# Table of Contents

Executive summary ........................................................................................................... 2  
Supply and Demand: Planning Scenario 1 & Planning Scenario 2 ................................... 2  
Recommendations ............................................................................................................ 3  
1 Background .................................................................................................................. 6  
2 Task Force Objectives ............................................................................................... 7  
3 Methodology ................................................................................................................ 7  
  3.1 Phase One: Review of Population and Demand Projections ............................... 7  
  3.2 Phase Two: Determination of Future Needs ....................................................... 8  
  3.3 Phase Three: Analysis of Future Water Supply Options .................................... 8  
  3.4 Phase Four: Formulation of Alternative Strategies ............................................. 9  
4 1998 Water Resource Plan ....................................................................................... 9  
5 Population Planning Scenarios .................................................................................. 11  
  5.1 Population Projection Methodology ................................................................... 11  
  5.2 Population Planning Scenarios .......................................................................... 12  
  5.3 Revised Population Forecasts ............................................................................ 13  
6 Water Demand Projections ....................................................................................... 14  
  6.1 Consumption per capita per day: 2005 Forward ............................................. 15  
  6.2 Planning Year Methodology .............................................................................. 15  
  6.3 Water Demand Projections .............................................................................. 17  
7 Evaluation of Supply and Demand: What is Needed? .......................................... 19  
  7.1 Existing Supplies .............................................................................................. 19  
  7.2 Additional Supply Needs: Planning Scenario 1 ............................................ 21  
  7.3 Additional Supply Needs: Planning Scenario 2 ............................................ 22  
8 Project Analysis .......................................................................................................... 23  
  8.1 Least Cost ........................................................................................................... 23  
  8.2 Contribution to Diversification ......................................................................... 25  
  8.3 Technical Feasibility ........................................................................................ 27  
  8.4 Risk .................................................................................................................... 29  
9 Task Force Recommendations .................................................................................. 31  
  9.1 Project Recommendations ................................................................................ 31  
  9.2 Implications for Planning Scenario 1 .................................................................. 33  
  9.3 Implications for Planning Scenario 2 .................................................................. 33  
  9.4 Aggregate Diversification .................................................................................. 36  
Appendix ......................................................................................................................... 38
EXECUTIVE SUMMARY

In 1998, after much analysis, community deliberation, and planning, the San Antonio City Council adopted the fifty-year Water Resource Plan (1998 Plan) of the San Antonio Water System (SAWS). The 1998 Plan established the guiding principles for water resource development and defined SAWS “...leadership role in the protection and development of water supplies for the San Antonio and Bexar County area.”

The adoption of the 1998 Plan and subsequent approval in 2000 of a multi-year funding mechanism to implement the plan, established the requirement that SAWS periodically review the 1998 Plan and make necessary adjustments in response to “… new policies, changing circumstances, and new technologies.” To fulfill this requirement, the President/CEO, David Chardavoyne, appointed an ad hoc Water Supply Task Force (Task Force) in February 2005 to conduct a comprehensive review of water supply plans.

To guide the evaluation process, the Task Force reaffirmed SAWS commitment to the principles governing the development of the 1998 Plan. In addition, the Task Force made more explicit SAWS commitment to identify a portfolio of water supply projects that will enable SAWS to provide an affordable, diversified, and sustainable supply of water resources now and in the future. To fulfill these commitments, the Task Force reevaluated the entire water resource plan, including population projections, per capita consumption estimates, aggregate demand forecasts, and supply development options to ensure that SAWS approach:

- Provides adequate water supplies, even during critical drought periods
- Postpones dependence on more costly resource supplies, if possible
- Promotes greater use of non-Edwards Aquifer supplies in the long-term
- Fulfills the needs of San Antonio customers, while providing the region with the option to utilize SAWS as the regional wholesale provider
- Recognizes the reality that future supplies must be affordable.

Supply and Demand: Planning Scenario 1 & Planning Scenario 2

The Task Force developed two scenarios to be used in planning for future water supply requirements: Planning Scenario 1 and Planning Scenario 2.

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2 Ibid 10.
In Planning Scenario 1 (PS1), SAWS serves a geographic area that is not much greater than its existing service area. PS1 includes the current SAWS service area; and the cities of Alamo Heights, Elmendorf, Kirby, Leon Valley and Shavano Park. In Planning Scenario 2 (PS2), SAWS serves as the regional wholesale water provider for all of the service areas and entities included in Planning Scenario 1; in addition to Atascosa Water Supply Corporation, Bexar Metropolitan Water District, and East Central Water Supply Corporation; the cities of Converse, Fair Oaks Ranch, Live Oak, Selma, and Windcrest; and portions of Comal, Kendall and Medina Counties. PS2 allows for regional planning and implementation, taking in the entire City of San Antonio Extraterritorial Jurisdiction in the northwestern portion of the County.

Assuming that the local Aquifer Storage and Recovery (ASR) project is used as a supply reserve, under PS1, SAWS current supplies during a critical drought period exceed demand in 2006 and 2007. Beginning in 2008, demand exceeds existing supply during a critical drought period, resulting in a shortfall that will grow from 4,786 acre-feet in 2008 to over 71,045 acre-feet in 2050. This shortfall necessitates that additional supplies be identified and implemented to meet future demand.

If regional communities and City Council elect SAWS to become the regional wholesale water provider, SAWS will accommodate growth outside its existing service area. The cost to develop additional water supplies for the region will be shared with regional communities and other water providers. In this scenario (PS2), the ASR will be used as a supply reserve; and the difference between existing supplies and future demand during a critical drought period grows from 6,282 acre-feet in 2006 to more than 124,896 acre-feet in 2050.

**Recommendations**

To identify future projects that could furnish sufficient supplies to meet these demands, the Task Force established several overarching criteria to weigh the merits of each project. These criteria were: least cost, contribution to diversification, technical feasibility, and risk. To determine the least cost alternative, the Task Force calculated the total incremental cost of each project (including operations, maintenance, and capital costs), discounted by the SAWS weighted average cost of debt. These total cost figures were then used to assess the expected annual cost per acre-foot of yield for each project. Contribution to diversification was evaluated by analyzing the incremental impact of each project on the percentage of non-Edwards Aquifer supplies in 2050. Technical feasibility was divided into two general areas: availability of supply and constructability. Finally, a risk matrix allowed for consideration of legislative and regulatory risks, as well as other factors.

Based on the results of this in-depth analysis, the Task Force recommends that the Board of Trustees authorize SAWS to undertake the following actions to ensure that it can provide the additional water supplies required under PS1 and accommodate the growth anticipated
under PS2, if the greater San Antonio community elects to have SAWS serve as a regional wholesale water provider.

- **Edwards Supply**: The Task Force recommends that SAWS solidify and increase its Edwards Aquifer supply. A portion of this strategy involves converting existing leases (currently 25,000 acre-feet) to permanent water purchases. An additional 35,000 acre-feet of water rights will also be acquired to supplement short-term supply needs and facilitate better management of the Edwards Aquifer.

- **Recharge Initiative**: The Task Force recommends that SAWS continue to actively participate in the Nueces River Basin Feasibility Study and Cibolo Creek Watershed Feasibility Study. Both studies are on-going and contain local and federal partners. In addition, a continued effort will be made with the EAA to solidify the recharge credit rules.

- **Brackish Groundwater**: The Task Force recommends that SAWS pursue a brackish groundwater desalination project to assist in diversifying overall supplies. This project could generate a moderately sized (up to 10,000 acre-feet) water supply facility with the potential to offset summer "peaks". Innovative procurement methods, such as Design Build Operate (DBO) and Build Own Operate Transfer (BOOT) should be explored, because estimates of savings through this approach are likely to be 20-30% of lifecycle costs.

- **Regional Carrizo**: The Task Force recommends that SAWS hire an outside consultant to conduct an independent and objective evaluation of the management and phase options for this project. This evaluation should result in a determination of the most effective approach to the design and implementation of the Regional Carrizo project.

- **LCRA-SAWS**: The Task Force recommends that this project continue to be explored as an option for meeting long-term needs. However, renegotiation of the existing contract within the project’s statutory constraints is necessary to more competitively address cost, control, yield, and the timing of the water delivery.

- **Simsboro**: The Task Force recommends termination of the existing contract with Alcoa in accordance with its terms and use. With respect to SAWS-owned water rights, SAWS should explore the possible use or disposition of these rights, as opportunity allows.

- **Lower Guadalupe Water Supply Project**: The Task Force recommends that SAWS end its participation in the Lower Guadalupe Water Supply Project due to the continued uncertainty
with the surface water and groundwater regulatory environment of the project area.

- **Other Potential Projects**: The Task Force recommends that SAWS continue evaluations of other potential water supply projects, including but not limited to: Coastal Desalination, Recharge and Recirculation, Mesa Water Supply Project, Trinity Aquifer, and Western Edwards Water projects.

Combined, these recommendations enable SAWS to provide affordable, diversified, and sufficient water supplies to meet demand in both PS1 and PS2. PS1, which is described fully in Section 5.2, is based on 1984 planning year conditions. In the short-term, the need for additional supplies are met by converting Edwards Aquifer leases to permanent acquisitions and acquiring additional Edwards Aquifer supplies through 2010. By the end of 2006, SAWS will have outlined its plans for the development of the Brackish Desalination project; this project is expected to be brought on line by 2010. After 2010, another non-Edwards Aquifer supply, the Regional Carrizo project is introduced. In order to meet long-term needs, the Recharge Initiative project is implemented. Under these planning assumptions, all of the projected demands through the year 2050 are met.

To accommodate demand in PS2 (which similar to PS1 is based on 1984 planning year conditions and described in Section 5.2) the Edwards Acquisition program is again accelerated to meet short-term demands between 2006 and 2010. Due to increases in the short-term shortfall, the Regional Carrizo project is brought on line in 2008, followed by Brackish Desalination in 2010. The Recharge and LCRA-SAWS projects are available to meet long-term demands. Using these planning assumptions, all of the projected demand in PS2 is met through 2050.
1 BACKGROUND

In 1998, after much analysis, community deliberation, and planning, the San Antonio City Council adopted the fifty-year Water Resource Plan (1998 Plan) of the San Antonio Water System (SAWS). The 1998 Plan established the guiding principles for water resource development and defined SAWS “...leadership role in the protection and development of water supplies for the San Antonio and Bexar County area.”3

The adoption of the 1998 Plan and subsequent approval in 2000 of a multi-year funding mechanism to implement the plan, established the requirement that SAWS periodically review the 1998 Plan and make necessary adjustments in response to “... new policies, changing circumstances, and new technologies.”4 To fulfill this requirement, the President/CEO, David Chardavoyne, appointed an ad hoc Water Supply Task Force (Task Force) in February 2005 to conduct a comprehensive review of water supply plans.

The Task Force consisted of the following members:

Mr. David Chardavoyne, President/CEO
Mr. Alex Briseño, Consultant and former San Antonio City Manager
Ms. Kelley Neumann, Vice President of Facilities Engineering and Construction
Ms. Susan Butler, Director of Water Resources
Mr. Dan Crowley, Financial Planning Manager
Mr. Steve Kosub, Corporate Counsel for Water Resources

In the course of its work, the Task Force received invaluable contributions and assistance from many members of SAWS staff. Special thanks are owed to Mr. Darren Thompson for his skilled data analysis; as well as Mr. Fred Arce and Mr. Kevin Morrison for their assistance in preparing water resource project background information; Mr. Gary Guy for his assistance with the cost evaluation process; and Mr. Lance Freeman for his support revising demographic information. The group was also ultimately joined by Mr. Doug Evanson, Chief Financial Officer, and Ms. Janelle Okorie, Vice President of Strategic Resource and Business Planning.

This report reviews the Task Force’s objectives, the methodology applied to the evaluation process, and the recommendations for structuring SAWS approach to the development of affordable, diversified, and sufficient water supplies. The document is being distributed to the public to assist the Task Force and SAWS with soliciting feedback on these important community issues.

2 TASK FORCE OBJECTIVES

The Task Force set out to reevaluate the entire water resource plan, including population projections, per capita consumption estimates, aggregate demand forecasts, and supply development options available to meet the demand between 2006 and 2050. To guide the evaluation process, the Task Force reaffirmed SAWS commitment to the principles governing the development of the 1998 Plan. In addition, the Task Force made more explicit SAWS commitment to identify a portfolio of water supply projects that will enable SAWS to provide an affordable, diversified, and sustainable supply of water resources now and in the future.

To fulfill these commitments, the Task Force’s objective was to ensure that SAWS approach:

- Provides adequate water supplies, even during critical drought periods
- Postpones dependence on more costly resource supplies, if possible
- Promotes greater use of non-Edwards Aquifer supplies in the long-term
- Fulfills the needs of San Antonio customers, while providing the region with the option to utilize SAWS as the regional wholesale provider
- Recognizes the reality that future supplies must be affordable.

3 METHODOLOGY

The Task Force developed a multi-phase approach to its analysis, and applied a systematic methodology to project evaluation. The methodology was divided into the following four phases.

3.1 Phase One: Review of Population and Demand Projections

The first phase comprised a detailed review of the assumptions underlying population projections and expected consumption per capita per day. The Task Force refined the projections from the Texas Water Development Board (TWDB) and the Texas State Data Center (TSDC) by assigning expected growth within the County geographically based on expected land use. Moreover, it reviewed the potential for increased water use efficiency over time and during drought conditions. Using these refined projections, the group developed a “base case” (which became known as Planning Scenario 1), as well as an “expanded service area case” (which became known as Planning Scenario 2) to be used as the basis of demand projections in future planning scenarios.
3.2 Phase Two: Determination of Future Needs

The Task Force identified those water supply projects that are currently on line or that will be on line by the beginning of 2006. The yield from existing water supplies was projected forward and compared to demand so that an estimate of the additional supply needs for Planning Scenario 1 and Planning Scenario 2 could be determined.

3.3 Phase Three: Analysis of Future Water Supply Options

The Task Force developed a list of quantitative and qualitative evaluation criteria that were used to ascertain the economic efficiency, diversification, technical feasibility, and risk associated with pursuing existing and potential water supply projects. Each project was evaluated and ranked in relation to other projects for each of the following criteria:

- **Least Cost**: Using historical financial data, construction cost estimates, and engineering reports prepared for and by SAWS, the Task Force calculated the total cost of each project using the CPI index to convert all costs to 2004 dollars and discounted these costs by the SAWS weighted average cost of debt (4.8%). Total costs were used to determine the expected annual cost per acre-foot of yield for each project on a 2004 cost basis.

- **Technical Feasibility**: The evaluation of technical feasibility included an assessment of the physical and technological aspects of construction; and the infrastructure and natural resource requirements necessary to carry out each project. The criteria used to evaluate technical feasibility were the availability of supply and constructability. The Task Force defined availability of supply as the degree to which sufficient quantities of water are available to meet shortfalls when additional supplies are needed. In contrast, constructability refers to the ease of design, infrastructure planning, and construction.

- **Diversification**: The Task Force evaluated each project’s contribution to diversification by determining the percent of non-Edwards supplies in 2050, assuming the incremental addition of each project. The percent of non-Edwards supplies for each project was then compared to ascertain which projects would have the greatest long-term impact on diversification.

- **Risk**: Developing a water supply project is inherently filled with risks throughout each stage of design, construction, and project implementation. These risks have the potential to cause significant delays in project design and construction and may render project implementation unachievable. While many types of risks could adversely affect large-scale projects, the Task Force focused on the impacts of environmental, legislative, and regulatory risks. Legislative and regulatory risks were defined as the likelihood that state groundwater and surface water law
would facilitate or impede the development of future water supplies. In contrast, environmental risks refer to a project's potential impacts on ecosystems, water quality, and sustainability.

3.4 Phase Four: Formulation of Alternative Strategies

In the final phase, the Task Force formulated alternative strategies for each project. The implications of these combined strategies were then reviewed to ensure that SAWS is able to achieve each of the objectives outlined in Section 2 of this report.

4 1998 WATER RESOURCE PLAN

The 1998 Plan defined the need for additional water supplies for the period between 2000 and 2050. The population projections used in the 1998 Plan were distributed through the Texas Water Development Board (TWDB) and based on information provided in the 1990 Census (Figure 1). At the time at which the 1998 Plan was released, these population projections represented the best data available through the TWDB.

The release of the 2000 Census made clear the need to update the population projections used in the 1998 Plan, because of the availability of information that more accurately depicts the dynamic nature of growth in the San Antonio and Bexar County region. In particular, two sets of assumptions governing population growth required revision: total population growth and ethnic and minority population growth. The 1990 Census inflated growth estimates for the total population of the San Antonio and Bexar County region, because it assumed that large segments of the population had been undercounted during the sampling process. In addition, the 1990 Census carried a high coefficient for ethnic and racial minority birth rates. Combined, these factors resulted in a population forecast in which the City of San Antonio more than doubled by 2050.

Demand projections for 1998 Plan were developed by utilizing TWDB population projections multiplied by consumption goals developed in 1997 by SAWS. Figure 2 shows the original demand projections from 1998 Plan.

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5 The term "coefficient" refers to the number of ethnic and racial minority persons per 1,000 people in the total U.S. population. In the 2000 Census, ethnic and racial minorities included people, who identified themselves as being of Hispanic or Latino origin or a member of a minority race. Hispanic origin refers to persons of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. Minority race categories include Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander.
A comparison between the water demand estimates outlined in the 1998 Plan and the actual consumption of water between 2000 and 2004 demonstrates the degree to which the 1998 Plan differed from actual customer demand. The water demand projections in the 1998 Plan specified an increase from 188,555 acre-feet to 197,375 acre-feet over this period. In contrast, actual demand declined by approximately 10%. This difference results in an overestimation of annual demand of between 25,000 acre-feet and 35,000 acre-feet (Figure 3). The lower than projected population growth, significant reduction in per capita consumption, and the higher than average rainfall during many of the last five years, explain a significant amount of this difference.
5 POPULATION PLANNING SCENARIOS

The release of the 2000 Census provided a basis for updating the population projections used in the 1998 Plan. In addition, to more accurately reflect future growth in the region, the Task Force developed two planning scenarios: Planning Scenario 1 (PS1) and Planning Scenario 2 (PS2). In PS1, SAWS provides for population growth within its existing service area, and the incorporated cities within its boundaries (except those served by Bexar Metropolitan Water District), without geographic expansion into other areas in Bexar County. In contrast, PS2 allows for regional expansion, taking in the majority of the county and areas outside the county that are within the City of San Antonio Extraterritorial Jurisdiction.

5.1 Population Projection Methodology

The proposed population projections over the next fifty years are based on the use of state and local models. The TWDB projects population based on the existing Texas State Data Center model (TSDC). The model uses the most recent national census (in this case, 2000), applies birth and death rates, as well as factors for migration and other issues that affect changes in population. These projections are reviewed and approved as part of the Region L planning process every five years. The population projections approved by Region L for Bexar County were used as the “sum total” or aggregate of expected population growth within the county.

The Task Force refined the population projections within the County using a model developed by the local Metropolitan Planning Organization (MPO). The MPO model projects growth in 900 planning areas within the County called Transportation Analysis Zones (TAZ). Each TAZ has a different growth rate determined by factors such as birth rates, death rates, ages, households, vacant land available, proximity to economic activity centers, and expected location of new transportation corridors.

The Task Force used the local MPO model based on TAZs to develop population projections for each Certificate of Convenience and Necessity (CCN) or service area within the County. These projections rely on TAZ growth rates, which consider the known planned developments and conservation areas, such as parks and flood plains. This methodology results in different population projections than the projections developed...
by the TWDB for CCNs within Bexar County. The TWDB methodology allocated population to purveyors by the size of the service area, with a single growth rate being applied across the County. In contrast, the MPO model allocates growth rates at the sub-county level, taking into account the fact that some areas are already densely developed, while others are growing rapidly. The Task Force believes that this additional level of refinement more accurately projects expected growth during the planning horizon.

Use of the local MPO model has resulted in a shift of population growth from the SAWS service area to Bexar Metropolitan Water District and others in the County. The re-allocation of population within Bexar County has resulted in a reduction in projected population within the SAWS service area of almost 150,000 persons in 2050. For the same year, the Bexar Metropolitan Water District service area projected population is expected to increase by approximately 82,000, and the remainder of the Bexar County service areas will gain approximately 68,000 people over the original projections.

5.2 Population Planning Scenarios

In PS1 (Figure 4), SAWS serves a geographic area that is not much greater than its existing service area. PS1 includes the current SAWS service area, the cities of Balcones Heights, China Grove and Olmos Park, in addition to the incorporated cities of Alamo Heights, Elmendorf, Kirby, Leon Valley and Shavano Park. Population projections used in the 1998 Plan represent approximately the same geographic area as PS.

![Planning Scenario 1](image)

In PS2 (Figure 5), SAWS serves as the regional wholesale water provider for all of the service areas and entities included in Planning Scenario 1; plus Atascosa Water Supply Corporation, Bexar Metropolitan Water
District, East Central Water Supply Corporation; the cities of Converse, Fair Oaks Ranch, Live Oak, Selma, and Windcrest; and portions of Comal, Kendall and Medina Counties. PS2 allows for regional expansion, taking in the entire City of San Antonio Extraterritorial Jurisdiction in the northwestern portion of the County.

5.3 Revised Population Forecasts

The availability of new data on population growth enabled the Task Force to revise the population projections included in the 1998 Plan. In this 2005 update, the projected population of PS1 increases from 1,216,720 in 2006 to 1,791,681 in 2050, an increase of more than 500,000, or 47% between 2006 and 2050 (Figure 6).

In comparison, the projected population of PS2 increases from 1,507,292 in 2006 to 2,403,458 in 2050, an increase of almost 900,000, or 59% (Figure 7).
6  WATER DEMAND PROJECTIONS

The Task Force developed a series of revised demand estimates to account for lessons learned based on SAWS successful conservation initiatives, and the selection of the 1984 planning year, which represents the driest three-year period in the last 30 years. In comparison to the 1998 Plan, the revised demand estimates adjust per capita consumption to reflect the attainment of the region’s previous water conservation goals. In addition, revised demand estimates reflect the use of the 1984 planning year and estimates of the impact of critical drought period restrictions on public consumption.
6.1 Consumption per capita per day: 2005 Forward

The Task Force relied heavily on SAWS Conservation Department to examine trends in gallons per capita per day (GPCD), and to provide revised conservation targets and consumption estimates through 2050. In 2004, the San Antonio community achieved the previously established 2025 goal of 132 GPCD. Looking forward, the Conservation Department is committed to building on its success, incorporating the provisions of the recently approved Conservation Ordinance (Ordinance 100322, passed January 20, 2005), and reducing GPCD further without interfering with the community’s growth policy or quality of life.

The Conservation Department and Task Force believe that our customers will be able to reach a minimum GPCD of 116 in a normal year and 122 GPCD in a dry year by the end of 2017 (Figure 8). The normalized GPCD for average weather conditions in 2004 is 129. The reduction to 116 will be accomplished in 2017 through: (1) an expected seven-gallon reduction due to increased recycled water use; (2) three GPCD would result from increased use of low-flow toilets; and (3) three GPCD from the implementation of the new conservation ordinance.

Once these targets are attained in 2017, it is projected that these GPCD figures will be sustained through 2050.

Figure 8 Consumption Goals

6.2 Planning Year Methodology

The Task Force defined a specific planning year, in order to adequately provide for projected demand. The planning year represents a dry year or group of dry years other than the drought of record that occurred in
The selected planning year is a “most likely” planning scenario, rather than the potentially “worst case” drought of record. It is used to evaluate expected availability of various supplies and to ensure that total supplies provide for projected water demands, even during critical period conditions.

To determine the appropriate planning year for the 2005 Update, the Task Force conducted an analysis of the past 30 years. This analysis indicated that more recent years were more representative of the current population and water demand patterns, and therefore more accurately represented a reasonable simulation of expected conditions and availability of supply, than the 1956 drought of record. The Task Force reviewed several years of data to determine the single year that should be used for planning purposes. The Task Force selected 1984 as the new basis for the water supply planning year, because:

- 1984 was the only year in the past thirty years that was the third year of a three-year drought, in which each year had annual rainfall less than 26.2 inches
- There have been no three-year dry periods in the last thirty years more severe than 1982-1984
- The Edwards Aquifer levels in 1984 were the lowest in the last thirty years, dropping into the low 620' mean sea level (MSL) range at the J-17 index well in Bexar County. This is the well used to determine various stages of critical period, or drought, during which Edwards Aquifer pumpers must reduce their water usage. Application of current critical period rules to the 1984 planning year would have resulted in the region spending all but 88 days (257 days) in varying levels of critical period with over 100 days in the most severe Stage IV restrictions
- Current commercial, industrial, and residential consumption patterns correspond more to consumption patterns during the last thirty years, than they do to the same patterns in the 1950.

The process for selecting the 1984 planning year is analogous to the process for constructing a water retention dam. The dam is conservatively designed to retain or pass the 100-year rainfall event, but not for the absolute worst case, historic rainfall. Similarly, the 1984 planning year is a conservative estimate of likely conditions: it represents the driest three-

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6 The drought of record was not used to project supply forecasts in the 1998 Plan. Instead, SAWS qualitatively considered the reduction in Edwards that would result from drought of record conditions, and selected a year-round 15% reduction in Edwards Aquifer supplies as the most reasonable estimate of future conditions. This 15% is equivalent to Stage III cutbacks. In the 2005 Update, the Task Force chose a 12.9% reduction in Edwards Aquifer supplies in 2006 and 2007. For years 2008 and beyond, the Edwards Aquifer supplies were reduced by 9.8%.
Selection of the 1984 planning year has important implications for demand. Because dry year demand is higher than wet year demand, it is necessary to plan supply to dry year demand. However, during periods of drought, dry year demand will be reduced by critical period management (CPM) water use restrictions imposed by city ordinance. The Task Force sought to determine what degree of reduction from dry year demand could be reasonably and prudently anticipated as a consequence of CPM restrictions.

Current (2005) CPM restrictions were in effect in 2000 when San Antonio experienced extreme dry year conditions. As such, the Task Force felt it was reasonable to use this year as a model by which to predict the effect of CPM restrictions in the future. In 2000, water use was reduced by 14.1% over six months of critical period Stage I and II restrictions. The restrictions were very effective early in the period (19.7% reduction in the first month) and less effective as the drought continued throughout the year.

Stage I and II restrictions relate primarily to landscape watering. Landscape watering in San Antonio has been reduced in recent years to roughly 70% of its pre-2000 (normal year) level. It therefore seemed reasonable to assume that drought restrictions in CPM Stage I and II would now have 70% of the impact that the same restrictions had in 2000. Thus, the Task Force assumed that the restrictions would reduce dry year demand by at least 9.9% (70% of 14.1%) over a nine-month term of the 1984 planning year.

To ensure that demand predictions err on the side of adequate supply, the Task Force adjusted this figure to 5% for a full planning year. Actual demand for purposes of supply was then calculated as 95% of dry year demand. Coincidentally, this analysis results in the effective equivalent of planning dry year supply to demand under current CPM Stage I restrictions. The availability of additional Stage II, III, and IV restrictions provides an additional buffer against the possibility of an even more extreme drought.

### 6.3 Water Demand Projections

Using the updated calculations for both population and per capita consumption goals, revised water demand projections have been developed for both planning scenarios. Each scenario will be referred to as a separate plan. With the reduced population projections and lowered consumption goals, the revised demand projections are lower than those included in the 1998 Plan.

The demand projections of PS 1 include population projections and SAWS consumption goals. In this scenario, demand increases by 37% (to over 230,000 acre-feet) between 2006 and 2050 (Figure 9).
In PS2, demand increases 48%, from 210,120 acre-feet in 2006 to 312,028 acre-feet in 2050 (Figure 10).

Figure 9 Planning Scenario 1 – Critical Period Demand

<table>
<thead>
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<th>Year</th>
<th>Population</th>
<th>GPD1</th>
<th>Demand</th>
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<td>1,216,720</td>
<td>133</td>
<td>213,328</td>
</tr>
<tr>
<td>2010</td>
<td>1,282,967</td>
<td>129</td>
<td>220,588</td>
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<td>2015</td>
<td>1,363,505</td>
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<td>227,677</td>
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<td>2020</td>
<td>1,444,042</td>
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1 Demand includes a 5% reduction during Stage I of CPM
2 Demand is represented in acre-feet

Figure 10 Planning Scenario 2 – Critical Period Demand

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<th>Year</th>
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<td>2020</td>
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1 SAWSC CCN (Includes Balcones Heights, China Grove and Olmos Park) Alamo Heights, Elmendorf, Kirby, Leon Valley and Shavano Park
2 Demand includes a 5% reduction during Stage I of CPM
3 Demand is represented in acre-feet
Figure 11 provides a comparison of the demand projections for the 1998 Plan, PS1 and PS2. Demand projections used in the 1998 Plan are well above demand projections in PS1 by a magnitude of 30,000 acre-feet in 2006 to 121,000 acre-feet in 2050. As Figure 11 clearly illustrates, the 1998 Plan anticipated much higher demand (which was driven largely by the forecast for much higher population growth), than what is now expected based on the most accurate data currently available.

PS2 demand projections are greater than those in the 1998 Plan through 2030. Beyond 2030, the projections included in the 1998 Plan exceed PS2.

7 EVALUATION OF SUPPLY AND DEMAND: WHAT IS NEEDED?

7.1 Existing Supplies

In the past 5-years, SAWS has completed significant research and development activities to meet the tasks outlined in the 1998 Plan. Completion of the SAWS water recycling system in 2001 yielded the first of many projects during this period. Water from the Trinity Aquifer (Oliver Ranch and BSR projects) was delivered in February 2002, and represented the first non-Edwards drinking water supply to be delivered to SAWS customers. Phase I of the Aquifer Storage and Recovery Project was completed in June 2004, providing SAWS with the much needed ability to store Edwards water. In addition, the Western Canyon Project will deliver the first surface water to SAWS in 2006.

The following is a description of projects that are currently on line or will be on line by 2006.
- **Edwards Aquifer Authority Permit:** The Edwards Aquifer will continue to be San Antonio's primary source of water. SAWS existing Edwards inventory (including base permit and acquisitions) is 196,425 acre-feet per year. Current rules of the Edwards Aquifer Authority allow use of approximately 35,000 acre-feet of so-called “junior” water rights from this inventory on an interruptible basis only. These rules will expire on December 31, 2007. It is possible that the EAA will provide for interruptible use of these “junior” rights in the future. However, the Task Force has conservatively assumed that they are not available at all under planning year conditions. Thus, under planning year conditions, SAWS pumping permit from the EAA is expected to provide approximately 134,593 acre-feet per year through 2007, and approximately 124,052 acre-feet per year thereafter. Potential changes in legislation or federal Incidental Take Permitting that could affect availability of Edwards water are not reflected in the plan.

- **Purchase/Lease of Additional Edwards Rights:** SAWS has leased 25,000 acre-feet from other permit holders in the Edwards Region. SAWS will work towards converting the volume of leased water in the inventory into permanent acquisitions.

- **Recycled Water:** In 2001, SAWS completed the first phase of its system to recycle treated wastewater effluent for irrigation and industrial uses. The project is designed to deliver up to 35,000 acre-feet per year, of which about 28,000 is available for use by businesses, parks and industries. About 7,000 is used to ensure flow into the San Antonio River and Salado Creeks during drought, replacing flow from Edwards wells. Over 23,000 acre-feet of water are under contract to recycled water customers or allocated to protect stream flow.

- **Oliver Ranch/BSR:** SAWS reached a milestone in the introduction of the first non-Edwards drinking water supply in February 2002 from the Lower Glen Rose/Cow Creek formation of the Trinity Aquifer in northern Bexar County. Technical evaluations continue to show that approximately 5,000 acre-feet of additional supply are sustainable from this source.

- **Western Canyon Project:** SAWS, SARA, City of Fair Oaks Ranch, City of Boerne and other water providers have contracted with the Guadalupe-Blanco River Authority to develop a surface water project from Canyon Lake. SAWS initial supply from the project is expected to be 8,500 acre-feet per year starting in 2006 with a long-term supply of 4,000 acre-feet. This is the first regional project as well as the first surface water source to be introduced by SAWS. This water supply will terminate by contract in 2037.
Aquifer Storage and Recovery Project: SAWS has completed construction of Phase I of the Aquifer Storage and Recovery Project and expects to complete the final phase of construction by the end of 2005. This project calls for the injection of Edwards Aquifer water into sand formations of the Carrizo Aquifer in south Bexar County for storage during times of high availability and withdrawal during periods of high demand and low availability. To date, SAWS has stored an estimated 10,000 acre-feet at the project site. Studies show that SAWS can obtain approximately 30,000 acre-feet of storage and retrieval from this project.

Local Carrizo Project. The Aquifer Storage and Recovery Project site includes the capacity for production and treatment of approximately 6,400 acre-feet of native Carrizo water. Additional infrastructure (primarily a wellfield) is required to utilize this supply. Additional transmission pipelines may also be necessary if the water is to be utilized during periods of aquifer injection.

7.2 Additional Supply Needs: Planning Scenario 1

Figure 12 illustrates additional supplies needed in PS1. The Edwards Aquifer supply for each year is reduced by 12.9% for the years 2006 and 2007. Beyond year 2007, an Edwards reduction of 9.8% was incorporated. The four other projects displayed in the supply side of the graph are Trinity, Local Carrizo, Western Canyon and ASR. The ASR project is treated as a “supply reserve,” and accordingly displayed above the red demand line. This “supply reserve” could be used to meet peak demands during two consecutive dry years. Because the project was designed to meet peak summer needs and be operated on an annual basis, it is not anticipated that water stored in the ASR will be available in the third year of a three-year drought. If the project proves to be able to store additional water or if it is not operated to supplement annual supply, the volume stored could potentially meet needs during the “plan year”. It should be noted that the ASR facility could accommodate either annual peaking demands or two-year storage. It cannot be used for both. Based on long-range weather forecasts and the current high Edwards Aquifer levels, SAWS anticipates utilizing the ASR project as terminal storage.

Between 2006 and 2007, SAWS has existing supply in excess of expected demand. After 2007, if the ASR project is used as a supply reserve and not included as a source of annual supply, there is a shortage of water during the planning year scenario. This supply shortfall is illustrated in Figure 12 in light blue. The shortfall grows from 4,786 acre-feet in 2008 to over 71,045 acre-feet in 2050. This growing shortfall necessitates that additional supplies be identified to meet this demand.
7.3 Additional Supply Needs: Planning Scenario 2

In Figure 13, the available Edwards Aquifer supply for each year is supplemented with supplies from other entities and reduced by the percentage discussed in Section 7. The four other projects displayed in the supply side of the graph are Trinity, Local Carrizo, Western Canyon and ASR. In addition, certain non-Edwards supplies are available to other entities. Again, the ASR project is treated as a “supply reserve” and displayed above the demand line.

Using the SB1 planning methodology to develop the yields for the additional water supplies for other entities, the first year of the planning horizon witnesses a shortfall in this scenario. This supply shortfall is shown in Figure 13 in light blue. The shortfall grows from 6,282 acre-feet in 2006 to over 124,896 acre-feet in 2050.
8 PROJECT ANALYSIS

The Task Force had the difficult assignment of identifying the most favorable water supply projects for San Antonio, while balancing ratepayer impacts. To assist in the evaluation of projects that could meet the need for additional supplies, the Task Force established several overarching criteria to weigh the merits of each potential project. These criteria were: least cost, contribution to diversification, technical feasibility, and risk. To determine the least cost alternative, the Task Force calculated the total incremental cost of each project, discounted by the weighted average cost of SAWS existing debt. These total cost figures were then used to assess the expected annual cost per acre-foot of yield for each project. Contribution to diversification was evaluated by analyzing the incremental impact of each project on the percentage of non-Edwards Aquifer supplies in 2050. The technical feasibility criteria category was divided into two general areas: availability of supply and constructability. The risk matrix also allowed for consideration of legislative and regulatory risks, as well as other factors.

Clearly, each project has positive and negative aspects. Moreover, there are many different methods by which to judge the value of the project; however, the aforementioned criteria were the most meaningful to the Task Force.

8.1 Least Cost

Cost is one of several important criteria that can be used to determine how best to prioritize potential projects. The costs that the Task Force
has utilized in the evaluation of the various projects come from three sources:

- Concept design and feasibility studies generated by external Consultants. These studies generally use as much site specific data as possible to develop specific pipeline routes; well location, size and depth; hydraulically determined pump station location(s); water quality parameters allowing treatment plan design; and specified delivery locations. The Regional Carrizo Project, Simsboro Project and the Lower Guadalupe Water Supply Project cost estimates have been developed in this manner.

- Operations, maintenance, and capital cost estimates generated by internal staff are another source of financial information. Edwards Aquifer Acquisitions and Brackish Groundwater desalination cost estimates were developed using this data.

- Cost estimates provided through the regional planning process are the final source. These estimates use pre-established cost for each integral portion of the project, assumed locations for well fields (actual if known), a pipeline route that usually depicts a straight line for delivery, pump station location picked from a map, assumed water quality based on available data, treatment parameters based on the assumed water quality, and a delivery location somewhere within the county but without knowledge of where the water is needed within the county. Recharge Initiative and LCRA-SAWS cost rely on this data.

Regardless of the source of the data, the Task Force understands the importance of ensuring that all data is evaluated on an equal cost basis. As such, all projects were updated to reflect 2004 costs and utilized the SAWS weighted average cost of debt for annual capital cost determination (4.8%). In order to convert the existing data into a comparable 2004 cost basis, the Consumer Price Index (Consumer Price Index, All Urban Consumers, All Items, 1982-1984 = 100.0) (CPI) was used to update those costs that were not already in 2004 USD. All the existing project cost estimates were converted using the cumulative percentage increases in the CPI.

To compare the projects on a cost basis, an annual cost was developed and an annual firm project yield in acre-feet of water was determined. By dividing the determined annual cost by the hypothetical annual firm yield of the project as planned, the Task Force calculated the annual cost per acre-foot. This cost may be higher if the yield is reduced. A graphic presentation of the annual cost per acre-foot is presented in Figure 14; additional detail on the cost for each project is provided in the Appendix 2.

Using this method of analysis, the Simsboro project is the most costly ($1,023 per acre-foot), while the Edwards Aquifer Acquisitions project is the least costly ($181 per acre-foot). The median cost is associated with
Regional Carrizo at full yield. The annual cost of this project is $851 per acre-foot (Figure 14).

8.2 Contribution to Diversification

Beyond the consideration of cost, the Task Force was committed to maintaining diversification among water supplies as insurance for potential Edwards Aquifer reductions. In order to determine the contribution of project diversification to SAWS existing water resource portfolio, the Task Force assumed that the construction of all projects under consideration would be complete by 2050. The Task Force defined a project's contribution to diversification as the percent of non-Edwards Aquifer supplies available in 2050, assuming the incremental addition of each project. As of January 1, 2006, SAWS existing supply portfolio relies on 11% non-Edwards water. With the expiration of the Western Canyon Project in year 2038, the non-Edwards supply reduces to 7.1%. The figure specified below denotes the increase in the percent of non-Edwards water in 2050, as a result of the singular addition of each of the projects.

Figure 15 provides a graphical comparison of an individual project's contribution to diversification versus cost per acre-foot.
Edwards Acquisition: The acquisition of additional Edwards Aquifer water will reduce the total non-Edwards supply to 5.9% in 2050.

Recharge Initiative: Recharge Initiatives reduce the total non-Edwards supply to 6.5% in 2050.

Brackish Groundwater: The brackish groundwater desalination project would contribute approximately 10,000 acre-feet to SAWS water supply. The addition of this supply would increase the total non-Edwards supply to 12.5% in 2050.

Regional Carrizo: The Regional Carrizo Project would contribute approximately 56,200 acre-feet to SAWS water supplies. The addition of this supply would increase the total non-Edwards supply to 12.5% in 2050.

LCRA-SAWS: The LCRA-SAWS project would contribute approximately 150,000 acre-feet to SAWS water supplies. The addition of this supply would increase the total non-Edwards supply to 51.8% in 2050.

Simsboro: The Simsboro Project would contribute approximately 55,000 acre-feet. The addition of this supply would increase the total non-Edwards supply to 30.7% in 2050.

Lower Guadalupe Water Supply Project: The Lower Guadalupe Water Supply Project would contribute approximately 94,500 acre-feet to SAWS water supply. The addition of this supply would increase the total non-Edwards supply to 41.4% in 2050.
8.3 Technical Feasibility

Project technical analysis is required in order to determine feasibility. Because a water supply project contains many technical components, investigation of each technical portion of the project is required to decide if the project requires further consideration. The Task Force condensed technical feasibility into two key areas. The first area is availability of supply, which was defined as a sufficient quantity of water available to meet shortfalls when additional supply is needed. The second technical criterion addresses constructability over time, which is defined, as the degree of difficulty in completing the design and construction of the project within the timeframe the water supply is required.

A short discussion of key feasibility information follows in the sections below.

- **Edwards Aquifer Acquisitions**: Edwards Aquifer water acquisition has the fewest obstacles to overcome, because such acquisitions are for the most part a “paper transfer” of water rights. Little, if any, new infrastructure is required for SAWS to pump the additional water. Additional water (65,000 acre-feet) is potentially available within the existing regulatory structure of the Edwards Aquifer Authority and in sufficient supply to meet near term goals. Moreover, a functioning market place has evolved for the sale and purchase of these rights.

- **Recharge Initiative**: The recharge initiative offers the potential to allow water to recharge into the Edwards Aquifer primarily from the Nueces River Basin and Cibolo Creek. Recharge enhancement continues to be a viable technology. Small catchment dams can be built on the outcrop or recharge zone of the Edwards Aquifer to capture runoff water which then allows it to naturally infiltrate into the Edwards Aquifer. Construction of these dams will increase water availability within the aquifer. This project is not considered infrastructure intensive.

- **Brackish Groundwater**: Brackish groundwater provides SAWS with a potential source of water that could be developed relatively close to San Antonio. The primary feasibility issues associated with this project concern identification of a sustainable source of water from the candidate aquifer(s), and disposal of the brine concentrate. Additional study will be required to address these standing technical issues. This source of water could assist SAWS in meeting peak demands and/or filling the water shortfall in future years. Based on preliminary TWDB studies, Region L appears to have one of the largest shares of brackish groundwater in multiple aquifers of any location in the Texas. If the project can be located within Bexar County constructability should not be a large issue. Ranking of the technical aspects of this project grouped around the mid-point primarily based on the fact that
additional study is required to better assess feasibility of this project.

- **Regional Carrizo**: In reviewing the technical feasibility of this 62,600 acre-foot project, the Task Force paid particular attention to hydrologic sustainability. SAWS previously completed in-depth groundwater modeling and the results indicate that this project has the potential to supply water for a minimum of 50 years. With aggressive, problem-free construction, the project could provide water in the time frame required to meet SAWS anticipated water shortfall. However, any project that requires the movement of water across long distances has relatively high potential for problems in the acquisition of right of way and pipeline construction.

- **LCRA-SAWS**: The LCRA-SAWS project will require significant work to prove that the project water availability is sustainable over time. Much of the 330,000 acre-feet of water identified in the project will be derived from advanced agricultural conservation techniques that are still not currently proven. Additionally, groundwater availability necessary for the project has not been sufficiently studied or confirmed. Surface water availability and storage volumes are still unknown at this time. With a project of this size and complexity construction will be a major challenge. The Task Force recommends renegotiation of the contract, which is discussed in detail in Section 9.1.

- **Simsboro**: Studies commissioned by SAWS indicate that the project could provide sustainable groundwater water from the Simsboro aquifer for at least 80 years. However, these studies are contradicted by the opinion of the groundwater conservation district in the project area. Any project that requires the movement of water from long distances has a relatively high potential for problems in the acquisition of right of way and pipeline construction. SAWS currently owns approximately 15,000 acre-feet of water associated with this project. SAWS will explore a possible sale, or trade, or other beneficial use of the water supply.

- **Lower Guadalupe Water Supply Project**: The LGWSP project will require significant work to prove that the project water availability is sustainable over time. A majority of the 94,500 acre-feet of water identified in the project will be derived from conjunctive use of surface and groundwater. Additionally, groundwater availability necessary for the project has not been sufficiently confirmed. Surface water availability and storage volumes are still uncertain at this time. With a project of this size and complexity construction will be a major challenge. Although technical feasibility is a large concern, the regulatory and environmental issues associated with the project overshadow technical feasibility considerations.
The Task Force determined that overall technical feasibility would be ranked on a scale from 1 to 5. The lower ranking indicates a more technically feasible project. Conversely, a higher ranking would indicate that a project was considered less technically feasible. Figure 16 provides a comparison of projects technical feasibility versus cost per acre-foot.

8.4 Risk

The Task Force focused on three major risk components: environmental, legislative, and regulatory, and rated these components in aggregate. Environmental risks concern critical issues such as the project’s impact on the health of bays and estuaries, and endangered species. Legislative risk is created by existing or potential statutory impairments to project viability. In contrast, regulatory risk centers on administrative permitting requirements at the local, state and federal level. The following sections provide a short discussion and assessment of project risk. Figure 17 provides a comparison of project risk versus cost per acre-foot.

- **Edwards Acquisitions**: The availability of Edwards Aquifer supplies has been limited by the Texas Legislature. The available supply is inadequate to satisfy SAWS future demand. All Edwards Aquifer supplies are subject to future additional regulatory restrictions on their use which may further limit their availability in periods of drought.

- **Recharge Initiative**: Although future legislation may allow the EAA to build and operate recharge structures, there is much uncertainty about the availability of recharge credits to SAWS. In particular, the holders of water rights in the Nueces Basin continue to express concern about the impact of a recharge project on their
in regards to environmental risk, further study must be performed to ascertain the potential impact of the Recharge Initiative on species in the impoundment area during construction.

- **Brackish Groundwater**: Feasibility work is required to fully evaluate brackish groundwater. These concerns were focused on disposal of the concentrate and potential additional groundwater regulation.

- **Regional Carrizo**: The majority of the Task Force’s concern relates to legislative and regulatory issues. The Gonzales County Underground Water Conservation District (GCUWCD) could decline to grant drilling and production permits; or they could reduce production to less than 2 AF/acre and necessitates acquisition of additional surface acreage under lease. Even if granted, these permits are currently valid for only two years, and drilling must begin immediately. There is much uncertainty associated with development of a project, such as this, in multiple phases. Further, acquisition of too much water could be viewed as detrimental to rural areas.

- **LCRA-SAWS**: Numerous risks are associated with the LCRA-SAWS Water Supply Project. In the environmental area, there is the potential to impact on threatened species in the Colorado River Basin and wetlands along proposed pipeline routes. The Blue Sucker is a threatened species that could be affected by surface water diversions and changes in water quality. In addition, the impact of diversion on freshwater flows to Matagorda Bay could impact bay health and productivity. Other risks of concern for the Task Force were the potential for contested case hearings on surface water and federal 404 permits. There is much uncertainty associated with the availability of necessary permits from local groundwater districts with jurisdiction over parts of the project’s water supply. Changes in environmental flow statutes could reduce the yield of the project. Further, acquisition of too much water could be viewed as detrimental to rural areas.

- **Simsboro**: There are four significant legislative and regulatory risks associated with this project. First, there is a high risk that a groundwater district could decline to grant drilling and operating permits, based on the fact that allocation of available manageable water could have been previously allocated prior to construction of the project. Second, a groundwater district could decline to renew the operating permits after the project is in operation. Operating permits are valid for 5 years. Third, the groundwater district could decline to renew SAWS export permit. The groundwater district Management Plan takes a very restrictive view of management of water resources. The quantity of water available will be based solely on recharge to the aquifer over the outcrop area. Fourth, acquisition of too much water could be viewed as detrimental to rural areas.
- **Lower Guadalupe Water Supply Project**: In regards to legislative and regulatory risks, there is a chance that one or more groundwater districts with jurisdiction over project groundwater supplies could decline to grant drilling and production permits. Statutory restrictions on the priority of surface water rights to be used in the project create a major impediment to the project's viability. In addition, the Task Force also identified many environmental risks to the Lower Guadalupe Water Supply Project. First, the impact of the project's water diversion on freshwater flows to San Antonio Bay could impact the bay's health, with resulting risk to the Whooping Crane population of the Aransas National Wildlife Refuge. Even perceived risk to this highly visible species is a concern. Second, there is the possibility that other threatened species and wetlands may be identified along the lengthy pipeline route.

**Figure 17 Risk Analysis**

Risk was ranked on scale from a minimum of 1 to a maximum of 5. A ranking of 1 indicates a less risky project and a ranking of 5 denotes a more risky project.

### 9 TASK FORCE RECOMMENDATIONS

#### 9.1 Project Recommendations

The Task Force recommends that the Board of Trustees authorize SAWS to undertake the following actions to ensure that it can provide the additional water supplies required under PS1 and accommodate the growth anticipated under PS2, if the greater San Antonio community elects to have SAWS serve as a regional wholesale water provider.

- **Edwards Supply**: The Task Force recommends that SAWS solidify and increase its Edwards Aquifer supply. A portion of this strategy involves converting existing leases (currently 25,000 acre-feet) to permanent water purchases. An additional 35,000 acre-feet of water rights will also be acquired to supplement short-
term supply needs and facilitate better management of the Edwards Aquifer.

- **Recharge Initiative:** The Task Force recommends that SAWS continue to actively participate in the Nueces River Basin Feasibility Study and Cibolo Creek Watershed Feasibility Study. Both studies are on-going and contain local and federal partners. In addition, a continued effort will be made with the EAA to solidify the recharge credit rules.

- **Brackish Groundwater:** The Task Force recommends that SAWS pursue a brackish groundwater desalination project to assist in diversifying overall supplies. This project could generate a moderately sized (up to 10,000 acre-feet) water supply facility with the potential to offset summer “peaks”. Innovative procurement methods, such as Design Build Operate (DBO) and Build Own Operate Transfer (BOOT) should be explored, because estimates of savings through this approach are likely to be 20-30% of lifecycle costs.

- **Regional Carrizo:** The Task Force recommends that SAWS hire an outside consultant to conduct an independent and objective evaluation of the management and phase options for this project. This evaluation should result in a determination of the most effective approach to the design and implementation of the Regional Carrizo project.

- **LCRA-SAWS:** The Task Force recommends that this project continue to be explored as an option for meeting long-term needs. However, renegotiation of the existing contract within the project’s statutory constraints is necessary to more competitively address cost, control, yield, and the timing of the water delivery.

- **Simsboro:** The Task Force recommends termination of the existing contract with Alcoa in accordance with its terms and use. With respect to SAWS owned water rights, SAWS will explore the possible use or disposition of these rights, as opportunity allows.

- **Lower Guadalupe Water Supply Project:** The Task Force recommends that SAWS end its participation in the Lower Guadalupe Water Supply Project due to the continued uncertainty with the surface water and groundwater regulatory environment of the project area.

- **Other Potential Projects:** The Task Force recommends that SAWS continue evaluations of other potential water supply projects, including but not limited to: Coastal Desalination, Recharge and Recirculation, Mesa Water Supply Project, Trinity Aquifer, and Western Edwards Water projects.
Combined, the projects warranting further investment and consideration provide 2.4% more supplies than what was proposed in the 1998 Plan.

9.2 Implications for Planning Scenario 1

These recommendations enable SAWS to provide sufficient water supplies to meet demand in PS1, which as described in Section 5.2, is based on 1984 planning year conditions. The anticipated sequencing of projects is illustrated in Figure 18. In the short-term, the need for additional supplies is met by converting Edwards Aquifer leases to permanent acquisitions and acquiring additional Edwards Aquifer supplies through 2010. By 2006, SAWS will have outlined its plans for the development of the Brackish Desalination project; this project is expected to be brought on line by 2010. After 2010, another non-Edwards Aquifer supply, the Regional Carrizo project is introduced. And, in order to meet long-term needs, the Recharge Initiative project is implemented. Under these planning assumptions, all of the projected demands through the year 2050 were met.

9.3 Implications for Planning Scenario 2

To accommodate demand in PS2, which is based on 1984 planning year conditions, the Edwards Acquisition program was again accelerated to meet short-term demands between 2006 and 2010. Due to increased shortage, the Regional Carrizo project was brought on line in 2008, followed by Brackish Desalination in 2010. The Recharge Initiatives and the LCRA-SAWS were brought in to meet long-term demands. Under these planning assumptions all of the projected demands through the year 2050 were met. The sequencing of projects is illustrated in Figure 19.
Figure 18 Planning Scenario 1
Critical Period Drought Supply vs. Demand – New Projects to Meet Demand

*In the third-year of a three-year drought, the ASR project will not be available

**2006 thru 2007 incorporates Stage IV, beyond 2008 Stage III is lowest CPM reduction

Scenario 1 Demand w/Stage I Cutbacks
Scenario 1 Demand w/Stage III-IV Cutbacks

Legend:
- Edwards Senior Supply
- Converted Edwards Leases
- Trinity Project
- Edwards Acquisitions
- Brackish Desal
- Regional Carrizo
- Recharge Initiatives
- ASR Project*
  *Includes 5% CPM Reduction
  **Includes worst CPM Reduction
**Figure 19 Planning Scenario 2**

Critical Period Drought Supply vs. Demand – New Projects to Meet Demand

*In the third-year of a three-year drought, the ASR project will not be available*

**2006 thru 2007 incorporates Stage IV, beyond 2008 Stage III is lowest CPM reduction**

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</tbody>
</table>

Legend:
- Edwards Senior Supply
- Converted Edwards Leases
- Trinity Project
- Local Carrizo
- Western Canyon
- Other Entities Non-Edwards
- Edwards Acquisitions
- Brackish Desal
- Regional Carrizo
- Recharge Initiatives
- LCRA/SAWS Water Supply Project
- ASR Project

* Includes 5% CPM Reduction
** Includes worst CPM Reduction
9.4 Aggregate Diversification

Based on these recommendations an illustration of aggregate diversification of SAWS water supply (non-Edwards versus Edwards) is provided in the figures below for Planning Scenario 1 and 2 respectively. Diversification of SAWS water supplies under Planning Scenario 1 in 2006 is approximately 11% (Figure 20). In 2013, aggregate diversification increases to 21% and is approximately 30% by 2020.

Under Planning Scenario 2, increased diversification occurs because of the requirement for larger non-Edwards supplies to meet projected demand. In 2006, water supply diversification is approximately 15%\(^7\) this increases significantly to over 50% in the years beyond 2020 (Figure 21).

\(^7\) 15% includes the addition of other entities’ non-Edwards supplies
Appendix
APPENDIX

Edwards Aquifer Acquisition Program

SAWS existing Edwards Aquifer inventory (including base permit and acquisitions) is 196,425 acre-feet per year. This amount includes approximately 25,000 acre-feet of leases. Lease terms are generally 5 or 10 years.

### Edwards Permit

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>159,040</td>
</tr>
<tr>
<td>Total Capital</td>
<td></td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>486,089,856</td>
</tr>
<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td></td>
</tr>
<tr>
<td>Annual O&amp;M (EAA Fee @ $35.79)</td>
<td>16,202,995</td>
</tr>
</tbody>
</table>

Cost/AF: $102

Annual Cost Of Water ($ per 1000 gallons): $0.31

Staff Estimate based on actual M&O

### Edwards Acquisitions

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>38,382</td>
</tr>
<tr>
<td>Total Capital</td>
<td>47,742,735</td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>117,310,745</td>
</tr>
<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>3,035,289</td>
</tr>
<tr>
<td>Annual O&amp;M (EAA Fee @ $35.79)</td>
<td>3,910,358</td>
</tr>
</tbody>
</table>

Cost/AF: $181

Annual Cost Of Water ($ per 1000 gallons): $0.56

Staff Estimate based on actual sales and M&O

### Edwards Leases

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>28,900</td>
</tr>
<tr>
<td>Total Capital</td>
<td></td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>155,955,960</td>
</tr>
<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td></td>
</tr>
<tr>
<td>Annual O&amp;M (EAA Fee @ $35.79)</td>
<td>5,198,532</td>
</tr>
</tbody>
</table>

Cost/AF: $180

Annual Cost Of Water ($ per 1000 gallons): $0.55

Staff Estimate based on actual leasing and M&O Cost
Recharge Initiative

The Recharge Initiative involves two projects, which are intended to build approximately 13,400 acre-feet per year of recharge structures on the Nueces River and Cibolo Creek for supply in the medium-term (after 2010). The Army Corps of Engineers are participating in both projects, and contribute funding for approximately 50% of the study costs. The study period for these potential projects is approximately 6 years. If the projects are determined to be feasible, the Army Corps of Engineers will fund up to 50% of the design and up to 65% of the construction costs.

Other study participants on the Cibolo Recharge Study include the San Antonio River Authority (SARA) and the Guadalupe Blanco River Authority (GBRA) on the Cibolo Recharge Study. The City of Corpus Christi, SARA, GBRA, and the Nueces River Authority are participating in the Nueces Recharge Study.

Cost Basis 2004

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>13,451</td>
</tr>
<tr>
<td>Total Capital</td>
<td>$ 93,009,960</td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>$ 31,099,680</td>
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<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>$ 1,932</td>
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<tr>
<td>Annual Capital (4.8%, 40 years)</td>
<td>$ 5,270,579</td>
</tr>
<tr>
<td>Annual O&amp;M</td>
<td>$ 1,036,656</td>
</tr>
</tbody>
</table>

| Cost/AF            | $ 469 |
| Annual Cost of Water ($ per 1000 gallons) | $ 0.24 |

SB1 estimate revised with 4.8% cost of debt
Desalination

Desalination provides SAWS with a potential source of water that could be developed relatively close to San Antonio. Total yield from a small brackish groundwater desalination project is estimated to be 10,000 acre-feet per year. In contrast, seawater desalination could yield as much as 112,000 acre-feet per year. These projects have the potential to not only diversify SAWS water resources in the short-term, but could also offset peak demands during summer months.

The financial information provided in the tables below includes integration costs.

### Brackish Groundwater Desalination

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>10,000</td>
</tr>
<tr>
<td>Total Capital</td>
<td>$58,288,093</td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>$58,417,300</td>
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<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>$3,705,720</td>
</tr>
<tr>
<td>Annual O&amp;M</td>
<td>$1,947,243</td>
</tr>
</tbody>
</table>

| Cost/AF                     | $565       |
| Annual Cost Of Water ($ per 1000 gallons) | $1.73 |

SB1 preliminary Estimate escalated to 2004 cost basis.

Constant delivery converted to 10,000 acre-feet

### Seawater Desalination

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>112,016</td>
</tr>
<tr>
<td>Total Capital</td>
<td>$1,151,529,265</td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>$2,137,432,410</td>
</tr>
<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>$73,209,558</td>
</tr>
<tr>
<td>Annual O&amp;M</td>
<td>$71,247,747</td>
</tr>
</tbody>
</table>

| Cost/AF                     | $1,290     |
| Annual Cost Of Water ($ per 1000 gallons) | $3.96 |

SB1 update to 2004 cost basis and revised with 4.8% cost of debt
Regional Carrizo Project

The Regional Carrizo project provides multi-phase groundwater delivery from Gonzales and Wilson County. Total yield is 62,600 acre-feet per year. Phase IA involves developing 6,400 acre-feet in southern Bexar County. Phase IB involves the development of approximately 22,600 acre-feet located in western Gonzales County. Designs are currently underway for the well field, pump stations, and transmission pipeline. Phase II involves addition of a well field in eastern Wilson County. This phase will provide approximately 11,000 acre-feet of water. Phase III will include approximately 22,600 acre-feet from eastern Gonzales County.

### Regional Carrizo Project

<table>
<thead>
<tr>
<th>Cost Basis (2004)</th>
<th>Phase IA</th>
<th>Phase IB</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>$ 6,400</td>
<td>$ 22,594</td>
<td>$ 11,000</td>
<td>$ 22,594</td>
<td>$ 62,588</td>
</tr>
<tr>
<td>Total Capital</td>
<td>$129,410,000</td>
<td>$222,017,000</td>
<td>$43,623,000</td>
<td>$144,816,000</td>
<td>$539,866,000</td>
</tr>
<tr>
<td>Total O&amp;M (30 Years)</td>
<td>$66,030,000</td>
<td>$212,970,000</td>
<td>$76,470,000</td>
<td>$213,420,000</td>
<td>$568,890,000</td>
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<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>$8,227,363</td>
<td>$14,114,940</td>
<td>$2,773,373</td>
<td>$9,206,814</td>
<td>$34,322,490</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$2,201,000</td>
<td>$7,099,000</td>
<td>$2,549,000</td>
<td>$7,114,000</td>
<td>$18,963,000</td>
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</tbody>
</table>

| Cost/AF           | $ 1,629  | $ 939    | $ 484    | $ 722     | $ 851   |
| Annual Cost Of Water ($ per 1000 gallons) | $ 5.00 | $ 2.88  | $ 1.49   | $ 2.22    | $ 2.61  |

Concept study costs revised with 4.8% cost of debt
LCRA-SAWS Water Supply Project

The LCRA-SAWS Water Supply Project provides for surface water delivery from the Lower Colorado River Basin. For the entire project, up to 330,000 acre-feet per year could be conserved or added to the lower Colorado River basin. Sources include up to 150,000 acre-feet per year from large off-channel storage ponds, up to 62,000 acre-feet per year from conjunctive use of groundwater and up to 118,000 acre-feet per year from agricultural irrigation conservation.

Of the 330,000 acre-feet per year to be developed, LCRA would transfer up to 150,000 acre-feet of surface water per year to San Antonio.

The financial information provided in the table below includes integration costs.

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
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<tbody>
<tr>
<td>Amount</td>
<td>150,000</td>
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<tr>
<td>Total Capital</td>
<td>$ 1,301,378,000</td>
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<tr>
<td>Total O&amp;M (30/40 Years)</td>
<td>$ 1,929,446,040</td>
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<td>Annual Capital (4.8%, 30/40 years)</td>
<td>$ 82,736,332</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$ 64,314,868</td>
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</table>

Cost/AF $ 980
Annual Cost Of Water ($ per 1000 gallons) $ 3.01

SB1 estimate revised with 4.8% cost of debt
Simsboro Project

The Simsboro Project involves groundwater delivery from Bastrop and Lee County. Total yield for this project is 55,000 acre-feet. All property required for the production of water from the Simsboro Aquifer has been acquired.

The financial information provided in the table below includes integration costs.

<table>
<thead>
<tr>
<th>Cost Basis</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>55,000</td>
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<tr>
<td>Total Capital</td>
<td>$ 535,066,600</td>
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<tr>
<td>Total O&amp;M (30 Years)</td>
<td>$ 667,800,000</td>
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<tr>
<td>Annual Capital (4.8%, 30 years)</td>
<td>$ 34,017,363</td>
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<td>Annual O&amp;M</td>
<td>$ 22,260,000</td>
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</table>

| Cost/AF                                   | $ 1,023         |
|Annual Cost of Water ($ per 1000 gallons)  | $ 3.14          |

Consultant update of SB1 data with revised 4.8% cost of debt
Lower Guadalupe Water Supply Project

The Lower Guadalupe Water Supply Project involves the provision of surface water from the Guadalupe River and groundwater from the Gulf Coast Aquifer. This project will require the construction of 133 miles of 69-inch transmission pipeline through Bexar County. To date, the concept delivery study and Phase I of the groundwater study has been completed.

The financial information provided in the table below includes integration costs.

<table>
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<tr>
<th>Cost Basis</th>
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<td>Total O&amp;M (30 Years)</td>
<td>$ 984,764,970</td>
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<td>Annual Capital (4.8%, 30/40 years)</td>
<td>$ 67,644,860</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$ 32,825,499</td>
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</table>

Cost/AF $ 962
Annual Cost of Water ($ per 1000 gallons) $ 2.95

SB1 estimate updated to 2004 cost basis revised with 4.8% cost of debt