------------|
| Average yearly demands:   City A lastin   Section   Section   City Alastin   Ci  | Softened water demand:   |          | Units    |              |              |                   |                 |                |            |              |
| City of Austin   ex-thyr   0   0   19802   22403   33004   33004   33004   11200   1  | Average yearly demands:  |          |          |              |              |                   |                 |                |            |              |
| Max day demands:  | City of Austin   |          |          |              |              |                   |                 |                |            | 3360<br>1120 |
| Max day demands   |  |          |          |              |              |                   |                 |                |            | 4480         |
| Construction   Cons  |  |          | mgd      | 0            | 0            | 20                | 30              | 40             | 40         | 4            |
| LGRA   mgd   0   0   10   20   20   20   20   |  |          | mad      | 0            | 0            | 25                | 35              | 50             | 50         | 5            |
| Vear   2015   2020   2030   2040   2050   2060   20   20   20   20   20   20  |  |          |          | 0            |              |                   |                 |                |            | 2            |
| Non-softened water demands   Note: Note  | Totals   |          | mgd      | 0            | 0            | 35                | 55              | 70             | 70         | 7            |
| Average yearly demands:   |  |          | Year =   | 2015         | 2020         | 2030              | 2040            | 2050           | 2060       | 2065         |
| SANS SARA ac-thyr 23050 23406 23433 31393 34411 37530 GBRA ac-thyr 0 0 0 0 000 8000 10000 12300 Totals mgd 94 204 214 218 223 227  Max day demands: SANS SARA GBRA mgd 24 27 33 36 40 44 GBRA GBRA Mgd 9 0 0 0 5 7 9 911 Totals mgd 109 265 276 281 287 283  Totals: softened and non-softened water demands Average yearly demand mgd 109 265 276 281 287 283  Total: softened and non-softened water demands Average yearly demand mgd 109 265 376 281 287 283  Water Reservoir  Sizing for ultimate conditions: Assumed number of days of consecutive Max Day demands Design (Max. Day) treated water production req'd in mgd Average treated water production in mgd Difference (shortfall of raw water) Fequired storage reservoir for raw water Total storage required Total storage required Total storage required Total storage recommended  Quantity Units Volume/each (ac-re-leaf) (\$\frac{1}{2}\$ | Non-softened water demands;                                      |          | Units    |              |              |                   |                 |                |            |              |
| SARA   CBRA   | Average yearly demands:  |          |          |              |              |                   |                 |                |            |              |
| Collection   Col  |  |          |          |              |              |                   |                 |                |            | 20500        |
| Totals  |  |          |          |              |              |                   |                 |                |            | 4112<br>1230 |
| Max day demands   |  |          | ac-it/yr |              |              |                   |                 |                |            | 258428       |
| SARRA mpd 24 27 33 36 40 44 44 77 15 15 15 15 16 16 15 16 16 16 16 16 16 16 16 16 16 16 16 16   |  | -        | mgd      |              |              |                   |                 |                |            | 230420       |
| SARA   migd   24   27   33   36   40   44   44   45   44   45   44   45   | Max day demands:   |          |          |              |              |                   |                 |                |            |              |
| Colst: softened and non-softened water demands   Average yearly demand   Mac Ally   Max day demand   Max d  | SAWS   |          |          |              |              |                   |                 |                |            | 23           |
| Totals  |  |          |          |              |              |                   |                 |                |            | 4            |
| Average yearly demand   mgd   mgd   sate   28406   261835   277996   294215   299634   3 mgd   mgd   mgd   sate   204   234   248   263   267   267   268   |  |          |          |              |              |                   |                 |                |            | 297          |
| Average yearly demand   a-e-Byr   93550   228406   281835   277996   294215   299634   3  | Totals   |          | niga     | 103          | 203          | 270               | 201             | 201            | 253        | 29           |
| Max day demand   mgd   109   265   311   336   357   363   363   364   364   364   364   364   365   365   363   365  |  | demands  |          |              | 000.100      |                   |                 |                |            |              |
| Nater Reservoir  Izing for ultimate conditions:  Assumed number of days of consecutive Max Day demands  Design (Max. Day) treated water production req'd in mgd  Average treated water production in mgd  Difference (shortfall of raw water)  Required storage reservoir for raw water  Add safety factor  Total storage recommended  Difference (shortfall of raw water)  Add safety factor  Total storage recommended  Difference (shortfall of raw water)  Add safety factor  Total storage required  Total storage recommended  Difference (shortfall of raw water)  Add safety factor  Difference (shortfall of raw water)  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 33 days  Doll (to vample, for repair of RWTM A) = 31 days  Doll (to vample, for repair of RWTM A) = 31 days  Do  | Average yearly demand  |          |          |              |              |                   |                 |                |            | 30323        |
| Design (Max. Day) treated water production req'd in mgd Average treated water production in mgd Difference (shortfall of raw water)  Required storage reservoir for raw water Add safety factor Total storage recommended  Quantity Units  Ceservoirs  Lestimated average depth of reservoir Surface area of reservoir Total land area reqd for reservoir Total land area reqd for reservoir Total and area reqd for reservoir Total to freservoir Total land area reqd for reservoir Total land area reqd for reservoir Total to freservoir Total land area reqd for reservoir  South million/year Total capital cost in millions = \$ 34.5  | Max day demand   |          | mgd      | 109          | 265          | 311               | 336             | 357            | 363        | 36           |
| Design (Max. Dey) treated water production req'd in mgd   | Sizing for ultimate conditions:                                  |          |          |              |              |                   |                 |                |            |              |
| Average treated water production in mgd   271 mgd   27  | 150040503 30 03644171 039 04305 W 0.00 04 P 1507 5042 00 2 20 54 |          |          |              |              |                   |                 |                |            |              |
| Difference (shortfall of raw water)  Difference (shortfall of raw water)  Required storage reservoir for raw water  Add safety factor Total storage recommended  Total storage recommended  Dunts  Quantity  Units  Volume/each (sac-feet) (sac-feet)  Cost  Total capital cost in millions  Envir & Archaeology, Surv, Total land area reqd for reservoir Total land area reqd for reservoir Total land area reqd for reservoir  Estimated deplacement cost Estimated replacement cost Estimated replacement cost Estimated replacement cost Estimated replacement cost Total land area reqd for servoir Total  Assumed life of reservoir Total  Possible repair of RWTM A) = 33 days  Total capital cost in millions = \$34.5  Mowing, maintaining fences, etc.   |  |          | n mga    |              |              | (which is also    | equal to sum of | ground and raw | water that |              |
| Required storage reservoir for raw water  |  |          |          |              |              | can be pumped     | to the WTP)     |                |            |              |
| Add safety factor Total storage required Total storage recommended    Continue   Continu  |  |          |          |              |              |                   |                 |                |            |              |
| Add safety factor Total storage required Total storage required Total storage required Total storage recommended    Country   | Required storage reservoir for raw w                             | ater     |          |              |              |                   |                 |                |            |              |
| Total storage required Total storage recommended    Continue   Con  | Add safety factor  | 25%      |          |              |              |                   |                 |                |            |              |
| Reservoirs    Quantity   Units   Volume/each (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet) (acre-feet)   (Value (acre-feet) (acre-  |  |          |          |              | ac-ft        |                   |                 |                |            |              |
| Cost   |  |          |          |              |              |                   |                 |                | 33 d       | lays         |
| Reservoirs   1   each   12,000 \$ 1,283 \$ 15.4 \$ 5.9 \$ 21.3  |  | Quantity | Linite   | Volume/each  | Unit Cost    |                   | Contigency,     | Total Capital  |            |              |
| Estimated average depth of reservoir  Surface area of reservoir  Ratio of total land area reqd to surface area of reservoirs  Total land area reqd for reservoirs  1.10  Servir & Archaeology, Surv, and Land Acq = 13.2  Total capital cost in millions = 34.5  Assumed life of reservoir  Estimated replacement cost  | Deconvoire   |          |          | 112          |              | Cost              |                 |                |            |              |
| Surface area of reservoir   480   acres   |  | •        |          |              | \$ 1,203     | \$ 15.4           | \$ 5.9          | \$ 21.3        |            |              |
| 1.10   Envir & Archaeology, Surv.   3.2   acres   Total capital cost in millions =   34.5   | Surface area of reservoir  |          |          |              |              |                   |                 |                |            |              |
| Total land area regd for reservoirs  528 acres  Total capital cost in millions = 34.5  Assumed life of reservoir  100 years  Estimated replacement cost Estimated maintenance Total  Year built  2015  NPV of Q&M costs NPV of Capital costs  528 acres and Land Acq = 13.2  34.5  Mowing, maintaining fences, etc.  Mowing, maintaining fences, etc.   |  |          | 1.10     |              |              | Envir & Arch      | naeology, Surv. |                |            |              |
| Estimated replacement cost  | Total land area reqd for reservoirs                              |          |          | acres        |              | a                 | ind Land Acq =  |                |            |              |
| Estimated maintenance Total  S 0.04 million/year S 0.19 million/year  Year built  2015  NPV of Q&M costs NPV of Capital costs S 3.5 million NPV of Capital costs S 34.5 million   | Assumed life of reservoir  |          | 100      | years        |              |                   |                 |                |            |              |
| Year built         2015           NPV of O&M costs         \$ 3.5 million           NPV of Capital costs         \$ 34.5 million  | Estimated maintenance  |          | \$ 0.04  | million/year | Mowing, main | taining fences, e | tc.             |                |            |              |
| NPV of O&M costs \$ 3.5 million NPV of Capital costs \$ 34.5 million  |  |          |          |              |              |                   |                 |                |            |              |
| NPV of Capital costs <u>\$ 34.5</u> million   |  |          |          |              |              |                   |                 |                |            |              |
| Total NPV of Capital and O&M Costs \$ 38.0 million  |  |          |          |              |              |                   |                 |                |            |              |
|   |  |          |          |              |              |                   |                 |                |            |              |

#### WTP

#### Plant Phasing and Capital Costs:

| Softening Treatment Trains Year =                             |    | 2015     |    | 20   | 020   |    | 2030     |    | 2040          |    | 205 |     |    | 2060    |     | 2065       |
|---|----|----------|----|------|-------|----|----------|----|---------------|----|-----|-----|----|---------|-----|------------|
| Average treated water production in mgd                       | -  | 2015     | -  | 20   | 0     | -  | 2030     | -  | 2040          | _  | 200 | 40  |    | 2000    | 40  | <br>40     |
| Design (Max. Day) treated water production reg'd in mgd       |    | 0        |    |      | 0     |    | 35       |    | 55            |    |     | 70  |    |         |     |            |
| Initial/additional Max day capacity built (mgd)               |    |          | ,  |      | U     |    |          |    |               |    |     | 70  |    |         | 70  | 70         |
| Total capacity on line (must exceed Design Max Day Reg'd)     |    |          |    |      | 0     |    | 50<br>50 |    | 20<br>70      |    |     | 70  |    |         | 70  | 70         |
| Total capacity on line (most exceed Design Max Day Red b)     |    | ·        | ,  |      | U     |    | 50       |    | 70            |    |     | 70  |    |         | 70  | /(         |
| Unit cost for max day treatment capacity (\$/gpd of capacity) |    |          |    |      |       | \$ | 1.78     | \$ | 2.14          |    |     |     |    |         |     |            |
| Estimated construction cost of expansion in \$millions        | \$ | -        | \$ | \$   | *     | \$ | 89.0     | \$ | 42.8          | \$ |     | ÷   | \$ |         | ÷   | \$         |
| Non-softening Treatment Trains                                |    |          |    |      |       |    |          |    | The second of |    |     |     |    | 100,000 | 200 | 20 N - 5 F |
| Year =  | _  | 2015     | _  | 20   | 020   |    | 2030     |    | 2040          |    | 205 |     | -  | 2060    |     | <br>2065   |
| Average treated water production in mgd                       |    | 84       |    |      | 204   |    | 214      |    | 218           |    |     | 223 |    |         | 227 | 231        |
| Design (Max. Day) treated water production req'd in mgd       |    | 109      |    |      | 265   |    | 276      |    | 281           |    |     | 287 |    |         | 293 | 297        |
| Additional Max day capacity built (mgd)                       |    | 200      |    |      | 100   |    |          |    | 222           |    |     |     |    |         |     |            |
| Total capacity on line (must exceed Design Max Day Req'd)     |    | 200      | ,  |      | 300   |    | 300      |    | 300           |    |     | 300 |    |         | 300 | 300        |
| Unit cost for max day treatment capacity (\$/gpd of capacity) | \$ | 1.15     | \$ | 5    | 1.32  |    |          |    |               |    |     |     |    |         |     |            |
| Estimated construction cost of expansion in \$millions        | \$ | 229.6    | \$ | •    | 131.5 | \$ | 12       | \$ |               | \$ |     |     | \$ |         | -   | \$<br>-    |
| Totals (Softening + Non-softening Trains)                     |    |          |    |      |       |    |          |    |               |    |     |     |    |         |     |            |
| Year =  |    | 2015     |    | 20   | 020   |    | 2030     |    | 2040          |    | 205 | 0   |    | 2060    | )   | 2065       |
| Total construction cost for both trains                       | \$ | 229.6    | \$ | 5    | 131.5 | \$ | 89.0     | \$ | 42.8          | \$ |     | -   | \$ |         |     | \$<br>-    |
| Contingencies   |    | 45.9     |    |      | 26.3  |    | 17.8     |    | 8.6           |    |     |     |    |         |     | - E        |
| Subtotal  | \$ | 275.5    | \$ | 5    | 157.8 | \$ | 106.8    | \$ | 51.3          | \$ |     | -   | \$ |         |     | \$<br>-    |
| Engineering, Legal, & Administrative                          |    | 41.3     |    |      | 23.7  |    | 16.0     |    | 7.7           |    |     |     |    |         |     | -          |
| Subtotal  |    | 316.8    |    |      | 181.5 |    | 122.8    |    | 59.0          |    |     |     |    |         |     | -          |
| Environmental & Archaelogy Studies and Mitigation & Land      |    |          |    |      |       |    |          |    |               |    |     |     |    |         |     |            |
| Acquisition and Surveying (see Note below)                    |    | 2.5      |    |      |       |    |          |    |               |    |     |     |    |         |     |            |
| Total estimated capital cost                                  | \$ | 319.3    | \$ |      | 181.5 | \$ | 122.8    | \$ | 59.0          | \$ |     | -   | \$ |         | -   | \$<br>-    |
| NPV of capital cost   |    | \$ 319.3 |    | \$   | 142.2 |    | \$ 59.1  |    | \$ 17.4       |    | \$  | -   |    | \$      | ÷   | \$ -       |
| Total NPV of WTP initial construction & expansions            | \$ | 538      |    |      |       |    |          |    |               |    |     |     |    |         |     |            |
| Note: Assumed land requirement for WTP (not including reserve |    | 100      | ac | cres |       |    |          |    |               |    |     |     |    |         |     |            |

| 0&M | Costs for | Softening Tra                   |                  |      |                     |                    |    |                     | O&M Cost | ts for | Non-Softening                | Trains:                                  |    |                       |       |            |                    |
|-----|-----------|---------------------------------|------------------|------|---------------------|--------------------|----|---------------------|----------|--------|------------------------------|--|----|-----------------------|-------|------------|--------------------|
|     | Year      | Plant<br>Capacity in<br>service | treated<br>water | Esti | imated C<br>unit co | curve              | N  | et present<br>value | Year     |        | Plant Capacity<br>in service | Estimated<br>treated water<br>production | E  | stimated O<br>unit co |       |            | t present<br>value |
| _   |           | mgd of<br>capacity              | mgd<br>produced  |      | per mg<br>reated    | \$million<br>/year |    | (\$)                |          |        | mgd of<br>capacity           | mgd<br>produced                          |    | per mg<br>treated     | \$mil | lion /year | (\$)               |
| -   | 2015      | -                               | -                |      | -                   | \$<br>•            | \$ | -                   | 2015     |        | 200                          | 84                                       | \$ | 374                   | \$    | 11.41      | \$<br>11.41        |
|     | 2016      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2016     |        | 200                          | 84                                       | \$ | 374                   | \$    | 11.41      | \$<br>10.87        |
|     | 2017      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2017     |        | 200                          | 84                                       | \$ | 374                   | \$    | 11.41      | \$<br>10.35        |
|     | 2018      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2018     |        | 200                          | 84                                       | \$ | 374                   | \$    | 11.41      | \$<br>9.86         |
|     | 2019      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2019     |        | 200                          | 84                                       | \$ | 374                   | \$    | 11.41      | \$<br>9.39         |
|     | 2020      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2020     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>19.98        |
|     | 2021      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2021     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>19.03        |
|     | 2022      | -                               | -                |      |                     | \$<br>-            | \$ |                     | 2022     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>18.12        |
|     | 2023      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2023     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>17.26        |
|     | 2024      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2024     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>16.44        |
|     | 2025      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2025     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>15.65        |
|     | 2026      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2026     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>14.91        |
|     | 2027      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2027     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>14.20        |
|     | 2028      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2028     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>13.52        |
|     | 2029      | -                               | -                |      |                     | \$<br>-            | \$ | -                   | 2029     |        | 300                          | 204                                      | \$ | 343                   | \$    | 25.50      | \$<br>12.88        |
|     | 2030      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 2.50                | 2030     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>12.86        |
|     | 2031      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 2.38                | 2031     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>12.24        |
|     | 2032      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 2.27                | 2032     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>11.66        |
|     | 2033      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 2.16                | 2033     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>11.11        |
|     | 2034      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 2.06                | 2034     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>10.58        |
|     | 2035      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 1.96                | 2035     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>10.07        |
|     | 2036      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 1.87                | 2036     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>9.59         |
|     | 2037      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 1.78                | 2037     | 1      | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>9.14         |
|     | 2038      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 1.69                | 2038     |        | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>8.70         |
|     | 2039      | 50                              | 20               | \$   | 712                 | \$<br>5.20         | \$ | 1.61                | 2039     | 1      | 300                          | 214                                      | \$ | 343                   | \$    | 26.73      | \$<br>8.29         |
|     | 2040      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 2.14                | 2040     | 1      | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>8.06         |
|     | 2041      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 2.04                | 2041     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>7.67         |
|     | 2042      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.94                | 2042     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>7.31         |
|     | 2043      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.85                | 2043     | )      | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>6.96         |
|     | 2044      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.76                | 2044     | į      | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>6.63         |
|     | 2045      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.68                | 2045     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>6.31         |
|     | 2046      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.60                | 2046     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>6.01         |
|     | 2047      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.52                | 2047     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>5.73         |
|     | 2048      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.45                | 2048     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>5.45         |
|     | 2049      | 70                              | 30               | \$   | 661                 | \$<br>7.24         | \$ | 1.38                | 2049     |        | 300                          | 218                                      | \$ | 343                   | \$    | 27.28      | \$<br>5.19         |
|     | 2050      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.75                | 2050     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>5.05         |
|     | 2051      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.67                | 2051     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>4.81         |
|     | 2052      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.59                | 2052     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>4.58         |
|     | 2053      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.51                | 2053     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>4.36         |
|     | 2054      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.44                | 2054     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>4.15         |
|     | 2055      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.37                | 2055     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>3.95         |
|     | 2056      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.31                | 2056     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>3.77         |
|     | 2057      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.24                | 2057     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>3.59         |
|     | 2058      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.18                | 2058     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>3.42         |
|     | 2059      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.13                | 2059     |        | 300                          | 223                                      | \$ | 343                   | \$    | 27.84      | \$<br>3.25         |
|     | 2060      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.07                | 2060     |        | 300                          | 227                                      | \$ | 343                   | \$    | 28.45      | \$<br>3.17         |
|     | 2061      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 1.02                | 2061     |        | 300                          | 227                                      | \$ | 343                   | \$    | 28.45      | \$<br>3.02         |
|     | 2062      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 0.97                | 2062     |        | 300                          | 227                                      | \$ | 343                   | \$    | 28.45      | \$<br>2.87         |
|     | 2063      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 0.93                | 2063     | ,      | 300                          | 227                                      | \$ | 343                   | \$    | 28.45      | \$<br>2.74         |
|     | 2064      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 0.88                | 2064     |        | 300                          | 227                                      | \$ | 343                   | \$    | 28.45      | \$<br>2.60         |
|     | 2065      | 70                              | 40               | \$   | 661                 | \$<br>9.65         | \$ | 0.84                | 2065     | ,      | 300                          | 231                                      | \$ | 343                   | \$    | 28.85      | \$<br>2.52         |
|     |           |                                 |                  |      |                     |                    |    |                     |          |        |                              |  |    |                       |       |            |                    |

Total NPV of O&M Costs \$

NPV Totals for O&M:
Softening trains
Non-softening Trains
\$

Total NPV of O&M Costs \$ 441

Raw Water Reservoir Water Treatment Plant Totals

| <br>PV of<br>al Costs | NF | V of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |  |  |  |  |
|-----------------------|----|-------------------|--|-------|--|--|--|--|
| \$<br>34              | \$ | 3.5               | \$                                       | 38    |  |  |  |  |
| \$<br>538             | \$ | 499               | \$                                       | 1,037 |  |  |  |  |
| \$<br>572             | \$ | 502               | \$                                       | 1.075 |  |  |  |  |

#### CTRWTP - Alternate 2A - WTP East of San Marcos Potable Water Transmission Mains

CTRWTP - Alternate 2 - WTP Midway Between Austin & San Antonio

 Initial year of analysis period
 2015

 Interest rate
 5%

 Evaluation period
 50
 years

 Unit cost of energy
 \$ 0.07
 per kwh

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

#### Summary of Demands

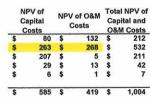
#### Average demands to be delivered in each segment

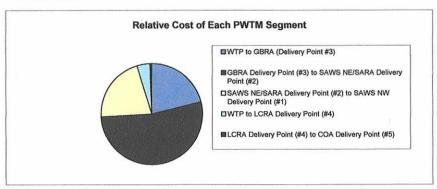
|          |       |        | in acre-feet/ye | ar     |        |        |        |
|----------|-------|--------|-----------------|--------|--------|--------|--------|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |
| SAWS NW  | 43800 | 123000 | 123000          | 123000 | 123000 | 123000 | 123000 |
| SAWS NE  | 29200 | 82000  | 82000           | 82000  | 82000  | 82000  | 82000  |
| Subtotal | 73000 | 205000 | 205000          | 205000 | 205000 | 205000 | 205000 |
| SARA     | 20550 | 23406  | 28433           | 31393  | 34411  | 37530  | 41128  |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |
| Total    | 93550 | 228406 | 261835          | 277996 | 294215 | 299634 | 303232 |

#### Summary

WTP to GBRA (Delivery Point #3)
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)
SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)
WTP to LCRA Delivery Point (#4)
LCRA Delivery Point (#4) to COA Delivery Point (#5)

Total for PWTMs





#### WTP to GBRA (Delivery Point #3) (Bold line in schematic below)



#### Demands for this pipe segment

|         |      | Average dem | ands to be del | ivered in each | segment in mgd | i .  |      |             |
|---------|------|-------------|----------------|----------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030           | 2040           | 2050           | 2060 | 2065 | Max d/Avg d |
| GBRA    | 0    | 0           | 5              | 7              | 9              | 11   | 11   | 2.0         |
| SAWS NE | 26   | 73          | 73             | 73             | 73             | 73   | 73   | 1.3         |
| SARA    | 18   | 21          | 25             | 28             | 31             | 34   | 37   | 1.3         |
| SAWS NW | 39   | 110         | 110            | 110            | 110            | 110  | 110  | 1.3         |
| Total   | 84   | 204         | 214            | 218            | 223            | 227  | 231  |             |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |  |
| GBRA   | 0    | 0    | 11   | 14   | 18   | 22   | 22   |  |  |  |  |  |
| SAWS NE  | 34   | 95   | 95   | 95   | 95   | 95   | 95   |  |  |  |  |  |
| SARA   | 24   | 27   | 33   | 36   | 40   | 44   | 48   |  |  |  |  |  |
| SAWS NW  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |  |  |  |  |  |
| Total  | 109  | 265  | 282  | 289  | 296  | 303  | 308  |  |  |  |  |  |

#### PWTM and Pump Station Costs

|  | PWTM and Pump Station Costs  |        |      |                |                 |         |                  |                              |   |
|--|--|--------|------|----------------|-----------------|---------|------------------|------------------------------|---|
|  | Design flow rate - year 2065   |        |      | 308<br>213,603 | mgd<br>gpm      |         |                  |                              |   |
|  | Pumping capacity of one pump   |        |      | 22,000         | gpm             |         |                  |                              |   |
|  | No. of pumps (not counting spare)  |        |      | 10             |                 |         |                  |                              |   |
|  | Peak flow rate (all pumps except spare)  |        |      | 220,000        | gpm             |         |                  |                              |   |
|  | Inside diameter of PWTM  |        |      | 120            |                 |         |                  |                              |   |
|  | Area   |        |      | 78.54          |                 |         |                  |                              |   |
|  | Length of PWTM   |        |      | 47,520         | miles<br>feet   | (linked | to mile          | age in schematic above)      |   |
|  | Estimated unit cost by condition: % of leng  |        |      | Unit cost      | Cost            |         |                  |                              |   |
|  | Rural - soil 100%  | 47,520 |      | 783            |                 | million |                  |                              |   |
|  | Rural - rock 0%<br>Urban - rock 0%   |        | \$   | 1,048          | \$ -            |         |                  |                              |   |
| Urban - rock   |  | -      | _ \$ | 1,186          | \$ -            |         |                  |                              |   |
|  |  | 47,520 |      |                | \$ 37.2         | million |                  |                              |   |
|  | Average estimated unit construction cost for PWT   | И      | \$   | 783            | per LF          |         |                  |                              |   |
|  | Total construction cost in millions  |        | \$   | 37.2           |                 |         |                  |                              |   |
|  | Contingencies  |        | \$   | 7.4            |                 |         |                  |                              |   |
|  | Subtotal   |        | \$   | 44.6           |                 |         |                  |                              |   |
|  | Engineering, Legal & Administrative  |        | \$   | 6.7            |                 |         |                  |                              |   |
|  | Subtotal   |        | \$   | 51.3           | ·:              |         |                  |                              |   |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq |  |        | \$   | 0.9            |                 |         |                  |                              |   |
|  | Total Capital Cost for PWTM in millions  |        | \$   | 52.2           |                 |         |                  |                              |   |
|  | Unit maintenance cost/year-mile  |        | \$   | 10,000         | \$/year-mile    | \$      | 0.090            | Million \$/year              |   |
|  | Velocity at peak flow rate   |        |      | 6.24           | fps             |         |                  |                              |   |
|  | C factor   |        |      | 120            |                 |         |                  |                              |   |
|  | Head loss per foot   |        |      | 0.00087        | ft/ft           |         | h <sub>f</sub> = | 3.552*QI1.85                 |   |
|  |  |        |      | 4.59           | ft/mile         |         |                  | C*(d) <sup>2.63</sup>        |   |
|  | Head loss at peak flow rate  |        |      | 41             | ft              |         |                  |                              |   |
|  |  | 0%     |      | 8              | ft              |         | 750              | Desired HGL At Delivery Poin | t |
|  | Total estimated losses   |        |      | 50             | ft              |         | 550              | Elev. At WTP                 |   |
|  | Average static head  |        |      | 200            | ft              |         | 200              | ft                           |   |
|  | Total estimated dynamic head   |        |      | 250            | ft              |         |                  |                              |   |
|  | отности постояния повет повет повет постоя постоя постоя постоя повет по |        |      | 108            | psi             |         |                  |                              |   |
|  | No of recommended pumping stations along route   |        |      | 0.72           |                 |         | 150              | psi (assumed max pressure    |   |
| No. of pumping stations used in cost estimate            |  |        |      | 1              |                 |         |                  | in pipe)                     |   |
| Average head per pump station                            |  |        |      | 250            | ft              |         |                  |                              |   |
|  | Assumed pump efficiency  |        |      | 85%            |                 |         |                  |                              |   |
|  | Assumed motor efficiency   |        |      | 90%            |                 |         |                  |                              |   |
|  | Estimated Hp required per pump   |        |      | 1.812          | hp/pump         |         |                  |                              |   |
|  |  |        |      |                | kw/pump         |         |                  |                              |   |
| Total hp per pump station (not counting spare)           |  |        |      |                | firm hp/station | 1       |                  |                              |   |
| Total kw per pump set (set=pumps in series along route)  |  |        |      |                | kw/pump set     |         | ump at           | each station)                |   |
|  | Unit capital cost for each pump station (from cost of  | curve) | s    | 1,111          | per firm hp of  | pump s  | ation            |                              |   |
| Construction cost per pump station                       |  |        | ैं   |                | million         |         |                  |                              |   |
|  | Total construction cost for pump stations  |        |      | 20.1           | for             |         | 1                | pump stations                |   |
|  | Contingencies  |        | \$   | 4.0            | 101             |         |                  |                              |   |
| Subtotal   |  |        | \$   | 24.2           | •1)             |         |                  |                              |   |
|  |  |        |      |                |                 |         |                  |                              |   |

Engineering, Legal & Administrative Total capital cost for pump stations

\$ 3.6 \$ 27.8 million

40% Estimated equipment cost as % of total

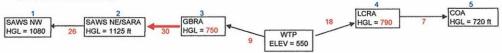
Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 8 million 20 years \$ 0.40 million/year

O&M Costs

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used      |      | Energ            | y co: | st                   | cos | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | То   | tal O&M<br>cost      | Ne    | t present<br>value |
|--------------|---|--|---------------------|------|------------------|-------|----------------------|-----|------------------------------------|----|-------------------------------|------|----------------------|-------|--------------------|
|              | mgd   |  | (kwh/day)           |      | (\$/day)         |       | /illion \$<br>/year) | (   | Million \$ /year)                  | (  | (Million \$ /year)            |      | Million \$<br>/year) |       | (\$)               |
| 2015         | 84  | 2.64                                       | 114,661             | \$   | 8,026            | \$    | 2.93                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 3.42                 | \$    | 3.42               |
| 2016         | 84  | 2.64                                       | 114,661             | \$   | 8,026            | \$    | 2.93                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 3.42                 | \$    | 3.26               |
| 2017         | 84  | 2.64                                       | 114,661             | \$   | 8,026            | \$    | 2.93                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 3.42                 | \$    | 3.10               |
| 2018         | 84  | 2.64                                       | 114,661             | \$   | 8,026            | \$    | 2.93                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 3.42                 | \$    | 2.96               |
| 2019         | 84  | 2.64                                       | 114,661             | \$   | 8,026            | \$    | 2.93                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 3.42                 | \$    | 2.82               |
| 2020         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 5.99               |
| 2021         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 5.71               |
| 2022         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 5.43               |
| 2023         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 5.17               |
| 2024         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 4.93               |
| 2025         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 4.69               |
| 2026         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 4.47               |
| 2027         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 4.26               |
| 2028         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 4.05               |
| 2029         | 204   | 6.44                                       | 279,949             | \$   | 19,596           | \$    | 7.15                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.65                 | \$    | 3.86               |
| 2030         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.84               |
| 2031         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.66               |
| 2032         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.49               |
| 2033         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.32               |
| 2034         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.16               |
| 2035         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 3.01               |
| 2036         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 2.87               |
| 2037         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 2.73               |
| 2038         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 2.60               |
| 2039         | 214   | 6.75                                       | 293,465             | \$   | 20,543           | \$    | 7.50                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 7.99                 | \$    | 2.48               |
| 2040         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 2.41               |
| 2041         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 2.29               |
| 2042         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 2.18               |
| 2043         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 2.08               |
| 2044         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.98               |
| 2045         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.88               |
| 2046         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.80               |
| 2047         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.71               |
| 2048         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.63               |
| 2049         | 218   | 6.89                                       | 299,544             | \$   | 20,968           | \$    | 7.65                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.15                 | \$    | 1.55               |
| 2050         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.51               |
| 2051         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.43               |
| 2052         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.37               |
| 2053         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.30               |
| 2054         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.24               |
| 2055         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.18               |
| 2056         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.12               |
| 2057         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.07               |
| 2058         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 1.02               |
| 2059         | 223   | 7.03                                       | 305,694             | \$   | 21,399           | \$    | 7.81                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.30                 | \$    | 0.97               |
| 2060         | 227   | 7.18                                       | 312,336             | \$   | 21,864           | \$    | 7.98                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.47                 | \$    | 0.94               |
| 2061         | 227   | 7.18                                       | 312,336             | \$   | 21,864           | \$    | 7.98                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.47                 | \$    | 0.90               |
| 2062         | 227   | 7.18                                       | 312,336             | \$   | 21,864           | \$    | 7.98                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.47                 | \$    | 0.86               |
| 2063         | 227   | 7.18                                       | 312,336             | \$   | 21,864           | \$    | 7.98                 | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.47                 | \$    | 0.81               |
| 2064<br>2065 | 227<br>231  | 7.18<br>7.28                               | 312,336<br>316,746  | \$   | 21,864<br>22,172 | \$    | 7.98<br>8.09         | \$  | 0.40                               | \$ | 0.090                         | \$   | 8.47<br>8.59         | \$    | 0.78               |
| 2000         | 231   | 7.20                                       | 310,740             | 4    | 22,172           | 4     | 0.09                 | 4   | 0.40                               | Ψ  |                               |      |                      | unio. | 35000              |
|              |   |  |                     |      |                  |       |                      |     |                                    |    | Total NPV                     | of O | &M Costs             | \$    | 132                |
|              |   | Capital Costs                              |                     |      |                  |       |                      |     | Yr built                           |    |                               |      |                      |       |                    |
|              |   |  | PWTM                |      | _                | \$    | 52                   |     | 2015                               |    |                               |      |                      | \$    | 52                 |
|              |   |  | <b>Pumping Stat</b> | non! | 5                | S     | 28                   |     | 2015                               |    |                               |      |                      | \$    | 28                 |

212

## GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) (Bold line in schematic below)



#### Demands for this pipe segment

| n |  |  |  |
|---|--|--|--|
|   |  |  |  |

|         |      | Average dem | ands to be deli | ivered in each s | segment in mgd |      |      |             |
|---------|------|-------------|-----------------|------------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NE | 26   | 73          | 73              | 73               | 73             | 73   | 73   | 1.3         |
| SARA    | 18   | 21          | 25              | 28               | 31             | 34   | 37   | 1.3         |
| SAWS NW | 39   | 110         | 110             | 110              | 110            | 110  | 110  | 1.3         |
| Total - | 84   | 204         | 208             | 211              | 214            | 217  | 220  |             |

| Max day o | demands to be | delivered in each | segment in mgd |
|-----------|---------------|-------------------|----------------|
| 2020      | 2030          | 2040              | 2050           |

| Year    | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|---------|------|------|------|------|------|------|------|
| SAWS NE | 34   | 95   | 95   | 95   | 95   | 95   | 95   |
| SARA    | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| SAWS NW | 51   | 143  | 143  | 143  | 143  | 143  | 143  |
| Total   | 109  | 265  | 271  | 274  | 278  | 281  | 286  |

#### PWTM and Pump Station Costs

| Design flow rate - year 2065   |             |         | 286         | mg    | d     |  |
|--|-------------|---------|-------------|-------|-------|--|
| Separation Control (Separation Control (Separa |             |         | 198,353     | gpr   | n     |  |
| Pumping capacity of one pump   |             |         | 20,000      | gpr   | n     |  |
| No. of pumps (not counting spare)  |             |         | 10          | 70.00 |       |  |
| Peak flow rate (all pumps except spare   | )           |         | 200,000     | gpr   | n     |  |
| Inside diameter of PWTM  |             |         | 120         | in.   |       |  |
| Area   |             |         | 78.54       | sf    |       |  |
| Length of PWTM   |             |         | 30          | mile  | es    | (linked to mileage in schematic above) |
|  |             |         | 158,400     | fee   | t     | •                                      |
| Estimated unit cost by condition:  | % of length | LF      | Unit cost   |       | Cost  | 795                                    |
| Rural - soil   | 50%         | 79,200  | \$<br>783   | \$    |       | million                                |
| Rural - rock   | 25%         | 39,600  | \$<br>1,048 | \$    | 41.5  |  |
| Urban - rock   | 25%         | 39,600  | \$<br>1,186 | \$    | 46.9  |  |
|  |             | 158,400 | <br>100000  | \$    | 150.5 | million                                |

| Average estimated unit cons | struction cost for PWTM |
|-----------------------------|-------------------------|
|-----------------------------|-------------------------|

| Average estimated unit construction cost for PWTM | \$<br>950   | per LF |
|---|-------------|--------|
| Total construction cost in millions               | \$<br>150.5 |        |
| Contingencies                                     | \$<br>30.1  |        |
| Subtotal  | \$<br>180.6 | -      |
|   |             |        |

| Engineering, Legal & Administrative                      | \$<br>27  |
|--|-----------|
| Subtotal   | \$<br>207 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>3   |
| Total Capital Cost for PWTM in millions                  | \$<br>210 |

| Unit maintenance cost/year-mile \$ 10,000 \$/year-mile \$ 0.300 Million |
|---|
|---|

| Velocity at peak flow rate<br>C factor          |             | 5.67<br>120 | fps     |   |
|---|-------------|-------------|---------|---|
| Head loss per foot                              |             | 0.00073     | ft/ft   | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |
| 5/20 A A A CONTRACTOR OF THE SECTION ASSESSMENT |             | 3.85        | ft/mile | C*(d)2.63                                   |
| Head loss at peak flow rate                     |             | 115         | ft      |   |
| Allowance for minor losses                      | 20%         | 23          | ft      | 1125 Desired HGL At Delivery Point          |
| Total estimated losses                          |             | 139         | ft      | 750 HGL At Delivery Point 3                 |
| Average static head                             |             | 375         | ft      | 375 ft                                      |
| Total estimated dynamic head                    |             | 514         | ft      |   |
|   |             | 223         | psi     |   |
| No of recommended pumping stations              | along route | 1.48        |         | 150 psi (assumed max pressure               |
| No. of pumping stations used in cost es         | stimate     | 2           |         | in pipe)                                    |
| Average head per pump station                   |             | 257         | ft      |   |

| No of recommended pumping stations along route<br>No. of pumping stations used in cost estimate<br>Average head per pump station | 1.48<br>2<br>257 ft | 150 psi (assumed max pressure in pipe) |
|--|---------------------|--|
| Assumed pump efficiency  | 85%                 |  |

| Assumed pump emoisticy                                  | 0070   |
|---|--|
| Assumed motor efficiency                                | 90%  |
| Estimated Hp required per pump                          | 1,695 hp/pump                                |
|   | 1,265 kw/pump                                |
| Total hp per pump station (not counting spare)          | 16,951 firm hp/station                       |
| Total kw per pump set (set=pumps in series along route) | 3.390 kw/pump set (one pump at each station) |

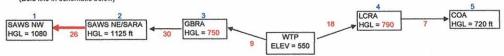
|  | -1   |                             |
|--|------|-----------------------------|
| Unit construction cost for each pump station (from cost curve) | \$   | per firm hp of pump station |
| Construction cost per pump station                             | 19.1 | million                     |

| Total construction cost for pump stations | 38.2       | for | 2 | pump statio |
|---|------------|-----|---|-------------|
| Contingencies                             | \$<br>7.6  | -   |   |             |
| Subtotal                                  | \$<br>45.9 |     |   |             |

|              | Value of equips<br>Assumed life of<br>Estimated main             | f equipment                                | cement cost        |       |                  | \$    | 20                   | yea | million<br>years<br>million/year   |    |                              |      | ip door do           |    | constr co          |
|--------------|--|--|--------------------|-------|------------------|-------|----------------------|-----|------------------------------------|----|------------------------------|------|----------------------|----|--------------------|
| &M Cos       | ts   |  |                    |       |                  |       |                      |     |                                    |    |                              |      |                      |    |                    |
| Year         | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used     |       | Energ            | у соз | t                    | co  | ther O&M<br>sts - Pump<br>Stations |    | intenance<br>costs -<br>PWTM | То   | otal O&M<br>cost     |    | t present<br>value |
|              | mgd  |  | (kwh/day)          |       | (\$/day)         |       | lillion \$<br>'year) | (   | (Million \$<br>/year)              | (  | Million \$ /year)            | (1   | Million \$<br>/year) |    | (\$)               |
| 2015         | 84   | 2.90                                       | 235,928            | \$    | 16,515           | \$    | 6.03                 | \$  | 0.76                               | \$ | 0.300                        | \$   | 7.09                 | \$ | 7.09               |
| 2016         | 84   | 2.90                                       | 235,928            | \$    | 16,515           | \$    | 6.03                 | \$  | 0.76                               | \$ | 0.300                        | \$   | 7.09                 | \$ | 6.75               |
| 2017         | 84   | 2.90                                       | 235,928            | \$    | 16,515           | \$    | 6.03                 | \$  | 0.76                               | \$ | 0.300                        | \$   | 7.09                 | \$ | 6.43               |
| 2018         | 84   | 2.90                                       | 235,928            | \$    | 16,515           | \$    | 6.03                 | \$  | 0.76                               | \$ | 0.300                        | \$   | 7.09                 | \$ | 6.13               |
| 2019         | 84   | 2.90                                       | 235,928            | \$    | 16,515           | \$    | 6.03                 | \$  | 0.76                               | \$ | 0.300                        | \$   | 7.09                 | \$ | 5.83               |
| 2020         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 12.37              |
| 2021         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 11.78              |
| 2022         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 11.22              |
| 2023         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 10.68              |
| 2024         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 10.17              |
| 2025         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 9.69               |
| 2026         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 9.23               |
| 2027         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72                | \$  | 0.76                               | \$ | 0.300                        | \$   | 15.78                | \$ | 8.79               |
| 2028         | 204  | 7.08                                       | 576,028            | \$    | 40,322           | \$    | 14.72<br>14.72       | \$  | 0.76<br>0.76                       | \$ | 0.300                        | \$   | 15.78<br>15.78       | \$ | 7.97               |
| 2029         | 204  | 7.08<br>7.24                               | 576,028<br>588,706 | \$    | 40,322<br>41,209 | S     | 15.04                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.11                | \$ | 7.75               |
| 2030         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | \$    | 15.04                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.11                | \$ | 7.78               |
| 2032         | 208  | 7.24                                       | 588,706            | S     | 41,209           | S     | 15.04                | Š   | 0.76                               | \$ | 0.300                        | \$   | 16.11                | \$ | 7.03               |
| 2032         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | S     | 15.04                | \$  | 0.76                               | Š  | 0.300                        | \$   | 16.11                | \$ | 6.69               |
| 2034         | 208  | 7.24                                       | 588,706            | Š     | 41,209           | Š     | 15.04                | Š   | 0.76                               | Š  | 0.300                        | Š    | 16.11                | s  | 6.37               |
| 2035         | 208  | 7.24                                       | 588,706            | Š     | 41,209           | Š     | 15.04                | Š   | 0.76                               | \$ | 0.300                        | \$   | 16.11                | Š  | 6.07               |
| 2036         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | \$    | 15.04                | \$  | 0.76                               | Š  | 0.300                        | \$   | 16.11                | s  | 5.78               |
| 2037         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | \$    | 15.04                | Š   | 0.76                               | \$ | 0.300                        | \$   | 16.11                | s  | 5.51               |
| 2038         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | \$    | 15.04                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.11                | \$ | 5.24               |
| 2039         | 208  | 7.24                                       | 588,706            | \$    | 41,209           | \$    | 15.04                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.11                | \$ | 4.99               |
| 2040         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 4.81               |
| 2041         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 4.58               |
| 2042         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 4.36               |
| 2043         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 4.16               |
| 2044         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.96               |
| 2045         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.77               |
| 2046         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.59               |
| 2047         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.42               |
| 2048         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.26               |
| 2049         | 211  | 7.33                                       | 596,171            | \$    | 41,732           | \$    | 15.23                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.30                | \$ | 3.10               |
| 2050         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | \$ | 2.99               |
| 2051         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | \$ | 2.85               |
| 2052         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49<br>16.49       | \$ | 2.7                |
| 2053<br>2054 | 214<br>214   | 7.42<br>7.42                               | 603,782<br>603,782 | \$    | 42,265<br>42,265 | \$    | 15.43<br>15.43       | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | \$ | 2.46               |
| 2055         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | \$ | 2.3                |
| 2056         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | Š  | 2.2                |
| 2057         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | s     | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | Š  | 2.1                |
| 2058         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | Š  | 0.300                        | \$   | 16.49                | \$ | 2.0                |
| 2059         | 214  | 7.42                                       | 603,782            | \$    | 42,265           | \$    | 15.43                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.49                | \$ | 1.93               |
| 2060         | 217  | 7.52                                       | 611,648            | \$    | 42,815           | \$    | 15.63                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.69                | \$ | 1.80               |
| 2061         | 217  | 7.52                                       | 611,648            | \$    | 42,815           | \$    | 15.63                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.69                | \$ | 1.77               |
| 2062         | 217  | 7.52                                       | 611,648            | \$    | 42,815           | \$    | 15.63                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.69                | \$ | 1.69               |
| 2063         | 217  | 7.52                                       | 611,648            | \$    | 42,815           | \$    | 15.63                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.69                | \$ | 1.6                |
| 2064         | 217  | 7.52                                       | 611,648            | \$    | 42,815           | \$    | 15.63                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.69                | \$ | 1.53               |
| 2065         | 220  | 7.63                                       | 620,722            | \$    | 43,451           | \$    | 15.86                | \$  | 0.76                               | \$ | 0.300                        | \$   | 16.92                | \$ | 1.4                |
|              |  |  |                    |       |                  |       |                      |     |                                    |    | Total NPV                    | of O | &M Costs             | \$ | 268.               |
|              |  | Capital Costs                              |                    |       |                  |       | 010 -                |     | Yr built                           |    |                              |      |                      | •  | 040                |
|              |  |  | PWTM               |       |                  | \$    | 210.6                |     | 2015                               |    |                              |      |                      | \$ | 210.               |
|              |  |  | Pumping Stat       | tions |                  | \$    | 52.7                 |     | 2015                               |    |                              |      |                      | \$ | 52.                |

Total NPV of Capital and O&M Costs in millions \$
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) 532

### SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1) (Bold line in schematic below)



#### Demands for this pipe segment

|  | m |  |  |
|--|---|--|--|
|  |   |  |  |

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |  |
| Total -  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |  |

Max d/Avg d

|         |      | Max day dem | ands to be deli | vered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 143         | 143             | 143             | 143            | 143  | 143  |
| Total   | 51   | 143         | 143             | 143             | 143            | 143  | 143  |

#### **PWTM and Pump Station Costs**

Design flow rate - year 2065 143 mgd 99,125 gpm

Pumping capacity of one pump 17,000 gpm No. of pumps (not counting spare) 6 Peak flow rate (all pumps except spare) 102,000 gpm

 Inside diameter of PWTM
 120 in.

 Area
 78.54 sf

 Length of RWTM
 26 miles

 137,280 feet
 137,280 feet

(linked to mileage in schematic above)

| Estimated unit cost by condition: | % of length | LF      | U  | nit cost | Cost        |         |
|-----------------------------------|-------------|---------|----|----------|-------------|---------|
| Rural - soil                      | 15%         | 20,592  | \$ | 783      | \$<br>16.1  | million |
| Rural - rock                      | 35%         | 48,048  | \$ | 1,048    | \$<br>50.4  |         |
| Urban - rock                      | 50%         | 68,640  | \$ | 1,186    | \$<br>81.4  |         |
|                                   | -           | 137,280 |    |          | \$<br>147.9 | million |

 Engineering, Legal & Administrative
 \$ 26.6

 Subtotal
 \$ 204.1

 Envir & Arch Studies & Mitigation, Surveying, & Land Acq
 \$ 2.6

 Total Capital Cost for PWTM in millions
 \$ 206.7

Unit maintenance cost/year-mile \$ 10,000 \$/year-mile \$ 0.260 Million \$/year

Velocity at peak flow rate 2.89 fps

Head loss per foot 120 120 120 120 Head loss per foot 120 120 120 120 120 Head loss per foot 120 120 120 120 120 120 Head loss per foot 120

Negative indicates gravity flow from #2 to #1; no pumping necessary.

Total NPV of Capital and O&M Costs in millions \$ 211.4 SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)

## WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



### Demands for this pipe segment

|  |  | na |  |  |
|--|--|----|--|--|
|  |  |    |  |  |

|       |      | Average dem | ands to be deli | ivered in each s | segment in mgd |      |      |
|-------|------|-------------|-----------------|------------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| LCRA  | 0    | 0           | 5               | 10               | 10             | 10   | 10   |
| COA   | 0    | 0           | 15              | 20               | 30             | 30   | 30   |
| Total | 0    | 0           | 20              | 30               | 40             | 40   | 40   |

2.0 1.68

|       |      | Max day dem | ands to be del | ivered in each | segment in mgd |      |      |
|-------|------|-------------|----------------|----------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030           | 2040           | 2050           | 2060 | 2065 |
| LCRA  | 0    | 0           | 10             | 20             | 20             | 20   | 20   |
| COA   | 0    | 0           | 25             | 34             | 50             | 50   | 50   |
| Total | 0    | 0           | 35             | 54             | 70             | 70   | 70   |

| PWTM and Pump Station Costs              |                  |        |            |      |      |  |
|--|------------------|--------|------------|------|------|--|
| Design flow rate - year 2065             |                  |        | 70         | mgc  | 1    |  |
|  |                  |        | 48,883     | gpm  | 1    |  |
| Pumping capacity of one pump             |                  |        | 10,000     | gpm  | 1    |  |
| No. of pumps (not counting spare)        |                  |        | 5          |      |      |  |
| Peak flow rate (all pumps except spare)  |                  |        | 50,000     | gpm  | 1    |  |
| Inside diameter of PWTM                  |                  |        | 72         | in.  |      |  |
| Area                                     |                  |        | 28.27      | sf   |      |  |
| Length of RWTM                           |                  |        | 18         | mile | s    | (linked to mileage in schematic above) |
|  |                  |        | 95,040     | feet |      |  |
| Estimated unit cost by condition:        | % of length      | LF     | Unit cost  |      | Cost |  |
| Rural - soil                             | 100%             | 95,040 | \$<br>365  | \$   | 34.7 | million                                |
| Rural - rock                             | 0%               | -      | \$<br>498  | \$   | -    |  |
| Urban - rock                             | 0%               |        | \$<br>552  | \$   |      |  |
|  |                  | 95,040 |            | \$   | 34.7 | million                                |
| Average estimated unit construction cos  | t for PWTM       |        | \$<br>365  | per  | LF   |  |
| Total construction cost in millions      |                  |        | \$<br>34.7 |      |      |  |
| Contingencies                            |                  |        | \$<br>6.9  |      |      |  |
| Subtotal                                 |                  |        | \$<br>41.7 |      |      |  |
| Engineering, Legal & Administrative      |                  |        | 6.3        |      |      |  |
| Subtotal                                 |                  |        | \$<br>47.9 | -    |      |  |
| Envir & Arch Studies & Mitigation, Surve | ying, & Land Acq |        | 1.8        |      |      |  |
| Total Capital Cost for PWTM              |                  |        | \$<br>49.7 |      |      |  |
|  |                  |        |            |      |      |  |

| Contingencies  | \$<br>6.9    |              |         |
|--|--------------|--------------|---------|
| Subtotal   | \$<br>41.7   | -            |         |
| Engineering, Legal & Administrative                      | \$<br>6.3    |              |         |
| Subtotal   | \$<br>47.9   |              |         |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>1.8    |              |         |
| Total Capital Cost for PWTM in millions                  | \$<br>49.7   | -            |         |
| Unit maintenance cost/year-mile                          | \$<br>10,000 | \$/year-mile | \$<br>0 |

| Unit maintenance cost/year-mile | \$ 10,000 | \$/year-mile | \$<br>0.180 Million \$/year |
|---------------------------------|-----------|--------------|-----------------------------|
| Velocity at peak flow rate      | 3.94      | fps          |                             |
| C factor                        | 120       |              |                             |
| Head loss per foot              | 0.0006    | ft/ft        | hr=   3.552*Q 1.85          |
|                                 | 3.55      | ft/mile      | C*(d) <sup>2.63</sup>       |

|                              |     | 0.00 | TUTTING |     | 1C-(a) 1                      |
|------------------------------|-----|------|---------|-----|-------------------------------|
| Head loss at peak flow rate  |     | 64   | ft      |     |                               |
| Allowance for minor losses   | 20% | 13   | ft      | 790 | Desired HGL At Delivery Point |
| Total estimated losses       |     | 77   | ft      | 550 | Elev. At WTP                  |
| Average static head          |     | 240  | ft      | 240 | ft                            |
| Total estimated dynamic head |     | 317  | ft      |     |                               |
| •                            |     | 137  | psi     |     |                               |

| No of recommended pumping stations along route | 0.92   | 150 psi (assumed max pressure |
|--|--------|-------------------------------|
| No. of pumping stations used in cost estimate  | 1      | in pipe)                      |
| Average head per pump station                  | 317 ft |                               |
| Assumed numn efficiency                        | 85%    |                               |

| Assumed pump efficiency                                 | 85%  |
|---|--|
| Assumed motor efficiency                                | 90%  |
| Estimated Hp required per pump                          | 1,046 hp/pump                                |
|   | 780 kw/pump                                  |
| Total hp per pump station (not counting spare)          | 5,228 firm hp/station                        |
| Total kw per pump set (set=pumps in series along route) | 1,046 kw/pump set (one pump at each station) |

| Total kw per pump set (set≔pumps in series along route)     | 1,046 kw/pump set | (one pump at each station) |
|---|-------------------|----------------------------|
| Helt construction and for each owns station (form and owns) | 4 444             | favora station             |

| for 1 pump station:  |
|----------------------|
| ioi i punip stations |
| 19.01992569995599    |
|                      |
|                      |
| million              |
| m                    |

40% Equip cost as % of constr cost

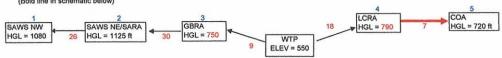
Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 3.0 million 20 years \$ 0.15 million/year

O&M Costs

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used   |                        | Energy cost costs - Pump cos |    | aintenance<br>costs -<br>PWTM | Total O&M<br>cost |                       | Ne    | et preser<br>value |      |              |    |      |
|--------------|---|--|------------------|------------------------|------------------------------|----|-------------------------------|-------------------|-----------------------|-------|--------------------|------|--------------|----|------|
|              | mgd   |  | (kwh/day)        |                        | (\$/day)                     |    | (Million \$                   |                   | (Million \$<br>/year) | (     | Million \$         | (    | Million \$   |    | (\$) |
| 2015         | Company of the Parket                             | was the story of                           |                  | NAME OF TAXABLE PARTY. |                              |    | with the same                 |                   |                       |       |                    | \$   |              | \$ | -    |
| 2016         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | -            | \$ | 2    |
| 2017         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   |              | \$ |      |
| 2018         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   |              | \$ | ~    |
| 2019         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | -            | \$ | ~    |
| 2020         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | 17           | \$ |      |
| 2021         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | -            | \$ | -    |
| 2022         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | •            | \$ | _    |
| 2023         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   |              | \$ | -2   |
| 2024         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   |              | \$ | *    |
| 2025         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | *            | \$ | _    |
| 2026         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | *            | \$ | 7    |
| 2027         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   | -            | \$ |      |
| 2028         |   |  |                  |                        |                              |    |                               |                   |                       |       |                    | \$   |              | \$ | -    |
| 2029         |   | 72.27                                      |                  | 21                     |                              |    |                               |                   |                       | 10000 |                    | \$   |              | \$ |      |
| 2030         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.5  |
| 2031         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.5  |
| 2032         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.5  |
| 2033         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.5  |
| 2034         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.4  |
| 2035         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.4  |
| 2036         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.4  |
| 2037         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.4  |
| 2038         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.4  |
| 2039         | 20  | 1.39                                       | 34,852           | \$                     | 2,440                        | \$ | 0.89                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.22         | \$ | 0.3  |
| 2040         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.4  |
| 2041         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.4  |
| 2042         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.4  |
| 2043         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.4  |
| 2044         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.4  |
| 2045         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.3  |
| 2046         | 30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15                  | \$    | 0.180              | \$   | 1.66         | \$ | 0.3  |
| 2047         | 30<br>30  | 2.08                                       | 52,278           | \$                     | 3,659                        | \$ | 1.34                          | \$                | 0.15<br>0.15          | \$    | 0.180              | \$   | 1.66<br>1.66 | \$ | 0.3  |
| 2048         | 30  | 2.08                                       | 52,278<br>52,278 | \$                     | 3,659                        | \$ | 1.34<br>1.34                  | \$                | 0.15                  | \$    | 0.180              | 5    | 1.66         | \$ | 0.3  |
| 2049         | 40  | 2.78                                       | 69,704           | \$                     | 3,659<br>4,879               | S  | 1.78                          | \$                | 0.15                  | S     | 0.180              | \$   | 2.11         | S  | 0.3  |
|              | 40  |  | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.3  |
| 2051         | 40  | 2.78                                       |                  | 200                    |                              |    | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | 5  | 0.3  |
| 2052<br>2053 | 40  | 2.78<br>2.78                               | 69,704<br>69,704 | \$                     | 4,879<br>4,879               | \$ | 1.78                          | 5                 | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.3  |
| 2053         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.3  |
| 2055         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.3  |
| 2056         | 40  | 2.78                                       | 69,704           | Š                      | 4,879                        | \$ | 1.78                          | S                 | 0.15                  | S     | 0.180              | S    | 2.11         | S  | 0.2  |
| 2057         | 40  | 2.78                                       | 69,704           | S                      | 4,879                        | \$ | 1.78                          | S                 | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.2  |
| 2058         | 40  | 2.78                                       | 69,704           | Š                      | 4,879                        | Š  | 1.78                          | Š                 | 0.15                  | \$    | 0.180              | S    | 2.11         | \$ | 0.2  |
| 2059         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | s                 | 0.15                  | \$    | 0.180              | Š    | 2.11         | \$ | 0.2  |
| 2060         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | Š     | 0.180              | \$   | 2.11         | \$ | 0.2  |
| 2061         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.2  |
| 2062         | 40  | 2.78                                       | 69,704           | Š                      | 4,879                        | \$ | 1.78                          | s                 | 0.15                  | s     | 0.180              | \$   | 2.11         | \$ | 0.2  |
| 2063         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | Š     | 0.180              | \$   | 2.11         | \$ | 0.2  |
| 2064         | 40  | 2.78                                       | 69,704           | Š                      | 4,879                        | Š  | 1.78                          | Š                 | 0.15                  | Š     | 0.180              | Š    | 2.11         | \$ | 0.   |
| 2065         | 40  | 2.78                                       | 69,704           | \$                     | 4,879                        | \$ | 1.78                          | \$                | 0.15                  | \$    | 0.180              | \$   | 2.11         | \$ | 0.1  |
|              |   |  |                  |                        |                              |    |                               |                   |                       |       | Total NPV          | of C | 0&M Costs    | \$ | 13   |
|              |   | Capital Costs                              | in million \$    |                        |                              |    |                               |                   | Yr built              |       |                    |      |              |    |      |
|              |   |  | PWTM             |                        |                              | S  | 49.7                          | _                 | 2030                  |       |                    |      |              | \$ | 23   |
|              |   |  | Pumping Stat     | ions                   |                              | Š  | 10.2                          |                   | 2030                  |       |                    |      |              | \$ | 4    |
|              |   |  | bing Stat        |                        |                              | *  |                               |                   | 2000                  | -     | otal NPV of        |      |              |    | 28   |

Total NPV of Capital and O&M Costs in millions \$ 42 WTP to LCRA Delivery Point (#4)

### LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)



#### Demands for this pipe segment

| Year | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|------|------|------|------|------|------|------|------|
|      | 2010 | 2020 |      |      |      |      |      |
| COA  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |
| otal | 0    | 0    | 15   | 20   | 30   | 30   | 30   |

Max d/Avg d

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |
|--|------|------|------|------|------|------|------|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
| COA  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |
| Total  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |

#### **PWTM and Pump Station Costs**

50 mgd 34,997 gpm Design flow rate - year 2065 54 in. 15.90 sf Inside diameter of PWTM Area Length of PWTM 7 miles 36,960 feet (linked to mileage in schematic above) % of length 100% 0% 0% Unit cost 244 \$ 337 \$ 369 \$ Estimated unit cost by condition: Rural - soil LF 36,960 Rural - rock Urban - rock 36,960

| Average estimated unit construction cost for PWTM        | \$<br>244  | pe  |
|--|------------|-----|
| Total construction cost in millions                      | \$<br>9.0  |     |
| Contingencies  | \$<br>1.8  | 200 |
| Subtotal   | \$<br>10.8 |     |
| Engineering, Legal & Administrative                      | \$<br>1.6  |     |
| Subtotal   | \$<br>12.4 |     |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.0  | l.  |
| Total Capital Cost for PWTM in millions                  | \$<br>12.4 |     |

Unit maintenance cost/year-mile 10,000 \$/year-mile 0.070 Million \$/year 4.90 fps Velocity at peak flow rate C factor

120 h<sub>f</sub>= | 3.552\*Q| 1.85 0.00141 ft/ft Head loss per foot 7.45 ft/mile | C\*(d)2.63 Head loss at peak flow rate 52 ft 720 Desired HGL At Delivery Point 790 Elev. At Delivery Point 4 -70 ft Allowance for minor losses Total estimated losses 10 ft 63 ft 20% Average static head Total estimated dynamic head -70 ft

Negative indicates gravity flow from #4 to #5; no pumping necessary.

-3 psi

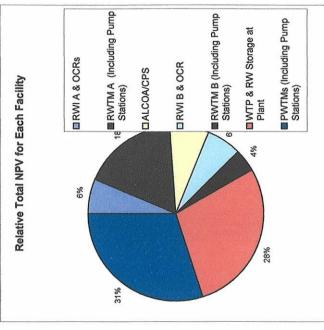
|                              |     |       |          |                            | M  | lillion \$ |
|------------------------------|-----|-------|----------|----------------------------|----|------------|
| Annual O&M Cost in million   | \$: |       | Yr built |                            |    |            |
| PWTM                         | \$  | 0.070 | 2030     | •                          |    |            |
|                              |     |       |          | Total NPV of O&M Costs     |    | \$0.55     |
| Capital Costs in million \$: |     |       | Yr built |                            |    |            |
| PWTM                         | \$  | 12.4  | 2030     |                            | \$ | 5.99       |
|                              |     |       |          | Total NPV of Capital Costs | \$ | 6.0        |

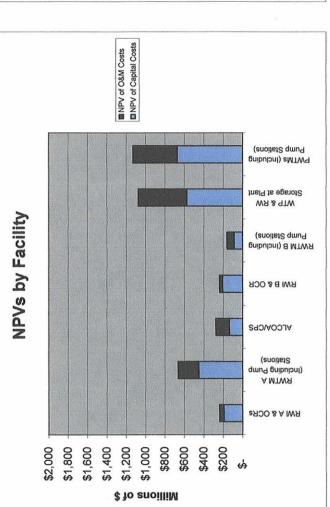
9.0 million

Total NPV of Capital and O&M Costs in millions \$ LCRA Delivery Point (#4) to COA Delivery Point (#5) 6.5

CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

| & RW Storage PWTMs (Including at Plant Pump Stations)      | W 11,000 ac-ft capacity; Conventional Each PWTM sized for settling with membrane filtration for SANS, SARA & Summary Sheet in with membrane filtration for COA & LCRA water   | 572 \$ 671              | 502 \$ 458          | 1,075 \$ 1,129             |
|--|---|-------------------------|---------------------|----------------------------|
| RWTM B (including WTP & RW Storage Pump Stations) at Plant |   | 86 \$                   | 75 \$               | 161 \$                     |
|  |   | 204 \$                  | 34                  | 238 \$                     |
| RWI B & OCR  | Sized for 2000 cfs to scalp water, 2 intakes; 8 miles of 120-inch raw water mains and 4 Octs at 15,000 ac-f/leach   | 69                      | 9                   | 8                          |
| ALCOA/CPS  | Non-Public wells; Sized for 2000 cfs Transmission of 55,000 ac-ft/year to the intakes; 8 miles of OCR at RWI B via 15 120-inch raw water miles of 54" gravity pipeline from Hwy 290 at 15,000 ac-ft/each east of Elgin  | \$ 135                  | \$ 141              | \$ 276                     |
| RWTM A (Including<br>Pump Stations)                        | ich<br>c-<br>nuous<br>w/  | \$ 451                  | \$ 213              | \$ 664                     |
| RWI A & OCRs   | Sized for 4000 cfs diameter pipe size to scalp water; 4 deliver 132,000 a lintakes, 4 miles of flyear on a confir 120-inch raw water basis; includes 3 mains & 4 OCRs at pumping stations 25,000 ac-it each along route | \$ 191                  | \$ 47               | \$ 238                     |
| Total NPVs in<br>Millions of \$                            |   | \$ 2,310                | \$ 1,470            | \$ 3,780 \$                |
| Phasing Scenario   | RWTM B & ALCOAVCPS<br>built by 2015; RWTM A built<br>in 2020.   | NPV of Capital Costs \$ | NPV of O&M Costs \$ | Total NPV of Capital & O&M |
| Alter-<br>nate   | 3A  |                         |                     |                            |
| WTP Location   | Northern<br>Corner of<br>Caldwell County  |                         |                     |                            |

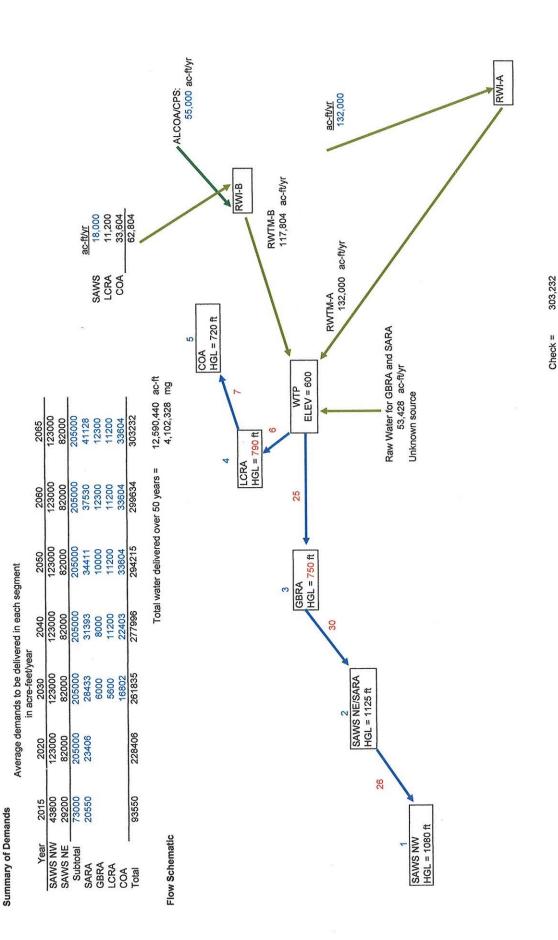




North Caldwell Co\_Alt3A;Flow Schematic

9/28/2005

Flow Schematic CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County



O&M Cost Calculations RWI A - Matagorda Co. River Intakes, and Storage CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County Initial year of analysis period Interest rate Contingency = 20% Engineering, Legal, Admin. = 15% Environmental & Archaeology Studies & Evaluation period 50 years Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile or = \$ 5,000 per acre Unit cost of energy 0.07 Inflatable Rubber Low Head Dam Total Estimated Constr. Cost Unit Constr. Cost (millions) Contigency, Total Capital Eng., etc. Cost (millions) (millions) Quantity (millions) Inflatable Rubber Low Head Dam 3.42 10 ft high 2.25 9.00 Estimated inflatable dam cost as % of total Value of inflatable dam Assumed life of inflatable dam Estimated maintenance/replacement cost 10 0.45 years \$ million/year Year built 2020 NPV of O&M Costs NPV of Capital Costs Total NPV of Capital and O&M Costs \$6.27 million \$ 9.73 million \$16.00 million Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) 132,000 ac-ft/year 182 cfs Average withdrawal 21.9 Ratio of design withdrawal rate to Total intake design withdrawal rate Total intake design withdrawal rate (for scalping high flows 1,795,200 gpm No. of Intakes 1,000 cfs 448,800 gpm Design withdrawal rate per intake No. of reservoirs Design flow to each reservoir 448,800 gpm 120 in. 78.54 sf Inside diameter of each RWTM Area Average length of each RWTM 4.0 miles for all RWTMs 21,120 feet 1 miles 5,280 feet 793 per LF \$ 1,254 Estimated construction cost for RWTM Total construction cost in millions 16.8 Contingencies Subtotal Engineering, Legal & Administrative \$\frac{1}{5}\$
Subtotal

Envir & Arch Studies & Mitigation, Surveying, & Land Acq \$\frac{1}{5}\$
Total Capital Cost for PWTM in millions \$\frac{1}{5}\$ 0.4 23.5 million Unit maintenance cost/year-mile \$ 10,000 \$/year-mile \$ 0.040 Million \$/year (all RWTMs to Reservoirs) Note: Assume each intake has two RWTMs pumping out of it, one to each reservoir. Design flow rate for each RWTM (from above) Pumping rate (one pump)
No. of pumps (not counting spare) pumping into each RW
Peak flow rate into each RWTM (all pumps except spare) 50,000 gpm 450,000 gpm 12.77 fps 120 0.00327 ft/ft Velocity at peak flow rate C factor hr= | 3.552\*Q|<sup>1.85</sup> | C\*(d)<sup>2.63</sup>| Head loss per foot 17.25 ft/mile 90 Elev of discharge at reservoir 50 Water surface elev in river 40 ft Head loss at peak flow rate 17 ft 5 ft 22 ft 40 ft 62 ft 27 psi Allowance for minor losses Total estimated losses 30% Total estimated losses Average static head Total estimated dynamic head 85% Assumed pump efficiency Assumed motor efficiency 90% 1,030 hp/pump 769 kw/pump 9,272 hp/RWTM 9,272 hp/intake 37,089 hp 27,668 kw Estimated Hp required per pump Total hp pumping into each RWTM (not counting spare)
Total hp at each intake (not counting spare)
Total hp all intakes (not counting spares)
Total kw all intakes (not counting spares) Unit construction cost for each pump station (from cost cui \$ Construction cost per intake/pump station No. of intakes from above 889 per firm hp of pump station \$ 1,190 8.2 million 4 each Total construction cost in millions Contigency, Eng., etc. in millions Total capital cost in millions 33.0 million 12.53 million 45.5 million

> 33.0 million 13.2 million 20 years

40% Estimated equip cost as % of total constr cost

Total construction cost for pump stations Value of equipment Assumed life of equipment Estimated maintenance/repla

| mgd | operating<br>/day        | (kwh/day)  | \$   | (\$/day)   |  |   | 10   |   |  |   |   |   |   |  |
|-----|--------------------------|--|--|--|--|---|--|---|--|---|---|---|---|--|
| 118 | :                        | :  | S  |  | -  | lillion \$<br>lyear)  |  | Million \$<br>/year)  |  | Million \$<br>/year)  | `/  | lillion \$<br>lyear)  | waysum  | (\$)   |
| 118 |                          | -  | -  |  | \$   | -   |  |   |  |   | \$  | -   | \$  |  |
| 118 | -                        |  | \$   | -  | \$   | -   |  |   |  |   | S   | -   | 5   |  |
| 118 | -                        | -  |  |  | S  | -   |  |   |  |   | S   | -   |   |  |
| 118 |                          | -  | \$   | -  | \$   | -   |  |   |  |   |   | -   | \$  |  |
| 118 |                          |  | \$   |  | \$   |   |  |   |  |   | S   |   | S   |  |
|     |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | S  | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
|     |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 3 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 1.64                     | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 1.64                     | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 3 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 3 1.64                   | 30,188   | S  | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 | 3 1.64                   | 30,188   | S  | 2,113  | \$   | 0.77  | \$   | 0.66  | S  | 0.040   | \$  | 1.47  | S   |  |
| 111 |                          | 30,188   | s  | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | S   |  |
| 111 |                          | 30,188   | s  | 2,113  | s  | 0.77  | \$   | 0.66  | s  | 0.040   | \$  | 1.47  | S   |  |
| 111 |                          | 30,188   | Š  | 2,113  | s  | 0.77  | S  | 0.66  | s  | 0.040   | S   | 1.47  | s   |  |
| 110 |                          | 30,188   | s  | 2,113  | s  | 0.77  | \$   | 0.66  | s  | 0.040   | S   | 1.47  | s   |  |
| 110 |                          | 30,188   | š  | 2,113  | \$   | 0.77  | Š  | 0.66  | š  | 0.040   | s   | 1.47  | \$  |  |
| 111 |                          | 30,188   | Š  | 2,113  | \$   | 0.77  | \$   | 0.66  | Š  | 0.040   | \$  | 1.47  | Š   |  |
| 111 |                          | 30,188   | Š  | 2,113  | š  | 0.77  | Š  | 0.66  | Š  | 0.040   | Š   | 1.47  | š   |  |
| 11  |                          | 30,188   | š  | 2,113  | Š  | 0.77  | Š  | 0.66  | š  | 0.040   | S   | 1.47  | Š   |  |
| 111 |                          | 30,188   | š  | 2,113  | Š  | 0.77  | \$   | 0.66  | Š  | 0.040   | \$  | 1.47  | š   |  |
| 110 |                          | 30,188   | Š  | 2,113  | Š  | 0.77  | Š  | 0.66  | Š  | 0.040   | \$  | 1.47  | s   |  |
|     |                          |  | S  | 2,113  | s  | 0.77  | Š  | 0.66  | Š  | 0.040   | S   | 1.47  | S   |  |
| 118 |                          | 30,188   | ŝ  | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | 5   | 1.47  | Š   |  |
| 111 |                          | 30,188   |  |  |  |   |  |   |  |   |   |   |   |  |
| 111 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 111 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  |   |  |
| 111 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 111 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 118 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 111 |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | S  | 0.77  | S  | 0.66  | \$   | 0.040   | S   | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
|     |                          | 30,188   | S  | 2,113  | \$   | 0.77  | \$   | 0.66  | S  | 0.040   | \$  | 1.47  | \$  |  |
|     |                          | 30,188   | \$   |  | \$   |   | \$   |   |  |   | \$  | 1.47  | \$  |  |
|     |                          | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   |   |  | 0.040   | \$  | 1.47  | \$  |  |
| 11  | 8 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  | 8 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  | 8 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
| 11  | B 1.64                   | 30,188   | \$   | 2,113  | \$   | 0.77  | \$   | 0.66  | \$   | 0.040   | \$  | 1.47  | \$  |  |
|     |                          |  |  |  |  |   |  |   |  | Total NPV   | of O8   | SM Costs  | \$  |  |
|     | 11:<br>11:<br>11:<br>11: | 118 1.64<br>118 1.64<br>118 1.64<br>118 1.64<br>118 1.64<br>118 1.64 | 118 1.64 30,188<br>118 1.64 30,188<br>118 1.64 30,188<br>118 1.64 30,188<br>118 1.64 30,188<br>118 1.64 30,188 | 118 1.64 30,188 \$ 118 1.64 30,188 \$ 118 1.64 30,188 \$ 119 1.64 30,188 \$ 110 1.64 30,188 \$ 110 1.64 30,188 \$ 111 1.64 30,188 \$ | 118 1.84 30,188 \$ 2,113<br>118 1.64 30,188 \$ 2,113 | 118 1.84 30,188 \$ 2,113 \$ 118 1.84 30,188 \$ 2,113 \$ 118 1.84 30,188 \$ 2,113 \$ 118 1.84 30,188 \$ 2,113 \$ 118 1.64 30,188 \$ 2,113 \$ 118 1.64 30,188 \$ 2,113 \$ 118 1.64 30,188 \$ 2,113 \$ 118 1.64 30,188 \$ 2,113 \$ 118 1.64 30,188 \$ 2,113 \$ | 118         1.84         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77           118         1.64         30,188         \$ 2,113         \$ 0,77 | 118         1.84         30,188         \$ 2,113         \$ 0,77         \$           118         1.84         30,188         \$ 2,113         \$ 0,77         \$           118         1.64         30,188         \$ 2,113         \$ 0,77         \$           118         1.64         30,188         \$ 2,113         \$ 0,77         \$           118         1.64         30,188         \$ 2,113         \$ 0,77         \$           118         1.64         30,188         \$ 2,113         \$ 0,77         \$           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ | 118         1.84         30,188         \$ 2,113         \$ 0,77         \$ 0,68           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66 | 118     1.84     30,188     \$ 2,113     \$ 0,77     \$ 0,68     \$ 118       1.84     30,188     \$ 2,113     \$ 0,77     \$ 0,68     \$ 118       1.84     30,188     \$ 2,113     \$ 0,77     \$ 0,68     \$ 118       1.84     30,188     \$ 2,113     \$ 0,77     \$ 0,66     \$ 118       1.84     30,188     \$ 2,113     \$ 0,77     \$ 0,66     \$ 0,68       118     1.64     30,188     \$ 2,113     \$ 0,77     \$ 0,66     \$ 0,68       118     1.64     30,188     \$ 2,113     \$ 0,77     \$ 0,66     \$ 0,68       118     1.64     30,188     \$ 2,113     \$ 0,77     \$ 0,66     \$ 0,68 | 118 1.84 30,188 \$ 2,113 \$ 0.77 \$ 0.68 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 | 118 1.84 30,188 \$ 2,113 \$ 0.77 \$ 0.68 \$ 0.040 \$ 118 1.84 30,188 \$ 2,113 \$ 0.77 \$ 0.68 \$ 0.040 \$ 118 1.84 30,188 \$ 2,113 \$ 0.77 \$ 0.68 \$ 0.040 \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ \$ 118 1.64 30,188 \$ 2,113 \$ 0.77 \$ 0.66 \$ 0.040 \$ \$ 118 1.64 30,188 \$ 0.77 \$ 0.66 \$ 0.040 \$ \$ 118 1.64 30,188 \$ 0.77 \$ 0.67 \$ 0.67 \$ 0.040 \$ \$ 1.040 | 118         1.84         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47           118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,66         \$ 0,040         \$ 1.47 | 118         1.64         30,188         \$ 2,113         \$ 0,77         \$ 0,68         \$ 0,040         \$ 1.47         \$ 1.47         \$ 1.89         \$ 2,113         \$ 0,77         \$ 0,66         \$ 0,040         \$ 1.47         \$ 1.47         \$ 1.84         30,188         \$ 2,113         \$ 0,77         \$ 0,66         \$ 0,040         \$ 1.47 |

Total NPV of Capital and O&M Costs in millions \$ 75.7

#### Reservoirs

|                                       | Quantity  |    | Units | Volume/each<br>(acre-feet) |      | t Cost<br>ac-ft)) | Con    | Total<br>struction<br>cost in<br>nillions |       | tigency,<br>g., etc. | otal in<br>nillions |
|---------------------------------------|-----------|----|-------|----------------------------|------|-------------------|--------|---|-------|----------------------|---------------------|
| Reservoirs                            | 4         |    | each  | 25000                      | \$   | 974<br>909        | \$     | 97.4                                      | \$    | 37.0                 | \$<br>134.4         |
| Estimated average depth of reserve    | oir       |    | 20    | ft                         |      |                   |        |   |       |                      |                     |
| Surface area of reservoir             |           |    | 5000  | acres                      |      |                   |        |   |       |                      |                     |
| Ratio of total land area reqd to surf | face area |    |       |                            |      |                   |        |   |       |                      |                     |
| of reservoir                          |           |    | 1.1   |                            |      |                   | Er     | vir & Arch                                |       |                      |                     |
| Total land area reqd for reservoirs   |           |    | 5500  | acres                      |      |                   |        |   |       | nd Acq =             | 27.                 |
| Assumed life of reservoir             |           |    | 100   | years                      |      | T                 | otal c | apital cos                                | in mi | llions =             | \$<br>161.9         |
| Estimated replacement cost            |           | \$ | 0.97  | million/year               |      |                   |        |   |       |                      |                     |
| Estimated maintenance                 |           |    | 0.4   | million/year               | Mowi | ng, main          | tainin | g fences,                                 | etc.  |                      |                     |
| Total                                 |           | \$ | 1.37  | million/year               |      |                   |        |   |       |                      |                     |
| Year built                            |           |    | 2020  |                            |      |                   |        |   |       |                      |                     |
| NPV of O&M costs                      |           | \$ | 19.1  | million                    |      |                   |        |   |       |                      |                     |
| NPV of Capital costs                  |           | \$ | 126.8 | million                    |      |                   |        |   |       |                      |                     |
| Total NPV of Capital and O&M Cos      | sts       | s  | 145.9 | million                    |      |                   |        |   |       |                      |                     |

| Summary   | NPV of<br>Capital Costs |       |    | IPV of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |  |
|---|-------------------------|-------|----|---------------------|--|-------|--|
| Inflatable Rubber Low Head Dam                                    | \$                      | 9.7   | \$ | 6.3                 | \$                                       | 16.0  |  |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$                      | 54.1  | \$ | 21.6                | \$                                       | 75.7  |  |
| Reservoirs  | \$                      | 126.8 | \$ | 19.1                | \$                                       | 145.9 |  |
| Total for RWI A   | \$                      | 190.6 | \$ | 47.0                | \$                                       | 237.6 |  |

O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

|        | Initial year of analysis period<br>Interest rate   |  | 2015                   |   |                      | E  | Engineering, Le  | Conting egal, Ac |                      |                     |               |            |                    |
|--------|--|--|------------------------|---|----------------------|--|--|------------------|----------------------|---------------------|---------------|------------|--------------------|
|        | Evaluation period  |  | 50                     | years                                     | Env                  |  | al & Archaeolo   |                  |                      |                     |               |            |                    |
|        | Unit cost of energy  | \$   |                        | per kwh                                   |                      |  | veying, and La   |                  |                      | \$                  | 100,00        | 0 pe       | r mile             |
| Raw Wa | ater Transmission Main - A   |  |                        |   |                      |  |  |                  |                      |                     |               |            |                    |
|        | Inside diameter of pipe  |  |                        |   |                      | 96   |  |                  |                      |                     |               |            |                    |
|        | Area   |  |                        |   |                      | 50.27  | miles  |                  |                      |                     |               |            |                    |
|        | Length of RWTM   |  |                        |   |                      | 665,280  |  |                  |                      |                     |               |            |                    |
|        | Estimated unit construction cos  | t for RW   | TM                     |   | \$                   | 567  | per LF   |                  |                      | \$                  | 86            | 5          |                    |
|        | Total construction cost in million   | ns   |                        |   | \$                   | 378  |  |                  |                      |                     |               |            |                    |
|        | Contingencies  |  |                        |   | \$                   | 76<br>453  |  |                  |                      |                     |               |            |                    |
|        | Subtotal   |  |                        |   | \$                   |  |  |                  |                      |                     |               |            |                    |
|        | Engineering, Legal & Administra  | ative  |                        |   | \$                   | 521  |  |                  |                      |                     |               |            |                    |
|        | Subtotal   |  |                        | 01  | \$                   | 13   |  |                  |                      |                     |               |            |                    |
|        | Envir & Arch Studies & Mitigation Total Capital Cost for   |  |                        |   | \$                   |  | million  |                  |                      |                     |               |            |                    |
|        | Unit maintenance cost/year-mile  | е  |                        |   | \$                   | 10,000   | \$/year-mile   | \$               | 1.260                | Millio              | n \$/yea      | ar         |                    |
|        | Design flow rate (after 100% but   | uildout)   |                        |   |                      |  | ac-ft/year   |                  |                      |                     |               |            |                    |
|        |  |  |                        |   |                      | 118  |  |                  |                      |                     |               |            |                    |
|        |  |  |                        |   |                      | 81,829   |  |                  |                      |                     |               |            |                    |
|        | Pumping rate (one pump)  |  |                        |   |                      | 16,400   | gpm  |                  |                      |                     |               |            |                    |
|        | No. of pumps (not counting spa   |  |                        |   |                      | 5  |  |                  |                      |                     |               |            |                    |
|        | Peak flow rate (all pumps excer  | ot spare)  |                        |   |                      | 82,000   | gpm  |                  |                      |                     |               |            |                    |
|        | Velocity at peak flow rate   |  |                        |   |                      | 3.63   | fps  |                  |                      |                     |               |            |                    |
|        | C factor   |  |                        |   |                      | 120  |  |                  |                      |                     |               |            |                    |
|        | Head loss per foot   |  |                        |   |                      | 0.00041  | ft/ft  |                  | h <sub>f</sub> =     | 13.5                | 52*QI1        | .85        |                    |
|        | 300000000000000000000000000000000000000  |  |                        |   |                      |  | ft/mile  |                  |                      |                     | 1)2.63        |            |                    |
|        | Head loss at peak flow rate  |  |                        |   |                      | 276  | ft   |                  |                      |                     |               |            |                    |
|        | Allowance for minor losses   |  | 10%                    |   |                      | 28   | ft   |                  | 550                  | Elev.               | At Sai        | n Ant      | onio East WTP      |
|        | Total estimated losses   |  |                        |   | -                    | 303  | ft   |                  | 90                   | Elev.               | At Ma         | tagor      | da OCRs            |
|        | Average static head  |  |                        |   |                      | 460  | ft   |                  | 460                  | ft                  |               |            |                    |
|        | Total estimated dynamic head   |  |                        |   |                      | 763  | ft   |                  |                      |                     |               |            |                    |
|        |  |  |                        |   |                      | 331  | psi  |                  |                      |                     |               |            |                    |
|        | No of pumping stations req'd al  |  |                        |   |                      | 2.21   |  |                  | 150                  |                     |               | ed ma      | x pressure         |
|        | No. of pumping stations used in  |  | timate                 | 9   |                      | 3.0  |  |                  |                      | in pip              | oe)           |            |                    |
|        | Average head per pump station  | 1  |                        |   |                      | 254  | п  |                  |                      |                     |               |            |                    |
|        | Assumed pump efficiency  |  |                        |   |                      | 85%  |  |                  |                      |                     |               |            |                    |
|        |  |  |                        |   |                      | 90%  |  |                  |                      |                     |               |            |                    |
|        | Assumed motor efficiency   |  |                        |   |                      | 4 272  | hp/pump  |                  |                      |                     |               |            |                    |
|        | Assumed motor efficiency<br>Estimated Hp required per pum  | р  |                        |   |                      |  |  |                  |                      |                     |               |            |                    |
|        | Estimated Hp required per pum  |  |                        |   |                      | 1,028  | kw/pump  |                  |                      |                     |               |            |                    |
|        | Estimated Hp required per pum  Total hp per pump station (not  | counting   |                        |   |                      | 1,028<br>6,888   | kw/pump<br>hp/station  |                  |                      |                     |               |            |                    |
|        | Estimated Hp required per pum  | counting   |                        |   |                      | 1,028<br>6,888   | kw/pump  | (one p           | ump at               | each                | station       | )          |                    |
|        | Estimated Hp required per pum  Total hp per pump station (not  Total kw per pump set (set=pu  Unit construction cost for each  | counting<br>imps in s<br>pump sta                                | eries                  | along route)                              | , \$                 | 1,028<br>6,888<br>4,133<br>1,347   | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of   |                  |                      |                     | station<br>95 |            |                    |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta  | counting<br>imps in s<br>pump sta                                | eries                  | along route)                              |                      | 1,028<br>6,888<br>4,133<br>1,347<br>9.3  | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million  |                  | station              | \$                  | 95            | 0          |                    |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir  | counting<br>imps in s<br>pump station                            | eries<br>ation (       | along route)<br>(from cost curv           | \$                   | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75  | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million   |                  | station<br>60        | \$<br>min.          | 95            | 0          | t avg pumping rate |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction co  | counting<br>imps in s<br>pump station<br>cost per                | eries<br>ation (       | along route)<br>(from cost curv           |                      | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75  | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million   |                  | station<br>60<br>5.0 | s<br>min.<br>mg     | 95<br>of stor | 0<br>age a | t avg pumping rate |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir  | counting<br>imps in s<br>pump station<br>cost per                | eries<br>ation (       | along route)<br>(from cost curv           | \$                   | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75  | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million   | pump             | station<br>60<br>5.0 | s<br>min.<br>mg     | 95<br>of stor | 0<br>age a |                    |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction cost No. of pump stations from abov Total construction cost in million  | counting<br>imps in s<br>pump station<br>cost per                | eries<br>ation (       | along route)<br>(from cost curv           | \$                   | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>3.0  | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>each  | pump             | station<br>60<br>5.0 | s<br>min.<br>mg     | 95<br>of stor | 0<br>age a |                    |
|        | Estimated Hp required per pum Total hp per pump station (not Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction co No. of pump stations from abov Total construction cost in millio Contigency, Eng., etc. in millio  | counting<br>imps in s<br>pump station<br>cost per                | eries<br>ation (       | along route)<br>(from cost curv           | \$                   | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>3.0<br>30.1<br>11.43                               | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>each  | pump             | station<br>60<br>5.0 | s<br>min.<br>mg     | 95<br>of stor | 0<br>age a |                    |
|        | Estimated Hp required per pum Total hp per pump station (not - Total kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction cost Total construction cost in millio Contigency, Eng., etc. in million  | counting imps in s pump station cost per we ns ns                | eries<br>ation (       | along route)<br>(from cost curv           | \$ \$                | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>3.0<br>30.1<br>11.43<br>41.5                       | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>million<br>million<br>million<br>million            | pump             | station<br>60<br>5.0 | s<br>min.<br>mg     | 95<br>of stor | 0<br>age a |                    |
|        | Estimated Hp required per pum Total hp per pump station (not rotal kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction co No. of pump stations from abox Total construction cost in millio Contigency, Eng., etc. in millio Total capital cost in millions Total construction cost for pum                     | counting imps in s pump station cost per ve                      | eries<br>ation (       | along route)<br>(from cost curv           | \$<br>\$<br>\$<br>\$ | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>30.1<br>11.43<br>41.5                              | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>million<br>million<br>million<br>million            | pump             | 60<br>5.0<br>0.15    | min.<br>mg<br>per g | 95<br>of stor | o<br>age a | iop reservoir      |
|        | Estimated Hp required per pum Total hp per pump station (not rotal kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction co No. of pump stations from about Total construction cost in millio Contigency, Eng., etc. in millio Total capital cost in millions Total construction cost for pum Value of equipment | counting mps in s  pump station  cost per  ve  ns ns             | eries<br>ation (       | along route)<br>(from cost curv           | \$ \$                | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>3.0<br>30.1<br>11.43<br>41.5<br>30.1<br>12.0       | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>million<br>million<br>million<br>million<br>million | pump             | 60<br>5.0<br>0.15    | min.<br>mg<br>per g | 95<br>of stor | o<br>age a |                    |
|        | Estimated Hp required per pum Total hp per pump station (not rotal kw per pump set (set=pu Unit construction cost for each Construction cost per pump sta Balancing reservoir Total construction co No. of pump stations from abox Total construction cost in millio Contigency, Eng., etc. in millio Total capital cost in millions Total construction cost for pum                     | counting mps in s  pump station  cost per  ve  ns  ns  p station | eries<br>ation<br>pump | along route)<br>(from cost curves station | \$<br>\$<br>\$<br>\$ | 1,028<br>6,888<br>4,133<br>1,347<br>9.3<br>0.75<br>10.03<br>3.0<br>30.1<br>11.43<br>41.5<br>30.1<br>12.0<br>20 | kw/pump<br>hp/station<br>kw/pump set<br>per firm hp of<br>million<br>million<br>million<br>million<br>million<br>million<br>million            | pump             | 60<br>5.0<br>0.15    | min.<br>mg<br>per g | 95<br>of stor | o<br>age a | iop reservoir      |

#### O&M Costs

| Year         | Flow pum<br>yea    |            | No. of<br>pump<br>"sets" | Energy<br>used       |    | Energy           | / CO | ost                   | CO | ther O&M<br>sts - Pump<br>Stations |    | intenance<br>costs -<br>RWTM | T  | otal O&M<br>cost     | Ne | et present<br>value |
|--------------|--------------------|------------|--------------------------|----------------------|----|------------------|------|-----------------------|----|------------------------------------|----|------------------------------|----|----------------------|----|---------------------|
| Z. CALLINA   | ac-ft/yr           | mgd        | operating<br>/day        | (kwh/day)            |    | (\$/day)         | (    | (Million \$<br>/year) | (  | (Million \$<br>/year)              | (  | Million \$<br>/year)         | (  | Million \$<br>/year) |    | (\$)                |
| 2015         |                    |            |                          |                      | \$ |                  | \$   | -                     |    |                                    | _  |                              | \$ |                      | \$ | -                   |
| 2016         |                    | •          | -                        | -                    | \$ |                  | \$   | -                     |    |                                    |    |                              | \$ |                      | \$ | -                   |
| 2017         | -                  | •          |                          |                      | \$ | •                | \$   | •                     |    |                                    |    |                              | \$ |                      | \$ |                     |
| 2018         | •                  |            | -                        | -                    | \$ |                  | \$   |                       |    |                                    |    |                              | \$ | *                    | \$ |                     |
| 2019         | 400.000            | 118        | 4.00                     | 404.000              | \$ | 24.040           |      | 12.65                 |    | 0.60                               | \$ | 1.260                        |    | 14.51                |    | 11.3                |
| 2020         | 132,000            | 118        | 4.99<br>4.99             | 494,936<br>494,936   | \$ | 34,646<br>34,646 | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 10.8                |
| 2021<br>2022 | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | S  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 10.8                |
| 2022         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 9.8                 |
| 2023         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | Š  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | S  | 9.3                 |
| 2025         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | Š  | 0.60                               | Š  | 1.260                        | \$ | 14.51                | \$ | 8.9                 |
| 2026         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | Š  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 8.4                 |
| 2027         | 132,000            | 118        | 4.99                     | 494,936              | Š  | 34,646           | \$   | 12.65                 | Š  | 0.60                               | Š  | 1.260                        | \$ | 14.51                | Š  | 8.0                 |
| 2028         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | Š    | 12.65                 | Š  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 7.6                 |
| 2029         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | s    | 12.65                 | s  | 0.60                               | S  | 1.260                        | s  | 14.51                | s  | 7.3                 |
| 2030         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | Š  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 6.9                 |
| 2031         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | s  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 6.6                 |
| 2032         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | s  | 1.260                        | \$ | 14.51                | S  | 6.3                 |
| 2033         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 6.0                 |
| 2034         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 5.7                 |
| 2035         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 5.4                 |
| 2036         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 5.2                 |
| 2037         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 4.9                 |
| 2038         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 4.7                 |
| 2039         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 4.5                 |
| 2040         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 4.2                 |
| 2041         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 4.0                 |
| 2042         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.8                 |
| 2043         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.7                 |
| 2044         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.5                 |
| 2045         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.3                 |
| 2046         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.2                 |
| 2047         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 3.0                 |
| 2048         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.9                 |
| 2049         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.7                 |
| 2050         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.6                 |
| 2051         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.5                 |
| 2052         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.3                 |
| 2053         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 2.2                 |
| 2054         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51<br>14.51       | \$ | 2.1                 |
| 2055<br>2056 | 132,000            | 118        | 4.99<br>4.99             | 494,936              | \$ | 34,646           |      | 12.65<br>12.65        |    | 0.60                               | \$ | 1.260<br>1.260               | \$ | 14.51                | \$ | 1.9                 |
|              | 132,000            | 118<br>118 | 4.99                     | 494,936              | \$ | 34,646           | 5    | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 1.8                 |
| 2057<br>2058 | 132,000            | 118        | 4.99                     | 494,936              | S  | 34,646<br>34,646 | S    | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | Š  | 1.7                 |
|              | 132,000            | 118        | 4.99                     | 494,936              | S  |                  | \$   | 12.65                 | \$ | 0.60                               | 5  | 1.260                        | \$ | 14.51                | \$ | 1.7                 |
| 2059<br>2060 | 132,000<br>132,000 | 118        | 4.99                     | 494,936<br>494,936   | \$ | 34,646<br>34,646 | \$   | 12.65                 | \$ | 0.60                               | 5  | 1.260                        | \$ | 14.51                | \$ | 1.6                 |
| 2060         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | S  | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 1.5                 |
| 2062         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 1.4                 |
| 2062         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | \$ | 1.3                 |
| 2064         | 132,000            | 118        | 4.99                     | 494,936              | \$ | 34,646           | \$   | 12.65                 | \$ | 0.60                               | \$ | 1.260                        | \$ | 14.51                | S  | 1.3                 |
| 2065         | 132,000            | 118        | 4.99                     | 494,936              | Š  | 34,646           | Š    | 12.65                 | Š  | 0.60                               | \$ | 1.260                        | Š  | 14.51                | \$ | 1.2                 |
|              |                    |            |                          | O.T.M.T.T.           |    |                  |      |                       |    |                                    |    | Total NPV                    |    |                      |    | 21                  |
|              |                    |            | 01-10                    | . la                 |    |                  |      |                       |    | V- b. "                            |    | July 14F V                   |    | GIII GUSES           | *  | 21                  |
|              |                    |            | Capital Cost             | s in million \$:     |    |                  |      | 524                   |    | Yr built                           |    |                              |    |                      | •  | 44                  |
|              |                    |            |                          | RWTM<br>Pumping Stat |    |                  | \$   | 534                   |    | 2020                               |    |                              |    |                      | \$ | 41                  |
|              |                    |            |                          |                      |    |                  |      | 42                    |    | 2020                               |    |                              |    |                      |    |                     |

Total NPV of Capital and O&M Costs in millions \$

## NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

Initial year of analysis period Interest rate Evaluation period Unit cost of energy 2015 5% 50 years 0.07 per kwh Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

|      |        |     | A          |       |
|------|--------|-----|------------|-------|
| weii | rieids | and | Collection | Lines |

|  | ALC   | OA    |             | CPS   |    | Total |         |
|--|-------|-------|-------------|-------|----|-------|---------|
| Year built -   | 20    | 15    | 1           | 2015  |    |       |         |
| Estimated Construction Cost in Millions                  |       |       |             |       |    |       |         |
| Wells (Based on Non-Public Water Supply Wells)           |       | 20.92 |             | 7.94  |    | 28.86 |         |
| Pipeline   |       | 13.03 |             | 5.94  |    | 18.97 |         |
| Pump Stations & Storage                                  |       | 8.51  |             | 0     |    | 8.51  |         |
| Subtotal   | T. M. | 42.46 |             | 13.88 |    | 56.34 |         |
| Contingency  |       | 8.49  |             | 2.78  |    | 11.27 |         |
| Subtotal   |       | 50.95 |             | 16.66 |    | 67.61 |         |
| Engineering, Legal & Administrative                      |       | 6.37  |             | 2.08  |    | 8.45  |         |
| Subtotal   |       | 57.32 |             | 18.74 |    | 76.06 |         |
| Environmental & Archaeology Studies & Mitigation         |       | 0.63  |             | 0.2   |    | 0.83  |         |
| Land Acquisition & Surveying                             |       | 0     |             | 0     |    | 0.00  |         |
| Groundwater Purchase                                     |       | 0     |             | 5.64  |    | 5.64  |         |
| ALCOA Construction Program Management Fee                |       | 5.45  |             | 0     |    | 5.45  |         |
| Interest During Construction (2 years, 6% int., 4% ret.) |       | 5.89  |             | 2.44  |    | 8.33  |         |
| Total Capital Cost                                       | 7     | 69.29 |             | 27.02 |    | 96.31 |         |
| Estimated Annual O&M Costs                               |       |       |             |       |    |       |         |
| O&M  |       | 0.67  |             | 0.18  |    | 0.85  |         |
| Pumping Energy   |       | 2.41  |             | 0.52  |    | 2.93  |         |
| ALCOA Project Management Fees                            |       | 0.35  |             | 0.00  |    | 0.35  |         |
| Purchase of Groundwater                                  |       | 2.00  |             | 0.00  |    | 2.00  |         |
| Groundwater District Fees                                |       | 0.65  |             | 0.25  |    | 0.90  |         |
| Mitigation Reserves                                      |       | 0.28  | 1200202-000 | 0.11  |    | 0.39  |         |
| Total Annual Cost  |       | 6.36  |             | 1.06  |    | 7.42  | Y       |
| NPV of O&M Costs   | \$    | 116   | \$          | 19    | s  | 125   | million |
|  |       | 69    | S           | 27    | S  |       | million |
| NPV of Capital Costs                                     | \$    | ****  | _           |       | _  |       | •       |
| Total NPV of Capital and O&M Costs for Well Fields       | \$    | 185   | \$          | 46    | \$ | 232   | million |

#### Cooling of Well Water

| Total number of wells in both fields                 | 120 wells | Approximate capacity per wel | 300    | gpm        |
|--|-----------|------------------------------|--------|------------|
| Percentage of wells with temperatures > than degrees | 5%        |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees | 6.0       | Rough check                  | 58,072 | ac-ft/year |

#### **Estimated Capital Costs**

| 2015          |  |
|---------------|--|
| 6.0           |  |
| \$<br>60,000  |  |
| \$<br>50,000  |  |
| \$<br>30,000  |  |
| \$<br>50,000  |  |
| \$<br>190,000 | Each   |
| \$<br>1.14    | million  |
| \$<br>0.23    |  |
| \$<br>1.37    | -  |
| \$<br>0.21    |  |
| \$<br>1.57    | -  |
| \$<br>1.57    | million  |
| ****          | 6.0<br>\$ 60,000<br>\$ 50,000<br>\$ 30,000<br>\$ 50,000<br>\$ 190,000<br>\$ 1.14<br>\$ 0.23<br>\$ 1.37<br>\$ 0.21<br>\$ 1.57 |

#### Estimated O&M Costs

| Value of equipment                                  | \$<br>0.4   | million                            |
|---|-------------|------------------------------------|
| Assumed life of equipment                           | 10          | years                              |
| Estimated maintenance/replacement cost              | \$<br>0.04  | million/year                       |
| Blower Hp per cooling tower                         | 10          | Нр                                 |
|   | 7           | kw                                 |
| Hours of operation                                  | 24          | hours                              |
| Power consumption per cooling tower                 | 179         | kwh per day                        |
|   | 65,350      | kwh per year                       |
| Power cost per cooling tower                        | \$<br>4,574 | 0.7 ESC. 3000 *040040.00 007000 14 |
| Total power cost for all cooling towers in millions | \$<br>0.03  | million per year                   |
| Regular operational checks and routine maintenance  | \$<br>6,000 | per month for all cooling towers   |
| •   | \$<br>0.07  | peryear                            |

Estimated O&M Cost \$
NPV of O&M costs \$ 0.14 million \$ per year 2.47 million \$

#### Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

54 in.

| Area   |           | 15.90   | sf           |   |
|--|-----------|---------|--------------|---|
| Length of Ground Water TM                          |           | 15      | miles        |   |
|  |           | 79,200  | feet         |   |
| Estimated construction cost for GWTM               | \$        | 327     | per LF       |   |
| Total construction cost in millions                | \$        | 25.9    |              |   |
| Contingencies                                      | \$        | 5.2     |              |   |
| Subtotal   | \$        | 31.1    | -            |   |
| Engineering, Legal & Administrative                | \$        | 4.7     |              |   |
| Subtotal   | \$        | 35.8    | -            |   |
| Envir & Arch Studies & Mitigation, Surveying, & La | nd Acq \$ | 1.5     |              |   |
| Total Capital Cost for PWTM in million             | \$        | 37.3    | million      |   |
| Unit maintenance cost/year-mile                    | \$        | 10,000  | \$/year-mile | \$ 0.150 Million \$/year                    |
| Design flow rate                                   |           | 55,000  | ac-ft/year   |   |
|  |           | 49      | mgd          |   |
|  |           | 34,095  | gpm          |   |
| Velocity at peak flow rate                         |           | 4.78    | fps          |   |
| C factor   |           | 120     | •            |   |
| Head loss per foot                                 |           | 0.00134 | ft/ft        | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |
|  |           | 7.10    | ft/mile      | C*(d) <sup>2.63</sup>                       |
| Head loss at peak flow rate                        |           | 106     | ft           |   |
| Allowance for minor losses                         | 10%       | 11      | ft           | 400 Elev. At RWI-B                          |
| Total estimated losses                             |           | 117     | ft           | 550 minus Elev Storage Tank at Hwy 290      |
| Average static head                                |           | -150    | ft           | -150 ft                                     |
| Total estimated dynamic head                       |           | -33     | ft           | (intake is lower than tank at Hwy 290)      |
|  |           | -14     | psi          |   |

#### Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

|                               |    |       |          |                            | Mi | illion \$ |
|-------------------------------|----|-------|----------|----------------------------|----|-----------|
| Annual O&M Cost in million \$ | :  | 150   | Yr built |                            |    |           |
| GWTM                          | \$ | 0.150 | 2015     | 5)                         |    |           |
|                               |    |       |          | Total NPV of O&M Costs     | \$ | 2.7       |
| Capital Costs in million \$:  |    |       | Yr built |                            |    |           |
| GWTM                          | \$ | 37.3  | 2015     | to:                        | \$ | 37.3      |
|                               |    |       |          | Total NPV of Capital Costs | S  | 37.3      |

| Summary   | IPV of<br>tal Costs | IPV of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |
|---|---------------------|---------------------|--|-------|
| Well Fields and Collection Lines (including tank and pump station at Hwy 290) | \$<br>96.3          | \$<br>135.5         | \$                                       | 231.8 |
| Cooling Towers for Selected High Temperature Wells                            | \$<br>1.6           | \$<br>2.5           | \$                                       | 4.0   |
| Ground Water Transmission Main and Pumping Station                            | \$<br>37.3          | \$<br>2.7           | \$                                       | 40.0  |
| Total for ALCOA CBS   | 42E 4               | 440.7               |  | 275.0 |

#### **O&M Cost Calculations** RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

Initial year of analysis period 2015 Interest rate Evaluation period 40 years Unit cost of energy 0.07 per kwh

Contingency = 20% Engineering, Legal, Admin. = 15%

Environmental & Archaeology Studies &

Mitigation, Surveying, and Land Acquisition = \$ 100,000 per mile or = \$ 5,000 per acre

#### Inflatable Rubber Low Head Dam

|                                | Quantity | Units | Size       | (  | Constr.<br>Cost<br>illions) | Est<br>Con: | Total<br>imated<br>str. Cost<br>illions) | Eng | tigency,<br>g., etc.<br>illions) | (  | Capital<br>Cost<br>illions) |
|--------------------------------|----------|-------|------------|----|-----------------------------|-------------|--|-----|----------------------------------|----|-----------------------------|
| Inflatable Rubber Low Head Dam | 2        | each  | 10 ft high | \$ | 2.25                        | \$          | 4.50                                     | \$  | 1.71                             | \$ | 6.21                        |

Estimated inflatable dam cost as % of total 2.25 million Value of inflatable dam Assumed life of inflatable dam 10 years Estimated maintenance/replacement cost 0.23 million/year 2015

NPV of O&M Costs

**NPV of Capital Costs** 

3.86 million 6.21 million

Total NPV of Capital and O&M Costs

10.07 million

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

#### Summary of withdrawals in acre-feet/year:

| Year     | 2015  | 2020  | 2030  | 2040  | 2050  | 2060  | 2065  |
|----------|-------|-------|-------|-------|-------|-------|-------|
| For SAWS | 18000 | 18000 | 18000 | 18000 | 18000 | 18000 | 18000 |
| LCRA     |       |       | 5600  | 11200 | 11200 | 11200 | 11200 |
| COA      |       |       | 16802 | 22403 | 33604 | 33604 | 33604 |
| Total    | 18000 | 18000 | 40402 | 51603 | 62804 | 62804 | 62804 |

Ultimate (Y2065) average design withdrawal rate

62,804 ac-ft/year 87 cfs

Total intake design withdrawal rate (for scalping high flows)

2.000 cfs 897,600 gpm 23.1 Ratio of design withdrawal rate to Total intake design withdrawal rate

No. of Intakes Design withdrawal rate per intake 1,000 cfs 448,800 gpm

No. of reservoirs Design flow to each reservoir

224,400 gpm

Inside diameter of each RWTM 120 in. 78.54 sf Average length of each RWTM 2 miles 10,560 feet

8.0 miles for all RWTMs 42,240 feet

Estimated construction cost for RWTMs 793 per LF Total construction cost in millions 33.5

Contingencies Subtotal 6.7 Engineering, Legal & Administrative Subtotal 0.8 Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions

0.080 Million \$/year (all RWTMs to Reservoirs) Unit maintenance cost/year-mile 10,000 \$/year-mile

926 kw/pump

#### Note: Assume intake has one RWTM pumping to the reservoir.

| Design flow rate for each RWTM (  | from above)  | 224,400 | gpm     |
|-----------------------------------|--|---------|---------|
| Pumping rate (one pump)           | STREET, STREET | 40,000  | gpm     |
| No. of pumps (not counting spare) | pumping into each RWT  | 6       |         |
| Peak flow rate into each RWTM (a  | Il pumps except spare)   | 240,000 | gpm     |
| Velocity at peak flow rate        |  | 6.81    | fps     |
| C factor                          |  | 120     |         |
| Head loss per foot                |  | 0.00102 | ft/ft   |
|                                   |  | 5.39    | ft/mile |
| Head loss at peak flow rate       |  | 11      | ft      |
| Allowance for minor losses        | 30%  | 3       | ft      |
| Total estimated losses            | -  | 14      | ft      |
| Average static head               |  | 80      | ft      |
| Total estimated dynamic head      | <del></del>  | 94      | ft      |

 $h_l = | \frac{3.552 * Q}{1.65} |^{1.65}$  $| C^*(d)^{2.63} |$ 

400 Discharge at reservoir 320 Water surface elev in river

41 psi Assumed pump efficiency 85% 90% 1,241 hp/pump Assumed motor efficiency Estimated Hp required per pump

| Total hp pumping into each RWTM (not counting spare)        | 7,448       | hp/RWTM  |
|---|-------------|--|
| Total hp at each intake (not counting spare)                | 14,897      | hp/intake  |
| Total hp all intakes (not counting spares)                  | 29,793      | hp   |
| Total kw all intakes (not counting spares)                  | 22,226      | kw   |
| Unit construction cost for each pump station (from cost cun | \$<br>889   | per firm hp of pump station \$ 830                 |
| Construction cost per intake/pump station                   | 13.2        | million  |
| No. of intakes from above                                   | 2           | each   |
| Total construction cost in millions                         | \$<br>26.5  | million  |
| Contigency, Eng., etc. in millions                          | \$<br>10.06 | million  |
| Total capital cost in millions                              | \$<br>36.6  | million  |
| Total construction cost for pump stations                   | \$<br>26.5  | million 40% Estimated equipment cost as % of total |
| Value of equipment  | \$<br>10.6  | million  |
| Assumed life of equipment                                   | 20          | years  |
| Estimated maintenance/replacement cost                      | \$<br>0.53  | million/year                                       |

| 0&M | Costs: |
|-----|--------|
|     |        |

|   | Year | Flow pum |     | No. of<br>pump<br>"sets" | Energy<br>used | Energ        | ус | ost                   | other O&M<br>osts - Pump<br>Stations |    | intenance<br>costs -<br>RWTM | To | otal O&M<br>cost     | Ne | et present<br>value |
|---|------|----------|-----|--------------------------|----------------|--------------|----|-----------------------|--------------------------------------|----|------------------------------|----|----------------------|----|---------------------|
|   |      | ac-ft/yr | mgd | operating<br>/day        | (kwh/day)      | <br>(\$/day) | ı  | (Million \$<br>/year) | (Million \$<br>/year)                | (  | Million \$<br>/year)         | (  | Million \$<br>/year) |    | (\$)                |
| - | 2015 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.77                |
|   | 2016 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.73                |
|   | 2017 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.70                |
|   | 2018 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.66                |
|   | 2019 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.63                |
|   | 2020 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.60                |
|   | 2021 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.57                |
|   | 2022 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.55                |
|   | 2023 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.52                |
|   | 2024 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.50                |
|   | 2025 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.47                |
|   | 2026 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.45                |
|   | 2027 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.43                |
|   | 2028 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.41                |
|   | 2029 | 18,000   | 16  | 0.28                     | 6,200          | \$<br>434    | \$ | 0.16                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.77                 | \$ | 0.39                |
|   | 2030 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.46                |
|   | 2031 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.44                |
|   | 2032 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.42                |
|   | 2033 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.40                |
|   | 2034 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.38                |
|   | 2035 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.36                |
|   | 2036 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.35                |
|   | 2037 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.33                |
|   | 2038 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.31                |
|   | 2039 | 40,402   | 36  | 0.63                     | 13,917         | \$<br>974    | \$ | 0.36                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 0.97                 | \$ | 0.30                |
|   | 2040 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.31                |
|   | 2041 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.30                |
|   | 2042 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.28                |
|   | 2043 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.27                |
|   | 2044 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.26                |
|   | 2045 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.25                |
|   | 2046 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.23                |
|   | 2047 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.22                |
|   | 2048 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.21                |
|   | 2049 | 51,603   | 46  | 0.80                     | 17,775         | \$<br>1,244  | \$ | 0.45                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.06                 | \$ | 0.20                |
|   | 2050 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.21                |
|   | 2051 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.20                |
|   | 2052 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 |    |                     |
|   | 2053 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.18                |
|   | 2054 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.17                |
|   | 2055 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.17                |
|   | 2056 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.16                |
|   | 2057 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 |    | 0.15                |
|   | 2058 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.14                |
|   | 2059 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           |    | 0.080                        | \$ | 1.16                 | \$ | 0.14                |
|   | 2060 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | S  | 1.16                 | S  | 0.13                |
|   | 2061 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ | 0.12                |
|   | 2062 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | 0.53                                 |    |                              |    |                      |    | 0.12                |
|   | 2063 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | \$ |                     |
|   | 2064 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16<br>1.16         | \$ | 0.11                |
|   | 2065 | 62,804   | 56  | 0.97                     | 21,633         | \$<br>1,514  | \$ | 0.55                  | \$<br>0.53                           | \$ | 0.080                        | \$ | 1.16                 | 9  | 0.10                |

Total NPV of O&M Costs \$ 17.1

 Capital Costs in million \$:
 Yr built

 RWTM to Reservoir Intake/Pumping Stations
 \$ 47.0
 2015
 \$ 47.0
 \$ 36.6
 \$ 36.6
 Total NPV of Capital Costs
 \$ 83.6

Total NPV of Capital and O&M Costs in millions \$ 100.3

#### Reservoirs

|                       | Quantity        | Units | Volume/each (acre-feet) | -  | nit Cost<br>6/ac-ft)) | Con   | Fotal<br>struction<br>ost in<br>illions | tigency,<br>g., etc. | otal in<br>illions |
|-----------------------|-----------------|-------|-------------------------|----|-----------------------|-------|---|----------------------|--------------------|
| Reservoirs            | 4               | each  | 15000                   | \$ | 1,180                 | \$    | 70.8                                    | \$<br>26.9           | \$<br>97.7         |
|                       |                 |       |                         | \$ | 0.004                 | per g | allon                                   |                      |                    |
| Estimated average den | th of reservoir | 20    | ft                      | S  | 1.096                 |       |   |                      |                    |

| Surface area of reservoir  | 3000        | acres        |   |
|--|-------------|--------------|---|
| Ratio of total land area reqd to surface area  |             |              |   |
| of reservoir   | 1.1         |              | Envir & Archaeology, Surv,                |
| Total land area regd for reservoirs  | 3300        | acres        | and Land Acq = 16.5                       |
| CONTRACTOR A AND ONE AND ONE ADDRESS AND A ADDRESS OF CONTRACTOR AND ADDRESS OF CONTRACTOR AND ADDRESS OF CONTRACTOR AND ADDRESS OF CONTRACTOR ADDRESS OF CONTRACTOR AND ADDRESS OF CONTRACTOR ADDRESS |             |              | Total capital cost in millions = \$ 114.2 |
| Assumed life of reservoir  | 100         | years        |   |
| Estimated replacement cost   | \$<br>0.71  | million/year |   |
| Estimated maintenance  | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.          |
| Total  | \$<br>0.75  | million/year |   |
| Year built   | 2015        |              |   |
| NPV of O&M costs   | \$<br>12.8  | million      |   |
| NPV of Capital costs   | \$<br>114.2 | million      |   |
| Total NPV of Capital and O&M Costs   | \$<br>127.0 | million      |   |

| Summary   | <br>IPV of<br>ital Costs | PV of O&M<br>Costs | Ca | pital and |
|---|--------------------------|--------------------|----|-----------|
| Inflatable Rubber Low Head Dam                                    | \$<br>6.2                | \$<br>3.9          | \$ | 10.1      |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>83.6               | \$<br>17.1         | \$ | 100.7     |
| Off Channel Reservoir   | \$<br>114.2              | \$<br>12.8         | \$ | 127.0     |
| Total for RWI A   | \$<br>204.0              | \$<br>33.8         | \$ | 237.8     |

O&M Cost Calculations RWTM B - RWI B near Bastrop to WTP CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

| Initial year<br>Interest rate<br>Evaluation<br>Unit cost of | period                       | eriod                  |               |                |    | nvironment     | Engineering,<br>al & Archaeo<br>veying, and L  | logy Studies   | in. =<br>s & | 15%   | •                   | per mile     |                 |
|---|------------------------------|------------------------|---------------|----------------|----|----------------|--|----------------|--------------|-------|---------------------|--------------|-----------------|
| mmary of averag   | je pumping                   | rates in ac            | re-feet/ye    | ar:            |    |                |  |                |              |       |                     |              |                 |
| Surface Water   |                              |                        |               |                |    |                |  |                |              |       |                     |              |                 |
| Year  | 2015                         | 2020                   | 2030          | 2040           |    | 2050           | 2060   | 2065           |              |       |                     |              |                 |
| For SAWS  | 18000                        | 18000                  | 18000         | 18000          |    | 18000          | 18000  | 18000          |              |       |                     |              |                 |
| COA   |                              |                        | 5600<br>16802 | 11200<br>22403 |    | 11200<br>33604 | 11200<br>33604   | 11200<br>33604 |              |       |                     |              |                 |
| Subtotal  | 18000                        | 18000                  | 40402         | 51603          | -  | 62804          | 62804  | 62804          |              |       |                     |              |                 |
| Groundwater   | 10000                        |                        | 10.100        |                |    |                |  | 0200           | 5.1          |       |                     |              |                 |
| Year  | 2015                         | 2020                   | 2030          | 2040           |    | 2050           | 2060   | 2065           |              |       |                     |              |                 |
| For SAWS  | 55000                        | 55000                  | 55000         | 55000          |    | 55000          | 55000  | 55000          | 0            | •     |                     |              |                 |
| Suface & groun  | 73000                        | 73000                  | 95402         | 106603         |    | 117804         | 117804   | 11780          | 4            |       |                     |              |                 |
| Ultimate (Y   | 2065) averaç                 | ge design p            | oumping ra    | te             |    | 117,804        | ac-ft/year   |                |              |       |                     |              |                 |
| zing of Raw Wate  | r Transmiss                  | sion Main I            | B & Pump      | Stations       |    |                |  |                |              |       |                     |              |                 |
| Inside diam   | eter of RWT                  | M                      |               |                |    | 84             | in.  |                |              |       |                     |              |                 |
| Area  |                              |                        |               |                |    | 38.48          |  |                |              |       |                     |              |                 |
| Length of F   | MTW                          |                        |               |                |    |                | miles  |                |              |       |                     |              |                 |
|   |                              |                        |               |                |    | 105,600        | feet   |                |              |       |                     |              |                 |
| Estimated   | unit construc                | tion cost fo           | r RWTM        |                | \$ | 467            | per LF   |                |              | \$    | 550                 |              |                 |
|   | ruction cost i               | in millions            |               |                | \$ | 49.4           |  |                |              |       |                     |              |                 |
| Contingend  |                              |                        |               |                | \$ | 9.9            |  |                |              |       |                     |              |                 |
| Engineerin  | Subtotal<br>g, Legal & Ac    | dministrativ           |               |                | \$ | 59.2           |  |                |              |       |                     |              |                 |
| Cudineeun   | Subtotal                     | armeni strativ         | e e           |                | \$ | 8.9<br>68.1    |  |                |              |       |                     |              |                 |
| Envir & Arc   | h Studies & I                | Mitigation.            | Surveying.    | & Land Acq     | Š  | 2.0            |  |                |              |       |                     |              |                 |
|   | Total Capita                 |                        |               |                | \$ |                | million  |                |              |       |                     |              |                 |
| Unit mainte   | nance cost/y                 | ear-mile               |               |                | \$ | 5,000          | \$/year-mile   | \$ 0.          | 100          | Milli | on \$/yea           | r            |                 |
| Design flow   | rate (after 1                | 100% builde            | out)          |                |    |                | ac-ft/year   |                |              |       |                     |              |                 |
|   |                              |                        |               |                |    |                | mgd  |                |              |       |                     |              |                 |
| D   |                              | -                      |               |                |    | 73,029         | gpm  |                |              |       |                     |              |                 |
| No. of pum  | ite (one pum<br>ps (not coun | ting spare)            |               |                |    | 15,000         | gpm  |                |              |       |                     |              |                 |
| Peak flow r   | ate (all pump                | os except s            | pare)         |                |    | 75,000         | gpm  |                |              |       |                     |              |                 |
| Velocity at<br>C factor                                     | peak flow rat                | te                     |               |                |    | 4.34           | fps  |                |              |       |                     |              |                 |
| Head loss   | er foot                      |                        |               |                |    | 0.00067        | ft/ft  |                | hæ           | 134   | 552*QI              | 85           |                 |
| 1104411000  |                              |                        |               |                |    |                | ft/mile  |                |              |       | (d) <sup>2.63</sup> |              |                 |
| Head loss   | at peak flow                 | rate                   |               |                |    | 71             | ft   |                |              |       |                     |              |                 |
|   | for minor loss               |                        | 10%           |                |    | 7              |  |                | 650          | Elev  | . At WT             | P            |                 |
| Total estim   | ated losses                  |                        |               |                |    | 78             | ft   |                | 400          | Elev  | of WSE              | in Bastrop   | eservoir        |
| Average st  |                              |                        |               |                |    | 250            |  |                | 250          | ft    |                     |              |                 |
| Total estim   | ated dynamic                 | c head                 |               |                |    | 328<br>142     |  |                |              |       |                     |              |                 |
| No of soco  | nmended pu                   | mnina stati            | ana alana     | routo          |    | 0.95           | - State of the sta |                | 150          | noi i | 'aaauma             | d max press  |                 |
|   | ping stations                |                        |               |                |    | 1.0            |  |                | 150          | in pi |                     | u max press  | ui <del>o</del> |
|   | ad per pump                  |                        |               |                |    | 328            |  |                |              |       | /                   |              |                 |
|   |                              |                        |               |                |    |                |  |                |              |       |                     |              |                 |
|   | ump efficien                 |                        |               |                |    | 85%            |  |                |              |       |                     |              |                 |
|   | notor efficien               |                        |               |                |    | 90%            | ha/a   |                |              |       |                     |              |                 |
| Estimated   | Hp required p                | bei pullip             |               |                |    |                | hp/pump<br>kw/pump   |                |              |       |                     |              |                 |
| Total hp pe   | r pump statio                | on (not cou            | nting spare   | e)             |    |                | hp/station   |                |              |       |                     |              |                 |
|   |                              |                        |               | along route)   |    |                | kw/pump se   | t (one pum     | p at         | each  | station)            |              |                 |
| Unit constr   | action cost fo               | or each pur            | np station    | (from cost cui | \$ | 1,307          | per firm hp  | of pump sta    | tion         |       |                     |              |                 |
|   | n cost per pu                | ump station            | 1             |                |    |                | million  |                |              |       |                     |              |                 |
| Balancing r   |                              |                        |               |                | \$ |                | million  | 1              |              |       | of stora            | ge at avg pu | mping rate      |
|   | Total constr                 | uction cost            | per pump      | station        | \$ | 11.37          | million  | \$ 0           | 5.0          |       | gal for o           | pen top rese | rvoir           |
| No. of pum  | p stations fro               | m above                |               |                |    | 1.0            | each   |                |              |       |                     |              |                 |
| Total const   | ruction cost i               | in millions            |               |                | \$ | 11.4           | million  |                |              |       |                     |              |                 |
|   | y, Eng., etc.                |                        |               |                | \$ |                | million  |                |              |       |                     |              |                 |
| Contingend  | ost in milli                 |                        |               |                | \$ |                | million  |                |              |       |                     |              |                 |
|   |                              |                        |               |                |    |                |  |                |              |       |                     |              |                 |
| Total capita  |                              |                        |               |                |    |                |  |                |              |       |                     |              |                 |
| Total capita  | ruction cost f               |                        | tations       |                | \$ |                | million  |                |              | _     |                     |              | - FI 87         |
| Total capita  | Value of equ                 | uipment                |               |                | \$ | 4.5            | million  | 5              | 40%          | Esti  | mated ed            | quipment cos | st as % of to   |
| Total capita  |                              | uipment<br>e of equipn | nent          | ent cost       |    | 4.5            |  | 15             | 40%          | Esti  | mated ed            | quipment cos | st as % of to   |

#### O&M Costs

| costs |            |               |                          |                    |      |                  |     |                      |    |                                      |    |                               |      |                      |    |                     |
|-------|------------|---------------|--------------------------|--------------------|------|------------------|-----|----------------------|----|--------------------------------------|----|-------------------------------|------|----------------------|----|---------------------|
| Yea   | ar Flow pu | mped by<br>ar | No. of<br>pump<br>"sets" | Energy<br>used     |      | Energy           | cos | st                   | co | other O&M<br>ests - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | To   | otal O&M<br>cost     | Ne | et present<br>value |
|       | ac-ft/yr   | mgd           | operating<br>/day        | (kwh/day)          |      | (\$/day)         |     | /illion \$<br>/year) | d  | (Million \$ /year)                   | )  | (Million \$ /year)            | (    | Million \$<br>/year) |    | (\$)                |
| 201   | 5 73,000   | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 3.33                |
| 201   | 6 73,000   | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 3.17                |
| 201   | 73,000     | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 3.02                |
| 201   | 73,000     | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.88                |
| 201   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.74                |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.61                |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.49                |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.37                |
| 202   |            | 65            | 3.02                     | 117,667            | S    | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.26                |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 2.15<br>2.05        |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | \$  | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3.33                 | \$ | 1.95                |
| 202   |            | 65<br>65      | 3.02<br>3.02             | 117,667            | \$   | 8,237<br>8,237   | 5   | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | S    | 3.33                 | \$ | 1.86                |
| 202   |            | 65            | 3.02                     | 117,667<br>117,667 | S    | 8,237            | S   | 3.01                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 3,33                 | \$ | 1.77                |
| 202   |            | 65            | 3.02                     | 117,667            | \$   | 8,237            | Š   | 3.01                 | \$ | 0.23                                 | 5  | 0.100                         | \$   | 3.33                 | Š  | 1.68                |
| 203   |            | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | Š    | 4.26                 | \$ | 2.05                |
| 203   |            | 85            | 3.94                     | 153,777            | Š    | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.95                |
| 203   |            | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | S  | 0.100                         | Š    | 4.26                 | s  | 1.86                |
| 203   |            | 85            | 3.94                     | 153,777            | Š    | 10,764           | S   | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.77                |
| 203   |            | 85            | 3.94                     | 153,777            | S    | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | s    | 4.26                 | \$ | 1.68                |
| 203   |            | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.60                |
| 203   |            | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.53                |
| 203   | 95,402     | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.46                |
| 203   | 95,402     | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.39                |
| 203   | 95,402     | 85            | 3.94                     | 153,777            | \$   | 10,764           | \$  | 3.93                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.26                 | \$ | 1.32                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.39                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.33                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.26                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.20                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.15                |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72                 | \$ | 1.09<br>1.04        |
| 204   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | \$  | 4.39                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 4.72<br>4.72         | \$ | 0.99                |
| 204   |            | 95<br>95      | 4.41<br>4.41             | 171,831<br>171,831 | \$   | 12,028<br>12,028 | S   | 4.39                 | S  | 0.23                                 | S  | 0.100                         | \$   | 4.72                 | Š  | 0.94                |
| 20-   |            | 95            | 4.41                     | 171,831            | \$   | 12,028           | Š   | 4.39                 | \$ | 0.23                                 | S  | 0.100                         | s    | 4.72                 | Š  | 0.90                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | s   | 4.85                 | s  | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | Š  | 0.94                |
| 20    |            | 105           | 4.87                     | 189,886            | š    | 13,292           | Š   | 4.85                 | Š  | 0.23                                 | s  | 0.100                         | Š    | 5.18                 | Š  | 0.89                |
| 20    |            | 105           | 4.87                     | 189,886            | Š    | 13,292           | Š   | 4.85                 | Š  | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | S  | 0.85                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | s  | 0.23                                 | S  | 0.100                         | \$   | 5.18                 | \$ | 0.81                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.77                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.74                |
| 20    | 56 117,804 | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | 5  | 0.100                         | \$   | 5.18                 | \$ | 0.70                |
| 20    | 57 117,804 | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.67                |
| 20    | 58 117,804 | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.64                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.61                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.58                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ |                                      | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.55                |
| 20    |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ |                                      | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.52                |
| 200   |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.50                |
| 200   |            | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.47                |
| 200   | 35 117,804 | 105           | 4.87                     | 189,886            | \$   | 13,292           | \$  | 4.85                 | \$ | 0.23                                 | \$ | 0.100                         | \$   | 5.18                 | \$ | 0.45                |
|       |            |               |                          |                    |      |                  |     |                      |    |                                      |    | Total NPV                     | of C | D&M Costs            | \$ | 74.9                |
|       |            |               | Capital Cos              | sts in million S   | 5:   |                  |     |                      |    | Yr built                             |    |                               |      |                      |    |                     |
|       |            |               |                          | RWTM               | 2000 |                  | \$  | 70.1                 |    | 2015                                 | •  |                               |      |                      | \$ | 70.1                |
|       |            |               |                          | Pumping St         | atio | ns               | \$  | 15.7                 |    | 2015                                 |    |                               |      |                      | \$ | 15.7                |
|       |            |               |                          |                    |      |                  |     |                      |    |                                      | -  | Tatal NIDWA                   | 10-  | -11-1 0              | •  | 00.0                |

Total NPV of Capital Costs \$ 85.8

Total NPV of Capital and O&M Costs in millions \$ 160.7

## O&M Cost Calculations WTP and Raw Water Storage Reservoir at WTP CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

2015 5% 50 years \$ 0.07 per kwh

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

#### Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

|  |                | Year =               | 2015   | 2020                     | 2030                      | 2040                             | 2050                         | 2060           | 2065           |
|--|----------------|----------------------|--|--------------------------|---------------------------|----------------------------------|------------------------------|----------------|----------------|
| Softened water demand:   |                | Units                |  |                          |                           |                                  |                              |                |                |
| Softened water demand;<br>Average yearly demands:                  |                |                      |  |                          |                           |                                  |                              |                |                |
| City of Austin<br>LCRA   |                | ac-ft/yr<br>ac-ft/yr | 0  |                          | 16802<br>5600             | 22403<br>11200                   | 33604<br>11200               | 33604<br>11200 | 33604<br>11200 |
| Totals<br>Totals   |                | ac-ft/yr<br>mgd      | 0  | 0                        |                           | 33603<br>30                      | 44804<br>40                  | 44804<br>40    | 44804          |
| Max day demands:<br>City of Austin                                 |                | mgd                  | 0  |                          |                           | 35                               | 50                           | 50             | 50             |
| LCRA Totals  |                | mgd                  | 0  |                          |                           | 20                               | 20                           | 20             | 20             |
| lotais   |                | mgd                  | 0  | 0                        | 35                        | 55                               | 70                           | 70             | 70             |
|  |                | Year =               | 2015   | 2020                     | 2030                      | 2040                             | 2050                         | 2060           | 2065           |
| Non-softened water demands:<br>Average yearly demands:             |                | Units                |  |                          |                           |                                  |                              |                |                |
| SAWS   |                | ac-ft/yr             | 73000  | 205000                   |                           | 205000                           | 205000                       | 205000         | 205000         |
| SARA   |                | ac-ft/yr             | 20550  | 23406                    |                           | 31393                            | 34411                        | 37530          | 41128          |
| GBRA   | ~              | ac-ft/yr             | 0  | 0                        | 0000                      | 8000                             | 10000                        | 12300          | 12300          |
| Totals<br>Totals   |                | mgd                  | 93550<br>84                                  | 228406<br>204            |                           | 244393<br>218                    | 249411<br>223                | 254830<br>227  | 258428<br>231  |
| Max day demands:<br>SAWS   |                |                      | 85   | 238                      | 238                       | 000                              | 238                          | 238            |                |
| SARA   |                | mgd<br>mgd           | 24   | 238                      |                           | 238<br>36                        | 40                           | 238            | 238            |
| GBRA   |                | mgd                  | 0  | 0                        |                           | 7                                | 9                            | 11             | 11             |
| Totals   |                | mgd                  | 109  | 265                      |                           | 281                              | 287                          | 293            | 297            |
| Total: coffeeed and non-coffeeed western                           | r domanda      |                      |  |                          |                           |                                  |                              |                |                |
| Total: softened and non-softened water<br>Average yearly demand    | demands        | ac-ft/yr<br>mgd      | 93550<br>84                                  | 228406<br>204            |                           | 277996<br>248                    | 294215<br>263                | 299634<br>267  | 303232<br>271  |
| Max day demand   |                | mgd                  | 109  | 265                      | 311                       | 336                              | 357                          | 363            | 367            |
| Sizing for ultimate conditions:<br>Assumed number of days of conse | cutive Max Day | demands              | 30   | days                     |                           |                                  |                              |                |                |
| Design (Max. Day) treated water pro                                |                | in mgd               |  | mgd                      | (which is also a          | equal to sum of                  | ground and raw               | water that     |                |
| Average treated water production in<br>Difference (shortfall of    |                |                      |  | mgd<br>mgd               | can be pumped             | to the WTP)                      | ground und ran               | notor that     |                |
| Required storage reservoir for raw                                 |                |                      | 2,889  | mg                       |                           |                                  |                              |                |                |
| Add safety factor  | 25%            |                      | 8,868<br>2,217                               | ac-ft<br>ac-ft           |                           |                                  |                              |                |                |
| Total storage required   |                |                      | 11,084                                       | ac-ft                    |                           |                                  |                              |                |                |
| Total storage recommended  |                |                      | 12,000                                       | ac-ft                    | Note: No. of<br>(for exar | days at averag                   | e day demand<br>of RWTM A) = | 33 d           | ays            |
|  | Quantity       | Units                | Volume/each<br>(acre-feet)                   | Unit Cost<br>(\$/ac-ft)) | Total<br>Construction     | Contigency,<br>Eng., etc.        | Total Capital<br>Cost        |                |                |
| Reservoirs   | 1              | each                 | 12,000                                       | \$ 1,283                 | Cost \$ 15.4              | \$ 5.9                           | \$ 21.3                      |                |                |
| Estimated average depth of reservo<br>Surface area of reservoir    |                | 25<br>480            | ft<br>acres                                  |                          |                           |                                  |                              |                |                |
| Ratio of total land area reqd to surf                              | ace area       | 1.10                 |  |                          |                           | aeology, Surv,                   |                              |                |                |
| Total land area reqd for reservoirs                                |                | 528                  | acres  |                          | Total capital cos         | nd Land Acq =<br>t in millions = | \$ 34.5                      |                |                |
| Assumed life of reservoir  |                | 100                  | years  |                          |                           |                                  |                              |                |                |
| Estimated replacement cost<br>Estimated maintenance<br>Total       |                | \$ 0.04              | million/year<br>million/year<br>million/year | Mowing, main             | taining fences, e         | tc.                              |                              |                |                |
| Year built   |                | 2015                 |  |                          |                           |                                  |                              |                |                |
| NPV of O&M costs<br>NPV of Capital costs                           |                |                      | million<br>million                           |                          |                           |                                  |                              |                |                |
| Total NPV of Capital and O&M Cos                                   | ts             | \$ 38.0              | million                                      |                          |                           |                                  |                              |                | v.             |
|  |                |                      |  |                          |                           |                                  |                              |                |                |

#### WTP

#### Plant Phasing and Capital Costs:

| Softening Treatment Trains                                    |    |          |    |          |    |         |    |         |    |        |    |    |      |    |       |
|---|----|----------|----|----------|----|---------|----|---------|----|--------|----|----|------|----|-------|
| Year =  |    | 2015     | _  | 2020     |    | 2030    | _  | 2040    | _  | 2050   | _  | 20 |      | -  | 2065  |
| Average treated water production in mgd                       |    | 0        |    | 0        |    | 20      |    | 30      |    |        | 0  |    | 40   |    | 40    |
| Design (Max. Day) treated water production req'd in mgd       |    | 0        | )  | 0        |    | 35      |    | 55      |    | 7      | 0  |    | 70   |    | 70    |
| Initial/additional Max day capacity built (mgd)               |    | 2.       |    | 200      |    | 50      |    | 20      |    | 100    |    |    | 1000 |    | 10000 |
| Total capacity on line (must exceed Design Max Day Req'd)     |    | 0        |    | 0        |    | 50      |    | 70      |    | 7      | 0  |    | 70   |    | 70    |
| Unit cost for max day treatment capacity (\$/gpd of capacity) |    |          |    |          | \$ | 1.78    | \$ | 2.14    |    |        |    |    |      |    |       |
| Estimated construction cost of expansion in \$millions        | \$ |          | \$ | -        | \$ | 89.0    | \$ | 42.8    | \$ | -      | \$ | \$ | -    | \$ |       |
| Non-softening Treatment Trains                                |    |          |    |          |    |         |    | 1221227 |    | 12.522 |    | 22 |      |    |       |
| Year =  |    | 2015     | _  | 2020     |    | 2030    | _  | 2040    | _  | 2050   |    | 20 |      |    | 2065  |
| Average treated water production in mgd                       |    | 84       |    | 204      |    | 214     |    | 218     |    | 22     |    |    | 227  |    | 231   |
| Design (Max. Day) treated water production req'd in mgd       |    | 109      |    | 265      |    | 276     |    | 281     |    | 28     | 7  |    | 293  |    | 297   |
| Additional Max day capacity built (mgd)                       |    | 200      |    | 100      |    |         |    |         |    |        |    |    |      |    |       |
| Total capacity on line (must exceed Design Max Day Req'd)     |    | 200      |    | , 300    |    | 300     |    | 300     |    | 30     | 0  |    | 300  |    | 300   |
| Unit cost for max day treatment capacity (\$/gpd of capacity) | \$ | 1.15     | \$ | 1.32     |    |         |    |         |    |        |    |    |      |    |       |
| Estimated construction cost of expansion in \$millions        | \$ | 229.6    | \$ | 131.5    | \$ |         | \$ | -       | \$ |        | \$ | 5  | •    | \$ |       |
| Totals (Softening + Non-softening Trains)                     |    |          |    |          |    |         |    |         |    |        |    |    |      |    |       |
| Year =  |    | 2015     |    | 2020     |    | 2030    |    | 2040    |    | 2050   |    | 20 | 60   |    | 2065  |
| Total construction cost for both trains                       | S  | 229.6    | S  |          | \$ |         | \$ |         | s  | -      | 5  |    | -    | S  | -     |
| Contingencies   |    | 45.9     |    | 26.3     | •  | 17.8    | •  | 8.6     | *  |        |    |    |      | •  |       |
| Subtotal  | \$ | 275.5    | \$ |          | \$ |         | S  |         | \$ |        | -  |    |      | S  |       |
| Engineering, Legal, & Administrative                          |    | 41.3     | •  | 23.7     | -  | 16.0    | •  | 7.7     | *  |        |    |    | -    |    | -     |
| Subtotal  |    | 316.8    | -  | 181.5    |    | 122.8   | -  | 59.0    |    |        | -  | -  |      |    |       |
| Environmental & Archaelogy Studies and Mitigation & Land      |    | 010.0    |    | 101.5    |    | 122.0   |    | 55.0    |    |        |    |    |      |    |       |
| Acquisition and Surveying (see Note below)                    |    | 2.5      |    |          |    |         |    |         |    |        |    |    |      |    |       |
| Total estimated capital cost                                  | \$ | 319.3    | \$ | 181.5    | \$ | 122.8   | \$ | 59.0    | \$ | -      | 5  | 3  | -    | \$ | -     |
| NPV of capital cost   |    | \$ 319.3 |    | \$ 142.2 |    | \$ 59.1 |    | \$ 17.4 |    | \$ -   |    | \$ | ÷    |    | \$ -  |
| Total NPV of WTP initial construction & expansions            | \$ | 538      |    |          |    |         |    |         |    |        |    |    |      |    |       |
| Note: Assumed land requirement for WTP (not including reserve |    | 100      | ac | cres     |    |         |    |         |    |        |    |    |      |    |       |

| Year | Plant<br>Capacity in<br>service | treated<br>water<br>production | Est | imated C<br>unit co | -  | cost from<br>urve | N    | et present<br>value | Year | Year Plant Capacity in service Estimated treated water production Estimated O&M cost fro unit cost curve |                 | cost curve |                   | Ne   | t prese<br>value |    |      |
|------|---------------------------------|--------------------------------|-----|---------------------|----|-------------------|------|---------------------|------|--|-----------------|------------|-------------------|------|------------------|----|------|
|      | mgd of<br>capacity              | mgd<br>produced                |     | per mg<br>reated    |    | million<br>/year  | nes- | (\$)                |      | mgd of<br>capacity   | mgd<br>produced |            | per mg<br>treated | \$mi | llion /year      |    | (\$) |
| 2015 | -                               | •                              |     |                     | \$ |                   | \$   | -                   | 2015 | 200  | 84              | \$         | 374               | \$   | 11.41            | \$ | 11.  |
| 2016 | *                               |                                |     |                     | \$ | -                 | \$   |                     | 2016 | 200  | 84              | \$         | 374               | \$   | 11.41            | \$ | 10   |
| 2017 | -                               | •                              |     |                     | \$ | -                 | \$   | 106                 | 2017 | 200  | 84              | \$         | 374               | \$   | 11.41            | \$ | 10   |
| 2018 | -                               | /# S                           |     |                     | \$ | -                 | \$   |                     | 2018 | 200  | 84              | \$         | 374               | \$   | 11.41            | \$ | 9    |
| 2019 | 4                               | -                              |     |                     | \$ | -                 | \$   |                     | 2019 | 200  | 84              | \$         | 374               | \$   | 11.41            | \$ | 9    |
| 2020 | -                               | -                              |     |                     | \$ | -                 | \$   | -                   | 2020 | 300  | 204             | \$         | 343               | \$   | 25.50            | \$ | 19   |
| 2021 | -                               | -                              |     |                     | \$ |                   | \$   |                     | 2021 | 300  | 204             | \$         | 343               | \$   | 25.50            | \$ | 19   |
| 2022 |                                 | -                              |     |                     | \$ |                   | \$   | -                   | 2022 | 300  | 204             | \$         | 343               | \$   | 25.50            | \$ | 18   |
| 2023 | -                               | -                              |     |                     | S  | -                 | S    | -                   | 2023 | 300  | 204             | S          | 343               | \$   | 25.50            | S  | 17   |
| 2024 |                                 | -                              |     |                     | s  | -                 | \$   |                     | 2024 | 300  | 204             | \$         | 343               | S    | 25.50            | S  | 16   |
| 2025 | _                               |                                |     |                     | Š  |                   | Ś    |                     | 2025 | 300  | 204             | Š          | 343               | Š    | 25.50            | \$ | 15   |
| 2026 | -                               |                                |     |                     | Š  | -                 | \$   |                     | 2026 | 300  | 204             | \$         | 343               | Š    | 25.50            | Š  | 14   |
| 2020 |                                 |                                |     |                     | S  |                   | S    |                     | 2027 | 300  | 204             | \$         | 343               | Š    | 25.50            | \$ | 14   |
| 2028 | 70                              |                                |     |                     | S  | -                 | \$   |                     | 2028 | 300  | 204             | \$         | 343               | s    | 25.50            | \$ | 13   |
|      | -                               | -                              |     |                     |    | -                 |      | •                   |      |  | 204             |            |                   |      |                  |    |      |
| 2029 |                                 | -                              |     | 240                 | \$ |                   | \$   |                     | 2029 | 300  |                 | \$         | 343               | \$   | 25.50            | \$ | 12   |
| 2030 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 2.50                | 2030 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 12   |
| 2031 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 2.38                | 2031 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 12   |
| 2032 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 2.27                | 2032 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 11   |
| 2033 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 2.16                | 2033 | . 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 11   |
| 2034 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 2.06                | 2034 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 10   |
| 2035 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 1.96                | 2035 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 10   |
| 2036 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 1.87                | 2036 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 8    |
| 2037 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 1.78                | 2037 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 5    |
| 2038 | 50                              | 20                             | \$  | 712                 | \$ | 5.20              | \$   | 1.69                | 2038 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 8    |
| 2039 | 50                              | 20                             | S   | 712                 | \$ | 5.20              | \$   | 1.61                | 2039 | 300  | 214             | \$         | 343               | \$   | 26.73            | \$ | 8    |
| 2040 | 70                              | 30                             | S   | 661                 | S  | 7.24              | \$   | 2.14                | 2040 | 300  | 218             | S          | 343               | S    | 27.28            | \$ | 8    |
| 2041 | 70                              | 30                             | \$  | 661                 | 5  | 7.24              | \$   | 2.04                | 2041 | 300  | 218             | s          | 343               | s    | 27.28            | S  | 7    |
| 2042 | 70                              | 30                             | s   | 661                 | Š  | 7.24              | \$   | 1.94                | 2042 | 300  | 218             | Š          | 343               | s    | 27.28            | \$ | - 7  |
| 2043 | 70                              | 30                             | Š   | 661                 | \$ | 7.24              | \$   | 1.85                | 2043 | 300  | 218             | Š          | 343               | \$   | 27.28            | Š  | 6    |
| 2044 | 70                              | 30                             | š   | 661                 | \$ | 7.24              | \$   | 1.76                | 2044 | 300  | 218             | Š          | 343               | Š    | 27.28            | Š  | ě    |
| 2045 | 70                              | 30                             | š   | 661                 | \$ | 7.24              | \$   | 1.68                | 2045 | 300  | 218             | \$         | 343               | Š    | 27.28            | Š  | e    |
| 2045 | 70                              | 30                             | Š   | 661                 | S  | 7.24              | \$   | 1.60                | 2046 | 300  | 218             | \$         | 343               | Š    | 27.28            | Š  | è    |
| 2046 | 70                              | 30                             |     | 661                 | \$ | 7.24              | \$   | 1.52                | 2047 | 300  | 218             | \$         | 343               | \$   | 27.28            | \$ |      |
|      | 70                              | 30                             | \$  | 661                 |    | 7.24              | \$   | 1.45                |      | 300  | 218             |            | 343               | Š    | 27.28            |    |      |
| 2048 |                                 |                                | \$  |                     | \$ |                   |      |                     | 2048 |  |                 | \$         |                   |      |                  | \$ | 5    |
| 2049 | 70                              | 30                             | \$  | 661                 | \$ | 7.24              | \$   | 1.38                | 2049 | 300  | 218             | \$         | 343               | \$   | 27.28            | \$ | 5    |
| 2050 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.75                | 2050 | 300  | 223             | \$         | 343               | S    | 27.84            | \$ |      |
| 2051 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.67                | 2051 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 4    |
| 2052 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.59                | 2052 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 4    |
| 2053 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.51                | 2053 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 4    |
| 2054 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.44                | 2054 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 4    |
| 2055 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.37                | 2055 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | :    |
| 2056 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.31                | 2056 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 3    |
| 2057 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.24                | 2057 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 3    |
| 2058 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.18                | 2058 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 3    |
| 2059 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.13                | 2059 | 300  | 223             | \$         | 343               | \$   | 27.84            | \$ | 3    |
| 2060 | 70                              | 40                             | \$  | 661                 | \$ | 9.65              | \$   | 1.07                | 2060 | 300  | 227             | \$         | 343               | \$   | 28.45            | \$ | 3    |
| 2061 | . 70                            | 40                             | \$  | 661                 | s  | 9.65              | \$   | 1.02                | 2061 | 300  | 227             | \$         | 343               | \$   | 28.45            | \$ | 3    |
| 2062 | 70                              | 40                             | Š   | 661                 | \$ | 9.65              | \$   | 0.97                | 2062 | 300  | 227             | Š          | 343               | š    | 28.45            | Š  | -    |
| 2063 | 70                              | 40                             | Š   | 661                 | Š  | 9.65              | Š    | 0.93                | 2063 | 300  | 227             | š          | 343               | š    | 28.45            | S  | - 1  |
| 2064 | 70                              | 40                             | Š   | 661                 | Š  | 9.65              | Š    | 0.88                | 2064 | 300  | 227             | \$         | 343               | š    | 28.45            | Š  | 2    |
| 2065 | 70                              | 40                             | Š   | 661                 | \$ | 9.65              | Š    | 0.84                | 2065 | 300  | 231             | Š          | 343               | Š    | 28.85            | \$ | 2    |
| 2000 | , 0                             | 40                             | φ   | 001                 | 4  | 0.00              | φ    | 0.04                | 2003 | 300  | 231             | 4          | 040               | 9    | 20.00            | Ψ  | - 4  |

NPV Totals for O&M:

A:
Softening trains
Non-softening Trains
\$

Summary

Raw Water Reservoir Water Treatment Plant Totals

| PV of<br>al Costs | <br>of O&M<br>costs | Ca | al NPV of<br>oital and<br>M Costs |
|-------------------|---------------------|----|-----------------------------------|
| \$<br>34          | \$<br>3.5           | \$ | 38                                |
| \$<br>538         | \$<br>499           | \$ | 1,037                             |
| F70               | F02                 |    | 4.075                             |

# Capital and O&M Cost Calculations Potable Water Transmission Mains CTRWTP - Alternate 3A - WTP in Northern Corner of Caldwell County

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition
\$ 100,000 per mile

#### Summary of Demands

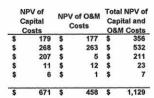
#### Average demands to be delivered in each segment

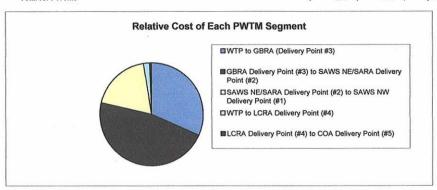
|       |                                  | in acre-reet/ye  | CII  |  |   |   |
|-------|----------------------------------|--|--|--|---|---|
| 2015  | 2020                             | 2030   | 2040   | 2050   | 2060  | 2065  |
| 43800 | 123000                           | 123000   | 123000   | 123000   | 123000  | 123000  |
| 29200 | 82000                            | 82000  | 82000  | 82000  | 82000   | 82000   |
| 73000 | 205000                           | 205000   | 205000   | 205000   | 205000  | 205000  |
| 20550 | 23406                            | 28433  | 31393  | 34411  | 37530   | 41128   |
|       |                                  | 6000   | 8000   | 10000  | 12300   | 12300   |
|       |                                  | 5600   | 11200  | 11200  | 11200   | 11200   |
|       |                                  | 16802  | 22403  | 33604  | 33604   | 33604   |
| 93550 | 228406                           | 261835   | 277996   | 294215   | 299634  | 303232  |
|       | 43800<br>29200<br>73000<br>20550 | 43800 123000<br>29200 82000<br>73000 205000<br>20550 23406 | 2015         2020         2030           43800         123000         123000           29200         82000         82000           73000         205000         205000           20550         23406         28433           6000         5600           16802 | 2015         2020         2030         2040           43800         123000         123000         123000           29200         82000         82000         82000           73000         205000         205000         205000           20550         23406         28433         31393           6000         8000         5600         11200           16802         22403 | 2015         2020         2030         2040         2050           43800         123000         123000         123000         123000           29200         82000         82000         82000         82000           73000         205000         205000         205000         205000           20550         23406         28433         31393         34411           6000         8000         10000           5600         11200         11200           16802         22403         33604 | 2015         2020         2030         2040         2050         2080           43800         123000         123000         123000         123000         123000         123000         123000         2000         820 |

#### Summary

WTP to GBRA (Delivery Point #3)
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)
SAWS NE/SARA Delivery Point (#1)
WTP to LCRA Delivery Point (#4)
LCRA Delivery Point (#4)

**Total for PWTMs** 





#### WTP to GBRA (Delivery Point #3) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

#### Demands for this pipe segment

| Year    | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 | Max d/Avg d |
|---------|------|------|------|------|------|------|------|-------------|
| GBRA    | 0    | 0    | 5    | 7    | 9    | 11   | 11   | 2.0         |
| SAWS NE | 26   | 73   | 73   | 73   | 73   | 73   | 73   | 1.3         |
| SARA    | 18   | 21   | 25   | 28   | 31   | 34   | 37   | 1.3         |
| SAWS NW | 39   | 110  | 110  | 110  | 110  | 110  | 110  | 1.3         |
| Total   | 84   | 204  | 214  | 218  | 223  | 227  | 231  |             |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |  |
| GBRA   | 0    | 0    | 11   | 14   | 18   | 22   | 22   |  |  |  |  |  |
| SAWS NE  | 34   | 95   | 95   | 95   | 95   | 95   | 95   |  |  |  |  |  |
| SARA   | 24   | 27   | 33   | 36   | 40   | 44   | 48   |  |  |  |  |  |
| SAWS NW  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |  |  |  |  |  |
| Total  | 109  | 265  | 282  | 289  | 296  | 303  | 308  |  |  |  |  |  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year   2065   308 mgd   213,603 gpm   | FWIM and Fullip Station Costs   |                       |             |       |           |       |       |                 |                          |
|--|---|-----------------------|-------------|-------|-----------|-------|-------|-----------------|--------------------------|
| Pumping capacity of one pump   21,500 gpm   10 | Design flow rate - year 2065  |                       |             |       | 308       | mgd   |       |                 |                          |
| No. of pumps (not counting spare)  |   |                       |             |       |           |       |       |                 |                          |
| Peak flow rate (all pumps except spare)   215,000 gpm  | Pumping capacity of one pump  |                       |             |       | 21,500    | gpm   |       |                 |                          |
| Total construction cost in millions  | No. of pumps (not counting spare)   |                       |             |       | 10        |       |       |                 |                          |
| Area     78.54       25  | Peak flow rate (all pumps except spare  | e)                    |             |       | 215,000   | gpm   |       |                 |                          |
| Length of PWTM   | Inside diameter of PWTM   |                       |             |       | 120       | in.   |       |                 |                          |
| Subtotal   Subtota   Sub | Area  |                       |             |       | 78.54     | sf    |       |                 |                          |
| Estimated unit cost by condition:   Sof length   LE   Unit cost   Cost   | Length of PWTM  |                       |             |       | 25        | mile  | S     | (linked to mile | eage in schematic above) |
| Rural - soil   100%   132,000   \$ 783   \$ 103.3 million  | Total Control of the | 100 - 100 - 100 - 100 | Index and a | ATT I | 132,000   | feet  | 100   |                 | •                        |
| Rural - soil   100%   132,000   783   103.3 million  | Estimated unit cost by condition:   | % of length           | LE          | 1     | Unit cost |       | Cost  |                 |                          |
| Urban - rock         0%         -         \$ 1,186         \$ -         \$ 103.3 million           Average estimated unit construction cost for PWTM         \$ 783 per LF           Total construction cost in millions         \$ 103.3 contingencies           Contingencies         \$ 20.7 subtotal           Subtotal         \$ 124.0   | Rural - soil  | 100%                  |             | \$    | 783       | \$    | 103.3 | million         |                          |
| 132,000  | Rural - rock  | 0%                    |             | \$    | 1,048     | \$    |       |                 |                          |
| Average estimated unit construction cost for PWTM \$ 783 per LF  Total construction cost in millions \$ 103.3 Contingencies \$ 20.7 Subtotal \$ 124.0  | Urban - rock  | 0%                    | on the      | \$    | 1,186     | \$    |       |                 |                          |
| Total construction cost in millions         \$ 103.3           Contingencies         \$ 20.7           Subtotal         \$ 124.0   |   |                       | 132,000     |       |           | \$    | 103.3 | million         |                          |
| Contingencies         \$ 20.7           Subtotal         \$ 124.0  | Average estimated unit construction c   | ost for PWTM          |             | \$    | 783       | per I | F     |                 |                          |
| Contingencies         \$ 20.7           Subtotal         \$ 124.0  | Total construction cost in millions   |                       |             | s     | 103.3     |       |       |                 |                          |
| Subtotal \$ 124.0  |   |                       |             | S     |           |       |       |                 |                          |
| Engineering, Legal & Administrative \$ 18.6  |   |                       |             | \$    |           | -     |       |                 |                          |
|  | Engineering, Legal & Administrative   |                       |             | \$    | 18.6      |       |       |                 |                          |

| Total construction cost in millions       |                    | \$       | 103.3   |                 |                  |                               |
|---|--------------------|----------|---------|-----------------|------------------|-------------------------------|
| Contingencies                             |                    | \$       | 20.7    |                 |                  |                               |
| Subtotal                                  |                    | \$       | 124.0   | •               |                  |                               |
| Engineering, Legal & Administrative       |                    | \$       | 18.6    |                 |                  |                               |
| Subtotal                                  |                    | \$       | 142.6   |                 |                  |                               |
| Envir & Arch Studies & Mitigation, Surve  | ying, & Land Acq   | \$       | 2.5     |                 |                  |                               |
| Total Capital Cost for PWTM               | in millions        | \$       | 145.1   |                 |                  |                               |
| Unit maintenance cost/year-mile           |                    | \$       | 10,000  | \$/year-mile    | \$ 0.250         | Million \$/year               |
| Velocity at peak flow rate                |                    |          | 6.10    | fps             |                  |                               |
| C factor                                  |                    |          | 120     |                 |                  |                               |
| Head loss per foot                        |                    |          | 0.00083 | ft/ft           | h <sub>f</sub> = | 13.552*Q 1.85                 |
|   |                    |          | 4.40    | ft/mile         | 100              | C*(d) <sup>2.63</sup>         |
|   |                    |          |         |                 |                  |                               |
| Head loss at peak flow rate               |                    |          | 110     | 100             | 700              |                               |
| Allowance for minor losses                | 20%                | -        | 22      |                 |                  | Desired HGL At Delivery Point |
| Total estimated losses                    |                    |          | 132     |                 | 200              | Elev. At WTP                  |
| Average static head                       |                    |          | 332     |                 | 200              | π                             |
| Total estimated dynamic head              |                    |          |         |                 |                  |                               |
|   |                    |          | 144     | psi             |                  |                               |
| No of recommended pumping stations a      |                    |          | 0.96    |                 | 150              | psi (assumed max pressure     |
| No. of pumping stations used in cost est  | imate              |          | 1       |                 |                  | in pipe)                      |
| Average head per pump station             |                    |          | 332     | ft              |                  |                               |
| Assumed pump efficiency                   |                    |          | 85%     |                 |                  |                               |
| Assumed motor efficiency                  |                    |          | 90%     |                 |                  |                               |
| Estimated Hp required per pump            |                    |          | 2,356   | hp/pump         |                  |                               |
|   |                    |          | 1,757   | kw/pump         |                  |                               |
| Total hp per pump station (not counting   | spare)             |          | 23,559  | firm hp/station | 6                |                               |
| Total kw per pump set (set=pumps in se    | eries along route) |          | 2,356   | kw/pump set     | (one pump at     | each station)                 |
| Unit capital cost for each pump station ( | from cost curve)   | S        | 1.047   | per firm hp of  | pump station     |                               |
| Construction cost per pump station        | v.,                | 10000000 |         | million         |                  |                               |
|   |                    |          |         |                 |                  |                               |

24.7

for \_\_\_\_\_ pump stations

Total construction cost for pump stations

Contingencies
Subtotal
Engineering, Legal & Administrative
Total capital cost for pump stations

10 million 20 years 0.49 million/year Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

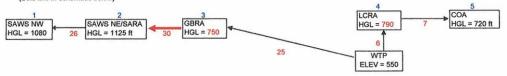
40% Estimated equipment cost as % of total

#### **O&M Costs**

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used     |     | Energ            | у со | st                   | co | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | Т    | otal O&M<br>cost      | Ne | et present<br>value |
|--------------|---|--|--------------------|-----|------------------|------|----------------------|----|------------------------------------|----|-------------------------------|------|-----------------------|----|---------------------|
|              | mgd   |  | (kwh/day)          |     | (\$/day)         |      | Million \$<br>/year) |    | (Million \$<br>/year)              | _  | (Million \$<br>/year)         |      | (Million \$<br>/year) |    | (\$)                |
| 2015         | 84  | 2.70                                       | 152,511            | \$  | 10,676           | \$   | 3.90                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 4.64                  | \$ | 4.64                |
| 2016         | 84  | 2.70                                       | 152,511            | \$  | 10,676           | \$   | 3.90                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 4.64                  | \$ | 4.42                |
| 2017         | 84  | 2.70                                       | 152,511            | \$  | 10,676           | \$   | 3.90                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 4.64                  | \$ | 4.21                |
| 2018         | 84  | 2.70                                       | 152,511            | \$  | 10,676           | \$   | 3.90                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 4.64                  | \$ | 4.01                |
| 2019         | 84  | 2.70                                       | 152,511            | \$  | 10,676           | \$   | 3.90                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 4.64                  | \$ | 3.82                |
| 2020         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26                 | \$ | 8.04                |
| 2021         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26                 | \$ | 7.65                |
| 2022         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26                 | \$ | 7.29                |
| 2023         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26                 | \$ | 6.94                |
| 2024         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26                 | \$ | 6.61                |
| 2025         | 204   | 6.59                                       | 372,362            | \$  | 26,065           | \$   | 9.51<br>9.51         | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.26<br>10.26        | 5  | 6.30                |
| 2026         | 204   | 6.59                                       | 372,362            |     | 26,065           |      |                      |    |                                    |    |                               |      |                       | \$ |                     |
| 2027<br>2028 | 204<br>204  | 6.59<br>6.59                               | 372,362<br>372,362 | \$  | 26,065           | \$   | 9.51<br>9.51         | \$ | 0.49                               | \$ | 0.250<br>0.250                | \$   | 10.26<br>10.26        | \$ | 5.71<br>5.44        |
| 2028         | 204   | 6.59                                       |                    | S   | 26,065<br>26,065 | \$   | 9.51                 | \$ | 0.49                               | S  | 0.250                         | \$   | 10.26                 | S  | 5.44                |
|              |   | 100000000000000000000000000000000000000    | 372,362            | \$  |                  | \$   | 9.51                 | \$ | 0.49                               | \$ | 0.250                         | 5    | 10.26                 | \$ | 5.15                |
| 2030         | 214<br>214  | 6.90<br>6.90                               | 390,339<br>390,339 | \$  | 27,324<br>27,324 | \$   | 9.97                 | S  | 0.49                               | \$ | 0.250                         | 5    | 10.72                 | \$ | 4.91                |
| 2032         | 214   | 6.90                                       |                    | \$  | 27,324           | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 4.68                |
| 2032         | 214   | 6.90                                       | 390,339<br>390,339 | \$  |                  | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 4.45                |
| 2034         | 214   | 6.90                                       | 390,339            | \$  | 27,324<br>27,324 | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 4.43                |
| 2034         | 214   | 6.90                                       | 390,339            | 5   | 27,324           | \$   | 9.97                 | \$ | 0.49                               | s  | 0.250                         | \$   | 10.72                 | \$ | 4.24                |
| 2035         | 214   | 6.90                                       | 390,339            | \$  | 27,324           | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 3.85                |
| 2036         | 214   | 6.90                                       | 390,339            | \$  | 27,324           | \$   | 9.97                 | Š  | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 3.66                |
| 2037         | 214   | 6.90                                       | 390,339            | \$  | 27,324           | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 3.49                |
| 2039         | 214   | 6.90                                       | 390,339            | \$  | 27,324           | \$   | 9.97                 | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.72                 | \$ | 3.49                |
| 2040         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | S    | 10.18                | Š  | 0.49                               | \$ | 0.250                         | S    | 10.72                 | S  | 3.23                |
| 2040         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | \$   | 10.18                | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.92                 | \$ | 3.23                |
| 2041         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | \$   | 10.18                | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.92                 | \$ | 2.93                |
| 2042         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | \$   | 10.18                | \$ | 0.49                               | \$ | 0.250                         | \$   | 10.92                 | \$ | 2.79                |
| 2043         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | \$   | 10.18                | \$ | 0.49                               | Š  | 0.250                         | \$   | 10.92                 | \$ | 2.65                |
| 2045         | 218   | 7.05                                       | 398,425            | Š   | 27,890           | S    | 10.18                | Š  | 0.49                               | Š  | 0.250                         | S    | 10.92                 | \$ | 2.53                |
| 2046         | 218   | 7.05                                       | 398,425            | Š   | 27,890           | \$   | 10.18                | s  | 0.49                               | Š  | 0.250                         | \$   | 10.92                 | S  | 2.41                |
| 2047         | 218   | 7.05                                       | 398,425            | Š   | 27,890           | Š    | 10.18                | Š  | 0.49                               | Š  | 0.250                         | \$   | 10.92                 | Š  | 2.29                |
| 2048         | 218   | 7.05                                       | 398,425            | \$  | 27,890           | Š    | 10.18                | Š  | 0.49                               | Š  | 0.250                         | \$   | 10.92                 | Š  | 2.18                |
| 2049         | 218   | 7.05                                       | 398,425            | Š   | 27,890           | \$   | 10.18                | Š  | 0.49                               | Š  | 0.250                         | Š    | 10.92                 | \$ | 2.08                |
| 2050         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | S  | 0.250                         | \$   | 11.13                 | \$ | 2.02                |
| 2051         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | Š  | 0.250                         | \$   | 11.13                 | \$ | 1.92                |
| 2052         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.83                |
| 2053         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.74                |
| 2054         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.66                |
| 2055         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.58                |
| 2056         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.51                |
| 2057         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.43                |
| 2058         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.37                |
| 2059         | 223   | 7.19                                       | 406,605            | \$  | 28,462           | \$   | 10.39                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.13                 | \$ | 1.30                |
| 2060         | 227   | 7.35                                       | 415,440            | \$  | 29,081           | \$   | 10.61                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.36                 | \$ | 1.26                |
| 2061         | 227   | 7.35                                       | 415,440            | \$  | 29,081           | \$   | 10.61                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.36                 | \$ | 1.20                |
| 2062         | 227   | 7.35                                       | 415,440            | \$  | 29,081           | \$   | 10.61                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.36                 | \$ | 1.15                |
| 2063         | 227   | 7.35                                       | 415,440            | \$  | 29,081           | \$   | 10.61                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.36                 | \$ | 1.09                |
| 2064         | 227   | 7.35                                       | 415,440            | \$  | 29,081           | \$   | 10.61                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.36                 | \$ | 1.04                |
| 2065         | 231   | 7.45                                       | 421,305            | \$  | 29,491           | \$   | 10.76                | \$ | 0.49                               | \$ | 0.250                         | \$   | 11.51                 | \$ | 1.00                |
|              |   |  |                    |     |                  |      |                      |    |                                    |    | Total NPV                     | of ( | O&M Costs             | \$ | 177                 |
|              |   | Capital Costs                              | in million \$:     |     |                  |      |                      |    | Yr built                           |    |                               |      |                       |    |                     |
|              |   |  | PWTM               |     |                  | \$   | 145                  | -  | 2015                               | 9  |                               |      |                       | \$ | 145                 |
|              |   |  | Pumping Stat       | ion | S                | \$   | 34                   |    | 2015                               |    |                               |      |                       | \$ | 34                  |
|              |   |  |                    |     | 777              | 17.  |                      |    |                                    | -  | C-1-1 NIDA / -                | 10   | apital Costs          | 8  | 179                 |

Total NPV of Capital and O&M Costs in millions \$ WTP to GBRA (Delivery Point #3)

## GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

#### Demands for this pipe segment

| D |  |  |  |
|---|--|--|--|
|   |  |  |  |
|   |  |  |  |

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |
|--|------|------|------|------|------|------|------|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
| SAWS NE  | 26   | 73   | 73   | 73   | 73   | 73   | 73   |
| SARA   | 18   | 21   | 25   | 28   | 31   | 34   | 37   |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |
| Total  | 84   | 204  | 208  | 211  | 214  | 217  | 220  |

| Max d/Avg d |
|-------------|
| 1.3         |
| 1.3         |
| 1.3         |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |
|--|------|------|------|------|------|------|------|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
| SAWS NE  | 34   | 95   | 95   | 95   | 95   | 95   | 95   |
| SARA   | 24   | 27   | 33   | 36   | 40   | 44   | 48   |
| SAWS NW  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |
| Total  | 109  | 265  | 271  | 274  | 278  | 281  | 286  |

#### **PWTM and Pump Station Costs**

|   | 158,400 | feet  |
|---|---------|-------|
| Length of PWTM                          |         | miles |
| Area                                    | 78.54   | sf    |
| Inside diameter of PWTM                 | 120     | in.   |
| Peak flow rate (all pumps except spare) | 200,000 | gpm   |
| No. of pumps (not counting spare)       | 10      |       |
| Pumping capacity of one pump            | 20,000  | gpm   |
|   | 198,353 | gpm   |
| Design flow rate - year 2065            | 286     | mgd   |

(linked to mileage in schematic above)

| Estimated unit cost by condition: | % of length | LF      | U    | nit cost | Cost        |         |
|-----------------------------------|-------------|---------|------|----------|-------------|---------|
| Rural - soil                      | 50%         | 79,200  | \$   | 783      | \$<br>62.0  | million |
| Rural - rock                      | 25%         | 39,600  | \$   | 1,048    | \$<br>41.5  |         |
| Urban - rock                      | 25%         | 39,600  | \$   | 1,186    | \$<br>46.9  |         |
|                                   |             | 158,400 | 1000 |          | \$<br>150.5 | million |

| Total construction cost in millions                      | \$<br>150.5 |
|--|-------------|
| Contingencies  | \$<br>30.1  |
| Subtotal   | \$<br>180.6 |
| Engineering, Legal & Administrative                      | \$<br>27.1  |
| Subtotal   | \$<br>207.6 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>3.0   |
| Total Capital Cost for PWTM in millions                  | \$<br>210.6 |

| Total Capital Cost for F VV III III IIIIIIOIla | •  | 210.0       |                  |   |
|--|----|-------------|------------------|---|
| Unit maintenance cost/year-mile                | \$ | 10,000      | \$/year-mile     | \$<br>0.300 Million \$/year                   |
| Velocity at peak flow rate<br>C factor         |    | 5.67<br>120 | fps              |   |
| Head loss per foot                             |    | 0.00073     | ft/ft<br>ft/mile | $h_{i}=  3.552*Q ^{1.85}$<br>$ C*(d)^{2.63} $ |
|  |    | 5.05        | TOTTING          | 1 C-(a) 1                                     |

| Head loss at peak flow rate  |     | 115 ft |                                    |
|------------------------------|-----|--------|------------------------------------|
| Allowance for minor losses   | 20% | 23 ft  | 1125 Desired HGL At Delivery Point |
| Total estimated losses       |     | 139 ft | 750 HGL At Delivery Point 3        |
| Average static head          |     | 375 ft | 375 ft                             |
| Total estimated dynamic head |     | 514 ft |                                    |

| Total estimated dynamic head                   | 514 ft  |                               |
|--|---------|-------------------------------|
|  | 223 psi |                               |
| No of recommended pumping stations along route | 1.48    | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 2       | in pipe)                      |
| Average head per pump station                  | 257 ft  |                               |
| Assumed pump efficiency                        | 85%     |                               |
| Assumed motor efficiency                       | 90%     |                               |

| Assumed motor efficiency                       | 90%    | i e             |
|--|--------|-----------------|
| Estimated Hp required per pump                 | 1,695  | hp/pump         |
|  | 1,265  | kw/pump         |
| Total hp per pump station (not counting spare) | 16,951 | firm hp/station |
|  |        |                 |

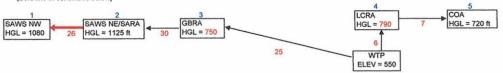
| Total kw per pump station (not counting spare)  Total kw per pump set (set=pumps in series along route) | 3,390 kw/pump set (one pump at each station)         |
|---|--|
| Unit construction cost for each pump station (from cost curve) Construction cost per pump station       | \$ 1,127 per firm hp of pump station<br>19.1 million |

| Total construction cost for pump stations | 38.2 | for | 2 | pump stations |
|---|------|-----|---|---------------|
|   |      |     |   |               |

| Contingen    | Subtotal<br>ng, Legal & Adm       | inistrative           | ations in millio     | ns  | ,                | \$<br>\$<br>\$ | 7.6<br>45.9<br>6.9<br>52.7 | mill | ion                    |    |                 |      |                |      |                |
|--------------|-----------------------------------|-----------------------|----------------------|-----|------------------|----------------|----------------------------|------|------------------------|----|-----------------|------|----------------|------|----------------|
|              |                                   | 381 (8                |                      |     |                  |                |                            |      |                        |    | 40%             | Equ  | ip cost as     | % of | constr cost    |
|              | Value of equip<br>Assumed life of |                       |                      |     |                  | \$             | 15                         | mill |                        |    |                 |      |                |      |                |
|              | Estimated mai                     |                       | cement cost          |     |                  | \$             | 0.76                       | mill | ion/year               |    |                 |      |                |      |                |
| O&M Cos      | ts                                |                       |                      |     |                  |                |                            |      |                        |    |                 |      |                |      |                |
|              | Flow pumped                       |                       |                      |     |                  |                |                            |      |                        |    |                 |      |                |      |                |
|              | by year                           | No. of pump<br>"sets" | Energy               |     | _                |                |                            |      | ther O&M               |    | intenance       | Т    | otal O&M       | Ne   | t present      |
| Year         | (average                          | operating             | used                 |     | Energ            | y cos          | st                         |      | sts - Pump<br>Stations | (  | costs -<br>PWTM |      | cost           |      | value          |
|              | flows from<br>Table above)        | /day                  |                      |     |                  |                |                            | 35   | Stations               |    | PAALIAI         |      |                |      |                |
|              |                                   |                       | 0                    |     | (014)            | (1)            | Million \$                 | (    | Million \$             | (  | Million \$      | (    | Million \$     |      | (6)            |
|              | mgd                               |                       | (kwh/day)            |     | (\$/day)         |                | /year)                     |      | /year)                 | _  | /year)          | -    | /year)         | _    | (\$)           |
| 2015<br>2016 | 84<br>84                          | 2.90<br>2.90          | 235,928<br>235,928   | \$  | 16,515<br>16,515 | \$             | 6.03                       | \$   | 0.76<br>0.76           | \$ | 0.300           | \$   | 7.09<br>7.09   | \$   | 7.09<br>6.75   |
| 2017         | 84                                | 2.90                  | 235,928              | \$  | 16,515           | \$             | 6.03                       | \$   | 0.76                   | \$ | 0.300           | \$   | 7.09           | \$   | 6.43           |
| 2018         | 84                                | 2.90                  | 235,928              | \$  | 16,515           | \$             | 6.03                       | \$   | 0.76                   | \$ | 0.300           | \$   | 7.09           | \$   | 6.13           |
| 2019         | 84                                | 2.90                  | 235,928              | \$  | 16,515           | \$             | 6.03                       | \$   | 0.76                   | \$ | 0.300           | \$   | 7.09           | \$   | 5.83           |
| 2020         | 204                               | 7.08                  | 576,028              | \$  | 40,322           | \$             | 14.72                      | \$   | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 12.37<br>11.78 |
| 2021<br>2022 | 204<br>204                        | 7.08<br>7.08          | 576,028<br>576,028   | \$  | 40,322<br>40,322 | \$             | 14.72<br>14.72             | \$   | 0.76<br>0.76           | S  | 0.300           | \$   | 15.78<br>15.78 | \$   | 11.76          |
| 2022         | 204                               | 7.08                  | 576,028              | \$  | 40,322           | \$             | 14.72                      | Š    | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 10.68          |
| 2024         | 204                               | 7.08                  | 576,028              | \$  | 40,322           | \$             | 14.72                      | \$   | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 10.17          |
| 2025         | 204                               | 7.08                  | 576,028              | \$  | 40,322           | \$             | 14.72                      | \$   | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 9.69           |
| 2026         | 204                               | 7.08                  | 576,028              | \$  | 40,322           | \$             | 14.72                      | \$   | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 9.23           |
| 2027         | 204<br>204                        | 7.08<br>7.08          | 576,028              | \$  | 40,322<br>40,322 | \$             | 14.72<br>14.72             | \$   | 0.76<br>0.76           | \$ | 0.300           | \$   | 15.78<br>15.78 | \$   | 8.79<br>8.37   |
| 2028<br>2029 | 204                               | 7.08                  | 576,028<br>576,028   | \$  | 40,322           | \$             | 14.72                      | \$   | 0.76                   | \$ | 0.300           | \$   | 15.78          | \$   | 7.97           |
| 2030         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | S              | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 7.75           |
| 2031         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 7.38           |
| 2032         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 7.03           |
| 2033         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 6.69           |
| 2034<br>2035 | 208<br>208                        | 7.24<br>7.24          | 588,706<br>588,706   | \$  | 41,209<br>41,209 | \$             | 15.04<br>15.04             | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11<br>16.11 | \$   | 6.37<br>6.07   |
| 2035         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | S    | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 5.78           |
| 2037         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | Š              | 15.04                      | S    | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 5.51           |
| 2038         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 5.24           |
| 2039         | 208                               | 7.24                  | 588,706              | \$  | 41,209           | \$             | 15.04                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.11          | \$   | 4.99           |
| 2040         | 211                               | 7.33                  | 596,171              | \$  | 41,732           | \$             | 15.23<br>15.23             | \$   | 0.76<br>0.76           | \$ | 0.300           | \$   | 16.30<br>16.30 | \$   | 4.81<br>4.58   |
| 2041<br>2042 | 211<br>211                        | 7.33<br>7.33          | 596,171<br>596,171   | \$  | 41,732<br>41,732 | \$             | 15.23                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.30          | \$   | 4.36           |
| 2042         | 211                               | 7.33                  | 596,171              | \$  | 41,732           | \$             | 15.23                      | Š    | 0.76                   | Š  | 0.300           | \$   | 16.30          | \$   | 4.16           |
| 2044         | 211                               | 7.33                  | 596,171              | \$  | 41,732           | \$             | 15.23                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.30          | \$   | 3.96           |
| 2045         | 211                               | 7.33                  | 596,171              | \$  | 41,732           | \$             | 15.23                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.30          | \$   | 3.77           |
| 2046         | 211                               | 7.33                  | 596,171              | \$  | 41,732           | \$             | 15.23                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.30          | \$   | 3.59<br>3.42   |
| 2047<br>2048 | 211<br>211                        | 7.33<br>7.33          | 596,171<br>596,171   | \$  | 41,732<br>41,732 | \$             | 15.23<br>15.23             | \$   | 0.76<br>0.76           | \$ | 0.300           | \$   | 16.30<br>16.30 | \$   | 3.42           |
| 2049         | 211                               | 7.33                  | 596,171              | S   | 41,732           | S              | 15.23                      | \$   | 0.76                   | Š  | 0.300           | \$   | 16.30          | \$   | 3.10           |
| 2050         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.99           |
| 2051         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.85           |
| 2052         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.71           |
| 2053         | 214<br>214                        | 7.42<br>7.42          | 603,782              | \$  | 42,265           | \$             | 15.43<br>15.43             | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49<br>16.49 | \$   | 2.58           |
| 2054<br>2055 | 214                               | 7.42                  | 603,782<br>603,782   | \$  | 42,265<br>42,265 | S              | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.40           |
| 2056         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.23           |
| 2057         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.12           |
| 2058         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.49          | \$   | 2.02           |
| 2059         | 214                               | 7.42                  | 603,782              | \$  | 42,265           | \$             | 15.43                      | \$   | 0.76<br>0.76           | \$ | 0.300           | \$   | 16.49<br>16.69 | \$   | 1.93<br>1.86   |
| 2060<br>2061 | 217<br>217                        | 7.52<br>7.52          | 611,648<br>611,648   | \$  | 42,815<br>42,815 | \$             | 15.63<br>15.63             | \$   | 0.76                   | \$ | 0.300           | \$   | 16.69          | \$   | 1.77           |
| 2062         | 217                               | 7.52                  | 611,648              | \$  | 42,815           | \$             | 15.63                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.69          | \$   | 1.69           |
| 2063         | 217                               | 7.52                  | 611,648              | \$  | 42,815           | \$             | 15.63                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.69          | \$   | 1.60           |
| 2064         | 217                               | 7.52                  | 611,648              | \$  | 42,815           | \$             | 15.63                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.69          | \$   | 1.53           |
| 2065         | 220                               | 7.63                  | 620,722              | \$  | 43,451           | \$             | 15.86                      | \$   | 0.76                   | \$ | 0.300           | \$   | 16.92          | \$   | 1.48           |
|              |                                   |                       |                      |     |                  |                |                            |      |                        |    | Total NPV       | of C | 0&M Costs      | \$   | 268.5          |
|              |                                   | Capital Costs         |                      |     |                  | s              | 210.6                      | -    | Yr built<br>2015       |    |                 |      |                | s    | 210.6          |
|              |                                   |                       | PWTM<br>Pumping Stat | ion | s                | \$             | 52.7                       |      | 2015                   |    |                 |      |                | \$   | 52.7           |
|              |                                   |                       | pang otal            |     | 70               | *              | V                          |      |                        | T  | otal NPV o      | f Ca | pital Costs    | \$   | 263.4          |
|              |                                   |                       |                      |     |                  |                |                            |      |                        |    |                 |      |                |      |                |

Total NPV of Capital and O&M Costs in millions \$ 532
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)

## SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

#### Demands for this pipe segment

Demands

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |
|--|------|------|------|------|------|------|------|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |
| Total -  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |

Max d/Avg d

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |
|--|------|------|------|------|------|------|------|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
| SAWS NW  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |  |  |
| Total  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |  |  |

#### PWTM and Pump Station Costs

| Design flow rate - year 2065   | 143     | mgd   |
|--|---------|-------|
| And the state of t | 99,125  | gpm   |
| Pumping capacity of one pump   | 20,000  | gpm   |
| No. of pumps (not counting spare)  | 5       |       |
| Peak flow rate (all pumps except spare)  | 100,000 | gpm   |
| Inside diameter of PWTM  | 120     | in.   |
| Area   | 78.54   | sf    |
| Length of RWTM   | 26      | miles |
|  |         |       |

26 miles 137,280 feet (linked to mileage in schematic above)

| Estimated unit cost by condition: | % of length | LE      | U  | nit cost |    | Cost  |         |
|-----------------------------------|-------------|---------|----|----------|----|-------|---------|
| Rural - soil                      | 15%         | 20,592  | \$ | 783      | \$ | 16.1  | million |
| Rural - rock                      | 35%         | 48,048  | \$ | 1,048    | \$ | 50.4  |         |
| Urban - rock                      | 50%         | 68,640  | \$ | 1,186    | \$ | 81.4  |         |
|                                   |             | 137,280 |    |          | S  | 147.9 | million |

| Total construction cost in millions                      | \$<br>147.9 |
|--|-------------|
| Contingencies  | \$<br>29.6  |
| Subtotal   | \$<br>177.4 |
| Engineering, Legal & Administrative                      | \$<br>26.6  |
| Subtotal   | \$<br>204.1 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>2.6   |
| Total Capital Cost for PWTM in millions                  | \$<br>206.7 |

|                                 | 19000190001  |              |             |                 |
|---------------------------------|--------------|--------------|-------------|-----------------|
| Unit maintenance cost/year-mile | \$<br>10,000 | \$/year-mile | \$<br>0.260 | Million \$/year |
| Valority at peak flow rate      | 2 84         | foe          |             |                 |

| Velocity at peak flow rate<br>C factor |     | 2.84    | fps     |   |
|--|-----|---------|---------|---|
| Head loss per foot                     |     | 0.00020 | ft/ft   | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |
|  |     | 1.07    | ft/mile | C*(d) <sup>2.63</sup>                       |
| Head loss at peak flow rate            |     | 28      | ft      |   |
| Allowance for minor losses             | 20% | 6       | ft      | 1080 Desired HGL At Delivery Point          |
| Total estimated losses                 |     | 33      | ft      | 1125 HGL At Delivery Point 2                |
| Average static head                    |     | -45     | ft      | -45 ft                                      |
| Total estimated dynamic head           |     | -12     | ft      |   |

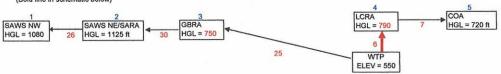
Negative indicates gravity flow from #2 to #1; no pumping necessary.

-5 psi

|               |                                |    |       |          |                            | M          | fillion \$ |
|---------------|--------------------------------|----|-------|----------|----------------------------|------------|------------|
| Annual O&M    | Annual O&M Cost in million \$: |    |       | Yr built |                            | M. Contain |            |
|               | PWTM                           | \$ | 0.260 | 2015     | -                          |            |            |
|               |                                |    |       |          | Total NPV of O&M Costs     |            | \$4.7      |
| Capital Costs | in million \$:                 |    |       | Yr built |                            |            |            |
|               | PWTM                           | \$ | 206.7 | 2015     | -                          | \$         | 206.7      |
|               |                                |    |       |          | Total NPV of Capital Costs | \$         | 206.7      |

Total NPV of Capital and O&M Costs in millions \$
SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)

## WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

0.060 Million \$/year

## Demands for this pipe segment Demands

| Year  | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 | Max d/Avg d |
|-------|------|------|------|------|------|------|------|-------------|
| LCRA  | 0    | 0    | 5    | 10   | 10   | 10   | 10   | 2.0         |
| COA   | 0    | 0    | 15   | 20   | 30   | 30   | 30   | 1.68        |
| Total | 0    | 0    | 20   | 30   | 40   | 40   | 40   |             |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |
|--|------|------|------|------|------|------|------|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
| LCRA   | 0    | 0    | 10   | 20   | 20   | 20   | 20   |  |  |
| COA  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |
| Total  | 0    | 0    | 35   | 54   | 70   | 70   | 70   |  |  |

#### **PWTM and Pump Station Costs**

Unit maintenance cost/year-mile

Velocity at peak flow rate

| Design flow rate - year 2065            | 70     | mgd   |  |
|---|--------|-------|--|
|   | 48,883 | gpm   |  |
| Pumping capacity of one pump            | 10,000 | gpm   |  |
| No. of pumps (not counting spare)       | 5      |       |  |
| Peak flow rate (all pumps except spare) | 50,000 | gpm   |  |
| Inside diameter of PWTM                 | 60     | in.   |  |
| Area                                    | 19.64  | sf    |  |
| Length of RWTM                          | 6      | miles | (linked to mileage in schematic above) |
| 2                                       | 31,680 | feet  |  |
|   |        |       | Divining had been brooked              |

| Estimated unit cost by condition:   | % of length   | LF     | Un | it cost | Co     | st  |         |
|-------------------------------------|---------------|--------|----|---------|--------|-----|---------|
| Rural - soil                        | 100%          | 31,680 | \$ | 282     | \$     | 8.9 | million |
| Rural - rock                        | 0%            |        | \$ | 388     | \$     | 1   |         |
| Urban - rock                        | 0%            |        | \$ | 427     | \$     |     |         |
|                                     |               | 31,680 |    |         | \$     | 8.9 | million |
| Average estimated unit construction | cost for PWTM |        | s  | 282     | per LF |     |         |
|                                     |               |        |    |         |        |     |         |

| Total construction cost in millions                      | \$<br>8.9  |
|--|------------|
| Contingencies  | \$<br>1.8  |
| Subtotal   | \$<br>10.7 |
| Engineering, Legal & Administrative                      | \$<br>1.6  |
| Subtotal   | \$<br>12.3 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.6  |
| Total Capital Cost for PWTM in millions                  | \$<br>12.9 |

| C factor   |     | 120     |         |                  |                               |
|--|-----|---------|---------|------------------|-------------------------------|
| Head loss per foot   |     | 0.00163 | ft/ft   | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>      |
|  |     | 8.63    | ft/mile |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate  |     | 52      | ft      |                  |                               |
| Allowance for minor losses   | 20% | 10      | ft      | 790              | Desired HGL At Delivery Point |
| Total estimated losses   |     | 62      | ft      | 550              | Elev. At WTP                  |
| Average static head  |     | 240     | ft      | 240              | ft                            |
| Total estimated dynamic head   |     | 302     | ft      |                  |                               |
| The state of the s |     | 131     | psi     |                  |                               |

10,000 \$/year-mile

5.67 fps

| 302   | ft   |  |
|-------|--|--|
| 131   | psi  |  |
| 0.87  |  | 150 psi (assumed max pressure  |
| 1     |  | in pipe)   |
| 302   | ft   |  |
| 85%   |  |  |
| 90%   |  |  |
| 997   | hp/pump  |  |
| 744   | kw/pump  |  |
| 4,987 | firm hp/station  | ı.   |
| 997   | kw/pump set  | (one pump at each station)   |
|       | 131<br>0.87<br>1<br>302<br>85%<br>90%<br>997<br>744<br>4,987 | 1<br>302 ft<br>85%<br>90%<br>997 hp/pump<br>744 kw/pump<br>4,987 firm hp/station |

| Unit construction cost for each pump station (from cost curve) | S | 1,426 | per firm hp of pump station |
|--|---|-------|-----------------------------|
| Construction cost per pump station                             |   | 7.1   | million                     |

| Construction cost per pump station        | 7.1 Itimilo |     |   |               |
|---|-------------|-----|---|---------------|
| Total construction cost for pump stations | 7.1         | for | 1 | pump stations |
| Contingencies                             | \$<br>1.4   |     |   |               |
| Subtotal                                  | \$<br>8.5   |     |   |               |
| Engineering, Legal & Administrative       | \$<br>1.3   |     |   |               |
|   |             |     |   |               |

9.8 million Total capital cost for pump stations \$ 40% Equip cost as % of constr cost 2.8 million 20 years 0.14 million/year

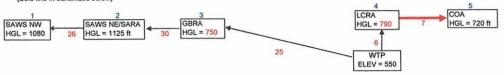
Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

#### O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day   | Energy<br>used |      | Energ    | gy c | cost                  |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM |      | tal O&M<br>cost      | Ne  | et prese<br>value |
|------|---|--|----------------|------|----------|------|-----------------------|----|--------------------------------------|----|-------------------------------|------|----------------------|-----|-------------------|
|      | mgd   |  | (kwh/day)      |      | (\$/day) |      | (Million \$<br>/year) |    | (Million \$<br>/year)                | (  | (Million \$                   |      | tillion \$<br>(year) |     | (\$)              |
| 2015 |   |  |                | -    |          |      |                       |    | 114411                               | -  | ///                           | \$   | -                    | \$  | -                 |
| 2016 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | 2                    | \$  | -                 |
| 2017 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                    | \$  |                   |
| 2018 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                    | \$  | -                 |
| 2019 |   |  |                |      |          |      |                       |    |                                      |    |                               | s    | 2                    | \$  |                   |
| 2020 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                      | \$  | -                 |
| 2021 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                    | \$  | -                 |
| 2022 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | 2                    | \$  | 12                |
| 2023 |   |  |                |      |          |      |                       |    |                                      |    |                               | Š    | - 9                  | \$  |                   |
| 2023 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | - 1                  | Š   | - 7               |
| 2025 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                      | \$  | -                 |
|      |   |  |                |      |          |      |                       |    |                                      |    |                               |      | -                    | \$  |                   |
| 2026 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                      | 200 |                   |
| 2027 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                      | \$  | -                 |
| 2028 |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | - 2                  | \$  | -                 |
| 2029 |   |  |                |      |          | 100  |                       |    |                                      |    |                               | \$   |                      | \$  |                   |
| 2030 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.                |
| 2031 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.4               |
| 2032 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.4               |
| 2033 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | S    | 1.05                 | \$  | 0.                |
| 2034 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.4               |
| 2035 | 20  | 1.39   | 33,241         | 5    | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.4               |
| 2036 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.3               |
| 2037 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.3               |
| 2038 | 20  | 1.39   | 33,241         | \$   | 2,327    | \$   | 0.85                  | s  | 0.14                                 | \$ | 0.060                         | \$   | 1.05                 | \$  | 0.                |
| 2039 | 20  | 1.39   | 33,241         | Š    | 2,327    | S    | 0.85                  | Š  | 0.14                                 | Š  | 0.060                         | S    | 1.05                 | \$  | 0.3               |
| 2040 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | Š  | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.4               |
| 2040 | 30  | 2.08   | 49,862         | S    | 3,490    | S    | 1.27                  | \$ | 0.14                                 | S  | 0.060                         | \$   | 1.48                 | s   | 0.4               |
| 2042 | 30  | 2.08   | 49,862         | Š    | 3,490    | Š    | 1.27                  | Š  | 0.14                                 | Š  | 0.060                         | S    | 1.48                 | \$  | 0.4               |
| 2042 | 30  | 2.08   |                | \$   |          | \$   |                       | S  |                                      | S  |                               | \$   |                      | \$  | 0.                |
|      |   | P. T. C. | 49,862         |      | 3,490    | -    | 1.27                  |    | 0.14                                 |    | 0.060                         |      | 1.48                 |     |                   |
| 2044 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.3               |
| 2045 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.3               |
| 2046 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.                |
| 2047 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.                |
| 2048 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.                |
| 2049 | 30  | 2.08   | 49,862         | \$   | 3,490    | \$   | 1.27                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.48                 | \$  | 0.                |
| 2050 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2051 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2052 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2053 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2054 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2055 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | S    | 1.90                 | \$  | 0.                |
| 2056 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | s    | 1.90                 | \$  | 0.                |
| 2057 | 40  | 2.78   | 66,483         | s    | 4,654    | s    | 1.70                  | Š  | 0.14                                 | Š  | 0.060                         | Š    | 1.90                 | s   | 0.                |
| 2058 | 40  | 2.78   | 66,483         | Š    | 4,654    | \$   | 1.70                  | š  | 0.14                                 | š  | 0.060                         | š    | 1.90                 | Š   | 0.                |
| 2059 | 40  | 2.78   | 66,483         | Š    | 4,654    | \$   | 1.70                  | Š  | 0.14                                 | Š  | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2060 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | 5  | 0.060                         | \$   | 1.90                 | S   | 0.                |
|      |   |  |                |      |          |      |                       |    |                                      |    |                               |      |                      |     |                   |
| 2061 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2062 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2063 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2064 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
| 2065 | 40  | 2.78   | 66,483         | \$   | 4,654    | \$   | 1.70                  | \$ | 0.14                                 | \$ | 0.060                         | \$   | 1.90                 | \$  | 0.                |
|      |   |  |                |      |          |      |                       |    |                                      |    | Total NPV                     | of O | RM Costs             | \$  | 11                |
|      |   | Capital Costs                                | in million \$: |      |          |      |                       |    | Yr built                             |    |                               |      |                      |     |                   |
|      |   |  | PWTM           |      |          | \$   | 12.9                  | -  | 2030                                 |    |                               |      |                      | \$  | 6                 |
|      |   |  | Pumping Stati  | ions |          | s    | 9.8                   |    | 2030                                 |    |                               |      |                      | s   | - 4               |
|      |   |  | A orati        |      |          |      |                       |    |                                      |    |                               |      |                      | *   |                   |

Total NPV of Capital and O&M Costs in millions \$
WTP to LCRA Delivery Point (#4) 23

#### LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

#### Demands for this pipe segment

Demand:

|         |      | Average dem | ands to be deli | vered in each s | segment in mgd | 1    |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| COA     | 0    | 0           | 15              | 20              | 30             | 30   | 30   |
| Total - | 0    | 0           | 15              | 20              | 30             | 30   | 30   |

Max d/Avg d 1.68

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |
|--|------|------|------|------|------|------|------|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
| COA  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |
| Total -  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |

#### **PWTM and Pump Station Costs**

Unit maintenance cost/year-mile

| stimated unit cost by condition: | % of length | LF     | Un             | it cost | Cost      |         |
|----------------------------------|-------------|--------|----------------|---------|-----------|---------|
| Rural - soil                     | 100%        | 36,960 | \$             | 244     | \$<br>9.0 | million |
| Rural - rock                     | 0%          |        | \$             | 337     | \$<br>-   |         |
| Urban - rock                     | 0%          |        | \$             | 369     | \$        |         |
|                                  |             | 36,960 | <b>EXECUTE</b> |         | \$<br>9.0 | million |

| Total construction cost in millions                      | \$<br>9.0  |
|--|------------|
| Contingencies  | \$<br>1.8  |
| Subtotal   | \$<br>10.8 |
| Engineering, Legal & Administrative                      | \$<br>1.6  |
| Subtotal   | \$<br>12.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.0  |
| Total Capital Cost for PWTM in millions                  | \$<br>12.4 |

| Velocity at peak flow rate  |     | 4.90    | fps     |                       |
|-----------------------------|-----|---------|---------|-----------------------|
| C factor                    |     | 120     |         |                       |
| Head loss per foot          |     | 0.00141 | ft/ft   | hr= 13.552*Q11.85     |
|                             |     | 7.45    | ft/mile | C*(d) <sup>2.63</sup> |
| Head loss at peak flow rate |     | 52      | ft      |                       |
| Allowance for minor losses  | 20% | 10      | ft      | 720 Desired HGL At    |
| Total estimated losses      |     | 63      | ft      | 790 Elev. At Deliver  |

Total estimated losses
Average static head
Total estimated dynamic head

10 ft 720 Desired HGL At Delivery Point 63 ft 790 Elev. At Delivery Point 4 790 Elev. At Delivery Point 4 790 ft 790 ft 790 ft

Negative indicates gravity flow from #4 to #5; no pumping necessary.

|                              |       |       |          |                            | Mi | llion \$ |
|------------------------------|-------|-------|----------|----------------------------|----|----------|
| Annual O&M Cost in million   | n \$: |       | Yr built |                            |    |          |
| PWTM                         | S     | 0.070 | 2030     | -                          |    |          |
|                              | 1000  |       |          | Total NPV of O&M Costs     |    | \$0.6    |
| Capital Costs in million \$: |       |       | Yr built |                            |    |          |
| PWTM                         | \$    | 12.4  | 2030     | -                          | \$ | 6.0      |
|                              |       |       |          | Total NPV of Capital Costs | \$ | 6.0      |

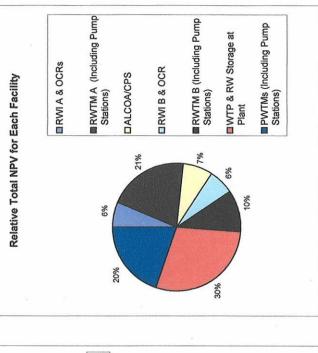
10,000 \$/year-mile

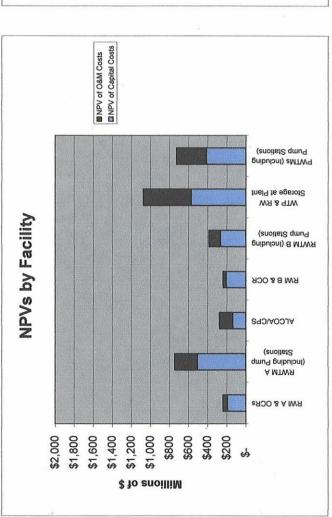
Total NPV of Capital and O&M Costs in millions \$ 6.5 LCRA Delivery Point (#4) to COA Delivery Point (#5)

0.070 Million \$/year

CTRWTP - Alternate 1B - WTP East of San Antonio

| Phasing Scenario Total NPVs in RWI A & OCRs Pump Stations)  RWTM A (Including Pump Stations)  RWTM A (Including Pump Stations)  Sized for 4000 cfs diameter pipe sized to scalp water, 4 deliver 132,000 acroscopinals via 2020.  Intakes, 4 miles of 96-inch acrominous in 2020.  Intakes, 4 miles of 96-inch acrominous stations wiles of 120-inch raw water passis; includes 3 mains & 4 OCRs at pumping stations wiles of 25,000 acrit each balancing reservoirs along route along route along route stations and 25,000 acrit each along route al | Millions of \$  Sized for 4000 cfs di to scalp water, 4 di trakes, 4 miles of ft 120-inch raw water be mains & 4 OCRs at plot 25,000 ac-ft each be 25,000 ac-ft each all states at 1,397 \$ 191 \$ |
|--|--|
| 3.682  | 3.682  |
| \$ 2.286<br>\$ 1,397<br>\$ 3,682   | RWTM B & ALCOA/CPS built by 2015; RWTM A built in 2020.  NPV of Capital Costs \$ 2,286  NPV of Capital & \$ 1,397  Total NPV of Capital & 0&M \$ 3,682   |
|  | Phasing Scenario  RWTM B & ALCOA/CPS built by 2015; RWTM A built in 2020.  NPV of Capital Costs  NPV of Capital & O&M  Total NPV of Capital & O&M  |
| Phasing Scenario RWTM B & ALCOA/CPS built by 2015; RWTM A built in 2020.  NPV of Capital Costs NPV of Capital & O&M Total NPV of Capital & O&M   | Pha RWTM built by 2 N  |
|  | Arier-nate   |





#### O&M Cost Calculations RWI A - Matagorda Co. River Intakes, and Storage CTRWTP

| CTRWTP   |  |                          |                                  |                                    |                                  |   |                                     |
|--|--|--------------------------|----------------------------------|------------------------------------|----------------------------------|---|-------------------------------------|
| Initial year of analysis perior<br>Interest rate   | d 2015<br>5%                           |                          |                                  | Engineering,                       | Contingency =<br>Legal, Admin. = |   |                                     |
| Evaluation period  |  | years                    |                                  | ental & Archae                     | eology Studies &                 | 1                                       |                                     |
| Unit cost of energy  | \$ 0.07                                | per kwh                  | Mitigation, S                    | urveying, and i                    | Land Acquisition<br>or =         |   | per mile<br>per acre                |
| Inflatable Rubber Low Head Dam   |  |                          |                                  |                                    |                                  |   |                                     |
|  | Quantity                               | Units                    | Size                             | Unit Constr.<br>Cost<br>(millions) | Constr. Cost                     | Contigency,<br>Eng., etc.<br>(millions) | Total Capital<br>Cost<br>(millions) |
| Inflatable Rubber Low Head Day   | m 4                                    | each                     | 10 ft high                       | \$ 2.25                            | \$ 9.00                          | \$ 3.42                                 | \$ 12.42                            |
| Estimated inflatable dam co  | st as % of total                       | 50%                      |                                  |                                    |                                  |   |                                     |
| Value of inflatable dam<br>Assumed life of inflatable da<br>Estimated maintenance/rep  |  | \$ 4.50<br>10<br>\$ 0.45 | million<br>years<br>million/year |                                    |                                  |   |                                     |
| Year built   |  | 2020                     |                                  |                                    |                                  |   |                                     |
| NPV of O&M Costs<br>NPV of Capital Costs<br>Total NPV of Capital and O   | &M Costs                               | \$ 9.73                  | million<br>million<br>million    |                                    |                                  |   |                                     |
| Raw Water Intake, Pumping Statio   | n, and RWTM (Ir                        | ntake to Rese            | ervoir)                          |                                    |                                  |   |                                     |
| Average withdrawal   |  |                          |                                  | ac-ft/year                         |                                  |   |                                     |
|  |  | in a black flamma        | 182                              | cfs                                | 21.9                             |   | gn withdrawal rate                  |
| Total intake design withdray   | val rate (for scalp                    | ing high flows           | 1,795,200                        | gpm                                |                                  | to Fotal Intak                          | e design withdrawal rate            |
| No. of Intakes<br>Design withdrawal rate per   | intake                                 | *                        | 1,000<br>448,800                 |                                    |                                  |   |                                     |
| No. of reservoirs<br>Design flow to each reservo   | ir                                     |                          | 448,800                          |                                    |                                  |   |                                     |
| Inside diameter of each RW   | тм                                     |                          |                                  | in.                                |                                  |   |                                     |
| Area<br>Average length of each RW  | тм                                     |                          | 78.54<br>5,280                   | miles                              | 4.0<br>21,120                    | miles for all f                         | RWTMs                               |
| Estimated construction cost  | for RWTM                               |                          | \$ 793                           | per LF                             |                                  | \$ 1,254                                |                                     |
| Total construction cost in m<br>Contingencies  | illions                                |                          | \$ 16.8<br>\$ 3.4                |                                    |                                  |   |                                     |
| Subtotal<br>Engineering, Legal & Admir   | nistrative                             |                          | \$ 20.1<br>\$ 3.0                | -                                  |                                  |   |                                     |
| Subtotal<br>Envir & Arch Studies & Mitig<br>Total Capital Co   | gation, Surveying<br>est for PWTM in n |                          | \$ 0.4                           | million                            |                                  |   |                                     |
| Unit maintenance cost/year   | -mile                                  |                          | \$ 10,000                        | \$/year-mile                       | \$ 0.040                         | Million \$/yea                          | r (all RWTMs to Reservoirs)         |
| Note: Assume each intake t   | nas two RWTMs                          | pumping out o            | of it, one to each               | h reservoir.                       |                                  |   |                                     |
| Design flow rate for each R<br>Pumping rate (one pump)   |  |                          | 448,800<br>50,000                | gpm<br>gpm                         |                                  |   |                                     |
| No. of pumps (not counting<br>Peak flow rate into each RV  |  |                          | 450,000                          | gpm                                |                                  |   |                                     |
| Velocity at peak flow rate<br>C factor   |  |                          | 12.77                            | fps                                |                                  |   |                                     |
| Head loss per foot   |  |                          | 0.00327                          |                                    | h <sub>f</sub> =                 | 13.552*QI1.                             | 35                                  |
|  |  |                          | 17.25                            | ft/mile                            |                                  | C*(d)2.63                               |                                     |
| Head loss at peak flow rate<br>Allowance for minor losses  | 30%                                    |                          |                                  | ft ft                              | 90                               | Flev of disch                           | arge at reservoir                   |
| Total estimated losses   | 007                                    |                          | 22                               | ft ft                              | 50                               | Water surface                           |                                     |
| Average static head<br>Total estimated dynamic he  | ead                                    |                          | 62                               | nt<br>nt<br>psi                    | 40                               | n ft                                    |                                     |
| Accumed numb officiency  |  |                          | 85%                              |                                    |                                  |   |                                     |
| Assumed pump efficiency<br>Assumed motor efficiency  |  |                          | 90%                              |                                    |                                  |   |                                     |
| Estimated Hp required per  | pump                                   |                          | 1,030<br>769                     | hp/pump<br>kw/pump                 |                                  |   |                                     |
| Total hp pumping into each<br>Total hp at each intake (not   |  | nting spare)             |                                  | hp/RWTM<br>hp/intake               |                                  |   |                                     |
| Total hp all intakes (not countries for the coun | inting spares)                         |                          | 37,089<br>27,668                 | hp                                 |                                  |   |                                     |
| Unit construction cost for e<br>Construction cost per intak<br>No. of intakes from above   | ach pump station                       | (from cost cu            |                                  | per firm hp o<br>million           | of pump station                  | \$ 1,180                                | ).                                  |
| Total construction cost in m   | illions                                |                          |                                  | million                            |                                  |   |                                     |
| Contigency, Eng., etc. in r<br>Total capital cost in millions  | illions                                |                          | \$ 12.53                         | million<br>million                 |                                  |   |                                     |
| Total construction cost for p  | oump stations                          |                          | \$ 33.0                          | million                            |                                  |   |                                     |
| Value of equipm<br>Assumed life of   |  |                          | \$ 13.2<br>20                    | million                            | 409                              | Estimated ed                            | quip cost as % of total constr cos  |
|  | tenance/replacen                       | nent cost                |                                  | million/year                       |                                  |   |                                     |

| Year | Flow purr<br>yea |      | No. of pump "sets" | Energy<br>used  |    | Energy   | у со | st                | cost               | ner O&M<br>s - Pump<br>tations | 0  | ntenance<br>osts -<br>RWTM              | То   | tal O&M<br>cost      |           | prese<br>value |  |
|------|------------------|------|--------------------|-----------------|----|----------|------|-------------------|--------------------|--------------------------------|----|---|------|----------------------|-----------|----------------|--|
|      | ac-ft/yr         | mgd  | operating<br>/day  | (kwh/day)       |    | (\$/day) |      | Million \$ /year) | (Million \$ /year) |                                |    | Million \$<br>/year)                    |      | Million \$<br>/year) | - Colombi | (\$)           |  |
| 2015 |                  | -    |                    |                 | \$ |          | \$   |                   |                    |                                |    |   | \$   | *                    | \$        |                |  |
| 2016 |                  |      |                    |                 | \$ | •        | \$   | 5                 |                    |                                |    |   | \$   |                      | \$        | - 1            |  |
| 2017 | *                |      |                    | 196             | \$ |          | \$   | -                 |                    |                                |    |   | \$   | •                    | \$        |                |  |
| 2018 |                  | 0.00 |                    | 0.50            | \$ |          | \$   |                   |                    |                                |    |   | \$   |                      | \$        |                |  |
| 2019 |                  |      |                    |                 | \$ |          | \$   |                   |                    |                                |    |   | \$   |                      | \$        |                |  |
| 2020 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 1.             |  |
| 2021 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 1.             |  |
| 2022 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 1              |  |
| 2023 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 1,             |  |
| 2024 | 132,000          | 118  | 1.64               | 30,188          | S  | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 0.             |  |
| 2025 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | S    | 1.47                 | \$        | 0              |  |
| 2026 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | S    | 0.77              | S                  | 0.66                           | S  | 0.040                                   | \$   | 1.47                 | \$        | 0              |  |
| 2027 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | \$   | 0.77              | \$                 | 0.66                           | S  | 0.040                                   | S    | 1.47                 | S         | 0              |  |
| 2028 | 132,000          | 118  | 1.64               | 30,188          | Š  | 2,113    | Š    | 0.77              | \$                 | 0.66                           | s  | 0.040                                   | s    | 1.47                 | \$        | 0              |  |
| 2029 | 132,000          | 118  | 1.64               | 30,188          | š  | 2,113    | Š    | 0.77              | s                  | 0.66                           | s  | 0.040                                   | s    | 1.47                 | S         | 0              |  |
| 2030 | 132,000          | 118  | 1.64               | 30,188          | Š  | 2,113    | \$   | 0.77              | s                  | 0.66                           | Š  | 0.040                                   | \$   | 1.47                 | s         | C              |  |
| 2030 | 132,000          | 118  | 1.64               | 30,188          | Š  | 2,113    | Š    | 0.77              | \$                 | 0.66                           | Š  | 0.040                                   | Š    | 1.47                 | s         | 0              |  |
|      |                  | 118  | 1.64               | 30,188          | \$ | 2,113    | s    | 0.77              | \$                 | 0.66                           | s  | 0.040                                   | š    | 1.47                 | \$        | C              |  |
| 2032 | 132,000          |      |                    |                 | s  | 2,113    | \$   | 0.77              | s                  | 0.66                           | Š  | 0.040                                   | Š    | 1.47                 | S         | Č              |  |
| 2033 | 132,000          | 118  | 1.64               | 30,188          |    |          |      |                   | \$                 | 0.66                           | s  | 0.040                                   | S    | 1.47                 | \$        | Ö              |  |
| 2034 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              |                    | 0.66                           |    | 0.040                                   | Š    | 1.47                 | S         | č              |  |
| 2035 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 |                                | \$ | 100000000000000000000000000000000000000 |      |                      | S         | č              |  |
| 2036 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 |           |                |  |
| 2037 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 0              |  |
| 2038 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0,66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | 0              |  |
| 2039 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2040 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | 5                  | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2041 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2042 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2043 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.68                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2044 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2045 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2046 | 132,000          | 118  | 1.64               | 30,188          | S  | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | 5    | 1.47                 | \$        | (              |  |
| 2047 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | S    | 0.77              | \$                 | 0.66                           | S  | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2048 | 132,000          | 118  | 1.64               | 30,188          | s  | 2.113    | \$   | 0.77              | \$                 | 0.66                           | S  | 0.040                                   | \$   | 1.47                 | \$        |                |  |
| 2049 | 132,000          | 118  | 1.64               | 30,188          | s  | 2.113    | \$   | 0.77              | s                  | 0.66                           | s  | 0.040                                   | S    | 1.47                 | S         | (              |  |
| 2050 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | \$   | 0.77              | \$                 | 0.66                           | S  | 0.040                                   | S    | 1.47                 | s         | - 1            |  |
| 2051 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | s    | 0.77              | s                  | 0.66                           | s  | 0.040                                   | \$   | 1.47                 | s         | - 0            |  |
| 2052 | 132,000          | 118  | 1.64               | 30,188          | s  | 2.113    | š    | 0.77              | s                  | 0.66                           | s  | 0.040                                   | s    | 1.47                 | s         | -              |  |
| 2052 | 132,000          | 118  | 1.64               | 30,188          | š  | 2,113    | š    | 0.77              | Š                  | 0.66                           | \$ | 0.040                                   | Š    | 1.47                 | Š         | - 8            |  |
| 2054 |                  | 118  | 1.64               | 30,188          | Š  | 2,113    | Š    | 0.77              | s                  | 0.66                           | s  | 0.040                                   | s    | 1.47                 | s         | - 1            |  |
|      | 132,000          | 2.55 | 1.64               | 30,188          | š  | 2,113    | Š    | 0.77              | Š                  | 0.66                           | š  | 0.040                                   | Š    | 1.47                 | Š         | - 6            |  |
| 2055 | 132,000          | 118  | 1.64               | 30,188          | s  | 2,113    | Š    | 0.77              | Š                  | 0.66                           | Š  | 0.040                                   | Š    | 1.47                 | Š         | - 1            |  |
| 2056 | 132,000          | 118  |                    |                 |    |          | S    | 0.77              | s                  | 0.66                           | Š  | 0.040                                   | Š    | 1.47                 | Š         | ì              |  |
| 2057 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    |      |                   | S                  | 0.66                           | Š  | 0.040                                   | s    | 1.47                 | Š         |                |  |
| 2058 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              |                    |                                |    |   |      |                      | s         |                |  |
| 2059 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | s                  | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 |           |                |  |
| 2060 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        |                |  |
| 2061 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | (              |  |
| 2062 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        |                |  |
| 2063 | 132,000          | 118  | 1.64               | 30,188          | \$ |          | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        |                |  |
| 2064 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | - 0            |  |
| 2065 | 132,000          | 118  | 1.64               | 30,188          | \$ | 2,113    | \$   | 0.77              | \$                 | 0.66                           | \$ | 0.040                                   | \$   | 1.47                 | \$        | -              |  |
|      |                  |      |                    |                 |    |          |      |                   |                    |                                |    | Total NPV                               | of C | 8M Costs             | \$        | -              |  |
|      |                  |      | Capital C          | ts in million 5 |    |          |      |                   |                    | Yr built                       |    |   |      |                      |           |                |  |
|      |                  |      | Capital Cos        | RWTM to R       |    | m re les | s    | 23.5              |                    | 2020                           | -  |   |      |                      |           | S              |  |

Reservoirs

|   | Quantity                                      | ntity Unit |       | Volume/each<br>(acre-feet) | Unit Cost<br>(\$/ac-ft)) |            | Total<br>Construction<br>Cost in<br>millions |                  | Contigency,<br>Eng., etc. |           |    | otal in<br>nillions |
|---|---|------------|-------|----------------------------|--------------------------|------------|--|------------------|---------------------------|-----------|----|---------------------|
| Reservoirs  | 4   |            | each  | 25000                      | \$                       | 974<br>909 | \$   | 97.4             | \$                        | 37.0      | \$ | 134.4               |
| Estimated average depth of reser                    | voir  |            | 20    | ft                         |                          |            |  |                  |                           |           |    |                     |
| Surface area of reservoir                           |   |            | 5000  | acres                      |                          |            |  |                  |                           |           |    |                     |
| Ratio of total land area reqd to su<br>of reservoir | Ratio of total land area reqd to surface area |            | 1.1   |                            |                          |            | E  | nvir & Arch      | aeolo                     | gy, Surv, |    |                     |
| Total land area reqd for reservoir                  | s   |            | 5500  | acres                      |                          |            | otal   | a<br>apital cost |                           | nd Acq =  | 5  | 27.5<br>161.9       |
| Assumed life of reservoir                           |   |            | 100   | years                      |                          | ,          | otal c                                       | apital coa       |                           | mona -    | *  | 101.0               |
| Estimated replacement cost                          |   | \$         | 0.97  | million/year               |                          |            |  |                  |                           |           |    |                     |
| Estimated maintenance                               |   | _          | 0.4   | million/year               | Mowi                     | ng, mair   | ntainir                                      | ng fences,       | etc.                      |           |    |                     |
| Total   |   | \$         | 1.37  | million/year               |                          |            |  |                  |                           |           |    |                     |
| Year built  |   |            | 2020  |                            |                          |            |  |                  |                           |           |    |                     |
| NPV of O&M costs                                    |   | \$         | 19.1  | million                    |                          |            |  |                  |                           |           |    |                     |
| NPV of Capital costs                                |   | \$         | 126.8 | million                    |                          |            |  |                  |                           |           |    |                     |
| Total NPV of Capital and O&M C                      | osts  | \$         | 145.9 | million                    |                          |            |  |                  |                           |           |    |                     |

Total NPV of Capital and O&M Costs in millions \$

| Sum | mary  | <br>IPV of<br>tal Costs | V of O&M<br>Costs | Capital and |       |  |
|-----|---|-------------------------|-------------------|-------------|-------|--|
|     | Inflatable Rubber Low Head Dam                                    | \$<br>9.7               | \$<br>6.3         | \$          | 16.0  |  |
|     | Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>54.1              | \$<br>21.6        | \$          | 75.7  |  |
|     | Reservoirs  | \$<br>126.8             | \$<br>19.1        | \$          | 145.9 |  |
|     | Total for RWI A   | \$<br>190.6             | \$<br>47.0        | \$          | 237.6 |  |

O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 1B - WTP East of San Antonio

Raw

|   | Initial year of analysis period 2015<br>Interest rate 5%   | F            |      | ngineering, L  |             | lmin. =          |                  |                         |
|---|--|--------------|------|----------------|-------------|------------------|------------------|-------------------------|
|   | Evaluation period 50 years Unit cost of energy \$ 0.07 per kwh   |              |      | al & Archaeolo |             |                  | \$ 100,000 pe    | er mile                 |
|   | One cost of energy   | iiiiiganori, | -    | oying, and Ed  |             |                  | , 100,000 p.     |                         |
| W | ater Transmission Main - A   |              |      |                |             |                  |                  |                         |
|   | Inside diameter of pipe  |              | 96   | in.            |             |                  |                  |                         |
|   | Area   | 50           | 0.27 |                |             |                  |                  |                         |
|   | Length of RWTM   |              | 142  | miles          |             |                  |                  |                         |
|   |  | 749,7        | 760  | feet           |             |                  |                  |                         |
|   | Estimated unit construction cost for RWTM  | \$ 5         | 567  | per LF         |             |                  |                  |                         |
|   |  |              |      | •              |             |                  |                  |                         |
|   | Total construction cost in millions  |              | 125  |                |             |                  |                  |                         |
|   | Contingencies<br>Subtotal  | 0 1          | 85   |                |             |                  |                  |                         |
|   | Engineering, Legal & Administrative  | \$           | 77   |                |             |                  |                  |                         |
|   | Subtotal   |              | 587  |                |             |                  |                  |                         |
|   | Envir & Arch Studies & Mitigation, Surveying, & Land Acq   | \$           | 14   |                |             |                  |                  |                         |
|   | Total Capital Cost for PWTM in millions  |              | 301  | million        |             |                  |                  |                         |
|   | Unit maintenance cost/year-mile  | \$ 10,0      | 200  | \$/year-mile   | s           | 1 420            | Million \$/year  |                         |
|   | Onit maintenance cost/year-mile  | \$ 10,0      | 000  | g/year-IIIIle  | 4           | 1.420            | Willion S/year   |                         |
|   | Design flow rate (after 100% buildout)   | 132,0        | 000  | ac-ft/year     |             |                  |                  |                         |
|   |  |              | 118  | mgd            |             |                  |                  |                         |
|   |  |              |      | gpm            |             |                  |                  |                         |
|   | Pumping rate (one pump)  | 16,4         |      | gpm            |             |                  |                  |                         |
|   | No. of pumps (not counting spare)  |              | 5    |                |             |                  |                  |                         |
|   | Peak flow rate (all pumps except spare)  | 82,0         | )00  | gpm            |             |                  |                  |                         |
|   | Velocity at peak flow rate   | 3            | .63  | fps            |             |                  |                  |                         |
|   | C factor   |              | 120  | •              |             |                  |                  |                         |
|   | Head loss per foot   | 0.00         | 041  | ft/ft          |             | h <sub>f</sub> = | [ 3.552*Q 1.85   |                         |
|   |  | 2            | .19  | ft/mile        |             |                  | C*(d)2.63        |                         |
|   | Constitution of the Consti |              |      |                |             |                  |                  |                         |
|   | Head loss at peak flow rate  |              | 311  |                |             | 000              | FI N.O 1         | and Fred MCD            |
|   | Allowance for minor losses 10%   |              | 342  |                |             |                  | Elev. At San Ant |                         |
|   | Total estimated losses<br>Average static head  |              | 510  |                |             | 510              | Elev. At Matago  | rua OCKS                |
|   | Total estimated dynamic head   |              | 852  |                |             | 310              |                  |                         |
|   | rolar osimaloa aynamo noad   |              | 369  |                |             |                  |                  |                         |
|   |  |              |      |                |             | 78126            | 227              |                         |
|   | No of pumping stations req'd along route   | 1            | 2.46 |                |             | 150              | psi (assumed m   | ax pressure             |
|   | No. of pumping stations used in cost estimate  |              | 3.0  | 4              |             |                  | in pipe)         |                         |
|   | Average head per pump station  |              | 284  | π              |             |                  |                  |                         |
|   | Assumed pump efficiency  |              | 85%  |                |             |                  |                  |                         |
|   | Assumed motor efficiency   |              | 90%  |                |             |                  |                  |                         |
|   | Estimated Hp required per pump   |              |      | hp/pump        |             |                  |                  |                         |
|   | Approximation of the state of t |              |      | kw/pump        |             |                  |                  |                         |
|   | Total hp per pump station (not counting spare)   |              |      | hp/station     |             |                  |                  |                         |
|   | Total kw per pump set (set=pumps in series along route)  | 4,6          | 012  | kw/pump set    | (one p      | ump at           | each station)    |                         |
|   | Unit constr. cost for each pump station (from cost curve)  | \$ 1,3       | 320  | per firm hp o  | f pump      | station          |                  |                         |
|   | Construction cost per pump station   |              |      | million        | , p. ann. p |                  |                  |                         |
|   | Balancing reservoir  | \$ 0         | .75  | million _      |             | 60               | min. of storage  | at avg pumping rate     |
|   | Total construction cost per pump station   | \$ 10        | .90  | million        |             | 5.0              |                  |                         |
|   | No of some stations from the second  |              | 20   |                | \$          | 0.15             | per gal for open | top reservoir           |
|   | No. of pump stations from above  |              | 3.0  | each           |             |                  |                  |                         |
|   | Total construction cost in millions  | \$ 3         | 2.7  | million        |             |                  |                  |                         |
|   | Contigency, Eng., etc. in millions   |              |      | million        |             |                  |                  |                         |
|   | Total capital cost in millions   | \$ 4         | 5.1  | million        |             |                  |                  |                         |
|   | Total construction cost for pump stations  | \$ 3         | 27   | million        |             |                  |                  |                         |
|   | Value of equipment   | 100          |      | million        |             | 40%              | Estimated equir  | ment cost as % of total |
|   | Assumed life of equipment  |              |      | years          |             |                  |                  |                         |
|   | Estimated maintenance/replacement cost   | \$ 0         |      | million/year   |             |                  |                  |                         |
|   | um en  |              |      |                |             |                  |                  |                         |
|   |  |              |      |                |             |                  |                  |                         |

#### O&M Costs

| Year         |                    | low pumped by year Power Sets" No. of Energy pump used Sets" Energy cost |                   | st                 | Other O&M<br>costs - Pump<br>Stations |                  |    | Maintenance<br>costs -<br>RWTM |    | Total O&M<br>cost     |     | et present<br>value |      |                   |    |                |
|--------------|--------------------|--|-------------------|--------------------|---------------------------------------|------------------|----|--------------------------------|----|-----------------------|-----|---------------------|------|-------------------|----|----------------|
|              | ac-ft/yr           | mgd  | operating<br>/day | (kwh/day)          |                                       | (\$/day)         | (  | Million \$<br>/year)           |    | (Million \$<br>/year) | (1  | Million \$ /year)   | (    | Million \$ /year) |    | (\$)           |
| 2015         | -                  | -  | -                 | -                  | \$                                    | -                | \$ | •                              |    |                       |     |                     | \$   | •                 | \$ | -              |
| 2016         | -                  | -  | -                 | -                  | \$                                    |                  | \$ | 1.0                            |    |                       |     |                     | \$   | -                 | \$ | -              |
| 2017         | -                  | -  | -                 | -                  | \$                                    |                  | \$ |                                |    |                       |     |                     | \$   | -                 | \$ |                |
| 2018         | -                  | •  | -                 | -                  | \$                                    | -                | \$ | -                              |    |                       |     |                     | \$   | •                 | \$ | *              |
| 2019         | 400.000            |  |                   | -                  | \$                                    | -                | \$ |                                |    | 0.05                  | •   | 4 400               | \$   | 40.40             | \$ | 40.00          |
| 2020         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 12.68          |
| 2021         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 12.08          |
| 2022         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 11.50          |
| 2023<br>2024 | 132,000<br>132,000 | 118<br>118   | 4.99<br>4.99      | 552,331<br>552,331 | \$                                    | 38,663<br>38,663 | \$ | 14.11                          | 5  | 0.65<br>0.65          | \$  | 1.420<br>1.420      | \$   | 16.19<br>16.19    | \$ | 10.96<br>10.43 |
| 2024         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 9.94           |
| 2025         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | S  | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 9.46           |
| 2020         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 9.40           |
| 2028         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 8.58           |
| 2029         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 8.18           |
| 2029         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | s  | 14.11                          | s  | 0.65                  | \$  | 1.420               | s    | 16.19             | Š  | 7.79           |
| 2030         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | S  | 7.41           |
| 2032         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | \$ | 14.11                          | S  | 0.65                  | \$  | 1.420               | \$   | 16.19             | S  | 7.06           |
| 2032         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 6.73           |
| 2034         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 6.41           |
| 2035         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 6.10           |
| 2036         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | Š  | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 5.81           |
| 2037         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 5.53           |
| 2038         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | S  | 14.11                          | Š  | 0.65                  | S   | 1,420               | Š    | 16.19             | Š  | 5.27           |
| 2039         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | Š  | 14.11                          | š  | 0.65                  | Š   | 1.420               | š    | 16.19             | Š  | 5.02           |
| 2040         | 132,000            | 118  | - 4.99            | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | Š  | 0.65                  | Š   | 1.420               | s    | 16.19             | S  | 4.78           |
| 2041         | 132,000            | 118  | 4.99              | 552,331            | Š                                     | 38,663           | \$ | 14.11                          | Š  | 0.65                  | \$  | 1.420               | š    | 16.19             | \$ | 4.55           |
| 2042         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 4.34           |
| 2043         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | Š  | 4.13           |
| 2044         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 3.93           |
| 2045         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 3.75           |
| 2046         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | Š  | 0.65                  | \$  | 1.420               | Š    | 16.19             | Š  | 3.57           |
| 2047         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1,420               | \$   | 16.19             | \$ | 3.40           |
| 2048         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 3.24           |
| 2049         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1,420               | \$   | 16.19             | \$ | 3.08           |
| 2050         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.93           |
| 2051         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.79           |
| 2052         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.66           |
| 2053         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | s  | 0.65                  | S   | 1,420               | S    | 16,19             | S  | 2.53           |
| 2054         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.41           |
| 2055         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.30           |
| 2056         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.19           |
| 2057         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 2.09           |
| 2058         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.99           |
| 2059         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.89           |
| 2060         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.80           |
| 2061         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.72           |
| 2062         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.63           |
| 2063         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.56           |
| 2064         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.48           |
| 2065         | 132,000            | 118  | 4.99              | 552,331            | \$                                    | 38,663           | \$ | 14.11                          | \$ | 0.65                  | \$  | 1.420               | \$   | 16.19             | \$ | 1.41           |
|              |                    |  |                   |                    |                                       |                  |    |                                |    |                       | Т   | otal NPV            | of C | &M Costs          | \$ | 238            |
|              |                    |  | Capital Cos       | ts in million \$   | <b>:</b>                              |                  |    |                                | _  | Yr built              |     |                     |      |                   |    |                |
|              |                    |  |                   | RWTM               |                                       | 2007             | \$ | 601                            |    | 2020                  |     |                     |      |                   | \$ | 471            |
|              |                    |  |                   | Pumping Sta        | atio                                  | ns               | \$ | 45                             |    | 2020                  |     |                     |      |                   | \$ | 35             |
|              |                    |  |                   |                    |                                       |                  |    |                                |    |                       | Tot | at NIDV/ of         | Car  | ital Costs        | \$ | 507            |

#### NPV CALCULATIONS ALCOA / CPS GROUNDWATER ###

| lds and Collection Lines                                 | ALC         | COA       | (  | PS    | - 8 | Total |
|--|-------------|-----------|----|-------|-----|-------|
| Year built   | 20          | 15        | 2  | 015   |     |       |
| Estimated Construction Cost in Millions                  |             |           |    |       |     |       |
| Wells (Based on Non-Public Water Supply Wells)           |             | 20.92     |    | 7.94  |     | 28.   |
| Pipeline   |             | 13.03     |    | 5.94  |     | 18.9  |
| Pump Stations & Storage                                  | Haragan Car | 8.51      |    | 0     |     | 8.    |
| Subtotal   |             | 42.46     |    | 13.88 |     | 56.   |
| Contingency  |             | 8.49      |    | 2.78  |     | 11.3  |
| Subtotal   |             | 50.95     |    | 16.66 |     | 67.   |
| Engineering, Legal & Administrative                      |             | 6.37      |    | 2.08  |     | 8.    |
| Subtotal   |             | 57.32     |    | 18.74 | 5   | 76.   |
| Environmental & Archaeology Studies & Mitigation         |             | 0.63      |    | 0.2   |     | 0.    |
| Land Acquisition & Surveying                             |             | 0         |    | 0     |     | 0.    |
| Groundwater Purchase                                     |             | 0         |    | 5.64  |     | 5.    |
| ALCOA Construction Program Management Fee                |             | 5.45      |    | 0     |     | 5.    |
| Interest During Construction (2 years, 6% int., 4% ret.) |             | 5.89      |    | 2.44  |     | 8.    |
| Total Capital Cost                                       |             | 69.29     |    | 27.02 |     | 96.   |
| Estimated Annual O&M Costs                               |             |           |    |       |     |       |
| O&M  |             | 0.67      |    | 0.18  |     | 0.    |
| Pumping Energy   |             | 2.41      |    | 0.52  |     | 2.    |
| ALCOA Project Management Fees                            |             | 0.35      |    | 0.00  |     | 0.    |
| Purchase of Groundwater                                  |             | 2.00      |    | 0.00  |     | 2.    |
| Groundwater District Fees                                |             | 0.65      |    | 0.25  |     | 0.    |
| Mitigation Reserves                                      | -           | 0.28      |    | 0.11  |     | 0.    |
| Total Annual Cost  |             | 6.36      |    | 1.06  |     | 7.    |
|  | •           | 440       |    | 19    | s   | 13    |
| NPV of O&M Costs   | \$          | 116<br>69 | \$ | 27    | \$  | 1,    |
| NPV of Capital Costs                                     |             |           |    |       |     | -     |
| Total NPV of Capital and O&M Costs for Well Fields       | \$          | 185       | \$ | 46    | \$  | 23    |

#### Cooling of Well Water

| Total number of wells in both fields                 | 120 wells | Approximate capacity per wel | 300    | gpm        |
|--|-----------|------------------------------|--------|------------|
| Percentage of wells with temperatures > than degrees | 5%        |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees | 6.0       | Rough check                  | 58,072 | ac-ft/year |

#### **Estimated Capital Costs**

| Year built  |    | 2015    |          |
|---|----|---------|----------|
| Number of Packaged Cooling Towers (300 gpm capacity/each) |    | 6.0     |          |
| Equipment cost (cooling towers and fans)                  | \$ | 60,000  |          |
| Installation and contractors mark-up                      | \$ | 50,000  |          |
| Structural slab   | \$ | 30,000  |          |
| Electrical  | \$ | 50,000  |          |
| Estimated Unit Construction Cost                          | \$ | 190,000 | Each     |
| Total construction cost                                   | \$ | 1.14    | million  |
| Contingencies   | \$ | 0.23    |          |
| Subtotal  | \$ | 1.37    | <b>.</b> |
| Engineering, Legal and Admin                              | \$ | 0.21    |          |
| Total Estimated Capital Cost                              | \$ | 1.57    |          |
| NPV of Capital Costs                                      | S  | 1.57    | million  |

#### Estimated O&M Costs

| Value of equipment                                  | \$<br>0.4   | million                          |
|---|-------------|----------------------------------|
| Assumed life of equipment                           | 10          | years                            |
| Estimated maintenance/replacement cost              | \$<br>0.04  | million/year                     |
| Blower Hp per cooling tower                         | 10          | Нр                               |
|   | 7           | kw                               |
| Hours of operation                                  | 24          | hours                            |
| Power consumption per cooling tower                 | 179         | kwh per day                      |
|   | 65,350      | kwh per year                     |
| Power cost per cooling tower                        | \$<br>4,574 | per year                         |
| Total power cost for all cooling towers in millions | \$<br>0.03  | million per year                 |
| Regular operational checks and routine maintenance  | \$<br>6,000 | per month for all cooling towers |
|   | \$<br>0.07  | per year                         |
| Estimated O&M Cost                                  | \$<br>0.14  | million \$ per year              |
| NPV of O&M costs                                    | \$<br>2.47  | million \$                       |

Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

54 in.

| Area                                     |                  | 15.90        | sf           |        |   |         |
|--|------------------|--------------|--------------|--------|---|---------|
| Length of Ground Water TM                |                  | 15           | miles        |        |   |         |
|  |                  | 79,200       | feet         |        |   |         |
| Estimated construction cost for GWTM     |                  | \$<br>327    | per LF       |        |   |         |
| Total construction cost in millions      |                  | \$<br>25.9   |              |        |   |         |
| Contingencies                            |                  | \$<br>5.2    |              |        |   |         |
| Subtotal                                 |                  | \$<br>31.1   | -            |        |   |         |
| Engineering, Legal & Administrative      |                  | \$<br>4.7    |              |        |   |         |
| Subtotal                                 |                  | \$<br>35.8   | •            |        |   |         |
| Envir & Arch Studies & Mitigation, Surve | ying, & Land Acq | \$<br>1.5    |              |        |   |         |
| Total Capital Cost for PWTN              | I in millions    | \$<br>37.3   | million      |        |   |         |
| Unit maintenance cost/year-mile          |                  | \$<br>10,000 | \$/year-mile | \$     | 0.150 Million \$/year                       |         |
| Design flow rate                         |                  | 55,000       | ac-ft/year   |        |   |         |
|  |                  | 49           | mgd          |        |   |         |
|  |                  | 34,095       | gpm          |        |   |         |
| Velocity at peak flow rate               |                  | 4.78         | fps          |        |   |         |
| C factor                                 |                  | 120          | 0.50         |        |   |         |
| Head loss per foot                       |                  | 0.00134      | ft/ft        |        | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |         |
|  |                  | 7.10         | ft/mile      |        | C*(d) <sup>2.63</sup>                       |         |
| Head loss at peak flow rate              |                  | 106          | ft           |        |   |         |
| Allowance for minor losses               | 10%              | 11           | ft           |        | 400 Elev. At RWI-B                          |         |
| Total estimated losses                   |                  | <br>117      | ft           |        | 550 minus Elev Storage Tank at              | Hwy 290 |
| Average static head                      |                  | -150         | ft           |        | -150 ft                                     |         |
| Total estimated dynamic head             |                  | -33          | ft           | (intak | te is lower than tank at Hwy 290)           |         |
|  |                  | -14          | psi          | 37     |   |         |

### Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

|    |                             |    |       |          |                            | Mi | illion \$ |
|----|-----------------------------|----|-------|----------|----------------------------|----|-----------|
| An | nual O&M Cost in million \$ | :  |       | Yr built |                            |    |           |
|    | GWTM                        | \$ | 0.150 | 2015     | -                          |    |           |
|    |                             |    |       |          | Total NPV of O&M Costs     | \$ | 2.7       |
| Ca | apital Costs in million \$: |    |       | Yr built | Sr.                        |    |           |
|    | GWTM                        | \$ | 37.3  | 2015     | -                          | \$ | 37.3      |
|    |                             |    |       |          | Total NPV of Canital Costs | S  | 37.3      |

| 0 | <br>ma | - |
|---|--------|---|
|   |        |   |

| ary   | Capi | Capital Costs |    |       | O&M Costs |       |  |
|---|------|---------------|----|-------|-----------|-------|--|
| Well Fields and Collection Lines (including tank and pump station at Hwy 290) | \$   | 96.3          | \$ | 135.5 | \$        | 231.8 |  |
| Cooling Towers for Selected High Temperature Wells                            | \$   | 1.6           | \$ | 2.5   | \$        | 4.0   |  |
| Ground Water Transmission Main and Pumping Station                            | \$   | 37.3          | \$ | 2.7   | \$        | 40.0  |  |
| Total for ALCOA-CPS   | \$   | 135.1         | \$ | 140.7 | \$        | 275.8 |  |

# O&M Cost Calculations RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir CTRWTP - Alternate 1B - WTP East of San Antonio

Initial year of analysis period 2015 Contingency = 20% Interest rate 5% Engineering, Legal, Admin. = 15% Evaluation period 40 years

Unit cost of energy \$ 0.07 per kwh Environmental & Archaeology Studies &

Mitigation, Surveying, and Land Acquisition = \$ 100,000 per mile or = \$ 5,000 per acre

#### Inflatable Rubber Low Head Dam

|                                | Quantity | Units | Size       | (  | Constr.<br>Cost<br>illions) | Est<br>Con: | imated<br>str. Cost<br>illions) | En | tigency,<br>g., etc.<br>illions) | (  | Capital<br>Cost<br>illions) |
|--------------------------------|----------|-------|------------|----|-----------------------------|-------------|---------------------------------|----|----------------------------------|----|-----------------------------|
| Inflatable Rubber Low Head Dam | 2 (      | each  | 10 ft high | \$ | 2.25                        | \$          | 4.50                            | \$ | 1.71                             | \$ | 6.21                        |

Estimated inflatable dam cost as % of total Value of inflatable dam \$ 2.25 million
Assumed life of inflatable dam 10 years
Estimated maintenance/replacement cost \$ 0.23 million/years

Year built 2015

DESCRIPTION DESCRIPTION OF THE STATE OF THE

 NPV of O&M Costs
 \$ 3.86 million

 NPV of Capital Costs
 \$ 6.21 million

Total NPV of Capital and O&M Costs \$ 10.07 million

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

#### Summary of withdrawals in acre-feet/year:

| Year     | 2015  | 2020  | 2030  | 2040  | 2050  | 2060  | 2065  |
|----------|-------|-------|-------|-------|-------|-------|-------|
| For SAWS | 18000 | 18000 | 18000 | 18000 | 18000 | 18000 | 18000 |
| LCRA     |       |       | 5600  | 11200 | 11200 | 11200 | 11200 |
| COA      |       |       | 16802 | 22403 | 33604 | 33604 | 33604 |
| Total -  | 18000 | 18000 | 40402 | 51603 | 62804 | 62804 | 62804 |

Ultimate (Y2065) average design withdrawal rate

62,804 ac-ft/year 87 cfs

Total intake design withdrawal rate (for scalping high flows) 2,000 cfs

23.1 Ratio of design withdrawal rate
2,000 cfs to Total intake design withdrawal rate
897,600 gpm

8.0 miles for all RWTMs

No. of Intakes 2
Design withdrawal rate per intake 1,000 cfs 448,800 gpm

No. of reservoirs

Design flow to each reservoir

224,400 gpm

 Inside diameter of each RWTM
 120 in.

 Area
 78.54 sf

 Average length of each RWTM
 2 miles

 10,560 feet
 10,560 feet

10,560 feet 42,240 feet

Estimated construction cost for RWTMs \$ 793 per LF \$ 1,254

Total construction cost in millions \$ 33.5

| Solution | Solution

Unit maintenance cost/year-mile \$ 10,000 \$/year-mile \$ 0.080 Million \$/year (all RWTMs to Reservoirs)

85%

90% 1.241 hp/pump

926 kw/pump

#### Note: Assume intake has one RWTM pumping to the reservoir.

224,400 gpm Design flow rate for each RWTM (from above) Pumping rate (one pump)
No. of pumps (not counting spare) pumping into each RWT 40,000 gpm Peak flow rate into each RWTM (all pumps except spare) 240,000 gpm Velocity at peak flow rate 6.81 fps 120 C factor hr= | 3.552\*Q|1.85 0.00102 ft/ft Head loss per foot | C\*(d)<sup>2.63</sup>| 5.39 ft/mile Head loss at peak flow rate Allowance for minor losses 11 ft 400 Discharge at reservoir 3 ft 14 ft Total estimated losses 320 Water surface elev in river 80 ft Average static head Total estimated dynamic head 94 ft 41 psi

Assumed pump efficiency Assumed motor efficiency

Estimated Hp required per pump

| Total hp pumping into each RWTM (not counting spare)         | 7,448       | hp/RWTM  |    |
|--|-------------|--|----|
| Total hp at each intake (not counting spare)                 | 14,897      | hp/intake  |    |
| Total hp all intakes (not counting spares)                   | 29,793      | hp   |    |
| Total kw all intakes (not counting spares)                   | 22,226      | kw   |    |
| Unit construction cost for each pump station (from cost cur- | \$<br>889   | per firm hp of pump station \$ 830                 |    |
| Construction cost per intake/pump station                    | 13.2        | million  |    |
| No. of intakes from above                                    | 2           | each   |    |
| Total construction cost in millions                          | \$<br>26.5  | million  |    |
| Contigency, Eng., etc. in millions                           | \$<br>10.06 | million  |    |
| Total capital cost in millions                               | \$<br>36.6  | million  |    |
| Total construction cost for pump stations                    | \$<br>26.5  | million 40% Estimated equipment cost as % of total | al |
| Value of equipment   | \$<br>10.6  | million  |    |
| Assumed life of equipment                                    | 20          | years  |    |
| Estimated maintenance/replacement cost                       | \$          | million/year                                       |    |

O&M Costs:

| Year         | Flow pun<br>yea  |          | No. of pump "sets" | Energy<br>used   |    | Energ        | ус | ost                   |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Т    | otal O&M<br>cost      | Ne | t present<br>value |
|--------------|------------------|----------|--------------------|------------------|----|--------------|----|-----------------------|----|--------------------------------------|----|-------------------------------|------|-----------------------|----|--------------------|
|              | ac-ft/yr         | mgd      | operating<br>/day  | (kwh/day)        |    | (\$/day)     |    | (Million \$<br>/year) |    | (Million \$<br>/year)                |    | (Million \$<br>/year)         |      | (Million \$<br>/year) |    | (\$)               |
| 2015         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.77               |
| 2016         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.73               |
| 2017         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.70               |
| 2018         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.66               |
| 2019         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.63               |
| 2020         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.60               |
| 2021         | 18,000           | 16       | - 0.28             | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.57               |
| 2022         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.55               |
| 2023         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.52               |
| 2024         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.50               |
| 2025         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.47               |
| 2026         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.45               |
| 2027         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.43               |
| 2028         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.41               |
| 2029         | 18,000           | 16       | 0.28               | 6,200            | \$ | 434          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                  | \$ | 0.39               |
| 2030         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.46               |
| 2031         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.44               |
| 2032         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.42               |
| 2033         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.40               |
| 2034         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.38               |
| 2035         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.36               |
| 2036         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | S  | 0.080                         | \$   | 0.97                  | S  | 0.35               |
| 2037         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | S  | 0.33               |
| 2038         | 40,402           | 36       | 0.63               | 13,917           | \$ | 974          | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                  | \$ | 0.31               |
| 2039<br>2040 | 40,402<br>51,603 | 36<br>46 | 0.63               | 13,917<br>17,775 | \$ | 974<br>1,244 | \$ |                       | \$ | 0.53<br>0.53                         | \$ | 0.080                         | \$   | 1.06                  | \$ | 0.30               |
| 2040         |                  | 46       | 0.80               |                  | \$ |              | \$ | 0.45                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.06                  | \$ | 0.30               |
| 2041         | 51,603<br>51,603 | 46       | 0.80               | 17,775<br>17,775 | \$ | 1,244        | \$ | 0.45                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.06                  | \$ | 0.30               |
| 2042         | 51,603           | 46       | 0.80               | 17,775           | 5  | 1,244        | \$ | 0.45                  | s  | 0.53                                 | \$ | 0.080                         | S    | 1.06                  | \$ | 0.27               |
| 2043         | 51,603           | 46       | 0.80               | 17,775           | \$ | 1,244        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.06                  | \$ | 0.26               |
| 2045         | 51,603           | 46       | 0.80               | 17,775           | Š  | 1,244        | Š  |                       | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                  | Š  | 0.25               |
| 2046         | 51,603           | 46       | 0.80               | 17,775           | \$ | 1,244        | Š  |                       | Š  | 0.53                                 | \$ | 0.080                         | Š    | 1.06                  | \$ | 0.23               |
| 2047         | 51,603           | 46       | 0.80               | 17,775           | S  | 1,244        | \$ |                       | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                  | Š  | 0.22               |
| 2048         | 51,603           | 46       | 0.80               | 17,775           | s  | 1,244        | Š  |                       | Š  | 0.53                                 | Š  | 0.080                         | s    | 1.06                  | \$ | 0.21               |
| 2049         | 51,603           | 46       | 0.80               | 17,775           | s  | 1,244        | \$ |                       | \$ | 0.53                                 | s  | 0.080                         | s    | 1.06                  | s  | 0.20               |
| 2050         | 62,804           | 56       | 0.97               | 21,633           | s  | 1,514        | Š  |                       | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.16                  | Š  | 0.21               |
| 2051         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | s  | 0.55                  | 5  | 0.53                                 | s  | 0.080                         | \$   | 1.16                  | \$ | 0.20               |
| 2052         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | S  | 0.080                         | s    | 1.16                  | s  | 0.19               |
| 2053         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.18               |
| 2054         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.17               |
| 2055         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | s  |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | s  | 0.17               |
| 2056         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.16               |
| 2057         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.15               |
| 2058         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.14               |
| 2059         | 62,804           | 56       | 0.97               | 21,633           | 5  | 1,514        | \$ | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.14               |
| 2060         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.13               |
| 2061         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.12               |
| 2062         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.12               |
| 2063         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.11               |
| 2064         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.11               |
| 2065         | 62,804           | 56       | 0.97               | 21,633           | \$ | 1,514        | \$ |                       | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                  | \$ | 0.10               |
|              |                  |          |                    |                  |    |              |    |                       |    |                                      |    |                               |      | 2000                  |    |                    |
|              |                  |          |                    |                  |    |              |    |                       |    |                                      |    | Total NPV                     | of ( | O&M Costs             | \$ | 17.1               |
|              |                  |          | Capital Cost       | s in million \$  |    |              |    |                       |    | Yr built                             |    |                               |      |                       |    |                    |
|              |                  |          | p., 5000           | RWTM to Re       |    | rvoir        | s  | 47.0                  | _  | 2015                                 | -  |                               |      |                       | \$ | 47.0               |

Total NPV of Capital and O&M Costs in millions \$ 100.

#### Reservoirs

|                        | Quantity        | Units | Volume/each (acre-feet) | nit Cost<br>\$/ac-ft) | Con   | Total<br>struction<br>cost in<br>sillions | tigency,<br>g., etc. | otal in<br>illions |
|------------------------|-----------------|-------|-------------------------|-----------------------|-------|---|----------------------|--------------------|
| Reservoirs             | 4               | each  | 15000                   | \$<br>1,180           | \$    | 70.8                                      | \$<br>26.9           | \$<br>97.7         |
|                        |                 |       |                         | \$<br>0.004           | per g | allon                                     |                      |                    |
| Estimated average dept | th of reservoir | 20    | ft                      |                       |       |   |                      |                    |

| Surface area of reservoir                     | 3000        | acres        |   |
|---|-------------|--------------|---|
| Ratio of total land area regd to surface area |             |              |   |
| of reservoir                                  | 1.1         |              | Envir & Archaeology, Surv,                |
| Total land area regd for reservoirs           | 3300        | acres        | and Land Acq = 16.5                       |
|   |             |              | Total capital cost in millions = \$ 114.2 |
| Assumed life of reservoir                     | 100         | years        |   |
| Estimated replacement cost                    | \$<br>0.71  | million/year |   |
| Estimated maintenance                         | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.          |
| Total   | \$<br>0.75  | million/year |   |
| Year built                                    | 2015        |              |   |
| NPV of O&M costs                              | \$<br>12.8  | million      |   |
| NPV of Capital costs                          | \$<br>114.2 | million      |   |
| Total NPV of Capital and O&M Costs            | \$<br>127.0 | million      |   |

| Summary   | <br>PV of<br>tal Costs | PV of O&M<br>Costs | Ca | pital and<br>M Costs |
|---|------------------------|--------------------|----|----------------------|
| Inflatable Rubber Low Head Dam                                    | \$<br>6.2              | \$<br>3.9          | \$ | 10.1                 |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>83.6             | \$<br>17.1         | \$ | 100.7                |
| Off Channel Reservoir   | \$<br>114.2            | \$<br>12.8         | \$ | 127.0                |
| Total for RWI A   | \$<br>204.0            | \$<br>33.8         | \$ | 237.8                |

#### **O&M Cost Calculations**

RWTM B - RWI B near Bastrop to WTP CTRWTP - Alternate 1B - WTP East of San Antonio

| Interest rate       | 5%         |         | Engineering, Legal, Admin. =                | 15% |         |          |
|---------------------|------------|---------|---|-----|---------|----------|
| Evaluation period   | 40         | years   | Environmental & Archaeology Studies &       |     |         |          |
| Unit cost of energy | \$<br>0.07 | per kwh | Mitigation, Surveying, and Land Acquisition | \$  | 100,000 | per mile |
|                     |            |         |   |     |         |          |

#### Summary of average pumping rates in acre-feet/year:

|                            | ce Water<br>Year   | 2015  | 2020                        | 2030         | 2040       |                | 2050                                     | 2060          | 20                  | 065              |                                    |
|----------------------------|--|---|-----------------------------|--------------|------------|----------------|--|---------------|---------------------|------------------|------------------------------------|
| F                          | or SAWS  | 18000   | 18000                       | 18000        | 18000      |                | 18000                                    | 18000         |                     | 000              | •                                  |
| - 1                        | CRA  |   |                             | 5600         | 11200      |                | 11200                                    | 11200         | 11                  | 200              |                                    |
|                            | COA  |   |                             | 16802        | 22403      |                | 33604                                    | 33604         |                     | 604              |                                    |
|                            | Subtotal   | 18000   | 18000                       | 40402        | 51603      |                | 62804                                    | 62804         |                     | 804              | •                                  |
| Groui                      | ndwater<br>Year  | 2015  | 2020                        | 2030         | 2040       |                | 2050                                     | 2060          | 20                  | 065              |                                    |
| F                          | or SAWS  | 55000   | 55000                       | 55000        | 55000      |                | 55000                                    | 55000         | 55                  | 000              |                                    |
| Sufac                      | ce & groun   | 73000   | 73000                       | 95402        | 106603     | 1              | 117804                                   | 117804        | 117                 | 804              |                                    |
| ι                          | Ultimate (Y20  | 065) averag   | ge design p                 | umping rate  | •          |                | 117,804                                  | ac-ft/year    |                     |                  |                                    |
| ing of                     | Raw Water  | Transmiss   | sion Main E                 | 3 & Pump S   | Stations   |                |  |               |                     |                  |                                    |
| Ir                         | nside diame  | ter of RWT  | м                           |              |            |                | 84                                       | in.           |                     |                  |                                    |
| A                          | Area   |   |                             |              |            |                | 38.48                                    | sf            |                     |                  |                                    |
| 1.                         | ength of RV  | MTV   |                             |              |            |                | 68                                       | miles         |                     |                  |                                    |
|                            | ***********  |   |                             |              |            |                | 359,040                                  | feet          |                     |                  |                                    |
| Е                          | Estimated un   | it construc   | tion cost fo                | r RWTM       |            | \$             | 467                                      | per LF        |                     |                  |                                    |
| Т                          | Total constru  | ction cost  | in millions                 |              |            | \$             | 167.8                                    |               |                     |                  |                                    |
| C                          | Contingencie   | S   |                             |              |            | \$             | 33.6                                     |               |                     |                  |                                    |
|                            |  | Subtotal  |                             |              |            | \$<br>\$<br>\$ | 201.4                                    |               |                     |                  |                                    |
| E                          | Engineering,   | Legal & Ad  | dministrativ                | е            |            | \$             | 30.2                                     |               |                     |                  |                                    |
|                            |  | Subtotal  |                             |              |            |                | 231.6                                    | M             |                     |                  |                                    |
| E                          | Envir & Arch   | Studies &   | Mitigation,                 | Surveying, a | & Land Acq | \$             | 6.8                                      |               |                     |                  |                                    |
|                            |  | Total Capita  | al Cost for I               | PWTM in m    | illions    | \$             | 238.4                                    | million       |                     |                  |                                    |
| ι                          | Jnit mainten   | ance cost/y   | ear-mile                    |              |            | \$             | 5,000                                    | \$/year-mile  | \$                  | 0.340            | Million \$/year                    |
| C                          | Design flow r  | ate (from t   | able above                  | )            |            |                | 117,804                                  | ac-ft/year    |                     |                  |                                    |
|                            |  |   |                             |              |            |                | 105                                      | mgd           |                     |                  |                                    |
|                            |  |   |                             |              |            |                | 73,029                                   | gpm           |                     |                  |                                    |
| F                          | Pumping rate   | (one pum  | p)                          |              |            |                | 15,000                                   | gpm           |                     |                  |                                    |
| 1                          | No. of pumps   | (not coun   | ting spare)                 |              |            |                | 5  |               |                     |                  |                                    |
| P                          | Peak flow rat  | e (all pump   | os except s                 | pare)        |            |                | 75,000                                   | gpm           |                     |                  |                                    |
| ٧                          | Velocity at pe   | eak flow rat  | te                          |              |            |                | 4.34                                     | fps           |                     |                  |                                    |
| (                          | C factor   |   |                             |              |            |                | 120                                      |               |                     |                  |                                    |
| F                          | Head loss pe   | r foot  |                             |              |            |                | 0.00067                                  | ft/ft         |                     | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>           |
|                            |  |   |                             |              |            |                | 3.55                                     | ft/mile       |                     |                  | C*(d) <sup>2.63</sup>              |
|                            | Head loss at   |   |                             |              |            |                | 242                                      |               |                     |                  |                                    |
|                            | Allowance fo   |   | ses                         | 10%          |            | _              | 24                                       |               |                     |                  | Elev. At WTP                       |
| 7                          | Total estimat  |   |                             |              |            |                | 266                                      | 155           |                     |                  | Elev of WSE in Bastrop reserve     |
|                            | Average stat   |   |                             |              |            |                | 250                                      |               | Control of the last | 250              | ft                                 |
|                            |  | ed dynami   | c head                      |              |            |                | 516                                      |               |                     |                  |                                    |
| A                          | Fotal estimat  |   |                             |              |            |                | 224                                      | psi           |                     |                  |                                    |
| A                          | Fotal estimat  |   |                             |              |            |                |  |               |                     |                  | 7227                               |
| T<br>N                     | No of recomm   |   |                             |              |            |                | 1.49                                     |               |                     | 150              | psi (assumed max pressure          |
| T                          |  | ng stations   | used in co                  |              |            |                | 1.49<br>2.0<br>258                       |               |                     | 150              | psi (assumed max pressure in pipe) |
| A<br>T<br>N                | No of recomr<br>No. of pumpi<br>Average hea  | ng stations<br>d per pump   | used in co<br>station       |              |            |                | 2.0<br>258                               |               |                     | 150              |                                    |
| A A A                      | No of recomr<br>No. of pumpi<br>Average hea<br>Assumed pu  | ng stations<br>d per pump<br>mp efficien                                  | used in co<br>station<br>cy |              |            |                | 2.0<br>258<br>85%                        |               |                     | 150              |                                    |
| A A A                      | No of recommon of pumping the second of pumping the second of the second | ng stations<br>d per pump<br>mp efficien<br>stor efficien                 | used in co<br>station<br>cy |              |            |                | 2.0<br>258<br>85%<br>90%                 | ft            |                     | 150              |                                    |
| A A A                      | No of recomr<br>No. of pumpi<br>Average hea<br>Assumed pu  | ng stations<br>d per pump<br>mp efficien<br>stor efficien                 | used in co<br>station<br>cy |              |            |                | 2.0<br>258<br>85%<br>90%<br>1,277        | ft<br>hp/pump |                     | 150              |                                    |
| T<br>N<br>N<br>A<br>A<br>E | No of recommon of pumping the second of pumping the second of the second | ng stations<br>d per pump<br>mp efficien<br>stor efficien<br>o required p | cy<br>cy<br>cy<br>per pump  | st estimate  |            |                | 2.0<br>258<br>85%<br>90%<br>1,277<br>953 | ft            |                     | 150              |                                    |

1,365 per firm hp of pump station 8.7 million 0.75 million 60 9.47 million 5.0

2.0 each

18.9 million

7.20 million 26.1 million

18.9 million 7.6 million 20 years 0.38 million/year

60 min. of storage at avg pumping rate 5.0 mg
0.15 per gal for open top reservoir

40% Estimated equipment cost as % of total

Unit construc cost for each pump station (from cost curve) \$ Construction cost per pump station
Balancing reservoir
Total construction cost per pump station

Total construction cost for pump stations
Value of equipment
Assumed life of equipment
Estimated maintenance/replacement cost

No. of pump stations from above

Total construction cost in millions

Contingency, Eng., etc. in millions Total capital cost in millions

#### O&M Costs

| Year | Flow pum<br>yea |     | No. of pump "sets" | Energy<br>used   |      | Energy   | / co | ost                   | COS | ther O&M<br>sts - Pump<br>Stations | aintenance<br>costs -<br>RWTM | Т    | otal O&M<br>cost      | Ne   | t present<br>value |
|------|-----------------|-----|--------------------|------------------|------|----------|------|-----------------------|-----|------------------------------------|-------------------------------|------|-----------------------|------|--------------------|
|      | ac-ft/yr        | mgd | operating<br>/day  | (kwh/day)        |      | (\$/day) |      | (Million \$<br>/year) | (   | Million \$<br>/year)               | (Million \$<br>/year)         |      | (Million \$<br>/year) |      | (\$)               |
| 2015 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 5.44               |
| 2016 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 5.19               |
| 2017 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 4.94               |
| 2018 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 4.70               |
| 2019 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 4.48               |
| 2020 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 4.27               |
| 2021 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 4.06               |
| 2022 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.87               |
| 2023 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.69               |
| 2024 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.51               |
| 2025 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.34               |
| 2026 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.18               |
| 2027 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 3.03               |
| 2028 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 2.89               |
| 2029 | 73,000          | 65  | 3.02               | 184,957          | \$   | 12,947   | \$   | 4.73                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 5.44                  | \$   | 2.75               |
| 2030 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 3.32               |
| 2031 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 3.16               |
| 2032 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 3.01               |
| 2033 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.86               |
| 2034 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.73               |
| 2035 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.60               |
| 2036 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.47               |
| 2037 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.36               |
| 2038 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.24               |
| 2039 | 95,402          | 85  | 3.94               | 241,716          | \$   | 16,920   | \$   | 6.18                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 6.89                  | \$   | 2.14               |
| 2040 | 106,603         | 95  | - 4.41             | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 2.25               |
| 2041 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 2.14               |
| 2042 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 2.04               |
| 2043 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.94               |
| 2044 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.85               |
| 2045 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.76               |
| 2046 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.68               |
| 2047 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.60               |
| 2048 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.52               |
| 2049 | 106,603         | 95  | 4.41               | 270,096          | \$   | 18,907   | \$   | 6.90                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 7.62                  | \$   | 1.45               |
| 2050 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.51               |
| 2051 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.44               |
| 2052 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.37               |
| 2053 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.31               |
| 2054 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.24               |
| 2055 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.19               |
| 2056 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.13               |
| 2057 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.08               |
| 2058 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 1.02               |
| 2059 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.98               |
| 2060 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.93               |
| 2061 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.88               |
| 2062 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.84/              |
| 2063 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.80               |
| 2064 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.76               |
| 2065 | 117,804         | 105 | 4.87               | 298,476          | \$   | 20,893   | \$   | 7.63                  | \$  | 0.38                               | \$<br>0.340                   | \$   | 8.34                  | \$   | 0.73               |
|      |                 |     |                    |                  |      |          |      |                       |     |                                    | Total NPV                     | of ( | O&M Costs             | \$   | 121.7              |
|      |                 |     | Capital Cos        | ts in million \$ | 5:   |          |      |                       |     | Yr built                           |                               |      |                       |      |                    |
|      |                 |     |                    | RWTM             |      |          | \$   | 238.4                 | -   | 2015                               |                               |      |                       | \$   | 238.4              |
|      |                 |     |                    |                  |      |          | 5230 |                       |     |                                    |                               |      |                       | 0.00 |                    |
|      |                 |     |                    | Pumping Sta      | atio | ns       | \$   | 26.1                  |     | 2015                               |                               |      |                       | \$   | 26.1               |

Total NPV of Capital and O&M Costs in millions \$ 386.2

# O&M Cost Calculations WTP and Raw Water Storage Reservoir at WTP CTRWTP - Alternate 1B - WTP East of San Antonio

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

2015 5% 50 years \$ 0.07 per kwh

Contingency = 20%
Engineering, Legal, Admin, = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

## Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

|  |                  |                | Year =               | 2015   | 2020                     | 2030                         | 2040   | 2050                  | 2060           | 2065            |
|--|------------------|----------------|----------------------|--|--------------------------|------------------------------|--|-----------------------|----------------|-----------------|
| Softened water demand:   |                  |                | Units                |  |                          |                              |  |                       |                |                 |
| Average yearly demands   |                  |                |                      |  |                          |                              |  |                       |                |                 |
| City of Austir<br>LCRA   | 1:               |                | ac-ft/yr<br>ac-ft/yr | 0  |                          |                              | 22403<br>11200                                       | 33604<br>11200        | 33604<br>11200 | 33604<br>11200  |
|  | Totals<br>Totals |                | ac-ft/yr<br>mgd      | 0  |                          |                              | 33603<br>30  | 44804<br>40           | 44804<br>40    | 44804<br>40     |
| Max day demands;<br>City of Austir<br>LCRA                               | 1                |                | mgd<br>mgd           | 0  |                          |                              | 35<br>20   | 50<br>20              | 50<br>20       | 50<br>20        |
| LONA   | Totals           |                | mgd                  |  |                          |                              | 55   | 70                    | 70             | 70              |
|  |                  |                | Year =               | 2015   | 2020                     | 2030                         | 2040   | 2050                  | 2060           | 2065            |
| Non-softened water demand  | S:               |                | Units                |  |                          |                              |  |                       |                |                 |
| Average yearly demands   | <b>:</b> :       |                |                      | 70000  |                          |                              | 005000   | 205000                | 205000         | 005000          |
| SAWS<br>SARA   |                  |                | ac-ft/yr<br>ac-ft/yr | 73000<br>20550                               |                          |                              | 205000<br>31393                                      | 34411                 | 37530          | 205000<br>41128 |
| GBRA   |                  |                | ac-ft/yr             | 0  | (                        | 6000                         | 8000   | 10000                 | 12300          | 12300           |
|  | Totals           |                |                      | 93550  |                          |                              | 244393   | 249411                | 254830         | 258428          |
|  | Totals           |                | mgd                  | 84   | 204                      | 214                          | 218  | 223                   | 227            | 231             |
| Max day demands:   |                  |                |                      |  |                          |                              |  |                       |                |                 |
| SAWS   |                  |                | mgd                  | 85   |                          |                              | 238  | 238                   | 238            | 238             |
| SARA<br>GBRA   |                  |                | mgd<br>mgd           | 24   |                          |                              | 36   | 40<br>9               | 44             | 48<br>11        |
| GBRA ,   | Totals           |                | mgd                  | 109  |                          |                              | 281  | 287                   | 293            | 297             |
|  |                  |                |                      |  |                          |                              |  |                       |                |                 |
| Total: softened and non-soft   | ened water de    | mands          |                      |  |                          |                              |  |                       |                |                 |
| Average yearly demand  |                  |                | ac-ft/yr<br>mgd      | 93550<br>84                                  |                          |                              | 277996<br>248  | 294215<br>263         | 299634<br>267  | 303232<br>271   |
| Max day demand   |                  |                | mgd                  | 109  | 265                      | 311                          | 336  | 357                   | 363            | 367             |
| aw Water Reservoir  Sizing for ultimate conditions Assumed number of day |                  | ve Max Day d   | emands               | 30   | days                     |                              |  |                       |                |                 |
| Design (Max. Day) treate   | d water produ    | ction req'd in | mgd                  |  | mgd                      |                              |  |                       |                |                 |
| Average treated water p  | oduction in m    | gd             |                      | 271  | mgd                      | (which is also can be pumped |  | ground and raw        | water that     |                 |
| Difference (s  | hortfall of raw  | water)         |                      | 96   | mgd                      | 2 224                        |  |                       |                |                 |
| Required storage reserve   |                  | er<br>25%      |                      | 2,889<br>8,868<br>2,217                      | mg<br>ac-ft<br>ac-ft     |                              |  |                       |                |                 |
| Total storage required   |                  | 2070           |                      | 11,084                                       | ac-ft                    |                              |  |                       |                |                 |
| Total storage recommer   | ded              |                |                      | 12,000                                       | ac-ft                    |                              | days at averag                                       |                       | 33 (           | lays            |
|  |                  | Quantity       | Units                | Volume/each<br>(acre-feet)                   | Unit Cost<br>(\$/ac-ft)) | Total<br>Construction        |  | Total Capital<br>Cost |                |                 |
| Reservoirs   |                  | 1              | each                 | 12,000                                       | \$ 1,283                 | \$ 15.4                      | Eng., etc.   | \$ 21.3               |                |                 |
| Estimated average depti<br>Surface area of reservol                      | of reservoir     |                | 25<br>480            | ft<br>acres                                  |                          |                              |  |                       |                |                 |
| Ratio of total land area re<br>of reservoir                              | eqd to surface   | area           | 1.10                 |  |                          | Emds 8 Assi                  | analamı Cunı   |                       |                |                 |
| Total land area reqd for   | reservoirs       |                | 528                  | acres  |                          | Total capital cos            | naeology, Surv,<br>and Land Acq =<br>t in millions ≃ | \$ 34.5               |                |                 |
| Assumed life of reservol   |                  |                | 100                  | years  |                          |                              |  |                       |                |                 |
| Estimated replacement of<br>Estimated maintenance<br>Total               | cost             |                | \$ 0.04              | million/year<br>million/year<br>million/year | Mowing, mair             | ntaining fences, e           | tc.  |                       |                |                 |
| Year built   |                  |                | 2015                 |  |                          |                              |  |                       |                |                 |
| NPV of O&M costs<br>NPV of Capital costs                                 |                  |                |                      | million<br>million                           |                          |                              |  |                       |                |                 |
| Total NPV of Capital and   | I O&M Costs      |                | \$ 38.0              | million                                      |                          |                              |  |                       |                |                 |

#### WTP

#### Plant Phasing and Capital Costs:

| Softening Treatment Trains                                      | 8  | 2045  |       | 2020     |               | 0000    |    | 2010    |    | 205           | •   | 2222     | 2005      |
|---|----|-------|-------|----------|---------------|---------|----|---------|----|---------------|-----|----------|-----------|
| Year =  |    | 2015  |       | 2020     |               | 2030    | -  | 2040    | -  | 205           |     | <br>2060 | 2065      |
| Average treated water production in mgd                         |    | 0     |       | 0        |               | 20      |    | 30      |    |               | 40  | 40       | 4         |
| Design (Max. Day) treated water production req'd in mgd         |    | 0     |       | 0        |               | 35      |    | 55      |    |               | 70  | 70       | 7         |
| Initial/additional Max day capacity built (mgd)                 |    |       |       | _        |               | 50      |    | 20      |    |               |     |          | -         |
| Total capacity on line (must exceed Design Max Day Req'd)       |    | 0     |       | 0        |               | 50      |    | 70      |    |               | 70  | 70       | 7         |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   |    |       |       |          | \$            | 1.78    | \$ | 2.14    |    |               |     |          |           |
| Estimated construction cost of expansion in \$millions          | \$ |       | \$    | -        | \$            | 89.0    | \$ | 42.8    | \$ |               | •   | \$       | \$<br>* : |
| Non-softening Treatment Trains                                  |    |       |       |          |               |         |    |         |    |               |     |          |           |
| Year =  |    | 2015  | 44.00 | 2020     | I Description | 2030    |    | 2040    |    | 205           | 0   | 2060     | <br>2065  |
| Average treated water production in mgd                         |    | 84    |       | 204      |               | 214     |    | 218     |    |               | 223 | 227      | 23        |
| Design (Max. Day) treated water production req'd in mgd         |    | 109   |       | 265      |               | 276     |    | 281     |    |               | 287 | 293      | 29        |
| Additional Max day capacity built (mgd)                         |    | 200   |       | 100      |               |         |    |         |    |               |     |          |           |
| Total capacity on line (must exceed Design Max Day Req'd)       |    | 200   |       | 300      |               | 300     |    | 300     |    |               | 300 | 300      | 30        |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   | \$ | 1.15  | \$    | 1.32     |               |         |    |         |    |               |     |          |           |
| Estimated construction cost of expansion in \$millions          | \$ | 229.6 | \$    | 131.5    | \$            |         | \$ | ¥       | \$ |               | -   | \$<br>   | \$<br>2   |
| Totals (Softening + Non-softening Trains)                       |    |       |       |          |               |         |    |         |    |               |     |          |           |
| Year =  |    | 2015  |       | 2020     |               | 2030    |    | 2040    |    | 205           | 0   | 2060     | 2065      |
| Total construction cost for both trains                         | \$ | 229.6 | \$    | 131.5    | \$            | 89.0    | \$ | 42.8    | \$ | of the second |     | \$       | \$<br>-   |
| Contingencies   |    | 45.9  |       | 26.3     |               | 17.8    |    | 8.6     |    |               |     | -        | -         |
| Subtotal  | \$ | 275.5 | \$    | 157.8    | \$            | 106.8   | \$ | 51.3    | \$ |               | -   | \$<br>-  | \$        |
| Engineering, Legal, & Administrative                            |    | 41.3  |       | 23.7     |               | 16.0    |    | 7.7     |    |               | -   |          | -         |
| Subtotal  |    | 316.8 |       | 181.5    |               | 122.8   |    | 59.0    |    |               |     | <br>-    | -         |
| Environmental & Archaelogy Studies and Mitigation & Land        |    |       |       |          |               |         |    |         |    |               |     |          |           |
| Acquisition and Surveying (see Note below)                      |    | 2.5   |       |          |               |         |    |         |    |               |     |          |           |
| Total estimated capital cost                                    | \$ | 319.3 | \$    | 181.5    | \$            | 122.8   | \$ | 59.0    | \$ |               | -   | \$<br>-  | \$<br>-   |
| NPV of capital cost   | \$ | 319.3 |       | \$ 142.2 |               | \$ 59.1 |    | \$ 17.4 |    | \$            | *   | \$ -     | \$ -      |
| Total NPV of WTP initial construction & expansions              | \$ | 538   |       |          |               |         |    |         |    |               |     |          |           |
| Note: Assumed land requirement for WTP (not including reservoir |    | 100   | acr   | es       |               |         |    |         |    |               |     |          |           |

### O&M Costs for Softening Trains:

#### O&M Costs for Non-Softening Trains;

| /ear         | Plant<br>Capacity in<br>service | Estimated<br>treated<br>water<br>production | Esti | mated O          |    |                 | Ne | et present<br>value | Year | Plant Capacity<br>in service | Estimated<br>treated water<br>production | \$ par ma |                  |      |            | value |       |
|--------------|---------------------------------|---|------|------------------|----|-----------------|----|---------------------|------|------------------------------|--|-----------|------------------|------|------------|-------|-------|
|              | mgd of<br>capacity              | mgd<br>produced                             |      | per mg<br>reated |    | nillion<br>year |    | (\$)                |      | mgd of<br>capacity           | mgd<br>produced                          |           | per mg<br>reated | \$mi | lion /year |       | (\$)  |
| 2015         | -                               |   |      |                  | \$ | •               | \$ | -                   | 2015 | 200                          | 84                                       | \$        | 374              | \$   | 11.41      | \$    | 11,41 |
| 2016         | *                               | -   |      |                  | \$ |                 | \$ | -                   | 2016 | 200                          | 84                                       | \$        | 374              | \$   | 11.41      | \$    | 10.8  |
| 2017         | -                               | -   |      |                  | \$ |                 | \$ | -                   | 2017 | 200                          | 84                                       | \$        | 374              | \$   | 11.41      | \$    | 10.3  |
| 2018         | -                               | -   |      |                  | \$ | -               | \$ | -                   | 2018 | 200                          | 84                                       | \$        | 374              | \$   | 11.41      | \$    | 9.8   |
| 2019         |                                 |   |      |                  | \$ |                 | \$ | 2                   | 2019 | 200                          | 84                                       | \$        | 374              | \$   | 11.41      | \$    | 9.3   |
| 2020         |                                 |   |      |                  | S  |                 | \$ |                     | 2020 | 300                          | 204                                      | \$        | 343              | \$   | 25.50      | \$    | 19.9  |
| 2021         |                                 | -   |      |                  | \$ | -               | \$ | 2                   | 2021 | 300                          | 204                                      | \$        | 343              | \$   | 25.50      | \$    | 19.0  |
| 2022         | -                               | -   |      |                  | \$ |                 | \$ | -                   | 2022 | 300                          | 204                                      | \$        | 343              | \$   | 25.50      | \$    | 18.1  |
| 2023         | -                               | -   |      |                  | S  |                 | s  |                     | 2023 | 300                          | 204                                      | S         | 343              | \$   | 25.50      | \$    | 17.2  |
| 2024         | -                               | -   |      |                  | \$ | -               | s  | -                   | 2024 | 300                          | 204                                      | \$        | 343              | \$   | 25.50      | \$    | 16.4  |
| 2025         |                                 |   |      |                  | s  |                 | s  |                     | 2025 | 300                          | 204                                      | \$        | 343              | \$   | 25.50      | \$    | 15.6  |
| 2026         |                                 |   |      |                  | s  |                 | Š  |                     | 2026 | 300                          | 204                                      | \$        | 343              | Š    | 25.50      | \$    | 14.9  |
| 2027         |                                 |   |      |                  | Š  |                 | Š  | 2                   | 2027 | 300                          | 204                                      | š         | 343              | š    | 25.50      | š     | 14.2  |
| 2028         | 2                               | _   |      |                  | Š  | -               | Š  | Į.                  | 2028 | 300                          | 204                                      | Š         | 343              | Š    | 25.50      | Š     | 13.5  |
| 2029         |                                 | 8   |      |                  | Š  |                 | Š  | - 5                 | 2029 | 300                          | 204                                      | š         | 343              | š    | 25.50      | š     | 12.   |
| 2030         | 50                              | 20  | \$   | 712              | Š  | 5.20            | Š  | 2.50                | 2030 | 300                          | 214                                      | š         | 343              | š    | 26.73      | Š     | 12.8  |
|              | 50                              | 20  | \$   | 712              | \$ | 5.20            | Š  | 2.38                | 2031 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 12.   |
| 2031<br>2032 | 50                              | 20  | S    | 712              | \$ | 5.20            | Š  | 2.30                | 2032 | 300                          | 214                                      | Š         | 343              | S    | 26.73      | \$    | 11.0  |
|              |                                 |   |      |                  | \$ |                 |    |                     |      | 300                          | 214                                      | Š         | 343              | \$   | 26.73      | \$    | 11.   |
| 2033         | 50                              | 20  | \$   | 712              |    | 5.20            | \$ | 2.16                | 2033 |                              |  |           | 343              | \$   |            |       | 10.5  |
| 2034         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 2.06                | 2034 | 300                          | 214                                      | \$        |                  |      | 26.73      | \$    |       |
| 2035         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 1.96                | 2035 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 10.   |
| 2036         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 1.87                | 2036 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 9.    |
| 2037         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 1.78                | 2037 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 9.    |
| 2038         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 1.69                | 2038 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 8.    |
| 2039         | 50                              | 20  | \$   | 712              | \$ | 5.20            | \$ | 1.61                | 2039 | 300                          | 214                                      | \$        | 343              | \$   | 26.73      | \$    | 8.    |
| 2040         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 2.14                | 2040 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 8.    |
| 2041         | 70                              | 30  | \$ . | 661              | \$ | 7.24            | \$ | 2.04                | 2041 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 7.    |
| 2042         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.94                | 2042 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 7.    |
| 2043         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.85                | 2043 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 6.    |
| 2044         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.76                | 2044 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 6.6   |
| 2045         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.68                | 2045 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 6.3   |
| 2046         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.60                | 2046 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 6.0   |
| 2047         | 70                              | 30  | \$   | 661              | \$ | 7.24            | \$ | 1.52                | 2047 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 5.7   |
| 2048         | 70                              | 30  | \$   | 661              | \$ | 7.24            | S  | 1.45                | 2048 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | \$    | 5.    |
| 2049         | 70                              | 30  | s    | 661              | s  | 7.24            | \$ | 1.38                | 2049 | 300                          | 218                                      | \$        | 343              | \$   | 27.28      | S     | 5.    |
| 2050         | 70                              | 40  | \$   | 661              | s  | 9.65            | \$ | 1.75                | 2050 | 300                          | 223                                      | \$        | 343              | \$   | 27.84      | \$    | 5.0   |
| 2051         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.67                | 2051 | 300                          | 223                                      | \$        | 343              | \$   | 27.84      | 5     | 4.1   |
| 2052         | 70                              | 40  | \$   | 661              | \$ | 9.65            | Š  | 1.59                | 2052 | 300                          | 223                                      | \$        | 343              | \$   | 27.84      | \$    | 4.    |
| 2053         | 70                              | 40  | š    | 661              | Š  | 9.65            | \$ | 1.51                | 2053 | 300                          | 223                                      | Š         | 343              | S    | 27.84      | s     | 4.    |
| 2054         | 70                              | 40  | Š    | 661              | \$ | 9.65            | š  | 1.44                | 2054 | 300                          | 223                                      | š         | 343              | Š    | 27.84      | Š     | 4.    |
| 2055         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.37                | 2055 | 300                          | 223                                      | Š         | 343              | Š    | 27.84      | š     | 3.    |
| 2056         | 70                              | 40  | s    | 661              | Š  | 9.65            | Š  | 1.31                | 2056 | 300                          | 223                                      | Š         | 343              | \$   | 27.84      | \$    | 3.    |
| 2056         | 70                              | 40  | S    | 661              | S  | 9.65            | \$ | 1.24                | 2057 | 300                          | 223                                      | Š         | 343              | Š    | 27.84      | Š     | 3.    |
| 2058         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.18                | 2058 | 300                          | 223                                      | \$        | 343              | \$   | 27.84      | Š     | 3.    |
|              |                                 |   |      |                  |    |                 |    |                     |      |                              |  |           | 343              |      |            |       |       |
| 2059         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.13                | 2059 | 300                          | 223                                      | \$        |                  | \$   | 27.84      | \$    | 3.    |
| 2060         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.07                | 2060 | 300                          | 227                                      | \$        | 343              | \$   | 28.45      | \$    | 3.    |
| 2061         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 1.02                | 2061 | 300                          | 227                                      | \$        | 343              | \$   | 28.45      | \$    | 3.    |
| 2062         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 0.97                | 2062 | 300                          | 227                                      | \$        | 343              | \$   | 28.45      | \$    | 2.    |
| 2063         | 70                              | 40  | \$   | 661              | \$ | 9.65            | \$ | 0.93                | 2063 | 300                          | 227                                      | \$        | 343              | \$   | 28.45      | \$    | 2.    |
| 2064         | 70                              | 40<br>40                                    | \$   | 661<br>661       | \$ | 9.65            | \$ | 0.88                | 2064 | 300<br>300                   | 227<br>231                               | \$        | 343<br>343       | \$   | 28.45      | \$    | 2.5   |
| 2065         | 70                              |   |      |                  |    | 9.65            |    |                     | 2065 |                              |  |           |                  |      | 28.85      |       |       |

NPV Totals for O&M:

Softening trains \$ 58

Non-softening Trains \$ 441

\$ 499

Summary

Raw Water Reservoir Water Treatment Plant Totals

| <br>PV of<br>al Costs | of O&M<br>Costs | Cap | al NPV of<br>pital and<br>M Costs |
|-----------------------|-----------------|-----|-----------------------------------|
| \$<br>34              | \$<br>3.5       | \$  | 38                                |
| \$<br>538             | \$<br>499       | \$  | 1,037                             |
| \$<br>572             | \$<br>502       | \$  | 1,075                             |

#### Capital and O&M Cost Calculations Potable Water Transmission Mains CTRWTP - Alternate 1B - WTP East of San Antonio

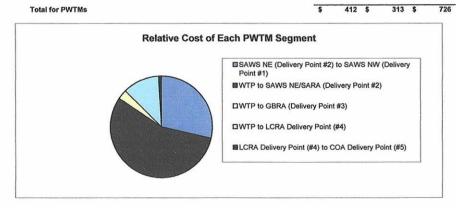
Initial year of analysis period 2015 Contingency = 20% Interest rate 5% Engineering, Legal, Admin. = 15% Evaluation period 50 years Environmental & Archaeology Studies & Unit cost of energy \$ 0.07 per kwh Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

#### **Summary of Demands**

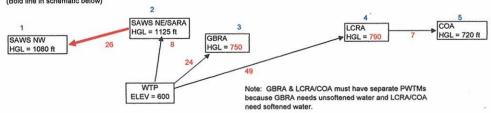
#### Average demands to be delivered in each segment

|          |       |        | in acre-feet/ye | ar     |        |        |        |
|----------|-------|--------|-----------------|--------|--------|--------|--------|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |
| SAWS NW  | 43800 | 123000 | 123000          | 123000 | 123000 | 123000 | 123000 |
| SAWS NE  | 29200 | 82000  | 82000           | 82000  | 82000  | 82000  | 82000  |
| Subtotal | 73000 | 205000 | 205000          | 205000 | 205000 | 205000 | 205000 |
| SARA     | 20550 | 23406  | 28433           | 31393  | 34411  | 37530  | 41128  |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |
| Total    | 93550 | 228406 | 261835          | 277996 | 294215 | 299634 | 303232 |

#### NPV of O&M Total NPV of Capital and Summary Capital Costs O&M Costs \$ 207 Costs SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1) WTP to SAWS NE/SARA (Delivery Point #2) WTP to GBRA (Delivery Point #3) WTP to LCRA Delivery Point (#4) LCRA Delivery Point (#4) to COA Delivery Point (#5) 203 117 289 405 5 14 1 22 84 7 17 70



## SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1) (Bold line in schematic below)



#### Demands for this pipe segment

|         |      | Average dem | ands to be deli | ivered in each | segment in mgd | ĺ    |      |             |
|---------|------|-------------|-----------------|----------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030            | 2040           | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NW | 39   | 110         | 110             | 110            | 110            | 110  | 110  | 1.3         |
| Total - | 39   | 110         | 110             | 110            | 110            | 110  | 110  |             |

|         |      | Max day dem | ands to be del | vered in each s | segment in mgd | l    |      |
|---------|------|-------------|----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030           | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 143         | 143            | 143             | 143            | 143  | 143  |
| Total   | 51   | 143         | 143            | 143             | 143            | 143  | 143  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 143     | mgd   |  |
|---|---------|-------|--|
| •                                       | 99,125  | gpm   |  |
| Pumping capacity of one pump            | 20,000  | gpm   |  |
| No. of pumps (not counting spare)       | 5       |       |  |
| Peak flow rate (all pumps except spare) | 100,000 | gpm   |  |
| Inside diameter of PWTM                 | 120     | in.   |  |
| Area                                    | 78.54   | sf    |  |
| Length of RWTM                          | 26      | miles | (linked to mileage in schematic above) |
|   | 137 280 | foot  | S 150                                  |

| Estimated unit cost by condition:     | % of length          | LF      | U    | nit cost |       | Cost  |         |
|---------------------------------------|----------------------|---------|------|----------|-------|-------|---------|
| Rural - soil                          | 15%                  | 20,592  | \$   | 783      | \$    | 16.1  | million |
| Rural - rock                          | 50%                  | 68,640  | \$   | 1,048    | \$    | 72.0  |         |
| Urban - rock                          | 35%                  | 48,048  | \$   | 1,186    | \$    | 57.0  |         |
|                                       |                      | 137,280 | 8.00 |          | \$    | 145.0 | million |
| Average estimated unit construction   | cost for PWTM        |         | \$   | 1,057    | per L | F     |         |
| Total construction cost in millions   |                      |         | \$   | 145.0    |       |       |         |
| Contingencies                         |                      |         | \$   | 29.0     |       |       |         |
| Subtotal                              |                      |         | \$   | 174.0    |       |       |         |
| Engineering, Legal & Administrative   |                      |         | \$   | 26.1     |       |       |         |
| Subtotal                              |                      |         | \$   | 200.2    |       |       |         |
|                                       | and And And And      |         | 2    | 2.6      |       |       |         |
| Envir & Arch Studies & Mitigation, Su | irveying, & Land Acc |         |      |          |       |       |         |

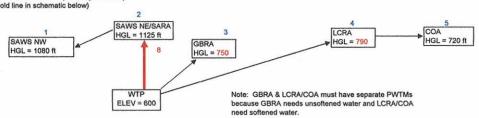
| Unit maintenance cost/year-mile |     | S | 10.000  | \$/year-mile | S | 0.260            | Million \$/year               |
|---------------------------------|-----|---|---------|--------------|---|------------------|-------------------------------|
| One manifolianos sossycar milo  |     | * | 10,000  | 4.,00        | * | 0.000            |                               |
| Velocity at peak flow rate      |     |   | 2.84    | fps          |   |                  |                               |
| C factor                        |     |   | 120     |              |   |                  |                               |
| Head loss per foot              |     |   | 0.00020 | ft/ft        |   | h <sub>f</sub> = | 3.552*Q 1.85                  |
|                                 |     |   | 1.07    | ft/mile      |   |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate     |     |   | 28      | ft           |   |                  |                               |
| Allowance for minor losses      | 20% |   | 6       | ft           |   | 1080             | Desired HGL At Delivery Point |
| Total estimated losses          |     |   | 33      | ft           |   |                  | HGL At Delivery Point 2       |
| Average static head             |     | - | -45     |              |   | -45              | ft                            |
| Total estimated dynamic head    |     |   | -12     |              |   |                  |                               |
|                                 |     |   | -5      | nsi          |   |                  |                               |

#### Negative indicates gravity flow from #2 to #1; no pumping necessary.

|                             |        |       |          | 12                         | <br>Aillion \$ |
|-----------------------------|--------|-------|----------|----------------------------|----------------|
| Annual O&M Cost in milli    | on \$: |       | Yr built |                            |                |
| PWTM                        | \$     | 0.260 | 2015     |                            |                |
|                             |        |       |          | Total NPV of O&M Costs     | \$4.7          |
| Capital Costs in million \$ |        |       | Yr built |                            |                |
| PWTM                        | \$     | 202.8 | 2015     | -                          | \$<br>202.8    |
|                             |        |       |          | Total NPV of Capital Costs | \$<br>202.8    |

Total NPV of Capital and O&M Costs in millions \$ 207.5 SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1)

#### WTP to SAWS NE/SARA (Delivery Point #2) (Bold line in schematic below)



## Demands for this pipe segment

| D |  |  |  |
|---|--|--|--|
|   |  |  |  |
|   |  |  |  |

|         |      | Avoidge delli | ands to be don | voida ili dacili a | oginioni in mga |      |      |
|---------|------|---------------|----------------|--------------------|-----------------|------|------|
| Year    | 2015 | 2020          | 2030           | 2040               | 2050            | 2060 | 2065 |
| SAWS NW | 39   | 110           | 110            | 110                | 110             | 110  | 110  |
| SAWS NE | 26   | 73            | 73             | 73                 | 73              | 73   | 73   |
| SARA    | 18   | 21            | 25             | 28                 | 31              | 34   | 37   |
| Total   | 84   | 204           | 208            | 211                | 214             | 217  | 220  |

| Max d/Avg d |
|-------------|
| 1.3         |
| 1.3         |
| 1.3         |

0.080 Million \$/year

\$

|         |      | Max day dem | ands to be deli | ivered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 143         | 143             | 143              | 143            | 143  | 143  |
| SAWS NE | 34   | 95          | 95              | 95               | 95             | 95   | 95   |
| SARA    | 24   | 27          | 33              | 36               | 40             | 44   | 48   |
| Total   | 109  | 265         | 271             | 274              | 278            | 281  | 286  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 286     | mgd   |  |
|---|---------|-------|--|
|   | 198,353 | gpm   |  |
| Pumping capacity of one pump            | 20,000  | gpm   |  |
| No. of pumps (not counting spare)       | 10      |       |  |
| Peak flow rate (all pumps except spare) | 200,000 | gpm   |  |
| Inside diameter of PWTM                 | 120     | in.   |  |
| Area                                    | 78.54   | sf    |  |
| Length of PWTM                          | 8       | miles | (linked to mileage in schematic above) |
|   | 42,240  | feet  |  |

| Estimated unit cost by condition: | % of length | LE     | U       | nit cost |    | Cost |         |
|-----------------------------------|-------------|--------|---------|----------|----|------|---------|
| Rural - soil                      | 25%         | 10,560 | \$      | 783      | \$ | 8.3  | million |
| Rural - rock                      | 50%         | 21,120 | \$      | 1,048    | S  | 22.1 |         |
| Urban - rock                      | 25%         | 10,560 | \$      | 1,186    | \$ | 12.5 |         |
|                                   |             | 42,240 | SULPTRI |          | \$ | 42.9 | million |

| Total construction cost in millions | \$<br>42.9 |
|-------------------------------------|------------|
| Contingencies                       | \$<br>8.6  |
| Subtotal                            | \$<br>51.5 |
| Engineering, Legal & Administrative | \$<br>7.7  |
| Subtotal                            | \$<br>59.2 |
|                                     |            |

| Engineering, Legal & Administrative                      | \$<br>7.7    |              |
|--|--------------|--------------|
| Subtotal   | \$<br>59.2   | -            |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.8    |              |
| Total Capital Cost for PWTM in millions                  | \$<br>60.0   | -            |
| Unit maintenance cost/year-mile                          | \$<br>10,000 | \$/year-mile |

| Velocity at peak flow rate<br>C factor |     | 5.67<br>120 | fps     |                  |                               |
|--|-----|-------------|---------|------------------|-------------------------------|
| Head loss per foot                     |     | 0.00073     | ft/ft   | h <sub>f</sub> = | 3.552*Q 1.85                  |
|  |     | 3.85        | ft/mile |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate            |     | 31          | ft      |                  |                               |
| Allowance for minor losses             | 20% | 6           | ft      | 1125             | Desired HGL At Delivery Point |
| Total estimated losses                 |     | 37          | ft      | 600              | Elev. At WTP                  |
| Average static head                    |     | 525         | ft      | 525              | ft                            |
| Total estimated dynamic head           |     | 562         | ft      |                  |                               |
|  |     | 244         | psi     |                  |                               |
|  |     |             |         |                  |                               |

| ,  | 244 psi       |                               |
|--|---------------|-------------------------------|
| No of recommended pumping stations along route | 1.62          | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 2             | in pipe)                      |
| Average head per pump station                  | 281 ft        |                               |
| Assumed pump efficiency                        | 85%           |                               |
| Assumed motor efficiency                       | 90%           |                               |
| Estimated Hp required per pump                 | 1,855 hp/pump |                               |
|  | 1,384 kw/pump |                               |
|  |               |                               |

| Total hp per pump station (not counting spare)          | 18,549 firm hp/station                       |
|---|--|
| Total kw per pump set (set=pumps in series along route) | 3,710 kw/pump set (one pump at each station) |
|   |  |

| Unit construction cost for each pump station (from cost curve) | \$<br>1,105 | per firm hp of pump station |
|--|-------------|-----------------------------|
| Construction cost per pump station                             | 20.5        | million                     |

| Total construction cost for pump stations | 41.0 | for | 2 | pump statio |
|---|------|-----|---|-------------|
|   |      |     |   |             |

 Contingencies
 \$
 8.2

 Subtotal
 \$
 49.2

 Engineering, Legal & Administrative
 \$
 7.4

 Total capital cost for pump stations in millions
 \$
 56.6
 million

 Value of equipment
 \$ 16 million

 Assumed life of equipment
 20 years

 Estimated maintenance/replacement cost
 \$ 0.82 million/year

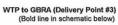
40% Equip cost as % of constr cost

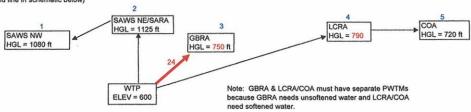
#### O&M Costs

| O&M Cos | ts   |  |                |      |          |      |                    |    |                                      |    |                               |      |                    |    |                     |
|---------|--|--|----------------|------|----------|------|--------------------|----|--------------------------------------|----|-------------------------------|------|--------------------|----|---------------------|
| Year    | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |      | Energ    | gy c | cost               |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | Т    | otal O&M<br>cost   | Ne | et present<br>value |
|         | mgd  |  | (kwh/day)      |      | (\$/day) |      | (Million \$ /year) |    | (Million \$ /year)                   | -  | (Million \$<br>/year)         |      | (Million \$ /year) |    | (\$)                |
| 2015    | 84   | 2.90                                       | 258,178        | \$   | 18,072   | \$   | 6.60               | \$ | 0.82                                 | \$ | 0.080                         | \$   | 7,50               | \$ | 7.50                |
| 2016    | 84   | 2.90                                       | 258,178        | \$   | 18,072   | \$   | 6.60               | \$ | 0.82                                 | \$ | 0.080                         | \$   | 7.50               | \$ | 7.14                |
| 2017    | 84   | 2.90                                       | 258,178        | \$   | 18,072   | \$   | 6.60               | \$ | 0.82                                 | \$ | 0.080                         | \$   | 7.50               | \$ | 6.80                |
| 2018    | 84   | 2.90                                       | 258,178        | \$   | 18,072   | \$   | 6.60               | \$ | 0.82                                 | \$ | 0.080                         | \$   | 7.50               | \$ | 6.48                |
| 2019    | 84   | 2.90                                       | 258,178        | \$   | 18,072   | \$   | 6.60               | \$ | 0.82                                 | \$ | 0.080                         | \$   | 7.50               | \$ | 6.17                |
| 2020    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 13.32               |
| 2021    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 12.69               |
| 2022    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 12.09               |
| 2023    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 11.51               |
| 2024    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 10.96               |
| 2025    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 10.44               |
| 2026    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 9.94                |
| 2027    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 9.47                |
| 2028    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 9.02                |
| 2029    | 204  | 7.08                                       | 630,351        | \$   | 44,125   | \$   | 16.11              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.01              | \$ | 8.59                |
| 2030    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 8.35                |
| 2031    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 7.95                |
| 2032    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 7.57                |
| 2033    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 7.21                |
| 2034    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 6.87                |
| 2035    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 6.54                |
| 2036    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 6.23                |
| 2037    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 5.93                |
| 2038    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 5.65                |
| 2039    | 208  | 7.24                                       | 644,225        | \$   | 45,096   | \$   | 16.46              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.36              | \$ | 5.38                |
| 2040    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 5.19                |
| 2041    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 4.94                |
| 2042    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 4.71                |
| 2043    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 4.48                |
| 2044    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 4.27                |
| 2045    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 4.06                |
| 2046    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 3.87                |
| 2047    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 3.69                |
| 2048    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.57              | \$ | 3.51                |
| 2049    | 211  | 7.33                                       | 652,394        | \$   | 45,668   | \$   | 16.67              | \$ |                                      | \$ | 0.080                         | \$   | 17.57              | \$ | 3.34                |
| 2050    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 3.22                |
| 2051    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 3.07                |
| 2052    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.92                |
| 2053    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.78                |
| 2054    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.65                |
| 2055    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.53                |
| 2056    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.41                |
| 2057    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.29                |
| 2058    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.18                |
| 2059    | 214  | 7.42                                       | 660,723        | \$   | 46,251   | \$   | 16.88              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 17.78              | \$ | 2.08                |
| 2060    | 217  | 7.52                                       | 669,331        | \$   | 46,853   | \$   | 17.10              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 18.00              | \$ | 2.00                |
| 2061    | 217  | 7.52                                       | 669,331        | \$   | 46,853   | \$   | 17.10              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 18.00              | \$ | 1.91                |
| 2062    | 217  | 7.52                                       | 669,331        | \$   | 46,853   | \$   | 17.10              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 18.00              | \$ | 1.82                |
| 2063    | 217  | 7.52                                       | 669,331        | \$   | 46,853   | \$   | 17.10              | \$ | 0.82                                 | \$ | 0.080                         | \$   | 18.00              | \$ | 1.73                |
| 2064    | 217  | 7.52                                       | 669,331        | \$   | 46,853   | \$   | 17.10              | \$ |                                      | \$ | 0.080                         | \$   | 18.00              | \$ | 1.65                |
| 2065    | 220  | 7.63                                       | 679,260        | \$   | 47,548   | \$   | 17.36              | \$ |                                      | \$ | 0.080                         | \$   | 18.26              | \$ | 1.59                |
|         |  |  |                |      |          |      |                    |    |                                      |    | Total NPV                     | of   | O&M Costs          | \$ | 288.7               |
|         |  | Capital Costs                              | in million e.  |      |          |      |                    |    | Yr built                             |    |                               |      |                    |    |                     |
|         |  | Capital Costs                              | PWTM           |      |          | \$   | 60.0               | -  | 2015                                 | -  |                               |      |                    | s  | 60.0                |
|         |  |  | Pumping Sta    | lion |          | 5    |                    |    | 2015                                 |    |                               |      |                    | \$ | 56.6                |
|         |  |  | rumping Sta    | uOn  | 5        | \$   | 00.0               |    | 2013                                 | -  | otal NDV o                    | 10   | apital Costs       |    | 116.6               |
|         |  |  |                |      |          |      |                    |    |                                      |    | Otal INF V O                  | . 00 | apital Costs       | 9  | 110.0               |

Total NPV of Capital and O&M Costs in millions \$ WTP to SAWS NE/SARA (Delivery Point #2)

405





### Demands for this pipe segment

| De | ma | nd |
|----|----|----|
|    |    |    |

| Year  | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |
|-------|------|------|------|------|------|------|------|
|       | 2010 | 2020 | 2000 | 2040 | 2000 | 2000 | 2000 |
| GBRA  | 0    | 0    | 5    | /    | 9    | 11   | 11   |
|       |      |      |      |      |      |      |      |
| Total | 0    | 0    | 5    | /    | 9    | 11   | 11   |

Max d/Avg d

|         |      | Max day dem | ands to be del | ivered in each s | segment in mgd | 1    |      |
|---------|------|-------------|----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 |
| GBRA    | 0    | 0           | 11             | 14               | 18             | 22   | 22   |
| Total - | 0    | 0           | 11             | 14               | 18             | 22   | 22   |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 22     | mgd   |
|---|--------|-------|
| **************************************  | 15,250 | gpm   |
| Pumping capacity of one pump            | 5,100  | gpm   |
| No. of pumps (not counting spare)       | 3      | 2.30  |
| Peak flow rate (all pumps except spare) | 15,300 | gpm   |
| Inside diameter of PWTM                 | 42     | in.   |
| Area                                    | 9.62   | sf    |
| Length of RWTM                          | 24     | miles |
|   |        |       |

24 miles 126,720 feet

(linked to mileage in schematic above)

|  |               | - Aller Brown Brown |                    | CHECK SHIPPING AND ADDRESS OF | STATE OF THE PERSON NAMED IN |      | and the second state of |
|--|---------------|---------------------|--------------------|-------------------------------|------------------------------|------|-------------------------|
| Estimated unit cost by condition:  | % of length   | LE                  | Un                 | it cost                       | C                            | ost  |                         |
| Rural - soil   | 100%          | 126,720             | \$                 | 174                           | \$                           | 22.0 | million                 |
| Rural - rock   | 0%            |                     | \$                 | 244                           | \$                           |      |                         |
| Urban - rock   | 0%            | Manufacture         | \$                 | 263                           | \$                           |      |                         |
|  |               | 126,720             | THE REAL PROPERTY. |                               | \$                           | 22.0 | million                 |
| Average estimated unit construction  Total construction cost in millions | cost for PWTM |                     | \$                 | 174                           | perLF                        |      |                         |
|  |               |                     | \$                 |                               |                              |      |                         |
| Contingencies<br>Subtotal  |               |                     | \$                 | 26.4                          | •                            |      |                         |
| Engineering, Legal & Administrative                                      |               |                     | \$                 | 4.0                           |                              |      |                         |
| Subtotal   |               |                     | \$                 | 30.4                          | - 2                          |      |                         |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq                 |               |                     |                    | 2.4                           |                              |      |                         |
| W  | mma a 1 1111  |                     | -                  | 200                           | -                            |      |                         |

| Little & Alcit Oldalos & Willigation, Our vo | ying, a cana may | -  | 4.7    |              |             |                 |  |
|--|------------------|----|--------|--------------|-------------|-----------------|--|
| Total Capital Cost for PWTM                  | in millions      | \$ | 32.8   |              |             |                 |  |
| Unit maintenance cost/year-mile              |                  | \$ | 10,000 | \$/year-mile | \$<br>0.240 | Million \$/year |  |
| Velocity at peak flow rate                   |                  |    | 3.54   | fps          |             |                 |  |
| C factor                                     |                  |    | 120    |              |             |                 |  |
|  |                  |    |        |              |             |                 |  |

| Head loss per foot          |     | 0.00104<br>5.47 | ft/ft<br>ft/mile | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup><br>  C*(d) <sup>2.63</sup> |
|-----------------------------|-----|-----------------|------------------|------------------|---|
| Head loss at peak flow rate |     | 131             | ft               |                  |   |
| Allowance for minor losses  | 20% | 26              | ft               | 740              | Desired HGL At Delivery Point                       |
| Total estimated losses      |     | 158             | ft               | 600              | Elev. At WTP  |
| Average static head         |     | 140             | ft               | 140              | ft  |

| Total estillated 103363                        | 100 11      | 000 1104. 711 4411            |
|--|-------------|-------------------------------|
| Average static head                            | 140 ft      | 140 ft                        |
| Total estimated dynamic head                   | 298 ft      |                               |
| •  | 129 psi     |                               |
| No of recommended pumping stations along route | 0.86        | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 1           | in pipe)                      |
| Average head per pump station                  | 298 ft      | 0000 - 0400000                |
| Assumed pump efficiency                        | 85%         |                               |
| Assumed motor efficiency                       | 90%         |                               |
| Estimated Hp required per pump                 | 501 hp/pump |                               |
|  |             |                               |

|   | 374   | kw/pump     |                            |
|---|-------|-------------|----------------------------|
| Total hp per pump station (not counting spare)          | 1,503 | hp/station  |                            |
| Total kw per pump set (set=pumps in series along route) | 501   | kw/pump set | (one pump at each station) |

| Unit construction cost for each pump station (from cost curve) | \$<br>1,718 | per firm hp of pump static |
|--|-------------|----------------------------|
| Construction cost per pump station                             | 2.6         | million                    |

| Construction cost per pump station        | 2.6 millio | n   |       |               |
|---|------------|-----|-------|---------------|
| Total construction cost for pump stations | 2.6        | for | 1     | pump stations |
| Contingencies                             | \$<br>0.5  | 25  | n+ 1/ |               |
| Subtotal                                  | \$<br>3.1  |     |       |               |
| Engineering, Legal & Administrative       | \$<br>0.5  |     |       |               |
|   |            |     |       |               |

Total capital cost for pump stations

\$ 3.6 million

40% Equip cost as % of constr cost

Value of equipment
Assumed life of equipment
Estimated maintenance/replacement cost

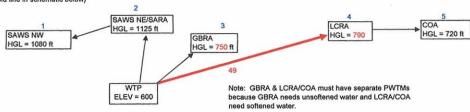
\$ 1.0 million 20 years \$ 0.05 million/year

O&M Costs

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy Energy used |     | Energy Energy cost costs - Po |     |              |         | gy Energy cost costs - Pump costs - |    | mp costs - |      | costs -              |     | Total O&M cost |  | Net present value |  |
|--------------|---|--|--------------------|-----|-------------------------------|-----|--------------|---------|-------------------------------------|----|------------|------|----------------------|-----|----------------|--|-------------------|--|
|              | mgd   |  | (kwh/day)          |     | (\$/day)                      |     | (Million \$  |         | (Million \$                         | (  | Million \$ |      | lillion \$<br>'year) |     | (\$)           |  |                   |  |
| 2015         |   |  |                    |     |                               |     |              |         |                                     |    |            | \$   |                      | \$  | -              |  |                   |  |
| 2016         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | *                    | \$  | -              |  |                   |  |
| 2017         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | 2                    | \$  |                |  |                   |  |
| 2018         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  |                |  |                   |  |
| 2019         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  | -              |  |                   |  |
| 2020         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  | -              |  |                   |  |
| 2021         |   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  | -              |  |                   |  |
| 2022         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   |                      |     |                |  |                   |  |
| 2023         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  | -              |  |                   |  |
| 2024         | -   |  |                    |     |                               |     |              |         |                                     |    |            |      | •                    | \$  | •              |  |                   |  |
| 2025         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | ~                    | \$  | -              |  |                   |  |
| 2026         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  | -              |  |                   |  |
| 2027         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | •                    | \$  | -              |  |                   |  |
| 2028         | -   |  |                    |     |                               |     |              |         |                                     |    |            | \$   | -                    | \$  |                |  |                   |  |
| 2029         |   |  |                    |     |                               |     |              |         |                                     |    |            | \$   |                      | \$  |                |  |                   |  |
| 2030         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.2            |  |                   |  |
| 2031         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.2            |  |                   |  |
| 2032         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  |                |  |                   |  |
| 2033         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 |     | 0.2            |  |                   |  |
| 2034         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.2            |  |                   |  |
| 2035         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.1            |  |                   |  |
| 2036         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.1            |  |                   |  |
| 2037         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.1            |  |                   |  |
| 2038         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.1            |  |                   |  |
| 2039         | 5   | 0.73                                       | 8,771              | \$  | 614                           | \$  | 0.22         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.52                 | \$  | 0.1            |  |                   |  |
| 2040         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2041         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2042         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2043         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2044         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | - 7 |                |  |                   |  |
| 2045         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2046         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2047         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2048         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2049         | 7   | 0.97                                       | 11,694             | \$  | 819                           | \$  | 0.30         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.59                 | \$  | 0.1            |  |                   |  |
| 2050         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 | \$  | 0.1            |  |                   |  |
| 2051         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 |     | 0.1            |  |                   |  |
| 2052         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 | \$  | 0.1            |  |                   |  |
| 2053         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      |      | 0.67                 |     |                |  |                   |  |
| 2054         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 | \$  | 0.1            |  |                   |  |
| 2055         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 | \$  | 0.0            |  |                   |  |
| 2056         |   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      |      | 0.67                 | \$  |                |  |                   |  |
| 2057         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 |     | 0.0            |  |                   |  |
| 2058         | 9   | 1.22                                       | 14,618             | \$  | 1,023                         | \$  | 0.37         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.67                 | \$  | 0.0            |  |                   |  |
| 2059         | 9   | 1.22<br>1.50                               | 14,618             | \$  | 1,023                         | \$  | 0.37<br>0.46 | \$      | 0.05                                | \$ | 0.240      | S    | 0.67<br>0.75         | \$  | 0.0            |  |                   |  |
| 2060         | 11  |  | 17,980             | \$  | 1,259                         |     |              | 5       | 0.05                                | \$ | 0.240      | \$   | 0.75                 | \$  | 0.0            |  |                   |  |
| 2061         | 11<br>11  | 1.50                                       | 17,980             | S   | 1,259                         | \$  | 0.46         | \$      | 0.05                                | \$ | 0.240      | \$   | 0.75                 | S   | 0.0            |  |                   |  |
| 2062<br>2063 | 11  | 1.50<br>1.50                               | 17,980             | 5   | 1,259<br>1,259                | \$  | 0.46         | \$      | 0.05                                | 5  | 0.240      | \$   | 0.75                 | \$  | 0.0            |  |                   |  |
| 2063         | 11  | 1.50                                       | 17,980             | \$  | 1,259                         | \$  | 0.46         | \$      |                                     | \$ | 0.240      | \$   | 0.75                 | \$  | 0.0            |  |                   |  |
| 2065         | 11  | 1.50                                       | 17,980<br>17,980   | \$  | 1,259                         | \$  | 0.46         | \$      |                                     | \$ | 0.240      | \$   | 0.75                 | \$  | 0.0            |  |                   |  |
|              |   |  |                    |     |                               |     |              |         |                                     |    | Total NPV  | of O | &M Costs             | \$  | 4              |  |                   |  |
|              |   | Capital Costs                              | in million \$:     |     |                               |     |              | line or | Yr built                            |    |            |      |                      |     |                |  |                   |  |
|              |   | or a sales are reconcession to             | PWTM               |     |                               | \$  | 33           |         | 2030                                |    |            |      |                      | \$  | 15             |  |                   |  |
|              |   |  | Pumping Stati      | ons |                               | \$  | 4            |         | 2030                                |    |            |      |                      | \$  | 1              |  |                   |  |
|              |   |  |                    |     |                               | (5) |              |         | 255000                              | -  |            | 000  | ital Costs           |     | 17             |  |                   |  |

Total NPV of Capital and O&M Costs in millions \$ 22.3 WTP to GBRA (Delivery Point #3)

## WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



## Demands for this pipe segment

| n |  |  |  |
|---|--|--|--|
|   |  |  |  |

|       |      | Average dem | ands to be del | ivered in each s | segment in mgd |      |      |             |
|-------|------|-------------|----------------|------------------|----------------|------|------|-------------|
| Year  | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 | Max d/Avg d |
| LCRA  | 0    | 0           | 5              | 10               | 10             | 10   | 10   | 2.0         |
| COA   | 0    | 0           | 15             | 20               | 30             | 30   | 30   | 1.68        |
| Total | 0    | 0           | 20             | 30               | 40             | 40   | 40   |             |

|       |      | max day dem | ands to be del | ivered in each s | segment in mga |      |      |
|-------|------|-------------|----------------|------------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 |
| LCRA  | 0    | 0           | 10             | 20               | 20             | 20   | 20   |
| COA   | 0    | 0           | 25             | 34               | 50             | 50   | 50   |
| Total | 0    | 0           | 35             | 54               | 70             | 70   | 70   |

#### **PWTM and Pump Station Costs**

Unit maintenance cost/year-mile

| Design flow rate - year 2065            | 70      | mgd   |  |
|---|---------|-------|--|
| •                                       | 48,883  | gpm   |  |
| Pumping capacity of one pump            | 10,000  | gpm   |  |
| No. of pumps (not counting spare)       | 5       |       |  |
| Peak flow rate (all pumps except spare) | 50,000  | gpm   |  |
| Inside diameter of PWTM                 | 72      | in.   |  |
| Area                                    | 28.27   | sf    |  |
| Length of RWTM                          | 49      | miles | (linked to mileage in schematic above) |
|   | 258,720 | feet  |  |
|   |         |       |  |

| Estimated unit cost by condition:   | % of length   | LE         | Un | it cost | C      | ost  |         |
|-------------------------------------|---------------|------------|----|---------|--------|------|---------|
| Rural - soil                        | 100%          | 258,720    | \$ | 365     | \$     | 94.5 | million |
| Rural - rock                        | 0%            | O Wasaiii. | \$ | 498     | \$     |      |         |
| Urban - rock                        | 0%            |            | \$ | 552     | \$     |      |         |
|                                     |               | 258,720    |    |         | \$     | 94.5 | million |
| Average estimated unit construction | cost for PWTM |            | \$ | 365     | per LF |      |         |

| Total construction cost in millions                      | \$<br>94.5  |
|--|-------------|
| Contingencies  | \$<br>18.9  |
| Subtotal   | \$<br>113.4 |
| Engineering, Legal & Administrative                      | \$<br>17.0  |
| Subtotal   | \$<br>130.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>4.9   |
| Total Capital Cost for PWTM in millions                  | \$<br>135.3 |

| Velocity at peak flow rate<br>C factor |     | 3.94<br>120 | fps     |   |
|--|-----|-------------|---------|---|
| Head loss per foot                     |     | 0.00067     | ft/ft   | h <sub>f</sub> =   3.552*Q  <sup>1.85</sup> |
|  |     | 3.55        | ft/mile | C*(d) <sup>2.63</sup>                       |
| Head loss at peak flow rate            |     | 174         | ft      |   |
| Allowance for minor losses             | 20% | 35          | ft      | 790 Desired HGL At Delivery Point           |
| Total estimated losses                 |     | 209         | ft      | 720 Elev. At Delivery Point 3               |
| Average static head                    |     | 70          | ft      | 70 ft                                       |
| Total estimated dynamic head           |     | 279         | ft      |   |
|  |     | 121         | psi     |   |
|  |     |             |         |   |

10,000 \$/year-mile \$

0.490 Million \$/year

| No of recommended pumping stations along route                 | 0.81                           | 150 psi (assumed max pressure |
|--|--------------------------------|-------------------------------|
| No. of pumping stations used in cost estimate                  | 1                              | in pipe)                      |
| Average head per pump station                                  | 279 ft                         |                               |
| Assumed pump efficiency  | 85%                            |                               |
| Assumed motor efficiency                                       | 90%                            |                               |
| Estimated Hp required per pump                                 | 921 hp/pump                    |                               |
|  | 687 kw/pump                    |                               |
| Total hp per pump station (not counting spare)                 | 4,605 firm hp/station          |                               |
| Total kw per pump set (set=pumps in series along route)        | 921 kw/pump set (one p         | oump at each station)         |
| Unit construction cost for each pump station (from cost curve) | \$ 1,445 per firm hp of pump s | station                       |
| Construction cost per pump station                             | 6.7 million                    |                               |
|  |                                |                               |

| 6.7 million | n             |         |                  |
|-------------|---------------|---------|------------------|
| 6.7         | for           | 1       | pump stations    |
| \$<br>1.3   | -             | 1       |                  |
| \$<br>8.0   |               |         |                  |
| \$<br>1.2   |               |         |                  |
| \$ \$       | 6.7<br>\$ 1.3 | 6.7 for | 6.7 for <u>1</u> |

Total capital cost for pump stations \$ 9.2 million

Value of equipment \$ 2.7 million

Assumed life of equipment 20 years

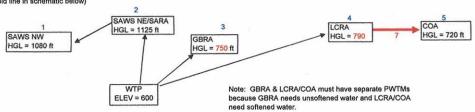
Estimated maintenance/replacement cost \$ 0.13 million/year

#### **O&M Costs**

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |      | Energ          | ју со | ost          | co | ther O&M<br>sts - Pump<br>Stations | (    | intenance<br>costs -<br>PWTM | То   | etal O&M<br>cost  | Ne   | t presen<br>value |
|------|---|--|----------------|------|----------------|-------|--------------|----|------------------------------------|------|------------------------------|------|-------------------|------|-------------------|
|      | mgd   |  | (kwh/day)      |      | (\$/day)       | (     | (Million \$  |    | (Million \$                        | (    | Million \$<br>/year)         |      | Million \$ /year) |      | (\$)              |
| 2015 |   |  |                |      |                |       |              | _  |                                    |      |                              | \$   | -                 | \$   | -                 |
| 2016 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | -                 | \$   |                   |
| 2017 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | •                 | \$   | -                 |
| 2018 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | 7.                | \$   |                   |
| 2019 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | *                 | \$   | -                 |
| 2020 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | *                 | \$   | -                 |
| 2021 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   |                   | \$   | 27.)              |
| 2022 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | *                 | \$   |                   |
| 2023 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   |                   | \$   | -                 |
| 2024 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | 7                 | \$   | -71               |
| 2025 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | -                 | \$   | 9.00              |
| 2026 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | -                 | \$   | -                 |
| 2027 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   | -                 | \$   |                   |
| 2028 |   |  |                |      |                |       |              |    |                                    |      |                              | \$   |                   | \$   | •                 |
| 2029 |   |  |                |      |                |       | 0.70         |    | 0.40                               |      | 0 400                        | \$   |                   | \$   | -                 |
| 2030 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.6               |
| 2031 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.6               |
| 2032 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.6               |
| 2033 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.5               |
| 2034 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.5               |
| 2035 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.5               |
| 2036 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.5               |
| 2037 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.4               |
| 2038 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.4               |
| 2039 | 20  | 1.39                                       | 30,696         | \$   | 2,149          | \$    | 0.78         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.41              | \$   | 0.4               |
| 2040 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.5               |
| 2041 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.5               |
| 2042 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.4               |
| 2043 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.4               |
| 2044 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.4               |
| 2045 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.4               |
| 2046 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.4               |
| 2047 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.3               |
| 2048 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.3               |
| 2049 | 30  | 2.08                                       | 46,044         | \$   | 3,223          | \$    | 1.18         | \$ | 0.13                               | \$   | 0.490                        | \$   | 1.80              | \$   | 0.3               |
| 2050 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.4               |
| 2051 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.3               |
| 2052 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | S     | 1.57         |    | 0.13                               | \$   | 0.490                        | S    | 2.19              | \$   | 0.3               |
| 2053 | 40  | 2.78                                       | 61,391         | \$   | 4,297          |       | 1.57         | \$ | 0.13<br>0.13                       | \$   | 0.490                        | S    | 2.19              | \$   | 0.3               |
| 2054 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ |                                    |      |                              |      |                   |      |                   |
| 2055 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.3               |
| 2056 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ |                                    | \$   | 0.490                        | \$   | -                 | \$   | 0.3               |
| 2057 | 40<br>40  | 2.78                                       | 61,391         | \$   | 4,297          | S     | 1.57         | 5  | 0.13<br>0.13                       | \$   | 0.490                        | S    | 2.19              | \$   | 0.2               |
| 2058 | 40  | 2.78                                       | 61,391         | S    | 4,297<br>4,297 | \$    | 1.57<br>1.57 | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.2               |
| 2059 | 40  | 2.78                                       | 61,391         | \$   |                | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.2               |
| 2060 | 40  | 2.78                                       | 61,391         |      | 4,297          | \$    |              | -  |                                    | 0.7% | 0.490                        | 5    | 1770000           | \$   | 0.2               |
| 2061 | 40  | 2.78                                       | 61,391         | \$   | 4,297<br>4,297 | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | S    | 2.19              | \$   | 0.2               |
| 2062 | 40  | 2.78                                       | 61,391         | \$   |                | \$    | 1.57         | \$ |                                    |      | 0.490                        | \$   | 2.19              | \$   | 0.2               |
| 2063 | 40<br>40  | 2.78                                       | 61,391         | \$   | 4,297          | \$    | 1.57         | \$ | 0.13                               | \$   | 0.490                        | \$   | 2.19              | \$   | 0.2               |
| 2064 |   | 2.78                                       | 61,391         |      | 4,297          | \$    | 1.57         |    | 0.13                               |      |                              | S    | 2.19              | \$   |                   |
| 2065 | 40  | 2.78                                       | 61,391         | \$   | 4,297          | ٩     | 1.57         | \$ | 0.13                               | \$   | 0.490                        | -27  |                   | 1.00 | 0.1               |
|      |   |  |                |      |                |       |              |    |                                    |      | Total NPV                    | or O | am Costs          | \$   | 14                |
|      |   | Capital Costs                              |                |      |                |       | 400 -        |    | Yr built                           |      |                              |      |                   |      |                   |
|      |   |  | PWTM           |      |                | \$    | 135.3        |    | 2030                               |      |                              |      |                   | \$   | 65                |
|      |   |  | Pumping Stat   | ions |                | \$    | 9.2          |    | 2030                               |      |                              |      |                   | \$   | 4.                |

Total NPV of Capital and O&M Costs in millions \$ 84 WTP to LCRA Delivery Point (#4)

## LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)



## Demands for this pipe segment

Demands

|       |      | Average dem | ands to be deli | ivered in each s | segment in mgd |      |      |
|-------|------|-------------|-----------------|------------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| COA   | 0    | 0           | 15              | 20               | 30             | 30   | 30   |
| Total | 0    | 0           | 15              | 20               | 30             | 30   | 30   |

Max d/Avg d 1.68

|         |      | Max day dem | ands to be deli | vered in each | segment in mgd | 1    |      |
|---------|------|-------------|-----------------|---------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040          | 2050           | 2060 | 2065 |
| COA     | 0    | 0           | 25              | 34            | 50             | 50   | 50   |
| Total - | 0    | 0           | 25              | 34            | 50             | 50   | 50   |

### PWTM and Pump Station Costs

Design flow rate - year 2065 50 mgd 34,997 gpm

54 in. 15.90 sf 7 miles 36,960 feet Inside diameter of PWTM Area Length of PWTM

(linked to mileage in schematic above)

| stimated unit cost by condition: | % of length | LF     | Un | it cost | Cost      |         |
|----------------------------------|-------------|--------|----|---------|-----------|---------|
| Rural - soil                     | 100%        | 36,960 | \$ | 244     | \$        | million |
| Rural - rock                     | 0%          |        | \$ | 337     | \$        |         |
| Urban - rock                     | 0%          | -      | \$ | 369     | \$        |         |
|                                  |             | 36,960 |    |         | \$<br>9.0 | million |

| Total construction cost in millions                      | \$ | 9.0  |
|--|----|------|
| Contingencies  | \$ | 1.8  |
| Subtotal   | \$ | 10.8 |
| Engineering, Legal & Administrative                      | \$ | 1.6  |
| Subtotal   | \$ | 12.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 0.0  |
| Total Capital Cost for PM/TM in millions                 | •  | 12.4 |

10,000 \$/year-mile 0.070 Million \$/year Unit maintenance cost/year-mile

4.90 fps 120 Velocity at peak flow rate C factor  $h_f = \left| \frac{3.552 \cdot Q}{C \cdot (d)^{2.63}} \right|^{1.85}$ Head loss per foot 0.00141 ft/ft 7.45 ft/mile 52 ft 10 ft 63 ft Head loss at peak flow rate

720 Desired HGL At Delivery Point 790 Elev. At Delivery Point 4 -70 ft Allowance for minor losses Total estimated losses Average static head Total estimated dynamic head -70 ft -3 psi

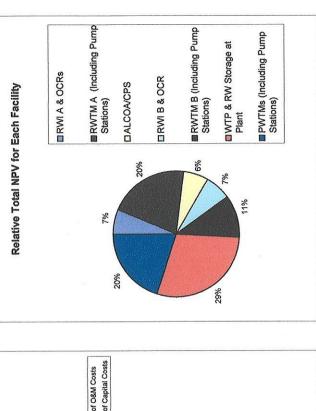
20%

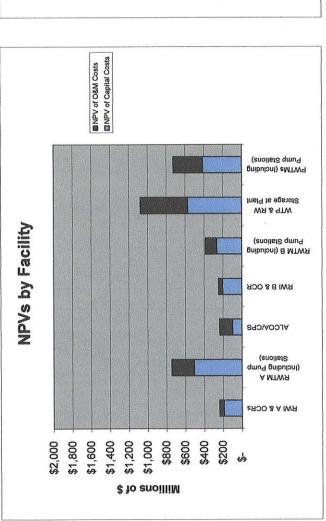
### Negative indicates gravity flow from #4 to #5; no pumping necessary.

|               |                 |       |       |          |                            | M  | lillion \$ |
|---------------|-----------------|-------|-------|----------|----------------------------|----|------------|
| Annual O&M (  | Cost in million | 1 \$: |       | Yr built |                            |    |            |
|               | PWTM            | \$    | 0.070 | 2030     | -                          |    |            |
|               |                 |       |       |          | Total NPV of O&M Costs     |    | \$0.55     |
| Capital Costs | in million \$:  |       |       | Yr built |                            |    |            |
|               | PWTM            | \$    | 12.4  | 2030     | -                          | \$ | 6.0        |
|               |                 |       |       |          | Total NPV of Capital Costs | \$ | 6.0        |

Total NPV of Capital and O&M Costs in millions \$ LCRA Delivery Point (#4) to COA Delivery Point (#5) 6.5 Page 1

|  |  | november 1              | nogentacione        | phonone                       |
|--|--|-------------------------|---------------------|-------------------------------|
| PWTMs (including<br>Pump Stations)   | Each PWTM sized<br>for maximum daily<br>demand (See PWTM<br>Summary Sheet in<br>the Appendices)  | \$ 412                  | \$ 313              | \$ 726                        |
| RWTM B (including WTP & RW Storage PWTMs (including Pump Stations) at Plant Pump Stations) | Raw water reservoir w/ 11,000 ac-ft capacity. Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water   | \$ 572                  | \$ 502              | \$ 1,075                      |
| RWTM B (including<br>Pump Stations)  | Sized for 117,804 ac-<br>flyr; 68 miles of 84"<br>pipeline with two<br>pumping stations and<br>balancing reservoirs  | \$ 265                  | \$ 122              | \$ 386                        |
| RWI B & OCR  | Sized for 2000 cfs (2 intakes) to scalp surface water plus an additional 76 cfs (55,000 ac-ft/yr) equilvalent to groundwater reheased to Big Sandy Creek; 8 miles of 120-inch pipe; 4 OCRs at 15,000 ac-ft/each                | \$ 204                  | \$ 43               | \$ 247                        |
| ALCOA/CPS  | Non-public wells;<br>Discharge of 55,000 ac-<br>flyear to Big Sandy<br>Creek near Hwy 290<br>east of Elgin with flow<br>to Colorado River just<br>upstream of RWI-B  | 86                      | \$ 138              | \$ 236 \$                     |
| RWTM A (Including<br>Pump Stations)  | e s  | \$ 507                  | \$ 238              | \$ 745 \$                     |
| RWI A & OCRs   | Sized for 4000 cfs diameter pipe sized to scalp water; 4 deliver 132,000 ac-intakes, 4 miles of flypear on a continuo 120-inch raw water basis; includes 3 mains & 4 OCRs at pumping stations w/ 25,000 ac-ft each along route | \$ 191                  | \$ 47               | \$ 238                        |
| Total NPVs in<br>Millions of \$  | , , , , , , , , , , , , , , , , , , ,  | \$ 2,248 \$             | \$ 1,403 \$         | \$ 3,652 \$                   |
| Phasing Scenario   | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020.  | NPV of Capital Costs \$ | NPV of O&M Costs \$ | Total NPV of Capital & O&M \$ |
| Alter-<br>nate   | ō  |                         |                     |                               |
| WTP Location   | East of San<br>Antonio   |                         |                     |                               |





O&M Cost Calculations
RWI A - Matagorda Co. River Intakes, and Storage
CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

| Initial year of analysis period<br>Interest rate | 2015<br>5% |     |         |              |          |                             | egal,   | ngency =<br>Admin. =                      | 15% |                                     |       |                                 |
|--|------------|-----|---------|--------------|----------|-----------------------------|---------|---|-----|-------------------------------------|-------|---------------------------------|
| Evaluation period                                | 50         | yea | rs      | Enviror      | mental & | Archae                      | ology ! | Studies &                                 |     |                                     |       |                                 |
| Unit cost of energy \$                           | 0.07       | per | kwh     | Mitigation,  | Surveyir | g, and L                    | and A   | cquisition                                | \$  | 100,000                             | per i | mile                            |
|  |            |     |         |              |          |                             |         | or=                                       | \$  | 5,000                               | per a | acre                            |
| nflatable Rubber Low Head Dam                    |            |     |         |              |          |                             |         |   |     |                                     |       |                                 |
|  | Quantity   | 1   | Units   | Size         | (        | Constr.<br>Cost<br>Illions) | Con     | Total<br>timated<br>str. Cost<br>illions) | E   | ntigency,<br>ng., etc.<br>nillions) |       | al Capital<br>Cost<br>nillions) |
| Inflatable Rubber Low Head Dam                   | 4          | eac | h       | 10 ft high   | \$       | 2.25                        | \$      | 9.00                                      | \$  | 3.42                                | \$    | 12.42                           |
| Estimated inflatable dam cost as %               | of total   |     | 50%     |              |          |                             |         |   |     |                                     |       |                                 |
| Value of inflatable dam                          |            | \$  | 4.50    | million      |          |                             |         |   |     |                                     |       |                                 |
| Assumed life of inflatable dam                   |            |     | 10      | years        |          |                             |         |   |     |                                     |       |                                 |
| Estimated maintenance/replacement                | nt cost    | \$  | 0.45    | million/year |          |                             |         |   |     |                                     |       |                                 |
| Year built                                       |            |     | 2020    |              |          |                             |         |   |     |                                     |       |                                 |
| NPV of O&M Costs                                 |            |     | \$6.27  | million      |          |                             |         |   |     |                                     |       |                                 |
| NPV of Capital Costs                             |            | \$  | 9.73    | million      |          |                             |         |   |     |                                     |       |                                 |
| Total NPV of Capital and O&M Cos                 | ts         |     | \$16.00 | million      |          |                             |         |   |     |                                     |       |                                 |

#### Raw W

Unit construction cost for each pump station (from cost cur \$ Construction cost per intake/pump station No. of intakes from above

Total construction cost for pump stations
Value of equipment
Assumed life of equipment
Estimated maintenanco/replacement cost

Total construction cost in millions Contigency, Eng., etc. in millions Total capital cost in millions

| 400.000         |  |   |   |
|-----------------|--|---|---|
|                 |  |   |   |
|                 |  | 21  | .9 Ratio of design withdrawal rate  |
|                 |  |   | to Total intake design withdrawal rate  |
| .,,,,           | Jr   |   |   |
| 1,000           | ole  |   |   |
|                 |  |   |   |
| 4               |  |   |   |
| 448,800         | gpm  |   |   |
|                 |  |   |   |
|                 |  | 9.2   |   |
|                 |  |   | .0 miles for all RWTMs<br>0 feet  |
| \$ 793          | per LF   |   | \$ 1,254  |
| \$ 16.8         |  |   |   |
|                 |  |   |   |
| \$ 20.1         | •  |   |   |
| \$ 3.0          | _  |   |   |
|                 |  |   |   |
|                 | million  |   |   |
| \$ 10,000       | \$/year-mile   | \$ 0.04   | 0 Million \$/year (all RWTMs to Reservoirs)   |
| it, one to each | reservoir.   |   |   |
| 448,800         | gpm  |   |   |
|                 | gpm  |   |   |
|                 |  |   |   |
| 450,000         | gpm  |   |   |
|                 | fps  |   |   |
|                 |  | 100   |   |
|                 |  |   | N=  3.552*Q  <sup>1.85</sup>  |
| 17.25           | ft/mile  |   | C*(d) <sup>2.63</sup>   |
| 17              | ft   |   |   |
|                 |  |   | 90 Elev of discharge at reservoir   |
|                 |  |   | 50 Water surface elev in river  |
|                 |  |   | 40 ft   |
|                 |  |   |   |
| 85%             |  |   |   |
| 90%             |  |   |   |
|                 |  |   |   |
|                 | hp/pump  |   |   |
| 769             | kw/pump  |   |   |
| 769<br>9,272    | kw/pump<br>hp/RWTM   |   |   |
| 769<br>9,272    | kw/pump<br>hp/RWTM<br>hp/intake  |   |   |
|                 | 182 4,000 1,795,200 4 1,000 448,800 4 448,800 78,54 5,280 \$ 793 \$ 13,4 \$ 20.1 \$ 23.1 \$ 23.5 \$ 10,000 it, one to each 448,800 50,000 12,777 120 0,00327 17,25 22 40 62 27 | 1,000 cfs 448,800 gpm  448,800 gpm  120 in. 78,54 sf 1 miles 5,280 feet  \$ 16.8 s.3.4 s.20.1 s.3.0 s.23.1 million \$ 10,000 \$/year-mile it, one to each reservoir. 448,800 gpm 450,000 gpm 12,77 fps 120 0.00327 ft/ft 17,25 ft/mile 17 ft 22 ft 40 ft 27 psi | 182 cfs  4,000 cfs 1,795,200 gpm  4 1,000 cfs 448,800 gpm  448,800 gpm  120 in. 78.54 sf 1 miles 4 5,280 feet 21,12  \$ 793 per LF \$ 16.8 \$ 3.4 \$ 20.1 \$ 23.1 \$ 0.4 \$ 23.5 million  \$ 10,000 \$/year-mile \$ 0.04  it, one to each reservoir.  448,800 gpm  50,000 gpm  12.77 fps 120 0.00327 ft/ft 17.25 ft/mile  17 ft 5 ft 22 ft 40 ft 65 ft 27 psi |

889 per firm hp of pump station \$ 1,180 8.2 million 4 each

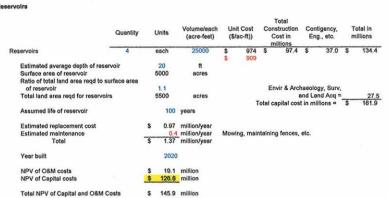
40% Estimated equip cost as % of total constr cost

33.0 million 12.63 million 45.5 million

33.0 million 13.2 million 20 years 0.66 million/year

| Year | Flow pum<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used  | Energy |          | y co | cost cost            |    | costs - Pump<br>Stations |       | costs -<br>RWTM      | Total O&M<br>cost |                     | Net p  |      |     |
|------|-----------------|-----|--------------------------|-----------------|--------|----------|------|----------------------|----|--------------------------|-------|----------------------|-------------------|---------------------|--------|------|-----|
|      | ac-ft/yr        | mgd | operating<br>/day        | (kwh/day)       |        | (\$/day) |      | Million \$<br>/year) |    | Million \$<br>/year)     | (     | Million \$<br>/year) |                   | lillion \$<br>year) | ****** | (\$) | )   |
| 2015 | •               | •   |                          | •               | \$     |          | \$   | -                    |    | V. aminimocci            | S ( ) | T-ASSEMBLE           | \$                | •                   | \$     |      | •   |
| 2016 | -               |     |                          |                 | \$     | -        | \$   | *                    |    |                          |       |                      | \$                | •                   | \$     |      | *   |
| 2017 | *               | •   |                          | •               | \$     | -        | \$   |                      |    |                          |       |                      | \$                |                     | S      |      | :   |
| 2018 | •               | •   | 7                        | •               | \$     |          | \$   | •                    |    |                          |       |                      | 5                 | -                   | \$     |      | •   |
| 2019 |                 |     |                          | 00 400          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | s     | 0.040                | \$                | 1.47                | \$     |      | 1.1 |
| 2020 | 132,000         | 118 | 1.64                     | 30,188          | \$     |          | \$   | 0.77                 | \$ | 0.66                     | 5     | 0.040                | \$                | 1.47                | S      |      | 1.  |
| 2021 | 132,000         | 118 | 1.64                     | 30,188          | 5      | 2,113    |      |                      | \$ |                          | \$    |                      | s                 |                     | \$     |      | 1.0 |
| 2022 | 132,000         | 118 | 1.64                     | 30,188          | s      | 2,113    | \$   | 0.77                 |    | 0.66                     |       | 0.040                |                   | 1.47                |        |      | 1.0 |
| 2023 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | S     | 0.040                | S                 | 1.47                | \$     |      |     |
| 2024 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.1 |
| 2025 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2026 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2027 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | S  | 0.68                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2028 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2029 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.68                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2030 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | S    | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2031 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2032 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2033 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2034 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2035 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2036 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2037 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2038 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | S    | 0.77                 | \$ | 0.66                     | \$    | 0.040                | S                 | 1.47                | \$     |      | 0.  |
| 2039 | 132,000         | 118 | 1.64                     | 30,188          | S      | 2,113    | S    | 0.77                 | \$ | 0.66                     | \$    | 0.040                | S                 | 1.47                | \$     |      | 0.  |
| 2040 | 132,000         | 118 | 1.64                     | 30,188          | s      | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | 5      |      | 0.  |
| 2041 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | S  | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2042 | 132,000         | 118 | 1.64                     | 30,188          | 5      | 2.113    | s    | 0.77                 | S  | 0.66                     | s     | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2043 | 132,000         | 118 | 1.64                     | 30,188          | Š      | 2,113    | S    | 0.77                 | s  | 0.66                     | \$    | 0.040                | s                 | 1.47                | \$     |      | 0   |
| 2044 | 132,000         | 118 | 1.64                     | 30,188          | š      | 2,113    | s    | 0.77                 | s  | 0.66                     | s     | 0.040                | s                 | 1.47                | \$     |      | 0.  |
| 2045 | 132,000         | 118 | 1.64                     | 30,188          | š      | 2,113    | \$   | 0.77                 | \$ | 0.66                     | š     | 0.040                | Š                 | 1.47                | S      |      | 0   |
| 2046 | 132,000         | 118 | 1.64                     | 30,188          | š      | 2,113    | \$   | 0.77                 | s  | 0.66                     | š     | 0.040                | Š                 | 1.47                | s      |      | 0   |
| 2047 | 132,000         | 118 | 1.64                     | 30,188          | Š      | 2,113    | \$   | 0.77                 | Š  | 0.66                     | š     | 0.040                | Š                 | 1.47                | Š      |      | 0   |
| 2048 | 132,000         | 118 | 1.64                     | 30,188          | š      | 2,113    | \$   | 0.77                 | Š  | 0.66                     | š     | 0.040                | š                 | 1.47                | š      |      | 0   |
| 2049 | 132,000         | 118 | 1.64                     | 30,188          | š      | 2,113    | Š    | 0.77                 | Š  | 0.66                     | š     | 0.040                | Š                 | 1.47                | Š      |      | 0   |
| 2050 |                 | 118 | 1.64                     | 30,188          | Š      | 2,113    | Š    | 0.77                 | Š  | 0.66                     | š     | 0.040                | Š                 | 1.47                | š      |      | 0   |
|      | 132,000         |     |                          |                 | s      |          | 3    | 0.77                 | Š  | 0.66                     | 5     | 0.040                | S                 | 1.47                | Š      |      | 0   |
| 2051 | 132,000         | 118 | 1.64                     | 30,188          |        | 2,113    | Š    | 0.77                 | Š  | 0.66                     | Š     | 0.040                | Š                 | 1.47                | Š      |      | 0   |
| 2052 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    |      |                      |    | 0.66                     | S     | 0.040                |                   | 1.47                | s      |      | 0.  |
| 2053 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ |                          |       |                      | \$                |                     | Š      |      |     |
| 2054 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                |        |      | 0.  |
| 2055 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.68                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2056 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | s  | 0.66                     | s     | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2057 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2058 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2059 | 132,000         | 118 | 1.84                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2060 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2061 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2062 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2063 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0   |
| 2064 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
| 2065 | 132,000         | 118 | 1.64                     | 30,188          | \$     | 2,113    | \$   | 0.77                 | \$ | 0.66                     | \$    | 0.040                | \$                | 1.47                | \$     |      | 0.  |
|      |                 |     |                          |                 |        |          |      |                      |    |                          |       | Total NPV            | of O              | M Costs             | \$     |      | 2   |
|      |                 |     | Capital Cos              | ts in million : |        |          | p.20 |                      |    | Yr built                 |       |                      |                   |                     |        | _    | 100 |
|      |                 |     |                          | RWTM to R       |        |          | \$   | 23.5                 |    | 2020                     |       |                      |                   |                     | 120    | \$   | 1   |
|      |                 |     |                          | Intake/Pum      | ping   | Stations | \$   | 45.5                 |    | 2020                     |       | otal NPV of          |                   | Desires (1997)      | \$     |      | 5   |

Reservoirs



Total NPV of Capital and O&M Costs in millions \$

| Summary   | -  | IPV of<br>tal Costs |    | PV of O&M<br>Costs | Ca | Total NPV of<br>Capital and<br>O&M Costs |  |  |
|---|----|---------------------|----|--------------------|----|--|--|--|
| Inflatable Rubber Low Head Dam                                    | \$ | 9.7                 | \$ | 6.3                | \$ | 16.0                                     |  |  |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$ | 54.1                | \$ | 21.6               | \$ | 75.7                                     |  |  |
| Reservoirs  | \$ | 126.8               | \$ | 19.1               | \$ | 145.9                                    |  |  |
| Total for RWI A   | \$ | 190.6               | 5  | 47.0               | \$ | 237.6                                    |  |  |

O&M Cost Calculations
RWTM A - Matagorda Co. to WTP
CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

|       | Initial year of analysis period<br>Interest rate | 201:          |                |         |          | ngineering,           |        | ngency =  |                         |                                 |
|-------|--|---------------|----------------|---------|----------|-----------------------|--------|-----------|-------------------------|---------------------------------|
|       |  |               |                |         |          |                       |        |           | 1370                    |                                 |
|       | Evaluation period                                |               | 0 years        |         |          | I & Archaeol          |        |           |                         |                                 |
|       | Unit cost of energy                              | \$ 0.07       | per kwh        | Mitigat | ion, Sun | veying, and L         | and Ac | quisition | \$ 100,000              | per mile                        |
| Raw W | ater Transmission Main - A                       |               |                |         |          |                       |        |           |                         |                                 |
|       | Inside diameter of pipe                          |               |                |         | 96       |                       |        |           |                         |                                 |
|       | Area   |               |                |         | 50.27    |                       |        |           |                         |                                 |
|       | Length of RWTM                                   |               |                |         |          | miles                 |        |           |                         |                                 |
|       |  |               |                | 7       | 49,760   | feet                  |        |           |                         |                                 |
|       | Estimated unit construction cost                 | for RWTM      |                | \$      | 567      | per LF                |        |           |                         |                                 |
|       | Total construction cost in million               | s             |                | \$      | 425      |                       |        |           |                         |                                 |
|       | Contingencies                                    |               |                | \$      | 85       |                       |        |           |                         |                                 |
|       | Subtotal   |               |                | \$      | 511      |                       |        |           |                         |                                 |
|       | Engineering, Legal & Administra                  | tive          |                | \$      | 77       |                       |        |           |                         |                                 |
|       | Subtotal   |               |                | \$      | 587      |                       |        |           |                         |                                 |
|       | Envir & Arch Studies & Mitigatio                 |               |                | \$      | 14       | 1000                  |        |           |                         |                                 |
|       | Total Capital Cost fo                            | r PWTM in i   | millions       | \$      | 601      | million               |        |           |                         |                                 |
|       | Unit maintenance cost/year-mile                  | 1             |                | \$      | 10,000   | \$/year-mile          | \$     | 1.420     | Million \$/year         |                                 |
|       | Design flow rate (after 100% but                 | ldout)        |                | 1       |          | ac-ft/year            |        |           |                         |                                 |
|       |  |               |                |         |          | mgd                   |        |           |                         |                                 |
|       |  |               |                |         | 81,829   |                       |        |           |                         |                                 |
|       | Pumping rate (one pump)                          |               |                |         |          | gpm                   |        |           |                         |                                 |
|       | No. of pumps (not counting spar                  |               |                |         | 5        |                       |        |           |                         |                                 |
|       | Peak flow rate (all pumps excep                  | t spare)      |                |         | 82,000   | gpm                   |        |           |                         |                                 |
|       | Velocity at peak flow rate                       |               |                |         | 3.63     | fps                   |        |           |                         |                                 |
|       | C factor   |               |                |         | 120      |                       |        |           |                         |                                 |
|       | Head loss per foot                               |               |                | 10      | 0.00041  | ft/ft                 |        | h.=       | [3.552*Q]1.8            | 5                               |
|       | rioda ioso por ioot                              |               |                |         |          | ft/mile               |        |           | 1 C*(d) <sup>2.63</sup> |                                 |
|       |  |               |                |         | 2.10     | TOTTING               |        |           | 10-(0)                  |                                 |
|       | Head loss at peak flow rate                      |               |                |         | 311      | ft                    |        |           |                         |                                 |
|       | Allowance for minor losses                       | 109           | 6              |         | 31       |                       |        | 600       | Flev At San             | Antonio East WTP                |
|       | Total estimated losses                           |               |                |         | 342      |                       |        |           | Elev. At Mata           |                                 |
|       | Average static head                              |               |                |         | 510      |                       | -      | 510       |                         |                                 |
|       | Total estimated dynamic head                     |               |                | -       | 852      |                       |        |           |                         |                                 |
|       | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,          |               |                |         | 369      |                       |        |           |                         |                                 |
|       | No of pumping stations req'd ald                 | na route      |                |         | 2.46     |                       |        | 150       | psi (assumed            | max pressure                    |
|       | No. of pumping stations used in                  |               | te             |         | 3.0      |                       |        |           | in pipe)                |                                 |
|       | Average head per pump station                    |               |                |         | 284      | ft                    |        |           |                         |                                 |
|       |  |               |                |         |          |                       |        |           |                         |                                 |
|       | Assumed pump efficiency                          |               |                |         | 85%      |                       |        |           |                         |                                 |
|       | Assumed motor efficiency                         |               |                |         | 90%      |                       |        |           |                         |                                 |
|       | Estimated Hp required per pump                   | 0             |                |         | 1,537    | hp/pump               |        |           |                         |                                 |
|       |  |               |                |         |          | kw/pump               |        |           |                         |                                 |
|       | Total hp per pump station (not c                 |               |                |         | 7,687    | hp/station            |        |           |                         |                                 |
|       | Total kw per pump set (set=pur                   | nps in series | s along route) |         | 4,612    | kw/pump se            | t (one | pump at   | each station)           |                                 |
|       | Unit constr. cost for each pump                  | station (fron | n cost curve)  | \$      | 1,320    | per firm hp           | of pum | station   |                         |                                 |
|       | Construction cost per pump stat                  |               |                | Š       |          | million               |        |           |                         |                                 |
|       | Balancing reservoir                              |               |                | \$      |          | million               | 1      | 60        | min. of storag          | e at avg pumping rate           |
|       | Total construction co                            | st per pum    | p station      | \$      |          | million               | 1      | 5.0       | mg                      |                                 |
|       | No. of pump stations from above                  | в             |                |         | 3.0      | each                  | \$     | 0.15      | per gal for op          | en top reservoir                |
|       | Total construction and to the                    | _             |                |         | 20.7     |                       |        |           |                         |                                 |
|       | Total construction cost in million               |               |                | \$      |          | million               |        |           |                         |                                 |
|       | Contigency, Eng., etc. in million                | S             |                | \$      |          | million               |        |           |                         |                                 |
|       | Total capital cost in millions                   |               |                | \$      | 45.1     | million               |        |           |                         |                                 |
|       | Total construction cost for pump                 | stations      |                | s       | 32.7     | million               |        |           |                         |                                 |
|       |  | Stations      |                | S       | 13.1     |                       |        | 40%       | Estimated en            | uipment cost as % of total      |
|       |  |               |                |         |          |                       |        |           | Latiniatou 60           | שוטוויויוווו טיסו מס יס טו וטופ |
|       | Value of equipment                               | nment         |                | •       |          | veare                 |        |           |                         |                                 |
|       | Assumed life of equi<br>Estimated maintena       |               | ment cost      | s       | 20       | years<br>million/year |        |           |                         |                                 |

#### **O&M Costs**

| Year         | Flow pum<br>yea    |            | No. of pump "sets" | Energy<br>used     |       | Energy           |    |                      |    | Other O&M<br>costs - Pump<br>Stations |    | Maintenance<br>costs -<br>RWTM |        | Total O&M cost |    | et present<br>value |
|--------------|--------------------|------------|--------------------|--------------------|-------|------------------|----|----------------------|----|---------------------------------------|----|--------------------------------|--------|----------------|----|---------------------|
|              | ac-ft/yr           | mgd        | operating<br>/day  | (kwh/day)          |       | (\$/day)         | (  | Million \$<br>/year) | (  | Million \$<br>/year)                  | (  | Million \$<br>/year)           | /year) |                |    | (\$)                |
| 2015         | -                  | -          | -                  | -                  | \$    |                  | \$ |                      | -  |                                       | -  |                                | \$     |                | \$ | -                   |
| 2016         | ~                  |            | -                  | 1000               | \$    | -                | \$ |                      |    |                                       |    |                                | \$     |                | \$ | -                   |
| 2017         | -                  | -          | -                  | -                  | \$    | -                | \$ |                      |    |                                       |    |                                | \$     | -              | \$ |                     |
| 2018         | -                  |            | -                  | 9.7                | \$    | 1.5              | \$ |                      |    |                                       |    |                                | \$     |                | \$ |                     |
| 2019         | -                  |            | -                  | 1.4                | \$    | -                | \$ |                      |    |                                       |    |                                | \$     |                | \$ |                     |
| 2020         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 12.68               |
| 2021         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 12.08               |
| 2022         | 132,000            | 118        | 4.99               | 552,331            | S     | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 11.50               |
| 2023         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | S  | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 10.96               |
| 2024         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | S  | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16,19          | \$ | 10.43               |
| 2025         | 132,000            | 118        | 4.99               | 552,331            | s     | 38,663           | \$ | 14.11                | s  | 0.65                                  | \$ | 1.420                          | s      | 16.19          | \$ | 9.94                |
| 2026         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 9.46                |
| 2027         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | S  | 1.420                          | s      | 16.19          | \$ | 9.01                |
| 2028         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | Š  | 0.65                                  | \$ | 1.420                          | Š      | 16.19          | \$ | 8.58                |
| 2029         | 132,000            | 118        | 4.99               | 552,331            | š     | 38,663           | Š  | 14.11                | Š  | 0.65                                  | \$ | 1.420                          | š      | 16.19          | Š  | 8.18                |
| 2030         | 132,000            | 118        | 4.99               | 552,331            | Š     | 38,663           | Š  | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | Š      | 16.19          | š  | 7.79                |
| 2031         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | S  | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | Š      | 16.19          | Š  | 7.41                |
| 2032         | 132,000            | 118        | 4.99               | 552,331            | S     | 38,663           | Š  | 14.11                | S  | 0.65                                  | S  | 1.420                          | S      | 16.19          | Š  | 7.06                |
| 2032         |                    | 118        | 4.99               |                    | \$    | 38,663           | \$ | 14.11                | S  | 0.65                                  | \$ | 1.420                          | Š      | 16.19          | Š  | 6.73                |
|              | 132,000            |            |                    | 552,331            |       |                  | \$ | 14.11                | \$ | 0.65                                  |    | 1.420                          | \$     | 16.19          | s  | 6.41                |
| 2034         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           |    |                      |    |                                       | \$ |                                |        |                |    |                     |
| 2035         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 6.10                |
| 2036         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 5.81                |
| 2037         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 5.53                |
| 2038         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 5.27                |
| 2039         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 5.02                |
| 2040         | 132,000            | 118        | _ 4.99             | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 4.78                |
| 2041         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 4.55                |
| 2042         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 4.34                |
| 2043         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 4.13                |
| 2044         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.93                |
| 2045         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.75                |
| 2046         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.57                |
| 2047         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.40                |
| 2048         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.24                |
| 2049         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 3.08                |
| 2050         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 2.93                |
| 2051         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | S  | 14.11                | \$ | 0.65                                  | \$ | 1,420                          | \$     | 16.19          | \$ | 2.79                |
| 2052         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | S  | 2.66                |
| 2053         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | s  | 14.11                | S  | 0.65                                  | s  | 1.420                          | \$     | 16.19          | S  | 2.53                |
| 2054         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 2.41                |
| 2055         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1,420                          | \$     | 16.19          | s  | 2.30                |
| 2056         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | s  | 14.11                | \$ | 0.65                                  | \$ | 1,420                          | S      | 16.19          | S  | 2.19                |
| 2057         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | Š      | 16.19          | Š  | 2.09                |
| 2058         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | Š  | 1.99                |
| 2059         | 132,000            | 118        | 4.99               | 552,331            | s     | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1,420                          | \$     | 16.19          | Š  | 1.89                |
| 2060         |                    | 118        | 4.99               |                    | S     |                  | \$ | 14.11                | S  | 0.65                                  | \$ | 1.420                          | S      | 16.19          | Š  | 1.80                |
| 2060         | 132,000<br>132,000 | 118        | 4.99               | 552,331<br>552,331 | \$    | 38,663<br>38,663 | \$ | 14.11                | S  | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | 5  | 1.72                |
| 2062         |                    | 118        | 4.99               |                    | \$    |                  | S  | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | 5      | 16.19          | \$ | 1.63                |
|              | 132,000            |            |                    | 552,331            |       | 38,663           |    |                      |    |                                       |    |                                |        |                |    |                     |
| 2063<br>2064 | 132,000            | 118<br>118 | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19<br>16.19 | S  | 1.56<br>1.48        |
|              | 132,000            |            |                    | 552,331            |       | 38,663           |    | 14.11                |    |                                       |    |                                |        |                |    |                     |
| 2065         | 132,000            | 118        | 4.99               | 552,331            | \$    | 38,663           | \$ | 14.11                | \$ | 0.65                                  | \$ | 1.420                          | \$     | 16.19          | \$ | 1.41                |
|              |                    |            |                    |                    |       |                  |    |                      |    |                                       | 1  | Total NPV                      | of O   | &M Costs       | \$ | 238                 |
|              |                    |            | Capital Cos        | ts in million \$:  | :     |                  |    |                      |    | Yr built                              |    |                                |        |                |    |                     |
|              |                    |            |                    | RWTM               |       |                  | \$ | 601                  | -  | 2020                                  |    |                                |        |                | \$ | 471                 |
|              |                    |            |                    | <b>Pumping Sta</b> | tion  | s                | \$ | 45                   |    | 2020                                  |    |                                |        |                | \$ | 35                  |
|              |                    |            |                    |                    | vere! | NAC.             |    | 1.5%                 |    | CHARLES                               | To | tal NPV of                     | Cap    | ital Costs     | \$ | 507                 |

Total NPV of Capital and O&M Costs in millions \$

745

East of SA\_Alt1C;RWTM A

# NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

| Initial year of analysis period | 2015               | Contingency = 20%   |   |
|---------------------------------|--------------------|---|---|
| Interest rate                   | 5%                 | Engineering, Legal, Admin. = 15%                              |   |
| Evaluation period               | 50 years           | Environmental & Archaeology Studies &                         |   |
| Unit cost of energy             | \$<br>0.07 per kwh | Mitigation, Surveying, and Land Acquisition \$ 100,000 per mi | 0 |

|  | ALCOA     | CPS   | Total |
|--|-----------|-------|-------|
| Year built   | 2015      | 2015  |       |
| Estimated Construction Cost in Millions                  |           |       |       |
| Wells (Based on Non-Public Water Supply Wells)           | 20.92     | 7.94  | 28.8  |
| Pipeline   | 13.03     | 5.94  | 18.9  |
| Pump Stations & Storage                                  | 8.51      | 0     | 8.5   |
| Subtotal   | 42.46     | 13.88 | 56.3  |
| Contingency  | 8.49      | 2.78  | 11.2  |
| Subtotal   | 50.95     | 16.66 | 67.6  |
| Engineering, Legal & Administrative                      | 6.37      | 2.08  | 8.4   |
| Subtotal   | 57.32     | 18.74 | 76.0  |
| Environmental & Archaeology Studies & Mitigation         | 0.63      | 0.2   | 0.8   |
| Land Acquisition & Surveying                             | 0         | 0     | 0.0   |
| Groundwater Purchase                                     | 0         | 5.64  | 5.6   |
| ALCOA Construction Program Management Fee                | 5.45      | 0     | 5.4   |
| Interest During Construction (2 years, 6% int., 4% ret.) | 5.89      | 2.44  | 8.3   |
| Total Capital Cost                                       | 69.29     | 27.02 | 96.3  |
| Estimated Annual O&M Costs                               |           |       |       |
| M&O  | 0.67      | 0.18  | 8.0   |
| Pumping Energy   | 2.41      | 0.52  | 2.9   |
| ALCOA Project Management Fees                            | 0.35      | 0.00  | 0.3   |
| Purchase of Groundwater                                  | 2.00      | 0.00  | 2.0   |
| Groundwater District Fees                                | 0.65      | 0.25  | 0.9   |
| Mitigation Reserves                                      | 0.28      | 0.11  | 0.3   |
| Total Annual Cost  | 6.36      | 1.06  | 7.4   |
| NW - COM Cont  |           |       |       |
|  | \$ 116 \$ |       |       |
| NPV of Capital Costs                                     | \$ 69 \$  | 27 \$ | 96    |

#### Cooling of Well Water

Total NPV of Capital and O&M Costs for Well Fields

| Total number of wells in both fields Percentage of wells with temperatures > than degrees Estimated number of wells with temperature > degrees |    | 120<br>5%<br>6.0 |                 | Approximate capacity per wel Rough check | 300<br>36,000<br>58,072 | gpm<br>gpm<br>ac-ft/year |
|--|----|------------------|-----------------|--|-------------------------|--------------------------|
| Estimated Capital Costs  |    |                  |                 |  |                         |                          |
| Year built   |    | 2015             |                 |  |                         |                          |
| Number of Packaged Cooling Towers (300 gpm capacity/each)  |    | 6.0              |                 |  |                         |                          |
| Equipment cost (cooling towers and fans)   | \$ | 60,000           |                 |  |                         |                          |
| Installation and contractors mark-up   | \$ | 50,000           |                 |  |                         |                          |
| Structural slab  | \$ | 30,000           |                 |  |                         |                          |
| Electrical   | S  | 50,000           |                 |  |                         |                          |
| Estimated Unit Construction Cost   | \$ | 190,000          | Each            |  |                         |                          |
| Total construction cost  | \$ | 1.14             | million         |  |                         |                          |
| Contingencies  | \$ | 0.23             |                 |  |                         |                          |
| Subtotal   | \$ | 1.37             | •               |  |                         |                          |
| Engineering, Legal and Admin   | \$ | 0.21             |                 |  |                         |                          |
| Total Estimated Capital Cost   | S  | 1.57             |                 |  |                         |                          |
| NPV of Capital Costs   | \$ | 1.57             | million         |  |                         |                          |
| Estimated O&M Costs  |    |                  |                 |  |                         |                          |
| Value of equipment   | \$ | 0.4              | million         |  |                         |                          |
| Assumed life of equipment  |    | 10               | years           |  |                         |                          |
| Estimated maintenance/replacement cost   | \$ | 0.04             | million/year    |  |                         |                          |
| Blower Hp per cooling tower  |    | 10               | Нр              |  |                         |                          |
|  |    | 7                | kw              |  |                         |                          |
| Hours of operation   |    | 24               | hours           |  |                         |                          |
| Power consumption per cooling tower  |    | 179              | kwh per day     |  |                         |                          |
|  |    | 65,350           | kwh per year    |  |                         |                          |
| Power cost per cooling tower   | \$ | 4,574            | per year        |  |                         |                          |
| Total power cost for all cooling towers in millions  | \$ | 0.03             | million per yea | ar                                       |                         |                          |
|  |    |                  |                 |  |                         |                          |

185 \$

46 \$

232 million

6,000 per month for all cooling towers 0.07 per year

0.14 million \$ per year 2.47 million \$

Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Estimated O&M Cost \$
NPV of O&M costs \$

None Req'd - flow in Big Sandy Creek

Regular operational checks and routine maintenance

### Summary

Well Fields and Collection Lines (including tank and pump station at Hwy 290)
Cooling Towers for Selected High Temperature Wells
Ground Water Transmission Main and Pumping Station
Total for ALCOA-CPS

| <br>PV of<br>tal Costs | 10000 | V of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |  |
|------------------------|-------|-------------------|--|-------|--|
| \$<br>96.3             | \$    | 135.5             | \$                                       | 231.8 |  |
| \$<br>1.6              | \$    | 2.5               | \$                                       | 4.0   |  |
| \$<br>-                | \$    |                   | \$                                       |       |  |
| \$<br>97.9             | \$    | 137.9             | \$                                       | 235.8 |  |

#### **O&M Cost Calculations**

Oam Cost Calculations
RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir
CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

Contingency = 20% Engineering, Legal, Admin. = 15% Initial year of analysis period 2015 Interest rate Evaluation period 5% 40 years Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 100,000 per mile Unit cost of energy \$ 0.07 per kwh or = S Inflatable Rubber Low Head Dam Total Estimated Unit Constr. Contigency, Total Capital Quantity Units Size Cost Eng., etc. (millions) Cost Constr. Cost (millions) (millions) 2.25 \$ 4.50 Inflatable Rubber Low Head Dam 2 each 10 ft high Estimated inflatable dam cost as % of total Value of inflatable dam 50% 2.25 million Assumed life of inflatable dam
Estimated maintenance/replacement cost 10 years 0.23 million/year

2015 Year built 3.86 million

NPV of O&M Costs NPV of Capital Costs Total NPV of Capital and O&M Costs

\$ 10.07 million

6.21 million

#### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

#### Summary of withdrawals in acre-feet/year:

| Year  | 2015  | 2020   | 2030                    | 2040          |      | 2050                              | 2060                     |    | 065                       |        |                             |          |
|---|---|--|-------------------------|---------------|------|-----------------------------------|--------------------------|----|---------------------------|--------|-----------------------------|----------|
| For SAWS  | 18000   | 18000  | 18000                   | 18000         |      | 18000                             | 18000                    | 18 | 8000                      |        |                             |          |
| LCRA  |   |  | 5600                    | 11200         |      | 11200                             | 11200                    |    | 200                       |        |                             |          |
| COA   |   | 1919-101-111-11                                | 16802                   | 22403         |      | 33604                             | 33604                    |    | 604                       |        |                             |          |
| Subtotals   | 18000   | 18000  | 40402                   | 51603         |      | 62804                             | 62804                    |    | 804                       |        |                             |          |
| ALCOA/CPS_  | 55000   | 55000  | 55000                   | 55000         |      | 55000                             | 55000                    |    | 000                       |        |                             |          |
| Totals  | 73000   | 73000  | 95402                   | 106603        |      | 117804                            | 117804                   | 11 | 7804                      |        |                             |          |
| Ultimate (Y20   | 65) averag  | je design su                                   | ırface water v          | withdrawal ra |      |                                   | ac-ft/year<br>cfs        |    | 22.1                      | Patio  | of design withdrawal rate   |          |
| Surface water   | withdrawa   | al rate (for s                                 | calping high            | flows)        |      | 2,000                             | cfs                      |    | 20.1                      |        | tal intake design withdrawa | rate     |
|   |   |  |                         |               |      | 897,600                           | gpm                      |    |                           |        | -                           |          |
| Plus additiona  | al withdraw   | al of oround                                   | dwater on co            | nstant basis  |      | 55,000                            | ac-ft/vr                 |    |                           |        |                             |          |
| i ius auginorie   | a minimum and   | ai oi giouii                                   |                         | iotain baaic  |      | 76                                |                          |    |                           |        |                             |          |
|   |   |  |                         |               |      | 34,095                            |                          |    |                           |        |                             |          |
| Total design v  | vithdrawal  | rate   |                         |               |      | 931,695                           | gpm                      |    |                           |        |                             |          |
|   |   |  |                         |               |      |                                   |                          |    |                           |        |                             |          |
| No. of Intakes  |   |  |                         |               |      | 2                                 |                          |    |                           |        |                             |          |
| Design withdr   | awal rate   | er intake                                      |                         |               |      | 465,848                           | gpm                      |    |                           |        |                             |          |
| No. of reserve  | oirs  |  |                         |               |      | 4                                 |                          |    |                           |        |                             |          |
| Design flow to  | each rese   | ervoir   |                         |               |      | 232,924                           | gpm                      |    |                           |        |                             |          |
|   |   |  |                         |               |      |                                   |                          |    |                           |        |                             |          |
| Inside diamet   | er of each  | RWTM   |                         |               |      | 120                               |                          |    |                           |        |                             |          |
| Area  |   |  |                         |               |      | 78.54                             |                          |    |                           |        | for all DIACTAGE            |          |
| Average lengt   | th of each  | RWIM   |                         |               |      | 10,560                            | miles<br>feet            |    | 42,240                    |        | for all RWTMs               |          |
| Estimated cor   | nstruction  | cost for RW                                    | TMs                     |               | \$   | 793                               | per LF                   |    |                           | \$     | 1,254                       |          |
| Total construc  | otion cost i  | n millione                                     |                         |               | s    | 33.5                              |                          |    |                           |        |                             |          |
| Contingencies   |   | ri ilililions                                  |                         |               | \$   | 6.7                               |                          |    |                           |        |                             |          |
|   | Subtotal  |  |                         |               | \$   | 40.2                              |                          |    |                           |        |                             |          |
| Engineering,  |   | ministrative                                   |                         |               | \$   | 6.0                               |                          |    |                           |        |                             |          |
|   | Subtotal  |  |                         |               | \$   | 46.2                              | •                        |    |                           |        |                             |          |
| Envir & Arch  |   | Mitigation, S                                  | Surveying, &            | Land Aca      | \$   | 0.8                               |                          |    |                           |        |                             |          |
|   |   |  | PWTM in mil             |               | \$   | 47.0                              | •                        |    |                           |        |                             |          |
|   | . о.с. оср.   |  |                         |               |      |                                   |                          |    |                           |        |                             |          |
| Unit maintens   |   | ear-mile                                       |                         |               | \$   | 10,000                            | \$/year-mile             | \$ | 0.080                     | Millio | on \$/year (all RWTMs to Re | servoirs |
|   | ance cost/y   |  | M pumping to            | o the reserve |      | 10,000                            | \$/year-mile             | \$ | 0.080                     | Millio | on \$/year (all RWTMs to Re | servoirs |
| Unit maintens   | ance cost/y   | s one RWT                                      |                         | o the reserv  |      | 10,000                            |                          | \$ | 0.080                     | Millio | on \$/year (all RWTMs to Re | servoirs |
| Unit maintena   | ance cost/y<br>e intake ha  | s one RWT<br>h RWTM (fi                        |                         | o the reserve |      |                                   | gpm                      | \$ | 0.080                     | Millio | n \$/year (all RWTMs to Re  | servoirs |
| Unit maintena<br>Note: Assume   | ance cost/y<br>e intake ha<br>ate for eac<br>(one pum                                 | s one RWT<br>h RWTM (fi                        | rom above)              |               | oir. | 232,924                           | gpm                      | \$ | 0.080                     | Millio | n \$/year (all RWTMs to Re  | servoirs |
| Unit maintena<br>Note: Assume<br>Design flow re<br>Pumping rate   | ance cost/y<br>e intake ha<br>ate for eac<br>(one pum                                 | s one RWT<br>h RWTM (fi<br>p)<br>ting spare)   | rom above) pumping into | each RWT      | oir. | 232,924<br>40,000                 | gpm<br>gpm               | \$ | 0.080                     | Millio | n \$/year (all RWTMs to Re  | servoirs |
| Unit maintens Note: Assume Design flow re Pumping rate No. of pumps   | ance cost/y<br>e intake ha<br>ate for each<br>(one pum<br>i (not coun-<br>e into each | h RWTM (fi<br>p)<br>ting spare) i<br>RWTM (all | rom above) pumping into | each RWT      | oir. | 232,924<br>40,000<br>6            | gpm<br>gpm               | \$ | 0.080                     | Millio | n \$√year (all RWTMs to Re  | servoirs |
| Unit maintena<br>Note: Assume<br>Design flow re<br>Pumping rate<br>No. of pumps<br>Peak flow rate<br>Velocity at pe | ance cost/y e intake ha ate for eac (one pum (not coun e into each                    | h RWTM (fi<br>p)<br>ting spare) i<br>RWTM (all | rom above) pumping into | each RWT      | oir. | 232,924<br>40,000<br>6<br>240,000 | gpm<br>gpm<br>gpm<br>fps | \$ | 0.080<br>h <sub>f</sub> = | 13.5   | 52*Q1 <sup>1,85</sup>       | servoirs |

11 ft 3 ft 14 ft

80 ft

30%

400 Discharge at reservoir

320 Water surface elev in river 80 ft

Head loss at peak flow rate

Allowance for minor losses Total estimated losses

Average static head

| Total estimated dynamic head                                |       | 94     | ft   |
|---|-------|--------|--|
| Total ostilitation dynamic fload                            |       |        | psi  |
| Assumed pump efficiency                                     |       | 85%    |  |
| Assumed motor efficiency                                    |       | 90%    |  |
| Estimated Hp required per pump                              |       | 1,241  | hp/pump  |
|   |       | 926    | kw/pump  |
| Total hp pumping into each RWTM (not counting spare)        |       | 7,448  | hp/RWTM  |
| Total hp at each intake (not counting spare)                |       | 14,897 | hp/intake  |
| Total hp all intakes (not counting spares)                  |       | 29,793 |  |
| Total kw all intakes (not counting spares)                  |       | 22,226 | kw   |
| Unit construction cost for each pump station (from cost cur | /€ \$ | 889    | per firm hp of pump station \$ 830                 |
| Construction cost per intake/pump station                   |       |        | million  |
| No. of intakes from above                                   |       | 2      | each   |
| Total construction cost in millions                         | \$    | 26.5   | million  |
| Contigency, Eng., etc. in millions                          | s     | 10.06  | million  |
| Total capital cost in millions                              | \$    | 36.6   | million  |
| Total construction cost for pump stations                   | s     | 26.5   | million 40% Estimated equipment cost as % of total |
| Value of equipment  | s     | 10.6   | million  |
| Assumed life of equipment                                   | *     | 20     | J20072707  |
| Estimated maintenance/replacement cost                      | \$    |        | million/year                                       |

O&M Costs:

| Yea | Flow pur   | mped by<br>ar | No. of pump "sets" | Energy<br>used |       | Energ    | y co | ost                   | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Т  | otal O&M<br>cost  | N       | et present<br>value |
|-----|--|---------------|--------------------|----------------|-------|----------|------|-----------------------|--------------------------------------|----|-------------------------------|----|-------------------|---------|---------------------|
|     | ac-ft/yr   | mgd           | operating<br>/day  | (kwh/day)      | 3-0.0 | (\$/day) |      | (Million \$<br>/year) | (Million \$ /year)                   | 9  | (Million \$<br>/year)         | (  | Million \$ /year) | 5010000 | (\$)                |
| 201 | 5 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 1.25                |
| 201 |  | 65            | 1,13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 1.19                |
| 201 | 7 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 1.14                |
| 201 | 8 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 1.08                |
| 201 | 9 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 1.03                |
| 202 | 0 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.98                |
| 202 | 1 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.93                |
| 202 | 2 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.89                |
| 202 | 3 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.85                |
| 202 | 4 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.81                |
| 202 | 5 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.77                |
| 202 | 6 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.73                |
| 202 | 7 73,000   | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.70                |
| 202 |  | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.66                |
| 202 |  | 65            | 1.13               | 25,145         | \$    | 1,760    | \$   | 0.64                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.25              | \$      | 0.63                |
| 203 | 0 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.70                |
| 203 | 1 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.66                |
| 203 |  | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.63                |
| 203 | 3 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.60                |
| 203 | 4 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.57                |
| 203 | 5 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.55                |
| 203 | 6 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.52                |
| 203 | 7 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.50                |
| 203 | 8 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.47                |
| 203 | 9 95,402   | 85            | 1.48               | 32,862         | \$    | 2,300    | \$   | 0.84                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.45              | \$      | 0.45                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.46                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.44                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.41                |
| 204 | 3 106,603  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.39                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.38                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.36                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.34                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.32                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.31                |
| 204 |  | 95            | 1.65               | 36,720         | \$    | 2,570    | \$   | 0.94                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.55              | \$      | 0.29                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.30                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.28                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.27                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.26                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.25                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.23                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.22                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.21                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.20                |
| 205 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.19                |
| 206 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.18                |
| 206 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.17                |
| 206 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.17                |
| 206 | 170 - 1710 N. H. | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.16                |
| 206 |  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.15                |
| 206 | 5 117,804  | 105           | 1.83               | 40,578         | \$    | 2,840    | \$   | 1.04                  | \$<br>0.53                           | \$ | 0.080                         | \$ | 1.65              | \$      | 0.14                |
|     |  |               |                    |                |       |          |      |                       |                                      |    |                               |    |                   |         |                     |

Total NPV of O&M Costs \$ 26.4 Capital Costs in million \$: RWTM to Reservoir Intake/Pumping Stations Yr built 2015 2015 47.0 36.6 47.0 Total NPV of Capital Costs \$ 110.0

Total NPV of Capital and O&M Costs in millions \$

|  | Quantity | Units       | Volume/each<br>(acre-feet) | -   | nit Cost<br>6/ac-ft) | Con     | Total<br>struction<br>cost in<br>nillions |         | tigency,<br>g., etc. | 0.7 | otal in<br>nillions |
|--|----------|-------------|----------------------------|-----|----------------------|---------|---|---------|----------------------|-----|---------------------|
| Reservoirs                               | 4        | <br>each    | 15000                      | \$  | 1,180                | \$      | 70.8                                      | \$      | 26.9                 | \$  | 97.7                |
| Estimated average depth of reservoir     | r        | 20          | ft                         |     |                      |         |   |         |                      |     |                     |
| Surface area of reservoir                |          | 3000        | acres                      |     |                      |         |   |         |                      |     |                     |
| Ratio of total land area regd to surface | ce area  |             |                            |     |                      |         |   |         |                      |     |                     |
| of reservoir                             |          | 1.1         |                            |     |                      | E       | nvir & Arcl                               | haeolo  | gy, Surv,            |     |                     |
| Total land area regd for reservoirs      |          | 3300        | acres                      |     |                      |         |   | and La  | nd Acq =             |     | 16.5                |
|  |          |             |                            |     |                      | Total o | capital cos                               | t in mi | llions =             | \$  | 114.2               |
| Assumed life of reservoir                |          | 100         | years                      |     |                      |         |   |         |                      | (2) |                     |
| Estimated replacement cost               |          | \$<br>0.71  | million/year               |     |                      |         |   |         |                      |     |                     |
| Estimated maintenance                    |          | \$<br>0.04  | million/year               | Mow | ing, mair            | tainin  | g fences,                                 | etc.    |                      |     |                     |
| Total                                    |          | \$<br>0.75  | million/year               |     |                      |         |   |         |                      |     |                     |
| Year built                               |          | 2015        |                            |     |                      |         |   |         |                      |     |                     |
| NPV of O&M costs                         |          | \$<br>12.8  | million                    |     |                      |         |   |         |                      |     |                     |
| NPV of Capital costs                     |          | \$<br>114.2 | million                    |     |                      |         |   |         |                      |     |                     |
| Total NPV of Capital and O&M Cos         | ts       | \$<br>127.0 | million                    |     |                      |         |   |         |                      |     |                     |

| Summary   | <br>PV of<br>tal Costs | OV of O&M<br>Costs | Ca | pital and |
|---|------------------------|--------------------|----|-----------|
| Inflatable Rubber Low Head Dam                                    | \$<br>6.2              | \$<br>3.9          | \$ | 10.1      |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>83.6             | \$<br>26.4         | \$ | 110.0     |
| Off Channel Reservoir   | \$<br>114.2            | \$<br>12.8         | \$ | 127.0     |
| Total for RWI A   | \$<br>204.0            | \$<br>43.1         | \$ | 247.1     |

O&M Cost Calculations
RWTM B - RWI B near Bastrop to WTP
CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

| initial year of analysis period     |        | 2015    |         | Contingency -                               | 2070 | 8       |          |
|-------------------------------------|--------|---------|---------|---|------|---------|----------|
| Interest rate                       |        | 5%      |         | Engineering, Legal, Admin. =                | 15%  | i i     |          |
| Evaluation period                   |        | 40      | years   | Environmental & Archaeology Studies &       |      |         |          |
| Unit cost of energy                 | S      | 0.07    | per kwh | Mitigation, Surveying, and Land Acquisition | \$   | 100,000 | per mile |
| Summary of average pumping rates in | acre-f | eet/yea | r:      |   |      |         |          |
|                                     |        |         |         |   |      |         |          |

#### S

| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
|----------------|-------|-------|-------|--------|--------|--------|--------|
| For SAWS       | 18000 | 18000 | 18000 | 18000  | 18000  | 18000  | 18000  |
| LCRA           |       |       | 5600  | 11200  | 11200  | 11200  | 11200  |
| COA            |       |       | 16802 | 22403  | 33604  | 33604  | 33604  |
| Subtotal       | 18000 | 18000 | 40402 | 51603  | 62804  | 62804  | 62804  |
| Groundwater    |       |       |       |        |        |        |        |
| Year           | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS       | 55000 | 55000 | 55000 | 55000  | 55000  | 55000  | 55000  |
| Suface & groun | 73000 | 73000 | 95402 | 106603 | 117804 | 117804 | 117804 |

Ultimate (Y2065) average design pumping rate

117,804 ac-ft/year

#### Sizing of Raw Water Transmission Main B & Pump Stations

| Inside diameter of RWTM                                  | 84          | in.          |    |
|--|-------------|--------------|----|
| Area   | 38.48       | sf           |    |
| Length of RWTM   | 68          | miles        |    |
|  | 359,040     | feet         |    |
| Estimated unit construction cost for RWTM                | \$<br>467   | per LF       |    |
| Total construction cost in millions                      | \$<br>167.8 |              |    |
| Contingencies  | \$<br>33.6  |              |    |
| Subtotal   | \$<br>201.4 |              |    |
| Engineering, Legal & Administrative                      | \$<br>30.2  |              |    |
| Subtotal   | \$<br>231.6 |              |    |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>6.8   |              |    |
| Total Capital Cost for PWTM in millions                  | \$<br>238.4 | million      |    |
| Unit maintenance cost/year-mile                          | \$<br>5,000 | \$/year-mile | \$ |
| Design flow rate (from table above)                      | 117,804     | ac-ft/year   |    |

| Unit maintenance cost/year-mile         | \$ 5,00 | 0 \$/year-mile | \$<br>0.340 Million \$/year |
|---|---------|----------------|-----------------------------|
| Design flow rate (from table above)     | 117,80  | 4 ac-ft/year   |                             |
|   | 10      | 5 mgd          |                             |
|   | 73,02   | 9 gpm          |                             |
| Pumping rate (one pump)                 | 15,00   | 0 gpm          |                             |
| No. of pumps (not counting spare)       |         | 5              |                             |
| Peak flow rate (all pumps except spare) | 75,00   | 0 gpm          |                             |
| Velocity at peak flow rate              | 4.3     | 4 fps          |                             |
| C factor                                | 12      | 0              |                             |
| Head loss per foot                      | 0.000   | 57 ft/ft       | hr=   3.552*Q 1.85          |
|   | 3.5     | 5 ft/mile      | C*(d) <sup>2.63</sup>       |
| Head loss at pack flow rate             | 2       | 12 8           |                             |

| Head loss at peak flow rate  |     | 242 | ft  |   |
|------------------------------|-----|-----|-----|---|
| Allowance for minor losses   | 10% | 24  | ft  |   |
| Total estimated losses       |     | 266 | ft  |   |
| Average static head          |     | 250 | ft  | _ |
| Total estimated dynamic head |     | 516 | ft  |   |
|                              |     | 224 | psi |   |
|                              |     |     |     |   |

650 Elev. At WTP 400 Elev of WSE in Bastrop reservoir 250 ft

150 psi (assumed max pressure

in pipe)

| No. of pumping stations used in cost estimate           | 2.0   |            |
|---|-------|------------|
| Average head per pump station                           | 258   | ft         |
| Assumed pump efficiency                                 | 85%   |            |
| Assumed motor efficiency                                | 90%   |            |
| Estimated Hp required per pump                          | 1,277 | hp/pum     |
|   | 953   | kw/pum     |
| Total hp per pump station (not counting spare)          | 6,386 | hp/station |
| Total kw per pump set (set=pumps in series along route) | 2.554 | kw/pum     |

No of recommended pumping stations along route

np mp tion ump set (one pump at each station) 1,365 per firm hp of pump station 8.7 million Unit construc cost for each pump station (from cost curve) \$
Construction cost per pump station

1.49

| Balancing reservoir                      | \$<br>0.75 | million _ |
|--|------------|-----------|
| Total construction cost per pump station | \$<br>9.47 | million   |
| No. of pump stations from above          | 2.0        | each      |
| Total construction cost in millions      | \$<br>18.9 | million   |
| Contingency, Eng., etc. in millions      | \$<br>7.20 | million   |

60 min. of storage at avg pumping rate 5.0 mg 0.15 per gal for open top reservoir

26.1 million Total capital cost in millions Total construction cost for pump stations
Value of equipment
Assumed life of equipment
Estimated maintenance/replacement cost 18.9 million 7.6 million 20 years 0.38 million/year

40% Estimated equipment cost as % of total

#### **O&M Costs**

| Year | Flow purr<br>yea   |          | No. of<br>pump<br>"sets" | Energy<br>used     |      | Energ            | y co | st                    | CO | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Т    | otal O&M<br>cost      | N  | et presen<br>value |
|------|--------------------|----------|--------------------------|--------------------|------|------------------|------|-----------------------|----|------------------------------------|----|-------------------------------|------|-----------------------|----|--------------------|
|      | ac-ft/yr           | mgd      | operating<br>/day        | (kwh/day)          |      | (\$/day)         | (    | (Million \$<br>/year) | (  | (Million \$<br>/year)              |    | (Million \$<br>/year)         |      | (Million \$<br>/year) |    | (\$)               |
| 2015 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 5.4                |
| 2016 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 5.1                |
| 2017 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 4.9                |
| 2018 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 4.7                |
| 2019 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 4.4                |
| 2020 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 4.2                |
| 2021 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 4.0                |
| 2022 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.8                |
| 2023 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.6                |
| 2024 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.5                |
| 2025 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.3                |
| 2026 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.1                |
| 2027 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 3.0                |
| 2028 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 2.8                |
| 2029 | 73,000             | 65       | 3.02                     | 184,957            | \$   | 12,947           | \$   | 4.73                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 5.44                  | \$ | 2.7                |
| 2030 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 3.3                |
| 2031 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 3.1                |
| 2032 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 3.0                |
| 2033 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 2.8                |
| 2034 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 2.7                |
| 2035 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 2.6                |
| 2036 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 2.3                |
| 2037 | 95,402             | 85       | 3.94                     | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ |                    |
| 2038 | 95,402             | 85<br>85 | 3.94<br>3.94             | 241,716            | \$   | 16,920           | \$   | 6.18                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 6.89                  | \$ | 2.2                |
| 2039 | 95,402             | 95       | 4.41                     | 241,716            | S    | 16,920           | S    | 6.18                  | S  | 0.38                               | 5  | 0.340                         | \$   | 7.62                  | \$ | 2.                 |
| 2040 | 106,603            | 95       |                          | 270,096            | 0.55 | 18,907           | \$   | 6.90                  | \$ |                                    | \$ | 0.340                         | S    | 7.62                  | \$ | 2.                 |
| 2041 | 106,603            | 95       | 4.41                     | 270,096            | \$   | 18,907           | S    | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 7.62                  | \$ | 2.0                |
| 2042 | 106,603<br>106,603 | 95       | 4.41<br>4.41             | 270,096<br>270,096 | \$   | 18,907<br>18,907 | \$   | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | 3    | 7.62                  | \$ | 1.9                |
| 2043 | 106,603            | 95       | 4.41                     | 270,096            | 5    | 18,907           | \$   | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 7.62                  | \$ | 1.8                |
| 2045 | 106,603            | 95       | 4.41                     | 270,096            | \$   | 18,907           | S    | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 7.62                  | \$ | 1.7                |
| 2045 | 106,603            | 95       | 4.41                     | 270,096            | \$   | 18,907           | S    | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | 5    | 7.62                  | \$ | 1.6                |
| 2047 | 106,603            | 95       | 4.41                     | 270,096            | \$   | 18,907           | \$   | 6.90                  | S  | 0.38                               | \$ | 0.340                         | 3    | 7.62                  | \$ | 1.6                |
| 2048 | 106,603            | 95       | 4.41                     | 270,096            | Š    | 18,907           | Š    | 6.90                  | Š  | 0.38                               | \$ | 0.340                         | \$   | 7.62                  | \$ | 1.6                |
| 2049 | 106,603            | 95       | 4.41                     | 270,096            | \$   | 18,907           | Š    | 6.90                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 7.62                  | Š  | 1.4                |
| 2050 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | S    | 7.63                  | \$ | 0.38                               | Š  | 0.340                         | \$   | 8.34                  | S  | 1.5                |
| 2051 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | Š  | 0.38                               | Š  | 0.340                         | Š    | 8.34                  | \$ | 1.4                |
| 2052 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | š  | 0.38                               | Š  | 0.340                         | Š    | 8.34                  | Š  | 1.3                |
| 2053 | 117,804            | 105      | 4.87                     | 298,476            | s    | 20,893           | Š    | 7.63                  | š  | 0.38                               | s  | 0.340                         | Š    | 8.34                  | Š  | 1.3                |
| 2054 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | s    | 7.63                  | \$ | 0.38                               | Š  | 0.340                         | \$   | 8.34                  | \$ | 1.2                |
| 2055 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | \$   | 7.63                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 8.34                  | \$ | 1.1                |
| 2056 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | Š  | 0.38                               | \$ | 0.340                         | \$   | 8.34                  | Š  | 1.1                |
| 2057 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | Š    | 7.63                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 8.34                  | Š  | 1.0                |
| 2058 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | Š    | 7.63                  | \$ | 0.38                               | \$ | 0.340                         | Š    | 8.34                  | \$ | 1.0                |
| 2059 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | S    | 7.63                  | Š  | 0.38                               | Š  | 0.340                         | Š    | 8.34                  | Š  | 0.9                |
| 2060 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | š  | 0.38                               | \$ | 0.340                         | Š    | 8.34                  | Š  | 0.1                |
| 2061 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | \$   | 7.63                  | Š  | 0.38                               | \$ | 0.340                         | s    | 8.34                  | \$ | 0.                 |
| 2062 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | š  | 0.38                               | Š  | 0.340                         | Š    | 8.34                  | \$ | 0.                 |
| 2063 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | Š    | 7.63                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 8.34                  | \$ | 0.                 |
| 2064 | 117,804            | 105      | 4.87                     | 298,476            | Š    | 20,893           | Š    | 7.63                  | Š  | 0.38                               | Š  | 0.340                         | \$   | 8.34                  | Š  | 0.                 |
| 2065 | 117,804            | 105      | 4.87                     | 298,476            | \$   | 20,893           | \$   | 7.63                  | \$ | 0.38                               | \$ | 0.340                         | \$   | 8.34                  | \$ | 0.                 |
|      |                    |          |                          |                    |      |                  |      |                       |    |                                    |    | Total NPV                     | of ( | O&M Costs             | \$ | 121                |
|      |                    |          | Capital Cos              | ts in million \$   | :    |                  |      |                       | _  | Yr built                           |    |                               |      |                       |    |                    |
|      |                    |          |                          | RWTM               |      |                  | \$   | 238.4                 | _  | 2015                               |    |                               |      |                       | \$ | 238                |
|      |                    |          |                          | <b>Pumping Sta</b> | atio | ns               | \$   | 26.1                  |    | 2015                               |    |                               |      |                       | \$ | 26                 |
|      |                    |          |                          |                    |      |                  |      |                       |    |                                    | 1  | otal NPV o                    | f Cr | pital Costs           | S  | 264                |

Total NPV of Capital and O&M Costs in millions \$ 386.2

O&M Cost Calculations
WTP and Raw Water Storage Reservoir at WTP
CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

|   |                       | Year =               | 2015   | 2020                     | 2030                         | 2040                               | 2050                         | 2060            | 2065  |
|---|-----------------------|----------------------|--|--------------------------|------------------------------|------------------------------------|------------------------------|-----------------|-------|
| Softened water demand:  |                       | Units                |  |                          |                              |                                    |                              |                 |       |
| Average yearly demands:   |                       | - Crinto             |  |                          |                              |                                    |                              |                 |       |
| City of Austin  |                       | ac-ft/yr             | 0  | 0                        |                              | 22403                              | 33604                        | 33604           | 3360  |
| LCRA  |                       | ac-ft/yr             | 0  | 0                        | 5600                         | 11200                              | 11200                        | 11200           | 1120  |
| Totals  |                       | ac-ft/yr             | 0  | 0                        |                              | 33603                              | 44804                        | 44804           | 4480  |
| Totals  |                       | mgd                  | 0  | 0                        | 20                           | 30                                 | 40                           | 40              | 4     |
| Max day demands:<br>City of Austin  |                       | mgd                  | 0  | 0                        | 25                           | 35                                 | 50                           | 50              | 5     |
| LCRA  |                       | mgd                  | 0  | 0                        |                              | 20                                 | 20                           | 20              | 2     |
| Totals  |                       | mgd                  | 0  | 0                        | 35                           | 55                                 | 70                           | 70              | 7     |
|   |                       |                      |  |                          |                              |                                    |                              |                 |       |
|   |                       | Year =               | 2015   | 2020                     | 2030                         | 2040                               | 2050                         | 2060            | 2065  |
| Non-softened water demands:   |                       | Units                |  |                          |                              |                                    |                              |                 |       |
| Average yearly demands:   |                       |                      | 70000  | 005000                   | 005000                       | 005000                             | 005000                       | 205000          | 00500 |
| SAWS  |                       | ac-ft/yr             | 73000<br>20550                               | 205000<br>23406          |                              | 205000<br>31393                    | 205000<br>34411              | 205000<br>37530 | 20500 |
| SARA<br>GBRA  |                       | ac-ft/yr<br>ac-ft/yr | 20550  | 23406                    | 6000                         | 8000                               | 10000                        | 12300           | 1230  |
| Totals  |                       | ac-loyi              | 93550  | 228406                   |                              | 244393                             | 249411                       | 254830          | 25842 |
| Totals  |                       | mgd                  | 84   | 20400                    |                              | 218                                | 223                          | 227             | 23042 |
|   |                       |                      |  |                          |                              |                                    |                              |                 |       |
| Max day demands:  |                       | -                    | -  | 000                      | 000                          | 000                                | 000                          | 238             | 23    |
| SAWS<br>SARA  |                       | mgd                  | 85<br>24                                     | 238                      |                              | 238                                | 238                          | 238             | 23    |
| GBRA  |                       | mgd<br>mgd           | 0  | 2/                       |                              | 7                                  | 9                            | 11              | 1     |
| Totals  |                       | mgd                  | 109  | 265                      |                              | 281                                | 287                          | 293             | 29    |
| Total: softened and non-softened wa<br>Average yearly demand  | ter demands           | ac-ft/yr<br>mgd      | 93550<br>84                                  | 228406<br>204            |                              | 277996<br>248                      | 294215<br>263                | 299634<br>267   | 30323 |
| Max day demand  |                       | mgd                  | 109  | 265                      | 311                          | 336                                | 357                          | 363             | 36    |
| Sizing for ultimate conditions:<br>Assumed number of days of con-                                   | secutive Max Day de   | mands                | 30   | days                     |                              |                                    |                              |                 |       |
| Design (Max. Day) treated water   | production req'd in r | ngd                  | 367  | mgd                      |                              |                                    |                              |                 |       |
| Average treated water production  | in mgd                |                      | 271  | mgd                      | (which is also can be pumped | equal to sum of                    | ground and rav               | v water that    |       |
| Difference (shortfall o   | of raw water)         |                      | 96   | mgd                      | can be pumped                | to the vvii )                      |                              |                 |       |
| Required storage reservoir for ra   | w water               |                      | 2,889  | mg                       |                              |                                    |                              |                 |       |
| Add safety factor   | 25%                   |                      | 8,868<br>2,217                               | ac-ft<br>ac-ft           |                              |                                    |                              |                 |       |
| Total storage required  | 2070                  |                      | 11,084                                       | ac-ft                    |                              |                                    |                              |                 |       |
| Total storage recommended   |                       |                      | 12,000                                       | ac-ft                    | Note: No. of<br>(for exam    | days at averag<br>nple, for repair | e day demand<br>of RWTM A) = | 33 0            | lays  |
|   | Quantity              | Units                | Volume/each<br>(acre-feet)                   | Unit Cost<br>(\$/ac-ft)) | Total<br>Construction        | Contigency,<br>Eng., etc.          | Total Capital<br>Cost        |                 |       |
| Reservoirs  | 1                     | each                 | 12,000                                       | \$ 1,283                 | \$ 15.4                      | \$ 5.9                             | \$ 21.3                      |                 |       |
|   | Service .             | 0.5                  |  |                          |                              |                                    |                              |                 |       |
| Estimated average depth of rese<br>Surface area of reservoir<br>Ratio of total land area regd to su |                       | 25<br>480            | ft<br>acres                                  |                          |                              |                                    |                              |                 |       |
| of reservoir  | maco area             | 1.10                 |  |                          | Envir & Arcl                 | naeology, Surv,                    |                              |                 |       |
| Total land area reqd for reservoir  | rs .                  | 528                  | acres  |                          |                              | and Land Acq =                     | 13.2                         |                 |       |
|   |                       |                      |  |                          | Total capital cos            | t in mill ons ≈                    | \$ 34.5                      |                 |       |
| Assumed life of reservoir   |                       | 100                  | years  |                          |                              |                                    |                              |                 |       |
| Estimated replacement cost<br>Estimated maintenance<br>Total  |                       | \$ 0.04              | million/year<br>million/year<br>million/year | Mowing, mair             | ntaining fences, e           | tc.                                |                              |                 |       |
| Year built  |                       | 2015                 | E .  |                          |                              |                                    |                              |                 |       |
| NPV of O&M costs  |                       | \$ 25                | million                                      |                          |                              |                                    |                              |                 |       |
| NPV of Capital costs  |                       |                      | million                                      |                          |                              |                                    |                              |                 |       |
|   | 2: 100                | 1651 1630121         | 1021511                                      |                          |                              |                                    |                              |                 |       |

\$ 38.0 million

Total NPV of Capital and O&M Costs

#### WTP

#### Plant Phasing and Capital Costs;

| Softening Treatment Trains  | 2045        |     | 0000     |    | 2000         | 2012       |    | 001 |                   | 0000     |    | 0005     |
|---|-------------|-----|----------|----|--------------|------------|----|-----|-------------------|----------|----|----------|
| Year =  | <br>2015    | -   | 2020     | -  | 2030         | <br>2040   | -  | 205 |                   | <br>2060 |    | 2065     |
| Average treated water production in mgd Design (Max. Day) treated water production reg'd in mgd | 0           |     | 0        |    | 20<br>35     | 30<br>55   |    |     | 40<br>70          | 40<br>70 |    | 40<br>70 |
|   | U           |     |          |    |              |            |    |     | 70                | 70       |    | 70       |
| Initial/additional Max day capacity built (mgd)   | 0           | 9   |          |    | 50           | 20         |    |     | 70                | 70       |    | 70       |
| Total capacity on line (must exceed Design Max Day Req'd)                                       | U           | 8   | 0        |    | 50           | 70         |    |     | 70                | 70       |    | 70       |
| Unit cost for max day treatment capacity (\$/gpd of capacity)                                   |             |     |          | \$ | 1.78         | \$<br>2.14 |    |     |                   |          |    |          |
| Estimated construction cost of expansion in \$millions  | \$<br>*     | \$  |          | \$ | 89.0         | \$<br>42.8 | \$ |     | ٠                 | \$<br>-  | \$ | -        |
| Non-softening Treatment Trains  |             |     |          |    |              |            |    |     |                   |          |    |          |
| Year =  | <br>2015    |     | 2020     |    | 2030         | <br>2040   |    | 205 |                   | <br>2060 |    | 2065     |
| Average treated water production in mgd   | 84          |     | 204      |    | 214          | 218        |    |     | 223               | 227      |    | 231      |
| Design (Max. Day) treated water production req'd in mgd   | 109         |     | 265      |    | 276          | 281        |    |     | 287               | 293      |    | 297      |
| Additional Max day capacity built (mgd)   | 200         |     | 100      |    |              |            |    |     |                   |          |    |          |
| Total capacity on line (must exceed Design Max Day Req'd)                                       | 200         | 1   | 300      |    | 300          | 300        |    |     | 300               | 300      |    | 300      |
| Unit cost for max day treatment capacity (\$/gpd of capacity)                                   | \$<br>1.15  | \$  | 1.32     |    |              |            |    |     |                   |          |    |          |
| Estimated construction cost of expansion in \$millions  | \$<br>229.6 | \$  | 131.5    | \$ | ( <b>4</b> ) | \$<br>-    | \$ |     |                   | \$<br>-  | \$ | ¥        |
| Totals (Softening + Non-softening Trains)   |             |     |          |    |              |            |    |     |                   |          |    |          |
| Year =  | 2015        |     | 2020     |    | 2030         | 2040       |    | 205 | 0                 | 2060     |    | 2065     |
| Total construction cost for both trains   | \$<br>229.6 | \$  | 131.5    | \$ | 89.0         | \$<br>42.8 | \$ |     |                   | \$<br>   | \$ |          |
| Contingencies   | 45.9        |     | 26.3     |    | 17.8         | 8.6        |    |     |                   | -        |    | -        |
| Subtotal  | \$<br>275.5 | \$  | 157.8    | \$ | 106.8        | \$<br>51.3 | \$ |     | -                 | \$<br>   | \$ |          |
| Engineering, Legal, & Administrative  | 41.3        |     | 23.7     |    | 16.0         | 7.7        |    |     |                   |          |    |          |
| Subtotal  | 316.8       |     | 181.5    |    | 122.8        | 59.0       |    |     |                   | -        |    | -        |
| Environmental & Archaelogy Studies and Mitigation & Land  |             |     |          |    |              |            |    |     |                   |          |    |          |
| Acquisition and Surveying (see Note below)  | 2.5         |     |          |    |              |            |    |     |                   |          |    |          |
| Total estimated capital cost  | \$<br>319.3 | \$  | 181.5    | \$ | 122.8        | \$<br>59.0 | \$ |     |                   | \$<br>-  | \$ | -        |
| NPV of capital cost   | \$ 319.3    |     | \$ 142.2 |    | \$ 59.1      | \$ 17.4    |    | \$  | (1 <del>9</del> ) | \$ -     | )  | \$ -     |
| Total NPV of WTP initial construction & expansions  | \$<br>538   |     |          |    |              |            |    |     |                   |          |    |          |
| Note: Assumed land requirement for WTP (not including reservoir                                 | 100         | acı | es       |    |              |            |    |     |                   |          |    |          |

#### O&M Costs for Softening Trains:

#### O&M Costs for Non-Softening Trains;

| d of acity     | mgd<br>produced |  | per mg<br>reated                                |  | million<br>/year<br>-<br>-<br>-  | \$   | (\$)   |  | mgd of capacity   | mgd<br>produced  |  | per mg  | \$mil   | lion /year   |  | 020   |
|----------------|-----------------|--|---|--|--|--|--|--|---|--|--|---|---|--|--|---|
|                | -               |  | and the second second second                    | \$   |  |  | •  |  |   | produced   | ti   | eated   |   | 0.5  |  | (\$)  |
|                |                 |  |   | \$   |  | S  |  | 2015   | 200   | 84   | \$   | 374   | \$  | 11.41  | \$   | 11  |
|                |                 |  |   | \$   |  |  | -  | 2016   | 200   | 84   | \$   | 374   | \$  | 11.41  | \$   | 10  |
|                |                 |  |   | \$   |  | \$   |  | 2017   | 200   | 84   | \$   | 374   | \$  | 11.41  | \$   | 10  |
|                | :               |  |   | \$   |  | \$   |  | 2018   | 200   | 84   | \$   | 374   | \$  | 11.41  | \$   | 9   |
|                | :               |  |   |  |  | \$   |  | 2019   | 200   | 84   | \$   | 374   | \$  | 11.41  | \$   | 9   |
|                | :               |  |   |  | -  | \$   |  | 2020   | 300   | 204  | S  | 343   | \$  | 25.50  | \$   | 19  |
|                | :               |  |   | \$   |  | \$   |  | 2021   | 300   | 204  | \$   | 343   | \$  | 25.50  | \$   | 19  |
|                | :               |  |   | S  | -  | \$   |  | 2022   | 300   | 204  | \$   | 343   | \$  | 25.50  | \$   | 18  |
|                | -               |  |   | Š  |  | Š  |  | 2023   | 300   | 204  | \$   | 343   | \$  | 25.50  | \$   | 17  |
| :              |                 |  |   | Š  | 1123   | \$   | 2  | 2024   | 300   | 204  | Š  | 343   | \$  | 25.50  | \$   | 16  |
| :              |                 |  |   | Š  | 723  | Š  |  | 2025   | 300   | 204  | š  | 343   | Š   | 25.50  | \$   | 15  |
| •              |                 |  |   | Š  |  | Š  | <u> </u>   | 2026   | 300   | 204  | Š  | 343   | Š   | 25.50  | \$   | 14  |
| -              | 2               |  |   | Š  | 950  | Š  | 8  | 2027   | 300   | 204  | Š  | 343   | Š   | 25.50  | \$   | 14  |
| -              | -               |  |   | \$   | 257  | Š  | 5  | 2028   | 300   | 204  | \$   | 343   | \$  | 25.50  | \$   | 13  |
|                |                 |  |   | \$   | 100  | Š  |  |  |   | 204  | \$   | 343   |   | 25.50  | \$   | 12  |
| EO             | - 00            |  | 740   |  | 5.20   |  | 2.60   | 2029   | 300   | 214  |  |   | \$  |  |  |   |
| 50             | 20              | \$   | 712   | \$   |  | \$   | 2.50   | 2030   | 300   |  | \$   | 343   | \$  | 26.73  | \$   | 12  |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 2.38   | 2031   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 12  |
| 50             | 20              | \$   | 712   | \$   | 5,20   | \$   | 2.27   | 2032   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 11  |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 2.16   | 2033   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 11  |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 2.06   | 2034   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 10  |
| 50             | 20              | \$   | 712   | 5  | 5.20   | \$   | 1.96   | 2035   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 10  |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 1.87   | 2036   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 9   |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 1.78   | 2037   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 8   |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 1.69   | 2038   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 8   |
| 50             | 20              | \$   | 712   | \$   | 5.20   | \$   | 1.61   | 2039   | 300   | 214  | \$   | 343   | \$  | 26.73  | \$   | 8   |
| 70             | 30              | \$   | 661   | \$   | 7.24   | \$   | 2.14   | 2040   | 300   | 218  | \$   | 343   | \$  | 27.28  | \$   | 8   |
| 70             | 30              | \$   | 661   | \$   | 7.24   | \$   | 2.04   | 2041   | 300   | 218  | \$   | 343   | \$  | 27.28  | \$   | 7   |
| 70             | 30              | \$   | 661   | \$   | 7.24   | \$   | 1.94   | 2042   | 300   | 218  | \$   | 343   | \$  | 27.28  | \$   | 7   |
| 70             | 30              | \$   | 661   | \$   | 7.24   | \$   | 1.85   | 2043   | 300   | 218  | \$   | 343   | \$  | 27.28  | \$   | 6   |
| 70             | 30              | \$   | 661   | \$   | 7.24   | \$   | 1.76   | 2044   | 300   | 218  | s  | 343   | \$  | 27.28  | \$   | 6   |
| 70             | 30              | \$   | 661   | S  | 7.24   | 5  | 1.68   | 2045   | 300   | 218  | S  | 343   | \$  | 27.28  | s  | 6   |
| 70             | 30              | \$   | 661   | S  | 7.24   | Š  | 1.60   | 2046   | 300   | 218  | s  | 343   | S   | 27.28  | s  | 6   |
| 70             | 30              | š  | 661   | Š  | 7.24   | Š  | 1.52   | 2047   | 300   | 218  | Š  | 343   | S   | 27.28  | Š  | 5   |
| 70             | 30              | š  | 661   | š  | 7.24   | š  | 1,45   | 2048   | 300   | 218  | š  | 343   | Š   | 27.28  | \$   | 5   |
| 70             | 30              | š  | 661   | Š  | 7.24   | \$   | 1.38   | 2049   | 300   | 218  | Š  | 343   | Š   | 27.28  | Š  | 5   |
| 70             | 40              | \$   | 661   | \$   | 9.65   | \$   | 1.75   | 2050   | 300   | 223  | Š  | 343   | Š   | 27.84  | Š  | 5   |
| 70             | 40              | \$   | 661   | Š  | 9.65   | \$   | 1.67   | 2051   | 300   | 223  | Š  | 343   | Š   | 27.84  | Š  | 4   |
| 70             | 40              | \$   | 661   | S  | 9.65   | \$   | 1.59   | 2052   | 300   | 223  | Š  | 343   | Š   | 27.84  | \$   | 4   |
| 70             | 40              | \$   | 661   | \$   | 9.65   | \$   | 1.51   | 2052   | 300   | 223  | S  | 343   | \$  | 27.84  | \$   | 4   |
| 70             | 40              | \$   |   |  |  |  |  |  | 300   | 223  |  | 343   |   | 27.84  | Š  | 4   |
| 70             |                 |  | 661   | \$   | 9.65   | \$   | 1.44   | 2054   |   |  | \$   | 343   | \$  |  |  |   |
|                | 40              | \$   | 661   | \$   | 9.65   | \$   | 1.37   | 2055   | 300   | 223  | \$   |   | \$  | 27.84  | \$   | 3   |
| 70             | 40              | \$   | 661   | \$   | 9.65   | \$   | 1.31   | 2056   | 300   | 223  | \$   | 343   | \$  | 27.84  | \$   | 3   |
| 70             | 40              | \$   | 661   | \$   | 9.65   | \$   | 1.24   | 2057   | 300   | 223  | \$   | 343   | \$  | 27.84  | \$   | 3   |
|                |                 |  |   |  |  |  |  |  |   |  |  |   | 33.00   |  |  | 3   |
| 70             |                 |  |   |  |  |  |  |  |   |  |  |   |   |  |  | 3   |
| 70             |                 |  |   |  |  |  |  |  |   |  |  |   | 3132.0  |  |  | 3   |
|                |                 |  |   |  |  |  |  |  |   |  |  |   |   |  |  | 3   |
| 70             |                 |  |   |  |  |  |  |  |   |  |  |   |   |  |  | 2   |
| 70             |                 |  | 661   | \$   | 9.65   |  |  |  |   |  |  | 343   | \$  |  |  | 2   |
| 70<br>70       | 40              | \$   | 661   | \$   | 9.65   |  | 0.88   | 2064   | 300   | 227  |  | 343   | \$  | 28.45  |  | 2   |
| 70<br>70<br>70 | 40              | \$   | 661   | \$   | 9.65   | \$   | 0.84   | 2065   | 300   | 231  | \$   | 343   | \$  | 28.85  | \$   | 2   |
| 70<br>70<br>70 | 0000            | 40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40 | 40 \$ 40 \$ 40 \$ 40 \$ 40 \$ 40 \$ 40 \$ 40 \$ | 40 \$ 661<br>40 \$ 661<br>0 40 \$ 661 | 0 40 \$ 661 \$<br>40 \$ 661 \$<br>0 40 \$ 661 \$ | 0 40 \$ 661 \$ 9.65<br>0 40 \$ 661 \$ 9.65 | 0 40 \$ 661 \$ 9.85 \$ 0 40 \$ 661 \$ 9.65 \$ 0 40 \$ 661 \$ 0 40 \$ 601 \$ 0 4 | 0 40 \$ 661 \$ 9.65 \$ 1.18<br>0 40 \$ 661 \$ 9.65 \$ 1.13<br>0 40 \$ 661 \$ 9.65 \$ 1.07<br>0 40 \$ 661 \$ 9.65 \$ 1.07<br>0 40 \$ 661 \$ 9.65 \$ 0.97<br>0 40 \$ 661 \$ 9.65 \$ 0.93<br>0 40 \$ 661 \$ 9.65 \$ 0.88<br>0 40 \$ 661 \$ 9.65 \$ 0.88 | 0         40         \$         661         \$         9.85         \$         1.18         2058           0         40         \$         661         \$         9.65         \$         1.13         2059           0         40         \$         681         \$         9.65         \$         1.07         2060           0         40         \$         661         \$         9.65         \$         1.02         2081           0         40         \$         661         \$         9.65         \$         0.97         2062           0         40         \$         661         \$         9.65         \$         0.93         2063           0         40         \$         661         \$         9.65         \$         0.84         2064           0         40         \$         661         \$         9.65         \$         0.84         2065 | 0 40 \$ 661 \$ 9.65 \$ 1.18 2058 300<br>0 40 \$ 661 \$ 9.65 \$ 1.13 2059 300<br>0 40 \$ 661 \$ 9.65 \$ 1.07 2060 300<br>0 40 \$ 661 \$ 9.65 \$ 1.07 2060 300<br>0 40 \$ 661 \$ 9.65 \$ 1.02 2061 300<br>0 40 \$ 661 \$ 9.65 \$ 0.97 2062 300<br>0 40 \$ 661 \$ 9.65 \$ 0.93 2063 300<br>0 40 \$ 661 \$ 9.65 \$ 0.88 2064 300<br>0 40 \$ 661 \$ 9.65 \$ 0.88 2064 300<br>0 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 | 0     40     \$     661     \$     9.65     \$     1.18     2058     300     223       0     40     \$     661     \$     9.65     \$     1.13     2059     300     223       0     40     \$     661     \$     9.65     \$     1.07     2060     300     227       0     40     \$     661     \$     9.65     \$     1.02     2061     300     227       0     40     \$     661     \$     9.65     \$     0.93     2063     300     227       0     40     \$     661     \$     9.65     \$     0.88     2064     300     227       0     40     \$     661     \$     9.65     \$     0.88     2064     300     227       0     40     \$     661     \$     9.65     \$     0.88     2064     300     227       0     40     \$     661     \$     9.65     \$     0.84     2065     300     231 | 0     40     \$     661     \$     9.65     \$     1.18     2058     300     223     \$       0     40     \$     661     \$     9.65     \$     1.13     2059     300     223     \$       0     40     \$     661     \$     9.65     \$     1.07     2060     300     227     \$       0     40     \$     661     \$     9.65     \$     1.02     2061     300     227     \$       0     40     \$     661     \$     9.65     \$     0.93     2063     300     227     \$       0     40     \$     661     \$     9.65     \$     0.88     2064     300     227     \$       0     40     \$     661     \$     9.65     \$     0.88     2064     300     227     \$       0     40     \$     661     \$     9.65     \$     0.84     2065     300     231     \$ | 0 40 \$ 661 \$ 9.65 \$ 1.18 2058 300 223 \$ 343 40 \$ 661 \$ 9.65 \$ 1.13 2059 300 223 \$ 343 40 \$ 661 \$ 9.65 \$ 1.13 2059 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 1.07 2060 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 1.02 2061 300 227 \$ 343 40 \$ 661 \$ 9.65 \$ 0.97 2062 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 0.93 2063 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 5 40 \$ 661 \$ 9.65 \$ 0.84 2065 300 231 \$ 343 | 0 40 \$ 661 \$ 9.65 \$ 1.18 2058 300 223 \$ 343 \$ 40 \$ 661 \$ 9.65 \$ 1.13 2059 300 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27.84 \$ 40 \$ 661 \$ 9.65 \$ 1.13 2059 300 223 \$ 343 \$ 27.84 \$ 50 40 \$ 661 \$ 9.65 \$ 1.07 2060 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 1.02 2061 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.97 2062 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.97 2062 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.93 2063 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.98 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 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40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 661 \$ 9.65 \$ 0.88 2064 \$ 300 227 \$ 343 \$ 28.45 \$ 50 40 \$ 600 \$ 600 \$ 0.8 |

NPV Totals for O&M:
Softening trains
Non-softening Trains
\$

| 8 | un | ım | ıß | у |
|---|----|----|----|---|
|   |    |    |    |   |

Raw Water Reservoir Water Treatment Plant Totals

| PV of<br>al Costs | of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Costs |       |  |  |
|-------------------|-----------------|--|-------|--|--|
| \$<br>34          | \$<br>3.5       | \$                                       | 38    |  |  |
| \$<br>538         | \$<br>499       | \$                                       | 1,037 |  |  |
| \$<br>572         | \$<br>502       | \$                                       | 1,075 |  |  |

# Capital and O&M Cost Calculations Potable Water Transmission Mains CTRWTP - Alternate 1C - WTP East of San Antonio (Discharge ALCOA/CPS groundwater to Big Sandy Creek)

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate 5% Evaluation period 50 years Unit cost of energy 0.07 per kwh

#### **Summary of Demands**

#### Average demands to be delivered in each segment

|          |       |        | in acre-feet/ye | ar     |        |        |        |
|----------|-------|--------|-----------------|--------|--------|--------|--------|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |
| SAWS NW  | 43800 | 123000 | 123000          | 123000 | 123000 | 123000 | 123000 |
| SAWS NE  | 29200 | 82000  | 82000           | 82000  | 82000  | 82000  | 82000  |
| Subtotal | 73000 | 205000 | 205000          | 205000 | 205000 | 205000 | 205000 |
| SARA     | 20550 | 23406  | 28433           | 31393  | 34411  | 37530  | 41128  |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |
| Total    | 93550 | 228406 | 261835          | 277996 | 294215 | 299634 | 303232 |

#### Summary

SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1)
WTP to SAWS NE/SARA (Delivery Point #2)
WTP to GBRA (Delivery Point #3)
WTP to LCRA Delivery Point (#4)
LCRA Delivery Point (#4) to COA Delivery Point (#5)

289 \$ 5 \$ 14 \$ 1 \$ 6 \$ 313 \$ 726 412 \$

Costs

NPV of Capital

Costs 203

17

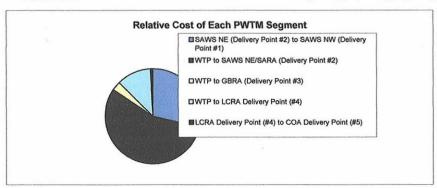
NPV of O&M Total NPV of Capital and

O&M Costs \$ 207

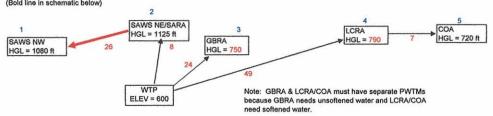
405

22

#### Total for PWTMs



# SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1) (Bold line in schematic below)



## Demands for this pipe segment

|         |      | Average dem | ands to be del | ivered in each | segment in mgd | 1    |      |             |
|---------|------|-------------|----------------|----------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030           | 2040           | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NW | 39   | 110         | 110            | 110            | 110            | 110  | 110  | 1.3         |
| Total - | 39   | 110         | 110            | 110            | 110            | 110  | 110  |             |

|         |      | Max day dem | ands to be deli | vered in each s | segment in mgd | f:   |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 143         | 143             | 143             | 143            | 143  | 143  |
| Total — | 51   | 143         | 143             | 143             | 143            | 143  | 143  |

# **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 143     | mgd   |  |
|---|---------|-------|--|
|   | 99,125  | gpm   |  |
| Pumping capacity of one pump            | 20,000  | gpm   |  |
| No. of pumps (not counting spare)       | 5       |       |  |
| Peak flow rate (all pumps except spare) | 100,000 | gpm   |  |
| Inside diameter of PWTM                 | 120     | in.   |  |
| Area                                    | 78.54   | sf    |  |
| Length of RWTM                          | 26      | miles | (linked to mileage in schematic above) |
|   | 137,280 | feet  | (#29-5000 mm) (                        |

| Estimated unit cost by condition: | % of length | LE      | y  | nit cost |    | Cost  |         |
|-----------------------------------|-------------|---------|----|----------|----|-------|---------|
| Rural - soil                      | 15%         | 20,592  | \$ | 783      | \$ | 16.1  | million |
| Rural - rock                      | 50%         | 68,640  | \$ | 1,048    | 3  | 72.0  |         |
| Urban - rock                      | 35%         | 48,048  | \$ | 1,186    | \$ | 57.0  |         |
|                                   |             | 137,280 |    |          | 3  | 145.0 | million |

| Total construction cost in millions                      | \$<br>145.0 |
|--|-------------|
| Contingencies  | \$<br>29.0  |
| Subtotal   | \$<br>174.0 |
| Engineering, Legal & Administrative                      | \$<br>26.1  |
| Subtotal   | \$<br>200.2 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>2.6   |
| Total Capital Cost for PWTM in millions                  | \$<br>202.8 |

| Unit maintenance cost/year-mile | \$ 10,000 | \$/year-mile | \$<br>0.260 | Million \$/year |  |
|---------------------------------|-----------|--------------|-------------|-----------------|--|
| Velocity at peak flow rate      | 2.84      | fps          |             |                 |  |
| C factor                        | 120       |              |             |                 |  |
| Head loss per foot              | 0.00020   | ft/ft        | h,=         | 13 552*011.85   |  |

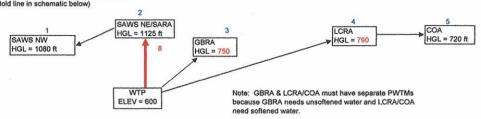
| Cractor                      |     | 120     |         |                                    |
|------------------------------|-----|---------|---------|------------------------------------|
| Head loss per foot           |     | 0.00020 | ft/ft   | h <sub>f</sub> =   3.552*Q 1.85    |
|                              |     | 1.07    | ft/mile | C*(d) <sup>2.63</sup>              |
| Head loss at peak flow rate  |     | 28      | ft      |                                    |
| Allowance for minor losses   | 20% | 6       | ft      | 1080 Desired HGL At Delivery Point |
| Total estimated losses       |     | 33      | ft      | 1125 HGL At Delivery Point 2       |
| Average static head          |     | -45     | ft      | -45 ft                             |
| Total estimated dynamic head |     | -12     | ft      |                                    |
|                              |     | -5      | psi     |                                    |
|                              |     |         |         |                                    |

# Negative indicates gravity flow from #2 to #1; no pumping necessary.

|                              |     |       |          |                            | N  | fillion \$ |
|------------------------------|-----|-------|----------|----------------------------|----|------------|
| Annual O&M Cost in million   | \$: |       | Yr built |                            |    |            |
| PWTM                         | \$  | 0.260 | 2015     |                            |    |            |
|                              |     |       |          | Total NPV of O&M Costs     |    | \$4.7      |
| Capital Costs in million \$: |     |       | Yr built |                            |    |            |
| PWTM                         | \$  | 202.8 | 2015     |                            | \$ | 202.8      |
|                              |     |       |          | Total NPV of Capital Costs | \$ | 202.8      |

Total NPV of Capital and O&M Costs in millions \$ 207.5 SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1)

# WTP to SAWS NE/SARA (Delivery Point #2) (Bold line in schematic below)



# Demands for this pipe segment Demands

|         |      | Average dem | ands to be deli | vered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 39   | 110         | 110             | 110             | 110            | 110  | 110  |
| SAWS NE | 26   | 73          | 73              | 73              | 73             | 73   | 73   |
| SARA    | 18   | 21          | 25              | 28              | 31             | 34   | 37   |
| Total   | 84   | 204         | 208             | 211             | 214            | 217  | 220  |

1.3 1.3 1.3

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |
|--|------|------|------|------|------|------|------|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |
| SAWS NW  | 51   | 143  | 143  | 143  | 143  | 143  | 143  |  |
| SAWS NE  | 34   | 95   | 95   | 95   | 95   | 95   | 95   |  |
| SARA   | 24   | 27   | 33   | 36   | 40   | 44   | 48   |  |
| Total  | 109  | 265  | 271  | 274  | 278  | 281  | 286  |  |

# **PWTM and Pump Station Costs**

| Design flow rate - year 2065   | 286     | mgd   |   |
|--|---------|-------|---|
|  | 198,353 | gpm   |   |
| Pumping capacity of one pump   | 20,000  | gpm   |   |
| No. of pumps (not counting spare)  | 10      |       |   |
| Peak flow rate (all pumps except spare)  | 200,000 | gpm   |   |
| Inside diameter of PWTM  | 120     | in.   |   |
| Area   | 78.54   | sf    |   |
| Length of PWTM   | 8       | miles | (linked to mileage in schematic above)  |
| The state of the s | 42,240  | feet  | Management of the state of the |
|  |         |       |   |

| Estimated unit cost by condition:   | % of length   | LE     | U  | nit cost | C      | ost  |         |
|-------------------------------------|---------------|--------|----|----------|--------|------|---------|
| Rural - soil                        | 25%           | 10,560 | \$ | 783      | \$     | 8.3  | million |
| Rural - rock                        | 50%           | 21,120 | \$ | 1,048    | \$     | 22.1 |         |
| Urban - rock                        | 25%           | 10,560 | \$ | 1,186    | \$     | 12.5 |         |
|                                     |               | 42,240 |    |          | \$     | 42.9 | million |
| Average estimated unit construction | cost for PWTM |        | \$ | 1,016    | per LF |      |         |

| Total construction cost in millions                      | \$ | 42.9 |
|--|----|------|
| Contingencies  | \$ | 8.6  |
| Subtotal   | \$ | 51.5 |
| Engineering, Legal & Administrative                      | \$ | 7.7  |
| Subtotal   | \$ | 59.2 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 0.8  |
| Total Capital Cost for PWTM in millions                  | S  | 60.0 |

| Unit maintenance cost/year-mile | \$ 10,000 | \$/year-mile | \$<br>0.080 | Million \$/year |
|---------------------------------|-----------|--------------|-------------|-----------------|
| Velocity at peak flow rate      | 5.67      | fps          |             |                 |
| C factor                        | 120       |              |             |                 |
| Head loss per foot              | 0.0007    | 8 61/61      | h.          | 12 5524011.85   |

| Head loss per foot           |     | 0.00073 | tvit    |      | 3.552*Q 1.85                  |
|------------------------------|-----|---------|---------|------|-------------------------------|
|                              |     | 3.85    | ft/mile |      | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate  |     | 31      | ft      |      |                               |
| Allowance for minor losses   | 20% | 6       | ft      | 1125 | Desired HGL At Delivery Point |
| Total estimated losses       |     | 37      | ft      | 600  | Elev. At WTP                  |
| Average static head          |     | 525     | ft      | 525  | ft                            |
| Total estimated dynamic head |     | 562     | ft      |      |                               |
|                              |     | 244     | mai     |      |                               |

|  | 244 psi |                               |
|--|---------|-------------------------------|
| No of recommended pumping stations along route | 1.62    | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 2       | in pipe)                      |
| Average head per pump station                  | 281 ft  | 5444 54 C                     |

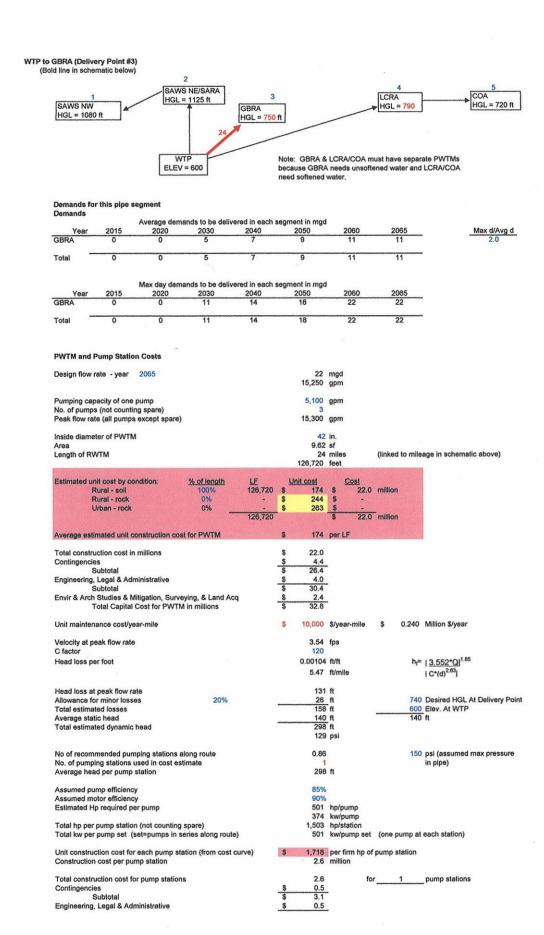
| Average head per pump station                           | 281 ft                                       |
|---|--|
| Assumed pump efficiency                                 | 85%  |
| Assumed motor efficiency                                | 90%  |
| Estimated Hp required per pump                          | 1,855 hp/pump                                |
|   | 1,384 kw/pump                                |
| Total hp per pump station (not counting spare)          | 18,549 firm hp/station                       |
| Total kw per pump set (set=pumps in series along route) | 3,710 kw/pump set (one pump at each station) |
|   |  |

| Unit construction cost for each pump station (from cost curve) | \$<br>1,105 | per firm hp of pump static |
|--|-------------|----------------------------|
| Construction cost per pump station                             | 20.5        | million                    |

| Total construction cost for pump stations | 41.0 | for | 2 | pump stations  |
|---|------|-----|---|----------------|
| Total continuous cost for paris stations  | 71.0 | 101 | - | point stations |

| contingen    | Subtotal                           | injetenti:          |                      |     |                  | \$ \$  | 8.2<br>49.2<br>7.4 | •   |                |    |                 |      |                  |      |                    |
|--------------|------------------------------------|---------------------|----------------------|-----|------------------|--------|--------------------|-----|----------------|----|-----------------|------|------------------|------|--------------------|
| ngineeni     | ng, Legal & Adm<br>Total capital c | ost for pump st     | ations in millio     | ons |                  | \$     | 56.6               | mil | lion           |    |                 | _    |                  |      |                    |
|              | Value of equip                     | ment                |                      |     |                  | \$     | 16                 | mil | lion           |    | 40%             | Equ  | ip cost as       | % of | constr co          |
|              | Assumed life of                    | of equipment        |                      |     |                  | s      | 20                 | yea |                |    |                 |      |                  |      |                    |
|              |                                    | intenance/repla     | icement cost         |     |                  | •      | 0.82               | mi  | lion/year      |    |                 |      |                  |      |                    |
| 08M Cos      |                                    |                     |                      |     |                  |        |                    |     |                |    |                 |      |                  |      |                    |
|              | Flow pumped<br>by year             | No. of pump         | _                    |     |                  |        |                    | 0   | ther O&M       | Ма | intenance       | -    |                  |      |                    |
| Year         | (average                           | "sets"<br>operating | Energy               |     | Energ            | gy cos | t                  | co  | sts - Pump     | C  | costs -         | 10   | otal O&M<br>cost | Ne   | t present<br>value |
|              | flows from<br>Table above)         | /day                |                      |     |                  |        |                    |     | Stations       |    | PWTM            |      |                  |      | 2.50.00            |
|              | mgd                                |                     | (kwh/day)            |     | (\$/day)         |        | lillion \$         |     | (Million \$    | (  | Million \$      | (1   | Million \$       |      | (\$)               |
| 2015         | 84                                 | 2.90                | 258,178              | \$  | 18,072           | \$     | year)<br>6.60      | \$  | /year)<br>0.82 | \$ | /year)<br>0.080 | \$   | /year)<br>7.50   | \$   | 7.50               |
| 2016         | 84                                 | 2.90                | 258,178              | \$  | 18,072           | \$     | 6.60               | \$  | 0.82           | \$ | 0.080           | \$   | 7.50             | \$   | 7.14               |
| 2017         | 84                                 | 2.90                | 258,178              | \$  | 18,072           | \$     | 6.60               | \$  | 0.82           | \$ | 0.080           | \$   | 7.50             | \$   | 6.80               |
| 2018         | 84                                 | 2.90                | 258,178              | \$  | 18,072           | \$     | 6.60               | \$  | 0.82           | \$ | 0.080           | \$   | 7.50             | \$   | 6.48               |
| 2019<br>2020 | 84<br>204                          | 2.90<br>7.08        | 258,178<br>630,351   | \$  | 18,072<br>44,125 | \$     | 6.60<br>16.11      | \$  | 0.82           | S  | 0.080           | \$   | 7.50<br>17.01    | \$   | 6.17<br>13.32      |
| 2020         | 204                                | 7.08                | 630,351              | \$  | 44,125           | S      | 16.11              | \$  | 0.82           | S  | 0.080           | \$   | 17.01            | \$   | 12.69              |
| 2022         | 204                                | 7.08                | 630,351              | \$  | 44,125           | \$     | 16.11              | \$  | 0.82           | \$ | 0.080           | \$   | 17.01            | \$   | 12.09              |
| 2023         | 204                                | 7.08                | 630,351              | \$  | 44,125           | \$     | 16.11              | \$  | 0.82           | \$ | 0.080           | \$   | 17.01            | \$   | 11.51              |
| 2024         | 204                                | 7.08                | 630,351              | \$  | 44,125           | \$     | 16.11              | \$  | 0.82           | \$ | 0.080           | \$   | 17.01            | \$   | 10.96              |
| 2025         | 204                                | 7.08                | 630,351              | \$  | 44,125           | \$     | 16.11              | \$  | 0.82           | \$ | 0.080           | \$   | 17.01            | \$   | 10.44              |
| 2026<br>2027 | 204<br>204                         | 7.08<br>7.08        | 630,351<br>630,351   | \$  | 44,125<br>44,125 | \$     | 16.11<br>16.11     | \$  | 0.82           | \$ | 0.080           | \$   | 17.01<br>17.01   | \$   | 9.94<br>9.47       |
| 2028         | 204                                | 7.08                | 630,351              | S   | 44,125           | S      | 16.11              | Š   | 0.82           | S  | 0.080           | \$   | 17.01            | Š    | 9.02               |
| 2029         | 204                                | 7.08                | 630,351              | \$  | 44,125           | \$     | 16.11              | \$  | 0.82           | \$ | 0.080           | \$   | 17.01            | \$   | 8.59               |
| 2030         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 8.35               |
| 2031         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 7.95               |
| 2032         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 7.57               |
| 2033         | 208<br>208                         | 7.24<br>7.24        | 644,225<br>644,225   | \$  | 45,096<br>45,096 | \$     | 16.46<br>16.46     | \$  | 0.82<br>0.82   | \$ | 0.080           | \$   | 17.36<br>17.36   | \$   | 7.21<br>6.87       |
| 2035         | 208                                | 7.24                | 644,225              | \$  | 45,096           | S      | 16.46              | \$  | 0.82           | Š  | 0.080           | \$   | 17.36            | \$   | 6.54               |
| 2036         | 208                                | 7.24                | 644.225              | Š   | 45,096           | s      | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 6.23               |
| 2037         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 5.93               |
| 2038         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 5.65               |
| 2039         | 208                                | 7.24                | 644,225              | \$  | 45,096           | \$     | 16.46              | \$  | 0.82           | \$ | 0.080           | \$   | 17.36            | \$   | 5.38               |
| 2040         | 211<br>211                         | 7.33<br>7.33        | 652,394<br>652,394   | S   | 45,668<br>45,668 | 5      | 16.67<br>16.67     | \$  | 0.82<br>0.82   | 5  | 0.080           | \$   | 17.57<br>17.57   | \$   | 5.19<br>4.94       |
| 2042         | 211                                | 7.33                | 652,394              | \$  | 45,668           | s      | 16.67              | Š   | 0.82           | Š  | 0.080           | Š    | 17.57            | \$   | 4.71               |
| 2043         | 211                                | 7.33                | 652,394              | \$  | 45,668           | \$     | 16.67              | \$  | 0.82           | \$ | 0.080           | \$   | 17.57            | \$   | 4.48               |
| 2044         | 211                                | 7.33                | 652,394              | \$  | 45,668           | \$     | 16.67              | \$  | 0.82           | \$ | 0.080           | \$   | 17.57            | \$   | 4.27               |
| 2045         | 211                                | 7.33                | 652,394              | \$  | 45,668           | \$     | 16.67              | \$  | 0.82           | \$ | 0.080           | \$   | 17.57            | \$   | 4.06               |
| 2046         | 211                                | 7.33<br>7.33        | 652,394              | \$  | 45,668           | \$     | 16.67<br>16.67     | \$  | 0.82<br>0.82   | \$ | 0.080           | \$   | 17.57<br>17.57   | \$   | 3.87<br>3.69       |
| 2047<br>2048 | 211<br>211                         | 7.33                | 652,394<br>652,394   | 5   | 45,668<br>45,668 | S      | 16.67              | \$  | 0.82           | \$ | 0.080           | \$   | 17.57            | \$   | 3.51               |
| 2049         | 211                                | 7.33                | 652,394              | s   | 45,668           | s      | 16.67              | \$  | 0.82           | Š  | 0.080           | \$   | 17.57            | \$   | 3.34               |
| 2050         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 3.22               |
| 2051         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 3.07               |
| 2052         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 2.92               |
| 2053         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 2.78               |
| 2054<br>2055 | 214<br>214                         | 7.42<br>7.42        | 660,723<br>660,723   | \$  | 46,251<br>46,251 | \$     | 16.88<br>16.88     | \$  | 0.82           | \$ | 0.080           | \$   | 17.78<br>17.78   | \$   | 2.65<br>2.53       |
| 2055         | 214                                | 7.42                | 660,723              | 3   | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 2.53               |
| 2057         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | Š  | 0.080           | \$   | 17.78            | \$   | 2.29               |
| 2058         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 2.18               |
| 2059         | 214                                | 7.42                | 660,723              | \$  | 46,251           | \$     | 16.88              | \$  | 0.82           | \$ | 0.080           | \$   | 17.78            | \$   | 2.08               |
| 2060         | 217                                | 7.52                | 669,331              | \$  | 46,853           | \$     | 17.10              | \$  | 0.82           | \$ | 0.080           | \$   | 18.00            | \$   | 2.00               |
| 2061         | 217                                | 7.52                | 669,331              | \$  | 46,853           | \$     | 17.10              | \$  | 0.82<br>0.82   | \$ | 0.080           | \$   | 18.00            | \$   | 1.91<br>1.82       |
| 2062         | 217                                | 7.52                | 669,331              | \$  | 46,853           | \$     | 17.10              |     | 0.82           | \$ | 0.080           | 5    | 18.00            | \$   | 1.73               |
| 2064         | 217                                | 7.52                | 669,331              |     | 46,853           |        | 17.10              |     | 0.82           |    | 0.080           |      | 18.00            |      | 1.65               |
| 2065         | 220                                | 7.63                | 679,260              |     | 47,548           |        | 17.36              |     | 0.82           |    | 0.080           |      | 18.26            | \$   | 1.59               |
|              |                                    |                     |                      |     |                  |        |                    |     |                |    | Total NPV       | of C | &M Costs         | \$   | 288.7              |
|              |                                    | Capital Costs       |                      |     |                  |        |                    | _   | Yr built       |    |                 |      |                  |      | 20.5               |
|              |                                    |                     | PWTM<br>Pumping Stat | inc |                  | \$     | 60.0               |     | 2015           |    |                 |      |                  | \$   | 60.0<br>56.6       |
|              |                                    |                     | Pumping Stat         | Ons | •                | 9      | 56.6               |     | 2015           | T  | otal NPV of     | Cer  | nital Coete      |      | 116.6              |

Total NPV of Capital and O&M Costs in millions \$ WTP to SAWS NE/SARA (Delivery Point #2) 405



Total capital cost for pump stations \$ 3.6 million

Value of equipment \$ 1.0 million

Assumed life of equipment 20 years

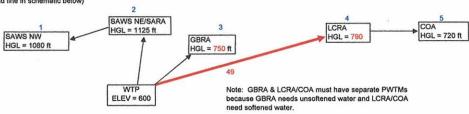
Estimated maintenance/replacement cost \$ 0.05 million/year

# **O&M Costs**

|      | Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |      | Energ    | ду с | cost                  |    | other O&M<br>ests - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | То   | tal O&M<br>cost       | Ne         | et present<br>value |
|------|--------------|---|--|----------------|------|----------|------|-----------------------|----|--------------------------------------|----|-------------------------------|------|-----------------------|------------|---------------------|
| 2000 | dwarana      | mgd   |  | (kwh/day)      |      | (\$/day) |      | (Million \$<br>/year) |    | (Million \$<br>/year)                | (  | Million \$<br>/year)          |      | /lillion \$<br>/year) |            | (\$)                |
|      | 2015         | -   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | •                     | \$         | •                   |
|      | 2016<br>2017 | -   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$         | •                   |
|      | 2018         | •   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$         | 170                 |
|      | 2019         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$         | •                   |
|      | 2020         | -   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$         |                     |
|      | 2021         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$         |                     |
|      | 2022         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$         | -                   |
|      | 2023         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | Š          | -                   |
|      | 2024         | -   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | 3.0                   | Š          | -                   |
|      | 2025         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | 5          | -                   |
|      | 2026         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   | - 1                   | \$         |                     |
|      | 2027         | -   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$         | -                   |
|      | 2028         | 1 2   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$         | -                   |
|      | 2029         |   |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$         | -                   |
|      | 2030         | 5   | 0.73                                       | 8,771          | \$   | 614      | \$   | 0.22                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.25                |
|      | 2031         | 5   | 0.73                                       | 8,771          | \$   | 614      | \$   | 0.22                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.24                |
|      | 2032         | 5   | 0.73                                       | 8,771          | Š    | 614      | Š    | 0.22                  | Š  | 0.05                                 | \$ | 0.240                         | Š    | 0.52                  | Š          | 0.23                |
|      | 2032         | 5   | 0.73                                       | 8,771          | Š    | 614      | \$   | 0.22                  | Š  | 0.05                                 | Š  | 0.240                         | S    | 0.52                  | \$         | 0.23                |
|      | 2034         | 5   | 0.73                                       | 8,771          | \$   | 614      | \$   | 0.22                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.20                |
|      | 2035         | 5   | 0.73                                       | 8,771          | S    | 614      | \$   | 0.22                  | S  | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.19                |
|      | 2036         | 5   | 0.73                                       | 8,771          | \$   | 614      | \$   | 0.22                  | Š  | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.19                |
|      | 2037         | 5   | 0.73                                       | 8,771          | Š    | 614      | \$   | 0.22                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.18                |
|      | 2038         | 5   | 0.73                                       | 8,771          | \$   | 614      | \$   | 0.22                  | s  | 0.05                                 | S  | 0.240                         | Š    | 0.52                  | \$         | 0.17                |
|      | 2039         | 5   | 0.73                                       | 8,771          | Š    | 614      | Š    | 0.22                  | Š  | 0.05                                 | \$ | 0.240                         | Š    | 0.52                  | \$         | 0.16                |
|      | 2040         | 7   | 0.73                                       | 11,694         | Š    | 819      | \$   | 0.30                  | Š  | 0.05                                 | \$ | 0.240                         | \$   | 0.52                  | \$         | 0.10                |
|      | 2040         | 7   | 0.97                                       | 11,694         | \$   | 819      | \$   | 0.30                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.59                  | \$         | 0.17                |
|      | 2042         | 7   | 0.97                                       | 11,694         | Š    | 819      | Š    | 0.30                  | S  | 0.05                                 | Š  | 0.240                         | \$   | 0.59                  | Š          | 0.17                |
|      | 2042         | 7   | 0.97                                       | 11,694         | \$   | 819      | S    | 0.30                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.59                  | \$         | 0.15                |
|      | 2044         | 7   | 0.97                                       | 11,694         | \$   | 819      | \$   | 0.30                  | \$ | 0.05                                 | \$ | 0.240                         | \$   | 0.59                  | \$         | 0.13                |
|      | 2045         | 7   | 0.97                                       | 11,694         | \$   | 819      | \$   | 0.30                  | S  | 0.05                                 | \$ | 0.240                         | \$   | 0.59                  | Š          | 0.14                |
|      | 2046         | 7   | 0.97                                       | 11,694         | Š    | 819      | Š    | 0.30                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.59                  | \$         | 0.13                |
|      | 2047         | 7   | 0.97                                       | 11,694         | \$   | 819      | \$   | 0.30                  | \$ | 0.05                                 | \$ | 0.240                         | S    | 0.59                  | \$         | 0.13                |
|      | 2048         | . 7   | 0.97                                       | 11,694         | Š    | 819      | S    | 0.30                  | s  | 0.05                                 | \$ | 0.240                         | \$   | 0.59                  | Š          | 0.12                |
|      | 2049         | 7   | 0.97                                       | 11,694         | s    | 819      | Š    | 0.30                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.59                  | š          | 0.11                |
|      | 2050         | 9   | 1.22                                       | 14,618         | Š    | 1,023    | Š    | 0.37                  | Š  | 0.05                                 | \$ | 0.240                         | \$   | 0.67                  | \$         | 0.12                |
|      | 2051         | 9   | 1.22                                       | 14,618         | Š    | 1,023    | Š    | 0.37                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.67                  | Š          | 0.11                |
|      | 2052         | 9   | 1.22                                       | 14,618         | Š    | 1,023    | Š    | 0.37                  | Š  | 0.05                                 | \$ | 0.240                         | Š    | 0.67                  | Š          | 0.11                |
|      | 2053         | 9   | 1.22                                       | 14,618         | Š    | 1,023    | \$   | 0.37                  | Š  | 0.05                                 | \$ | 0.240                         | \$   | 0.67                  | \$         | 0.10                |
|      | 2054         | 9   | 1.22                                       | 14,618         | Š    | 1,023    | Š    | 0.37                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.67                  | \$         | 0.10                |
|      | 2055         | . 9   | 1.22                                       | 14,618         | s    | 1,023    | \$   | 0.37                  | Š  | 0.05                                 | S  | 0.240                         | \$   | 0.67                  | \$         | 0.09                |
|      | 2056         | 9   | 1.22                                       | 14,618         | \$   | 1,023    | \$   | 0.37                  | \$ | 0.05                                 | \$ | 0.240                         | s    | 0.67                  | \$         | 0.09                |
|      | 2057         | 9   | 1,22                                       | 14,618         | Š    | 1,023    | Š    | 0.37                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.67                  | Š          | 0.09                |
|      | 2058         | 9   | 1.22                                       | 14,618         | s    | 1,023    | Š    | 0.37                  | s  | 0.05                                 | \$ | 0.240                         | Š    | 0.67                  | \$         | 0.08                |
|      | 2059         | 9   | 1.22                                       | 14,618         | s    | 1,023    | s    | 0.37                  | Š  | 0.05                                 | \$ | 0.240                         | \$   | 0.67                  | \$         | 0.08                |
|      | 2060         | 11  | 1.50                                       | 17,980         | Š    | 1,259    | \$   | 0.46                  | Š  | 0.05                                 | Š  | 0.240                         | Š    | 0.75                  | \$         | 0.08                |
|      | 2061         | 11  | 1.50                                       | 17,980         | \$   | 1,259    | Š    | 0.46                  | š  | 0.05                                 | \$ | 0.240                         | Š    | 0.75                  | Š          | 0.08                |
|      | 2062         | 11  | 1.50                                       | 17,980         | \$   | 1,259    | \$   | 0.46                  | s  | 0.05                                 | Š  | 0.240                         | \$   | 0.75                  | \$         | 0.08                |
|      | 2063         | 11  | 1.50                                       | 17,980         | \$   | 1,259    | \$   | 0.46                  | Š  | 0.05                                 | Š  | 0.240                         | \$   | 0.75                  | Š          | 0.07                |
|      | 2064         | 11  | 1.50                                       | 17,980         | \$   | 1,259    | Š    | 0.46                  | \$ | 0.05                                 | \$ | 0.240                         | S    | 0.75                  | Š          | 0.07                |
|      | 2065         | 11  | 1.50                                       | 17,980         | \$   | 1,259    | \$   | 0.46                  | \$ | 0.05                                 | Š  | 0.240                         | \$   | 0.75                  | S          | 0.07                |
|      |              | 0.00  |  | ,              |      | .,       | -    | 3.10                  | *  | 2.30                                 | •  |                               | 7    |                       | 1 <b>.</b> |                     |
|      |              |   |  |                |      |          |      |                       |    |                                      |    | Total NPV                     | of O | &M Costs              | \$         | 4.8                 |
|      |              |   | Capital Costs                              | in million \$: |      |          |      |                       |    | Yr built                             |    |                               |      |                       |            |                     |
|      |              |   |  | PWTM           |      |          | \$   | 33                    | -  | 2030                                 |    |                               |      |                       | \$         | 15.8                |
|      |              |   |  | Pumping Stat   | ions |          | \$   | 4                     |    | 2030                                 |    |                               |      |                       | \$         | 1.7                 |
|      |              |   |  |                |      |          |      |                       |    |                                      | T  | otal NPV of                   | Cap  | ital Costs            | \$         | 17.5                |

Total NPV of Capital and O&M Costs in millions \$ 22.3 WTP to GBRA (Delivery Point #3)

# WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



# Demands for this pipe segment Demands

|       |      | Average dem | ands to be del | ivered in each s | segment in mgd | B. Contractor |      |             |
|-------|------|-------------|----------------|------------------|----------------|---------------|------|-------------|
| Year  | 2015 | 2020        | 2030           | 2040             | 2050           | 2060          | 2065 | Max d/Avg d |
| LCRA  | 0    | 0           | 5              | 10               | 10             | 10            | 10   | 2.0         |
| COA   | 0    | 0           | 15             | 20               | 30             | 30            | 30   | 1.68        |
| Total | 0    | 0           | 20             | 30               | 40             | 40            | 40   |             |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| LCRA   | 0    | 0    | 10   | 20   | 20   | 20   | 20   |  |  |  |
| COA  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |  |
| Total  | ^    | ^    | 26   | EA   | 70   | 70   | 70   |  |  |  |

## **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 70      | mgd   |  |
|---|---------|-------|--|
|   | 48,883  | gpm   |  |
| Pumping capacity of one pump            | 10,000  | anm   |  |
| No. of pumps (not counting spare)       | 5       | abin  |  |
| Peak flow rate (all pumps except spare) | 50,000  | gpm   |  |
| Inside diameter of PWTM                 | 72      | in.   |  |
| Area                                    | 28.27   | sf .  |  |
| Length of RWTM                          | 49      | miles | (linked to mileage in schematic above) |
|   | 258,720 | feet  |  |

| Estimated unit cost by condition:   | % of length          | LF      | U     | nit cost              | Co | st   |         |
|-------------------------------------|----------------------|---------|-------|-----------------------|----|------|---------|
| Rural - soil                        | 100%                 | 258,720 | \$    | 365                   | \$ | 94.5 | million |
| Rural - rock                        | 0%                   |         | \$    | 498                   | \$ | 1    |         |
| Urban - rock                        | 0%                   |         | \$    | 552                   | \$ |      |         |
|                                     |                      | 258,720 |       |                       | \$ | 94.5 | million |
| Average estimated unit construction |                      | \$      | 365   | per LF                |    |      |         |
| T-1-111                             |                      |         | •     | 94.5                  |    |      |         |
| lotal construction cost in millions |                      |         | \$    | 94.5                  |    |      |         |
|                                     |                      |         | \$    | 18.9                  |    |      |         |
|                                     |                      |         |       |                       |    |      |         |
| Contingencies<br>Subtotal           |                      |         | \$ \$ | 18.9                  | •  |      |         |
| Contingencies<br>Subtotal           |                      |         | \$    | 18.9<br>113.4         |    |      |         |
| Engineering, Legal & Administrative | urveying, & Land Acq |         | \$ \$ | 18.9<br>113.4<br>17.0 |    |      |         |

| Unit maintenance cost/year-mile         |             | \$ | 10,000  | \$/year-mile | \$       | 0.490            | Million \$/year               |
|---|-------------|----|---------|--------------|----------|------------------|-------------------------------|
| Velocity at peak flow rate              |             |    | 3.94    | fps          |          |                  |                               |
| C factor                                |             |    | 120     |              |          |                  |                               |
| Head loss per foot                      |             |    | 0.00067 | ft/ft        |          | h <sub>f</sub> = | 3.552*QI <sup>1.85</sup>      |
|   |             |    | 3.55    | ft/mile      |          |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate             |             |    | 174     | ft           |          |                  |                               |
| Allowance for minor losses              | 20%         |    | 35      | ft           |          | 790              | Desired HGL At Delivery Point |
| Total estimated losses                  |             | -  | 209     | ft           |          | 720              | Elev. At Delivery Point 3     |
| Average static head                     |             |    | 70      | ft           | C. House | 70               | ) ft                          |
| Total estimated dynamic head            |             |    | 279     | ft           |          |                  |                               |
|   |             |    | 121     | psi          |          |                  |                               |
| No of recommended pumping stations a    | along route |    | 0.81    |              |          | 150              | psi (assumed max pressure     |
| No. of pumping stations used in cost es | timate      |    | 1       |              |          |                  | in pipe)                      |
| Average head per pump station           |             |    | 279     | ft           |          |                  | 1.5.5                         |

| Average head per pump station                                  | 2/9 11                                     |
|--|--|
| Assumed pump efficiency  | 85%  |
| Assumed motor efficiency                                       | 90%  |
| Estimated Hp required per pump                                 | 921 hp/pump                                |
|  | 687 kw/pump                                |
| Total hp per pump station (not counting spare)                 | 4,605 firm hp/station                      |
| Total kw per pump set (set=pumps in series along route)        | 921 kw/pump set (one pump at each station) |
| Unit construction cost for each pump station (from cost curve) | \$ 1.445 per firm hp of pump station       |

| Construction cost per pump station        | • | 6.7 million |     |   |   |  |  |  |
|---|---|-------------|-----|---|---|--|--|--|
| Total construction cost for pump stations |   | 6.7         | for | 1 | F |  |  |  |
| A - II I                                  |   | 4.0         | -   |   |   |  |  |  |

| Total construction cost for pump stations | 6.7       | for | 1 | pump stations |
|---|-----------|-----|---|---------------|
| Contingencies                             | \$<br>1.3 | -   |   |               |
| Subtotal                                  | \$<br>8.0 |     |   |               |
| Engineering, Legal & Administrative       | \$<br>1.2 |     |   |               |

| Total capital cost for pump stations   | \$ | 9.2  | million      | 40% Equip cost as % of constr cost |
|--|----|------|--------------|------------------------------------|
| Value of equipment                     | \$ | 2.7  | million      | 40% Equip cost as % of constr cost |
| Assumed life of equipment              |    | 20   | years        |                                    |
| Estimated maintenance/replacement cost | S  | 0.13 | million/year |                                    |

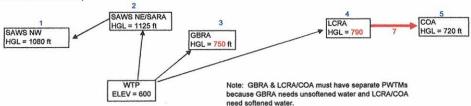
O&M Costs

| Year        | Flow pumped<br>by year<br>(average<br>flows from<br>Table above)   | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |      | Energ    | gy c | ost                   |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | То   | tal O&M<br>cost       | Ne    | et present<br>value |
|-------------|--|--|----------------|------|----------|------|-----------------------|----|--------------------------------------|----|-------------------------------|------|-----------------------|-------|---------------------|
| 40-00 TOTAL | mgd  |  | (kwh/day)      |      | (\$/day) |      | (Million \$<br>/year) | 1  | (Million \$<br>/year)                | (  | Million \$ /year)             |      | /lillion \$<br>/year) |       | (\$)                |
| 2015        | A STATE OF THE PARTY OF T |  |                | -    |          |      |                       | A  |                                      |    |                               | \$   |                       | \$    | -                   |
| 2016        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | *                     | \$    | •                   |
| 2017        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$    |                     |
| 2018        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$    |                     |
| 2019        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | •                     | \$    | •                   |
| 2020        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | •                     | \$    |                     |
| 2021        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | *                     | \$    |                     |
| 2022        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$    | -                   |
| 2023        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   |                       | \$    |                     |
| 2024        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | *                     | \$    |                     |
| 2025        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$    |                     |
| 2026        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$    | •                   |
| 2027        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | •                     | \$    |                     |
| 2028        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | -                     | \$    | -                   |
| 2029        |  |  |                |      |          |      |                       |    |                                      |    |                               | \$   | •                     | \$    | •                   |
| 2030        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.68                |
| 2031        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.64                |
| 2032        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.61                |
| 2033        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.58                |
| 2034        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.56                |
| 2035        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.53                |
| 2036        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.51                |
| 2037        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.48                |
| 2038        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.46                |
| 2039        | 20   | 1.39                                       | 30,696         | \$   | 2,149    | \$   | 0.78                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.41                  | \$    | 0.44                |
| 2040        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.53                |
| 2041        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.51                |
| 2042        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.48                |
| 2043        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.46                |
| 2044        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.44                |
| 2045        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.42                |
| 2046        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.40                |
| 2047        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.38                |
| 2048        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1,18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.36                |
| 2049        | 30   | 2.08                                       | 46,044         | \$   | 3,223    | \$   | 1.18                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 1.80                  | \$    | 0.34                |
| 2050        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.40                |
| 2051        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.38                |
| 2052        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.36                |
| 2053        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.34                |
| 2054        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.33                |
| 2055        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.31                |
| 2056        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.30                |
| 2057        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | S  | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.28                |
| 2058        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.27                |
| 2059        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.26                |
| 2060        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.24                |
| 2061        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | \$   | 1.57                  | \$ | 0.13                                 | Š  | 0.490                         | \$   | 2.19                  | \$    | 0.23                |
| 2062        | 40   | 2.78                                       | 61,391         | Š    | 4,297    | \$   | 1.57                  | Š  | 0.13                                 | S  | 0.490                         | \$   | 2.19                  | \$    | 0.22                |
| 2063        | 40   | 2.78                                       | 61,391         | š    | 4,297    | \$   | 1.57                  | Š  | 0.13                                 | \$ | 0.490                         | \$   | 2.19                  | \$    | 0.21                |
| 2064        | 40   | 2.78                                       | 61,391         | \$   | 4,297    | Š    | 1.57                  | Š  | 0.13                                 | Š  | 0.490                         | Š    | 2.19                  | Š     | 0.20                |
| 2065        | 40   | 2.78                                       | 61,391         | Š    | 4,297    | Š    | 1.57                  | Š  | 0.13                                 | Š  | 0.490                         | \$   | 2.19                  | Š     | 0.19                |
| 2000        | ,,,,   |  |                | •    | .,       |      |                       | ~  | 0.10                                 |    | Total NPV                     |      |                       | 7,510 | 14.3                |
|             |  | Onellal On the                             | la asililaa C  |      |          |      |                       |    | V- L                                 |    | i Stat 141° V                 | 51 0 | um 003(3              | ٠     | 14.3                |
|             |  | Capital Costs                              |                |      |          |      | 400.0                 |    | Yr built                             |    |                               |      |                       |       | 05.4                |
|             |  |  | PWTM           |      |          | \$   | 135.3                 |    | 2030                                 |    |                               |      |                       | \$    | 65.1                |
|             |  |  | Pumping Stat   | ions | ,        | \$   | 9.2                   |    | 2030                                 | -  | -4-1 NIDA ( -                 |      | Hal Oart              | \$    | 69.5                |
|             |  |  |                |      |          |      |                       |    |                                      | T  | otal NPV of                   | Cap  | ital Costs            | \$    | 6                   |

Total NPV of Capital and O&M Costs in millions \$ 84
WTP to LCRA Delivery Point (#4)

# LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)





# Demands for this pipe segment

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |
| COA  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |  |  |
| Total  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |  |  |

Max d/Avg d

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| COA  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |  |
| Total -  | 0    | 0    | 25   | 34   | 50   | 50   | 50   |  |  |  |

### **PWTM and Pump Station Costs**

Design flow rate - year 2065

50 mgd 34,997 gpm

Inside diameter of PWTM

Area Length of PWTM

54 in. 15.90 sf 7 miles 36,960 feet

| Estimated unit cost by condition:  | % of length     | LF     | U  | nit cost |      | Cost        |
|------------------------------------|-----------------|--------|----|----------|------|-------------|
| Rural - soil                       | 100%            | 36,960 | \$ | 244      | S    | 9.0 million |
| Rural - rock                       | 0%              |        | \$ | 337      | \$   |             |
| Urban - rock                       | 0%              |        | \$ | 369      | \$   |             |
|                                    |                 | 36,960 |    |          | \$   | 9.0 million |
|                                    |                 |        |    |          |      |             |
| vorgae estimated unit construction | nost for PIATEM |        | 2  | 244      | nerl | F           |

| Total construction cost in millions                      | \$<br>9.0  |
|--|------------|
| Contingencies  | \$<br>1.8  |
| Subtotal   | \$<br>10.8 |
| Engineering, Legal & Administrative                      | \$<br>1.6  |
| Subtotal   | \$<br>12.4 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$<br>0.0  |
| Total Canital Cost for PWTM in millions                  | \$<br>12 4 |

Unit maintenance cost/year-mile 10,000 \$/year-mile 4.90 fps Velocity at peak flow rate C factor Head loss per foot 0.00141 ft/ft

0.070 Million \$/year

(linked to mileage in schematic above)

7.45 ft/mile

 $h_{\rm f} = \frac{3.552 \cdot Q}{1.85} \frac{1.85}{1.85}$ 

Head loss at peak flow rate Allowance for minor losses Total estimated losses Average static head
Total estimated dynamic head

52 ft 10 ft 63 ft -70 ft 20% -3 psi

720 Desired HGL At Delivery Point 790 Elev. At Delivery Point 4 -70 ft

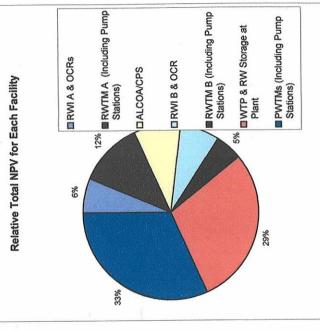
# Negative indicates gravity flow from #4 to #5; no pumping necessary.

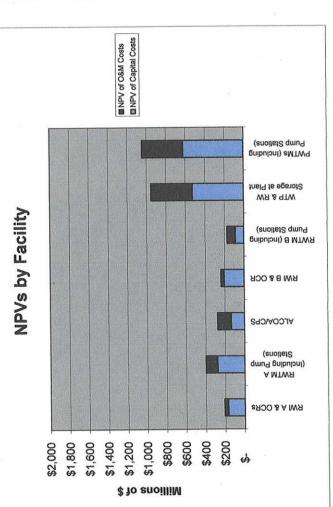
|                              |        |       |          | 2                          | M  | lillion \$ |
|------------------------------|--------|-------|----------|----------------------------|----|------------|
| Annual O&M Cost in millio    | on \$: |       | Yr built |                            |    |            |
| PWTM                         | \$     | 0.070 | 2030     |                            |    |            |
|                              |        |       |          | Total NPV of O&M Costs     |    | \$0.55     |
| Capital Costs in million \$: |        | 772   | Yr built |                            |    |            |
| PWTM                         | \$     | 12.4  | 2030     |                            | \$ | 6.0        |
|                              |        |       |          | Total NPV of Capital Costs | \$ | 6.0        |

Total NPV of Capital and O&M Costs in millions \$ LCRA Delivery Point (#4) to COA Delivery Point (#5) 6.5 Page 1

CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

| WTP Location nate | Phasing Scenario   | Total NPVs in<br>Millions of \$ | RWI A & OCRs   | RWTM A (Including<br>Pump Stations) | ALCOA/CPS   | RWI B & OCR  | RWTM B (Including<br>Pump Stations) | RWTM B (Including Pump Stations) at Plant Pump Stations)   | PWTMs (Including<br>Pump Stations)  |
|-------------------|--|---------------------------------|--|-------------------------------------|---|--|-------------------------------------|--|---|
| 88                | Reduced SAWS demand in 2020 by 66,000 ac-ft/yr (& SARA to 0 demand); RWTM B & ALCOA/CPS built by 2015; RWTM A built in 2030. |                                 | 126 miles of 96-ir to water ploe sized for 4000 cfs diameter pipe sized to scalp water, 4 deliver 132,000 a intakes, 4 miles of flyear on a contil 120-inch raw water basis; includes 3 mains & 4 OCRs at pumping stations 25,000 ac-ft each balancing reserve along route | ich<br>c-<br>ruous<br>w/            | Non-Public wells: Transmission of 55,000 ac-fayear to the intakes; 8 miles of 0CR at RWI B via 15 120-inch raw water miles of 54" gravity mains and 4 OCRs pipeline from Hwy 290 at 15,000 ac-fleadest of Elgin | Sized for 2000 cfs Sized for 117,804 act to scalp water; 2 ftyr, 20 miles of 84" intakes; 8 miles of pipeline with one 120-inch raw water pumping station and mains and 4 OCRs balancing reservoir at 15,000 ac-fleach |                                     | Raw water reservoir w/ 11,000 ac-ft capacity; Conventional settling with membrane filtration for SAWS, SARA & GBRA; Lime softening with membrane filtration for COA & LCRA water | Each PWTM sized for maximum daily demand (See PWTM Summary Sheet in the Appendices) |
|                   | NPV of Capital Costs \$  | \$ 2,016                        | \$ 170   | \$ 277                              | \$ 135  | \$ 204   | \$ 86                               | \$ 524   | \$ 620  |
|                   | NPV of O&M Costs \$  |                                 | 88   | \$ 121                              | \$ 141  | \$   | \$ 87                               | \$ 427 \$  | \$ 424  |
|                   | Total NPV of Capital & O&M \$  | \$ 3,287 \$                     | \$ 207   | 388                                 | \$ 276  | \$ 238   | \$ 172                              | \$ 951   | \$ 1,044  |



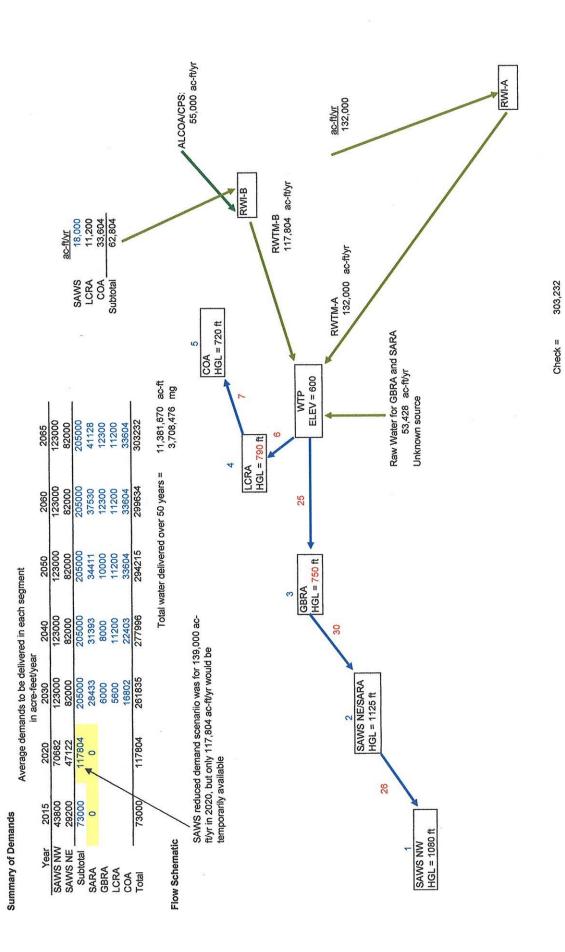


9/28/2005

North Caldwell Co\_Alt3B;Flow Schematic

9/28/2005

Flow Schematic CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands



O&M Cost Calculations
RWI A - Matagorda Co. River Intakes, and Storage
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

| Initial year of analysis period<br>Interest rate<br>Evaluation period   |                                    |        | years                        | Environn                            | nental &                                      | Archae       | egal, A |                           | 15%             | 22-                 | 12       |                        |
|---|------------------------------------|--------|------------------------------|-------------------------------------|---|--------------|---------|---------------------------|-----------------|---------------------|----------|------------------------|
| Unit cost of energy   | \$                                 | 0.07   | per kwh                      | Mitigation, S                       | urveyin                                       | g, and L     | and Ac  | quisition<br>or =         |                 | 5,000               | per mi   |                        |
| Inflatable Rubber Low Head Dam  | Quar                               | ntity  | Units                        | Size                                | C   | Constr.      | Estin   | otal<br>mated<br>tr. Cost | Eng             | gency,              | C        | Capital<br>ost         |
| Inflatable Bubbard and Hand Dam   | -                                  |        | anah                         | 10 ft blob                          | (mi   | lions)       |         | 9.00                      | (mil            | 3.42                | (mili    | 12.42                  |
| Inflatable Rubber Low Head Dam  |                                    |        | each                         | 10 ft high                          | 3   | 2.25         | •       | 9.00                      | ٥               | 3.42                | *        | 12.42                  |
| Estimated inflatable dam cost<br>Value of inflatable dam<br>Assumed life of inflatable dam<br>Estimated maintenance/replac  |                                    |        | \$ 4.50<br>10<br>\$ 0.45     | million<br>years<br>million/year    |   |              |         |                           |                 |                     |          |                        |
| Year built  |                                    |        | 2020                         |                                     |   |              |         |                           |                 |                     |          |                        |
| NPV of O&M Costs<br>NPV of Capital Costs<br>Total NPV of Capital and O&M  | Costs                              |        | \$6.27<br>\$ 9.73<br>\$16.00 | million<br>million<br>million       |   |              |         |                           |                 |                     |          |                        |
| Raw Water Intake, Pumping Station,  | and RWT                            | M (in  | take to Rese                 | ervoir)                             |   |              |         |                           |                 |                     |          |                        |
| Average withdrawal  |                                    |        |                              | 132,000<br>182                      | ac-fl/)                                       | /ear         |         | 21.9                      | Ratio           | of desig            | n withd  | rawal rate             |
| Total intake design withdrawal  | rate (for s                        | scalpi | ing high flows               | 4,000<br>1,795,200                  | cfs<br>gpm                                    |              |         |                           |                 |                     |          | withdrawal rate        |
| No. of Intakes<br>Design withdrawal rate per into   | ike                                |        | 2.                           | 1,000<br>448,800                    |   |              |         |                           |                 |                     |          |                        |
| No. of reservoirs<br>Design flow to each reservoir  |                                    |        |                              | 448,800                             | 4<br>) gpm                                    |              |         |                           |                 |                     |          |                        |
| Inside diameter of each RWTh  | 1                                  |        |                              |                                     | 0 in.   |              |         |                           |                 |                     |          |                        |
| Area<br>Average length of each RWTN   | I.                                 |        |                              |                                     | 1 miles<br>feet                               |              |         | 4.0<br>21,120             |                 | for all R           | WTMs     |                        |
| Estimated construction cost for   | r RWTM                             |        |                              | \$ 793                              | per LJ  | F            |         |                           |                 |                     |          |                        |
| Total construction cost in milli<br>Contingencies<br>Subtotal   | ons                                |        |                              | \$ 16.8<br>\$ 3.4<br>\$ 20.1        |   |              |         |                           |                 |                     |          |                        |
| Engineering, Legal & Administ<br>Subtotal<br>Envir & Arch Studies & Mitigat<br>Total Capital Cost   | lon, Surve                         |        |                              | \$ 3.0<br>\$ 23.1<br>\$ 0.4         | )   | n            |         |                           |                 |                     |          |                        |
| Unit maintenance cost/year-m  | ile                                |        |                              | \$ 10,000                           | \$/yea  | r-mile       | \$      | 0.040                     | Million         | \$/year             | (all RV  | /TMs to Reservoirs)    |
| Note: Assume each intake has  | two RW                             | TMs p  | oumping out o                | of it, one to eac                   | ch resen                                      | voir.        |         |                           |                 |                     |          |                        |
| Design flow rate for each RWT<br>Pumping rate (one pump)<br>No. of pumps (not counting sp<br>Peak flow rate into each RWT   | are) pum                           | ping i | nto each RW                  | 448,800<br>50,000<br>450,000        | gpm   |              |         |                           |                 |                     |          |                        |
| Velocity at peak flow rate  |                                    |        |                              | 12.77                               |   |              |         |                           |                 |                     |          |                        |
| C factor<br>Head loss per foot  |                                    |        |                              | 0.0032<br>17.25                     |   | 9            |         | h <sub>f</sub> =          | 13,55<br>1 C*(d | 2°Q  <sup>1.8</sup> | 5        |                        |
| Head loss at peak flow rate<br>Allowance for minor losses<br>Total estimated losses<br>Average static head<br>Total estimated dynamic head  |                                    | 30%    |                              | 4                                   | 7 ft<br>5 ft<br>2 ft<br>0 ft<br>2 ft<br>7 psi |              |         |                           | Water           | f discha            |          | reservoir<br>n river   |
| Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pui Total hp pumping into each R Total hp at each intake (not co Total hp all intakes (not count Total kw all intakes (not count | NTM (not<br>unting sp<br>ng spares | are)   | nting spare)                 | 85°<br>90°<br>1,030<br>76°<br>9,27° | % hp/pu<br>9 kw/pu<br>2 hp/R\<br>2 hp/inl     | MTM          |         |                           |                 |                     |          |                        |
| Unit construction cost for each<br>Construction cost per intake/p<br>No. of intakes from above  |                                    |        | (from cost cu                | 8.3                                 |   | rm hp o<br>n | f pump  | station                   |                 |                     |          |                        |
| Total construction cost in milli<br>Contigency, Eng., etc. in milli<br>Total capital cost in millions   |                                    |        |                              | \$ 12.50                            | millio<br>millio<br>millio                    | n            |         |                           |                 |                     |          |                        |
| Total construction cost for pur<br>Value of equipmer<br>Assumed life of eq  | t                                  | 15     |                              | \$ 13.2                             | 0 millio<br>2 millio<br>3 years<br>3 millio   | n            |         | 40%                       | Estim           | ated eq             | uip cosi | t as % of total constr |

| Year | Flow pun<br>yea |     | No. of pump "sets" | Energy<br>used                |    | Energ          | у с | ost                   | cos | her O&M<br>ts - Pump<br>Stations | C        | ntenance<br>osts -<br>RWTM | Tol  | tal O&M<br>cost      |    | prese<br>value |
|------|-----------------|-----|--------------------|-------------------------------|----|----------------|-----|-----------------------|-----|----------------------------------|----------|----------------------------|------|----------------------|----|----------------|
|      | ac-ft/yr        | mgd | operating<br>/day  | (kwh/day)                     |    | (\$/day)       | 9   | (Million \$<br>/year) | ()  | Million \$ /year)                |          | Aillion \$<br>/year)       |      | fillion \$<br>/year) |    | (\$)           |
| 2015 | -               | -   |                    |                               | \$ | -              | \$  | -                     | 1   | - Annahistania                   | orazetea | de serviciones             | \$   | intrices:            | \$ | Name of Street |
| 2016 |                 |     | -                  |                               | \$ |                | \$  |                       |     |                                  |          |                            | S    |                      | \$ |                |
| 2017 |                 |     |                    |                               | \$ |                | \$  | -                     |     |                                  |          |                            | \$   | -                    | \$ |                |
| 2018 |                 | -   | -                  |                               | \$ | -              | S   | 2                     |     |                                  |          |                            | S    | -                    | \$ |                |
| 2019 | -               |     | -                  |                               | S  |                | \$  | -                     |     |                                  |          |                            | \$   |                      | \$ |                |
| 2020 |                 |     |                    | 2                             | s  |                | s   | 2                     |     |                                  |          |                            | s    |                      | \$ |                |
| 2021 |                 | 0   |                    |                               | š  |                | Š   |                       |     |                                  |          |                            | Š    |                      | s  |                |
| 2022 |                 |     | -                  | 2                             | s  |                | Š   | 2                     |     |                                  |          |                            | s    | -                    | \$ |                |
| 2023 | 74              |     | 12                 | 2                             | Š  |                | \$  | _                     |     |                                  |          |                            | Š    | 227                  | \$ |                |
| 2024 | -               |     | -                  | - 0                           | š  |                | š   |                       |     |                                  |          |                            | Š    |                      | s  |                |
| 2025 | 1500            |     |                    |                               | š  |                | Š   | 1                     |     |                                  |          |                            | Š    |                      | \$ |                |
| 2026 | -               | -   | -                  |                               | \$ |                | \$  |                       |     |                                  |          |                            | \$   | -                    | Š  |                |
| 2020 | -               | -   | -                  | •                             | \$ | -              | s   | -                     |     |                                  |          |                            | S    |                      | 5  |                |
|      | -               | -   |                    |                               |    | -              | s   |                       |     |                                  |          |                            | S    |                      |    |                |
| 2028 | -               | -   |                    | -                             | \$ | -              |     | -                     |     |                                  |          |                            |      | •                    | \$ |                |
| 2029 | 400 000         |     |                    |                               | \$ |                | \$  | -                     |     |                                  |          |                            | \$   |                      | \$ | - 2            |
| 2030 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | s   | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2031 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | 5        | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2032 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2033 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2034 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2035 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2036 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2037 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2038 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2039 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | 5   | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2040 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2041 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | S   | 0.68                             | 5        | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2042 | 132,000         | 118 | 1.64               | 30,188                        | S  | 2,113          | S   | 0.77                  | \$  | 0.66                             | S        | 0.040                      | 5    | 1.47                 | S  | 0              |
| 2043 | 132,000         | 118 | 1.64               | 30,188                        | s  | 2,113          | s   | 0.77                  | s   | 0.66                             | S        | 0.040                      | S    | 1.47                 | \$ | 0              |
| 2044 | 132,000         | 118 | 1.64               | 30,188                        | s  | 2,113          | \$  | 0.77                  | S   | 0.68                             | S        | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2045 | 132,000         | 118 | 1.64               | 30,188                        | s  | 2,113          | s   | 0.77                  | s   | 0.66                             | s        | 0.040                      | s    | 1.47                 | S  | 0              |
| 2046 | 132,000         | 118 | 1,64               | 30,188                        | s  | 2,113          | s   | 0.77                  | s   | 0.66                             | s        | 0.040                      | s    | 1.47                 | \$ | 0              |
| 2047 | 132,000         | 118 | 1.64               | 30,188                        | š  | 2,113          | Š   | 0.77                  | s   | 0.66                             | Š        | 0.040                      | s    | 1.47                 | Š  | 0              |
| 2048 | 132,000         | 118 | 1.64               | 30,188                        | š  | 2,113          | s   | 0.77                  | s   | 0.66                             | s        | 0.040                      | s    | 1.47                 | S  | 0              |
| 2049 | 132,000         | 118 | 1.64               | 30,188                        | š  | 2,113          | Š   | 0.77                  | \$  | 0.66                             | š        | 0.040                      | Š    | 1.47                 | š  | Ö              |
| 2050 | 132,000         | 118 | 1.64               | 30,188                        | Š  | 2,113          | s   | 0.77                  | Š   | 0.66                             | Š        | 0.040                      | Š    | 1.47                 | S  | Ö              |
| 2050 |                 | 118 | 1.64               |                               |    |                | \$  |                       | S   | 0.66                             | S        |                            |      |                      | S  | ò              |
| 2052 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113<br>2,113 | 5   | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | S  | Č              |
|      |                 | 118 |                    |                               |    |                | 5   |                       | \$  | 0.66                             |          |                            |      |                      | S  |                |
| 2053 | 132,000         |     | 1.64               | 30,188                        | \$ | 2,113          |     | 0.77                  |     |                                  | \$       | 0.040                      | \$   | 1.47                 |    | 0              |
| 2054 | 132,000         | 118 | 1.64               | 30,188                        | s  | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2055 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | S    | 1.47                 | \$ | 0              |
| 2056 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | s   | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | S  | 0              |
| 2057 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2058 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | S   | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | (              |
| 2059 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2060 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2061 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.68                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2062 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2063 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.68                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
| 2064 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | (              |
| 2065 | 132,000         | 118 | 1.64               | 30,188                        | \$ | 2,113          | \$  | 0.77                  | \$  | 0.66                             | \$       | 0.040                      | \$   | 1.47                 | \$ | 0              |
|      |                 |     |                    |                               |    |                |     |                       |     |                                  | ,        | Total NPV                  | of O | RM Coete             | \$ | 1              |
|      |                 |     |                    |                               |    |                |     |                       | -   |                                  |          | Con In V                   | 5,50 | with charge          | •  |                |
|      |                 |     | Capital Cos        | ts in million \$<br>RWTM to R |    | neoire         | s   | 23.5                  |     | Yr built<br>2030                 |          |                            |      |                      | s  |                |
|      |                 |     |                    |                               |    |                |     |                       |     |                                  |          |                            |      |                      |    |                |

5.5 2030 \$ 21.

Total NPV of Capital and O&M Costs in millions \$ 45.5

## Reservoirs

|  | Quantity |    | Units      | Volume/each<br>(acre-feet) |      | t Cost<br>ac-ft)) | Con    | Total<br>struction<br>cost in<br>nillions |       | tigency,<br>g., etc. |    | rotal in<br>millions |
|--|----------|----|------------|----------------------------|------|-------------------|--------|---|-------|----------------------|----|----------------------|
| Reservoirs   | 4        |    | each       | 25000                      | \$   | 974               | \$     | 97.4                                      | \$    | 37.0                 | \$ | 134.4                |
| Estimated average depth of reserve<br>Surface area of reservoir<br>Ratio of total land area read to surf |          |    | 20<br>5000 | ft<br>acres                |      |                   |        |   |       |                      |    |                      |
| of reservoir   | aco area |    | 1.1        |                            |      |                   | En     | vir & Arch                                | aeolo | gy, Surv,            | 3  |                      |
| Total land area reqd for reservoirs  |          |    | 5500       | acres                      |      |                   |        |   |       | nd Acq =             |    | 27.5                 |
| Assumed life of reservoir  |          |    | 100        | years                      |      | Т                 | otal c | apital cost                               | in mi | llions =             | \$ | 161.9                |
| Estimated replacement cost   |          | s  | 0.97       | million/year               |      |                   |        |   |       |                      |    |                      |
| Estimated maintenance  |          |    | 0.4        |                            | Mowi | ng, main          | tainin | g fences,                                 | etc.  |                      |    |                      |
| Total  |          | \$ | 1.37       | million/year               |      |                   |        | 70 B                                      |       |                      |    |                      |
| Year built   |          |    | 2020       |                            |      |                   |        |   |       |                      |    |                      |
| NPV of O&M costs   |          | s  | 19.1       | million                    |      |                   |        |   |       |                      |    |                      |
| NPV of Capital costs   |          | \$ | 126.8      | million                    |      |                   |        |   |       |                      |    |                      |
| Total NPV of Capital and O&M Cos   | its      | \$ | 145,9      | million                    |      |                   |        |   |       |                      |    |                      |

| Summary   | IPV of<br>tal Costs | V of O&M<br>Costs | Cap | al NPV of<br>pital and<br>M Costs |
|---|---------------------|-------------------|-----|-----------------------------------|
| Inflatable Rubber Low Head Dam                                    | \$<br>9.7           | \$<br>6.3         | \$  | 16.0                              |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>33.2          | \$<br>12.3        | 5   | 45.5                              |
| Reservoirs  | \$<br>126.8         | \$<br>19.1        | \$  | 145.9                             |
| Total for RWI A   | \$<br>169.7         | \$<br>37.7        | s   | 207.4                             |

O&M Cost Calculations
RWTM A - Matagorda Co. to WTP
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

|      | Initial year of analysis period 2015 Interest rate 5%   |                    | Contingency = 20%<br>Engineering, Legal, Admin. = 15%  |
|------|---|--------------------|--|
|      | Evaluation period 50 years  | Environmen         | al & Archaeology Studies &   |
|      |   |                    | veying, and Land Acquisition \$ 100,000 per mile   |
|      | Unit cost of energy \$ 0.07 per kwh   | winigation, ou     | veying, and cand Acquisition \$ 100,000 per fillie   |
| w Wa | ater Transmission Main - A  |                    |  |
|      | Inside diameter of pipe   |                    | in.  |
|      | Area  | 50.27              |  |
|      | Length of RWTM  | 665,280            | miles<br>feet  |
|      | Estimated unit construction cost for RWTM   | \$ 567             | per LF   |
|      | Total construction cost in millions   | \$ 378             |  |
|      | Contingencies   | \$ 76              |  |
|      | Subtotal  | \$ 453             | *):  |
|      | Engineering, Legal & Administrative   | \$ 68              |  |
|      | Subtotal  | \$ 521             | *):  |
|      | Envir & Arch Studies & Mitigation, Surveying, & Land Acq  | \$ 13              |  |
|      | Total Capital Cost for PWTM in millions   |                    | million  |
|      | Unit maintenance cost/year-mile   | \$ 10,000          | \$/year-mile \$ 1.260 Million \$/year  |
|      | Design flow rate (after 100% buildout)  | 132,000            | ac-ft/year   |
|      |   | 118                | mgd  |
|      |   | 81,829             | gpm  |
|      | Pumping rate (one pump)   | 16,400             | gpm  |
|      | No. of pumps (not counting spare)   | 5                  |  |
|      | Peak flow rate (all pumps except spare)   | 82,000             | gpm  |
|      | Velocity at peak flow rate  | 3.63               | fps  |
|      | C factor  | 120                |  |
|      | Head loss per foot  | 0.0004             | ft/ft hr=   3.552*Q  <sup>1.85</sup>   |
|      |   |                    | ft/mile   C*(d) <sup>2.63</sup>  |
|      | Head loss at peak flow rate   | 276                | f  |
|      | Allowance for minor losses 10%  |                    | ft 550 Elev. At San Antonio East WTP   |
|      | Total estimated losses  | 303                |  |
|      | Average static head   | 46                 | The state of the s |
|      | Total estimated dynamic head  | 76:                |  |
|      | Total estimated dynamic nead  |                    | psi  |
|      | No of pumping stations req'd along route  | 2.2                | 150 psi (assumed max pressure  |
|      | No. of pumping stations used in cost estimate   | 3.0                |  |
|      | Average head per pump station   | 25                 |  |
|      | Assumed pump efficiency   | 85%                |  |
|      | Assumed motor efficiency  | 909                |  |
|      | Estimated Hp required per pump  | 1,378              | hp/pump  |
|      |   | 1,028              | kw/pump  |
|      | Total hp per pump station (not counting spare)  |                    | hp/station   |
|      | Total kw per pump set (set=pumps in series along route)   | 4,133              | kw/pump set (one pump at each station)   |
|      | Unit construction cost for each pump station (from cost curv  |                    | per firm hp of pump station  |
|      | Construction cost per pump station  |                    | million -  |
|      | Balancing reservoir   |                    | _million 60 min. of storage at avg pumping ra  |
|      | Total construction cost per pump station  | \$ 10.03           | million 5.0 mg<br>0.15 per gal for open top reservoir  |
|      | No. of pump stations from above   | 3.0                | each   |
|      | Total construction cost in millions   |                    | million  |
|      |   | \$ 11.43           | million  |
|      | Contigency, Eng., etc. in millions  |                    |  |
|      |   | \$ 41.5            | million  |
|      | Contigency, Eng., etc. in millions  |                    | million  |
|      | Contigency, Eng., etc. in millions<br>Total capital cost in millions  | \$ 30.1            |  |
|      | Contigency, Eng., etc. in millions Total capital cost in millions Total construction cost for pump stations | \$ 30.1<br>\$ 12.0 | million  |

# O&M Costs

| Year | Flow pun<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used      |       | Energy   | у со | st                   | cost | er O&M<br>s - Pump<br>ations | C  | intenance<br>osts -<br>RWTM  |      | tal O&M<br>cost      | Ne | et prese<br>value |
|------|-----------------|-----|--------------------------|---------------------|-------|----------|------|----------------------|------|------------------------------|----|--|------|----------------------|----|-------------------|
|      | ac-ft/yr        | mgd | operating<br>/day        | (kwh/day)           |       | (\$/day) | (    | Million \$<br>/year) |      | lillion \$<br>year)          |    | Million \$<br>/year)   |      | Villion \$<br>/year) |    | (\$)              |
| 2015 | -               | -   | -                        | -                   | \$    | -        | \$   | -                    |      |                              |    | TO SUPPLIED THE SU | \$   | -                    | \$ | -                 |
| 2016 | -               | -   | -                        |                     | \$    |          | \$   |                      |      |                              |    |  | \$   |                      | \$ |                   |
| 2017 | -               |     |                          |                     | \$    |          | \$   |                      |      |                              |    |  | \$   |                      | \$ |                   |
| 2018 |                 |     | -                        |                     | \$    | -        | \$   |                      |      |                              |    |  | \$   | -                    | \$ | 1/2               |
| 2019 | •               | -   | -                        | •                   | \$    | •        | \$   |                      |      |                              |    |  | \$   |                      | \$ | ()                |
| 2020 | -               |     |                          |                     | \$    | 3.00     | \$   |                      |      |                              |    |  | \$   |                      | \$ | 33                |
| 2021 | -               |     |                          | -                   | \$    |          | \$   |                      |      |                              |    |  | \$   |                      | \$ | - 5               |
| 2022 | -               |     | -                        | -                   | \$    |          | \$   |                      |      |                              |    |  | \$   |                      | \$ | 200               |
| 2023 | -               |     | -                        | -                   | \$    | -        | \$   |                      |      |                              |    |  | \$   |                      | \$ |                   |
| 2024 | 1940            |     |                          | 0.40                | \$    | -        | \$   |                      |      |                              |    |  | \$   | -                    | \$ |                   |
| 2025 | -               |     |                          | -                   | \$    |          | \$   |                      |      |                              |    |  | \$   | 2                    | \$ |                   |
| 2026 | -               | -   | -                        | -                   | \$    |          | \$   | -                    |      |                              |    |  | \$   | -                    | \$ |                   |
| 2027 | -               |     | -                        |                     | \$    |          | S    |                      |      |                              |    |  | \$   | -                    | \$ | - 6               |
| 2028 | -               |     | -                        | _                   | \$    | -        | \$   |                      |      |                              |    |  | \$   | -                    | \$ |                   |
| 2029 |                 |     |                          |                     | \$    |          | \$   | - 2                  |      |                              |    |  | \$   | -                    | \$ |                   |
| 2030 | 132,000         | 118 | 4.99                     | 494,936             | Š     | 34,646   | S    | 12.65                | s    | 0.60                         | \$ | 1.260  | \$   | 14.51                | Š  | 6                 |
| 2031 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | Š    | 12.65                | Š    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 6                 |
| 2032 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | Š    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 6                 |
| 2032 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | Š    | 12.65                | Š    | 0.60                         | Š  | 1.260  | \$   | 14.51                | S  | 6                 |
| 2033 |                 | 118 | 4.99                     |                     | \$    | 34,646   | \$   | 12.65                | S    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 5                 |
|      | 132,000         |     |                          | 494,936             |       |          |      |                      | 200  |                              |    |  |      |                      | \$ |                   |
| 2035 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                |    | 5                 |
| 2036 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 5                 |
| 2037 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 4                 |
| 2038 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 4                 |
| 2039 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | S    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 4                 |
| 2040 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 4                 |
| 2041 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 4                 |
| 2042 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 3                 |
| 2043 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 3                 |
| 2044 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 3                 |
| 2045 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | . 3               |
| 2046 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 3                 |
| 2047 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 3                 |
| 2048 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2049 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2050 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2051 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | S    | 0.60                         | \$ | 1.260  | S    | 14.51                | \$ | 2                 |
| 2052 | 132,000         | 118 | 4.99                     | 494,936             | s     | 34,646   | S    | 12.65                | s    | 0.60                         | \$ | 1.260  | S    | 14.51                | s  | 2                 |
| 2053 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2054 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | s    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2055 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | Š    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 2                 |
| 2056 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | Š    | 0.60                         | \$ | 1.260  | Š    | 14.51                | Š  | 1                 |
| 2057 | 132,000         | 118 | 4.99                     | 494,936             | Š     | 34,646   | \$   | 12.65                | S    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2058 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | S    | 12.65                | Š    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2059 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | Š    | 12.65                | Š    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2060 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | S    | 0.60                         | Š  | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2061 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | S    | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | - 1               |
|      |                 |     |                          |                     |       |          |      |                      | 200  |                              |    |  |      |                      |    |                   |
| 2062 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2063 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | . 1               |
| 2064 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
| 2065 | 132,000         | 118 | 4.99                     | 494,936             | \$    | 34,646   | \$   | 12.65                | \$   | 0.60                         | \$ | 1.260  | \$   | 14.51                | \$ | 1                 |
|      |                 |     |                          | Oli Mileson Salano  |       |          |      |                      |      |                              | Т  | otal NPV   | of O | &M Costs             | \$ |                   |
|      |                 |     |                          | s in million \$:    |       |          |      |                      |      | r built                      |    |  |      |                      |    |                   |
|      |                 |     |                          | RWTM                |       |          | \$   | 534                  |      | 2030                         |    |  |      |                      | \$ | - 1               |
|      |                 |     |                          | <b>Pumping Stat</b> | tions | 5        | \$   | 42                   | 3    | 2030                         |    |  |      |                      | \$ |                   |
|      |                 |     |                          |                     |       |          |      |                      |      |                              |    | al NPV of  |      |                      | \$ |                   |

# NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

| Initial year of analysis period | 2015               | Contingency = 20%   |
|---------------------------------|--------------------|---|
| Interest rate                   | 5%                 | Engineering, Legal, Admin. = 15%                                |
| Evaluation period               | 50 years           | Environmental & Archaeology Studies &                           |
| Unit cost of energy             | \$<br>0.07 per kwh | Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile |

| elds and Collection Lines                                | ALCOA | CPS   | Total |
|--|-------|-------|-------|
| Year built -   | 2015  | 2015  | Total |
| Tour built   | 2010  | 2010  |       |
| Estimated Construction Cost in Millions                  |       |       |       |
| Wells (Based on Non-Public Water Supply Wells)           | 20.92 | 7.94  | 28.8  |
| Pipeline   | 13.03 | 5.94  | 18.9  |
| Pump Stations & Storage                                  | 8.51  | 0     | 8.8   |
| Subtotal   | 42.46 | 13.88 | 56.3  |
| Contingency  | 8.49  | 2.78  | 11.2  |
| Subtotal   | 50.95 | 16.66 | 67.6  |
| Engineering, Legal & Administrative                      | 6.37  | 2.08  | 8.4   |
| Subtotal   | 57.32 | 18.74 | 76.0  |
| Environmental & Archaeology Studies & Mitigation         | 0.63  | 0.2   | 0.6   |
| Land Acquisition & Surveying                             | 0     | 0     | 0.0   |
| Groundwater Purchase                                     | 0     | 5.64  | 5.6   |
| ALCOA Construction Program Management Fee                | 5.45  | 0     | 5.4   |
| Interest During Construction (2 years, 6% int., 4% ret.) | 5.89  | 2.44  | 8.3   |
| Total Capital Cost                                       | 69.29 | 27.02 | 96.3  |
| Estimated Annual O&M Costs                               |       |       |       |
| O&M  | 0.67  | 0.18  | 0.8   |
| Pumping Energy   | 2.41  | 0.52  | 2.9   |
| ALCOA Project Management Fees                            | 0.35  | 0.00  | 0.3   |
| Purchase of Groundwater                                  | 2.00  | 0.00  | 2.0   |
| Groundwater District Fees                                | 0.65  | 0.25  | 0.9   |
| Mitigation Reserves                                      | 0.28  | 0.11  | 0.3   |
| Total Annual Cost  | 6.36  | 1.06  | 7.4   |

| NPV of O&M Costs                                   | s  | 116 | s  | 19 | \$ | 135 | million |
|--|----|-----|----|----|----|-----|---------|
| NPV of Capital Costs                               | \$ | 69  | \$ | 27 | Š  | 96  | million |
| Total NPV of Capital and O&M Costs for Well Fields | \$ | 185 | \$ | 46 | \$ | 232 | millior |

## Cooling of Well Water

| Total number of wells in both fields                 | 120 wells | Approximate capacity per wel | 300    | gpm        |
|--|-----------|------------------------------|--------|------------|
| Percentage of wells with temperatures > than degrees | 5%        |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees | 6.0       | Rough check                  | 58,072 | ac-ft/year |
| Fetimated Capital Costs                              |           |                              |        |            |

| Year built  | 2015          |         |
|---|---------------|---------|
| Number of Packaged Cooling Towers (300 gpm capacity/each) | 6.0           |         |
| Equipment cost (cooling towers and fans)                  | \$<br>60,000  |         |
| Installation and contractors mark-up                      | \$<br>50,000  |         |
| Structural slab   | \$<br>30,000  |         |
| Electrical  | \$<br>50,000  |         |
| Estimated Unit Construction Cost                          | \$<br>190,000 | Each    |
| Total construction cost                                   | \$<br>1.14    | million |
| Contingencies   | \$<br>0.23    |         |
| Subtotal  | \$<br>1.37    | •       |
| Engineering, Legal and Admin                              | \$<br>0.21    |         |
| Total Estimated Capital Cost                              | \$<br>1.57    |         |
| NPV of Capital Costs                                      | \$<br>1.57    | million |

# Estimated O&M Costs

| Value of equipment   | \$ | 0.4    | million                          |
|--|----|--------|----------------------------------|
| Assumed life of equipment  |    | 10     | vears                            |
| Estimated maintenance/replacement cost   | \$ | 0.04   | million/year                     |
| Blower Hp per cooling tower  |    | 10     | Нр                               |
| 000000 20 000 € • • • • • • • • • • • • • • • •  |    | 7      | kw                               |
| Hours of operation   |    | 24     | hours                            |
| Power consumption per cooling tower  |    | 179    | kwh per day                      |
| A MODE OF THE CONTRACT OF THE SECTION OF A VINCORY AND ADDRESS OF A SECTION OF THE SECTION OF TH |    | 65,350 | kwh per year                     |
| Power cost per cooling tower   | S  | 4,574  |                                  |
| Total power cost for all cooling towers in millions  | \$ | 0.03   | million per year                 |
| Regular operational checks and routine maintenance   | s  | 6,000  | per month for all cooling towers |
|  | \$ | 0.07   | per year                         |

Estimated O&M Cost \$
NPV of O&M costs \$ 0.14 million \$ per year 2.47 million \$

54 in.

# Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

| Area   |                    |    | 15.90   | sf           |            |                  |   |
|--|--------------------|----|---------|--------------|------------|------------------|---|
| Length of Ground Water TM  |                    |    | 15      | miles        |            |                  |   |
|  |                    |    | 79,200  | feet         |            |                  |   |
| Estimated construction cost for GWTN   | T.                 | \$ | 327     | per LF       |            |                  |   |
| Total construction cost in millions  |                    | \$ | 25.9    |              |            |                  |   |
| Contingencies  |                    | \$ | 5.2     |              |            |                  |   |
| Subtotal   |                    | \$ | 31.1    | •            |            |                  |   |
| Engineering, Legal & Administrative  |                    | \$ | 4.7     |              |            |                  |   |
| Subtotal   |                    | \$ | 35.8    | •            |            |                  |   |
| Envir & Arch Studies & Mitigation, Sun   | veying, & Land Acq | \$ | 1.5     |              |            |                  |   |
| Total Capital Cost for PWT   |                    | \$ |         | million      |            |                  |   |
| Unit maintenance cost/year-mile  |                    | \$ | 10,000  | \$/year-mile | \$ 0.      | .150             | Million \$/year   |
| Design flow rate   |                    |    | 55,000  | ac-ft/year   |            |                  |   |
|  |                    |    | 49      | mgd          |            |                  |   |
|  |                    |    | 34,095  |              |            |                  |   |
| Velocity at peak flow rate   |                    |    | 4.78    | fps          |            |                  |   |
| C factor   |                    |    | 120     |              |            |                  |   |
| Head loss per foot   |                    |    | 0.00134 | ft/ft        |            | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>  |
|  |                    |    | 7.10    | ft/mile      |            |                  | C*(d) <sup>2.63</sup>   |
| Head loss at peak flow rate  |                    |    | 106     | ft           |            |                  |   |
| Allowance for minor losses   | 10%                |    | 11      | ft           |            | 400              | Elev. At RWI-B  |
| Total estimated losses   |                    |    | 117     | ft           |            | 550              | minus Elev Storage Tank at Hwy 290  |
| Average static head  |                    |    | -150    | ft           |            | -150             |   |
| Total estimated dynamic head   |                    | -  | -33     |              | (intake is | lower            | than tank at Hwy 290)   |
| and the second s |                    |    | -14     | psi          |            |                  | or the second of the second o |

# - Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

| Annual O&M Cost in million \$ |    |       | Yr built |                            | М  | illion \$ |
|-------------------------------|----|-------|----------|----------------------------|----|-----------|
| GWTM                          | s  | 0.150 | 2015     | 6                          |    |           |
|                               |    |       |          | Total NPV of O&M Costs     | \$ | 2.7       |
| Capital Costs in million \$:  |    |       | Yr built |                            |    |           |
| GWTM                          | \$ | 37.3  | 2015     |                            | \$ | 37.3      |
|                               |    |       |          | Total NPV of Capital Costs | \$ | 37.3      |

### Summary

Well Fields and Collection Lines (including tank and pump station at Hwy 290)
Cooling Towers for Selected High Temperature Wells
Ground Water Transmission Main and Pumping Station
Total for ALCOA-CPS

| <br>IPV of<br>tal Costs | <br>of O&M<br>Costs | Ca | Capital and |  |  |  |  |
|-------------------------|---------------------|----|-------------|--|--|--|--|
| \$<br>96.3              | \$<br>135.5         | \$ | 231.8       |  |  |  |  |
| \$<br>1.6               | \$<br>2.5           | \$ | 4.0         |  |  |  |  |
| \$<br>37.3              | \$<br>2.7           | \$ | 40.0        |  |  |  |  |
| \$<br>135.1             | \$<br>140.7         | \$ | 275.8       |  |  |  |  |

O&M Cost Calculations
RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

Initial year of analysis period 2015 Contingency = 20% Engineering, Legal, Admin. = 15% Interest rate 5% Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 100,000 per mile
or = \$ 5,000 per acre Evaluation period 40 years \$ 0.07 per kwh Unit cost of energy Inflatable Rubber Low Head Dam Total Total Contigency, Total Capital Estimated Constr. Cost (millions) (millions) Unit Constr. Quantity Cost Units (millions) (millions) 2.25 1.71 \$ 6.21 Inflatable Rubber Low Head Dam 10 ft high 4.50 \$ Estimated inflatable dam cost as % of total 50% 2.25 million 10 years 0.23 million/year Value of inflatable dam
Assumed life of inflatable dam
Estimated maintenance/replacement cost 2015 NPV of O&M Costs NPV of Capital Costs 3.86 million 6.21 million \$ 10.07 million Total NPV of Capital and O&M Costs

## Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

# Su

|                             |             | in acre-feet                                     |               |              | Includes 18k | + 11.2k of LCR | A's + 33.6k of C | DA's                                    |
|-----------------------------|-------------|--|---------------|--------------|--------------|----------------|------------------|---|
| Year                        | 2015        | 2020   | 2030          | 2040         | 2050         | 2060           | 2065             |   |
| or SAWS                     | 18000       | 62804  | 18000         | 18000        | 18000        | 18000          | 18000            |   |
| .CRA                        |             |  | 5600          | 11200        | 11200        | 11200          | 11200            |   |
| COA                         |             |  | 16802         | 22403        | 33604        | 33604          | 33604            | •                                       |
| otal                        | 18000       | 62804  | 40402         | 51603        | 62804        | 62804          | 62804            |   |
| Ultimate (Y2                | 2065) ave   | rage design v                                    | vithdrawal re | ite          | 62,804<br>87 | ac-ft/year     |                  |   |
|                             |             |  |               |              | 0.           | Old            | 23.1             | Ratio of design withdrawal rate         |
| Total intake                | design w    | ithdrawal rate                                   | (for scalpin  | g high flows | 2,000        | cfs            |                  | to Total intake design withdrawal rate  |
|                             |             |  |               |              | 897,600      | gpm            |                  |   |
| No. of Intake               | 98          |  |               |              |              | 2              |                  |   |
|                             |             | e per intake                                     |               |              | 1,000        |                |                  |   |
|                             |             |  |               |              | 448,800      |                |                  |   |
|                             |             |  |               |              |              |                |                  |   |
| No. of reser<br>Design flow |             | eservoir   |               |              | 224,400      | 4<br>apm       |                  |   |
| Dosigit now                 | to outin    | 00017011   |               |              | 221,100      | 81             |                  |   |
| anda dana                   |             | ah DIACTAR                                       |               |              | 10           | 0 in.          |                  |   |
| inside diami<br>Area        | eter or ea  | CH RVV I W                                       |               |              | 78.5         |                |                  |   |
| Average len                 | oth of ear  | ch RWTM  |               |              |              | 2 miles        | 8.0              | miles for all RWTMs                     |
| wordgo ion                  | gui oi ou   | J. 1 ( 1 ( 1 ) 1 ) 1   1   1   1   1   1   1   1 |               |              | 10,560       |                | 42,240           |   |
| Estimated c                 | onstruction | on cost for RV                                   | VTMs          |              | \$ 793       | perLF          |                  |   |
|                             |             |  |               |              |              | 9781           |                  |   |
|                             |             | st in millions                                   |               |              | \$ 33.5      |                |                  |   |
| Contingenci                 |             |  |               |              | \$ 6.7       |                |                  |   |
|                             | Subtotal    | Administrativ                                    |               |              | \$ 6.0       |                |                  |   |
|                             | Subtotal    | Administrativ                                    |               |              | \$ 6.0       |                |                  |   |
|                             |             | & Mitigation,                                    | Surveying,    | & Land Acq   | \$ 0.8       |                |                  |   |
|                             |             | oital Cost for F                                 |               |              | \$ 47.0      |                |                  |   |
| Unit mainte                 | nance cos   | st/year-mile                                     |               |              | \$ 10,000    | \$/year-mile   | \$ 0.080         | Million \$/year (all RWTMs to Reservoin |
| Note: Assur                 | ne intake   | has one RW                                       | TM pumping    | to the reser | voir.        |                |                  |   |
| Design flow                 | rate for e  | ach RWTM (                                       | from above)   |              | 224,400      |                |                  |   |
| Pumping ra                  |             |  |               |              |              | gpm            |                  |   |
|                             |             | unting spare)                                    |               |              |              |                |                  |   |
| Peak flow n                 | ate into ea | ach RWTM (a                                      | III pumps ex  | cept spare)  | 240,000      | gpm            |                  |   |
| Velocity at p               | eak flow    | rate   |               |              |              | fps            |                  |   |
| C factor                    |             |  |               |              | 120          |                | 7/8/5            | 4.05                                    |
| Head loss p                 | er foot     |  |               |              | 0.0010       |                | h <sub>l=</sub>  | 13.552*QI <sup>1.85</sup>               |
|                             |             |  |               |              | 5.39         | ft/mile        |                  | C*(d) <sup>2.63</sup>                   |
| Head loss a                 | t peak flo  | w rate   |               |              | 1            | 1 ft           |                  |   |
| Allowance f                 |             |  | 30%           |              |              | 3 ft           | 400              | Discharge at reservoir                  |
| Total estima                |             |  |               |              |              | 4 ft           |                  | Water surface elev in river             |
| Average sta                 | atic head   |  |               |              |              | O ft           | 80               | ) ft                                    |
| Total estima                | ated dyna   | mic head   |               |              | 17           | 4 ft           |                  |   |
|                             |             |  |               |              | 4            | 1 psi          |                  |   |
| Assumed p                   |             |  |               |              | 85           |                |                  |   |
| Assumed m                   |             |  |               |              | 90           |                |                  |   |
| Estimated F                 | Ip require  | d per pump                                       |               |              |              | hp/pump        |                  |   |
|                             |             |  |               |              | 920          | 8 kw/pump      |                  |   |

| np pumping into each RWTM (not counting spare)        |   | 7,448   | hp/RWTM  |   |  |
|---|---|---|--|---|--|
| np at each intake (not counting spare)                |   | 14,897  | hp/intake  |   |  |
| np all intakes (not counting spares)                  |   | 29,793  | hp   |   |  |
| kw all intakes (not counting spares)                  |   | 22,226  | kw   |   |  |
| onstruction cost for each pump station (from cost cur | \$  | 889   | per firm hp of pum   | p station   |  |
| ruction cost per intake/pump station                  |   | 13.2  | million  |   |  |
| intakes from above                                    |   | 2   | each   |   | 5  |
| construction cost in millions                         | \$  | 26.5  | million  |   |  |
| jency, Eng., etc. in millions                         | \$  | 10.06   | million  |   |  |
| capital cost in millions                              | \$  | 36.6  | million  |   |  |
| construction cost for pump stations                   | \$  | 26.5  | million  | 40%   | Estimated equipment cost as % of total   |
| Value of equipment                                    | \$  | 10.6  | million  |   | Angele and the second control of the second  |
| Assumed life of equipment                             |   | 20  | years  |   |  |
| Estimated maintenance/replacement cost                | \$  | 0.53  | million/year   |   |  |
|   | nuction cost per intake/pump station intakes from above construction cost in millions tency, Eng., etc. in millions capital cost in millions construction cost for pump stations Value of equipment Assumed life of equipment | pa at each intake (not counting spare) p all intakes (not counting spares) wave all intakes (not counting spares) construction cost for each pump station (from cost cur- precion cost per intake/pump station intakes from above construction cost in millions spaneacy, Eng., etc. in millions scapital cost in millions Value of equipment Assumed life of equipment | 14,897   14,897   14,897   14,897   19,191   11,897   19,191   11,897   19,191   11,897   19,793   1 | part each intake (not counting spare) p all intakes (not counting spares) p all intakes (not counting | part each Intake (not counting spare) part each Intake (not counting spares) 29,793 hp pall intakes (not counting spares) 22,226 kw  construction cost for each pump station (from cost cur struction cost per intake/pump station 13.2 million 13.3 million |

O&M Costs:

| Year | Flow pum<br>yea  |          | No. of<br>pump<br>"sets" | Energy<br>used  |      | Energ      | y c | ost                   |    | other O&M<br>ests - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | Te   | otal O&M<br>cost     | Ne   | t present<br>value |
|------|------------------|----------|--------------------------|-----------------|------|------------|-----|-----------------------|----|--------------------------------------|----|-------------------------------|------|----------------------|------|--------------------|
|      | ac-ft/yr         | mgd      | operating<br>/day        | (kwh/day)       |      | (\$/day)   |     | (Million \$<br>/year) | 3  | (Million \$ /year)                   | (  | (Million \$<br>/year)         | (    | Million \$<br>/year) |      | (\$)               |
| 2015 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.77               |
| 2016 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.73               |
| 2017 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.70               |
| 2018 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.66               |
| 2019 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | 1000 | 0.63               |
| 2020 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434<br>434 | \$  | 0.16<br>0.16          | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.60               |
| 2021 | 18,000           | 16<br>16 | 0.28                     | 6,200           | \$   | 434        |     | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   |                      | S    | 0.57               |
| 2022 | 18,000<br>18,000 | 16       | 0.28                     | 6,200<br>6,200  | S    | 434        | \$  | 0.16                  | \$ | 0.53<br>0.53                         | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.52               |
| 2023 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | 5   | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.52               |
| 2025 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | \$   | 0.50               |
| 2025 | 18,000           | 16       | 0.28                     | 6,200           | 5    | 434        | \$  | 0.16                  | 5  | 0.53                                 | S  | 0.080                         | 5    | 0.77                 | S    | 0.47               |
| 2027 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | S    | 0.43               |
| 2028 | 18,000           | 16       | 0.28                     | 6,200           | Š    | 434        | S   | 0.16                  | \$ | 0.53                                 | S  | 0.080                         | \$   | 0.77                 | Š    | 0.43               |
| 2029 | 18,000           | 16       | 0.28                     | 6,200           | \$   | 434        | \$  | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | S    | 0.39               |
| 2030 | 40,402           | 36       | 0.28                     | 13,917          | \$   | 974        | Š   | 0.16                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.77                 | S    | 0.46               |
| 2031 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | S   | 0.36                  | Š  | 0.53                                 | S  | 0.080                         | 3    | 0.97                 | Š    | 0.44               |
| 2032 | 40,402           | 36       | 0.63                     | 13,917          | \$   | 974        | Š   | 0.36                  | Š  | 0.53                                 | Š  | 0.080                         | Š    | 0.97                 | Š    | 0.42               |
| 2032 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | \$  | 0.36                  | š  | 0.53                                 | S  | 0.080                         | Š    | 0.97                 | S    | 0.40               |
| 2034 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | Š   | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                 | \$   | 0.38               |
| 2035 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | Š   | 0.36                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 0.97                 | \$   | 0.36               |
| 2036 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | Š   | 0.36                  | Š  | 0.53                                 | s  | 0.080                         | Š    | 0.97                 | Š    | 0.35               |
| 2037 | 40,402           | 36       | 0.63                     | 13,917          | Š    | 974        | \$  | 0.36                  | s  | 0.53                                 | Š  | 0.080                         | \$   | 0.97                 | Š    | 0.33               |
| 2038 | 40,402           | 36       | 0.63                     | 13,917          | S    | 974        | S   | 0.36                  | Š  | 0.53                                 | S  | 0.080                         | \$   | 0.97                 | S    | 0.31               |
| 2039 | 40,402           | 36       | 0.63                     | 13,917          | \$   | 974        | Š   | 0.36                  | s  | 0.53                                 | Š  | 0.080                         | \$   | 0.97                 | \$   | 0.30               |
| 2040 | 51,603           | 46       | 0.80                     | 17,775          | Š    | 1,244      | \$  | 0.45                  | \$ | 0.53                                 | Š  | 0.080                         | \$   | 1.06                 | \$   | 0.31               |
| 2041 | 51,603           | 46       | 0.80                     | 17,775          | š    | 1,244      | Š   | 0.45                  | \$ | 0.53                                 | Š  | 0.080                         | \$   | 1.06                 | \$   | 0.30               |
| 2042 | 51,603           | 46       | 0.80                     | 17,775          | Š    | 1,244      | Š   | 0.45                  | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                 | S    | 0.28               |
| 2043 | 51,603           | 46       | 0.80                     | 17,775          | Š    | 1,244      | \$  | 0.45                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.06                 | Š    | 0.27               |
| 2044 | 51,603           | 46       | 0.80                     | 17,775          | Š    | 1,244      | \$  | 0.45                  | s  | 0.53                                 | \$ | 0.080                         | Š    | 1.06                 | \$   | 0.26               |
| 2045 | 51,603           | 46       | 0.80                     | 17,775          | s    | 1,244      | Š   | 0.45                  | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                 | Š    | 0.25               |
| 2046 | 51,603           | 46       | 0.80                     | 17,775          | s    | 1,244      | \$  | 0.45                  | s  | 0.53                                 | \$ | 0.080                         | Š    | 1.06                 | \$   | 0.23               |
| 2047 | 51,603           | 46       | 0.80                     | 17,775          | š    | 1,244      | \$  | 0.45                  | \$ | 0.53                                 | \$ | 0.080                         | Š    | 1.06                 | Š    | 0.22               |
| 2048 | 51,603           | 46       | 0.80                     | 17,775          | Š    | 1,244      | Š   | 0.45                  | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                 | S    | 0.21               |
| 2049 | 51,603           | 46       | 0.80                     | 17,775          | S    | 1,244      | Š   | 0.45                  | Š  | 0.53                                 | Š  | 0.080                         | Š    | 1.06                 | \$   | 0.20               |
| 2050 | 62,804           | 56       | 0.97                     | 21,633          | Š    | 1,514      | Š   | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | Š    | 1.16                 | S    | 0.21               |
| 2051 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | S   | 0.55                  | Š  | 0.53                                 | S  | 0.080                         | s    | 1.16                 | \$   | 0.20               |
| 2052 | 62,804           | 56       | 0.97                     | 21,633          | Š    | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | Š  | 0.080                         | s    | 1.16                 | \$   | 0.19               |
| 2053 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | S   | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.18               |
| 2054 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.17               |
| 2055 | 62,804           | 56       | 0.97                     | 21,633          | s    | 1,514      | \$  | 0.55                  | s  | 0.53                                 | s  | 0.080                         | s    | 1.16                 | S    | 0.17               |
| 2056 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | S  | 0.080                         | \$   | 1.16                 | S    | 0.16               |
| 2057 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.15               |
| 2058 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | S    | 0.14               |
| 2059 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.14               |
| 2060 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.13               |
| 2061 | 62,804           | 56       | 0.97                     | 21,633          | S    | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | s  | 0.080                         | \$   | 1.16                 | \$   | 0.12               |
| 2062 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.12               |
| 2063 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.11               |
| 2064 | 62,804           | 56       | 0.97                     | 21,633          | s    | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.11               |
| 2065 | 62,804           | 56       | 0.97                     | 21,633          | \$   | 1,514      | \$  | 0.55                  | \$ | 0.53                                 | \$ | 0.080                         | \$   | 1.16                 | \$   | 0.10               |
|      |                  |          |                          |                 |      |            |     |                       |    |                                      |    | Total NPV                     | of C | 0&M Costs            | \$   | 17.1               |
|      |                  |          | Capital Cost             | s in million \$ |      |            |     |                       |    | Yr built                             |    |                               |      |                      | •    | 4                  |
|      |                  |          |                          | RWTM to Re      |      |            | \$  | 47.0                  |    | 2015                                 |    |                               |      |                      | \$   | 47.0               |
|      |                  |          |                          | Intake/Pump     | ping | Stations   | S   | 36.6                  |    | 2015                                 |    |                               |      |                      | \$   | 36.6               |

Total NPV of Capital and O&M Costs in millions \$

# Reservoirs

|            | Quantity | Units | Volume/each<br>(acre-feet) | nit Cost<br>(ac-ft)) | C  | struction<br>ost in<br>illions | tigency,<br>g., etc. | otal in<br>nillions |
|------------|----------|-------|----------------------------|----------------------|----|--------------------------------|----------------------|---------------------|
| Reservoirs | 4        | each  | 15000                      | \$<br>1,180          | \$ | 70.8                           | \$<br>26.9           | \$<br>97.7          |

Estimated average depth of reservoir

20

| Surface area of reservoir   | 3000        | acres        |  |      |
|---|-------------|--------------|--|------|
| Ratio of total land area regd to surface area   |             |              |  |      |
| of reservoir  | 1.1         |              | Envir & Archaeology, Surv,             |      |
| Total land area regd for reservoirs   | 3300        | acres        | and Land Acq =                         | 16.5 |
| A CARCAGO AND A CARCAGO A CARCAGO AND A CARCAGO A |             | ,            | Total capital cost in millions = \$ 11 | 14.2 |
| Assumed life of reservoir   | 100         | years        | 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |      |
| Estimated replacement cost  | \$<br>0.71  | million/year |  |      |
| Estimated maintenance   | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.       |      |
| Total   | \$<br>0.75  | million/year |  |      |
| Year built  | 2015        |              |  |      |
| NPV of O&M costs  | \$<br>12.8  | million      |  |      |
| NPV of Capital costs  | \$<br>114.2 | million      |  |      |
| Total NPV of Capital and O&M Costs  | \$<br>127.0 | million      |  |      |

| Sur | mmary   | 33507 | IPV of<br>tal Costs | <br>V of O&M<br>Costs | Capital and |       |  |
|-----|---|-------|---------------------|-----------------------|-------------|-------|--|
|     | Inflatable Rubber Low Head Dam                                    | \$    | 6.2                 | \$<br>3.9             | \$          | 10.1  |  |
|     | Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$    | 83.6                | \$<br>17.1            | \$          | 100.7 |  |
|     | Off Channel Reservoir   | \$    | 114.2               | \$<br>12.8            | \$          | 127.0 |  |
|     | Total for RWI A   | \$    | 204.0               | \$<br>33.8            | \$          | 237.8 |  |

O&M Cost Calculations
RWTM B - RWI B near Bastrop to WTP
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

|   | Initial year of<br>Interest rate |                         | eriod                         | 2015<br>5%    |                    |              |            | ngineering, L         | Contingency = egal, Admin. = |       |                     |              |                 |
|---|----------------------------------|-------------------------|-------------------------------|---------------|--------------------|--------------|------------|-----------------------|------------------------------|-------|---------------------|--------------|-----------------|
|   | Evaluation p                     |                         |                               |               | years              |              |            | & Archaeolo           |                              |       | 100 000             | nor mile     |                 |
| 33                                      | Unit cost of e                   | anergy                  | 0                             | \$ 0.07       | per kwh            | willigation, | Quiv       | eying, and Le         | and Acquisition              | 9     | 100,000             | per mile     |                 |
| 4 20000 0000000000000000000000000000000 | y of average                     | pumping                 |                               |               | ar:<br>of LCRA's + | 33.6k of CO  | A's        |                       |                              |       |                     |              |                 |
| Surf                                    | ace Water                        | 2015                    | 2020                          | 2030          | 2040               | 2050         |            | 2060                  | 2065                         |       |                     |              |                 |
| -                                       | Year<br>For SAWS                 | 18000                   | 62804                         | 18000         | 18000              | 18000        | ) ;        | 18000                 | 18000                        | -     |                     |              |                 |
|   | LCRA                             | 10000                   | 02001                         | 5600          | 11200              | 11200        |            | 11200                 | 11200                        |       |                     |              |                 |
| 0                                       | COA                              |                         |                               | 16802         | 22403              | 33604        |            | 33604                 | 33604                        |       |                     |              |                 |
| _                                       | Subtotal                         | 18000                   | 62804                         | 40402         | 51603              | 62804        | •          | 62804                 | 62804                        |       |                     |              |                 |
| Grou                                    | undwater<br>Year                 | 2015                    | 2020                          | 2030          | 2040               | 2050         |            | 2060                  | 2065                         |       |                     |              |                 |
|   | For SAWS                         | 55000                   | 55000                         | 55000         | 55000              | 55000        |            | 55000                 | 55000                        | -     |                     |              |                 |
| Sufa                                    | ace & grour                      | 73000                   | 117804                        | 95402         | 106603             | 117804       | 4          | 117804                | 117804                       | -     |                     |              |                 |
|   | Ultimate (Y2                     | 065) avera              | ige design p                  | umping rat    | te                 | 117,         | 804        | ac-ft/year            |                              |       |                     |              |                 |
| Sizing of                               | f Raw Water                      | Transmis                | sion Main E                   | 3 & Pump      | Stations           |              |            |                       |                              |       |                     |              |                 |
|   | Inside diame                     | ter of RW               | TM                            |               |                    |              | 84         | in.                   |                              |       |                     |              |                 |
|   | Area                             |                         |                               |               |                    | 38           | 3.48       | sf                    |                              |       |                     |              |                 |
|   | Length of RV                     | MTM                     |                               |               |                    | 405          |            | miles                 |                              |       |                     |              |                 |
|   |                                  |                         |                               |               |                    | 105,         | 800        | feet                  |                              |       |                     |              |                 |
|   | Estimated u                      | nit constru             | ction cost for                | r RWTM        |                    | \$           | 467        | per LF                |                              |       |                     |              |                 |
|   | Total constru                    | uction cost             | in millions                   |               |                    | s 4          | 19.4       |                       |                              |       |                     |              |                 |
|   | Contingencie                     | es                      |                               |               |                    | \$           | 9.9        |                       |                              |       |                     |              |                 |
|   |                                  | Subtotal                | 20 000 00 000                 |               |                    |              | 59.2       |                       |                              |       |                     |              |                 |
|   | Engineering                      | , Legal & A<br>Subtotal | dministrativ                  | е             |                    | \$ 6         | 8.9        |                       |                              |       |                     |              |                 |
|   | Envir & Arch                     |                         | Mitigation                    | Surveying     | & Land Aco         |              | 2.0        |                       |                              |       |                     |              |                 |
|   |                                  |                         | al Cost for P                 |               |                    |              |            | million               |                              |       |                     |              |                 |
|   | Unit mainter                     | nance cost              | /year-mile                    |               |                    | \$ 5,        | 000        | \$/year-mile          | \$ 0.100                     | Mill  | ion \$/yea          | r            |                 |
|   | Design flow                      | rate (after             | 100% buildo                   | out)          |                    |              |            | ac-ft/year            |                              |       |                     |              |                 |
|   |                                  |                         |                               |               |                    |              | 105        |                       |                              |       |                     |              |                 |
|   | Dumning rat                      | a (ana nur              | 201                           |               |                    |              |            | gpm<br>gpm            |                              |       |                     |              |                 |
|   | Pumping rat<br>No. of pump       |                         |                               |               |                    | 10,          | 5          | gpiii                 |                              |       |                     |              |                 |
|   |                                  |                         | nps except s                  | pare)         |                    | 75,          | ,000       | gpm                   |                              |       |                     |              |                 |
|   | Velocity at p                    | eak flow ra             | ate                           |               |                    |              | 4.34       | fps                   |                              |       |                     |              |                 |
|   | C factor                         | oun now it              | ato                           |               |                    |              | 120        | ileo                  |                              |       |                     |              |                 |
|   | Head loss p                      | er foot                 |                               |               |                    | 0.00         | 0067       | ft/ft                 | hr                           | = 13. | 552*QI1             | B5           |                 |
|   |                                  |                         |                               |               |                    | :            | 3.55       | ft/mile               |                              |       | (d) <sup>2.63</sup> |              |                 |
|   |                                  |                         |                               |               |                    |              |            |                       |                              |       |                     |              |                 |
|   | Head loss a                      |                         |                               | 400/          |                    |              | 71         |                       | CE                           | 0 510 |                     |              |                 |
|   | Allowance for<br>Total estima    |                         |                               | 10%           | 01                 |              | 7          |                       |                              |       | v. At WT            | in Bastrop   | reservoir       |
|   | Average sta                      |                         | 9                             |               |                    |              | 250        |                       |                              | O ft  | V OI VVOL           | in Dasirop   | 103014011       |
|   | Total estima                     |                         | nic head                      |               |                    |              | 328        |                       |                              |       |                     |              |                 |
|   |                                  |                         |                               |               |                    |              | 142        | psi                   |                              |       |                     |              |                 |
|   | No of socos                      |                         | umalas stati                  | ana alana     | routo              |              | 0.95       |                       | 16                           | nei   | /accumo             | d max press  | 11100           |
|   |                                  |                         | umping stati<br>is used in co |               |                    |              | 1.0        |                       | 15                           |       | oipe)               | u max press  | idio            |
|   | Average her                      |                         |                               | or outilities | 7                  |              | 328        |                       |                              |       |                     |              |                 |
|   |                                  |                         |                               |               |                    |              | 0501       |                       |                              |       |                     |              |                 |
|   | Assumed pu                       |                         |                               |               |                    |              | 85%<br>90% |                       |                              |       |                     |              |                 |
|   | Assumed m<br>Estimated H         |                         |                               |               |                    | 1            |            | hp/pump               |                              |       |                     |              |                 |
|   | Latinated                        | ip required             | hor bamb                      |               |                    |              |            | kw/pump               |                              |       |                     |              |                 |
|   | Total hp per                     | pump sta                | tion (not cou                 | nting span    | e)                 | 8,           | ,125       | hp/station            |                              |       |                     |              |                 |
|   | Total kw per                     | r pump set              | (set=pump                     | s in series   | along route)       | 1,           | 625        | kw/pump set           | (one pump a                  | t eac | h station)          |              |                 |
|   | Linit consta                     | etion cost              | for each pur                  | nn etation    | (from cost c       | u \$ 1       | 307        | ner firm hn o         | of pump station              |       |                     |              |                 |
|   |                                  |                         | pump station                  |               | (IIOIII COSt C     |              |            | million               | n pump station               |       |                     |              |                 |
|   | Balancing re                     |                         | pannp ciano.                  |               |                    |              |            | million _             | 6                            | 0 mir | n. of store         | ge at avg p  | umping rate     |
|   |                                  | Total cons              | truction cost                 | per pump      | station            | \$ 1         | 1.37       | million               |                              | ) mg  |                     |              | CILI PAI        |
| (6)                                     | No. of pump                      | stations f              | rom above                     |               |                    |              | 1.0        | each                  | \$ 0.15                      | per   | r gal for o         | pen top rese | ervoir          |
|   | Total const                      | nuction one             | t in millions                 |               |                    | s            | 11.4       | million               |                              |       |                     |              |                 |
|   | Total constr                     |                         | t in millions                 |               |                    |              |            | million               |                              |       |                     |              |                 |
|   | Total capita                     |                         |                               | 3             |                    |              |            | million               |                              |       |                     |              |                 |
|   |                                  |                         |                               | ongres-c      |                    |              | ngogi vies | 2.002.126-2.00        |                              |       |                     |              |                 |
|   |                                  |                         | t for pump s                  | tations       |                    |              |            | million               |                              | , -   | tionat - d -        | tanat        | at an 0/ -f1-1- |
|   |                                  | Value of e              |                               | nont          |                    | \$           |            | million               | 409                          | 6 Es  | timated e           | quipment co  | st as % of tota |
|   |                                  |                         | life of equipn<br>maintenance |               | ent cost           | s            |            | years<br>million/year |                              |       |                     |              |                 |
|   |                                  | -omnated                | mannenano                     | on opiacen    | ioni oosi          | •            | 0.20       | mmor//yedi            |                              |       |                     |              |                 |
|   |                                  |                         |                               |               |                    |              |            |                       |                              |       |                     |              |                 |

### **O&M Costs**

| Year                             | Flow purr<br>yea  |          | No. of pump "sets" | Energy<br>used     | used |                  |          | st                | CO | other O&M<br>ests - Pump<br>Stations | RWTM |                      | Total O&M<br>cost |                      | Ne | t present<br>value |
|----------------------------------|-------------------|----------|--------------------|--------------------|------|------------------|----------|-------------------|----|--------------------------------------|------|----------------------|-------------------|----------------------|----|--------------------|
|                                  | ac-ft/yr          | mgd      | operating<br>/day  | (kwh/day)          |      | (\$/day)         |          | Million \$ /year) |    | (Million \$<br>/year)                |      | Million \$<br>/year) |                   | Million \$<br>/year) |    | (\$)               |
| 2015                             | 73,000            | 65       | 3.02               | 117,667            | \$   | 8,237            | \$       | 3.01              | \$ | 0.23                                 | \$   | 0.100                | \$                | 3.33                 | \$ | 3.33               |
| 2016                             | 73,000            | 65       | 3.02               | 117,667            | \$   | 8,237            | \$       | 3.01              | \$ | 0.23                                 | \$   | 0.100                | \$                | 3.33                 | \$ | 3.17               |
| 2017                             | 73,000            | 65       | 3.02               | 117,667            | \$   | 8,237            | \$       | 3.01              | \$ | 0.23                                 | \$   | 0.100                | \$                | 3.33                 | \$ | 3.02               |
| 2018                             | 73,000            | 65       | 3.02               | 117,667            | \$   | 8,237            | \$       | 3.01              | \$ | 0.23                                 | \$   | 0.100                | \$                | 3.33                 | \$ | 2.88               |
| 2019                             | 73,000            | 65       | 3.02               | 117,667            | \$   | 8,237            | \$       | 3.01              | \$ | 0.23                                 | \$   | 0.100                | \$                | 3.33                 | \$ | 2.74               |
| 2020                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 4.06               |
| 2021                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.86               |
| 2022                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.68               |
| 2023                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.51               |
| 2024                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.34               |
| 2025                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.18               |
| 2026                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 3.03               |
| 2027                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 2.88               |
| 2028                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 2.75               |
| 2029                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 2.62               |
| 2030                             | 95,402            | 85       | 3.94               | 153,777            | \$   | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 2.05               |
| 2031                             | 95,402            | 85       | 3.94               | 153,777            | \$   | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 1.95               |
| 2032                             | 95,402            | 85       | 3.94               | 153,777            | \$   | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 1.86               |
| 2033                             | 95,402            | 85<br>85 | 3.94               | 153,777            | \$   | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 1.77               |
| 2034                             | 95,402            |          | 3.94               | 153,777            | 5    | 10,764           |          | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 1.68               |
| 2035                             | 95,402            | 85<br>85 | 3.94               | 153,777            | S    | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.26                 | \$ | 1.60               |
| 2036                             | 95,402            | 85       | 3.94               | 153,777            | S    | 10,764           | \$       | 3.93              |    | 0.23                                 | \$   | 0.100                | \$                | 4.26<br>4.26         | \$ | 1.53               |
| 2037                             | 95,402            | 85       | 3.94               | 153,777            | S    | 10,764           | \$       | 3.93              | \$ | 0.23                                 | \$   | 0.100                | 5                 |                      | \$ | 1.46               |
| 2038                             | 95,402            | 85       | 3.94<br>3.94       | 153,777<br>153,777 | S    | 10,764<br>10,764 | S        | 3.93              | \$ | 0.23                                 | \$   | 0.100                | S                 | 4.26<br>4.26         | S  | 1.39<br>1.32       |
| 2039                             | 95,402<br>106,603 | 95       | 4.41               | 171,831            | S    | 12,028           | S        | 4.39              | S  | 0.23                                 | S    | 0.100                | S                 | 4.72                 | S  | 1.32               |
| 2040                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | S        | 4.39              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.72                 | S  | 1.33               |
| 2041                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | \$       | 4.39              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.72                 | \$ | 1.26               |
| 2042                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | \$       | 4.39              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.72                 | \$ | 1.20               |
| 2043                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | \$       | 4.39              | \$ | 0.23                                 | \$   | 0.100                | \$                | 4.72                 | S  | 1.15               |
| 2045                             | 106,603           | 95       | 4.41               | 171,831            | Š    | 12,028           | \$       | 4.39              | \$ | 0.23                                 | 5    | 0.100                | \$                | 4.72                 | Š  | 1.09               |
| 2046                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | s        | 4.39              | s  | 0.23                                 | s    | 0.100                | \$                | 4.72                 | S  | 1.04               |
| 2047                             | 106,603           | 95       | 4.41               | 171,831            | Š    | 12,028           | Š        | 4.39              | Š  | 0.23                                 | Š    | 0.100                | Š                 | 4.72                 | Š  | 0.99               |
| 2048                             | 106,603           | 95       | 4.41               | 171,831            | š    | 12,028           | Š        | 4.39              | \$ | 0.23                                 | \$   | 0.100                | Š                 | 4.72                 | \$ | 0.94               |
| 2049                             | 106,603           | 95       | 4.41               | 171,831            | \$   | 12,028           | \$       | 4.39              | \$ | 0.23                                 | S    | 0.100                | \$                | 4.72                 | \$ | 0.90               |
| 2050                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | s  | 0.23                                 | s    | 0.100                | S                 | 5.18                 | s  | 0.94               |
| 2051                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | S  | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | S  | 0.89               |
| 2052                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.85               |
| 2053                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.81               |
| 2054                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.77               |
| 2055                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.74               |
| 2056                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.70               |
| 2057                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.67               |
| 2058                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.64               |
| 2059                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.61               |
| 2060                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.58               |
| 2061                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.55               |
| 2062                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.52               |
| 2063                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.50               |
| 2064                             | 117,804           | 105      | 4.87               | 189,886            | \$   | 13,292           | \$       | 4.85              | \$ | 0.23                                 | \$   | 0.100                | \$                | 5.18                 | \$ | 0.47               |
| 2065 117,804 105 4.87 189,886 \$ |                   |          |                    | 13,292             | \$   | 4.85             | \$       | 0.23              | \$ | 0.100                                | \$   | 5.18                 | \$                | 0.45                 |    |                    |
|                                  |                   |          |                    |                    |      |                  |          |                   |    |                                      |      | Total NPV            | of C              | O&M Costs            | \$ | 86.6               |
| Capital Costs is willian 6.      |                   |          |                    |                    |      |                  | Yr built |                   |    |                                      |      |                      |                   |                      |    |                    |
| Capital Costs in million \$:     |                   |          |                    |                    | \$   | 70.1             | -        | 2015              | Ě  |                                      |      |                      | \$                | 70.1                 |    |                    |
| RWTM Pumping Stations            |                   |          |                    | ns                 | S    | 15.7             |          | 2015              |    |                                      |      |                      | S                 | 15.7                 |    |                    |
|                                  |                   |          |                    | , amping on        | utio |                  | •        | 10.7              |    | 2010                                 | T    | otal NPV of          | Ca                | pital Costs          |    | 85.8               |
|                                  |                   |          |                    |                    |      |                  |          |                   |    |                                      |      |                      |                   | F 50010              | -  |                    |

Total NPV of Capital and O&M Costs in millions \$

North Caldwell Co\_Alt3B;RWTM B

O&M Cost Calculations
WTP and Raw Water Storage Reservoir at WTP
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

2015 Contingency = 20%
5% Engineering, Legal, Admin. = 15%
50 years Environmental & Archaeology Studies &
\$ 0.07 per kwh Mitgation, Surveying, and Land Acquisition = \$ 25,000 per acre Initial year of analysis period Interest rate Evaluation period Unit cost of energy

# Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

| Treated Water Production by Treatment Typ  | e (from Den   | nand Chart - | BE SURE TO C                                 | HECK)        |                        |                                  |                |            |          |
|--|---------------|--------------|--|--------------|------------------------|----------------------------------|----------------|------------|----------|
|  |               | Year =       | 2015   | 2020         | 2030                   | 2040                             | 2050           | 2060       | 2065     |
| Softened water demand;   |               | Units        |  |              |                        |                                  |                |            |          |
| Average yearly demands:  |               | Olino        |  |              |                        |                                  |                |            |          |
| City of Austin   |               | ac-ft/yr     | 0  | 0            | 16802                  | 22403                            | 33604          | 33604      | 33604    |
| LCRA   |               | ac-ft/yr     | 0  | 0            | 5600                   | 11200                            | 11200          | 11200      | 11200    |
| Totals   |               | ac-ft/yr     | 0  | 0            | 22402                  | 33603                            | 44804          | 44804      | 44804    |
| Totals   |               | mgd          | ő  | ő            | 20                     | 30                               | 40             | 40         | 40       |
| Max day demands:   |               |              |  |              |                        |                                  |                |            |          |
| City of Austin   |               | mgd          | 0  | 0            | 25                     | 35                               | 50<br>20       | 50<br>20   | 50<br>20 |
| LCRA   |               | mgd          | 0  | 0            | 10                     | 20                               | 20             | 20         | 20       |
| Totals   |               | mgd          | 0  | 0            | 35                     | 55                               | 70             | 70         | 70       |
| SAWS reduced demand scena  | arilo was for |              |  |              |                        |                                  |                |            |          |
| 139,000 ac-ft/yr in 2020, but only 117 would be temporar                                 | ,804 ac-ft/yr | Year =       | 2015   | 2020         | 2030                   | 2040                             | 2050           | 2060       | 2065     |
| Non-softened water demands:  | ily available | Units        |  |              |                        |                                  |                |            |          |
| Average yearly demands:  |               | - Olino      |  | \            |                        |                                  |                |            |          |
| SAWS   |               | ac-ft/yr     | 73000  | 117804       | 205000                 | 205000                           | 205000         | 205000     | 205000   |
| SARA   |               | ac-ft/yr     | 0  | 0            | 28433                  | 31393                            | 34411          | 37530      | 41128    |
| GBRA   |               | ac-ft/yr     | 0  | 0            | 6000                   | 8000                             | 10000          | 12300      | 12300    |
| Totals   | ~             |              | 73000  | 117804       | 239433                 | 244393                           | 249411         | 254830     | 258428   |
| Totals   |               | mgd          | 65   | 105          | 214                    | 218                              | 223            | 227        | 231      |
| Max day demands:   |               |              |  |              |                        |                                  |                |            |          |
| SAWS   |               | mgd          | 85   | 137          | 238                    | 238                              | 238            | 238        | 238      |
| SARA   |               | mgd          | 0  | 0            | 33                     | 36                               | 40             | 44         | 48       |
| GBRA   |               | mgd          | 0  | 0            | 5                      | 7                                | 9              | 11         | 11       |
| Totals   |               | mgd          | 85   | 137          | 276                    | 281                              | 287            | 293        | 297      |
| Total: softened and non-softened water d   | emands        |              |  |              |                        |                                  |                |            |          |
| Average yearly demand  |               | ac-ft/yr     | 73000  | 117804       | 261835                 | 277996                           | 294215         | 299634     | 303232   |
|  |               | mgd          | 65   | 105          | 234                    | 248                              | 263            | 267        | 271      |
| Max day demand   |               | mgd          | 85   | 137          | 311                    | 336                              | 357            | 363        | 367      |
| Raw Water Reservoir  Sizing for ultimate conditions:  Assumed number of days of consecut | tive Max Day  | demands      | 30   | days         |                        |                                  | ×              |            |          |
| Design (Max. Day) treated water produ  |               |              |  | mgd          |                        |                                  |                |            |          |
| Average treated water production in r  |               |              |  | mgd          |                        |                                  | ground and raw | water that |          |
| Difference (shortfall of ray   | 17.           |              | or the second                                | mgd          | can be pumped          | to the WTP)                      |                |            |          |
|  |               |              |  |              |                        |                                  |                |            |          |
| Required storage reservoir for raw wa  | ter           |              | 2,889<br>8.868                               | mg<br>ac-ft  |                        |                                  |                |            |          |
| Add safety factor  | 25%           |              | 2,217  | ac-ft        |                        |                                  |                |            |          |
| Total storage required   | 2070          |              | 11,084                                       | ac-ft        |                        |                                  |                |            |          |
| Total storage recommended  |               |              | 12,000                                       | ac-ft        |                        | days at averag                   |                | 00         |          |
|  |               |              |  |              | (for exam              | nple, for repair                 | OIRWIMA) =     | 33 d       | ays      |
|  |               |              | Volume/each                                  | Unit Cost    | Total                  | Contigency,                      | Total Capital  |            |          |
|  | Quantity      | Units        | (acre-feet)                                  | (\$/ac-ft))  | Construction<br>Cost   | Eng., etc.                       | Cost           |            |          |
| Reservoirs   | 1             | each         | 12,000                                       | \$ 1,283     | \$ 15.4                | \$ 5.9                           | \$ 21.3        |            |          |
| Estimated average depth of reservoir<br>Surface area of reservoir                        |               | 25<br>480    | ft   |              |                        |                                  |                |            |          |
| Ratio of total land area reqd to surface   | e area        | -            | acres  |              |                        |                                  |                |            |          |
| of reservoir   |               | 1.10         |  |              |                        | aeology, Surv,                   |                |            |          |
| Total land area reqd for reservoirs  |               | 528          | acres  |              | a<br>Total capital cos | nd Land Acq =<br>t in millions = | \$ 34.5        |            |          |
| Assumed life of reservoir  |               | 100          | years  |              |                        |                                  |                |            |          |
| Estimated replacement cost   |               | \$ 0.15      | million/year                                 |              |                        |                                  |                |            |          |
| Estimated replacement cost Estimated maintenance Total                                   |               | \$ 0.04      | million/year<br>million/year<br>million/year | Mowing, main | taining fences, e      | tc.                              |                |            |          |
| Year built   |               | 2015         |  |              |                        |                                  |                |            |          |
| NPV of O&M costs<br>NPV of Capital costs   |               |              | million<br>_million                          |              |                        |                                  |                |            |          |
| Total NPV of Capital and O&M Costs   |               | \$ 38.0      | million                                      |              |                        |                                  |                |            |          |

# WTP

# Plant Phasing and Capital Costs:

| Softening Treatment Trains Year =                             |    | 2015     |    | 2020     |    | 2030     |    | 2040    |    | 2050 | ,   | 2060     |    | 208 | 35  |
|---|----|----------|----|----------|----|----------|----|---------|----|------|-----|----------|----|-----|-----|
| Average treated water production in mgd                       |    | 0        | -  | 0        |    | 20       | -  | 30      | -  | 2000 | 40  | <br>4    | 0  | 200 | 40  |
| Design (Max. Day) treated water production reg'd in mgd       |    | o        |    | 0        |    | 35       |    | 55      |    |      | 70  | 7        |    |     | 70  |
| Initial/additional Max day capacity built (mgd)               |    |          |    | U        |    | 50       |    | 20      |    |      |     |          | •  |     |     |
|   |    | 0        |    | 0        |    | 50       |    | 70      |    |      | 70  | 7        | 0  |     | 70  |
| Total capacity on line (must exceed Design Max Day Req'd)     |    | U        |    | U        |    | 50       |    | 70      |    |      | 70  | ,        | U  |     | /(  |
| Unit cost for max day treatment capacity (\$/gpd of capacity) |    |          |    |          | \$ | 1.78     | \$ | 2.14    |    |      |     |          |    |     |     |
| Estimated construction cost of expansion in \$millions        | \$ | -        | \$ | 140      | \$ | 89.0     | \$ | 42.8    | \$ |      | ×   | \$       | \$ |     | -   |
| Non-softening Treatment Trains Year ■                         |    | 2015     |    | 2020     |    | 2030     |    | 2040    |    | 2050 |     | 2060     |    | 206 | 25  |
|   | _  | 2015     | -  | 105      |    | 214      | -  | 218     | -  | 2000 | 223 | <br>2000 | 7  | 200 | 231 |
| Average treated water production in mgd                       |    |          |    |          |    |          |    | 281     |    |      | 287 | 29       |    |     | 297 |
| Design (Max. Day) treated water production req'd in mgd       |    | 85       |    | 137      |    | 276      |    | 201     |    |      | 201 | 29       | 3  |     | 28  |
| Additional Max day capacity built (mgd)                       |    | 100      |    | 100      |    | 100      |    |         |    |      |     |          | •  |     | -   |
| Total capacity on line (must exceed Design Max Day Req'd)     |    | 100      |    | 200      |    | 300      |    | 300     |    |      | 300 | 30       | U  |     | 300 |
| Unit cost for max day treatment capacity (\$/gpd of capacity) | \$ | 1.32     | \$ | 1.32     | \$ | 1.32     |    |         |    |      |     |          |    |     |     |
| Estimated construction cost of expansion in \$millions        | \$ | 131.5    | \$ | 131.5    | \$ | 131.5    | \$ | - 1     | \$ |      | ě   | \$<br>٠  | \$ |     | •   |
| Totals (Softening + Non-softening Trains)                     |    |          |    | 1000000  |    | 12.00221 |    | 1-50-00 |    |      | 207 |          |    |     |     |
| Year = .  |    | 2015     |    | 2020     |    | 2030     |    | 2040    |    | 2050 | )   | <br>2060 |    | 200 | 35  |
| Total construction cost for both trains                       | \$ | 131.5    | \$ |          | \$ | 220.5    | \$ |         | \$ |      | -   | \$       | \$ |     | -   |
| Contingencies   | _  | 26.3     |    | 26.3     |    | 44.1     |    | 8.6     |    |      | -   | <br>     |    |     | -   |
| Subtotal  | \$ | 157.8    | \$ |          | \$ | 264.7    | \$ |         | \$ |      | •   | \$<br>-  | \$ |     | -   |
| Engineering, Legal, & Administrative                          |    | 23.7     |    | 23.7     | _  | 39.7     |    | 7.7     |    |      | _   | <br>-    |    |     | -   |
| Subtotal  |    | 181.5    |    | 181.5    |    | 304.4    |    | 59.0    |    |      |     |          |    |     |     |
| Environmental & Archaelogy Studies and Mitigation & Land      |    |          |    |          |    |          |    |         |    |      |     |          |    |     |     |
| Acquisition and Surveying (see Note below)                    |    | 2.5      |    |          |    |          |    |         |    |      |     |          |    |     |     |
| Total estimated capital cost                                  | \$ | 184.0    | \$ | 181.5    | \$ | 304.4    | \$ | 59.0    | \$ |      | -   | \$<br>•  | \$ | 0   |     |
| NPV of capital cost   |    | \$ 184.0 |    | \$ 142.2 |    | \$ 146.4 |    | \$ 17.4 |    | \$   | 2   | \$ -     |    | \$  | -   |
| Total NPV of WTP initial construction & expansions            | \$ | 490      |    |          |    |          |    |         |    |      |     |          |    |     |     |
| Note: Assumed land requirement for WTP (not including reserv  |    | 100      | ac | res      |    |          |    |         |    |      |     |          |    |     |     |

| O&M Costs for | Softening Tra                   | ains:            |      |                    |      |                    |    |                     | O&M Costs fo | r Non-Softening           | Trains;                                  |    |                       |      |             |    |                    |  |
|---------------|---------------------------------|------------------|------|--------------------|------|--------------------|----|---------------------|--------------|---------------------------|--|----|-----------------------|------|-------------|----|--------------------|--|
| Year          | Plant<br>Capacity in<br>service | treated<br>water | Esti | mated C<br>unit co |      | cost from<br>urve  | N  | et present<br>value | Year         | Plant Capacity in service | Estimated<br>treated water<br>production | E  | stimated O<br>unit co |      |             |    | t present<br>value |  |
|               | mgd of capacity                 | mgd<br>produced  |      | per mg<br>eated    | \$   | \$million<br>/year |    | (\$)                |              | mgd of<br>capacity        | mgd<br>produced                          | 1  | \$ per mg<br>treated  | \$mi | llion /year |    | (\$)               |  |
| 2015          |                                 | -                |      |                    | \$   | -                  | \$ | -                   | 2015         | 100                       | 65                                       | \$ | 436                   | 5    | 10.37       | \$ | 10.37              |  |
| 2016          | -                               |                  |      |                    | \$   | -                  | \$ | -                   | 2016         | 100                       | 65                                       | 5  | 436                   | \$   | 10.37       | \$ | 9.87               |  |
| 2017          | -                               | -                |      |                    | \$   | -                  | \$ | -                   | 2017         | 100                       | 65                                       | \$ | 436                   | \$   | 10.37       | \$ | 9.40               |  |
| 2018          |                                 |                  |      |                    | Š    |                    | \$ | -                   | 2018         | 100                       | 65                                       | Š  | 436                   | s    | 10.37       | \$ | 8.96               |  |
| 2019          |                                 | -                |      |                    | Š    | -                  | \$ | -                   | 2019         | 100                       | 65                                       | \$ | 436                   | Š    | 10.37       | \$ | 8.53               |  |
| 2020          |                                 | -                |      |                    | Š    |                    | Š  | -                   | 2020         | 200                       | 105                                      | Š  | 374                   | Š    | 14.37       | Š  | 11.26              |  |
| 2021          |                                 |                  |      |                    | Š    |                    | Š  | _                   | 2021         | 200                       | 105                                      | š  | 374                   | š    | 14.37       | Š  | 10.73              |  |
| 2022          | 2                               | -                |      |                    | Š    | -                  | Š  | -                   | 2022         | 200                       | 105                                      | š  | 374                   | Š    | 14.37       | Š  | 10.21              |  |
| 2023          |                                 | -                |      |                    | \$   |                    | \$ | -                   | 2023         | 200                       | 105                                      | \$ | 374                   | Š    | 14.37       | \$ | 9.73               |  |
| 2024          | -                               | -                |      |                    | Š    | -                  | \$ | -                   | 2024         | 200                       | 105                                      | \$ | 374                   | \$   | 14.37       | \$ | 9.26               |  |
|               | -                               | -                |      |                    |      | -                  | S  | -                   |              | 200                       | 105                                      | Š  | 374                   | Š    | 14.37       | Š  |                    |  |
| 2025          | -                               | -                |      |                    | \$   | -                  | \$ | -                   | 2025         |                           | 105                                      |    | 374                   | \$   |             |    | 8.82<br>8.40       |  |
| 2026          | -                               | -                |      |                    | \$   | •                  | *  | -                   | 2026         | 200                       |  | \$ |                       |      | 14.37       | \$ |                    |  |
| 2027          | -                               | -                |      |                    | \$   | -                  | \$ | -                   | 2027         | 200                       | 105                                      | \$ | 374                   | \$   | 14.37       | \$ | 8.00               |  |
| 2028          | -                               | -                |      |                    | \$   | -                  | \$ | -                   | 2028         | 200                       | 105                                      | \$ | 374                   | \$   | 14.37       | \$ | 7.62               |  |
| 2029          |                                 |                  |      |                    | \$   |                    | \$ |                     | 2029         | 200                       | 105                                      | \$ | 374                   | \$   | 14.37       | \$ | 7.26               |  |
| 2030          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 2.50                | 2030         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 12.86              |  |
| 2031          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 2.38                | 2031         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 12.24              |  |
| 2032          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 2.27                | 2032         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 11.66              |  |
| 2033          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 2.16                | 2033         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 11.11              |  |
| 2034          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 2.06                | 2034         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 10.58              |  |
| 2035          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 1.96                | 2035         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 10.07              |  |
| 2036          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 1.87                | 2036         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 9.59               |  |
| 2037          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 1.78                | 2037         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 9.14               |  |
| 2038          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 1.69                | 2038         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 8.70               |  |
| 2039          | 50                              | 20               | \$   | 712                | \$   | 5.20               | \$ | 1.61                | 2039         | 300                       | 214                                      | \$ | 343                   | \$   | 26.73       | \$ | 8.29               |  |
| 2040          | 70                              | 30               | \$   | 661                | \$   | 7.24               | 5  | 2.14                | 2040         | 300                       | 218                                      | \$ | 343                   | \$   | 27.28       | \$ | 8.06               |  |
| 2041          | 70                              | 30               | \$   | 661                | \$   | 7.24               | \$ | 2.04                | 2041         | 300                       | 218                                      | \$ | 343                   | \$   | 27.28       | 5  | 7.67               |  |
| 2042          | 70                              | 30               | \$   | 661                | \$   | 7.24               | S  | 1.94                | 2042         | 300                       | 218                                      | \$ | 343                   | \$   | 27.28       | S  | 7.31               |  |
| 2043          | 70                              | 30               | \$   | 661                | \$   | 7.24               | \$ | 1.85                | 2043         | 300                       | 218                                      | \$ | 343                   | s    | 27.28       | \$ | 6.96               |  |
| 2044          | 70                              | 30               | Š    | 661                | Š    | 7.24               | Š  | 1.76                | 2044         | 300                       | 218                                      | Š  | 343                   | Š    | 27.28       | Š  | 6.63               |  |
| 2045          | 70                              | 30               | Š    | 661                | Š    | 7.24               | Š  | 1.68                | 2045         | 300                       | 218                                      | Š  | 343                   | \$   | 27.28       | Š  | 6.31               |  |
| 2046          | 70                              | 30               | Š    | 661                | \$   | 7.24               | \$ | 1.60                | 2046         | 300                       | 218                                      | Š  | 343                   | \$   | 27.28       | \$ | 6.01               |  |
| 2047          | 70                              | 30               | Š    | 661                | Š    | 7.24               | Š  | 1.52                | 2047         | 300                       | 218                                      | Š  | 343                   | \$   | 27.28       | \$ | 5.73               |  |
| 2048          | 70                              | 30               | Š    | 661                | Š    | 7.24               | š  | 1.45                | 2048         | 300                       | 218                                      | š  | 343                   | \$   | 27.28       | Š  | 5.45               |  |
| 2049          | 70                              | 30               | Š    | 661                | Š    | 7.24               | Š  | 1.38                | 2049         | 300                       | 218                                      | Š  | 343                   | Š    | 27.28       | Š  | 5.19               |  |
| 2050          | 70                              | 40               | š    | 661                | \$   | 9.65               | Š  | 1.75                | 2050         | 300                       | 223                                      | Š  | 343                   | š    | 27.84       | Š  | 5.05               |  |
| 2051          | 70                              | 40               | Š    | 661                | \$   | 9.65               | Š  | 1.67                | 2051         | 300                       | 223                                      | Š  | 343                   | Š    | 27.84       | Š  | 4.81               |  |
| 2052          | 70                              | 40               | š    | 661                | Š    | 9.65               | Š  | 1.59                | 2052         | 300                       | 223                                      | Š  | 343                   | Š    | 27.84       | Š  | 4.58               |  |
| 2053          | 70                              | 40               | Š    | 661                | š    | 9.65               | Š  | 1.51                | 2053         | 300                       | 223                                      | Š  | 343                   | Š    | 27.84       | \$ | 4.36               |  |
| 2054          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.44                | 2054         | 300                       | 223                                      | Š  | 343                   | S    | 27.84       | S  | 4.15               |  |
| 2055          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.44                | 2055         | 300                       | 223                                      | \$ | 343                   | \$   | 27.84       | \$ | 3.95               |  |
| 2056          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.31                | 2056         | 300                       | 223                                      | \$ | 343                   | \$   | 27.84       | \$ | 3.77               |  |
|               | 70                              |                  |      |                    |      |                    |    |                     |              |                           |  | \$ | 343                   | \$   |             | \$ |                    |  |
| 2057          | 70                              | 40<br>40         | \$   | 661<br>661         | \$   | 9.65<br>9.65       | \$ | 1.24                | 2057         | 300                       | 223                                      | \$ | 343                   | \$   | 27.84       | \$ | 3.59<br>3.42       |  |
| 2058          |                                 |                  |      |                    | \$   |                    | \$ |                     | 2058         | 300                       | 223                                      |    |                       |      |             |    |                    |  |
| 2059          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.13                | 2059         | 300                       | 223                                      | \$ | 343                   | \$   | 27.84       | \$ | 3.25               |  |
| 2060          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.07                | 2060         | 300                       | 227                                      | \$ | 343                   | \$   | 28.45       | \$ | 3.17               |  |
| 2061          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 1.02                | 2061         | 300                       | 227                                      | \$ | 343                   | \$   | 28.45       | \$ | 3.02               |  |
| 2062          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 0.97                | 2062         | 300                       | 227                                      | \$ | 343                   | \$   | 28.45       | \$ | 2.87               |  |
| 2063          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 0.93                | 2063         | 300                       | 227                                      | \$ | 343                   | \$   | 28.45       | \$ | 2.74               |  |
| 2064          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 0.88                | 2064         | 300                       | 227                                      | \$ | 343                   | \$   | 28.45       | \$ | 2.60               |  |
| 2065          | 70                              | 40               | \$   | 661                | \$   | 9.65               | \$ | 0.84                | 2065         | 300                       | 231                                      | \$ | 343                   | \$   | 28.85       | \$ | 2.52               |  |
|               |                                 |                  | To   | tal NPV            | of O | &M Costs           | \$ | 58                  |              |                           |  |    | Total NPV             | of O | &M Costs    | \$ | 366                |  |

NPV Totals for O&M:
Softening trains
Non-softening Trains
Non-softening Trains
\$ 366
\$ 423

Summary Raw Water Reservoir

Water Treatment Plant Totals

|    | NPV of<br>ital Costs | of O&M<br>Costs | Capital and |     |  |  |  |
|----|----------------------|-----------------|-------------|-----|--|--|--|
| \$ | 34                   | \$<br>3.5       | \$          | 38  |  |  |  |
| \$ | 490                  | \$<br>423       | \$          | 913 |  |  |  |
| S  | 524                  | \$<br>427       | S           | 951 |  |  |  |

# Capital and O&M Cost Calculations

Potable Water Transmission Mains
CTRWTP - Alternate 3B - WTP in Northern Corner of Caldwell County - Delayed SAWS and SARA Demands

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate Evaluation period Unit cost of energy 5% 50 years 0.07 per kwh

### **Summary of Demands**

# Average demands to be delivered in each segment

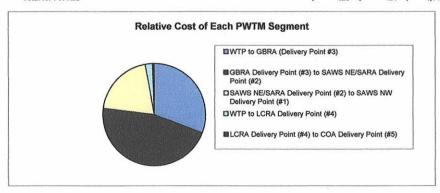
|          |       |        | in acre-feet/ye | ear    |        |        |        |
|----------|-------|--------|-----------------|--------|--------|--------|--------|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |
| SAWS NW  | 43800 | 70682  | 123000          | 123000 | 123000 | 123000 | 123000 |
| SAWS NE  | 29200 | 47122  | 82000           | 82000  | 82000  | 82000  | 82000  |
| Subtotal | 73000 | 117804 | 205000          | 205000 | 205000 | 205000 | 205000 |
| SARA     | 0     | 0      | 28433           | 31393  | 34411  | 37530  | 41128  |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |
| Total    | 73000 | 117804 | 261835          | 277996 | 294215 | 299634 | 303232 |

## Summary

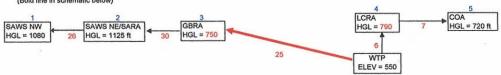
WTP to GBRA (Delivery Point #3)
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)
SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)
WTP to LCRA Delivery Point (#4)
LCRA Delivery Point (#4) to COA Delivery Point (#5)

Total for PWTMs

| C  | PV of apital osts | 0.70 | of O&M<br>osts | Total NPV o<br>Capital and<br>O&M Costs |       |  |  |  |
|----|-------------------|------|----------------|---|-------|--|--|--|
| \$ | 179               | \$   | 144            | \$                                      | 323   |  |  |  |
| \$ | 217               | \$   | 263            | \$                                      | 481   |  |  |  |
| \$ | 207               | \$   | 5              | \$                                      | 211   |  |  |  |
| \$ | 11                | \$   | 12             | \$                                      | 23    |  |  |  |
| \$ | 6                 | \$   | 1              | \$                                      | 7     |  |  |  |
| \$ | 620               | S    | 424            | \$                                      | 1.044 |  |  |  |



## WTP to GBRA (Delivery Point #3) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

# Demands for this pipe segment

| Year    | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 | Max d/Avg o |
|---------|------|------|------|------|------|------|------|-------------|
| GBRA    | 0    | 0    | 5    | 7    | 9    | 11   | 11   | 2.0         |
| SAWS NE | 26   | 42   | 73   | 73   | 73   | 73   | 73   | 1.3         |
| SARA    | 0    | 0    | 25   | 28   | 31   | 34   | 37   | 1.3         |
| SAWS NW | 39   | 63   | 110  | 110  | 110  | 110  | 110  | 1.3         |
| Total   | 65   | 105  | 214  | 218  | 223  | 227  | 231  |             |

|         |      | Max day dem | ands to be del | vered in each s | segment in mgd |      |      |
|---------|------|-------------|----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030           | 2040            | 2050           | 2060 | 2065 |
| GBRA    | 0    | 0           | 11             | 14              | 18             | 22   | 22   |
| SAWS NE | 34   | 55          | 95             | 95              | 95             | 95   | 95   |
| SARA    | 0    | 0           | 33             | 36              | 40             | 44   | 48   |
| SAWS NW | 51   | 82          | 143            | 143             | 143            | 143  | 143  |
| Total   | 85   | 137         | 282            | 289             | 296            | 303  | 308  |

# PWTM and Pump Station Costs

| PWIM and Pump Station Costs             |                      |         |     |   |                 |          |                  |                              |    |
|---|----------------------|---------|-----|---|-----------------|----------|------------------|------------------------------|----|
| Design flow rate - year 2065            |                      |         |     | 308                                     | mgd             |          |                  |                              |    |
|   |                      |         |     | 213,603                                 | gpm             |          |                  |                              |    |
| Pumping capacity of one pump            |                      |         |     | 21,500                                  | gpm             |          |                  |                              |    |
| No. of pumps (not counting spare)       |                      |         |     | 10                                      | 37              |          |                  |                              |    |
| Peak flow rate (all pumps except spa    | re)                  |         |     | 215,000                                 | gpm             |          |                  |                              |    |
|   |                      |         |     |   |                 |          |                  |                              |    |
| Inside diameter of PWTM<br>Area         |                      |         |     | 120<br>78.54                            |                 |          |                  |                              |    |
| Length of PWTM                          |                      |         |     | 100000000000000000000000000000000000000 | miles           | /linked  | to mile          | age in schematic above)      |    |
| rendin or Law Livi                      |                      |         |     | 132,000                                 | 10.1            | (IIIIKGU | to mile          | age in schematic above)      |    |
| Estimated unit cost by condition:       | % of length          | LF      | Ur  | nit cost                                | Cost            |          |                  |                              |    |
| Rural - soil                            | 100%                 | 132,000 | \$  | 783                                     |                 | million  |                  |                              |    |
| Rural - rock                            | 0%                   |         | \$  | 1,048                                   | \$ -            | 50000000 |                  |                              |    |
| Urban - rock                            | 0%                   |         | \$  | 1,186                                   | \$ -            |          |                  |                              |    |
| Olbail 100K                             |                      | 132,000 | - * | 1,100                                   |                 | million  |                  |                              |    |
| Average estimated unit construction     | cost for PWTM        |         | \$  | 783                                     | perLF           |          |                  |                              |    |
| Total acceptantian and in million       |                      |         |     | 400.0                                   |                 |          |                  |                              |    |
| Total construction cost in millions     |                      |         | \$  | 103.3                                   |                 |          |                  |                              |    |
| Contingencies                           |                      |         | \$  | 20.7                                    |                 |          |                  |                              |    |
| Subtotal                                |                      |         | \$  | 124.0                                   |                 |          |                  |                              |    |
| Engineering, Legal & Administrative     |                      |         | \$  | 18.6                                    |                 |          |                  |                              |    |
| Subtotal                                |                      |         | \$  | 142.6                                   |                 |          |                  |                              |    |
| Envir & Arch Studies & Mitigation, Su   | irveying, & Land Acq |         | \$  | 2.5                                     |                 |          |                  |                              |    |
| Total Capital Cost for PW               | /TM in millions      |         | \$  | 145.1                                   |                 |          |                  |                              |    |
| Unit maintenance cost/year-mile         |                      |         | \$  | 10,000                                  | \$/year-mile    | \$       | 0.250            | Million \$/year              |    |
| Velocity at peak flow rate              |                      |         |     | 6.10                                    | fps             |          |                  |                              |    |
| C factor                                |                      |         |     | 120                                     |                 |          |                  |                              |    |
| Head loss per foot                      |                      |         |     | 0.00083                                 | ft/ft           |          | h <sub>1</sub> = | 3.552*QI1.85                 |    |
|   |                      |         |     | 4.40                                    | ft/mile         |          |                  | C*(d) <sup>2.63</sup>        |    |
| Uned to a stand flower                  |                      |         |     | 440                                     |                 |          |                  |                              |    |
| Head loss at peak flow rate             | 0001                 |         |     | 110                                     |                 |          | 750              | B                            |    |
| Allowance for minor losses              | 20%                  |         |     | 22                                      |                 |          |                  | Desired HGL At Delivery Poin | Į. |
| Total estimated losses                  |                      |         |     | 132                                     |                 | -        |                  | Elev. At WTP                 |    |
| Average static head                     |                      |         | -   | 200                                     |                 |          | 200              | ft                           |    |
| Total estimated dynamic head            |                      |         |     | 332                                     |                 |          |                  |                              |    |
|   |                      |         |     | 144                                     | psi             |          |                  |                              |    |
| No of recommended pumping station       |                      |         |     | 0.96                                    |                 |          | 150              | psi (assumed max pressure    |    |
| No. of pumping stations used in cost    | estimate             |         |     | 1                                       |                 |          |                  | in pipe)                     |    |
| Average head per pump station           |                      |         |     | 332                                     | ft              |          |                  |                              |    |
| Assumed pump efficiency                 |                      |         |     | 85%                                     |                 |          |                  |                              |    |
| Assumed motor efficiency                |                      |         |     | 90%                                     |                 |          |                  |                              |    |
| Estimated Hp required per pump          |                      |         |     | 2,356                                   | hp/pump         |          |                  |                              |    |
|   |                      |         |     |   | kw/pump         |          |                  |                              |    |
| Total hp per pump station (not count    | ing spare)           |         |     |   | firm hp/station | 1        |                  |                              |    |
| Total kw per pump set (set≂pumps i      |                      |         |     |   | kw/pump set     |          | ump at           | each station)                |    |
| Unit capital cost for each pump station | on (from cost curve) |         | \$  | 1.047                                   | per firm hp of  | numn s   | tation           |                              |    |
| Construction cost per pump station      | ( 5111 0001 001 00   |         | •   |   | million         | Family 9 |                  |                              |    |
| Total construction cost for pump stat   | ione                 |         |     | 24.7                                    | to              | r        | 1                | pump stations                |    |
| Total constitution cost for pump stat   | 10110                |         |     | 24.1                                    | 10              |          |                  | - bamb aggroup               |    |

Contingencies
Subtotal
Engineering, Legal & Administrative
Total capital cost for pump stations

4.4 34.0 million

40% Estimated equipment cost as % of total

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

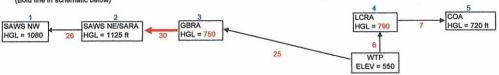
10 million 20 years 0.49 million/year \$ \$

O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used         |     | Energ    | y cos | st                   | cos | her O&M<br>ts - Pump<br>stations | •  | intenance<br>costs -<br>PWTM | To   | otal O&M<br>cost     | Ne | t present<br>value |
|------|---|--|------------------------|-----|----------|-------|----------------------|-----|----------------------------------|----|------------------------------|------|----------------------|----|--------------------|
|      | mgd   |  | (kwh/day)              |     | (\$/day) |       | /illion \$<br>/year) |     | /lillion \$<br>/year)            | (  | Million \$<br>/year)         | (1   | Million \$<br>/year) |    | (\$)               |
| 2015 | 65  | 2.10                                       | 119,009                | \$  | 8,331    | \$    | 3.04                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 3.78                 | \$ | 3.78               |
| 2016 | 65  | 2.10                                       | 119,009                | \$  | 8,331    | \$    | 3.04                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 3.78                 | \$ | 3.60               |
| 2017 | 65  | 2.10                                       | 119,009                | \$  | 8,331    | \$    | 3.04                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 3.78                 | \$ | 3.43               |
| 2018 | 65  | 2.10                                       | 119,009                | \$  | 8,331    | \$    | 3.04                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 3.78                 | \$ | 3.27               |
| 2019 | 65  | 2.10                                       | 119,009                | \$  | 8,331    | \$    | 3.04                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 3.78                 | \$ | 3.11               |
| 2020 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 4.43               |
| 2021 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 4.22               |
| 2022 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 4.02               |
| 2023 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.82               |
| 2024 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.64               |
| 2025 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.47               |
| 2026 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.30               |
| 2027 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.15               |
| 2028 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 3.00               |
| 2029 | 105   | 3.40                                       | 192,051                | \$  | 13,444   | \$    | 4.91                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 5.65                 | \$ | 2.85               |
| 2030 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 5.15               |
| 2031 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 4.91               |
| 2032 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 4.68               |
| 2033 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 4.45               |
| 2034 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 4.24               |
| 2035 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 4.04               |
| 2036 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 3.85               |
| 2037 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 3.66               |
| 2038 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 3.49               |
| 2039 | 214   | 6.90                                       | 390,339                | \$  | 27,324   | \$    | 9.97                 | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.72                | \$ | 3.32               |
| 2040 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 3.23               |
| 2041 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 3.07               |
| 2042 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.93               |
| 2043 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.79               |
| 2044 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.65               |
| 2045 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.53               |
| 2046 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.41               |
| 2047 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.29               |
| 2048 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.18               |
| 2049 | 218   | 7.05                                       | 398,425                | \$  | 27,890   | \$    | 10.18                | \$  | 0.49                             | \$ | 0.250                        | \$   | 10.92                | \$ | 2.08               |
| 2050 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 2.02               |
| 2051 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.92               |
| 2052 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.83               |
| 2053 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.74               |
| 2054 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.66               |
| 2055 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.58               |
| 2056 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.5                |
| 2057 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.43               |
| 2058 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.37               |
| 2059 | 223   | 7.19                                       | 406,605                | \$  | 28,462   | \$    | 10.39                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.13                | \$ | 1.30               |
| 2060 | 227   | 7.35                                       | 415,440                | \$  | 29,081   | \$    | 10.61                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.36                | \$ | 1.26               |
| 2061 | 227   | 7.35                                       | 415,440                | \$  | 29,081   | \$    | 10.61                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.36                | \$ | 1.20               |
| 2062 | 227   | 7.35                                       | 415,440                | \$  | 29,081   | \$    | 10.61                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.36                | \$ | 1.15               |
| 2063 | 227   | 7.35                                       | 415,440                | \$  | 29,081   | \$    | 10.61                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.36                | \$ | 1.09               |
| 2064 | 227   | 7.35                                       | 415,440                | \$  | 29,081   | \$    | 10.61                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.36                | \$ | 1.04               |
| 2065 | 231   | 7.45                                       | 421,305                | \$  | 29,491   | \$    | 10.76                | \$  | 0.49                             | \$ | 0.250                        | \$   | 11.51                | \$ | 1.00               |
|      |   |  |                        |     |          |       |                      |     |                                  |    | Total NPV                    | of C | &M Costs             | \$ | 144                |
|      |   | Capital Costs                              | in million \$:<br>PWTM |     |          | s     | 145                  |     | Yr built                         | S  |                              |      |                      | s  | 145                |
|      |   |  |                        | ine |          | \$    | 145                  |     | 2015                             |    |                              |      |                      | \$ |                    |
|      |   |  | Pumping Stal           | ion | 5        | D.    | 34                   |     | 2015                             |    |                              |      |                      | 3  | 34                 |

Total NPV of Capital and O&M Costs in millions \$
WTP to GBRA (Delivery Point #3) 323

### GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

# Demands for this pipe segment

|         |      | Average dem | ands to be del | ivered in each s | segment in mgd | 1    |      |             |
|---------|------|-------------|----------------|------------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NE | 26   | 42          | 73             | 73               | 73             | 73   | 73   | 1.3         |
| SARA    | 0    | 0           | 25             | 28               | 31             | 34   | 37   | 1.3         |
| SAWS NW | 39   | 63          | 110            | 110              | 110            | 110  | 110  | 1.3         |
| Total   | 65   | 105         | 208            | 211              | 214            | 217  | 220  |             |

Max day demands to be delivered in each segment in mgd 2020 2030 2040 2050

| SAWS NE | 34 | 55  | 95  | 95  | 95  | 95  | 95  |   |
|---------|----|-----|-----|-----|-----|-----|-----|---|
| SARA    | 0  | 0   | 33  | 36  | 40  | 44  | 48  |   |
| SAWS NW | 51 | 82  | 143 | 143 | 143 | 143 | 143 |   |
| Total   | 85 | 137 | 271 | 274 | 278 | 281 | 286 | _ |

### **PWTM and Pump Station Costs**

Design flow rate - year 2065 286 mgd 198,353 gpm 20,000 gpm Pumping capacity of one pump No. of pumps (not counting spare)
Peak flow rate (all pumps except spare) 200,000 gpm Inside diameter of PWTM 120 in. 78.54 sf 30 miles Length of PWTM (linked to mileage in schematic above)

158,400 feet Estimated unit cost by condition: % of length Unit cost 79,200 \$ 39,600 \$ Rural - soil Rural - rock 50% 25% 783 \$ 1,048 \$ 62.0 million 41.5 Urban - rock 25% 39,600 158,400 1,186 46.9

150.5 million Average estimated unit construction cost for PWTM 950 per LF \$ Total construction cost in millions 150.5 Contingencies 30.1 180.6 Subtotal

Engineering, Legal & Administrative 27.1 Subtotal Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions 3.0

Unit maintenance cost/year-mile 10,000 \$/year-mile \$ 0.300 Million \$/year

Velocity at peak flow rate 5.67 fps C factor 120 hr= | 3.552\*Q|<sup>1.85</sup> | C\*(d)<sup>2.63</sup>| 0.00073 ft/ft Head loss per foot 3.85 ft/mile

Head loss at peak flow rate 115 ft 20% 1125 Desired HGL At Delivery Point Allowance for minor losses 23 ft 139 ft 750 HGL At Delivery Point 3 375 ft Total estimated losses 375 ft 514 ft Average static head Total estimated dynamic head 223 psi

No of recommended pumping stations along route No. of pumping stations used in cost estimate 1.48 150 psi (assumed max pressure in pipe) Average head per pump station 257 ft

Assumed pump efficiency Assumed motor efficiency 85% 90% Estimated Hp required per pump 1,695 hp/pump 1,265 kw/pump

Total hp per pump station (not counting spare) 16,951 firm hp/station Total kw per pump set (set=pumps in series along route) 3,390 kw/pump set (one pump at each station)

Unit construction cost for each pump station (from cost curve) 1,127 per firm hp of pump station 19.1 million Construction cost per pump station

38.2 Total construction cost for pump stations 2 \_pump stations

| Contingencies                                    | \$<br>7.6  |              |  |
|--|------------|--------------|--|
| Subtotal   | \$<br>45.9 | -            |  |
| Engineering, Legal & Administrative              | \$<br>6.9  |              |  |
| Total capital cost for pump stations in millions | \$<br>52.7 | million      |  |
|  |            |              | 40% Equip cost as % of constr cos  |
| Value of equipment                               | \$<br>15   | million      | The state of the s |
| Assumed life of equipment                        | 20         | years        |  |
| Estimated maintenance/replacement cost           | \$<br>0.76 | million/year |  |

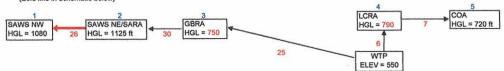
O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used     |     | Energ            | ду с | ost            | co | other O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | т    | otal O&M<br>cost | Ne | et present<br>value |
|------|---|--|--------------------|-----|------------------|------|----------------|----|-------------------------------------|----|-------------------------------|------|------------------|----|---------------------|
|      | mgd   |  | (kwh/day)          |     | (\$/day)         |      | (Million \$    |    | (Million \$                         | (  | (Million \$                   | (    | Million \$       |    | (\$)                |
| 2015 | 65  | 2.26                                       | 184,102            | \$  | 12,887           | \$   | 4.70           | \$ | 0.76                                | \$ | 0.300                         | \$   | 5.77             | \$ | 5.77                |
| 2016 | 65  | 2.26                                       | 184,102            | \$  | 12,887           | \$   | 4.70           | \$ | 0.76                                | \$ | 0.300                         | \$   | 5.77             | \$ | 5.49                |
| 2017 | 65  | 2.26                                       | 184,102            | \$  | 12,887           | \$   | 4.70           | \$ | 0.76                                | \$ | 0.300                         | \$   | 5.77             | \$ | 5.23                |
| 2018 | 65  | 2.26                                       | 184,102            | \$  | 12,887           | \$   | 4.70           | \$ | 0.76                                | \$ | 0.300                         | \$   | 5.77             | \$ | 4.98                |
| 2019 | 65  | 2.26                                       | 184,102            | \$  | 12,887           | \$   | 4.70           | \$ | 0.76                                | \$ | 0.300                         | \$   | 5.77             | \$ | 4.75                |
| 2020 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 6.78                |
| 2021 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 6.46                |
| 2022 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 6.15                |
| 2023 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 5.86                |
| 2024 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 5.58                |
| 2025 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 5.31                |
| 2026 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 5.06                |
| 2027 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | S    | 8.66             | \$ | 4.82                |
| 2028 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | 5  | 4.59                |
| 2029 | 105   | 3.65                                       | 297,096            | \$  | 20,797           | \$   | 7.59           | \$ | 0.76                                | \$ | 0.300                         | \$   | 8.66             | \$ | 4.37                |
| 2030 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | \$   | 15.04          | \$ | 0.76                                | S  | 0.300                         | \$   | 16.11            | \$ | 7.75                |
| 2031 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | \$   | 15.04          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.11            | \$ | 7.38                |
| 2032 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | \$   | 15.04          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.11            | \$ | 7.03                |
| 2033 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | \$   | 15.04          | \$ | 0.76                                | S  | 0.300                         | \$   | 16.11            | \$ | 6.69                |
| 2034 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | S    | 15.04          | \$ | 0.76                                | S  | 0.300                         | \$   | 16.11            | s  | 6.37                |
| 2035 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | s    | 15.04          | \$ | 0.76                                | \$ | 0.300                         | s    | 16.11            | s  | 6.07                |
| 2036 | 208   | 7.24                                       | 588,706            | S   | 41,209           | s    | 15.04          | s  | 0.76                                | s  | 0.300                         | s    | 16.11            | s  | 5.78                |
| 2037 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | \$   | 15.04          | Š  | 0.76                                | S  | 0.300                         | s    | 16.11            | \$ | 5.51                |
| 2038 | 208   | 7.24                                       | 588,706            | \$  | 41,209           | s    | 15.04          | Š  | 0.76                                | s  | 0.300                         | \$   | 16.11            | s  | 5.24                |
| 2039 | 208   | 7.24                                       | 588,706            | s   | 41,209           | s    | 15.04          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.11            | s  | 4.99                |
| 2040 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | Š    | 15.23          | Š  | 0.76                                | \$ | 0.300                         | Š    | 16.30            | \$ | 4.81                |
| 2041 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | \$   | 15.23          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.30            | \$ | 4.58                |
| 2042 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | \$   | 15.23          | Š  | 0.76                                | \$ | 0.300                         | \$   | 16.30            | \$ | 4.36                |
| 2043 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | \$   | 15.23          | \$ | 0.76                                | \$ | 0.300                         | s    | 16.30            | Š  | 4.16                |
| 2044 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | \$   | 15.23          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.30            | Š  | 3.96                |
| 2045 | 211   | 7.33                                       | 596,171            | s   | 41,732           | \$   | 15.23          | \$ | 0.76                                | Š  | 0.300                         | \$   | 16.30            | Š  | 3.77                |
| 2046 | 211   | 7.33                                       | 596,171            | s   | 41,732           | Š    | 15.23          | \$ | 0.76                                | \$ | 0.300                         | š    | 16.30            | Š  | 3.59                |
| 2047 | 211   | 7.33                                       | 596,171            | \$  | 41,732           | s    | 15.23          | \$ | 0.76                                | \$ | 0.300                         | s    | 16.30            | S  | 3.42                |
| 2048 | 211   | 7.33                                       | 596,171            | Š   | 41,732           | \$   | 15.23          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.30            | Š  | 3.26                |
| 2049 | 211   | 7.33                                       | 596,171            | S   | 41,732           | Š    | 15.23          | Š  | 0.76                                | Š  | 0.300                         | Š    | 16.30            | Š  | 3.10                |
| 2050 | 214   | 7.42                                       | 603,782            | 5   | 42,265           | \$   | 15.43          | 5  | 0.76                                | Š  | 0.300                         | \$   | 16.49            | \$ | 2.99                |
| 2051 | 214   | 7.42                                       | 603,782            | S   | 42,265           | Š    | 15.43          | S  | 0.76                                | 5  | 0.300                         | Š    | 16.49            | Š  | 2.85                |
| 2052 | 214   | 7.42                                       | 603,782            | S   | 42,265           | \$   | 15.43          | Š  | 0.76                                | S  | 0.300                         | \$   | 16.49            | Š  | 2.71                |
| 2052 | 214   | 7.42                                       | 603,782            | \$  | 42,265           | \$   | 15.43          | Š  | 0.76                                | Š  | 0.300                         | \$   | 16.49            | Š  | 2.58                |
| 2054 | 214   | 7.42                                       | 603,782            | S   | 42,265           | \$   | 15.43          | Š  | 0.76                                | \$ | 0.300                         | \$   | 16.49            | S  | 2.46                |
| 2055 | 214   | 7.42                                       | 603,782            | S   | 42,265           | \$   | 15.43          | S  | 0.76                                | \$ | 0.300                         | \$   | 16.49            | Š  | 2.34                |
|      | 214   | 7.42                                       |                    | \$  | 42,265           | \$   | 15.43          | S  | 0.76                                | \$ | 0.300                         | S    | 16.49            | S  | 2.23                |
| 2056 |   | 127.000                                    | 603,782            |     |                  | \$   |                |    |                                     |    |                               | \$   | 16.49            | 5  | 2.23                |
| 2057 | 214<br>214  | 7.42<br>7.42                               | 603,782<br>603,782 | \$  | 42,265<br>42,265 | \$   | 15.43<br>15.43 | \$ | 0.76<br>0.76                        | \$ | 0.300                         | \$   | 16.49            | \$ | 2.12                |
|      |   |  |                    |     |                  |      |                |    |                                     |    |                               | 1000 |                  |    |                     |
| 2059 | 214   | 7.42                                       | 603,782            | \$  | 42,265           | \$   | 15.43          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.49            | \$ | 1.93                |
| 2060 | 217   | 7.52                                       | 611,648            | \$  | 42,815           | \$   | 15.63          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.69            | \$ | 1.86                |
| 2061 | 217   | 7.52                                       | 611,648            | \$  | 42,815           | \$   | 15.63          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.69            | \$ | 1.77                |
| 2062 | 217   | 7.52                                       | 611,648            | \$  | 42,815           | \$   | 15.63          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.69            | \$ | 1.69                |
| 2063 | 217   | 7.52                                       | 611,648            | \$  | 42,815           | \$   | 15.63          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.69            | \$ | 1.60                |
| 2064 | 217   | 7.52                                       | 611,648            | \$  | 42,815           | \$   | 15.63          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.69            | \$ | 1.53                |
| 2065 | 220   | 7.63                                       | 620,722            | \$  | 43,451           | \$   | 15.86          | \$ | 0.76                                | \$ | 0.300                         | \$   | 16.92            |    | 1.48                |
|      |   |  |                    |     |                  |      |                |    |                                     |    | Total NPV                     | of ( | D&M Costs        | \$ | 217.2               |
|      |   | Capital Costs                              | in million \$:     |     |                  |      |                |    | Yr built                            |    |                               |      |                  |    |                     |
|      |   |  | PWTM               |     |                  | \$   | 210.6          | _  | 2015                                |    |                               |      |                  | \$ | 210.6               |
|      |   |  | Pumping Stati      | 000 |                  | Š    | 52.7           |    | 2015                                |    |                               |      |                  | s  | 52.7                |
|      |   |  |                    |     |                  | ಾ    | 32.1           |    |                                     |    |                               |      |                  |    | 32.1                |

Total NPV of Capital and O&M Costs in millions \$
GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)

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# SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

# Demands for this pipe segment Demands

|         |      | Average dem | ands to be deli | ivered in each s | segment in mgd | I    |      |             |
|---------|------|-------------|-----------------|------------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NW | 39   | 63          | 110             | 110              | 110            | 110  | 110  | 1.3         |
| Total   | 39   | 63          | 110             | 110              | 110            | 110  | 110  |             |

|         |      | Max day dem | ands to be deli | ivered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040             | 2050           | 2060 | 2065 |
| SAWS NW | 51   | 82          | 143             | 143              | 143            | 143  | 143  |
| Total   | 51   | 82          | 143             | 143              | 143            | 143  | 143  |

# **PWTM and Pump Station Costs**

| Design flow rate - year 2065   | 143     | mgd   |  |
|--|---------|-------|--|
| Signature Estate State Andrew Service (Service Service | 99,125  | gpm   |  |
| Pumping capacity of one pump   | 20,000  | gpm   |  |
| No. of pumps (not counting spare)  | 5       |       |  |
| Peak flow rate (all pumps except spare)  | 100,000 | gpm   |  |
| Inside diameter of PWTM  | 120     | in.   |  |
| Area   | 78.54   | sf    |  |
| Length of RWTM   | 26      | miles | (linked to mileage in schematic above) |
| TO 0 - ■ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | 137,280 | feet  |  |

| Estimated unit cost by condition:      | % of length         | LF      | U  | nit cost | Co       | ost   |         |       |                 |
|--|---------------------|---------|----|----------|----------|-------|---------|-------|-----------------|
| Rural - soil                           | 15%                 | 20,592  | \$ | 783      | \$       | 16.1  | million |       |                 |
| Rural - rock                           | 35%                 | 48,048  | \$ | 1,048    | \$       | 50.4  |         |       |                 |
| Urban - rock                           | 50%                 | 68,640  | \$ | 1,186    | \$       | 81.4  |         |       |                 |
|  |                     | 137,280 |    |          | \$       | 147.9 | million |       |                 |
| Average estimated unit construction of | cost for PWTM       |         | \$ | 1,077    | per LF   |       |         |       |                 |
| Total construction cost in millions    |                     |         | \$ | 147.9    |          |       |         |       |                 |
| Contingencies                          |                     |         | \$ | 29.6     |          |       |         |       |                 |
| Subtotal                               |                     |         | \$ | 177.4    | -        |       |         |       |                 |
| Engineering, Legal & Administrative    |                     |         | \$ | 26.6     |          |       |         |       |                 |
| Subtotal                               |                     |         | \$ | 204.1    | -        |       |         |       |                 |
| Envir & Arch Studies & Mitigation, Su  | rveying, & Land Acq |         | \$ | 2.6      | 20       |       |         |       |                 |
| Total Capital Cost for PW              | TM in millions      |         | \$ | 206.7    | 70       |       |         |       |                 |
| Unit maintenance cost/year-mile        |                     |         | \$ | 10,000   | \$/year- | mile  | \$      | 0.260 | Million \$/year |
| Velocity at peak flow rate             |                     |         |    | 2.84     | fps      |       |         |       |                 |

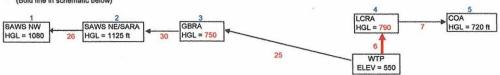
| Unit maintenance cost/year-mile  |     | \$<br>10,000 | \$/year-mile | \$<br>0.260      | Million \$/year               |
|--|-----|--------------|--------------|------------------|-------------------------------|
| Velocity at peak flow rate<br>C factor   |     | 2.84         | fps          |                  |                               |
| Head loss per foot   |     | 0.00020      | ft/ft        | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>      |
|  |     | 1.07         | ft/mile      |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate  |     | 28           | ft           |                  |                               |
| Allowance for minor losses   | 20% | 6            | ft           | 1080             | Desired HGL At Delivery Point |
| Total estimated losses   |     | <br>33       | ft           | 1125             | HGL At Delivery Point 2       |
| Average static head  |     | -45          | ft           | -45              | ft                            |
| Total estimated dynamic head   |     | <br>-12      | ft           |                  |                               |
| United and the state of the sta |     | -5           | psi          |                  |                               |

# Negative indicates gravity flow from #2 to #1; no pumping necessary.

|                              | _   |       |          |                            | M  | lillion \$ |
|------------------------------|-----|-------|----------|----------------------------|----|------------|
| Annual O&M Cost in million   | \$: |       | Yr built |                            |    |            |
| PWTM                         | \$  | 0.260 | 2015     |                            |    |            |
|                              |     |       |          | Total NPV of O&M Costs     |    | \$4.7      |
| Capital Costs in million \$: |     |       | Yr built |                            |    |            |
| PWTM                         | \$  | 206.7 | 2015     |                            | \$ | 206.7      |
|                              |     |       |          | Total NPV of Capital Costs | \$ | 206.7      |

Total NPV of Capital and O&M Costs in millions \$
SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)

# WTP to LCRA Delivery Point (#4) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

# Demands for this pipe segment Demands

|       | Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |             |  |  |  |
|-------|--|------|------|------|------|------|------|-------------|--|--|--|
| Year  | 2015   | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 | Max d/Avg d |  |  |  |
| LCRA  | 0  | 0    | 5    | 10   | 10   | 10   | 10   | 2.0         |  |  |  |
| COA   | 0  | 0    | 15   | 20   | 30   | 30   | 30   | 1.68        |  |  |  |
| Total | 0  | ^    | 20   | 30   | 40   | AD   | 40   |             |  |  |  |

 
 Max day demands to be delivered in each segment in mgd

 2020
 2030
 2040
 2050

 0
 10
 20
 20

 0
 25
 34
 50

 0
 35
 54
 70
 2050 20 50 70 LCRA COA Total

# **PWTM and Pump Station Costs**

| Design flow rate - year 2065            | 70     | mgd   |  |
|---|--------|-------|--|
|   | 48,883 | gpm   |  |
| Pumping capacity of one pump            | 10,000 | gpm   |  |
| No. of pumps (not counting spare)       | 5      |       |  |
| Peak flow rate (all pumps except spare) | 50,000 | gpm   |  |
| Inside diameter of PWTM                 | 60     | in.   |  |
| Area                                    | 19.64  | sf    |  |
| Length of RWTM                          | 6      | miles | (linked to mileage in schematic above) |
|   | 31,680 | feet  |  |
|   |        |       |  |

| Estimated unit cost by condition:       | % of length | LE     | Ur | it cost |       | Cost |         |
|---|-------------|--------|----|---------|-------|------|---------|
| Rural - soil                            | 100%        | 31,680 | \$ | 282     | \$    | 8.9  | million |
| Rural - rock                            | 0%          | -      | \$ | 388     | \$    | -    |         |
| Urban - rock                            | 0%          |        | \$ | 427     | \$    | -    |         |
|   |             | 31,680 |    |         | \$    | 8.9  | million |
| Average estimated unit construction cos | t for PWTM  |        | \$ | 282     | per L | F    |         |

| The age of the anni of the age of | <br>non por nr |
|--|----------------|
| Total construction cost in millions  | \$<br>8.9      |
| Contingencies  | \$<br>1.8      |
| Subtotal   | \$<br>10.7     |
| Engineering, Legal & Administrative  | \$<br>1.6      |
| Subtotal   | \$<br>12.3     |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq   | \$<br>0.6      |
| Total Capital Cost for PWTM in millions  | \$<br>12.9     |

| Half malistan and protein as will- |   | 40.000 |              | • | 0.000 | 14700           |
|------------------------------------|---|--------|--------------|---|-------|-----------------|
| Unit maintenance cost/year-mile    | 9 | 10,000 | \$/year-mile | 3 | 0.060 | Million \$/year |

| Velocity at peak flow rate   |     | 5.67    | fps     |                                   |
|------------------------------|-----|---------|---------|-----------------------------------|
| C factor                     |     | 120     |         |                                   |
| Head loss per foot           |     | 0.00163 | ft/ft   | hr= 13.552*Q11.85                 |
|                              |     | 8.63    | ft/mile | C*(d) <sup>2.63</sup>             |
| Head loss at peak flow rate  |     | 52      | ft      |                                   |
| Allowance for minor losses   | 20% | 10      | ft      | 790 Desired HGL At Delivery Point |
| Total estimated losses       |     | 62      | ft      | 550 Elev. At WTP                  |
| Average static head          |     | 240     | ft -    | 240 ft                            |
| Total estimated dynamic head |     | 302     | ft      |                                   |

| Average static head  | 240 ft  | 240 ft                        |
|--|---------|-------------------------------|
| Total estimated dynamic head   | 302 ft  |                               |
|  | 131 psi |                               |
| No of recommended pumping stations along route   | 0.87    | 150 psi (assumed max pressure |
| No. of pumping stations used in cost estimate  | 1       | in pipe)                      |
| Average head per pump station  | 302 ft  |                               |
| NAMES OF THE PROPERTY OF THE P |         |                               |

| Average head per pump station                                  | 302         | ft                                     |
|--|-------------|--|
| Assumed pump efficiency  | 85%         |  |
| Assumed motor efficiency                                       | 90%         |  |
| Estimated Hp required per pump                                 | 997         | hp/pump                                |
|  | 744         | kw/pump                                |
| Total hp per pump station (not counting spare)                 | 4,987       | firm hp/station                        |
| Total kw per pump set (set=pumps in series along route)        | 997         | kw/pump set (one pump at each station) |
| Unit construction cost for each pump station (from cost curve) | \$<br>1,426 | per firm hp of pump station            |

| Construction cost for each pump station (from cost curve) | \$  | per tim i | np of pur | np stati | on   |
|---|-----|-----------|-----------|----------|------|
| Total construction cost for nump stations                 | 7.1 |           | for       | 1        | numn |

| Total Control of the Parish Control       |   |     |     |   |   |
|---|---|-----|-----|---|---|
| Total construction cost for pump stations |   | 7.1 | for | 1 | pump stations                           |
| Contingencies                             | \$                                      | 1.4 | _   |   | *************************************** |
| Subtotal                                  | \$                                      | 8.5 |     |   |   |
| Engineering, Legal & Administrative       | \$                                      | 1.3 |     |   |   |
|   | *************************************** |     |     |   |   |

Total capital cost for pump stations

\$ 9.8 million

40% Equip cost as % of constr cost

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost

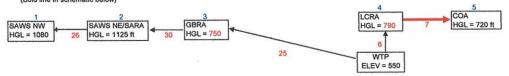
2.8 million 20 years 0.14 million/year

| Year         | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used       |    | Energ          | ду с | ost          | co | ther O&M<br>sts - Pump<br>Stations | c         | intenance<br>osts -<br>PWTM | То   | tal O&M<br>cost      | Ne | t preser<br>value |
|--------------|---|--|----------------------|----|----------------|------|--------------|----|------------------------------------|-----------|-----------------------------|------|----------------------|----|-------------------|
|              | mgd   |  | (kwh/day)            |    | (\$/day)       |      | (Million \$  | (  | Million \$ /year)                  | (1        | Million \$<br>/year)        |      | fillion \$<br>/year) |    | (\$)              |
| 2015         |   |  |                      |    |                |      |              |    |                                    | - Control |                             | \$   |                      | \$ | -                 |
| 2016         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   |                      | \$ |                   |
| 2017         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   |                      | \$ |                   |
| 2018         | V   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | -                    | \$ | -                 |
| 2019         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | •                    | \$ | -                 |
| 2020         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | *                    | \$ |                   |
| 2021         |   |  |                      |    |                |      |              |    |                                    |           |                             | S    | -                    | \$ | -                 |
| 2022         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | •                    | \$ |                   |
| 2023         |   |  |                      |    |                |      |              |    |                                    |           |                             |      | •                    | \$ | 7.50              |
| 2024         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | •                    | \$ |                   |
| 2025         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   | -                    | \$ | -                 |
| 2026<br>2027 |   |  |                      |    |                |      |              |    |                                    |           |                             | S    | 12.1                 | S  | 170               |
| 2028         |   |  |                      |    |                |      |              |    |                                    |           |                             | \$   |                      | Š  |                   |
| 2029         |   |  |                      |    |                |      |              |    |                                    |           |                             | š    |                      | š  |                   |
| 2030         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.5               |
| 2031         | 20  | 1.39                                       | 33,241               | Š  | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | S    | 1.05                 | \$ | 0.4               |
| 2032         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | s    | 1.05                 | \$ | 0.4               |
| 2033         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | s  | 0.14                               | \$        | 0.060                       | s    | 1.05                 | s  | 0.4               |
| 2034         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.4               |
| 2035         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.                |
| 2036         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.3               |
| 2037         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.3               |
| 2038         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.3               |
| 2039         | 20  | 1.39                                       | 33,241               | \$ | 2,327          | \$   | 0.85         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.05                 | \$ | 0.3               |
| 2040         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.4               |
| 2041         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.4               |
| 2042         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.4               |
| 2043         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.3               |
| 2044         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.3               |
| 2045         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.3               |
| 2046         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.3               |
| 2047         | 30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48                 | \$ | 0.3               |
| 2048         | 30<br>30  | 2.08                                       | 49,862               | \$ | 3,490          | \$   | 1.27         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.48<br>1.48         | \$ | 0.                |
| 2049<br>2050 | 40  | 2.08<br>2.78                               | 49,862<br>66,483     | \$ | 3,490<br>4,654 | \$   | 1.27<br>1.70 | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.40                 | \$ | 0.                |
| 2050         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | S  | 0.                |
| 2052         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | Š  | 0.14                               | S         | 0.060                       | S    | 1.90                 | Š  | 0.                |
| 2053         | 40  | 2.78                                       | 66,483               | Š  | 4,654          | Š    | 1.70         | Š  | 0.14                               | \$        | 0.060                       | S    | 1.90                 | Š  | 0.                |
| 2054         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | Š    | 1.70         | \$ | 0.14                               | S         | 0.060                       | \$   | 1.90                 | Š  | 0.                |
| 2055         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | s    | 1.90                 | s  | 0.3               |
| 2056         | 40  | 2.78                                       | 66,483               | Š  | 4,654          | \$   | 1.70         | Š  | 0.14                               | \$        | 0.060                       | s    | 1.90                 | Š  | 0.                |
| 2057         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2058         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.3               |
| 2059         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2060         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2061         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2062         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2063         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2064         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
| 2065         | 40  | 2.78                                       | 66,483               | \$ | 4,654          | \$   | 1.70         | \$ | 0.14                               | \$        | 0.060                       | \$   | 1.90                 | \$ | 0.                |
|              |   |  |                      |    |                |      |              |    |                                    |           | Total NPV                   | of O | &M Costs             | \$ | 11                |
|              |   | Capital Costs                              |                      |    |                |      |              |    | Yr built                           |           |                             |      |                      |    |                   |
|              |   |  | PWTM                 |    |                | \$   | 12.9         |    | 2030                               |           |                             |      |                      | \$ | 6                 |
|              |   |  | <b>Pumping Stati</b> |    |                | \$   | 9.8          |    | 2030                               |           |                             |      |                      | \$ | 4                 |

Total NPV of Capital and O&M Costs in millions \$
WTP to LCRA Delivery Point (#4)

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# LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)



Note: GBRA & LCRA/COA must have separate PWTMs because GBRA needs unsoftened water and LCRA/COA need softened water.

# Demands for this pipe segment Demands

|         |      | Average dem | ands to be del | ivered in each : | segment in mgd | 1    |      |   |
|---------|------|-------------|----------------|------------------|----------------|------|------|---|
| Year    | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 |   |
| COA     | 0    | 0           | 15             | 20               | 30             | 30   | 30   | - |
| Total - | 0    | 0           | 15             | 20               | 30             | 30   | 30   |   |

Max d/Avg d 1.68

|       |      | Max day dem | ands to be deli | vered in each s | segment in mgd | (i)  |      |
|-------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year  | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| COA   | 0    | 0           | 25              | 34              | 50             | 50   | 50   |
| Total | 0    | 0           | 25              | 34              | 50             | 50   | 50   |

# DMTM and Dump Station Costs

| PWTM and Pump Station Costs            |                 |        |                |           |           |      |         |                  |                               |
|--|-----------------|--------|----------------|-----------|-----------|------|---------|------------------|-------------------------------|
| Design flow rate - year 2065           |                 |        |                | 50        | mgd       |      |         |                  |                               |
|  |                 |        |                |           |           |      |         |                  |                               |
| Inside diameter of PWTM                |                 |        |                |           | in.       |      |         |                  |                               |
| Area                                   |                 |        |                | 15.90     |           |      |         |                  |                               |
| Length of PWTM                         |                 |        |                |           | miles     |      | (linked | to mile          | eage in schematic above)      |
|  |                 |        |                | 36,960    | feet      |      |         |                  |                               |
| Estimated unit cost by condition:      | % of length     | LF     | Ţ              | Jnit cost | Co        | st   |         |                  |                               |
| Rural - soil                           | 100%            | 36,960 | \$             | 244       | \$        | 9.0  | million |                  |                               |
| Rural - rock                           | 0%              |        | \$             | 337       | \$        | -    |         |                  |                               |
| Urban - rock                           | 0%              |        | \$             | 369       | * \$      |      |         |                  |                               |
|  |                 | 36,960 |                |           | \$        | 9.0  | million |                  |                               |
| Average estimated unit construction    | cost for PWTM   |        | \$             | 244       | per LF    |      |         |                  |                               |
| Total construction cost in millions    |                 |        | \$             | 9.0       |           |      |         |                  |                               |
| Contingencies                          |                 |        | \$             | 1.8       |           |      |         |                  |                               |
| Subtotal                               |                 |        | \$             | 10.8      |           |      |         |                  |                               |
| Engineering, Legal & Administrative    |                 |        | \$ \$ \$ \$ \$ | 1.6       |           |      |         |                  |                               |
| Subtotal                               |                 |        | \$             | 12.4      |           |      |         |                  |                               |
| Envir & Arch Studies & Mitigation, St  |                 |        | \$             | 0.0       |           |      |         |                  |                               |
| Total Capital Cost for PV              | VTM in millions |        | \$             | 12.4      |           |      |         |                  |                               |
| Unit maintenance cost/year-mile        |                 |        | \$             | 10,000    | \$/year-r | nile | \$      | 0.070            | Million \$/year               |
| Velocity at peak flow rate             |                 |        |                | 4.90      | fps       |      |         |                  |                               |
| C factor                               |                 |        |                | 120       |           |      |         |                  |                               |
| Head loss per foot                     |                 |        |                | 0.00141   | ft/ft     |      |         | h <sub>f</sub> = | 1 3.552*QI <sup>1.85</sup>    |
| 50000000000000000000000000000000000000 |                 |        |                | 7.45      | ft/mile   |      |         |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate            |                 |        |                | 52        | ft        |      |         |                  |                               |
| Allowance for minor losses             | 20%             |        |                | 10        | ft        |      |         | 720              | Desired HGL At Delivery Point |
| Total estimated losses                 |                 |        | -              | 63        |           |      |         | 790              | Elev. At Delivery Point 4     |
| Average static head                    |                 |        |                | -70       | ft        |      | -       | -70              | ft                            |
| Total estimated dynamic head           |                 |        |                | -7        |           |      |         |                  |                               |
|  |                 |        |                | -3        | psi       |      |         |                  |                               |

# Negative indicates gravity flow from #4 to #5; no pumping necessary.

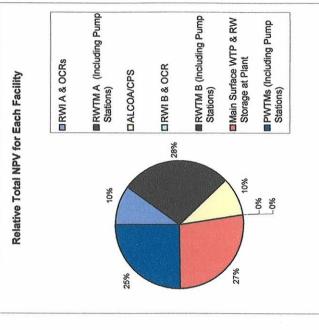
-3 psi

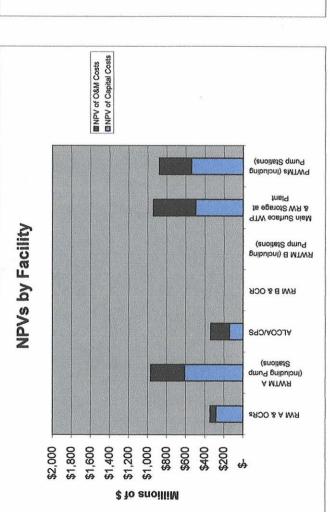
|                              |     |            |              |                               | Mi | illion \$ |
|------------------------------|-----|------------|--------------|-------------------------------|----|-----------|
| Annual O&M Cost in million   | \$: | -          | Yr built     | _                             |    |           |
| PWTM                         | \$  | 0.070      | 2030         |                               |    |           |
|                              |     |            |              | Total NPV of O&M Costs        |    | \$0.6     |
| Capital Costs in million \$: |     |            | Yr built     |                               |    |           |
| PWTM                         | \$  | 12.4       | 2030         | <del>7</del>                  | \$ | 6.0       |
|                              |     |            |              | Total NPV of Capital Costs    | \$ | 6.0       |
|                              |     | Total N    | PV of Capita | and O&M Costs in millions     | \$ | 6.5       |
|                              |     | LCRA Deliv | ery Point (# | i) to COA Delivery Point (#5) |    |           |

CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

| I NPVs in RWI A & OCRs Sized for 6000 ofs to scalp water. 6 intakes & 6 OCRs at 25,000 acrft a | Millions of \$ Millions of \$ Sized for 6000 cfs to scalp water. 6 intakes & 6 OCRs at 25,000 ac-ft at 25,000 ac |
|--|--|
| each pumping stations w/ balancing reservoirs along route 1,399 \$ 61 \$   | 284<br>61  |
| 3,472 \$ 344 \$  |  |

0.85

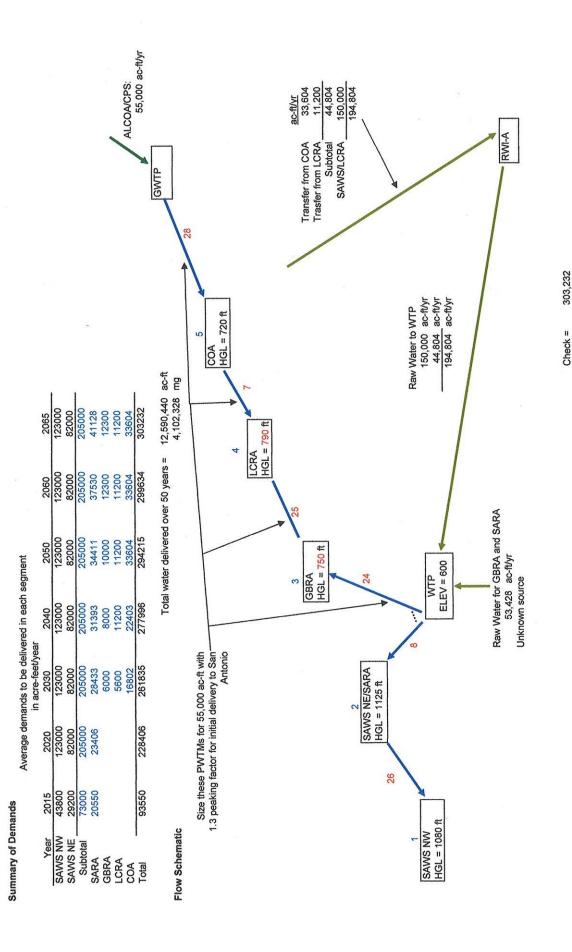




East of SA\_Alt1D; Flow Schematic

9/28/2005

Flow Schematic CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA



O&M Cost Calculations
RWI A - Matagorda Co. River Intakes, and Storage
CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

| Initial year of analysis period   | 2015                                      |                 |  |  |                            | 2001  |        |
|---|---|-----------------|--|--|----------------------------|---|--------|
| Interest rate<br>Evaluation period  | ate 5% n period 50 years                  |                 | Contingency = 20% Engineering, Legal, Admin. = 15% Environmental Archaeology Studies & Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile |  |                            |   |        |
| Unit cost of energy   | \$ 0.07                                   | per kwii        | wingation, or  | aveying, and L                                   | or =                       |   |        |
| Inflatable Rubber Low Head Dam  | Quantity                                  | Units           | Size   | Unit Constr.                                     | Total<br>Estimated         | Contigency, Total Capital<br>Eng., etc. Cost                        |        |
|   | acantay                                   | Omito           | 5425   | (millions)                                       | Constr. Cost<br>(millions) | (millions) (millions)   |        |
| Inflatable Rubber Low Head Dam  | 6   | each            | 10 ft high   | \$ 2.25  | \$ 13.50                   | \$ 5.13 \$ 18.63  |        |
| Estimated inflatable dam cost as<br>Value of inflatable dam<br>Assumed life of inflatable dam<br>Estimated maintenance/replacer   |   |                 | million<br>years<br>million/year   |  |                            |   |        |
| Year built  |   | 2020            |  |  |                            |   |        |
| NPV of O&M Costs<br>NPV of Capital Costs<br>Total NPV of Capital and O&M C  | Costs                                     |                 | million<br>million<br>million  |  |                            |   |        |
| Raw Water Intake, Pumping Station, as   | nd RWTM (In                               | take to Rese    | ervoir)  |  |                            |   |        |
| Average withdrawal  |   |                 | 194,804  | ac-ft/year                                       |                            |   |        |
| 120000000000000000000000000000000000000   | 2002                                      | 100002000       | 269  | cfs  | 22.3                       | Ratio of design withdrawal rate                                     |        |
| Total intake design withdrawal re   | ate (for scalpi                           | ng high flows   | 2,692,800  | ofs<br>gpm                                       |                            | to Total intake design withdrawal rate                              |        |
| Design withdrawal rate per intak  | е   | *               | 1,000<br>448,800   |  |                            |   |        |
| No. of reservoirs<br>Design flow to each reservoir  |   |                 | 448,800  | gpm  |                            |   |        |
| Inside diameter of each RWTM  |   |                 | 144  |  |                            |   |        |
| Area<br>Average length of each RWTM   |   |                 | 113.10<br>1<br>5,280   | miles  | 6.0<br>31,680              | miles for all RWTMs   |        |
| Estimated construction cost for   | RWTM                                      |                 |  | per LF   | 684*3468                   |   |        |
| Total construction cost in millior<br>Contingencies   | ns  |                 | \$ 33.4<br>\$ 6.7  |  |                            |   |        |
| Subtotal<br>Engineering, Legal & Administra   | itive                                     |                 | \$ 40.0<br>\$ 6.0  |  |                            |   |        |
| Subtotal<br>Envir & Arch Studies & Mitigatio<br>Total Capital Cost fo   |   |                 | \$ 46.0<br>\$ 0.6<br>\$ 46.6   | million  |                            |   |        |
| Unit maintenance cost/year-mile   | 1   |                 | \$ 10,000  | \$/year-mile                                     | \$ 0.060                   | Million \$/year (all RWTMs to Reservoirs)                           |        |
| Note: Assume each intake has t  | wo RWTMs p                                | umping out o    | of it, one to each   | reservoir,                                       |                            |   |        |
| Design flow rate for each RWTN<br>Pumping rate (one pump)<br>No. of pumps (not counting spai<br>Peak flow rate into each RWTM   | re) pumping in                            | nto each RW     | 448,800<br>50,000<br>9<br>450,000  | gpm<br>gpm<br>gpm                                |                            |   |        |
| Velocity at peak flow rate  |   |                 | 8.87   | fps  |                            |   |        |
| C factor<br>Head loss per foot  |   |                 | 0.00135<br>7.10  | ft/ft<br>ft/mile                                 | h <sub>f</sub> =           | 3.552*Q  <sup>1.85</sup><br>  C*(d) <sup>2.63</sup>                 |        |
| Head loss at peak flow rate<br>Allowance for minor losses<br>Total estimated losses<br>Average static head<br>Total estimated dynamic head  | 30%                                       |                 | 9<br>40<br>49  | ft<br>ft<br>ft<br>ft                             | 50                         | Elev of discharge at reservoir<br>Water surface elev in river<br>ft |        |
| Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump Total hp pumping into each RW Total hp all each intake (not cou Total hp all intakes (not countin Total kw all intakes (not countin | TM (not coun<br>nting spare)<br>g spares) | ting spare)     | 85%<br>90%<br>813<br>606<br>7,313  | hp/pump<br>kw/pump<br>hp/RWTM<br>hp/intake<br>hp |                            |   |        |
| Unit construction cost for each pump station (from cost cu<br>Construction cost per intake/pump station<br>No. of intakes from above  |   | 889<br>6.5<br>6 | per firm hp of<br>million<br>each  | pump station                                     |                            |   |        |
| Total construction cost in millior<br>Contigency, Eng., etc. in millior<br>Total capital cost in millions   |   |                 | \$ 14.82   | million<br>million<br>million                    |                            |   |        |
| Total construction cost for pum<br>Value of equipment<br>Assumed life of equi<br>Estimated maintena   | pment                                     | ent cost        | \$ 15.6<br>20  | million<br>million<br>years<br>million/year      | 40%                        | Estimated equip cost as % of total const                            | r cost |

| Year         | Flow pun   |                 | No. of<br>pump<br>"sets"<br>operating | Energy<br>used   |     | Energ          |    |                       | co | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM |      | tal O&M<br>cost      | Ne | t pre<br>valu | esent<br>ue |
|--------------|--|-----------------|---------------------------------------|------------------|-----|----------------|----|-----------------------|----|------------------------------------|----|-------------------------------|------|----------------------|----|---------------|-------------|
|              | ac-ft/yr   | mgd             | /day                                  | (kwh/day)        |     | (\$/day)       | 1  | (Million \$<br>/year) | -  | (Million \$ /year)                 |    | (Million \$ /year)            |      | Aillion \$<br>/year) |    | (\$           | )           |
| 2015         | on the same of the | annimización de | MATERIAL PROPERTY.                    |                  | \$  | -              | \$ | •                     | -  |                                    |    |                               | \$   |                      | \$ |               | -           |
| 2016         |  | -               | -                                     |                  | \$  | -              | \$ | -                     |    |                                    |    |                               | \$   |                      | \$ |               |             |
| 2017         | *  | -               | -                                     | -                | \$  |                | \$ |                       |    |                                    |    |                               | \$   |                      | \$ |               |             |
| 2018         |  | *               |                                       | -                | \$  | -              | \$ | -                     |    |                                    |    |                               | \$   |                      | \$ |               |             |
| 2019         |  | *               |                                       |                  | \$  |                | \$ | -                     |    |                                    |    |                               | \$   |                      | \$ |               | (*)         |
| 2020         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.36        |
| 2021         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.30        |
| 2022         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.23        |
| 2023         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.18        |
| 2024         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.12        |
| 2025         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.07        |
| 2026         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 1.02        |
| 2027         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.080                         | \$   | 1.74                 | \$ |               | 0.97        |
| 2028         | 194,804  | 174             | 2.42                                  | 35,139           | S   | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.92        |
| 2029         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.88        |
| 2030         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.84        |
| 2031         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.80        |
| 2032         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | s  | 0.060                         | \$   | 1.74                 | \$ |               | 0.76        |
| 2033         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.72        |
| 2034         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.6         |
| 2035         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.6         |
| 2036         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.6         |
| 2037         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.5         |
| 2038         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ | 0.90                  | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.5         |
| 2039         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.54        |
| 2040         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.5         |
| 2041         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.4         |
| 2042         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.4         |
| 2043         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.4         |
| 2044         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | s  | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.4         |
| 2045         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.4         |
| 2046         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.3         |
| 2047         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.36        |
| 2048         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.3         |
| 2049         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.3         |
| 2050         | 194,804  | 174             | 2.42                                  | 35,139           | s   | 2,460          | \$ |                       | s  | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.3         |
| 2051         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.3         |
| 2052         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | S  | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.2         |
| 2053         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | s    | 1.74                 | \$ |               | 0.2         |
| 2054         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | S    | 1.74                 | \$ |               |             |
| 2055         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.2         |
| 2056         | 194,804  | 174             | 2.42                                  | 35,139           | S   | 2,460          | S  |                       | \$ | 0.78                               | S  | 0.060                         | s    | 1.74                 |    |               |             |
| 2057         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | \$ | 0.060                         | S    | 1.74                 | \$ |               | 0.2         |
| 2058         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       |    | 0.78                               | \$ | 0.060                         |      |                      | \$ |               |             |
| 2059         | 194,804  | 174             | 2.42                                  | 35,139           | S   | 2,460          | \$ |                       | 5  | 0.78                               | \$ | 0.060                         | \$   | 1.74                 | \$ |               | 0.2         |
| 2060         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78                               | S  | 0.060                         | \$   | 1.74                 | \$ |               | 0.1         |
| 2061         | 194,804  | 174             | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       |    |                                    |    |                               |      | 1.74                 | S  |               | 0.1         |
| 2062         | 194,804  | 174<br>174      | 2.42                                  | 35,139           | \$  | 2,460          | \$ |                       | \$ | 0.78<br>0.78                       | 5  | 0.060                         | \$   | 1.74                 | S  |               | 0.1         |
| 2063         | 194,804  |                 | 2.42                                  | 35,139           |     | 2,460          | 5  |                       | \$ | 0.78                               | 5  | 0.060                         | S    | 1.74                 | 5  |               | 0.1         |
| 2064<br>2065 | 194,804  | 174<br>174      | 2.42                                  | 35,139<br>35,139 | 5   | 2,460<br>2,460 | \$ |                       | \$ | 0.78                               | S  | 0.060                         | S    | 1.74                 | \$ |               | 0.1         |
| 2065         | 194,804  | 1/4             | 2.42                                  | 35,139           | 3   | 2,460          | Þ  | 0.90                  | Þ  | 0.78                               | 3  |                               |      |                      |    |               |             |
|              |  |                 |                                       |                  |     |                |    |                       |    |                                    |    | Total NPV                     | of O | &M Costs             | \$ |               | 25.         |
|              |  |                 | Capital Cos                           | ts in million \$ |     |                |    | 40.0                  |    | Yr built                           |    |                               |      |                      |    |               | 20          |
|              |  |                 |                                       | RWTM to R        | 626 | IVOILE         | \$ | 46.6                  |    | 2020                               |    |                               |      |                      |    | \$            | 36.         |

 Capital Costs in million \$:
 Yr built
 \$ 36.5

 RWTM to Reservoirs Inteke/Pumping Stations
 \$ 46.6
 2020
 \$ 36.5

 \$ 5.8
 2020
 \$ 42.2

 Total NPV of Capital Costs
 \$ 76.7

Total NPV of Capital and O&M Costs in millions \$ 104.3

#### Reservoirs

|   | Quantity |      | Units      | Volume/each<br>(acre-feet) | Unit Cost<br>(\$/ac-ft)) |          | c    | Total<br>Construction<br>Cost in<br>millions |         | tigency,<br>g., etc. |    | Total in<br>millions |
|---|----------|------|------------|----------------------------|--------------------------|----------|------|--|---------|----------------------|----|----------------------|
| Reservoirs  | 6        |      | each       | 25000                      | \$                       | 974      | \$   | 146.0  | \$      | 55.5                 | \$ | 201.5                |
| Estimated average depth of reservo<br>Surface area of reservoir |          |      | 20<br>7500 | ft<br>acres                |                          |          |      |  |         |                      |    |                      |
| Ratio of total land area reqd to surfa<br>of reservoir          | ace area |      | 1.1        |                            |                          |          |      | Envir & Arch                                 | naeolo  | gy, Surv             |    |                      |
| Total land area reqd for reservoirs                             |          | 8250 |            | acres                      |                          |          |      | 8  | ind La  | nd Acq =             | _  | 41.3                 |
| Assumed life of reservoir                                       |          |      | 100        | years                      |                          | 1        | ota  | I capital cost                               | t in mi | llions =             | \$ | 242.8                |
| Estimated replacement cost                                      |          | \$   | 1.46       | million/year               |                          |          |      |  |         |                      |    |                      |
| Estimated maintenance   |          |      | 0.4        | million/year               | Mowi                     | ng, mair | ntai | ning fences,                                 | etc.    |                      |    |                      |
| Total   |          | \$   | 1.86       | million/year               |                          |          |      | N-00-00-00-00-00-00-00-00-00-00-00-00-00     |         |                      |    |                      |
| Year built  |          |      | 2020       |                            |                          |          |      |  |         |                      |    |                      |
| NPV of O&M costs  |          | \$   | 25.9       | million                    |                          |          |      |  |         |                      |    |                      |
| NPV of Capital costs  |          | \$   | 190.2      | million                    |                          |          |      |  |         |                      |    |                      |
| Total NPV of Capital and O&M Cos                                | ts       | \$   | 216.1      | million                    |                          |          |      |  |         |                      |    |                      |

| Summary   | 0.000000 | IPV of<br>tal Costs | PV of O&M<br>Costs | Ca | pital and<br>M Costs |
|---|----------|---------------------|--------------------|----|----------------------|
| Inflatable Rubber Low Head Dam                                    | \$       | 14.6                | \$<br>9.4          | \$ | 24.0                 |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$       | 78.7                | \$<br>25.6         | \$ | 104.3                |
| Reservoirs  | \$       | 190.2               | \$<br>25.9         | \$ | 216.1                |
|   | \$       | 283.5               | \$<br>60.9         | \$ | 344.4                |

# O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

Raw

|   | Initial year of analysis period 2015<br>Interest rate 5%<br>Evaluation period 50 years |     | nvironment   | Engineering, L<br>al & Archaeolo | egal,  | udies &          | 15%                                    |
|---|--|-----|--------------|----------------------------------|--------|------------------|--|
|   | Unit cost of energy \$ 0.07 per kwh  | Mit | igation, Sur | veying, and La                   | and A  | equisition       | \$ 100,000 per mile                    |
| w | ater Transmission Main - A   |     |              |                                  |        |                  |  |
|   | Inside diameter of pipe  |     | 108          |                                  |        |                  |  |
|   | Area   |     | 63.62        |                                  |        |                  |  |
|   | Length of RWTM   |     |              | miles                            |        |                  |  |
|   |  |     | 749,760      | feet                             |        |                  |  |
|   | Estimated unit construction cost for RWTM  | \$  | 676          | per LF                           |        |                  |  |
|   | Total construction cost in millions  | \$  | 507          |                                  |        |                  |  |
|   | Contingencies  | \$  | 101          |                                  |        |                  |  |
|   | Subtotal   | \$  | 608          |                                  |        |                  |  |
|   | Engineering, Legal & Administrative  | \$  | 91           |                                  |        |                  |  |
|   | Subtotal   | \$  | 700          |                                  |        |                  |  |
|   | Envir & Arch Studies & Mitigation, Surveying, & Land Acq                               | \$  | 14           |                                  |        |                  |  |
|   | Total Capital Cost for PWTM in millions  | \$  |              | million                          |        |                  |  |
|   | Unit maintenance cost/year-mile  | \$  | 10,000       | \$/year-mile                     | \$     | 1.420            | Million \$/year                        |
|   | Design flow rate (after 100% buildout)   |     | 194,804      | ac-ft/year                       |        |                  |  |
|   |  |     |              | mgd                              |        |                  |  |
|   |  |     | 120,762      |                                  |        |                  | *                                      |
|   | Pumping rate (one pump) No. of pumps (not counting spare)                              |     | 20,000       | gpm                              |        |                  |  |
|   | Peak flow rate (all pumps except spare)  |     | 120,000      | anm                              |        |                  |  |
|   | r oak now rate (an pumps except spare)   |     | 120,000      | Abin                             |        |                  |  |
|   | Velocity at peak flow rate   |     | 4.20         | fps                              |        |                  |  |
|   | C factor   |     | 120          |                                  |        |                  |  |
|   | Head loss per foot   |     | 0.00047      | ft/ft                            |        | h <sub>f</sub> = | 3.552*Q 1.85                           |
|   |  |     | 2.50         | ft/mile                          |        |                  | C*(d) <sup>2.63</sup>                  |
|   |  |     |              |                                  |        |                  | 3.7.12                                 |
|   | Head loss at peak flow rate  |     | 355          |                                  |        |                  |  |
|   | Allowance for minor losses 10%   |     | 35           |                                  |        |                  | Elev. At San Antonio East WTP          |
|   | Total estimated losses   |     | 390          |                                  | _      |                  | Elev. At Matagorda OCRs                |
|   | Average static head  | -   | 510          |                                  |        | 510              | Ħ                                      |
|   | Total estimated dynamic head   |     | 900<br>390   |                                  |        |                  |  |
|   |  |     | 380          | psi                              |        |                  |  |
|   | No of pumping stations req'd along route   |     | 2.60         |                                  |        | 150              | psi (assumed max pressure              |
|   | No. of pumping stations used in cost estimate  |     | 3.0          |                                  |        |                  | in pipe)                               |
|   | Average head per pump station  |     | 300          | ft                               |        |                  |  |
|   | Maria Cara Cara Cara Cara Cara Cara Cara   |     |              |                                  |        |                  |  |
|   | Assumed pump efficiency  |     | 85%          |                                  |        |                  |  |
|   | Assumed motor efficiency   |     | 90%          |                                  |        |                  |  |
|   | Estimated Hp required per pump   |     |              | hp/pump<br>kw/pump               |        |                  |  |
|   | Total hp per pump station (not counting spare)   |     |              | hp/station                       |        |                  |  |
|   | Total kw per pump set (set=pumps in series along route)                                |     |              | kw/pump set                      | t (one | pump at          | each station)                          |
|   | transmitted bank and transfer and transfer   |     | -,           |                                  |        | pantip an        |  |
|   | Unit constr. cost for each pump station (from cost curve)                              | \$  | 1,214        | per firm hp o                    | of pum | p station        |  |
|   | Construction cost per pump station   | \$  |              | million                          |        |                  |  |
|   | Balancing reservoir  | \$  |              | million                          |        |                  | min. of storage at avg pumping rate    |
|   | Total construction cost per pump station   | \$  | 15.62        | million                          |        | 8.0              |  |
|   | No. of pump stations from above  |     | 2.0          | each                             | \$     | 0.15             | per gal for open top reservoir         |
|   | No. of pump stations from above  |     | 3.0          | eacri                            |        |                  |  |
|   | Total construction cost in millions  | \$  | 46.9         | million                          |        |                  |  |
|   | Contigency, Eng., etc. in millions   | \$  |              | million                          |        |                  |  |
|   | Total capital cost in millions   | \$  | 64.7         | million                          |        |                  |  |
|   |  |     |              |                                  |        |                  |  |
|   | Total construction cost for pump stations  | \$  |              | million                          |        | 4000             | F-F                                    |
|   | Value of equipment   | \$  |              | million                          |        | 40%              | Estimated equipment cost as % of total |
|   | Assumed life of equipment<br>Estimated maintenance/replacement cost                    | S   |              | years<br>million/year            |        |                  |  |
|   | Latinated maintenance/replacement cost   | 9   | 0.84         | millotoyear                      |        |                  |  |
|   |  |     |              |                                  |        |                  |  |

#### O&M Costs

| Year | Flow purr<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used        |     | Energy | 10       | ost                   | COS | ther O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>RWTM | 1    | Total O&M<br>cost     | N  | et present<br>value |
|------|------------------|-----|--------------------------|-----------------------|-----|--------|----------|-----------------------|-----|------------------------------------|----|-------------------------------|------|-----------------------|----|---------------------|
|      | ac-ft/yr         | mgd | operating<br>/day        | (kwh/day)             | (\$ | /day)  |          | (Million \$<br>/year) | (   | Million \$<br>/year)               | (  | Million \$ /year)             |      | (Million \$<br>/year) | -  | (\$)                |
| 2015 | -                | -   |                          | - \$                  |     | -      | \$       |                       |     |                                    |    |                               | \$   |                       | \$ | -                   |
| 2016 | *                | -   | -                        | - \$                  |     | *      | \$       |                       |     |                                    |    |                               | \$   |                       | \$ |                     |
| 2017 | -                | -   | -                        | - \$                  |     | -      | \$       |                       |     |                                    |    |                               | \$   |                       | \$ | -                   |
| 2018 | -                | •   | -                        | - \$                  |     | •      | \$       |                       |     |                                    |    |                               | \$   |                       | \$ |                     |
| 2019 |                  | -   | 12.750                   | - \$                  |     |        | \$       |                       | 828 | 5020                               | 2  | 2.722                         | \$   |                       | \$ |                     |
| 2020 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 19.08               |
| 2021 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 18.18               |
| 2022 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 17.31               |
| 2023 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 16.49               |
| 2024 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 15.70               |
| 2025 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | Ş        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 14.95               |
| 2026 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 14.24               |
| 2027 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 13.56               |
| 2028 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1,420                         | \$   |                       | \$ | 12.92               |
| 2029 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | S        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 12.30               |
| 2030 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 11.72               |
| 2031 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 11.16               |
| 2032 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 10.63               |
| 2033 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 10.12               |
| 2034 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 9.64                |
| 2035 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 9.18                |
| 2036 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | 9        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 8.74                |
| 2037 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 8.33                |
| 2038 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 7.93                |
| 2039 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 7.55                |
| 2040 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 7.19                |
| 2041 | 194,800          | 174 | 6.04                     | 861,036 \$            |     | 60,272 | S        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 6.85                |
| 2042 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 6.52                |
| 2043 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 6.21                |
| 2044 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 5.92                |
| 2045 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 5.64                |
| 2046 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 5.37                |
| 2047 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 5.11                |
| 2048 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 4.87                |
| 2049 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 4.64                |
| 2050 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 4.42                |
| 2051 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 4.21                |
| 2052 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 4.01                |
| 2053 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 3.81                |
| 2054 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 3.63                |
| 2055 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | \$       | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 3.46                |
| 2056 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 3.30                |
| 2057 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        | 22.00                 | \$  | 0.94                               | \$ | 1,420                         | \$   | 24.36                 | \$ | 3.14                |
| 2058 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.99                |
| 2059 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.85                |
| 2060 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 9        | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.71                |
| 2061 | 194,800          | 174 | 6.04                     | 861,036 \$            | 5   | 60,272 | 5        | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.58                |
| 2062 | 194,800          | 174 | 6.04                     | 861,036               | 5   | 60,272 | 5        | 22.00                 | \$  | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.46                |
| 2063 | 194,800          | 174 | 6.04                     | 861,036               | 5   | 60,272 | 5        | 22.00                 | S   | 0.94                               | \$ | 1.420                         | \$   | 24.36                 | \$ | 2.34                |
| 2064 | 194,800          | 174 | 6.04                     | 861,036               |     | 60,272 | 5        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 2.23                |
| 2065 | 194,800          | 174 | 6.04                     | 861,036               |     | 60,272 | 5        |                       | \$  | 0.94                               | \$ | 1.420                         | \$   |                       | \$ | 2.12                |
|      |                  |     |                          |                       |     |        |          |                       |     |                                    |    | Total NPV                     | of 4 | O&M Costs             | \$ | 358                 |
|      |                  |     |                          |                       |     |        | Yr built |                       |     |                                    |    |                               |      |                       |    |                     |
|      |                  |     |                          | RWTM                  |     |        | 4        |                       |     | 2020                               |    |                               |      |                       | \$ | 559                 |
|      |                  |     |                          | <b>Pumping Statio</b> | ons |        | 5        | 65                    |     | 2020                               |    |                               |      |                       | \$ | 51                  |
|      |                  |     |                          |                       |     |        |          |                       |     |                                    | To | tal NPV of                    | Ca   | apital Costs          | \$ | 610                 |
|      |                  |     |                          |                       |     |        |          | Total                 | NΡ\ | of Capita                          | an | d O&M Cos                     | sts  | in millions           | \$ | 968                 |

# NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

| Initial year of analysis period |   | 2015         | Contingency = 20%   |  |
|---------------------------------|---|--------------|---|--|
| Interest rate                   |   | 5%           | Engineering, Legal, Admin. = 15%                                |  |
| Evaluation period               |   | 50 years     | Environmental & Archaeology Studies &                           |  |
| Unit cost of energy             | S | 0.07 per kwh | Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile |  |

|  | ALC | COA   |                    | CPS   |    | Total |
|--|-----|-------|--------------------|-------|----|-------|
| Year built   | 20  | 15    |                    | 2015  |    |       |
| Estimated Construction Cost in Millions                  |     |       |                    |       |    |       |
| Wells (Based on Non-Public Water Supply Wells)           |     | 32.97 |                    | 12.51 |    | 45.4  |
| Pipeline   |     | 13.03 |                    | 5.94  |    | 18.9  |
| Pump Stations & Storage                                  |     | 8.51  |                    | 0     | 1  | 8.5   |
| Subtotal   |     | 54.51 |                    | 18.45 |    | 72.9  |
| Contingency  |     | 10.90 |                    | 3.69  |    | 14.5  |
| Subtotal   |     | 65.41 |                    | 22.14 | 7  | 87.5  |
| Engineering, Legal & Administrative                      |     | 8.18  |                    | 2.77  |    | 10.9  |
| Subtotal   |     | 73.59 |                    | 24.91 |    | 98.   |
| Environmental & Archaeology Studies & Mitigation         |     | 0.63  |                    | 0.2   | d  | 0.8   |
| Land Acquisition & Surveying                             |     | 0     |                    | 0     |    | 0.0   |
| Groundwater Purchase                                     |     | 0     |                    | 5.64  |    | 5.6   |
| ALCOA Construction Program Management Fee                |     | 5.45  |                    | 0     | 1  | 5.4   |
| Interest During Construction (2 years, 6% int., 4% ret.) |     | 5.89  |                    | 2.44  | 1  | 8.3   |
| Total Capital Cost                                       |     | 85.56 | (1-2-3-2-14)<br>/- | 33.19 |    | 118.  |
| Estimated Annual O&M Costs                               |     |       |                    |       |    |       |
| O&M  |     | 0.67  |                    | 0.18  |    | 0.1   |
| Pumping Energy   |     | 2.41  |                    | 0.52  |    | 2.9   |
| ALCOA Project Management Fees                            |     | 0.35  |                    | 0.00  |    | 0.3   |
| Purchase of Groundwater                                  |     | 2.00  |                    | 0.00  |    | 2.0   |
| Groundwater District Fees                                |     | 0.65  |                    | 0.25  | 5  | 0.9   |
| Mitigation Reserves                                      |     | 0.28  | V                  | 0.11  |    | 0.3   |
| Total Annual Cost  |     | 6.36  |                    | 1,08  | 1  | 7.    |
|  |     | 440   |                    | 40    |    |       |
| NPV of O&M Costs   | \$  | 116   | \$                 | 19    |    |       |
| NPV of Capital Costs                                     | \$  | 86    | \$                 | 33    | -  |       |
| Total NPV of Capital and O&M Costs for Well Fields       | \$  | 202   | \$                 | 53    | \$ | 25    |

#### Cooling of Well Water

| oning of train tracer                                     |    |         |                |                              |        |            |
|---|----|---------|----------------|------------------------------|--------|------------|
| Total number of wells in both fields                      |    | 120     | wells          | Approximate capacity per wel | 300    | gpm        |
| Percentage of wells with temperatures > than degrees      |    | 5%      |                |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees      |    | 6.0     |                | Rough check                  | 58,072 | ac-ft/year |
| Estimated Capital Costs                                   |    |         |                |                              |        |            |
|   |    |         |                |                              |        |            |
| Year built  |    | 2015    |                |                              |        |            |
| Number of Packaged Cooling Towers (300 gpm capacity/each) |    | 6.0     |                |                              |        |            |
| Equipment cost (cooling towers and fans)                  | \$ | 60,000  |                |                              |        |            |
| Installation and contractors mark-up                      | \$ | 50,000  |                |                              |        |            |
| Structural slab   | \$ | 30,000  |                |                              |        |            |
| Electrical  | \$ | 50,000  |                |                              |        |            |
| Estimated Unit Construction Cost                          | \$ | 190,000 | Each           |                              |        |            |
| Total construction cost                                   | \$ | 1.14    | million        |                              |        |            |
| Contingencies   | \$ | 0.23    |                |                              |        |            |
| Subtotal  | \$ | 1.37    |                |                              |        |            |
| Engineering, Legal and Admin                              | S  | 0.21    |                |                              |        |            |
| Total Estimated Capital Cost                              | \$ | 1.57    | 58             |                              |        |            |
| NPV of Capital Costs                                      | \$ | 1.57    | million        |                              |        |            |
| Estimated O&M Costs                                       |    |         |                |                              |        |            |
| Value of equipment  | \$ | 0.4     | million        |                              |        |            |
| Assumed life of equipment                                 |    | 10      | years          |                              |        |            |
| Estimated maintenance/replacement cost                    | \$ | 0.04    | million/year   |                              |        |            |
| Blower Hp per cooling tower                               |    | 10      | Нр             |                              |        |            |
|   |    | 7       | kw             |                              |        |            |
| Hours of operation  |    | 24      | hours          |                              |        |            |
| Power consumption per cooling tower                       |    | 179     | kwh per day    |                              |        |            |
|   |    | 65,350  | kwh per year   |                              |        |            |
| Power cost per cooling tower                              | \$ | 4,574   | per year       |                              |        |            |
| Total power cost for all cooling towers in millions       | \$ | 0.03    | million per ye | ar                           |        |            |
|   |    |         |                |                              |        |            |

6,000 per month for all cooling towers 0.07 per year

0.14 million \$ per year \$2.47 million \$

Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Estimated O&M Cost \$
NPV of O&M costs

Regular operational checks and routine maintenance

None Req'd - flow in Big Sandy Creek

#### Water Treatment Plant (Iron & manganese removal)

| Estimated capital cost     | \$<br>22.6 | million |
|----------------------------|------------|---------|
| Year built                 | 2015       |         |
| NPV of capital cost        | \$<br>22.6 | million |
| Estimated annual O&M costs | \$<br>3.19 | million |
| NPV of O&M costs           | \$<br>58.2 | million |

(From HDR 2004 update)

(From HDR 2004 update; 1/2 of O&M estimate; Table 2)

#### Summary

Well Fields and Collection Lines (including tank and pump station at Hwy 290) Cooling Towers for Selected High Temperature Wells Ground Water Transmission Main and Pumping Station Water Treatment Plant (Iron & manganese removal)

Total for ALCOA-CPS

| - Table 1 | IPV of<br>ital Costs | 10.00 | of O&M<br>Costs | Cap | al NPV of<br>pital and<br>M Costs |
|-----------|----------------------|-------|-----------------|-----|-----------------------------------|
| \$        | 118.7                | \$    | 135.5           | \$  | 254.2                             |
| \$        | 1.6                  | \$    | 2.5             | \$  | 4.0                               |
| \$        |                      | \$    | -               | \$  |                                   |
| \$        | 22.6                 | \$    | 58.2            | \$  | 80.8                              |
| \$        | 142.9                | \$    | 196.1           | \$  | 339.1                             |

Check only
49 mgd average production
64 mgd peak \$ 0.35 per gpd of capacity \$ 22.34 milion

17885 mg per year \$ 200 per mg treated 3.58 million

O&M Cost Calculations
Surface WTP and Raw Water Storage Reservoir at WTP
CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

2015 5% 50 years \$ 0.07 per kwh Initial year of analysis period Interest rate Evaluation period Unit cost of energy

Treated Water Production by Treatment Type (from Demand Chart - BE SURE TO CHECK)

|  | Yes                | r= 2015                              | 2020           | 2030                               | 2040                            | 2050           | 2060          | 2065          |
|--|--------------------|--------------------------------------|----------------|------------------------------------|---------------------------------|----------------|---------------|---------------|
|  | 108                | 2013                                 | 2020           | 2030                               | 2040                            | 2000           | 2000          | 2005          |
| Softened water demand:   | Unite              |                                      |                |                                    |                                 |                |               |               |
| None req'd   |                    | 0                                    | 0              | 0                                  | 0                               | 0              | 0             | 0             |
|  |                    | 2015                                 | 0000           | 0000                               | 0040                            |                |               | 2005          |
| Non-softened water demands;  | Yea<br>Units       |                                      | 2020           | 2030                               | 2040                            | 2050           | 2060          | 2065          |
| Average yearly demands:  |                    |                                      |                |                                    |                                 |                |               |               |
| SAWS   | ac-ft/y            |                                      |                | 205000                             | 205000                          | 205000         | 205000        | 205000        |
| SARA   | ac-ft/y            |                                      |                | 28433                              | 31393                           | 34411          | 37530         | 41128         |
| GBRA   | ac-ft/y            | 0 00000                              | 0              | 6000                               | 8000                            | 10000          | 12300         | 12300         |
| Totals<br>Totals   | mgd                | 93550<br>84                          |                | 239433<br>214                      | 244393<br>218                   | 249411<br>223  | 254830<br>227 | 258428<br>231 |
| Totals   | mga                |                                      | 204            | 214                                | 210                             | 220            | 22,           | 201           |
| Max day demands:   |                    |                                      |                |                                    |                                 |                |               |               |
| SAWS   | mgd                |                                      |                | 238                                | 238                             | 238            | 238           | 238           |
| SARA   | mgd                | 24                                   |                | 33                                 | 36                              | 40             | 44            | 48            |
| GBRA Totals  | mgd<br>mgd         | 109                                  |                | 276                                | 281                             | 287            | 293           | 297           |
| Totals   | nigo               | 100                                  | 203            | 210                                | 201                             | 201            | 203           | 201           |
| Total: coffeed and non-coffeed water do                                  | mailda             |                                      |                |                                    |                                 |                |               |               |
| Total: softened and non-softened water de<br>Average yearly demand       | manos<br>ac-ft/y   | r 93550                              | 228406         | 239433                             | 244393                          | 249411         | 254830        | 258428        |
| ritotago jouniy domana   | mgd                |                                      |                | 214                                | 218                             | 223            | 227           | 231           |
| Max day demand   | mgd                |                                      | 265            |                                    | 281                             | 287            | 293           | 297           |
|  |                    |                                      |                |                                    |                                 |                |               |               |
| aw Water Reservoir   |                    |                                      |                |                                    |                                 |                |               |               |
| Sizing for ultimate conditions:<br>Assumed number of days of consecution | ve Max Day demands | 30                                   | days           |                                    |                                 |                |               |               |
| Design (Max. Day) treated water produ                                    | ction req'd in mgd | 297                                  | mgd            |                                    |                                 |                |               |               |
| Average treated water production in m                                    | gd                 | 231                                  | mgd            | (which is also ed<br>can be pumped |                                 | ground and raw | water that    |               |
| Difference (shortfall of raw   | water)             | 66                                   | mgd            |                                    |                                 |                |               |               |
| Required storage reservoir for raw water                                 | er                 | 1,989                                | mg             |                                    |                                 |                |               |               |
| ******   | 0.504              | 6,105                                | ac-ft          |                                    |                                 |                |               |               |
| Add safety factor Total storage required                                 | 25%                | 1,526<br>7,631                       | ac-ft<br>ac-ft |                                    |                                 |                |               |               |
| Total storage recommended  |                    | 12,000                               | ac-ft          |                                    | lays at average                 |                |               |               |
|  |                    |                                      |                | (for exam)                         | ple, for repair of              | f RWTM A) =    | 33 d          | ays           |
|  | Quantity Units     | Volume/each                          |                | Total<br>Construction              | Contigency,                     |                |               |               |
| 3  | addinary office    | (acre-teet)                          | (\$/ac-ft))    | Cost                               | Eng., etc.                      | Cost           |               |               |
| Reservoirs   | 1 each             | 12,000                               | \$ 1,283       | \$ 15.4                            | \$ 5.9                          | \$ 21.3        |               |               |
| Estimated average depth of reservoir<br>Surface area of reservoir        |                    | 25 ft<br>80 acres                    |                |                                    |                                 |                |               |               |
| Ratio of total land area reqd to surface                                 | area               |                                      |                |                                    |                                 |                |               |               |
| of reservoir   |                    | .10                                  |                |                                    | aeology, Surv,                  |                |               |               |
| Total land area reqd for reservoirs                                      | 5                  | 328 acres                            | 1              | ar<br>Total capital cost           | id Land Acq =_<br>in millions = | \$ 34.5        |               |               |
| Assumed life of reservoir  | -                  | 00 years                             |                |                                    |                                 |                |               |               |
| Estimated replacement cost   | \$ 0               | .15 million/year                     |                |                                    |                                 |                |               |               |
| Estimated maintenance Total  | \$ 0               | .04 million/year<br>.19 million/year | Mowing, main   | taining fences, etc                | <b>5.</b>                       |                |               |               |
| Year built   |                    | 015                                  |                |                                    |                                 |                |               |               |
| NPV of O&M costs   |                    | 3.5 million                          |                |                                    |                                 |                |               |               |
| NPV of Capital costs   | \$ 3               | 4.5 million                          |                |                                    |                                 |                |               |               |
| Total NPV of Capital and O&M Costs                                       | \$ 3               | 8.0 million                          |                |                                    |                                 |                |               |               |
|  |                    |                                      |                |                                    |                                 |                |               |               |

#### WTP

#### Plant Phasing and Capital Costs:

| Softening Treatment Trains Year ≃   |       | 2015     |    | 2020     |    | 2030 | 1   |    | 2040 |     | 205 | 0   |      | 206 | n   |       | 2065 |     |  |
|---|-------|----------|----|----------|----|------|-----|----|------|-----|-----|-----|------|-----|-----|-------|------|-----|--|
| Average treated water production in mgd   |       | 0        | -  | 0        | -  | 2000 | 0   | -  | 0    |     | 200 | 0   | -    | 200 | 0   | _     | 2000 | 0   |  |
| Design (Max. Day) treated water production reg'd in mgd   |       | 0        |    | 0        |    |      | ő   |    | 0    |     |     | 0   |      |     | o   |       |      | 0   |  |
|   |       | U        |    | U        |    |      | U   |    | U    |     |     | ·   |      |     | v   |       |      | U   |  |
| Initial/additional Max day capacity built (mgd) Total capacity on line (must exceed Design Max Day Reg'd) |       | 0        | 8  | 0        |    |      | 0   |    | 0    |     |     | 0   |      |     | 0   |       |      | 0   |  |
| Total capacity on line (must exceed Design Max Day Req d)   |       | U        | 6  | U        |    |      | U   |    | U    |     |     | U   |      |     | U   |       |      | U   |  |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   |       |          |    |          |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Estimated construction cost of expansion in \$millions  | \$    | -        | \$ | •        | \$ |      | •   | \$ |      | \$  |     | ٠   | \$   |     |     | \$    |      | •   |  |
| Non-softening Treatment Trains  | 2     |          |    | V2-2022  |    |      | 2.7 |    |      |     |     | _   |      |     | 201 |       |      |     |  |
| Year =  |       | 2015     | _  | 2020     |    | 2030 |     |    | 2040 |     | 205 |     |      | 206 |     |       | 2065 |     |  |
| Average treated water production in mgd   |       | 84       |    | 204      |    |      | 214 |    | 218  |     |     | 223 |      |     | 227 |       |      | 231 |  |
| Design (Max. Day) treated water production req'd in mgd   |       | 109      |    | 265      |    |      | 276 |    | 281  |     |     | 287 |      |     | 293 |       |      | 297 |  |
| Additional Max day capacity built (mgd)   |       | 200      |    | 100      |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Total capacity on line (must exceed Design Max Day Req'd)   |       | 200      |    | 300      |    |      | 300 |    | 300  |     |     | 300 |      |     | 300 |       |      | 300 |  |
| Unit cost for max day treatment capacity (\$/gpd of capacity)   | \$    | 1.15     | \$ | 1.32     |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Estimated construction cost of expansion in \$millions  | \$    | 229.6    | \$ | 131.5    | \$ |      |     | \$ | *    | \$  |     | *   | \$   |     | •   | \$    |      | -   |  |
| Totals (Softening + Non-softening Trains)   |       |          |    |          |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Year =  |       | 2015     |    | 2020     |    | 2030 | )   |    | 2040 |     | 205 | 0   |      | 206 | 0   |       | 2065 |     |  |
| Total construction cost for both trains   | \$    | 229.6    | Ś  |          | \$ |      | -   | \$ | -    | \$  | -   | -   | \$   | -   | -   | \$    |      | -   |  |
| Contingencies   | 10000 | 45.9     |    | 26.3     |    |      |     |    |      | 7.5 |     |     | 2000 |     |     | LEITO |      |     |  |
| Subtotal  | S     | 275.5    | S  | 157.8    | S  |      | -   | \$ | _    | \$  |     |     | S    |     | -   | S     |      | -   |  |
| Engineering, Legal, & Administrative  |       | 41.3     |    | 23.7     |    |      | *   | •  | -    |     |     |     |      |     |     |       |      | -   |  |
| Subtotal  |       | 316.8    |    | 181.5    |    |      | -   |    | -    |     |     |     |      |     | -   |       |      | _   |  |
| Environmental & Archaelogy Studies and Mitigation & Land  |       |          |    |          |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Acquisition and Surveying (see Note below)  |       | 2.5      |    |          |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Total estimated capital cost  | \$    | 319.3    | \$ | 181.5    | \$ |      | -   | \$ | -    | \$  |     |     | \$   |     | -   | \$    |      | -   |  |
| NPV of capital cost   | 5     | \$ 319.3 |    | \$ 142.2 |    | \$   | •   |    | \$ - |     | \$  |     |      | \$  | -   |       | \$   | -   |  |
| Total NPV of WTP initial construction & expansions  | \$    | 461      |    |          |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |
| Note: Assumed land requirement for WTP (not including reservoir   | r.    | 100      | ac | res      |    |      |     |    |      |     |     |     |      |     |     |       |      |     |  |

## O&M Costs for Softening Trains: Estimated

#### O&M Costs for Non-Softening Trains:

|   | Year | Plant<br>Capacity in<br>service | Estimated<br>treated<br>water<br>production | Estimated Os<br>unit cos |       |               | Ne    | et present<br>value | Year | Plant Capacity in service | Estimated<br>treated water<br>production | Es | stimated O<br>unit co |       |            | Ne | t present<br>value |
|---|------|---------------------------------|---|--------------------------|-------|---------------|-------|---------------------|------|---------------------------|--|----|-----------------------|-------|------------|----|--------------------|
|   |      | mgd of<br>capacity              | mgd<br>produced                             | \$ per mg<br>treated     |       | illion<br>ear |       | (\$)                |      | mgd of<br>capacity        | mgd<br>produced                          |    | per mg<br>treated     | \$mil | llon /year |    | (\$)               |
| - | 2015 | -                               | -   |                          | \$    | -             | \$    | -                   | 2015 | 200                       | 84                                       | \$ | 374                   | \$    | 11.41      | \$ | 11.41              |
|   | 2016 | -                               | -   |                          | \$    |               | \$    | 100                 | 2016 | 200                       | 84                                       | \$ | 374                   | \$    | 11.41      | \$ | 10.87              |
|   | 2017 | -                               |   |                          | \$    | -             | \$    |                     | 2017 | 200                       | 84                                       | \$ | 374                   | \$    | 11.41      | \$ | 10.35              |
|   | 2018 | -                               | -   |                          | \$    | -             | \$    |                     | 2018 | 200                       | 84                                       | \$ | 374                   | \$    | 11.41      | \$ | 9.86               |
|   | 2019 | -                               |   |                          | \$    | -             | \$    | -                   | 2019 | 200                       | 84                                       | \$ | 374                   | \$    | 11.41      | \$ | 9.39               |
|   | 2020 | -                               | -   |                          | \$    | -             | \$    | -                   | 2020 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 19.98              |
|   | 2021 | -                               | -   |                          | \$    | -             | \$    | -                   | 2021 | 300                       | 204                                      | \$ | 343                   | \$    | 25,50      | \$ | 19.03              |
|   | 2022 |                                 | -   |                          | \$    |               | \$    | -                   | 2022 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 18.12              |
|   | 2023 | -                               | -   |                          | \$    | -             | \$    |                     | 2023 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 17.26              |
|   | 2024 | -                               | -   |                          | \$    |               | \$    | ~                   | 2024 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 16.44              |
|   | 2025 | -                               | -   |                          | \$    |               | \$    | ( ·                 | 2025 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 15.65              |
|   | 2026 | -                               | -   |                          | \$    | ~             | \$    | -                   | 2026 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 14.91              |
|   | 2027 | _                               | -   |                          | \$    | -             | \$    | -                   | 2027 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 14.20              |
|   | 2028 | _                               | -   |                          | \$    | -             | \$    | -                   | 2028 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 13.52              |
|   | 2029 | -                               | -   |                          | S     | -             | 5     | -                   | 2029 | 300                       | 204                                      | \$ | 343                   | \$    | 25.50      | \$ | 12.88              |
|   | 2030 | -                               |   |                          | S     |               | S     |                     | 2030 | 300                       | 214                                      | \$ | 343                   | S     | 26.73      | S  | 12.86              |
|   | 2031 | -                               |   |                          | \$    | -             | \$    |                     | 2031 | 300                       | 214                                      | \$ | 343                   | \$    | 26.73      | s  | 12.24              |
|   | 2032 | _                               | -   |                          | \$    | -             | \$    |                     | 2032 | 300                       | 214                                      | S  | 343                   | s     | 26.73      | s  | 11.66              |
|   | 2033 | -                               | -   |                          | \$    | -             | \$    |                     | 2033 | 300                       | 214                                      | \$ | 343                   | \$    | 26.73      | \$ | 11.11              |
|   | 2034 | -                               | -   |                          | \$    | -             | \$    |                     | 2034 | 300                       | 214                                      | \$ | 343                   | \$    | 26.73      | \$ | 10.58              |
|   | 2035 | -                               |   |                          | \$    | _             | \$    | -                   | 2035 | 300                       | 214                                      | Š  | 343                   | \$    | 26.73      | \$ | 10.07              |
|   | 2036 |                                 |   |                          | s     | _             | Š     |                     | 2036 | 300                       | 214                                      | \$ | 343                   | \$    | 26.73      | \$ | 9.59               |
|   | 2037 |                                 |   |                          | \$    | -             | S     | _                   | 2037 | 300                       | 214                                      | \$ | 343                   | \$    | 26.73      | \$ | 9.14               |
|   | 2038 | _                               |   |                          | Š     |               | Š     |                     | 2038 | 300                       | 214                                      | š  | 343                   | Š     | 26.73      | Š  | 8.70               |
|   | 2039 |                                 |   |                          | Š     | - 2           | Š     |                     | 2039 | 300                       | 214                                      | \$ | 343                   | Š     | 26.73      | Š  | 8.29               |
|   | 2040 |                                 |   |                          | Š     |               | Š     |                     | 2040 | 300                       | 218                                      | Š  | 343                   | š     | 27.28      | Š  | 8.06               |
|   | 2041 |                                 |   |                          | š     | -             | Š     |                     | 2041 | 300                       | 218                                      | Š  | 343                   | š     | 27.28      | Š  | 7.67               |
|   | 2042 |                                 | -   | 46                       | Š     |               | \$    | -                   | 2042 | 300                       | 218                                      | Š  | 343                   | Š     | 27.28      | Š  | 7.31               |
|   | 2043 |                                 | -   |                          | Š     |               | Š     | 1.5                 | 2043 | 300                       | 218                                      | Š  | 343                   | \$    | 27.28      | Š  | 6.96               |
|   | 2044 |                                 |   |                          | Š     | - 2           | Š     | -                   | 2043 | 300                       | 218                                      | Š  | 343                   | Š     | 27.28      | \$ | 6.63               |
|   | 2045 | - 0                             |   |                          | š     |               | \$    |                     | 2045 | 300                       | 218                                      | \$ | 343                   | \$    | 27.28      | \$ | 6.31               |
|   | 2046 |                                 | 10  |                          | Š     | - 2           | Š     | 100                 | 2045 | 300                       | 218                                      | S  | 343                   | Š     | 27.28      | Š  | 6.01               |
|   | 2047 | 9                               |   |                          | \$    | - 5           | Š     |                     | 2047 | 300                       | 218                                      | \$ | 343                   | \$    | 27.28      | \$ | 5.73               |
|   | 2048 |                                 | -   |                          | Š     | -             | Š     | 2.7                 | 2048 | 300                       | 218                                      | \$ | 343                   | \$    | 27.28      | \$ | 5.45               |
|   | 2049 | •                               |   |                          | Š     | -             | S     |                     | 2049 | 300                       | 218                                      | \$ | 343                   | Š     | 27.28      | S  |                    |
|   | 2050 |                                 | -   |                          | Š     | 7             | S     | , <del>-</del>      | 2050 | 300                       | 210                                      | \$ | 343                   | Š     | 27.84      | \$ | 5.19<br>5.05       |
|   | 2051 | -                               | -   |                          | š     | -             | Š     |                     | 2051 | 300                       | 223                                      | \$ | 343                   | \$    | 27.84      | Š  |                    |
|   | 2052 | -                               |   |                          | 5     |               | S     |                     |      |                           | 223                                      | \$ | 343                   |       |            |    | 4.81               |
|   | 2052 |                                 | -   |                          | S     | -             | S     |                     | 2052 | 300<br>300                | 223                                      | \$ | 343                   | \$    | 27.84      | \$ | 4.58               |
|   | 2053 | -                               |   |                          | \$    | -             | 5     |                     | 2053 |                           | 223                                      |    |                       | \$    |            |    | 4.36               |
|   | 2054 | 5                               | -   |                          |       | 5             | 5     | •                   | 2054 | 300                       | 223                                      | \$ | 343<br>343            | \$    | 27.84      | \$ | 4.15               |
|   | 2056 | - 1                             | -   |                          | \$    | 7             | \$    | •                   | 2055 | 300                       |  | \$ | 343                   | \$    | 27.84      | \$ | 3.95               |
|   | 2056 | 7                               |   |                          |       | -             | 5     |                     | 2056 | 300                       | 223                                      | \$ |                       | \$    | 27.84      | \$ | 3.77               |
|   |      | -                               | -   |                          | \$    | 7             | 0.000 |                     | 2057 | 300                       | 223                                      | \$ | 343                   | \$    | 27.84      | \$ | 3.59               |
|   | 2058 | -                               | -   |                          | \$    |               | \$    |                     | 2058 | 300                       | 223                                      | \$ | 343                   | \$    | 27.84      | \$ | 3.42               |
|   | 2059 | -                               | -   |                          | \$    | -             | \$    |                     | 2059 | 300                       | 223                                      | \$ | 343                   | \$    | 27.84      | \$ | 3.25               |
|   | 2060 | -                               | -   |                          | \$    | -             | \$    |                     | 2060 | 300                       | 227                                      | \$ | 343                   | \$    | 28.45      | \$ | 3.17               |
|   | 2061 | -                               | -   |                          | \$    | -             | \$    | •                   | 2061 | 300                       | 227                                      | \$ | 343                   | \$    | 28.45      | 5  | 3.02               |
|   | 2062 | -                               | -   |                          | \$    | -             | \$    | •                   | 2062 | 300                       | 227                                      | \$ | 343                   | \$    | 28.45      | \$ | 2.87               |
|   | 2063 | -                               | -   |                          | \$    | •             | \$    | •                   | 2063 | 300                       | 227                                      | \$ | 343                   | \$    | 28.45      | \$ | 2.74               |
|   | 2064 | -                               | -   |                          | \$    | -             | \$    | •                   | 2064 | 300                       | 227                                      | \$ | 343                   | \$    | 28.45      | \$ | 2.60               |
|   | 2065 | -                               | -   |                          | \$    | -             | \$    |                     | 2065 | 300                       | 231                                      | \$ | 343                   | \$    | 28.85      | \$ | 2.52               |
|   |      |                                 |   | Total NPV o              | f O&M | Costs         | \$    | -                   |      |                           |  | 15 | Total NPV             | of O  | RM Costs   | \$ | 441                |

NPV Totals for O&M:

Softening trains
Non-softening Trains
\$ -\$ 441
\$ 441

Summary

 
 NPV of Capital Costs
 NPV of Oath Costs
 Total NPV of Capital and QaM Costs

 \$ 34
 \$ 3.5
 \$ 38

 \$ 461
 \$ 441
 \$ 903

 \$ 496
 \$ 445
 \$ 941
 Raw Water Reservoir Water Treatment Plant Totals

## Capital and O&M Cost Calculations Potable Water Transmission Mains CTRWTP - Alternate 1D - WTP East of San Antonio & ALCOA/CPS Water Ultimately to COA & LCRA

Initial year of analysis period 2015 Contingency = 20% Interest rate 5% Engineering, Legal, Admin. = 15% Evaluation period 50 years Environmental & Archaeology Studies & Unit cost of energy \$ 0.07 per kwh Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

#### Summary of Demands

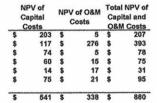
#### Average demands to be delivered in each segment

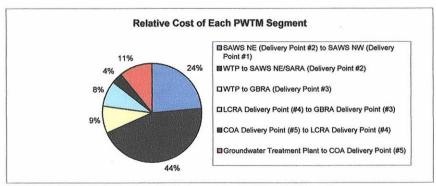
|          |       |        | in acre-feet/ye | ar     |        |        |        |
|----------|-------|--------|-----------------|--------|--------|--------|--------|
| Year     | 2015  | 2020   | 2030            | 2040   | 2050   | 2060   | 2065   |
| SAWS NW  | 33000 | 123000 | 123000          | 123000 | 123000 | 123000 | 123000 |
| SAWS NE  | 22000 | 82000  | 82000           | 82000  | 82000  | 82000  | 82000  |
| Subtotal | 55000 | 205000 | 205000          | 205000 | 205000 | 205000 | 205000 |
| SARA     | 0     | 23406  | 28433           | 31393  | 34411  | 37530  | 41128  |
| GBRA     |       |        | 6000            | 8000   | 10000  | 12300  | 12300  |
| LCRA     |       |        | 5600            | 11200  | 11200  | 11200  | 11200  |
| COA      |       |        | 16802           | 22403  | 33604  | 33604  | 33604  |
| Total    | 55000 | 228406 | 261835          | 277996 | 294215 | 299634 | 303232 |

#### Summary

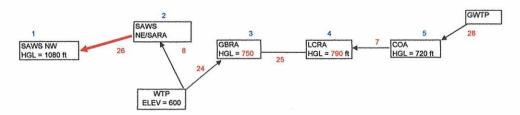
SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1) WTP to SAWS NE/SARA (Delivery Point #2) WTP to GBRA (Delivery Point #3) LCRA Delivery Point (#4) to GBRA Delivery Point (#3) COA Delivery Point (#5) to LCRA Delivery Point (#4) Groundwater Treatment Plant to COA Delivery Point (#5)

Total for PWTMs





### SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1) (Bold line in schematic below)



#### Demands for this pipe segment

|         |      | Average dem | ands to be deli | vered in each | segment in mgd | ı    |      |
|---------|------|-------------|-----------------|---------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040          | 2050           | 2060 | 2065 |
| SAWS NW | 29   | 110         | 110             | 110           | 110            | 110  | 110  |
| Total - | 29   | 110         | 110             | 110           | 110            | 110  | 110  |

Max d/Avg d

|         |      | Max day dem | ands to be deli | vered in each s | segment in mgd |      |      |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 |
| SAWS NW | 38   | 143         | 143             | 143             | 143            | 143  | 143  |
| Total   | 38   | 143         | 143             | 143             | 143            | 143  | 143  |

#### **PWTM and Pump Station Costs**

| Design flow rate - year 2065   | 143     | mgd    |
|--|---------|--------|
| The state of the s | 99,125  | gpm    |
| Pumping capacity of one pump   | 20,000  | gpm    |
| No. of pumps (not counting spare)  | 5       | 177-55 |
| Peak flow rate (all pumps except spare)  | 100,000 | gpm    |
| Inside diameter of PWTM  | 120     | in.    |

 Inside diameter of PWTM
 120 in.

 Area
 78.54 sf

 Length of RWTM
 26 miles

 137,280 feet
 137,280 feet

(linked to mileage in schematic above)

| stimated unit cost by condition: | % of length | LE      | U  | nit cost | Cost        |         |
|----------------------------------|-------------|---------|----|----------|-------------|---------|
| Rural - soil                     | 15%         | 20,592  | \$ | 783      | \$<br>16.1  | million |
| Rural - rock                     | 50%         | 68,640  | \$ | 1,048    | \$<br>72.0  |         |
| Urban - rock                     | 35%         | 48,048  | \$ | 1,186    | \$<br>57.0  |         |
|                                  |             | 137,280 |    |          | \$<br>145.0 | million |

| Total construction cost in millions                      | \$ | 145.0 |
|--|----|-------|
| Contingencies  | \$ | 29.0  |
| Subtotal   | \$ | 174.0 |
| Engineering, Legal & Administrative                      | \$ | 26.1  |
| Subtotal   | \$ | 200.2 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | \$ | 2.6   |
| Total Capital Cost for PM/TM in millions                 | 2  | 202.8 |

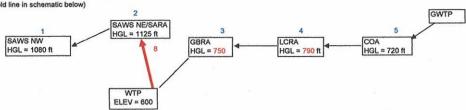
Unit maintenance cost/year-mile \$ 10,000 \$/year-mile \$ 0.280 Million \$/year

Negative indicates gravity flow from #2 to #1; no pumping necessary.

| 100    |                        |     |       |          |                            | N  | illion \$ |
|--------|------------------------|-----|-------|----------|----------------------------|----|-----------|
| Annua  | I O&M Cost in million  | \$: |       | Yr built |                            |    |           |
|        | PWTM                   | \$  | 0.260 | 2015     |                            |    |           |
|        |                        |     |       |          | Total NPV of O&M Costs     |    | \$4.7     |
| Capita | I Costs in million \$: |     |       | Yr built |                            |    |           |
|        | PWTM                   | \$  | 202.8 | 2015     |                            | \$ | 202.8     |
|        |                        |     |       |          | Total NPV of Capital Costs | \$ | 202.8     |

Total NPV of Capital and O&M Costs in millions \$ 207.5 SAWS NE (Delivery Point #2) to SAWS NW (Delivery Point #1)

#### WTP to SAWS NE/SARA (Delivery Point #2) (Bold line in schematic below)



#### Demands for this pipe segment

|         |      | Average dem | ands to be deli | vered in each s | segment in mgd | l    |      |             |
|---------|------|-------------|-----------------|-----------------|----------------|------|------|-------------|
| Year    | 2015 | 2020        | 2030            | 2040            | 2050           | 2060 | 2065 | Max d/Avg d |
| SAWS NW | 29   | 110         | 110             | 110             | 110            | 110  | 110  | 1.3         |
| SAWS NE | 20   | 73          | 73              | 73              | 73             | 73   | 73   | 1.3         |
| SARA    | 0    | 21          | 25              | 28              | 31             | 34   | 37   | 1.3         |
| Total   | 49   | 204         | 208             | 211             | 214            | 217  | 220  |             |

|         |      | Max day dem | ands to be del | ivered in each s | segment in mgd |      |      |
|---------|------|-------------|----------------|------------------|----------------|------|------|
| Year    | 2015 | 2020        | 2030           | 2040             | 2050           | 2060 | 2065 |
| SAWS NW | 38   | 143         | 143            | 143              | 143            | 143  | 143  |
| SAWS NE | 26   | 95          | 95             | 95               | 95             | 95   | 95   |
| SARA    | 0    | 27          | 33             | 36               | 40             | 44   | 48   |
| Total   | 64   | 265         | 271            | 274              | 278            | 281  | 286  |

#### **PWTM and Pump Station Costs**

| 286     | mgd   |  |
|---------|---|--|
| 198,353 | gpm   |  |
| 20,000  | gpm   |  |
| 10      |   |  |
| 200,000 | gpm   | ×  |
| 120     | in.   |  |
| 78.54   | sf  |  |
| 8       | miles   | (linked to mileage in schematic above)   |
| 42,240  | feet  | 11   |
|         | 198,353<br>20,000<br>10<br>200,000<br>120<br>78.54<br>8 | 286 mgd<br>198,353 gpm<br>20,000 gpm<br>10<br>200,000 gpm<br>120 in.<br>78.54 sf<br>8 miles<br>42,240 feet |

| Estimated unit cost by condition:   | % of length   | LE     | U  | nit cost | Co     | st   |         |
|-------------------------------------|---------------|--------|----|----------|--------|------|---------|
| Rural - soil                        | 25%           | 10,560 | \$ | 783      | \$     | 8.3  | million |
| Rural - rock                        | 50%           | 21,120 | \$ | 1,048    | \$     | 22.1 |         |
| Urban - rock                        | 25%           | 10,560 | \$ | 1,186    | \$     | 12.5 |         |
|                                     |               | 42,240 |    |          | \$     | 42.9 | million |
| Average estimated unit construction | cost for PWTM |        | \$ | 1,016    | per LF |      |         |

| Total construction cost in millions                      | \$ | 42.9 |
|--|----|------|
| Contingencies  | \$ | 8.6  |
| Subtotal   | \$ | 51.5 |
| Engineering, Legal & Administrative                      | \$ | 7.7  |
| Subtotal   | \$ | 59.2 |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq | S  | 0.8  |
| Total Capital Cost for PWTM in millions                  | S  | 60.0 |

| \$<br>10,000 | \$/year-mile | \$   | 0.080            | Million \$/year |
|--------------|--------------|--|------------------|-----------------|
| 5.67         | fps          |  |                  |                 |
| 120          |              |  |                  |                 |
| 0.00073      | fl/ft        |  | h <sub>f</sub> = | 13.552*QI1.85   |
| \$           | 5.67<br>120  | \$ 10,000 \$/year-mile<br>5.67 fps<br>120<br>0.00073 ft/ft | 5.67 fps<br>120  | 5.67 fps<br>120 |

| Ctactor                      |     | 120     |         |                  |                               |
|------------------------------|-----|---------|---------|------------------|-------------------------------|
| Head loss per foot           |     | 0.00073 | ft/ft   | h <sub>f</sub> = | 3.552*Q 1.85                  |
|                              |     | 3.85    | ft/mile |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate  |     | 31      | ft      |                  |                               |
| Allowance for minor losses   | 20% | 6       | ft      | 1125             | Desired HGL At Delivery Point |
| Total estimated losses       |     | 37      | ft      | 600              | Elev. At WTP                  |
| Average static head          |     | 525     | ft      | 525              | ft                            |
| Total actimated dynamic head |     | 562     | ft      |                  |                               |

| rotal estimated dynamic nead                   | 244 psi |                               |  |  |  |  |  |  |  |
|--|---------|-------------------------------|--|--|--|--|--|--|--|
| No of recommended pumping stations along route | 1.62    | 150 psi (assumed max pressure |  |  |  |  |  |  |  |
| No. of pumping stations used in cost estimate  | 2       | in pipe)                      |  |  |  |  |  |  |  |
| Average head per pump station                  | 281 ft  |                               |  |  |  |  |  |  |  |
| Assumed numb officiency                        | 95%     |                               |  |  |  |  |  |  |  |

| Assumed pump efficiency                                 | 85%  |
|---|--|
| Assumed motor efficiency                                | 90%  |
| Estimated Hp required per pump                          | 1,855 hp/pump                                |
|   | 1,384 kw/pump                                |
| Total hp per pump station (not counting spare)          | 18,549 firm hp/station                       |
| Total kw per pump set (set=pumps in series along route) | 3,710 kw/pump set (one pump at each station) |

| A STATE OF THE PARTY OF THE STATE OF THE STA |             |                             |
|--|-------------|-----------------------------|
| Unit construction cost for each pump station (from cost curve)   | \$<br>1,105 | per firm hp of pump station |
| Construction cost per pump station   | 20.5        | million                     |

| Total construction cost for pump stations | 41.0 | for | 2 | pump stations |
|---|------|-----|---|---------------|
|   |      |     |   |               |

| Contingencies Subtotal Engineering, Legal & Administrative Total capital cost for pump stations in millions Value of equipment Assumed life of equipment Estimated maintenance/replacement cost |  |  | ons                    | \$ 16 million 20 years |                  |      |                |     |                                    | 40% Equip cost as % of con |                               |      |                  |    |                     |
|---|--|--|------------------------|------------------------|------------------|------|----------------|-----|------------------------------------|----------------------------|-------------------------------|------|------------------|----|---------------------|
|   | Estimated mai                                    | ntenance/repla                             | cement cost            |                        |                  | \$   | 0.82           | mil | lion/year                          |                            |                               |      |                  |    |                     |
| O&M Cos   | sts  |  |                        |                        |                  |      |                |     |                                    |                            |                               |      |                  |    |                     |
| Year  | Flow pumped<br>by year<br>(average<br>flows from | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used         |                        | Energ            | ду с | ost            | co  | ther O&M<br>sts - Pump<br>Stations |                            | aintenance<br>costs -<br>PWTM | T    | otal O&M<br>cost | Ne | et present<br>value |
|   | Table above)<br>mgd                              |  | (kwh/day)              |                        | (\$/day)         |      | (Million \$    |     |                                    |                            | (Million \$                   | (    | Million \$       |    | (\$)                |
| 2015  | 49   | 1.70                                       | 151,788                | \$                     | 10,625           | S    | /year)<br>3.88 | S   | /year)<br>0.82                     | S                          | /year)<br>0.080               | Ś    | /year)<br>4.78   | \$ | 4.78                |
| 2016  | 49   | 1.70                                       | 151,788                | š                      | 10,625           | \$   | 3.88           | \$  | 0.82                               | \$                         | 0.080                         | Š    | 4.78             | \$ | 4.55                |
| 2017  | 49   | 1.70                                       | 151,788                | \$                     | 10,625           | \$   | 3.88           | \$  | 0.82                               | \$                         | 0.080                         | \$   | 4.78             | \$ | 4.33                |
| 2018  | 49   | 1.70                                       | 151,788                | \$                     | 10,625           | \$   | 3.88           | \$  | 0.82                               | \$                         | 0.080                         | \$   | 4.78             | \$ | 4.13                |
| 2019  | 49   | 1.70                                       | 151,788                | \$                     | 10,625           | \$   | 3.88           | \$  | 0.82                               | \$                         | 0.080                         | \$   | 4.78             | \$ | 3.93                |
| 2020  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 13.32               |
| 2021  | 204<br>204                                       | 7.08<br>7.08                               | 630,351<br>630,351     | \$                     | 44,125<br>44,125 | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01<br>17.01   | \$ | 12.69<br>12.09      |
| 2022<br>2023  | 204  | 7.08                                       | 630,351                | S                      | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 11.51               |
| 2024  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | Š                          | 0.080                         | Š    | 17.01            | \$ | 10.96               |
| 2025  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | Š    | 16.11          | Š   | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 10.44               |
| 2026  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 9.94                |
| 2027  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 9.47                |
| 2028  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 9.02                |
| 2029  | 204  | 7.08                                       | 630,351                | \$                     | 44,125           | \$   | 16.11          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.01            | \$ | 8.59                |
| 2030  | 208<br>208                                       | 7.24<br>7.24                               | 644,225<br>644,225     | \$                     | 45,096<br>45,096 | \$   | 16.46<br>16.46 | \$  | 0.82<br>0.82                       | \$                         | 0.080                         | \$   | 17.36<br>17.36   | \$ | 8.35<br>7.95        |
| 2032  | 208  | 7.24                                       | 644,225                | 5                      | 45,096           | \$   | 16.46          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36            | \$ | 7.57                |
| 2033  | 208  | 7.24                                       | 644,225                | Š                      | 45,096           | \$   | 16.46          | Š   | 0.82                               | Š                          | 0.080                         | \$   | 17.36            | \$ | 7.21                |
| 2034  | 208  | 7.24                                       | 644,225                | \$                     | 45,096           | \$   | 16.46          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36            | \$ | 6.87                |
| 2035  | 208  | 7.24                                       | 644,225                | \$                     | 45,096           | \$   | 16.46          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36            | \$ | 6.54                |
| 2036  | 208  | 7.24                                       | 644,225                | \$                     | 45,096           | \$   | 16.46          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36            | \$ | 6.23                |
| 2037  | 208  | 7.24                                       | 644,225                | \$                     | 45,096           | \$   | 16.46          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36            | \$ | 5.93                |
| 2038  | 208<br>208                                       | 7.24<br>7.24                               | 644,225<br>644,225     | \$                     | 45,096<br>45,096 | \$   | 16.46<br>16.46 | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.36<br>17.36   | \$ | 5.65<br>5.38        |
| 2039  | 211  | 7.24                                       | 652,394                | S                      | 45,668           | \$   | 16.46          | \$  | 0.82                               | 5                          | 0.080                         | \$   | 17.57            | \$ | 5.19                |
| 2040  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 4.94                |
| 2042  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 4.71                |
| 2043  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 4.48                |
| 2044  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 4.27                |
| 2045  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 4.06                |
| 2046  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | \$   | 16.67          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 3.87                |
| 2047  | 211  | 7.33<br>7.33                               | 652,394<br>652,394     | \$                     | 45,668<br>45,668 | \$   | 16.67<br>16.67 | \$  | 0.82                               | 5                          | 0.080                         | \$   | 17.57<br>17.57   | \$ | 3.69<br>3.51        |
| 2049  | 211  | 7.33                                       | 652,394                | \$                     | 45,668           | S    | 16.67          | Š   | 0.82                               | \$                         | 0.080                         | \$   | 17.57            | \$ | 3.34                |
| 2050  | 214  | 7.42                                       | 660,723                | Š                      | 46,251           | s    | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 3.22                |
| 2051  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 3.07                |
| 2052  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 2.92                |
| 2053  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 2.78                |
| 2054  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 2.65                |
| 2055<br>2056  | 214<br>214                                       | 7.42<br>7.42                               | 660,723<br>660,723     | 5                      | 46,251<br>46,251 | 5    | 16.88<br>16.88 | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78<br>17.78   | \$ | 2.53<br>2.41        |
| 2057  | 214  | 7.42                                       | 660,723                | S                      | 46,251           | S    | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | Š  | 2.29                |
| 2058  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 2.18                |
| 2059  | 214  | 7.42                                       | 660,723                | \$                     | 46,251           | \$   | 16.88          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 17.78            | \$ | 2.08                |
| 2060  | 217  | 7.52                                       | 669,331                | \$                     | 46,853           | \$   | 17.10          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 18.00            | \$ | 2.00                |
| 2061  | 217  | 7.52                                       | 669,331                | \$                     | 46,853           | \$   | 17.10          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 18.00            | \$ | 1.91                |
| 2062  | 217  | 7.52                                       | 669,331                | \$                     | 46,853           | \$   | 17.10          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 18.00            | \$ | 1.82                |
| 2063<br>2064  | 217<br>217                                       | 7.52<br>7.52                               | 669,331                | \$                     | 46,853<br>46,853 | \$   | 17.10<br>17.10 | \$  | 0.82                               | \$                         | 0.080                         | \$   | 18.00<br>18.00   | \$ | 1.73<br>1.65        |
| 2065  | 220  | 7.63                                       | 669,331<br>679,260     | \$                     | 47,548           | \$   | 17.10          | \$  | 0.82                               | \$                         | 0.080                         | \$   | 18.26            | \$ | 1.59                |
|   |  |  |                        |                        |                  |      |                |     |                                    |                            | Total NPV                     | of C | D&M Costs        | \$ | 276.4               |
|   |  | Carital Carts                              | in million &           |                        |                  |      |                |     | V- h:14                            |                            |                               |      |                  |    |                     |
|   |  | Capital Costs                              | in million \$:<br>PWTM |                        |                  | s    | 60.0           | -   | Yr built<br>2015                   | 0                          |                               |      |                  | \$ | 60.0                |
|   |  |  | Pumping Stat           | ion                    | 3                | S    | 56.6           |     | 2015                               |                            |                               |      |                  | \$ | 56.6                |
|   |  |  | ping Otut              |                        |                  | -    | 55.0           |     |                                    | T                          | otal NPV of                   | Ca   | pital Costs      | \$ | 116.6               |

Total NPV of Capital and O&M Costs in millions \$ 393 WTP to SAWS NE/SARA (Delivery Point #2)

Total NPV of Capital Costs \$

#### WTP to GBRA (Delivery Point #3) (Bold line in schematic below) GWTP SAWS NE/SARA HGL = 1125 ft SAWS NW GBRA LCRA COA HGL = 1080 ft HGL = 750 ft HGL = 720 ft HGL = 790 During first five years, flow in this line will be in opposite direction, that is from GBRA to SAWS NE but via Surface WTP which will be built in 2020. WTF ELEV = 600 Ultimate demands for this pipe segment Average demands to be delivered in each segment in mgd 2020 2030 2040 2050 0 5 7 9 Year GBRA Max d/Avg d 2065



#### **PWTM and Pump Station Costs**

| Design flow rate - year 2015 flow i   | s greater than 2065 | 5 flow           |        | 64        | mg   | 4    |                      |                         |
|---------------------------------------|---------------------|------------------|--------|-----------|------|------|----------------------|-------------------------|
| Design now rate - year 2015 now i     | s greater man 2000  | J HOW            |        |           |      |      |                      |                         |
| Pumping capacity of one pump          |                     |                  |        | 9,000     | gpr  | n    |                      |                         |
| No. of pumps (not counting spare)     |                     |                  |        | 5         |      |      |                      |                         |
| Peak flow rate (all pumps except spar |                     |                  | 45,000 | gpr       | n    |      |                      |                         |
| Inside diameter of PWTM               |                     |                  |        | 72        | in.  |      |                      |                         |
| Area                                  |                     |                  |        | 28.27     | sf   |      |                      |                         |
| Length of RWTM                        |                     |                  |        | 24        | mile | es   | (linked to mile      | age in schematic above) |
| POS DEZWYMIERS III DIANA III VAN TIVA | 1                   | C Des Incasation | ewn (t | 126,720   | fee  |      | ATRICK (PER ADDITION |                         |
| Estimated unit cost by condition:     | % of length         | LE               |        | Unit cost |      | Cost |                      |                         |
| Rural - soil                          | 100%                | 126,720          | \$     | 365       | \$   | 46.3 | million              |                         |
| Rural - rock                          | 0%                  |                  | \$     | 498       | \$   |      |                      |                         |
| Urban - rock                          | 0%                  |                  | \$     | 552       | \$   |      |                      |                         |

| Urban - rock                          | 0%                   | STATE OF STATE OF | \$ | 552    | \$       |      | 2000   |       |               |
|---------------------------------------|----------------------|-------------------|----|--------|----------|------|--------|-------|---------------|
|                                       |                      | 126,720           |    |        | \$       | 46.3 | millio | n     |               |
| Average estimated unit construction   | cost for PWTM        |                   | \$ | 365    | per LF   |      |        |       |               |
| Total construction cost in millions   |                      |                   | \$ | 46.3   |          |      |        |       |               |
| Contingencies                         |                      |                   | \$ | 9.3    |          |      |        |       |               |
| Subtotal                              |                      |                   | \$ | 55.6   |          |      |        |       |               |
| Engineering, Legal & Administrative   |                      |                   | \$ | 8.3    |          |      |        |       |               |
| Subtotal                              |                      |                   | \$ | 63.9   | 7        |      |        |       |               |
| Envir & Arch Studies & Mitigation, St | irveying, & Land Acq |                   | \$ | 2.4    | 20       |      |        |       |               |
| Total Capital Cost for PV             | /TM in millions      |                   | \$ | 66.3   |          |      |        |       |               |
| Linit maintenance cost/year-mile      |                      |                   | •  | 10.000 | \$hear-o | oile | •      | 0.240 | Million S/ves |

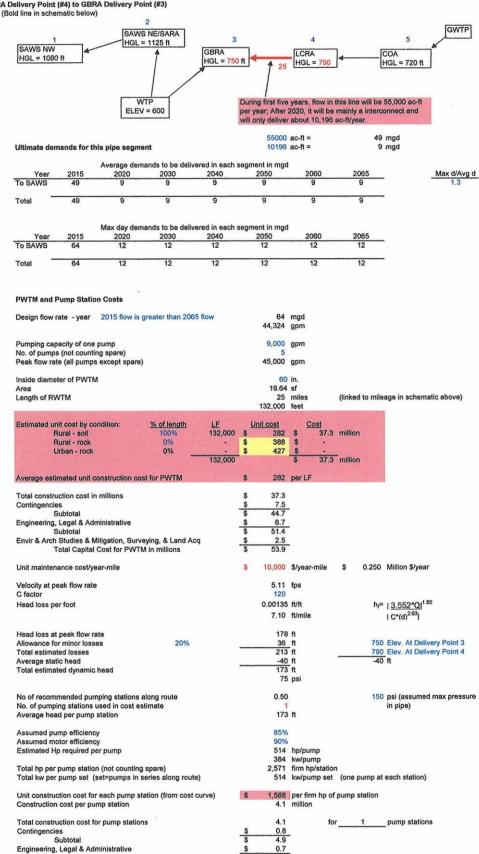
| Total Capital Cost for PWTM in millions            | \$             | 66.3    |                |      |                  |                               |
|--|----------------|---------|----------------|------|------------------|-------------------------------|
| Unit maintenance cost/year-mile                    | \$             | 10,000  | \$/year-mile   | \$   | 0.240            | Million \$/year               |
| Velocity at peak flow rate                         |                | 3.55    | fps            |      |                  |                               |
| C factor   |                | 120     |                |      |                  |                               |
| Head loss per foot                                 |                | 0.00055 | ft/ft          |      | h <sub>f</sub> = | 13.552*Q11.85                 |
|  |                | 2.92    | ft/mile        |      |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate                        |                | 70      | ft             |      |                  |                               |
| Allowance for minor losses 2                       | 0%             | 14      | ft             |      | 750              | Desired HGL At Delivery Point |
| Total estimated losses                             |                | 84      | ft             |      |                  | Elev. At WTP                  |
| Average static head                                |                | 150     |                |      | 150              | ft                            |
| Total estimated dynamic head                       | V-2001         | 234     | ft             |      |                  |                               |
|  |                | 102     | psi            |      |                  |                               |
| No of recommended pumping stations along route     |                | 0.68    |                |      | 150              | psi (assumed max pressure     |
| No. of pumping stations used in cost estimate      |                | 1       |                |      |                  | in pipe)                      |
| Average head per pump station                      |                | 234     | ft             |      |                  |                               |
| Assumed pump efficiency                            |                | 85%     |                |      |                  |                               |
| Assumed motor efficiency                           |                | 90%     |                |      |                  |                               |
| Estimated Hp required per pump                     |                | 696     | hp/pump        |      |                  |                               |
|  |                | 519     | kw/pump        |      |                  |                               |
| Total hp per pump station (not counting spare)     |                | 3,479   | hp/station     |      |                  |                               |
| Total kw per pump set (set≃pumps in series along   | route)         | 696     | kw/pump set    | (one | pump at          | each station)                 |
| Unit construction cost for each pump station (from | cost curve) \$ | 1,514   | per firm hp of | pump | station          |                               |

#### **O&M Costs**

| Year         | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used  | Energy cost |        |                      |    | costs -              |       | otal O&M<br>cost     | Ne   | et present<br>value  |    |              |
|--------------|--|--|-----------------|-------------|--------|----------------------|----|----------------------|-------|----------------------|------|----------------------|----|--------------|
|              | mgd  |  | (kwh/day)       | (\$         | i/day) | Million \$<br>/year) | (1 | Million \$<br>/year) |       | Million \$<br>/year) |      | Million \$<br>/year) |    | (\$)         |
| 2015         |  | 4  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.24         |
| 2016         |  | 7  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.23         |
| 2017         |  |  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.22         |
| 2018         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.21         |
| 2019         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.20         |
| 2020         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.19<br>0.18 |
| 2021         |  | 1  |                 |             |        |                      |    |                      | 5     | 0.240                | \$   | 0.24                 | \$ | 0.18         |
| 2022<br>2023 |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | \$ | 0.17         |
| 2023         |  |  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | \$ | 0.15         |
| 2024         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | \$ | 0.15         |
| 2026         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | s    | 0.24                 | \$ | 0.14         |
| 2027         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | š    | 0.24                 | s  | 0.13         |
| 2028         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | \$ | 0.13         |
| 2029         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | s    | 0.24                 | \$ | 0.12         |
| 2030         |  | _ 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.12         |
| 2031         |  | Flow is by gra                             | vity in opposit | e dire      | ction  |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.11         |
| 2032         |  |  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.10         |
| 2033         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.10         |
| 2034         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.09         |
| 2035         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.09         |
| 2036         |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.09         |
| 2037         |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.08         |
| 2038         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.08         |
| 2039         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.07         |
| 2040         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.07         |
| 2041         |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.07         |
| 2042         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.06         |
| 2043         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.06         |
| 2044         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.06         |
| 2045         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.06         |
| 2046         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.05         |
| 2047         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.05         |
| 2048         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.05<br>0.05 |
| 2049<br>2050 |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.05         |
| 2050         |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | S    | 0.24                 | \$ | 0.04         |
| 2052         |  | - 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.04         |
| 2052         |  | 1  |                 |             |        |                      |    |                      | Š     | 0.240                | Š    | 0.24                 | Š  | 0.04         |
| 2054         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | Š  | 0.04         |
| 2055         |  | 1  |                 |             |        |                      |    |                      | Š     | 0.240                | Š    | 0.24                 | \$ | 0.03         |
| 2056         |  |  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.03         |
| 2057         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.03         |
| 2058         |  | 1  |                 |             |        |                      |    |                      | \$    | 0.240                | Š    | 0.24                 | \$ | 0.03         |
| 2059         |  | ₩  |                 |             |        |                      |    |                      | \$    | 0.240                | \$   | 0.24                 | \$ | 0.03         |
| 2060         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | \$ | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.08         |
| 2061         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | \$ | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.07         |
| 2062         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | \$ | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.07         |
| 2063         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | s  | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.07         |
| 2064         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | \$ | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.06         |
| 2065         | 11   | 0.85                                       | 14,150          | \$          | 990    | \$<br>0.36           | \$ | 0.11                 | \$    | 0.240                | \$   | 0.71                 | \$ | 0.06         |
|              |  |  |                 |             |        |                      |    |                      |       | Total NPV            | of C | O&M Costs            | \$ | 4.9          |
|              |  | Capital Costs                              | in million \$:  |             |        |                      |    | Yr built             |       |                      |      |                      |    |              |
|              |  |  | PWTM            |             |        | \$<br>66             |    | 2015                 | • 1 5 |                      |      |                      | \$ | 66.3         |
|              |  |  | Pumping Stati   | ions        |        | \$<br>7              |    | 2015                 |       |                      |      |                      | \$ | 7.3          |
|              |  |  | 2, 55           |             |        |                      |    |                      | T     | otal NPV o           | Ca   | pital Costs          | \$ | 73.6         |

Total NPV of Capital and O&M Costs in millions \$ 78.5 WTP to GBRA (Delivery Point #3)

### LCRA Delivery Point (#4) to GBRA Delivery Point (#3)



Total capital cost for pump stations

\$ 5.6 million

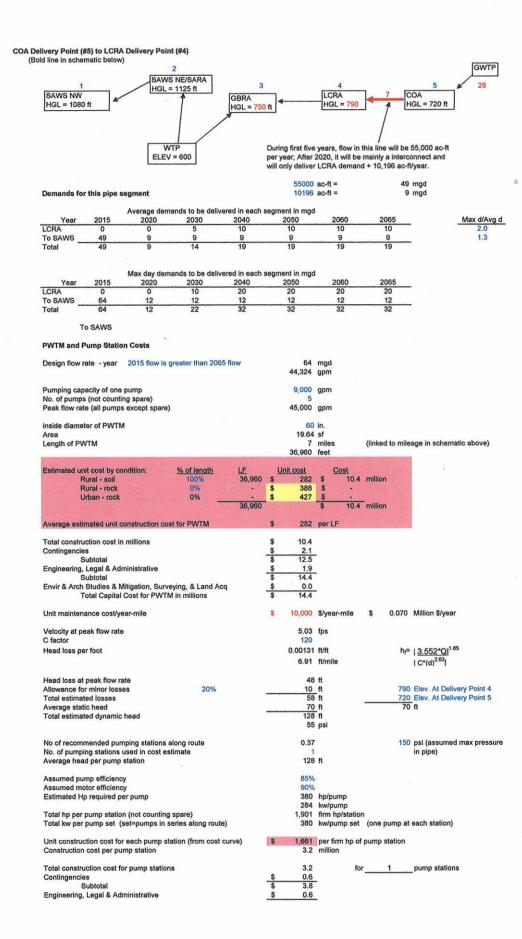
40% Equip cost as % of constr cost

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 1.6 million 20 years \$ 0.08 million/year

**O&M Costs** 

| Year         | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used |      | Energ      | Эу ( | cost                  |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | Т    | otal O&M<br>cost     | Ne | et present<br>value |
|--------------|--|--|----------------|------|------------|------|-----------------------|----|--------------------------------------|----|-------------------------------|------|----------------------|----|---------------------|
|              | mgd  |  | (kwh/day)      |      | (\$/day)   |      | (Million \$<br>/year) |    | (Million \$<br>/year)                |    | (Million \$<br>/year)         | (    | Million \$<br>/year) |    | (\$)                |
| 2015         | 49   | 3.79                                       | 46,745         | \$   | 3,272      | \$   | 1.19                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53                 | \$ | 1.53                |
| 2016         | 49   | 3.79                                       | 46,745         | \$   | 3,272      | \$   | 1.19                  | \$ |                                      | \$ | 0.250                         | \$   | 1.53                 | \$ | 1.45                |
| 2017         | 49   | 3.79                                       | 46,745         | \$   | 3,272      | \$   | 1.19                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53                 | \$ | 1.38                |
| 2018         | 49   | 3.79                                       | 46,745         | \$   | 3,272      | \$   | 1.19                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53                 | \$ | 1.32                |
| 2019         | 49   | 3.79                                       | 46,745         | \$   | 3,272      | \$   | 1.19                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53                 | \$ | 1.26                |
| 2020         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.43                |
| 2021         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.41                |
| 2022         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.39                |
| 2023         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.37                |
| 2024         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.36                |
| 2025         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.34                |
| 2026         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0,55                 | \$ | 0.32                |
| 2027         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.31                |
| 2028         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.29                |
| 2029         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.28                |
| 2030         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.27                |
| 2031         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.25                |
| 2032         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.24                |
| 2033         |  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 80.0                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.23                |
| 2034         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.22                |
| 2035         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.21                |
| 2036         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.20                |
| 2037         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.19                |
| 2038         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.18                |
| 2039         |  | 0.70                                       | 8,666          | \$   | 607        | 3    | 0.22                  | \$ | -                                    | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.17                |
| 2040         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.16                |
| 2041         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.16                |
| 2042         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.15                |
| 2043         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 00000000              | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.14                |
| 2044         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.13                |
| 2045<br>2046 | 9  | 0.70                                       | 8,666          | \$   | 607<br>607 | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55<br>0.55         | \$ | 0.13                |
| 2046         | 9  | 0.70<br>0.70                               | 8,666          | \$   | 607        | \$   | 0.22<br>0.22          | \$ |                                      | \$ | 0.250<br>0.250                | \$   | 1000000              | 5  | 0.12                |
| 2047         | 9  | 0.70                                       | 8,666<br>8,666 | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55<br>0.55         | \$ | 0.12<br>0.11        |
| 2049         | 9  | 0.70                                       | 8,666          | \$   | 607        | 5    | 0.22                  | \$ |                                      | S  | 0.250                         | \$   | 0.55                 | s  | 0.11                |
| 2050         | 9  | 0.70                                       | 8,666          | \$   | 607        | S    | 0.22                  | \$ |                                      | S  | 0.250                         | 5    | 0.55                 | s  | 0.10                |
| 2051         | 9  | 0.70                                       | 8,666          | \$   | 607        | S    | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | S  | 0.10                |
| 2052         | 9  | 0.70                                       | 8,666          | s    | 607        | \$   | 0.22                  | \$ |                                      | Š  | 0.250                         | \$   | 0.55                 | \$ | 0.09                |
| 2053         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | S  |                                      | Š  | 0.250                         | s    | 0.55                 | \$ | 0.09                |
| 2054         | 9  | 0.70                                       | 8,666          | Š    | 607        | Š    | 0.22                  | \$ |                                      | Š  | 0.250                         | Š    | 0.55                 | s  | 0.08                |
| 2055         | 9  | 0.70                                       | 8,666          | š    | 607        | s    | 0.22                  | Š  |                                      | Š  | 0.250                         | \$   | 0.55                 | Š  | 0.08                |
| 2056         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.07                |
| 2057         | 9  | 0.70                                       | 8,666          | Š    | 607        | \$   |                       | Š  |                                      | Š  | 0.250                         | Š    | 0.55                 | \$ | 0.07                |
| 2058         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | s  | 0.250                         | \$   | 0.55                 | \$ | 0.07                |
| 2059         | 9  | 0.70                                       | 8,666          | \$   | 607        | S    | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.06                |
| 2060         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.06                |
| 2061         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.06                |
| 2062         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.06                |
| 2063         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.05                |
| 2064         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   |                       | \$ |                                      | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.05                |
| 2065         | 9  | 0.70                                       | 8,666          | \$   | 607        | \$   | 0.22                  | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55                 | \$ | 0.05                |
|              |  |  |                |      |            |      |                       |    |                                      |    | Total NDV                     | ~    | OPM Coats            | •  | 15.1                |
|              |  |  |                |      |            |      |                       |    |                                      |    | i Otal NPV                    | or C | 0&M Costs            | 4  | 15.1                |
|              |  | Capital Costs                              |                |      |            |      |                       |    | Yr built                             |    |                               |      |                      |    |                     |
|              |  |  | PWTM           |      |            | \$   | 53.9                  |    | 2015                                 |    |                               |      |                      | \$ | 53.9                |
|              |  | 9  | Pumping Stat   | ions | 3          | \$   | 5.6                   |    | 2015                                 |    |                               |      |                      | \$ | 5.6                 |
|              |  |  |                |      |            |      |                       |    |                                      | 1  | Total NPV of                  | Ça   | pital Costs          | \$ | 59.6                |

Total NPV of Capital and O&M Costs in millions \$ 75 LCRA Delivery Point (#4) to GBRA Delivery Point (#3)



Total capital cost for pump stations \$ 4.4 million

Value of equipment \$ 1.3 million

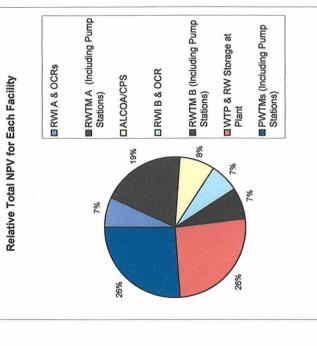
Assumed life of equipment 20 years
Estimated maintenance/replacement cost \$ 0.06 million/year

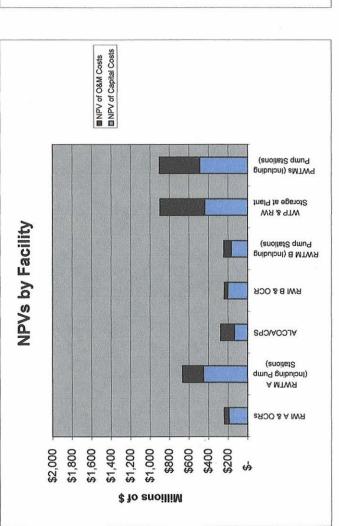
#### **O&M Costs**

| Year         | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used      |         | Energ          | gy ( | cost               |    | Other O&M<br>osts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | т    | otal O&M<br>cost | Ne | et present<br>value |
|--------------|--|--|---------------------|---------|----------------|------|--------------------|----|--------------------------------------|----|-------------------------------|------|------------------|----|---------------------|
|              | mgd  |  | (kwh/day)           | 10 punt | (\$/day)       |      | (Million \$ /year) | )  | (Million \$<br>/year)                |    | (Million \$<br>/year)         | (    | (Million \$      |    | (\$)                |
| 2015         | 49   | 3.79                                       | 46,745              | \$      | 3,272          | \$   | 1.19               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53             | \$ | 1.53                |
| 2016         | 49   | 3.79                                       | 46,745              | \$      | 3,272          | \$   | 1.19               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53             | \$ | 1.45                |
| 2017         | 49   | 3.79                                       | 46,745              | \$      | 3,272          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53             | \$ | 1.38                |
| 2018         | 49   | 3.79                                       | 46,745              | \$      | 3,272          | \$   | 1.19               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 1.53             | \$ | 1.32                |
| 2019         | 49   | 3.79<br>0.70                               | 46,745              | \$      | 3,272<br>607   | \$   | 1.19               | \$ | 0.08<br>0.08                         | \$ | 0.250<br>0.250                | \$   | 1.53<br>0.55     | \$ | 1.26<br>0.43        |
| 2020         | 9  | 0.70                                       | 8,666               | \$      | 607            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.43                |
| 2021         | 9  | 0.70                                       | 8,666<br>8,666      | S       | 607            | S    | 0.22               | Š  | 0.08                                 | S  | 0.250                         | S    | 0.55             | \$ | 0.39                |
| 2023         | 9  | 0.70                                       | 8,666               | S       | 607            | S    | 0.22               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.35                |
| 2024         | 9  | 0.70                                       | 8,666               | 5       | 607            | Š    | 0.22               | S  | 0.08                                 | Š  | 0.250                         | \$   | 0.55             | Š  | 0.36                |
| 2025         | 9  | 0.70                                       | 8,666               | \$      | 607            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.34                |
| 2026         | 9  | 0.70                                       | 8,666               | \$      | 607            | Š    |                    | Š  | 0.08                                 | S  | 0.250                         | Š    | 0.55             | \$ | 0.32                |
| 2027         | 9  | 0.70                                       | 8,666               | \$      | 607            | s    |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.31                |
| 2028         | 9  | 0.70                                       | 8,666               | \$      | 607            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.29                |
| 2029         | 9  | 0.70                                       | 8,666               | \$      | 607            | \$   | 0.22               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.55             | \$ | 0.28                |
| 2030         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   | 0.34               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.32                |
| 2031         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   | 0.34               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.31                |
| 2032         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   | 0.34               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.29                |
| 2033         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.28                |
| 2034         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.27                |
| 2035         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.25                |
| 2036         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.24                |
| 2037         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.23                |
| 2038         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   | 10                 | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.22                |
| 2039         | 14   | 1.09                                       | 13,425              | \$      | 940            | \$   | 0.34               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.67             | \$ | 0.21                |
| 2040         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.24                |
| 2041         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.22                |
| 2042         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.21                |
| 2043         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.20                |
| 2044         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.19                |
| 2045         | 19<br>19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.18                |
| 2046<br>2047 | 19   | 1.47<br>1.47                               | 18,185<br>18,185    | \$      | 1,273<br>1,273 | \$   |                    | \$ | 0.08                                 | \$ | 0.250<br>0.250                | \$   | 0.80             | \$ | 0.18<br>0.17        |
| 2047         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.17                |
| 2049         | 19   | 1.47                                       | 18,185              | S       | 1,273          | S    |                    | S  | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.15                |
| 2050         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | S    |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.14                |
| 2051         | 19   | 1.47                                       | 18,185              | Š       | 1,273          | S    |                    | S  | 0.08                                 | S  | 0.250                         | Š    | 0.80             | \$ | 0.14                |
| 2052         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | Š  | 0.13                |
| 2053         | 19   | 1.47                                       | 18,185              | Š       | 1,273          | S    |                    | š  | 0.08                                 | Š  | 0.250                         | Š    | 0.80             | Š  | 0.12                |
| 2054         | 19   | 1.47                                       | 18,185              | s       | 1,273          | \$   |                    | s  | 0.08                                 | \$ | 0.250                         | S    | 0.80             | \$ | 0.12                |
| 2055         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | S    | 0.80             | s  | 0.11                |
| 2056         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.11                |
| 2057         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.10                |
| 2058         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   | 0.46               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.10                |
| 2059         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   | 0.46               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.09                |
| 2060         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   | 0.46               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.09                |
| 2061         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   | 0.46               | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.08                |
| 2062         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.08                |
| 2063         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.08                |
| 2064         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   |                    | \$ | 0.08                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.07                |
| 2065         | 19   | 1.47                                       | 18,185              | \$      | 1,273          | \$   | 0.46               | \$ | 80.0                                 | \$ | 0.250                         | \$   | 0.80             | \$ | 0.07                |
|              |  |  |                     |         |                |      |                    |    |                                      |    | Total NPV                     | of ( | D&M Costs        | \$ | 16.6                |
|              |  | Capital Costs                              | in million \$:      |         |                |      |                    |    | Yr built                             |    |                               |      |                  |    |                     |
|              |  |  | PWTM                |         |                | \$   |                    | -  | 2015                                 |    |                               |      |                  | \$ | 14.4                |
|              |  |  | <b>Pumping Stat</b> | ions    | 3              | \$   | 4.4                |    | 2015                                 |    |                               |      |                  | \$ | 4.4                 |
|              |  |  |                     |         |                |      |                    |    |                                      | 7  | otal NPV o                    | f Ca | pital Costs      | \$ | 14.4                |

Total NPV of Capital and O&M Costs in millions \$ 31.0
COA Delivery Point (#5) to LCRA Delivery Point (#4)

| WTP Location          | Alter- | Phasing Scenario  | Total NPVs in | RWI A & OCRs  | RWTM A (Including  | ALCOA/CPS   | RWI B & OCR  | RWTM B (Including   | RWTM B (Including WTP & RW Storage PWTMs (Including Pinno Stations)  | PWTMs (Including  |
|-----------------------|--------|---|---------------|---|--|---|--|---|--|---|
|                       | late   |   | minore of the |   | (cuones duns)  |   |  | dump demons)  |  | ramp canonal  |
| East of San<br>Marcos | 2A     | RWTM B & ALCOA/CPS<br>built by 2015; RWTM A built<br>in 2020. |               | Sized for 4000 cfs 1 to scalp water, 4 cf intakes, 4 miles of fi 120-inch raw water mains & 4 p OCRs at 25,000 p ac-ft each | 26 miles of 96-inch iameter pipe sized to lefiver 132,000 ac- lyear on a continuous lassis; includes 3 umping stations w/ alanding reservoirs long route | Non-Public wells; Sized for 2000 cfs Transmission of 55,000 to scalp water; 2 ac-ftyear to the OCR at intrakes, 8 miles of RWI B via 15 miles of 120-inch raw water 54" gravity pipeline from main, 4 OCRs at Hwy 290 east of Elgin 15,000 ac-ft/each | Sized for 2000 cfs to scalp water, 2 intakes, 8 miles of 120-inch raw water main, 4 Ocfs at 15,000 ac-f/each | Raw wate Raw water 1,000 wt 11,000 wt 11,000 wt 11,000 wt 11,000 wt 11,000 with mer pumping station and balancing reservoir SOFTEN PROVIDIA | Raw water reservoir Each PWTIM so capacity, for BASE DEM conventional settling (average daily with membrane filtration for all participants (NO Sheet in the SOFTENING Appendices) | Each PWTM sized<br>for BASE DEMAND<br>(average daily<br>demand) (See<br>PWTM Summary<br>Sheet in the<br>Appendices) |
|                       |        | NPV of Capital Costs  | \$ 2,076 \$   | \$ 191  | \$ 451   | \$ 135  | \$ 204   | \$ 168  | \$ 439   | \$ 489  |
|                       |        | NPV of O&M Costs \$   | \$ 1,381      | \$ 47   | \$ 213   | \$ 141  | 8  | \$ 75   | \$ 457   | \$ 413  |
|                       |        | Total NPV of Capital & O&M \$                                 | \$ 3,457 \$   | \$ 238  | \$ 664   | \$ 276  | \$ 238   | \$ 243  | \$ 896   | \$ 902  |





9/28/2005

O&M Cost Calculations RWI A - Matagorda Co. River Intakes, and Storage CTRWTP - Alternate 2A - WTP East of San Marcos Initial year of analysis period interest rate Evaluation period Unit cost of energy 5% 50 years \$ 0.07 per kwh Inflatable Rubber Low Head Dam | Unit Constr. | Cost (millions) | Total | Estimated Constr. Cost (millions) | Cost Quantity Units Inflatable Rubber Low Head Dam 4 each 10 ft high Estimated inflatable dam cost as % of total Value of inflatable dam Assumed life of inflatable dam Estimated maintenance/replacement cost \$ 4.50 million 10 years \$ 0.45 million/year Year built 2020 \$6.27 million \$ 9.73 million \$16.00 million NPV of O&M Costs NPV of Capital Costs Total NPV of Capital and O&M Costs Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

| Average withdrawal   |                    | ac-ft/year   |                 |  |
|--|--------------------|--------------|-----------------|--|
|  | 182                | cfs          |                 |  |
|  |                    |              | 21.9            | Ratio of design withdrawal rate                |
| Total intake design withdrawal rate (for scalping high flows   |                    |              |                 | to Total intake design withdrawal rate         |
|  | 1,795,200          | gpm          |                 |  |
| No. of Intakes   | 4                  |              |                 |  |
| Design withdrawal rate per intake  | 1,000              | cfs          |                 |  |
| Dosign matarian rate per mitare  | 448,800            |              |                 |  |
|  |                    | ap           |                 |  |
| No. of reservoirs  | 4                  |              |                 |  |
| Design flow to each reservoir  | 448,800            | gpm          |                 |  |
|  |                    |              |                 |  |
|  | 1000               |              |                 |  |
| Inside diameter of each RWTM   | 120                |              |                 |  |
| Area   | 78.54              |              | 4.0             | miles for all RWTMs                            |
| Average length of each RWTM  | 5,280              | miles        | 21,120          |  |
|  | 5,200              | ieut         | 21,120          | leet   |
| Estimated construction cost for RWTM   | \$ 793             | per LF       |                 |  |
| Localitation Constitution Court for 1447 file  | 9 100              | pui Li       |                 |  |
| Total construction cost in millions  | \$ 16.8            |              |                 |  |
| Contingencies  | \$ 3.4             |              |                 |  |
| Subtotal   | \$ 20.1            |              |                 |  |
| Engineering, Legal & Administrative  | \$ 3.0             |              |                 |  |
| Subtotal   | \$ 23.1            | -            |                 |  |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq   | \$ 0.4             |              |                 |  |
| Total Capital Cost for PWTM in millions  | \$ 23.5            | million      |                 |  |
|  |                    |              |                 |  |
| Unit maintenance cost/year-mile  | \$ 10,000          | \$/year-mile | \$ 0.040        | Million \$/year (all RWTMs to Reservoirs)      |
|  |                    |              |                 |  |
| Note: Assume each intake has two RWTMs pumping out of  | of it, one to each | reservoir.   |                 |  |
| Design flow sate for each DWTM (from about)  | 449 900            | anm          |                 |  |
| Design flow rate for each RWTM (from above)  | 448,800            |              |                 |  |
| Pumping rate (one pump) No. of pumps (not counting spare) pumping into each RW   | 50,000             | gpm          |                 |  |
| Peak flow rate into each RWTM (all pumps except spare)   | 450,000            | anm          |                 |  |
| Peak now rate into each NYY I'm (all pumps except spare)   | 450,000            | abin         |                 |  |
| Velocity at peak flow rate   | 12.77              | fps          |                 |  |
| C factor   | 120                |              |                 |  |
| Head loss per foot   | 0.00327            | ft/ft        | he              | 13.552*QI <sup>1.85</sup>                      |
|  |                    | ft/mile      |                 | 1 C*(d) <sup>2.63</sup> 1                      |
|  | ,,,,,,,            |              |                 | 10(0)  |
| Head loss at peak flow rate  | 17                 | ft           |                 |  |
| Allowance for minor losses 30%   | 5                  | ft           | 90              | Elev of discharge at reservoir                 |
| Total estimated losses   | 22                 | ft           |                 | Water surface elev in river                    |
| Average static head  | 40                 | ft           | 40              | n  |
| Total estimated dynamic head   | 62                 | ft           |                 |  |
|  | 27                 | psi          |                 |  |
|  |                    |              |                 |  |
| Assumed pump efficiency  | 85%                |              |                 |  |
| Assumed motor efficiency   | 90%                |              |                 |  |
| Estimated Hp required per pump   |                    | hp/pump      |                 |  |
|  |                    | kw/pump      |                 |  |
| Total hp pumping into each RWTM (not counting spare)   |                    | hp/RWTM      |                 |  |
| Total hp at each intake (not counting spare)   |                    | hp/intake    |                 |  |
| Total hp all intakes (not counting spares)   | 37,089             |              |                 |  |
| Total kw all intakes (not counting spares)   | 27,668             | kw           |                 |  |
| Unit construction cost for each pump station (from cost cu   |                    | nor firm bo  | of numn station |  |
| Construction cost for each pump station (from cost cu  |                    | million      | of pump station |  |
| No. of intakes from above  |                    | each         |                 |  |
| .,   |                    | 50011        |                 |  |
| Total construction cost in millions  | \$ 33.0            | million      |                 |  |
| Contigency, Eng., etc. in millions   |                    | million      |                 |  |
| Total capital cost in millions   |                    | million      |                 |  |
| a net recent and all and a second a second and a second a |                    |              |                 |  |
| Total construction cost for pump stations  |                    | million      |                 |  |
| Value of equipment   |                    | million      | 40%             | Estimated equip cost as % of total constr cost |
| Assumed life of equipment  |                    | years        |                 |  |
| Estimated maintenance/replacement cost   | \$ 0.66            | million/year |                 |  |
|  |                    |              |                 |  |

| &M Costs | 2                |     |                          |                |    |          |      |                       |     |                                    |    |                             |    |                      |    |                     |
|----------|------------------|-----|--------------------------|----------------|----|----------|------|-----------------------|-----|------------------------------------|----|-----------------------------|----|----------------------|----|---------------------|
| Year     | Flow purr<br>yea |     | No. of<br>pump<br>"sets" | Energy<br>used |    | Energ    | у со | ost                   | 005 | ther O&M<br>sts - Pump<br>Stations | c  | intenance<br>osts -<br>RWTM | То | otal O&M<br>cost     | N  | et present<br>value |
|          | ac-ft/yr         | mgd | operating<br>/day        | (kwh/day)      |    | (\$/day) | -    | (Million \$<br>/year) | (   | Million \$<br>/year)               | () | Million \$ /year)           |    | Million \$<br>/year) |    | (\$)                |
| 2015     |                  | •   |                          | •              | \$ |          | \$   |                       |     |                                    |    |                             | \$ |                      | \$ |                     |
| 2016     |                  |     |                          | •              | \$ | -        | \$   | -                     |     |                                    |    |                             | \$ |                      | \$ |                     |
| 2017     |                  |     | -                        |                | \$ |          | \$   |                       |     |                                    |    |                             | \$ | •                    | \$ | *                   |
| 2018     | 7                |     |                          |                | \$ | •        | \$   |                       |     |                                    |    |                             | \$ | •                    | \$ | -                   |
| 2019     | 7                |     | •                        | •              | \$ | -        | \$   |                       |     |                                    |    |                             | \$ | •                    | \$ |                     |
| 2020     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 1.15                |
| 2021     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 1.10                |
| 2022     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 1.05                |
| 2023     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 1.00                |
| 2024     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.95                |
| 2025     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.90                |
| 2026     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | S  | 0.040                       | \$ | 1.47                 | \$ | 0.86                |
| 2027     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.82                |
| 2028     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.78                |
| 2029     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.74                |
| 2030     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.7                 |
| 2031     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.67                |
| 2032     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.64                |
| 2033     | 132,000          | 118 | 1.64                     | 30,188         | S  | 2.113    | S    | 0.77                  | \$  | 0.66                               | S  | 0.040                       | S  | 1.47                 | \$ | 0.6                 |
| 2034     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | S   | 0.66                               | \$ | 0.040                       | S  | 1.47                 | \$ | 0.5                 |
| 2035     | 132,000          | 118 | 1.64                     | 30,188         | s  | 2.113    | S    | 0.77                  | s   | 0.66                               | s  | 0.040                       | s  | 1.47                 | \$ | 0.55                |
| 2036     | 132,000          | 118 | 1.64                     | 30,188         | S  | 2.113    | s    | 0.77                  | Š   | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.5                 |
| 2037     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | s    | 0.77                  | s   | 0.66                               | s  | 0.040                       | s  | 1.47                 | s  | 0.5                 |
| 2038     | 132,000          | 118 | 1.64                     | 30,188         | Š  | 2,113    | s    | 0.77                  | Š   | 0.66                               | Š  | 0.040                       | s  | 1.47                 | Š  | 0.48                |
| 2039     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | Š   | 0.66                               | Š  | 0.040                       | Š  | 1.47                 | Š  | 0.4                 |
| 2040     | 132,000          | 118 | 1.64                     | 30,188         | Š  | 2,113    | S    | 0.77                  | Š   | 0.66                               | Š  | 0.040                       | Š  | 1.47                 | s  | 0.4                 |
| 2041     | 132,000          | 118 | 1.64                     | 30,188         | š  | 2,113    | \$   | 0.77                  | š   | 0.66                               | Š  | 0.040                       | s  | 1.47                 | s  | 0.4                 |
| 2041     | 132,000          | 118 | 1.64                     | 30,188         | Š  | 2,113    | s    | 0.77                  | Š   | 0.66                               | Š  | 0.040                       | š  | 1.47                 | Š  | 0.3                 |
| 2042     |                  | 118 | 1.64                     | 30,188         | s  | 2,113    | Š    | 0.77                  | Š   | 0.66                               | s  | 0.040                       | Š  | 1.47                 | š  | 0.3                 |
|          | 132,000          |     |                          |                |    | 2,113    | S    | 0.77                  | Š   | 0.66                               | \$ | 0.040                       | Š  | 1.47                 | Š  | 0.3                 |
| 2044     | 132,000          | 118 | 1.64                     | 30,188         | S  |          | \$   | 0.77                  | s   | 0.66                               | s  | 0.040                       | Š  | 1.47                 | s  | 0.3                 |
| 2045     | 132,000          |     |                          | 30,188         |    | 2,113    |      |                       |     |                                    |    |                             |    | 1.47                 | S  |                     |
| 2046     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ |                      |    | 0.3                 |
| 2047     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.3                 |
| 2048     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2049     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | S  | 0.2                 |
| 2050     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2051     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2052     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2053     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2054     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2055     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.2                 |
| 2056     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.20                |
| 2057     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2058     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2059     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2060     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | \$ | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2061     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | \$   | 0.77                  | \$  | 0.66                               | s  | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2062     | 132,000          | 118 | 1.64                     | 30,188         | \$ | 2,113    | s    | 0.77                  | s   | 0.66                               | s  | 0.040                       | s  | 1.47                 | \$ | 0.1                 |
| 2063     | 132,000          | 118 | 1.64                     | 30,188         | s  | 2.113    | s    | 0.77                  | s   | 0.66                               | s  | 0.040                       | s  | 1.47                 | \$ | 0.1                 |
| 2064     | 132,000          | 118 | 1.64                     | 30,188         | š  | 2,113    | Š    |                       | Š   | 0.66                               | s  | 0.040                       | \$ | 1.47                 | \$ | 0.1                 |
| 2065     | 132,000          | 118 | 1.64                     | 30,188         | Š  | 2,113    | \$   | 0.77                  | Š   | 0.66                               | Š  | 0.040                       | Š  | 1.47                 | Š  | 0.1                 |

Total NPV of O&M Costs \$ 21.6

 Capital Costs in million \$:
 Yr built
 Yr built
 \$ 18.4

 RWTM to Reservoirs Intake/Pumping Stations
 \$ 45.5
 2020
 \$ 35.6

 Total NPV of Capital Costs
 \$ 54.1

Total NPV of Capital and O&M Costs in millions \$ 75.

#### Reservoirs

|   | Quantity | Units       | Volume/each<br>(acre-feet) |      | t Cost<br>ac-ft)) | Con    | Total<br>struction<br>cost in<br>nillions |         | tigency,<br>g., etc. |    | otal in<br>nillions |
|---|----------|-------------|----------------------------|------|-------------------|--------|---|---------|----------------------|----|---------------------|
| Reservoirs  | 4        | each        | 25000                      | \$   | 974               | \$     | 97.4                                      | \$      | 37.0                 | \$ | 134.4               |
| Estimated average depth of reservo                                  | oir      | 20          | ft                         |      |                   |        |   |         |                      |    |                     |
| Surface area of reservoir<br>Ratio of total land area regd to surfa | 200 200  | 5000        | acres                      |      |                   |        |   |         |                      |    |                     |
| of reservoir  | ace area | 1.1         |                            |      |                   | Er     | vir & Arch                                | naeolo  | gy, Surv,            | 2  |                     |
| Total land area reqd for reservoirs                                 |          | 5500        | acres                      |      |                   |        |   |         | nd Acq =             |    | 27.5                |
| Assumed life of reservoir   |          | 100         | years                      |      | Т                 | otal c | apital cost                               | t in mi | llions =             | \$ | 161.9               |
| Estimated replacement cost  |          | \$<br>0.97  | million/year               |      |                   |        |   |         |                      |    |                     |
| Estimated maintenance   |          | <br>0.4     |                            | Mowi | ng, mair          | tainin | g fences,                                 | etc.    |                      |    |                     |
| Total   |          | \$<br>1.37  | million/year               |      |                   |        |   |         |                      |    |                     |
| Year built  |          | 2020        |                            |      |                   |        |   |         |                      |    |                     |
| NPV of O&M costs  |          | \$<br>19.1  | million                    |      |                   |        |   |         |                      |    |                     |
| NPV of Capital costs  |          | \$<br>126.8 | million                    |      |                   |        |   |         |                      |    |                     |
| Total NPV of Capital and O&M Cos                                    | its      | \$<br>145.9 | million                    |      |                   |        |   |         |                      |    |                     |

| Summary   | IPV of<br>tal Costs | PV of O&M<br>Costs | Caj | al NPV of<br>pital and<br>M Costs |
|---|---------------------|--------------------|-----|-----------------------------------|
| Inflatable Rubber Low Head Dam                                    | \$<br>9.7           | \$<br>6.3          | \$  | 16.0                              |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>54.1          | \$<br>21.6         | \$  | 75.7                              |
| Reservoirs  | \$<br>126.8         | \$<br>19.1         | \$  | 145.9                             |
| Total for RWI A   | \$<br>190.6         | \$<br>47.0         | \$  | 237.6                             |

#### O&M Cost Calculations RWTM A - Matagorda Co. to WTP CTRWTP - Alternate 2A - WTP East of San Marcos

| Total estimated losses   |   |
|--|---|
| Evaluation period Unit cost of enerty \$ 0.07 per kwh Mitigation, Surveying, and Land Acquisition \$ 10  Raw Water Transmission Main - A  Inside diameter of pipe Area 50.27 sf 126 miles 665,280 feet  Estimated unit construction cost for RWTM 5 567 per LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 5 76 yer LF  Total construction cost in millions 7 76 yer LF  Total construction cost in millions 7 76 yer LF  Total Capital Cost for PWTM in millions 7 8 76 yer LF  Total Capital Cost for PWTM in millions 7 9 13 yer limiter 1 13 yer li   |   |
| Raw Water Transmission Main - A  Inside diameter of pipe Area Length of RWTM Estimated unit construction cost for RWTM  Total construction cost in millions Contingencies Subtotal Engineering, Legal & Administrative Subtotal Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions  Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate Allowance for minor losses Average static head Total estimated obsess Average static head Total estimated dynamic head  Assumed pump efficiency Assumed motor efficiency Link wyer pump station (not counting spare) Total hy per pump station (not counting spare) Total construction cost per pump station Unit construction cost per pump station Total construction cost   |   |
| Raw Water Transmission Main - A  | 0000 per mile   |
| Inside diameter of pipe Area Length of RWTM Length of RWTM Length of RWTM Length of RWTM Lestimated unit construction cost for RWTM Se65,280 feet  Estimated unit construction cost for RWTM Se65,280 feet  Estimated unit construction cost for RWTM Se65,280 feet  Total construction cost in millions Subtotal Subtotal Sengineering, Legal & Administrative Subtotal Engineering, Legal & Administrative Subtotal Security Administrative Security Ad   | you ber time  |
| Length of RWTM   |   |
| Length of RWTM   |   |
| Estimated unit construction cost for RWTM    Second   Sec   |   |
| Estimated unit construction cost for RWTM  Total construction cost in millions Contingencies Subtotal Engineering, Legal & Administrative Subtotal Envir & Arch Studies & Miligation, Surveying, & Land Acq Total Capital Cost for PWTM in millions  Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  Unit and loss at peak flow rate C factor  Head loss at peak flow rate Allowance for minor losses Total estimated dynamic head  No of pumping stations req'd along route No. of pumping stations req'd along route No. of pumping stations req'd along route Average static head Average head per pump station Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hy required per pump Total kw per pump station (not counting spare) Total kw per pump station Unit construction cost for each pump station Float from cost curv Unit construction cost per pump station  Unit construction cost per pump station Float from cost curv South Advance South   |   |
| Total construction cost in millions  |   |
| Contingencies   Subtotal   Subt   |   |
| Engineering, Legal & Administrative Subtotal Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions  Unit maintenance cost/year-mile  S 10,000 S/year-mile \$ 10,000 S/year-mile \$ 1.260 Millions  Unit maintenance cost/year-mile  Unit maintenance cost/year-mile  S 10,000 S/year-mile \$ 1.260 Millions  S 534 million  Unit maintenance cost/year-mile  S 10,000 S/year-mile \$ 1.260 Millions  S 534 million  S 534 million  S 521 S 4 million  S 521 S 4 million  S 10,000 S/year-mile \$ 1.260 Millions  S 10,000 S/year-mile \$ 1.260 Millions S 10,000 S 10   |   |
| Subtotal   S   13   13   13   13   13   13   14   15   14   15   14   15   14   15   14   15   15  |   |
| Subtotal   S   13   13   13   13   13   13   14   15   14   15   14   15   14   15   14   15   15  |   |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions  Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated dynamic head  No. of pumping stations used in cost estimate Average head per pump station Assumed pump efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Unit construction cost for each pump station Balancing reservoir Total construction cost per pump station Balancing reservoir Total construction cost per pump station Balancing reservoir Total construction cost per pump station Find a construction cost per pump   |   |
| Total Capital Cost for PWTM in millions  Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  132,000  132,000  138,020  118 mgd  81,829 gpm  16,400 gpm  16,400 gpm  No. of pumps (not counting spare)  Peak flow rate (all pumps except spare)  Velocity at peak flow rate  C factor  Head loss per foot  120  Head loss at peak flow rate  Allowance for minor losses  10%  Total estimated losses  Average static head  No. of pumping stations used in cost estimate  Average head per pump station  Total hp per pump station (not counting spare)  Total hp per pump station (not counting spare)  Total kw per pump station  Balancing reservoir  Total construction cost for each pump station  Balancing reservoir  Total construction cost per pump station  Balancing reservoir  Total construction cost per pump station  S 10,000  \$1,260  \$1,260  \$4,137  \$4,260  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,137  \$4,260  \$4,260  \$4,137  \$4,260  \$4,260  \$4,137  \$4,260  \$ |   |
| Unit maintenance cost/year-mile  Design flow rate (after 100% buildout)  Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated losses Average static head No. of pumping stations used in cost estimate No. of pumping stations used in cost estimate Average head per pump station Assumed pump efficiency Estimated Ip required per pump Total hp per pump station (not counting spare) Total ww per pump set (set-pumps in series along route)  Unit construction cost for each pump station Balancing reservoir Total construction cost per pump station Balancing reservoir Total construction cost per pump station  S 0.03  132,000 ac-ft/year  132,000 ac-ft/year  138,000 ac-ft/year  148 mgd ac-ft/year  188 mgd ac-ft/year  16,400 gpm  16,400 gpm  16,400 gpm  2.20 2.19 460 ft  |   |
| Design flow rate (after 100% buildout)   |   |
| Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  No. of pumps (flow rate) No. of pumping stations used in cost estimate Assumed pump efficiency Assumed pump efficiency Assumed motor efficiency Assumed motor efficiency Static hard spare in the spare is along route No. of pumping station cost for each pump station Balancing reservoir No. of pump station Static hard static hard static hard spare) Total hyper pump station Static hard static hard static hard spare) Total hyper pump station Static hyper pump static h  | 5/year <sub>4</sub>   |
| Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated dynamic head  No. of pumping stations used in cost estimate No. of pumping stations used in cost estimate Assumed pump efficiency Assumed motor efficiency Estimated Hy required per pump  Total hy per pump station Total construction cost for each pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  16,400 16,400 17,400 18,200 19,000 19,000 11,400 12,000 18,400 19,000 19,   |   |
| Pumping rate (one pump) No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated dynamic head  No of pumping stations req'd along route Average head per pump station Average had per pump station Average had per pump station Fotal hp per pump station (not counting spare) Total hp per pump station (not counting spare) Total kw per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  16,400 gpm  82,000 gpm  16,400 gpm  82,000 gpm  16,400 gpm  82,000 gpm  3.63 fps  120  0.00041 ft/ft hr=   3.552  2.19 ft/mile   C'(d)²  120  120  120  120  121  120  122  133 ft 130 gillion 133 psi  1460 ft 133 ft 1331 psi  150 psi (ast 150   |   |
| No. of pumps (not counting spare) Peak flow rate (all pumps except spare)  Velocity at peak flow rate C factor Head loss per foot  C factor  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated dynamic head  No of pumping stations req'd along route Average head per pump station Assumed pump efficiency Assumed motor efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump station Balancing reservoir Construction cost per pump station Balancing reservoir Total construction cost per pump station  Velocity at peak flow rate 3.63 fps 2.21 ft/mile  120  0.00041 ft/fit hr=   3.552 2.19 ft/mile 120  226 ft 330 ft 303 ft 30 Elev. A 460 ft 331 psi  No of pumping stations req'd along route 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0  |   |
| Velocity at peak flow rate   |   |
| Velocity at peak flow rate C factor Head loss per foot  Head loss at peak flow rate Allowance for minor losses Average static head Total estimated dynamic head  No of pumping stations req'd along route Average head per pump station Average head per pump Total hp per pump station from cost curv Estimated Hp required per pump Total hp per pump station Unit construction cost for each pump station Balancing reservoir Total construction cost per pump station  3.63 fps 120 0.00041 ft/ft hr=   3.552 2.19 ft/mile 1276 ft 28 ft 550 Elev. A 460 ft 460 ft 460 ft 331 psi  150 psi (ast in pipe) 1,028 kw/pump set (one pump at each sterm of the pump station 2,3 million 3,3 million 3,3 million 3,5 million 3,5 million 5,0 min. of 5,0 min. of 5,0 mg  |   |
| C factor Head loss per foot  120 0.00041 ft/ft h; 3.552  2.19 ft/mile  1 C*(d)²  Head loss at peak flow rate Allowance for minor losses 10% 28 ft 28 ft 550 Elev. A Total estimated losses Average static head 460 ft Total estimated dynamic head 763 ft 331 psi  No of pumping stations req'd along route No. of pumping stations used in cost estimate No. of pumping stations used in cost estimate No. of pumping stations used in cost estimate Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route)  Unit construction cost for each pump station Balancing reservoir Total construction cost per pump station Balancing reservoir Total construction cost per pump station Figure 1.3552  10.03 ft 331 psi 150 psi (ass 3.0 in pipe) 1.378 kw/pump 1.028 kw/pump 1.028 kw/pump 1.028 kw/pump set (one pump at each station series along route) 1.347 per firm hp of pump station 9.3 million 60 min. of Total construction cost per pump station 5.0 mg  |   |
| Head loss per foot    C'(d)^2   Head loss at peak flow rate   276 ft   28 ft   550 Elev. A   28 ft   550 Elev. A   303 ft   30 Elev. A   460 ft   460 ft   460 ft   460 ft   331 psi   301 psi   30  |   |
| Head loss at peak flow rate Allowance for minor losses 10% 28 ft 28 ft 303 ft 90 Elev. A Average static head Total estimated dynamic head  No of pumping stations req'd along route Average head per pump station No. of pumping stations used in cost estimate 3.0 Average head per pump station Average head per pump station  No estimated dynamic head  No. of pumping stations used in cost estimate Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Somition  100 min. of Total construction cost per pump station  100 min. of 100 m  |   |
| Head loss at peak flow rate Allowance for minor losses 10% 28 ft 28 ft 303 ft 90 Elev. A Average static head Total estimated dynamic head  No of pumping stations req'd along route Average head per pump station No. of pumping stations used in cost estimate 3.0 Average head per pump station Average head per pump station  No estimated dynamic head  No. of pumping stations used in cost estimate Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Somition  100 min. of Total construction cost per pump station  100 min. of 100 m  | *QI <sup>1.85</sup>   |
| Allowance for minor losses Total estimated losses Average static head Total estimated dynamic head Total per pump station sused in cost estimate Average head per pump station Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Somition Total construction cost per pump station Total construction cost per pump   |   |
| Allowance for minor losses Total estimated losses Average static head Total estimated dynamic head Total per pump station sused in cost estimate Average head per pump station Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Somition Total construction cost per pump station Total construction cost per pump   |   |
| Total estimated losses Average static head Assumed pump efficiency Estimated Prequired per pump Total hp per pump station (not counting spare) Total hy per pump set (set=pumps in series along route) Unit construction cost per pump station Balancing reservoir Total construction cost per pump station  300 in pipe)  2.21 350 psi (ass 30, in pipe)  3.0 in pipe)  4.55 mg  85%  85%  85%  85%  85%  86%  88%  88%   | San Antonio East WTP  |
| Average static head Total estimated dynamic head  No of pumping stations req'd along route No. of pumping stations used in cost estimate No. of pumping stations used in cost estimate Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total hp per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  S 0.75 million  100 min. of 100 m  | t Matagorda OCRs  |
| Total estimated dynamic head  763 ft 331 psi  No of pumping stations req'd along route No. of pumping stations used in cost estimate Average head per pump station  Assumed pump efficiency Assumed motor efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set≈pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir  Total construction cost per pump station  Balancing reservoir  Total construction cost per pump station  Balancing reservoir  Total construction cost per pump station  Balancing reservoir  Total construction cost per pump station  Sumillion  Balancing meservoir  10.03 million  5.0 min. of 5.0 mg  | Watagorda Corts   |
| No of pumping stations req'd along route No. of pumping stations used in cost estimate No. of pumping station used in cost estimate Static Research Static Research Static Research Static Research Static Research No. of pumping station static Static Research Stat   |   |
| No. of pumping stations used in cost estimate  Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing mainlion  Balancing main  |   |
| No. of pumping stations used in cost estimate  Average head per pump station  Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Balancing mainlion  Balancing main  | sumed max pressure  |
| Assumed pump efficiency Assumed motor efficiency Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  S 10.03 million  100 min. of 5.0 mg.  |   |
| Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  S 10.03 million  1.377 per firm hp of pump station 9.3 million 60 min. of 5.0 mg   |   |
| Assumed motor efficiency Estimated Hp required per pump Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  Total construction cost per pump station  Balancing reservoir Total construction cost per pump station  S 10.03 million  1.377 per firm hp of pump station 9.3 million 60 min. of 5.0 mg   |   |
| Estimated Hp required per pump  Total hp per pump station (not counting spare) Total kw per pump set (set=pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  Total construction cost for each pump station  Balancing reservoir  Total construction cost per pump station  1,378   hp/pump   1,378   kw/pump   1,   |   |
| Total hp per pump station (not counting spare) Total kw per pump set (set≃pumps in series along route)  Unit construction cost for each pump station Construction cost per pump station Balancing reservoir Total construction cost per pump station  1,028 kw/pump 6,888 hp/station 4,133 kw/pump set (one pump at each station series along route)  1,347 per firm hp of pump station 9,3 million 0,75 million 5,0 mg  |   |
| Total kw per pump set (set=pumps in series along route)  4,133 kw/pump set (one pump at each struction cost for each pump station (from cost curv \$ 1,347 per firm hp of pump station 9.3 million  Balancing reservoir  Total kw per pump set (one pump at each struction cost per pump station 9.3 million 60 min. of 5.0 mg   |   |
| Total kw per pump set (set≈pumps in series along route)  Unit construction cost for each pump station (from cost curv \$ 1,347 per firm hp of pump station   |   |
| Construction cost per pump station  Balancing reservoir  Total construction cost per pump station  9.3 million  00 min. of 00 min. of 5.0 mg   | ution)  |
| Construction cost per pump station  Balancing reservoir  Total construction cost per pump station  9.3 million  00 min. of 00 min. of 5.0 mg   |   |
| Balancing reservoir Total construction cost per pump station  \$ 0.75 million \$ 10.03 million \$ 5.0 mg   |   |
| Total construction cost per pump station \$ 10.03 million 5.0 mg   | storage at avg pumping rate   |
|  |   |
| No. of pump stations from above 3.0 each   | for open top reservoir  |
|  |   |
| Total construction cost in millions \$ 30.1 million  |   |
| Contigency, Eng., etc. in millions  \$ 11.43 million  Total capital cost in millions  \$ 41.5 million  |   |
|  |   |
| Total construction cost for pump stations \$ 30.1 million  | AND A SECURITY OF THE PARTY OF |
|  | ted equipment cost as % of tot  |
| Assumed life of equipment 20 years   |   |
| Estimated maintenance/replacement cost \$ 0.60 million/year  |   |

#### O&M Costs

| Year | Flow purr<br>yea |     | No. of pump "sets" | Energy<br>used    |      | Energy   |    |                      | cos | ther O&M<br>sts - Pump<br>Stations | (  | intenance<br>costs -<br>RWTM |      | otal O&M<br>cost      | Ne  | et present<br>value |
|------|------------------|-----|--------------------|-------------------|------|----------|----|----------------------|-----|------------------------------------|----|------------------------------|------|-----------------------|-----|---------------------|
|      | ac-ft/yr         | mgd | operating<br>/day  | (kwh/day)         |      | (\$/day) | (  | Million \$<br>/year) | (   | Million \$<br>/year)               | (  | Million \$<br>/year)         |      | (Million \$<br>/year) |     | (\$)                |
| 2015 | -                | -   | •                  | -                 | \$   | -        | \$ | -                    | -   |                                    |    |                              | \$   | -                     | \$  | -                   |
| 2016 | 17               |     | 7                  |                   | \$   |          | \$ | 1/2:                 |     |                                    |    |                              | \$   |                       | \$  | -                   |
| 2017 | -                | *   | -                  | -                 | \$   | -        | \$ |                      |     |                                    |    |                              | \$   | (-)                   | \$  | -                   |
| 2018 | -                | -   | -                  | -                 | \$   | -        | \$ |                      |     |                                    |    |                              | \$   | -                     | \$  |                     |
| 2019 |                  |     | 11 Same            |                   | \$   | 200      | \$ |                      |     |                                    | -  |                              | \$   |                       | \$  |                     |
| 2020 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 11.37               |
| 2021 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 10.83               |
| 2022 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 10.31               |
| 2023 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 9.82                |
| 2024 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 9.35                |
| 2025 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 8.91                |
| 2026 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 8.48                |
| 2027 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 8.08                |
| 2028 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 7.69                |
| 2029 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 7.33                |
| 2030 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 6.98                |
| 2031 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 6.65                |
| 2032 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 6.33                |
| 2033 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | s   | 0.60                               | s  | 1.260                        | \$   | 14.51                 | \$  | 6.03                |
| 2034 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 5.74                |
| 2035 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | s  | 1.260                        | s    | 14.51                 | \$  | 5.47                |
| 2036 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | S  | 1.260                        | \$   | 14.51                 | \$  | 5.21                |
|      |                  | 118 | 4.99               |                   | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | s  | 1.260                        | \$   | 14.51                 | \$  | 4.96                |
| 2037 | 132,000          |     |                    | 494,936           | \$   |          | \$ |                      | \$  |                                    | \$ |                              | \$   |                       | \$  | 4.72                |
| 2038 | 132,000          | 118 | 4.99               | 494,936           |      | 34,646   |    | 12.65                |     | 0.60                               |    | 1.260                        |      | 14.51                 |     |                     |
| 2039 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 4.50                |
| 2040 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 4.28                |
| 2041 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 4.08                |
| 2042 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.89                |
| 2043 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.70                |
| 2044 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.52                |
| 2045 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.36                |
| 2046 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.20                |
| 2047 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 3.04                |
| 2048 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.90                |
| 2049 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.76                |
| 2050 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.63                |
| 2051 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | s   | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.50                |
| 2052 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.39                |
| 2053 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | s  | 1.260                        | \$   | 14.51                 | \$  | 2.27                |
| 2054 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.16                |
| 2055 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 2.06                |
|      |                  |     |                    | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.96                |
| 2056 | 132,000          | 118 | 4.99               |                   |      |          |    |                      |     |                                    |    |                              |      |                       |     | 1.87                |
| 2057 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  |                     |
| 2058 | 132,000          | 118 | 4.99               | 494,936           | \$   |          | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.78                |
| 2059 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.70                |
| 2060 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.61                |
| 2061 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.54                |
| 2062 | 132,000          | 118 | 4.99               | 494,936           | \$   |          | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.46                |
| 2063 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.39                |
| 2064 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.33                |
| 2065 | 132,000          | 118 | 4.99               | 494,936           | \$   | 34,646   | \$ | 12.65                | \$  | 0.60                               | \$ | 1.260                        | \$   | 14.51                 | \$  | 1.27                |
|      |                  |     |                    |                   |      |          |    |                      |     |                                    | •  | Total NPV                    | of ( | O&M Costs             | \$  | 213                 |
|      |                  |     | Capital Cos        | ts in million \$: |      |          |    |                      |     | Yr built                           |    |                              |      |                       |     |                     |
|      |                  |     | -up.tai 003        | RWTM              |      |          | \$ | 534                  |     | 2020                               | •  |                              |      |                       | \$  | 418                 |
|      |                  |     |                    | Pumping Stat      | tion | 16       | \$ | 42                   |     | 2020                               |    |                              |      |                       | \$  | 33                  |
|      |                  |     |                    | , umping ola      | ioi  |          | Ψ  | 42                   |     | 2020                               | To | tal NIDV of                  | Co   | pital Costs           |     | 451                 |
|      |                  |     |                    |                   |      |          |    |                      |     |                                    | 10 | cal INP V OT                 | υd   | Pital Custs           | . 4 | 401                 |

# NPV CALCULATIONS ALCOA / CPS GROUNDWATER CTRWTP - Alternate 2A - WTP East of San Marcos

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile Initial year of analysis period Interest rate Evaluation period Unit cost of energy 2015 5% 50 years 0.07 per kwh

|  | AL | COA   |             | CPS   |           | Total |       |
|--|----|-------|-------------|-------|-----------|-------|-------|
| Year built   | 2  | 015   |             | 2015  |           |       |       |
| Estimated Construction Cost in Millions                  |    |       |             |       |           |       |       |
| Wells (Based on Non-Public Water Supply Wells)           |    | 20.92 |             | 7.94  |           | 28.86 |       |
| Pipeline   |    | 13.03 |             | 5.94  |           | 18.97 |       |
| Pump Stations & Storage                                  |    | 8.51  | t even made | 0     |           | 8.51  |       |
| Subtotal   |    | 42.46 |             | 13.88 |           | 56.34 |       |
| Contingency  |    | 8.49  |             | 2.78  | 210-211-2 | 11.27 |       |
| Subtotal   |    | 50.95 |             | 16.66 |           | 67.61 |       |
| Engineering, Legal & Administrative                      |    | 6.37  |             | 2.08  |           | 8.45  |       |
| Subtotal   |    | 57.32 | 10011       | 18.74 |           | 76.06 |       |
| Environmental & Archaeology Studies & Mitigation         |    | 0.63  |             | 0.2   |           | 0.83  |       |
| Land Acquisition & Surveying                             |    | 0     |             | 0     |           | 0.00  |       |
| Groundwater Purchase                                     |    | 0     |             | 5.64  |           | 5.64  |       |
| ALCOA Construction Program Management Fee                |    | 5.45  |             | 0     |           | 5.45  |       |
| Interest During Construction (2 years, 6% int., 4% ret.) |    | 5.89  |             | 2.44  |           | 8.33  |       |
| Total Capital Cost                                       |    | 69.29 |             | 27.02 |           | 96.31 |       |
| Estimated Annual O&M Costs                               |    |       |             |       |           |       |       |
| O&M  |    | 0.67  |             | 0.18  |           | 0.85  |       |
| Pumping Energy   |    | 2.41  |             | 0.52  |           | 2.93  |       |
| ALCOA Project Management Fees                            |    | 0.35  |             | 0.00  |           | 0.35  |       |
| Purchase of Groundwater                                  |    | 2.00  |             | 0.00  |           | 2.00  |       |
| Groundwater District Fees                                |    | 0.65  |             | 0.25  |           | 0.90  |       |
| Mitigation Reserves                                      |    | 0.28  |             | 0.11  |           | 0.39  |       |
| Total Annual Cost  |    | 6.36  |             | 1.06  |           | 7.42  |       |
| NPV of O&M Costs   | \$ | 116   | \$          | 19    | s         | 135   | milli |
| NPV of Capital Costs                                     | \$ | 69    | \$          | 27    | \$        |       | mill  |
| Total NPV of Capital and O&M Costs for Well Fields       | \$ | 185   | \$          | 46    | \$        | 232   | mil   |

#### Cooling of Well Water

| Total number of wells in both fields  | 120 wells | Approximate capacity per wel | 300    | gpm        |
|---|-----------|------------------------------|--------|------------|
| Percentage of wells with temperatures > than degrees  | 5%        |                              | 36,000 | gpm        |
| Estimated number of wells with temperature > degrees  | 6.0       | Rough check                  | 58,072 | ac-ft/year |
| 120 Principal Control Company Control |           |                              |        |            |

#### **Estimated Capital Costs**

| V CONTRACTOR OF THE CONTRACTOR |               |         |
|--|---------------|---------|
| Year built   | 2015          |         |
| Number of Packaged Cooling Towers (300 gpm capacity/each)  | 6.0           |         |
| Equipment cost (cooling towers and fans)   | \$<br>60,000  |         |
| Installation and contractors mark-up   | \$<br>50,000  |         |
| Structural slab  | \$<br>30,000  |         |
| Electrical   | \$<br>50,000  |         |
| Estimated Unit Construction Cost   | \$<br>190,000 | Each    |
| Total construction cost  | \$<br>1.14    | million |
| Contingencies  | \$<br>0.23    |         |
| Subtotal   | \$<br>1.37    |         |
| Engineering, Legal and Admin   | \$<br>0.21    |         |
| Total Estimated Capital Cost   | \$<br>1.57    |         |
| NPV of Capital Costs   | \$<br>1.57    | million |

#### Estimated O&M Costs

| Value of equipment                                  | \$<br>0.4   | million                          |
|---|-------------|----------------------------------|
| Assumed life of equipment                           | 10          | years                            |
| Estimated maintenance/replacement cost              | \$<br>0.04  | million/year                     |
| Blower Hp per cooling tower                         | 10          | Нр                               |
|   | 7           | kw                               |
| Hours of operation                                  | 24          | hours                            |
| Power consumption per cooling tower                 | 179         | kwh per day                      |
| N 33 B  | 65,350      | kwh per year                     |
| Power cost per cooling tower                        | \$<br>4,574 |                                  |
| Total power cost for all cooling towers in millions | \$<br>0.03  | million per year                 |
| Regular operational checks and routine maintenance  | \$<br>6,000 | per month for all cooling towers |
|   | \$<br>0.07  | per year                         |
| Estimated O&M Cost                                  | \$<br>0.14  | million \$ per year              |
| NPV of O&M costs                                    | \$<br>2.47  | million \$                       |

Ground Water Transmission Main and Pump Station (Hwy 290 to Bastrop Intake)

Inside diameter of transmission pipe

54 in.

| Area   |                | 15.90   | sf           |  |
|--|----------------|---------|--------------|--|
| Length of Ground Water TM  |                | 15      | miles        |  |
|  |                | 79,200  | feet         |  |
| Estimated construction cost for GWTM   | \$             | 327     | per LF       |  |
| Total construction cost in millions  | \$             | 25.9    |              |  |
| Contingencies  | \$<br>\$<br>\$ | 5.2     |              |  |
| Subtotal   | \$             | 31.1    | •            |  |
| Engineering, Legal & Administrative  | \$             | 4.7     |              |  |
| Subtotal   | \$             | 35.8    | •            |  |
| Envir & Arch Studies & Mitigation, Surveying, & Lar  | nd Acq \$      | 1.5     |              |  |
| Total Capital Cost for PWTM in millions  | \$             | 37.3    | million      |  |
| Unit maintenance cost/year-mile  | \$             | 10,000  | \$/year-mile | \$ 0.150 Million \$/year               |
| Design flow rate   |                | 55,000  | ac-ft/year   |  |
|  |                | 49      | mgd          |  |
|  |                | 34,095  | gpm          |  |
| Velocity at peak flow rate   |                | 4.78    | fps          |  |
| C factor   |                | 120     | 118.000      |  |
| Head loss per foot   |                | 0.00134 | ft/ft        | hr=   3.552*Q 1.85                     |
|  |                | 7.10    | ft/mile      | C*(d) <sup>2.63</sup>                  |
| Head loss at peak flow rate  |                | 106     | ft           |  |
| Allowance for minor losses   | 10%            | 11      | ft           | 400 Elev. At RWI-B                     |
| Total estimated losses   | No.            | 117     | ft           | 550 minus Elev Storage Tank at Hwy 290 |
| Average static head  |                | -150    | ft           | -150 ft                                |
| Total estimated dynamic head   |                | -33     | ft           | (intake is lower than tank at Hwy 290) |
| an appointment of the second |                | -14     | psi          | ************************************** |

#### Negative indicates gravity flow from Hwy 290 to Bastrop Intake; no pumping necessary.

|                               |             |          |                            | MI | illion \$ |
|-------------------------------|-------------|----------|----------------------------|----|-----------|
| Annual O&M Cost in million \$ | 7.00        | Yr built | J                          |    |           |
| GWTM                          | \$<br>0.150 | 2015     | •                          |    |           |
|                               |             |          | Total NPV of O&M Costs     | \$ | 2.7       |
| Capital Costs in million \$:  |             | Yr built | 2                          |    |           |
| GWTM                          | \$<br>37.3  | 2015     | -                          | \$ | 37.3      |
|                               |             |          | Total NPV of Canital Costs | S  | 37.3      |

| Su |  |  |
|----|--|--|
|    |  |  |

Well Fields and Collection Lines (including tank and pump station at Hwy 290) Cooling Towers for Selected High Temperature Wells Ground Water Transmission Main and Pumping Station Total for ALCOA-CPS

| NPV of<br>Capital Costs |       | NF | OV of O&M<br>Costs | Total NPV of<br>Capital and<br>O&M Cost |       |  |  |
|-------------------------|-------|----|--------------------|---|-------|--|--|
| \$                      | 96.3  | \$ | 135.5              | \$                                      | 231.8 |  |  |
| \$                      | 1.6   | \$ | 2.5                | \$                                      | 4.0   |  |  |
| \$                      | 37.3  | \$ | 2.7                | \$                                      | 40.0  |  |  |
| •                       | 135 1 | é  | 440.7              | e                                       | 275 0 |  |  |

O&M Cost Calculations RWI B - Colorado River Intake at Bastrop and Off Channel Reservoir CTRWTP - Alternate 2A - WTP East of San Marcos

| Initial year of analysis period<br>Interest rate<br>Evaluation period | 2015<br>5% |      |       |   | Engir | eering, l                  |     | ngency =<br>Admin. =                  |    |                                       |       |                            |
|---|------------|------|-------|---|-------|----------------------------|-----|---------------------------------------|----|---------------------------------------|-------|----------------------------|
| Unit cost of energy   | \$ 0.07    |      |       | Environmental & Archaeology Studies & Mitigation, Surveying, and Land Acquisition |       |                            |     |                                       |    | 100,000                               | per m |                            |
| Inflatable Rubber Low Head Dam  |            |      |       |   |       |                            |     | or=                                   | \$ | 5,000                                 | per a | are:                       |
|   | Quantity   | U    | nits  | Size  | (     | Constr.<br>Cost<br>Ilions) | Est | otal<br>mated<br>str. Cost<br>llions) | E  | entigency,<br>ing., etc.<br>millions) | (     | Capital<br>Cost<br>Ilions) |
| Inflatable Rubber Low Head Dam  | 2          | each |       | 10 ft high  | \$    | 2.25                       | \$  | 4.50                                  | \$ | 1.71                                  | \$    | 6.21                       |
| Estimated inflatable dam cost as 9                                    | % of total |      | 50%   |   |       |                            |     |                                       |    |                                       |       |                            |
| Value of inflatable dam   |            | \$   | 2.25  | million   |       |                            |     |                                       |    |                                       |       |                            |
| Assumed life of inflatable dam  |            |      | 10    | years   |       |                            |     |                                       |    |                                       |       |                            |
| Estimated maintenance/replaceme                                       | ent cost   | \$   | 0.23  | million/year  |       |                            |     |                                       |    |                                       |       |                            |
| Year built  |            | 20   | 015   |   |       |                            |     |                                       |    |                                       |       |                            |
| NPV of O&M Costs  |            | \$   | 3.86  | million   |       |                            |     |                                       |    |                                       |       |                            |
| NPV of Capital Costs  |            | \$   | 6.21  | _million  |       |                            |     |                                       |    |                                       |       |                            |
| Total NPV of Capital and O&M C  | osts       | \$   | 10.07 | million   |       |                            |     |                                       |    |                                       |       |                            |

### Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir)

| Year                        | 2015          | 2020            | 2030                       | 2040          |       | 2050              | 2060              | 2065             |   |
|-----------------------------|---------------|-----------------|----------------------------|---------------|-------|-------------------|-------------------|------------------|---|
| For SAWS                    | 18000         | 18000           | 18000                      | 18000         |       | 18000             | 18000             | 18000            | *   |
| LCRA                        |               |                 | 5600                       | 11200         |       | 11200             | 11200             | 11200            |   |
| COA                         |               | 212042002-004   | 16802                      | 22403         |       | 33604             | 33604             | 33604            | 2   |
| Total                       | 18000         | 18000           | 40402                      | 51603         |       | 62804             | 62804             | 62804            | -   |
| Ultimate (Y2                | .065) avera   | age design v    | withdrawal ra              | ate           |       |                   | ac-ft/year<br>cfs |                  |   |
|                             |               |                 |                            |               |       |                   |                   | 23.1             | Ratio of design withdrawal rate           |
| Total intake                | design wit    | hdrawal rate    | e (for scalpin             | g high flows) |       | 2,000<br>897,600  |                   |                  | to Total intake design withdrawal rate    |
| No. of Intake               |               |                 |                            |               |       | 2                 |                   |                  |   |
| Design with                 |               | ner intake      |                            |               |       | 1,000             | cfs               |                  |   |
| Design Willia               | ulawai late   | per imake       |                            |               |       | 448,800           |                   |                  |   |
|                             |               |                 |                            |               |       | The second second |                   |                  |   |
| No. of reser<br>Design flow |               | servoir         |                            |               |       | 224,400           | gpm               |                  |   |
| •                           |               |                 |                            |               |       |                   |                   |                  |   |
| Inside diame                | eter of eacl  | h RWTM          |                            |               |       | 120               | in.               |                  |   |
| Area                        |               |                 |                            |               |       | 78.54             |                   |                  |   |
| Average len                 | gth of each   | n RWTM          |                            |               |       |                   | miles             |                  | miles for all RWTMs                       |
|                             |               |                 |                            |               |       | 10,560            | feet              | 42,240           | feet                                      |
| Estimated o                 | onstruction   | cost for RV     | NTMs                       |               | \$    | 793               | per LF            |                  |   |
| Total constr                |               | in millions     |                            |               | \$    | 33.5              |                   |                  |   |
| Contingenci                 |               |                 |                            |               | \$    | 6.7               |                   |                  |   |
| ;<br>Engineering            | Subtotal      | dministratio    | 10                         |               | \$    | 40.2<br>6.0       |                   |                  |   |
|                             | Subtotal      | Millionali      | ,,                         |               | \$    | 46.2              |                   |                  |   |
|                             |               |                 | Surveying, a               |               | \$    | 0.8               |                   |                  |   |
|                             | Total Capit   | al Cost for I   | PWTM in mi                 | llions        | \$    | 47.0              |                   |                  |   |
| Unit mainter                | nance cost    | /year-mile      |                            |               | \$    | 10,000            | \$/year-mile      | \$ 0.080         | Million \$/year (all RWTMs to Reservoirs) |
| Note: Assun                 | ne intake h   | as one RW       | TM pumping                 | to the reser  | voir. |                   |                   |                  |   |
|                             |               |                 | from above)                |               |       | 224,400           |                   |                  |   |
| Pumping rat                 |               |                 |                            |               |       | 40,000            | gpm               |                  |   |
|                             |               |                 | pumping in<br>all pumps ex | to each RWT   | 1     | 240,000           |                   |                  |   |
| reak now re                 | ite iiito eac | AT IVAA LIAI (e | iii puilips ex             | cept spare)   |       | 240,000           | gpiii             |                  |   |
| Velocity at p               | eak flow ra   | ate             |                            |               |       | 6.81              | fps               |                  |   |
| C factor                    |               |                 |                            |               |       | 120               |                   | 1.02553          | _ 105                                     |
| Head loss p                 | er foot       |                 |                            |               |       | 0.00102           |                   | h <sub>f</sub> = | 1 3.552*QI <sup>1.85</sup>                |
|                             |               |                 |                            |               |       | 5.39              | ft/mile           |                  | C*(d) <sup>2.63</sup>                     |
| Head loss a                 | t peak flow   | rate            |                            |               |       | 11                | ft                |                  |   |
| Allowance for               |               |                 | 30%                        |               |       | 3                 |                   |                  | Discharge at reservoir                    |
| Total estima                |               |                 |                            |               |       | 14                |                   |                  | Water surface elev in river               |
| Average sta                 |               |                 |                            |               |       | 80                |                   | 80               | ft .                                      |
| Total estima                | ited dynam    | nic head        |                            |               |       | 94<br>41          | ft<br>psi         |                  |   |
| Assumed -                   | ima efficie   | nov             |                            |               |       | 85%               | A.I.              |                  |   |
| Assumed pu<br>Assumed m     |               |                 |                            |               |       | 90%               |                   |                  |   |
| Estimated H                 |               |                 |                            |               |       |                   | hp/pump           |                  |   |
|                             | r             | La bamb         |                            |               |       |                   | kw/pump           |                  |   |

| Total hp pumping into each RWTM (not counting spare)         | 7,448       | hp/RWTM  |
|--|-------------|--|
| Total hp at each intake (not counting spare)                 | 14,897      | hp/intake  |
| Total hp all intakes (not counting spares)                   | 29,793      | hp   |
| Total kw all intakes (not counting spares)                   | 22,226      | kw   |
| Unit construction cost for each pump station (from cost cur- | \$<br>889   | per firm hp of pump station                        |
| Construction cost per intake/pump station                    | 13.2        | million  |
| No. of intakes from above                                    | 2           | each   |
| Total construction cost in millions                          | \$<br>26.5  | million  |
| Contigency, Eng., etc. in millions                           | \$<br>10.06 | million  |
| Total capital cost in millions                               | \$<br>36.6  | million  |
| Total construction cost for pump stations                    | \$<br>26.5  | million 40% Estimated equipment cost as % of total |
| Value of equipment   | \$<br>10.6  | million  |
| Assumed life of equipment                                    | 20          | years  |
| Estimated maintenance/replacement cost                       | \$<br>0.53  | million/year                                       |

O&M Costs:

| Year         | Flow pum<br>yea  |     | No. of pump "sets" | Energy<br>used |    | Energy cost |    |                    | co | ther O&M<br>sts - Pump<br>Stations |    | intenance<br>costs -<br>RWTM | To | otal O&M<br>cost  | Ne | et present<br>value |
|--------------|------------------|-----|--------------------|----------------|----|-------------|----|--------------------|----|------------------------------------|----|------------------------------|----|-------------------|----|---------------------|
|              | ac-ft/yr         | mgd | operating<br>/day  | (kwh/day)      |    | (\$/day)    | (  | (Million \$ /year) |    | (Million \$ /year)                 | (  | Million \$ /year)            | (  | Million \$ /year) |    | (\$)                |
| 2015         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.77                |
| 2016         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.73                |
| 2017         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.70                |
| 2018         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.66                |
| 2019         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.63                |
| 2020         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.60                |
| 2021         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.57                |
| 2022         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.55                |
| 2023         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.52                |
| 2024         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.50                |
| 2025         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.47                |
| 2026         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.45                |
| 2027         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.43                |
| 2028         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.41                |
| 2029         | 18,000           | 16  | 0.28               | 6,200          | \$ | 434         | \$ | 0.16               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.77              | \$ | 0.39                |
| 2030         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.46                |
| 2031         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.44                |
| 2032         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.42                |
| 2033         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.40                |
| 2034         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.38                |
| 2035         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.36                |
| 2036         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.35                |
| 2037         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.33                |
| 2038         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.31                |
| 2039         | 40,402           | 36  | 0.63               | 13,917         | \$ | 974         | \$ | 0.36               | \$ | 0.53                               | \$ | 0.080                        | \$ | 0.97              | \$ | 0.30                |
| 2040         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.31                |
| 2041         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.30                |
| 2042         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.28                |
| 2043         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.27                |
| 2044         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.26                |
| 2045         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.25                |
| 2046         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.23                |
| 2047         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.22                |
| 2048         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.21                |
| 2049         | 51,603           | 46  | 0.80               | 17,775         | \$ | 1,244       | \$ | 0.45               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.06              | \$ | 0.20                |
| 2050         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.21                |
| 2051         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.20                |
| 2052         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.19                |
| 2053         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.18                |
| 2054         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.17                |
| 2055         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.17                |
| 2056         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.16                |
| 2057         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.15                |
| 2058         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.14                |
| 2059         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.14                |
| 2060         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.13                |
| 2061         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.12                |
| 2062         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.12                |
| 2063         | 62,804           | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | \$ | 0.53                               | \$ | 0.080                        | \$ | 1.16              | \$ | 0.11                |
|              |                  | 56  | 0.97               | 21,633         | S  | 1,514       | S  | 0.55               | \$ | 0.53                               | S  | 0.080                        | S  | 1.16              | S  | 0.11                |
| 2064<br>2065 | 62,804<br>62,804 | 56  | 0.97               | 21,633         | \$ | 1,514       | \$ | 0.55               | Š  | 0.53                               | Š  | 0.080                        | Š  | 1.16              | Š  | 0.10                |

Total NPV of O&M Costs \$ 17.1

 Capital Costs in million \$:
 Yr built
 47.0
 2015
 \$ 47.0
 47.0
 \$ 36.6
 \$ 36.6
 \$ 36.6
 Total NPV of Capital Costs
 \$ 83.6

Total NPV of Capital and O&M Costs in millions \$ 100.

#### Reservoirs

|                            | Quantity  | Units | Volume/each (acre-feet) | nit Cost<br>5/ac-ft)) | Construction<br>Cost in<br>millions |       | Contigency,<br>Eng., etc. |      | otal in    |
|----------------------------|-----------|-------|-------------------------|-----------------------|-------------------------------------|-------|---------------------------|------|------------|
| Reservoirs                 | 4         | each  | 15000                   | \$<br>1,180           | \$                                  | 70.8  | \$                        | 26.9 | \$<br>97.7 |
|                            |           |       |                         | \$<br>0.004           | per g                               | allon |                           |      |            |
| Estimated average death of | receptoir | 20    | 4                       |                       |                                     |       |                           |      |            |

| Surface area of reservoir                     | 3000        | acres        |                                     |       |
|---|-------------|--------------|-------------------------------------|-------|
| Ratio of total land area regd to surface area |             |              |                                     |       |
| of reservoir                                  | 1.1         |              | Envir & Archaeology, Surv,          |       |
| Total land area regd for reservoirs           | 3300        | acres        | and Land Acq =                      | 16.5  |
|   |             |              | Total capital cost in millions = \$ | 114.2 |
| Assumed life of reservoir                     | 100         | years        |                                     |       |
| Estimated replacement cost                    | \$<br>0.71  | million/year |                                     |       |
| Estimated maintenance                         | \$<br>0.04  | million/year | Mowing, maintaining fences, etc.    |       |
| Total   | \$<br>0.75  | million/year |                                     |       |
| Year built                                    | 2015        |              |                                     |       |
| NPV of O&M costs                              | \$<br>12.8  | million      |                                     |       |
| NPV of Capital costs                          | \$<br>114.2 | million      |                                     |       |
| Total NPV of Capital and O&M Costs            | \$<br>127.0 | million      |                                     |       |

| Summary   | IPV of<br>tal Costs |    | PV of O&M<br>Costs | Capital and |       |  |
|---|---------------------|----|--------------------|-------------|-------|--|
| Inflatable Rubber Low Head Dam                                    | \$<br>6.2           | \$ | 3.9                | \$          | 10.1  |  |
| Raw Water Intake, Pumping Station, and RWTM (Intake to Reservoir) | \$<br>83.6          | \$ | 17.1               | \$          | 100.7 |  |
| Off Channel Reservoir   | \$<br>114.2         | \$ | 12.8               | \$          | 127.0 |  |
| Total for RWI A   | \$<br>204.0         | S  | 33.8               | \$          | 237.8 |  |

# O&M Cost Calculations RWTM B - RWI B near Bastrop to WTP CTRWTP - Alternate 2A - WTP East of San Marcos

Initial year of analysis period Interest rate Evaluation period Unit cost of energy 2015 5% 40 years \$ 0.07 per kwh Contingency = 20%
Engineering, Legal, Admin, = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

| Suface Water<br>Year | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
|----------------------|-------|-------|-------|--------|--------|--------|--------|
| For SAWS             | 18000 | 18000 | 18000 | 18000  | 18000  | 18000  | 18000  |
| LCRA                 |       |       | 5600  | 11200  | 11200  | 11200  | 11200  |
| COA                  |       |       | 16802 | 22403  | 33604  | 33604  | 33604  |
| Subtotal             | 18000 | 18000 | 40402 | 51603  | 62804  | 62804  | 62804  |
| Groundwater          |       |       |       |        |        |        |        |
| Year                 | 2015  | 2020  | 2030  | 2040   | 2050   | 2060   | 2065   |
| For SAWS             | 55000 | 55000 | 55000 | 55000  | 55000  | 55000  | 55000  |
| Suface & grour       | 73000 | 73000 | 95402 | 106603 | 117804 | 117804 | 117804 |

#### Sizing

| Inside diameter of RWTM   |       | 96           | in.                       |        |                  |  |
|---|-------|--------------|---------------------------|--------|------------------|--|
| Area  |       | 50,27        |                           |        |                  |  |
| Length of RWTM  |       | 36           | miles                     |        |                  |  |
|   |       | 190,080      |                           |        |                  |  |
| Estimated unit construction cost for RWTM   | \$    | 567          | per LF                    |        |                  |  |
| Total construction cost in millions   | \$    | 107.9        |                           |        |                  |  |
| Contingencies   | \$    | 21.6         |                           |        |                  |  |
| Subtotal  | \$    | 129.4        |                           |        |                  |  |
| Engineering, Legal & Administrative   | \$    | 19.4         | i .                       |        |                  |  |
| Subtotal  | \$    | 148.9        |                           |        |                  |  |
| Envir & Arch Studies & Mitigation, Surveying, & Land Acc<br>Total Capital Cost for PWTM in millions | \$    | 3.6<br>152.5 | million                   |        |                  |  |
| Unit maintenance cost/year-mile   | \$    | 5,000        | \$/year-mile              | \$     | 0.180            | Million \$/year                        |
| Design flow rate (after 100% buildout)  |       | 117,804      | ac-ft/year                |        |                  |  |
| 3 (3)   |       | 105          | mgd                       |        |                  |  |
|   |       | 73,029       |                           |        |                  |  |
| Pumping rate (one pump)   |       | 15,000       | gpm                       |        |                  |  |
| No. of pumps (not counting spare)   |       | 5            |                           |        |                  |  |
| Peak flow rate (all pumps except spare)   |       | 75,000       | gpm                       |        |                  |  |
| Velocity at peak flow rate  |       | 3.32         | fps                       |        |                  |  |
| C factor  |       | 120          | 10.50                     |        |                  |  |
| Head loss per foot  |       | 0.00035      | ft/ft                     |        | h <sub>f</sub> = | 3.552*Q  <sup>1.85</sup>               |
|   |       |              | ft/mile                   |        | 200              | C*(d) <sup>2.63</sup>                  |
| Head loss at peak flow rate   |       | 67           | ft                        |        |                  |  |
| Allowance for minor losses 10%  |       | 7            |                           |        |                  | Elev. At WTP                           |
| Total estimated losses  |       | 74           |                           |        |                  | Elev of WSE in Bastrop reservoir       |
| Average static head   |       | 250          |                           |        | 250              | ft                                     |
| Total estimated dynamic head  |       | 324          |                           |        |                  |  |
|   |       | 140          | psi                       |        |                  |  |
| No of recommended pumping stations along route  |       | 0.93         |                           |        | 150              | psi (assumed max pressure              |
| No. of pumping stations used in cost estimate   |       | 1.0          |                           |        |                  | in pipe)                               |
| Average head per pump station   |       | 324          | ft                        |        |                  |  |
| Assumed pump efficiency   |       | 85%          |                           |        |                  |  |
| Assumed motor efficiency  |       | 90%          |                           |        |                  |  |
| Estimated Hp required per pump  |       |              | hp/pump                   |        |                  |  |
|   |       |              | kw/pump                   |        |                  |  |
| Total hp per pump station (not counting spare)  | 20    |              | hp/station                |        |                  |  |
| Total kw per pump set (set=pumps in series along route  | )     | 1,602        | kw/pump set               | (one   | pump at          | each station)                          |
| Unit construction cost for each pump station (from cost of  | uı \$ |              | per firm hp of<br>million | f pump | o station        |  |
| Construction cost per pump station Balancing reservoir  | •     |              | million                   |        | en               | min. of storage at avg pumping rate    |
| Total construction cost per pump station  | \$    |              | million                   |        |                  | mg                                     |
|   |       |              |                           | \$     |                  | per gal for open top reservoir         |
| No. of pump stations from above   |       | 1.0          | each                      |        |                  |  |
| Total construction cost in millions   | \$    | 11.2         | million                   |        |                  |  |
| Contingency, Eng., etc. in millions   | \$    |              | million                   |        |                  |  |
| Total capital cost in millions  | \$    |              | million                   |        |                  |  |
| Total construction cost for pump stations   | \$    |              | million                   |        |                  |  |
| Value of equipment  | \$    |              | million                   |        | 40%              | Estimated equipment cost as % of total |
| Assumed life of equipment   |       |              | years                     |        |                  |  |
| Estimated maintenance/replacement cost  | \$    |              | million/year              |        |                  |  |

#### O&M Costs

| Year         | Flow pun<br>yea    |          | No. of<br>pump<br>"sets"<br>operating | Energy<br>used     |      | Energy           |    |                       | co | other O&M<br>sts - Pump<br>Stations | )     | aintenance<br>costs -<br>RWTM |    | otal O&M<br>cost      | Ne  | et present<br>value |
|--------------|--------------------|----------|---------------------------------------|--------------------|------|------------------|----|-----------------------|----|-------------------------------------|-------|-------------------------------|----|-----------------------|-----|---------------------|
|              | ac-ft/yr           | mgd      | /day                                  | (kwh/day)          |      | (\$/day)         |    | (Million \$<br>/year) |    | (Million \$<br>/year)               |       | (Million \$<br>/year)         |    | (Million \$<br>/year) | *** | (\$)                |
| 2015         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 3.37                |
| 2016         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 3.21                |
| 2017         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 3.06                |
| 2018         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.91                |
| 2019         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.77                |
| 2020         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.64                |
| 2021         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.51                |
| 2022         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.39                |
| 2023         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.28                |
| 2024         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.17                |
| 2025         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 2.07                |
| 2026         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 1.97                |
| 2027         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 1.88                |
| 2028         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 1.79                |
| 2029         | 73,000             | 65       | 3.02                                  | 115,984            | \$   | 8,119            | \$ | 2.96                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 3.37                  | \$  | 1.70                |
| 2030         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 2.06                |
| 2031         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.96                |
| 2032         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.87                |
| 2033         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.78                |
| 2034         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.69                |
| 2035         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.61                |
| 2036         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.54                |
| 2037         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.46                |
| 2038         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  |     | 1.39                |
| 2039         | 95,402             | 85       | 3.94                                  | 151,577            | \$   | 10,610           | \$ | 3.87                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.28                  | \$  | 1.33                |
| 2040         | 106,603            | 95       | - 4.41                                | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73<br>4.73          | \$  | 1.40                |
| 2041         | 106,603            | 95<br>95 | 4.41                                  | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73                  | \$  | 1.33<br>1.27        |
| 2042         | 106,603            | 95<br>95 | 4.41                                  | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73                  | \$  | 1.21                |
| 2043         | 106,603            | 95<br>95 | 4.41                                  | 169,373            | 5    | 11,856           | \$ | 4.33                  | \$ | 0.22                                | 5     | 0.180                         | 5  | 4.73                  | S   | 1.15                |
| 2044         | 106,603            | 95       | 4.41<br>4.41                          | 169,373            | \$   | 11,856<br>11,856 | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73                  | \$  | 1.09                |
| 2045<br>2046 | 106,603            | 95       | 4.41                                  | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | S     | 0.180                         | \$ | 4.73                  | \$  | 1.09                |
| 2046         | 106,603            | 95       | 4.41                                  | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73                  | \$  | 0.99                |
| 2047         | 106,603            | 95       | 4.41                                  | 169,373            | \$   | 11,856           | \$ | 4.33                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 4.73                  | \$  | 0.95                |
| 2048         | 106,603<br>106,603 | 95       | 4.41                                  | 169,373<br>169,373 | \$   | 11,856           | \$ | 4.33                  | S  | 0.22                                | \$    | 0.180                         | S  | 4.73                  | S   | 0.90                |
| 2049         | 117,804            | 105      | 4.41                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | Š  | 0.22                                | \$    | 0.180                         | \$ | 5.19                  | Š   | 0.94                |
| 2050         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | S  | 0.22                                | 5     | 0.180                         | \$ | 5.19                  | s   | 0.90                |
| 2052         | 117,804            | 105      | 4.87                                  | 187,170            | S    | 13,102           | Š  | 4.78                  | S  | 0.22                                | Š     | 0.180                         | \$ | 5.19                  | Š   | 0.85                |
| 2052         | 117,804            | 105      | 4.87                                  | 187,170            | S    | 13,102           | Š  | 4.78                  | S  | 0.22                                | S     | 0.180                         | 5  | 5.19                  | Š   | 0.81                |
| 2054         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 5.19                  | Š   | 0.77                |
| 2055         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | S  | 0.22                                | \$    | 0.180                         | \$ | 5.19                  | \$  | 0.74                |
| 2056         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | S  | 4.78                  | S  | 0.22                                | 5     | 0.180                         | \$ | 5.19                  | S   | 0.70                |
| 2057         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | Š  | 4.78                  | Š  | 0.22                                | \$    | 0.180                         | \$ | 5.19                  | Š   | 0.67                |
| 2058         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | s  | 4.78                  | \$ | 0.22                                | \$    | 0.180                         | Š  | 5.19                  | \$  | 0.64                |
| 2059         | 117,804            | 105      | 4.87                                  | 187,170            | Š    | 13,102           | s  | 4.78                  | s  | 0.22                                | \$    | 0.180                         | s  | 5.19                  | Š   | 0.61                |
| 2060         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | \$ | 0.22                                | Š     | 0.180                         | \$ | 5.19                  | Š   | 0.58                |
| 2061         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | Š  | 0.22                                | \$    | 0.180                         | \$ |                       | S   | 0.55                |
| 2062         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | \$ | 4.78                  | \$ | 0.22                                | \$    | 0.180                         | \$ | 5.19                  | \$  | 0.52                |
| 2063         | 117,804            | 105      | 4.87                                  | 187,170            | Š    | 13,102           | Š  | 4.78                  | s  | 0.22                                | Š     | 0.180                         | \$ | 5.19                  | Š   | 0.50                |
| 2064         | 117,804            | 105      | 4.87                                  | 187,170            | š    | 13,102           | s  | 4.78                  | Š  | 0.22                                | Š     | 0.180                         | \$ |                       | Š   | 0.47                |
| 2065         | 117,804            | 105      | 4.87                                  | 187,170            | \$   | 13,102           | Š  | 4.78                  | s  | 0.22                                | \$    | 0.180                         | \$ |                       | Š   | 0.45                |
| 2000         | 117,004            | 100      | 4.01                                  | 107,110            | •    | 10,102           | •  | 1.70                  | •  | 0.22                                | •     |                               |    |                       |     |                     |
|              |                    |          |                                       |                    |      |                  |    |                       |    |                                     |       | I otal NPV                    | of | O&M Costs             | \$  | 75.4                |
|              |                    |          | Capital Cos                           | ts in million \$   | 6:   |                  |    |                       | -  | Yr built                            | 0     |                               |    |                       | -   |                     |
|              |                    |          |                                       | RWTM               |      |                  | \$ | 152.5                 |    | 2015                                |       |                               |    |                       | \$  | 152.5               |
|              |                    |          |                                       | Pumping St         | atio | ns               | \$ | 15.5                  |    | 2015                                | 13.22 |                               |    |                       | \$  | 15.5                |
|              |                    |          |                                       |                    |      |                  |    |                       |    |                                     | 1     | otal NPV o                    | C  | apital Costs          | \$  | 168.0               |

Total NPV of Capital and O&M Costs in millions \$ 243.4

O&M Cost Calculations WTP and Raw Water Storage Reservoir at WTP CTRWTP - Alternate 2A - WTP East of San Marcos

Special case for using plant as a base loaded plant only; no peaking factor; AND ALL NON-SOFTENED WATER PRODUCTION

2015

Initial year of analysis period Interest rate Evaluation period Unit cost of energy

5% 50 years \$ 0.07 per kwh

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition = \$ 25,000 per acre

| Treated Water Production | by Treatment Type | (from Domand Chart) |
|--------------------------|-------------------|---------------------|
| reated water Production  | by freatment type | (from Demand Chart) |

|  | Year = _   | 2015  | 2020   | 2030   | 2040   | 2050   | 2060   | 2065   |
|--|------------|-------|--------|--------|--------|--------|--------|--------|
| NON-Softened water demand:                             | Units      |       |        |        |        |        |        |        |
| Average yearly demands:                                |            |       |        |        |        |        |        |        |
| City of Austin   | ac-ft/yr   | 0     | 0      | 16802  | 22403  | 33604  | 33604  | 33604  |
| LCRA   | ac-ft/yr   | 0     | 0      | 5600   | 11200  | 11200  | 11200  | 11200  |
| Totals   | ac-ft/yr   | 0     | 0      | 22402  | 33603  | 44804  | 44804  | 44804  |
| Totals   | mgd        | 0     | 0      | 20     | 30     | 40     | 40     | 40     |
| Max day demands:<br>City of Austin<br>LCRA             | mgd<br>mgd |       |        |        |        |        |        |        |
| Totals   | mgd -      | 0     | 0      | 20     | 30     | 40     | 40     | 40     |
|  | Year = _   | 2015  | 2020   | 2030   | 2040   | 2050   | 2060   | 2065   |
| Non-softened water demands:<br>Average yearly demands: | Units      |       |        |        |        |        |        |        |
| SAWS   | ac-ft/yr   | 73000 | 205000 | 205000 | 205000 | 205000 | 205000 | 205000 |
| SARA   | ac-ft/yr   | 20550 | 23406  | 28433  | 31393  | 34411  | 37530  | 41128  |
| GBRA   | ac-ft/yr   | 0     | 0      | 6000   | 8000   | 10000  | 12300  | 12300  |
| Totals   |            | 93550 | 228406 | 239433 | 244393 | 249411 | 254830 | 258428 |

|  | Totals<br>Totals | mgd               | 93550<br>84 | 228406 | 239433 | 244393<br>218 | 249411 | 254830 | 258428 |
|--|------------------|-------------------|-------------|--------|--------|---------------|--------|--------|--------|
| Max day demands:<br>SAWS<br>SARA<br>GBRA |                  | mgd<br>mgd<br>mgd |             |        |        |               |        |        |        |
|  | Totals           | mgd               | 84          | 204    | 214    | 218           | 223    | 227    | 231    |

| Total: ALL non-softened water demands | ac-ft/yr | 93550 | 228406 | 261835 | 277996 | 294215 | 299634 | 303232 |
|---------------------------------------|----------|-------|--------|--------|--------|--------|--------|--------|
| Average yearly demand                 | mgd      | 84    | 204    | 234    | 248    | 263    | 267    | 271    |
| Max day demand                        | mgd 📗    | 84    | 204    | 234    | 248    | 263    | 267    | 271    |

#### Raw Water Reservoir

| Assumed number of days of consecutive | utive Max Day demands | 30           | days           |  |        |     |
|---------------------------------------|-----------------------|--------------|----------------|--|--------|-----|
| Design (Max. Day) treated water pro-  | duction req'd in mgd  | 271          | mgd            |  |        |     |
| Average treated water production in   | mgd                   | 271          | mgd            | (which is also equal to sum of ground and raw water<br>can be pumped to the WTP) | r that |     |
| Difference (shortfall of ra           | w water)              | 0            | mgd            |  |        |     |
| Required storage reservoir for raw w  | ater                  |              | mg             |  |        |     |
| Add safety factor                     | 25%                   |              | ac-ft<br>ac-ft |  |        |     |
| Total storage required                |                       | 1/ 8= 11 · H | ac-ft          |  |        |     |
| Total storage recommended             |                       | 6,000        | ac-ft          | Note: No. of days at average day demand<br>(for example, for repair of RWTM A) = | 17     | day |

|  | Quantity | Units   | Volume/each<br>(acre-feet) |     | nit Cost<br>\$/ac-ft)) | Co     | Total onstruction Cost |        | tigency,<br>g., etc. | al Capital<br>Cost |
|--|----------|---------|----------------------------|-----|------------------------|--------|------------------------|--------|----------------------|--------------------|
| Reservoirs   | 1        | each    | 6,000                      | \$  | 1,666                  | \$     | 10.0                   | \$     | 3.8                  | \$<br>13.8         |
| Estimated average depth of reservoir                     |          | 25      | ft                         |     |                        |        |                        |        |                      |                    |
| Surface area of reservoir                                |          | 240     | acres                      |     |                        |        |                        |        |                      |                    |
| Ratio of total land area reqd to surface<br>of reservoir | e area   | 1.10    |                            |     |                        |        | Envir & Arcl           | haeolo | ogy, Surv            |                    |
| Total land area regd for reservoirs                      |          | 264     | acres                      |     |                        |        | 8                      | and La | nd Acq =             | 6.6                |
|  |          |         |                            |     |                        | Tota   | l capital cos          | t in m | illions =            | \$<br>20.4         |
| Assumed life of reservoir                                |          | 100     | years                      |     |                        |        |                        |        |                      |                    |
| Estimated replacement cost                               |          | \$ 0.10 | million/year               |     |                        |        |                        |        |                      |                    |
| Estimated maintenance                                    |          | \$ 0.04 | million/year               | Mow | ving, main             | tainii | ng fences, e           | tc.    |                      |                    |
| Total  |          | \$ 0.14 | million/year               |     |                        |        |                        |        |                      |                    |
| Year built   |          | 2015    | 5                          |     |                        |        |                        |        |                      |                    |
| NPV of O&M costs   |          | \$ 2.6  | million                    |     |                        |        |                        |        |                      |                    |
| NPV of Capital costs                                     |          | \$ 20.4 | million                    |     |                        |        |                        |        |                      |                    |

\$ 22.9 million

Total NPV of Capital and O&M Costs

#### WTP

#### Plant Phasing and Capital Costs:

| NON - Softening Treatment Trains                              |       |          |      |         |       |      | _   | 1000000    |    |      |     |            | 2222 |      |      |  |
|---|-------|----------|------|---------|-------|------|-----|------------|----|------|-----|------------|------|------|------|--|
| Year □  |       | 2015     |      | 2020    |       | 203  |     | <br>2040   |    | 2050 |     |            | 2060 |      | 2065 | nga.                                       |
| Average treated water production in mgd                       |       | 0        |      | 0       |       |      | 20  | 30         |    |      | 40  |            | 40   |      |      | 40   |
| Design (Max. Day) treated water production req'd in mgd       |       | 0        |      | 0       |       |      | 20  | 30         |    |      | 40  |            | 40   |      |      | 40   |
| Initial/additional Max day capacity built (mgd)               |       |          |      |         | 92    |      |     |            |    |      |     |            |      |      |      |  |
| Total capacity on line (must exceed Design Max Day Req'd)     |       | 0        |      | 0       | 1     |      | 0   | 0          |    |      | 0   |            | 0    |      |      | 0  |
| Unit cost for max day treatment capacity (\$/gpd of capacity) |       |          |      |         | Will. | e li |     |            | I  |      |     |            |      |      |      |  |
| Estimated construction cost of expansion in \$millions        | \$    | -        | \$   | •       | \$    |      | *   | \$         | \$ |      | •   | \$         | -    | \$   | ~    |  |
| Non-softening Treatment Trains                                |       | 2045     |      | 0000    |       |      |     | 0040       |    | 205  |     |            |      |      | 0005 |  |
| Year =  |       | 2015     |      | 2020    |       | 203  |     | <br>2040   |    | 2050 |     | _          | 2060 | _    | 2065 | 31   |
| Average treated water production in mgd                       | CONT. |          |      | 204     |       |      | 214 | 218        |    |      | 223 | en a compa | 227  |      |      |  |
| Design (Max. Day) treated water production req'd in mgd       |       | 84       |      | 204     |       |      | 234 | 248        |    |      | 263 |            | 267  |      | 2    | 71 For special case, this includes demands |
| Additional Max day capacity built (mgd)                       | 900   | 200      |      | 50      |       |      |     | 25         |    | 12.4 |     |            |      |      |      | from rows above                            |
| Total capacity on line (must exceed Design Max Day Req'd)     |       | 200      |      | 250     | 5     |      | 250 | 275        |    |      | 275 |            | 275  |      | 2    | 75   |
| Unit cost for max day treatment capacity (\$/gpd of capacity) | \$    | 1.15     | \$   | 1.51    |       |      |     | \$<br>1.73 |    |      |     |            |      |      |      |  |
| Estimated construction cost of expansion in \$millions        | \$    | 229.6    | \$   | 75.4    | \$    |      | 2   | \$<br>43.2 | \$ |      |     | \$         | ū    | \$   |      |  |
| Totals (ALL Non-softening Trains)                             |       |          |      |         |       |      |     |            |    |      |     |            |      |      |      |  |
| Year =  |       | 2015     |      | 2020    |       | 203  | 0   | 2040       |    | 2050 | 0   |            | 2060 |      | 2065 |  |
| Total construction cost for both trains                       | \$    | 229.6    | \$   | 75.4    | \$    |      |     | \$<br>43.2 | \$ |      | -   | \$         | -    | \$   | -    |  |
| Contingencies   |       | 45.9     |      | 15.1    | - 2   |      | -   | 8.6        |    |      |     |            |      | - 60 | -    |  |
| Subtotal  | \$    | 275.5    | \$   | 90.4    | \$    |      | -   | \$<br>51.8 | \$ |      |     | \$         | -    | \$   | -    |  |
| Engineering, Legal, & Administrative                          |       | 41.3     |      | 13.6    |       |      | -   | 7.8        |    |      | -   |            | -    |      | ~    |  |
| Subtotal  |       | 316.8    |      | 104.0   |       |      | -   | 59.6       |    |      |     |            | -    |      |      |  |
| Environmental & Archaelogy Studies and Mitigation & Land      |       |          |      |         |       |      |     |            |    |      |     |            |      |      |      |  |
| Acquisition and Surveying (see Note below)                    |       | 2.5      |      |         |       |      |     |            |    |      |     |            |      |      |      |  |
| Total estimated capital cost                                  | \$    | 319.3    | \$   | 104.0   | \$    |      | -   | \$<br>59.6 | \$ |      | -   | \$         | -    | \$   | -    | <del></del>                                |
| NPV of capital cost   |       | \$ 319.3 |      | \$ 81.5 |       | \$   | -   | \$ 17.6    |    | \$   |     |            | \$ - |      | \$ - |  |
| Total NPV of WTP initial construction & expansions            | \$    | 418      |      |         |       |      |     |            |    |      |     |            |      |      |      |  |
| Note: Assumed land requirement for WTP (not including reserv  |       | 100      | acre | es      |       |      |     |            |    |      |     |            |      |      |      |  |

#### O&M Costs for Softening Trains;

#### O&M Costs for Non-Softening Trains;

| Year | Plant<br>Capacity in<br>service | Estimated<br>treated<br>water<br>production  | Estimated Of unit cos  |    |                 |    | t present<br>value | ! | Year | Plant Capacity in service | Estimated<br>treated water<br>production | E  | stimated O        |       |            |    | t present<br>value |
|------|---------------------------------|--|--|----|-----------------|----|--------------------|---|------|---------------------------|--|----|-------------------|-------|------------|----|--------------------|
|      | mgd of<br>capacity              | mgd<br>produced  | \$ per mg<br>treated   |    | nillion<br>year |    | (\$)               | - |      | mgd of<br>capacity        | mgd<br>produced                          |    | per mg<br>treated | \$mil | lion /year |    | (\$)               |
| 2015 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2015 | 200                       | 84                                       | \$ | 374               | \$    | 11.41      | \$ | 11.41              |
| 2016 |                                 | -  |  | \$ | -               | \$ | 2                  |   | 2016 | 200                       | 84                                       | \$ | 374               | \$    | 11.41      | \$ | 10.87              |
| 2017 | -                               |  |  | \$ | -               | \$ | 2                  |   | 2017 | 200                       | 84                                       | \$ | 374               | \$    | 11.41      | \$ | 10.35              |
| 2018 |                                 | -  |  | \$ | -               | \$ | -                  |   | 2018 | 200                       | 84                                       | \$ | 374               | \$    | 11.41      | \$ | 9.86               |
| 2019 |                                 | -  |  | \$ | -               | \$ | 2.                 |   | 2019 | 200                       | 84                                       | \$ | 374               | \$    | 11.41      | \$ | 9.39               |
| 2020 |                                 |  |  | \$ |                 | \$ | =                  |   | 2020 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 20.79              |
| 2021 | **                              | :00  |  | \$ | *               | \$ | *                  |   | 2021 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 19.80              |
| 2022 | -                               |  |  | \$ | -               | \$ | -                  |   | 2022 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 18.86              |
| 2023 | -                               | 200  |  | \$ | -               | \$ | -                  |   | 2023 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 17.96              |
| 2024 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2024 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 17.11              |
| 2025 |                                 | -  |  | \$ | -               | \$ | 2                  |   | 2025 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 16.29              |
| 2026 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2026 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 15.52              |
| 2027 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2027 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 14.78              |
| 2028 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2028 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 14.07              |
| 2029 | -                               | -  |  | \$ | -               | \$ | -                  |   | 2029 | 250                       | 204                                      | \$ | 357               | \$    | 26.54      | \$ | 13.40              |
| 2030 | (*):                            | MOTOCY-303   | SE WITCH STREET  | \$ | *               | \$ | *                  |   | 2030 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 13.38              |
| 2031 |                                 |  |  | \$ | ¥               | \$ | -                  |   | 2031 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 12.74              |
| 2032 | -                               |  |  | \$ | 2               | \$ | €                  |   | 2032 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 12,14              |
| 2033 |                                 |  |  | \$ | -               | \$ | 2                  |   | 2033 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 11.56              |
| 2034 |                                 |  |  | S  |                 | \$ | 2                  |   | 2034 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 11.01              |
| 2035 | -                               |  |  | \$ | 2               | \$ | 2                  |   | 2035 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 10.48              |
| 2036 | -                               | DAY OF THE PARTY OF  |  | \$ | -               | \$ | -                  |   | 2036 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 9.99               |
| 2037 | -                               |  |  | \$ | -               | S  | -                  |   | 2037 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 9.51               |
| 2038 | -                               |  |  | \$ | ~               | \$ | -                  |   | 2038 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 9.06               |
| 2039 | -                               |  |  | s  |                 | \$ | -                  |   | 2039 | 250                       | 214                                      | \$ | 357               | \$    | 27.82      | \$ | 8.63               |
| 2040 | -                               |  | SASTA PERM   | \$ | 2               | \$ | 2                  |   | 2040 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 8.21               |
| 2041 |                                 |  |  | S  | 2               | \$ | 2                  |   | 2041 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 7.82               |
| 2042 |                                 |  | A Comment  | \$ | 2               | \$ | 2                  |   | 2042 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 7.45               |
| 2043 |                                 |  |  | \$ |                 | \$ |                    |   | 2043 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 7.09               |
| 2044 | -                               |  |  | \$ | -               | \$ | _                  |   | 2044 | 275                       | 218                                      | s  | 349               | S     | 27.81      | \$ | 6.76               |
| 2045 | -                               | K  | 100  | \$ | -               | \$ | -                  |   | 2045 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 6.43               |
| 2046 |                                 | Story Challe   |  | \$ | -               | s  | -                  |   | 2046 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | S  | 6.13               |
| 2047 | -                               |  | TE SHEET ST  | \$ | -               | \$ | -                  |   | 2047 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | S  | 5.84               |
| 2048 | -                               |  |  | \$ | -               | \$ | -                  |   | 2048 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 5.56               |
| 2049 |                                 | 15   |  | \$ | -               | Š  |                    |   | 2049 | 275                       | 218                                      | \$ | 349               | \$    | 27.81      | \$ | 5.29               |
| 2050 |                                 | No. of the second  |  | \$ | 2               | Š  | 2                  |   | 2050 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 5.14               |
| 2051 | -                               |  |  | \$ | -               | \$ | 2                  |   | 2051 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 4.90               |
| 2052 |                                 | The state of   |  | \$ |                 | \$ |                    |   | 2052 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 4.67               |
| 2053 |                                 |  | West March   | \$ | -               | \$ | -                  |   | 2053 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 4.44               |
| 2054 |                                 |  | 7.101.12.8   | \$ | -               | Š  | -                  |   | 2054 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 4.23               |
| 2055 |                                 |  |  | Š  | *               | \$ | -                  |   | 2055 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 4.03               |
| 2056 | 345                             |  |  | \$ | -               | Š  | -                  |   | 2056 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 3.84               |
| 2057 | -                               | 2 3/1 -1   | THE PARTY OF THE P | \$ | -               | \$ | -                  |   | 2057 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 3.66               |
| 2058 |                                 |  | 5 4 681 63   | \$ |                 | Š  | 2                  |   | 2058 | 275                       | 223                                      | Š  | 349               | s     | 28.38      | \$ | 3.48               |
| 2059 | 2                               |  |  | Š  | -               | Š  | 2                  |   | 2059 | 275                       | 223                                      | \$ | 349               | \$    | 28.38      | \$ | 3.32               |
| 2060 | Ş. 1                            | A RESIDEN  |  | \$ | -               | Š  | 2                  |   | 2060 | 275                       | 227                                      | \$ | 349               | Š     | 29.00      | \$ | 3.23               |
| 2061 |                                 |  |  | Š  | -               | Š  | -                  |   | 2061 | 275                       | 227                                      | \$ | 349               | \$    | 29.00      | \$ | 3.07               |
| 2062 | 1177                            | 0.8 72-1724  |  | \$ | -               | Š  | -                  |   | 2062 | 275                       | 227                                      | Š  | 349               | \$    | 29.00      | \$ | 2.93               |
| 2063 |                                 | The state of the s |  | Š  | -               | s  |                    |   | 2063 | 275                       | 227                                      | Š  | 349               | Š     | 29.00      | Š  | 2.79               |
| 2064 | 150                             | the Complete   |  | \$ | -               | Š  |                    |   | 2064 | 275                       | 227                                      | \$ | 349               | \$    | 29.00      | \$ | 2.65               |
| 2065 | 120                             | A LIVE III   |  | Š  | -               | \$ | -                  |   | 2065 | 275                       | 231                                      | Š  | 349               | Š     | 29.40      | Š  | 2.56               |
|      |                                 |  |  |    |                 | T  |                    |   |      | 21.0                      | -41                                      | 7  |                   | 5:    |            | -  |                    |

NPV Totals for O&M:

VI: Softening trains \$
Non-softening Trains \$

Summary

Raw Water Reservoir Water Treatment Plant Totals

| <br>PV of<br>al Costs | N  | OV of O&M<br>Costs | Cap | I NPV of<br>ital and<br>I Costs |
|-----------------------|----|--------------------|-----|---------------------------------|
| \$<br>20              | \$ | 2.6                | \$  | 23                              |
| \$<br>418             | \$ | 454                | \$  | 873                             |
| \$<br>439             | \$ | 457                | \$  | 896                             |

#### CTRWTP - Alternate 2A - WTP East of San Marcos Potable Water Transmission Mains CTRWTP - Alternate 2 - WTP Midway Between Austin & San Antonio

 Initial year of analysis period Interest rate
 2015 | 5%

 Evaluation period
 50 years

 Unit cost of energy
 \$ 0.07 per kwh

Contingency = 20%
Engineering, Legal, Admin. = 15%
Environmental & Archaeology Studies &
Mitigation, Surveying, and Land Acquisition \$ 100,000 per mile

Special case for using plant as a base loaded plant only; no peaking factor

#### Summary of Demands

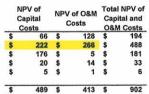
Average demands to be delivered in each segment

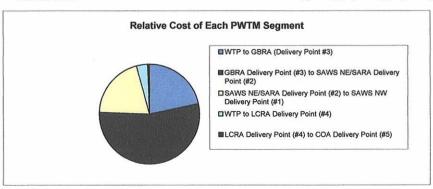
| in acre-feet/year |       |        |        |        |        |        |        |  |  |  |  |
|-------------------|-------|--------|--------|--------|--------|--------|--------|--|--|--|--|
| Year              | 2015  | 2020   | 2030   | 2040   | 2050   | 2060   | 2065   |  |  |  |  |
| SAWS NW           | 43800 | 123000 | 123000 | 123000 | 123000 | 123000 | 123000 |  |  |  |  |
| SAWS NE           | 29200 | 82000  | 82000  | 82000  | 82000  | 82000  | 82000  |  |  |  |  |
| Subtotal          | 73000 | 205000 | 205000 | 205000 | 205000 | 205000 | 205000 |  |  |  |  |
| SARA              | 20550 | 23406  | 28433  | 31393  | 34411  | 37530  | 41128  |  |  |  |  |
| GBRA              |       |        | 6000   | 8000   | 10000  | 12300  | 12300  |  |  |  |  |
| LCRA              |       |        | 5600   | 11200  | 11200  | 11200  | 11200  |  |  |  |  |
| COA               |       |        | 16802  | 22403  | 33604  | 33604  | 33604  |  |  |  |  |
| Total             | 93550 | 228406 | 261835 | 277996 | 294215 | 299634 | 303232 |  |  |  |  |
|                   |       |        |        |        |        |        |        |  |  |  |  |

#### Summary

WTP to GBRA (Delivery Point #3) GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1) WTP to LCRA Delivery Point (#4) LCRA Delivery Point (#4) to COA Delivery Point (#5)

Total for PWTMs





### WTP to GBRA (Delivery Point #3) (Bold line in schematic below)

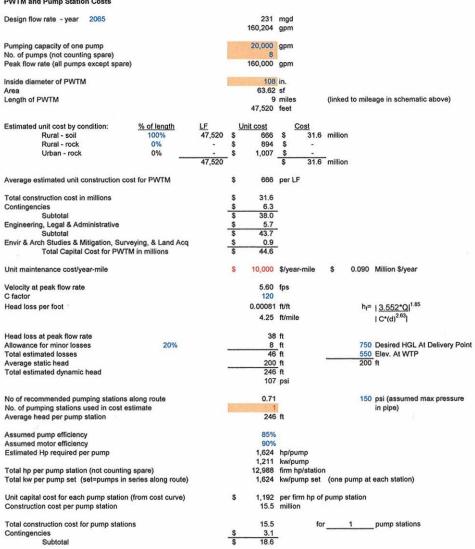


#### Demands for this pipe segment

| Year    | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 | Max d/Avg d |
|---------|------|------|------|------|------|------|------|-------------|
| GBRA    | 0    | 0    | 5    | 7    | 9    | 11   | 11   | 1.0         |
| SAWS NE | 26   | 73   | 73   | 73   | 73   | 73   | 73   | 1.0         |
| SARA    | 18   | 21   | 25   | 28   | 31   | 34   | 37   | 1.0         |
| SAWS NW | 39   | 110  | 110  | 110  | 110  | 110  | 110  | 1.0         |
| Total   | 84   | 204  | 214  | 218  | 223  | 227  | 231  |             |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |
| GBRA   | 0    | 0    | 5    | 7    | 9    | 11   | 11   |  |  |  |  |
| SAWS NE  | 26   | 73   | 73   | 73   | 73   | 73   | 73   |  |  |  |  |
| SARA   | 18   | 21   | 25   | 28   | 31   | 34   | 37   |  |  |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |  |
| Total  | 84   | 204  | 214  | 218  | 223  | 227  | 231  |  |  |  |  |

#### **PWTM and Pump Station Costs**



Engineering, Legal & Administrative Total capital cost for pump stations \$ 2.8 \$ 21.4 million

Value of equipment
Assumed life of equipment
Estimated maintenance/replacement cost

\$ 6 million 20 years \$ 0.31 million/year 40% Estimated equipment cost as % of total

O&M Costs

| Year | Flow pumped<br>by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used  |      | Energ    | ду с | ost                   | CO | other O&M<br>sts - Pump<br>Stations |    | aintenance<br>costs -<br>PWTM | Т    | otal O&M<br>cost     | Ne | t present<br>value |
|------|--|--|-----------------|------|----------|------|-----------------------|----|-------------------------------------|----|-------------------------------|------|----------------------|----|--------------------|
|      | mgd  |  | (kwh/day)       |      | (\$/day) |      | (Million \$<br>/year) |    | (Million \$<br>/year)               | (  | Million \$<br>/year)          | (    | Million \$<br>/year) |    | (\$)               |
| 2015 | 84   | 2.90                                       | 112,984         | \$   | 7,909    | \$   | 2.89                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 3.29                 | \$ | 3.29               |
| 2016 | 84   | 2.90                                       | 112,984         | \$   | 7,909    | \$   | 2.89                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 3.29                 | \$ | 3.13               |
| 2017 | 84   | 2.90                                       | 112,984         | \$   | 7,909    | \$   | 2.89                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 3.29                 | \$ | 2.98               |
| 2018 | 84   | 2.90                                       | 112,984         | \$   | 7,909    | \$   | 2.89                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 3.29                 | \$ | 2.84               |
| 2019 | 84   | 2.90                                       | 112,984         | \$   | 7,909    | \$   | 2.89                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 3.29                 | \$ | 2.70               |
| 2020 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 5.84               |
| 2021 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 5.56               |
| 2022 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 5.29               |
| 2023 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 5.04               |
| 2024 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 4.80               |
| 2025 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 4.57               |
| 2026 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 4.35               |
| 2027 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 4.15               |
| 2028 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 3.95               |
| 2029 | 204  | 7.08                                       | 275,854         | \$   | 19,310   | \$   | 7.05                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.45                 | \$ | 3.76               |
| 2030 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 3.75               |
| 2031 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 3.57               |
| 2032 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 3.40               |
| 2033 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 3.24               |
| 2034 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 3.08               |
| 2035 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 2.94               |
| 2036 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 2.80               |
| 2037 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | \$   | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 2.66               |
| 2038 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | S    | 7.39                  | S  | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 2.54               |
| 2039 | 214  | 7.42                                       | 289,172         | \$   | 20,242   | s    | 7.39                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.79                 | \$ | 2.41               |
| 2040 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | S  | 2.35               |
| 2041 | 218  | 7.58                                       | 295,162         | s    | 20,661   | \$   | 7.54                  | \$ | 0.31                                | S  | 0.090                         | \$   | 7.94                 | \$ | 2.23               |
| 2042 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | S    | 7.54                  | S  | 0.31                                | \$ | 0.090                         | S    | 7.94                 | S  | 2.13               |
| 2043 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 2.03               |
| 2044 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | s  | 1.93               |
| 2045 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 1.84               |
| 2046 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | s    | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 1.75               |
| 2047 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 1.67               |
| 2048 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | s    | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 1.59               |
| 2049 | 218  | 7.58                                       | 295,162         | \$   | 20,661   | \$   | 7.54                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 7.94                 | \$ | 1.51               |
| 2050 | 223  | 7.73                                       | 301,223         | s    | 21,086   | s    | 7.70                  | s  | 0.31                                | S  | 0.090                         | \$   | 8.10                 | s  | 1.47               |
| 2051 | 223  | 7.73                                       | 301,223         | \$   | 21,086   | \$   | 7.70                  | \$ | 0.31                                | \$ | 0.090                         | S    | 8.10                 | \$ | 1.40               |
| 2052 | 223  | 7.73                                       | 301,223         | Š    | 21,086   | s    | 7.70                  | s  | 0.31                                | s  | 0.090                         | Š    | 8.10                 | s  | 1.33               |
| 2053 | 223  | 7.73                                       | 301,223         | \$   | 21,086   | \$   | 7.70                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 8.10                 | \$ | 1.27               |
| 2054 | 223  | 7.73                                       | 301,223         | Š    | 21,086   | Š    | 7.70                  | Š  | 0.31                                | Š  | 0.090                         | S    | 8.10                 | \$ | 1.21               |
| 2055 | 223  | 7.73                                       | 301,223         | \$   | 21,086   | s    | 7.70                  | \$ | 0.31                                | š  | 0.090                         | \$   | 8.10                 | \$ | 1.15               |
| 2056 | 223  | 7.73                                       | 301,223         | Š    | 21,086   | Š    | 7.70                  | Š  | 0.31                                | Š  | 0.090                         | š    | 8.10                 | \$ | 1.10               |
| 2057 | 223  | 7.73                                       | 301,223         | \$   | 21,086   | \$   | 7.70                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 8.10                 | \$ | 1.04               |
| 2058 | 223  | 7.73                                       | 301,223         | Š    | 21,086   | Š    | 7.70                  | Š  | 0.31                                | š  | 0.090                         | \$   | 8.10                 | \$ | 0.99               |
| 2059 | 223  | 7.73                                       | 301,223         | Š    | 21,086   | Š    | 7.70                  | š  | 0.31                                | \$ | 0.090                         | \$   | 8.10                 | \$ | 0.95               |
| 2060 | 227  | 7.90                                       | 307,767         | Š    | 21,544   | Š    | 7.86                  | Š  | 0.31                                | Š  | 0.090                         | Š    | 8.26                 | \$ | 0.92               |
| 2061 | 227  | 7.90                                       | 307,767         | \$   | 21,544   | \$   | 7.86                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 8.26                 | \$ | 0.88               |
| 2062 | 227  | 7.90                                       | 307,767         | Š    | 21,544   | \$   | 7.86                  | Š  | 0.31                                | Š  | 0.090                         | s    | 8.26                 | \$ | 0.83               |
| 2063 | 227  | 7.90                                       | 307,767         | Š    | 21,544   | Š    | 7.86                  | Š  | 0.31                                | \$ | 0.090                         | Š    | 8.26                 | \$ | 0.79               |
| 2064 | 227  | 7.90                                       | 307,767         | Š    | 21,544   | \$   | 7.86                  | Š  | 0.31                                | Š  | 0.090                         | S    | 8.26                 | \$ | 0.76               |
| 2065 | 231  | 8.01                                       | 312,113         | \$   | 21,848   | \$   | 7.97                  | \$ | 0.31                                | \$ | 0.090                         | \$   | 8.37                 | \$ | 0.73               |
|      |  |  |                 |      |          |      |                       |    |                                     |    | Total NPV                     | of ( | D&M Costs            | \$ | 128                |
|      |  | Capital Costs                              | in million \$:  |      |          |      |                       |    | Yr built                            |    |                               |      |                      |    |                    |
|      | PWTM   |  |                 |      |          | \$   | 45                    |    | 2015                                |    |                               |      |                      | \$ | 45                 |
|      |  |  | Pumping Stat    | 1    |          |      |                       |    |                                     |    |                               |      |                      | S  | 21                 |
|      |  |  | Fullipling Stat | IOUS | 5        | \$   | 21                    |    | 2015                                |    |                               |      |                      | 9  | 41                 |

Total NPV of Capital and O&M Costs in millions \$ 194 WTP to GBRA (Delivery Point #3)

## GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2) (Bold line in schematic below)



## Demands for this pipe segment Demands

|         | Average demands to be delivered in each segment in rigg |      |      |      |      |      |      |  |  |  |  |
|---------|---|------|------|------|------|------|------|--|--|--|--|
| Year    | 2015  | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |  |
| SAWS NE | 26  | 73   | 73   | 73   | 73   | 73   | 73   |  |  |  |  |
| SARA    | 18  | 21   | 25   | 28   | 31   | 34   | 37   |  |  |  |  |
| SAWS NW | 39  | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |  |
| Total   | 84  | 204  | 208  | 211  | 214  | 217  | 220  |  |  |  |  |

| Max  | d/A | vg d |
|------|-----|------|
| 1000 | 1.0 |      |
|      | 1.0 |      |
|      | 1.0 |      |

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| SAWS NE  | 26   | 73   | 73   | 73   | 73   | 73   | 73   |  |  |  |
| SARA   | 18   | 21   | 25   | 28   | 31   | 34   | 37   |  |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |
| Total  | 84   | 204  | 208  | 211  | 214  | 217  | 220  |  |  |  |

| PWTM and Pump Station Costs  |                         |              |                |                                |         |         |   |
|--|-------------------------|--------------|----------------|--------------------------------|---------|---------|---|
| Design flow rate - year 2065   |                         |              | 220<br>152,579 | mgd<br>gpm                     |         |         |   |
| Pumping capacity of one pump   |                         | Descri       | 19,000         | apm                            |         |         |   |
| No. of pumps (not counting spare)  |                         | 1000         | 8              | gpin                           |         |         |   |
|  |                         | <b>BLUSS</b> |                |                                |         |         |   |
| Peak flow rate (all pumps except spare)  |                         |              | 152,000        | gpm                            |         |         |   |
| Inside diameter of PWTM  |                         | 100          | 108            |                                |         |         |   |
| Area   |                         |              | 63.62          |                                |         |         |   |
| Length of PWTM   |                         |              | 30<br>158,400  | miles<br>feet                  | (linked | to mile | age in schematic above)                             |
| Estimated unit cost by condition:  | % of length LF          |              | Unit cost      | Cost                           |         |         |   |
| Rural - soil   | 50% 79,20               |              | 666            | \$ 52.7                        | million |         |   |
| Rural - rock   | 25% 39.60               | 0 \$         | 894            | \$ 35.4                        |         |         |   |
| Urban - rock   | 25% 39,60               |              | 1,007          | \$ 39.9                        |         |         |   |
| Olbaii - Pook  | 158,40                  |              | 1,007          |                                | million |         |   |
| Average estimated unit construction cos  | st for PWTM             | \$           | 808            | per LF                         |         |         |   |
| Total construction cost in millions  |                         | s            | 128.0          |                                |         |         |   |
| Contingencies  |                         | Š            | 25.6           |                                |         |         |   |
| Subtotal   |                         | \$           | 153.6          | •                              |         |         |   |
|  |                         | \$           | 23.0           |                                |         |         |   |
| Engineering, Legal & Administrative<br>Subtotal                                  |                         | \$           | 176.7          | -                              |         |         |   |
|  |                         |              | 100000         |                                |         |         |   |
| Envir & Arch Studies & Mitigation, Surve<br>Total Capital Cost for PWTM          |                         | \$           | 3.0<br>179.7   | -                              |         |         |   |
| Unit maintenance cost/year-mile  |                         | \$           | 10,000         | \$/year-mile                   | \$      | 0.300   | Million \$/year                                     |
| Velocity at peak flow rate<br>C factor   |                         |              | 5.32<br>120    | fps                            |         |         |   |
|  |                         |              | 0.00073        | 0/0                            |         | h m     | 1 0 FF0+01.85                                       |
| Head loss per foot   |                         |              |                | ft/mile                        |         | 116-    | 3.552*Q  <sup>1.85</sup><br>  C*(d) <sup>2.63</sup> |
|  |                         |              |                | 1125                           |         |         | 1-1-7   |
| Head loss at peak flow rate  | 222                     |              | 116            |                                |         |         |   |
| Allowance for minor losses   | 20%                     | _            | 23             |                                |         |         | Desired HGL At Delivery Point                       |
| Total estimated losses   |                         |              | 139            |                                |         |         | HGL At Delivery Point 3                             |
| Average static head  |                         |              | 375            | ft                             |         | 375     | ft  |
| Total estimated dynamic head   |                         |              | 514            | ft                             |         |         |   |
|  |                         |              | 223            | psi                            |         |         |   |
| No of recommended pumping stations a   | along route             |              | 1,49           | i                              |         | 150     | psi (assumed max pressure                           |
| No. of pumping stations used in cost es  |                         |              | 2              |                                |         |         | in pipe)  |
| Average head per pump station  | imato                   | 0.00         | 257            | ft                             |         |         | m pipe)   |
| Assumed pump efficiency  |                         |              | 85%            |                                |         |         |   |
| Assumed motor efficiency   |                         |              | 90%            |                                |         |         |   |
| Estimated Hp required per pump   |                         |              |                | hp/pump                        |         |         |   |
| Estimated rip required per pump  |                         |              |                | kw/pump                        |         |         |   |
| T-1-1 b  |                         |              |                |                                | 23      |         |   |
| Total hp per pump station (not counting<br>Total kw per pump set (set=pumps in s |                         |              |                | firm hp/station<br>kw/pump set |         | ump at  | each station)                                       |
|  |                         |              | 4 404          |                                |         |         | en Copinio de Copinio de Haraco. Es                 |
| Unit construction cost for each pump st<br>Construction cost per pump station    | ation (from cost curve) | \$           |                | per firm hp of<br>million      | pump st | ation   |   |
| Total construction cost for pump station   | uS .                    |              | 30.8           | fo                             | r :     | 2       | pump stations                                       |
| Contingencies  |                         | \$           | 6.2            |                                |         |         |   |
| Subtotal   |                         | \$           | 37.0           |                                |         |         |   |
|  |                         |              |                |                                |         |         |   |

Engineering, Legal & Administrative 5.5 42.5 million Total capital cost for pump stations in millions 40% Equip cost as % of constr cost Value of equipment S 12 million Assumed life of equipment years Estimated maintenance/replacement cost 0.62 million/year **O&M** Costs Flow pumped No. of pump by year Other O&M Maintenance Total O&M Net present "sets" Energy Year Energy cost costs - Pump costs operating used Stations PWTM flows from /day Table above) (Million S (Million \$ (Million S (Million \$ mgd (kwh/day) (\$/day) (\$) /year) /year) /year) 0.300 /year) 6.95 2015 3.05 236,242 16.537 6.04 0.62 6.95 6.62 2016 84 3.05 236.242 16.537 6.04 S 0.62 0.300 6.95 84 3.05 236,242 16,537 6.04 0.62 0.300 6.95 \$ 6.31 84 236,242 16,537 6.04 0.300 6.01 2018 3.05 0.62 6.95 84 3.05 236,242 16,537 6.04 0.62 0.300 6.95 5.72 2019 2020 204 7.45 7.45 576,795 40,376 14.74 \$ 0.62 0.300 15.65 \$ 12.26 204 576,795 14.74 0.300 15.65 11.68 2021 40,376 11.12 2022 204 7.45 576.795 40.376 14.74 \$ 0.62 0.300 15.65 204 7.45 0.300 576,795 40,376 2023 7.45 7.45 14.74 14.74 2024 204 576,795 40.376 \$ 0.62 0.300 15.65 10.09 204 576,795 40,376 0.62 0.300 15.65 9.61 2025 204 7.45 7.45 14.74 14.74 2026 576,795 40.376 0.62 0.300 15 65 9 15 576,795 40,376 0.62 0.300 15.65 8.72 2027 204 40,376 40,376 14.74 14.74 \$ 2028 7.45 576,795 0.62 0.300 15.65 8.30 7.45 576.795 0.62 0.300 15.65 7.91 2029 589,490 589,490 208 7.62 41,264 15.06 0.62 0.300 15.98 7.69 7.62 0.62 0.300 7.32 2031 208 41.264 15.06 15.98 2032 208 7.62 589,490 41,264 15.06 0.62 0.300 15.98 6.97 0.300 15,98 2033 208 7.62 589,490 41.264 15.06 0.62 \$ \$ \$ 6.64 2034 208 7.62 41,264 0.300 6.32 2035 208 7.62 589 490 41,264 15.06 0.62 0.300 15.98 6.02 208 7.62 41,264 0.62 0.300 15.98 5.73 589,490 15.06 2036 208 208 7.62 7.62 2037 589,490 41,264 15.06 0.62 0.300 15.98 5.46 589,490 41,264 0.62 0.300 15.98 5.20 2038 15.06 208 211 7.62 2039 589,490 41,264 15.06 0.62 0.300 15 98 4 95 0.300 596,964 41,788 0.62 16.17 4.77 15.25 2040 0.300 2041 211 7.71 596,964 41,788 15.25 0.62 16.17 4 55 4.33 2042 211 7.71 596,964 41,788 15.25 0.62 16.17 2043 211 7.71 596,964 41,788 15.25 0.62 0.300 16.17 4.12 2044 211 7.71 596.964 41.788 15.25 0.62 16.17 3.93 0.300 7.71 596,964 0.62 16.17 3.74 211 211 7.71 7.71 2046 596.964 41.788 15.25 0.62 16.17 3.56 596,964 41,788 15.25 0.62 0.300 3.39 2047 2048 211 7.71 7.71 596 964 41.788 15 25 0.62 16 17 3 23 41,788 0.62 0.300 2049 596,964 16.17 214 214 2050 7.81 604 586 42,321 15 45 0.62 0.300 16.36 2.97 42,321 0.62 0.300 604,586 15.45 16.36 2.83 2051 7.81 2052 214 7.81 604.586 42,321 15.45 \$ 0.62 0.300 16.36 2.69 604,586 0.300 2.56 214 7.81 42,321 15.45 0.62 16.36 2053 0.300 2054 214 7.81 604,586 42,321 15.45 0.62 16.36 2.44 2.32 2055 214 604,586 42,321 15.45 0.62 16.36 7.81 0.300 7.81 604,586 42,321 15.45 0.62 16.36 2.21 2057 214 7.81 604.586 42.321 15.45 0.62 16.36 2.11 0.300 214 7.81 604,586 42,321 15.45 0.62 16.36 2.01 2058 2059 214 7.81 604.586 42.321 15.45 \$ 0.62 16.36 1.91 217 42,872 0.62 2060 7.91 612,462

> 16.80 Total NPV of O&M Costs \$ 266.0

16.56

16.56

16.56

16.56

1.76

1.67

1.59

1.52

1.46

Capital Costs in million \$: Yr built 2015 179.7 **PWTM** \$ 179.7 Pumping Stations 42.5 Total NPV of Capital Costs \$

\$

15.65 \$

15.65

15.65

15.65

15.88

Total NPV of Capital and O&M Costs in millions \$ 488 GBRA Delivery Point (#3) to SAWS NE/SARA Delivery Point (#2)

0.62

0.62

0.62

0.62

0.62

0.300

0.300

0.300 \$

0.300

0.300 \$

2061

2062

2063

2064

217 217

217

217 220 7.91

7.91

7.91

7.91

8.03

612.462

612,462

612.462

612,462

621,548

42.872

42,872

42.872

42,872

43,508

## SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1) (Bold line in schematic below)



#### Demands for this pipe segment

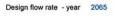
| n | _ | m | - | n | d | e |
|---|---|---|---|---|---|---|

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |
| Total  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |

Max d/Avg d

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| SAWS NW  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |
| Total -  | 39   | 110  | 110  | 110  | 110  | 110  | 110  |  |  |  |

#### **PWTM and Pump Station Costs**



110 mgd 76,250 gpm

Pumping capacity of one pump No. of pumps (not counting spare) Peak flow rate (all pumps except spare) 13,000 gpm 6 78,000 gpm

Inside diameter of PWTM Area Length of RWTM 108 in. 63.62 sf 26 miles 137,280 feet

(linked to mileage in schematic above)

| Estimated unit cost by condition: | % of length | LF      | U  | nit cost | Cost        |         |
|-----------------------------------|-------------|---------|----|----------|-------------|---------|
| Rural - soil                      | 15%         | 20,592  | \$ | 666      | \$<br>13.7  | million |
| Rural - rock                      | 35%         | 48,048  | \$ | 894      | \$<br>42.9  |         |
| Urban - rock                      | 50%         | 68,640  | \$ | 1,007    | \$<br>69.2  |         |
|                                   |             | 137,280 |    |          | \$<br>125.8 | million |

Average estimated unit construction cost for PWTM

916 per LF

| Total construction cost in millions |  |
|-------------------------------------|--|
| Contingencies                       |  |
| Subtotal                            |  |
| Engineering, Legal & Administrative |  |
| Cubtotal                            |  |

\$ 125.8 \$ 25.2 \$ 151.0 \$ 22.6 \$ 173.6

Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions

176.2 10,000 \$/year-mile

1.13 ft/mile

0.260 Million \$/year

Unit maintenance cost/year-mile
Velocity at peak flow rate
C factor

2.73 fps 120 0.00021 ft/ft

 $h_l = \frac{3.552 \times Q}{1 \cdot C^*(d)^{2.63}}$ 

Head loss at peak flow rate Allowance for minor losses Total estimated losses Average static head Total estimated dynamic head

Head loss per foot

29 ft 6 ft 35 ft -45 ft -10 ft 4 psi

1080 Desired HGL At Delivery Point 1125 HGL At Delivery Point 2 -45 ft

Negative indicates gravity flow from #2 to #1; no pumping necessary.

|           |                      |       |       |          |                            | M  | lillion \$ |
|-----------|----------------------|-------|-------|----------|----------------------------|----|------------|
| Annual C  | 0&M Cost in millio   | n \$: | 100   | Yr built |                            |    |            |
|           | PWTM                 | \$    | 0.260 | 2015     | <del>-</del>               |    |            |
|           |                      |       |       |          | Total NPV of O&M Costs     |    | \$4.7      |
| Capital C | Costs in million \$: |       |       | Yr built |                            |    |            |
|           | PWTM                 | \$    | 176.2 | 2015     | -                          | \$ | 176.2      |
|           |                      |       |       |          | Total NPV of Capital Costs | \$ | 176.2      |

Total NPV of Capital and O&M Costs in millions \$ 181.0 SAWS NE/SARA Delivery Point (#2) to SAWS NW Delivery Point (#1)

#### WTP to LCRA Delivery Point (#4)



#### Demands for this pipe segment

Demands

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| LCRA   | 0    | 0    | 5    | 10   | 10   | 10   | 10   |  |  |  |
| COA  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |  |
| Total  | 0    | 0    | 20   | 30   | 40   | 40   | 40   |  |  |  |

Max d/Avg d

| Max day demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|------|--|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |  |
| LCRA   | 0    | 0    | 5    | 10   | 10   | 10   | 10   |  |  |  |
| COA  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |  |
| Total  | 0    | 0    | 20   | 30   | 40   | 40   | 40   |  |  |  |

**PWTM and Pump Station Costs** 40 mgd 27,775 gpm Design flow rate - year 2065 7,000 gpm Pumping capacity of one pump No. of pumps (not counting spare) Peak flow rate (all pumps except spare) 28,000 gpm Inside diameter of PWTM 54 in. Area Length of RWTM (linked to mileage in schematic above) 18 miles 95,040 feet Estimated unit cost by condition: Unit cost % of length Cost 244 \$ 337 \$ 23.2 million 95,040 \$ Rural - soil 100% Rural - rock 0% 0% 369 95,040 23.2 million Average estimated unit construction cost for PWTM 244 per LF Total construction cost in millions 23.2 Contingencies 4.6 27.8 Subtotal Engineering, Legal & Administrative 32.0 Subtotal Envir & Arch Studies & Mitigation, Surveying, & Land Acq Total Capital Cost for PWTM in millions 1.8 Unit maintenance cost/year-mile 10,000 \$/year-mile \$ 0.180 Million \$/year Velocity at peak flow rate 3.92 fps C factor 120  $h_f = [\frac{3.552 \text{°Q}}{1.85}]^{1.85}$  $[\text{C*(d)}^{2.63}]$ Head loss per foot 0.00093 ft/ft 4.93 ft/mile Head loss at peak flow rate 89 ft 790 Desired HGL At Delivery Point 20% 18 ft 106 ft Allowance for minor losses 550 Elev. At WTP 240 ft Total estimated losses 240 ft 346 ft Average static head Total estimated dynamic head 150 psi No of recommended pumping stations along route No. of pumping stations used in cost estimate 1.00 150 psi (assumed max pressure in pipe) Average head per pump station 346 ft Assumed pump efficiency Assumed motor efficiency 85% 90% Estimated Hp required per pump 801 hp/pump 597 kw/pump kw/pump Total hp per pump station (not counting spare) 3,202 801 kw/pump set (one pump at each station) Total kw per pump set (set=pumps in series along route) 1,534 per firm hp of pump station 4.9 million Unit construction cost for each pump station (from cost curve) Construction cost per pump station Total construction cost for pump stations pump stations Contingencies Subtotal

0.9 6.8 million

Engineering, Legal & Administrative

Total capital cost for pump stations

40% Equip cost as % of constr cost

Value of equipment Assumed life of equipment Estimated maintenance/replacement cost \$ 2.0 million 20 years \$ 0.10 million/year

#### O&M Costs

| Year | by year<br>(average<br>flows from<br>Table above) | No. of pump<br>"sets"<br>operating<br>/day | Energy<br>used   |     | Energ    | ду с | ost         |    | Other O&M<br>osts - Pump<br>Stations | c  | intenance<br>osts -<br>PWTM |      | al O&M<br>cost      | Ne | et preser<br>value |
|------|---|--|------------------|-----|----------|------|-------------|----|--------------------------------------|----|-----------------------------|------|---------------------|----|--------------------|
|      | mgd   |  | (kwh/day)        | (   | (\$/day) | 3    | (Million \$ | 1  | (Million \$<br>/year)                | (  | Million \$<br>/year)        |      | lillion \$<br>year) |    | (\$)               |
| 2015 |   | No college de la College                   |                  |     |          |      |             |    |                                      |    |                             | \$   | -                   | \$ | -                  |
| 2016 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   | -                   | \$ | -                  |
| 2017 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   | •                   | \$ | -                  |
| 2018 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   |                     | \$ |                    |
| 2019 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   |                     | \$ | -                  |
| 2020 |   |  |                  |     |          |      |             |    |                                      |    |                             | S    |                     | \$ | -                  |
| 2021 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   | -                   | \$ |                    |
| 2022 |   |  |                  |     |          |      |             |    |                                      |    |                             | S    |                     | \$ | -                  |
| 2023 |   |  |                  |     |          |      |             |    |                                      |    |                             |      | -                   | \$ |                    |
| 2024 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   | -                   | \$ |                    |
| 2025 |   |  |                  |     |          |      |             |    |                                      |    |                             |      |                     | \$ |                    |
| 2026 |   |  |                  |     |          |      |             |    |                                      |    |                             | \$   |                     | \$ | •                  |
| 2027 |   |  |                  |     |          |      |             |    |                                      |    |                             | S    | -                   |    |                    |
| 2028 |   |  |                  |     |          |      |             |    |                                      |    |                             |      |                     | \$ | -                  |
| 2029 |   | 4.00                                       | 00.400           |     | 0.000    |      | 0.07        |    | 0.40                                 |    | 0.400                       | \$   | 4.00                | \$ | 0.6                |
| 2030 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 22733              |
| 2031 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2032 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2033 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2034 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2035 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2036 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.4                |
| 2037 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2038 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.                 |
| 2039 | 20  | 1.98                                       | 38,120           | \$  | 2,668    | \$   | 0.97        | \$ |                                      | \$ | 0.180                       | \$   | 1.25                | \$ | 0.3                |
| 2040 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.                 |
| 2041 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.4                |
| 2042 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.4                |
| 2043 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.4                |
| 2044 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.4                |
| 2045 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.                 |
| 2046 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.                 |
| 2047 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.3                |
| 2048 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.                 |
| 2049 | 30  | 2.98                                       | 57,180           | \$  | 4,003    | \$   | 1.46        | \$ |                                      | \$ | 0.180                       | \$   | 1.74                | \$ | 0.3                |
| 2050 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.4                |
| 2051 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.3                |
| 2052 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.3                |
| 2053 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.                 |
| 2054 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ | 0.10                                 | \$ | 0.180                       | \$   | 2.23                | \$ | 0.                 |
| 2055 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ | 0.10                                 | \$ | 0.180                       | \$   | 2.23                | \$ | 0.                 |
| 2056 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.3                |
| 2057 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.:                |
| 2058 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.:                |
| 2059 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.:                |
| 2060 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | . 2.23              | \$ | 0.:                |
| 2061 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.3                |
| 2062 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.3                |
| 2063 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ | 0.10                                 | \$ | 0.180                       | \$   | 2.23                | \$ | 0.:                |
| 2064 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ |                                      | \$ | 0.180                       | \$   | 2.23                | \$ | 0.:                |
| 2065 | 40  | 3.97                                       | 76,240           | \$  | 5,337    | \$   | 1.95        | \$ | 0.10                                 | \$ | 0.180                       | \$   | 2.23                | \$ | 0.                 |
|      |   |  |                  |     |          |      |             |    |                                      |    | Total NPV                   | of O | &M Costs            | \$ | 13                 |
|      |   | Capital Costs                              | in million \$:   |     |          |      |             |    | Yr built                             |    |                             |      |                     |    |                    |
|      |   |  | PWTM             |     |          | S    | 33.8        | -  | 2030                                 |    |                             |      |                     | \$ | 16                 |
|      |   |  | Pumping Station  | one |          | S    | 6.8         |    | 2030                                 |    |                             |      |                     | Š  | 3                  |
|      |   |  | . Jimping Gratin |     |          | *    | 0.0         |    | 2000                                 | -  |                             |      | ital Costs          |    | 19                 |

Total NPV of Capital and O&M Costs in millions \$ 33
WTP to LCRA Delivery Point (#4)

## LCRA Delivery Point (#4) to COA Delivery Point (#5) (Bold line in schematic below)





#### Demands for this pipe segment

| Average demands to be delivered in each segment in mgd |      |      |      |      |      |      |      |  |  |
|--|------|------|------|------|------|------|------|--|--|
| Year   | 2015 | 2020 | 2030 | 2040 | 2050 | 2060 | 2065 |  |  |
| COA  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |
| Total -  | 0    | 0    | 15   | 20   | 30   | 30   | 30   |  |  |



| 2015 | 2020 | 2030 | 2040 | 2050                             | 2060         | 2065  |
|------|------|------|------|----------------------------------|--------------|---|
| 0    | 0    | 15   | 20   | 30                               | 30           | 30  |
|      |      |      | 20   | 30                               |              |   |
|      | 2015 |      |      | 2015 2020 2030 2040<br>0 0 15 20 | 0 0 15 20 30 | 2015         2020         2030         2040         2050         2060           0         0         15         20         30         30 |

#### PWTM and Pump Station Costs

Design flow rate - year 2065

30 mgd 20,832 gpm

Inside diameter of PWTM

48 in.

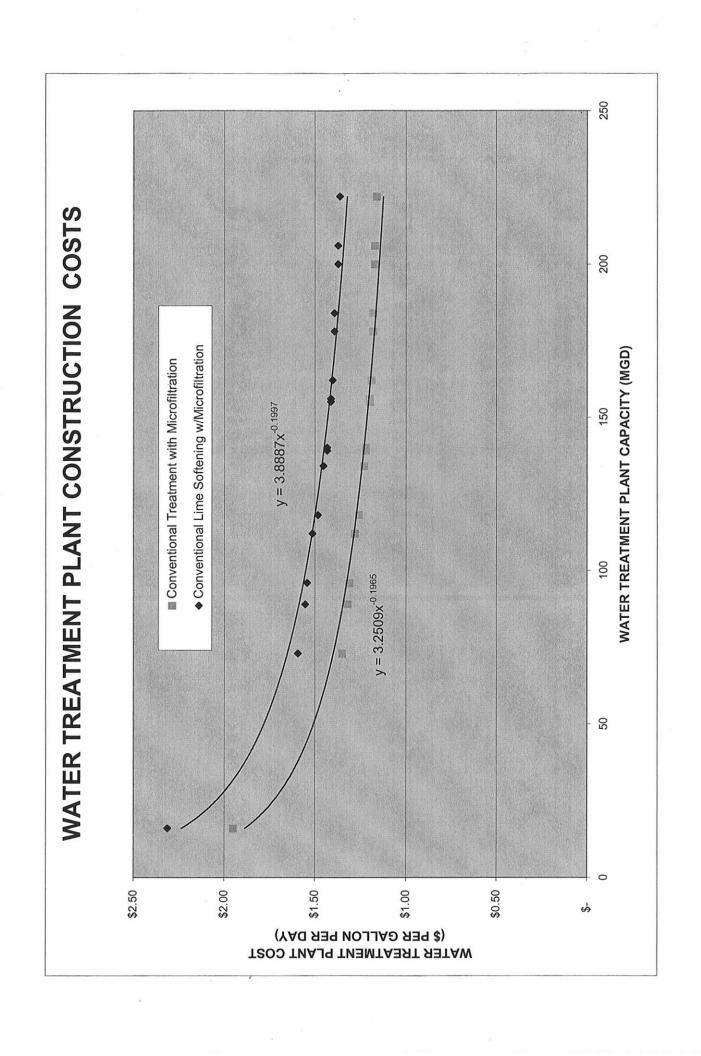
| inside diameter of PVV I M            |                     |        |    | 48        | in.       |     |         |                  |                               |
|---------------------------------------|---------------------|--------|----|-----------|-----------|-----|---------|------------------|-------------------------------|
| Area                                  |                     |        |    | 12.57     | sf        |     |         |                  |                               |
| Length of PWTM                        |                     |        |    | 7         | miles     |     | (linked | to mile          | age in schematic above)       |
|                                       |                     |        |    | 36,960    | feet      |     | •       |                  | ,                             |
| Estimated unit cost by condition:     | % of length         | LF     | u  | Init cost | Cos       | t   |         |                  |                               |
| Rural - soil                          | 100%                | 36,960 | \$ | 208       | \$        | 7.7 | million |                  |                               |
| Rural - rock                          | 0%                  | -      | \$ | 289       | \$        | -   |         |                  |                               |
| Urban - rock                          | 0%                  |        | \$ | 314       | \$        | 2   |         |                  |                               |
|                                       |                     | 36,960 |    |           | \$        | 7.7 | million |                  |                               |
| Average estimated unit construction   | cost for PWTM       |        | \$ | 208       | per LF    |     |         |                  |                               |
| Total construction cost in millions   |                     |        | \$ | 7.7       |           |     |         |                  |                               |
| Contingencies                         |                     |        | \$ | 1.5       |           |     |         |                  |                               |
| Subtotal                              |                     |        | \$ | 9.2       |           |     |         |                  |                               |
| Engineering, Legal & Administrative   |                     |        | \$ | 1.4       |           |     |         |                  |                               |
| Subtotal                              |                     |        | \$ | 10.6      |           |     |         |                  |                               |
| Envir & Arch Studies & Mitigation, Su | rveying, & Land Acq |        | \$ | 0.0       |           |     |         |                  |                               |
| Total Capital Cost for PW             | /TM in millions     |        | \$ | 10.6      | 50        |     |         |                  |                               |
| Unit maintenance cost/year-mile       |                     |        | \$ | 10,000    | \$/year-m | ile | \$      | 0.070            | Million \$/year               |
| Velocity at peak flow rate            |                     |        |    | 3.69      | fps       |     |         |                  |                               |
| C factor                              |                     |        |    | 120       |           |     |         |                  |                               |
| Head loss per foot                    |                     |        |    | 0.00096   | ft/ft     |     |         | h <sub>f</sub> = | 3.552*Q 1.85                  |
|                                       |                     |        |    | 5.06      | ft/mile   |     |         |                  | C*(d) <sup>2.63</sup>         |
| Head loss at peak flow rate           |                     |        |    | 35        | ft        |     |         |                  |                               |
| Allowance for minor losses            | 20%                 |        |    | 7         |           |     |         |                  | Desired HGL At Delivery Point |
| Total estimated losses                |                     |        |    | 42        |           |     |         |                  | Elev. At Delivery Point 4     |
| Average static head                   |                     |        |    | -70       |           |     |         | -70              | ft                            |
| Total estimated dynamic head          |                     |        |    | -28       |           |     |         |                  |                               |
|                                       |                     |        |    | -12       | nsi       |     |         |                  |                               |

#### Negative indicates gravity flow from #4 to #5; no pumping necessary.

-12 psi

|                     |                |             |          |                            | N  | Million \$ |
|---------------------|----------------|-------------|----------|----------------------------|----|------------|
| Annual O&M Cost     | in million \$: |             | Yr built | vii                        |    |            |
| PW                  | M              | \$<br>0.070 | 2030     | -                          |    |            |
|                     |                |             |          | Total NPV of O&M Costs     |    | \$0.55     |
| Capital Costs in mi | llion \$:      |             | Yr built |                            |    |            |
| PW                  | M              | \$<br>10.6  | 2030     | -                          | \$ | 5.10       |
|                     |                |             |          | Total NPV of Capital Costs | \$ | 5.1        |

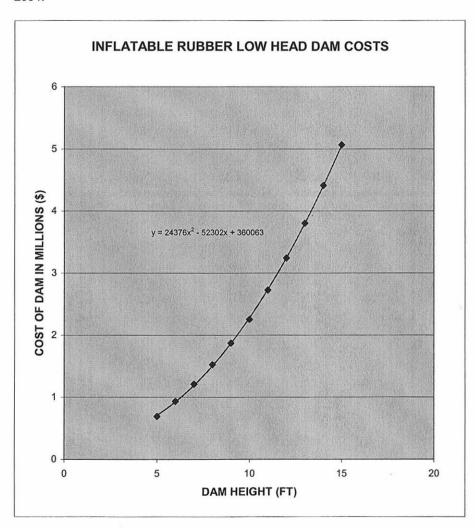
Total NPV of Capital and O&M Costs in millions \$ LCRA Delivery Point (#4) to COA Delivery Point (#5) 5.6



#### INFLATABLE RUBBER LOW HEAD DAM COST

| Dam Height<br>(ft) | Total Cost<br>(\$) | Cost<br>Per Height<br>(\$) |
|--------------------|--------------------|----------------------------|
| 5                  | 688,000            | 137,600                    |
| 6                  | 930,000            | 155,000                    |
| 7                  | 1,208,000          | 172,571                    |
| 8                  | 1,520,000          | 190,000                    |
| 9                  | 1,868,000          | 207,556                    |
| 10                 | 2,250,000          | 225,000                    |
| 11                 | 2,723,000          | 247,545                    |
| 12                 | 3,240,000          | 270,000                    |
| 13                 | 3,803,000          | 292,538                    |
| 14                 | 4,410,000          | 315,000                    |
| 15                 | 5,063,000          | 337,533                    |

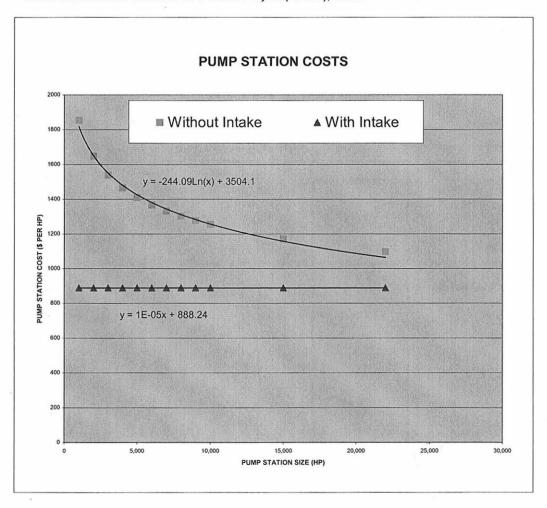
<sup>\*</sup> Costs based on the LCRA-SAWS Water Project (LSWP), 2004.



## PUMP STATION COSTS WITH & WITHOUT INTAKE STRUCTURES

| Pump Station | Pump Station<br>Cost Without<br>Intake Structure | Cost<br>Per HP | Pump Station<br>Cost With<br>Intake Structure | Cost<br>Per HP |
|--------------|--|----------------|---|----------------|
| (HP)         | (\$)   | (\$)           | (\$)  | (\$)           |
| 1,000        | 1,854,000  | 1854           | 888,000                                       | 888            |
| 2,000        | 3,296,000  | 1648           | 1,776,800                                     | 888            |
| 3,000        | 4,615,000  | 1538           | 2,664,000                                     | 888            |
| 4,000        | 5,860,000  | 1465           | 3,553,600                                     | 888            |
| 5,000        | 7,052,000  | 1410           | 4,442,000                                     | 888            |
| 6,000        | 8,204,000  | 1367           | 5,330,400                                     | 888            |
| 7,000        | 9,324,000  | 1332           | 6,218,800                                     | 888            |
| 8,000        | 10,416,000                                       | 1302           | 7,107,200                                     | 888            |
| 9,000        | 11,486,000                                       | 1276           | 7,995,600                                     | 888            |
| 10,000       | 12,536,000                                       | 1254           | 8,884,000                                     | 888            |
| 15,000       | 17,551,000                                       | 1170           | 13,326,000                                    | 888            |
| 22,000       | 24,119,000                                       | 1096           | 19,544,800                                    | 888            |

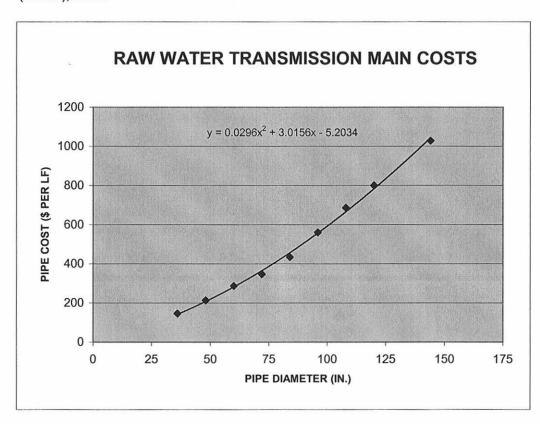
<sup>\*</sup> Costs based on the LCRA-SAWS Water Project (LSWP), 2004.



#### RAW WATER TRANSMISSION MAIN COSTS

| (in.) | (\$ / LF) |
|-------|-----------|
| 36    | 146       |
| 48    | 213       |
| 60    | 287       |
| 72    | 347       |
| 84    | 434       |
| 96    | 560       |
| 108   | 686       |
| 120   | 800       |
| 144   | 1028      |

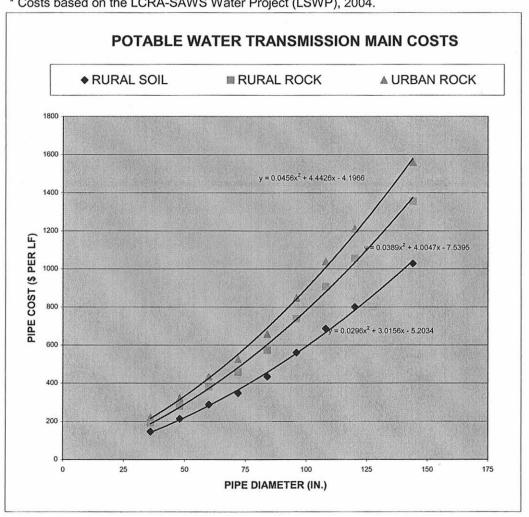
<sup>\*</sup> Costs based on the LCRA-SAWS Water Project (LSWP), 2004.



#### POTABLE WATER TRANSMISSION MAIN COSTS

|          | RU        | RAL       | URBAN     |
|----------|-----------|-----------|-----------|
| Г        | SOIL      | ROCK      | ROCK      |
| Diameter | Cost      | Cost      | Cost      |
| (in.)    | (\$ / LF) | (\$ / LF) | (\$ / LF) |
| 36       | 146       | 193       | 221       |
| 48       | 213       | 281       | 322       |
| 60       | 287       | 379       | 434       |
| 72       | 347       | 458       | 525       |
| 84       | 434       | 573       | 657       |
| 96       | 560       | 739       | 847       |
| 108      | 686       | 906       | 1038      |
| 120      | 800       | 1056      | 1211      |
| 144      | 1028      | 1356      | 1560      |

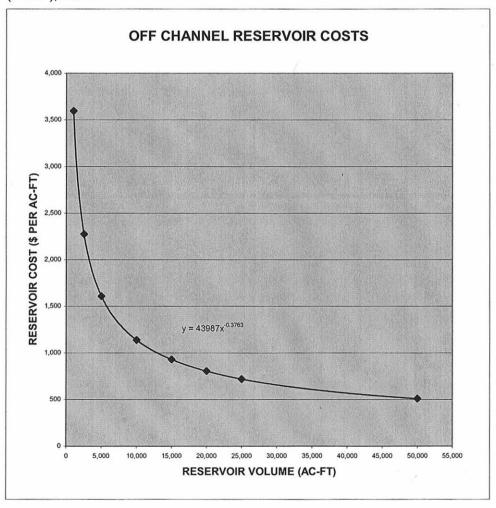
\* Costs based on the LCRA-SAWS Water Project (LSWP), 2004.



#### OFF CHANNEL RESERVOIR COSTS

| Volume<br>(ac-ft) | Total Cost<br>(\$) | Cost Per Ac-Ft<br>(\$) |
|-------------------|--------------------|------------------------|
| 1,000             | 3,595,061          | 3,595                  |
| 2,500             | 5,684,290          | 2,274                  |
| 5,000             | 8,038,800          | 1,608                  |
| 10,000            | 11,368,580         | 1,137                  |
| 15,000            | 13,923,610         | 928                    |
| 20,000            | 16,077,600         | 804                    |
| 25,000            | 17,975,000         | 719                    |
| 50,000            | 25,420,918         | 508                    |

\* Costs based on the LCRA-SAWS Water Project (LSWP), 2004.



## APPENDIX 2

# CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO WATER SYSTEM

MEETING MINUTES AND PARTICIPANT COMMENTS



# TEXAS WATER DEVELOPMENT BOARD

Jack Hunt, Vice Chairman
J. Kevin Ward Thomas Weir Labatt III, Member
Executive Administrator James E. Herring, Member

E. G. Rod Pittman, *Chairman*William W. Meadows, *Member*Dario Vidal Guerra, Jr., *Member* 

July 28, 2005

Mr. Scott Ahlstrom, P.E. Lower Colorado River Authority P. O. Box 220 Austin, Texas 78767-0220

RE:

Regional Water Supply Facility Planning Grant Contract between the Lower Colorado River Authority (LCRA) and the Texas Water Development Board (BOARD), TWDB Contract No. 2004-483-522, Draft Report Comments

Dear Mr. Ahlstrom:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 2004-483-522. As stated in the above-referenced contract, the CONTRACTOR (S) will consider incorporating comments from the EXECUTIVE ADMINISTRATOR as shown in Attachment 1 and other commentors on the draft final report into a final report. The CONTRACTOR (S) will include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report.

The Board looks forward to receiving one (1) electronic copy, one (1) unbound single-sided camera-ready original, and nine (9) bound double-sided copies of the final report on this study.

If you have any questions concerning this contract, please contact Mr. David Meesey, the Board's designated Contract Manager for this study, at (512) 936-0852.

Sincerely,

William F. Mullican, III

**Deputy Executive Administrator** 

Office of Planning

c: David Meesey, TWDB

A Member of the Texas Geographic Information Council (TGIC)

# Attachment 1 Board Contract No. 2004-483-522 Central Texas Regional Water Treatment Plant Study Comments

#### **General Comments**

- 1. The draft report consists of a series of technical memos that represent work performed under specific tasks in the contract scope of work. However, the memos are somewhat difficult to follow and would be improved through the addition of an executive summary that lays out the purpose of the study, introduction, conclusions and recommendations.
- 2. The tasks in the report do not follow the task sequence in the scope of work, which leads to confusion. In some instances, it is unclear whether or not particular scope of work tasks (i.e. 3, 10, and 11) are addressed in the report.
- 3. Better documentation of the participants, study area, comments received, and changes in emphasis made during the study could prove useful for reference in future years as this region grows and centralized water treatment becomes an even bigger issue than it is today.

#### Specific Comments from the Contract Scope of Work

- 1. Task 3 Develop a Diagrammatic Trial Design of a Consolidated System Featuring a Single Water Treatment Plant Along with Necessary Raw Water and Finished Water Piping, does not include the raw and finished water piping components.
- 2. Task 6 Establish Potential Plant Sites and Treated Water Pipeline Corridors, is only partly addressed, in that the discussion in the technical memorandum is limited primarily to connection points and does not address pipeline corridors. A corridor is defined as a narrow passageway or route. Typically existing right-of-ways for highways, railroads, power lines and possibly other utilities would be considered as possible corridors for water pipelines.
- 3. Task 8 Examine Phasing Potential and the Effect of Phasing on Unit Costs, is only partly addressed, as no unit or other costs are demonstrated in the analysis of phasing.

#### Suggestions for Improving the Report (Listed By Technical Memorandum Subject)

#### 1. Task 2 – Demand Projections

Bullet 1 under methodology refers to a City of Austin system model for determining future needs and planning improvements. Additional explanation would be helpful as to the type of model and how the model results were coordinated.

Bullet 2 under methodology states that SAWS is <u>developing</u> several potential sources of water. For the ones listed, it might be more accurate to state that SAWS is <u>evaluating</u> several potential sources.

Bullet 5 under methodology refers to LCRA demands but does not describe the basis for or how the LCRA demands were computed.

#### 2. Task 4 - Water Treatment Process

Page 16, under Raw Water Storage, second paragraph. The technical memorandum recommends sizing the raw water storage reservoir to hold the differential between peak and average demand for a 30-day period. Please provide the reference for the 30-day period, such as water delivery data or engineering guidance document. Also the Task 9 technical memorandum was based on a raw water storage reservoir sized for 15 days of storage at average flow. The technical memorandum might clarify that both criteria provide similar reservoir sizes, if that is the case, or the same criterion should be used for both technical memoranda.

#### 3. Task 8 - Phasing Potential

Table 8-3, Facilities Phasing, is unclear. For example three of the rows are identical. Additional explanation needs to be added to distinguish between Alternatives 1A, 1B, and 1C.

#### 4. Tasks 3 and 10 - Economic Analysis

On page 1, under Unit Costs, second paragraph, Appendix 1 was not included.

The tables are difficult to read. Suggest either enlarging to 11 x 17 or revising to utilize larger fonts and/or decrease the amount of descriptive information inside table columns.

#### 5. Task 14 - Conclusions and Major Project Issues

The last sentence on page 1 states that the lower costs for the four new alternatives were not comparable or that the changes to the basic scenario were not realistic and/or could not be implemented. Additional explanation and supporting information should be provided to support this conclusion, as it is not obvious from the information presented in this and the other technical memoranda.

6. Costs – The cost analysis appears to be cursory, and documentation for the basis of cost estimates is not included.



#### **MEETING MINUTES**

Date: August 24, 2004

Time: 2:00 PM

Subject: Central Texas Regional Water Treatment Plant to Serve Austin and San Antonio Water

System

Location: Aquarena Springs, San Marcos, Texas

Present: See Attached List

The following items are believed to have been discussed at the above dated meeting. Unless adjustments are requested, these minutes will be filed as official documentation for this project.

The purpose of the meeting was to provide an update on project progress and receive participant input on project assumptions and demands. Agenda items are shown in italics and the related discussion summarized below.

- I. Review Response to Requested Information
  - A handout was distributed listing the status of specific information which had previously been requested from each participant. Participants were asked to review the list and provide outstanding items at their earliest convenience.
- II. Review Study Area Map
  - A handout was distributed showing the proposed study area. It was agreed that the study area in Williamson County will be shown as that area within Austin's service area only and that the service boundary for Bexar County will remain shown as the Bexar County line. Participants agreed to review and provide comment, if any.
- III. Discuss Study Assumptions (reference August 2 letter)
  - A peaking factor of 1.3 was discussed for the SAWS demand. SAWS typically uses a 1.3 peaking factor for planning purposes. The City of Austin will be including a peaking factor of 1.65. A general discussion of peaking factors concluded that the peaking factor will be unique for each participant and will be reflected in requested capacity and ultimate plant component sizing.
  - A discussion of groundwater centered on the point that the intent of the study is to determine the feasibility of a regional water treatment plant and it is not intended to be a water supply study. Although groundwater may impact phasing or other aspects of the facilities, the study will concentrate on surface water treatment.
  - The selection of conventional lime softening was questioned with regards to the hardness of water taken from near the delta as compared to water upstream. Water properties will be further considered in process assumptions.
  - The best available cost data will be used for the study. This may include data from the Lower Guadalupe study (pending authorization and acceptance of assumptions) or data from TWDB regional plans. Currently, updated costs from Appendix A of the Region L Water Plan are being considered.

#### IV. Review Response to Request for Water Demand Data

 A table showing each study participant and incremental years for the study period (2015 to 2065) was displayed for recording demands. Draft demands for GBRA, LCRA, and the City of Austin were discussed. The participants will further consider demand needs and forward the information.

#### V. Discuss Delivery Points and HGLs

• It was acknowledged that SAWS and the City of Austin provided delivery points. The GBRA delivery point will be directly from the plant. Participants will further consider delivery points and HGLs and forward the information.

#### VI. Discuss News Release

The possibility of a news release was discussed. It was determined that a one page project
description would be developed and kept on-hand for press purposes. LCRA will initiate
the effort and provide a draft to participants for input.

#### VII. Information Required Prior to Next Meeting

- a. Potential Plant Sites
- b. Finalized Demands and Delivery Points
- If participants have previously considered plant sites within the study area the information will be forwarded to the project team (particularly the City of Austin and SAWS). Otherwise the team will select conceptual plant locations.
- Participants will finalize demands, delivery point locations and delivery HGLs and forward the information no later than September 3<sup>rd</sup>.

#### VIII. Set Next Meeting Date and Discuss Next Meeting Agenda

- a. Discuss Treatment Process
- b. Review Diagrammatic Trial Design
- The next meeting was set for Wednesday, September 22, 2004 at 2:00 PM, at Aquarena Springs.

| ACTION                            | RESPONSIBLE PARTY | DEADLINE                  |
|-----------------------------------|-------------------|---------------------------|
| Outstanding Requested Information | All Participants  | September 3 <sup>rd</sup> |
| Finalize Demands                  | All Participants  | September 3 <sup>rd</sup> |
| Finalize Delivery Points and HGLs | All Participants  | September 3 <sup>rd</sup> |
| Upstream and Downstream Water     | LCRA              | September 3 <sup>rd</sup> |
| Quality and Hardness Data         |                   | _                         |
| One Page Project Summary          | LCRA              | September 3 <sup>rd</sup> |

### CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO August 24, 2004

| Name            | Organization                | Phone No.      | E-Mail Address                |
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| Teresa Lutes    | Austin Water Utility        | (512) 972-0179 | teresa.lutes@ci.austin.tx.us  |
| Fred Blumberg   | GBRA                        | (830) 379-5822 | fblumberg@gbra.org            |
| Thomas D. Hill  | GBRA                        | (830) 379-5822 | thill@gbra.org                |
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| Karen Friese    | K Friese & Associates, Inc. | (512) 338-1704 | kfriese@kfriese.com           |
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| Scott Ahlstrom  | LCRA                        | (512) 473-3367 | sahlstrom@lcra.org            |
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| Kevin Morrision | SAWS                        | (210) 704-7253 | kmorrison@saws.org            |
| Meg Conner      | SAWS                        | (210) 704-7613 | mconner@saws.org              |
| David Meesey    | TWDB                        | (512) 936-0852 | david.meesey@twdb.state.tx.us |



#### **MEETING MINUTES**

Date: October 6, 2004

Time: 2:00 PM

Subject: Central Texas Regional Water Treatment Plant to Serve Austin and San Antonio Water

System

Location: Aquarena Springs, San Marcos, Texas

Present: See Attached List

The following items are believed to have been discussed at the above dated meeting. Unless adjustments are requested, these minutes will be filed as official documentation for this project.

The purpose of the meeting was to provide an update on project progress and receive participant input on project demands, alternative scenarios, Simsboro water use potential, and upcoming actions. Agenda items are shown in italics and the related discussion summarized below.

#### I. Review demand calculations

- A table showing average day demand, maximum delivery rate, and delivery points with HGLs was distributed and reviewed.
- The City of Austin and LCRA may each be including demands for the Heep Ranch area in the reported numbers. Jason and Teresa will resolve any discrepancy.
- Demands for Bastrop County/Aqua will not be included in the study at this time.
- The maximum delivery rate for GBRA will include a peaking factor of two (2).
- Delivery points were reviewed and agreed to. GBRA's delivery point is assumed to be at the plant site.
- The Blanco River Basin will be added to the study area.

#### II. Review ALCOA/CPS groundwater availability assumptions.

- Selected pages from "Preliminary Feasibility of Options to Deliver ALCOA/CPS Groundwater to Bexar County", HDR, January 2000, were distributed.
- The CTRWTP study is assuming Scenario A from the HDR report 40,000 acft/yr from ALCOA and 15,000 acft/yr from CPS. SAWS is comfortable with this assumption.
- TSAWS reported that the "Direct Pipeline" delivery option for ALCOA/CPS groundwater is the most probable option at this point in time. SAWS will provide updated cost estimates.
- ALCOA/CPS groundwater quality was reviewed. Iron and manganese content may require treatment or blending. High temperatures may be the primary item of concern.

#### III. Review anticipated raw water quality in the Lower Colorado vs. Town Lake.

- A Water Quality Summary Table with selected Town Lake, Wharton, and Bay City parameters from the Waterquality.LCRA.org website was distributed and reviewed.
- A list of regulations and treated water quality objectives was distributed and discussed.

- IV. Review water treatment technology issues and options.
  - A chart showing water treatment plant unit costs vs. capacity was distributed and reviewed.
  - It was pointed out that based on maximum delivery rates a 367 MGD plant is currently being considered. This size plant is in the \$1.00/gal range on the chart.
  - Conventional lime softening is being assumed for the plant. The question of what if SAWS and/or SARA do not want softened water was raised. Two options are available (1) deliver softened water and blend with unsoftened water or (2) have separate treatment trains.
  - The relative cost of conventional lime softening with membrane treatment would add approximately \$0.25/gal as compared to conventional lime softening with granular filtration (typical for City of Austin plants). Since each scenario examined for the CTRWTP project will use the same treatment process the treatment method selected will not impact the outcome.
- V. Review three preliminary intake/treatment/transmission system layouts with cost estimates.
  - Maps showing each system layout were distributed. Three treatment plant location
    alternatives were examined for preliminary screening. Each scenario includes an intake
    near Bastrop and an intake at the north Matagorda County line. The treatment plant
    locations include one on the northeast side of San Antonio, one near San Marcos, and one
    on the southeast side of Austin. Each scenario delivers water to each participant's
    identified delivery point.
  - Capital cost estimates for the scenarios were reviewed and Alternative 2, treatment plant located near San Marcos, is the least cost alternative.
  - Options for blending groundwater into the raw surface water were discussed. The most
    economical option is to transport the groundwater to the river/Bastrop intake via Big Sandy
    Creek. It was noted that environmental and other factors must be considered to ensure
    feasibility of this transport means.
  - Although the preliminary analysis is intended to be an alternatives screening process to
    narrow the options for further consideration, "cost drivers" and their effect on each
    alternative should be identified before eliminating any options. For example, diverting all
    of the raw water from Matagorda and deleting the Bastrop intake could impact the location
    of the least cost alternative.
  - LCRA noted that the identified demand is greater than the available supply from the Colorado River (by 53,428 acft/yr in year 2065) and questioned the source of supply water for SARA and GBRA demands. Reducing the plant size by the overage amount will not significantly impact the plant unit cost per gallon and it was decided to take the demand out of the raw water lines but to leave it in the finished water lines for cost estimating purposes.
  - The City of Austin's options of interim water sale (depending on Austin's needs) and timing of future treatment plant projects relative to the CTRWTP may have a significant impact on project phasing.
- VI. Proposed project schedule for next 3 months.
  - Deliver Technical Memorandums for tasks one through five by November 15.
  - Schedule next meeting for early December (actual meeting date to be determined).
  - Deliver technical memorandums for tasks six through nine by January 15.

### VII. Information or assistance needed from participants

• Comments, concerns, and questions on the project from the participants will be forwarded to Jason Eichler by October 20<sup>th</sup>.

#### VIII. Discuss Project Description (news release)

- Comments on the project description will be forwarded to Jason Eichler by October 20<sup>th</sup>.
- It was noted that the project description is not intended as a press release but will be kept on-hand in case information is requested by the press.

#### **ACTION ITEMS**

| ACTION                              | RESPONSIBLE PARTY | DEADLINE                  |
|-------------------------------------|-------------------|---------------------------|
| Project comments/concerns/questions | All Participants  | October 20 <sup>th</sup>  |
| Project Description comments        | All Participants  | October 20 <sup>th</sup>  |
| Task 1 thru 5 Tech. Memos           | KFA               | November 15 <sup>th</sup> |
| Task 6 thru 9 Tech Memos            | KFA               | January 15 <sup>th</sup>  |

### CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO October 6, 2004

| Name            | Organization                | Phone No.                             | E-Mail Address                |
|-----------------|-----------------------------|---------------------------------------|-------------------------------|
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|                 |                             | (512) 473-3200                        |                               |
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| Meg Conner      | SAWS                        | (210) 704-7613 <u>mconner@saws.or</u> |                               |
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#### **MEETING MINUTES**

Date: March 7, 2005 Time: 9:30 AM

Subject: Central Texas Regional Water Treatment Plant to Serve Austin and San Antonio Water

System

Location: Aquarena Springs, San Marcos, Texas

Present: See Attached List

The following items are believed to have been discussed at the above dated meeting. Unless adjustments are requested, these minutes will be filed as official documentation for this project.

The purpose of the meeting was to review the Draft Technical Memorandums and discuss the direction of the remainder of the study. Agenda items are shown in italics and the related discussion summarized below.

#### I. Brief Presentations of Technical Memorandums

- Each Technical Memorandum was briefly presented.
- Written comments on the memorandums will be submitted by the Participants within two weeks.

#### II. Discussion

- The original purpose of the study was summarized as determining if a regional facility to serve Austin and San Antonio Water System would be less expensive than individual projects. It was discussed that the conclusion of the study could go beyond providing a net present value of a regional facility and may include items such as:
  - o Should two sub-regional facilities be considered (south Austin and San Antonio)?
  - o A regional alternative which involves two plants (Alt. 1D).
  - o Identification of specific next step(s) which could be taken after completion of the study.
- Various scenarios for possible economic analysis were discussed. These scenarios included:
  - Not applying a peaking factor to the SAWS demand since other sources may be available to supply the peak;
  - Splitting the sources such that supply from the Bastrop area would be used in the south Austin sub-region and supply from the Matagorda area would be used in the San Antonio sub-region. Austin expressed concern with source compatibility and requested more information if the supply split is further pursued.

#### III. Future Milestones

• The project team will evaluate study findings and discussions to date and propose a methodology for completing the work.

#### **ACTION ITEMS**

| ACTION                        | RESPONSIBLE PARTY | DEADLINE       |
|-------------------------------|-------------------|----------------|
| Technical Memorandum Comments | All Participants  | March 21, 2005 |
| Project Methodology           | Study Team        | March 21, 2005 |

#### **Regional Treatment Plant Comments & Questions**

- Is the planned Bastrop Diversion capable of diverting more than the 18,000 AF/yr? Any additional water that could be diverted at Bastrop could reduce the costs associated with the transmission line between Matagorda County and the Regional Treatment Plant. This could provide significant cost savings for all parties. This may also assist with phasing opportunities.
- Finished water quality remains a major issue as we move through the remainder of this study. Since San Antonio would be taking the majority of water from this treatment plant, it would seem reasonable to match San Antonio's water quality. This needs to be further discussed.
  - o Treatment with Chloramines is a major issue for the SAWS system and will need to be thoroughly investigated. Chlorine injection is utilized throughout the entire SAWS system.
- What is the elevation of the Treatment Plant in Caldwell County?
- Is water from the Simsboro Project considered in all of the alternatives or only the composite?
- Demand numbers for the LCRA-SAWS Water Project can be phased in to reduce the production requirements.

|           | Simsboro | Bastrop | LCRA-SAWS | Total   |
|-----------|----------|---------|-----------|---------|
| Year 2020 | 55,000   | 18,000  | 66,000    | 139,000 |
| Year 2030 | 55,000   | 18,000  | 132,000   | 205,000 |

• For Simsboro water conveyed directly to the treatment plant by pipeline should reflect costs for public supply wells (in the Alcoa & CPS wellfields). If the water is dropped in the Colorado River, then non-public well costs should be utilized.

### CENTRAL TEXAS REGIONAL WATER TREATMENT PLANT TO SERVE AUSTIN AND SAN ANTONIO March 7, 2005

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| Everett Owen    | KFA                  | (512) 338-1704 | eowen@kfriese.com             |
| Karen Friese    | KFA                  | (512) 338-1704 | kfriese@kfriese.com           |
| Tom Owens       | KFA                  | (512) 338-1704 | towens@kfriese.com            |
|                 |                      | (512) 473-3200 |                               |
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| Phil Weynand    | SARA                 | (210) 302-3629 | pweynand@sara-tx.org          |
| Kevin Morrision | SAWS                 | (210) 704-7253 | kmorrison@saws.org            |
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| Gilbert Ward    | TWDB                 |                | gilbert.ward@twdb.state.tx.us |
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# Austin Water Utility 4/12/2005

#### Central Texas Water Treatment Plant to Serve Austin and San Antonio

#### Comments on Cover Letter

We offer the following comments on the Cover Letter (February 11, 2005):

On page 2, in the section discussing potentially reconsidering initial assumptions:

- a. Peaking vs. base load assumption: Due to the large number of associated initial assumptions and uncertainties and for consistent comparison purposes, we recommend keeping the assumption that the projected maximum delivery rate should be based on a projected peaking factor for Austin's portion of the projected plant demand. Austin's portion of the demand projection includes using an average day to peak day demand multiplier of 1.67.
- b. Treatment Process assumption: the letter suggests that the second assumption reconsideration would be for the proposed treatment facility to have only one unsoftened treatment process. With this assumption, the water from the proposed plant would not be compatible with the current or future City of Austin water provided to Austin customers and thus would not meet Austin's needs. For the results of the study to remain applicable Austin, as set forth in the original scope, the study should continue to evaluate the feasibility of a single facility to meet both Austin and San Antonio needs. To meet water compatibility requirements, the study should continue to assume the plant's treatment process for Austin's portion will produce softened water compatible with Austin's water.

#### Comments on Draft Technical Memorandums

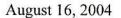
We offer the following comments on the Draft Technical Memorandums on the above Project:

- 1. Task 4 Background Section, end of the first sentence of Paragraph 7: Suggest changing the word "preferences" to "requirements".
- 2. Task 4 Background Section, Figure 4.1 and the other project maps: As previously suggested, consider changing "project service area" to indicate the service areas of Austin and San Antonio, as originally shown in the project scope materials. As currently depicted, the project service area indicates considerable portions of outside of the project service areas as discussed over the course of the project, including large areas of Williamson and Bastrop County.
- 3. Task 4, first line of text under Table 4-1: Suggest changing "downstream of the City of Austin" to "in the Lower Colorado River Basin", since one of the points is Town Lake.
- 4. Task 4, Notes under Table 4-3: In the Note at the bottom of the table there is a reference to "100 miles down river". It is unclear what is being referred to.
- Table 4-4 states the City of Austin utilizes only Chloramine for disinfection. This is incorrect. The City of Austin utilizes a combination of chlorine and chloramine disinfection. Also, suggest changing heading "size" to "capacity".
- 6. Task 4, end of second paragraph from the end of the "Softening" section: Suggest changing "Clearly Austin is used to soft water" to "Austin Water Utility provides softened water."
- 7. Task 4, last paragraph in "Softening" section: Suggest changing "...Austin using chloramines" to "Austin utilizes a combination of chlorine and chloramine disinfection."
- 8. Task 4, in the second sentence of the Paragraph 5 in the "Process Alternatives" section: Suggest changing the word "prefer" to "require".

- 9. Task 4, in the section just above "Residuals Disposal", approximately 3 paragraphs are duplicated from the text immediately above.
- 10. Task 4, "Raw Water Storage" section: An assumption of 30 successive peak days seems very conservative. It may be worthwhile to examine this assumption to determine if a shorter duration of successive peak days would significantly impact the sizing and costs of the raw water storage facilities.
- 11. Task 4, Figure 4.7, is unit cost information available that would range high enough to cover the largest plant size contemplated by the project?
- 12. Task 5, Page 2 of 5, third paragraph: Not sure as to the validity of the listed advantages numbered 2 and 3 (i.e., downstream water quality and public perceptions items), particularly the water quality item. Recommend reducing the list down to one advantage (item #1 on list), that being the presence of the dam with its associated lake.
- 13. Task 5, Page 4 of 5, Bastrop Raw Water Intake Facilities section: In this section it is unclear if the project contemplates two or four 15,000 acre-foot off-channel reservoirs at the Bastrop location. The first paragraph mentions two and the fourth paragraph mentions four. Are the two extra off-channel reservoirs only needed if the system is sized for both Colorado River water and ALCOA water? Also in the same portion of the report, suggest that it should be noted that any required off-channel reservoirs near Bastrop would need to be constructed on land from willing sellers and would address all applicable environmental concerns.
- 14. Task 6, Table 6-2, last item in "Design Basis" column: What is definition of "downstream" in this table? Is that downstream of the treatment process? Would the term "participants" work there instead?
- 15. Tasks 3 and 10, Page 1 of 4 and tables 3-10-1 and 2: Add an item #5 to the list, prepare a total unit cost for each alternative, in \$/af or \$/MGD. In Tables 3-10-1 and 2, add plant capacity and the unit cost figure for each alterative.
- 16. Tasks 3 and 10, Page 3 of 4: In the second paragraph from the bottom of the page the report states that Alternative 3B would require an agreement, including the City of Austin and others, for SAWS to temporarily withdrawal water at the Bastrop intake in excess of 18,000 af-ft/yr. While the concept details are unclear, there are a number of potential issues with this alternative including water rights and water supply issues and its inconsistency with the adopted Lower Colorado Regional Water Planning Group (Region K) water plan.
- 17. Tasks 3 and 10, Page 4 of 4: The draft states "The COA would need to verify that treated groundwater from the ALCOA/CPS well fields would be compatible with its treated water from other sources, and that its treatment would be less expensive than treatment of surface water from the Colorado River in its own treatment plant". It is expected that the treated groundwater would not be compatible with Austin's treated water.
- 18. Tasks 3 and 10, Page 4 of 4 states "The COA, LCRA, and SAWS would need to negotiate a water rights transfer that would give SAWS access to 44,804 af/yr (...33,604 from COA) of Colorado River water in return for the same amount from the ALCOA/CPS well fields." Austin has concerns/issues with this Alterative related to comparative reliability, particularly during drought conditions, long-term water supply availability, and water compatibility. Additionally, Alternative 1D is problematic in that it is not consistent with the study's approach of examining a single facility. It also does not result in significant cost savings.

We appreciate the opportunity to comment on the draft technical memos. We look forward to the opportunity to further comment as the report nears completion.

Should you have any questions please contact Chris Lippe (512-972-0108) or Teresa Lutes (512-972-0179)





Jason Eichler, P. E. LCRA Water & Wastewater Utility Services P.O. Box 220 Austin, TX 78767-0220

Re: Central Texas Water Treatment Plant Study

Dear Mr. Eichler:

Thank you for your letter of August 2, 2004 addressing project-engineering assumptions. The SAWS staff and I have reviewed the assumptions and offer the following comments and suggestions:

- Assumption Item 2: While service from such a distance is likely to be designed at constant rate, we need to evaluate the cost of oversizing for potential future volumes or some moderate peaking vs. the cost of local storage to meet summer peaking requirements. We have typically selected a 1.3 peaking factor in other water supply projects to reduce the size of terminal storage required. Additionally, we need to refine the withdrawal rates from the Lower Colorado River and look at the diversion from Bastop area with LCRA. It is possible that we could consider the use of the diversion rate identified in the Region L plan.
- Assumption Items 3 & 4: It is important that the water derived from the Simsboro project remain as input source of water for this project. One of the potential future uses of the Simsboro project may be to meet regional needs. If the project were to be utilized in this capacity, treatment at the source would be more important than if Bexar County users were the primary users. The potential to co-locate groundwater treatment facilities was key to our involvement in the study.
- Assumption Item 5: We may need additional detail regarding the selection of appropriate treatment/softening process assessment of the quality of the receiving waters in our system.
- First paragraph after the assumptions: Because this is a high level regional study, we recommend that the river authorities provide the expected water demands within their service areas. It is probable that the River Authorities have more detailed information on some of the communities that may need water along the pipeline route. The table with County demand projections should also be broken down by city, so that work on potential pipeline alignments can be more easily accomplished.

- Specific Request #1 (page 2): Please use the Region L planning forecast and break out by city.
- Specific Request #2 (page 2): Potential demand along the pipeline alignment is an expected outcome of the study rather than an input from the study participants.
- Specific Request #3 (page 2): SAWS' total water demand in 2050 as projected in the Region L plan is approximately 291,858 AF/yr. SAW water supply is derived from a number of sources, of which this could potentially be one.

#### Water Delivery Points:

For the purposes of this study, our infrastructure planning staff has requested that water be delivered at two potential locations. Approximately 60% of the water would be delivered to a point on the west side of San Antonio and the remaining 40% would be dropped at the northeast location. Detailed maps will be forwarded.

- Western Delivery Point: Highway 211 and FM 471 (Culebra Property)
- Northeast Delivery Point:
  Green Mountain Rd and Loop 1604 (Green Mountain Pump Sta.)

#### System Water Quality

I have included the most recent water quality report that characterizes the overall system water quality to assist with determination of appropriate water treatment and system compatibility issues.

Again, thank you for the opportunity to comment on the assumption for the project. If you should require additional information please contact me at (210) 704-7375 or Kevin Morrison at (210) 704-7253.

Sincerely,

Susan Butler

Director – Water Resources

Cc: Karen Friese, P.E.
Steve Raabe, P.E. - SARA
Fred Blumberg – GBRA
Chris Lippe – City of Austin
File

## Types Of Contaminants

Sources for drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- Microbiological contaminants, such as viruses and bacteria which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Cryptosporidium is an example of a microbiological contaminant affecting surface water sources. Since SAWS uses underground aquifers as water sources, Cryptosporidium is not a tested contaminant.
- Inorganic contaminants, such as salts and metals which can be naturally-occurring or result from urban stormwater

runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming;

- Pesticides and herbicides, which may have a variety of sources such as agriculture, urban stormwater runoff and residential uses;
- Organic chemical contaminants which are by-products of industrial processes and petroleum production and can also come from gas stations, urban stormwater runoff and septic systems and;
- Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities.

Contaminants may be found in drinking water and may cause taste, color or odor problems. These types of problems are not necessarily causes for health concerns. For more information on taste, odor or color of drinking water, contact SAWS Customer Service Department at (210)704-SAWS (7297).

## Understanding The Charts

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for margin of safety.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Not regulated: The contaminant is not currently regulated by the Environmental Protection Agency.

pCi/l: Picocuries per liter. A measure of radioactivity in water.

ppm: Parts per million. One part per million equals one teaspoon in 1,302 gallons, which is enough water to fill a typical bathtub more than 40 times.

ppb: Parts per billion. One part per billion is equal to one teaspoon in 1,302,000 gallons – enough to fill a typical bathtub more than 40,000 times.

N/A: Not applicable ND: Not detected

Points-of-entry: Entry point to the distribution system which is representative of each well after disinfection.

Remember that these substances are shown in parts per million or parts per billion. As you will see in these charts, water delivered by SAWS is of excellent quality.

| Substance                              | Test<br>Year | Concentration<br>Range Found | Highest<br>Concentration<br>Found | Maximum Contaminant Level (MCL) | Maximum Contaminant Level Goal (MCLG) | Possible Source   |
|--|--------------|------------------------------|-----------------------------------|---------------------------------|---------------------------------------|---|
| Nitrate (ppm)                          | 2003         | 0.6 ~ 2.12                   | 2.12                              | 10                              | 10                                    | Runoff from fertilizer use; leaching from septic tanks, sewage; crosion of natural deposits.  |
| Barium (ppm)                           | 2003         | 0.0487 - 0.0516              | 0.0516                            | 2                               | 2                                     | Discharge from drilling wastes; discharge from metal refineries; erosion of natural deposits. |
| Fluoride (ppm)*                        | 2003         | 0.5 - 1.1                    | 1.1                               | 4                               | 4                                     | Erosion of natural deposits; Discharge from fertilizer and aluminum factories.                |
| Nitrite (ppm)                          | 2003         | ND - 0.01                    | 0.01                              | Į.                              | 1                                     | Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits.  |
| Tetrachloroethylene<br>(ppb)           | 2003         | ND - 0.9                     | 0.9                               | 5                               | . 0                                   | Leaching from PVC pipes; discharge from factories and dry cleaners.                           |
| Di-(2-ethylhexyl)<br>phthalate (pph)** | 2003         | ND-4.19                      | 4.19                              | 6                               | 0                                     | Discharge from rubber and chemical factories.   |
| Gross alpha<br>adjusted (pCi I)        | 2003         | ND - 3.4                     | 3.4                               | 15                              | 0                                     | Erosion of natural deposits.  |

<sup>\*</sup> Fluoride in the form of hydrofluorosilic acid (H<sub>2</sub>SiF<sub>6</sub>) was added to SAWS drinking water as of August 2002.

<sup>\*\*</sup>Phthalate contamination was unavoidable in the process of analyzing the sample for this substance, therefore this concentration may not have been reliable.

Other Substances (2003)

| Substance                     | Concentration Range (ppm) | Average Consentation Found(o | pm) <sub>rea</sub> MCE (ppm); |
|-------------------------------|---------------------------|------------------------------|-------------------------------|
| Calcium                       | 71-91                     | 81                           | Not Regulated                 |
| Chloride                      | 20                        | 20                           | 250                           |
| Copper                        | 0.005 - 0.007             | 0.006                        | l l                           |
| Magnesium                     | 16 - 29                   | 23                           | Not Regulated                 |
| Sodium                        | 6 - 9                     | 8                            | Not Regulated                 |
| Sulfate                       | 17 - 20                   | 19                           | 250                           |
| Total Hardness <sup>a</sup>   | 240 - 343                 | 292                          | Not Regulated                 |
| Total Alkalinity <sup>a</sup> | 209 - 319                 | 264                          | Not Regulated                 |
| Total Dissolved Solids        | 283 - 358                 | 321                          | 500                           |
| Zinc                          | 0.0336 - 0.129            | 0.08                         | 5                             |

| Substance                 | MCL | Amount Found                                | Source                               |
|---------------------------|-----|---|--------------------------------------|
| Total Coliform (presence) | ь   | Highest Monthly % of positive samples 3.24% | Naturally present in the environment |
| Fecal Coliform (presence) | c   | 0   | Human and animal fecal waste         |

A routine sample and a repeat sample are total coliform positive, and one is also fecal coliform or E. coli positive

Total coliform bacteria are used as indicators of microbial contamination of drinking water because testing for them is easy. While not disease-causing organisms themselves, they are often found in association with other microbes that are capable of causing disease. Coliform bacteria are more hardy than many disease-causing organisms; therefore, their absence from water is a good indication that the water is microbiologically safe for human consumption.

Fecal coliform bacteria and in particular, E. coli are members of the coliform bacteria group originating in the intestinal tract of warm-blooded animals and are passed into the environment through feces. The presence of fecal coliform bacteria (E. coli) in drinking water may indicate recent contamination of the drinking water with fecal material. The table above indicates whether total or fecal coliform bacteria were found in the monthly drinking water samples submitted for testing last year.

| Required Monitoring - No MCL's <sup>d</sup> (2003) |                      |                             |  |  |  |
|--|----------------------|-----------------------------|--|--|--|
| Substance e  | Range Detected (ppb) | Average Concentration (ppb) | Reason for monitoring  |  |  |
| Chloroform   | ND                   | ND                          | d These values are from points-of-entry  |  |  |
| Bromodichlormethane                                | ND - 2.4             | 1.1                         | Unregulated contaminants are those for which EPA has not established drinking water standards. The purpose of        |  |  |
| Dibromochloromethane                               | ND - 2.9             | 1.6                         | unregulated contaminant monitoring is to assist EPA in   |  |  |
| Bromoform  | ND - 1.3             | 1.t                         | determining the occurrence of unregulated contaminants in drinking water and whether future regulation is warranted. |  |  |

| Lead and Copper Results (2001) |                 |              |   |                    |  |  |  |
|--------------------------------|-----------------|--------------|---|--------------------|--|--|--|
| Substance                      | 90th Percentile | Action Level | Number of residences exceeding Action Level | Possible Source    |  |  |  |
| Lead (ppb)                     | 4.9             | 15           | 0   | Corrosion of       |  |  |  |
| Copper (ppm)                   | 0.215           | 1.3          | 0   | household plumbing |  |  |  |

These two metals enter the water because of corrosion of household plumbing. Many older homes have copper pipes that were put together with lead-based solder. The 90° percentile means that 90 percent of the homes measured had less than that. A total of 50 residences were monitored.

What Are Coliforms?

I tend to agree with the comment that one of the outcomes should be discussions among GBRA, LCRA and City of Austin related to northern Hays County. That should be included in the conclusions/recommendations section of the final report.

thnaks. fmb

----Original Message----

From: Jason Eichler [mailto:jason.eichler@lcra.org]

Sent: Monday, March 28, 2005 1:47 PM

To: Fred Blumberg

Subject: Re: FW: In-kind services documentation

Thanks Fred. I seemed to recall you had a comment to list all the financial assumptions such as interest rates so each entity could make their own comparisons. Let me know if there is anything else you would like to discuss/revise.

Jason

#### *MEMORANDUM*



November 24, 2004

TO: Karen Friese, Tom Owens

FROM: Jason Eichler

CC: Scott Ahlstrom, Bill Leisering, Ron Anderson, Ken Hall

SUBJECT: Comments on draft report.

I have completed a preliminary review of the Central Texas study and prepared comments below. I appreciate the effort that has gone into producing this draft, and look forward to helping with development of the report. I understand that work is continuing on this draft, so some of the comments mentioned below may already be in progress.

I also anticipate it will be difficult to collect comments from the other project participants in a timely manner given the volume of the draft and material covered. And consequently, I would like to have the opportunity to perform an additional review with LCRA staff based on the comments below prior to issuing to the other participants. I believe this will help expedite the review process.

#### Comments by Jason Eichler

- General: It appears the draft submitted addresses most of the items in Tasks 1 – 10 in the scope. Please complete the Table of Contents, and Purpose & Scope to allow project participants to compare the progress of this draft with the scope and budget. This will also help in prioritizing future efforts that may be needed in some sections as we collect comments from the participants.
- 2. General: Please complete any sections of the draft that have not been completed (Unit Cost Section). In addition, please provide references to tables and figures in the appropriate locations, and include all figures referenced in the text.
- General: The Project Viability Assessment has been finalized and is available on the LCRA website. Please ensure that costing data is consistent with this report.
- 4. See attached for additional comments.



March 24, 2005

Mr. Jason Eichler, P.E. Lower Colorado River Authority P.O. Box 220 Austin, TX 78767

RE: Comments on the Regional Treatment Plant Draft Technical Memorandums provided by K Friese & Associates

Dear Mr. Eichler:

Thank you for the opportunity to review and comment on the draft technical memorandums for the Central Texas Water Treatment Plant Study. From a general perspective, SAWS primary concerns with the concept of the Regional Treatment Plant center around the overall costs and water compatibility issues. SAWS offers the following comments for your review and consideration.

Sincerely,

Susan Butler

Director, Water Resources

& Marin for

# Regional Treatment Plant Draft Technical Memo Comments San Antonio Water System

#### Task 1 Memo

• Page 1 of 2 - Add date to HDR Engineering, Inc. "Concept Delivery Study" – Groundwater Quality, SAWS, June 2004.

#### Task 2 Memo

• **General Comment** - Consider identifying additional potential customers and participants along the IH-35 corridor (as mentioned in the Detailed Scope of Services, 1<sup>st</sup> page, last paragraph).

#### Task 4 Memo

- Page 1 of 19 Consider adding language to clarify the 18,000 AF/yr diversion at Bastrop. Any water that can be diverted at Bastrop will serve to reduce the water that is taken at Matagorda and thus will reduce the size and ultimate cost of the transmission line portion of the project from the lower part of the basin.
- Page 4 of 19, 3<sup>rd</sup> paragraph Consider removing sentence referring to SAWS Simsboro project. It makes it appear as if the additional water supply from the Simsboro was an after thought. The possibility of treatment of water from the Simsboro project was one of the primary reasons SAWS decided to participate in the study and included in the original scope.
- Page 4 of 19, 3<sup>rd</sup> paragraph Consider additional language to clarify that the \$ 864 per AF/yr is the cost for the entire project. This includes the cost of the raw water, well field, transmission facilities including a 107-mile transmission line to a point in eastern Bexar County, and a water treatment plant (51.6 MGD) to remove iron & manganese. Costs do not include integration into SAWS distribution system.
- Page 6 of 19, Table 4-2 Add reference to cite the source of the data.
- Page 9 of 19 Consider adding a listing of all abbreviations for water treatment. Did not see anything for HAA5.
- Page 10 of 19 Possibly provide additional detail regarding the statement addressing "acceptable" total hardness. Not sure if it is relevant since each system receiving water would determine the level of softening to match their distribution system.
- Page 11 of 19, first full sentence Consider citing the source regarding San Antonio's use of individual softener systems. The percentage of households utilizing softeners may not be very high when you consider San Antonio's population.
- Page 13 of 19, Table 4-7 Consider enlarging the table possibly breaking it into two parts.
- Page 18 of 19 Consider additional discussion for the "30 peak days in succession". Possibly need additional discussion if the users require 30 peak days in a row from this plant or have additional water resources from their system

- available. Discuss whether building additional peak capacity into the treatment plant is cost effective.
- Page 18 of 19, Cost Estimates Please add language to indicate the cost basis are the costs presented 4<sup>th</sup> Qtr. 2004?
- Page 19 of 19 Is Debt Service included in the O&M costs?
- Page 19 of 19, Figure 4.7 In the capital costs illustrated in the figure, do these costs include interest during the construction period?

#### Task 5 Memo

- Page 2 of 5, 2<sup>nd</sup> Paragraph It is suggested that water availability data be provided to clarify why the diversion at Bastrop and Town Lake are not appropriate for all withdrawals.
- Page 3 of 5, Alcoa/CPS Groundwater It is suggested that additional language be included about the actual quantity of water entering the treatment plant from this source (how did you account for channel and evaporative losses), or was that taken into account at this level of study?

#### Task 6 Memo

• General Comment – Throughout this memo text and tables, please change the SAWS Culebra Reservoir and Green Mountain Reservoir to Culebra Pump Station and Green Mountain Pump Station respectively.

#### Task 7 Memo

• **General Comment** – please change the word "Reservoir" to "Pump Station" throughout the SAWS connection point write up.

#### Task 3 & 10 Memo

- It is suggested that the memo title "Economic Analysis" be changed to "Financial Analysis".
- Page 3 of 4 Add language to state what discount rate was utilized.
- Page 3 of 4, alternative 1C, Are the costs of a TPDES permit included?