CHAPTER 6 – STRATEGIC CONCLUSIONS

CASS PHASE I PRELIMINARY FINDINGS

The Current Salt Imbalance

In a typical year, 1.5 million acre-feet of CAP water at 650 mg/L TDS, carrying more than 1.32 million tons of salts, is transported into central Arizona. This is the salt load via CAP water alone. The SRP system carries another 0.53 million tons of salts into central Arizona. Though the CAP and Salt River are the main sources of salts to the region, the Gila River, Agua River, and society itself import additional salts. The vast majority of the salts never leave central Arizona. The net result is nearly 1.1 million tons of salts remaining in the Phoenix metropolitan area each year. Tucson is currently retaining 100,000 tons of salts annually, Pinal County is retaining 600,000 tons annually, Harquahala is retaining 60,000 tons annually, and Gila Bend is retaining 450,000 tons annually.

These salts accumulate in groundwater, in the vadose zone, in salt sinks, and essentially wherever evaporation takes place. Initial estimates show that in the Phoenix Metro area about 39 percent of the salts are ending up in the groundwater through agriculture and recharge projects. About 22 percent of the salts are locked up in the vadose zone as a result of urban landscaping practices, where they remain until sufficient percolation water is available to flush the salts to the water table. Depending on the particular setting, this infiltration to groundwater may occur in a few years or require a couple of decades. Approximately 8 percent of the salts end up in salt sinks, which include lined ponds such as the Palo Verde Nuclear Generating Station evaporative ponds, effluent lagoons, and urban lakes. The remaining 31 percent of the salt is deposited in cooling towers, evaporative coolers, water fixtures, water heaters, and virtually anywhere else that evaporation occurs.

This salt imbalance began in the early 20th century with the damming of the Salt and Verde Rivers. Salts that would normally have been carried away to the sea were channeled to irrigate the farm fields that were helping expand the local agricultural industry. During the 70 years between the completion of Roosevelt Dam and the completion of the CAP, the volume of salts retained in the Phoenix metropolitan area was estimated at about 0.5 million tons. These salts were brought in from the Salt, Verde, Gila, and Agua Fria Rivers, along with input from residential, commercial, industrial, and agricultural (particularly fertilizer) use. With the completion of the CAP canal to Phoenix in the mid-1980s, the salt loading substantially increased. Estimates of future salt loading suggest by 2040 that retention of salts in the Phoenix metropolitan area may exceed 1.5 million tons annually.

Public Impacts

Hard water in the Phoenix metropolitan area is a pervasive problem. This water typically contains elevated levels of calcium and/or magnesium, resulting in poor taste, water spots on dishes, buildup of minerals on plumbing fixtures, and other annoying properties. Homeowners and businesses install water softeners to exchange the calcium and magnesium ions for sodium ions. This process removes the hardness from the water but it contributes to the increase of salinity at the wastewater treatment plants.

Groundwater delivered to users in the Tucson metropolitan area is generally very low in TDS. As CAP water becomes a larger portion of the water delivered to the residents, TDS levels will increase. Salinity problems may become noticeable. The public in the Tucson area is very sensitive to water quality issues

and previously rejected the direct use of CAP water. As TDS levels rise with increasing utilization of CAP water, water managers in the Tucson metropolitan area will need to consider options for managing the issue of declining water quality to maintain public acceptance of CAP water.

Economic Impacts

The economic impacts related to the importation and use of high-salinity water have not restricted population growth and urban development, nor prevented agriculture from thriving in central Arizona. Currently, the economic impacts are subtle, and the costs of managing high-TDS water are spread among municipalities, businesses, and agriculture. This spreading of the economic costs throughout society has lessened the impact.

An economic analysis on the impact of salinity to central Arizona was conducted for CASS. One of the things learned from that economic modeling was that the Phoenix metropolitan area currently experiences the majority of the economic impacts. Tucson currently has minimal economic impacts from salinity, but as Tucson expands its use of CAP water the economic impacts due to salinity in that area will increase.

Colorado River water can be compared to established water quality standards and the economic costs can be estimated for not meeting those standards. The secondary MCL for TDS, as established by the Environmental Protection Agency, is 500 mg/L. The 30-year average TDS of Colorado River water is approximately 650 mg/L at the entrance of the CAP at Lake Havasu. If CAP water delivered to users met the secondary MCL, the savings to central Arizona users is calculated to be about $22 million annually. These savings would be in the form of extended life of residential water appliances, larger crop yields, less water used to leach salts from the soil, and reduced costs to businesses and industry for such things as cooling tower maintenance and treatment of water used in manufacturing processes.

The TDS of Salt and Verde River waters is about 475 mg/L and the TDS of the CAP water is about 650 mg/L, if salinity levels were lowered by 100 mg/L in both of these water sources, the savings could be about $30 million annually.

It is important to remember that the economic model used to calculate these impacts is a simplified tool. However, the model provides useful information for identifying where those impacts are taking place, assessing the magnitude of the economic impacts to society, and as a means of comparing these costs against the cost of implementing solutions.

Phase I Conclusions

The salinity problem in central Arizona is a pervasive problem that subtly affects everyone living in this area. The importing of 1.32 million tons of salts annually through the CAP system and 0.53 million tons of salts annually through the SRP system cannot be ignored. In the Phoenix metropolitan area alone over 1 million tons of salts are retained annually, this will eventually cause long-term economic and environmental impacts. However, for the short term, salinity impacts are not restricting growth and development in central Arizona.

The Tucson metropolitan area has just begun to import quantities of CAP water and its accompanying salt load. Managing salt will be an emerging challenge for Tucson. In addition, continued irrigation in the agricultural areas of Pinal County, the Harquahala Basin, and the Gila Bend Basin will result in impaired

groundwater. This groundwater will require advanced water treatment prior to use for potable purposes as well as methods to dispose or minimize the concentrate.

The Technical Committee believes it is important that Phase II of the Central Arizona Salinity Study proceed. Phase II will involve a more detailed look at the salinity problem and a comprehensive assessment of possible solutions. At this point there is no clear solution, but it is recognized that the salt load must be managed to keep central Arizona economically and environmentally sound.

CASS PHASE II

Phase II of the CASS will consist of analyzing different strategies to manage salinity and investigating the salinity problem further. This will be accomplished through continued research, strategizing among the various study partners, and additional economic modeling. Several facets of the salinity problem will require additional attention, such as concentrate disposal, brackish groundwater treatment, salinity control in wastewater treatment plants, and the long-term implications of importing over 1 million tons of salts into the Phoenix metropolitan area. The Tucson metropolitan area will need special focus to cope with their developing salinity issues. Phase II of CASS will require approximately two years for completion.

The following is not a "task list"—rather, it presents a series of concepts that will be used as an outline as Phase II of CASS develops.

1. One of the main topics of Phase II will be an economic cost-benefit analysis for different approaches to managing salinity. Different regional management strategies will be devised and analyzed. Some of the varying approaches may include managing salinity on the watershed, removing salts on the CAP and Salt River, removing salts at water treatment plants, removing salts at wastewater treatment plants, and removing salts from recovered groundwater.
2. Management of brine concentrate and recovery of as much water from the concentrate as possible are important issues that need to be solved to allow central Arizona the ability to manage the salts that are brought into the region. Costs for desalinization of water are decreasing, as evidenced by the number of desalinization plants along the west coast of the U.S. Desalinization will continue to grow in importance in central Arizona through the foreseeable future, but disposal of the brine concentrate will be an associated challenge. For this reason, Phase II of CASS will examine disposal options.
3. Brackish groundwater is a resource that will need to be utilized to meet the potable water demands of a growing population. Treating brackish groundwater may be cheaper than importing water from distant sources. An appraisal level study of the construction of a brackish groundwater treatment facility, or facilities, to use this important water resource will be conducted during Phase II.
4. The Phase II study will further examine continued salt loading, determine where the bulk of salts are accumulating, and estimate the rate of impact to groundwater as well as other economic and environmental consequences of this salt imbalance.
5. While regional strategies may be implemented in the future, these ventures will take time, cooperation, and funding to make major changes in the way central Arizona manages salts. One of the Phase II study objectives will be to identify smaller, less expensive near-term strategies that may be immediately implemented by individual communities.
6. Salinity is not a well-publicized issue. Obviously, there are more pressing issues in central Arizona that demand immediate attention and funding. The development of a public awareness campaign on

salinity issues will also be a part of the Phase II study. The public awareness campaign may initially be directed toward providing essential information to community officials, politicians, and city management personnel, for eventual distribution to their communities.

7. The Phase II study will incorporate any other investigation or research that the Technical Committee feels is necessary to fully understand and report on the salinity issue and solutions in central Arizona.