Securing Our Water Future

Together

WATER RESOURCE PLAN

San Antonio Water System

Water Is Life
Don't Waste It
Acknowledgements

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The Citizens Advisory Panel

SAWS wishes to acknowledge the hard work and dedication of the Citizens Advisory Panel members in reviewing and commenting on the Water Resource Plan, performing the benchmarking assessment for adherence to the evaluation criteria and in reaching consensus on the content of the Plan.

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A RESOLUTION

OF THE SAN ANTONIO CITY COUNCIL
ENDORsing THE SAN ANTONIO WATER
SYSTEM (SAWS) WATER RESOURCE PLAN AND
DIRECTing SAWS STAFF TO PERIODICALLY
BRIEF CITY COUNCIL ON THE STATUS OF
IMPLEMENTING THE PLAN.

WHEREAS, the report of the Citizens Committee on Water Policy, A Framework for Progress: Recommended Water Strategies for the San Antonio Area, was adopted by the City Council on January 30, 1997, and referred to SAWS for analysis and development of an action plan to implement the recommendations of the report; and

WHEREAS, on April 1, 1997, the SAWS Board of Trustees responded to the City Council request with adoption of SAWS "Water Resource Action Plan" which plan included recommendations for short term actions and the development of a long term Water Resource Plan; and

WHEREAS, on April 3, 1997, San Antonio City Council unanimously endorsed the Water Resource Action Plan including the requirement for a long term water resource plan; and

WHEREAS, the Water Resource Plan draft was prepared by SAWS and presented to SAWS’ Citizens Advisory Panel and to the community through an intensive public outreach effort; and

WHEREAS, the draft Water Resource Plan has been modified to respond to the comments of the public and the Citizens Advisory Panel; and

WHEREAS, the Citizens Advisory Panel has applied the evaluation criteria established by the Citizens Committee on Water Policy and have completed their benchmarking assessment of the Water Resource Plan with a favorable report; and

WHEREAS, the Water Resource Plan commits SAWS to a leadership role in the protection and development of water supplies for the San Antonio/Bexar County area, to a balanced approach for water supplies utilizing the Edwards Aquifer and additional supplies, to regional cooperation, and to efficiency and economy of water development, and provision of water in sufficient quantities to meet the projected needs of the San Antonio/Bexar County area; and

WHEREAS, the San Antonio Water System Board of Trustees approved a Resolution on October 20, 1998, that; (i) accepted the benchmarking assessment submitted by the Citizens Advisory Panel; (ii) adopted the Water Resource Plan, an executive summary copy of which is attached as Exhibit I and incorporated herein verbatim for all purposes; (iii) forwarded the plan to City Council for their endorsement; and (iv) directed SAWS staff to implement the plan upon City Council endorsement; NOW THEREFORE:
BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SAN ANTONIO:

SECTION 1. That the Water Resource Plan is hereby endorsed in its entirety.

SECTION 2. SAWS is directed to periodically brief the City Council on the status of implementing the Water Resource Plan.

SECTION 3. This Resolution becomes effective ten (10) days following its passage.

PASSED and APPROVED this 5th day of November, 1998.

M A Y O R

ATTEST:

City Clerk

APPROVED AS TO FORM: CITY ATTORNEY

RES
Emb. No. 98-40-42

NOV 05 1998

Karen L. Rodriguez

CITY CLERK
SAWS Mission Statement

MISSION:

The purpose of the San Antonio Water System is to provide quality and reliable water, wastewater, reuse water, and other related services at reasonable costs and in an effective manner for our consumers.

We also provide leadership in managing and developing water resources in the San Antonio region.
1.0 Executive Summary

Introduction

The water needs of San Antonio and Bexar County are expected to double in the next fifty years. This plan describes the actions that the San Antonio Water System (SAWS) will take to meet those water needs. It describes the current and future water demands for the area and the potential sources of supply to meet those demands. It also discusses the policies, planning activities, and decision-making processes that will guide the selection and development of water supply solutions.

This plan is the product of two-plus years of community effort. In June, 1996, the San Antonio City Council appointed the Citizens Committee on Water Policy, a thirty-four member citizens group representing all of the community’s interests and viewpoints on water. This committee developed new water policy for the City to respond to the impending limits on pumping from the Edwards Aquifer being implemented by the Edwards Aquifer Authority (EAA). The report declared that San Antonio has a water problem, (i.e., a limited supply from the Edwards Aquifer and increasing demands), that San Antonio should begin immediately to develop additional supplies, and that San Antonio should pursue a series of technical studies to increase the supply available from the Aquifer. In particular, the committee focused on the public decision-making process that should guide the selection and development of water resource solutions.

Two subsequent citizens committees appointed by SAWS have refined the public decision-making process and assisted in the development of this plan. Concurrent with these committee activities SAWS has sought out and received substantial public input to the development of this plan through
information fairs, public meetings, speakers bureau presentations and other outreach methods. All of the comments received have been considered in the drafting of this plan.

**Evaluation of Water Resources**

The policy direction received from the three citizen committees, in combination with policies related to water adopted by City Council and SAWS over the years, serve as the foundation for this plan. The following water resources principles summarize these policies.

- **San Antonio Water System** has the responsibility to ensure an adequate water supply for the City of San Antonio. SAWS will take a leadership role in providing supplies for the Greater San Antonio/Bexar County area.

- Water will be provided for the San Antonio/Bexar County community in sufficient quantities to meet projected growth.

- Conservation is the first source of water available.

- The Edwards Aquifer is the cornerstone of the San Antonio/Bexar County water supply. A substantial effort, through technical study, will be made to increase the supply of water available from the Edwards Aquifer.

- Additional non-Edwards groundwater and existing surface water supplies will be pursued immediately to supplement the supply available from the Edwards Aquifer.

- A margin of excess supply over demand should be on hand to provide for unexpected growth and to meet critical period demands.

- Expenditures for water supply and water quality protection represent investments in the City’s future.
• Protection of water quality in the Edwards Aquifer and in other supplies is of paramount importance.

• Water solutions for the San Antonio/Bexar County area must be developed in a regional context through regional planning processes.

• Decision-making criteria developed by the Citizens Committee on Water Policy as refined by subsequent SAWS committees will be the basis for decision-making on future water supply options.

• Public participation will continue to be a fundamental part of SAWS’ decision-making process on water resource projects.

The Citizens Committee on Water Policy set out the following criteria to evaluate the suitability of water supply solutions.

• Trust and Credibility – San Antonio’s water policy development process should be credible, open and inclusive to earn the trust of the community and the region.

• Community Unity – San Antonio’s water supply policy should promote a sense of unity within the community.

• Availability and Reliability – San Antonio’s water supply policy should provide adequate supplies of high quality water with a high degree of reliability.

• Economic Opportunity – San Antonio’s water policy should provide for economic opportunity and sustainable growth for all parts of San Antonio and be compatible with regional needs.

• Environment and Sustainability- San Antonio’s water policy should contribute to a healthy local and regional environment, stretching from the catchment basin to the bays and estuaries.
• Efficiency and Affordability – San Antonio's water policy should consider the total economic impact of implementation strategies and encourage a reasonable approach for allocating those costs and benefits.

• Governance and Control – San Antonio's water policy should consider the relationship between regional and local cooperation and governance and the role natural processes play in the relationship.

• Fairness and Equity - San Antonio's water policy should distribute benefits fairly within the San Antonio area without discriminating against any interest group in the region.

The Citizens Working Group, the first citizens committee appointed by SAWS, refined these criteria and developed a set of benchmarking questions to be answered for to ensure adherence to these criteria.

Finally, SAWS developed technical criteria for evaluating water supply solutions. The criteria are:

• Firm Yield
• Average Yield
• Engineering Feasibility
• Constructability
• Regulatory Acceptance/Permitability
• Timing of Development
• Financial Feasibility

This plan will be reviewed on a periodic basis to adjust to new policies, changing circumstances, and new technologies. The interval for revision will be not more than three years.
Regional Planning and Management

This plan presumes that SAWS will develop water supply solutions for San Antonio and Bexar County, in a regional context. Regional partners should respect the hydrologic, environmental and economic interdependence between San Antonio and its neighbors. SAWS will carry this plan into the regional water planning venue as a consensus statement of San Antonio’s position on water resource planning and development.

In 1996, the Edwards Aquifer Authority began operations to manage the Edwards Aquifer under a state statute as a result of a regional initiative under the cloud of lawsuits filed to protect endangered species at Comal and San Marcos Springs. This management imposes pumping limits on current users of the Edwards Aquifer. The EAA will set a specified limit on each Edwards Aquifer water user based on historical use. SAWS expects that its permitted amount will be equal to or less than current water use. The annual amount is subject to further restrictions through operation of a critical period management plan. These limitations on availability of water from the Edwards Aquifer were acknowledged by the Citizens Committee on Water Policy in 1996. This has resulted in policy direction by City Council to pursue additional water supplies in parallel with efforts to increase the supply available from the Edwards Aquifer.

Additional water supplies to meet current and future needs above the amounts allowed from the Edwards Aquifer will come from projects outside the San Antonio/Bexar County area. These will be regional solutions developed in the context of complex, competing and diverse interests in those sources of supply. The 75th Legislature in 1997 passed Senate Bill 1, a major water reform bill. This Act and subsequent rule making by the Texas Water Development Board divided the state into
sixteen regions, each required to develop its own regional plan. Regional plans will be combined to create the State Water Plan. The regional water plans are required to be completed by September 1, 2000. San Antonio is in Region “L”, which consists of the Upper Nueces Basin, the San Antonio Basin, and the Guadalupe Basin as shown on Figure ES-1. Senate Bill 1 requires that any water supply project requiring permits from the Texas Natural Resource Conservation Commission must be contained in the regional plan.
Recommendations

Participation in Regional Planning and Management

This plan recommends that SAWS work with other Bexar County area cities and purveyors to ensure that the entire San Antonio/Bexar County area’s water needs are considered in the development of the regional water plan.

- SAWS should actively participate in the regional planning process on behalf of San Antonio and other Bexar County interests.
- SAWS should pursue changes to existing legislation and regulations that limit access to water supplies.
- SAWS should continue to support the activities of the Edwards Aquifer Authority in the management of the Edwards Aquifer.
- SAWS should aggressively defend its application in the adjudication process at the EAA to ensure that SAWS receives a fair permit amount.
- SAWS should actively study the potential for increasing the total pumping allowed from the Edwards Aquifer.

Water Quality

Protection of the water quality in the Edwards Aquifer is as fundamental element of this plan. The City of San Antonio Water Quality Ordinance, SAWS Recharge Zone Property Acquisition program, SAWS Watershed Management Plan and the Texas Natural Resource Conservation Commission Chapter 213 Rules are in place today, working effectively to protect the water quality in the Edwards
Aquifer. As other sources of supply are developed for San Antonio, water quality measures will be similarly enacted to protect those sources. All additional sources of supply will be treated as necessary to meet all state and federal drinking water standards as a minimum.

Recommendations for Protection of Water Quality

This plan recommends that:

- SAWS should maintain an aggressive water quality protection program based on sound science and technical data.
- SAWS should seek to improve state rules and enforcement for water quality protection.
- SAWS should continue the sensitive recharge land acquisition program.
- SAWS should implement the Watershed Management Plan and coordinate with other city functions that relate to runoff and drainage.
- SAWS should begin developing expertise in the design and operation of treatment facilities in anticipation of additional supplies.

Existing and Projected Demands

This plan presents projected future water demands and proposes to meet future water supply goals that exceed actual projected demands by ten years. This excess of supply over demand provides a surplus inventory for unexpected growth and a margin of safety during critical periods when supply sources may be limited.
Table ES-1 presents SAWS' projected population according to Texas Water Development Board projections in ten-year increments from 2000 to 2050. SAWS' projected demand is population times per capita water use. The projected per capita demands shown are those that SAWS proposes to meet through application of its aggressive conservation program. SAWS supply goal proposes to meet the demand ten years in advance.

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAWS Projected Population</td>
<td>1,137,369</td>
<td>1,360,669</td>
<td>1,621,857</td>
<td>1,886,190</td>
<td>2,125,314</td>
<td>2,394,753</td>
</tr>
<tr>
<td>SAWS Projected Demand Per Capita (gpcd)</td>
<td>148</td>
<td>140</td>
<td>135</td>
<td>135</td>
<td>132</td>
<td>132</td>
</tr>
<tr>
<td>SAWS Projected Demand (Acre-Feet)</td>
<td>188,555</td>
<td>213,380</td>
<td>245,256</td>
<td>278,890</td>
<td>314,247</td>
<td>354,086</td>
</tr>
<tr>
<td>Projected Demand plus 10 Year Supply (AF)</td>
<td>213,381</td>
<td>245,256</td>
<td>278,890</td>
<td>314,247</td>
<td>354,086</td>
<td>389,494</td>
</tr>
</tbody>
</table>

The data presented in Table ES-1 is presented graphically in Figure ES-2

Figure ES-2  SAWS Water Demand with Expected Conservation
Figure ES-3 presents the projected water demands through 2050 for Bexar County.

![Graph showing projected water demands from 2008 to 2050 for Bexar County](image)

Source: TWDB projections below normal rainfall advanced conservation.

Figure ES-3 Bexar County Water Demands

Similarly, Figure ES-4 presents the projected demands by the Texas Water Development Board for the Senate Bill 1 Region L planning area.

![Graph showing projected water demands from 2008 to 2050 for Region L](image)

Source: TWDB projections below normal rainfall advanced conservation.

Figure ES-4 Region "L" Projected Water Demands
Recommendations for Meeting Existing and Projected Demands

This plan recommends that:

- SAWS should continue to use the Texas Water Development Board population and water
demand projections as a baseline for estimating future water requirements.
- SAWS should adjust the TWDB projections to account for water savings through conservation.
SAWS should encourage the entire region to pursue conservation standards when determining
future supply requirements.
- SAWS should expand its aggressive conservation plan over time.
- SAWS should re-estimate demand projections in the periodic assessment of this plan.

Water Supplies

SAWS has several sources of water available to meet current and future demands.

Current Sources

The current sources of water supply are:

- The Edwards Aquifer under the pumping right to be issued by the Edwards aquifer Authority,
estimated between 148,000 and 170,000 acre-feet per year.
- Acquisition of a limited amount of Edwards pumping rights from others.
- SAWS Recycled Water Project, which will provide approximately 35,000 acre-feet per year.
- The Canyon/Bulverde Project which will supply 3,000 acre-feet of treated drinking water from
  Canyon Lake annually diminishing to 2,000 acre-feet over the 40-year life of a contract with the
  Guadalupe-Blanco River Authority.
Aquifer Optimization

The supply available from the Edwards Aquifer may be increased in the future as a result of technical studies currently programmed. This initiative is referred to in this plan as Aquifer Optimization.

These studies include:

- Recharge enhancement
- Range Management
- Recirculation of excess springflows
- Flowpath studies
- Study of the saline water line
- Biological assessment of the habitat requirements for endangered species.
- Augmentation of springflows
- Weather modification to increase rainfall and recharge of the aquifer.
- Computer modeling to simulate the operation of the Edwards Aquifer.

This plan assumes, for purposes of calculating the amount of potential future supplies required, that approximately 200,000 acre-feet is available from current supply sources.

Future Supplies – Existing Sources

Potential future supply sources include non-Edwards groundwater and existing surface water.

Groundwater sources include the Carrizo Aquifer, a major aquifer within San Antonio’s planning
region which is capable of supporting regional demands. Several minor aquifers, including the Trinity
Group north and west of San Antonio and the Queen City and Wilcox Aquifers south and east of San
Antonio, can be considered suitable for localized needs. Generally, groundwater has less regulatory
and environmental complications to development than do surface sources.

Existing surface supplies in the region include Medina Lake, Canyon Lake and the Guadalupe River.
Medina Lake is presently committed to irrigation demand with a potential for conversion of at least
a portion of its supply to municipal use.

The permitted yield of Canyon Lake is presently committed. The Guadalupe-Blanco River Authority
is currently increasing the permitted yield of the Lake from 50,000 acre-feet per year to approximately
85,000 acre-feet per year. Some portion of the increased yield may be available for the City of San
Antonio.

Some run of river rights, those that divert the normal flow of a river without a storage component,
are available. Run of river rights are not firm supplies, but may be used in conjunction with existing
or new storage projects to create a firm yield. SAWS is currently negotiating with the Guadalupe-
Blanco River Authority for a combination of existing run of river supplies and additional Canyon
Lake yield.

Table ES-2 presents a sampling of potential existing sources that might be available in the region with
volumes and unit costs indicated. Within a river basin the amounts shown were independently derived
and are not additive. This data was developed from previous technical study of water supply sources in the region.

<table>
<thead>
<tr>
<th>Table ES-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Yield and Costs of Potential Supplies from Existing Surface Water Projects</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>San Antonio River Basin</strong></td>
</tr>
<tr>
<td>Medina Lake Diversion to WTP (Water Treatment Plant)</td>
</tr>
<tr>
<td><strong>Guadalupe River Basin</strong></td>
</tr>
<tr>
<td>Canyon Lake released to Lake Dunlap Diversion to WTP</td>
</tr>
<tr>
<td>Guadalupe River Diversion near Lake Dunlap to WTP, with transfers downstream</td>
</tr>
<tr>
<td>Uniform Delivery (5,000 ac ft/yr Diversion at Lake Dunlap/35,000 ac ft/yr diversion at Gonzales)</td>
</tr>
<tr>
<td>Guadalupe River Divisions at Gonzales to Mid Cities/CRWA/Bexar County with Regional WTP</td>
</tr>
</tbody>
</table>

Source: Trans-Texas Water Program
Note: Inclusion of these projects in this table is for illustrative purposes only and does not mean that they have been selected for development by SAWS. The Trans Texas Water Program did not perform an average yield analysis on any of the potential projects.

**Future Supplies – New Sources**

Several new surface supplies may be developed in the region. Table ES-3 compares Region L 2050 water demands with existing supplies. A shortage for the region is indicated, suggesting that new surface sources (i.e. reservoirs) will be needed.

<table>
<thead>
<tr>
<th>Table ES-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.B. 1 Region “L” 2050 Water Demands and Existing Supplies (Acre Feet)</td>
</tr>
<tr>
<td>River Basin</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Nueces</td>
</tr>
<tr>
<td>San Antonio</td>
</tr>
<tr>
<td>Guadalupe</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Reported by Trans-Texas Water Program from Texas Water Development Board data.
Minor differences may occur between the Trans-Texas planning area and the SB 1 planning area for these basins.
Table ES-4 presents a listing of new reservoir projects that have been previously identified by technical study in Region L. The firm yield amounts are not additive within each river basin.

<table>
<thead>
<tr>
<th>Table ES-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Yield and Costs of Potential New Surface Water Projects</td>
</tr>
<tr>
<td>Firm Yield (Acre Feet/Year)</td>
</tr>
<tr>
<td><strong>San Antonio River Basin</strong></td>
</tr>
<tr>
<td>Cibolo Reservoir with imported water from the San Antonio River – Diverted to Water Treatment Plant (WTP)</td>
</tr>
<tr>
<td>Cibolo Reservoir with imported water from San Antonio/Guadalupe/Colorado Rivers – Diverted to WTP</td>
</tr>
<tr>
<td>Goliad Reservoir – Diverted to WTP</td>
</tr>
<tr>
<td><strong>Guadalupe River Basin</strong></td>
</tr>
<tr>
<td>Cuero Reservoir - Diverted to WTP</td>
</tr>
<tr>
<td>Sandies Reservoir - Diverted to WTP</td>
</tr>
<tr>
<td>Guadalupe River Dam No. 7 – Raw water at reservoir</td>
</tr>
<tr>
<td>Gonzalez Reservoir – Raw water at reservoir</td>
</tr>
<tr>
<td>Cisne Crossing Reservoir – Raw water at reservoir</td>
</tr>
<tr>
<td>Dilworth Reservoir – Raw water at reservoir</td>
</tr>
<tr>
<td>Lockhart Reservoir – Raw water at reservoir</td>
</tr>
</tbody>
</table>

Source: Trans-Texas Water Program

Note: Inclusion of these projects in this table is for illustrative purposes only and does not mean that they have been selected for development by SAWS. The Trans Texas Water Program did not perform an average yield analysis on any of the potential projects.

New reservoir projects require ten to thirty years to develop. Reservoir projects will most likely be regional projects, developed through partnerships of cities, river authorities and others, and subject to the Senate Bill 1 planning process.

Aquifer storage and recovery is a new water resource technology that utilizes wells drilled into an aquifer for the injection and storage of water during times of excess supply for retrieval during times of supply shortage. Typically the water is treated to drinking water standards and injected into a suitable aquifer in a multiple well field and the water is retrieved later from the same wells. Aquifer storage and recovery does not create a new supply of water, but it can make an interruptible supply
available on a firm yield basis. Potential sources of supply for an Aquifer Storage and Recovery project for San Antonio are the Edwards Aquifer or any other non-Edwards groundwater or surface water source. SAWS is studying the potential for aquifer storage and recovery in Bexar and surrounding counties.

Locally, sites such as old quarries may be useful for storing small quantities of water to meet seasonal peak demands.

Recommendations for Development of Existing and Future Supplies

This plan recommends that:

• SAWS should continue to use the current sources including SAWS' Edwards Aquifer pumping right.

• SAWS should acquire a limited amount of other Edwards Aquifer pumping rights

• SAWS' should complete the Recycled Water Project and the Canyon Lake/Bulverde Project.

• SAWS should pursue opportunities to acquire non-Edwards groundwater and existing surface water supplies.

• SAWS should begin long-term planning for one or more new surface water storage projects.

• SAWS should continue to study the feasibility of aquifer storage and recovery as a potential water supply management tool.
Financial Considerations

The financial impacts of additional water supply sources on an average customer water bill can only be generally estimated at this time. No major projects have been studied in sufficient detail to allow a projection of financial impacts on a project-specific basis.

For purposes of generalizing the financial impacts, an estimated average cost of $724 per acre-foot was used for the cost of additional water supplies over and above the amounts available from the existing supply sources discussed above. Table ES-5 presents the per capita impact of the cost of additional supplies.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Projected Population</th>
<th>Existing Supplies 1</th>
<th>Additional Supply Goal Acre-Feet/Year</th>
<th>Projected Water Supply Costs/Yr.</th>
<th>Annual Cost Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,360,669</td>
<td>207,380</td>
<td>37,876</td>
<td>$27,422,224</td>
<td>$20.15</td>
</tr>
<tr>
<td>2020</td>
<td>1,621,857</td>
<td>209,380</td>
<td>69,510</td>
<td>$50,325,240</td>
<td>$31.03</td>
</tr>
<tr>
<td>2030</td>
<td>1,886,190</td>
<td>211,380</td>
<td>102,867</td>
<td>$74,475,708</td>
<td>$39.48</td>
</tr>
<tr>
<td>2040</td>
<td>2,125,314</td>
<td>213,380</td>
<td>140,706</td>
<td>$101,871,144</td>
<td>$47.93</td>
</tr>
<tr>
<td>2050</td>
<td>2,394,753</td>
<td>215,380</td>
<td>174,114</td>
<td>$126,058,536</td>
<td>$52.64</td>
</tr>
</tbody>
</table>

1 Existing supplies are Edwards Aquifer, Recycled Water and Canyon Lake Project.

These projected increases are in water bills only Sewer charges are not included.

Tables ES-6 and ES 7 present the impacts on residential and commercial water bills, respectively.
<table>
<thead>
<tr>
<th>Decade</th>
<th>Current Monthly Water Bill (10,000 gal/month)</th>
<th>Increase Over Current Bill</th>
<th>Projected Bill in Constant Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>$12.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$18.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$3.24</td>
<td>$21.34</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$5.17</td>
<td>$23.27</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$6.73</td>
<td>$24.83</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>$8.19</td>
<td>$26.29</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>$8.98</td>
<td>$27.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Average Consumption (20,000 gal/month)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$29.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$43.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$7.75</td>
<td>$51.02</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$12.38</td>
<td>$55.66</td>
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</tr>
<tr>
<td>2030</td>
<td>$16.11</td>
<td>$59.39</td>
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<td>2040</td>
<td>$19.56</td>
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<td>2050</td>
<td>$21.48</td>
<td>$64.76</td>
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<td></td>
<td><strong>Below Average Consumption (5,000 gal/month)</strong></td>
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<tr>
<td>1998</td>
<td>$8.74</td>
<td></td>
<td></td>
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<tr>
<td>2003</td>
<td>$12.85</td>
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<tr>
<td>2010</td>
<td>$2.31</td>
<td>$15.16</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$3.68</td>
<td>$16.53</td>
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<tr>
<td>2030</td>
<td>$4.79</td>
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<td>2040</td>
<td>$5.82</td>
<td>$18.67</td>
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</tr>
<tr>
<td>2050</td>
<td>$6.39</td>
<td>$19.25</td>
<td></td>
</tr>
</tbody>
</table>

These projected increases are in water bills only. Sewer charges are not included.

The 2003 estimates include costs increases from normal operating procedures described above.
Table ES-7

Impacts on Monthly Commercial Bills of 50 Year Water Supply Goals

<table>
<thead>
<tr>
<th>Decade</th>
<th>Current Monthly Water Bill</th>
<th>Increase Over Current Bill</th>
<th>Projected Bill in Constant Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Consumption (54,700 gal/month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$55.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$81.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>$6.24</td>
<td>$88.22</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>$23.50</td>
<td>$105.48</td>
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<td>2030</td>
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<td>$30.58</td>
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<td>2040</td>
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<td>$37.12</td>
<td>$119.10</td>
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<tr>
<td>2050</td>
<td></td>
<td>$40.77</td>
<td>$122.75</td>
</tr>
<tr>
<td></td>
<td>Below Average Consumption (20,000 gal/month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$23.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$34.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>$3.24</td>
<td>$37.99</td>
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<td>2020</td>
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<td>$9.96</td>
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<tr>
<td>2050</td>
<td></td>
<td>$17.28</td>
<td>$52.03</td>
</tr>
</tbody>
</table>

These projected increases are in water bills only. Sewer charges are not included.

The 2003 estimates include costs increases from normal operating procedures described above.

Table ES-6 indicates an increase in the average residential water bill varying from $3.24 at 2010 to $9.00 at 2050. Varying increases are shown for the above and below average customers. A reminder that these amounts are for the additional water supply cost and do not include increases in cost for operating, maintenance and infrastructure costs for SAWS. These more routine costs are estimated to increase the average water bill by $6.00 over the next five years in addition to the incremental cost associated with additional water supplies.

Table ES-6 presents a limited analysis of the order of magnitude impact of new water supply costs on average residential water bill. Note that this analysis excludes sewer charges, changes in local infrastructure costs, SAWS operating costs, and many other variables.
Recommendations for Funding of Water Supply Solutions

This plan recommends that:

- SAWS should use a combination of revenue sources to fund the future water quality and supply development measures recommended in this plan.
- SAWS should pursue federal grants and low interest loans.
- SAWS should develop regional coalitions to take advantage of economies of scale.
- SAWS should develop lifeline rates for low water users and those on fixed incomes.
- SAWS should continue to pursue all available measures to reduce and contain costs while maintaining high quality service.

Plan Review and Implementation Schedules

This plan will be presented for review and approval by the SAWS Board of Trustees in October, 1998. Following that, it will be presented to the City Council. After adoption in its final form, it will become the guiding document for planning and development of water supply solutions for the City of San Antonio.

Conclusion

Important near-term uses of this plan include guidance for the conservation, protection and acquisition of water supplies, for participation in the SB-1 planning process and for SAWS legislative agenda. Short-term solutions (1-5 years) are most clearly defined in this plan. Mid-term (6-15 years) and long-term (16-50 years) solutions are successively less well defined as to cost and water supply potential. This plan will be continually updated as better information becomes
available through time. The next revision of the plan can be expected to be project specific on one or more projects as SAWS is able to execute contracts for water supplies and the SB-1 regional planning process defines the water supply projects that will be constructed to meet the needs of the region.
2.0 Introduction

2.1 Purpose

Water use in San Antonio is expected to double to nearly 400,000 acre-feet per year by 2050. Likewise, Bexar County’s total annual water use is expected to increase from 300,000 acre-feet today to over 500,000 acre-feet per year by 2050.

Historically, San Antonio and Bexar County have met their water supply needs by pumping from the Edwards Aquifer. However, the Edwards Aquifer is now a regulated resource, managed by the Edwards Aquifer Authority. The Edwards will always be the cornerstone of our drinking water supply, but it cannot support unlimited increases in pumping. In fact, the aquifer can not meet all of San Antonio/Bexar County’s 2050 demands, even if efforts are successful to increase the aquifer’s yield. Therefore San Antonio and Bexar County need a multi-faceted and balanced approach to pursuing additional water supplies to meet the remainder of our water needs.

This plan documents the current status of San Antonio/Bexar County’s water situation and describes how our water needs will be met in the future. This is essential to ensure an economically and environmentally sustainable community. The plan is intended to guide the water resource policy and financial planning of the San Antonio Water System, San Antonio’s legislative activities in the 76th session of the Legislature in 1999, and Bexar County’s participation in the Senate Bill 1 regional water planning process.
This water resources plan is also important to the South Central Texas region as whole, including the Edwards Aquifer area, the upper Nueces River Basin, the Guadalupe River Basin, and the San Antonio River Basin. San Antonio and Bexar County’s current and future water requirements represent such a substantial portion of the region’s total demands that San Antonio’s approach to water supply solutions will strongly influence the pace and direction of water resource development by others in the region. Thus San Antonio has a responsibility to the region to pursue solutions cooperatively with other regional interests.

Good regional solutions will require strong coalitions among regional interests. These solutions will need to be balanced and sustainable over time to ensure the long term economic prosperity and environmental quality that we currently enjoy in South Central Texas. Fortunately, regional interests are moving into a new era of cooperation, seeking solutions that respect the region’s present diversity of cultural, economic and natural resources by building on our successes to manage our resources wisely.

This plan does not address short-term issues or recommend solutions on a project-specific basis. Instead it assesses the range of potential solutions that are available and describes the future activities that are necessary to arrive at project-specific decisions on major water resource opportunities. It focuses on future water supply activities that are longer term, larger in scale, more regional in nature, and not yet well enough defined in the regional planning context for particular projects to be specified at this time. It is a conceptual plan, recommending policies to guide SAWS in the future selection, planning and development of specific water supply projects. In addition to listing potential water supply opportunities, it recommends a mix for a diversified, comprehensive and balanced portfolio.
of water supply sources. It also recommends a process through which good decisions can be made with substantial public input on the selection of water supply alternatives.

SAWS’ service area does not include the entire city limits of San Antonio nor is it contained wholly within the city. (See Figure 1.) References in this plan to “SAWS” demands include only those requirements within our existing certificated service area. In keeping with the previous citizen reports and planning efforts, SAWS is committed to working with other purveyors and cities in the area to ensure the needs of all are met in the most economical, sustainable manner possible. We hope to work with other purveyors as this conceptual plan is refined and implemented.
2.2 Background

On July 10, 1996, San Antonio’s Mayor and City Council appointed the Citizens Committee on Water Policy. The committee was composed of 34 members representing the full range of viewpoints, interests and constituencies in water issues. The committee’s report, *Framework for Progress: Recommended Water Policy Strategy for the San Antonio Area*, was released in January 1997. The report concluded that San Antonio does have a water problem; that although the Edwards Aquifer is the cornerstone of our water supply, a diversity of supplies is required; that the potential for increasing the supply available from the Edwards Aquifer needs to be evaluated and pursued; that activities to meet short term water needs should proceed immediately; and that the City needs a comprehensive, multi-faceted and balanced water supply plan for the development of long-term capital projects and resource management. The Framework Report also recommended decision-making criteria designed to achieve general consensus for selection of future water resources projects.

The San Antonio City Council adopted the Committee’s recommendations and referred the report to the San Antonio Water System for a response. Subsequently the SAWS Board of Trustees adopted a *Water Resources Action Plan* which expanded upon the Committee’s policy recommendations with a list of short term (three to five year) activities to be pursued immediately in the development of a long term water resources plan. City Council then adopted the *Water Resources Action Plan* and directed the San Antonio Water System to pursue the described activities.

One of the first successes of the *Water Resource Action Plan* was the development of a Citizens Working Group, which was appointed by the SAWS Board on September 16, 1997. This group’s charge was to expand upon the decision making criteria of the Citizens Committee and to make
recommendations to the Board on benchmarks, actions and strategies for evaluation of water resource policies, plans and projects. The Citizens Working Group presented their report to the Board on April 7, 1998. The current plan document represents the next phase of this citizen-driven process to develop a water resource plan to meet the needs of San Antonio and Bexar County.

Additionally, Senate Bill 1 of the 1997 Legislature requires regional water resource planning. Consideration must be given to local plans during the regional planning process. San Antonio/Bexar County will be best served during this process by having a water resources portfolio representing our community’s willingness to invest in various water sources and consensus for that plan at the regional planning level.

In addition to the legal and regulatory complexities, Bexar County’s water issues are further complicated by the proliferation of utilities. Although SAWS is by far the largest water purveyor in the county, it is only one of roughly 62 water providers. Thus it is very important that SAWS coordinate with these other entities in the planning and development of additional water supplies.

SAWS has already begun the coordination process by convening the Bexar County Water Advisory Council. This group includes the other cities and water agencies in Bexar County. Their focus is to coordinate efforts regarding drought or critical period management as well as the acquisition and purchase of additional water supplies.
2.3 Existing Water Resource Policies

The City of San Antonio has a strong policy regarding non-degradation of the Edwards Aquifer water supply. Over the last decade, this policy has produced some of the most proactive groundwater protection measures in the state. Major elements of this policy include the following.

- Creation of the Edwards Recharge Overlay Zone in 1975.

- Adoption of the Perspectives report (The Edwards Aquifer: Perspectives for Local and Regional Action) in 1987, which identified needed actions by the city, county and state for water quality protection.

- The requirement of triple containment for underground storage tanks on the recharge zone.

- The direction to proceed with implementation of a comprehensive water quality program as described in The Edwards Aquifer: San Antonio Mandates for Water Quality. The Mandates include 33 measures to protect water quality.

- Passage of the Water Quality Ordinance by the City Council, which established minimum standards for impervious cover, flood plain buffering, protection of recharge features and other requirements for subdivision development over the recharge zone.

- Adoption of the City of San Antonio Master Plan, which identifies Edwards Aquifer Protection as a significant policy. The Master Plan Implementation Advisory Committee also identified this as a priority.

Conservation is to be considered a significant source of water for the community. The prevailing conservation ethic has reduced SAWS' pumping by over 20,000 acre-feet/year between 1984 and 1997, even though SAWS' service population has increased by over 200,000 consumers. This commitment to efficient water use is expressed in the following policies and programs.
• The community's commitment to water use efficiency began in earnest in 1984 with "Operation Conservation."

• Emphasis on conservation was affirmed with adoption of a Drought Management Plan in 1988.

• A Conservation and Reuse Plan was adopted in 1993.

• A conservation rate structure was implemented in 1994.
  • Conservation rebate programs were implemented beginning in 1995.
  • A Community Conservation Committee was appointed in 1997.

• The City of San Antonio Master Plan identifies water conservation as a significant policy. The Master Plan Advisory Committee also identified this as a priority.

Water recycling is an extension of the City's commitment to water use efficiency. Elements implementing this policy include the following.

• Beginning after the 1950s drought, the City constructed Braunig and Calaveras Lakes to capture groundwater-based discharges from the city's water treatment plants for use by City Public Service. This has reduced the city's reliance on the Edwards Aquifer by up to 30,000 acre-feet/year.

• The City reaffirmed its commitment to recycling in a 1985 resolution (85-20-32) and through creation of the Alamo Conservation and Reuse District in 1989.

• Design of a local recycling program began with the passage of the Conservation and Reuse Plan by SAWS Board in 1993. Construction of this $84 million project is approximately 20% completed. It will deliver approximately 35,000 acre-feet/year for non-drinking uses by 2001.

• The Master Plan also identifies water recycling as a significant policy, and the Master Plan Implementation Advisory Committee has also identified this as a priority.
The City of San Antonio supports regional solutions that recognize the economic and hydrologic connections within the region. Expressions of this policy include the following.

- SAWS participated in the Trans-Texas Water Project which provided a significant body of technical data accepted by water planners throughout the region.

- City Council Resolution No 95-48-48 directed SAWS to continue studying the feasibility of surface water supplies as part of a regional solution.

- The Citizens Committee on Water Policy encouraged an emphasis on maximizing the yield from the Edwards aquifer, but recommended that surface and other water rights be pursued while the opportunity exists, as part of a comprehensive and balanced strategy. The CCOWP recommended that preference be given to projects that meet both aquifer optimization and additional water supply strategies.

2.4 Water Resource Principles

The following principles have also guided development of this plan.

- The San Antonio Water System has the principle responsibility to ensure an adequate water supply for the City of San Antonio. SAWS was created in 1992 to coordinate and conduct activities related to water policy, water quality protection and water supply management.

- The San Antonio/Bexar County community will continue to grow over time. Water will be provided in sufficient quantities to ensure that growth is not limited by unavailability of water.

- Conservation is the first source of water that is available. SAWS will achieve a reduction of pumpage to 140 gallons or less per capita per day by 2008. Planning forecast demand figures
should be based on the projected per capita water use expected from application of conservation measures.

- The Edwards Aquifer is the cornerstone of our water supply. It requires water quality protection and management by the Edwards Aquifer Authority.

- Efforts will be made through substantial further study to determine the feasibility of aquifer optimization and the availability of other water sources including recharge enhancement.

- A comprehensive, multi-faceted and balanced array of Edwards and non-Edwards supply sources will result in greater reliability and stability over time. Total dependence on the Edwards Aquifer as a sole source of supply is not feasible. Water supply opportunities available to us right now may not be available in the future. Therefore various water supply opportunities should be pursued simultaneously with studies to determine the extent that the yield from the Edwards can be increased or optimized.

- A margin of excess supply over demand should be on hand to provide for economic development and for excess supply during critical periods. Water supply should be available to meet two to five years of projected growth in the short-term and to meet a minimum of 10 years projected growth in the long-term.

- Expenditures for water supply and water quality protection represent investments in our future. They create jobs and help develop our community.

- The technical analyses performed in the Trans-Texas Water Program provide the best available information on feasibility, firm yields and cost estimates for many water supply solutions that are available to the community. Analysis of other projects will be conducted during the SB 1 Regional Planning Process.
- It is in the best interest of the City of San Antonio that the water needs of the entire Greater San Antonio/Bexar County area are met through cooperative local and regional planning and implementation processes. SAWS will exercise leadership in developing water supply projects that benefit the San Antonio region. SAWS will operate as the regional water supplier to the extent necessary to provide the best solutions for the San Antonio region.

- Criteria developed by the Citizens Committee on Water Policy, as reported in the Framework for Progress report and refined through the Citizens Working Group, will be the basis for decision making on future water supply options. Public participation will continue to be a fundamental part of SAWS’ decision making process on water resources projects.

2.5 Planning Approach

SAWS has adopted all of the short-term water supply activities approved by the City Council when the Water Resources Action Plan was adopted by Council on April 1, 1997. These actions include:

- Develop Long Term Water Resource Plan
- Study Aquifer Optimization
- Expand Regional Cooperation
- Study Recharge Enhancement (Guadalupe Basin)
- Participate in Recharge Enhancement Pilot Projects (Nueces Basin)
- Expand Public Information
- Accelerate Conservation Activities
- Continue Drought Management
- Continue Recycled Water Program
• Study the Potential of Aquifer Storage and Recovery

• Protect Water Quality

• Expand Saline Water Study

• Expand Surface Water Options

• Participate in Weather Modification Pilot Project

These activities, generally local and within the purview of the City and SAWS, are being conducted. Each activity has its own schedule for completion as well as a budget. Together, these ongoing activities are supported by annual expenditures of approximately $55,000,000 from the SAWS budget. The funds from other participating agencies are an addition to the SAWS amount.

In addition, SAWS has recently executed a contract with the Guadalupe-Blanco River Authority for a surface water supply from Canyon Lake delivered to the northern portion of the SAWS service area. The initial delivery will be about 3,000 acre-feet per year, diminishing to 2,000 acre-feet per year during the 40-year term of the contract.

Identification of suitable sources of water involves an understanding of watersheds. The relationship between ground and surface water is very complex in this region. The decisions that are made to provide water for San Antonio and Bexar County must consider impacts to bays and estuaries as well as impacts to ecosystems and habitat. The human and economic considerations are equally as important.
The approach to this plan attempts to build in maximum flexibility over time and will strictly adhere to evaluation criteria and other policy recommendations outlined in the citizen-developed report, *A Framework for Progress: Recommended Water Policy Strategy for the San Antonio Area*, described in this report. This plan proposes to balance solutions based on evaluation criteria, keep options open as long as possible, protect water quality and solve water supply development issues, all to provide the best and most efficient, assured water supply for the City. The plan is intended to identify water sources and their relative amounts needed to meet the projected fifty-year demands. This conceptual plan when approved will provide direction to San Antonio Water System concerning appropriate water sources to pursue. Subsequent iterations of this plan will provide even more specificity with respect to timing, amount, location and cost of water supply solutions.

Perhaps most importantly, this plan affirms and continues the community consensus process that began with the Citizens Committee in 1996 and continued with Citizens Working Group to articulate the problem, provide strategic direction for the community regarding water resources and develop a process to move in that direction.

### 2.6 Public Information / Public Participation

Over the last two years, the San Antonio Water System has aggressively expanded its public outreach programs to inform and involve citizens on water issues and programs. The information efforts include a continuous stream of water information through mass media public service announcements, town hall meetings, neighborhood board meetings, a new newsletter on the water action plan, SAWS’ web page, bill inserts, SAWS’ cable TV show, news stories and various printed pieces. SAWS has also increased its public involvement work to include individual stakeholder interviews, bill insert
surveys, and four major citizen committees which focus on water planning, water conservation, water recycling and the Mitchell Lake Wetlands project.

Providing a process for public review also included a strong outreach effort through the SAWS Speakers Bureau, public forums, web page and distribution of the plan at public libraries and other locations. Knowledge of, involvement with and acceptance of this conceptual plan throughout the community is a major objective that SAWS is committed to attaining.

Libraries. In addition to the public information tools listed in the Citizens Working Group report (media coverage, bill inserts, Water Action newsletter), SAWS staff has made the long term plan available to the community by distributing copies at the public libraries.

Internet. People with the access to the Internet were able to download the document from the SAWS web page (www.saws.org). SAWS staff will also work to have the long-term plan listed and linked from other Internet sites.

Speakers Bureau. SAWS' speakers bureau conducted neighborhood and civic group presentations on the water plan. All neighborhood associations received letters informing them of the water plan and encouraging them to call SAWS to arrange a meeting to give members a chance to learn about and ask questions regarding the plan.

Television. SAWS also took advantage of cable TV opportunities to explain the long-term water plan. It was featured on SAWS' cable show "Waterlines," and an electronic town hall meeting.
Town Hall Meetings. For the past year, SAWS has hosted town hall meetings every other month to inform citizens about various aspects of the short-term Water Resources Action Plan as well to prepare the community to consider this long-term plan. Four town hall meetings were hosted during July and August. Ads in local newspapers were purchased to increase public awareness of these meetings. Approximately 175 citizens participated in these four meetings.

The openness and frequency of SAWS communications with the public have been designed to build a good foundation of community trust on which the long-term water plan could be discussed. Research shows that the community is interested in San Antonio's future water plans, and the positive feedback from enhanced water information sets the stage for a good dialogue with the citizens regarding a long-term water plan for the community. SAWS created opportunities to get citizens input before the plan was adopted by the Board of Trustees.

Public involvement in developing this Water Resources Plan centered on a Citizens Advisory Panel as suggested in the report issued by the Citizens Working Group. The CWG report outlines this public involvement process. (Figure 2)

- The Water Resources Plan and its elements have been reviewed by staff, including engineering, environmental, and economic factors. This analysis incorporated all the technically oriented elements of the criteria, benchmarks, and actions/strategies. It included economic analysis covering financial feasibility, economic efficiency, economic equity, and socio-economic impacts. During this process, staff contacted affected interests, including parties directly affected by the proposal as well as
interests having a broader concern about public impacts of water policy and project implementation.

- SAWS staff then consulted with the Citizens Advisory Panel (CAP). This committee was appointed by the Board of Trustees on June 16, 1998 and represents the major interests and points of view in the community with regard to water policy. Its mandate is to work closely with the staff in reviewing projects in light of the criteria, particularly those that reflect fundamental community values and are difficult to reduce to technical or quantifiable terms.

- The CAP identified concerns raised under the criteria, serving, in effect, as a kind of conscience of the community. It engaged in dialogue with staff about responding to those concerns. The CAP does not formally vote on accepting or rejecting projects, but it provided clear and early indications to staff and the Board of Trustees on how well this plan meets the criteria and how community constituencies are likely to respond.

- The plan was then reviewed by a committee of the Board, which engaged in further dialogue with the staff and the CAP about how the plan relates to Board concerns, and the criteria.

- Concurrently staff provided information to the general public about the plan through various media, including water bill enclosures. Staff also provided an information proposal to the 4,000 or so member mailing list that receives the SAWS newsletter.

- Public meetings were held to provide an opportunity to all members of the community and affected public to express their views. These comments were recorded and reviewed by the staff and CAP. Staff responded in written form, indicating how the
public comments have been considered and dealt with in reviewing the plan.

(Appendix 12.2)

• The Board of Trustees was briefed on the plan and the CAP’s benchmarking assessment at the October 6th Board meeting. The Board subsequently adopted the plan two weeks later. Following adoption by the Board the plan was forwarded to the City Council for endorsement.
Figure 2: Recommended Public Process

Criteria and Benchmarks are Applied Throughout the Process

Recommended Public Process
2.7 Plan Review and Revision

This Water Resources Plan is a working document that will provide a framework for diversifying our water resources and providing a secure water supply for the future. This plan will be revised as new information and technologies arise. The staff and Citizens Advisory Panel will conduct an annual assessment of the Water Plan and the projects and policies implemented under it, and will publish an Annual Report on the Water Plan. Where evaluation indicates a need for corrective action, such action should be taken in a timely manner. SAWS will hold an annual public workshop to present the Annual Report and have dialogue with citizens about the Plan.

This plan will be formally reevaluated and updated at least every three years. Updates will follow the same public process as this 1998 Water Resource Plan. They will incorporate any new information and management strategies that will have a bearing on the outcome of the original plan. The update will review and reevaluate population and water demand projections, per capita conservation goals, new water resource management strategies, including optimization of the Edwards Aquifer, changes in legislative policies and plans, changes in the amount and availability of potential additional supplies and small and minority business participation on project implementation.
3.0 Evaluation of Water Resources

Development of this plan was greatly influenced by the strategic direction provided by the Citizens Committee on Water Policy (CCOWP) in their 1994 Framework Report (Appendix 12.3). A significant element of that report is the identification of criteria that should be used in evaluating water resource policies, plans and projects.

3.1 Criteria of the Citizens Committee on Water Policy

The criteria carefully crafted by the CCOWP include the following:

- **Trust and Credibility** - San Antonio’s water policy development process should be credible, open, and inclusive to earn the trust of the community and the region.

- **Community Unity** - San Antonio’s water policy should promote a sense of unity within the community.

- **Availability and Reliability** - San Antonio’s water policy should respect sound planning practices. It should identify specific sources of water, how much water can reasonably be derived from those sources, and conditions and constraints, if any, on securing water from those sources. Access to adequate supplies of high quality water with a high degree of reliability should be integral to the policy.

- **Economic Opportunity** - San Antonio’s water policy should provide for economic opportunity and sustainable growth for all parts of San Antonio and be compatible with regional needs.

- **Environment and Sustainability** - San Antonio’s water policy should contribute to a healthy local and regional environment, stretching from the catchment basin to the bays and estuaries.
• **Efficiency and Affordability** - San Antonio’s water policy should consider the total economic impact of implementation strategies and encourage a reasonable approach for allocating those costs and benefits.

• **Governance and Control** - San Antonio’s water policy should consider the relationship between regional and local cooperation and governance and the role natural processes play in the relationship.

• **Fairness and Equity** - San Antonio’s water policy should be based on principles of fairness and equity. It should distribute benefits fairly within the San Antonio area and uphold the principles of fairness and equity in the region. It should not unilaterally discriminate against any interest group in the region, including San Antonio.

The CCOWP concluded that each criterion was as important as all the others and that water resource decisions should fully address all of the criteria in order to ensure that the needs of the entire community are addressed.

### 3.2 Findings and Conclusions of the Citizens Working Group

SAWS fully accepted the CCOWP criteria in the development of the Water Resource Action Plan in April 1997. However, when SAWS attempted to use the criteria to evaluate water resource initiatives, it soon became apparent that more definition was needed in both content and process in order to apply the criteria to the projects being considered.

Therefore the SAWS Board appointed the Citizens Working Group to explore and more fully elaborate the criteria. The Citizens Working Group developed a series of “benchmarking questions”
to be answered for all water resource policies, plans and projects. Their benchmarking questions (see Appendix 12.4) will be applied to this plan as well as to other policies, plans and projects this plan may generate.

3.3 Additional Technical Criteria

In addition to the criteria and benchmarks recommended by the two citizens committees, SAWS must use some technical criteria to evaluate the various options. These include:

- *Firm Yield* – The amount available in a drought of record.
- *Average Yield* – The average amount available over the historic period of record.
- *Engineering Feasibility* – The ability to design and operate the project within known and accepted engineering practices.
- *Constructability* – The ability to construct the project within a reasonable cost, with minimal environmental impacts, and without major construction obstacles.
- *Regulatory Acceptance/Permitability* - The ability to acquire all local, state and federal permits required to build the project.
- *Timing* - The ability to construct the project within a reasonable timeframe to meet the needs of a growing community.
- *Financial Feasibility* – The ability to permit, design and construct the project at a reasonable cost to the ratepayer.

3.4 Methodology

Evaluation of a plan or policy will thus have two components: technical evaluation and application of the criteria and benchmarks. The technical evaluation will determine whether the project or policy
is feasible from a multidisciplinary perspective including engineering, geology, biology, ecology, environment, finance, economics and regulatory/legal aspects. Then the benchmarking assessment will be conducted, as recommended by the Citizens Working Group and as refined over time. This two-stage assessment is intended to facilitate choices among projects as well as to help determine the acceptability of a single project.

The SAWS Board of Trustees will make their determination regarding a policy, plan or project upon the completion of both the technical and the benchmarking analyses.
4.0 Regional Planning and Management

4.1 Guiding Principles

This plan was developed and considered in a regional context. The following basic "guiding principles" were applied.

- There is a hydrologic, environmental and economic interdependence between San Antonio and its regional neighbors. This interdependence must be respected in order to ensure an adequate water supply for economic growth throughout the region. Therefore water resources must be planned and developed on a regional basis.

- Regional cooperation and partnership arrangements in implementation are integral parts of successful water resource planning and development.

- SAWS will carry this Water Resource Plan to the SB 1 regional planning venue as a representation of San Antonio's interests in water resource planning and development. There it will be combined with other local plans to form the regional plan required by SB 1.

4.2 Management of the Edwards Aquifer

4.2.1 Background on the Edwards Aquifer Authority

In 1959, following several years of intense drought, regulation of the Edwards Aquifer began with the creation of the Edwards Underground Water District (EUWD) by the 56th Texas Legislature. The EUWD was given a limited mandate to protect the Edwards Aquifer as a resource, but it was not given regulatory powers to limit withdrawals. The Texas Water Quality Act of 1967 empowered the Texas Water Quality Board to protect underground water quality. Following a short but intense
drought in 1984, the counties overlying the Edwards Aquifer began to develop mutually supporting conservation and drought management plans.

During the late 1980s the State Legislature began to seriously consider regulating groundwater withdrawals from the Edwards Aquifer. The EUWD Act was revised in 1987 to require the District to adopt a Drought Management Plan to relieve some of the stress on the Comal and San Marcos Springs. Two years later a proposal to regulate groundwater under an Edwards Aquifer Management Plan failed and a Legislative Committee was appointed to study the Edwards Aquifer.

In 1991, the Sierra Club filed a lawsuit against the U.S. Fish and Wildlife Service of the Department of the Interior alleging violations of the Endangered Species Act at the San Marcos and Comal Springs. The premise of the lawsuit (Sierra Club et al. v. Manual Lujan, Jr.) was that the Fish and Wildlife Service had failed to protect endangered species by allowing Edwards Aquifer users to overdraft the aquifer.

In February 1993, U.S. District Court Judge Lucius Bunton handed down judgment in the case. The judgement identified minimum springflow requirements for Comal and San Marcos springs and “strongly suggested” the Texas Legislature develop a regulatory system to avoid “unlawful takings” of endangered species by May 31, 1993.

Senate Bill 1477 was passed by the 73rd Texas Legislature on May 23, 1993, and it was signed by the Governor on June 11, 1993. This Act established the Edwards Aquifer Authority as the successor to the Edwards Underground Water District, effective September 1, 1993. However, the legality of
the EAA was challenged by the League of United Latin American Citizens, who alleged a lack of equal representation of minorities by the newly appointed EAA Board. LULAC filed for a review of the Act by the U. S. Department of Justice on August 11, 1993, preventing implementation of the Act as scheduled.

In May of 1995 the 74th Legislature passed HB 3189, amending SB 1477 by establishing a 15-member elected board for the EAA, with board members elected from geographic districts throughout the region. In August of 1995 the Civil Rights Division of the Justice Department precleared SB 1477/HB 3189 under the Voting Rights Act. A lawsuit filed in Medina County challenging the constitutionality of SB 1477/HB 3189 was rejected by the Texas Supreme Court, and the newly created EAA began operations at the end of June 1996.

4.2.2 Regulation by Withdrawal Limits

Since 1996, the Edwards Aquifer Authority’s first elections have been held and its Board has begun to carry out the charge vested in them by the Texas Legislature. The EAA’s general mandate is to protect terrestrial and aquatic life, domestic and municipal water supplies, the operation of existing industries and the economic development of the state by managing the aquifer as a regional resource. Its primary purpose is to regulate groundwater withdrawals from the Edwards Aquifer in order to ensure an adequate supply to the region’s historical users and to maintain springflow at Comal and San Marcos Springs.

The EAA is required by its enabling Act to limit withdrawals from the aquifer to 450,000 acre-feet per year immediately and to further reduce withdrawals to 400,000 acre-feet per year by 2008. The
Act also provides for increases in these pumping limits if the yield from the aquifer can be increased through recharge enhancement projects or other management technologies to protect springflows. In addition, SB 1477 requires the EAA to implement and enforce water management practices, procedures, and methods to ensure that, by December 31, 2012, continuous minimum springflows at Comal and San Marcos Springs are maintained to protect endangered and threatened species.

The statutory withdrawal limit is being implemented through a groundwater permitting process. Every Edwards aquifer user, with the exception of domestic and livestock well owners using less than 25,000 gallons a day, will be required to obtain a permit with a specified annual limit on aquifer water withdrawal. SAWS’ current water use is 178,000 acre-feet per year, and its historic high pumping (the basis for its permit application) was 193,944 acre-feet in 1984. SAWS expects to receive a permit for 148,000 to 170,000 acre-feet.

4.2.3 Regulation by Critical Period Management

In addition to the annual withdrawal limits from the aquifer described above, withdrawals will be further reduced during “critical periods” of low rainfall or reduced springflows through further restrictions on water uses and monthly limits on total water use. These reductions are governed by the Critical Period Management Plan originally adopted by the EAA in December of 1996 and amended in 1998. During critical periods, SAWS’ withdrawal permits will be reduced from 10%-30% of summer demand peak, depending on the severity of the critical period. Prudent planning requires that sufficient supplies be acquired to reduce the impact of these water use restrictions in the future.
In responding to these limitations, SAWS must also deal with what is called "demand hardening."

This refers to the diminished ability of customers to reduce their water demands during a supply shortage if they are already conserving water. For example, a customer who installs ultra-low flow toilets and showerheads during a normal supply period has fewer opportunities to conserve additional water during a drought. Many short-term demand management measures, such as taking shorter showers, save less water after efficient water technology is installed. Nonetheless, long-term conservation measures play a significant role in reducing the frequency and duration of critical periods. Additionally, customers who have practiced long-term conservation techniques may be more willing to reduce demands during a critical period. So, the impact of curtailment measures during a drought may be reduced over time as water efficient technology becomes increasingly prevalent, but curtailment measures still remain a viable alternative for drought contingency planning.

4.3 Regional Planning

4.3.1 Trans-Texas Water Program

The venue for regional water planning until 1997 was the Trans-Texas Water Program. This program was organized and managed by the Texas Water Development Board as a first effort to move state water planning to the local and regional level. Senate Bill 1 (discussed below) is the next generation regional planning effort that has now supplanted the Trans-Texas Water Program for this area.

The purpose of the Trans-Texas Water Program was to identify the most cost-effective and environmentally sensitive strategies to meet each region's water needs. The Upper Nueces, San Antonio, Guadalupe and Colorado River basins were included in San Antonio's planning region.
The program amassed a significant amount of technical information on more than 40 potential sources of supply, many of them studied in several permutations. These sources were evaluated for availability, cost and environmental considerations. This excellent technical data is now available for use in selection of management strategies for the region through the SB 1 planning process, which is now underway. The technical data from the Trans-Texas Water Program for water supply volumes and costs are used later in this plan.

4.3.2 Senate Bill 1

Senate Bill 1, a major water law reform bill passed by the 75th Legislature in 1997, requires the establishment of water planning regions in Texas, and the development of a statewide water plan.

For the first time in the history of the state, SB 1 will require that new water supply projects be selected and approved through a regional planning process, and ultimately be incorporated into the statewide water plan. Permitting of new projects is contingent on those projects being included in the approved regional and state water plans. The Act also makes significant changes to Texas water law in the areas of water marketing, water transfers, and reuse. The implementation of SB 1 will present several issues of potentially significant impact to San Antonio and SAWS as the City moves to secure its long-term water resources.

Senate Bill 1 also made significant changes in the approach to state water planning. Most notably, SB 1 shifts emphasis from a somewhat “top down” planning approach directed by the TWDB to a more “bottom up” approach. Specifically, SB 1 requires the TWDB to establish regional planning areas and to appoint members to an initial regional planning group for each region. With technical and financial assistance from the TWDB and in accordance with planning guidelines set forth by the
TWDB, the regional water planning groups are to prepare a consensus-based regional water plan by September 1, 2000. Once completed, the TWDB will assemble the regional water plans into a new state water plan by September 1, 2001.

In February 1998, the TWDB adopted rules establishing 16 water planning regions and designated the initial members of the regional water planning groups to implement the SB 1 planning process. The South Central Regional Water Planning Area (designated by the TWDB as Region L) encompasses the entire jurisdiction of the San Antonio Water System, Bexar County, the Edwards Aquifer Region, the Upper Nueces River Basin and the San Antonio and Guadalupe River Basins. (Figure 3)
The regional planning groups have set out a two-phase planning approach. The first phase, which is scheduled to be completed by August 1, 1998, is the development of a detailed scope of work, budget and schedule for the subsequent development of the regional water plans. The second phase, scheduled to begin during the fall of 1998, is to develop the regional water plan.

There are 11 key tasks in the development of the regional water plan. These are:

- Identification of projected 50 year water demands within each region for municipal, manufacturing, irrigation, steam electric power generation, mining, and livestock watering.
- Evaluation of the adequacy of existing water supplies.
- Identification of areas of projected water supply surplus and deficit within the planning area.
- Identification and evaluation of potentially feasible water management strategies to meet the needs of the region.
- Selection of strategies to meet the near term (0-30 years) and long term (30-50 years) water supply needs of the region during “drought of record” hydrologic conditions and when flows are at 50-75% of normal.
- Evaluation of the social and economic impacts of not meeting specific water supply needs as a result of there being no feasible water management strategy to meet that need.
- Evaluation and, if appropriate, development of recommendations regarding streams of unique ecological value” and/or sites for future reservoir development.
- Evaluation of policy issues and, if appropriate, development of recommendations.
- Using the information and analyses derived from the preceding tasks, preparation of a draft regional water plan.
• Conduct a public hearing on the draft regional water plan.

• Revision of the draft plan, as appropriate, adoption of the plan and submittal to the TWDB for inclusion in the state water plan.

4.4 Recommendations

It is important to remember that SAWS’ Water Resource Plan, when approved by the San Antonio City Council, will be carried into the SB 1 planning process representing a unified statement by the citizens of San Antonio on how best to meet San Antonio’s water needs. The SB 1 planning venue represents an excellent opportunity for San Antonio, SAWS and Bexar County to develop the regional cooperation and partnerships necessary for successful development of major regional water resource projects.

• SAWS should coordinate with other Bexar County area purveyors and cities to jointly pursue completion of existing supply strategies as well as groundwater and existing surface water supplies.

• SAWS and others representing Bexar County interests should participate in SB 1 regional planning activities and develop strong relationships with others in the region to select and develop projects.

• SAWS should monitor proposed local, state and federal legislation and rule making, and pursue changes to existing legislation (SB1477 / SB1) that limits San Antonio/Bexar County’s access to water supplies.

• SAWS should continue to support the activities of the EAA in Edwards Aquifer management.
• SAWS should participate with other agencies to study the potential of increasing the total limit on Edwards pumping if sufficient flow can be provided for endangered species and downstream needs.

• SAWS should aggressively defend its application for its historic pumping volume.

• SAWS should take the lead in forming and strengthening regional coalitions and partnerships
5.0 Water Quality

5.1 Guiding Principles

The following “guiding principles” are to be applied in issues of water quality.

- The Edwards Aquifer is the primary source of water for a growing region. Protection of water quality is a fundamental requirement of meeting our current and future needs.
- Water quality protection measures based on sound science and technical data should be proactively developed and implemented not only in Bexar County, but also throughout the region.
- A watershed protection and management approach will effectively protect drinking water supplies as well as maintain environmental viability.
- Water quality should be commensurate with the intended water use (e.g., recycled water for non-drinking uses).
- New sources of water will meet or exceed drinking water standards prior to introduction to the SAWS distribution system.

5.2 Protection of the Edwards Aquifer

The City of San Antonio and the San Antonio Water System have some of the most aggressive water quality regulations in the state. These rules regulate everything from construction activity on the Edwards Aquifer Recharge Zone to protection of watersheds within San Antonio’s extraterritorial jurisdiction. The avenues for enforcing these rules and protecting water quality are the City’s Water Quality Ordinance, recharge zone property acquisition, watershed management plans, and the TNRCC’s Chapter 213 Rules. Each of these is described in more detail in the section below.
5.2.1 Water Quality Ordinance

San Antonio Ordinance # 81491, passed January 12, 1995, regulates development over the Edwards Aquifer Recharge Zone. The ordinance imposes limits on impervious cover and requires buffer zones to protect floodplains and significant recharge features.

5.2.2 Recharge Zone Property Acquisition

This program is to identify, acquire and protect those areas on the recharge zone that are the most sensitive in relation to available recharge. It provides funds to acquire land in order to protect recharge water quality.

The main objectives of the program are to protect water quality and to reduce the detrimental impact of certain land uses by achieving a balance between economic growth and environmental protection. SAWS anticipates multi-agency cooperation and encourages funding contributions from other entities. SAWS has programmed $3.25 million for land acquisition for the next five years.

Sites will be considered in this program under the following criteria:

- **Primary Criteria**: the presence of faulting, stream or river channels, or other recharge features; maximum thickness of Edwards limestone; category 1 (grandfathered) status under the Water Quality Ordinance.

- **Secondary Criteria**: watershed area, slope, stream gradient, surrounding land use, estimated annual recharge to watershed.
5.2.3 Watershed Management Plan

One of the San Antonio Water System’s objectives is the protection of all watersheds in Bexar County and the region. While SAWS has jurisdiction within only a limited area of the city and the extraterritorial jurisdiction, a watershed approach to managing water resources is used throughout this plan. With this in mind, SAWS has developed a watershed protection master plan to assist in achieving this goal.

The following is a brief overview of the Watershed Master Plan for protecting water quality in San Antonio and Bexar County. By implementing the Watershed Master Plan, San Antonio takes a leadership role in promoting actions that will protect water quality and enhance the amount of recharge taking place in the recharge zone.

The Watershed Master Plan, together with the City of San Antonio’s Master Plan goals, provide a mechanism for education and the preservation of watersheds to balance economic growth and environmental requirements. Some of the components of the plan are described in the following section.

SAWS will carry out the policy of non-degradation of the Edwards Aquifer and ensure the protection of the water quality of watersheds crossing Bexar County and discharging to the waterways of the United States.
This will be accomplished by utilizing the 33 Mandates, ordinances and direction provided by City Council, and putting into service state regulations, federal regulations and the City of San Antonio NPDES permit, and other mechanisms and agents to extend protection to:

- The drainage area which channels runoff that flows into streams;
- The Recharge Zone which is a conduit for direct entry of water to the aquifer;
- The transition zone which is geologically fractured and faulted;
- The storm sewer system and discharges to tributaries, creeks and watersheds; and
- Water supply wells used for potable water.

The goal of this effort is to comprehensively manage the watershed as a whole and to protect the water supply from any potential contamination through a balance of economic development and environmental considerations. To accomplish this, SAWS will:

- Have a highly regarded water quality education program which increases awareness of water quality issues including stormwater, aquifer protection, wellhead protection, potable water standards and the sensitivity and significance of environmental areas. This will be done by proactively outreaching to contractors, developers, neighborhood associations, schools, customers and other public and private entities to share and receive information and ideas.
- Explore and apply appropriate technologies in establishing data collection activities and provide for accurate interpretation as a tool in the decision making process. SAWS will perform or participate in studies to provide the technical information and data required to protect the Edwards Aquifer and Bexar County watersheds.
- Establish a superior GIS database for the Edwards Aquifer and each watershed throughout Bexar County. This will include data related to testing, chemical analyses, land use and other factors,
which will aid staff, the SAWS Board, City Council, or the general public in the planning process for protection of water quality and our drinking water supply.

- Establish a network of sampling stations in every watershed, which can provide water quality data at any location in Bexar County. SAWS will comprehensively manage and monitor regional watersheds to ensure water quality for human and environmental needs. SAWS will provide proper review and oversight of development and construction activities on the Recharge Zone and throughout Bexar County so that the non-degradation policy is implemented and permit requirements are met to protect the pristine quality of our drinking water supply.

- Continually review and recommend regulations, ordinances and statutes to meet water quality protection based on sound science and technical data.

- First, try to educate and bring into compliance, and then if necessary, bring enforcement actions against any person who may be acting as a potential source of contamination of the water quality in the Edwards Aquifer, other potable water sources, or the watersheds of Bexar County.

- Provide courteous, responsive and helpful response to citizen complaints concerning water.

- Continue to develop and upgrade staff so that they are recognized as experts on water quality in the region.

5.2.4 Chapter 213 Rules

As a response to Texas' concerns regarding the preservation and protection of the excellent quality of water available from the Edwards Aquifer, the Texas Natural Resource Conservation Commission (TNRCC) enacted regulations under authority of the Texas Water Code. These Edwards Rules are contained in 30 Texas Administrative Code (TAC) Sections 213.1-213.14, better known as the Chapter 213 Edwards Rules. These rules are strictly geared to regulating activities on the Edwards
Aquifer Recharge Zone and Edwards Aquifer Transition Zone. One avenue the TNRCC uses to regulate this activity is with the application process. This process identifies potential sources of contamination to the Edwards Aquifer. All development over the recharge zone must comply with the Edwards Aquifer Protection Plan (EAPP). The EAPP consists of the following items: Water Pollution Abatement Plan, Organized Sewage Collection System, Static Hydrocarbon and Hazardous substance storage in underground and above ground storage tanks. All of these items are mechanisms used to regulate development on the Edwards Aquifer Recharge Zone.

5.3 Treatment and Integration of Additional Supplies

Unless specifically designated for non-drinking water uses, all additional supplies of water developed and delivered to the city will meet all state and federal drinking water standards. The same benchmarking and decision making process that was used to adopt this Water Resource Plan will determine how to best deliver all additional sources of water.

Issues that will be decided by this process would include the following:

- Treating additional drinking water supplies to the same excellent quality that the City currently enjoys from the Edwards aquifer;
- Delivery areas of new supplies; and
- Timing of use of the various new supplies.

The benchmarking and decision making process will balance the competing goals of maximum efficiency, cost of water and the community’s desire to have equal access to Edwards water.
However, any decision made will probably necessitate greater variability with respect to the sources of water that will be available to SAWS customers at their tap in the course of a year.

SAWS’ existing delivery system consists of over 4,000 miles of pipes reaching more than 275,000 connections. The system is a collection of "hubs" wherein water is pumped from the Edwards Aquifer at pump stations into large diameter pipes. As the water moves away from these pumping stations the pipes get smaller and smaller. Thus imported water will need to be distributed through these pumping stations, which exist all over SAWS service area in the artesian zone of the Edwards Aquifer.

Further the system is also divided into service levels established by planes of pressure within the distribution mains. The elevation of the ground influences the boundaries of these service levels. From an engineering perspective it is more efficient to have water flow within the service levels, rather than between them. However, it is possible to interconnect the service levels. The costs of interconnection have not yet been determined.

As various sources of water recommended by this plan are developed, an analysis will be required to determine the best location to deliver these supplies. Supplies could be delivered to various pumping stations, or to growth areas, or to a particular least cost area, or supplies could be recharged into the Edwards Aquifer and then pumped and delivered as we do now. This decision has not been made and will undergo the same decision making process and benchmarking analysis as other water resource issues.
5.4 Recommendations

- SAWS should maintain an aggressive water quality protection program based on sound science and technical data.
- SAWS should seek to improve state rules and enforcement regarding water quality protection.
- SAWS should continue the property acquisition program to ensure protection of the most sensitive properties. Partners such as the Bexar Land Trust and the Texas Parks and Wildlife Department as well as other governmental and non-profit agencies should be sought to maximize the effectiveness of this program.
- SAWS should implement the Watershed Management Plan and coordinate with other city functions such as drainage regulation and maintenance, land use planning and site design requirements.
- SAWS should develop a contingency plan in the event of aquifer contamination.
- SAWS should continue to develop the expertise to design and maintain drinking water treatment facilities in anticipation of additional supplies being integrated into the system.
6.0 Existing and Projected Water Demands

6.1 Guiding Principles

The following “guiding principles” are to be applied in considering existing and projected water demands.

- An aggressive conservation program is the most cost-effective and environmentally responsible source of water that any water purveyor can develop.
- Water use efficiency (or “demand management”) can be achieved through permanent structural changes as well as behavioral changes.
- Drought contingency plans, including curtailment measures, are an appropriate method of managing demand during unusually dry periods.
- A responsible water supplier plans for projected growth. Water availability should not limit growth.
- SAWS should consider the expected water demands of all of Bexar County in its water resource planning.

6.2 Population and Water Demand Projections

6.2.1 SAWS Service Area Projections

Projected future water demand is based on a projection of future population multiplied by the projected future average water use per person. Population and water use projections are frequently controversial in the development of a long-term plan because the chosen projections dictate the amount and ultimately the cost of additional water supplies.
This Water Resources Plan includes population and water demand projections to 2050 for the SAWS service area, Bexar County, and the Edwards Region. It uses the Texas Water Development Board’s “most likely” population series, and then applies SAWS’ “most likely per capita consumption” for the future based on SAWS’ aggressive conservation program and goals. The TWDB most likely population projection was developed by consensus of the planning staffs of the TWDB, Texas Natural Resource Conservation Commission (TNRCC), and the Texas Parks and Wildlife Department (TPWD) as the growth pattern most likely to occur in this area. These population projections were then multiplied by the most likely water demand per capita projection for the San Antonio Water System to produce the total projected demand. (See Table 1.)

| Table 1 |
|-----------------|----------|----------|----------|----------|----------|----------|
| San Antonio Water System Fifty Year Supply Goals |
| 2000 | 2010 | 2020 | 2030 | 2040 | 2050 |
| SAWS Projected Population | 1,137,369 | 1,360,669 | 1,621,857 | 1,886,190 | 2,125,314 | 2,394,753 |
| SAWS Projected Demand Per Capita (gpcd) | 148 | 140 | 135 | 132 | 132 | 132 |
| SAWS Projected Demand (Acre-Feet) | 188,555 | 213,380 | 245,256 | 278,890 | 314,247 | 354,086 |
| Projected Demand plus 10 Year Supply (AF) | 213,381 | 245,256 | 278,890 | 314,247 | 354,086 | 389,494 |

The TWDB water demand projections for SAWS are based on an average consumption of 185 gallons per capita per day (gpcd) in 1998, declining to 165 gpcd by 2050. However, SAWS staff believes that this TWDB projection overestimates SAWS’ actual demand. In 1993, SAWS adopted a Conservation and Reuse Plan that set a goal of reducing per capita consumption to 150 gpcd by 1998. This goal was actually realized a year early, in 1997. By continuing and expanding SAWS’ aggressive conservation efforts, SAWS staff estimates that by 2000 our per capita consumption will decline to 148 gpcd, and that we will reach the goal of 140 gpcd by the target of 2007. Thereafter average consumption will continue to decline, until it stabilizes at 132 gpcd by 2030.
Conservation will continue to play an extremely important role in SAWS’ water future. However, for this plan the amount saved through conservation is not represented as an additional source of water, but instead as a reduction in demand (see Figure 4).

![SAWS Expected Conservation Savings](image)

**Figure 4.** TWDB vs. SAWS Water Demand Projections, 2000 - 2050

### 6.2.2 Conservation and Projected Water Demand

SAWS has reduced per capita consumption by 25% since the mid-1980s. This success in reducing demand has been due to a broad array of conservation strategies. First among these strategies is a "conservation rate structure," which uses inverted block rates to reward efficient use of water with a lower price per gallon and to deter inefficient use with higher unit prices at larger volumes. This is supplemented by rebates for retrofitting, for both indoor and outdoor water conservation by both residential and commercial customers. In addition, aggressive programs of universal metering and leak detection have reduced water losses in the water distribution system.
SAWS will continue to expand and refine these conservation strategies, with added emphasis on education to change consumer behavior. We will continue to work with school districts and other agencies involved in the education of children, to increase awareness of water conservation and reduce domestic water consumption. We will also continue to deliver information and education about ways to reduce water use at home and at work through public associations, neighborhood groups, civic organizations and public meetings. Additional efforts will include greater quantification of non-metered water uses such as fire fighting, main flushing, and water pressure testing, in order to better quantify, and hopefully reduce, the amount of unmetered water use. SAWS will continue to monitor all these programs to ensure that they are all producing optimum results.

A more detailed description of the conservation program for the next five years is contained in an Appendix at the end of this document. This conservation and reuse plan is required by 30 Texas Administrative Code, Chapter 288, and it must be updated every five years with the Texas Natural Resource Conservation Commission. The attached revision of the original 1993 plan was produced with input from the Community Conservation Committee and the Water Recycling Advisory Committee as well as other citizens.

6.2.3 SAWS Minimum Supply Goal

It is prudent to establish a buffer or "minimum supply goal" that exceeds projected demands as part of our planning strategy. Developing supply ahead of demand will allow sufficient time to meet any contingencies in bringing the next source on line. Also, this will ensure that SAWS has enough water supply on hand to meet the needs of everyone even in times of drought or from unexpected growth in water use that exceeds the average growth rate used in the demand projection stream.
This plan proposes that SAWS is to meet our projected water supply requirement 10 years in advance of need as a minimum supply goal (for example, the 2010 water demand will be available by the year 2000). (See Figure 5) Thus by 2000, SAWS will need to have over 200,000-acre feet of water supply to reach this supply goal. By 2050 SAWS’ supply goal is expected to double to nearly 400,000-acre feet.

![Graph](image)

**Figure 5.** SAWS Projected Water Demand, 2000 - 2050

### 6.2.4 Bexar County Projections

Bexar County’s total water needs are important to this plan because SAWS must consider the needs of the entire county for planning purposes. SAWS has assumed the responsibility to be a leader in water resource planning for the entire county. Bexar County represents between 40% and 60% of the region’s total water demand on the Edwards Aquifer.
Bexar County has over 62 water providers within its boundaries, of which SAWS is the largest. For the remainder of Bexar County and the Edwards Region, this plan uses the TWDB's "most likely" population projection and TWDB's projected per capita water demand under below normal rainfall conditions and with advanced conservation practices. The TWDB projected per capita demands are used because SAWS can't anticipate others' future per capita consumption as for the SAWS system. Actual demand reductions due to conservation outside SAWS' service area can be incorporated into future revisions of this plan.

Under these assumptions, by 2000 Bexar County will need approximately 400,000 acre-feet of water supply to meet its needs. (See Figure 6) By 2050 Bexar County is projected to have a demand of over 650,000 acre-feet. This is 250,000 acre-feet more than the EAA is currently able to allocate for the entire region under SB 1477 and existing aquifer withdrawal limits, clearly indicating a need for additional non-Edwards supplies for San Antonio and Bexar County, unless the yield from the Edwards can be increased.

Figure 6. Bexar County Projected Water Demand 2000 - 2050
Table 2

Region “L” and Bexar County Water Demands, 2000-2050
(Acre-Feet per Year)

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6.2.5 Regional Projections

Although this is a local plan for San Antonio, it must also consider the growing needs of the region to which we are economically and hydrologically linked. SB 1 planning Region “L” includes 21 counties surrounding San Antonio: Atascosa, Bexar, Caldwell, Calhoun, Comal, DeWitt, Dimmit, Frio, Goliad, Gonzales, Guadalupe, Hays (part), Karnes, Kendall, LaSalle, Medina, Refugio, Uvalde, Victoria, Wilson and Zavala. TWDB’s 1996 consensus projections of water demand for this 21 county region, compared with a summary of the estimated water supplies available within the region, indicate the total demand/supply picture for the region (see Figure 7).
In 1990, water use in Region L was 1,130,399 acre-feet, of which 300,042 acre-feet (26.5%) was used in Bexar County. Projected water demands for the region in 2050 are 1,617,755 acre-feet per year, of which 653,079 acre-feet (40%) is projected for Bexar County (Table 2). Demands for municipal, industrial, steam-electric power generation, and mining purposes are projected to increase in future years due to increasing population. Demands for irrigation are projected to decline as a result of both increased water conservation and decreased federal farm programs. Demands for livestock are projected to remain constant at the estimated carrying capacity of the region’s rangeland.

The estimated water supply for the 21 county region in 1990 was 1,625,222 acre-feet per year. This is projected to decline to 1,422,647 acre-feet per year by 2010, and without development of additional supplies it will remain at that level through 2050. The reasons for the decline in supply available are the pumping limits set by SB 1477 and the assumption that withdrawals from the Carrizo Aquifer will be reduced in order to slow the rate of depletion or mining that aquifer.

A comparison of projected demand with available supplies shows that shortages are projected to occur for the 21 county region beginning in about 2022. A shortage of 54,212 acre-feet per year in 2030 is projected to increase to 195,103 acre-feet per year in 2050.
Thus the total regional demands could be met from existing regional supplies available through about 2020, if these supplies were readily available to all parts of the region. However, this is not the case. For example, the water supply available locally in Bexar County is estimated at 359,568 acre-feet per year from 2010 through 2050. Comparing this local supply with Bexar County's projected demands shows that shortages of about 50,000 acre-feet per year could occur as early as 2000. The local shortage is projected to increase to about 325,000 acre-feet per year in 2050.

![Graph showing projected water demand](image)

Source: TWDB projections below normal rainfall advanced conservation.

Figure 7. Region “L” Projected Water Demand 2000 - 2050

### 6.3 Recommendations

- SAWS should continue to use the TWDB population and water demand projections as a baseline for estimating future water demand requirements.
- SAWS should adjust the TWDB projections to account for water savings through conservation at the local level to ensure that supplies that are not needed are not acquired.
- SAWS should encourage the entire region to pursue conservation standards when determining future supply requirements.
• SAWS should expand its aggressive conservation plan over time.

• SAWS should re-estimate demand projections in the annual assessment of the Water Resources Plan and formally update these projections at least every three years to account for changes in population trends as well as refinements in consumption pattern estimations.
7.0 WATER SUPPLIES

7.1 Guiding Principles

The following “guiding principles” should be applied in considering possible water supplies.

- The Edwards Aquifer will continue to be the region’s primary source of supply. Opportunities to increase the supply without violating the goals for aquifer management set out in the Edwards Aquifer Authority enabling statute will be studied and pursued.

- SAWS will defend its historic right to use the Edwards Aquifer.

- Development of necessary additional amounts of water supply is a capital investment necessary to support the economy of the San Antonio area.

- Multiple sources, utilized in a comprehensive and balanced strategy, are desired to provide a more reliable overall water supply. These sources will reduce SAWS’ relative dependence on the Edwards Aquifer, and hence reduce San Antonio’s vulnerability to legal or regulatory limitations on the aquifer.

- Supplies that provide a “firm yield,” a consistent supply during the drought of record, provide the most reliability for municipal uses.

- Interruptible supplies (supplies that may not produce water in a drought) may be part of a water supply strategy, provided sufficient storage is available to use them when needed.

- The cultural and social impacts of SAWS’ water resource development program on the citizens of San Antonio and citizens in the source areas will be considered in decisions on water supply projects.
• SAWS will have a goal of maintaining an excess of supply over demand at any point in time equal to the projected growth requirements for the next ten years.

• Additional water supplies will be pursued in tandem with opportunities to increase the Edwards Aquifer supply. If more water becomes available from the Edwards Aquifer, the requirements for additional supplies and the additional water supply activities will be adjusted accordingly.

• SAWS will consider the water needs of the Greater San Antonio/Bexar County area when additional supplies are acquired.

• Consideration of projects to develop additional water supplies will acknowledge the needs of others in the region. To the extent that others outside of San Antonio/Bexar County wish to participate, partnerships will be created to allow joint development to benefit all participants.

• SAWS will pursue additional supplies through option contracts or other contract structures that commit the supply to SAWS but allow an appropriate amount of time for consideration of the project in the public process. SAWS may incur dollar costs to hold the seller commitment for a period of time to allow a final commitment by SAWS in this manner.

• SAWS’ acquisition of additional supplies will recognize the SB 1 regional planning process now being developed, and the need for future water projects to be included in the approved regional plan. However, potential opportunities to take additional supplies under contract will be acted upon.

• Interbasin transfers of surface supplies, even from the Guadalupe Basin to the San Antonio Basin, are limited by the interbasin transfer provisions of SB 1. One of the tests for approval of an interbasin transfer by TNRCC is the degree to which the receiving basin has developed its own basic supplies. Emphasis will be placed in acquisition and development of existing or new surface water supplies within the San Antonio Basin.
• Existing supplies in SB1 Region L planning area are insufficient to meet projected needs in the region. It is prudent to begin the planning of new water resource projects, including storage projects.

7.2 Current Supply Sources

7.2.1 Background on the Edwards Aquifer

For more than 8,000 years people have settled in the 3,600 square mile area of the Edwards Aquifer because of its fresh flowing spring water. Today, it is the primary source of water for 1.3 million people, the majority of them living in San Antonio.

The Edwards Aquifer began forming about 100 million years ago when all of central Texas was covered shallow seas. Thirty-five million years later, when dinosaurs were becoming extinct, the inland seas receded for the last time, leaving behind layers of shells and coral. In time, these layers formed the porous, honeycombed limestone rock of the Edwards Aquifer. The Edwards Aquifer extends 176 miles from Bracketville in Kinney County to Kyle in Hays County. Cities, towns, rural communities, farm and ranchlands all depend on the aquifer's water for domestic, commercial, agricultural, industrial and recreational purposes.

The Edwards Aquifer System is quite complex and includes three distinct geologic segments as well as springflow. The Edwards limestone formation consists of the drainage or catchment area, the recharge zone, and the artesian or reservoir zone. (see figure 8)
**Drainage Area**

The area north and west of the aquifer is called the Edwards Plateau, or more commonly, the Texas Hill Country. It serves as the catchment or drainage area for the aquifer. The drainage area, which includes all or part of eight counties, is the largest component of the aquifer system, spanning approximately 4,400 square miles. Rain falling on the drainage area soaks into the porous limestone of the plateau, forming spring-fed streams. These streams flow downhill, over relatively impermeable older formations, until they reach the recharge zone.

**Recharge Zone**

The next segment, called the recharge zone, is geologically known as the Balcones Fault Zone. An abundance of Edwards limestone exposed at the surface with its permeable and porous nature provides the path for water to seep into the artesian area.

Recharge is water that enters the aquifer's underground reservoir through geological features such as fractures, sinkholes and caves. The streams flowing down from the Edwards Plateau cross the recharge zone and disappear into the ground. Rain falling directly on the recharge zone also percolates or seeps into the ground and enters the underground reservoir.

The recharge zone encompasses 1,500 square miles and forms the northern boundary of the artesian area in Kinney, Uvalde, Medina, Bexar, Comal and Hays counties. Even though precipitation is greater in the eastern counties, the largest amount of recharge to the Edwards Aquifer occurs in the catchment basins of the western counties. Larger catchment areas and larger recharge areas than those in the east characterize the western basins. The Nueces River basin, the Frio-Sabinal basins and
the Seco-Hondo-Medina basins (located in Medina, Uvalde and Kinney Counties) supply about 70 percent of the total recharge to the aquifer.

**Artesian /Reservoir Area**

The artesian/reservoir area is a complex network of honeycombed rock with spaces varying from extremely small to huge open caverns. This rock underlies nearly 2,100 square miles and spans approximately 180 miles from west to east, in a strip varying from five to 30 miles wide. The artesian area underlies the six counties south and east of the Balcones Fault Zone: Kinney, Uvalde, Medina, Bexar, Comal and Hays Counties.

Unlike the recharge zone, water flowing over the artesian area cannot seep directly down into the aquifer. However, the water that enters in the recharge zone flows underground into the artesian area. This area is confined between two impermeable rock formations. Water contained in the artesian area is under enough pressure that it is forced up through cracks and fissures forming springs at the surface.

Water leaving the aquifer is referred to as discharge. Water is discharged from the aquifer naturally by springs and through flowing wells, and by pumping. When the aquifer level goes up, spring discharge increases. Correspondingly, a lower aquifer level produces lower natural discharge rates.

The Edwards level reading reported each day in the news is measured in feet above sea level at an index well ("J-17") on the grounds of Fort Sam Houston. It is an indicator of hydrologic pressure in the Edwards, and only indirectly reflects the absolute quantity of water in the aquifer. The lowest
Edwards level recorded was 612' msl in 1956, at the height of the drought of record. The highest reading was 703.3' msl, in June 1992 after months of record rainfall.

*Spring Flow*

Before there was any pumping, the aquifer was held in a natural balance between recharge and spring discharges. There are five major springs in the Edwards region: Leona springs in Uvalde, San Antonio and San Pedro springs in San Antonio, Comal springs in New Braunfels, and San Marcos springs in San Marcos.
7.2.2 SAWS' Edwards Aquifer Pumping Right

The Edwards Aquifer will always be the principal source in SAWS' water supply portfolio. Therefore any discussion of water supplies for San Antonio must begin with the Edwards Aquifer. It is inexpensive compared to other sources and available in significant quantities relative to SAWS' total needs even with the Edwards Aquifer Authority's permit program discussed below. New non-Edwards Aquifer sources will require five years or more to construct. The Edwards Aquifer and recycled water are SAWS' only sources in the short term.

As discussed above (Section 4.2), SB 1477 established the Edwards Aquifer Authority to regulate groundwater pumping from the Edwards Aquifer. The EAA is currently conducting an adjudication process to determine the amount of water that will be permitted to each Edwards Aquifer water user claiming historic water use in the period 1971-1993.

SAWS has applied for a permit based on a maximum historical use of 193,000 acre-feet per year. The final permit amount may be less than the maximum historical use, according to a pro rata reduction process prescribed by SB 1477. Most likely SAWS' and other permits will equal the users' average use during the historical period, which is the statutory minimum. SAWS expects the minimum to be between 148,000 and 170,000 acre-feet per year. SAWS' current water use is approximately 178,000 acre-feet per year.

There are two opportunities for increasing the supply available to SAWS from the Edwards Aquifer, and SAWS is pursuing both of them. They are to acquire other Edwards Aquifer pumping rights through water market transactions as allowed by SB 1477 and to increase the total supply available
from the Edwards Aquifer through optimization and recharge enhancement. Aquifer optimization and recharge enhancement are discussed further in Sections 7.2.4 and 7.2.5 below.

7.2.3 Acquisition of Additional Edwards Aquifer Pumping Rights

In the short term (three to five years), except for the recycled water supply discussed elsewhere in this plan, no other source of water besides the Edwards is available to SAWS. Therefore additional Edwards Aquifer groundwater rights will be required to meet SAWS’ needs.

To date, SAWS has acquired approximately 4,000 acre-feet per year of Edwards Aquifer groundwater rights from other permit holders. This process is just beginning, and it will continue according to the Policy for Acquisition of Additional Edwards Aquifer Supply expressed by SAWS Resolution No. 97-265, adopted October 7, 1995. (See Appendix 12.6) This policy limits SAWS’ acquisition of other Edwards Aquifer groundwater pumping to reasonable amounts so as not to harm the economy of the irrigation area of the Edwards region or disrupt the cultural and social processes of that area. This limitation also acknowledges San Antonio’s need to develop other non-Edwards Aquifer supplies as a hedge against future limitations on the Edwards Aquifer, occasioned by critical droughts or litigation to protect endangered species at Comal and San Marcos Springs. The Acquisition Policy also acknowledges that a shift of a significant volume of pumping from the western counties to Bexar County may increase the frequency of critical periods.

Since SAWS’ final groundwater pumping permit is not yet known, it is impossible at this time to specify the precise amount of additional Edwards Aquifer rights which will need to be acquired. The
target amount will be developed and refined in the ensuing two to three years while the EAA adjudication process operates to arrive at a final SAWS groundwater pumping right amount.

7.2.4 Optimization of the Edwards Aquifer

Senate Bill 1477 caps total groundwater pumping rights at 450,000 acre-feet per year. This amount must be reduced to 400,000 acre-feet per year by 2008. In addition, SB 1477 requires the EAA to implement water management practices by the end of 2012 to maintain continuous minimum springflows at Comal and San Marcos Springs, in order to protect endangered and threatened species. However, SB 1477 also allows the total pumping limit to be increased if sound technical analysis proves that increased pumping can be allowed without violating the Act’s management precepts.

The Citizens Committee “Framework” Report coined the term “Aquifer Optimization” to describe the application of technology to increase the supply available from the Edwards Aquifer. The Committee further recommended that the City should pursue Aquifer Optimization in parallel with efforts to acquire additional non-Edwards Aquifer groundwater and surface water supplies. The CCOWP also recommended that preference be given to projects that meet both optimization and additional supply strategies.

Reasoning that the entire Edwards Aquifer region could benefit from increasing the supply available for the Edwards Aquifer, SAWS has asked the EAA to take the lead in the Aquifer Optimization activity. The EAA is now managing this activity with significant technical and financial support by SAWS. The Aquifer Optimization effort is proposed to begin with studies of technical elements related to the supply available from the Edwards Aquifer. These elements include the following.
• Engineered structures on or upstream of the recharge zone to enhance recharge.

Recharge enhancement structures or recharge dams have been evaluated and have been proven to be a viable alternative for increasing the yield of the Edwards Aquifer. As part of the Trans-Texas Water Program Phase II analysis, studies previously conducted for the Edwards Underground Water District were continued. These studies evaluated and prioritized potential locations for additional recharge dams in the Nueces, San Antonio, and Guadalupe River basins. These structures were identified for sites where direct recharge into the Edwards Aquifer can be enhanced by temporarily detaining storm flows behind dams, allowing time for infiltration through the streambeds.

• Range management programs on the recharge zone to enhance recharge.

The Range Management Study will conduct a pilot project to determine the effect on soil moisture and runoff of selective clearing of invasive shrubs and continued intensive management of grasslands in the recharge zone. Previous studies by range management scientists in the western portion of the recharge zone have indicated that direct infiltration of rainfall into the soil will be increased, resulting in more recharge to the aquifer and increased local springflow.

• Recirculation and recharge of excess spring flows emanating from the Edwards Aquifer to increase total storage in the Aquifer.
The concept behind this option is that some quantity of flow from the major springs that is in excess of downstream and species requirements during wet periods might be captured and transported back to an area for reinjection or recharge into the aquifer. Preliminary technical work was conducted by the Trans-Texas Water Program to examine the potential benefits of springflow recirculation. Coordination with other Optimization studies will help to determine the optimum locations for reinjection into flow paths that will retain this water in the Edwards for maximum periods of time. This might delay or possibly prevent critical drops in spring flow.

- Flow path studies to better understand how water recharging the Edwards Aquifer moves from the recharge zone and through the aquifer to the spring areas.

A better understanding of these pathways and how they affect water flow will aid in locating the ideal sites for recharge dams and recirculation project sites. These studies will also provide necessary data for optimum positioning of pumping centers and for designing Edwards aquifer emergency response plans.

- Saline Water Line Study to determine the potential for movement of saline water into the fresh water portion of the aquifer during periods of extended regional drought conditions.

This study is underway. Concern that intrusion of saline water might affect water quality in the major springs and in several municipal well fields has resulted in the design and construction of a region-wide monitoring well network. Additional monitoring wells are being drilled in Kyle and other areas of the aquifer. Long-term monitoring will answer the question of whether saline
water intrusion might occur, and will provide a sentinel system for the springs and wells that might be affected. This study must be conducted over many years so that sufficient data can be collected to establish conclusive findings.

- Biological Assessment studies of the various species and their habitats in the spring areas and river systems to better understand their flow requirements.

These studies will also evaluate the effects of the various Aquifer Optimization strategies on any of the endangered species or their habitats. This is a critical element in determining potentially available yields from the Edwards.

- Augmentation of Comal and San Marcos springflows to provide sufficient flows for endangered species and their habitats.

Studies of this option will examine currently operating systems worldwide, and will determine whether some form of augmentation might be safely implemented on a pilot project scale in the Edwards Aquifer. Previous studies suggest that augmentation may be feasible, but substantial issues remain.

The significance of this option is that if spring flow can be successfully and safely augmented during extended drought periods to maintain the species and their habitats in or near the spring openings, then additional water might be available for all aquifer users.
- Weather modification to increase rainfall and recharge of the Edwards Aquifer.

Cloud seeding operations have been successfully carried out for several years in other areas of Texas. A well designed and properly monitored program in the catchment and recharge areas of the Edwards aquifer region could potentially increase rainfall that would enter the streams and rivers that run across the Recharge Zone, thus increasing recharge. The EAA is seeking a permit to conduct such a program.

- Edwards Aquifer flow modeling project.

This will use new data from the Flow Path studies to construct or recalibrate a predictive model of the Edwards Aquifer for use as a tool for future aquifer management. Accurate predictions of spring flow and aquifer levels at significant sites as a result of changing aquifer conditions will result in increased ability to effectively manage the Edwards aquifer. A more accurate flow model will also help identify sites for recharge dams, pumping centers, and injection well sites.

One of the recommendations of the Aquifer Optimization effort was the formation of an advisory group of technical representatives from local, state and federal agencies, academic institutions and other interested parties. This group has been formed and has developed scopes of work for the study of the technical elements set out above. A managing consultant has been selected by the EAA and is being engaged to perform the studies. This will be a multi-year effort. SAWS estimates that approximately $500,000 per year may be required for the Saline Water Line Study and an additional $500,000 per year for other optimization studies. If these efforts culminate in technical proof that
the pumping limits in SB 1477 can be increased without compromising the management goals of SB 1477, then SAWS and others could have their permitted pumping amounts increased. SB 1477 specifically provides that an entity increasing recharge to the Edwards Aquifer may retrieve the amount recharged during the preceding 12 month period less the amount that was calculated as spring discharge.

7.2.5 Recharge Enhancement

Recharge enhancement, one component of Aquifer Optimization, has been proven as a viable technology to increase the supply of water available from the Edwards Aquifer. Small scale projects built specifically for recharge by the Edwards Underground Water District and flood control dams built on the recharge zone are in place and contributing annually, on average, several thousand acre-feet of additional recharge to the Edwards Aquifer. Large-scale projects have been studied, and appear to be technically feasible, sufficient to increase the total recharge to the Edwards Aquifer by 10% or more. This would be 20,000 – 60,000 acre feet under average and drought conditions.

There has been a continuous debate in the community about how to evaluate and measure the worth of recharge enhancement amounts in comparison to other water supply solutions available to the City of San Antonio. Other potential ground and surface water solutions are normally evaluated as to the unit cost of water available on a firm annual basis even in the drought of record. Legal and environmental constraints are generally well known and factored into the cost. This is not the case with recharge projects, which can be evaluated with present technology only for the increase in volume of recharge to the aquifer. The benefit to the City of any recharge project cannot be
calculated at this time for comparison to other alternatives because the EAA has not yet approved the rules for recharge credits.

So, we do not have a way to make a direct comparison of the benefits and costs of recharge projects to the benefits and costs other water resources projects. Indirectly, we can compare the amounts recharged with other supplies. Therein lies the debate over how to evaluate a recharge project for comparison to other projects.

Previous studies have presented amounts of additional recharge from proposed projects under two conditions: the amount recharged on long-term average, and the amount recharged during the drought of record. Typically, there is a five to one difference in the two scenarios, with the long-term average being five times greater than the drought average. Thus the drought average unit cost is five times larger than the long-term average unit cost.

Additional recharge has a regionwide benefit of increased water available for pumping or springflow. Therefore, a case can be made for evaluating recharge projects for their long-term average recharge. If all water in the region is managed in a conjunctive manner including complete utilization of Edwards Aquifer springflows, a very good case can be made for analyzing recharge projects on the basis of long-term additional recharge provided. Technical studies using a computer model to simulate the operation of the Edwards aquifer have shown a carryover benefit to following years from additional recharge in a particular year.
On the other hand it can be argued that using the drought average additional recharge is a better comparison to other projects that are evaluated for their firm yield during a repeat of the drought of record. Most recharge projects when evaluated provide near zero recharge in the most critical drought years. Further, the Edwards Aquifer Authority, through application of rules not yet written, will regulate the amount of the benefit allowed from a particular recharge project.

For purposes of evaluating and selecting recharge projects in competition with other water supply sources for San Antonio, SAWS will apply the benchmark criteria. The drought average unit cost may be presented for purposes of calculating an average cost of water in the future from all projects, but this is not meant to suggest that SAWS will use that unit cost as controlling in the evaluation of any particular potential recharge project.

SAWS is committed to recharge enhancement for the Edwards Aquifer as part of a comprehensive management strategy. The best approach to recharge enhancement would be a regional program supported by the EAA or other regional entities and constructed for the benefit of all users of the Edwards Aquifer. Individual recharge projects may be pursued independently by SAWS for SAWS' benefit, but only after the EAA adopts rules assuring that SAWS will benefit, as measured by additional pumping allowed, commensurate with the costs for any project that SAWS might construct.

7.2.6 Recycled Water

In 1996 the SAWS Board of Trustees authorized design and construction of the Recycled Water Project to recycle 35,000 acre-feet per year of treated wastewater from SAWS' water recycling
centers (wastewater treatment plants) to water users now served from the Edwards Aquifer for non-drinking water purposes. These uses are principally irrigation of public parks and golf courses and industrial processing and cooling uses. Such recycling has the effect of increasing SAWS supplies of Edwards Aquifer water available for drinking water purposes by about 35,000 acre-feet. The construction phase is 25% complete as of June 1, 1998. The 35,000 acre-feet per year will be phased in over the next 2-4 years as the project is completed. Figure 9 provides a general description of the Recycled Water Project.
WATER RECYCLING SYSTEM

Figure 9
7.2.7 Canyon/Bulverde Project

In 1997, SAWS was given the opportunity to participate in a surface water supply project being developed by the Guadalupe-Blanco River Authority (GBRA) for western Comal and eastern Kendall Counties. SAWS negotiated and approved a contract with GBRA to receive water treated to state and federal drinking water standards on a wholesale basis from the project delivered to the north and northwest sectors of SAWS’ distribution system. Although small enough in scale to be termed a pilot project, the project serves as a model for regional cooperation on later and larger surface water projects that might be pursued. The contract provides for an initial supply in excess of 3,000 acre-feet per year, which will be reduced to 2,000 acre-feet per year over the initial 40-year term of the contract. The project, which is just beginning the permitting and design phase, will be constructed in approximately three years by GBRA.

7.2.8 Volume and Cost of Current Water Supplies

Because there are no other practical alternatives, SAWS’ water supply goals for the next five years must be met from a combination of the current supplies discussed above. They are SAWS’ EAA groundwater pumping rights, the acquisition of additional groundwater pumping rights, the Recycled Water Program and the Canyon/Bulverde Project. The relative volumes of SAWS’ permitted and acquired pumping rights cannot be known until the EAA adjudication process is completed.

The costs of current supplies totaling about 200,000 acre-feet per year, including our anticipated EAA permit and additional acquired supplies as well as water quality measures, are already programmed in SAWS’ five-year financial forecast. The cost to deliver recycled water is approximately $400/acre-foot per year for capital and operational costs. The purchase price for
additional Edwards supplies is expected to be $500 - $700 per acre-foot for a one time capital purchase, based on recent acquisitions. The total cost of water from the Canyon/Bulverde Project, including the costs of delivery and treatment to drinking water standards, will be approximately $660 per acre-foot. Section 8 of this plan translates the estimated costs of future water resources to be acquired by the City into cost impacts on a per person basis.

7.2.9 Recommendations – Current Water Supplies

- SAWS should take all necessary steps in the EAA permit adjudication process to obtain the maximum amount of Edwards Aquifer groundwater pumping right allowed by SB 1477 and the EAA permitting rules.
- SAWS should acquire limited amounts of other Edwards Aquifer groundwater pumping rights according to the SAWS' Edwards Acquisition Policy.
- SAWS should support the study of Aquifer Optimization by the Edwards Aquifer Authority with both staff and funding.
- SAWS should complete the Recycled Water Project.
- SAWS should complete the Canyon/Bulverde Project.

7.3 Possible Future Supply Sources

7.3.1 Background on Additional Sources

Given the limitations on acquisition of Edwards Aquifer groundwater pumping rights according to the policy described above and the need to have a diversified, comprehensive and balanced water supply strategy, this plan proposes that future SAWS needs will come from other new supplies. That
is, the immediate demands will be met from the EAA permit, recycling, the Canyon/Bulverde project and acquisition of additional supplies. By 2050, SAWS will need an additional 174,000 acre-feet per year. Total Bexar County water demands by 2050 will increase to more than 650,000 acre-feet.

Additional water supplies available to the City can be categorized as “other” (non-Edwards Aquifer) groundwater, existing surface water, and new storage sources. Each of these categories, and the multiple sources available in each category, have a widely varying set of factors that affect their potential for development. These factors are environmental, regulatory and political in nature. Also cost, size, complexity and time of project development are factors that will affect project selection. Furthermore, the regional planning process prescribed by SB 1 will have a significant impact on the selection of future water supply projects.

The following sections describe each of the categories of potential future supplies, with emphasis on important factors affecting development of that source. Additionally, potential volume, cost, and the status of acquisition of each source by SAWS are discussed.

7.3.2 Other Aquifers

Sources

The Texas Water Development Board has identified and characterized nine major aquifers (including the Edwards Aquifer) and twenty minor aquifers throughout the state. The major aquifers are shown in Figure 10.
Major Aquifers of Texas

Aquifers

Edwards (BFZ)

Gulf Coast

Edwards-Trinity (Plateau)

Trinity

Edwards-Trinity (Plateau)

Seymour

Ogallala

Hueco-Mesilla Bolson

Cenozoic Pecos Alluvium

Carrizo-Wilcox

* OUTCROP (That part of the water-bearing rock layer which appears at the land surface.)

* DOWNDIP (That part of the water-bearing rock layer which dips below other rock layers.)

Figure 10
Within the reasonable reach of facilities, the Carrizo-Wilcox and the Gulf Coast Aquifer, to the south and east of San Antonio, have significant supply potential relative to future SAWS demands. In contrast, the aquifers nearby, within SAWS' service area in Bexar County and to the north and west, offer only limited quantities of water to meet localized needs. Some of the aquifers that are being studied are described in more detail below.

*Austin Chalk*

The Austin Chalk produces water in Bexar County. As its name implies, its predominant lithology is chalk and water is produced from fractures. Production rates are generally low with a few very good wells, which may have hydraulic communication with the Edwards Aquifer. The saline portion of this aquifer is present in the lower onethird of the county. Areas away from cities and developments would be the most likely choices to study, such as Medina County.

*Carrizo Sand*

The Carrizo Sandstone is a very good candidate to investigate as a future water source. This includes not only in Bexar County, but also in other counties adjacent to Bexar and possibly as far away as McMullen County, where Carrizo water is present with total dissolved solids less that 500 mg/l.

Water quality of the Carrizo is generally good, although iron is present in some areas.

*Trinity Group*

The “Trinity Group” includes the Upper and Lower Glen Rose, Cow Creek, Hensell Sand, and Hosston Sand. In general, these aquifers are found to the north of San Antonio. They have been described and analyzed as a source of water in "Ground-Water Availability of the Lower Cretaceous
Formations in the Hill Country of South-Central Texas," TDWR Report 273, 1983. Production rates are usually low. Fracturing of the limestones is the primary means of permeability. Some of the sandstones have good primary permeability. Most of the water in the Trinity Group is generally of good quality, with total dissolved solids of less than 1000 mg/l. According to one of the studies, the Glen Rose is a source of a small percentage of Edwards water.

Areas away from developments and current pumping centers should be investigated. According to the "North Bexar County Water Resources Study" by Simpson et al., growing demand upon the Trinity aquifer is a serious concern in northern Bexar County. A similar concern exists for Kendall and Comal counties. Possible counties for additional study would be those to the west, northwest, north, and northeast of San Antonio.

**Queen City**

The Queen City is a sandstone aquifer in Atascosa, Wilson and Frio Counties. The best wells appear to be located in central Atascosa County. The City of Pleasanton has several Queen City water wells. The Queen City may be attractive because it is not as extensively exploited as the Edwards or Carrizo Aquifers. Additionally, yields are moderate and much higher than is generally seen in the Trinity Group of aquifers. The water quality above the 1000 mg/l contour is generally good.

**Wilcox**

The Wilcox aquifer is in southeast Bexar County and the adjacent counties to the southeast, south, and southwest of San Antonio. Geologically, the Wilcox aquifer is located between the Carrizo Formation and the Midway Group. Water production from the Wilcox is generally less in volume
than that observed from the Carrizo or Edwards. Additionally, excess iron is often a problem. It has been suggested that more modern testing and completion methods may improve production and decrease the iron production.

Factors Affecting Development

Groundwater sources generally have less regulatory and environmental complications to development than surface sources, although groundwater conservation districts with the power to limit production and export of groundwater exist in the region, particularly in the nearby Carrizo-Wilcox area. Costs of groundwater are also generally less, particularly if the source quality requires little or no treatment to meet drinking water standards. A typical large-scale groundwater development requires multiple wells over a large area, connected by piping to a centralized pumping station and pipeline for delivery to the users. Permitting, land acquisition, design and construction of this type of project can be completed in approximately five years.

Volumes and Cost

The Trans-Texas Water Program identified 90,000 acre-feet of Carrizo Aquifer water that could be developed at a cost of $419 per acre-foot delivered to San Antonio. However, the Trans-Texas study did not address in detail the regulatory limitations, water level implications and potential impacts of this proposal on interconnected surface flows. Further studies analyzing these additional factors are likely to reduce that volume substantially.
Status of Acquisition

SAWS has engaged a consultant to examine the Carrizo-Wilcox Aquifer to determine the areas that have the best quality and quantity of water available, while considering local water needs. A scope of work is currently being prepared. This study is expected to require approximately six to 12 months to complete. Joint participation of interested groundwater conservation districts, river authorities and local interests will be sought in the study effort. Additionally, SAWS is preparing a grant application to the TWDB to help fund this study.

7.3.3 Existing Surface Water Supplies

Sources

Figure 11 is a map of SB 1 Regional Planning Area “L” in relation to surface water and the Edwards Aquifer. In the Upper Nueces Basin portion of Region L, no existing surface supplies exist that could be considered for utilization by SAWS.
In the San Antonio River Basin, Medina Lake has developed a major portion of the Medina River's supply potential. At present this supply is committed the lake’s original purpose: irrigation of approximately 33,000 acres in Bexar, Medina and Atascosa Counties. Recently a portion of the supply has been dedicated to Bexar Metropolitan Water District to support a surface water supply project with a treatment plant for municipal purposes in southwestern Bexar County. There is some question of the reliability of the Medina Lake/Medina River supply, because both the lake and the river dried up in the drought of the 1950s. SAWS has already acquired roughly 7,500 acre feet of flood flows from Leon Creek.

In the lower Medina River and the San Antonio River downstream of its confluence with the Medina, the majority of flow (other than flood events) is SAWS’ wastewater return flow. These flows are committed to the SAWS Recycled Water Project described above, to City Public Service for power generation purposes at Braunig and Calaveras Lakes, and to minimum flow requirements for water rights and instream flows which utilize the wastewater return flow stream. Some wastewater return flows in excess of these commitments are available, but they will likely require storage to provide a firm supply during droughts. Some existing water rights on the San Antonio River, mostly for irrigation purposes, could also possibly be acquired and converted to municipal use. However, the reliability of supply during the critical periods for these water rights is questionable.

In the Guadalupe Basin, the existing surface water supplies are Canyon Lake, existing run-of-the-river appropriations and remaining unappropriated water. The Guadalupe-Blanco River Authority has filed an application with the TNRCC for amendment to the Canyon Lake water rights permit. This amendment will make additional 35,000 acre-feet of firm yield available. Existing unutilized
appropriations and new appropriations may provide 60,000 acre-feet of additional supply. However, it must be noted that all or a substantial portion of this additional supply will be required for future increases in water demands in the Guadalupe Basin.

Farther east of the Guadalupe Basin there are existing reservoir and run-of-river rights that are currently unutilized or underutilized. Subject to future water needs in those basins, there may be supplies available from those sources.

Statutory Limitation

The interbasin transfer provisions of SB 1 significantly affect SAWS' ability to move water from outside the San Antonio River Basin into the San Antonio River Basin. SB 1 stipulates that any existing water supply loses its priority in the "first in time is first in right" operation of the state's water code and becomes junior to all other water rights in the basin of origin when it is transferred to another river basin. SAWS has not calculated the impact of this provision for any specific existing surface supply source in a neighboring basin. Expectations are, though, that it may render significantly less water available from any of the existing supplies, depending on the priority date of the right. This would have the effect of increasing the cost and reducing the reliability of that source. The viability of these sources may increase if this legislative constraint is amended.

Other Factors Affecting Development

Generally, surface water is significantly more regulated than groundwater in Texas. The Texas Natural Resource Conservation Commission regulates surfacewater in the state both for the protection of prior water rights holders and for protection of the environment. Major surface rights
holders are also subject to federal regulation, particularly for environmental protection. TNRCC is currently writing rules to interpret the new Texas Water Code provisions of SB 1 related to interbasin transfers.

Additional issues relating to instream flows and bay and estuary requirements will need to be resolved prior to any diversion of existing surface supplies to SAWS, whether it is an interbasin transfer or not. All of these issues will need to be addressed during the permit process at TNRCC for any new surface water use.

Owners of existing supplies may be inclined to sell these supplies for a specified period of time and require those supplies to be returned or offset by the construction of new projects in the future. Typically utilization of any existing surface water supply requires the construction of a pump station and pipeline from the source to the point of use. Five years is a reasonable timeframe in which to construct such a project.

*Volumes and Cost*

Table 3 indicates the potential volumes and costs of a selected list of existing supply sources as reported by the Trans-Texas Water Program. The costs are for water treated to drinking water standards and delivered to the San Antonio Water System in 1996 dollars.
Table 3

Firm Yield and Costs of Potential Supplies from Existing Surface Water Projects

<table>
<thead>
<tr>
<th></th>
<th>Firm Yield (Acre Feet/Year)</th>
<th>Cost per Acre-Foot (1996 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Antonio River Basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medina Lake Diversion to WTP (Water Treatment Plant)</td>
<td>29,000</td>
<td>$451</td>
</tr>
<tr>
<td>Guadalupe River Basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canyon Lake released to Lake Dunlap Diversion to WTP</td>
<td>15,000</td>
<td>$504</td>
</tr>
<tr>
<td>Guadalupe River Diversion near Lake Dunlap to WTP, with transfers downstream</td>
<td>49,785</td>
<td>$749</td>
</tr>
<tr>
<td>Uniform Delivery (5,000 ac ft/yr Diversion at Lake Dunlap/35,000 ac ft/yr diversion at Gonzales)</td>
<td>40,000</td>
<td>$436</td>
</tr>
<tr>
<td>Guadalupe River Divisions at Gonzales to Mid Cities/CRWA/Bexar County with Regional WTP</td>
<td>50,000</td>
<td>$435</td>
</tr>
</tbody>
</table>

Source: Trans-Texas Water Program
Note: Inclusion of these projects in this table is for illustrative purposes only and does not mean that they have been selected for development by SAWS. The Trans Texas Water Program did not perform an average yield analysis on any of the potential projects.

Status of Acquisition

SAWS, GBRA and the San Antonio River Authority have approved an Outline for a Preliminary Agreement as a first step to begin discussions on a large-scale delivery of water from existing supplies in the Guadalupe Basin to SAWS. Most likely, this supply would utilize existing run-of-the-river rights or new appropriations in combination with Canyon Lake water supply to provide a firm yield supply to San Antonio/Bexar County. Discussions are just beginning on this prospect, and specific volumes have not yet been addressed. Lines of communication with river authorities representing river basins farther east are also open. In the current atmosphere of uncertainty related to the interbasin transfer provisions of SB 1 and other political considerations, discussions about potential supplies from those sources have been very limited to date. SAWS will continue to pursue potential sources from all existing surface supply sources.
7.3.4 New Surface Water Supplies

Existing surface and groundwater supplies in SB 1 Region L are not sufficient to meet total demands in the region. Table 4 presents the deficiencies of supply versus demand for SB 1 Region L.

<table>
<thead>
<tr>
<th>River Basin</th>
<th>Demand</th>
<th>Supply</th>
<th>Surplus (Shortage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nueces</td>
<td>530,000</td>
<td>415,000</td>
<td>(&lt;115,000)</td>
</tr>
<tr>
<td>San Antonio</td>
<td>721,000</td>
<td>457,000</td>
<td>(&lt;264,000)</td>
</tr>
<tr>
<td>Guadalupe</td>
<td>371,000</td>
<td>550,000</td>
<td>179,000</td>
</tr>
<tr>
<td>Total</td>
<td>1,622,000</td>
<td>1,422,000</td>
<td>(&lt;200,000)</td>
</tr>
</tbody>
</table>

*Source: Reported by Trans-Texas Water Program from Texas Water Development Board data. Minor differences may occur between the Trans-Texas planning area and the SB 1 planning area for these basins.*

**Potential Sources**

In the Upper Nueces Basin portion of Region L, there is some potential for additional surface water development. Previous study of this potential has been in the context of recharge dams on or above the Edwards Aquifer Recharge Zone designed and operated to increase recharge to the Edwards Aquifer. No large-scale water supply projects have been considered for movement of water by pipeline to remote demands.

In the San Antonio basin, a medium sized reservoir project on Cibolo Creek, on the recharge zone of the Edwards Aquifer, has been identified for purposes of increasing recharge to the Edwards Aquifer. Smaller projects on tributary streams on or above the recharge zone have also been examined to increase aquifer recharge. Major surface water reservoir projects developed for firm yield supply have been identified on Cibolo Creek in Wilson County and on the San Antonio River near Goliad.
In the Guadalupe Basin, a medium size reservoir project on the Blanco River on the Edwards Aquifer recharge zone has been identified and studied for purposes of increasing recharge to the Edwards Aquifer. Major reservoir sites identified in the Guadalupe Basin include:

- Cloptin Crossing Project on the Blanco River near Wimberly in Hays County
- Cuero Reservoir on the Guadalupe River in DeWitt and Gonzales Counties
- Sandies Creek Reservoir (also referred to as Cuero II and Lindenau) in DeWitt and Gonzales Counties
- Dam No. 7 upstream from Canyon Reservoir.

Medium scale reservoir projects identified include:

- Lockhart Reservoir on Plum Creek near Lockhart
- Dilworth Reservoir on Peach Creek in Gonzales County.

**Factors Affecting Development**

Of the array of new water supplies available to SAWS, new surface water supply projects will be the most difficult to develop given the environmental, political and regulatory factors affecting development. Time to develop surface water projects is longer than other potential supplies. Small and medium reservoir projects require at least ten years to develop. Large-scale projects may require 20 or more years from initiation of planning to completion and filling. Despite the potential for obstacles, SAWS participation in a new surface water project would represent a firm supply permanently dedicated to SAWS. Cost for water from large-scale projects may be favorable in comparison to the cost of developing other existing surface supplies, taking advantage of economies
of scale. New surface water supply projects on a scale to support SAWS' future demands will be subject to the SB 1 regional planning process because of their regional nature and environmental impacts.

**Volume and Costs**

Table 5 analyzes potential new surface water projects that could be developed for firm yield supply as discussed above, according to the Trans-Texas Water Program. Amounts available vary depending on size and operation of a particular project. These volumes are not additive; each was studied as a stand-alone project. The cost per acre-foot is the project development expected annual costs, including reservoir, pipelines, and treatment facilities, as well as operation and maintenance costs. Capital costs in the Trans-Texas study were annualized over a 25-year period assuming 7% interest on debt financing.

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Firm Yield and Costs of Potential New Surface Water Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Firm Yield (Acre Feet/Year)</td>
</tr>
<tr>
<td><strong>San Antonio River Basin</strong></td>
<td></td>
</tr>
<tr>
<td>Cibolo Reservoir with imported water from the San Antonio River – Diverted to Water Treatment Plant (WTP)</td>
<td>75,600</td>
</tr>
<tr>
<td>Cibolo Reservoir with imported water from San Antonio/Guadalupe/Colorado Rivers – Diverted to WTP</td>
<td>162,900</td>
</tr>
<tr>
<td>Goliad Reservoir – Diverted to WTP</td>
<td>115,500</td>
</tr>
<tr>
<td><strong>Guadalupe River Basin</strong></td>
<td></td>
</tr>
<tr>
<td>Cuero Reservoir - Diverted to WTP</td>
<td>145,448</td>
</tr>
<tr>
<td>Sandies Reservoir – Diverted to WTP</td>
<td>74,741</td>
</tr>
<tr>
<td>Guadalupe River Dam No. 7 – Raw water at reservoir</td>
<td>30,927</td>
</tr>
<tr>
<td>Gonzalez Reservoir – Raw water at reservoir</td>
<td>75,093</td>
</tr>
<tr>
<td>Clopton Crossing Reservoir – Raw water at reservoir</td>
<td>33,163</td>
</tr>
<tr>
<td>Dilworth Reservoir – Raw water at reservoir</td>
<td>18,195</td>
</tr>
<tr>
<td>Lockhart Reservoir – Raw water at reservoir</td>
<td>6,339</td>
</tr>
</tbody>
</table>

Source: Trans-Texas Water Program

Note: Inclusion of these projects in this table is for illustrative purposes only and does not mean that they have been selected for development by SAWS. The Trans Texas Water Program did not perform an average yield analysis on any of the potential projects.
Status of Acquisition

A decision to pursue a new surface water supply project is a major commitment, which has not yet been analyzed or seriously contemplated through the decision-making process at SAWS. As mentioned previously, pursuit of these projects must be programmed in the SB 1 regional planning process as well as the Citizens Advisory Panel process.

SAWS has programmed a study of the potential for small-scale storage reservoirs in Bexar County and nearby areas. These sites typically would be used to store water from another source. Potential applications are for storage of recycled water, or of excess Edwards Aquifer water, or for raw water supplies brought from distant sources.

7.3.5 Aquifer Storage and Recovery

Description

Aquifer Storage and Recovery (ASR) is a technology that utilizes an existing subsurface geologic formation, generally an aquifer, for purposes of storing water brought from other sources. This technology uses wells to inject water during period of excess supply for storage and later recovery during periods of deficit supply. A typical application is wintertime storage of treated water from excess treatment plant capacity for recovery during critical summer periods when insufficient treatment plant capacity is available. Likely applications of this technology for SAWS would be the storage of excess Edwards Aquifer water, or the capture, treatment and storage of intermittently available surface water supplies. Water could be recovered in these applications to meet summertime peaks and reduce demands on the Edwards Aquifer, particularly during critical periods. Long-term storage to meet drought needs when other supplies might be less available is another alternative. The
water is typically treated to drinking water standards before injection. Injected water is recovered from the same wells used to inject, requiring only disinfection before delivery for drinking water purposes.

Sources

Aquifer Storage and Recovery does not create a new supply of water. It allows the operator of the ASR project to increase the reliability of supplies available from other sources that are otherwise less reliable. The sources of supply for an ASR project developed for San Antonio may come from any of the other supply sources discussed previously.

Factors Affecting Development

From a financial and environmental viewpoint, ASR as a storage option is significantly better than surface water storage reservoirs. The most significant factor affecting development is location of a good candidate formation within reasonable proximity to the source of supply and/or demand. The formation must have the correct properties to allow successful operation of an ASR project. The porosity and permeability of the formation (its ability to store water and keep it in one place) need to be such that the injected water remains near the well to allow later recovery. Chemical reactions between the introduced water and the native water that may potentially affect operation of the wells must also be considered.

A three-step process is generally used to determine the feasibility of an ASR project. Step 1 is a “desktop survey” in the target area to determine from existing information which formations might be the best candidates for an ASR project. This step identifies and recommends locations for test
wells to be drilled in Step 2. Test wells provide additional geologic information on formation structure and native water quality. If results of Step 2 are deemed positive, Step 3 is the construction of a pilot well or prototype facility, which is operated through several injection and recovery cycles to further define the operation characteristics of the selected formation. From information developed in Step 3 a full-scale project can be developed. Depending on the total volume of storage required, multiples of the original well are drilled and connected with piping to the supply and destination points for the project.

**Volume Available**

The volume of storage in a particular project varies depending upon the project needs and the characteristics and size of the candidate formation. Projects have been constructed with the ability to augment peak supplies with treated drinking water at rates of 8 to 100 million gallons per day (MGD). Total storage of ASR well fields vary depending on the formation.

**Costs**

Projects identified in the Step 1 study effort being conducted for Bexar range from $75 to $400 per acre-foot of storage volume. This does not include the cost of developing and bringing the supply, including treatment, to the ASR project, or the cost of moving the water from the ASR project to the demand destination. No cost estimates are currently available for an operation of an Aquifer Storage and Recovery project for San Antonio in combination with other source supplies.
Status

As mentioned above SAWS, in cooperation with Bexar Metropolitan Water District, is conducting a study of the potential for aquifer storage and recovery in Bexar County. This study effort is being funded through the Texas Water Development Board with matching grant funds from SAWS and Bexar Metropolitan Water District. Step 1 has been completed, reporting that the best opportunity for ASR in Bexar County is in the Carrizo-Wilcox Aquifer in southern Bexar County. Other aquifers studied were the Trinity Group in northern Bexar County, and the brackish portion of the Edwards Aquifer downdip of the bad-water line. The scope of work for Step 2, to drill test wells in the Carrizo-Wilcox Aquifer, is being developed at this writing.

7.3.6 Local Storage

Local resources such as the recycled water project, small surface water rights and excess Edwards Aquifer water that may accrue in rainy years or through optimization strategies could be maximized by small storage sites in Bexar County. Such sites may be available in existing facilities such as Calaveras and Braunig Lakes or Mitchell Lake. Additionally, existing quarries may prove useful for storing small volumes of water to meet seasonal peaks.

7.3.7 Recommendations – Potential Future Water Supplies

- SAWS should conduct studies to evaluate potential cultural, economic, social and water resource impacts of additional new supplies in order to avoid or minimize these impacts.
- SAWS should initiate and complete feasibility studies of other groundwater sources available, in cooperation with other interested agencies.
• SAWS should pursue opportunities that arise to acquire other groundwater sources.

• SAWS should pursue negotiations to acquire existing surface water supplies that might fit into a comprehensive and balanced water supply strategy.

• SAWS should pursue the developing opportunity with GBRA to assess the Guadalupe Basin for available supplies and move toward contract development for these supplies.

• SAWS should seek out and pursue other opportunities in more distant river basins despite the limitations on interbasin transfers in SB 1.

• SAWS should begin planning now for one or more new surface water storage projects, in recognition of the 10 to 30 year project development time. This planning activity should not be taken as a commitment to build a project. Commitment should come only after considerable scrutiny of the project by the evaluation and decision-making process described in Section 3.0. Any new surface storage project also must be subjected to full evaluation and inclusion in the Region L plan before SAWS can commit to build a project.

• SAWS should continue to study the feasibility of ASR as a potential water supply management tool.

• SAWS should pursue well field development and the necessary transmission lines for ASR if the study results in a favorable recommendation.

• SAWS should consider partnerships for promising sites that will benefit not only San Antonio but also others in the region.

• SAWS should explore using existing facilities in Bexar County for storage to meet seasonal peak demands.
7.4 Possible Acquisition Sequence

Figure 12 illustrates how future water supplies could be brought on line to meet SAWS’/Bexar County supply goals. The sequence of acquisition of incremental sources is suggested by the relative difficulty of obtaining each type of supply in combination with its development time. However, this illustration should not be taken as a commitment to add supplies in any particular order. Availability of additional supplies will ultimately determine the sequence of water supplies acquired.

Generally, water supplies are purchased in large quantities. At these increments will exceed the indicated supply goal. However, larger quantities may be purchased or developed more efficiently in the long run, even though this will have the effect of increasing costs to the ratepayer beyond what would otherwise be required in the short term if the supplies were provided in smaller increments only to meet annual increases in demand.

Some of the supply options that were discussed previously take a considerable amount of time to plan and implement. Therefore, supplies such as ground water and existing surface water projects are the most feasible means to meet the first two or three decades of water needs. Other water resource projects that could meet our demands in the long term are surface water reservoirs. Because these projects take a much longer time to complete and will not have an impact until later in the planning process, they are represented as the later options in Figure 12.
Figure 12. SAWS Supply Goal and Demand Curve: Fifty-Year Forecast without Aquifer Optimization

Results from the Edwards Aquifer Optimization studies are expected within the next three to ten years. If favorable for increasing the yield from the Edwards, development of other supply options may be pushed even further into the future, as illustrated in Figure 13. In the meantime, however, SAWS would be prudent to continue pursuing the other ground and surface water supplies in the event that the Optimization studies are not conclusive or favorable.
Figure 13. SAWS Supply Goal and Demand Curve: Fifty-Year Forecast with Aquifer Optimization

Again the specific projects to be developed to complete this recommended portfolio will be determined through the SB 1 process as well as the public process implemented by SAWS. Cultural, economic, and social variables beyond the scope of this local plan will all affect the SB 1 process.
8.0 Financial Considerations

8.1 Guiding Principles

The following "guiding principles" are applied in considering financial impacts of this plan on the ratepayers.

- The Citizens Committee on Water Policy acknowledged that cost effectiveness is an important element in water resource planning, but that the "least cost" alternative is not always the best one.
- Cost comparisons between projects need to carefully compare similar supplies. That is, firm yield supplies of one project should be evaluated against firm yield supplies of another project.
- All available funding mechanisms should be considered, including impact fees, grants, low interest loans, bonded debt financing, and a means to establish stable revenue requirement over time and minimize rate impact over the long term. Currently SAWS finances its capital requirements primarily with long term debt.
- SAWS will implement cost reduction and containment measures to reduce the rate impacts from water supply acquisition and management. SAWS will also explore non-rate payer revenues from utility related business opportunities. Such measures should not reduce customer satisfaction or quality of service.

- Costs and revenue requirements can be forecast with greater degree of accuracy over a shorter period of time. SAWS uses a five-year period in its multiyear financial plan. Estimates for timeframes greater than that will be increasingly less accurate.
Because specific projects have not been selected through a regional or public process, estimated average project costs are appropriate at the present time for calculating the magnitude of financial impacts of long term additional supply.

8.2 Future Water Supply Costs

This plan does not recommend any specific future water supply projects. Specific projects will be identified, evaluated and selected through the SAWS review and approval process at the local level described in Section 3.0 above, and where appropriate through the SB 1 regional planning process described in Section 4.0 above.

For purposes of calculating long term financial impacts on rates and revenue requirements, this financial analysis uses the average cost per acre-foot (including annualized capital cost plus operating expenses) for all the projects identified as potential water resources, projects in the Trans-Texas Water Program Phase II report. That cost is $724 per acre-foot. (See Figure 14.) As SAWS and the Citizens Advisory Panel identify and pursue specific water resource projects, a more comprehensive and detailed financial analysis will be conducted as part of the technical feasibility studies associated with each project.
The Trans-Texas Water Program analysis of supply sources indicated that each type of project potentially available to San Antonio has a wide variability in cost (See Figure 14). The specific projects and combinations of projects selected will affect greatly the actual calculated annual debt service and operating costs. At this stage of long term planning, the average annualized cost, as indicated in Figure 14, is useful for forecasting financial impacts of future supply development. Figure 15 shows the probable range of costs for those additional supplies. These forecasts of future impacts will be updated as more certainty is obtained with respect to which projects are ultimately pursued and acquired.
Figure 15. Comparison of Range of Unit Costs of Water Supply Options

8.3 Estimated Customer Impacts

SAWS' general financial planning models are for a five-year planning period, updated annually for detailed fiscal planning. These models consider SAWS' operating plans and internal capital improvements program, as well as additional water supplies. These plans include an annual review of the capital improvements plan, to optimize infrastructure and supply needs. The review and analysis of all of these elements produces an optimal mix of financing requirements. Table 6 shows the necessary impact on the average monthly residential bill to fund the ongoing operating, maintenance and infrastructure costs, plus all of the short term water resources activities described in the Water Resources Action Plan dated April 1, 1997, in response to the Citizens Committee "Framework" report. Those major short term activities include continued operation and improvement of conservation programs, completion of the water recycling program, water quality protections,
studying aquifer optimization, and purchasing limited amounts of Edwards Aquifer rights. The projected rate increases indicated in Table 6 do not include the projected financial impacts of the development and operation of additional water supplies that are the subject of this section of the plan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Current Bill $'s</th>
<th>Increase Over Current Bill $'s</th>
<th>Projected Bill $'s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>12.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>0.87</td>
<td>13.16</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>1.86</td>
<td>14.15</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>2.78</td>
<td>15.07</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td>4.19</td>
<td>16.48</td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td>5.81</td>
<td>18.10</td>
</tr>
</tbody>
</table>

Average consumption (10,000 gal/month). Does not include sewer charges

The following analysis focuses solely on financial impacts associated with additional water supply projects. It illustrates the relative impact of additional supplies on existing water bills over and above the increases resulting from the normal operating, maintenance and infrastructure costs and continuation of the short term water resources activities in Table 6 above. The incremental impacts of additional water supply costs are presented here as per capita costs and increases on an average monthly residential bill. The SAWS however, has made a commitment not to raise waste water rates during this same period.

8.3.1 Assumptions

- The population and water demand projections in previous sections are used in this analysis.
• All costs are presented in constant dollars. Actual future dollar costs will be affected by many variables that cannot be forecast in this analysis. These variables include the rate of inflation, capital costs associated with other infrastructure projects, and operating costs.

• The presentation of monthly bills illustrated does not include sewer charges.

• Average costs were developed from the Trans-Texas Water Program. All water supply costs are in 1996 dollars.

• All costs are based on a continuation of existing SAWS operating costs and practices.

• Water supply projects have impacts on both customers and SAWS revenue requirements. A detailed revenue requirements and rate study would be required to estimate the impacts of specific projects on customers and SAWS. Such studies are not possible with the long-term planning horizon used for this analysis.

• Costs for additional sources include facilities to treat and deliver water to San Antonio.

• SAWS’ infrastructure costs to distribute the delivered water within the City are not included for purposes of this presentation because those costs will occur irrespective of the source of additional supplies. These infrastructure costs will be highly variable depending on the location of delivery points and the amount of water which is required to be delivered to the City.

8.3.2 Estimated Residential Bill Impacts

It is estimated that the cost to design, construct and operate the water supply projects required to meet the 50-year demand projections will be approximately $2.6 billion. While this is a substantial cost, the number of people paying for the additional supplies will double by 2050. See Table 1.
To reveal the implications of additional water supply costs for individuals and families, Table 7 presents the costs on an annual per capita basis. The projected additional water supply requirements have been calculated based on the projected demands presented in Table 1 less the amount of existing supplies available. That difference is multiplied by the average cost per acre-foot (\$724 per acre-foot per year), resulting in the projected water supply costs per year within each decade. These costs have been projected to indicate the magnitude of water supply costs per person over the 50 year planning horizon. Of course, the impact will be lower if outside funding is received from federal, state and other sources.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Projected Population</th>
<th>Existing Supplies (Acre Feet)</th>
<th>Additional Supply Goal Acre-Feet/Year</th>
<th>Projected Water Supply Costs/Yr.</th>
<th>Annual Cost Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,360,669</td>
<td>207,380</td>
<td>37,876</td>
<td>$27,422,224</td>
<td>$20.15</td>
</tr>
<tr>
<td>2020</td>
<td>1,621,857</td>
<td>209,380</td>
<td>69,510</td>
<td>$50,325,240</td>
<td>$31.03</td>
</tr>
<tr>
<td>2030</td>
<td>1,886,190</td>
<td>211,380</td>
<td>102,867</td>
<td>$74,475,708</td>
<td>$39.48</td>
</tr>
<tr>
<td>2040</td>
<td>2,125,314</td>
<td>213,380</td>
<td>140,706</td>
<td>$101,871,144</td>
<td>$47.93</td>
</tr>
<tr>
<td>2050</td>
<td>2,394,753</td>
<td>215,380</td>
<td>174,114</td>
<td>$126,058,536</td>
<td>$52.64</td>
</tr>
</tbody>
</table>

1 Existing supplies are Edwards Aquifer, Recycled Water and Canyon Lake Project. These projected increases are in water bills only Sewer charges are not included.

Another way to look at the potential impact of the water supply costs is for the increase in monthly bill. As already noted, without a detailed rate study, an accurate assessment cannot be made for this long-term planning horizon. The calculation assumes an equal distribution of all costs to all customer classifications and usage levels. In real practice, that is never the case. Actual rates are based on actual statistics and accepted rate making practices. With that qualification, Table 8 presents the impact of additional water supply projects on the average, above average and below average residential monthly water bill in San Antonio. For the SAWS fiscal year ending in 1997, the average
monthly residential consumption was 9,153 gallons. This usage today translates into an average water bill of $12.29. As shown in Table 6 above, by the year 2003 the expected average water bill is estimated to be $18.10. Table 8 indicates the projected incremental increase in future bills in constant (1998) dollars for the average residential customer, an above average customer (one using 20,000 gallons per month) and a below average customer (using only 5,000 gallons per month).

<table>
<thead>
<tr>
<th>Decade</th>
<th>Current Monthly Water Bill</th>
<th>Increase Over Current Bill</th>
<th>Projected Bill in Constant Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>$12.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$18.10</td>
<td>$5.73</td>
<td>$24.83</td>
</tr>
<tr>
<td>2010</td>
<td>$21.34</td>
<td>$6.73</td>
<td>$27.08</td>
</tr>
<tr>
<td>2020</td>
<td>$23.27</td>
<td>$7.66</td>
<td>$30.93</td>
</tr>
<tr>
<td>2030</td>
<td>$24.83</td>
<td>$8.73</td>
<td>$33.56</td>
</tr>
<tr>
<td>2040</td>
<td>$26.29</td>
<td>$9.91</td>
<td>$36.20</td>
</tr>
<tr>
<td>2050</td>
<td>$27.08</td>
<td>$10.25</td>
<td>$37.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Consumption (10,000 gal/month)</th>
<th>1998</th>
<th>$29.38</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$43.28</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$51.02</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$55.66</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$59.39</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>$62.84</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>$64.76</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Above Average Consumption (20,000 gal/month)</th>
<th>1998</th>
<th>$12.85</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$29.63</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$37.25</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$41.92</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$46.77</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>$51.16</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>$55.55</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Below Average Consumption (5,000 gal/month)</th>
<th>1998</th>
<th>$8.74</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$12.85</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$15.16</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$16.53</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$17.64</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>$18.67</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>$19.25</td>
<td></td>
</tr>
</tbody>
</table>

These projected increases are in water bills only. Sewer charges are not included.
The 2003 estimates include costs increases from normal operating procedures described above.
Actual rates after the year 2003 will be higher as a result of normal increases in operating, maintenance and infrastructure costs and inflationary increases in construction of infrastructure and additional water supply projects.

8.3.3 Estimated Commercial Bill Impacts

Residential customers are not the only customers who will be affected by these additional costs. Commercial and all other SAWS customers will also be affected. The average commercial bill in the city is approximately 54,700 gallons per month. Table 9 presents the financial impacts to this average commercial customer’s water bill, along with the impact to a below average commercial customer using 20,000 gallons a month. Given the extended range of consumption which exists above the average, a parallel analysis to the one given for the residential customers of an “above average” commercial customer is not likely to be meaningful.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Current Monthly Water Bill</th>
<th>Increase Over Current Bill</th>
<th>Projected Bill in Constant Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Consumption (54,700 gal/month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$55.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>$81.98</td>
<td>$6.24</td>
<td>$88.22</td>
</tr>
<tr>
<td>2010</td>
<td>$6.24</td>
<td></td>
<td>$88.22</td>
</tr>
</tbody>
</table>

Table 9
Impacts on Monthly Commercial Bills of 50 Year Water Supply Goals
<table>
<thead>
<tr>
<th>Year</th>
<th>2020</th>
<th>$23.50</th>
<th>$105.48</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2030</td>
<td>$30.58</td>
<td>$112.56</td>
</tr>
<tr>
<td></td>
<td>2040</td>
<td>$37.12</td>
<td>$119.10</td>
</tr>
<tr>
<td></td>
<td>2050</td>
<td>$40.77</td>
<td>$122.75</td>
</tr>
</tbody>
</table>

Below Average Consumption (20,000 gal/month)

<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>$23.64</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
<td>$34.75</td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>$3.24</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>$9.96</td>
</tr>
<tr>
<td>2030</td>
<td></td>
<td>$12.96</td>
</tr>
<tr>
<td>2040</td>
<td></td>
<td>$15.73</td>
</tr>
<tr>
<td>2050</td>
<td></td>
<td>$17.28</td>
</tr>
</tbody>
</table>

These projected increases are in water bills only. Sewer charges are not included.
The 2003 estimates include costs increases from normal operating procedures described above.

### 8.3.4 Impacts of Large Increments of Supply

Water supplies may become available in greater amounts than the annual increments of needed supply. Thus, financial impacts may be recognized earlier if these larger increments of supply are obtained in advance of the needed increase in supply for any particular year. For example, if a 60,000 acre-foot supply becomes available in 2010 (in advance of the 2010 additional supply requirement of 37,870 acre feet), the estimated increase is $5.14 per month for the average residential customer compared to the $3.24 per month indicated if the 2010 demand is exactly met and not exceeded by available additional supplies. A corresponding effect would occur for the below average and above average residential bill and the commercial bills.

### 8.4 Revenue Sources

The San Antonio Water System has several sources of funds to finance water supply projects. The primary source is long term debt. SAWS’ philosophy is that assets with a long life are paid with long-term debt (water revenue bonds). Short term financing of long life assets is done with tax exempt commercial paper. At periodic intervals, the commercial paper is converted to long term debt. Sales
revenue is SAWS' principal revenue source to pay operating costs and the debt service (principal and interest) on long term debt.

SAWS may utilize a Texas Water Development Board debt financing program that reduces the interest rate that SAWS pays on long term debt. In addition, SAWS will pursue state and federal grants can and will be pursued by SAWS to reduce water supply costs. SAWS is also developing regional partnerships with other water purveyors to share in new water resource project costs, to take advantage of economies of scale and reduce unit costs. Other avenues to consider may include impact fees and, ultimately, water rates.

In addition to securing diverse revenue sources, SAWS is committed to reducing costs for basic operations. SAWS is also committed to developing non-rate payer revenues associated with water utility operations. Management of these costs and potential revenues is a high priority for SAWS.

8.5 Recommendations

- SAWS should use a combination of revenue sources to fund future water quality and supply development measures.
- SAWS should pursue federal grants and low interest loans to finance the recommended portfolio of projects.
- SAWS should develop regional coalitions so that participating partners contribute their fair share.
- SAWS should develop a “price affordability index” to ensure that its rate structure provides “lifeline” rates for low water users and those on fixed incomes.
• SAWS should work with the City of San Antonio to consider establishing recreation fees to help finance new surface storage projects.

• SAWS should work with the City of San Antonio to explore the use of impact fees to help finance new supplies.

• SAWS should recognize the "cost avoidance" benefits of conservation and recycling in future cost-benefit analyses performed to evaluate specific projects.

• SAWS should continue to pursue measures to contain costs for daily operations while maintaining high quality service.
9.0 Recommendations

Each previous section has concluded with recommendations on how we evaluate projects and work regionally and on measures for water quality protection and supply acquisition. These are summarized here for convenience.

9.1 Regional Planning and Management

- SAWS should coordinate with other Bexar County area purveyors and cities to jointly pursue completion of existing supply strategies as well as groundwater and existing surface water supplies.
- SAWS and others representing Bexar County interests should participate in SB 1 regional planning activities and develop strong relationships with others in the region to select and develop projects.
- SAWS should monitor local, state and federal proposed legislation and rule making and pursue changes to existing legislation (SB 1477/SB1) that limits San Antonio/Bexar County’s access to water supplies.
- SAWS should continue to support the activities of the EAA in Edwards Aquifer management.
- SAWS should participate with other agencies to study the potential of increasing the limit on Edwards pumping if sufficient flow can be provided for endangered species and downstream needs.
- SAWS should aggressively defend its application for its historic pumping volume.
- SAWS should take the lead in forming and strengthening regional coalitions and partnerships.
9.2 Water Quality

- SAWS should maintain an aggressive water quality protection program based on sound science and technical data.
- SAWS should seek to improve state rules and enforcement regarding water quality protection.
- SAWS should continue the property acquisition program to ensure protection of the most sensitive properties. Partners such as the Bexar Land Trust, the Texas Parks and Wildlife Department, other governmental and non profit agencies should be sought to maximize the effectiveness of this program.
- SAWS should implement the Watershed Management Plan and coordinate with other city functions such as drainage regulation and maintenance, land use planning and site design requirements.
- SAWS should continue to develop the expertise to design and maintain drinking water treatment facilities in anticipation of additional supplies being integrated into the system.

9.3 Demand Management

- SAWS should continue to use the TWDB population and water demand projections as a baseline for estimating future water demand requirements.
- SAWS should adjust the TWDB projections to account for water savings through conservation at the local level to ensure that supplies that are not needed are not acquired.
- SAWS should encourage the entire region to pursue conservation standards when determining future supply requirements.
- SAWS should expand its aggressive conservation plan over time.
• SAWS should re-estimate demand projections in the annual assessment of the Water Resources Plan and formally update these projections at least every three years to account for changes in population trends as well as refinements in consumption patterns estimations.

9.4 Water Supplies

9.4.1 Current Water Supplies

• SAWS should take all necessary steps in the EAA permit adjudication process to obtain the maximum amount of Edwards Aquifer groundwater pumping right allowed by SB 1477 and the EAA permitting rules.

• SAWS should acquire limited amounts of other Edwards Aquifer groundwater pumping rights according to the SAWS’ Edwards Acquisition Policy.

• SAWS should support the study of Aquifer Optimization by the Edwards Aquifer Authority with both staff and funding.

• SAWS should complete the Recycled Water Project.

• SAWS should complete the Canyon/Bulverde Project.

9.4.2 Possible Future Water Supplies

• SAWS should conduct studies to evaluate potential cultural, economic, social and water resource impacts of alternative new water supplies in order to avoid or minimize these impacts.

• SAWS should initiate and complete feasibility studies of other groundwater sources available, in cooperation with other interested agencies.

• SAWS should pursue opportunities that arise to acquire other groundwater sources.
• SAWS should pursue negotiations to acquire existing surface water supplies that might fit into a comprehensive and balanced water supply strategy.

• SAWS should pursue the developing opportunity with GBRA to assess the Guadalupe Basin for available supplies and move toward contract development for these supplies.

• SAWS should seek out and pursue other opportunities in more distant river basins despite the limitations on interbasin transfers in SB 1.

• SAWS should begin planning now for one or more new surface water storage projects, in recognition of the 10 to 30 year project development time. This planning activity should not be taken as a commitment to build a project. Commitment should come only after considerable scrutiny of the project by the evaluation and decision-making process described in Section 3.0. Any new surface storage project also must be subjected to full evaluation and inclusion in the Region L plan before SAWS can commit to build a project.

• SAWS should continue to study the feasibility of ASR as a potential water supply management tool.

• SAWS should pursue well field development and the necessary transmission lines for ASR if the study results in a favorable recommendation.

• SAWS should consider partnerships for promising sites that will benefit not only San Antonio but also others in the region.

• SAWS should explore using existing facilities in Bexar County for storage to meet seasonal peak demands.
9.5 Financial Considerations

- SAWS should use a combination of revenue sources to fund future water quality and supply development measures.

- SAWS should pursue federal grants and low interest loans to finance the recommended portfolio of projects.

- SAWS should develop regional coalitions so that participating partners contribute their fair share.

- SAWS should develop a "price affordability index" to ensure that its rate structure provides "lifeline" rates for low water users and those on fixed incomes.

- SAWS should work with the City of San Antonio to consider establishing recreation fees to help finance new surface storage projects.

- SAWS should work with the City of San Antonio to explore the use of impact fees to help finance new supplies.

- SAWS should recognize the "cost avoidance" benefits of conservation and recycling in future cost-benefit analyses performed to evaluate specific projects.

- SAWS should continue to pursue measures to contain costs for daily operations while maintaining high quality service.
10.0 Plan Review and Implementation Schedules

10.1 Proposed Plan Review and Approval Schedule

10.1.1 Public Review and Comment

A variety of techniques were used to inform the public about the availability of this plan and to encourage further public comment and feedback to SAWS. This feedback was reviewed and addressed in plan revisions and community members who provided comments were informed as to how their comments were incorporated into the final SAWS Water Resources Plan.

SAWS also provided the following opportunities for the public to learn more about the draft Plan:

- **Speakers Bureau** – A mass mailing to San Antonio civic, community, neighborhood and business organizations was conducted, notifying them that members of the Speakers Bureau were available to make presentations on the draft Water Resources Plan. SAWS Community Relations staff scheduled over 75 meetings with these organizations during the review period.

- **Copies of Draft Plan at SAWS Facilities, City Hall and Local Libraries** – SAWS made copies of the draft plan available at its facilities. Additional copies were distributed to City Hall and local libraries so they were readily available for public review and comment. SAWS made additional copies of the plan available upon request.

- **Local Press Coverage** – SAWS distributed press releases to the local media soliciting news coverage regarding the draft plan and the public’s ability to provide comments and feedback. An "electronic" town meeting with television stations was held on September 30.
• **Public Meetings** – Four public meetings, one in each quadrant of the city, were scheduled in July and August.

• **Briefings to Water Agency and Elected Officials** – SAWS conducted one-on-one briefings with local and regional water agency officials on the draft Plan. These officials were encouraged to provide feedback to SAWS and to promote the availability of the plan for review by their own constituencies.

• **Advertising in the Local Media** – SAWS advertised in the local media regarding the town hall meetings and availability of the draft Water Resources Plan.

• **Other Notification** – SAWS notified the community as to the availability of the plan through notices in the monthly water bills, articles in Water Action (monthly newsletter), mailings to interested parties on community lists, and materials on the home page (http://www.saws.org). A telephone hotline was also established so that citizens could receive information about the plan.

10.1.2 Technical Review

SAWS forwarded the Water Resources Plan to local, state, and federal agencies for their review and comment. Suggested changes were incorporated into the Plan and the comments reflected in an Appendix.

10.1.3 Approval Process

**SAWS Board Approval** – The Water Resources Plan will be finalized at the close of the public comment period and after the review of the benchmarking assessment by the Citizens Advisory Panel.
The plan will be reviewed by the Water Resources Committee of the Board, briefed to other Board committees, and then taken to the Board for their consideration and approval.

City Council Support – Upon approval by the Board, the Water Resources Plan will be presented to the City Council of San Antonio for a resolution of support and endorsement. Other Boards, Councils and Commissions may also be encouraged to consider resolutions supporting the plan.

10.1.4 Update Process
The issues and projects included in the 50 year Water Resources Plan are complex, as is the regulatory and physical environment within which they must fit. As conditions change over time, SAWS must have the ability to revise the plan as necessary. The plan and its implementation will be reviewed each year in an annual assessment as recommended by the Citizens Working Group, and it will be formally updated at least every three years.

10.2 Fifty Year Implementation Timeline
The Framework for Progress report identified specific actions that SAWS should take immediately. These actions were further developed in the Water Resource Action Plan approved in April 1997. Implementation has begun. These actions, along with others recommended in this plan, will be continued or initiated over the next several years.

Activities identified in future years are increasingly less precise than those identified on the more immediate horizon.
10.2.1 Years 1-5

- Expand public information/involvement programs.
- Accelerate conservation programs.
- Continue drought/critical period management.
- Complete the Water Recycling Water Program, Phase I.
- Complete the Aquifer Storage and Recovery Pilot Project, and begin project if results are favorable.
- Enhance Water Quality Protection.
- Expand the Saline Water Study ("Bad Water Line Study").
- Purchase Options on Surface Water Rights.
- Participate in Weather Modification (Cloud Seeding) Pilot Project.
- Continue Aquifer Optimization Studies.
- Study Recharge Enhancement in the Guadalupe Basin.
- Participate in Recharge Enhancement Pilot Project in the Nueces Basin.
- Participate in the SB 1 Regional Planning process and submit regional plan to TWDB (September 2000).
- Protect EAA permitted withdrawals.
- Acquire additional Edwards supply according to adopted Board policy.
- Construct Canyon/Bulverde Project.
- Complete agreement with GBRA and SARA for additional supplies from the Guadalupe River Basin.
- Study other groundwater sources and pursue acquisition if results are favorable.
• Pursue state, federal, and private funding for water supply projects and land acquisitions on the recharge zone.

• Pursue additional surface water rights through contract options and other mechanisms.

• Begin the planning and permitting process for new storage pursuant to SB 1 regional plan.

• Conduct annual assessments of the Water Resources Plan.

• Conduct formal update in year three (2001) subsequent to completion of regional plan.

10.2.2 Years 6-15

• Continue ongoing programs identified in years 1-5 such as conservation, water quality protection, drought management, public information and involvement.

• Make decisions regarding utilization of surface water options and begin project design.

• Complete projects to import into the county groundwater or existing surface water supplies.

10.2.3 Years 16-50

• Begin the construction of new surface water storage if water demand is sufficient and if optimization studies do not provide increased yields from the Edwards aquifer, if the public supports such action, if permits are granted and if funding is secured.
11.0 Organizational Relationships

11.1 Responsibilities for Plan Implementation

San Antonio City Council

The City Council is responsible for approving rate increases for the San Antonio Water System. To the extent that the development of additional water supplies for the City of San Antonio requires additional revenues, the San Antonio Water System will carry proposals for rate increases to City Council. In addition, SAWS will carry forward to City Council for approval any major policy decisions on water planning or projects and provide periodic briefings to City Council on major water resources issues.

San Antonio Water System Board of Trustees

The San Antonio Water System has been delegated responsibility for water resource planning for the City of San Antonio. In fulfillment of the responsibility, the SAWS Board of Trustees will act on matters of planning and implementation of appropriate water resource activities to provide the requisite supplies for the City of San Antonio. The SAWS Board of Trustees will approve the Water Resources Plan, annual updates and revisions to the plan, in addition to all projects that emanate from the implementation of the plan.

San Antonio Water System Water Resource Committee

The Water Resources Committee is composed of three members of the SAWS Board of Trustees, one of which is the Chairman of the Board. Acting as a subcommittee of the Board of Trustees, the
Water Resources Committee has the responsibility for reviewing proposals by staff for water resources planning and development activities. The Water Resources Committee provides direction to the staff and recommends action items for consideration by the full Board of Trustees.

San Antonio Water System Executive Management

The President/Chief Executive Officer, the Chief Financial Officer and the Chief Operating Officer provide general direction for the execution of the Water Resource Plan, including review and approval of all staff activities for conformance to SAWS policies and procedures and the Water Resources Plan.

Water Resource Policy Review Team

This team is composed of the Vice Presidents of Planning, Operations, Treatment and Engineering. This team will meet regularly to review the status and implementation of the Water Resources Plan. In particular, this team is responsible for ensuring that the implementation of the Water Resources Plan meets the objectives of the entire organization as Water Resources projects are planned, designed, constructed and operated. The Vice President of Planning will chair this team.

The Planning Group

The Vice President of Planning has direct responsibility for the development and execution of the Water Resources Plan including the responsibility to annually update the plan with requisite approvals. The Vice President of Planning and the responsibility to coordinate input to the planning process from the other groups for the development of water resources through the water resources
policy review team. The Vice president of Planning will have ownership or primary responsibility of all water resource projects during the planning and development stage. The Vice President of Planning will continue to provide support during the design, construction and operation phases of any Water Resources project. The Vice President of Planning is responsible for water quality protection and the execution of the evaluation and decision-making process described in the plan. The Vice President of Planning is also the person delegated to support the activities of the Water Resources Committee.

The Engineering Group

The Vice President of Engineering Group is responsible for ensuring that good engineering principles are applied during the planning, design and construction of water resources projects. The Vice President of Engineering will assume ownership or primary responsibility of a water resource project when it enters the design stage and continuing through construction and start-up. The Vice President of Engineering will ensure that the Engineering Group continues to support the Operations or Treatment Group until a water resources project is fully operational.

Vice Presidents of Operations and Treatment

These vice presidents will participate in the Water Resources policy guidance team to ensure that decisions that ultimately affect the operation of a Water Resources project that will come under their purview are considered in the planning, design and construction phases. These vice presidents will assume ownership or primary responsibility for Water Resources projects at the time of start-up.
The Finance Department

The Finance Group has a continuing responsibility to provide funding sources for the development, construction and operation of Water Resources projects. The Finance Group will make financial forecasts of revenue requirements based on estimates of the cost of water resources projects furnished by the other groups.

The Water Resources Department

The Director of Water Resources Department will serve as Program Director for all additional water supply programs and projects through the planning process associated with any particular project. This responsibility includes negotiating contracts for water supplies, assuring conformance of all water supply projects with SAWS polices and procedures, providing direction on concepts, and coordinating with regional planning activities.

Project Manager – Water Resource Plan

The Project Manager for the Water Resources Plan in the Water Resources Department is responsible for coordinating, managing, and reporting all aspects of the Water Resources Plan including the management of the annual review and update process.

Project Managers – Water Resource Projects

Individual project managers will be assigned responsibilities for one or more water resources projects when they are identified and sufficiently programmed for study and/or development. Project managers will serve as team leaders of a project team organized to provide the requisite technical
support from across the company. Team members will generally be at the director and manager level at SAWS. Each project will dictate the participation on the team.

11.2 Organizational Charts

Figure 16 illustrates the relationship and network necessary to refine and begin implementing the recommendations of this plan.
## Table of Responsible Parties

<table>
<thead>
<tr>
<th>Additional Water Sources</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation</td>
<td>San Antonio Water System (SAWS)</td>
</tr>
<tr>
<td>Recycled Supply</td>
<td>SAWS</td>
</tr>
<tr>
<td>Edwards Optimization</td>
<td>EAA, SAWS and other Regional Partners</td>
</tr>
<tr>
<td>Canyon/Bulverde Project</td>
<td>SAWS, GBRA, SARA and Bexar Met</td>
</tr>
<tr>
<td>Existing Surface Water</td>
<td>SAWS, TNRCC</td>
</tr>
<tr>
<td></td>
<td>GBRA, SARA other Regional Partners</td>
</tr>
<tr>
<td>Additional Edwards Supplies</td>
<td>SAWS and Regional Water Resource Development Group</td>
</tr>
<tr>
<td>Other Ground Water</td>
<td>SAWS and other Regional Partners</td>
</tr>
<tr>
<td>Aquifer Storage and Recovery</td>
<td>SAWS, Bexar Met and TWDB</td>
</tr>
<tr>
<td>New Storage Supplies</td>
<td>SAWS, SARA and other Regional Partners</td>
</tr>
</tbody>
</table>

*ty: c/s*
12.0 Appendices

12.1 Benchmarking Analysis
12.2 Public Comments and Responses
12.3 Framework for Progress Report (CCOWP Report)
12.4 Citizens Working Group Recommendations
12.5 Conservation and Reuse Plan
12.6 Edwards Acquisition Policy
12.7 Trans-Texas List of Potential Water Supply Projects
Benchmarking Assessment
Appendix 12.1
MEMORANDUM

DATE: September 29, 1998

TO: San Antonio Water System Board of Trustees

FROM: Dr. Charlie Cotrell, Chairman
Citizens Advisory Panel

SUBJECT: Benchmarking Assessment
Water Resources Plan

The Citizens Advisory Panel has extensively reviewed the Water Resources Plan and public comments concerning elements of the plan. Additionally, the CAP has applied the criteria and benchmarks developed by previous citizens' groups.

The attached Benchmark Assessment represents the consensus of the CAP members and reflects our best judgement regarding the acceptability of the plan in light of the criteria.

SAWS has generally followed the public process outlined in the Citizens Working Group report. This is necessary for the credibility of the process and the growing trust in SAWS. Continuing to adhere to the process throughout the implementation of the Water Resources Plan will be key to its success and we encourage you to stay the course.

We feel that the Water Resources Plan, as written, includes water quality protection and supply development issues that are acceptable to the community and that fall within the guidelines of the Citizens Committee on Water Policy "Framework" Report.

We thank you for the opportunity to be involved in the planning process and look forward to continuing our work on other water resources issues.
Citizens Advisory Panel
Benchmarking Assessment
Water Resources Plan
September 22, 1998

The benchmarking assessment is an analysis conducted jointly by the Citizens Advisory Panel and staff, applying the criteria and benchmarks to the Water Resources Plan. This assessment also incorporates comments and issues raised by the general public.

TRUST AND CREDIBILITY

1. Does the public perceive that long-range water needs of the San Antonio Region (as specified in the water plan) are being addressed and met?

This benchmark can not be fully assessed during the plan development phase. Staff believes that the multi-faceted approach identified in the Water Resources Plan (WRP) will provide a diversified inventory of water sources to meet the long-term demands. This is consistent with the comprehensive approach recommended in the “Framework” report.

2. Have citizens accepted plans or projects requiring large capital expenditures to meet future water needs by consensus reached through the public process of the Citizens Advisory Council (Citizens Advisory Panel) or by referendum recommended by SAWS and called by the City Council?

The WRP has been discussed by the CAP, presented to citizens at town hall meetings and neighborhood meetings and generally followed the process outlined by the CWG. Individual projects requiring large expenditures are not part of this plan. It is premature to answer this question at this time.

3. Has there been broad, open and timely public cooperation and input into the formulation of water management policies, strategies and projects?

SAWS developed the WRP based on the strategic direction provided by the Citizens Committee on Water Policy (CCOWP). The WRP is a response to the recommendations of the CCOWP and intended to provide a comprehensive and consistent guideline incorporating existing and new SAWS policies. The DRAFT WRP has been circulated to agencies, municipalities and water purveyors that may be interested and/or affected by SAWS water resources planning. The DRAFT plan was presented to dozens of neighborhood associations, civic groups and professional organizations. It is available on the SAWS website, public libraries and SAWS facilities. Four public meetings were held throughout the community to learn which elements of the plan could be generally supported and which elements resulted in members of the public having reservations.
The comments received from these venues have been addressed in an Appendix to the Water Resources Plan as well as led to revisions to the draft plan.

The DRAFT plan was a staff-generated working paper that was refined and modified as needed through the public review process. The DRAFT plan was reviewed and refined by the Citizens Advisory Panel. Additional opportunities for input will be afforded at SAWS Board of Trustees and City Council meetings. Information about the process was publicized in local media and Water Action newsletter.

4. Has there been interagency cooperation in water planning?

There are opportunities for interagency cooperation both in the review of the PLAN and in the incorporation of the SAWS plan into the regional plan required under S.B.1. Additionally, partnering between agencies has been demonstrated through the implementation of on-going programs and projects incorporated into the plan. These include:

- Drought management – SAWS, Edwards Aquifer Authority (EAA) and Water Advisory Council (WAC)
- Water Recycling Program – SAWS, San Antonio River Authority (SARA), City Public Service, City of San Antonio, Texas Water Development Board
- Canyon Lake Pilot Project – SAWS, Guadalupe-Blanco River Authority (GBRA), SARA, Bexar Metropolitan Water District and Western Comal County Purveyors
- Edwards Optimization Studies – SAWS, EAA, Technical Advisory Group consisting of local, state and federal agencies
- Aquifer Storage and Recovery Project – SAWS, Bexar Met and TWDB
- Edwards Acquisition Program – Joint Purchasing Program – SAWS, SARA, EAA, public purveyors and suppliers, municipalities, Bexar County.

Interagency cooperation occurs through formal processes such as the Regional Water Planning Group deliberations mandated by Senate Bill 1 as well as “informal” processes such as that which resulted in the Canyon Lake Pilot Project. Recommended policies or projects resulting from the “non-mandated” cooperative efforts require action by one or more Boards (Councils or commissions) and will be subject to the public process developed by the Citizens Working Group.

5. Are there increased levels of citizen participation in and acceptance of programs, such as conservation, xeriscaping, etc?

Water use efficiency goals embedded into the demand projections hinge on increased citizen and commercial participation in conservation programs. The levels to which such participation have increased and are expected to increase are not directly related to the development of this plan. The Conservation and Reuse/Recycling Plan is included as an appendix to the WRP. The ultimate measure of success in the conservation programs is not the number of rebates issues, but rather the increased efficiency of water used as measured by per capita consumption.
The Water Resources Plan establishes "supply goals" which call for acquisition of supplies ahead of anticipated demand. For example, the goal for 2000 is to have sufficient supplies for expected demand in 2010. For years eleven through fifty, the supplies should be developed twenty years ahead of demand due to the typical lag time of project development.

Similarly, ensuring no degradation of water quality in the Edwards and meeting or exceeding permit requirements for stormwater quality should also be considered successful results of the Water Resources Plan.

Meeting the water supply and quality protection goals while adhering to the criteria in the "Framework" will be a measure of success. Furthermore, accomplishing these tasks while maintaining public trust and community unity will be truly indicative of successful implementation.

6. Is SAWS/City of San Antonio carrying through to completion their plans, goals and promises regarding water policy?

Development of a long-term Water Resources Plan was included as an action item in the Water Resources Action Plan adopted by the Board and City Council in April, 1997. This long-term planning is in addition to pursuit of the "immediate actions" programmed in the WRAP.

Additionally, the SAWS Board committed to a formal public process in April, 1998 subsequent to accepting the recommendations of the Citizens Working Group. The first step was the appointment of the Citizens Advisory Panel in June, 1998. Additionally, new plans, projects and programs including the Water Resources Plan and the Open Market Process for Edwards acquisition are undergoing benchmarking assessments as called for in the process recommendations. The public meetings on the WRP held in late July and August as well as the formal comment process are also components of the public process.

An additional step of the public process will be an annual assessment. This is intended to be an evaluation of the Water Resources Plan and the policies/projects developed under it. The assessment will be conducted jointly by staff and the Citizens Advisory Panel, documented in an Annual Report, and discussed at a public workshop.

7. Is SAWS educating the public and monitoring the degree to which the public understands the benefits and cost of programs?

It is premature to gauge the public understanding of the Water Resources Plan at this time. Comments received during the public process and the response to those comments are included as a part of the final Water Resources Plan.

Comments received at the four public meetings, speaker's bureau presentations and other forums as well as the written comments suggest that the community is generally supportive of long range planning and generally supportive of diversifying the water
resources portfolio. A frequently heard comment indicated that residents were generally accepting of higher water bills, but insistent that due diligence be done to ensure that costs were contained to the extent possible and that cost/benefit analyses be conducted. The notions of a “price affordability index” and “lifeline rates” were supported particularly to protect seniors, those on fixed incomes and large families.

8. Is accurate information readily available and fully disclosed?

As previously stated, SAWS is making every effort to make the WRP easily accessible. We believe the information to be accurate.

SAWS will continue to use the web page, water bill inserts, Water Action newsletters, cable show, public meetings, speakers’ bureau, information fairs, CAP discussions and other avenues to provide information to the public on water resources projects.

COMMUNITY/UNITY

1. Does SAWS provide equivalent access to water for all areas it serves?

The WRP does not address distribution within the SAWS service area specifically. Section 5.4, however, discusses the concept that different sources of water may be delivered to different “pumping centers” within the service area shown in the Plan. The flexibility this suggests will ensure that added supplies to meet growth needs will be available to all areas served by SAWS.

2. Does SAWS/City of San Antonio reach out to the community for feedback and input at all times and especially prior to making important decisions?

SAWS believes that the public process discussed previously is a good faith effort to seek and incorporate public input into the WRP. Dozens of speaker’s bureau presentations as well as four public meetings were held specifically to address the plan. Furthermore, SAWS has briefed County Commissioners, SB 1 Regional Water Planning Group, City Council and others on the elements in the plan. Additional opportunities for public comment include Board of Trustees and City Council meetings.

3. Has SAWS/City of San Antonio created a process for full review of conflicting views and has use of this process resulted in consensus on the major issues?

The CAP is the third step of a process beginning with the CCOWP that has worked toward developing community consensus with respect to water issues. Through the CAP and the public comment process, SAWS seeks to reach consensus on the elements of the Water Resources Plan. A critical element of these public committees is the broad representation of community issues and concerns voiced by the members.

It is premature to assess whether consensus has been achieved; however, many areas of common ground were identified in both the Citizens Committee on Water Policy and
Citizen Working Group deliberations. The members agreed that “the San Antonio area faces a major water problem which demands immediate attention and a long-term plan of action for satisfying its needs now and in the future.” (Framework for Progress Report, 1/97) Members of the CCOWP also agreed that the Edwards aquifer is the cornerstone of water supply solutions for the San Antonio/Bexar County community and that both water quantity and water quality issues need to be addressed. The citizens’ committees have also achieved consensus on criteria to be used by policy makers when developing water policy issues. Additionally, citizens have agreed on a public process to institutionalize an arena in which conflicting views can be discussed with civility and respect.

4. Do SAWS policies and practices regarding executive sessions and Public Information Act requests support the principle of helping the public be fully informed.

This is not applicable to the WRP. The SAWS Board of Trustees adheres to both the spirit and the letter of the law with respect to items for discussion at both open and executive sessions. Some transactions within the scope of water acquisition programs that are included in the plan may be discussed during executive sessions because of the sensitivity of contract negotiations and real estate transactions.

5. Have conflicting views been resolved with civility, respect and patience, not through inappropriate use of power, exclusion and innuendo?

Through the process of the CCOWP, CWG and CAP, resolution of conflicting views is possible. The open process is consistent with that end.

6. Have controversial issues been subject to a public validation process?

The work of the CCOWP provided the basis for the PLAN. The CAP process, public meetings and comment process, and other outreach efforts are intended to validate recommendations within the plan. It is SAWS’ intention that changes that significantly alter the scope and/or the budget of on-going projects will be handled as new projects.

AVAILABILITY AND RELIABILITY

1. Does the plan respect the Edwards Aquifer as the cornerstone of water supply, including protection of recharge and catchment areas?

The PLAN identified the importance of the Edwards through mechanisms such as water quality protection, increasing the efficiency through conservation and recycling programs and studying ways to increase its yield.
2. Is the plan consistent with the comprehensive management plan?

This is the comprehensive management plan, developed on the basis of currently available information and will be refined with comprehensive analyses and prioritization over time.

3. Does the water plan/project identify or qualify the following:

Sources of water – Sources of water are described in Section 7.0.

Volumes of water from each source during average and drought conditions – Sources identified in Section 7.0 are firm yield sources, except for the amount of Edwards supply reduced during critical periods. Reductions during critical periods are discussed. The diversity of sources is intended to reduce the impacts of a drought. The plan focuses almost exclusively on firm yields (yield during drought conditions.) Average yields have been included for water supplies to provide information and not as a basis for planning. Average yields can often be made “firm” when used in combination with additional storage. Potential uses of interruptable or average yields as part of comprehensive and balanced management strategy are discussed in the plan.

Conditions or constraints – General constraints on some sources are included in the plan. Additional analysis will be performed on future projects to determine the extent to which they are constrained. All customers will benefit from additional water supply. Even if they do not receive the water directly, the water replaced by the imported water will be available elsewhere within the system. For the plan to succeed, it is important that the community endorse the idea of a mix of supplies of water in addition to the current Edwards water. This must occur prior to any specific plan being implemented.

Duration of water availability – This will be evaluated on a project by project basis. Water saved by conservation through permanent structural changes is a permanent source as is recycled water. The Edward acquisitions so far have been a combination of permanent transfers and leases.

Actual water demand for the various users based on best available projections of population growth – TWDB projections are used statewide for water planning activities. They represent consensus planning numbers on the part of state agencies, (TWDB, TNRCC, and TP&W) and general public acceptability as determined through a public process when the methodology was proposed. The TWDB forecast was refined using local per capita usage number more reflective of actual conditions.
4. **Does the plan identify water sources that provide stable supply over the next fifty years?**

The plan identifies additional sources of water that may be available to meet our fifty-year requirements. The plan also sets forth a proposed acquisition sequence for those sources. The regional planning process, currently underway, will determine what region water solutions are available to SAWS. After the regional planning process is concluded, the Water Resources Plan may be modified by adding the projects that are selected to the defined strategies and projects. After the entire planning process is completed, the Plan will be revised to list the specific projects and programs with a timeline to deliver the required quantities of water for the next 50 years.

During this planning process, SAWS will continue to pursue both short term and long term solutions outlined in this Plan. Timelines should be established to meet the short term needs of the system until the planning process is completed.

5. **Are the conclusions based on sound, scientific knowledge and reliable data?**

The plan relies on data from the TWDB and the Trans Texas Water Program as primary sources of data. Other information and concepts are based on multidisciplinary expertise.

6. **Does the plan/project evaluate all options and keep them open for consideration?**

Consistent with the CCOWP recommendations, the plan is intended to be flexible and open. It suggests acquiring sources or at least water rights now before the option to secure them be foreclosed due to competition by other agencies and communities. Evaluation of specific projects will give preference to those that meet both the optimization and the water supply goals.

7. **Is the plan consistent with Texas water law and does it identify changes needed?**

The plan is consistent with current state and federal laws and suggests changes to provisions limiting ability for Interbasin Transfers. The plan should also include a review of SB 1477 on a biannual basis for possible changes that might benefit the region and are consistent with the criteria from the Framework for Progress. Periodic review of state and federal laws as they may impact the San Antonio/Bexar County community will be conducted to ensure that the plan remains viable in a changing regulatory environment.
ECONOMIC OPPORTUNITY

1. Does the plan provide that each economic sector has adequate water for sustainable growth?

The projected demand includes usage for various types of water users. The plan identifies projected demand for municipal, industrial, agricultural and other uses. The plan does not evaluate the impacts to economic viability from legislation such as SB 1477.

2. Does the plan ensure that San Antonio is able to attract business because of water availability?

The plan proposes to acquire supply about ten years ahead of projected demand to ensure available supply for new industry as well as to provide some level of cushioning during drought conditions. Additional supplies include increased volumes from the Edwards aquifer due to acquisitions, optimization methods including recharge, recycled water for non-potable uses, use of existing surface water and development of additional firm supplies through new surface reservoir(s) and aquifer storage and recovery projects.

3. Does the water plan provide for participation by all parts of San Antonio in economic opportunity?

The plan specifically addresses the needs for the SAWS service area, but contemplates the need to develop supplies for the entire county. That is, SAWS is willing to plan for and develop additional supplies to the extent that other purveyors in the County desire SAWS to do so. Joint ventures or partnerships wherein participants share equally in the costs and the benefits are envisioned.

The demand projections include anticipated growth for all sectors in Bexar County. Similarly, estimated supply requirements will meet the needs of all economic and geographic sectors. While the supply requirements specifically identify the needs expected within the SAWS service area, adjustments can be made to include requirements for all of Bexar County and the region. SAWS intends to partner with other municipal, industrial and agricultural users throughout the region to develop future supplies.
ENVIRONMENT AND SUSTAINABILITY

1. Does the plan adversely or positively impact species/ecosystem health? Does the plan protect and support species/ecosystem health?

The plan identifies the need and commits to protect springflow and, therefore, endangered species habitat through both management regimes and optimization studies. One of the essential studies of the optimization program is to determine the flow requirements for endangered species at San Marcos and Comal Springs. It also states that instream flow requirements as well as bay and estuary considerations are essential for future planning activities. The recycling program explicitly studied environmental impacts of construction as documented in the Environmental Assessment. Further, the project seeks to improve water quality and flow in the Salado Creek, improve water quality in the downtown segment of the San Antonio River and maintain flows of high quality water downstream of the treatment plants. Additional assessment will be required on a project specific basis.

2. Is water quality protected?

Section 5 of the plan entitled “Water Quality” specifies actions to protect water quality with respect to the Edwards Aquifer recharge zone as well as other watersheds within Bexar County and the region. More detailed analysis will be required on a project specific basis.

The plan includes activities based on sound science and technical data where and when necessary to increase protection of the recharge zone as well as other rivers and creeks. These activities include increased enforcement of existing regulations, collection of data to determine effectiveness of these measures and provide basis for future guidelines, and education for all segments of the general public to increase awareness and compliance.

3. Does the plan protect and improve the hydrologic balance (recharge=discharge while maintaining flexibility over the long-term) of the Edwards Aquifer system?

The plan establishes that maintaining the hydrologic balance of the Edwards is fundamental to management and protection of the resource. It further identifies that the volume of long-term recharge may be increased over time with the construction of recharge dams and through strategies such as range management. Projects involving conservation, recycling or importing non-Edwards supplies will all have a positive impact on recharge/discharge balance compared to full reliance on Edwards supplies given current knowledge and technology.

Additionally, projects that bring new supplies into SAWS system may result in increased discharge from the recycling centers. To the extent that such increase is not used for local recycling, it may potentially enhance downstream flows for water right holders, instream environmental uses and bay/estuary needs.
EFFICIENCY AND AFFORDABILITY

1. Are potential projects/plans prioritized based on results of cost/benefit analyses (qualitative and quantitative)?

Detailed cost/benefit analyses will need to be conducted for each project and for alternatives to the project to fully answer this question. Generally, the types of projects with minimal environmental impacts and low financial costs are recommended for acquisition prior to sources having greater environmental, financial and social costs. Some potential projects can not be analyzed until studies have been completed. The plan identifies such studies and recommends financing mechanisms. These recommended actions must be funded and begun as soon as possible.

2. To what degree does the San Antonio area benefit from its investment in water projects?

SAWS ratepayers will benefit commensurate with the System’s investment in water supply projects. This will be evaluated on a project specific basis.

3. Does SAWS base its water plan on an economic analysis model that provides comprehensive review of financial feasibility, economic efficiency [impact], economic equity and socio-economic factors referenced in the “Framework for Progress”?

Financial Feasibility: The plan identifies the incremental cost of providing the volume of additional water resource requirements estimated for 2050. For the average residential water customer inside the City who uses 10,000 gallons per month, the bill will increase from $12.29 to $21.27 per month. This calculation uses water supply development costs in current dollars. No attempt is made to include inflation or fluctuation in other capital and operational requirements of the System. Changes in the rate structure are also not considered in the calculation. Expected rate increase resulting from the existing five-year forecast are also not included in the estimate of the incremental cost to develop water supplies. Pursuit of outside funding sources including grants, low interest loans and partnerships will reduce the incremental costs to the consumer. Additionally, non-rate revenue sources such as impact fees, recreational fees for storage projects and other funding alternatives may further reduce the rate impacts if decisions are made to pursue alternative funding options.

It is currently anticipated that in addition to revenues from the sale of water, SAWS may require the use of bonds to fund large capital-intensive projects should they be selected through the regional and public processes identified in the WRP. Bond funding will need to be evaluated on a project specific basis.

Economic Efficiency: The economic efficiency of projects will need to be evaluated on a project specific basis. Comparative cost analyses among alternatives will be conducted as a tool for project evaluation and selection.
Economic Equity: Cost-sharing formulas that distribute financial impacts among SAWS and other project partners will have to be evaluated before cooperative agreements are finalized.

In addition, consideration must be given to equitable distribution of costs among customers within the SAWS service area. Currently, SAWS has established a cost-of-service rate structure superimposed with a conservation incentive model. That is, the costs to serve each class of customer are recovered through rate-based revenues from each respective class. The pricing structure within the residential class is designed to provide a “lifeline” rate for low users and a disincentive for high water use.

SAWS current approach to rate making does not differentiate between new and existing customers, between geographic service areas within the system, nor between those benefiting directly from a project versus the system wide benefits of additional supplies. The cost differentials between new and existing customers located in different geographical areas are identified through impact fees, or one-time capital recovery fees. The plan should not make recommendations regarding future rate structures.

Socio-Economic Implications: The plan incorporates existing Board policy regarding limiting acquisition of Edwards supplies such that the negative socio-economic impacts to the area of origin are minimized. Specific impacts to regions and communities will need to be evaluated on a project specific basis.

The plan recommends that an affordability index be developed to ensure that the cost of water does not increase faster than the ability of the low volume and low impact consumer to pay for it.

4. Do all categories of water users share equitably in the costs?

This issue was addressed under the Economic Equity discussion above.

GOVERNANCE AND CONTROL

1. Was the plan developed by SAWS/City of San Antonio based on input from citizens of San Antonio and does it represent the needs and wishes of the people of San Antonio?

It is premature to assert that the Water Resource Plan represents the wishes of the people of San Antonio; however, the WRP is based on recommendations of the Citizens Committee on Water Policy and the Citizens Working Group. Additionally, it is consistent with the goals and policies identified in the City of San Antonio Master Plan. The CAP reviewed the WRP.

The DRAFT plan was available at libraries, SAWS facilities and on the SAWS web page. Four town hall meetings specifically devoted to discussion of the DRAFT plan were held in July and August. Approximately 65 Speakers Bureau presentations to neighborhood
and civic groups were also held throughout the summer. City Council members also hosted neighborhood leader meetings during which the plan was presented and discussed. Comments from these venues were documented and addressed prior to presentation to the SAWS Board and City Council. Written comments were also solicited from local, state and federal agencies as well as the general public. Subsequent to modifications, the plan was also available for review.

2. Does the plan promote regional cooperation and consider regional water needs?

Regional cooperation and planning are critical implementation strategies of the WRP. Selection of projects during the regional planning process underway due to SB 1 has been identified as the next step. Participation at the regional level to determine the viability of projects that meet regional needs does not preclude SAWS from pursuing projects on its own. Further, SAWS is committed to planning for the entire county to the extent that such collaborative planning is desired by other purveyors, municipalities and water interests.

3. Does the plan promote any actions that would foreclose options?

This plan is intended to ensure maximum flexibility and provide for pursuit of opportunities that arise. Several comments were received at the public meetings regarding the possibility of certain optimization options being foreclosed if surface water projects are pursued. SAWS has committed both funding and staff resources in support of aggressive pursuit of optimization studies through the Technical Advisory Group appointed by the Edwards Aquifer Authority. Some of the studies may require years to complete; additional water supplies for the community will be required over the next several years prior to the completion of some of the optimization work. These studies must be pursued and pumping limits raised if the optimization studies prove that the yields from the Edwards can be increased while meeting the management goals of the EAA. Based on recommendations of the Citizens Committee on Water Policy, optimization studies and acquisition of other water sources are to be pursued simultaneously. The CCOWP report stated that water rights acquisitions should be evaluated against all other options with preference being given to projects that meet both optimization and water supply strategies.

It is staff’s belief that all options have remained open in the Water Resources Plan. If the drought yields and unit water costs of recharge are used to compare the benefit/cost of these projects against others, the construction of recharge projects could be foreclosed as an option. It is likely that failure to proceed with surface and non-Edwards groundwater contract options and/or supply development will result in foreclosure of options as interests in other regions “tie up” available supplies. Conversely, supplies from the Edwards aquifer may increase in the future and be available only to those in the Edwards aquifer region if optimization studies and the resultant projects prove successful.
Legislation and rule making which forecloses options should be monitored. The following list is not all-inclusive, nor does it indicate that these suggestions have been fully explored and endorsed. Rather, they suggest a thorough approach to monitoring and amending legislative avenues that close options.

- SB 1477 amendments and rule making to address the requirement to protect springflow by 2012; provide for springflow recirculation; allow transfers from Medina and Uvalde County by pipelines; and clarify minimum permit allocation and recharge in the Nueces River Basin.
- SB 1 amendments to facilitate interbasin transfers.

4. What is the percentage of the plan that is implemented by agencies accountable to citizens in San Antonio?

SAWS and the City of San Antonio have pursued those actions that are within local control including conservation, recycling, water quality protection within the Extra-Territorial Jurisdiction of the city, limited acquisition of additional Edwards rights and Aquifer Storage and Recovery studies in Bexar County.

The Edwards Aquifer Authority has embraced the optimization studies and SAWS continues to support those efforts with both staff time and funding. Other options including transfers from existing surface water reservoirs, construction of new storage and possibly even groundwater imports will require inter-agency cooperation on a regional level.

A table identifying the various water sources and agencies involved with implementation of the options is included in the plan to illustrate involvement of agencies accountable to San Antonio.

5. Does the plan recognize natural limits on water supply and find ways to supplement the natural water cycle?

The plan identifies the hydrologic balance of the Edwards aquifer and suggests ways to increase the yield through recharge, weather modification, range management and other optimization techniques that will maintain the hydrologic balance. A key element of the optimization theories is that natural limitations on the Edwards continue to be investigated to better determine what the “real” limits are and manage the water use accordingly. Importation of water into the region also supplements water availability due to natural processes. Finally, the WRP identifies the role of curtailment measures as a valid drought contingency response.

FAIRNESS AND EQUITY

1. Does the plan distribute water by amount, cost and quality equitably to all areas served by SAWS?
The plan is intended to ensure an adequate supply of water for the entire SAWS service area and the County. It acknowledges, but does not offer resolution for, the institutional and jurisdictional fragmentation that results in differential service between purveyors.

The plan contemplates potential for importation of different sources into different pumping stations throughout the service area. While each customer may not receive the same blend of sources as another customer, nor receive the same blend of sources from day to day under this scenario, all customers would receive water of drinking quality meeting federal standards. Non-potable users may receive water of a different quality appropriate for their use (e.g. recycling customers).

Historically, SAWS has charged the same rates within each class of customer throughout the service area. The plan does not specifically address rate issues.

2. **Does the plan comply with agreed upon regional water management goals?**

It is premature to gauge conformance to regional goals since the goals have not yet been established by the SB 1 Regional Water Planning Group. The WRP identifies SAWS’ desire to ensure that regional water needs are met.

The WRP also establishes compliance with the management goals currently established for the Edwards aquifer region, but includes flexibility should the management goals change over time.

3. **Do other water agencies in the region accept principles underlying the San Antonio water plan?**

SAWS distributed the DRAFT plan to local, state and federal agencies. Comments received indicated general acceptance; however, not all agencies commented.

4. **Does the plan place constraints on ourselves that others are not observing and that might limit future options?**

The plan does not limit our options as to the type of water resources that we would pursue. Through policies such as the Board’s Edwards acquisition policy included as an appendix to the WRP, the role of additional Edwards rights for meeting long term needs has been limited to ensure the health of the regional economy as well as to better protect the Edwards as a resource.

5. **Does the plan assure the water is affordable to low income residents while also remaining reliable?**

The rate structure is not specifically addressed in the plan; however, the continuation of “lifeline” rates and the development of a price affordability index is recommended.
6. Does the plan attempt to meet the economic needs for water of all groups?

The demand projections include anticipated growth for all sectors in Bexar County. Similarly, estimated supply requirements will meet the needs of all economic and geographic sectors. While the supply requirements specifically identify the needs expected within the SAWS service area, adjustments can be made to include requirements for all of Bexar County and the region. SAWS intends to partner with other municipal, industrial and agricultural users throughout the region to develop future supplies.

7. Does it [the plan] meet the needs of each ecosystem during periods of shortage?

The Edwards Aquifer Authority has implemented a Critical Period Management Plan, which assures reasonable steps to protect springflows at Comal and San Marcos Springs. Furthermore, SAWS is working with the San Antonio River Authority to develop a flow management plan for discharges into the San Antonio River that will maintain flow in the river and meet peak demands by City Public Service and local recycling customers during low flow periods.

8. Is the cost of water fairly assessed among water users throughout the region?

The plan estimates the average unit (acre foot) cost of water supplies necessary to meet the expected growth in the San Antonio area. The plan also recommends partnerships within the region to ensure that needs are met in all river basins. Specific cost allocations have not been developed for future projects. Water supply development contracts will undergo the public process as discussed elsewhere.

The existing contract with GBRA establishes a raw water cost for the Bexar County users which is equivalent to the “in-basin” cost. The “out-of-basin” charge is $24/acre foot.

9. Does the plan identify ways in which current law allocates water unfairly?

The plan recommends that existing and future legislation and rule making be monitored to assure that options are not foreclosed. Specifically, changes to the inter-basin transfer provisions included in SB 1 are recommended.

10. Do those who benefit from the water plan pay a fair share of the costs?

It is assumed in the WRP that SAWS ratepayers will benefit commensurate with the System’s investment in water supply projects. This will be evaluated on a project specific basis.

A guiding principle in the development of the plan is that those who benefit from additional water supplies for Bexar County and the region will support development of those supplies. “Those that benefit” include regional users that partner with SAWS/ City
of San Antonio as well as customers within the SAWS service area. The benefits of an adequate water supply include the direct benefit of receiving "new" water as well as the indirect benefit resulting from supplies sufficient to meet the needs of a growing population and the expanding economic base to support those families. SAWS is committed to both paying its fair share for water supplies and studies as well as assuring that the rates it charges are fair to its customers.
Public Comments and Responses
Appendix 12.2
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Introduction

The Draft Water Resource Plan was released to the general public on July 14, 1998. SAWS pursued an aggressive public information and input to solicit comments on the draft plan, which included a series of four townhall meetings, presentations to professional organizations, neighborhood groups and solicitation of individual public comments on the draft water resource plan. The draft plan was also transmitted to all of the local, regional state and federal agencies that would have an interest in the draft plan.

Several individuals, industries, professional organizations and municipalities made specific comments, recommendations and suggestions for clarifications of the draft plan. Comments were received at "town hall meetings" in all four quadrants of the city, and in numerous speakers bureau presentations. Organizations which commented officially on the draft plan included the Greater San Antonio Chamber of Commerce, the San Antonio Real Estate Council, the Greater San Antonio Builders Association, the Open Space Advisory Board, Northside Neighborhoods for Organized Development, and the Guadalupe-Blanco River Authority. Individuals who commented in writing included Hans Helland, Stephen Grigory, Gary Ortiz, and Tom Culberson.

This appendix records the comments received and reports the changes which have been made in this document in response. The sections, pages, tables and figures commented upon refer to the draft dated 6/28/98. The responses (indicated by italics) refer to the corresponding locations in this document. Where sections have been reorganized, for
clarity the comments and responses are presented in approximate order of the discussion in this document.
General Comments on the Plan

The Greater San Antonio Chamber of Commerce commented that the SAWS Board and staff should be commended for their work. They stated that the Water Management Plan encompasses the many components that are essential to a long-term water policy for our community and region. They share SAWS’ concern in providing our communities with a reliable, safe supply of water as economically as possible.

*These comments support the original draft plan. No change is made.*

The Greater San Antonio Builders Association commented that SAWS should be commended for taking a leadership role in this process. They suggested the SAWS look at all options to provide additional water supplies for San Antonio that are affordable, high quality, and proven technologically.

*This comment supports the original draft plan. No change is made.*

Northside Neighborhoods for Organized Development commented that the various options that the plan addresses are commendable and they encouraged SAWS to take a vigorous approach in determining the solutions that alleviate some of our water problems.

*This comment supports the original draft plan. No change is made.*

The Open Space Advisory Board commented that they support the thoroughness and proactive approach of the plan. Other items they support include: local and regional cooperation, protection of water quality, the non-degradation policy, water conservation,
water supply diversification, the public involvement process, and the annual assessment
of the water resource plan.

This comment supports several specific components of the plan. No change is made.

The Real Estate Council of San Antonio commented that they support moving forward
with the diversification of San Antonio’s water supply. They support looking at all
options, as long as they are based on proven technology and good science, and keeping in
mind affordability and quality. They encourage SAWS’ permanent acquisition of water
sources that are deemed feasible, and support SAWS’ participation in regional planning
activities and working with other water purveyors in the area to ensure a balanced
approach to securing water supplies for our area.

These comments support the original draft plan. No change is made.

An individual commented that he found the concept of sustainability too narrowly
defined in the Framework for Progress document. It is far more than the hydrological
balance of recharge equals discharge. The individual believes that SAWS should
encourage inner city redevelopment and discourage suburban sprawl, especially over the
recharge zone.

SAWS cannot change the “Framework for Progress” Report now. SAWS is committed to
support the City of San Antonio Master Plan. The plan does not address infrastructure
requirements within the service area, but rather water resources management. No
change is made.
Section 2 – Introduction to the Plan

An individual suggested that the plan include a clear and direct mission statement to express the purpose of the plan. The individual also suggested that SAWS should design a logo to better market the plan to the general public.

Section 2.1 sets out the purpose of the plan and Section 2.6 discusses SAWS’ ongoing public information program. The general mission statement of the San Antonio Water System is added to the introductory materials.

The Real Estate Council of San Antonio applauded SAWS’ efforts to encourage community input on this issue as long as SAWS does not become “hamstrung” or restricted by the process.

SAWS is very committed to the public process set out in section 2.5 of the plan. That is why the SAWS Board appointed a 29 member Citizens Advisory Panel to act as a sounding board on all new water resource policies, plans and projects. SAWS believes that this process is needed in order to reach community consensus on water resource projects in San Antonio as well the region. SAWS does not believe that this process will hinder or hamstring the process of water supply diversification. No change is made.

The Greater San Antonio Builders Association commented that community involvement in facing the water issue is needed to resolve this problem.

This comment essentially supports the original draft plan. No change is made.
An individual commented that SAWS needs to implement or consider recommendations from the citizens and not act independently on water planning efforts.

The draft plan is the result of the intensive public participation program discussed in Sections 2 and 3. Again, SAWS is committed to this process. No change is made.

A CAP member commented that the plan should include a map of SAWS’ service area to clarify which portions of Bexar County SAWS covers and which portions are served by other purveyors.

The map is added as Figure 1.

An individual commented that page 1 paragraph 1 was misleading by stating that the Edwards Aquifer is expected to meet half of the 2050 demands. This decision has not been made.

The revised plan adds language in Section 2.1 to clarify that the Edwards Aquifer will meet approximately half of the SAWS demand at current pumping limits, and that future changes in pumping limits will affect the proportion accordingly.

An individual commented that the statement that the Edwards Aquifer has been our sole source of water is inaccurate. We have for some time used recycled water for Calaveras, Braunig, and Mitchell Lakes.

The original draft plan did state in Section 2 that the Edwards Aquifer has been our sole source of water for San Antonio. This is clarified by adding the word “drinking” water supply.
An individual commented that page 2, paragraph 1, makes reference to pursuing solutions that make sense to everyone in the region. This should be changed to “pursue solutions cooperatively with interests in the region.”

This suggestion improves the original meaning of the sentence. It is incorporated in Section 2.1.

An individual commented on page 3, paragraph 1, that the entire emphasis of the Citizens Committee Report was that “San Antonio needs a multi-faceted and balanced approach to pursuing additional supplies.” This idea should replace the first sentence in the paragraph which states “However, San Antonio needs to pursue additional supplies and diversify our portfolio with additional supply alternatives.”

The revised plan includes the substance this comment at several points.

An individual commented that in Section 2.2, the third sentence needs to be changed to paraphrase more closely what the Citizens Committee Report actually concluded: “that the Edwards Aquifer is the cornerstone of our water supply and a comprehensive multi-faceted and balanced strategy is required…”

This does not change the meaning of the original sentence. The substance of the suggestion is incorporated in Section 2.2.

An individual commented that on page 8, paragraph 3, the Citizens Committee did not limit the pursuit of water rights to surface water only. “Surface water” should be
replaced by “all” and the statement added from the report, “especially those that meet a comprehensive and balanced strategy.”

The draft plan did not intend to suggest that surface water is the only other additional supply. This was included to show that the acquisition of additional water supplies is to be pursued concurrently with the optimization studies. The “Framework Report” was silent on non-Edwards groundwater as an additional supply, but language is added to the revised plan (Section 2.3) to include that source.

An individual commented that on page 9, paragraph 3, the statement is more complete as follows: “Efforts will be made through substantial further study to determine the feasibility of aquifer optimization and the availability of other water sources including recharge and surface water options.”

This does not change the meaning of the original sentence. The revised plan includes recharge enhancement as a component of aquifer optimization. Surface water is addressed in other paragraphs and should not be included here.

An individual commented that on page 9, paragraph 4, the statement is more accurate as follows: “A comprehensive, multi-faceted and balanced sources of supply will result in greater reliability and stability over time. Various water supply opportunities should be pursued simultaneously with studies to determine…”

The draft plan’s intent was to clarify that the Edwards Aquifer should not be the sole potable water source for the long term. It also suggests that the pursuit of additional supplies needs to start immediately, due to the potential unavailability of these sources in
the long term. The revised plan incorporates the substance of these comments (Section 2.4).

An individual commented on page 9, last paragraph: The statement is inaccurate, especially in regard to recharge and imports to recharge which are misrepresented. The determination of feasibility and firm yields is not an accurate statement. The words "feasibility and firm" should be deleted.

The draft plan uses the Trans-Texas Study as a guide on the evaluation of additional water supplies because it is the best available information. Clarifying language is added to the revised plan where the Trans-Texas Study is discussed.

An individual commented on pages 10-11, Section 2.5: To accurately reflect the words in the Water Resources Action Plan, the following additions are necessary (Additions are underlined):

1. **Develop long term water resource plan**
2. **Expand regional cooperation**
3. **Study recharge enhancement (Guadalupe Basin)**
4. **Participate in recharge enhancement projects (Nueces Basin)**
5. **Expand Public Information**
6. **Program Study the potential of aquifer storage and recovery**
7. **Participate in Weather Modification Pilot project**

The revised plan reflects the elements as listed in language in the Water Resources Action Plan (Section 2.5).
An individual commented that on page 12, paragraph 1, the word “diversified” should be replaced by “comprehensive and balanced.”

*The draft plan intended in this section to state that diversification may include several possibilities in addition to the Edwards Aquifer. SAWS believes that “diversification” of our water supply is very important and should remain in the language of the plan. There seems to be no conflict between the original and the suggested language, and so the suggested language is added at several points in the revised plan.*
Section 3 – Evaluation of Water Resources

A CAP member suggested that the chart on the public process be incorporated into the plan in order for the general public to better understand the public process. 

This chart is moved from the Appendix to the main body of the plan, in Section 2.6.

Several individuals suggested that costs should be compared before choosing and identifying specific projects.

Cost is one of the criteria for the evaluation and selection of projects as described in Section 3, but not the only one. It is premature at this point to do a cost analysis for specific projects in this plan. The draft plan does not recommend or endorse specific projects, but instead outlines water resource options that will meet our long-term water needs in some combination. No change is made.

Several individuals suggested that the plan should include more emphasis on public meetings and talk shows.

The planning process has been extensive. SAWS will continue to pursue additional opportunities for balanced input, as discussed in Section 2.6. No change is made.

A CAP member commented that SAWS needs to have a survey or a way to measure whether we have been successful in the public involvement process a year from now.

SAWS has been working in cooperation with the Citizens Advisory Panel to create a tool to evaluate the public involvement process. However, SAWS believes that this issue
should be separated from the content of the draft plan at this point. The analysis would be better initiated in the annual assessment of the final plan. No change is made.
Section 4 – Regional Planning and Management

Northside Neighborhoods for Organized Development commented that they strongly endorsed the need for regional and comprehensive planning.

This comment supports the original draft plan. No change is made.

The Greater Chamber commented that they understand that the economy of the Edwards Aquifer region is interdependent. All will prosper together, or all will fail together. They encouraged regional coalitions to develop projects that produce economies of scale and that will benefit the entire region.

These comments support the original draft plan. No change is made.

The Greater San Antonio Builders Association commented that they support SAWS' participation in the regional planning process.

This comment supports the original draft plan. No change is made.

Several individuals commented that Edwards Optimization and Water Quality issues need to addressed regionally and not only in San Antonio.

SAWS agrees that these two issues need to be addressed both locally and regionally. Therefore SAWS will remain an advocate for regional cooperation on these issues. No change is made.

The Guadalupe-Blanco River Authority commented that Section 4.2.2 describes the withdrawal limits established in Senate Bill 1477. The paragraph states that the “EAA is
required by state law to limit withdrawals from the Edwards Aquifer to 450,000 acre-feet per year immediately and to further reduce withdrawals to 400,000 acre-feet per year by 2008." Section 1.14 of SB 1477 also requires that the EAA implement and enforce water management practices, procedures, and methods to ensure that, not later that December 31, 2012, the continuous minimum springs flow of the Comal Springs and the San Marcos Springs be maintained to protect endangered and threatened species.

The revised plan includes these comments in Section 4.2.2.

Several individuals suggested that SAWS should aggressively pursue raising the pumping limit on withdrawals from the Edwards Aquifer.

Raising the pumping limit for the Edwards Aquifer will require technical proof that larger amounts can be pumped while still meeting the management objectives of the Edwards Aquifer Authority statute. The Aquifer Optimization Studies are designed to provide the requisite technical studies to prove this can be done. The revised plan includes extensive additional discussion of these studies (Section 7.2.4), which SAWS strongly supports.

Several individuals suggested that the plan should include a commitment to protect springflow quantity and quality.

One of the purposes of this plan is to diversify our water resources in order to protect springflow and downstream needs. SAWS is committed to protecting water quality, and the plan describes several mechanisms used to regulate water quality locally and regionally. No change is made.
An individual commented that on page 25, paragraph 3, the Comal Springs “jeopardy” number was 200 cfs, and San Marcos 100 cfs. The “take” numbers are lower. The court judgement protected nothing and guaranteed nothing. It merely required the U.S. Fish and Wildlife Service to come up with these numbers, notify various parties, and file monthly reports, and it allowed the Plaintiffs to seek additional relief if the State of Texas did not have in effect a regulatory system (not a “management plan”) to avoid unlawful takings, etc.

The purpose of this section is to give a general interpretation of the outcome of the lawsuit and the general impacts to people in the region. The wording in Section 4.2.1 is clarified.

An individual commented on page 25: Between the lawsuit and SB 1477 it is important to note that the City of San Antonio and SAWS supported a Summary Bill Outline on January 9, 1993. This outline became SB 1477. We are now discovering how detrimental this bill is to San Antonio.

SAWS disagrees that SB 1477 is detrimental to San Antonio. The commenter did not offer changes to the plan and none have been made.

An individual commented on page 26, paragraph 2: The EAA began operations on June 28, 1996, following a Texas Supreme Court ruling. At this point, the Medina County lawsuit should be mentioned as occurring between the summer of 1995 and 1996.

The substance of this comment is incorporated as clarification in Section 4.2.1.
An individual commented on page 27, paragraph 1: At the end of the paragraph add — “And its historical high pumping was 193,944 ac ft in 1984 and represents the amount of water SAWS applied for in the permitting process of the EAA.”

*The substance of the comment is added at the end of Section 4.2.2.*

An individual commented on page 27, paragraph 2, third sentence: “The Critical Period Management Plan imposes further restrictions; it does not override the annual pumping limits.”

*The substance of the comment is incorporated as clarification in Section 4.2.3.*

An individual suggested that the plan should include specific language on periodic reviews of state and federal laws as they pertain to water resource issues.

*The recommendation in Section 4.4 is expanded and clarified.*

An individual suggested that in Section 4.4, page 33, paragraph 1 should end after “pumping” (thus deleting “if sufficient flow can be provided for species and for downstream needs.”) Another separate item should read “SAWS should pursue making additional supplies available from the Edwards aquifer.”

*SAWS believes that it is very important that sufficient flow for the springs and other downstream users remain an important component of Edwards Aquifer management and a determinant of the feasibility of optimization. Therefore no change is made in response*
to the first part of this comment. The second comment is addressed at length in Sections 7.2.4 and 7.2.5.
Section 5 – Water Quality

The Greater Chamber stated that few could argue with the need to protect the quality of our water. As our sole source of water, it is foolish to unnecessarily jeopardize the Edwards.

This comment supports the original draft of Section 5. No change is made.

Numerous individuals supported the draft plan’s aggressive water quality protection measures.

These comments support the original draft plan. No changes are made.

An individual commented that a maximum effort should be made to promote protection of the water quality in the Edwards Aquifer. Entities with regulatory powers, i.e., the City of San Antonio, Bexar County, the EAA, and TNRCC, should be strongly encouraged to promote, fund, and enforce measures to this end.

This comment essentially supports the original draft plan. No change is made.

The Open Space Advisory Board had several concerns specifically with the Recharge Acquisition Program. The details of this program are not apparent. The draft plan indicates that approximately $500,000 - $750,000 per year is budgeted for this program. What percentage of this yearly allocation will go towards land purchases as opposed to funding for administration expenses? What is the current and/or anticipated level of multi-agency cooperation? How is SAWS encouraging funding contributions from other entities? They suggested program money should be focused on property which is not only
environmentally sensitive, but which may be at present and future risk of negative impacts from land use activities. It would not be reasonable or justifiable to spend program funds in acquiring land from developers, which already is deemed undevelopable and is therefore at lower risk.

The sensitive land acquisition program funds will be 100% allocated for the purchase of sensitive land. SAWS is consulting with other nonprofit and governmental entities to form partnerships. SAWS is actively pursuing federal, state and local participation in funding this program. Section 5.2.2 is clarified to address these questions.

The Open Space Advisory Board asked how a GIS database for the Edwards Aquifer will be developed. How will SAWS work with other agencies? Who will manage the project? How will data exchange be handled? The GIS database should include Category status under the Water Quality ordinance, percent impervious cover, zoning and land use, and POADP status.

SAWS has contracted with the U.S. Geological Survey to develop the databases. SAWS is also a member of the local GIS users group, which includes other local and regional agencies. The logistics of this program is still being developed and will be available at a later date. USGS is expected to deliver a draft model of the cumulative rating coverage this fall, which graphically depicts the items recommended. While a critical component of a water resource management strategy, additional detail on the GIS development is addressed in other SAWS processes and is not appropriate for this document. No change is made in Section 5.2.3.
The Open Space Advisory Board had a concern about the use of recycled water having a negative effect on water quality. What safeguards are being used to protect Edwards water quality from recycled water lines on the recharge and transition zones of the aquifer? Will the availability of recycled water on the recharge zone promote additional development?

The supply available from the recycling program is expected to be utilized within Loop 1604. Studies are currently underway to identify potential impacts from the use of recycled water on the recharge zone. Results will indicate if additional treatment of the recycled water will be required should additional supplies be available in the future. No change is made in Section 5.

The Open Space Advisory Board commented that it is necessary for SAWS to have a well-conceived contingency plan in the event of aquifer contamination.

The revised plan adds this as a recommendation in Section 5.4.

Several organizations commented that the revisions to the Chapter 213 rules, currently under consideration by TNRCC, are not the best means of protecting our water quality. SAWS has been very active and will continue to be so in encouraging specific changes to the TNRCC's Chapter 213 rules. Also, SAWS has other water protection measures that can be used to enforce water quality within our jurisdiction. These include the Water Quality Ordinance, the 33 mandates, and the sensitive land acquisition program. No change is made.
The Greater Chamber commented that they recommended to TNRCC the following revisions to the rules regulating activity on the Edwards recharge and transition zones:

- Conduct a regulatory impact analysis to determine the true cost of implementing the proposed rules.

- Develop rules based on the hydro-geological characteristics of the region, and not artificial boundaries of political subdivisions.

- Continue its practice of rules based on design standards and not proposed performance standards.

SAWS will continue to support regional protection of the Edwards. However, this comment is more appropriately addressed to TNRCC and does not suggest revision of this plan. No change is made.

A CAP member suggested that the plan needs to clarify the discussion of treatment of additional water supplies and to emphasize that all resources brought on line will meet the water quality standards of the Edwards Aquifer.

Section 5 of the plan recommends that all new sources of water brought into the system meet or exceed all federal and state drinking water standards. Section 5.3 is revised to clarify the intent.

A CAP member commented that SAWS needed to clarify section 5.4 of the plan to better emphasize how new sources of water will be brought into different parts of the service area.

Section 5.3 is extensively rewritten to clarify.
Several individuals supported the watershed management approach of the draft plan.

_These comments support the original draft plan. No changes are made (Section 5.2.3)._  

Several individuals commented that the plan should commit SAWS to no tax abatements for construction over the Edwards aquifer recharge zone.

_SAWS does not have the power to grant or deny tax abatements. However SAWS has been assisting the City of San Antonio staff in developing a tax phase-in program which addresses particular concerns over the development over the Edwards Recharge Zone._

_No change is made._

Several individuals suggested that the plan should address the economic impacts of recharge zone protection.

_Such analysis will be subject to the public process and benchmarking assessment. No change is made._

Several individuals commented that they did not want water other than Edwards Aquifer water to be delivered to their house.

_Where additional supplies are delivered and how they are distributed will be a function of the timing, location and volumes of additional supplies acquired. These issues will be decided in the public decision-making process on how these supplies will be integrated into SAWS’ distribution system. No change is made._
An individual commented that on page 39, Section 5.3, the second sentence raises a question as to SAWS’ intentions. The caveats to excellent quality water should be removed and the statement removed and restated.

The intent of this section was to indicate that SAWS regards the treatment of additional water supplies to all federal and state drinking water standards as a minimum. Where possible and according to community decisions balancing water quality and economics, greater levels of treatment may be provided. Section 5.3 is revised to clarify this issue.

An individual commented on page 40, Section 5.4: again SAWS appears to have made the decisions that imported supplies will need to be “injected at the various pumping stations.” Imported supplies may be stored underground and may be pumped at the various pump stations. Thereby, the problem of where to deliver the new water will not exist except in the growth areas where SAWS infrastructure has yet to be constructed or can easily be expanded or altered.

This section did not intend to imply that these were the only options available. Instead it was merely a general representation of how the system works, to illustrate how additional sources of water could be incorporated into the existing distribution system. In appendix 12.5 of the draft plan, the Trans-Texas list of potential projects lists several options on how the imported water may be used, and one of them is direct recharge to the Edwards. Section 5.3 is revised to clarify this issue.

An individual commented that on page 41, the second sentence of last paragraph of Section 5.4 should be changed to allow for all possible options: “Supplies could be
delivered into various pumping stations or to the growth areas or the least cost area, or supplies could be pumped from the Edwards Aquifer and delivered as we do now. The delivery of additional supplies decision has not...”

As discussed in response to the previous comment, Section 5.3 is clarified.

The Open Space Advisory Board commented that development of water treatment facilities for new water sources should begin now due to the time it takes to permit and construct these facilities. The planning process should also be accompanied by a public relations campaign to educate the public.

The type, size and location of water treatment facilities will be determined by the sources of supplies acquired. Development of these facilities will be subject to the public process described in the plan. This comment essentially supports the plan, and so no change is made.
Section 6 – Existing and Projected Water Demands

Northside Neighborhoods for Organized Development commented that the water issue is the greatest challenge facing San Antonio and our state. With the constraints placed on us by SB 1, the natural occurrences of drought, and population growth, it is critical that SAWS and others pursue an aggressive conservation education program and enforcement of conservation regulations.

This comment essentially supports the original draft plan, which is built on the assumption that SAWS’ aggressive conservation goals will be met in the long term. The methods by which these goals will be met - including education and enforcement - are described in more detail in Appendix 12.5. Conservation programs emphasizing consumer education are discussed in Section 6.2.2.

An individual commented that the strong emphasis on reducing water demands for the SAWS service area and for Bexar County could be accomplished by pursuing a more aggressive water conservation policy to reduce peak demand in the summer and during droughts.

This comment essentially supports the original draft plan. No change is made.

Numerous individuals and the Open Space Advisory Board suggested that SAWS include in the plan the cooperative development of high visibility water conservation demonstration sites. Water saver landscaping of public facilities and hands-on involvement by schools, businesses and neighborhood groups will go a long way in promoting conservation.
The Conservation and Reuse Plan addresses these comments and is included as an appendix to the plan.

The Open Space Advisory Board commented that the draft plan deals with population growth as a given. They suggested that the plan should address the issue of population growth rather than accepting it.

The plan proposes to supply water needs for the growth that may occur consistent with the City of San Antonio’s Master Plan and the Citizens Committee Report. If a later community decision is made to limit growth, then water requirements can be adjusted accordingly. No change is made.

An individual commented that SAWS should work on mechanisms to see that all new commercial and residential construction has a water budget that will significantly reduce current peak demands. Rate structure changes such as a fifth block for residential use should be used to encourage reductions. The individual stated that SAWS could work to this end by placing demands on customers and purveyors to which SAWS provides water and by lobbying for such measures with the EAA, in the SB 1 process, and in the Texas legislature.

SAWS is committed to exploring all potential mechanisms to maximize our water conservation efforts. The Community Conservation Committee is exploring rate structure changes to encourage additional conservation and currently works with wholesale water customers to encourage conservation. The Conservation and Reuse Plan is included as Appendix 12.5. No change is made.
An individual commented that in an era of limited use of the Edwards Aquifer, it would be prudent to examine the growth of commercial and industrial water demand to determine which types of businesses we should be attracting to the area. As an example, if we are trying to attract water intensive businesses such as golf courses vs. computer chip manufacturers, which will yield the types of jobs we need in this community?

*The Citizens Committee on Water Policy recommended that water availability should neither inhibit nor promote growth. As the municipally owned water purveyor, SAWS must follow the growth management and economic development policies of the City of San Antonio Master Plan. No change is made.*

The Guadalupe-Blanco River Authority commented that Section 6.1 of the draft plan states that “SAWS should consider the expected demands of the whole county during its water resource planning activities.” They suggest that the demand projections of the entire region be considered.

*The statement was intended to convey that SAWS will acquire supplies sufficient to meet the expected demands of the entire county to the extent desired by Bexar County purveyors. SAWS agrees wholeheartedly with the GBRA that the needs of the entire region should be considered and met. The revised plan clarifies this and includes demand projections for all of SB 1 Planning Region L.*

GBRA commented that Table 6.2 should probably be amended to clarify that counties within the Guadalupe River Basin have greater total demands than are shown in this
table. The existing table only includes the portion of the demand within the Edwards region. A clarifying note would be helpful.

*Table 2 is revised to include the entire 21-county SB 1 Region “L.”*

The Greater Chamber commented that the Texas Water Development Board’s projections should be used as a baseline for estimating future requirements. However, SAWS, in conjunction with appropriate municipal and county entities, should monitor population trends and consumption patterns to ensure that any investment in resources designed to meet our projected water needs is on target.

*This comment essentially supports the original draft plan. Section 6.3 recommends an annual assessment of the population and water demands in order to use the most current data available. No change is made.*

Several individuals raised concerns about the method by which the water demands in the plan were derived. Are the figures accurate? How can we be sure?

*The draft plan’s population and water demand projections were derived by taking TWDB population estimates for SAWS’ service area and multiplying by SAWS’ projected per person consumption to get projected demand. Staff feels that these projections express the most likely scenarios for the system. As with other dynamic elements of the plan, these figures will be reevaluated and updated periodically as new census data and per capita consumption data becomes available.*
FINAL DRAFT
09/28/98
An individual commented that he supports the concept of continually reevaluating water demands before proceeding with major water projects. The projection of ever-increasing population may be incompatible with sustaining a good quality of life in the region, and thus population growth may slow.

*Water demands will be reevaluated prior to initiation of major water projects. No change is made.*

An individual asked how is unaccounted for water is addressed in the plan.

*The unaccounted for water is already incorporated in the projected demand. No change is made.*

An individual commented that the plan's recommendations after 2010 are unrealistic.

The solutions outlined do not meet the projected demand.

*SAWS staff has clearly analyzed the projected demands and has used the technical data developed by the Trans-Texas Water Program in appendix 12.7 to quantify the availability of the various water supplies. In section 7.4 of the plan, the illustrated acquisition sequences meet our future demands until 2050. SAWS believes that the analysis for each decade is as accurate as possible. No change is made.*

An individual commented that on page 49, figure 6.3, the figure shows Bexar County demand of approximately 225,000 acre-feet in 1990. The actual pumpage in 1990 was 276,800 acre-feet. By correcting the error the spike in the graph would be removed.

*Figures 5 and 6 are revised to show only projected water demands 2000-2050.*
An individual commented on pages 49-50, figure 6.4 and table 6.2: the demand numbers for 1990 seem to be inconsistent for other Edwards region counties and need to be reevaluated based on the Trans-Texas Study.

Staff has reevaluated the projected water demands. Table 2 includes all 21 counties in SB 1 planning region “L.”

An individual commented that the demand projections in the plan need to reflect recharge.

The plan looks at water demands and potential water supplies separately, and regards recharge as a form of supply rather than a form of demand. Due to the complexity of recharge alternatives and the EAA’s not finalizing the rules on recharge credits, it is impossible at this point to know how much recharge will affect the projected demand. No change is made.
Section 7 – Water Supplies

The Greater San Antonio Builders Association commented that they support the permanent acquisition of water sources that are deemed feasible, and encourage community input on these issues.  

*This comment supports the original draft plan. No change is made.*

Many individuals supported the plan’s acquisition of additional water supplies, including existing surface water, other groundwater, stormwater runoff, and new surface supplies.  

*These comments support the original draft plan. No change is made.*

An individual commented that on page 52, the fourth “guiding principle” should be changed to read “Additional sources utilized in a comprehensive and balanced strategy are desired to provide a more reliable water supply.” The second sentence should be eliminated because non-Edwards supplies do not necessarily reduce the legal or regulatory limitations on that source. In fact the risks may be greater.  

*This principle is rewritten to clarify the issue (Section 7.1).*

An individual commented that the plan needs to incorporate run-of-river flows as an option. There is no firm yield for these supplies, but they could be available to SAWS.  

*The draft plan recommends examining all water resource possibilities. A guiding principle in the water supply section (Section 7.1) acknowledges the role of interruptible*
supplies, which include run-of-river rights. Such supplies can be made firm with storage such as Aquifer Storage and Recovery. No change is made.

Current Supply Sources

An individual commented on page 56, last paragraph: the water is discharged from the aquifer naturally by springs or through wells. Pumping wells as well as flowing wells both discharge water.

*The suggested clarifications are made in Section 7.2.1.*

An individual suggested that on page 57, paragraph 1, the sentence should read “The Edwards level reading from the J-17 well at Ft. Sam Houston which is reported in various news mediums is measured in feet above sea level. It is an indicator of hydrologic pressure in the Edwards aquifer and is an indirect indicator of the quantity of water in the aquifer.” The rest of the paragraph should be deleted. This individual further commented that the plan should say “The fresh/saline water interface, known as the bad water line, is physically a transition zone defined by a facies change in the aquifer when total dissolved solids values are less than 1,000 mg/l (freshwater) diverge from total dissolved solids of 1,000 mg/l or greater (Saline). The increase in salinity of water in the freshwater/saline interface is dependent upon many variables, including pressure declines, formation features such as porosity and permeability, structural features such as faults, hydrologic properties such as hydrologic gradient, transmissivity, water flow paths and other differences between the freshwater and saline zones. The consensus of opinion in the scientific community is that the bad water line will not move in any significant way.”
Clarifying language is added to indicate an indirect relationship between aquifer level and quantity of water (Section 7.2.1). A brief reference to the relationship between aquifer levels and potential movement of the bad water line remains. A more detailed discussion is provided in the expanded section on aquifer optimization (Section 7.2.4).

An individual suggested that on page 58, paragraph 1, the third sentence should be restated as follows: “It is inexpensive and of very high quality compared to other sources and available in significant quantities even with the EAA...” The final sentence of the paragraph should add: “The Edwards aquifer and recycled water will be...”

The comment suggests that the Edwards Aquifer is of better quality than other sources. There are treatment mechanisms that can treat other sources of water to the same or better quality than that of the Edwards. No change is made. The second recommendation, acknowledging recycled water as an existing supply, is incorporated in Section 7.2.2.

An individual suggested that on page 58, paragraph 2, the third sentence (discussing SAWS’ likely final permit amount for Edwards Aquifer pumping) should be deleted.

The discussion of the current status of SAWS’ permit application and SAWS’ expectations of a final permit is necessary to understand the issue. However, the paragraph is rewritten to clarify the issue of the statutory minimum (Section 7.2.2).

An individual suggested that on page 58, paragraph 3, there are numerous opportunities for increasing the supply available to SAWS. SAWS may increase the supply by:
(a) Recharge structure construction.

(b) Studies that determine additional supplies are available from the Edwards aquifer.

(c) Implementation of water management strategies, including conservation, springflow augmentation, diversions downstream of the springs, reuse, supplemental recharge, conjunctive management of surface and subsurface water and drought management plan.

(d) Legislative action to amend SB 1477.

The opportunities referred to in (a) (b) and (c) are discussed in various sections of the plan, particularly in the expanded Sections 7.2.4 and 7.2.5. SAWS supports SB 1477 and does not recommend legislative action to amend it.

An individual suggested that on page 59, paragraph 2, the Citizens Committee goal did not say that reducing dependence on the Edwards aquifer or acquiring non-Edwards supplies would increase the reliability of our water supply. That statement is not true as written. We may acquire non-Edwards supplies, but increase our dependence on the aquifer as a storage facility and delivery vehicle. In the last part of the paragraph we contradict the limited acquisition statement in the first paragraph. It correctly leaves open the possibility of acquiring more pumping rights from the Edwards.

There are numerous references in the Citizens Committee Report to the acquisition of additional and reliable sources of supply. However, the first sentence of this paragraph was out of context to the meaning of this section and has been deleted (Section 7.2.3).
An individual suggested that on page 59, paragraph 1, the limitation strategy and the use of the litigation threat has been a policy of SAWS and the City. The continuation of this bad policy; giving away access to the aquifer, unilaterally limiting what we will buy, giving up our reliable water supply for insecure out of basin water, in order to acquire non-Edwards water that will not guarantee springflow is a policy that needs to be reconsidered and restated.

SAWS has been and will remain a strong supporter of local regulation of the Edwards Aquifer. SAWS feels strongly that the Edwards needs to be carefully managed in order to keep this source in balance. No change is made (Section 7.2.3).

An individual suggested that on page 60, paragraph 1, the part of the second sentence beginning with “water level, springflow”… should be deleted to more accurately describe the provisions of the Act.

The suggested change does not change the original meaning of the plan. Its substance is incorporated in Section 7.2.4.

An individual suggested that on page 62, paragraph 1, the last sentence is not an accurate statement of SB 1477. It should read “SB 1477 specifically provides that an entity increasing recharge to the Edwards may retrieve all or part of the recharged amount, as demonstrated and established by expert testimony.”

The substance of the comment is addressed in revised language (Section 7.2.4).
Several individuals suggested that on page 75, the plan should delete the word “limited” from the first recommendation [to acquire additional Edwards Aquifer pumping rights]. One suggested substituting “additional supplies available.”

*The Edwards Acquisition Policy adopted by the SAWS Board of Trustees states that SAWS will purchase a “limited” amount of Edwards supplies to meet SAWS short term needs.*  No change is made (Section 7.2.9).

The Greater Chamber commented that as the largest purveyor in the region, SAWS may be responsible for buying down 70% of the excess Edwards Aquifer pumping rights, which amounts between $35 - $70 million. There is no mention of this cost in the report and it needs to be considered.

*It is not possible to quantify how much water will have to be “bought down” at this point. Therefore an estimate of the cost was not a part of the financial analysis for this plan.*  

No change is made.

The Greater Chamber commented that although the process for increasing the pumping limit in SB 1477 seems impossible, the EAA and SAWS must commit the resources necessary to pay for the science that may allow the 450,000 acre-feet limit to be increased. They also stated that the entities that invest in the process that raises the limit must be allowed access to that “found” water.

*The plan recommends that SAWS continue to participate in the study of Aquifer Optimization in cooperation with the EAA. No change is made.*
The Greater Chamber commented that they support further studies of the aquifer in an effort to efficiently utilize its natural abilities of storage and recovery, recharge, etc. They are pleased to hear that the Edwards Aquifer Optimization Studies have been implemented and are expected within the next three to ten years.

*This comment supports the original draft plan. No change is made.*

Several individuals commented that they supported the purchase of Edwards Aquifer pumping rights from other permit holders.

*These comments support the original draft plan. No change is made.*

Several individuals supported stronger measures for the study of Edwards Aquifer optimization. More detail is needed to be specific in the draft plan.

*Section 7.2.4 is revised to expand the discussion of Aquifer Optimization.*

An individual commented that the optimization studies should have strong, defined criteria to protect environmental water demands with regard to quantity and quality at Comal and San Marcos Springs.

*This comment supports the original draft plan. No change is made.*

An individual commented that the plan needs to emphasize the true biological needs of endangered species in order potentially to increase the supply available from the Edwards.
The draft plan recommends the continuation of the aquifer optimization studies. One of these studies is a biological assessment on the endangered species at Comal and San Marcos springs. This study is being managed by the EAA with technical and financial support by SAWS. If the optimization proves to be a viable alternative, then other projects will be pushed further into the future. No change is made.

An individual suggested that on page 64, paragraph 2, the three additional options of artificial recharge, interbasin transfer to recharge, and springflow recirculation can be considered stand-alone as well as an integral part of any optimization plan. There is adequate information available on each option to include it in a separate section under potential future water supplies. It should be inserted after section 7.3.2 as new subsections. New subsections should be added at this point before existing surface water: Section 7.3.3 Artificial Recharge, Section 7.3.4 Interbasin Transfer of Artificial Recharge, and Section 7.3.5 Springflow Recirculation. Details on each are included with comments.

The revised plan includes a substantially expanded section (7.2.4) discussing in more detail each component of the Aquifer Optimization study.

An individual commented that range management should be included as a measure to maintain the hydrologic balance of the Edwards aquifer.

Section 7.2.4 of the revised plan includes discussion of range management as one element of the ongoing studies which SAWS supports.
Several individuals commented suggesting that the plan should address the use of stormwater runoff as recharge.

*Section 7.2.5 on Recharge Enhancement is substantially expanded.*

Several individuals recommended that recharge enhancement or the construction of recharge dams needs more emphasis in the plan. They recommended that recharge enhancement not be included in optimization studies but instead be its own section in the plan.

*The plan is revised as suggested (Section 7.2.5).*

Several individuals commented that the plan should not just study recharge enhancement structures, but instead start construction.

*SAWS is committed to the study of recharge enhancement and aquifer optimization. The EAA has taken the role of lead agency in these studies. SAWS cannot commit to construct a recharge enhancement project before the EAA adopts the rules for recharge credits. However, the revised plan gives greater emphasis to recharge enhancement as a proven technology (Section 7.2.5).*

An individual commented that on page 69, the yields should be based on average amounts, since the firm yields will depend on EAA actions in regard to recharge rules.

The drought period numbers are irrelevant to an accurate comparison to other options.

*The issue of how to measure the yields of recharge projects is addressed in an expanded discussion of recharge enhancement (Section 7.2.5).* The "guiding principles" for SAWS
water supply include acquisition of firm yield supplies. That does not preclude use of interruptible supplies such as recharge which can be managed to increase firm yields.

An individual commented the Endangered Species Act has been used for purposes other than what Congress originally contemplated.

This plan responds to state mandates to regulate and manage the Edwards Aquifer, and generally accepts the framework of existing state and federal law. No change is made.

Many individuals commented in support of the water recycling program. They also recommended expansion of the program to include residential and potentially other customers.

The expansion of the recycling program will be considered as the initial phase nears completion. No change is made.

The Guadalupe-Blanco River Authority commented that Section 7.2.6 describes the project being developed by GBRA to serve western Comal and eastern Kendall counties. The plan describes how SAWS was given an opportunity to participate in this surface water supply project. They suggested it would be best if that section identifies this project as the “Western Comal Project.” Also, they recommended that the second sentence on page 63 be revised to read “The contract provides for an initial supply in excess of 3,000 acre-feet per year, which will be reduced to 2,000 acre-feet per year over the forty-year initial term of the Contract.” Also, the total cost of delivered, treated water from the Western Comal Project will be approximately $660 per acre-foot. The draft
plan references $550 per acre-foot, but it does not specify if that amount includes treatment and delivery.

SAWS has already given this project the name "Canyon-Bulverde pilot project" and so for consistency it remains the same. However, the plan is revised to incorporate the other suggestions to clarify this section (Section 7.2.7).

An individual commented on page 63, paragraph 3: If our permit is 148,000 acre-feet, how can we use 200,000 acre-feet as being covered by our current rate structure? The 200,000 acre-foot amount quoted is the combination of SAWS' Edwards permit and other acquired supplies. Clarifying language is added (Section 7.2.8).

An individual commented that on page 63, paragraph 3, the purchase price for additional Edwards supplies will exceed $550 per acre-foot. If it refers to what has been purchased to date, it may be correct. Future acquisitions may not be as cheap. A higher average cost should be used in the five-year plan.

The estimate for the Canyon-Bulverde Project has been increased to $660 per acre-foot per year based on new cost estimates. Purchases of Edwards supplies to date have been in the range of $500-$700 per acre-foot for permanent acquisitions. This section is revised accordingly (Section 7.2.8).
An individual suggested that on page 64, paragraph 1 in Section 7.3.1, the first sentence should be restated as follows: "and the need to have a comprehensive and balanced water supply strategy, this plan proposes that some future SAWS needs will come from…"

_The substance of the comment is incorporated in Section 7.3.1._

The Greater Chamber commented that in developing further available groundwater sources, feasibility studies should be initiated and coordinated with relevant agencies.

_Section 7.3 of the draft plan recommends that studies to evaluate other groundwater be initiated to evaluate the feasibility and potential quantity of water available for SAWS, Bexar County and the region. An in depth feasibility analysis will be done on a project-specific basis. It is premature to do a feasibility analysis at this point in the planning process. The plan recommends that all additional water supplies pursued will be coordinated with local and regional agencies. SAWS will not pursue additional groundwater in areas that are not deemed economically or environmentally feasible to everyone involved. No change is made._

GBRA commented that Section 7.3.2 describes other underground water resources. The section on the Trinity Group should include a statement that "The Trinity Aquifer in Kendall and Comal counties is unable to produce quantities sufficient for consideration as a source of supply by SAWS."

_The draft plan recommends in section 7.3.2 that SAWS evaluate the feasibility of all potential options. It would be premature at this point to discount any options that have_
An individual commented on page 71, paragraph 1: Didn’t we already acquire some of existing surface water rights in the Leon Creek watershed?

*The plan is revised to reflect the recent acquisition of 7,500 acre-feet of run-of-river, non-firm supply on Leon Creek (Section 7.3.3).*

*Addition needs to be inserted early in Section 7.3.3*

Several individuals commented that the plan needs to place emphasis on existing surface water development.

These comments essentially support the original draft plan. SAWS has already acquired 3,000 acre-feet of water from the GBRA for Bexar County. No change is made.

The Greater Chamber commented that every effort must be made to acquire new surface water within our regional planning area.

The comment essentially supports the recommendations of the plan in section 7.3. These include beginning the planning for new surface water reservoirs, with the recognition that selection of new large-scale reservoirs will occur in the SB 1 regional planning process. No change is made.

Several individuals suggested that SAWS continue with the Canyon-Bulverde project and further pursue additional supplies from the Guadalupe River Basin.

These comments support the original draft plan. No change is made.
Several individuals commented that the plan should place more emphasis on the construction of new surface reservoirs as an alternative.

Section 7.3.4 of the plan clearly recommends initiation of planning for a new surface water reservoir. However, this must be with the recognition that the selection of a large-scale surface reservoir will come from the SB 1 regional planning process. No change is made.

An individual commented that he supported the thorough investigation of water resource options such as purchase of Edwards Aquifer water rights, recharge enhancement, recirculation of Comal and San Marcos springflows, utilization of the Carrizo and Wilcox Aquifers for Aquifer Storage and Recovery, weather modification, and transfers from existing surface water supplies in the Guadalupe River basin, before significant efforts are devoted to the construction of new reservoirs and transfers from more distant river basins.

This comment supports the original draft plan. No change is made.

Several individuals suggested that the plan should specify which surface water reservoirs SAWS will pursue.

It is premature to specify which surface water reservoirs will be pursued at this point in the planning process. Section 7.3.4 recommends that SAWS, in cooperation with others in the SB 1 planning region, merely start the process of planning for the development of some new surface water reservoirs, due to the 10-30 year development time which these
projects require. New surface water projects will be evaluated and selected at the regional planning level. No change is made.

An individual commented that the Trans-Texas Water Program may not be the best way to compare costs. The Trans-Texas cost analysis incorporates the old Applewhite project as well as other potentially non-feasible alternatives.

SAWS recognizes that many of the projects included in the Trans-Texas study may not be feasible. However, that study represents the best technical data available to illustrate the incremental costs of developing water supplies until 2050. SAWS will do financial analysis at such time as specific projects are being developed or considered. No change is made.

An individual suggested that on page 74, table 7.1, there are numerous other existing surface water projects listed in Trans-Texas. Should they be listed?

This table in the revised plan (Table 3) merely offers a sample of the potential supplies from existing surface water projects to provide context of volumes and costs. No change is made.

An individual suggested that on page 69, the statement that existing surface and ground water supplies in Region L are not sufficient to meet total demands is incorrect, if recharge, recirculation, and interbasin transfers to recharge are not considered new supplies.
Table 4 shows the gross available ground and surface water supplies in Region L. Recharge and recirculation are relocations of these gross supplies that do not add to the total. Utilization of these strategies to increase storage in the aquifer will not likely affect the entire 200,000 acre-foot annual deficiency indicated in the table for the year 2050. The statement is correct as written (Section 7.3.4).

An individual suggested that the recommendations on future water supplies should include one to “pursue negotiations over existing surface water supplies that might fit into a comprehensive and balanced water supply strategy.”

The suggestion is incorporated in Section 7.3.7.

An individual suggested that on page 78, table 7.2, the Guadalupe Basin projects are not correct. The existing surface water projects are listed again in this section.

Table 7.2 in the draft plan did have an error in the Guadalupe River basin projects. Table 5 is corrected with accurate Trans-Texas data.

Several individuals commented that they supported the pursuit of Aquifer Storage and Recovery as a management tool for additional supply.

These comments support the original draft plan. No change is made.

An individual suggested that the plan should include the desalination of seawater as an option for the future, possibly by 2075.
The current draft plan is based on securing water supplies until 2050. At this point in time the desalination of sea water in not an economically feasible alternative when compared to other available alternatives. By 2075 this may be a viable option. No change is made.

The Greater Chamber commented that it is prudent to fund studies to evaluate all the variables that may affect our water supply: cultural, economic, and social. 

The suggestion is added as an explicit recommendation (Section 7.3.7).
Section 8 – Financial Considerations

Several individuals suggested that the draft plan clarify that the increase in water bills to residential customers will also apply to commercial and other SAWS customers. The financial impact set out in Section 9 of the original draft plan focused on the average residential customer. The revised plan includes a completely new Section 8.3.3, which discusses the impacts to SAWS' commercial and industrial customers.

The Greater Chamber commented that the projected increase to monthly residential water bills would increase significantly through 2050. By SAWS' own forecast with 1998 rates as a baseline, residential water rates will increase:

- 26% in 2010;
- 42% in 2020;
- 55% in 2030;
- 67% in 2040; and,
- 73% by 2050.

This comment merely reinterprets the financial projections in the plan. No change is made.

The Greater Chamber commented that they support SAWS' efforts to develop an equitable distribution of the costs associated with providing water to both the residential and general (non-residential) customers. They also support the pass-through fee SAWS will collect to pay the Edwards Aquifer Authority its surcharge for water drawn from the
Edwards Aquifer. They commented further that the estimated $2.6 billion price tag for new water supplies must be offset by means other than rate increases as much as possible. *These comments essentially support the original draft plan. Section 8 recommends that a combination of revenue sources be pursued in order to offset costs through regional partnerships, federal grants, low interest loans, and the study of impact fees. No change is made.*

The Greater Chamber commented that SAWS owes the taxpayer the due diligence of determining whether competitive outsourcing of its wastewater treatment facilities would yield savings, and suggested consideration of a Request for Proposal for a private sector manager of the wastewater treatment facilities. They commented further that their support for the plan, and the necessary rate increases, is contingent upon the completion of a formal assessment of cost savings opportunities through competitive outsourcing. *SAWS is committed to cost containment and is studying all means of maximizing efficiency. This is discussed at the end of Section 8.4.*

The Greater Chamber and several individuals commented in support of the plan’s development of a price affordability index/lifeline rates in order to contain costs for low water users. *These comments support the original draft plan. No change is made (Section 8.5).*

Several individuals stated their concern that the potential increase of $9.00 in average residential water bills by 2050 could adversely affect people on fixed incomes. These
individuals recommended that the plan change the word "should" develop a price affordability index to "will" develop such an index.

*All of the plan's recommendations are phrased "should" because they are the conclusions and recommendations of this planning process. Implementation of the recommendations will be carried out over time by the SAWS Board of Trustees. No change is made (Section 8.5).*

An individual suggested that figures 9.1 and 9.2 should be eliminated as they inaccurately compare costs of natural recharge and imported recharge.

*The purpose of these figures is merely to illustrate an average cost of water for purposes of projecting the financial implications of future water supplies. These figures are not intended to reflect the relative merit of any particular source, and the plan does not suggest any priority among potential sources. No change is made (figures 13 and 14).*
Framework for Progress Report
Appendix 12.3
Citizen's Committee On Water Policy Signature Page

The members of the Mayor’s Citizens Committee on Water Policy were appointed under the leadership of Mayor William Thornton and members of the City Council to discuss and explore all the issues relevant to a comprehensive water policy for the City of San Antonio.

This Committee has responded to its charge through a consensus-building process that has considered different views on future water policy.

After seven months we have developed a report that the Committee respectfully submits for the consideration of the Mayor and City Council.

We, the undersigned members of the Citizens Water Policy Committee, agree that the enclosed Framework for Progress is an accurate record of our agreements and deliberations on the water issues facing the San Antonio area. We have been appointed to this Committee as individual citizens and it is in this capacity that we sign this document. As citizens, we urge and support the implementation of this report by the City Council. These recommendations as a whole should not be construed, and have not been formally adopted, as the policy of any of the organizations or communities with which we are affiliated.

We appreciate the opportunity to serve on this Committee and trust that the report submitted will be instrumental in the future design and implementation of water policy.

Mr. Hugh Ames
Ms. Maria Antonietta Berriozabal
Col. David Cannan
Ms. Maria del Carmen De Luna
Mr. Ernani Falcone
Mr. Curtis Gunn, Jr.

Joe J. Bernal
Ms. Evelyn Bonavita
Fr. Michael DeGerolami
Mr. Don Durden
Mr. Barry Harris
Mr. Hans R.F. Helland
Mrs. Wray C. Hood
Ms. Susan K. Hughes
Mr. Jordan Meisner
Dr. Jerry Morrissey
George Ozuna, P. E.
Mr. Juan Patlan
Mr. Kirk Patterson
Mr. Gerald Rolf
Ms. Kay Turner
Mr. Ed L. White Jr.

Lenn Hellmann
Lanny Hoffmann
Dr. Gregory Hudspeth
Mr. Jim Lopez
Elaine Mendoza
Ms. Elaine Mendoza
Hon. MaryJane Nunez
Ms. Ann Paddie
Mrs. Carol Patterson
Mr. Jack Rogers
Mrs. Fay Sinkin
Mr. Peter Vallecillo
Mr. Richard Woodward
CITIZENS COMMITTEE ON WATER POLICY
A FRAMEWORK FOR PROGRESS
Recommended Water Policy Strategy
For The San Antonio Area

Purpose

This Framework for Progress summarizes the details of the final report of the Citizens Committee on Water Policy. It is structured to capture the most important elements of the policy for use in communicating the Committee’s recommendations to the Mayor and City Council. The reader is encouraged to read the entire report to gain a complete understanding of this complex issue.

Recognizing the Complexity of the Water Problem

The need to develop a reliable, high quality water supply for the San Antonio Area—one which is capable of supporting long-term economic growth and prosperity for all its citizens as well as satisfying legitimate environmental and regional concerns—has led to a prolonged community-wide debate concerning strategies for securing such a water supply. The debate over the competing strategies has led to confusion in the community about whether there truly is a “water problem.” The full Committee, representing all of the community’s divergent views, opinions, constituencies, and interests, wishes to state for the record that the San Antonio area faces a major water problem which demands immediate attention and a long-term plan of action for satisfying its needs now and in the future.

The problem is complex because it has many elements. These include the regional aspects which prevent the San Antonio area from entirely solving its water needs unilaterally; the endangered species dependent upon springflows at Comal and San Marcos Springs; the needs of New Braunfels, San Marcos, and downstream interests; water quality concerns in the catchment area and over the recharge zone; and the incomplete technical studies which are needed to guide a more thorough analysis of the alternatives, to name a few. Our fellow citizens should not be confused by the previous debate over approaches. San Antonio and Bexar County, as well as those in the entire region currently dependent upon the Edwards Aquifer in any form or manner for their water, are faced with a compelling water problem which must be addressed through sound policy and a well-conceived plan of action.

A Single Approach With Several Parts—A Consensus-Based Solution

The problem is so complex that no single strategy can currently be relied upon to both address the water question as well as bring together this divided community. Rather, the Committee has come to recognize that each of the various competing strategies has benefits. When combined together in a comprehensive strategy, they forge not only a sound plan of action but provide the basis for bringing the community together so it can move forward in its efforts to satisfy long-term water needs. The keystone of this strategy is a multi-faceted approach. This approach balances immediate short-term initiatives and the initial stages of long-term traditional strategies, many of which the City is already pursuing, with the further exploration of aquifer management techniques, which must still be proven effective with the Edwards Aquifer but which may offer great long-term potential not only to San Antonio but also to the entire region. With the keystone being a multi-faceted approach, the strategy then is one of flexibility which preserves options so that if lower cost alternatives, new
technologies, or other scientific breakthroughs become feasible, they can still be incorporated into the plan.

In addition to addressing the quantity of water, protecting the quality of the water in the Aquifer and ensuring the quality of water entering the Aquifer is a continual and fundamental concern. The strategy must include region-wide measures to protect the Aquifer recharge zone and the catchment area in any solution that is proposed. As we grow in population and as growth to the suburbs continues, we witness increasing development over the Edwards Recharge Zone, an increasing pollutant load, and the need for cooperative protection/enhancement of the catchment area. Addressing quantity and quality problems together in a cohesive plan of action will provide the most enduring legacy we can leave future generations.

Criteria-Based Water Management Plan

Based on careful and open examination of interests and needs in the community, the Committee members drafted a set of criteria to govern the evaluation of the specific water policy and management plan alternatives. These criteria describe outcomes that should be accomplished with San Antonio’s water policy, covering the areas of trust and credibility, community unity, availability and reliability, economic opportunity, environment and sustainability, efficiency and affordability, governance and control, and fairness and equity. They embody a set of principles that should be used consistently by policy makers:

- to frame the continuing dialogue on water issues;
- to guide our planning and choice of projects to consider;
- to evaluate technological recommendations; and
- to maximize our flexibility and responsiveness to change over the long term.

As the implementing body of the City Council, SAWS should be directed to develop its Water Management Plan using the criteria included in detail in the Committee’s final report and presented below in the appendix.

A Balance Between Immediate Needs and Long-term Potential

With the likelihood of another year of drought continuing through 1997, immediate action is essential. This immediate action can take many forms from low-cost solutions, such as voluntary water conservation programs by consumers, to major capital expenditures which would add to the City and County infrastructure. The balanced approach recognizes this reality but also recognizes that there is incomplete technical information concerning such things as the springflow requirements for the endangered species, saline water interfaces, aquifer flow paths, recharge features, land management, and springflow augmentation, that when provided could influence the direction of capital outlays and reduce the impact on the individual and business community ratepayers.

Fortunately, time works to our advantage. The results of specific technical studies can be completed within four or five years. Certain feasibility studies could be completed in even less time. The lead-time for major capital expenditures involving regulatory permits, financing, engineering, etc., allows for preliminary work and some on-going projects to proceed while the studies are completed. After completion, all data can then be evaluated against our discrete list of criteria to determine the appropriate courses of action.
One of the promising studies deals with aquifer management and conjunctive use, which have come to be called aquifer "optimization." The concept offers the potential for repeatedly tapping the vast capacity of the Edwards formation and filling it back up without depleting its supply of water over the long term. However, many questions must be answered before such a strategy could be adopted and its benefits could be realized. Further, despite the potential benefits that aquifer optimization offers, the studies could determine that the strategy is not feasible or too costly. Therefore, the need to pursue other available options and technologies becomes crucial, and waiting until the optimization studies are complete is ill-advised. Thus, the balanced approach recognizes the opportunities, yet it also respects the uncertainties by managing the risk with deliberate, graduated investment in several areas concurrently. They include but are not limited to the following, which when combined together satisfy a need for immediate action in 1997 as well as exploring the long-term options. They are discussed in more detail below:

- Conservation
- Surface Water Rights
- Reuse
- Responses to Critical Low Flows at the Springs
- Irrigation Suspension (Dry-Year Option)
- Weather Modification (Cloud Seeding)
- Aquifer Optimization
- Recharge Enhancement
- Saline Water Study

Balanced Strategy for Water Management

Conservation

Endorse conservation as an important element in responsible resource stewardship. Modify and strengthen current programs and investigate and implement additional effective and efficient programs. The Committee Report provides a list of examples of possible activities.

Surface Water Rights

Evaluate water rights within the context of other water resources, with preference for purchase placed on those projects which meet both Aquifer optimization and additional supply strategies. Opportune projects which may not meet both strategies should not be excluded from consideration for purchase but should be evaluated further for economic feasibility and overall benefits.

Reuse Water

Evaluate and implement a water recycling concept with increased emphasis on using recycled water to encourage location and relocation of industries near recycled water sources while also studying the possibility of using recycled water for downstream trades.
Responses to Critical Low Flows at the Springs

1) Endangered Species Refuge

Request that the U.S. Fish and Wildlife Service reexamine its Recovery Plan and consider all reasonable options that might protect the endangered species at Comal Springs in all or part of their current habitat or in refuges during a drought that would dry up the springs. Streamflow enhancement outlined below is one of the options to be considered. Support the maintenance of the San Marcos Fish Hatchery as a refuge.

2) Temporary Streamflow Enhancement

Collaborate with U.S. Fish and Wildlife Service, New Braunfels, U.S. Geological Survey, Edwards Aquifer Authority, Guadalupe Blanco River Authority, and others to consider the feasibility, including environmental impacts, of temporary stream augmentation during diminished springflow at Comal Springs. If agreement is reached by all parties that nearby wells should be used in temporary stream augmentation, begin to test these wells in an environmentally sound manner for their capability to provide streamflow enhancement.

Irrigation Suspension (Dry-Year Option)

Use this program in 1997 while evaluating its overall economic impacts and its contribution to meeting springflow needs.

Weather Modification (Cloud Seeding)

While this strategy was not presented to the Committee, members support study of its possible application in the Edwards region.

Aquifer Optimization and Related Studies

Initiate a comprehensive program of research to determine if the production capacity of the Aquifer can be increased and to discover strategies that optimize the supply of water available from the Aquifer. The goal of optimization strategies is to combine the use of surface and groundwater supplies in the entire Aquifer region in order to meet all economic and ecological needs while maintaining sufficient springflows at Comal and San Marcos Springs to preserve the endangered species habitat and benefits provided by this water to the downstream Guadalupe River basin. Concurrently, the City should begin development of additional supplies. If the optimization studies demonstrate the effectiveness of strategies for efficiently combining the additional supplies with the Aquifer supply, the additional supply projects will be reconfigured and redirected, as appropriate for their stage of development, to conform to the proven Aquifer optimization strategies.

There are many additional studies supporting this effort; they must be coordinated closely and not fragmented. They are detailed in the Committee Report and include feasibility and costs of long-term spring and river augmentation, flowpath and structural studies of the Aquifer, feasibility of springflow recirculation, refinement of biological assessment of endangered species at the springs including springflow requirements, and related studies.

Saline Water Study

This study has already been approved by the City Council, and we urge its prompt implementation.
Overarching Components of Strategy

Governance

This document addresses and fairly represents the divergent interests of our community. The recommendations were developed to ensure that the implementation process allows for local and regional participation. The recommendations advocate for policy that is sensitive to local and regional needs while encouraging the development of governance structures that are fair, balanced, and efficient in managing ground and surface water.

Ethical Issues: We urge the City Council to enforce and/or amend, if needed, the City’s public disclosure policies to prevent conflict of interest problems by requiring stringent public disclosure for members of the City’s established Boards, Commissions, and ad hoc committees. In addition, this requirement should apply to contractors who are doing or seeking business contracts with the City. It should require that those with conflict of interest must disclose that conflict, and they should not be allowed to decide any issues where the conflict occurs.

Building Trust and Cooperation through Public Participation:

The present Committee has begun the task of building trust and a climate of cooperation on water issues between the city government and various community groups interested in water, as well as among the groups in their dealings with each other. The effort that led to this report is but a step. The work must continue if the City is to avoid the deadlock over water issues that has hampered sound planning in the past.

This Committee recommends that the City Council establish a process to carry on the work of building and maintaining trust and a climate of cooperation on water issues. Among other things, the process should provide:

- a program of continuing public education, information, and outreach activities on water issues.

Additional information vehicles are needed to distribute timely, reliable, understandable, and complete information when forming and implementing water policy.

SAWS should be encouraged to broadcast its meetings on public access television, and to post notices of its meetings in places beyond those required by law. These might include neighborhood centers, churches, and other places where interested persons are likely to gather. Mailing notice to persons who might be significantly affected by proposed actions should be considered.

- an opportunity for the public to participate in a meaningful way in forming and implementing water policy. This includes a chance to comment at the early stages of proposals rather than at the end of the process.

In the effort to build and maintain trust and cooperation, we urge the City Council to use citizen volunteers who represent the various community water interests. Most of the members of the present Committee have offered to serve as needed or desired by the City Council. No costs should be incurred by this additional service.
Water expenditures as an economic development tool: Water expenditures, like any procurement, represent an economic development generator which creates jobs and helps develop our community. Policies, similar to those already used by the City, should be adopted in awarding water-related contracts that encourage all businesses—especially local, small, minority, and women-owned—to participate.

Voting rights: There must be vigilance to protect the voting rights of all citizens.

Regional cooperation: Regular communication must extend to groups and institutions in our region such as the Alamo Area Council of Governments, Edwards Aquifer Authority, Guadalupe Blanco River Authority, San Antonio River Authority, Nueces River Authority, Texas Natural Resource Conservation Commission, Texas Water Development Board, the Council of Mayors, and others. Communication with these entities should be looked upon as an opportunity to provide for public input, not deal-making behind closed doors.

Public disclosure of costs: Prior to pursuit of any new water strategy, whether construction projects or pumping limits, there should be full disclosure of what it will cost ratepayers to implement such proposals. Public confidence in the process cannot begin until this fundamental information is provided at the outset.

Regional Cooperation

Cultivate regional cooperation and establish strategic partnerships with regional agencies as a necessary step in the development of any management strategy. Their cooperation will be essential to pursuit of a regional approach to resolution of water issues.

Keeping Options Open

Assert as City policy before the Legislature, the EAA, TNRCC and other rule-making bodies that options to pursue the full variety of water strategies should be kept open while a comprehensive water management plan is under development.

Water Quality

Support a water quality objective of non-degradation with clear regulation and efficient, effective enforcement and regional cooperation. Measure and report the impacts on ratepayers of water quality degradation, e.g. costs of treatment, health impacts, etc.

Implement a series of steps to protect water quality (as detailed in the Committee Report), including evaluation and improvement of pollution abatement plans, charging impact fees for the economic costs associated with development on the catchment area and recharge zone, proposing new regional rules to limit impervious cover on the recharge zone to those standards currently in effect for San Antonio, taking a regional lead in developing comprehensive land use planning for the Edwards Recharge Zone and the drainage basin, updating and strengthening the permitted uses table, and many additional steps.

Conclusion

In conclusion, the Committee recommends that the City undertake this series of immediate steps as well as longer term studies and consequent actions that will provide the foundation for further decisions regarding our choices for the future.
A Framework for Progress

We, the Citizens Committee on Water Policy, thank you for the opportunity to present our recommendations on San Antonio's water policy. We have not assumed this responsibility lightly. On the contrary, we view this as an historic opportunity to unite this City and move it forward. Thus inspired, have worked hard to do what is right for both our current and future citizens. We hope the result of our work over the past six months proves to be a valuable resource as you lead our City into the Twenty-first century.
CRITERIA FOR A SOLUTION

There are many examples where a hastily-crafted solution has solved one problem, only to create another or several other problems. Because there are multiple solutions or a range of solutions to our water problem, the Committee worked to identify and examine the large range of issues that affect and are affected by water. Based upon our common interests and goals, we have established criteria for evaluating potential solutions in order to improve the chances for desired or acceptable results.

Consideration of eight relevant categories of issues led to the development of policy guidelines, stated briefly in the Executive Summary of this document, and presented below.

We propose to use these guidelines as criteria against which all potential solutions must be measured for acceptability. We must emphasize how important we believe it is that these criteria be employed in the development of a water policy and plan for San Antonio and the region.

A. Trust and Credibility: San Antonio’s water policy development process should be credible, open, and inclusive to earn the trust of the community and the region.

The policy should be based on a sound body of knowledge and understanding but demonstrate a sensitivity to technical information that is not yet available, so that it is a credible policy. The Committee believes the consensus process, together with other actions, has the potential to achieve an acceptable balance between technical understanding and trust, allowing the community and the region to support the plan.

B. Community/Unity: San Antonio’s water policy should promote a sense of unity within the community.

To achieve community unity, each interest group should have a legitimate opportunity to have its concerns, ideas, and positions genuinely considered by the broader community. Conflicting views should be resolved with civility, respect, and patience, not through inappropriate use of power, exclusion, or innuendo.

C. Availability and Reliability: San Antonio’s water policy should respect sound planning practices. It should identify specific sources of water, how much water can reasonably be derived from those sources, and conditions or constraints, if any, of securing water from those sources. Access to adequate supplies of high quality water with a high degree of reliability should be integral to the policy.

1. Planning — The Committee believes San Antonio’s water policy should address our needs for fifty to sixty years, with an emphasis on the next twenty years. The policy should neither penalize nor favor one category of use (e.g. residential, commercial, agricultural, recreational, etc.). The members agree that we should not allow the lack of availability to limit San Antonio’s potential or, by extrapolation along the lines of fairness, the potential of any other part of the region.

2. Sources of Water — Our policy should recognize the Edwards Aquifer as the cornerstone of our water sources. Expanded knowledge of the Aquifer system will enhance our understanding of how we might manage the Aquifer to optimize its
yield in conjunction with other sources. San Antonio and the region should develop a water policy that incorporates some efficient combination of sources.

3. Conditions of Availability — The Committee believes we should consider more than scientific and engineering factors that affect availability. We should also consider prudent and timely improvements to the legal and political context that might facilitate consideration of a broader range of scientific and engineering options. San Antonio should exercise leadership in preventing actions that diminish the amount of recharge taking place in the recharge zone.

D. Economic Opportunity: San Antonio’s water policy should provide for economic opportunity and sustainable growth for all parts of San Antonio and be compatible with regional needs.

1. Aquifer as an Economic Asset — The Aquifer is an important economic asset of the region.

2. Water and Growth — San Antonio’s water policy should help transform uncertainty and limitation into certainty and potential.

E. Environment and Sustainability: San Antonio’s water policy should contribute to a healthy local and regional environment, stretching from the catchment basin to the bays and estuaries.

1. Ecosystems — The policy should respect, protect, and support the natural biodiversity of the region by providing a sufficient volume of water to all ecosystems of the region so they can function properly.

2. Water Quality — The policy should promote the maintenance of the high quality water that we now extract from the Aquifer. Thus, San Antonio’s water policy should encourage the development of a regional policy to protect the quality of runoff to the recharge zone and catchment area.

3. Sustainability — San Antonio’s water policy should support a sustainable system. In general, the policy should respect the equation of recharge equals discharge, while maintaining flexibility over the long term.

4. Economic Aspects of the Environment — The policy should recognize the relationship between a healthy environment and a healthy economy for both local and regional arenas.

F. Efficiency and Affordability: San Antonio’s water policy should consider the total economic impact of implementation strategies and encourage a reasonable approach for allocating those costs and benefits.

1. Cost and Benefit — The policy should employ economic analyses including a cost-benefit analysis for each strategy, separately and in combination so that they may be compared. The technical and other assumptions on which each strategy or analysis is based should be included in the analysis of each strategy. The cost-benefit analysis should contribute to the prioritization of potential strategies. The policy should employ economic analyses including:
   - Financial feasibility
   - Economic efficiency
   - Economic equity
Socio-economic implications

2. Allocation of Costs — The policy should fairly distribute the cost of strategies that benefit the region on a regional basis. Locally, the policy should also encourage a fair distribution of costs taking into consideration ability to pay, who benefits, and the timing and financing mechanisms available to amortize infrastructure investments. Each analysis should include a variety of factors including socio-economic.

G. Governance and Control: San Antonio’s water policy should consider the relationship between regional and local cooperation and governance and the role natural processes play in the relationship.

1. Regional Cooperation — The policy should be founded on the premise that San Antonio wants to do no harm to the region nor the region to San Antonio. The policy should encourage regional cooperation in the development of governance structures that are fair, balanced, and efficient in managing ground and surface water. The policy should encourage a regional plan that will be implemented in a timely manner and emphasize San Antonio’s desire to pursue a fair solution.

2. Local Control — San Antonio should take responsibility for its water future, continually seeking and reinforcing local consensus and serving as a leader in developing regional solutions.

3. Fragmented Jurisdictions — The City’s policy should be to foster accountable, cooperative relationships with other agencies.

4. Legal Concerns — The Committee is concerned that any legislative action be focused on preserving, not foreclosing future management options.

5. Role of Natural Processes — The policy should recognize how much we rely on nature for our water supply and how little direct influence we have over the natural processes from which we derive our water. The Committee recognizes that the natural process may be positively influenced through actions such as weather modification (e.g., cloud seeding) and selective brush (range) management and an analysis of cost and benefit should be undertaken.

H. Fairness and Equity: San Antonio’s water policy should be based on principles of fairness and equity. It should distribute benefits fairly within the San Antonio area and uphold the principles of fairness and equity in the region. It should not unilaterally discriminate against any interest group in the region, including San Antonio.

1. Local Fairness — As long as we do not have a consensus on water policy, business and employment will be affected negatively, resulting in detrimental effects region-wide, especially on low income populations. Thus, our policy should encourage strategies that can create an atmosphere of certainty in a reasonably short time. In terms of equity, any water policy that is developed, or strategy that is incorporated, must provide economic and developmental growth opportunities for low income populations and historically underserved areas of San Antonio. The policy should encourage the fairness and equity of the internal management of water institutions, contracting for services and delivery of services.

2. Regional Fairness — The policy should encourage management of the Aquifer for the benefit of all parties and should encourage regional planning.
We, the members of the Citizens Working Group present the attached recommendations to the Board of Trustees of SAWS in fulfillment of our charge of September 16, 1997.

[Signatures]

*Member not available to sign report
INTRODUCTION

On September 16, 1997, the Board of Trustees of the San Antonio Water System (SAWS) appointed a Citizens Working Group (CWG) to develop recommendations regarding water planning. Independent facilitators were retained to manage the process. The charge to the CWG was as follows:

Advise and make recommendations to the SAWS Board of Trustees regarding the goals, methods and direction of water planning for the San Antonio area in an effort to further the recommendations of the Citizens Committee on Water Policy as documented in their report, “A Framework for Progress: Water Policy Strategy for the San Antonio Area.”

To achieve this charge, the Citizens Working Group will carry out the following tasks:

1) Gain a comprehensive overview of the full range of the existing options, responsibilities, and constraints regarding water resources planning now facing the SAWS Board of Trustees.

2) Review, refine and suggest benchmarks for the criteria outlined in the “Framework for Progress” report

3) Review the proposed benchmarks in relation to SAWS works in progress, including the Action Steps presented in the “Water Resources Action Plan” and the “Framework for Progress” report

4) Present findings to the SAWS Board of Trustees after a careful effort to identify and resolve differences

The CWG met from October 1, 1997, through March 23, 1998, and developed the recommendations presented below. CWG members provided limited input to SAWS on works in progress, as requested in #3 of the charge above. Due to time constraints, the CWG did not attempt to apply the proposed benchmarks and related public process in any detail to on-going projects since the proposal is still a work in progress and the CWG lacked resources to review any project in depth.

The CWG sees the need for an on-going public involvement process to build on the trust that began to be established as a result of the work of the Mayor's Citizens Committee on Water Policy. The CWG recognizes progress made as a result of SAWS' efforts to implement the Framework for Progress Report and urges the Board of Trustees to sustain...
over the long-term efforts to involve citizens in a meaningful way in its planning and decision-making. This can only enhance the credibility of SAWS and of the City’s entire water planning program.

STARTING POINT

The CWG began with the premise articulated in the “Framework for Progress” report of the Mayor’s Citizens Committee on Water Policy (Mayor’s Committee). “The (water) problem is so complex that no single strategy can currently be relied upon to both address the water question as well as bring together this divided community. Rather the Committee has come to recognize that each of the various competing strategies has benefits. When combined together in a single comprehensive strategy, they forge not only a sound plan of action but provide the basis for bringing the community together so it can move forward in its efforts to satisfy long-term water needs.” The Mayor’s Committee recommended that eight criteria be used to evaluate future policies, plans and projects in an effort to continue the process of overcoming past divisions, promoting trust in the process and building unity in the community about water policy. Those criteria are: 1) trust and credibility, 2) community unity, 3) availability and reliability, 4) economic opportunity, 5) environment and sustainability, 6) efficiency and affordability, 7) governance and control, and 8) fairness and equity.

The CWG recognizes that the building of trust and credibility in water decision-making, policies, plans, and projects is fundamental to all elements of the benchmarks and the proposed planning and implementation process. The criteria, benchmarks, actions/strategies and procedural recommendations should be regarded as a means to achieve trust, credibility, and a sense of unity in the San Antonio area community.

A primary task of the CWG was to work with SAWS staff to define concrete ways in which the criteria could become an on-going component of SAWS decisions and operations. The staff identified for the CWG the basic elements of current SAWS planning and decision-making, including opportunities of possible integration and application of the eight criteria developed by the Citizens Committee on Water Policy.

As described by the staff, SAWS current decision process consists of the following basic steps:

1) Generation of ideas for policies and projects from numerous sources, including the City Council, the Board of Trustees, staff, the public, and others.

2) Evaluation of those ideas by staff through a process that emphasizes engineering needs and may also include consideration of environmental and economic issues.

3) Consideration of staff recommendations by a committee of the Board of Trustees, followed by a back-and-forth process with staff until concerns of the Trustees have been satisfied.
4) Decision by the Board of Trustees in public session, following presentation of public comments.

5) Consideration and decision, if required, by the City Council in public session, possibly accompanied by further public hearings.

6) Implementation of plans, policies, and projects by the staff.

7) Assessment of projects (this element is not always carried out).

CWG members propose two basic elements to modify the process that has been used till now. These elements are: a) changes to the decision process to include further opportunities for citizen involvement and for application of the eight criteria; and b) a set of benchmarks and actions/strategies by which progress can be measured in achieving the goals identified in the criteria.

RECOMMENDATIONS

Public Process

CWG recommends that the process for selecting water projects be changed. Central to everything is the development of a balanced and comprehensive water plan utilizing the eight criteria. With such a water plan in place, the particular policies and projects necessary to achieve its goals can be identified and implemented in the context of the greater concept that provides for all community needs.

In considering recommendations for new elements for SAWS public process, the CWG was keenly aware of the problem of bogging down decision-making in onerous new procedural requirements. We respect the fact that the SAWS Board of Trustees and the City Council, which make the decisions about water policy, are themselves citizen representatives and accountable to the public. The following suggestions about citizen involvement are intended to save rather than squander time and resources. The CWG believes that this system will provide early identification of problems that exist and will have to be dealt with sooner or later. Approaching these problems in an orderly way early in the process will provide the means for prompt response that should expedite decisions, not slow them down.

The CWG believes that trust, credibility and community unity can best be supported by following a policy that all proposals should go through this public process. The CWG recognizes that certain projects may require confidential business negotiations. It recommends that all policies and strategies shaping the SAWS approach to such negotiations should be as detailed as possible and arrived at through the public process. Following the conclusion of private, confidential negotiations, the tentative agreements would be submitted to the public process for decision by the Board of Trustees.
Following is narrative description of the public process steps. A chart is attached presenting a graphic summary.

1. The Water Plan itself will go through the following process. Once adopted, the Plan becomes the principal generator of required studies, policies, and projects for implementation. In cases not covered by the Water Plan, opportunities can be offered by the public, staff, Board, City Council or others.

2. The staff provides regular information to the public about upcoming projects, possibly in the form of a calendar of Water Plan implementation.

3. For the proposals arising outside the scope of the Plan, staff will conduct a “fatal flaw” analysis to test compatibility with the Water Plan and the criteria.

4. The Plan and its elements are reviewed in a comprehensive staff analysis, including engineering, environmental, and economic factors. This analysis will incorporate all the technically oriented elements of the criteria, benchmarks, and actions/strategies, including a comprehensive economic analysis covering financial feasibility, economic efficiency, economic equity, and socio-economic impacts. During this process, staff will contact all affected interests, including parties directly affected by the proposal as well as interests having a broader concern about public impacts of water policy and project implementation.

5. Staff then consults a Citizens Advisory Committee (CAC). This committee, expected to number between 20 and 30 persons, will be appointed by the Board of Trustees and will represent all the major interests and points of view in the community with regard to water policy. Its mandate is to work closely with the staff in reviewing projects in light of the criteria, particularly those that reflect fundamental community values and are difficult to reduce to technical or quantifiable terms. The CAC will identify concerns raised under the criteria, serving, in effect, as a kind of conscience of the community, and engage in dialogue with staff about responding to those concerns. It will not formally vote on accepting or rejecting projects but will provide clear and early indications to staff and the Board of Trustees on how well the policy or project meets the criteria and how public interest and constituencies are likely to respond.

6. The project is then reviewed by a committee of the Board which engages in dialogue with the staff and the CAC about how the project or policy relates to Board concerns, Water Plan goals, and the criteria.

7. Following this review, staff provides information to the general public about the project or policy through various media, including water bill enclosures, and provides a detailed description of the proposal to the 4000 or so member mailing list that receives the SAWS newsletter.
8. A public hearing would then be held to provide an opportunity to all members of the community and affected public to express their views. These comments would be recorded and reviewed by the staff and CAC. Staff would respond in written form indicating how the public comments had been considered and dealt with in reviewing the proposal.

9. The Board of Trustees would then vote on the proposal in public session.

10. If the decision by the City Council is required, or deemed desirable, there may be additional public hearings.

11. The City Council would then vote on the proposal in public session.

12. Implementation of the project or policy would take place.

13. The staff and Citizens Advisory Committee would conduct an annual assessment of the Water Plan and the projects and policies implemented under it, and would publish an Annual Report on the Water Plan. Where evaluation indicates a need for corrective action, such action should be taken in a timely manner.

14. SAWS would hold an annual public workshop to present the Annual Report and have dialogue with citizens about the Plan.

The CWG recommends that this process be instituted in the near future and be used for review of the conceptual water plan which SAWS has scheduled for review and decision during the spring and summer of 1998.

**Benchmarks and Actions/Strategies**

In considering how to implement the criteria, the CWG used the concept of the "benchmark". For purposes of this report, benchmarks are specific indicators designed to measure the ability of the water plan or its component projects and policies to meet the goals articulated in the criteria. They are designed to identify what has changed or what has remained the same as a result of the plan. The CWG has expressed the benchmarks below as questions to be asked during the process of considering each proposal as well as the plan as a whole. Some of the ideas generated by the CWG in thinking about how to measure results turned out to be more useful as actions and strategies designed to achieve goals defined in the criteria. The accompanying table sets out in parallel columns the criteria language, taken verbatim from the Mayor's Committee Framework for Progress Report, the benchmark questions and the action and strategy statements.

The CWG recommends adoption of the benchmarks and actions/strategies detailed in the accompanying table as a means of making the criteria developed by the 1997 Mayor's Committee on Water Policy operational and of measuring progress in applying them.
The CWG recommends the following principles as critical to effective implementation of the criteria.

1. All criteria are to be employed in reviewing the Water Plan and all plans, policies and projects that flow from it.
2. Each segment of the process - consultative, decisional and administrative - should employ the criteria in recommendations, decisions, implementation and assessment.
3. All criteria are important in assessing the Water Plan and plans, policy or project that flow from it. Balancing of criteria will be done on a case by case basis with sensitivity to the overriding concern that trust and credibility be maintained and enhanced.
4. All actors in the process should fully understand the criteria and how they are applied. The staff and trustees of SAWS/City of San Antonio, members of City Council and city staff, the citizen advisors, and members of the public should all be thoroughly familiar with these principles and the process by which they are applied in practice. SAWS should take steps to assure that turnover does not cause a loss of institutional memory.

CONCLUSION

The members of the Citizens Working Group recommend to the SAWS Board of Trustees adoption of these suggestions for implementation of the criteria of the Framework for Progress Report. We recognize that development of a new approach to citizen involvement is a work in progress. It will take time and experience to refine the model and fit it to the practical realities of water planning and decision-making. Further definition will be required by the SAWS Board, working with staff and the proposed Citizens Advisory Committee.

We see our work as the second stage in a long term process that is essential for building a true spirit of trust and unity in the San Antonio area relating to water issues. We urge the SAWS Board of Trustees to stay the course, following the guidance of the Mayor's Committee Report, and continue incorporating the eight criteria into all phases of its operations. We believe that an enhanced public process is absolutely essential to bringing Community Unity to water planning in San Antonio.
Recommended Public Process
Criteria and Benchmarks are Applied Throughout the Process

Water Plan Components

Staff Analysis
- Engineering
- Economic
- Financial
- Environmental
- Contact all Affected Parties

Citizens Advisory Committee (CAC)

SAWS Board Committee

Communication to General Public
- Customer Mailout
- Various Media
- Detail Mailing Newsletter List

Public Hearing / Meeting

SAWS Board

Proposals Outside the Scope of Water Plan

Public Meetings

City Council Decision If Required

Implementation

Annual Assessment

Annual Public Workshop

Annual Report on Water Plan
# TRUST AND CREDIBILITY

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<th>MAYOR'S COMMITTEE CRITERIA</th>
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| San Antonio's water policy development process should be credible, open, and inclusive to earn the trust of the community and the region. The policy should be based on a sound body of knowledge and understanding but demonstrate a sensitivity to technical information that is not yet available, so that it is a credible policy. The Committee believes the consensus process, together with other actions, has the potential to achieve an acceptable balance between technical understanding and trust, allowing the community and the region to support the plan. | The Citizens Working Group presumes that SAWS/City of San Antonio will adhere to the criteria in the Framework for Progress Report as a basis for building trust and credibility.  
1. Does the public perceive that long-range water needs of the San Antonio region (as specified in the water plan) are being addressed and met?  
2. Have citizens accepted plans or projects requiring large capital expenditures to meet future water needs by consensus reached through the public process of the Citizens Advisory Council or by a referendum recommended by SAWS and called by the City Committee?  
3. Has there been broad, open and timely public cooperation and input into the formulation of water management policies, strategies and projects? | 1. Use statistically reliable polling methods to measure changes in public knowledge and feelings about water management and SAWS.  
2. Communicate frequently on current happenings related to the water situation through clear and accurate statements to the public by various media:  
   - airing of SAWS proceedings on TV  
   - presentations through press, mailings, radio, etc.  
   - use of local associations/neighborhood groups to create network of personal communication through phone trees, precincts, etc. |
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<td>4. Has there been interagency cooperation in water planning? • Measured through joint decisions, acceptance of recommendations, increased revenues from outside sources. 5. Are there increased levels of citizen participation in and acceptance of programs, such as conservation, xeriscaping, etc.? 6. Is SAWS/City of San Antonio carrying through to completion their plans, goals, and promises regarding water policy? 7. Is SAWS educating the public and monitoring the degree to which the public understands the benefits and costs of programs? 8. Is accurate information readily available and fully disclosed?</td>
<td>3. Certain types of information need to be disclosed to public • conflict of interest • sources of technical data • solutions categorized as long or short term • alternatives linked to preclude eliminating more cost-effective options • studies, costs, timeliness, impact on rate-payers, etc. available to public through websites (with actual data for peer review), water bill inserts, etc. • pro's and con's of each decision • water projects prioritized by criteria factors, including costs per acre foot</td>
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<td>4. The public can judge the soundness of the knowledge base supporting the plan through:</td>
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<td>• outline of data used to make decisions</td>
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<td>• disclosure of outside consultants and their reports</td>
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<td>5. Effectiveness of process in building trust and credibility can be established by:</td>
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<td>• showing links between what SAWS says it will do and what it does</td>
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<td>• publicizing that the process is actually used and results of the process</td>
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<td>• ability of SAWS to meet all other criteria</td>
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<td>• identifying all studies needed and tracking completion to close data gaps</td>
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<td>6. Citizens must be represented broadly by geographical sector of city, by interest groups, civic organizations, economic activities, etc. in the SAWS public process.</td>
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<td>7. Educate the public about the Edwards Aquifer and its governance</td>
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<td>8. The political, legal and legislative strategies of SAWS should be consistent with the water plan.</td>
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<td>9. Communicate about rate structure.</td>
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<td>10. Communicate indirect benefits of policies and projects to public.</td>
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<td>11. Financially support, advocate and monitor the expansion of environmental education programs in school.</td>
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<tr>
<td>San Antonio's water policy should promote a sense of equity within the community.</td>
<td>1. Does SAWS provide equivalent access to water for all areas it serves? 2. Does SAWS/City reach out to the community for feedback and input at all times and especially prior to making important decisions? 3. Has SAWS/City created a process for full review of conflicting views and has use of this process resulted in consensus on the major issues? 4. Do SAWS' policies and practices regarding executive sessions and Public Information Act requests support the principle of helping the public be fully informed? 5. Have conflicting views been resolved with civility, respect and patience, not through inappropriate use of power, exclusion and innuendo? 6. Have controversial issues been subject to public validation process?</td>
<td>1. Respond to all citizen input through some form of correspondence. 2. Provide equivalent communication opportunities and access to equipment for public meetings/hearing in different parts of town. 3. Respond to Public Information Act requests in a timely and complete manner. 4. Conduct surveys, questionnaires, polls to gauge the public perceptions and viewpoints. 5. Take appropriate action to reach-out for community input and to review conflicting views. 6. If SAWS determines as a result of consultation with the Citizen's Advisory Committee that a vote of the people is warranted, it may recommend that City Council hold a referendum.</td>
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### MAYOR'S COMMITTEE CRITERIA

San Antonio's water policy should respect sound planning practices. It should identify specific sources of water, how much water can reasonably be derived from those sources, and conditions and constraints, if any, of securing water from those sources. Access to adequate supplies of high quality water with a high degree of reliability should be integral to the policy.

1. Planning - The Committee believes San Antonio's water policy should address our needs for fifty to sixty years, with an emphasis on the next twenty years. The policy should neither penalize nor favor one category of use (e.g. residential, commercial, agricultural, recreational, etc.). The members agree that we should not allow the lack of availability to limit San Antonio's potential or, by extrapolation along the lines of fairness, the potential of any other part of the region.

### CITIZENS WORK GROUP BENCHMARKS

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
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<tr>
<td>1. Does the plan respect the Edwards Aquifer as the cornerstone of water supply, including protection of recharge and catchment areas (for quantity as well as quality)?</td>
<td>Has the project been evaluated as part of some efficient combination of alternatives?</td>
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<td>2. Is the project consistent with or part of the comprehensive management plan?</td>
<td>• Consider and evaluate all strategies</td>
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<td>3. Does the water plan/project identify or qualify the following:</td>
<td>• Do not foreclose options.</td>
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<td>• sources of water</td>
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<td>• volume of water from each source</td>
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<td>• during the year</td>
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<td>• under drought conditions</td>
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<td>• conditions or constraints on each source</td>
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<td>• percent of customers benefiting</td>
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<td>• duration of water availability - total length of time</td>
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### CITIZENS WORK GROUP ACTIONS/STRATEGIES

1. Pursue alternatives that can work in efficient combination with the Edwards Aquifer supply.
2. Consider using a diverse citizens technical advisory group.
3. The plan needs to evaluate all options and keep them open for consideration.
4. Support changes in Texas water law to enable us to efficiently use our water sources.
5. Pursue necessary funding to evaluate options and enable study and research.
### Availability and Reliability (con't)

<table>
<thead>
<tr>
<th>Mayor's Committee Criteria</th>
<th>Citizens Work Group Benchmarks</th>
<th>Citizens Work Group Actions / Strategies</th>
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<tbody>
<tr>
<td>2. Sources of water - Our policy should recognize the Edwards Aquifer as the cornerstone of our water sources. Expanded knowledge of the Aquifer system will enhance our understanding of how we might manage the Aquifer to optimize its yield in conjunction with other sources. San Antonio and the region should develop a water policy that incorporates some efficient combination of sources.</td>
<td>• actual water demand for the various users based on best available projections of population growth?</td>
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<td>3. Conditions of Availability - The Committee believes we should consider more than scientific and engineering factors that affect availability. We should also consider prudent and timely improvements to the legal and political context that might facilitate consideration of a broader range of scientific and engineering options. San Antonio should exercise leadership in preventing actions that diminish the amount of recharge taking place in the recharge zone.</td>
<td>4. Does the plan identify water sources that provide stable supply over the next 50 years?</td>
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<td>5. Are the conclusions based on sound, scientific knowledge, and reliable data? They include or identify:</td>
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<td>• Background information/sources utilized in the plan/project</td>
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<td>• Adequate funds for study and research</td>
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<td>6. Does the plan/project evaluate all options and keep them open for consideration?</td>
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<td>7. Is the plan consistent with Texas water law and does it identify changes needed?</td>
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<td>San Antonio's water policy should provide for economic opportunity and sustainable growth for all parts of San Antonio and be compatible with regional needs. 1. Aquifer as an Economic Asset - The Aquifer is an important economic asset of the region. 2. Water and Growth - San Antonio's water policy should help transform uncertainty and limitation into certainty and potential.</td>
<td>1. Does the plan provide that each economic sector (industry, tourism, recreation, agriculture, etc.) has adequate water for sustainable growth? 2. Does the plan ensure that San Antonio is able to attract business because of water availability? 3. Does the water plan provide for participation by all parts of San Antonio in economic opportunity?</td>
<td>1. Provide assurances that future quantities of water will be available for existing and new industry and for sustainable population growth. 2. Provide recycled water options for industry. 3. Develop definition of sustainable growth. It may not be uniform throughout San Antonio or the region. 4. Evaluate the impact of current or proposed policies that limit pumpage and that may affect our economic viability. 5. Publicize how San Antonio's economic vitality is a benefit to many in the region. 6. Structure contracts for the implementation of the water plan so small businesses may compete and benefit.</td>
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<td>San Antonio's water policy should contribute to a healthy local and regional environment, stretching from the catchment basin to the bays and estuaries. 1. Ecosystems - The policy should respect, protect, and support the natural biodiversity of the region by providing sufficient volume of water to all ecosystems of the region so they can function properly. 2. Water Quality - the policy should promote the maintenance of the high quality water that we now extract from the Aquifer. Thus, San Antonio's water policy should encourage the development of a regional policy to protect the quality of runoff to the recharge zone. 3. Sustainability - San Antonio's water policy should support a sustainable system. In general, the policy should respect the equation of recharge equals discharge, while maintaining flexibility over the long term.</td>
<td>1a. Does the plan adversely or positively impact species/ecosystem health? 1b. Does the plan protect and support species ecosystem health? 2. Is water quality protected? 3. Does the plan protect and improve the hydrologic balance (recharge=discharge while maintaining flexibility over the long-term) of the Edwards Aquifer system?</td>
<td>1. Support studies to determine the volume of water flowing to the ecosystems that is critical for their protection. 2. Support inventory of existing species and research on what it takes for a species to survive. 3. Monitor quality of storm-water runoff being recharged. 4. Determine water quality standards for various water usages that can be measured over time. 5. Reduce the discharge of pollutants. 6. Incorporate water quality guidelines from Citizens Report, &quot;The Framework for Progress.&quot; 7. Analyze volume of recharge (as a percent of annual rainfall) and quantify balance of recharge/discharge over time. 8. Actively support range management programs. 9. Monitor the adoption of environmental strategies in the region.</td>
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<td>4. Economic Aspects of the Environment</td>
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<td>- The policy should recognize the relationship between</td>
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<td>10. SAWS should encourage and</td>
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<td>a healthy environment and a healthy economy for both</td>
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<td>participate in a regional water</td>
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<td>local and regional areas.</td>
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<td>policy that includes a determination</td>
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<td>of downstream needs by participants</td>
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<td>in the regional planning process.</td>
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<td>11. The plan should urge use of</td>
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<td>economic incentives/disincentives to</td>
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<td>manage development over recharge/</td>
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<td>catchment areas to preserve water</td>
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<td>quality and quantity. Analysis</td>
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<td>should be on a case-by-case basis,</td>
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<td>but take into account the cumulative</td>
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<td>effect of such development.</td>
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<td>12. Monitor the following:</td>
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<td>• percent of impervious cover over the recharge zone</td>
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<td>• changes in consumption of water due to environmental policies</td>
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<td>• conservation of water by households and businesses</td>
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<td>• percent increase in use of water conservation devices</td>
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<td>• development and effectiveness of land-use regulations throughout the region</td>
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<td>• percent of critical recharge zone in the public domain</td>
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<td>• percent change in the number of environmental strategies initiated</td>
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<td>13. Support efforts to reduce of traffic (truck and rail) of hazardous materials over the recharge zone and catchment areas.</td>
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## EFFICIENCY AND AFFORDABILITY

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| San Antonio's water policy should consider the total economic impact of implementation strategies and encourage a reasonable approach for allocating those costs and benefits. 1. Cost and Benefit - The policy should employ economic analyses including a cost-benefit analysis for each strategy, separately and in combination so that they may be compared. The technical and other assumptions on which each strategy or analysis is based should be included in the analysis of each strategy. The cost-benefit analysis should contribute to the prioritization of potential strategies. The policy should employ economic analyses including:  
- Financial feasibility  
- Economic efficiency  
- Economic equity  
- Socio-economic implications | 1. Are potential projects/plans prioritized based on results of cost/benefit analyses (quantitative and qualitative)?  
2. To what degree does San Antonio area benefit from its investment in water projects?  
3. Does SAWS base the water plan on an economic analysis model that provides comprehensive review of financial feasibility, economic impact, economic equity and socio-economic factors referenced in "Framework for Progress"??  
4. Do all categories of water users share equitably in the costs? | 1a. Analyze how costs are allocated geographically within and outside Bexar County.  
1b. Ascertain how much SAWS benefits from investment in regional projects.  
1c. Determine if cost-sharing formulas for large regional projects are favorable for San Antonio.  
2. Educate others in region to the economic impact of projects.  
3. Evaluate projects that can be done by San Antonio alone vs. projects that need partners.  
4. Perform cost/benefit analyses for all policies and projects - both for individual projects/policies and in combination with others.  
5. Use economic analysis to promote conservation and efficient use of water. |
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<td>2. Allocation of Costs - The policy should fairly distribute the cost of strategies that benefit the region on a regional basis. Locally, the policy should also encourage a fair distribution of costs taking into consideration ability to pay, who benefits, and the timing and financing mechanisms available to amortize infrastructure investments. Each analysis should include a variety of factors including socio-economic.</td>
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<td>6. Undertake analyses which include the cost of no decisions and actions. 7. Conduct performance review on continuing basis of systems (programs or policies) in place. 8. Choose alternative based on best overall value (may not be cheapest) 9. Undertake cost/benefit analyses to go beyond economic feasibility to include but not be limited to: • viable project longevity • timely completion of project • project cost over time</td>
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<td>10. Develop short-term programs that help rate-payers and solve expected future problems.</td>
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<td>11. Develop an affordability index for water which is measured over time. Need a rate scale or a way to measure impact on consumer - especially low income consumer to ensure that water is affordable.</td>
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<td>12. Identify impact of environmental strategies on growth and agree on levels to be maintained.</td>
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<td>13. Water users should share in water availability and costs.</td>
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## GOVERNANCE AND CONTROL

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| San Antonio’s water policy should consider the relationship between local and regional cooperations and governance and the role natural processes play in the relationship.  
1. Regional Cooperations - The policy should be founded on the premise that San Antonio wants to do no harm to the region nor the region to San Antonio. The policy should encourage regional cooperation in the development of governance structures that are fair, balanced and efficient in managing ground and surface water. The policy should encourage a regional plan that will be implemented in a timely manner and emphasize San Antonio's desire to pursue a fair solution.  
2. Local Control - San Antonio should take responsibility for its water future, continually seeking and reinforcing local consensus and serving as a leader in developing regional solutions.  
3. Fragmented Jurisdictions - The City's policy should be to foster accountable, cooperative relationships with other agencies. | 1. Was the plan developed by SAWS/City of San Antonio based on input from citizens of San Antonio and does it represent the needs and wishes of the people of San Antonio?  
2. Does the plan promote regional cooperation and consider regional water needs?  
3. Does the plan promote any actions that would foreclose options?  
4. What is the percentage of plan that is implemented by agencies accountable to citizens in San Antonio?  
5. Does the water plan recognize natural limits on water supply and find ways to supplement the natural water cycle? | 1a. Seek solutions that are voluntarily adopted by the area (not imposed by outside government institutions, including state legislature).  
1b. Advocate that regional and federal governance and state law are balanced, efficient and fair.  
2a. Monitor the degree to which regional cooperation and decision-making lead to achievement of regional water needs.  
2b. Work to achieve cooperation, agreement, joint planning, etc. by water policy agencies.  
3. SAWS/City of San Antonio should advocate that the San Antonio legislative delegation and state legislation promote implementation of the San Antonio water plan. |
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<td>4. Legal Concerns - The Committee is concerned that any legislative action be focused on preserving, not foreclosing future management options.</td>
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<td>4. SAWS/City of San Antonio support legislative action or action by water agencies at local, state, regional, federal levels that preserves rather than forecloses water management options.</td>
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<td>5. Role of Natural Processes - The policy should recognize how much we rely on nature for our water supply and how little direct influence we have over the natural processes from which we derive our water. The Committee recognizes that the natural process may be positively influenced through actions such as weather modification (e.g. cloud seeding) and selective brush (range) management and an analysis of cost and benefit should be undertaken.</td>
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<td>5. Support development of a process by regional agencies for project review to promote understanding by outside entities of San Antonio activities.</td>
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<td>6. Monitor environmental issues as regional concerns.</td>
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<td>7. Monitor regional response to water markets.</td>
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<td>9. SAWS/City of San Antonio should advocate modifications of Texas water law that support the goals and objectives of the water plan.</td>
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<td>10. Develop cohesiveness on water issues by local legislative representatives.</td>
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<td>11. SAWS must be represented in formulation of rules, regulations and policies in the region.</td>
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<td>12. Seek to change perception of San Antonio by our regional partners and seek to change perception of regional partners by San Antonio.</td>
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<td>13. Cooperate in supplementing natural water cycle and evaluate costs and benefits.</td>
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## FAIRNESS AND EQUITY

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<td>Fairness and Equity - San Antonio's water policy should be based on principles of fairness and equity. It should distribute benefits fairly within the San Antonio Area and uphold the principles of fairness and equity in the region. It should not unilaterally discriminate against any interest group in the region, including San Antonio. 1. Local Fairness - As long as we do not have a consensus on water policy, business and employment will be affected negatively, resulting in detrimental effects region-wide, especially on low income populations. Thus, our policy should encourage strategies that can create an atmosphere of certainty in a reasonably short time.</td>
<td>1. Does the plan distribute water by amount, cost and quality equitably to all areas served by SAWS? 2. Does the plan comply with agreed upon regional water management goals? 3. Do other water agencies in the region accept principles underlying the San Antonio water plan? 4. Does the plan place constraints on ourselves that others are not observing and that might limit future options? 5. Does the plan assure that water is affordable to low income residents while also remaining reliable?</td>
<td>1. Ensure access to water by historically undeserved areas. 2. Develop an equitable critical period management plan that provides: • equitable consideration of communities of interest during shortages • fair pricing policies especially during periods of shortage • environmental equity - during rationing, what are the priorities? 3. The cost of water should be fairly assessed among water users; those who benefit from water plan should pay a fair share of the costs.</td>
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| In terms of equity, any water policy that is developed, or strategy that is incorporated, must provide economic and developmental growth opportunities for low income populations and historically undeserved areas of San Antonio. The policy should encourage the fairness and equity of the internal management of water institutions, contracting for services and delivery of services.  
2. Regional Fairness - The policy should encourage management of the Aquifer for the benefit of all parties and should encourage regional planning. | 6. Does the plan attempt to meet the economic needs for water of all groups?  
7. Does it meet the water needs of each ecosystem during periods of shortage?  
8. Is the cost of water fairly assessed among water users throughout the region?  
9. Does the plan identify ways in which current law allocates water unfairly?  
Conservation and Reuse Plan
Appendix 12.5
Acknowledgements

San Antonio Water System Board of Trustees

Juan J. Patlan, Chairman
Christina Garcia-Sanchez, Vice Chairman
J.J. Amaro, Secretary
Nancy Bohman, Trustee
Norman Dugas, Trustee
Mary Q. Kelly, Trustee
Howard W. Peak, Mayor

The CCC Steering Committee

SAWS wishes to acknowledge the hard work and dedication of the CCC Steering Committee Panel members in reviewing and commenting on the Water Conservation and Reuse Plan, performing the benchmarking assessment for adherence to the evaluation criteria and in reaching consensus on the content of the Plan.

Yolanda Arellano, Chair, San Antonio Restaurant Association
Kelly Hall, Green Industry Alliance
Chuck Ahrens, Bexar Metropolitan
Richard Hurd, City of San Antonio Parks and Recreation Department
Norma Amsberry, League Of Women Voters
Rick Illgner, Edwards Aquifer Authority
Sam Dawson, Pape-Dawson Engineers
Ginger Miller, Hogan Real Estate
Jack De Vaughn, Southeastside Community Organization
Jerry Morrisey, Alamo Chapter Sierra Club
Harold Fears, Sunnyslope Pasadena Heights Neighborhood Association
Stanley Pehl, 76th Engineer Group
Calvin Finch, Texas Agricultural Extension Service
Rufus Stephens, Texas Parks and Wildlife
Patrick Garcia, San Antonio Manufacturers Association
Frank Thomas, Northside ISD
Delia Guajardo, Jefferson Neighborhood Association
Jimmy Thomas, Hyatt Regency Hill Country Resort
Acknowledgements

San Antonio Water System Staff

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1. Executive Summary

1.1 Background Rationale

The Water Conservation and Reuse Plan serves as a guide to long-range decision making and day-to-day operations through explicit statements of policy and the identification of specific strategies of policy implementation. Many of the programs described in the Plan are ongoing in nature and will be revised as needed through monitoring and citizen input. Other strategies described in the Plan will require additional development and refinement as they are put into practice. In most cases, implementation requires specific funding approval by the Board of Trustees.

The San Antonio Water System Board of Trustees adopted this Plan on November 17, 1998. It replaces a 1993 Plan and will serve as SAWS Conservation and Reuse Plan for the next five years.

After the drought of 1996, San Antonio Water System (SAWS) organized the Community Conservation Committee (CCC), composed of representatives from diverse groups in the local area, to act as the force to promote water conservation practices among the San Antonio and Bexar County population. The response from the community resulted in a total membership of approximately 50 organizations and 86 individuals that represent many interests, organizations and activities within the city and county. The first Community Conservation Committee was appointed to serve for one year from February 1997 to January 1998. The CCC was re-appointed in May of 1998 for a two-year term. The CCC is the cornerstone of SAWS’ public involvement in conservation and drought management efforts.

A portion of the revenues from the fourth tier of the residential water rate structure and a monthly conservation fee on nonresidential accounts are used to fund conservation programs. To the extent that people are using more water and paying more for that water, the revenue generated will be used to provide structural changes in water use patterns and education about water conservation.

Behavioral and structural water use changes are the cornerstone of the Water Conservation and Reuse Plan programs. Educational programs for school-age children, for residential customers, and for specific nonresidential audiences representing large sectors of the commercial economy (i.e., hotels, restaurants, etc.), are key components of the Plan. Through the use of an inverted block rate structure for residential customers, an incentive to reduce water use is provided for those who use large amounts of water and therefore pay a higher per unit rate. General class customers (business, schools, hospitals, apartments, etc.) all pay a fixed monthly fee based on the size of their water meter which funds their conservation programs. The Plan also includes activities that will permanently change water use patterns: water recycling, retrofit of public and private plumbing fixtures, landscapes and increased efficiency in agricultural irrigation will create the permanent, lasting water savings that can be counted on as a water source for the future.
1.2 San Antonio Water System and Customer Profile
The reason it is possible to design a plan with rate structures, retrofit rebates, and wastewater recycling features is that considerable attention has been given to basic information about both the System and the individual customer.

System Customer Highlights include:
- 90% residential customer connections; 10% general class customer connections
- Single family customers use 49% of water; Nonresidential customers use 42% of water; Municipal/wholesale uses and unaccounted for water make up the rest of the total.
- Reduction in per capita pumping from 160 gpcd (gallons per capita per day) in 1993 to 150 gpcd in 1997

Customer Highlights
- Seasonal use – 17.5% (Percent difference between summer and annual pumpage)
- The maximum daily pumpage in 1997 was 271.4 MG and minimum daily pumpage was 112.2 MG
- 10% of residential customers use 25% of total residential water

1.3 Goals of System
Per Capita
SAWS per capita pumping has been decreasing since 1984, when the value was 213 gpcd, to 150 gpcd in 1997. In part, the decrease can be attributed to higher than average rainfall during 1991, 1992 and 1997, but a significant portion of the decrease is due to ongoing water conservation activities at SAWS. The outcome of the activities to date is that the “easy” conservation has been achieved. The next steps toward reducing per capita consumption will require more resources and effort.

The specific per capita goals are:

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<td>gpcd</td>
<td>160</td>
<td>150</td>
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Recycled Water
In addition, SAWS has an aggressive water recycling plan to deliver 35,000 acre feet/year of treated wastewater to commercial/industrial customers. The Recycled Water System will come on-line over the next five years. The Conservation and Recycling Programs listed below represent a significant effort by SAWS to meet the challenge of providing water to a population of more than one million people through aggressive demand management.

Basis for Goals
SAWS’ water conservation goal has been to improve water use efficiency in all areas. There has been considerable success in reducing per capita use. The stated intent of the SAWS Board of Trustees and management is to continue the progress of improving water use efficiency. Court and legislative events in the early 1990’s created conditions which
Permit limits on water pumping imposed by the Edwards Aquifer Authority (EAA) in 1998 will result in additional requirements for water conservation. The EAA's enabling legislation (SB 1477) also dictated a reduction in pumping limits by an additional 50,000 acre feet by the year 2008. These pumping limits would eliminate much of the discretionary use that is the target of Senate Bill (SB) 1477 for reduction. The specific reduction that can be interpreted from SB 1477 is approximately a 7% reduction of current SAWS pumping. This reduction would represent a per capita use of approximately 140 gpcd by the year 2008. Population growth and the attendant increase in total water demand will be met with additional conservation efforts and new sources of water, including water recycling.

1.4 SAWS Conservation and Recycling Programs
SAWS Conservation Programs are divided into 7 basic categories.
- Residential
  - Indoor
  - Outdoor
- Commercial/Industrial/Institutional
- Education
- Public Outreach
- SAWS System
- Agricultural
- Monitoring

Residential Indoor
Indoor residential programs include a toilet rebate program for residential retrofits, "Kick the Can," which features a $75 per toilet rebate, and Plumbers to People, a plumbing repair assistance program, which aids low-income citizens. Low flow showerheads/aerators are distributed to people who request them. Requests are received at public events, through the mail or on the SAWS hotline, 704-SAVE. In addition, all SAWS customers receive a bill insert every month which has conservation tips and a graph of their water use for the current month and the previous 12 months.

Residential Outdoor
Residential outdoor programs include a Watersaver Landscape program which offers rebates for installation of xeriscapes. Watersaver Landscape demonstration sites include the Jones Maltsberger Turf and Xeriscape Demonstration Site and the Northwest Conservation Wildscape Site. Plans exist to build a demonstration garden and rainharvesting system at the San Antonio Botanical Center and to have a number of new demonstration gardens constructed throughout San Antonio through the Texas Agricultural Extension Service. In addition, neighborhood outreach programs include the Plaza Florencia Subdivision in which watersaving landscapes were installed. An annual xeriscape contest awards two neighborhood associations and the individual homeowners in those neighborhoods for their xeriscape efforts. To assist in expanding the use of greywater in San Antonio, plumbing codes have been adopted and educational packets are being distributed to local residents. Greywater is untreated household wastewater that has not come in contact with toilet waste or food waste. It includes used water from lavatories, washing machines, and laundry tubs. It does not include wastewater from toilets, kitchen sinks, dishwashers or laundry water from soiled diapers.
Commercial/Industrial/Institutional
SAWS has been offering workshops on conservation methods to various types of businesses for a number of years. In 1998 the commercial/industrial/institutional programs were expanded to include the toilet retrofit and landscape rebates that were already offered to residential customers. Water audits and case-by-case rebates for large-scale retrofits are also available. Beginning in 1996, car wash businesses that meet certain conservation criteria were certified and provided a sign to be posted on their place of business. This program is being expanded to various businesses throughout the community including schools, restaurants, hotels, etc. who set a positive example for water conservation, install low water use equipment, educate their employees about conservation, and are willing to post a water saver certification logo on their business to inform the public that they, too, save water. Every year SAWS presents the Best Practices Water Conservation Awards to recognize businesses that voluntarily initiate water conservation practices. The Awards also provide a platform to educate other businesses.

Education
SAWS’ education program includes K-12 curriculum development. Mini-grants are provided to local educators for conservation programs, xeriscape demonstration gardens, pollution prevention and other environmental awareness programs. The Major Rivers Program is distributed to all 4th grade classes in Bexar County. A pilot program to evaluate other curriculum designs was initiated in 1998 and will result in expanding curriculum development for the K-12 years.

Public Outreach
Public outreach is a multi-faceted program area that includes a speaker’s bureau which provides speakers on a number of SAWS topics, of which conservation is the most requested topic. The Community Conservation Committee, (CCC) which is made up of 86 representatives of diverse interests in the San Antonio community, is a direct link between SAWS and many interest groups. In addition, SAWS has an award winning conservation display (20’ x 8’) which is exhibited at various public fairs. Information packets are also prepared and available to all who request information on the Hotline, 704-SAVE. Conservation information may also be obtained through the web page, http://www.saws.org. SAWS sponsors and/or participates in a number of special events such as the Fall Garden Fair, Spring Jazz Brunch, and Earth Day to encourage the general public to learn more about water conservation and environmental protection issues. Public service announcement campaigns with professionally developed commercials that air on television, radio, and local newspapers are a major component of public outreach.

SAWS System
Every effort is being made to reduce water loss in SAWS facilities and throughout the distribution system. Through the leak detection program, metering of city facilities and replacement of older pipe, unaccounted-for water has reduced from 15% in the mid-1980’s to 5%-8% in recent years. Facilities inspections are conducted to ensure that water-conserving features are installed and that all facility managers operate in a water-conserving manner. Employee education programs, such as Master Gardener classes and information fairs are regularly scheduled.
Agricultural
SAWS' agricultural conservation program is currently under development, focusing on technology for agricultural irrigation. EAA rules provide additional incentives by rewarding the installation of water conserving irrigation equipment in exchange for a transfer of the right to pump the saved water.

Monitoring
All SAWS customers are metered and consumption is recorded monthly. SAWS surveys the entire distribution system tri-annually to maintain unaccounted-for water numbers. Meters are replaced a minimum of once every 15 years and SAWS is considering reducing the replacement rate to once every 10 years.

SAWS also has a monitoring program where customers' water use is compiled by census tract to evaluate the impact of the conservation programs. All conservation programs are periodically analyzed to evaluate their effectiveness. If necessary, programs are adjusted to improve their effectiveness.

Recycled Water
Over the next five years, SAWS recycled water program will provide up to 35,000 acre feet per year of recycled water per year to commercial and industrial businesses in Bexar County. Two major pipelines to deliver this water are under construction. By substituting 20 percent of SAWS demand on the Edwards Aquifer with recycled water for non-drinking uses, aquifer water can be preserved for drinking water and allow San Antonio a continued high quality of life. In addition, recycled water will help to preserve the economic vitality of the region by providing businesses with a firm supply of water to use for commercial, industrial, and manufacturing purposes.

1.5 Public Input
Public input in the development of this plan had several components. A pre-draft scoping hearing was held on June 17, 1998 to solicit input on the plan. It was presented to the Water Recycling Advisory Committee on July 2, 1998. A series of public meetings of the CCC was held in early September 1998 to provide an opportunity for discussion and input in the draft.

More than 500 copies of the Draft Plan were distributed to the public. The plan was distributed to local libraries and a mailing list of approximately 3,500 citizens who have expressed an interest in the plan was notified of its availability. Written comments were accepted through September 14, 1998.

As the Edwards Aquifer Authority's Critical Period Management Rules are developed and modified, the City of San Antonio's Aquifer Management Plan will be updated. Public hearings will be held and the changes will be thoroughly discussed with the CCC.
2. Overview

San Antonio has historically enjoyed an abundant supply of good, readily available water. Originally, the San Antonio River and San Pedro Creek adequately addressed the domestic needs of area residents. By 1891, however, those resources could no longer support the rapidly growing population base. In order to sustain its development, the City turned from surface streams to their source—the Edwards Aquifer. This exceptional formation has met the continually increasing water demands of metropolitan San Antonio as well as the rest of the “Edwards Region” for almost a century. Despite the Edwards' vast capacity, it cannot be expected to sustain the City indefinitely. Conservation, therefore, represents a critical element in San Antonio's water strategy.

In July 1988 the City of San Antonio adopted the following policy regarding water conservation.

- Conservation is to be treated as a source of water, with a goal of reducing total regional water demand by the year 2007. This will be achieved by a combination of measures including:
  - Public and school education programs to develop wise water use practices;
  - Restructuring water rates to encourage conservation through increasing block rates, seasonal peak rates, and excess use penalties;
  - Institution of leak detection programs by water purveyors;
  - Building Code amendments to require installation of water conserving fixtures and appliances in all new construction;
  - Ordinances requiring retrofit of existing structures with water conserving devices upon sale or structural remodeling;
  - Ordinances and education programs to reduce the use of water in urban landscape irrigation; and
  - Retrofitting of public facilities with water conserving fixtures and more efficient landscape irrigation.
- The City of San Antonio will develop a program to recycle wastewater as a substitute for other supplies.

In 1993, SAWS published its first “Conservation and Reuse Plan” which led to the policies and programs enacting the above policy statement. In 1997, the SAWS Board of Trustees appointed the Community Conservation Committee (CCC). The CCC, comprised of a cross section of San Antonio citizens, made a series of recommendations to the SAWS Board to expand conservation programs and policies (Appendix A). SAWS is currently responding to the CCC recommendations through the development of new programs. The Water Recycling Advisory Committee (WRAC) with representatives from neighborhood and environmental groups, as well as potential customers and other agencies, was appointed in 1994 and has recommended policies and rates.

Conservation and reuse are not merely aspects of municipal policy; they are the continuing responsibility of every purveyor, public and private. The City of San Antonio and SAWS have initiated projects intended to further these policies with specific action items. This plan details the approach employed by the San Antonio Water System in implementing water conservation and reuse programs for San Antonio and the region and in expanding those programs in response to the input of the CCC and the WRAC.
2.1 System Profile

The concept of management of the Edwards Aquifer has long been a controversial issue. The individual interests across the region are diverse with strongly held opinions. The San Antonio City Council grew increasingly frustrated by the lack of local consensus and a focal point for water issues. These feelings were translated into action in December 1991, when the City Council voted to consolidate all City of San Antonio water, wastewater, reuse and stormwater activities into one agency—San Antonio Water System (SAWS).

SAWS, as the single largest pumper from the Edwards Aquifer, has grown beyond serving San Antonio in a facility/purveyor sense to become a leader in Edwards Aquifer management programs and policies.

SAWS serves 273,276 accounts or a population of 1,027,517 with more than 3,742 miles of water mains. The potable water quality is so good that the only treatment provided is chlorination at the wellheads because of state law. The System has the capacity to pump up to 778.2 million gallons a day. The wastewater service area provides for 261,610 customer accounts with more than 4,509 miles of wastewater mains.

Approximately 90% of the system services single-family residential connections who used 49% of the water in 1997. Thus, the continued emphasis for SAWS is to refine an open outreach approach to customers and other user groups by providing information and education to all age levels. Programs are aimed at both water quality by watershed (stormwater) and the Edwards Aquifer Recharge Zone and quantity (conservation and reuse).

SAWS’ Planning Group is in the process of coordinating the preparation of plans for the various departments of SAWS. Included among these is the Conservation and Reuse Plan. Since 1993, the Edwards Aquifer Authority, created by SB 1477, has come into existence. The Mayor’s Committee on Water met in 1996 and issued its report, and the CCC met and made its recommendations which were passed by the SAWS Board of Trustees in 1997. The long range Water Resources Plan is currently being prepared. This 1998 Conservation and Reuse Plan is being prepared to bring the document up to date and to reflect these and other important changes of the past five years.

Various regulatory agencies require specific plans for permits and financial assistance. The Texas Water Development Board (TWDB) requires that a water conservation plan be submitted with each request for grants and loans. The Texas Natural Resource Conservation Commission (TNRCC) requires a water conservation plan for any water diversion permit application. TNRCC also requires that a reuse study be submitted within a year of issuance of a wastewater discharge permit. SB 1477 also requires that a water conservation and reuse plan be prepared by water utilities. SB1 requires drought contingency and conservation planning.

Some non-metered uses such as fire suppression and main flushing to meet water quality mandates of TNRCC are essential for public health and safety, but are not included in metered water figures. When the System output figures are being discussed, the amount represents water pumped from wells. When referring to individual areas or categories of
use, the reference is to metered water use. The total amount pumped is that amount monitored as the water is removed from ground and elevated storage tanks, while the total metered amount is the water delivered to paying customers metered at their individual addresses.

SAWS per capita use (based upon the total pumped) for the past several years is presented in Figure 1. This data indicates that SAWS per capita pumping has decreased, from approximately 180 gpcd in 1987 to 150 gpcd in 1997.

**Figure 1**

**Gallons Per Capita Per Day Pumped**  
1988 - 1997

![Graph showing gallons per capita per day pumped from 1988 to 1997.](image)

It is notable that SAWS per capita use is lower than the cities of Austin, Dallas, and Houston. Some suburban areas such as Alamo Heights have much higher per capita use and some, such as Kirby, have substantially lower use rates. The best explanation for these differences is found in metered water data aggregated by census tracts and analyzed for water use and median home value. A linear regression analysis was performed on selected census tracts for per capita use as a function of median home value from the 1990 Census data. The per capita usage increases as the median home value increases. Since the usage data is for the period January, February and March 1993, a reasonable estimate of indoor water use is obtained. The per capita use at the low end is approximately 70 gpcd, which is about the low end of the scale for typical indoor use. This data and these analyses have been used extensively as the basis for conservation rates and other conservation planning.

### 2.2 Water Use

Water use data is maintained in a number of ways. A useful database is the number of bills and the total amount of metered water used at a specific range of use. For the purposes of understanding water use in SAWS, the distribution of the percent of the total...
bills and the amount of metered water represented by those bills was analyzed for residential and commercial categories for customers inside the city limits (ICL) for the years 1996 and 1997.

Conservation and drought management efforts have reduced the apparent differences between wet and dry years since the implementation of the 1993 Conservation and Reuse Plan. For instance, 1996 was a dry year and annual pumping was approximately 178,290 acre feet (AF); 1997 was a slightly wet year and annual pumping was approximately 174,000 AF.

Analysis of SAWS bills indicates that approximately 10% of SAWS residential customers use approximately 25% of the total water used regardless of the amount of rainfall. These distributions are useful in establishing the percentile ranking of use. For an “average” to wet year, shown as 1997, 54% of single family residential customers use less than or equal to 7,200 gallons per month (gal/month). Ninety percent or less of the bills indicated use less than approximately 15,700 gal/month.

Figure 2 shows another illustration of the distribution with the first four levels of use corresponding to the four tiers of the residential water rates. SAWS water rates are included in Appendix C.

Figure 2

Residential Annual Usage - 1997
Percent of Customers vs. Percent of Usage

A similar analysis was conducted on commercial accounts. The results are presented in Figure 3. This data indicates that the vast majority of commercial and industrial use is by
a small number of commercial accounts. However, these firms represent a substantial portion of the employment base in San Antonio.

2.3 Type of Use
The SAWS water use data is maintained in several ways. Customers can be identified by census tract, account type and meter size. An important distinction for the purpose of conservation planning is the type of use. The 1997 distribution by type of use is presented in Table 1 and Figure 4.
Table 1
Distribution By Type of Use - 1997

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent of Total</th>
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<tbody>
<tr>
<td>Residential</td>
<td>49.3%</td>
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<tr>
<td>Commercial</td>
<td>21.4%</td>
</tr>
<tr>
<td>Apartment</td>
<td>14.9%</td>
</tr>
<tr>
<td>Industrial</td>
<td>3.3%</td>
</tr>
<tr>
<td>City Accounts</td>
<td>1.5%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>0.8%</td>
</tr>
<tr>
<td>SAWS Metered</td>
<td>0.2%</td>
</tr>
<tr>
<td>SAWS Unmetered</td>
<td>8.6%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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</table>

Figure 4 Distribution By Type of Use in 1997

Seasonal Use
In semi-arid south Texas, seasonal water use is a major component of annual use. As seen in Figure 5, the peak pumping month for San Antonio is August, which corresponds to high temperatures and low rainfall. Landscape watering, increased cooling demand, and increased water consumption during the hot, dry months lead to a summer peak in the months of June through September.
Figure 5

Percent of Annual System Pumpage By Month
1979 - 1996

Average pumping during the summer months exceeds the annual monthly average for the last 20 years by 17.5%. During the four driest years (1982, 1988, 1989 and 1996) the difference was 23.6%. This increase in water use indicates the need for aggressive outdoor and industrial cooling management programs to reduce the peak months’ pumpage. SAWS recycled water and conservation programs are designed in part to alleviate this peak pumping effect on demand.

Figure 6 shows the relative difference between winter months, the average month and summer months for the last 20 years, and the two most recent years. The growth in average monthly consumption of less than 1% for 1996 and 1997 as compared to the 20-year average is an indication that overall conservation has reduced per capita consumption. During the same 20-year period, population in the area has increased approximately 2% per year.
The relative difference between 1996 summer and winter use (June through September vs. November through February) shown in Figure 6 indicates that the Aquifer Management Plan restrictions on water use and the rate surcharge applied during the drought of 1996 helped lower the average pumping during the peak summer months. The dry year contributed to higher use overall during 1996 as compared to 1997, indicating that weather is a driving force in overall water use. The actual daily pumping, rainfall and Edwards Aquifer water levels (J-17 Index Well) are presented in the SAWS web page, http://www.saws.org. A sample page is illustrated in Appendix B.
3. Specific Conservation And Reuse Goals

3.1 Per Capita Goals
In 1997 per capita pumpage was 150 gpcd; the previous year, 1996, per capita pumpage was 156 gpcd. These values are relatively low and some of the reductions can be attributed to the City of San Antonio’s efforts at water conservation. A large portion of the reduction of SAWS’ per capita pumpage is due to rainfall conditions. In 1997, San Antonio had 33.9” of rainfall which contributed to the per capita reductions. In 1996 San Antonio had 17” of rainfall; this was the second consecutive year of a drought and saw the Edwards Aquifer drop to a level of 627.5’ mean sea level at the J-17 index well.

SAWS conservation goal:

“Conservation is to be treated as a source of water, with a goal of reducing total regional water demand by the year 2007.”

Short-term Goals
A short term goal for SAWS is to maintain the current per capita rate of approximately 150 gpcd and to use this value as the base for further reductions. Since some reductions in per capita use have occurred, additional reductions will become more difficult to accomplish. In the absence of any demand management, per capita use would be expected to rise over time. This has been the historic trend due to such factors as increases in per capita income, and acquisition of more water using appliances. The current national trends to use water conserving fixtures and household appliances in new construction may mitigate the otherwise expected rise in per capita use. The following table describes the proposed goals for per capita reductions.

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Long-term Goals
The following program goals have been established:

- increase the public’s awareness of water-saving methods, in order to encourage customers to voluntarily conserve water, thus reducing Edwards Aquifer use;
- reduce existing customers’ water usage by encouraging landscape improvements and replacement of inefficient plumbing fixtures;
- decrease water consumption among new customers by requiring water efficient plumbing fixtures and xeriscaping in new construction;
- maximum use of recycled wastewater for non-potable needs;
- utilize conservation rates and incentives to modify the long-term water use patterns of SAWS’ customers and to encourage on-site industrial reuse;
- maintain unaccounted-for water totals at rates lower than the national average;
- reduce the peaks in per capita usage during drought periods.

SAWS has continued and expanded active water conservation and water recycling programs which were begun at the City of San Antonio, the former City Water Board,
and the Alamo Conservation and Reuse District. The water conservation goal has been to improve water use efficiency in all areas. Considerable success has been had in reducing per capita use. The stated intent of the SAWS Board of Trustees and management has been to continue the progress of improving water use efficiency. Recent court and legislative events have created conditions which have helped to accelerate those efforts.

3.2 Water Recycling Goals
Reuse of treated municipal wastewater for irrigation is an essential element of the SAWS Conservation and Reuse Plan designed to reduce the use of potable groundwater for non-potable applications. A major goal of this plan is to virtually eliminate the use of groundwater for irrigation and stream augmentation while preserving the integrity of the Edwards Aquifer which underlies much of south-central Texas.

In addition to recycled water currently used by CPS in cooling lakes, SAWS is embarking on a water recycling program that will ultimately provide 35,000 acre feet of recycled water per year to commercial and industrial businesses in Bexar County. By substituting 20 percent of SAWS demand on the Edwards aquifer with recycled water for non-drinking uses, aquifer water can be preserved for drinking water and allow San Antonio a continued high quality of life. In addition, recycled water will help to preserve the economic vitality of the region by providing businesses with a firm supply of water to use for commercial, industrial, and manufacturing purposes.
4. Conservation Programs

4.1 Program Overview
San Antonio's water conservation efforts can be traced back to 1984 when the first inverted block rate structure was introduced and general conservation messages were communicated to the public. In 1988 conservation efforts were expanded with school education programs such as Major Rivers. Pilot projects retrofitting public buildings with low-flow fixtures were also initiated. Since the 1980's all public buildings have been metered, inverted block rates have been steepened and programs have been expanded.

SAWS current and anticipated water conservation programs are divided into seven program areas. Residential programs which serve 91% of SAWS customers are further subdivided into Indoor and Outdoor programs. Commercial/Institutional/Industrial Programs serve the other nine percent of customers. All three of these program areas provide financial incentives for equipment retrofits as well as education programs. In addition two program areas provide educational efforts targeted for those of school age and for education and outreach to adults. Our internal efforts to reduce water waste and keep the system operating efficiently are covered by SAWS system programs. We also have a metering and monitoring program for assisting with efficiency throughout the system. The Agricultural Program provides incentives and research funds to assist in reducing demand regionally on the Edwards aquifer.

4.2 Residential - Indoor
Kick-the-Can Toilet Retrofit
This program offers a $75.00 rebate for each toilet retrofitted. Up to two toilets per home are eligible for a rebate. More than 25,000 toilets have been retrofitted since 1994 and more than 8,400 toilets were retrofitted in 1997 through this program. A pilot distribution program is under current development (summer 1998) which will distribute (and install) new toilets directly to low income residents within a target area of the City.

Plumbers to People—Low income plumbing repair assistance program
Leak repair and retrofits are provided to homeowners who qualify for this program, which is operated in cooperation with the Community Action Division of the City of San Antonio (COSA). Recipients must meet Federal Assistance Guidelines. More than 500 homes have been repaired since the inception of this program.

Bill Insert—Conservation Tips
Every month SAWS customers receive a reminder on the back of their bill which provides tips on conservation techniques, instructions on how to access the benefits of the conservation rebate programs, and reminds them about the need for conservation. On the front of the bill, a graph of the past year’s monthly water use and the average use this month of the 400 closest neighbors give the customer a benchmark by which to measure their water use.

Showerheads/Aerators Distribution
At public information fairs, special events such as Earth Day, and during radio broadcasts of public events, low-flow showerheads and faucet aerators are given away to
participants/attendees. By focusing giveaways on events and information fairs which are water conservation or environmentally related, the proportion of the recipients who actually install the fixtures is maximized. A retrofit kit program is planned with potential distribution door-to-door by community based organizations. The kit will include a showerhead, two low-flow aerators, toilet leak detection tablets, and conservation information.

**High Efficiency Washing Machine Rebate**
In partnership with City Public Service (CPS), a rebate will be offered for purchasing high efficiency washing machines. Each utility will rebate $100 per machine, with a limit of one per household.

**Winter Averaging**
SAWS sewer bills are based on the average monthly water consumption between mid-November and mid-March. Three consecutive billing cycles (30-day period) within this four-month period determine the average monthly water consumption for each account. This average is called the customer’s “winter average.” Sewer rates are applied to the winter average and the total becomes the customer’s sewer bill for the next 12 months. SAWS, in cooperation with San Antonio Plumbing Distributors, Home Depot and Habitat for Humanity Restore hosts events known as “Gear Up for Winter Averaging” at these locations. These events are a means of distributing ultra low flow toilets, low flow aerators, and showerheads to the public. Customers are informed that if they install these devices they will save money on their yearly sewer and water bills as well as conserve water.

**Leak Detection Kits**
SAWS will implement a Leak Detection Kit Program in the fall of 1998. This program will involve mailing 270,000 Leak Detection Kits to all customers of SAWS. Each kit includes two dye tablets for detecting leaks in toilets and instructions in English and Spanish on how to use the dye tablets.

**4.3 Residential - Outdoors**
**Watersaver Landscape Rebates**
SAWS will continue to offer eligible homeowners a rebate of $100 to $500 at a rate of $.10 per square foot. For homeowners whose conversion or new installation uses 50% or more turfgrass, the rebate is $.05 per square foot. More than 1.8 million square feet of high water turfgrass has been converted as of May 1998.

**Workshops**
SAWS sponsors educational workshops which the Bexar County Master Gardeners hosts every month at various locations to educate homeowners on the seven steps of successful xeriscaping.

**Jones-Maltzberger Turf Demonstration Site**
SAWS maintains an educational landscape demonstration site with the cooperation of the Bexar County Master Gardeners. The site, which is located on Jones-Maltzberger one block north of Loop 410, includes several turf plots of zoysia, bermudagrass, and buffalo grass varieties as well as a small xeriscape area and several ground covers. The
site is also the location of a potential evapotranspiration (PET) weather station for the Texas Agricultural Extension Service (TAES) PET network.

**Xeriscape Contest**
This annual contest, co-sponsored with the Bexar County Master Gardeners, Texas Agricultural Extension Service (TAES), and local media outlets, awards both individual homeowners and neighborhood associations with the most aesthetically pleasing xeriscape. Contestants’ water bills are examined to verify water savings. A Mother’s Day weekend Garden Tour showcases the winning neighborhoods and homes.

**Habitat for Humanity, Plaza Florencia Subdivision**
Located at the corner of Groff and Florencia, on the city’s westside, this demonstration site introduces xeriscape and wildscapes and the concept of watersaving landscaping to less affluent areas of San Antonio through cooperation with non-profit organizations.

**San Antonio Botanical Garden Rain Harvesting Demonstration and Xeriscape Demonstration Garden**
SAWS and the City of San Antonio have entered into a joint effort to promote rain harvesting and watersaving landscaping at the San Antonio Botanical Center. Both commercial and residential-scale rain harvesting projects will be constructed and available for workshops on rain harvesting. A one-half acre site is being converted into a watersaver demonstration garden where patrons can obtain conservation information on xeriscape plants, etc. Free public workshops on xeriscape principles are also planned.

**Northwest Conservation Site Wildscape**
In cooperation with the Texas Parks & Wildlife Department and the Bexar County Master Gardeners, SAWS has established a wildscape demonstration garden for public viewing. In addition SAWS compost made from biosolids from the wastewater treatment plants is also available to the public at the site, located at 6798 Culebra.

**TAES Demonstration Gardens**
Three community wildscape demonstration gardens are being installed and maintained by the Texas Agricultural Extension Service and the Green Brigade Program (an award-winning program for troubled youth). These demo gardens are located on 700 Garcia Street, 3427 Northeast Parkway, and 647 S. Main Avenue. The sites will be a community resource for education in wildscaping in the San Antonio area.

**Greywater Use Policies**
In 1996, the City of San Antonio adopted Appendix G of the Uniform Plumbing Code which deals with residential greywater systems. In an effort to address the Aquifer Management Plan, greywater from residential laundry washing machines may be discharged directly onto the ground surface under the following conditions:
- Limited to single family dwellings only.
- Irrigation areas must be in a fenced area and in control of the occupant of that residence. The area must be of limited use and access by residents, pets, and foot traffic.
- Cannot be used during times of rain.
- Irrigation must not create a public health nuisance such as surface ponding.
- The irrigation area must support plant growth such as grass or bushes, or be overlaid
with vegetative cover.

- The discharge point of the hose shall be kept a minimum of 10 feet from property lines.
- The Director of the San Antonio Metropolitan Health District may suspend this practice if he determines that it creates a negative impact on community health.

4.4 Commercial/Industrial/Institutional Workshops and Education Programs
SAWS hosts numerous workshops each year to target specific needs of various business sectors. Hotels, restaurants, hospitals, and schools have all been topics of previous workshops. Operating engineers and facility managers are the typical targets of the workshops.

SAWS will continue to provide workshops aimed at specific types of industries or users of specific technologies. The workshops will provide information on ways to conserve water, incentives available from SAWS, and how to develop conservation and drought management plans.

Education programs will also be developed to reach the end-users of “commercial” water, such as apartment tenants, business employees, students and teachers, and facility visitors. For example, “information bites” will be made available for placement in company newsletters.

Best Practices Water Conservation Awards
SAWS established the Best Practices Water Conservation Award Program to recognize businesses that have voluntarily initiated sound water conservation practices and to provide a platform where examples of resourceful and creative water conservation activities could be shared with the community. Entries have been received from a wide variety of businesses, organizations, associations and industries. Criteria for businesses represent fundamental water conservation practices in addition to design innovation and transferability to similar industries. All of these practices must result in quantifiable water use savings.

Elementary School Retrofit Program
Funds raised from a Critical Period surcharge during the summer of 1996 have allowed more than 40 local elementary schools to retrofit toilets, urinals and fix leaky plumbing.

Plumbing Code Changes
The City of San Antonio adopted the appropriate sections of the Universal Plumbing Code to allow for greywater systems and rain harvesting systems within the city limits. Staff’s current focus is on waterless urinals. Pilot projects have been pursued at SAWS and USAA to study the effectiveness of waterless urinals in reducing water use. Preliminary results report remarkable savings. The City Plumbing Code must be amended prior to implementation of a large-scale program.

Expanded Programming
Beginning April 1, 1998, SAWS began offering conservation incentive programs for commercial customers such as apartments, office buildings, hotels and motels, hospitals, schools, and manufacturers. About 40% of the water SAWS sells is consumed by general
class customers. As recommended by the CCC, which represents a broad base of community interests, SAWS' commercial customers are now being charged a monthly fee which will pay for these new conservation programs.

**Toilet Retrofit Rebate**
The first and largest program is a toilet retrofit rebate program. As in the residential rebate programs, the rebate is $75.00 per toilet. However, non-residential customers are required to apply for the rebate prior to making the retrofit and a SAWS conservation technician or contractor will do an on-site visit to verify the need for the retrofits. Non-residential customers with a need for showerheads and aerators will also receive such low-flow devices at the time of their site visit.

**Watersaver Landscape Rebate Program**
The Watersaver Landscape Rebate for commercial customers is currently based on the residential rebate guidelines, although there are a few additional requirements. Commercial customers must provide a plant list and an irrigation design plan (if used), and must agree to not overseed with winter rye grass. The rebate is $.10 per square foot (up to $500) if 50% of the irrigated area is planted in drought tolerant plants other than turf. If more than 50% of the irrigated area is planted in turf, the rebate is $.05 per square foot (up to $250). Rebate programs for landscapes smaller than 1000 square feet or larger than 5,000 square feet are being developed and will be introduced to the public at a future date.

**Certification Programs**
Like the current carwash certification program, other businesses will be able to be certified as water conserving. These programs will be introduced as they are developed for particular types of businesses such as restaurants, schools and hotels. All certified businesses will be required to do some employee education on water conservation. Certified businesses will receive a sign from SAWS that they can display at their facilities. SAWS will institute a promotional campaign to encourage the public to recognize these businesses as good corporate citizens.

**Business Water Audits**
Businesses who use over a certain level of water on a monthly basis will be eligible for a shared-cost water use audit of their property to determine the best ways they can save water. SAWS will rebate a pre-determined portion of the cost of the audit. These audits will be performed or supervised by a licensed engineer who has been pre-qualified by SAWS. Smaller businesses may request an audit by a SAWS planner or may request instructions on how they can perform an audit themselves.

**Large-scale Retrofit Program**
The Large-scale Retrofit Program will allow large-scale water users to apply on a case-by-case basis for a SAWS rebate for installation of water conserving equipment. The rebate may be for up to one-half of the cost of the retrofit, depending on the amount of water to be saved and other factors. The program will require a pre-audit and a pre-inspection and on-going verification of water savings.
**High Efficiency Washing Machines**
Customers purchasing high efficiency washing machines will be able to receive a $100 rebate for each machine. CPS will offer an additional $100 rebate per machine.

**Other Programs**
The commercial conservation program is designed to be flexible and to meet the requirements of a broad spectrum of customers. As other needs are identified, new programs will be developed and current programs will be improved. Similar to the toilet, high efficiency washing machine, and water-saver landscape rebate programs, it is possible that over time, specific types of rebates will be developed for business customers who have common usage patterns. As those usage patterns or processes are determined, SAWS may offer a standard rebate to all of the customers in a given category.

**4.5 Education**
**K-12 Curriculum Development**
SAWS staff work with existing curriculums and local educators to develop new curriculums with a focus on local watersheds, the Edwards Aquifer, and conservation and water quality needs. Texas Assessment of Academic Skills (TAAS) and Texas Essential Knowledge and Skills (TEKS) guidelines are taken into account to make the results more amenable to use by teachers.

**Mini-Grants**
Funds raised through Water Quality violations are reinvested in the community through grants to educators for water conservation and water quality protection projects. Numerous student-coordinated campus xeriscapes have been funded through the mini-grant program. Approximately $50,000 has been awarded over the past three years to schools and community groups for projects promoting water conservation, pollution prevention and environmental awareness. Projects include xeriscape outdoor classrooms in numerous elementary schools, teacher workshops and community environmental events. The average grant award is $2,500.

**Major Rivers**
Since the late 1980's SAWS has worked with local fourth grade teachers to promote the Major Rivers Program. All fourth grade classes, in both public and private campuses, receive copies of the curriculum.

**4.6 Public Outreach**
**Speakers Bureau**
SAWS executive management and staff are regular speakers to civic, business neighborhood and educational organizations. Conservation is one of the most frequently requested topics and together with recycling is a major focus of SAWS' public presentation efforts.

**Community Conservation Committee**
Eighty-six members representing diverse interests of the San Antonio community were appointed to the Community Conservation Committee (CCC) in February 1997. They developed numerous recommendations for area commercial and residential conservation programs and landscape ordinances to reduce water consumption in San Antonio. These recommendations are presented in Appendix A. In May 1998, a new Committee
(comprised of previous and new members) was appointed by the SAWS Board of Trustees for a 2-year term.

WRAC
The Water Recycling Advisory Committee (WRAC) was appointed by the SAWS Board in 1994 and provides feedback regarding proposed policies, engineering designs and decisions related to the Water Recycling Program. This diverse group of neighborhood leaders, environmentalists, agencies’ representatives and customers have been instrumental in developing rate structures, extension policies and alignment decisions.

Conservation Display
A 20 ft. by 8 ft. display with several panels allows SAWS personnel to participate in numerous professional conferences and conventions held in San Antonio. The attractive display includes information about rebate programs, a full-scale toilet display and plenty of storage space for aerators, showerheads and literature. SAWS has received awards for the display at the annual Home and Garden Show in San Antonio.

SAWS Bill Format and Bill Insert
The award-winning bill design has been recognized internationally for its ease of comprehension and the effectiveness of the conservation message, which is reinforced by statistical information on neighborhood usage and helpful tips on conservation in every bill. The bill also includes a graph of the customer’s water use for the current month and the previous 12 months.

Public Information Fairs
Numerous public information fairs, “town hall” style meetings and special events are sponsored bi-monthly by SAWS in order to disseminate information on SAWS programs. Here SAWS offers its customers and the general public the opportunity to give input on what kinds of issues or activities the community would like to see from SAWS.

Information Packets/Showerhead and Aerator Distribution
SAWS conservation staff responds to at least 300 requests monthly for information packets covering general conservation and specific conservation program information, as well as answering numerous specific questions about conservation. Showerheads and aerators are distributed at most public events in which SAWS participates or sponsors. Literature is available in English and Spanish.

Special Events
In addition to the public information fairs, SAWS sponsors or participates in a wide variety of community based special events each year. A partial list of events include: Fall Garden Fair, Spring Jazz Brunch, Earth Day, Basura Bash clean ups, Texas Recycles Day, Viva Botanica, Mother’s Day Xeriscape Garden Tour, Mulch Day and Employee Conservation and Health Fairs for USAA, Sony, CPS and others.

Public Service Announcements
SAWS has developed television and radio public service announcements about water conservation to inform the public about existing conservation programs and to provide general water conservation information.
4.7 Saws System

Leak Detection
Through the purchase of equipment and the staffing of permanent leak detection crews, SAWS has reduced its unaccounted-for water from 10%-15% in the mid-1980's to 5% in a normal year and only up to 9% during the 1996 summer drought period. This compares to the national average for water utilities of 10%. SAWS also allows its crews to assist other public agencies in locating leaks on their properties. Most notably, the San Antonio Housing Authority and the San Antonio Parks Department have utilized this service.

Facility Plan Review
SAWS has eleven office locations housing customer service centers, recycling centers, and staff; approximately 86 pump stations; and over 100 lift stations in the greater San Antonio area. Conservation staff is reviewing all SAWS locations and identifying equipment which, if installed, will result in permanent water conservation. Staff is also identifying procedural changes to improve water conservation. As a part of this program, appropriate facilities are being identified for watersaver landscape (xeriscape) demonstration gardens. Locations identified to date include the SAWS Main Office, Northwest Conservation Site, Mission Road Service Center, and Medio Creek Recycling Center.

Capital Improvement Plan
SAWS' goal in the Capital Improvement Plan (CIP) is to attain a 2% annual replacement rate of existing mains so the entire system can be replaced every 50 years. This will assist in reducing unaccounted for water losses through main breaks in older areas of the system. SAWS will target high main break areas, work to reduce response times to main breaks and seek increased CIP funding for system improvements to minimize water losses.

Employee Education Initiative
SAWS conservation staff sponsors a series of employee fairs for SAWS' own 1600 employees. The department also sponsors Bexar County Master Gardener classes for SAWS employees interested in becoming Master Gardeners.

4.8 Agricultural Conservation
While few SAWS customers use water for agricultural irrigation or for livestock, a unique opportunity exists in a regional context to reduce demand with a direct benefit to SAWS customers. EAA rules allow for irrigation users to transfer water rights when the water is conserved through the installation of water conserving equipment. By replacing furrow and pivot sprinkler irrigation with low energy precise application (LEPA), low pressure precise application (LPPA), and drip irrigation, a 10% to 50% savings can be accomplished. SAWS will work with irrigators throughout the Edwards region to increase water savings.

EAA rules will also provide SAWS with credits for water added to recharge through brush management. Studies may be funded to determine the extent that brush management provides additional water through conservation.
4.9 Metering and Monitoring
SAWS meters all customers and records consumption monthly. The goal is to survey meters in the entire distribution system bi-annually and to maintain the unaccounted-for water statistic at or below the national average of 10% of total annual pumpage. Over the next five years, 18,000 meters per year are scheduled to be replaced. All new meters are tested; those not within batch standards are returned to the manufacturer. Meter standards meet all requirements of the State and Edwards Aquifer Authority.

Compound meters, capable of measuring flow at low and high ranges, will be used in conjunction with some existing meters to determine if water is passing the meters without being measured.

Areas experiencing an unusual number of line breakages are targeted for main replacement. The time required to repair system leaks after notification is maintained and evaluated on a monthly basis. An accounting method for determining water loss by size of leak is being developed to assist in this effort.

Pumping is monitored at the wells and measured continuously. Daily pumping amounts are correlated to weather events and Edwards Aquifer levels to analyze overall and per-capita pumping. Forecasts are then prepared of the amount of water that will be pumped in response to a particular per capita use rate or to maintain a particular Aquifer level. SAWS will review the feasibility of calculating summer averages along with winter averages to use as a tool for program development.

Research
In addition to monitoring the effectiveness of existing programs SAWS supports research in areas which can help to broaden the impact of conservation efforts. Current research projects include the Evapotranspiration Study cosponsored with TAES and the Bexar County Master Gardeners; and the Price Elasticity Study cosponsored with the Cities of Austin and Corpus Christi. Other research efforts include consumer satisfaction surveys to determine the showerheads and ultra-low flush toilets most likely to receive popular support. Research topics in the future will include drought tolerance evaluations of local landscaping materials; brush management to improve groundwater balances; and metering and submetering studies.

Studies will be conducted to consider the placement of pressure control devices in areas of the system in lower elevations and to require pressure controls on new housing. SAWS staff will track water use by census tract to evaluate the impact of the program across SAWS’ customer spectrum. Additional topics will be considered during the next five years as changes in water demand patterns dictate or in response to proposals from the academic and government communities and the public.

4.10 Inter-agency Cooperation and Government Coordination
The Conservation Department partners and contracts with numerous non-profit and governmental agencies and organizations to provide expanded services to the citizens of San Antonio. The Department also provides policy and technical guidance to the City regarding changes to ordinances and City Codes affecting water use.
Agencies and organizations that are an integral part of conservation outreach include the Texas Parks and Wildlife Department, the Texas Agricultural Extension Service, Bexar County Master Gardeners, and the Green Brigade Programs. For example, the annual xeriscape contest is co-sponsored by SAWS, the Bexar County Master Gardeners, the Texas Agricultural Extension Service, and local media outlets.

Both Habitat for Humanity, as a drop-off location for retrofitted toilets and an information location, and the San Antonio Botanical Center, as a location for visual and hands-on landscaping and rain harvesting information, contribute to outreach efforts as well. Collaborative efforts with other municipalities and water purveyors in Bexar County are coordinated through the Water Advisory Council (WAC). Monthly meetings provide a forum for coordination of conservation efforts year-round.

A partnership with CPS (City Public Service) provides customers with rebates from both agencies on High Efficiency washing machines. The Community Action Division of the City performs intake procedures for applicants to the Plumbers to People program. Military bases such as Fort Sam Houston and Lackland AFB provide SAWS' conservation information to their on-base residents, and Brooks AFB has participated in a study on showerhead efficiency and provided conservation information to base personnel.

Future partnerships will include a community based non-profit organization assisting with the distribution of a retrofit kit including aerators, toilet leak detection tablets and conservation information.

**City of San Antonio Code**

Drought management has been a part of San Antonio City Code since 1984, and community input received through SAWS is used to formulate recommendations for revisions to the City Code where conservation and water resources are concerned. Water rates, mandated by City ordinance, are established with SAWS' recommendations. Guidance on plumbing code changes, such as that allowing the use of greywater inside the city limits, is also provided to the City Council.

### 4.11 Future Services

Continued analysis of programs and modification, as necessary, will determine future services. The expansion of existing programs and the creation of new ones will allow conservation to reach all segments of the population: commercial, residential, and educational. Publicity and educational pieces will continue to be emphasized, with the goal of increasing awareness of conservation in general, as well as participation in all available retrofit programs.

Potential commercial and industrial programs include integration of watersaver landscape methods for all City properties, a commercial rain harvesting program, a flapper replacement program, and a rebate program for rain sensors. Possible future residential programs include establishing a fifth tier for high-end users, expansion of the toilet distribution program to all residential customers, a door-to-door distribution of conservation kits, as well as a rain-sensor rebate program. In the educational arena, curriculum units will be available for all grade levels, and classroom presentations will continue.
Public input will be sought on the creation and implementation of all new programs, and this means record keeping and data analysis will continue to be an integral part of the overall conservation process. Program databases will continue to be compiled and statistically analyzed in order to gauge successes and identify target areas for increased efforts. Communication of statistical findings through graphics and maps will help both the general public and SAWS' staff understand what goals have been achieved and what still needs to be accomplished for our overall conservation goals to be met.
5. Water Recycling

5.1 Program Overview
The reuse of treated effluent is an essential element of SAWS’ water resources and conservation planning. SAWS’ Water Recycling Program will provide 35,000 acre feet of recycled water per year to commercial and industrial users, representing 20% of SAWS’ current demand on the Edwards aquifer. Recycled water is non-potable and will be used for non-potable uses such as landscape irrigation, cooling towers, and river flow maintenance, thus conserving Edwards aquifer water for drinking uses. Recycled water will help to preserve the economic vitality of the region by providing businesses with a firm supply of water to use for commercial, industrial and manufacturing purposes.

5.2 History and Background
The City of San Antonio and much of the surrounding area is dependent on the Edwards Aquifer as a sole source of water for municipal, commercial, agricultural, and recreational uses. Historically, water needs of the region have been satisfied by wells that pump from the Edwards aquifer. Due to increased demands, limitations of permitted withdrawal rights, and the continual threat of drought, SAWS has embarked on acquiring and developing additional sources of water.

Recycled Water, one of several source options currently under development by the San Antonio Water System, has been recognized as a potential resource since the late 190’s.

City Public Service, San Antonio’s gas and electric utility, uses vast amounts of water to produce electricity for half a million customers. However, due to a historic decision made in 1957, CPS utilizes primarily recycled wastewater to cool power plants. CPS has saved more than 525,000 acre feet of water since 1965. Faced with the worst drought in history during the 1950’s, CPS found an alternative Edwards Aquifer water – the use of recycled water for nearly 100% of its power plant cooling. Between 1966 and 1970, the first power plants to use recycled water came “on-line” at Braunig and Calaveras Lakes. In addition, the lakes provided thousands of acres for recreational use.

More recently, the San Antonio Water System’s Conservation and Reuse Plan of 1993 proposed the development of the current Recycling Program. An Engineering Feasibility Report for the Recycled Water Program was completed and approved by the San Antonio Water System Board of Trustees in October, 1996, thus accelerating development of this important resource.

Recycled water program policies were further defined through Board resolutions approved in 1997 outlining distribution main extension, policies, guidelines for exchange of Edwards Aquifer rights, and rates. Pipeline construction began in September 1997. In March, 1998 the City Council of San Antonio amended Chapter 34, Article VII of the San Antonio Code to include Recycled Water Service and Rates. (Appendix C)
5.3 Program Goals
One of the primary goals of the Recycled Water Program is to replace non-potable uses of Edwards Aquifer water with recycled water to free up Edwards Aquifer water for potable purposes.

The recycled water project has a fundamental goal of transferring water permitted Edwards aquifer water rights as consideration for delivery of recycled water to customers who have Edwards withdrawal rights.

Another goal is to promote economic development along the alignments of the Recycled Water System. Use of recycled water near the source will benefit the community by helping the economy and will also minimize costs to deliver recycled water.

5.4 Recycled Water Market
SAWS staff is currently in negotiations with potential customers for recycled water sales. This is the second part of a two-part process. The first part of the customer development process was to obtain requests for recycled water service. In June 1997, SAWS received requests from 78 sites for a total potential use of 48,000 acre feet per year. SAWS has programmed 35,000 acre feet per year. Potential demand has exceeded supply during the first stage of this process. The second part of the process is actual negotiations with the potential customers which will result in service agreements. Service agreements will be finalized during October – November, 1998.

5.5 Recycled Water System
The attached figure indicates the general alignment of Phase One of the recycled water transmission system. This phase will deliver 35,000 acre feet of recycled water per year. Approximately 73 miles of transmission mains (42" to 12") will be installed plus associated on-line pumping and storage facilities. Estimated cost for Phase One is $81.4 million.

Phase Two includes provisions for future growth, branch interconnections, source interconnections, and treatment capability upgrades. This phase will provide redundancy in the system to ensure continued service. The alignments for Phase Two have not yet been determined. Candidates well suited to use recycled water are located to the west and north of Loop 1604. Analyses to determine the fate of nutrients through a turf study are underway and will be completed prior to extension of service onto the recharge zone.

5.6 Rates
The Water Recycling Program identifies two categories of customers: 1) those with an existing Edwards Aquifer well and a permit to pump Edwards Aquifer water; and 2) those with no Edwards Aquifer permit.

Edwards Exchange Customer – A customer who trades Edwards Aquifer pumping withdrawal rights in exchange for recycled water will pay a rate of $75 an acre foot for recycled water. This is approximately the current cost of producing an acre foot from the Edwards aquifer.
Existing and New Customers – Customers who are currently served by SAWS potable water system or new customers who desire recycled water service will pay SAWS a rate of approximately $275 an acre foot for recycled water. This rate is equal to existing general class rate for potable water.
6. Drought Management

San Antonio’s Aquifer Management Plan (AMP) is contained in Chapter 34, section of the City of San Antonio’s Code. It is a city ordinance and in addition, falls under the mandates of the Edwards Aquifer Authority as established in SB 1477. Attached to this document in Appendix D is the Aquifer Management Plan, Chapter 34 of the City Code.

The EAA’s rules have different levels of restrictions which are reflected in San Antonio’s AMP and referred to by the EAA as “Critical Periods”. Table 3 shows the various stages, the winter base multiplier for those stages and a transfer reduction coefficient for those stages. The winter base multiplier is founded on the concept that winter months of 1995 and 1996 represented a baseline usage throughout the Edwards region. Each of these multipliers puts a specific limit on monthly pumpage during a declared critical period based on the average daily pumpage of the winter of 1995 and 1996. In SAWS’ case, the winter baseline average is 134.7 million gallons a day. This number, when multiplied by the various baseline multipliers provides the monthly pumping limit for each of the stages. The various reduction stages of the AMP are triggered in San Antonio by the height above mean sea level of the J-17 index well. This particular well has been chosen for its high correlation with the index well levels and springsflow at the Comal Springs in New Braunfels.

<table>
<thead>
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<th>J-17 Well Level</th>
<th>Reduction Stage</th>
<th>Maximum Allowable Withdrawals</th>
<th>Transfer Multiplier</th>
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<td>650</td>
<td>I</td>
<td>1.7 x base withdrawals</td>
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<td>Emergency Springflow Conditions</td>
<td>*15% reduction of interim permit amount</td>
<td>.85*</td>
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</table>

*Proposed

As the EAA moves to formally permit water rights, critical period management restrictions are likely to be calculated differently. Instead of using baseline multipliers, restrictions are likely to be based upon a percentage of the permitted water right. The transfer rules as reflected in Table 3 already contain the concept that water rights which are transferred to a recipient can be reduced during the critical period stages by a transfer multiplier as listed in the table. This will reduce pumpage during those particular stages. The EAA also allows for the additional acquisition of rights to make up the difference in the reduction. This should lead to overall reduction in pumpage, since in order to have enough water to handle pumpage demands during a drought, a purveyor would acquire excess additional water rights, thus taking them out of use for agricultural or some other municipal/industrial use in an amount larger than anticipated demand. This will result in an overall reduction of pumpage across the aquifer during critical period stages.

In Figure 8, a graph is shown of the most recent drought summer, the summer of 1996 in which aquifer levels at the index J-17 well fell to 627.5 msl on June 23, 1996. The
average monthly levels of the aquifer and SAWS' average monthly pumpage are illustrated.

Figure 8

The 1996 drought management had an impact on overall pumping. It moved the daily peaks to weekend days by limiting outdoor watering to Saturdays and Sundays. The shift in peak pumping resulted in stresses to water mains, and storage capacity in the system. As a result, watering restrictions have been revised in the current Aquifer Management Plan (See Appendix D). Watering days are spread over the entire week by limiting each address by its last digit to one of five days each week during Stage 3.

San Antonio's Aquifer Management Plan meets all the requirements for a drought contingency plan as listed in Chapter 288 30 TAC. It includes public involvement, as specified in City of San Antonio Code, Section §34-326. The minimum requirements, including the initiation and termination of drought stages, are found in with Sections §34-319, §34-322, and §34-324. The Aquifer Management Plan specifies four stages, in Section §34-322, and identifies the specific restrictions implemented under each stage in Sections §34-322 and §34-323 as well as Section §34-332. Variances are granted to water users who apply and comply with the requirements listed in Section §34-332. Sections §34-326, §34-328, and §34-329 identify the procedures for the enforcement of water use restrictions. The Chapter 34 sections cited above are all located in Appendix D.
7. Public Input

The San Antonio Water System strongly believes in the importance of public involvement and public input in all water resource programs and policies including in the development of conservation programs, the Aquifer Management Plan and the Water Recycling Program for the City. Included in this public involvement and participation process are numerous different facets.

The City of San Antonio has incorporated drought management measures in its City Code since 1984. The specific water use restrictions have been amended over the years, based on input from the general public and affected water users such as the green industry, car washes, community associations, and other water-intensive users. Additionally, lessons learned during critical periods have also led to amendments to the drought plans.

The most recent drought response plan, the Aquifer Management Plan (AMP), was passed by the City Council of San Antonio in April, 1997. It was patterned after both the existing city plan and the Critical Period Management Rules of the Edwards Aquifer Authority. Both plans resulted from extensive work with affected user groups and the general public. Specifically, the AMP incorporated suggestions received during the 1995-1996 drought as well as water use reduction measures recommended by specific industries. The AMP was approved by the SAWS Board of Trustees at a public meeting and forwarded to the City Council where the provisions were adopted by ordinance.

The Community Conservation Committee (CCC) was created in February 1997 for a one-year term. It was re-appointed in May of 1998 for a two-year term. Through the working groups and task forces of the CCC, detailed discussions are held regarding various elements of the conservation programs and plan. The original CCC came up with a series of recommendations to the SAWS Board. Many are the core of the new commercial conservation programs that were launched in the spring of 1998.

The 1997 CCC recommendations are listed in Appendix A. A number of a public meetings were hosted by the CCC in which the public was given an opportunity to provide comments regarding the 1998 Conservation and Reuse Plan. The transcripts of comments made at those meetings plus six written comments that were received by September 14, 1998 are listed in Appendix E.

The draft plan was published and distributed to the public, including interested persons that attended SAWS public information fairs and those who expressed an interest to SAWS regarding conservation issues. It also was distributed at local public libraries and comments were sought through September 14, 1998.

When revisions are made to the AMP, San Antonio’s drought management plan, Appendix D, public hearings will be held. At least twice in the next five years there will be revisions to the AMP. The first time will be following the EAA’s creation of a Stage V or Aquifer Springflow Emergency Stage, in the fall of 1998. The second revision is expected to occur in the year 2000 or 2001, when the final pumping permit amounts are determined and the EAA’s Critical Period Rules are changed to reflect the new permitted water rights structure.
APPENDIX A

CCC RECOMMENDATIONS
APPENDIX A
1997 COMMUNITY CONSERVATION COMMITTEE SUMMARY

The original Community Conservation Committee (CCC) was appointed to a one-year term by the San Antonio Water System Board of Trustees on February 4, 1997. The CCC was comprised of more than 85 members representing a broad cross-section of community interests. Its goal was to act as a vehicle promoting water conservation and conservation practices among the population of San Antonio and Bexar County. The 1997 CCC was representative of diverse interests in our community who have voluntarily shown leadership in the conservation of water. Its composition reflected the need for all sectors of the community to contribute to demand reduction through conservation.

- It was organized into four work groups representing Institutions, Government/Military, Civic/Social/Environmental, and Business/Industry interests. In addition, there was a Landscape task force.

- A Steering Committee of 12 members equally representing the work groups was selected from the membership. The Steering Committee provided direction and coordination among the work groups. The Steering Committee reported to the San Antonio Water System Board of Trustees, through the Chairperson, on the activities of the work groups.

- The San Antonio Water System Board of Trustees appointed Bill Sartor (local businessman) as Chairperson of the CCC at its June 3, 1997 meeting. As Chairperson, he was the spokesperson for the CCC and kept the Board informed on the activities of the Committee.

- On October 21, 1997, the CCC presented to the SAWS Board of Trustees recommendations from the Government/Military, Business/Industry, and Institutions work groups, relating to the creation of new commercial conservation programs and a fee structure to support them.

- On January 20, 1998, the CCC presented to the SAWS Board of Trustees recommendations from the Civic/Social/Environmental group, relating to the creation of non-residential programs.

The consensus points presented in this final report include recommendations for the implementation of the commercial certification programs; new and expanded residential programs; enhancements to landscape and outdoor conservation; and the structure and goals for a newly appointed CCC.
RECOMMENDATIONS OF THE COMMUNITY CONSERVATION COMMITTEE:

• Commercial Conservation Incentive Program
  A.
  1. The general class customers should have a Conservation Incentive Program funded by dedicated revenues generated by general class customers.

  2. The general class conservation fund should be generated through a graduated fee based on meter size charged to all general class customers.

  3. The general class conservation fee should be designed to raise $20.3 million over 10 years, to provide the programs listed below for general class customers.

  4. The San Antonio Water System should sponsor a Watersaver Certification Program for its schools, businesses, manufacturers, military bases, non-profits, government agencies and others who initiate conservation programs with demonstrable water savings.

  5. In recognition of the need for stewardship of our shared resources, the San Antonio Water System Watersaver Certification Program should be designed to be used by other water purveyors and users of the Edwards Aquifer.

  6. The San Antonio Water System should provide incentives in the form of rebates to manufacturers, hotels, apartments, and all general class customers who retrofit high-water use equipment with low-flow equipment such as low-flow toilets or horizontal axis washing machines, or install low water use landscaping. Large scale retrofit rebates should be considered on a case-by-case basis.

  7. The San Antonio Water System should expand its educational efforts to the business and government communities by providing workshops on water conservation techniques and equipment to restaurant and hotel managers, engineers, apartment managers, and other general class customers.

  8. The San Antonio Water System should provide assistance to business owners in performing a water use self-audit and provide audits to large scale users, such as manufacturers and other general class customers using more than 150,000 gallons of water per month. The audits should be performed by accredited professionals on a shared-cost basis.

  9. The San Antonio Water System should provide educational materials to businesses and apartments for employees and apartment tenants including water conservation information which is useful both at work and in the home.

  10. The program should be implemented in an accelerated fashion.
B. The San Antonio Water System staff should be instructed to prepare and present a recommendation to the San Antonio City Council for implementation of a conservation fee to all general class customers of the San Antonio Water System to fund the general class Conservation Incentive Program.

- **Residential Programs**
  1. Develop and adopt a plan to study residential water use patterns, specifically identifying locations for future watersaver demonstration sites near high water use neighborhoods.

  2. Work with community partners to designate sites (i.e., neighborhood associations, Parade of Homes, Habitat for Humanity) to be developed as watersaver demonstration landscapes using established criteria and partnerships with local businesses.

  3. Continue partnerships to develop watersaver irrigation techniques (i.e., Evapotranspiration Project).

  4. Put in place an annual community activity to take place on or near summer solstice to promote conservation through the effective use of mulch in landscaping.

  5. Disseminate information through a variety of different media (i.e., local media, neighborhood newsletters) targeting neighborhood associations and residential water users, trade associations, chambers of commerce and municipalities. Information should be distributed in a timely manner in conjunction with peak water use periods.

  6. Establish partnerships with local nurseries, neighborhood groups, community organizations, military and government organizations, and the media to continually promote indoor and outdoor water conservation initiatives and activities.

  7. Use positive reinforcement on SAWS water bills (i.e., positive messages for low water users, conservation ideas, etc.). Avoid negative messages in promoting water conservation.

  8. Develop a mechanism for gathering "success stories" of water saving techniques from the community at large. SAWS should utilize information to improve its conservation program and to promote and educate the community on water conservation practices utilizing a variety of different media (i.e., local media, neighborhood newsletters).

  9. Recognize residential and commercial watersaver landscapes and water harvesting systems and promote demonstration sites and public/government/military watersaver sites.

  10. Establish a residential audit program.

  11. Establish a program to distribute conservation kits door-to-door. Consider utilizing volunteer groups and other innovative methods (i.e., neighborhood associations, youth groups, etc.) to distribute the kits.
12. Establish a fifth rate block for residential users at 24,688 gallons per month. Funds generated should be dedicated to accelerating conservation programs.

- **Landscape and Outdoor Conservation Programs**
  1. Existing ordinances such as the Tree Preservation Ordinance and the Landscape Ordinance should be assessed to determine if and how they impact water conservation. All new San Antonio ordinances which may impact water resources should be coordinated with SAWS staff so they do not negatively impact water conservation or degrade water quality and in fact encourage water conservation and the preservation or improvement of water quality.

  2. Provide fact sheets that licensed irrigators and others (e.g. nurseries, landscape architects, etc.) can distribute to their customers to encourage them to install rain sensors on automatic irrigation systems. Provide a rebate for someone installing rain sensors on an existing irrigation system.

  3. Require sub-meters for landscaping on new commercial and residential properties with irrigation systems.

  4. Promote programs and policies which take a long-term approach to development that results in water conservation and water quality preservation.

  5. Watersaver Landscape Programs should have program elements of education, recognition, and incentives.

  6. Programs should reserve the greatest incentives and recognition for actions which first preserve natural habitat, along a continuum of water use to occasionally irrigated xeriscapes. Education programs should be developed to support this concept. Programs designed under this recommendation should take into consideration land use best management practices when assessing existing plants on a particular property.

  7. Where supplemental irrigation is used, require drip irrigation systems in rights-of-way, including medians and traffic islands where there is vegetation, narrow strips of vegetation in parking lots, and other areas where spray or rotary heads would result in water spraying onto the paved area.

- **Recommended Structure and Goals for Future Committee**
  1. Maintain a long-term commitment to water conservation and ensure public input through the reappointment of the Community Conservation Committee.

  2. The re-appointed CCC should be structured as a 12-15 member steering committee representing a cross-section of stakeholders which meets on a monthly basis and an expanded group of ambassadors or partners which meets on a quarterly basis. Working groups and taskforces (i.e., residential, commercial, landscape) will be comprised of members from the steering committee and partners group, as needed, for specific issues or projects.
3. The interactive process with the public and the conservation goals of the programs will be best served if the new staff funded by the commercial conservation fee are placed and remain in the SAWS Conservation Division in the Planning Group during the initial years of the programs.

4. Among its tasks, the new CCC should give input on the progress of the design and implementation of the new commercial conservation programs. As the programs develop, the CCC’s advice should be sought before modifications of the programs are implemented.

5. The Landscape Taskforce should be re-appointed, as part of the CCC, and include a broad-based coalition of stakeholders, including neighborhoods, green industry representatives, developers and builders, architects, commercial interests, environmental groups, and governmental agencies. The two primary tasks of the Landscape Taskforce should be to:

   a. Assess the Landscape Ordinance, the Tree Ordinance, and other ordinances to determine their effect on water conservation.

   b. Study the concept of creating criteria for “conforming” and “non-conforming” landscapes for all properties as an incentive for retrofitting and installing new landscaping which uses appropriate landscaping material and, if irrigation is necessary, is irrigated efficiently year-round. Pending approval of the Edwards Aquifer Authority, conforming properties would have a different set of watering limitations when irrigation restrictions go into effect.
APPENDIX B

SAWS WEB PAGE
Appendix B

THE DAILY READING FROM THE BEXAR COUNTY INDEX WELL (J17) AND SAW'S DAILY PUMPAGE ARE PROVIDED FOR YOUR REFERENCE. IF YOU HAVE ANY QUESTIONS PLEASE CALL CHRIS POWERS 210-704-7396.

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1998 Pumpage To Date 32,288.40MG
1998 Average Daily Pumpage 167.30MG
1998 Rainfall To Date 10.86"
1998 Departure from normal -5.69"

Minimum 1997 Comal Spring Flow 192 cfs 01/30/97
Maximum 1997 Comal Spring Flow 340 cfs 12/20/97

EDWARDS LEVEL will be posted sometime between 9:30am and noon.
EDWARDS AUTHORITY phone number is 222-2204, or you may link to
their website at www.e-aquifer.com

http://saws.org

Minimum Edwards Level
Historic 612.5' 08/17/56
1997 648.7' 02/05/97
1998 640.8' 06/29/98
Maximum Edwards Level
Historic 703.3' 06/14/92
1997 677.9' 06/30/97
1998 681.5' 03/24/98

41
APPENDIX C

SAWS WATER RATES
APPENDIX C
SAN ANTONIO WATER SYSTEM
SAN ANTONIO, TEXAS

RESIDENTIAL WATER AND SEWER RATE SCHEDULES
Effective 12:01 a.m., September 1, 1994
Ordinance No. 80330 dated June 16, 1994

WATER

The Monthly Meter Charge (minimum bill) for all residential water service INSIDE THE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

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<td>Over 17,205</td>
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The Monthly Meter Charge (minimum bill) for all residential water service OUTSIDE THE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

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<td>Next 4,488</td>
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<td>Over 17,205</td>
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The Volume Charge "Seasonal" Rate Per 100 Gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge "Standard" Rate Per 100 Gallons shall be utilized.

SEWER

Sewer service charges for all metered residential connections are computed on the basis of average water usage for 90 days during three consecutive billing periods beginning after November 15 and ending on or about March 15 of each year and are billed according to the rate schedules below.

INSIDE CITY LIMITS (ICL)

First 1,496 gallons, Minimum Charge $5.70
Over 1,496 gallons, $ 0.1526 per 100 gallons

OUTSIDE CITY LIMITS (OCL)

First 1,496 gallons, Minimum Charge $6.84
Over 1,496 gallons, $ 0.1831 per 100 gallons

New customers or customers moving from one location to another who would not have a winter record of water usage will be billed an Unaveraged Residential Charge of $15.97 per month.
SAN ANTONIO WATER SYSTEM  
SAN ANTONIO, TEXAS  

GENERAL WATER AND SEWER RATE SCHEDULES  
Effective 12:01 a.m., April 1, 1998  
Ordinance No. 87043 dated December 1, 1997  

WATER

The Monthly Meter Charge (minimum bill) for all general water service INSIDE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

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<td><strong>Seasonal</strong></td>
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The Volume Charge "Seasonal" Rate Per 100 Gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge "Standard" Rate Per 100 Gallons shall be utilized.

The Monthly Meter Charge (minimum bill) for all general water service OUTSIDE THE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

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<tr>
<td><strong>Standard</strong></td>
<td><strong>Seasonal</strong></td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>$ 9.67</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>12.44</td>
</tr>
<tr>
<td>1&quot;</td>
<td>16.04</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>25.10</td>
</tr>
<tr>
<td>2&quot;</td>
<td>36.52</td>
</tr>
<tr>
<td>3&quot;</td>
<td>98.21</td>
</tr>
<tr>
<td>4&quot;</td>
<td>144.01</td>
</tr>
<tr>
<td>6&quot;</td>
<td>272.75</td>
</tr>
<tr>
<td>8&quot;</td>
<td>412.08</td>
</tr>
<tr>
<td>10&quot;</td>
<td>566.76</td>
</tr>
<tr>
<td>12&quot;</td>
<td>705.29</td>
</tr>
</tbody>
</table>

The Volume Charge "Seasonal" Rate Per 100 Gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge "Standard" Rate Per 100 Gallons shall be utilized.

SEWER

Sewer service charges are computed from the water usage schedules below for all metered connections.

**INSIDE CITY LIMITS (ICL)**
- First 1.496 gallons - Minimum Charge $6.40
- Over 1.496 gallons - $0.1489 per 100 gallons

**OUTSIDE CITY LIMITS (OCL)**
- First 1.496 gallons - Minimum Charge $7.68
- Over 1.496 gallons - $0.1787 per 100 gallons
SAN ANTONIO WATER SYSTEM  
SAN ANTONIO, TEXAS  

RECYCLED WATER SCHEDULES  
Effective 12:01 a.m., April 5, 1998  
Ordinance No. 87597 dated March 26, 1998  

The Monthly Meter Charge (minimum bill) for all general recycled water service furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

(a) For Edwards Exchange Customers

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Net Meter Charge</th>
<th>Gross Meter Charge</th>
<th>Step in Gallons</th>
<th>Rate Per 100 Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8&quot;</td>
<td>$8.00</td>
<td>$8.40</td>
<td>Transferred amount</td>
<td>$0.0230</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>10.40</td>
<td>10.92</td>
<td>All in excess of Transfered amount</td>
<td>$0.0917</td>
</tr>
<tr>
<td>1&quot;</td>
<td>13.55</td>
<td>14.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>21.55</td>
<td>22.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>31.51</td>
<td>33.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot;</td>
<td>83.81</td>
<td>88.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td>124.56</td>
<td>130.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>237.61</td>
<td>249.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>358.16</td>
<td>376.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&quot;</td>
<td>491.12</td>
<td>515.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12&quot;</td>
<td>605.96</td>
<td>635.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Volume Charge “Seasonal” Rate Per 100 Gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge “Standard” Rate Per 100 Gallons shall be utilized.

(b) For Existing Customers

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Net Meter Charge</th>
<th>Gross Meter Charge</th>
<th>Step in Gallons</th>
<th>Rate Per 100 Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8&quot;</td>
<td>$8.00</td>
<td>$8.40</td>
<td>Transferred amount</td>
<td>$0.0230</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>10.40</td>
<td>10.92</td>
<td>All in excess of Transfered amount</td>
<td>$0.0917</td>
</tr>
<tr>
<td>1&quot;</td>
<td>13.55</td>
<td>14.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>21.55</td>
<td>22.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>31.51</td>
<td>33.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot;</td>
<td>83.81</td>
<td>88.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td>124.56</td>
<td>130.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>237.61</td>
<td>249.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>358.16</td>
<td>376.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&quot;</td>
<td>491.12</td>
<td>515.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12&quot;</td>
<td>605.96</td>
<td>635.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Volume Charge “Seasonal” Rate Per 100 Gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge “Standard” Rate Per 100 Gallons shall be utilized.
SAN ANTONIO WATER SYSTEM
SAN ANTONIO, TEXAS

WHOLESALE RATE SCHEDULES
Effective 12:01 a.m., September 1, 1994
Ordinance No. 80330 dated June 16, 1994

The Monthly Meter Charge (minimum bill) for all wholesale water service INSIDE THE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Meter Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>$226.53</td>
</tr>
<tr>
<td>8&quot;</td>
<td>339.80</td>
</tr>
<tr>
<td>10&quot;</td>
<td>453.08</td>
</tr>
<tr>
<td>12&quot;</td>
<td>645.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step in gallons</th>
<th>Rate Per 100 gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 748,100</td>
<td>Standard: $0.0569</td>
</tr>
<tr>
<td></td>
<td>Seasonal: $0.0648</td>
</tr>
<tr>
<td>All in excess of 748,100</td>
<td>0.0633</td>
</tr>
<tr>
<td></td>
<td>0.0712</td>
</tr>
</tbody>
</table>

The Volume Charge "Seasonal" Rate Per 100 gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge "Standard" Rate Per 100 gallons shall be utilized.

The Monthly Meter Charge (minimum bill) for all wholesale water service OUTSIDE THE CITY LIMITS of San Antonio furnished through meters of the following sizes together with the Monthly Volume Charge measured per 100 gallons for water usage in every instance of service for each month or fraction thereof shall be as follows:

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Meter Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>$294.49</td>
</tr>
<tr>
<td>8&quot;</td>
<td>441.74</td>
</tr>
<tr>
<td>10&quot;</td>
<td>588.99</td>
</tr>
<tr>
<td>12&quot;</td>
<td>839.29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step in gallons</th>
<th>Rate Per 100 gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 748,100</td>
<td>Standard: $0.0741</td>
</tr>
<tr>
<td></td>
<td>Seasonal: $0.0842</td>
</tr>
<tr>
<td>All in excess of 748,100</td>
<td>0.0823</td>
</tr>
<tr>
<td></td>
<td>0.0926</td>
</tr>
</tbody>
</table>

The Volume Charge "Seasonal" Rate Per 100 gallons shall be applied to all billings beginning July 1 and ending on or about October 31 of each year. At all other times the Volume Charge "Standard" Rate Per 100 gallons shall be utilized.

"Wholesale water service will not be provided through a meter smaller than 6" in order to comply with fire-flow requirements and the "Criteria for Water Supply and Distribution in the City of San Antonio and its Extraterritorial Jurisdiction."

SEWER

INSIDE CITY LIMITS (ICL)

Wholesale: $0.1362 per 100 gallons of contributed wastewater. ($1.03 per 100 cubic feet)

The entity sewer service charges as set forth above establish inside city limits of San Antonio entity customers as a customer class with rates computed for the class as a whole.

OUTSIDE CITY LIMITS (OCL)

Wholesale: $67.00/month billing fee plus $0.1467 per 100 gallons of contributed wastewater. ($1.0976 per 100 cubic feet)

The entity sewer service charges as set forth above establish outside city limits of San Antonio entity customers as a customer class with rates computed for the class as a whole.
APPENDIX D

AQUIFER MANAGEMENT PLAN
the EPA's rules and regulations shall be facilitated and coordinated by the board; however, such program shall not be deemed to be a part of the "system" as that term is defined in City Ordinance No. 75686, approved and adopted April 30, 1992. All revenues and expenses and other accounts related to the stormwater program shall be accounted for on a full cost of service basis separate and apart from all other funds for which the board has responsibility.

(2) No later than one (1) year prior to the expiration of the initial permit issued by the EPA, city council shall reevaluate this section and determine whether such utility shall become a part of the "system" as that term is defined in City Ordinance No. 75686.

(f) Repayment of stormwater expenses. Funds advanced by the wastewater system for stormwater or drainage plans, programs, and services in an approximate amount of five million dollars ($5,000,000.00) to support the stormwater program shall be repaid from revenues generated by stormwater rates over a period not to exceed five (5) years from the effective date of this section. Once the specific amount of dollars expended by the wastewater system for stormwater or drainage plans, programs, and services has been finally determined, such specific amount is hereby authorized to be substituted for the approximate amount of five million dollars ($5,000,000.00) set out herein.

(Ord. No. 77949, §§ 1—6, 5-13-93)
Editor's note—Ord. No. 77949, §§ 1—6, adopted May 13, 1993 has been included herein at the discretion of the editor as § 34-235.

Secs. 34-236—34-270. Reserved.

ARTICLE IV. WATER CONSERVATION
AND REUSE*

DIVISION 1. GENERALLY
Secs. 34-271—34-286. Reserved.

*Editor's note—Ord. No. 80574, § 14, adopted Aug. 4, 1994, repealed former Art. IV, §§ 34-271—34-283, relative to liquid waste transportation and disposal regulations, which derived from Ord. No. 64987, adopted May 7, 1987; and Ord. No. 69740, adopted June 29, 1989. Said Ord. No. 80574 enacted new provisions regarding similar subject matter which have been included in this chapter as Division 4 of Article V, § 34-511 et seq.

DIVISION 2. WASTING WATER

Sec. 34-287. Wasting water.

(a) It shall be unlawful for any person within the city to waste water.

(b) Definitions. As used in this section the following terms shall mean:

Air-conditioning, air-conditioning system or air-conditioning installation shall mean and apply to one (1) or more air-conditioning units used primarily for human comfort cooling, and shall be considered on the basis that one (1) compressor motor horsepower is equal to one (1) ton of refrigeration.

Maximum degree of beneficial use shall mean the use of water under means and by methods of conservation as set out in this section so that only that amount of water as is actually and necessarily required for a specific purpose be used by the consumer or inhabitant.

Recirculation shall not include or permit discharge of water into any well or underground cave or crevice or other underground water stratum.

Waste shall mean causing, suffering, or permitting a flow of water, if derived from any private well of more than two hundred (200) feet in depth or from a water main, to run into any river, creek or other natural water course or drain, superficial or underground channel, bayou, or into any sanitary or storm sewer, any street, road or highway, or upon the lands of another person or upon public lands, without first having obtained the maximum degree of beneficial use thereof.

Water regulating valve shall mean a regulating valve, the purpose of which is to limit the maximum use of water to a predetermined rate.

Water conserving device shall mean a cooling tower, spray pond, evaporative condenser or other equipment by which water is cooled and recirculated, thereby limiting the use of water to that amount lost through evaporation.

(c) Enforcement and penalties, generally.

(1) Inspections and enforcement. The inspection division of the department of public

Supp. No. 36  2450
works and all persons employed by such inspection division shall, at all reasonable hours, have free access to premises wherein any air-conditioning system, refrigeration system or evaporative water cooling system or units are installed, used and operated, or where water is being used for any purpose from any main or from any well of depth greater than two hundred (200) feet below ground surface to examine such equipment and to ascertain if there is more water being used than allowed by this section and whether or not the provisions of such sections have been, and are being, complied with in all respects.

(2) Access to premises. The chief of police and all persons employed by and in the police department of the city shall, at all reasonable hours, have free access to all premises using water for watering of lawns, shrubs and trees, and for swimming pools to ascertain whether or not the provisions of this section have been, and are being, complied with in all respects.

(3) Penalties. Any person violating any provision of this section shall be guilty of a misdemeanor, and upon conviction thereof shall be liable to a fine as provided in section 1-5 of this Code.

(4) Continued violations. At locations of repeated or continued violations, the inspection division of the department of public works shall have the authority to order the city waterworks board of trustees to discontinue the supply to the violator of water from city mains.

(5) Nuisance declared. The violation of any part of this section shall be a nuisance which may be abated and enjoined by the city.

(d) Regulated activities.

(1) Car wash fundraisers.

a. Defined. Any special-purpose car wash activity or event, at which automobiles and other motorized vehicles are washed, and any money collected, regardless whether through donations or fees, whether held for profit, for charity, or for any other purpose, or whether the sponsor of the event is a for-profit or non-profit organization.

b. Activity prohibited. It shall be unlawful and a violation of this division, as well as a violation of Article VI, Division 5, section 34-702, for any person, organization, or business to operate any car wash fundraiser within the city, unless such car wash fundraiser is held at a licensed, permanent car wash facility which is equipped with properly operating water conserving and/or reuse equipment, and unless the car wash fundraiser activity utilizes that equipment.

c. Enforcement and penalties.

1. Presumption.

(i) Sponsor. For purposes of this section, it shall be presumed that any person, organization, or business (including school or religious institution) with whom the offending person, organization or business is affiliated or in whose name the offending person, organization or business is operating the prohibited activity ("sponsor"), has knowingly used, caused to be used, or permitted to be used the water in a manner contrary to any provision of this section 34-287(d)(1).

Proof of the offending person's, organization's or business's affiliation with or operation in the name of the defendant-sponsor named in the criminal complaint filed pursuant to this section shall constitute in evidence a prima facie presumption that the sponsor is a person who permitted or caused illegal ad hoc car wash activity to occur.

(ii) Person, organization or business permitting water use. For
purposes of this section, it shall be presumed that any person, organization, or business, in whose name a water meter connection is registered with the water purveyor servicing the property, has knowingly used, caused to be used, or permitted to be used the water in a manner contrary to any provision of this section 34-287(d)(1). Proof that the particular premises has a water meter connection registered in the name of the defendant named in the criminal complaint filed pursuant to this section shall constitute in evidence a presumption that the person in whom such water connection is registered is a person who permitted or caused illegal ad hoc car wash activity water to occur on the premises.

2. **Penalties.** Any person violating any provision of this section 34-287(d)(1) shall be guilty of a misdemeanor, and upon citation thereof and conviction thereof, shall be liable to a fine not exceeding five hundred dollars ($500.00).

3. **Additional enforcement personnel.** The president/CEO of the San Antonio Water System is hereby authorized to designate qualified San Antonio Water System personnel to serve notices of violations of this section and take all necessary actions to file a complaint with the Municipal Prosecutor's Office.

(2) **Cooling systems.** It shall be unlawful for any person within the city to install, use or operate any individual or collective system of refrigeration or air-conditioning equipment in any premises except under the following conditions and specifications:

a. All installations of any such equipment of a total of over three (3) tons shall be equipped with a water conserving device such as an evaporative condenser, water cooling tower or other conserving or water recirculating device, which device shall not consume for makeup purposes in excess of five (5) percent of the water recirculated or of the consumption that would normally be used without such device.

b. All installations of such equipment of a total of three (3) tons or under not using recirculated water shall be provided with an automatic water regulating valve so as to limit the flow of water in relation to the condenser temperature reduction requirements of the apparatus. In no case shall such equipment use in excess of two (2) gallons of water per minute per ton capacity.

c. It shall be unlawful for any person using and operating any swimming pools, any refrigeration or air-conditioning equipment or installations using water from private wells of more than two hundred (200) feet in depth to cause, suffer, allow or permit water used by and in such equipment or installation to be returned or recirculated or drained back into such well or water source, either directly or indirectly.

d. Equipment used for a purpose other than air conditioning shall be considered on the basis that one (1) compressor motor horsepower is equal to six-tenths of a ton of refrigeration.

e. Refrigeration of air-conditioning equipment using illuminating gas for energy shall be rated on the basis that one (1) ton is equal to the removal of twelve thousand (12,000) British thermal units per hour with a twenty-five (25) degree differential Fahrenheit evaporating temperature and seventy-eight (78) degree Fahrenheit condensing temperature.

f. It shall be unlawful for any person within the city to use and operate any
evaporative water cooler heretofore used or operated, or hereafter installed, used or operated, which evaporative water cooler is designed to deliver one thousand eight hundred (1,800) or more cubic feet of air per minute unless it is equipped with:

1. A water recirculating device or pump; or
2. An automatic water regulating device or valve which automatically limits the flow of water to that amount lost through evaporation.

It shall be unlawful for any person within the city to sell or offer to sell any evaporative water cooler designed to deliver one thousand eight hundred (1,800) or more cubic feet of air per minute unless such evaporative water cooler, when sold, offered for sale or delivered, is equipped with a water recirculating device or pump, or automatic water-regulating device or valve.

(Ord. No. 17390, §§ 1—8, 3-20-52; Ord. No. 17692, § 1, 5-29-52; Code 1959, §§ 41-30—41-36; Ord. No. 80574, § 7, 8-4-94; Ord. No. 83703, § 1, 2-29-96)

Secs. 34-288—34-300. Reserved.

DIVISION 3. RESTRICTIONS ON LANDSCAPE WATERING

Sec. 34-301. Prohibited landscape watering methods.

It shall be a violation of this division for any owner or occupant, or for any person, individual, corporations or partnership in apparent control of any property in the City of San Antonio, intentionally, knowingly, recklessly, or criminally negligently to perform landscape watering or to allow or cause landscape watering on said property on any day between the hours of 10:00 a.m. and 8:00 p.m. or at any other time set out in Article IV, Division 4, Aquifer Management Plan, when additional restrictions on landscape irrigation may be in effect, by using individual sprinklers or sprinkler systems.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-302. Definitions.

For the purposes of this division the following words and phrases shall have the meaning given in this section:

Individua sprinklers or sprinkler systems. Any method or device used for the application of water on said property other than the methods and/or devices set out in section 34-304.

Landscape watering. The application of water to any member of the plant kingdom, including any tree shrub, vine, herb, flower, succulent, groundcover or grass species, that is growing or has been planted out of doors.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-303. Presumption.

For purposes of this section, it shall be presumed that any person, individual, corporation, or partnership in whose name a water meter connection is registered with the water purveyor servicing the property, has knowingly made, caused, used or permitted to be used the water in a manner contrary to any provision of this section. Proof that the particular premises has a water meter connection registered in the name of the defendant named in the criminal complaint filed pursuant to this section shall constitute in evidence a prima facie presumption that the person in whom such water connection is registered is a person who permitted or caused illegal landscape watering to occur on the premises.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-304. Permitted landscape watering methods.

The following methods of landscape watering are permitted at any time:

(a) Landscape watering with a hand held hose with a manual or automatic shut-off nozzle operated by one person;
§ 34-304

SAN ANTONIO CODE

(b) Landscape watering with a bucket having a holding capacity of five (5) gallons or less; and

(c) Landscape watering with a drip irrigation system. For purposes of this section, "drip irrigation" shall mean an automatic water-saving irrigation system (drip, porous pipe, etc.).

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-305. Defenses to prosecution.

(a) It shall be a defense to prosecution that landscape watering was performed on any plant or seed planted in or transplanted to an area within such period of time as to accomplish a reasonable establishment and maintenance of growth.

(b) It shall be a defense to prosecution that landscape watering was performed by those commercial enterprises in the business of growing or maintaining plants for sale, such as plant nurseries; provided, however, that such landscape watering shall be performed solely for the establishment, growth, and maintenance of such plants.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-306. Penalty provision.

(a) A criminal penalty is hereby established whereby any person who is duly convicted of a violation of any provision of this division shall be deemed to be guilty of a misdemeanor and shall, upon conviction, be punished by a fine not exceeding two hundred dollars ($200.00).

(b) The president/CEO of the San Antonio Water System is hereby authorized to designate qualified San Antonio Water System personnel to serve notices of violations of this section and take all necessary actions to file a complaint with the municipal prosecutor's office.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-307. Additional enforcement remedies.

In addition to any other remedies provided by this division, the City of San Antonio and SAWS may, at any time, seek legal and/or equitable remedies or file charges against any person, corporation or other entity believed to be in violation of this division. In furtherance thereof, the SAWS Legal Department is authorized and instructed to commence any action, in law or in equity, including the filing of criminal charges, deemed necessary for the purpose of enforcing this division.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-308. Severability.

If any provision of this division or the application thereof to any person or circumstance shall be held to be void or invalid for any reason, the remainder of this division and the application of such provision to other persons and circumstances shall nevertheless be valid, and the city council hereby declares that this division would have been enacted without such invalid provision.

(Ord. No. 80574, § 6, 8-4-94)

Sec. 34-309. Conflict.

No provision of this section is intended to, nor shall any part or portion thereof, be construed in such a manner as to conflict with the Texas Water Code.

(Ord. No. 80574, § 6, 8-4-94)

Secs. 34-310—34-315. Reserved.

DIVISION 4. AQUIFER MANAGEMENT PLAN

Sec. 34-316. Adoption of aquifer management plan, water use reduction measures, and aquifer stage conditions.

The aquifer management plan, including the water use reduction measures and associated aquifer stage conditions set out therein, is hereby adopted.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-317. Definitions.

Aesthetic use. The use of water for fountains, waterfalls, and landscape lakes and ponds where such use is entirely ornamental and serves no other functional purpose.
Agricultural irrigation. Irrigation for the purpose of growing crops commercially for human consumption or to use as feed for livestock or poultry.

Athletic field. A sports playing field, the essential feature of which is turf grass, used primarily for organized sports for schools, professional sports, or sanctioned league play.

Base usage. For a primary user who is not a conjunctive user, base usage shall mean the average monthly total underground water usage for the three (3) lowest months of November and December of 1995 and January and February of 1996. For a primary user who is a conjunctive user, base usage shall mean the average monthly total underground water usage for the three (3) lowest months of November and December and the following January and February during each of the three (3) consecutive twelve-month periods preceding the commencement of the primary user’s use of the non-Edwards Aquifer water which qualifies the primary user as a conjunctive user.

Beneficial use. The use of this amount of water that is economically necessary for a purpose authorized by law, when reasonable intelligence and reasonable diligence one used in applying the water for that purpose.

Bucket. Bucket or other container holding five gallons or less, used singly by one person.

Computer controlled irrigation system (CCIS). A system comprised of a computer controller (digital operating system), software, interface modules, satellite field controllers, soil sensors, weather station, or similar devices which is capable of achieving maximum efficiency and conservation in the application of water for irrigation. A CCIS, at a minimum, should be designed to (i) prevent over watering, flooding, pooling, evaporation and run-off; and, (ii) prohibit sprinkler heads from applying water at an intake rate exceeding the capability of the soil.

Drip irrigation. An automatic water-saving irrigation system (drip, porous pipe, etc.).

Evapotranspiration rate (ET Rate). The rate in which both the combination of evaporation from soil surface and transpiration from vegetation will occur for specific climatic conditions.

Existing landscaping plant. A landscaping plant existing in an area after such period of time as to accomplish an establishment and maintenance of growth.

Golf course. An irrigated and landscaped playing area made up of greens, tees, fairways, roughs and related areas used for the playing of golf.

Hand-held hose. A hose attended by one person, fitted with a manual or automatic shutoff nozzle.

Health care facility. Any hospital, clinic, nursing home or other health care or medical research facility.

Household use. The use of water, other than uses in the outdoor category, for personal needs or for household purposes, such as drinking, bathing, heating, cooking, sanitation or cleaning, whether the use occurs in a residence or in a commercial or industrial facility.

Impervious surface area. Any structure or any street, driveway, sidewalk, patio or other surface area covered with brick, paving, tile or other impervious material.

Industrial use. The use of water for or in connection with commercial or industrial activities, including manufacturing, bottling, brewing, food processing, scientific research and technology, recycling, production of concrete, asphalt, and cement, commercial uses of water for tourism, entertainment, and hotel or motel lodging, generation of power other than hydroelectric, and other business activities.

Irrigation suspension program (ISP). A program administered by the Edwards Aquifer Authority pursuant to which agricultural irrigators within the Edwards Aquifer Authority’s boundaries voluntarily agree to suspend some irrigation use of the underground water from the Edwards Aquifer in consideration for payments voluntarily funded by ISP participants.
Landscape renovation. The removal and replacement of existing landscape plants with new landscaping plants.

Landscape watering. The application of underground water to grow or maintain landscaping plants, such as flowers, ground covers, turf or grasses (other than golf courses or athletic fields), shrubs, and trees, but for purposes of this chapter does not include:

1. Essential use without waste of underground water by a commercial nursery to the extent the water is used for production rather than decorative landscaping;

2. Application of underground water without waste to a noncommercial family garden or orchard the produce of which is for household consumption only; and

3. Application of underground water in the morning before 10:00 a.m. and in the evening after 8:00 p.m. by means of a bucket (not to exceed five (5) gallons in capacity), hand-held hose, soaker hose, or properly installed drip irrigation system, immediately next to a concrete foundation solely for the purpose of preventing, and to the extent the watering is necessary to prevent substantial damage to the foundation or the structure caused by movement of the foundation.

Landscaping plant. Any member of the kingdom plantae, including any tree, shrub, vine, herb, flower, succulent, groundcover or grass species, that grows or has been planted out-of-doors.

Livestock. Cattle, sheep, goats, hogs, poultry, horses, and game, domestic, exotic and other animals and birds, including zoo animals, used for commercial or personal purposes.

Livestock use. The use of water for drinking by or washing of livestock.

Maintenance level. The level of water in a swimming pool required for proper operation of circulation and filter equipment for the swimming pool.

msl. Elevation above mean sea level.

Mulch. Any material such as bark, leaves, straw or other materials left loose and applied to the soil surface to reduce evaporation.

New landscaping plant. Any plant or seed planted in or transplanted to an area within such period of time as to accomplish a reasonable establishment and maintenance of growth. Application of grass seed to an existing stand of grass or turf is not considered new landscaping for the purposes of this chapter.

Organic material. Organic substances in differing stages of decay.

Other outdoor use. The use of water outdoors for the maintenance, cleaning and washing of structure and mobile equipment, including automobiles and boats, and the washing of streets, driveways, sidewalks, patios and other similar areas.

Park. A tract of land, other than a golf course, maintained by a city, private organization, or individual, as a place of beauty or of public recreation.

Person. An individual, corporation, organization, government or governmental subdivision or agency, business trust, estate, trust, partnership, association, and any other legal entity.

Pervious surface. Any ground surface which can absorb water or other liquids.

Power production use. The use of water for steam generation and the use of water for cooling and for replenishment of cooling reservoirs.

Private residential swimming pool. (See "Swimming pool").

Property address. Property address means the street address of a property, unless multiple street addresses are served by a single meter, in which case the billing address will be used.

Public. Municipally-owned or operated facilities.

Public swimming pool. (See "Swimming pool").

Soil amendment. An addition to soil containing one-third (1/3) sand and two-thirds (2/3) organic material.
Soil holding capacity. The amount of moisture in the soil that can occur without becoming saturated.

Swimming pool. Any structure, basin, chamber, or tank including hot tubs, containing an artificial body of water for swimming, diving, or recreational bathing, and having a depth of two (2) feet or more at any point.

(a) Private residential swimming pool. Any swimming pool located on private property under the control of the homeowner, the use of which is limited to swimming or bathing by the homeowner's family or invited guests.

(b) Public swimming pool. Any swimming pool, other than a private residential swimming pool, intended to be used collectively by persons for swimming or bathing, operated by any person as defined herein, whether owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for such use. The term includes, but is not limited to, apartment community pools, condominium association pools and community association pools.

TDS. Total dissolved solids.

Turf. A surface layer of earth containing mowed grass with roots.

Vegetable garden. Any "non-commercial" vegetable garden planted primarily for household use; "non-commercial" includes incidental direct selling of produce from such a vegetable garden to the public.

Waste, includes, but is not limited to, allowing water to run off into a gutter, ditch or drain, or failing to repair a controllable leak.

Water utility use. Water used for withdrawal, treatment, remediation, transmission and distribution by potable water system.

Watering day. A day designated for landscape watering limited to the morning hours from midnight to 10:00 a.m. and the evening hours from 8:00 p.m. to midnight. Thus, if Saturday is a designated watering day, the period of time referenced is Saturday morning between 12:00 a.m. to 10:00 a.m., and Saturday evening between 8:00 p.m. and midnight.

Zonal irrigation system. An irrigation system which segregates by station areas of shrubs, ground cover, bedding plants, and turf to accommodate a diversity of watering requirements.

(Ord. No. 83860, § 2, 3-28-96; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-318. Bases of water use reduction measures and aquifer stage conditions.

The water use reduction measures shall be based on the aquifer stage conditions (see section 34-322, "Trigger Levels"). The aquifer stage conditions shall be based on the Edwards Aquifer water levels in Well AY-68-37-203 in San Antonio (also known as "Dodd Field Test Well" or "J-17") as set out in section 34-322, except that Stage IV need not be based on such water levels but may instead be based on aquifer water quality or on other aquifer, seasonal or weather conditions not based on water levels in J-17 (set out in section 34-324).

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 83860, § 3, 3-28-96; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-319. Implementation of water use reduction measures and stages, generally.

The water use reduction measures shall be declared to be in effect when the aquifer level at J-17 falls to six hundred fifty (650) feet msl. Each stage of the water use reduction measures shall be automatically implemented when the aquifer water in J-17 reaches the "trigger levels" set out in sections 34-322 through 34-324. Specific water use reduction measures are set out in Table I of this division and shall cover the categories of regulated uses, applicable stages and corresponding required water use reduction measures.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-320. Declaration of water use reduction measures, stages in effect; notice by publication required.

(a) The city manager, in consultation with SAWS, is hereby authorized to declare that each "trigger level" has been reached and that the water use reduction measures and each respective stage are in effect.
§ 34-320

(b) Notices of the implementation and termination of the water use reduction measures and each of the various stages, as appropriate, shall be publicly announced and published in a daily newspaper for a minimum of one day. The implementation or termination of the measures and each of its stages shall become effective immediately upon publication of the respective notice. (Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-321. Water advisory council to be organized.

When the water use reduction measures are declared to be in effect, a water advisory council, composed of water purveyors and other interested jurisdictions, shall be organized. This group shall provide a forum for information exchange and cooperation to ensure that the aquifer management plan is understood and equitably implemented.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-322. "Trigger levels" for preparation for and implementation and termination of water use reduction measures, Stages I through IV.

Implementation and termination of Stages I through IV of the Water Use Reduction Measures shall occur according to the following schedule:

<table>
<thead>
<tr>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifer Awareness</td>
<td>Aquifer Watch</td>
<td>Aquifer Warning</td>
<td>Aquifer Risk</td>
</tr>
<tr>
<td>655</td>
<td>650</td>
<td>642</td>
<td>636</td>
</tr>
</tbody>
</table>

| | | | |
| 650 | 642 | 636 | 632 |

| | | | |
| 655 | 650 | 642 | 636 |

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 82533, § 1, 7-20-95; Ord. No. 83703, § 2, 2-29-96; Ord. No. 83860, § 4, 3-28-96; Ord. No. 85945, § 1, 4-24-97)
Sec. 34-323. Designated landscape irrigation times and days (Stages II, III, and IV).

During any period when Stages II, III, or IV have been declared to be in effect, irrigation with a sprinkler or irrigation system of existing landscape on any property (other than golf courses and athletic fields, the restrictions for which are set out in section 34-332) may occur only on certain designated days and at certain times, as follows:

(a) *Stage II - residential.* Properties zoned "residential," in accordance with the last digit of the property address:

<table>
<thead>
<tr>
<th>Last Digit of Address</th>
<th>Days and Times Permitted Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODD</td>
<td>Sundays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Thursdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>EVEN</td>
<td>Saturdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Tuesdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
</tbody>
</table>

(b) *Stage II - nonresidential.* Properties zoned other than "residential," without regard to address:

<table>
<thead>
<tr>
<th>Days and Times Permitted Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mondays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>Fridays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
</tbody>
</table>

(c) *Stage III.* All properties (residential and nonresidential), in accordance with the last digit of the property address:

<table>
<thead>
<tr>
<th>Last Digit of Address</th>
<th>Days and Times Permitted Stage III</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Mondays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>2.3</td>
<td>Tuesdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>4.5</td>
<td>Wednesdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>6.7</td>
<td>Thursdays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
<tr>
<td>8.9</td>
<td>Fridays, except 10:00 a.m. through 8:00 p.m.</td>
</tr>
</tbody>
</table>

(d) *Stage IV.* All properties (residential and nonresidential), in accordance with the last digit of the property address:

<table>
<thead>
<tr>
<th>Last Digit of Address</th>
<th>Days and Times Permitted Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Mondays, 3:00 a.m. through 7:00 a.m. and 8:00 p.m. through 11:00 p.m.</td>
</tr>
<tr>
<td>2.3</td>
<td>Tuesdays, 3:00 a.m. through 7:00 a.m. and 8:00 p.m. through 11:00 p.m.</td>
</tr>
<tr>
<td>4.5</td>
<td>Wednesdays, 3:00 a.m. through 7:00 a.m. and 8:00 p.m. through 11:00 p.m.</td>
</tr>
<tr>
<td>6.7</td>
<td>Thursdays, 3:00 a.m. through 7:00 a.m. and 8:00 p.m. through 11:00 p.m.</td>
</tr>
<tr>
<td>8.9</td>
<td>Fridays, 3:00 a.m. through 7:00 a.m. and 8:00 p.m. through 11:00 p.m.</td>
</tr>
</tbody>
</table>
(e) Except in Stage IV. Watering with a hand held hose, soaker hose, drip irrigation system or bucket of five (5) gallons or less is permitted on any day except between 10:00 a.m. and 8:00 p.m. In Stage IV, watering with a hand-held hose, soaker hose, drip irrigation system or bucket of five (5) gallons or less to maintain trees, shrubs, and other ornamental plants, but not grass or turf, is permitted any day of the week only from 7:00 a.m. through 11:00 a.m.

NOTE: Vehicle washing at home is limited to designated landscape watering days and times, but use of commercial facility is permitted any day. Citizens are encouraged to wash their vehicles at certified conservation facilities.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 83703, § 3, 2-29-96; Ord. No. 83860, § 5, 3-28-96; Ord. No. 84082, § 1, 5-9-96; Ord. No. 84286, § 6, 7-18-96; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-324. Implementation of water use reduction measures, Stage IV ("Aquifer Risk").

(a) Implementation of Stage IV need not be based on the trigger levels set forth in section 34-322 but may instead be based on consideration of aquifer water quality or on other aquifer, seasonal or weather conditions not based on water levels in J-17.

(b) Whenever aquifer water quality measures thirty (30) percent TDS above historical average and above the maximum TDS value for any public water supply well, the city manager, in consultation with SAWS, shall declare the city to be officially in Stage IV. Appropriate additional measures to protect the aquifer shall be imposed by city council as necessary, and those measures applicable to Stage IV currently set out in section 34-332, Specific Water Use Reduction Measures, shall also be implemented automatically upon declaration of Stage IV.

(c) Regardless of consideration of aquifer quality, whenever city council may determine that other aquifer, seasonal, or weather conditions not based on water levels in J-17 warrant, it may also declare the city to be officially in Stage IV and may impose additional restrictions for all water uses.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 83703, § 4, 2-29-96; Ord. No. 83860, § 6, 3-28-96; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-325. Termination of water use reduction measures, stages.

When the aquifer level at J-17 rises to six hundred fifty-five (655) feet msl during a period when the water use reduction measures have been declared in effect, the city manager, or his designee, in consultation with SAWS, shall monitor consistency of aquifer levels for the next five (5) to ten (10) days to determine if conditions warrant termination of the measures, and such determination shall include consideration of pumping trends, seasonal adjustments, and current and forecast precipitation. After this monitoring period and due consideration of all of the above-described conditions, the city manager, in consultation with SAWS, may declare the measures terminated.

Notice of the termination of the water use reduction measures and each of its various stages, as appropriate, shall be publicly announced and published in a daily newspaper for a minimum of one day. Termination of the measures and each of its stages shall become effective immediately upon publication of the respective notice.

(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-326. Education and enforcement.

As the success of the Water Use Reduction Measures depends largely on public cooperation, city and SAWS policies shall provide for extensive use of a water conservation "hot line," so that the public may provide the city and SAWS with information relating to violators. The president/CEO of SAWS is hereby granted the authority to designate qualified SAWS personnel to enforce this provision in the manner and to the extent allowed by law, including the filing of complaints with the municipal prosecutor's office for such violations. SAWS' procedures pertaining to its educational and enforcement efforts regarding water use re-
duction measures shall be set forth in internal operating procedures, which shall be made available to the public.
(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-327. Violation.

Unless within three (3) working days from receipt of a notice of violation stating that a complaint may be filed with the municipal prosecutor's office the improper use of water cited therein is not cured, repaired, or otherwise resolved. It shall be a violation of this division for any person intentionally, knowingly, recklessly, or negligently to use water or to allow or cause the use of water in violation of any of the provisions of this division within the corporate limits of the City of San Antonio.
(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-328. Registered water meter user presumed liable.

For purposes of this division, in any case where water has been used in a manner contrary to any provision of this division, it shall be presumed that the person, individual, corporation, or partnership in whose name a water meter connection is registered with the water purveyor servicing the property, has intentionally, knowingly, recklessly, or negligently made, caused, used or permitted to be used, the water in such a contrary manner. Proof that the particular premises had a water meter connection registered in the name of the defendant cited in a criminal complaint filed pursuant to this division shall constitute a prima facie presumption that the defendant is a person who permitted or caused the use of water in a manner contrary to any provision of this division.
(Ord. No. 85945, § 1, 4-24-97)

Sec. 34-329. Penalty for violation.

Any person, individual, corporation or partnership who is convicted of a violation of any provision of this division in a criminal court shall be deemed, upon conviction, to be guilty of a misdemeanor and shall be punished by a fine not less than one hundred dollars ($100.00) per violation and not to exceed two thousand dollars ($2,000.00) per violation. Civil penalties for violations of this division may also be assessed as allowed by applicable state law.
(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-330. This division to prevail if conflict.

In the event any section of this division conflicts in effect or application with any other section of a City Code or ordinance, the section(s) of this division shall prevail.
(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-331. Severability.

If, for any reason, any section, sentence, clause or part of this division is held legally invalid, such judgment shall not prejudice, affect, impair or invalidate the remaining sections of this division, but shall be confined to the specific section, sentence, clause, or part of this division held legally invalid.
(Ord. No. 80574, § 12, 8-4-94; Ord. No. 85945, § 1, 4-24-97)

Sec. 34-332. Specific water use reduction measures.

Specific water use reduction measures, their corresponding stages and scope are set out in the table, below:

<table>
<thead>
<tr>
<th>Measures for</th>
<th>Stages</th>
<th>Scope of Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Services</td>
<td>I, II, III, IV</td>
<td>Fire-fighting &amp; medical uses — no restrictions.</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Reduction in fire hydrant &amp; sewer line flushing recommended.</td>
</tr>
<tr>
<td></td>
<td>II, III, IV</td>
<td>Hydrant flushing &amp; sewer line flushing — only on emergency basis.</td>
</tr>
<tr>
<td>Measures for</td>
<td>Stages</td>
<td>Scope of Restrictions</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Water Utility Use</td>
<td>I, II, III, IV</td>
<td>Water utilities are encouraged to implement voluntary measures, such as improving leak detection surveys and repair programs and stabilizing and equalizing system pressure.</td>
</tr>
<tr>
<td>Power Production</td>
<td>I, II, III, IV</td>
<td>Water used for power production shall be voluntarily reduced.</td>
</tr>
<tr>
<td>Military</td>
<td>I, II, III, IV</td>
<td>Compliance with mandatory reduction measures for those uses in the outdoor, essential and utility categories.</td>
</tr>
<tr>
<td>Agricultural</td>
<td>I</td>
<td>Reduction of water use by any means available is encouraged.</td>
</tr>
<tr>
<td></td>
<td>II, III, IV</td>
<td>The escape of irrigation tailwater, as that term is commonly used in the agricultural community is prohibited. Water loss through percolation in transmission canals is prohibited.</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>Additional reductions may be imposed by the city council if conditions warrant.</td>
</tr>
<tr>
<td>Livestock Use</td>
<td>I, II, III, IV</td>
<td>Reduction of water use by any means available is encouraged.</td>
</tr>
<tr>
<td>Industrial, Commercial, and Other</td>
<td>I, II, III, IV</td>
<td>Reduction of water use by any means available is encouraged. Compliance with the specific water use reduction measures is required for those uses in the outdoor category, including landscape watering, swimming pools, hot tubs and similar facilities, golf courses, aesthetic uses such as fountains; such restrictions specifically include industrial users, as well as all others. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution.</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>Additional reductions may be imposed by the city council if conditions warrant. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution.</td>
</tr>
<tr>
<td>Restaurants, other eating establishments</td>
<td>I, II, III, IV</td>
<td>Prohibited from serving water to non-employees except when requested by the non-employee.</td>
</tr>
<tr>
<td>Measures for</td>
<td>Stages</td>
<td>Scope of Restrictions</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Household</td>
<td>I, II, III, IV</td>
<td>Reduction of water use by any means available is encouraged. Compliance with the mandatory demand reduction measures shall be achieved for those uses in the outdoor category, such as landscape watering, swimming pools, hot tubs and similar facilities.</td>
</tr>
<tr>
<td>Swimming Pool, Hot Tub, etc.</td>
<td>I, II, III, IV</td>
<td>All swimming pools other than public swimming pools must be covered with an effective evaporation cover or screen or evaporation shields covering at least twenty-five (25) percent of the surface of the pool when the pool is not in active use. Active use includes necessary maintenance that requires removal of the cover, screen, or shields. Filling and replenishing to maintenance level permitted for new and existing swimming pools. Drainage permitted only onto pervious surface, or onto pool deck where the water is transmitted directly to a pervious surface, only if: 1. Draining excess water from pool due to rain in order to lower water to maintenance level; 2. Repairing, maintaining or replacing pool component which has become hazardous; or 3. Repairing pool leak. Filling of all new and existing swimming pools prohibited, unless at least thirty (30) percent of water obtained from source other than Edwards Aquifer. Replenishing to maintenance level of public swimming pools only permitted. Draining permitted only onto pervious surface, or onto pool deck where the water is transmitted directly to a pervious surface, only if: 1. Draining excess water from pool due to rain in order to lower water to maintenance level; 2. Repairing, maintaining or replacing pool component which has become hazardous; or 3. Repairing pool leak. Refilling of public swimming pool permitted only if pool has been drained for the repairs, maintenance or replacement set out in items 2 or 3, above.</td>
</tr>
<tr>
<td>Aesthetics (fountains, waterfalls, etc.)</td>
<td>II, III, IV</td>
<td>Outside and inside prohibited. Use of recirculated, reused or recycled water is a defense to prosecution under this paragraph.</td>
</tr>
<tr>
<td>Other Outdoor Uses</td>
<td>I, II, III, IV</td>
<td>Waste is prohibited. No person may allow irrigation tailwater to escape from that person's land.</td>
</tr>
</tbody>
</table>
Measures for Stages

Scope of Restrictions

Use of Edwards Aquifer water to wash any impervious outdoor ground covering, such as a parking lot, driveway, street or sidewalk, is prohibited. The washing of any impervious surfaces for immediate health and safety shall be a defense to prosecution under this paragraph. Non-commercial washing of vehicles and mobile equipment (e.g., washing vehicle at a residence) is permitted only on assigned residential landscape designated watering days and times (see section 34-323) with hand-held hose (with automatic shut-off nozzle) or bucket of five (5) gallons or less, but is prohibited between the hours of 10:00 a.m. and 8:00 p.m. every day. Use of commercial vehicle wash facility permitted any day. Citizens are encouraged to wash their cars no more than twice a month. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution.

<table>
<thead>
<tr>
<th>Landscape Irrigation:</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established Plants</td>
<td></td>
</tr>
</tbody>
</table>

Landscape watering using individual sprinkler or sprinkler systems for established landscaping plants is permitted only between the hours of 8:00 p.m. and 10:00 a.m. Watering with hand-held hose, soaker hose, bucket, or drip irrigation is permitted at any time. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution.
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**Measures for Stages**

II

**Scope of Restrictions**

Landscape watering using individual sprinkler or sprinkler systems is permitted only on designated landscape watering days and times (see Section 34-323) but is prohibited every day between the hours of 10:00 a.m. and 8:00 p.m., except that landscape watering is permitted any day with handheld hose, soaker hose, bucket, or drip irrigation system. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. Voluntary irrigation system audits encouraged. A user may file with SAWS a request for an exception to the designated days and times. In the event a complete watering cycle of an irrigation system requires a length of time in excess of that allowed in this section to complete the cycle, and the user files and implements a water conservation plan designating the controllers, stems and lengths of watering time per station, or, when watering during the specific provisions of this section creates waste, a variance shall be granted. A variance may also be granted if the request includes: (1) a statement indicating compelling reasons why the user is unable to meet the specific designated watering times and days; and (2) a water conservation plan. The water conservation plan must also include proof of irrigation efficiency of 60% or greater and demonstrate specific measures to be taken to reduce consumption to meet the reduction goal established for Stage II. SAWS may, on a case by case basis, waive the requirements for irrigation efficiency and/or submission of a water conservation plan. Upon the approval of the water conservation plan as set forth herein, the user may be granted an exception.
Measures for Stages Scope of Restrictions

III Landscape watering using individual sprinklers or sprinkler systems is permitted only on designated landscape watering days and times (see Section 34-323(c)), except that landscape watering is permitted any day with hand-held hose, soaker hose, bucket or drip irrigation system to maintain shrubs, trees, ground covers, and other ornamental plants, but not grass or turf, on any day before 10:00 a.m. and after 8:00 p.m. Use of non-Edwards Aquifer water, gray water, treated wastewater or reused water is a defense to prosecution. Voluntary irrigation system audits encouraged. A user may file with SAWS a request for an exception to the designated days and times. In the event a complete watering cycle of an irrigation system requires a length of time in excess of that allowed in this section to complete the cycle, and the user files and implements a water conservation plan designating the controllers, stems and lengths of watering time per station, or, when watering during the specific provisions of this section creates waste, a variance shall be granted. A variance may also be granted if the request includes: (1) a statement indicating compelling reasons why the user is unable to meet the specific designated watering times and days; and (2) a water conservation plan. The water conservation plan must also include proof of irrigation efficiency of 60% or greater and demonstrated specific measures to be taken to reduce consumption to meet the reduction goal established for Stage III. SAWS may, on a case by case basis, waive the requirements for irrigation efficiency and/or submission of a water conservation plan. Upon the approval of the water conservation plan as set forth herein, the user may be granted an exception.
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<th>Measures for</th>
<th>Stages</th>
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<tr>
<td>IV</td>
<td></td>
<td>Landscape watering using individual sprinklers or sprinkler systems is permitted only on designated landscape watering days and times (see section 34-323(d)), except that landscape watering with handheld hose, soaker hose, bucket or drip irrigation system is permitted on any day from 7:00 a.m. until 11:00 a.m. to maintain shrubs, trees, ground covers, and other ornamental plants, but not grass or turf. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. Voluntary irrigation system audits are encouraged. A user may file with SAWS a request for an exception to the designated days and times. In the event a complete watering cycle of an irrigation system requires a length of time in excess of that allowed in this section to complete the cycle, and the user files and implements a water conservation plan designating the controllers, stems, and lengths of watering time per station, or, when watering during the specific provisions of this section creates waste, a variance shall be granted. A variance may also be granted if the request includes: (1) a statement indicating compelling reasons why the user is unable to meet the specific designated watering times and days; and (2) a water conservation plan. The water conservation plan must also include proof of irrigation efficiency of sixty (60) percent or greater and demonstrate specific measures to be taken to reduce consumption to meet the reduction goal established for Stage IV. SAWS may, on a case by case basis, waive the requirements for irrigation efficiency and/or submission of a water conservation plan. Upon the approval of the water conservation plan as set forth herein, the user may be granted an exception.</td>
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<td>Measures for</td>
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<td>Scope of Restrictions</td>
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<tr>
<td>Landscape Irrigation</td>
<td>I</td>
<td>Landscape watering permitted to maintain adequate growth until established. Thereafter, landscape watering using individual sprinkler or sprinkler systems for landscaping plants is permitted only between the hours of 8:00 p.m. and 10:00 a.m. Watering with hand-held hose, soaker hose, bucket of five (5) gallons or less, or drip irrigation system is permitted at any time. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. Installers of new landscapes are encouraged to utilize exclusively water-use-efficient trees, shrubs, ground covers, ornamental plants and turf, and to utilize proper horticultural practices, including proper soil preparation and the use of mulch and zonal irrigation systems.</td>
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II

Landscape watering permitted to maintain adequate growth until established. Thereafter, landscape watering using individual sprinklers or sprinkler systems is permitted only on designated landscape watering days and times (see section 34-323), but is prohibited except on residential landscape watering days, and only between the hours of 8:00 p.m. and 10:00 a.m. Landscape watering is permitted any day with hand-held hose, soaker hose, bucket of five (5) gallons or less, or drip irrigation system, but is prohibited every day between the hours of 10:00 a.m. and 8:00 p.m. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. Voluntary irrigation system audits encouraged. Installers of new landscapes are encouraged to utilize exclusively water-use-efficient trees, shrubs, ground covers, ornamental plants and turf, and to utilize proper horticultural practices, including proper soil preparation and the use of mulch and zonal irrigation systems.
Landscape watering permitted to maintain adequate growth until established. Thereafter, landscape watering using individual sprinklers or sprinkler systems is permitted only on designated landscape watering days and times (see Section 34-323(c)). Landscape watering is permitted any day with hand-held hose, soaker hose, bucket of five (5) gallons or less, or drip irrigation system, but is prohibited every day between the hours of 10:00 a.m. and 8:00 p.m. Installation of new landscapes is permitted only if not more than 50% of the available landscape area is planted with water-use-efficient turf and if proper horticultural practices are followed, including proper soil preparation and the use of mulch and zonal irrigation systems. A user may file with SAWS a request to install more than fifty (50) percent water-use-efficient turf. The request must include: (1) a statement or plan describing the landscaping plan; and (2) a statement indicating how the landscaping plan will achieve the goals of this chapter. Upon the approval of the alternate landscaping plan as set forth herein, the user may be granted an exception. Landscape renovation (see Section 34-317) is allowed only if proper horticultural practices are followed, including proper soil preparation and the use of mulch. Additionally, if the newly renovated landscaped area is watered with an irrigation system, then a zonal irrigation system must be installed.

Installation of new landscapes is permitted only if the new landscapes utilize exclusively water-use-efficient trees, shrubs, ground covers, ornamental plants and turf, and if proper horticultural practices are followed, including proper soil preparation and the use of mulch and zonal irrigation systems.

Landscape watering for new plantings is permitting until material is established. Thereafter, landscape watering using individual sprinklers or sprinkler systems is permitted only on designated landscape watering days and times (see section 34-323(d)), except that landscape watering with a hand-held hose, soaker hose, bucket or drip irrigation system is permitted on any day from 7:00 a.m. to 11:00 a.m. to maintain trees, shrubs, ground covers, other ornamental plants, but not grass or turf. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. Voluntary irrigation system audits are encouraged.
### Measures for Stages

<table>
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<tr>
<th>Measures for</th>
<th>Stages</th>
<th>Scope of Restrictions</th>
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<tbody>
<tr>
<td>Golf Course (as defined)</td>
<td>I, II, III, IV</td>
<td>Irrigation with a sprinkler or irrigation system allowed between the hours of 8:00 p.m. and 10:00 a.m.</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>A. Ten (10) percent reduction in the replacement of daily evapotranspiration rate (&quot;ET Rate&quot;) or daily soil-holding capacity, achieved by use of an existing and properly operating CCIS (as defined) capable of achieving such water conservation goals; or</td>
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<td>B. Use of not more than 1.8 times the base usage for a golf course not equipped with a CCIS.</td>
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<td>II</td>
<td>Reduction of irrigation between the hours of 8:00 p.m. and 10:00 a.m., as follows:</td>
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<td>A. Twenty (20) percent reduction in replacement of daily ET Rate or daily soil holding capacity, achieved by use of an existing and properly operating CCIS (as defined) capable of achieving such water conservation goals; or</td>
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<td>B. Use of not more than 1.6 times the base usage for a golf course not equipped with a CCIS.</td>
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<td>III</td>
<td>Reduction of irrigation between hours of 8:00 p.m. and 10:00 a.m., as follows:</td>
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<td></td>
<td>A. Thirty (30) percent reduction (or twenty (20) percent reduction, if user is an ISP participant) in replacement of daily ET Rate or daily soil holding capacity, achieved by use of an existing and properly operating CCIS (as defined) capable of achieving such water conservation goals.</td>
</tr>
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<td>B. Use of not more than 1.4 times the base usage for a golf course not equipped with a CCIS.</td>
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<td>IV</td>
<td>Reduction of irrigation between hours of 8:00 p.m. and 10:00 a.m., as follows:</td>
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<td>A. If a golf course is approved as a &quot;conforming golf course&quot; by the Edwards Aquifer Authority, thirty (30) percent reduction (or twenty (20) percent reduction, if user is an ISP participant) in the replacement of daily ET rate or daily soil holding capacity; or</td>
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<tr>
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<td>B. If a golf course is not approved as a &quot;conforming golf course&quot; by the Edwards Aquifer Authority, forty (40) percent reduction (thirty (30) percent reduction if user is an ISP participant) in the replacement of daily ET rate as monitored by a properly operating CCIS or use of not more than 1.3 times the base usage for a golf course not equipped with a CCIS.</td>
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### Measures for Stages

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<th>Scope of Restrictions</th>
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<td></td>
<td>I, II, III, IV</td>
<td>Use of non-Edwards Aquifer water, gray water, treated wastewater or reused water is a defense to prosecution. Maintenance of new turf — irrigation permitted to maintain adequate growth until established. Once established, irrigation according to respective reduction measures only. Hand-held watering — irrigation by hand-held hose (no larger than 1” diameter) is permitted between the hours of 10:00 a.m. and 8:00 p.m. provided such irrigation is required to prevent an imminent threat of harm to a limited area (less than 500 sf) of existing turf caused by disease, nutritional requirements, or exposure and has a duration of 15 minutes or less.</td>
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<tr>
<td>Parks/athletic fields</td>
<td>I</td>
<td>Irrigation permitted only between the hours of 8:00 p.m. and 10:00 a.m.; prohibited between the hours of 10:00 a.m. and 8:00 p.m. every day. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution. <strong>Athletic fields</strong> — watering permitted between the hours of midnight through 9:00 a.m., unless a water conservation and reuse plan approved by the Edwards Aquifer Authority is in effect. Use of non-Edwards Aquifer water, gray water, treated wastewater or reuse water is a defense to prosecution.</td>
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<td>II, III, IV</td>
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(Ord. No. 80574, § 12, 8-4-94; Ord. No. 83703, § 5, 2-29-96; Ord. No. 83860, § 7, 3-28-96; Ord. No. 84082, § 2, 5-9-96; Ord. No. 85945, § 1, 4-24-97)

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**DIVISION 2. TOILETS, SEPTIC TANKS, PRIVIES**

Sec. 34-441. Definitions.

The following definitions shall apply in the interpretation and the enforcement of this division:

**Baffle** shall mean any wall or separation that prevents the fluid from the influent channel of the septic tank from flowing directly through to the effluent channel. This may be accomplished by use of a wall, a weir or a sanitary tee.

**Septic tank system** shall mean a system for the treatment of sewage or water-borne wastes from a

*Note—See the editor's note to Art. III. Div. 3 of this chapter.*
dwellings or business establishment. The septic tank system shall consist of a watertight drain line from the house to a watertight septic tank, a distribution box and an absorption field consisting of trench, gravel and disposal line.
(Code 1950, § 58-6; Ord. No. 21416, § 1, 6-23-55; Code 1959, § 18-65; Ord. No. 80574, § 11, 8-4-94)

Sec. 34-442. Enforcement.

It shall be the duty of the director of public health to enforce the provisions of this division, and, in the performance of this duty, he or his duly authorized agent is hereby authorized to enter, at any reasonable hour, any premises as may be necessary in the enforcement of this division.
(Code 1950, § 58-1; Code 1959, § 18-66; Ord. No. 80574, § 11, 8-4-94)

Sec. 34-443. Mandatory disposal facilities.

It shall be unlawful to permit, maintain or use any ground, lot, yard, residence, place of business or other place or building within the city where persons reside, congregate or are employed which is not provided with means for the disposal of human excreta, either by a flush toilet connected with a sewerage system approved by the state department of health, a septic tank conforming to the requirements of this division or a privy which meets the requirements of construction and maintenance provided in this division.
(Code 1950, § 58-2; Code 1959, § 18-67; Ord. No. 80574, § 11, 8-4-94)

Sec. 34-444. Connection to sanitary sewer.

Every residence, place of business or other building or place where persons reside, congregate or are employed, which abuts a street in which there is a public sanitary sewer or which is within two hundred (200) feet of a public sanitary sewer, shall be connected to the sewer by the owner or agent of the premises in the most direct
APPENDIX E

PUBLIC COMMENTS
Community Conservation Committee Meeting
And
Public Scoping Hearing on the Conservation and Reuse Plan
June 17, 1998

CCC Suggestions/Questions on Conservation and Reuse Plan presentation.

- Change language to say meters should be "95%" accurate, or "within 5% accuracy.

- What is universal metering? This means that no class or individual user may be without a meter.

- Are there greywater standards? Yes. There is a standard set in the plumbing code. One can use greywater in their home as long as they follow the plumbing code.

- Please expand on the concept of wholesale water supply. An example is East Central - they are a water purveyor to whom we sell water which they then resell. By state law they are required to have a conservation plan in place, which we are required to make sure they have. There is an available list of all wholesale customers; if someone wants a copy they can call us.

- What is pressure control? It's a technique for water conservation especially where you have higher water pressure and will have higher flow depending on the size of aperture. Reducing pressure is one means to reduce flow through system. There is an amazing difference between an irrigation system under 50 pounds per square inch (psi) vs. 44 psi. Just 6 psi can really change the amount of water thrown by system.

- Rebate programs for pressure systems/recycling/metering - especially for metering. This has been discussed in the past, but no final resolution has been reached.

- Plumbers to People is not well known in the community at large - the program needs more publicity.

- Typical to this area, there is a lot of subsurface water just below the ground. One example is the Institute of Texan Cultures - water was migrating in and they had to pump it out, so they decided to pump it into their fountains. Another area is the Via Complex where they have to continuously pump water out because it seeps in. The Menger Hotel has had this problem for years. When the aquifer level is up, they have to continuously pump or their basement fills. Has there been a study on drilling scalper wells and repumping this water into the recharge zone? This is a good idea for a study.
- What about a rebate for recycling? Is this possible?
The large-scale rebate program is designed to assist with internal recycling of water, not purchasing recycled water. If you have a system that you're interested in putting into business that would recycle water, you could apply for rebate to assist with the cost. We don't have a program where it's a standard rebate because savings and recycling is particular to the type of business. We can determine the appropriate size of rebate by working from the application, basing the rebate on water savings and costs.

- What about rebates for using turf-builder?
In terms of improving the quality of soil vs. changing out plants? There is not a rebate set up for improving the quality of soil. However, the current rebate is given for taking out turf and putting in drought tolerant plants. These can be shrubbery or perennials in a mulched bed, or some type of drought tolerant turf. We encourage building up soil as part of that process, but it is not a requirement of receiving a rebate.

- Is there flexibility built into program that rebates can be given if someone comes up with a great water saving idea?
This is an idea we're looking at, in terms of the equipment rebate. For example, we had a meeting with the San Antonio Restaurant Association and they said not to develop a rebate for ice machines because it turns out that payback from moving from single pass to a recycled ice machine or cooled ice machine occurs in a matter of months. So there's no need for rebate. A restaurant owner related his own experience during that meeting: his first water bill was only $400 after changing to new ice machine, and his previous water bills had been $1600. So we will not necessarily give a rebate to all water-conserving equipment because payback might be realized in a short time through savings on the water bill.

- What about irrigation systems vs. hand watering? I've noticed that even in Stage II, hand watering is allowed every day vs. the irrigation systems are only allowed twice a week. Wouldn't there seem to be less abuse by putting an irrigation system in and rebating something?
All sprinklers are under the same restrictions. With hand-held hoses, experience has shown that folks who are willing to carry a hose around the yard use less water, because those who use sprinklers are more likely to forget about them and leave them on for extended periods. However, all systems require education; they are just machinery and can cause a lot of water waste if not used right. The Landscape Task Force is discussing putting together design criteria for those who choose to put an in-ground system in to make sure that they have the most water conserving system possible.

- Are there any agricultural users within San Antonio? What are their restrictions?
Irrigation systems that many of them use are very inefficient. There are some in Bexar County and there are some in the City.
• The Texas Water Development Board reports that agricultural water use is on the decline, while municipal and industrial uses are increasing. Also, agricultural systems are becoming more efficient. We have a program in the design phase to assist people in implementation of agricultural conservation similar to the rebate program for businesses. This will help them to purchase equipment. Efficiencies of 95% can be reached with some agricultural irrigation systems.

• What about the idea that was put forth sometime last year about using washing machine water for landscape? This can be done right now; it is in the City Code. SAWS sends packets out regularly to customers who request information on this topic. There are guidelines for how to do it correctly - for example, water must be filtered.

• Isn't there a company in town doing it right now? There is a subdivision called Palladium Villas, north of Thousand Oaks on Jones Maltsberger, that is on a dual system and have been from beginning. They have "black water lines" which is where toilet, dishwasher and kitchen sink drain. The second system is one of "greywater lines," into which the tub, bathroom sink and washing machine drain. These lines go through an extensive filtering system, and then into a holding tank. The subdivision pumps this water for irrigation. Another good use would be foundation watering. However, it is difficult to retrofit with these systems. Structures need to be originally built this way. It is possible to put a filter on the washing machine in order to use this water for landscaping, but if it is used for landscape irrigation, care needs to be taken that the water doesn't pool or go into the neighbor's yard. A rebate is not available for this yet; more research is being done.

• Comment on the farm irrigation program: through the Farm Service Agency or Natural Resource Conservation Service, there's a program that upgrades systems that aren't up to current standards. Most new systems are very efficient these days, but any old systems that need upgrading can participate in the programs - just contact either organization.

• Water quality enforcement, especially over recharge zone: how are we doing with new development? There are a series of ordinances and state laws that a builder has to go through. Several groups have to approve the builder's proposal. For example, if the proposed development is in the City, both the City zoning department and SAWS staff reviews applications. The Stormwater department also reviews applications to make sure they're in compliance. Stormwater quality is an EPA regulation and we have enforcement ability with regard to this regulation up to the County line. We inspect sewer lines over the recharge zone, as well as underground storage tanks. These have to be registered and monitored by SAWS on a regular basis. If an organization or individual has a well, it has to be put on plat so we can monitor it.
In regard to development over the recharge zone, there is an ordinance called the Water Quality Ordinance. This designates the land on the basis of when it was platted for the preliminary overall development plan. If the land was owned before the ordinance was passed, it can be developed as is. If the land is inside the City limits, and the plat was obtained later on, up to 30% of the land can be developed. If the land is outside City limits, only 15% is covered. In addition, there are buffer restrictions. SAWS staff is working on a Guidance Manual that will contain all the watersheds in Bexar County and make sure that all of them are protected in accordance with federal law. We also have a Stormwater and Water Quality education program that go into the schools, as well as a Speaker's Bureau that would be available to come to any group. Just call 704-7548 to get a speaker.

- What is the latest information on the catfish farm?
The applicant received a letter from the EAA. He was requesting 46,483 acre feet (AF) and received a permit at 6,934 AF. So he will be protesting. He is taking the issue to court.

Citizens Comments/Questions
- Are any studies or information available on retrofitting to ULF toilets? Is it worthwhile if have to flush more than once to do job?
There are studies available, and we can make these available to people if they are interested.

- Regarding the horizontal vs. vertical washing machines - a long time ago there was one that was at about a 30° angle. Is this one of the ones available now?
There are three models that currently qualify. The Maytag is at a slight angle, but it qualifies because it uses far less water than a top loading machine.
Conservation efforts should address both baseline use by all major water users categories and the seasonal peak usage which is mostly driven by landscape watering.

The incentive plan that was developed for reducing commercial and industrial usage with input from last year's CCC should be implemented with assessment of how well it is achieving its goals. If participation is below expectations, the targeted users should be surveyed to determine changes that might be made to make participation more desirable.

The retrofitting of residential and apartment fixtures should be considered. Pilot programs should be initiated and evaluated to determine if a widescale retrofit effort might be feasible.

Much more effort is needed to reduce peak seasonal use due to landscape watering, both residential and commercial. I believe that the landscaping taskforce needs to establish a target per square foot water usage for a water efficient landscape which can be promoted both for new and existing landscapes. Models of efficient landscapes with and without automated sprinklers systems should be developed and promoted. Incentives and programs should be developed that would over a period of perhaps 10 years result in 90% of new landscapes meeting the target. Efforts to make current landscape water usage more efficient should continue. The evapotranspiration study should be completed and its results used to educate the public about efficient water usage through all available media.

I believe that summer seasonal water usage similar to the winter usage should be calculated. It can be used both as a educational tool and to assess surcharges for high usage. The amount of new water supply that will have to developed will be partly dependent on peak seasonal usage. Those that excessively increase this demand should bear more of the costs for the development of additional water supplies.

The issue of how to best utilize reuse water should be considered. In the long term some reuse water may be best utilized as a potable water source rather than solely for industrial processes and water playing fields, golf courses and other landscapes. In the short term, it may be useful to investigate whether it is cost effective to promote the hauling of reuse water to public and private landscapes which are currently be served by inefficient and wasteful sprinkler systems.

Jerry Morrissey
June 18, 1998

Mr. Chris Brown  
Acting Director, Conservation  
San Antonio Water System  
1001 E. Market Street  
San Antonio, TX  78205

Re: Community Conservation Committee

Dear Chris:

Please find attached for your use some of my preliminary thoughts and ideas for conservation of water.

I am really enjoying working with you and your staff on this committee. Your comprehensive planning and hard work is quite obvious. Please call me as you see fit.

Sincerely,

Pape-Dawson Engineers, Inc.

Samuel G. Dawson, P.E.  
Executive Vice President, CEO

Attachments

SDAWSON/LETTERS/980618A1
CONSERVATION COMMITTEE

IDEAS FOR CONSERVATION OF WATER

- Have SAWS representatives heavily involved with the building permit process for both commercial and residential construction. More importantly, SAWS staff should be represented at the preliminary development meetings led by Alex Garcia in Building Inspections for commercial development, which typically takes place prior to completion of site and construction plans. At this stage in the process the developer, builder, property owner, etc. could be made aware of the following:
  - Rebate Programs
  - Incentive Programs
  - Xeriscape Alternates
  - All Other Water Saver Issues

- Provide incentives for retrofitting chilled water cooling systems or installing water saver systems with new construction.

- Provide incentives for installing moisture sensitive cut-off systems with all existing and/or new irrigation systems. Market possibilities with all irrigation contractors and landscape architects.

- For large commercial construction, provide incentives for capturing all roof drainage to be re-used for irrigation purposes. Recently some projects have used underground cisterns for capturing the water for reuse.

- Consider maximum distances between hot water heaters and fixtures to avoid running large volumes of water while waiting for the water to get hot. Possibly consider a rebate program to install under sink hot water heater devices to provide immediate warm water. This could be used for all hotel/motel and residential construction.

- Make pool suppliers aware of the 25 percent pool cover criteria and market pool covers.

- Provide incentives for contractors to use water from dead end water lines to avoid wasted water for flushing.

- Provide incentives for xeriscaping for all new projects.

- Consider providing incentives for new commercial and residential construction for looping water mains to avoid dead end water systems which in turn require flushing and wasting water.

Dawson comments
July 1, 1998

Mr. Chris Brown  
Conservation Manager  
San Antonio Water System  
1001 E. Market St.  
San Antonio, TX 78003

Dear Chris,

The following are the recommendations of the San Antonio Committee of the Southwest Car Wash Association. If you have any questions, please call.

Stage 3

1. No home car washing
2. No washing of driveways at any car washes
3. Certified car washes have no operating restrictions
4. A. Non Certified car washes are restricted to 80% of their average water usage for the same month last year. Any water usage over the limit would be billed with a 20% surcharge.
   B. Non certified car washes hours of operation would be restricted to 85% of regular operating hours (1 day per week as determined by SAWS)

(Note: In the Valley they plan to turn the water off when the limit is reached in one city and surcharge the overage in most of the cities. San Antonio may be able to surcharge. Who is going to watch the meter to physically cut the water off?)

Stage 4 (Stage 3 restrictions plus)

1. Certified car washes have no restrictions
2. A. Non Certified car washes are restricted to 60% of their average water usage for the same month last year. Any water usage over the limit would be billed with a 40% surcharge. (Note: Restrictions plus surcharge percent equals 100%)
   B. Non Certified car washes hours of operation would be restricted to 70% of regular operating hours (2 days per week as determined by SAWS).
3. Car washes that do NOT constitute at least 50% of the revenue on a property combined with another business or businesses must close. (Note: this needs to be carefully worded to not close car rental agencies, detail shops, etc.)

Stage 5

1. All Non Certified car washes close.
2. Certified car washes hours of operation would be restricted to 85% of regular operating hours (1 day per week as determined by SAWS)
All Stages:

1. Certified car washes would lose their certification if they incur 3 violations (i.e. washing driveways, major leaks, etc.) in a 12-month period. They could not reapply for 6 months. (Note: I think this will keep the operators more conscientious of the program, and not treat it as a joke. I don't believe that this is restrictive for the serious operator.)

2. Any car wash with 100% reclaim (i.e. with no sewer hook up) would be allowed to operate without restrictions at any stage.

Respectfully Submitted,

Bill Sartor
Chairman
San Antonio Committee
Southwest Car Wash Association
Community Conservation Committee Input to Draft Plan

Presentation
The CCC held four public meetings in the month of September at which input was received regarding the draft Plan. Thirty-eight people attended these meetings representing civic organizations, business associations, environmental groups, institutional and government agencies and the general public.

The meetings each started with a presentation of the key elements of the Plan which is summarized below. This was followed by a question and answer period and public comment period. The questions and comments from each meeting are listed below. A list of attendees is also attached.

Conservation staff reviewed all the elements of the plan, pointing out the changes in the 1998 version. This new version includes the Water Resources Planning Process, the SB1 requirements, the Edwards Aquifer Authority’s (EAA) Drought Plan, and the public participation process as well as the rebate programs that have been implemented, the Recycled Water Program, the Non-Residential Conservation Program, and an analysis of the water use patterns of SAWS customers.

He explained that he anticipates having to change it at least twice in the next five years because of the new Springflow Emergency Measures and the shift from interim permits to permanent permits. Both of these regulations of the EAA will require modifications to the plan. The plan is required to be updated every five years according to state regulations.

Comments
The CCC members and the public made the following comments or recommendations regarding the plan:

Landscape Task Force
September 1, 1998

- Expectation/differences should be articulated for per capita usage in wet years and drought years.
- Concern was expressed about those situations where SAWS provides services within the Extra-Territorial Jurisdiction (ETJ), but there are no conservation regulations. Possibly changing the ordinance to include the ETJ was recommended. Staff responded that the SB1 process and the Edwards Aquifer Authority should have jurisdiction in those areas. All of SAWS customers, whether they were inside the City Limits or not, are eligible for the water conservation programs it offers.
- The Web page address should be included in the appendix.
Could reuse water be provided to the small cities? Staff responded that there was already more demand than supply, so he was not sure what the potential is.

It was suggested that a rebate be offered for rains sensors installed on automatic sprinkler systems.

A concern was expressed over the impact on the per capita usage when high usage areas are annexed.

Attending: Harry Dawson, Dee Emory, Gerry Shown, Ginger, Miller, Larry Cordell, Jerry Morrissey, Michael Bogard, Allyn Hopkins, Bill Ellis, Karen Guz, Jimmy Thomas, Chris, Brown, Kelly Hall, Sherry Christofilis, Linda Ximenes, Dana Nichols

Residential Task Force Meeting
September 2, 1998

Is recycling usage included in the 140 gallons per capita per day goal?
Not at this time; SAWS’ Recycled Water Program could potentially drive our per capita figures down below 140 gpcd if the reuse water is not included in the calculations.

Will there be representation from area high schools at future CCC meetings?
Board members would like a regular membership of students included in the planning. (Students from Jefferson High School attended the September 9th CCC meeting.)

Attending: Mary Bradshaw, Robert Hambright, Yolanda Arrellano, Delia Guajardo, Chris Brown, Humberto Ramos, and Sonia Jimenez

Non-Residential Task Force Meeting
September 8, 1998

Are there any common factors associated with those residential water users who have very high consumption rates? Income level tends to correlate with the amount of water used.

How will the non-residential conservation programs being implemented affect the SAWS Commercial Accounts by Meter Size graph on page 12 of the Water Conservation and Reuse Plan? There will most likely be a shift toward the center of the curve as the larger-scale users begin to take advantage of the large-scale programs.

How is industrial water use determined? Through the use of Standard Industrial Codes (SIC). Currently, there is no breakdown by customer or business type.
• What has been the percent benefit of a water conservation plan? There has been approximately a seven percent reduction in water use between 1993 and 1997. This reduction is equal to about 10,000-acre feet.

• Are there communities who are already at or below the 140 gallons per capita per day level? Yes, some communities have usage rates as low as 85 gallons per capita per day (gpcd). Tuscon currently has a per capita usage of 125 gallons per day. However, they also have a very restrictive landscaping ordinance, high water rates, and over two decades of promoting conservation practices.

• Can city agencies use the Conservation and Reuse Plan to attract new businesses? This document is not designed for that purpose. However, SAWS’ Economic Development Department uses some of the material from the plan and reformatts it for that purpose.

• Many well users are not accounted for. How does that affect the amount of water allocated to San Antonio by the EAA? Unaccounted for well users do not really affect the amount of water allocated to San Antonio. However, better accounting of well users could potentially reduce stress on the aquifer.

• How does San Antonio rate in comparison to cities such as Houston and Dallas? In calculating the per-capita consumption, the Texas Water Development Board excludes industrial water consumption. This often leaves San Antonio at a disadvantage with its large volume of tourism. However, San Antonio is still viewed as having a strong conservation program, and we use less water per capita than Austin, Dallas, and Houston.

Attending:  Ed Wilcut, Sonia Jimenez, Jim Shipley, Chris Brown, Sam Dawson, Irene Reyes, Bob Rogers, Stanley Pehl, Patrick Garcia, Frank Thomas, John Weems, Robert Hambright

Community Conservation Committee
Meeting of the Whole
September 9, 1998

• Define a wholesale customer.
• What opportunities exist to address the conservation needs of the small commercial water user?
  • Toilet Retrofit Program—3,000 have participated to date
  • Free audits are available now, although it is not promoted extensively because of a limited staff to do them
  • Notification in the bills about programs that exist
  • Information in the newsletter that goes out with the bill
  • Trade shows, ads, press conferences
  • Self-audit is available
• One person recommended a local conservation tradeshow. (There is a national trade show that focuses on water conservation that is conducted every three years.)
• The representatives from Austin were asked to give an update on how Austin is doing. They said their main problem has been capacity. There were days they had to appeal to people not to water because there simply was not enough capacity to meet the needs. They were encouraged to see so many people involved with water conservation in San Antonio. They added that one of the hardest things was to promote water conservation when there was no drought. They, like the CCC, wanted to get people to conserve water, whether or not there was a drought.

• A question was asked about the status of the fifth block rate. Staff explained that as had been reported earlier, the Residential Task Force will be looking at the data developed by the Finance Department. The issue will go through the CCC process, so the recommendation will be made to the Steering Committee for their approval and then to the CCC as a whole.

• It was recommended that an individual analysis be made of the high end water users to determine how much of their water use was legitimate and how much was irrigation. It would be up to them to establish what their indoor water use is. The comment was made that it was okay to create and apply a surcharge for water wasters. The suggestion was made to do an extensive educational campaign aim at water wasters. The press should be encouraged to publish the names of the highest water users more often.

• Many of the commercial users have made changes on their own because it is cost-beneficial to them. SAWS is in a position to help them with financial incentives where it is justified.

• Cisterns/rain catchment should be encouraged as much as possible.

• Rebates for rain sensors should be included for residential and commercial irrigation systems.

• The data looks good.

• The report looks great.

• Several categories were not discussed.
  • Areas of potential savings
  • 10 gallons per capita per day as the goal
  • Domestic savings were not shown (Mr. Brown commented that the analytical basis was probably not available yet. He could only make ballpark estimates based on similar situations in other cities.)

• SAWS was commended for educating and encouraging the community to conserve water.

• Sometimes it seems that a drought is the only way to get people to take the need to conserve water seriously. Otherwise it is politically hard to spend money on conservation.

Attending: Jerry Morrisey, Ginger Miller, Kelly Hall, Mary Bradshaw, Patrick Garcia, Bob Neal, A.C. Alvarez, Brad Chandler, Norma Amsberry, Ruth Lofgren, Mr. and Mrs. C. Carter, George Windrow, Jeanne Cantu, Kathy Cantu, Anna Nuñez, and Tania Trejo
9/14/98

Mr. Chris Brown
Acting Director, Conservation
San Antonio Water System
1001 E. Market Street
San Antonio, Texas 78205

RE: Comments for Conservation and Reuse Plan

Dear Chris:

The Green Industry Alliance would like to respectfully submit our comments to you concerning the Conservation and Reuse Plan currently out for public comment. Attached you will find a set of recommendations on behalf of the GIA that we feel would significantly impact our ability to conserve water in the community. Please note that we have included two additional comments to our recommendations from the time we first submitted these remarks to the Landscape Task Force on August 5, 1998. I have made a note beside the two items on the attached page for your review.

We appreciate the opportunity to participate on the CCC and Landscape Task Force and remain committed to the process of finding measures to conserve water in the region.

Sincerely,

Kelly Hall
President - Green Industry Alliance

* * * * *

The Alliance is an association of Green industry professionals, organized to promote responsible landscape development, management, and maintenance through professional standards and sound regional policy.
Establish minimum criteria for installation of new landscape irrigation systems based on the rules and regulations for licensed irrigators in the State of Texas along with the standards for irrigation design and installation as outlined in the Texas Turf Irrigation Associations Water Conservation by Design publication

Inspection of back flow prevention devices

Rain sensors should be standard in all new installations (see criteria)

Landscape Irrigation meters/submeters

There is an opportunity at the time of an existing system retrofit to upgrade the water conservation devices on the system (ie meter/submeter, rain sensor, controller - this is similar to upgrading any other item on your property that is “out of code”)

Landscape Practices

Criteria established should apply to all types of “water” customers - residential and the general use customer

All new landscape installations should show evidence of the following:

Topsoil - 6” for landscape area (imported or native)

Mulch for all planting beds

Soil amendments - 2/3 organic and 1/3 sand (subject to variance depending on site conditions)

Adaptive plant material selections

Exceptions to Landscape Practices would include renovations to existing landscapes
August 5, 1998
Landscape Task Force Meeting
Recommendations from the Green Industry Alliance on Water Conservation in the Landscape

General

Begin the practice of year round conservation - expand the year round ordinance of after 8:00 p.m. and before 10:00 a.m. to include language similar to Stage II of the Aquifer Management Plan. Stage II has proven effective in curtailing outdoor water use and could be adapted to year round practices.

Give consideration to an increase in water rates - this may come anyway as a result of having to build new infrastructure for alternative water resources. An increase in water rates can be argued as a nonintrusive approach to curtailing the use of a scarce resource as compared to restrictions and other regulatory enforcement.

Regulatory solutions should be compatible with the science of efficient landscape water management - that is the relationship of water - soil - plants. The concept of Xerescape is wonderful - providing all elements work together. Solutions must satisfy the following definition of landscape water management efficiency - putting on just the amount of water you need when you need it.

Investigate the possibility of establishing conservation criteria for areas in the ETJ that SAWS will be contracting with to provide services (rev 9/14/98)

Establish a continuing education/certification program for green industry professionals so that via an educational class green industry professionals can be certified as water conservation professionals (rev 9/14/98)

Continue the cooperative effort of the community via the Landscape Task Force so that solutions can be monitored and improved upon as needed.

Landscape Irrigation

Criteria established should apply to all types of "water" customers - residential and the general use customer.
September 8, 1998

Mr. Chris Brown  
Conservation Manager  
San Antonio Water Systems  
1010 E. Market Street  
San Antonio TX 78203

Dear Chris:

Here are some of my ideas for conserving water, especially during the summer months.

Stage 2 restrictions should be in effect every summer but probably should be called something else such as Summer Conservation Program.

Discourage landscape installations during July and August for both residential and commercial properties through education and the media. Should not be mandated because of possible adverse economical effects on the green industry. The industry could do planning, soil preparation, installation of irrigation systems and pervious hardscapes; but, the actual plant material installation should be delayed.

Sincerely,

Dee

Dee Emory  
Environmental Support Coordinator  
Bexar Country Master Gardeners
Additional Comments on Water Conservation and Reuse Plan
Submitted by Jerry Morrisey

To achieve further water use reduction, SAWS needs to support innovative changes in water-saving technologies and water management techniques. This will require an open-minded approach by businesses and citizens to the long-term value of innovative water conservation measures. One avenue that should be explored is the feasibility of a yearly tradeshow devoted solely to water conservation products, concepts and services.

The long-held Texas virtue of self-reliance should be used as a community value to promote water conservation. With regard to residential water usage, the design of new homes and their landscapes should emphasize baseline and peak water use reduction. Measures which could be incorporated into new construction include: use of the most efficient appliances, toilets, and fixtures available; appropriate siting of hot water heaters; installation of gray water systems; use of rain water harvesting and storage to reduce or eliminate peak summer demand for municipal water; preservation of native landscape, reduction of turf area, and use of only drought tolerant turf, flowers, shrubs and trees; use of mulches and improvement of soil quality; and the reduction of landscape watering to once a week. Many of these measures could be applied to existing homes and landscapes.

The use of the residential rate structure should continue to be used as a tool to reduce water consumption. The addition of a fifth rate tier should be instituted to encourage the highest water users to implement watersaving measures. Summer water use surcharges should be used in the driest of years to induce reduction in peak demand. These higher rates are justified because high water usage helps to determine the amount of water supply that has to be developed at higher costs. Part or all of the increased revenue should be made available for residential conservation programs including rebate programs.

September 14, 1998

[Signature]
Mr. Chris Brown  
Conservation Manager - Water Resource Department  
San Antonio Water System  
1001 E. Market Street  
San Antonio, Texas 78298  
Fax: 704-7374

September 14, 1998

In July 1988, The City of San Antonio adopted policies regarding water conservation which became component policies of the City of San Antonio, City Water Board and the Alamo Conservation and Reuse District.

Senate Bill 1477 was then passed into law in June 1993 which stated that by the year 2008 the overall water limit on usage would be 400,000 AF. This gave a new meaning to water conservation. The San Antonio Manufacturers Association (SAMA) recognizes that the City of San Antonio accounts were non-revenue, were unmetered prior to 1988, that actual metering was not completed until 1990 and that the Conservation Rate Structure has been in place since 1980 and later modified to four blocks in 1988, but only for residential.

SAMA was approached by Mayor Nelson Wolf in November 1993 to be represented on the "2050 Water Resources Committee" which then gave credence to an important planning consideration to address: a. "Municipal" water demand by looking at: (1) the price of water; (2) building codes to require water conserving fixtures; and (3) ordinances limiting lawn watering; and b. "Industrial" water demand.

SAMA has recognized the need to be supportive of new and accurate data in order that San Antonio as a whole be properly represented to secure our water rights.

Our involvement in the Community Conservation Committee saw rise to ensuring that fairness was extended to all sectors of our community, including the manufacturing community, in supporting the process to create a Conservation Incentive Program for General Class Customer and a dedicated conservation fee to fund the program. As a result the SAWS Board of Trustee passed the program and fees on October 21, 1997.

SAMA recognizes SAWS for their efforts in bringing water conservation and recycling to the forefront and SAMA will continue our efforts to support the improvement of the Water Conservation and Reuse Plan as drafted in August 1998.

Michael H. Harris  
President

cc: Patrick Garcia, SAMA Representative To the Community Conservation Committee
Policy for

Acquisition of Additional Edwards Aquifer Supply

San Antonio Water System

Adopted by Resolution No. 97-265 dated October 7, 1997
ADDITIONAL EDWARDS AQUIFER SUPPLY POLICY

PURPOSE

The San Antonio Water System (SAWS) along with the entire region is entering an era of regulated withdrawals from the Edwards Aquifer. Because the annual permitted amounts for the region are currently statutorily limited to 450,000 acre-feet per year, it is entirely possible that SAWS permitted withdrawal will be less that the current demand for water. The Edwards Aquifer Authority (EAA) has begun the process of determining permitted volumes that each user of Edwards water may withdraw from the aquifer. The timeline for issuing the permits is uncertain, but is likely to occur within the next two to five years.

SAWS is currently pursuing an aggressive conservation program which has substantially decreased both total and system-wide demand for Edwards water. Additional conservation will not meet the immediate demands for water. Additionally, SAWS has begun construction on a water recycling system which will deliver 35,000 acre-feet of non-drinking water to businesses throughout the system; thus, reducing reliance of the Edwards Aquifer. This system will require three to five years to complete. Other water sources may be available to SAWS and these are being vigorously pursued; however, no "new" water can be developed within the timeframe expected for the issuance of permits by the EAA.

Therefore, it is necessary for SAWS to acquire limited volumes of additional Edwards supply to meet the expected short term deficit between system requirements and permitted withdrawals.

This policy establishes the constraints and criteria to be used to determine which Edwards supplies are appropriate for acquisition to meet the short-term needs of this community while ensuring that such acquisition preserves the cultural, social, environmental and economic interests of all those affected in the region.

POLICY

The San Antonio Water System intends to acquire water rights from the Edwards Aquifer to add to the SAWS permit in amounts sufficient to meet the immediate requirements of the system and provide an excess for short-term growth. The Edwards Aquifer is not sufficient to meet long-term demands for San Antonio, but will continue to be a key component of a balanced, diversified water supply portfolio.

Further, acquisition of additional supply from the Edwards will be conducted such that:

- only a limited volume of permanent acquisitions of additional supply from the Edwards Aquifer will be acquired to meet current requirements in excess of SAWS permitted withdrawal amount;
- the cultural, social, environmental, and economic interests of those in the region affected by these acquisitions will be preserved;
- springflow needs and minimization of peak demands from the aquifer will be a criterion included in acquisition decisions;
• the best combination of available methods of acquiring Edwards supplies including purchases, leases, trades, and agricultural conservation programs will be sought;

• criteria recommended by the Citizens Committee on Water Policy in the "Framework for Progress" report and expected to be refined by the Citizens Working Group for Water Planning will be used to evaluate acquisitions; and

• additional factors to be considered in the determination of best methods are price, availability, amounts, and community and regional acceptance.

METHODS OF ACQUISITION

**Lease**

Senate Bill 1477 (73rd Leg., R.S. ch. 626, 1993 Texas General Laws 2353) limits an irrigation user to leasing one half of his water right to another user. This legislative provision may be legally challenged on the basis that it is an unconstitutional restraint on the right to alienate property; however, leasing of water rights will remain an option.

**Conservation Equipment**

Senate Bill 1477 (73rd Leg., R.S. ch. 626, 1993 Texas General Laws 2353) also provides that a permit holder installing water-conserving equipment may sell the conserved water. This method would take advantage of that provision by paying a permit holder to install conservation equipment in trade for the conserved water. Agricultural conservation is included as an element of the 1993 Conservation and Reuse Plan adopted by the Board.

**Trade**

Recycled water or other non-drinking water may be traded for Edwards Aquifer water rights. SAWS is currently pursuing this method for Edwards users in Bexar County.

**Dry Year Option**

Though not specifically mentioned in the EAA statute, a dry year option or irrigation suspension program may be used as a method for allowing additional SAWS withdrawals from the aquifer. A dry year option is generally discussed as a multi-year contract with a farmer that allows the buyer to exercise an option causing a farmer to cease irrigation for a specified period of time. The buyer would then be allowed to withdraw an additional amount from the aquifer. The irrigation suspension program is a one year method that pays a farmer not to pump in return for a specified additional withdrawal from the aquifer authorized through the Edwards Aquifer Authority Critical Period Management Plan. The EAA successfully implemented this method in 1997 with SAWS and other pumpers participating.

**Range Management**

Brush control and other land management activities may increase recharge to the Edwards Aquifer. There is a provision in Senate Bill 1477 that provides that any
entity creating additional recharge will receive a direct benefit for doing so. With this method, SAWS would pay for the brush control or land management activities and derive a benefit of additional pumping from the aquifer through the Senate Bill 1477 statutory provision mentioned.

**Recharge Enhancements**

The Edwards Aquifer Authority statute provides that an entity creating additional recharge to the Edwards Aquifer may withdraw appropriate additional amounts in relation to the additional recharge created. SAWS could fund recharge projects to acquire additional supplies from the Edwards Aquifer.

**Purchase Land**

SAWS may purchase land that has, or expects to have, a water right associated with it. All or part of the permitted right may be transferred to SAWS use. Other methods described below might be applied to this land in SAWS ownership, e.g., implementation of high efficiency irrigation equipment to permanently reduce use. Option, leases, suspension and other methods will also complement permanent acquisitions.

**Purchase Water Rights**

SAWS may purchase water rights separate from the land or, in the case of a retiring industry, for transfer to SAWS use. With this method, the land or other properties associated with the water right remains with the owner.

**BACKGROUND AND CURRENT CONDITIONS**

Senate Bill 1477 (73rd Leg., R.S. ch. 626, 1993 Texas General Laws 2353) contains very limited provisions addressing transfer and acquisition of authorized Edwards withdrawals by SAWS or others in the region. The statute provides that water used for irrigation purposes may be leased. A permit holder who installs equipment to conserve water may sell the conserved amount. In addition, a market will likely exist in acquisition of permit rights and authorized withdrawals. Given the apparent intent of the legislature to allow a market for these rights, SAWS program will examine and pursue all possibilities.

The Edwards Aquifer Authority is currently reviewing claims for Edwards Aquifer water rights. The water rights of Edwards users have not been clearly defined in this process to date. Additionally, the Edwards Aquifer Authority is considering rules relating to interim authorizations, permits, transfers of permits, and critical period management. Each of these rules will have an impact on the value and utility of any water right acquired. Acquisition of additional Edwards supply must be conducted with full understanding of the developing regulations concerning water rights at the Edwards Aquifer Authority.

The Edwards Aquifer Authority is required to develop a comprehensive management plan for administration of the aquifer and development of additional supplies necessary to meet the needs of the region. Senate Bill 1477 allows the Authority to operate a market to acquire, hold, sell, and retire water rights. The Edwards Aquifer Authority funding requirements for operation in the water market will be supported by fees from SAWS and the other aquifer water users. Acquisition of additional Edwards supply will be coordinated with the comprehensive management plan by the EAA.
CONCLUSION

This policy establishes that San Antonio Water System will pursue a limited acquisition of additional supply from the Edwards Aquifer. It further establishes criteria and identifies methods for pursuing such acquisition. The policy offered recognizes the complex, and as yet undefined, circumstances in which the program is proposed for operation. More specificity of policy will be developed as proposed acquisition methods are pursued and refined. Similarly, contributing to a more defined policy will be the concurrent rule-making activities at the Edwards Aquifer Authority as those progress to further define the water rights and market conditions under which the acquisition program can operate.
Trans Texas Water Program
List of Potential Water Supply Projects
Appendix 12.7
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Water Supply Options</th>
<th>Quantity of Water a/cf/yr</th>
<th>Unit Cost of Water 1st Qt. 1996 Prices $/a/cf</th>
<th>Acres Impacted Long-Term No.</th>
<th>Order</th>
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<tr>
<td>1</td>
<td>L-10 Demand Reduction (Water Conservation)</td>
<td>90,000</td>
<td>276</td>
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<td>2</td>
<td>L-11 Exchange Reclaimed Water for Edwards Irrigation Water</td>
<td>38,000</td>
<td>475</td>
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<td>127</td>
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<td>3</td>
<td>L-12 Exchange Reclaimed Water for BMA Medina Lake Water (Included with Option S-13)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>4</td>
<td>L-13A Recycling/Reuse Plans by SAWS</td>
<td>35,000</td>
<td>380</td>
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<td>4</td>
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<td>5</td>
<td>L-13B Reclaimed Water to Edwards Aquifer</td>
<td>92,000</td>
<td>771</td>
<td>61</td>
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<td>6</td>
<td>L-14 Transfer of Reclaimed Water to Corpus Christi via Choke Canyon (Mitigation for other Options)</td>
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<td>L-15 Purchase or Lease of Edwards Irrigation Water for Municipal and Industrial Use</td>
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<td>L-16 Demineralization of Edwards “Bad Water”</td>
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<td>L-17 Natural Recharge-Type 1 Projects; Nueces/Guadalupe/San Antonio Basins (1947-56 Drought Average)</td>
<td>35,600</td>
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<td>4,660</td>
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<td>L-18A Natural Recharge-Type 2 Projects; Nueces/Guadalupe/San Antonio Basins (1947-56 Drought Average)</td>
<td>33,870</td>
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<td>4,186</td>
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<td>11</td>
<td>L-23A Edwards Recirculation-Sustainable Yield Pumpage, Lake Dunlap Diversions to Recharge Zone</td>
<td>87,000</td>
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<td>L-23B Edwards Recirculation-Sustainable Yield Pumpage, Gonzales &amp; Lake Dunlap Diversion to Recharge Zone</td>
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<td>L-24 Flood Retarding Structures Outlet Modifications for Recharge Enhancement</td>
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<td>N-10 Nueces River Basin Water Rights</td>
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<td>16</td>
<td>S-10 Unappropriated Streamflow near Elmendorf--1988 Return Flows; 1947-56 Drought Average</td>
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<td>S-11 Unappropriated Streamflow near Falls City--1988 Return Flows; 1947-56 Drought Average</td>
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<td>S-12 Unappropriated Streamflow near Goliad--1988 Return Flows; 1947-56 Drought Average</td>
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<td>NA</td>
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<td>19</td>
<td>S-13A Medina Lake--Divert &amp; Inject to aquifer; 1947-56 Drought Average</td>
<td>26,700</td>
<td>896</td>
<td>76</td>
<td>31</td>
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<td>20</td>
<td>S-13B Medina Lake--Divert to aquifer recharge zone; 1947-56 Drought Average</td>
<td>26,700</td>
<td>614</td>
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<td>30</td>
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</table>

Table 3-1 Continued Next Page

Trans-Texas Water Program

West Central Study Area

Summary Report of Water Supply Alternatives
## Water Supply Options

<table>
<thead>
<tr>
<th>No.</th>
<th>Quantity of Water</th>
<th>Unit Cost of Water 1st Qt. 1996 Prices</th>
<th>Acres Impacted Long-Term</th>
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<td></td>
<td>acft/yr</td>
<td>Order</td>
<td>$/acft</td>
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<tr>
<td>21</td>
<td>S-13C</td>
<td>29,000</td>
<td>69</td>
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<tr>
<td>22</td>
<td>S-13D</td>
<td>37,500</td>
<td>59</td>
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<tr>
<td>23</td>
<td>S-14A</td>
<td>22,500</td>
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<tr>
<td>24</td>
<td>S-14B</td>
<td>22,500</td>
<td>74</td>
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<tr>
<td>25</td>
<td>S-14C</td>
<td>7,700</td>
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<td>26</td>
<td>S-14D</td>
<td>14,900</td>
<td>84</td>
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<td>27</td>
<td>S-15A</td>
<td>32,300</td>
<td>66</td>
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<tr>
<td>28</td>
<td>S-15B</td>
<td>32,300</td>
<td>67</td>
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### Guadalupe River Basin

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Trans-Texas Water Program  
West Central Region
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<td>Quantity of Water</td>
<td>Unit Cost of Water</td>
<td>Acres Impacted</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>acft/yr</td>
<td>1st Qt. 1996 Prices</td>
<td>Long-Term</td>
</tr>
<tr>
<td>119</td>
<td>Carrizo Aquifer</td>
<td>90,000</td>
<td>24</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>CZ-10A</td>
<td></td>
<td>545</td>
<td>1,567</td>
</tr>
<tr>
<td>120</td>
<td>Carrizo Aquifer</td>
<td>90,000</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>CZ-10B</td>
<td></td>
<td>466</td>
<td>1,697</td>
</tr>
<tr>
<td>121</td>
<td>Carrizo Aquifer</td>
<td>90,000</td>
<td>26</td>
<td>16</td>
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<tr>
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<td>CZ-10C</td>
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<td>419</td>
<td>1,466</td>
</tr>
<tr>
<td>122</td>
<td>Carrizo Aquifer</td>
<td>220,000</td>
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<td>26</td>
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<td></td>
<td>CZ-10D</td>
<td></td>
<td>480</td>
<td>3,075</td>
</tr>
</tbody>
</table>

* Includes treatment costs.
| Includes Applewhite excluded. |
| Stahl secondary pump station facility. |

Without application of Trans-Texas In-Stream Environmental Criteria.

Ordered from largest quantity to smallest quantity of the 106 options listed which have data for quantity of water, cost of water, and acreage affected.

Ordered from lowest cost per acre-foot to highest cost per acre-foot of the 106 options listed which have data for quantity of water, cost of water, and acreage affected.

Ordered from lowest quantity of acreage affected to highest quantity of acreage affected for the 106 which have data for quantity of water, cost of water, and acreage affected.

For estimates of quantities and unit costs for 1934-89 average conditions, see text of option in Appendix: For Appendix page number see extreme left column of this table.

Yields and costs for 72" pipeline are shown on Appendix A Page A-72. For a 96" pipeline, drought average is 12,150 acft/yr at $792 per acft, with long-term average of 50,050 acft/yr at $224 per acft; for a 120" pipeline, drought average is 12,370 acft/yr at $1,107 per acft, with long-term average of 38,500 acft/yr at $279 per acft.

Note: Aquifer modeling is needed to evaluate benefits of different recharge rates upon water supply.

Yields and costs for 72" pipeline are shown on Appendix A Page A-74. For a 96" pipeline, drought average is 74,600 acft/yr at $437 per acft, with long-term average of 152,800 acft/yr at $263 per acft; for a 120" pipeline, drought average is 81,800 acft/yr at $544 per acft, with long-term average of 208,900 acft/yr at $270 per acft.

Note: Aquifer modeling is needed to evaluate benefits of different recharge rates upon water supply.

NA means not applicable.