INDIAN FIRMING STUDY COMMISSION

FINAL REPORT

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INDIAN FIRMING STUDY COMMISSION MEMBERS

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EXECUTIVE SUMMARY

This report of the Indian Firming Study Commission (Study Commission) will provide as background an overview and description of the State's obligation for Indian Firming and an overview of the modeling efforts completed by Arizona Department of Water Resources (ADWR) staff to determine the estimated volumetric obligation for Indian Firming. Additionally, this report will summarize the solution elements reviewed by the Study Commission, including the water supply availability analysis and a review of the estimated cost and availability of funds to meet the obligation. Finally, the report will provide the recommendations from the Study Commission to the Arizona Legislature.

In December of 2004 President Bush signed legislation approving the Arizona Water Settlements Act (Settlement Act) P.L. 108-451, settling longtime claims to water by the Gila River Indian Community (Community) and the Tohono O'odham Nation. A key provision within the Settlement Act is the provision for enacting State legislation creating an Indian Firming Program (Firming Program) for the Community and future Indian water rights settlements. The provision authorizes the Secretary of the Interior (Secretary) and the State of Arizona (State) to develop a Firming Program to ensure that 60,648 acre-feet of non-Indian Agricultural priority Central Arizona Project (CAP) water made available for re-allocation to Indian tribes shall, for a 100-year period, be delivered during water shortages in the same manner as water with an municipal and industrial (M&I) priority is delivered during water shortages. Because the non-Indian Agricultural priority water has the lowest priority on the Central Arizona Project (CAP) system, in times of shortage this supply would be reduced or eliminated before M&I and Indian priority supplies are impacted. Therefore, in the case of reallocating non-Indian Agricultural priority water to the tribes, the parties to the Settlement Act agreed to increase the reliability (firm) of this block of water in times of shortage on the Colorado River. The importance of this provision is underscored by the clause in the Settlement that State legislation be enacted as part of the enforceability conditions to the Settlement.

The Settlement further identifies specific firming responsibilities for the Secretary and the State. Of the 60,648 acre-feet, the Secretary has responsibility for 28,200 acre-feet, as required by the Southern Arizona Water Rights Settlement Act (SAWRSA). The State agreed to firm 15,000 acre-feet for the Community, consistent with the Settlement. Responsibility for the remaining 17,447 acre-feet, which is to be dedicated for future Indian settlements, was divided equally (8,724 acre-feet each) between the Secretary and the State. Therefore, the State's total responsibility under this program is 23,724 acre-feet.

In the spring of 2005 the Arizona Legislature created the Indian Firming Study Commission (Study Commission) to develop the Firming Program for Arizona (Appendix I HB 2728, Section 12) by:

- Reviewing the modeling assumptions that were developed by the Arizona Department of Water Resources to estimate the volume of water needed to meet the firming obligation;
- Identifying options for meeting the firming obligations;
- Identifying cost components for each of the firming options;
- Identifying funding sources appropriate to finance the options; and
- Identifying the necessary changes to the Arizona Revised Statutes to meet the firming obligations.

Summary of Recommendations

The Study Commission reviewed several options for meeting the State's obligation. First, however, the Study Commission identified the following issues that needed to be considered prior to developing possible solution elements:

- The capability of delivering water to the Community whether it is stored and recovered, or directly delivered for use or storage by the Community.
- In times of shortage well capacity may be limited for recovery due to the need for increased groundwater pumping.
- Competition for excess supplies will increase over the next ten, twenty, fifty, and even one hundred years. Competition for underground storage capacity could also increase in the early years.
- How can the firming program be implemented while ensuring that the goals of the Active Management Areas are being met?

After reviewing estimated shortages, water supply availability, mechanisms for ensuring water would be made available to the tribes in times of shortage, and potential costs and funding availability the Study Commission concluded that the Arizona Water Banking Authority (AWBA), in cooperation with the Arizona Department of Water Resources (ADWR) and the Central Arizona Water Conservation District (CAWCD), is the most appropriate and best suited entity to fulfill the State's obligations described in Section 105(b) of the Settlements Act. The Study Commission recognizes that in order to fulfill this role, the AWBA needs to be provided with sufficient funding or the mechanisms to develop the funding necessary to implement the Indian Firming Program on behalf of the State and recommends that the Arizona Legislature provide the AWBA with appropriate funding to do so. Additionally, the Study Commission recommends the AWBA be empowered by the Arizona Legislature to include the following programs to address annual Indian Firming needs within its Annual Plan of Operation and the 10-Year Plan:

- Traditional water banking (off reservation underground storage of excess water for future recovery and delivery);
- On-Reservation Storage and Recovery;
- Leasing of non-Indian Agricultural priority or Indian priority CAP water from Indian tribes;
- Importation of groundwater from authorized groundwater basins;
- Use of long-term storage credits developed by the AWBA prior the Enforceability Date, as defined in the Act.
- Enter into a Memorandum of Understanding with the United States for monetary or in-kind goods or services pursuant to section 306(b) of the Arizona Water Settlements Act; and
- Use of general fund appropriations and withdrawal fees, collected within the Phoenix, Pinal and Tucson Active Management Areas, to store and recover water, lease Indian CAP supplies, import groundwater, and deliver water to the Indian Communities for the purposes of satisfying the Section 105(b) State obligation.

BACKGROUND

On December 10, 2004 President Bush signed the Arizona Water Settlements Act (Settlement Act) P.L. 108-451, thus creating greater certainty for some water users in Arizona and settling longtime claims to water by the Gila River Indian Community (Community). A key provision within the Settlement is the provision for implementing State legislation creating a Firming Program for the Community and future Indian water rights settlements. The provision reflects the result of lengthy negotiations between the Arizona Department of Water Resources (ADWR) and the Department of the Interior. The provision authorizes the Secretary of the Interior (Secretary) and the State of Arizona (State) to develop a firming program to ensure that 60,648 acre-feet of non-Indian Agricultural priority water made available for re-allocation to Indian tribes shall, for a 100-year period, be delivered during water shortages in the same manner as water with an municipal and industrial (M&I) priority is delivered during water shortages. Because the non-Indian agricultural priority water has the lowest priority on the Central Arizona Project (CAP) system, in times of shortage this supply would be reduced or eliminated before M&I and Indian priority supplies are impacted. Therefore, in the case of reallocating non-Indian Agricultural priority water to the tribes, the parties to the Settlement Act agreed to increase the reliability (firm) of this block of water in times of shortage on the Colorado River. The importance of this provision is underscored by the clause in the Settlement Act that State legislation be enacted as part of the enforceability conditions to the Settlement.

The Settlement Act further identifies specific firming responsibilities for the Secretary and the State (Section 105(b) – See Appendix I). Of the 60,648 acre-feet of non-Indian Agricultural priority water reallocated to the tribes, the Secretary has the responsibility for firming 28,200 acre-feet, as required by the Southern Arizona Water Rights Settlement Act (SAWRSA). The State agreed to firm 15,000 acre-feet for the Community, consistent with the Settlement Act. Responsibility for the remaining 17,447 acre-feet, which is to be dedicated for future Indian settlements, was divided equally (8,724 acre-feet each) between the Secretary and the State. Therefore, the State's total responsibility under this program is 23,724 acre-feet. Additionally, the State agreed to "assist the Secretary" in firming its water (see Section 306(b) – Appendix II).

A. STUDY COMMISSION OBJECTIVES

In the spring of 2005 the Arizona Legislature created the Indian Firming Study Commission (Study Commission) to develop the Firming Program for Arizona (Appendix III - HB 2728, Section 12) to:

- Review the modeling assumptions that were developed by ADWR to estimate the volume of water needed to meet the firming obligation;
- Assist in the development of options for meeting the firming obligations;
- Identify cost components for each of the firming options;
- Identify funding sources appropriate to finance the options; and
- Identify the necessary changes to statute to meet the obligations.

The Study Commission has held six public meetings at ADWR. Staff has also met with the United States Bureau of Reclamation to review the State's role in assisting the United States in meeting its firming obligation as required in the Settlement Act, the Community to discuss firming options on tribal lands and possible water supply options available from the Community. Additionally, staff has met with the San Carlos Apache Tribe to discuss possible water supply options available from the Tribe, as well as with water providers in the Phoenix area to discuss recovery and transmission options.

The meetings focused on reviewing modeling studies to identify potential shortages to the CAP supply and the estimated firming volume needed to meet the State's firming obligation, identifying water supplies potentially available to meet the firming obligation, and identifying possible solution elements for meeting the firming obligation. The Study Commission was asked to identify options, or combination of options, that could be utilized to actually make water available to the Community in times of shortage, based on the estimated volume of water needed for firming.

B. WHAT IS FIRMING?

Section 105 of the Settlements Act (S. 437) is titled "Firming of Central Arizona Project Indian Water." The provision reflects the result of lengthy negotiations between state parties, who were primarily represented by ADWR, and the Department of the Interior. The provision authorizes the Secretary and the State to develop a firming program to ensure that 60,648 acre-feet of non-Indian Agricultural priority water made available for re-allocation to Indian tribes shall, for a 100 year period, be delivered during water shortages in the same manner as water with an M&I priority is delivered during water shortages. The Settlement Act then goes on to specify specific responsibilities for the Secretary and for the State. While the Settlement Act reflects an agreement between the State and the Secretary on many aspects of the firming commitment, there are still unresolved issues that must be negotiated as the program is developed.

The need for a Firming Program is based on the negotiators' understanding of the priorities that would be used to allocate water during times when there would not be enough water available to the CAP subcontractors to meet all

contract commitments. In the early 1980's, when the Secretary was completing initial allocations of CAP water, he established four categories of water contracts. Miscellaneous contracts would be the first reduced, followed by non-Indian Agriculture. A co-equal priority was established for Indian and M&I allocations. The reason for these priorities was to establish a logical method for reducing water orders when demands exceeded supply. Most surface water systems operating in the western United States use the law of prior appropriation, which establishes a "first in time, first in right" method for allocating water during shortages. This law does not apply to Colorado River water that is contracted pursuant to Section 5 of the Boulder Canyon Project Act, so the Secretary sought to develop his own system for CAP water. During the recent settlement negotiations process, a decision was made not to alter the previously adopted priority system. Therefore, the term non-Indian Agricultural priority remains a term used for purposes of shortage allocation, even though, after the settlement process, the water used in this category is likely to be for Indian or M&I purposes rather than non-Indian Agriculture.

In recognition that a higher priority in times of shortage means greater reliability, and therefore greater value, the Department of Interior negotiators sought to increase the amount of M&I priority water that could be dedicated for Indian water rights settlements. In particular, they sought control over 65,647 acre-feet of allocations that had originally been allocated and offered to M&I water users, but were declined prior to signing of subcontracts. At various stages in the negotiations over CAP repayment with CAWCD, the Department of Interior was willing to give extra consideration for this firmer supply if it could be used for federal purposes. During negotiations with various Indian tribes, the Department of Interior had suggested that M&I priority water would be re-allocated to those tribes as part of future settlement agreements. However, as CAWCD/Interior negotiations proceeded, many state parties, as well as ADWR objected to the use of the 65,647 acre-feet for any use other than non-Indian M&I. In an effort to develop a "win-win" approach, the State parties suggested that a water management program could be developed for a portion of the lower priority non-Indian Agricultural water that would improve its reliability or "firmness."

After agreement that a Firming Program would be acceptable as a substitute for reallocation of the M&I unallocated water, the parties further negotiated levels of responsibility. The amount of firming was reduced by 5,000 acre-feet in recognition that ASARCO had increased its settlement offer toward the Community water budget by an additional 5,000 acre-feet from its M&I allocation. Of the remaining 60,647 acre-feet, the Secretary took responsibility for firming 28,200 acre-feet as required by the Southern Arizona Water Rights Settlement Act (SAWRSA) and the State agreed to firm 15,000 acre-feet toward

the Gila River Indian Community settlement. The balance of 17,447 acre-feet, which would be dedicated for future settlements, was divided equally with each party accepting the responsibility for 8,724 acre-feet. These levels of responsibility are specified in Section 105 of the Settlements Act. Arizona's commitment to firm 15,000 acre-feet for the benefit of the Gila River Indian Community settlement is also confirmed in paragraph 8.23 of the Gila River Indian Community Settlement Agreement (Settlement Agreement).

What is "In the Same Manner as Water with an M&I Priority?"

The State and the Department of the Interior have not reached a mutual understanding of what is meant by the phrase "in the same manner as water with an M&I priority is delivered during water shortages." The difference of interpretations was not discovered until after most of the other negotiations had been completed, and so it was decided that this and any other remaining issues could be resolved as the Firming Program was developed. The significance of the divergent viewpoints may have very limited practical application, depending upon the degree of severity of CAP water supply shortfalls. In short, the State's interpretation is that the obligation to provide a replacement water supply only occurs when the water supply drops below the level required for meeting the "firmed" water target level. In the case of the Community, if the amount of non-Indian Agricultural water available to the Community drops below 15,000 acre-feet, the State would have some obligation to provide an alternative supply. The federal viewpoint is that Community could be affected, and therefore is owed firming water, even if the non-Indian Agricultural supply is greater than 15,000 acre-feet, but is lower than their full settlement budgeted volume of 120,200 acre-feet. The following examples illustrate how this difference in interpretation translates into firming obligation:

Examples – Baseline calculation

The total non-Indian Agricultural contract amount equals 317,000 acre-feet. The Community's share of the non-Indian Agricultural contract amount is 120,200 acre-feet or about 38 percent. If the Community had received 15,000 acre-feet of M&I priority water, its share of non-Indian Agricultural water would be reduced to 105,200 acre-feet or about 33 percent.

Example 1 – Full NIA Supply of 317,000 af is available.

State perspective

GRIC receives 120,200 af, which is greater than 15,000 af so no firming is required.

Fed perspective

GRIC should receive 15,000 af as if it were M&I priority and 33% of the 317,000 af NIA water or about 105,200 af. The total GRIC should receive is 120,200, which is what it does receive, so no firming is required.

Example 2 – 33% shortage to NIA
Available NIA supply is 211,000 af

State perspective
GRIC receives 38% of 211,000 af or about 80,000 af. Since this is greater than 15,000 af **no firming is required**.
Fed perspective
GRIC should receive 15,000 af as if it were M&I priority and 33% of the 211,000 af NIA water or 69,600 af. The total GRIC should receive is 84,600 af. The state needs to make up the **shortfall of 4,600 af** between what GRIC received and what it would have received if the 15,000 af was M&I priority.

Example 3 – 50% shortage to NIA
Available NIA supply is about 159,000 af.

State perspective
GRIC receives 38% of 159,000 af or about 60,000 af. Since this is greater than 15,000 af, **no firming is required**.
Fed perspective
GRIC should receive 15,000 af as if it were M&I priority and 33% of the 159,000 af of NIA water or 52,500 af. The total GRIC should receive is 67,500 af. The state needs to make up the **shortfall of 7,500 af**.

Example 4 – 90% shortage to NIA
Available NIA supply is about 32,000 af

State perspective
GRIC receives 38% of 32,000 af or about 12,000 af. Since this is less than the 15,000 af, **firming is required of 3,000 af** to guarantee equivalency with M&I priority water users.
Fed perspective
GRIC should receive 15,000 af as if it were M&I priority and 33% of the 32,000 af of NIA water or 10,600 af. The total GRIC should receive is 25,600 af. The state needs to make up the **shortfall of 13,600 af**.

Example 5 – 100% shortage to NIA
Available NIA supply is 0.

State perspective
GRIC receives 38% of 0 or 0 af. Since this is less than the 15,000 af, the **firming required is 15,000 af.**
Fed perspective
GRIC should receive 15,000 af as if it were M&I priority and 33% of 0 af or 0 af. The total GIRC should receive is 15,000 af. The state needs to make up the **shortfall of 15,000 af**.

The examples show that there is no difference in perspective when there is no shortage to non-Indian Agricultural supplies or there is a 100 percent shortage to non-Indian Agricultural supplies, but in between, there is a considerable difference in the resulting firming requirement.

One additional example illustrates the more commonly anticipated firming requirement when the CAP supply is less than adequate to satisfy all M&I subcontract needs.

Example 6 – 100% shortage to NIA and 25% Shortage to M&I

An M&I subcontract for 15,000 af would only receive 75% of its supply or about 11,250 af.

The State would be required to provide an equivalent supply of 11,250 af to satisfy the firming obligation, but GRIC would still fall short by all of its other NIA priority water.

While the examples shown above used the Community firming commitment of 15,000 acre-feet, the situations would be similar for the remaining 8,724 acre-feet of the State's firming obligation for future Indian Settlements.

C. MODELING SCENARIOS

In order to estimate the volume needed to meet the firming obligations under the Settlement Act, ADWR staff began by using the Colorado River System Simulation model, know as the CRSSez model, to analyze approximately 200 combinations (See Appendix IV) of the variables identified in Table 1.

Table 1. CRSSez Model Input Variables and Descriptions

Input Variable	**Description of Input Variable**
Hydrology	The model uses a period of historic hydrology that can be selected by the user. The available hydrologic data is 1906-2002. The start year can be any year in this period and any portion(s) of the historic hydrology can be utilized.
Lower Basin Demand Projections	This is a demand schedule developed in 1997 by ADWR and CAP. ADWR and CAP are currently working on updating the projected consumptive uses for on-river uses and for CAP users. Current runs project full utilization of allocation by the Lower Basin states.
Upper Basin Demand Schedules	This is the total quantity of demand for the Upper Basin starting at the current demand and building up to a specified demand level. Current demand in the Upper Basin is approximately 4.1 MAF. Build-out demands in the Upper Basin have been estimated using current demand, limited Upper Basin build-out at 4.8 MAF, and a maximum build-out demand of 5.4 MAF.
Reservoir Elevations	Reservoir elevations are input for the 5 Upper Basin reservoirs and Lakes Mead and Powell. The user can select any reservoir elevation desired as a starting point for projecting, however, current reservoir elevations are typically utilized.

Input Variable	**Description of Input Variable**
Surplus strategy	The surplus strategy utilized is one that will avoid spills in the system. Due to the Interim Surplus Guidelines (ISG) there are now two options. In both, Lake Mead elevations are used to determine if a spill could occur in that year. If so, a surplus year is declared and extra water can be made available to the Lower Basin States.
Mexico Delivery	Deliveries to Mexico can be set at any level. Most model runs done to date have set Mexican deliveries to 1.5 MAF pursuant to the Treaty. Additional water can be identified as delivered to Mexico in times of surplus or flood control releases but is limited to 200 KAF.
Operation of the Yuma Desalinization Plant ("Yuma Desalter")	This variable is essentially an "on" or "off" selection. The variable can be turned on at any point within the span of the model run, i.e. begin operation of Yuma Desalter in 2009.
Lake Mead Shortage Protection Elevation	The strategy involves selecting a specific Lake Mead elevation and then protecting against dropping below that elevation. The probability of achieving that protection is also user selected. Values used for this analysis include 915 feet; 1,000 feet; 1,050 feet; and 1,083 feet. Elevation 1,000 and 1,050 feet are the lake elevation of the Southern Nevada Water Authority's system intakes. The probability of achieving this protection is then expressed in percentage of occurrence.
Arizona Shortage Delivery	This variable is set based on the total amount of water that will be available to all Arizona Colorado River water users when a shortage declaration is made on the Colorado system. Two values have been modeled for this purpose: (1) delivery of 2.3 MAF to Arizona users during shortages (i.e., 500 KAF shortage), and (2) delivery of 2.0 MAF to Arizona users during shortages (i.e., 800 KAF shortage). It should be noted that there is not currently an established minimum or maximum volume that may be used by the Bureau in these events and the values that have been used are simply planning numbers.
Lake Mead Minimum Elevation	This variable is an elevation; any value could be input. Two are commonly used in current analyses, (1) 1,000 feet, which is the minimum elevation from which Southern Nevada can withdraw water, and (2) 915 feet, which is the minimum elevation for releases through the dam.
CAP Shortage Sharing Method	On-River users would share shortage at an equal percentage with CAP. The shortage sharing method described in the Gila River Indian Community Water Rights Settlement Agreement between CAP, Indian and M&I uses has been used for these purposes.

D. ESTIMATED FIRMING VOLUME

Table 2 describes a few of the most likely combinations used to estimate the water available for delivery to Arizona for the next 100 years. The input variables chosen represented a range of possible operational conditions—from the optimistic to the conservative—including input parameters that form a reasonable basis for further analysis and decision-making. All of the analyses used January 1, 2003 reservoir levels at Lake Mead and Lake Powell and assumed full utilization by Mexico of its entitlement under the Mexican Water Treaty (1.5 million acre feet during normal and shortage years and 1.7 million acre feet during surplus years).

Based on this analysis, the estimated Indian Firming obligation is 548,770 acre-feet over the 100-year period. A range of firming volumes was also presented, between 400,000 acre-feet and 600,000 acre-feet based on various assumptions for how much water is cut from the CAP entitlement, 300,000 acre-feet, 500,000 acre-feet, or 800,000 acre-feet. The model results using these parameters were then input into the shortage calculation spreadsheet, that assumed both a constant normal year annual demand for CAP water of 1.49 million acre-feet or a limited mainstream demand of 1.25 million acre-feet for the projection period (2003 to 2103).

Table 2. Indian Firming Scenarios

MODELING SCENARIOS AND ESTIMATED FIRMING VOLUMES (REVISED) INDIAN FIRMING STUDY COMMISSION (Acre-Feet - Values rounded to the nearest 10s)				
Upper Colorado River Basin Buildup Assumption	**2003 Mainstem Use Projection Assumption**	**300,000 AF Shortage**	**500,000 AF Shortage**	**800,000 AF Shortage**
4.6 Million Acre-Feet	**Normal**	**448,640**	**447,490**	**383,330**
	Limited to 1.25 Million Acre-Feet	**296,610**	**366,450**	**298,710**
4.8 Million Acre-Feet AWBA Option	**Normal**	**646,850**	**548,770**	**420,500**
	Limited to 1.25 Million Acre-Feet	**474,100**	**493,200**	**357,230**
4.8 Million Acre-Feet	**Normal**	**657,060**	**569,880**	**435,860**
	Limited to 1.25 Million Acre-Feet	**482,050**	**510,920**	**373,300**
5.0 Million Acre-Feet	**Normal**	**845,570**	**805,470**	**555,390**
	Limited to 1.25 Million Acre-Feet	**656,940**	**798,380**	**529,280**

Basis for Proposed Volume

Surplus Strategy

Surplus strategies can be designed to meet many different objectives, including flood control, spill avoidance, and to use stored water to meet excess demands. The system spill avoidance strategy is used by ADWR, whereby Lake Mead elevations are used to determine if a spill could occur in any year. If so, a surplus year is declared and extra water can be made available to the Lower Basin States[1]. A "70R" surplus strategy was adopted by the AWBA Study Commission

[1] Arizona, California, and Nevada

for planning purposes and is used in this analysis beginning in 2017. Under a 70R strategy, if there is not sufficient space to store the 70th percentile runoff (about 17.3 million acre-feet) at the beginning of the year, then a surplus is declared. In the years prior to 2017, the surplus strategy is based on the Interim Surplus Guidelines adopted in 2000. The Interim Surplus Guidelines were created by the Basin States[2] to assist California agencies in incrementally reducing consumptive use to 4.4 million acre-feet during an interim period commencing on January 1, 2002 and ending on December 31, 2016. The Interim Surplus Guidelines use modified Lake Mead elevations to determine if a surplus could be declared in any year and allow the reservoir to be drawn down more than under the 70R strategy.

Shortage Strategy

The shortage strategy involves selecting a specific Lake Mead elevation and then operating the system to protect against dropping below that elevation. The Lake Mead shortage trigger elevation is used to determine whether a shortage should be declared in a given year. If the elevation of Lake Mead is greater than the trigger, then no shortage is declared. If the elevation of Lake Mead is less than the trigger, a shortage is declared. The following Lake Mead shortage elevations were analyzed for this exercise: 915 feet; 1,000 feet; 1,050 feet and 1,083 feet. Elevation 1,000 and 1,050 feet are the lake elevation of the Southern Nevada Water Authority's system intakes. Staff believes that it is important operationally to protect the intakes of the Southern Nevada Water Authority; elevations 1,000 and 1,050 were identified as the appropriate assumptions for this variable. Further analysis showed no significant difference in the results of using either of these assumptions and thus staff recommends using the upper elevation of 1,050 feet.

Another assumption within this variable is the probability of achieving the specified protection elevation. This variable is also user specified. A percentage probability can be assigned to the probability of the lake staying above the shortage trigger elevation. The probability of achieving this protection is expressed in percentage of occurrence (i.e., 80% of the time, Lake Mead can be operated to protect the lake level at or above the specified elevation). Staff reviewed the elevation shortage protection probabilities of 50 percent and 80 percent and found that although using a 50 percent elevation shortage protection probability resulted in slightly more water being available to CAP, it was not significant enough to warrant a deviation from the AWBA Study Commission recommendation of 80 percent. Thus staff recommends using 80 percent, which is consistent with the recommendations of the AWBA Study Commission.

[2] Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming

Minimum Lake Mead Elevations

This variable projects the minimum elevation to which Lake Mead can be drawn down to. The deeper the minimum elevation impacts the amount of reduction that would be required of Arizona Priority 4 users (including the CAP) and Southern Nevada users. Maintaining a higher elevation during a shortage declaration would increase the amount of shortage to be borne by these users; therefore staff is recommending a minimum Lake Mead elevation of 915 feet.

Upper Basin Demands

The values analyzed for this variable revealed the largest impact to the availability of water supplies to CAP. Staff analyzed Upper Basin Demands at the following levels: current demand of 4.1 million acre-feet; limited demands of 4.8 million acre-feet; and slightly less than full build out demands of 5.4 million acre-feet. Additionally, staff reviewed levels of 4.6 million acre-feet and 5.0 million acre-feet. Full build out in the Upper Basin is the amount of water that could be consumptively used if currently legislated, but unfunded, projects are built including development of oil shale reserves. Limited Upper Basin Demands are based on utilizing current projects to their full capacity, resulting in a demand of 4.6 million acre-feet. However, in the analyses conducted by the AWBA Study Commission, allowances for additional development (200 thousand acre-feet) was included on top of what was anticipated (4.6 million acre-feet) for a total demand of 4.8 million acre-feet. Staff recommends using the estimated Upper Basin demand of 4.8 million acre-feet, consistent with the AWBA Study Commission recommendations because the demands are based on actual projects in place as well as allowing for limited development.

Operation of the Yuma Desalinization Plant

Pursuant to the Mexican Treaty, the United States is required to ensure delivery of 1.5 million acre-feet per year in normal and shortage years to Mexico. Historically agricultural return flows made up a significant portion of this delivery, which has resulted in the quality of the water to be undesirable to the users in Mexico due to high salinity. In response to this issue, the United States and Mexico entered into Minute 242, which requires the U.S. to deliver water at Morelos Dam with an average salinity of no more than 115 parts per million (ppm) ± 30 ppm over the average salinity of the water at Imperial Dam. To meet this requirement the U.S. explored several options for improving the quality of water delivered to Mexico. The solution selected was to bypass the Wellton-Mohawk Irrigation and Drainage District (WMIDD) agricultural returns until the construction and operation of the Yuma Desalinization Plant (YDP) could treat the drainage water. The plant was completed in 1992 and was expected to desalt some of the WMIDD drainage water to be blended with additional drainage water from the WMIDD in Arizona and then delivered to Mexico. The YDP was operated for eight months and then put into standby status in 1993 to repair

damage to the drainage canal and to repair various design and construction deficiencies. Since 1993, water has continued to be by-passed from the WMIDD to the Cienega de Santa Clara that has been over and above Mexico's entitlement. The model assumes approximately 120,000 acre-feet of by-pass water per year resulting in a drawdown of Lake Mead because of the inability to use the desalted water from WMIDD to meet the entitlement. Staff analyzed re-initiating operation of the YDP in 2009, consistent with recent US Bureau of Reclamation (USBR) statements; delaying operation of the Desalter to 2030; and not operating the Desalter. As expected, delaying or not operating the YDP resulted in slightly higher shortages. Staff recommends using the assumption that the YDP will begin operation in 2009, consistent with USBR public statements that actions will be taken to run the YDP or offset the by-pass.

Shortage to CAP

In a year in which the Secretary declares a shortage on the Colorado River, Arizona Priority 4 users and Southern Nevada will have their deliveries reduced to a predetermined shortage delivery amount. The analysis performed by staff focused on three possible levels of cutback that might affect Arizona Priority 4 users (300 thousand acre-feet, 500 thousand acre-feet or 800 thousand acre-feet) in the event that a shortage is declared. The scenario in which Arizona took a deeper cut to its allocation (800 thousand acre-feet) revealed that the average probability of shortage decreased slightly, however, the cumulative volume of shortage was greater than occurred with 500 thousand acre-feet or 300 thousand acre-feet. For instance, using the current M&I banking obligations as a benchmark (which assumed a 500 thousand acre-feet shortage to Arizona), cutting Arizona's deliveries by 800 thousand acre-feet resulted in an additional 3 million acre-feet acre-foot shortage over the 100-year period to M&I water users. Thus as 800 thousand acre-feet shortage makes M&I supplies less firm and reduces the volume of water that would need to be firmed on behalf of the Tribes, due to the shortage sharing criteria in the Gila River Indian Community Water Settlement Agreement. Although this reduces the potential cost to the State for developing the firming volume other factors need to be considered. The increased shortage volume due to the greater shortage to Arizona would result in an additional firming requirement by the AWBA for M&I subcontractors. It would also require the development of additional groundwater supplies in shortage years (in addition to the recovery of the firming water), resulting in the need for additional well capacity and potentially increasing the cost to develop supplies in shortage years. For these reasons, the 800 thousand acre-feet shortage assumption is not recommended as a planning assumption.

E. WATER SUPPLY OVERVIEW

(Indian Firming Technical Committee - Water Resources Analysis November 17, 2003)

Prior to the formation of the Study Commission, the AWBA was asked by ADWR to create the Indian Firming Technical Committee (Technical Committee) to review options for meeting the State's obligation for Indian Firming. The Technical Committee identified the use of a variety of either full or partial water sources. The ability to have several options available in a flexible manner may lower costs. In addition, the Technical Committee found that there might be opportunities to enter into partnerships with other parties to have multi-objective projects.

Central Arizona Project Water

There are several categories of CAP water that may be used to meet firming objectives. CAP water is likely to be found to be a highly feasible alternative since it is currently the AWBA's primary water source and there is excellent infrastructure available for water delivery directly to many Indian Reservations and to recharge facilities.

Excess Water

Excess water is CAP water that may be available on a year-to-year basis that is not delivered pursuant to a long-term contract or subcontract. Generally, this supply is thought of as a transitional supply that will be available only until long-term subcontracts and Indian contracts are fully utilized. The AWBA was created as an institution that would be able to utilize excess water and, to date, it has exclusively stored water from this source.

- Water Bank pool – CAWCD has adopted policies on how it will market excess water among competing uses. Agriculture will be entitled to a first priority pool, but that pool will be capped in volume and will reduce over time. Currently, state statutes place the AWBA as the last priority user for excess water. Studies performed by ADWR and CAWCD indicate that excess water will be available to some degree until about the year 2025.
- Periodic surplus supplies – Even after long term contractors are fully utilizing their CAP supplies, there will be opportunities for excess water supplies to be marketed. Since CAP is entitled to utilize any of Arizona's Lower Basin entitlement that is not consumed by other contractors, it will be able to divert surplus water that may periodically be available from the Colorado River. While the probability of surplus will decrease over time, ADWR water supply studies show that there will be periods of high runoff that will enable surplus declarations. The "sponge" provision of the CAP contract also creates the opportunity to sell excess water in any

year when consumptive uses by non-CAP Colorado River water users falls below 1,310,000 acre feet.

NIA subcontract

Under the terms of the Settlement Agreement, after completion of relinquishments of non-Indian Agricultural subcontracts by agricultural districts, there will be two pools of non-Indian Agricultural priority water available for future allocation. While one pool will be held by the Secretary and is reserved for use in Indian water rights settlements, the other will be held in trust by ADWR for future allocation for non-Indian purposes. The State, acting through the AWBA, either by itself or in partnership with others, could seek an allocation of a portion of this non-Indian supply. Since the non-Indian Agricultural water subcontract will be shorted at the same time Indian firming water is needed, this supply cannot be used directly as a substitute supply. It could, however, be used as a source of water for earning long-term storage credits.

Indian Lease

Several Indian settlement agreements have created opportunities for Indian tribes and Communities to lease a portion of their CAP supplies. In order to satisfy assured water supply requirements, lessees have sought leases that will last for at least 100 years and are for high priority water allocations. The State, acting through the AWBA could by itself, or in partnership, attempt to negotiate a lease. As mentioned above, for the purposes of meeting the firming obligation, it is not necessary to lease highest priority water and it may not even be necessary to have a long-term 100-year lease. Another option would be to enter into a lease for the same non-Indian Agricultural priority water that is in need of firming. For example, the State by itself, or in partnership with another party, could lease the 15,000 acre-feet of non-Indian Agricultural priority water from the Community but pay for the lease as if it were leasing M&I priority water. Then, in times of shortage, the shortage would simply be borne by the State and no firming or substitute supply would be required. An alternative would be to lease the water from the Community, but allow a call back option by the Community in years when the supply is not shorted.

Non-CAP Colorado River water

Contract transfer or lease

While there currently is no active water rights market for Colorado River water, it is possible that such a market could develop in the future. On two occasions, in the context of obtaining water for Indian water rights settlements, water was transferred from Yuma area irrigation districts to CAP service area tribes. The owners of land in the Cibola Irrigation District have recently marketed their Colorado River contract rights. In order to be useful for firming non-Indian Agricultural priority water shortages, the contract rights must either be of higher

priority than CAP water or the water supplies obtained must be used to obtain underground storage credits. The Cibola rights are the same priority as CAP.

Dry year options

Since firming water is only needed in shortage years, it may be unnecessary to purchase or lease permanent water rights. If arrangements could be made to fallow irrigated land only during drought years, agricultural use could continue in most years. To some extent, a dry year options program can be viewed as a temporary transfer of priority where the senior right holder agrees to accept a lower priority in exchange for compensation.

Other surface water

Opportunities to develop additional surface water supplies within Arizona are very limited. Except for periodic flood events, most of the state's watersheds are fully appropriated. However, in limited circumstances, flood flows may be a water supply that can be used in conjunction with recharge facilities.

Salt/Verde floodwater

During the 1970's and 1980's there were frequent occurrences when runoff from the Salt and Verde River watersheds exceeded the Salt River Project (SRP) storage capacity causing water to be released to the Salt River bed. Since that time, Roosevelt Dam storage has been increased, but the Verde River still has limited reservoir storage capacity. In previous spill events, SRP provided "spill" water to agricultural lands. However, with the rapid urbanization of SRP and Roosevelt Water Conservation District (RWCD) lands in the metro Phoenix area, agricultural lands may no longer be available to utilize these spill water supplies. If recharge sites are strategically located, it may be possible for some of the spill water to be stored underground.

Little Colorado River floodwater

There are no large reservoirs on the Little Colorado River. Periodically, flood flows have been significant in this watershed, but the opportunities to make use of those supplies are limited due to high sediment loads and lack of storage facilities. Opportunities to utilize Little Colorado River water would probably be practical only if a portion of the State's firming obligation is dedicated to a Navajo or Hopi water rights settlement.

Effluent

Treated municipal effluent is a highly reliable water supply that can be obtained by contract with a water treating entity. Furthermore, as municipal water demands increase, more treated effluent will become available in the future. The ability to directly deliver effluent in times of CAP shortage will need to be determined on a case by case basis. However, even if the effluent cannot be

mixed with other water supplies, it may be a very good water supply for underground storage.

Excess effluent not under contract or pledged for Assured Water Supply

Much of the municipal effluent in the Phoenix Active Management Area (Phoenix AMA) is being put to use for power plants, golf course and turf irrigation, agricultural irrigation, and for other service area requirements. In the Tucson Active Management Area (Tucson AMA) much of the effluent supply is directly used or stored underground for long-term storage credits. However, as population expands, there may be situations where the supply of effluent exceeds local demands. If these supplies are purchased in conjunction with an underground storage and recovery plan, they may be a useful opportunity to meet the Indian firming obligation.

Mesa/Chandler effluent committed to GRIC exchange

Under the terms of the Settlement Agreement, Mesa and Chandler will exchange A+ effluent for the Community's Indian priority CAP water. In years of CAP shortage, the CAP water may be reduced to some extent. In that case, the Cities' effluent portion of the exchange may also be reduced proportionally. If the exchange follows this scenario, then there may be a limited amount of excess effluent owned by the Cities that could be purchased by the State to meet the firming obligation to the Community. This water would not need to be recharged since it could be delivered directly to the Community.

Groundwater

Groundwater is a plentiful and reliable water supply, but it is subject to extensive regulation by state law. Groundwater has the advantage that it is already stored underground and so it does not need to be banked. Also, most groundwater is of adequate quality and can be mixed with other supplies in existing canals and aqueducts.

Grandfathered Rights

Grandfathered rights are the most commonly used rights to withdraw groundwater in the five Active Management Areas. Of the three kinds of Grandfathered rights, Irrigation Grandfathered Rights would likely be the least useful since they are limited to irrigation use (agricultural uses on 10 or more acres) and are appurtenant to the land. Type I and Type 2 non-irrigation Grandfathered Rights may be more useful. For example, a Type 1 or Type 2 right could be purchased or leased and pumped into the CAP aqueduct or other delivery canals during shortage periods.

Poor quality water

There are numerous occurrences of poor quality groundwater where remedial action is needed. If the State were to participate in funding the clean up of some of this water, it may be able to use that supply either directly or by exchange to meet firming or Southside replenishment requirements.

Water logged area groundwater

In the Buckeye area in the Phoenix AMA there is an excess amount of groundwater that has historically had to be pumped for drainage purposes. This source of supply can be accessed by permit rather than requiring a Grandfathered right. If this water were treated to improve its quality, it may be useable as a supply for direct delivery to the Community or for exchange to other water users.

Groundwater imported from outside of AMAs or from off-reservation sources

The groundwater transportation statutes allow, subject to limitations, importation of groundwater from the Harquahala Irrigation Non-Expansion Area, the McMullen Valley Basin and from the Butler Valley Basin. If appropriate infrastructure is constructed, water could be pumped into the CAP aqueduct to supplement supplies during times of shortage. Depending on which Indian reservations are the recipients of the 8,724 acre-feet of non-Indian Agricultural priority water in the future, off-reservation groundwater may have potential as a source for firming in areas not served directly by the CAP.

Yuma Area groundwater mound

The Yuma area groundwater mound is legally groundwater rather than Colorado River water. However, it is made available for transfer by using this source to meet the needs of Colorado River contractors. State law has been modified to allow the issuance of permits that will allow a party to pay for drainage pumping and receive the benefits of the captured water via exchange mechanisms.

Existing Long Term Storage Credits

Under current law, long-term storage credits are marketable commodities. Currently, the AWBA and CAWCD hold the majority of these credits. The AWBA credits are committed to statutory purposes and while they can be "loaned", they must be paid back. The CAWCD credits are an asset of the District. At this time, it appears CAWCD will reserve those credits for purchase by the Central Arizona Groundwater replenishment District (CAGRD). However, since the Indian firming requirement covers a 100-year period, the possibility exists that CAWCD may be willing to dispose of some or all of its credits in the future, especially if the AWBA is successful in providing sufficient M&I firming for subcontractors. It is also possible that in the future some other

entity, such as a city or wastewater treatment plant owner or a private business, may accumulate long-term storage credits from excess effluent or other supplies that they may want to use as a marketable asset.

Conserved water

Both within Arizona and in neighboring states, there are numerous examples of one party paying for water conservation efforts of another party and then benefiting from the conserved water. During the course of the negotiations of the Gila River Indian Community settlement, RWCD developed a water conservation proposal whereby it would use canal extensions and regulating reservoirs to reduce lost and unaccounted for water. The conserved water would have been made available for meeting the State's firming obligation to the Community. This project or others like it could be investigated further. Quite often the water conservation projects have been the result of canal lining cooperative efforts. Within the CAP service area there are very few opportunities to participate in a lining project, since most canals and aqueducts are already lined. The exception is the San Carlos Project canal systems, which are mostly unlined, but would be improved as a result of the settlement agreements. The lining of the San Carlos Irrigation and Drainage District (SCIDD) system may present an opportunity for cost sharing with the State if some of the conserved water could be used for Indian firming.

REVIEW OF OPTIONS CONSIDERED

The Study Commission reviewed several options for the development of the Indian Firming Program. This Section describes the options reviewed, the issues related to each, the estimated costs of each[3], and an evaluation of the advantages and disadvantages of using the approach.

A. TRADITIONAL AWBA APPROACH

- The AWBA would add Indian firming to their water banking responsibilities. Storage would occur through permitted off-reservation facilities.
- Water credits would be transferred to CAWCD for recovery in times of shortage.
- CAWCD would recover water through its recovery plan and deliver water to the Community and other tribes either directly or by exchange.
- The Community and other tribes would order CAP water and would pay as if there were no shortage.

Issues

- Over the next 20 years, the AWBA will need to purchase and store an additional ±548,770 acre-feet (plus losses and cut to the aquifer) of excess CAP supply.
- Would need to establish a priority vs. existing M&I firming and Interstate banking obligations.
- A recovery plan would need to address potential third party effects, including impact on local groundwater levels.
- May cause a timing impact on CAGRD and other secondary users of excess water.
- Will probably require extending AWBA funding period beyond 2016.

Estimated Cost (at today's cost)

- At current rates water purchase and storage averages for direct underground storage (based on GRUSP) = $88.60/acre-feet * 548,770 acre-feet * 1.1 (10% losses and aquifer cut) = **$53,480,000.**
- At current rates water purchase and storage averages for Groundwater Savings Facility storage = $42.00/acre feet * 548,770 acre-feet * 1.1 = **$25,350,000.**
- At current rates assuming 50% Underground Storage Facility/50% Groundwater Savings Facility = **$39,420,000.**

[3] It should be noted that the estimated costs are based on today's cost and assume the full firming volume. If a combination of options are used the associated costs could be reduced.

- Recovery costs are unknown, but need to assume amortization of CAP owned wells, possible leases of non-CAP wells, pumping energy, conveyance or wheeling to Indian delivery points.
- If recovery cost is less than or equal to the CAP delivery charges paid by Indian water users, there would not be an incremental additional cost to the State for recovery. If recovery cost is greater than delivery charge, there could be an additional State cost.

Evaluation

- Advantages
  - Similar to current AWBA firming activities. Would expand need for recovery, but would still use same techniques. Few statutory amendments would be needed.
  - Transparent to tribes – water delivered in times of shortage.
  - If there are few shortages, the State maintains a valuable asset that can be used for other purposes.
  - Some of storage and recovery cost is offset by payment for CAP water by tribes.
- Disadvantages
  - High upfront expense to purchase and store excess CAP water.
  - Funding would be required for several years.
  - Over time, there will be less excess water supply available.
  - Could add complexity to recovery plan – especially if much of the 8,724 acre-feet would need to be delivered by exchange.

B. WATER BANKING ON TRIBAL LANDS

- Two potential approaches
  - Traditional permits for storage and recovery as overseen by ADWR; and/or
  - Non-traditional storage and recovery contracts between AWBA, CAP, and the Community or other tribe.
- Water would be delivered on a schedule for either:
  - Direct recharge at underground storage facilities.
  - Direct delivery to the Community/other tribes for on-reservation use. An account similar to a Groundwater Savings Facility credit account would be established. Cost sharing for storage would depend on negotiated agreements.
  - If 548,770 acre-feet is estimated volume for shortage scenario split into:
    - Community 346,971 acre-feet
    - Other Settlements 201,799 acre-feet

Issues

- Payment issues

    - Under more traditional approach credits would be owned by AWBA and CAP would pay for on-reservation recovery, but tribes would have to pay for CAP delivery in times of shortage.
    - Under non-traditional approach, credits would not be earned, but a *firming account* would be credited with deposits and debited in times of shortage. The Community/other tribes would pump groundwater in lieu of ordering CAP water. They would pay for recovery, but would not make CAP payments for "firmed" water. They could also choose not to pump and absorb the shortage.
- Water supply availability (excess CAP water) would be the same as under the AWBA traditional alternative.
- Advanced delivery to the Community will be subject to high conveyance losses until the main canal to the inter-connect delivery point is lined. Options exist for delivery through the RWCD canal, SRP's canal system, the reclaimed water line that will be constructed between the Greenfield Water Reclamation Plant and the Community, or Maricopa Stanfield Irrigation and Drainage District (MSIDD) canal, but will probably require payment of capacity and use fees.
- There are currently no underground storage facilities on the Gila River Indian Community reservation, so unless one is constructed, only direct delivery for current uses would be viable.
- This plan could work well for the Community's 15,000 acre-foot component, but could be more difficult for 8,724 acre-foot component. However, if the Community would allow advanced delivery of all 548,770 acre-feet, then could provide firming for other tribes by forbearing a portion of their CAP Indian priority supply in times of shortage. The Community could then either receive groundwater pumped as credits or pumped as groundwater. The Community water budget accounting method (contained in the Settlement Agreement) would need to be amended so the Community is not penalized for not taking CAP water that was available.

Estimated Cost (at today's cost)

- The Community has indicated that it believes the advanced water delivered to the reservation should be at no cost. This is because it would not necessarily be offsetting existing groundwater withdrawals, so there may not be an offsetting savings in pumping cost. At current rates this would be equal to $70/acre-foot.
- Delivery to the reservation past the CAP turnout would be subject to losses and delivery charges. These charges are unknown at the present time, but a reasonable assumption may be about $10/acre foot.
- Total storage cost = 548,770 acre-feet * 1.05 (5% loss factor) * $80 = **$46,100,000**.

- Recovery would need to take place from on-reservation wells. Additional well capacity would be needed, but it is unknown if the Community will have excess well capacity once its irrigation project is completed.
- Under the more traditional approach, CAWCD would need to lease on-reservation wells and pay for recovery. However, it would receive payment for CAP delivery charges to offset cost.
- Under the non-traditional approach, the Community would bear all costs of infrastructure and pumping, but would not pay CAP charges.

Evaluation

- Advantages
    - Advanced banking agreement could establish a maximum firming exposure limit (at least for the Community).
    - On-reservation storage and recovery not in competition for capacity with other AWBA missions.
    - The Community would benefit from assistance in obtaining and using CAP water while canal project is being built.
    - Creates opportunities for partnerships between State and tribes.

- Disadvantages
    - Early delivery water is committed to Indian tribes, even if there are few shortages. No underground storage facilities currently constructed on tribal lands.
    - High upfront expense to purchase and store excess CAP water.
    - Non-traditional storage and recovery would require authorizing legislation.
    - Requires contracts (and possibly legislation) which must honor tribal sovereignty (compact?).
    - Firming for the Community easier to accomplish than firming for other 8,724 acre-feet.

C. LEASE OF INDIAN CAP WATER

- State would partner with CAGRD, or other interested parties, to lease 15,000 acre-feet of non-Indian Agricultural priority water from the Community at M&I priority price for a 100-year period. The leased water would bear the shortage burden. When water is available, CAGRD would use it for replenishment. State share of lease would cover the burden of the shortages.
- To provide a shortage supply for the remaining 8,724 acre-feet, the State and CAGRD could lease additional non-Indian Agricultural priority water from tribes for 100-year period as new settlements are negotiated.

- If non-Indian Agricultural priority leases are unavailable, the State and CAGRD could seek leases of Indian priority water from tribes whose settlements allow leasing.

Estimated Cost

- Lease payments are made up-front or over time plus interest. Current rate is about $2200 per acre-foot of contract right.
- Lease cost = $2200 * 23,724 acre-feet = $52,190,000.
- If lease cost is shared proportionally:
    - CAGRD ≈ 70% = $36,530,000
    - State ≈ 30% = **$15,660,000**
    - CAWCD would receive water delivery payments from CAGRD when water is available, but would not receive payments from State in shortage years.

Evaluation

- Advantages
    - Doesn't require use of excess water, which makes it available for other purposes. Doesn't require storage and recovery resources.
    - Allows economic cost sharing arrangement with CAGRD. Both partners will benefit.
    - State exposure is limited if there are only limited shortages.
    - Potential low cost for State contribution.

- Disadvantages
    - Tribes lose the benefit of the water resource for 100 years (although they receive payment).
    - Would require large upfront payments by State and CAGRD. State funding may need to be financed which will increase cost due to interest charges.
    - Settlement agreements may have limitations on leases.
    - State legislation may be needed, depending on which State agency is authorized to enter into lease contract.

D. DRY YEAR FALLOWING BANK AND/OR GROUNDWATER IMPORTATION

- State would arrange for alternative supplies that could be delivered through the CAP only in times of shortage.
- Dry year options could be taken with high priority Colorado River irrigation districts or the Ak Chin Indian Community to intentionally reduce consumptive use in years when there is a firming obligation.

- As an alternative or in conjunction with the fallowing bank, groundwater could be imported from the Butler Valley Basin under contract with the State Land Department.

Estimated Cost

- State would need to plan to obtain 548,770 acre-feet plus approximately 5% for distribution losses.
- Cost for land fallowing options are subject to negotiation with willing sellers. Based on Palo Verde IDD programs in California, cost could be between $153-$203/acre-foot. 548,770 *1.05* $153 ($203) = **$88,160,000 to $116,970,000**.
- Cost for Butler Valley Basin groundwater would include State Land Department (SLD) payments, wells and pipeline infrastructure, and pumping costs.

Evaluation

- Advantages
  - High priority supplies and groundwater are secure sources.
  - State exposure is limited if there are few shortages.
  - Expenses can be deferred until shortages are more imminent.
  - State payments to SLD would benefit Land Trust.
- Disadvantages
  - Land fallowing is controversial and could affect area of origin.
  - Cost is very uncertain until negotiated. Potentially very expensive.
  - Hard to justify fallowing land on-River so water can be used for irrigation on-reservation.
  - Groundwater development will require infrastructure development.
  - Would need extensive legal/institutional arrangements including authorization.

E. COMBINATION OF SOLUTION ELEMENTS

- The State could use a combination of two or more of the solution elements described above.

FUNDING AND WATER SUPPLY AVAILABILITY

A. EXISTING AWBA OBLIGATIONS

The Arizona Water Banking Authority (AWBA) was created in 1996. Until the AWBA was created, Arizona did not use its full 2.8 million acre-foot share of Colorado River water. It was estimated at the time that without the AWBA, Arizona would not have used its full allocation until the year 2030. During that interim period, the accumulated amount of water left in the Colorado River would have amounted to approximately 14 million acre-feet, most of which would most likely be used by Southern California.

Leaving a portion of Arizona's water in the Colorado River was a lost opportunity. The AWBA gives Arizona the capability to further secure the dependable water supplies necessary to ensure the state's long-term prosperity.

The AWBA was created to store unused Arizona Colorado River water to meet future needs for:

1. Assuring adequate supply to municipal and industrial users in times of shortages or disruptions of the CAP system;
2. Meeting the management plan objectives of the Arizona Groundwater Management Act;
3. Assisting in the settlement of Indian water rights claims; and
4. Exchanging water to assist Colorado River communities.

The primary responsibility of the AWBA is to firm M&I supplies for CAP subcontractors. The AWBA Study Commission was tasked with making recommendations regarding the potential for shortages to Arizona's Colorado River supply and how many credits would be needed to firm the M&I supply. To achieve this objective, the Commission identified two areas that needed to be addressed. The first involved developing assumptions to be used in determining the frequency and quantity of water supply shortages on the Colorado River system. The second was a determination of how much water would need to be stored to protect against projected shortages. This analysis was be based upon the agreed upon assumptions and a computer model developed by the Bureau of Reclamation for Colorado River modeling purposes. The Commission's 1998 final report (1998 Report) listed the assumptions that were deemed appropriate for use in the model. Based on the assumptions and protecting for an annual CAP M&I demand of 676,000 acre-feet, the model output showed that approximately 3.029 million acre-feet of credits would be needed to firm CAP M&I supplies through 2100. This volume was then delineated for each Active

Management Area (AMA), based on the CAP subcontractors located in these areas as follows:

- Phoenix AMA = 1,500,000 acre-feet
- Pinal AMA = 320,000 acre-feet
- Tucson AMA = 810,000 acre-feet

The remaining volume was to be used for on-River Priority 4 users in the amount of 420,000 acre-feet.

In addition to these functions, the AWBA can also undertake additional water banking activities. The AWBA Study Commission, created in 1996 to consider and recommend possible additional roles for the AWBA in carrying out Arizona's water policy, proposed a series of water banking amendments during the 1999 legislative session, all of which were passed by the Legislature and signed into law in April by Governor Hull. These statutory amendments include provisions to allow the AWBA to perform banking services for specific entities in Arizona and create a mechanism for distribution of long-term storage credits earned on behalf of specific Arizona entities; to permit the AWBA to store effluent for the same purposes allowed for Central Arizona Project water but only when all available excess CAP water has been stored or when excess CAP water is not available to the AWBA; to protect non-CAP surface water supplies; to create a mechanism for long-term storage credit lending; and to require the AWBA to include in each annual report a section that discusses how the previous year's activity fits in with the AWBA's long-term goals.

Additionally, in 2002 the AWBA formally approved all agreements necessary to store water on behalf of Southern Nevada Water Authority (SNWA)[4], and the Colorado River Commission of Nevada (CRCN)[5]. Interstate water banking is allowed for both Nevada and California; however, no formal agreements are in place to store water for California at this time. The AWBA agreements with the SNWA/CRCN provide for the storage of 1.2 million-acre feet.

B. ABILITY OF AWBA TO MEET EXISTING OBLIGATIONS

In order to meet the Indian firming obligation, staff first had to determine if there was water and money available. Also, as the Study Commission determined that the AWBA was the most appropriate entity to assist the State in meeting its obligation for Indian firming, the Study Commission had to determine if the AWBA could meet its existing obligations and agreements for M&I firming and assisting the SNWA/CRCN. Staff at ADWR in cooperation with the AWBA and

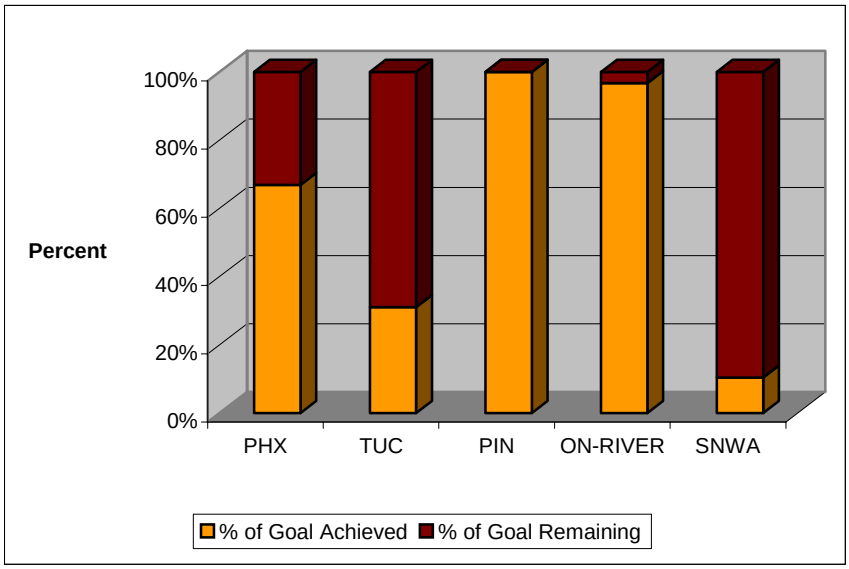
[4] A political subdivision of the State of Nevada created to manage water resources for the Las Vegas Valley.
[5] An agency of the State of Nevada with a mission, in part, to acquire, manage and protect all of Nevada's water and hydropower resources from the Colorado River for southern Nevada.

CAWCD ran scenarios based on the estimated availability of excess CAP supplies, recharge facility availability, and funding available to the AWBA. The following sections provide the information used by the Study Commission staff to make this determination.

Availability of Water Supplies

Figure 1 illustrates the AWBA's progress towards its existing goals and agreements. To date the AWBA has stored a total of approximately 2.2 million acre-feet of water for M&I firming, on–River firming, and for SNWA. The AWBA has a remaining obligation of approximately 1.9 million acre-feet.

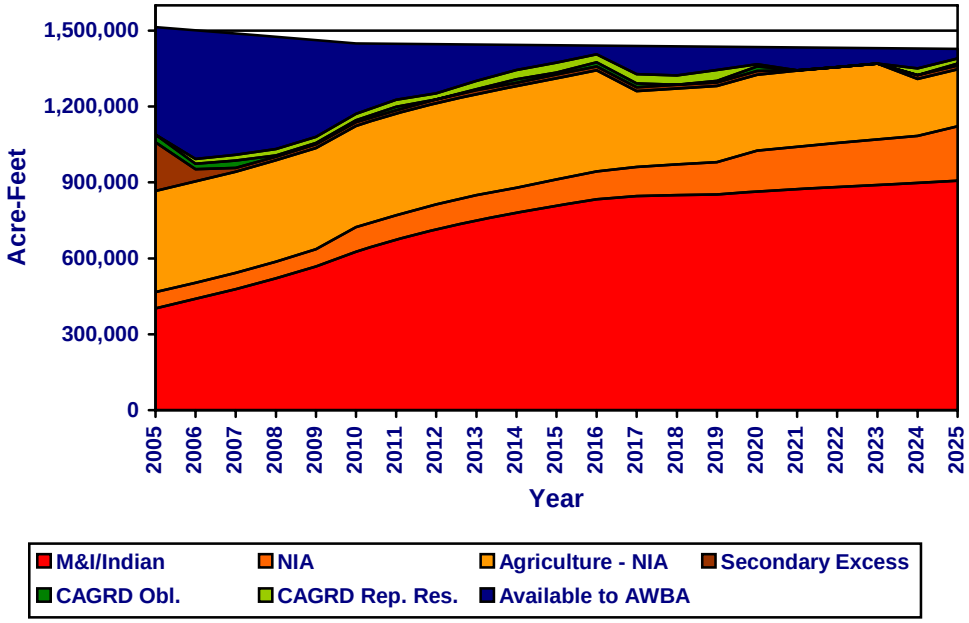
Figure 1. AWBA Progress through 2004



In 2004/2005, CAWCD staff conducted an extensive analysis of the available CAP water supplies based on demands for CAP water by Indian, M&I, and Agricultural contractors and sub-contractors. Additionally, staff reviewed the need for meeting the obligations of the CAGRD, the entity created to provide replenishment services for subdivisions seeking an Assured Water Supply under A.R.S. 45-576, as well as other entities who contract for excess CAP supplies while they are available[6]. The CAWCD staff also included the estimated AWBA obligations in their analysis. As illustrated in Figure 2, below, excess CAP supplies totaling approximately 4 million acre-feet are estimated to be available to the AWBA through the year 2025.

[6] Pursuant to State statute, the AWBA has the last priority for excess CAP water supplies, therefore all other Arizona water users must have access to CAP water before the AWBA can have access to these supplies.

Figure 2. Estimated CAP Water Supply Availability
(Source:CAWCD)



Based on the estimated supply availability of 4 million acre-feet through 2025 and the AWBA's estimated remaining demands of approximately 1.9 million acre-feet, the Study Commission concludes that sufficient water is projected to be available to the AWBA to meet its existing obligations and agreements. It further should be noted that 1 million acre feet of that demand is for SNWA, which leaves approximately 900,000 acre-feet of M&I and On-River (in-State) demands. Furthermore, estimated water supplies are available for the purposes of Indian firming.

Availability of Funding Sources

The majority of the money utilized by the AWBA comes from existing revenue sources and from fees paid by those that benefit directly from the stored water. There are restrictions on the manner in which funds must be expended based on their source of generation. In 2000, the AWBA obtained its funding from the following sources:

Groundwater Withdrawal Fees

Groundwater withdrawal fees are collected within the Phoenix, Pinal and Tucson Active Management Areas (AMA) for each acre-foot of groundwater pumped from non-exempt wells. A portion of the withdrawal fees, $2.50 per acre-foot, is transferred from ADWR to the AWBA, through 2016. Long-term

storage credits accrued with these monies must be used to benefit the AMA in which they were collected[7]. To date the AWBA has expended approximately $24 million since 1996 and it is projected that the AWBA could collect approximately 3.5 million dollars per year.

Four-Cent Tax

The AWBA also utilizes a four-cent *ad valorem* property tax collected in the three-county CAP service area (Maricopa, Pinal, and Pima). The CAWCD is statutorily authorized to levy this tax through 2016 and deposit the funds in the AWBA account if the money is not needed for certain CAP costs. It has done so every year since the AWBA's inception. Money from this source must be used to benefit the county in which it was collected. The AWBA has expended approximately $57 million from this account since 1996.

General Fund Appropriation

The AWBA has also in the past received a general fund appropriation in an annual amount determined to be appropriate by the Arizona Legislature and the Governor. The annual appropriation has been $2 million, however this has not been available to the AWBA since 2002. Water stored with these funds may be used to assist communities along the Colorado River, to assist in meeting state water management objectives or as a component of Indian water rights settlements.

Estimated Future Revenues and Obligations

It is projected that the AWBA needs approximately $100 million dollars to meet its in-State demands (the remaining money will come from SNWA for its remaining one million acre-feet). It is estimated that approximately $118 million dollars could be collected within the three counties to meet their M&I firming obligations. Based on estimated water supply availability and estimated revenues, the Study Commission concludes that the AWBA has the ability to meet its existing obligations and agreements.

C. ABILITY TO MEET INDIAN FIRMING OBLIGATIONS

Staff analyzed the remaining supplies available after the AWBA has met its obligations as well as the projected revenues from withdrawal fees. While sufficient water supplies are projected to be available through 2025, funding is necessary to meet the obligation. The estimated funding needs (in today's dollars) range from $16 million to $53 million. The potential available funds collected from withdrawal fees totals approximately $28.5 million, but only if the transfer from ADWR to the AWBA is extended beyond 2016. In order to meet

[7] In 2004, the Arizona Legislature appropriated $9 million dollars from this fund to offset budget shortfalls.

the obligation, it is estimated that the general fund appropriation of $2 million would need to be restored to the AWBA beginning in 2008.

RECOMMENDATIONS

Recognizing the AWBA existing mission and obligations for firming CAP M&I supplies, the Study Commission has concluded that the AWBA, in cooperation with the ADWR and CAWCD, is the most appropriate and best suited entity to fulfill the State's obligations described in Section 105(b) of the Settlements Act. **Therefore, the Study Commission recommends that the AWBA be provided with sufficient funding or mechanisms to develop the funding necessary to implement the Indian Firming Program on behalf of the State**. Additionally, the Study Commission recommends the AWBA be empowered by the Arizona Legislature to include programs to address annual Indian Firming requirements within its Annual Plan of Operation and the 10-Year Plan.

A. OPTIONS FOR AN INDIAN FIRMING PROGRAM

The Arizona Legislature charged the Study Commission to first, "study the options for a water firming program that would satisfy the requirements of section 105(b)(2) of the Arizona water settlements act (P.L. 108-451) ."

The Study Commission evaluated a number of options and concluded that the options are more than adequate to meet the requirements of Section 105(b) of the Arizona Water Settlements Act. Based on this conclusion, the Study Commission recommends the Legislature provide the AWBA the flexibility to meet this obligation by authorizing it to use a combination of one or more of the following options:

- Traditional Water Banking (off-reservation underground storage of excess water for future recovery and delivery);
- On-Reservation storage and recovery;
- Leasing of Non-Indian Agricultural priority or Indian priority CAP water from Indian tribes;
- Importation of groundwater from authorized groundwater basins;
- Use of long-term storage credits developed by the AWBA prior the Enforceability Date, as defined in the Act;
- Enter into a Memorandum of Understanding with the United States for monetary or in-kind goods or services pursuant to section 306(b) of the Settlements Act; and
- Use of general fund appropriations and withdrawal fees, collected within the Phoenix, Pinal and Tucson Active Management Areas, to store and recover water, lease Indian CAP supplies, import groundwater, and deliver water to the Indian Communities for the purposes of satisfying the Section 105(b) State obligation.

B. MECHANISMS FOR FIRMING WATER SUPPLIES

Secondly the Study Commission was asked to "identify appropriate mechanisms for the firming of water under the water firming program, including storage and recovery with specification of authorized entities to recover the water and determination of the financial structure for the recovery, as well as forbearance, and other alternative mechanisms."

The Study Commission recommends that the AWBA use the following mechanisms to meet the State's obligation for Indian Firming:

1. Obtain Long Term Storage Credits by:
    a. Storage of water at permitted underground storage facilities.
    b. Storage of water at permitted groundwater savings facilities.
2. Deliver water to Indian communities for direct beneficial use in years prior to any shortages, which will be recovered or credited toward satisfaction of the obligation to provide substitute water in years when CAP NIA priority supplies are reduced.
3. Lease of CAP water, in partnership with other entities, from one or more Indian tribes to:
    a. Bear shortages that otherwise would be borne by the Community or other tribes who are the beneficiaries of the State Firming Program; or
    b. Obtain higher priority water to deliver to Indian communities in times of shortage; or
    c. Develop Long-Term Storage Credits for the purposes of Indian firming;
4. Utilize other sources of water (e.g., effluent) for storage and recovery or for direct delivery to Indian Communities when an adequate volume of excess CAP water is not available to the AWBA for Indian firming purposes.
5. Utilize imported groundwater from allowable groundwater basins (Butler Valley Basin, Harquahala INA, and McMullen Valley Basin) if:
    a. Transportation is consistent with State law; and
    b. Partnership agreements have been developed with entities who have or will develop the supply infrastructure to utilize imported groundwater; and
    c. Delivery is for Indian communities as a substitute supply in times of shortage.
6. Contract with CAWCD for wheeling non-CAP supplies through the CAP canal for delivery of stored water, imported groundwater, or other sources

of supply to Indian Communities in times of shortage, for purposes of Indian firming.

7. Transfer long-term storage credits to the CAWCD for recovery and delivery to Indian communities in times of shortage.
8. In cooperation with CAWCD and in conjunction with overall AWBA-related recovery planning, periodically develop options and milestones for recovery of water stored for delivery to Indian Communities in times of shortage.
9. In cooperation with Indian communities, periodically identify recovery options for water stored on tribal lands that meet the State's obligation to deliver water, pursuant to agreements for recovery with Indian communities in times of shortage.
10. Periodically review the estimated Indian firming volume to determine progress towards meeting the Indian firming obligation and to determine appropriate mechanisms for meeting that obligation.
11. Only if other mechanisms prove to be insufficient to satisfy the State's obligations, use existing AWBA long-term storage credits from the Phoenix, Pinal and Tucson AMAs stored using previously collected withdrawal fees.
12. For purposes of satisfying the Indian firming obligation and to the extent necessary, extend the timeframe for the transfer of withdrawal fees to the AWBA, collected in the Phoenix, Pinal and Tucson AMAs.
13. As identified through periodic review of the Firming Program, create a reserve fund, using withdrawal fees collected in the Phoenix, Pinal, and Tucson AMAs:
    a. For the future pumping and transportation of groundwater from allowable groundwater basins (Butler Valley Basin, Harquahala INA, and McMullen Valley Basin); and/or
    b. For the purposes of recovering non-CAP credits and delivery to Indian communities in times of shortage; and
    c. Subject to reversion to AMA water management accounts.
14. Develop mechanisms, to "assist the Secretary in firming water" for the SAWRSA, not to exceed $3,000,000, which may include:
    a. Monetary contributions;
    b. In-kind goods or services as agreed to by the Secretary and the State;
    c. Transfer of existing long-term storage credits developed by the AWBA using withdrawal fees collected in the Phoenix, Pinal or Tucson AMAs; and/or
    d. Use of State Demonstration Underground Storage Facilities at the in-state rate.

C. LEGISLATIVE REVIEW

Finally, the Study Commission was to "study the existing powers and duties of the Arizona water banking authority and the general statutory authorities necessary to implement the firming program and to make recommendations regarding appropriate statutory and regulatory provisions that are necessary to fully implement the water firming program".

The Study Commission reviewed the existing powers and duties of the AWBA. Based on the recommended options identified in section A, the Study Commission recommends the statutes be amended to authorize the AWBA to:

1. Act as the agent for the State of Arizona in meeting the State's obligation to deliver water in times of shortage pursuant to the Indian firming program.
2. Store water at permitted recharge facilities for the purposes of Indian firming.
3. Enter into contracts or agreements with the United States and Indian Communities for storage, recovery or direct delivery of water pursuant to the Firming Program.
4. Enter into leasing agreements with one or more Indian community, in partnership with other entities, for non-Indian agricultural priority or Indian priority CAP water.
5. Enter into contracts for the use of water sources, such as effluent, other than excess CAP water.
6. Enter into contracts for the use of imported groundwater from allowable groundwater basins (Butler Valley Basin, Harquahala INA, and McMullen Valley Basin) consistent with State law for the purposes of Indian Firming.
7. Enter into agreements with the CAWCD delivery of water to Indian communities.
8. Subject to the periodic review of progress towards meeting the State's Indian firming obligation, allow for the use of existing long-term storage credits developed from withdrawal fees collected from the Phoenix, Pinal, or Tucson Active Management Areas.
9. Transfer long-term storage credits to the CAWCD for recovery and subsequent delivery to Indian communities in times of shortage.
10. To the extent necessary for Indian firming purposes, extend the transfer of withdrawal fees from the Phoenix, Pinal, and Tucson AMA water management accounts past the current expiration date of 2016. Use of Pinal AMA funds will first be used to meet the obligations of the Southside Replenishment Program.

11. Subject to periodic review, to develop a reserve fund using or for the purposes of Indian firming, comprised of:
    a. General fund appropriations;
    b. Withdrawal fees collected from the Phoenix, Pinal, and Tucson AMAs; and
    c. Subject to reversion to AMA water management accounts.

APPENDICES

APPENDIX I
SECTION 105 – ARIZONA WATER SETTLEMENTS ACT

SEC . 105. FIRMING OF CENTRAL ARIZONA PROJECT INDIAN WATER.

(a) FIRMING PROGRAM - The Secretary and the State shall develop a firming program to ensure that 60,648 acre-feet of the agricultural priority water made available pursuant to the master agreement and reallocated to Arizona Indian tribes under section 104(a)(1), shall for a 100-year period, be delivered during water shortages in the same manner as water with a municipal and industrial delivery priority in the Central Arizona Project system is delivered during water shortages.

(b) DUTIES –

(1) SECRETARY – The Secretary shall –

(A) firm 28,200 acre-feet of agricultural priority water reallocated to the Tohono O'odham Nation under section 104(a)(1)(A)(ii); and

(B) firm 8,724 acre-feet of agricultural priority water reallocated to Arizona Indian tribes under section 104(a)(1)(A)(iii).

(2) STATE – The state shall –

(A) firm 15,000 acre-feet of agricultural priority water reallocated to the Community under section 104(a)(1)(A)(i); and

(B) firm 8,724 acre-feet of agricultural priority water reallocated to Arizona Indian tribes under section 104(a)(1)(A)(iii).

(C) assist the Secretary in carrying out obligations of the secretary under paragraph (1)(A) in accordance with section 306 of the Southern Arizona Water Rights Settlement Amendments Act (as added by section 301).

(c) AUTHORIZATION OF APPROPRIATIONS – There are authorized to be appropriated to the Secretary such sums as are necessary to carry out the duties of the Secretary under subsection (b)(1).

APPENDIX II
SECTION 306 – ARIZONA WATER SETTLEMENTS ACT

SEC . 306. ADDITIONAL WATER DELIVERY.

(a) IN GENERAL – In addition to the delivery of water described in section 304(a), the Secreatry shall deliver annually from the main project works of the central Arizona project, a total of 28,200 acre-feet of NIA priority water suitable for agricultural use, of which -

(1) 23,000 acre-feet shall -

(A) be delivered to, and used by, the San Xavier Reservation; or

(B) otherwise be used by the nation in accordance with section 309; and

(2) 5,200 acre-feet shall –

(A) be delivered to, and used by, the eastern Schuk Toak District; or

(B) otherwise be used by the nation in accordance with section 309.

(b) STATE CONTRIBUTION – To assist the Secretary in firming water under section 105(b)(1)(A)of the Arizona Water Settlements Act, the State shall contribute $3,000,000 -

(1) in accordance with a schedule that is acceptable to the secretary and the State; and

(2) in the form of cash or in-kind goods and services.

APPENDIX III
HOUSE BILL 2728

Sec. 12. Arizona water firming program study commission
A. The Arizona water firming program study commission is established. The purpose of the commission is to:
1. Study the options for a water firming program that would satisfy the requirements of section 105(b)(2) of the Arizona water settlements act (P.L. 108-451).
2. Identify appropriate mechanisms for the firming of water under the water firming program, including storage and recovery with specification of authorized entities to recover the water and determination of the financial structure for the recovery, as well as forbearance, and other alternative mechanisms.
3. Study the existing powers and duties of the Arizona water banking authority and the general statutory authorities necessary to implement the firming program and to make recommendations regarding appropriate statutory and regulatory provisions that are necessary to fully implement the water firming program.
B. The commission consists of members who are appointed by the director of the department of water resources and who represent at least the following entities:
1. Municipal and industrial priority central Arizona project water users.
2. Agricultural improvement districts established pursuant to title 48, chapter 17, Arizona Revised Statutes.
3. Non-Indian agricultural priority central Arizona project water users.
4. The Gila River Indian community.
5. The Tohono O'odham nation.
6. A multi-county water conservation district established under title 48, chapter 22, Arizona Revised Statutes.
7. The Arizona water banking authority established under title 45, chapter 14, Arizona Revised Statutes.
8. Hardrock mining industries.
C. The director of the department of water resources shall serve as chairperson of the commission. All members appointed by the director shall be knowledgeable in water resource management in this state. The president of the senate and the speaker of the House of Representatives, or their designees, shall serve as nonvoting ex officio members of the commission.
D. The department of water resources shall provide staff support for the commission.
E. The commission shall submit to the legislature an interim report of its activities on or before November 1, 2005 and shall report its final findings and recommendations to the legislature on or before January 6, 2006. The commission

shall provide copies of each report to the secretary of state and the director of the Arizona state library, archives and public records.

Sec. 13. Delayed repeal

Section 12 of this act, establishing the Arizona water firming program study commission, is repealed on June 1, 2006.

Sec. 14. State and tribal cooperation for acquisition of certain land

A. This state recognizes the interest of the Gila River Indian community to acquire and to place into trust status a parcel of land located within the exterior boundaries of the community's reservation. This state, through any of its authorized agencies, in cooperation with the community and on application of the community shall take actions in accordance with Arizona law for the acquisition of the property designated as section 36, township 4 south, range 4 east, Gila and Salt river base and meridian, to include the maximum right, title and interest in that property, including mineral rights as permitted by Arizona law.

B. For purposes of a finding by the secretary of interior or for any other legal requirement, the state and the community agree that this section combined with the enactment of the firming program authorized by this act fully satisfies section 207(c)(1)(E) of the Arizona water settlements act (P.L. 108-451).

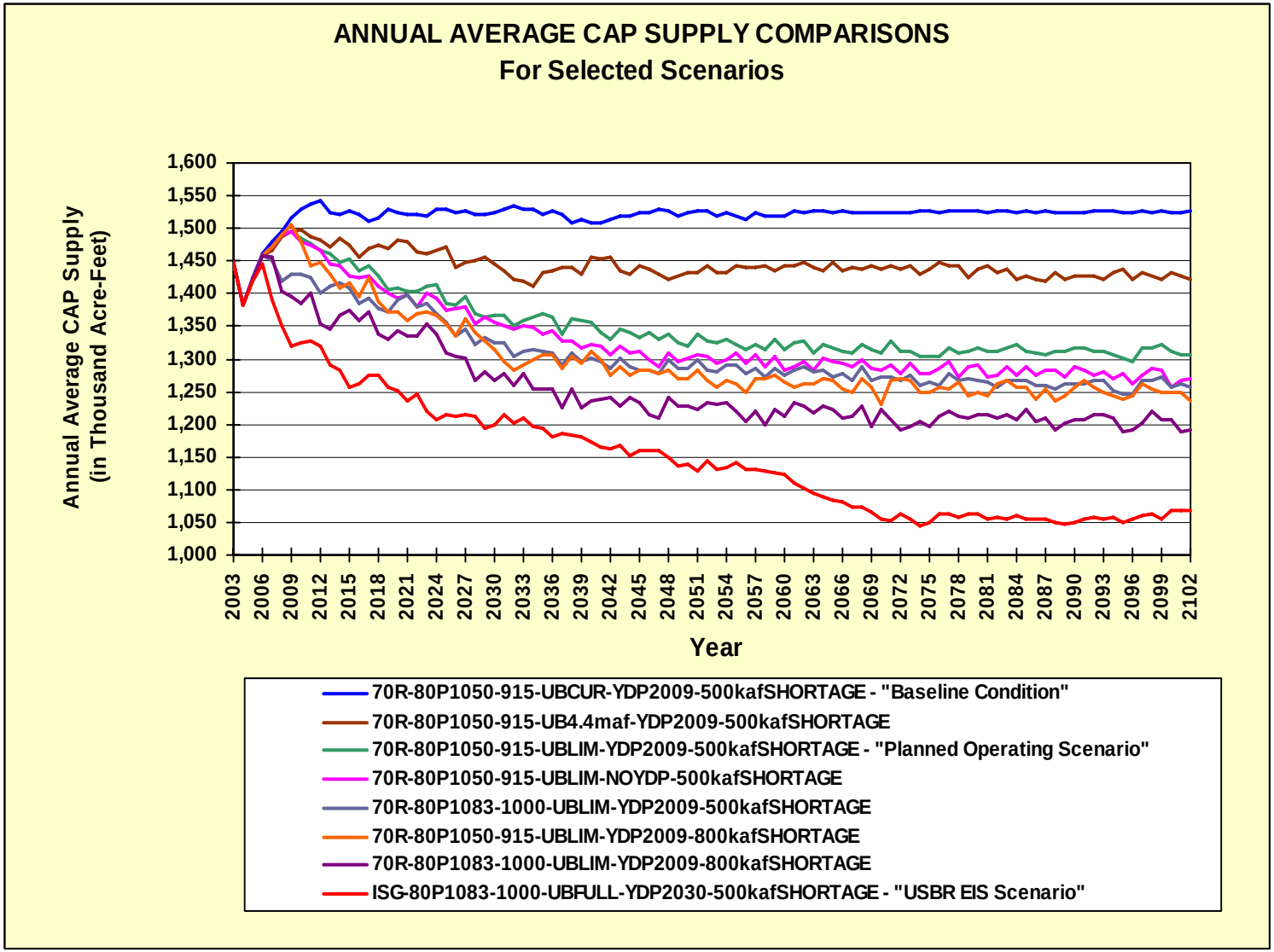
Sec. 15. Conditional enactment; written notice

A. Sections 45-611, 45-2423, 45-2425 and 45-2457, Arizona Revised Statutes, as amended by this act, sections 45-2602 and 45-2604, Arizona Revised Statutes, as added by this act, title 45, chapter 15, articles 2, 3 and 6, Arizona Revised Statutes, as added by this act, and title 45, chapter 16, Arizona Revised Statutes, as added by this act, are effective only if on or before December 31, 2010 the United States secretary of interior publishes in the federal register the statements of findings described in sections 207(c)(1) and 302(c) of the Arizona water settlements act (P.L. 108-451).

B. The director of the department of water resources shall promptly provide written notice to the executive director of the Arizona legislative council of the date of publication of the findings or if the condition prescribed in subsection A of this section is not met. The date of publication is the effective date of the conditional enactment.

Sec. 16. Conditional delayed repeal; conditional enactment

A. Title 45, chapter 15, Arizona Revised Statutes, as added by this act, and section 11 of this act, relating to the establishment of the water firming program for Arizona Indian tribes, are repealed if the condition prescribed in section 15 of this act is not met.

B. Section 45-841.01, Arizona Revised Statutes, as amended by section 3 of this act, is effective only if the condition prescribed in section 15 of this act is not met.

APPENDIX IV
MODELING SCENARIOS