2014

Recovery of Water Stored by the Arizona Water Banking Authority

A Joint Plan by AWBA, ADWR and CAP

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1/9/2014

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Executive Summary

For nearly two decades, the Arizona Water Banking Authority (AWBA), the Arizona Department of Water Resources (ADWR) and the Central Arizona Water Conservation District (CAWCD, referred to in this plan as CAP) have been engaged in an innovative program to store Colorado River water in the aquifers of Central and Southern Arizona. The AWBA has stored nearly 4 million acre-feet of Central Arizona Project water (CAP water) underground since its inception in 1996.

The AWBA's storage credits will be recovered to meet the needs of CAP Municipal and Industrial (M&I) Priority subcontractors and Fourth Priority (P-4) on-River M&I users during declared shortages on the Colorado River; to meet the State's obligations pursuant to Indian water rights settlements; and to meet interstate water banking obligations with Nevada.

This Plan is a collaborative effort among the AWBA, ADWR, CAP and stakeholders to provide a roadmap for recovering AWBA credits. It builds on past planning efforts, practical experience and couples it with clarified roles, updated analysis and the identification of key decision points and actions. The focus of this Plan is on projected recovery needs and actions through 2045.

The analysis in this Plan relied on both existing models, including the Bureau of Reclamation's Colorado River Simulation System (CRSS), as well as a custom recovery model that was used to calculate the probability of specific recovery volumes occurring through time, based on a range of supply and demand conditions.

The range of possible future recovery needs identified in this Plan frames the general likelihood, timing and magnitude of potential recovery activity. It then applies that information to the Active Management Area (AMA) level by evaluating plausible credit requests by CAP, credit distribution by the AWBA and the potential opportunities to accomplish that recovery. Modeling indicates that the majority of the earliest recovery will be focused in the Pinal AMA. Recovery in the Phoenix and Tucson AMAs will become more significant later in the planning horizon.

Successful recovery depends on the effective implementation of the kinds of recovery opportunities identified in this Plan. A number of recommendations to pursue these recovery opportunities are made. While some aspects of implementation may be premature for consideration in this Plan (e.g., terms of yet-to-be developed contracts or agreements), there are important process steps that are identified, including critical points in the operational timeline and issues related to the collection of recovery costs.

CAP is committed to entering into long term recovery agreements with recovery partners to meet projected recovery capacities as well as the commissioning of the technical studies required to develop the infrastructure for new recovery projects when necessary. ADWR, AWBA, and CAP are committed to ongoing collaboration, monitoring and analysis to ensure that recovery modeling assumptions remain reasonable and up to date.

Section 1:
Background, Purpose & Scope

Issue Background

For nearly two decades, the Arizona Water Banking Authority (AWBA), the Arizona Department of Water Resources (ADWR) and the Central Arizona Water Conservation District (CAWCD, referred to in this plan as CAP) have been engaged in an innovative program to store Colorado River water in the aquifers of Central and Southern Arizona. The AWBA has stored nearly 4 million acre-feet[1] of Central Arizona Project water (CAP water) underground since its inception in 1996.[2]

The storage of CAP water by the AWBA has occurred pursuant to regulations administered by ADWR, which issues long-term storage credits (credits) for both direct recharge and for irrigation with CAP water in-lieu of pumping groundwater. The AWBA has storage credits in the Phoenix, Pinal and Tucson Active Management Areas[3] that can be recovered[4] in the future when the need arises.

The AWBA's credits will be recovered to meet the needs of CAP Municipal and Industrial (M&I) Priority subcontractors and Fourth Priority (P-4) on-River M&I users during declared shortages on the Colorado River; to meet the State's obligations pursuant to Indian water rights settlements; and to meet interstate water banking obligations with Nevada.

The need to recover AWBA credits will unfold over many decades and will be triggered by shortages on the Colorado River, Indian settlement requirements, specific interstate contractual obligations and possible disruptions in operations to the CAP system. Many factors will determine the timing, magnitude, location and method of this recovery, and numerous entities will be involved. Effective planning and coordination among AWBA, ADWR, CAP, CAP customers, recovery partners and others is essential to successful recovery of this water.

Planning Process

In response to past recovery events for California and in response to requests from CAP customers, there have been a number of efforts by the AWBA, ADWR and CAP to plan for recovery[5]. This latest plan builds on these efforts and solidifies a comprehensive and coordinated approach among the three organizations.

This document and the associated planning are products of the Interagency Recovery Planning Group which includes staff from the AWBA, ADWR and CAP. In May of 2012, ADWR

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[1] That storage has resulted in 3.8 million acre-feet of long-term storage credits, after subtracting losses and a 5% "cut-to-the-aquifer." One acre-foot equals 325,851 gallons.
[2] Arizona Water Banking Authority, 2013 Plan of Operation
[3] Active Management Areas were established under the 1980 Groundwater Management Act. Strict groundwater management statutes and rules exist in these areas.
[4] Recovery is the act of turning long-term storage credits into a useable water supply
[5] CAP's Draft Conceptual Plans to Recover Stored Water, 2007; AWBA's Water Supply and Demand Study, 2011; CAP's Planning for Recovery, 2012

established the Ad Hoc Recovery Planning Group to serve as a venue for feedback and guidance by regional representation of customers and stakeholders for the joint agency planning process. The Ad Hoc Group includes representatives from CAP, AWBA, ADWR, Arizona Municipal Water Users Association (AMWUA), Southern Arizona Water Users Association (SAWUA), Salt River Project (SRP) and Pinal County water users.

Purpose and Scope

This Plan is a collaborative effort among the AWBA, ADWR, CAP and stakeholders to provide a roadmap for recovering AWBA credits. It builds on past planning efforts, practical experience and couples it with clarified roles, updated analysis and the identification of key decision points and actions.

The focus of this Plan is on projected recovery needs and actions through 2045. The three entities believe that this time period provides a reasonable balance between the uncertainty of long-range planning and the practical decisions and actions needed to ensure successful implementation of future recovery. Specifically, the Plan is intended to:

- Clarify roles and interactions of the primary institutions involved in the recovery of AWBA credits
- Establish planning-level certainty around key recovery concepts
- Identify both shortage and non-shortage recovery triggers
- Analyze and project the potential timing and magnitude of recovery under a range of future supply and demand conditions
- Identify potential recovery partners and opportunities to meet recovery needs
- Identify key recovery decision points and actions to be taken within the planning horizon
- Analyze findings to improve future storage decisions
- Provide the framework for continued cooperation between CAP, ADWR and AWBA
- Allow for CAP to manage disruptions in operations on a case-by-case basis outside the scope of this document

As discussed in Section 5, the timing and magnitude of recovery depend heavily on factors such as future water supply and demand conditions that are highly uncertain. Given the complex nature of that uncertainty, this Plan employs a scenario-based approach which allows for the evaluation and preparation for a range of potential outcomes. This approach, combined with clarity on key concepts, is designed to provide ADWR, CAP, AWBA, CAP customers and stakeholders with confidence that recovery can be accomplished in an effective and efficient manner.

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Section 2:
Roles & Responsibilities

Understanding the roles and responsibilities of the entities involved in the recovery of AWBA credits is an essential first step in the planning process.

Arizona Water Banking Authority (AWBA)

The AWBA was formed in 1996 to store the unused portion of Arizona's annual entitlement of Colorado River water. At the time, Arizona was not fully utilizing its entitlement of 2.8 million acre-feet. By storing this water, made available as excess CAP water[6], the AWBA not only helped the state use its full entitlement but also created a long-term supply to meet future needs. Through 2012, the AWBA has accrued more than 3.8 million acre-feet of credits within CAP's three county service area to support various goals and obligations:

- To firm[7] water supplies for CAP Municipal and Industrial (M&I) Priority subcontractors and P-4 on-River M&I users during declared shortages
- To meet the State's obligation to firm up to 23,724 acre-feet of Non-Indian Agricultural (NIA) priority CAP water pursuant to Indian water rights settlements[8]
- To fulfill water management objectives of the Arizona Groundwater Code
- To meet interstate water banking obligations with Nevada

The AWBA stores water to meet these goals and obligations utilizing several funding sources, each of which has statutory purposes and restrictions that are discussed in Section 3.

The AWBA manages its activities through its Annual Plan of Operation and Ten-Year Plan, including the storage of water and the distribution of credits for recovery, consistent with its statutory and contractual responsibilities. In anticipation of a recovery event, the AWBA will review requests for long-term storage credits from CAP before distribution.

The AWBA is also responsible for certifying the amount of water recovered in a given year for the purpose of developing intentionally created unused apportionment (ICUA) for Nevada. ICUA is the mechanism that allows Nevada to receive the water that was stored in Arizona on its behalf. Interstate banking between Arizona and Nevada is discussed in more detail in Section 5.

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[6] Excess CAP water is the water available for delivery on a year-to-year basis after meeting orders pursuant to long-term CAP entitlements

[7] Firming is the use of one supply to increase the reliability of another supply. In this case, it is the use of stored water to supplement Colorado River water in times of reduced supply

[8] For all practical purposes, this firming obligation will only occur as a result of a declared shortage on the Colorado River; however, it could also result in the extreme case that Arizona on-River demand would reach high enough levels, which could cause a shortage in CAP's 1.415 million acre-feet of long-term entitlements

Central Arizona Water Conservation District (CAP)

The Central Arizona Water Conservation District (CAP) was created in 1971 to manage and operate the Central Arizona Project (Project) and to repay the Federal government for the State's portion of the construction costs. There are over 80 M&I and Indian long-term contract and subcontract holders, and these long-term CAP entitlements total 1.415 million acre-feet. However, CAP's right to divert Colorado River water entitles CAP to divert the difference between Arizona's 2.8 million acre-feet and the amount used by on-River right holders. For example, in 2012, CAP diverted over 1.6 million acre-feet of water, of which approximately 1 million acre-feet went to long-term CAP entitlements and 600,000 acre-feet[9] was delivered as excess CAP including approximately 136,000 acre-feet delivered to the AWBA.

As a designated recovery agent for the AWBA, CAP is responsible for recovering water stored by the AWBA in support of CAP M&I subcontract firming, on-River firming (specifically with Mohave County Water Authority (MCWA)[10]) and interstate banking on behalf of the Southern Nevada Water Authority (SNWA). CAP may also have recovery responsibilities to satisfy the State's obligation to Indian tribes under the Arizona Water Settlements Act (Settlements Act) though no specific recovery agreement exists at this time.

CAP is responsible for scheduling deliveries and, when necessary, determining the specific reductions to each class of user firmed by the AWBA in accordance with its established contractual priorities. CAP will then make a request to the AWBA for credits to meet these shortfalls. CAP works closely with its customers and voluntary recovery partners to turn the credits that it receives from the AWBA into a useable water supply. If necessary, CAP may also construct and operate recovery infrastructure pursuant to recovery well permits issued by ADWR[11].

Arizona Department of Water Resources (ADWR)

ADWR was created in 1980, as part of the Groundwater Management Act, to ensure long-term reliable supplies for the state. ADWR administers and enforces Arizona's groundwater code and surface water laws. ADWR's Director also consults, advises, and cooperates with the United States Secretary of the Interior on Colorado River issues.[12]

ADWR serves two primary roles in the recovery process: regulatory and advisory. In its regulatory role, ADWR administers and enforces the Underground Water Storage and Recovery Program. It is responsible for reviewing and issuing permits, such as underground storage facility permits, water storage permits and recovery well permits. It also handles long-term storage credit accounting, including credit recovery and transfers. In its advisory role, ADWR will work closely with CAP and AWBA to ensure planned recovery activities are consistent with ADWR statues, rules and policies.

[9] This figure includes 400,000 acre-feet of excess designated as the Agricultural Pool
[10] Exchange Agreement between Central Arizona Conservation District and The Mohave County Water Authority
[11] A.R.S. § 48-3713.B
[12] A.R.S. § 45-107

Bureau of Reclamation (Reclamation)

The Secretary of the Interior (Secretary), through Reclamation is the contracting authority for water on the Lower Colorado River. Reclamation, through the Lower and Upper Colorado Regions, manages and administers programs related to the Colorado River for the Department of the Interior, including making a determination on the condition of the Colorado River system.

For recovery activities that rely directly on CAP facilities and project power, Reclamation has a role that is determined by contracts and agreements with CAP. Reclamation also has a role in ensuring that recovery cost collection policies are consistent with its contractual agreements with CAP. Additionally, Reclamation oversees Colorado River accounting, including aspects of interstate banking and the development of IUCA.

The Secretary, like the State, also has an obligation to firm certain NIA priority CAP water supplies for existing and future settlements of Indian water rights claims under the Arizona Water Settlements Act. Although this Plan does not address recovery on behalf of Federal customers, CAP, AWBA and ADWR are committed to coordinating with Reclamation on these efforts.

CAP's Recovery Partners

CAP's recovery partners are entities that *voluntarily* enter into an agreement with CAP to facilitate meeting demands during a shortage on the Colorado River, or an interstate request, by "receiving" a portion of their CAP water order in the form of AWBA credits. Recovery partners can agree to receive credits for all or a portion of their order and, by doing so, help CAP offset a shortfall to a particular pool of water.

Recovery partners may include CAP M&I subcontractors, irrigation districts or Indian communities that hold and use a CAP long-term entitlement[13]. In some circumstances, a third party that owns the necessary infrastructure (regional conveyance system) may perform the physical recovery for a CAP customer that has agreed to be a recovery partner with CAP. For this document, these entities will be referred to as "third party recovery partners."

Beneficiaries

Beneficiaries of recovery are any Colorado River water users for which the AWBA has a firming responsibility or contractual obligation. Specific beneficiaries are CAP M&I Priority subcontractors and P-4 on-River M&I users, Indian Tribes that receive a portion of the NIA priority CAP supply subject to AWBA firming, and Nevada. It is important to note that being a recovery beneficiary does not require becoming a recovery partner.

[13] CAP Ag Pool water is not considered a long-term entitlement but irrigation districts using this supply are ideal recovery partners for interstate recovery during non-shortage conditions

Other Interested Parties

There are numerous other interested parties such as AMWUA, SAWUA, SRP, Active Management Area Groundwater User Advisory Councils (AMA GUACs) and Pinal AMA water users that have an interest and stake in how the future recovery of AWBA storage will be managed and implemented.

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Section 3:
Funding, Purpose & Location of Credits

The AWBA has accrued over 3.8 million acre-feet of credits through 2012. Of these, approximately 3.2 million acre-feet are for Arizona's needs, and just over 600,000 acre-feet[14] are for interstate purposes, accrued specifically on behalf of the Southern Nevada Water Authority (SNWA) under the state's interstate banking program.

There are several factors that will determine where the recovery of these credits will occur including: the funding sources that are used to accrue the credits; the statutory purpose for distributing the credits; and the location of both the credits and CAP's recovery partners.

Funding Sources

The AWBA credits are accrued utilizing four main revenue sources:

- an *ad valorem* property tax of up to four cents per $100 assessed valuation in the three-county CAP service area levied and collected by CAP
- $2.50 per acre-foot of the $3.00 per acre-foot groundwater withdrawal fee in the Tucson, Phoenix, and Pinal AMAs collected by ADWR
- general fund appropriations
- proceeds of interstate banking activities

While the AWBA is authorized to use these funding sources, the availability of revenues from each source varies on an annual basis. Furthermore, CAP's authority to levy the *ad valorem* property tax is set to expire January 2, 2017. A.R.S. § 45-2425 further describes how revenues are made available to the Arizona Water Banking Fund.

In addition to its primary funding sources, the AWBA has received revenue from two other sources—shortage reparations and the water storage capital charge. As part of the Arizona-Nevada Shortage-Sharing Agreement executed on February 9, 2007, SNWA agreed to provide $8 million in "shortage reparations" funding to the AWBA to assist Arizona in offsetting impacts from any shortages during the "Interim Period".[15] The AWBA also utilizes monies collected from CAP's water storage capital charge[16] at recharge projects in Pima County that were constructed with State Demonstration Funds. Those revenues are deposited into the *ad valorem* tax fund for Pima County.

[14] AWBA 2012 Annual Report
[15] The Interim Period is the period beginning on the date the Secretary issued the Colorado River Interim Guidelines for the Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, December 13, 2007, and ending on December 31, 2025 (through preparation of the 2026 Annual Operating Plan).
[16] CAP assesses an underground water storage capital charge, currently $9/AF in Pima County, for use of its storage facilities by certain classes of users.

Credits accrued by the AWBA are further categorized according to the AMA/County in which the funds were collected. **Table 1** identifies the amount of credits accrued by location and the funding source used.

Table 1 AWBA Credits Accrued through 2012, by AMA and Funding Source (AF)

Funding Source	Phoenix AMA	Pinal AMA	Tucson AMA	Total
4-Cent Ad Valorem Tax[1]	1,329,925	187,465	390,334	1,907,724
Withdrawal Fees	293,632	394,896	98,788	787,316
General Fund	42,316	306,968	54,546	403,830
Other Intrastate:				
Indian Firming Appropriation	-	-	28,481	28,481
Shortage Reparation	20,642	60,507	1,227	82,376
GSF Operator Full Cost Share[2]	-	14,125	-	14,125
Intrastate TOTAL	1,686,514	963,961	573,376	3,223,851
Interstate - Nevada	51,009	439,851	109,791	600,651
TOTAL	**1,737,523**	**1,403,812**	**683,167**	**3,824,502**

[1] Funds are collected by County, but storage and credits are accounted by AMA. To date, all Maricopa County funds are stored in the Phoenix AMA, Pinal County in the Pinal AMA and Pima County in the Tucson AMA.

[2] Credits accrued from water stored in 2011at Pinal AMA GSFs in which the GSF operators paid all of the AWBA's water delivery costs because AWBA funding resources for the AMA were fully subscribed and the water was needed to avoid crop losses.

Statutory Purposes

While the AWBA has the authority to distribute, extinguish, or exchange its credits, this authority does not apply equally across all categories of credits held by the AWBA.[17]

Ad Valorem Tax Credits

AWBA credits accrued using the ad valorem water storage tax fund can only be distributed by the AWBA for the benefit of the county in which the monies were collected and cannot be extinguished or exchanged. Statute requires that the AWBA distribute these credits to CAP to the extent necessary to meet the demands of its M&I subcontractors during shortages or disruptions in operations to the CAP system. At the determination of the AWBA that the amount of credits accrued using the ad valorem tax

[17] The purposes for which each category of credits may be used is further described in A.R.S. § 45-2457.

exceeds the amount needed for the purposes described above, the AWBA may also distribute the credits to M&I providers within CAP's service area to firm other surface water supplies[18] (e.g. SRP water).

Withdrawal Fee Credits

Credits earned using withdrawal fees have a broad range of statutorily authorized uses including firming CAP M&I subcontracts, implementing Indian water rights settlements to the extent credits accrued from legislative appropriations are not available, and furthering the water management objectives in each of the three AMAs. The AWBA may only distribute or extinguish credits accrued using withdrawal fees for the benefit of the AMA in which the monies were collected. At this time, except for 5,621 acre-feet of withdrawal fee credits in the Tucson AMA that have been identified by the AWBA for meeting its Indian settlement obligation to the federal government, these credits have not been dedicated for a specific purpose. Therefore, these credits remain available to the AWBA for meeting any of the purposes identified above.

General Fund Credits

Credits earned using appropriations from the State's General Fund can be used for firming on-River P4 M&I users, firming CAP M&I subcontractors, settling Indian water rights claims, or extinguished to further water management goals. The AWBA is required (45-2457(B)(1)) however, to reserve a reasonable number of General Fund credits for firming on-River P4 M&I users and has therefore resolved to give first priority for use of these credits for this purpose.[19] The AWBA has accrued 403,830 acre-feet of credits of the 420,000 acre-feet of credits originally identified as the amount of credits that should be set aside for on-River P-4 M&I firming.

To provide additional certainty, the Mohave County Water Authority (MCWA) entered into a contract with the AWBA to firm specific on-River P4 M&I users. To date, 256,174 acre-feet of the 403,830 acre-feet of General Fund credits have been reserved as part of the MCWA contract. CAP and MCWA have also entered into an agreement for the exchange and recovery of these reserved credits when they are transferred to MCWA's long-term storage credit account during shortages.[20]

At this time, MCWA is the only on-River P-4 M&I entity that has contracted with the AWBA for firming. Through resolution, the AWBA established the procedures by which other On-River entities can also enter into contract with the AWBA. [21] The AWBA has further resolved that as these General Fund credits are used and replaced, the new credits will be earmarked for the entity that paid the replacement costs and that they would be used for the same purpose the original credits were used.[22] The AWBA also received a

[18] ARS§ 45-2457 (B)(8)(a)
[19] AWBA Resolution 2002-1 prioritizes use of general fund credits in the following order 1) firming on-River M&I users, 2) implementing the settlement of water right claims by Arizona Indian communities, 3) firming CAP M&I priority subcontracts, and 4) fulfilling water management objectives of the Groundwater Code.
[20] Exchange Agreement between CAP and MCWA dated September 27, 2005, amended November 4, 2010.
[21] AWBA Resolution 2010-1
[22] AWBA Resolution 2008-1

general fund appropriation authorized specifically for meeting part of the State's Indian settlement obligations, which resulted in the accrual of 28,481 acre-feet of credits. These credits will be made available to the Federal government as part of the State's obligation to assist the Federal government in meeting its Indian firming obligations under the Southern Arizona Water Rights Settlement Act. The State does not have an obligation to recover these credits.

Credits accrued with General Fund appropriations may also be exchanged for credits held by others if those credits were accrued in a location that better enables the AWBA to meet its goals and obligations.

Shortage Reparation Credits

The primary purpose for credits accrued with shortage reparation funds is to assist in making water available to those entities that are impacted by shortages during the Interim Period. The AWBA does not have statutory limitations on how or where these credits may be utilized. Any credits not used during the Interim Period would remain available to the AWBA for meeting any of its goals and obligations.

Table 2 Summary of Intrastate Funding Sources and Allowable Use

FUNDING SOURCE	Firming M&I CAP	Firming On-River M&I (P-4)	Firming Indian Settlements (NIA)	Fulfilling Water Management Objectives
Ad Valorem Taxes	X			
Groundwater Withdrawal Fees	X		X	X
General Fund	X	X	X	X
Shortage Reparations	X	X	X	X

Interstate Banking Credits

Credits accrued pursuant to an interstate banking agreement are recovered within CAP's service area so that an equal amount of Colorado River water, or intentionally created unused apportionment (ICUA) from Arizona, can be made available to the contracting state for diversion when it requests the stored water. The amount of credits that can be accrued annually or used to develop ICUA are governed by state statute and a number of separate agreements including, the individual storage agreements between the AWBA and the contracting state, storage and interstate release agreements among the U.S., AWBA, and contracting state parties, agreements for developing ICUA between AWBA and CAP, and agreements for recovering the credits

among the AWBA, CAP and the contracting state parties. A complete description of this process is provided in Section 5.

Location

Since 1997, the AWBA has stored water at two dozen different recharge facilities at various times located in the Phoenix, Pinal, and Tucson AMAs (see **Figure 1** and **Table 3** for more detail). By statute, recovery must occur within the AMA where the original storage took place, and there are often hydrologic and policy advantages for recovery to take place in the vicinity of the specific storage facility. Location of the credits is therefore a key consideration in recovery planning.

The AWBA has accrued over 3.2 million acre-feet of intrastate credits through 2012. Of these, nearly 1.7 million acre-feet of credits are in the Phoenix AMA, over 960,000 acre-feet are in the Pinal AMA, and over 570,000 acre-feet are in the Tucson AMA. The AWBA has also accrued over 600,000 acre-feet of credits on behalf of SNWA. More than two-thirds of these credits, nearly 440,000 acre-feet, have been accrued in the Pinal AMA. There are many factors that will determine where the recovery of AWBA credits will occur, including; the funding source, the statutory purpose, and the location of both the credits and recovery partners.

AWBA storage activity is accounted for at the level of individual recharge facility, while the financial accounting is tracked at the AMA (and County) level. As a consequence, credits earned at an individual facility are not specifically differentiated by funding source. It is only when recovery takes place that the storage facility and funding source accounting is reconciled.

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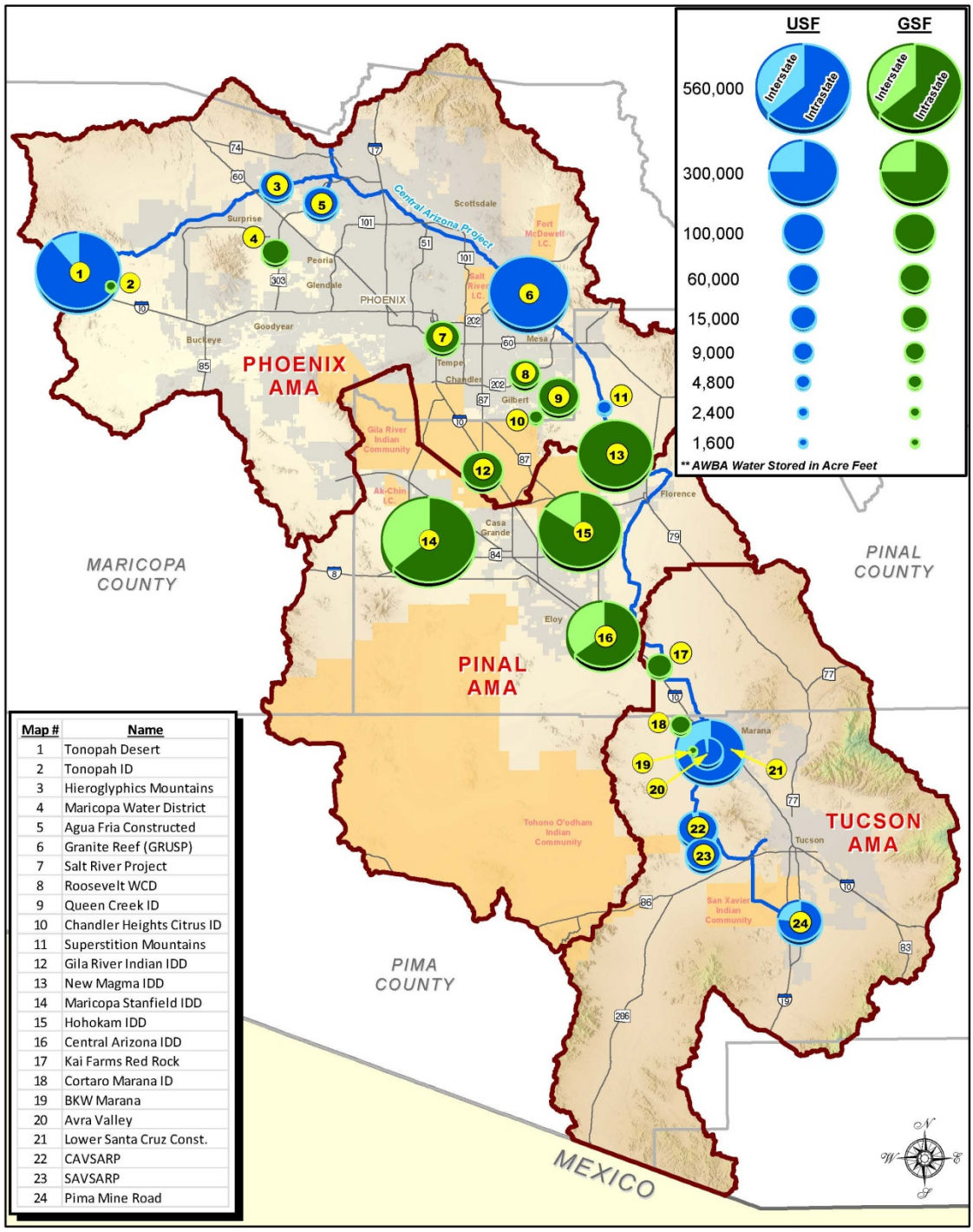

Map #	Name
1	Tonopah Desert
2	Tonopah ID
3	Hieroglyphics Mountains
4	Maricopa Water District
5	Agua Fria Constructed
6	Granite Reef (GRUSP)
7	Salt River Project
8	Roosevelt WCD
9	Queen Creek ID
10	Chandler Heights Citrus ID
11	Superstition Mountains
12	Gila River Indian IDD
13	New Magma IDD
14	Maricopa Stanfield IDD
15	Hohokam IDD
16	Central Arizona IDD
17	Kai Farms Red Rock
18	Cortaro Marana ID
19	BKW Marana
20	Avra Valley
21	Lower Santa Cruz Const.
22	CAVSARP
23	SAVSARP
24	Pima Mine Road

Figure 1 Map showing locations of intrastate and interstate credits (AF) by recharge facility

Table 3 AWBA LTS Credits Accrued through 2012 by Site

AWBA - Recharge Sites		LTS Credits Accrued Through 2012		
PHOENIX AMA		Intrastate	Interstate	Total
USF	GRUSP	399,967	-	399,967
	AGUA FRIA	75,325	-	75,325
	HIEROGLYPHIC MTNS	67,684	-	67,684
	TONOPAH DESERT	403,095	51,009	454,104
	SUPERSTITION MTNS	4,571	-	4,571
	Subtotal	*950,642*	*51,009*	*1,001,651*
GSF	CHANDLER HGTS CID	4,518	-	4,518
	MWD	47,172	-	47,172
	NEW MAGMA	353,519	-	353,519
	QUEEN CREEK	104,080	-	104,080
	SRP	77,327	-	77,327
	RWCD	58,575	-	58,575
	TONOPAH ID	2,368	-	2,368
	GRIIDD-PHX	88,313	-	88,313
	Subtotal	*735,872*	-	*735,872*
	Total Storage	**1,686,514**	**51,009**	**1,737,523**
PINAL AMA				
GSF	CAIDD	217,673	117,497	335,170
	HOHOKAM	369,391	71,407	440,798
	MSIDD	359,820	250,946	610,766
	GRIIDD-Pinal	17,077	-	17,077
	Total Storage	**963,961**	**439,851**	**1,403,812**
TUCSON AMA				
USF	AVRA VALLEY	59,588	1,315	60,903
	CAVSARP	90,444	4,717	95,161
	PIMA MINE RD	97,190	29,828	127,019
	LOWER SANTA CRUZ	224,544	73,930	298,475
	SAVSARP	76,758	-	76,758
	Subtotal	*548,524*	*109,791*	*658,315*
GSF	CMID	8,642	-	8,642
	KAI FARMS (Red Rock)	14,335	-	14,335
	BKW-FARMS	1,641	-	1,641
	Subtotal	*24,618*	-	*24,618*
	Total Storage	**573,142**	**109,791**	**682,933**
	45-841.01 Credits	**234**		**234**
TOTAL		**3,223,851**	**600,651**	**3,824,502**

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Section 4:
Methods & Cost

Recovery to make up for shortfalls to a firmed user pool or to fill an interstate request can be accomplished using a number of different recovery methods, each with its own attributes and associated costs.

Methods

There are three basic methods of recovery that CAP will use to recover AWBA credits: direct recovery, indirect recovery and credit exchange. The methods are differentiated by their reliance on the CAP system and whether or not additional well capacity and pumping is needed (see **Table 4**).

Table 4 Differences among the three types of Recovery

	Direct Recovery	Indirect Recovery	Credit Exchange
Water into CAP system	**Yes**	**No**	**No**
Additional Pumping & Energy required	**Yes**	**Yes**	**No**

Indirect recovery and credit exchange also require that some CAP customers voluntarily agree to become recovery partners by agreeing to a reduced delivery of their CAP water order and in turn receiving AWBA credits to make up for the reduced delivery. In most cases, the recovery partner will also receive compensation for the agreed upon arrangement with CAP. Factors such as where credits are located, the cost of recovery and the needs and availability of recovery partners will all determine which methods are utilized.

Direct Recovery

Direct recovery is when stored water is pumped from permitted recovery wells and then returned directly to the CAP system for delivery to CAP customers.

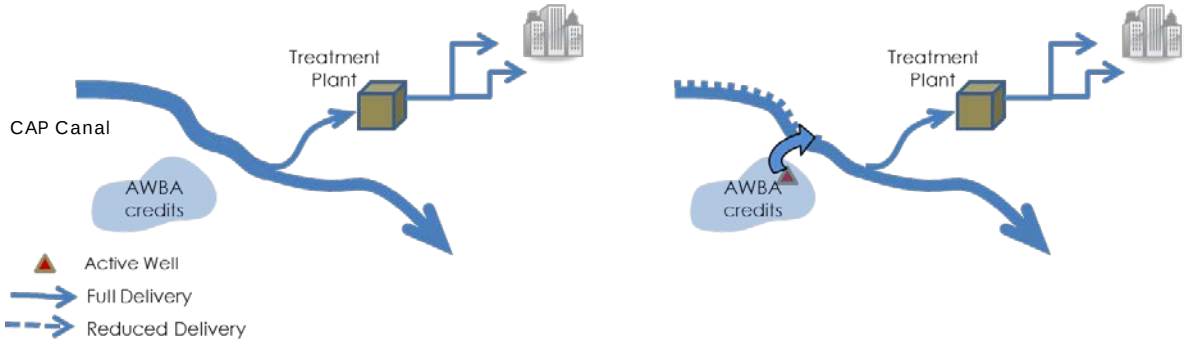

Figure 2 Normal Conditions vs. Direct Recovery

In most cases, CAP would be the entity performing direct recovery. Although existing wells could be used for direct recovery, it is likely that new recovery wells will be needed. An example of direct recovery would be the development of a new recovery well field and related pipeline relatively close to the CAP canal. AWBA credits would then be pumped from the recovery wells and directly returned to the CAP canal for delivery to CAP customers to offset the shortfall to CAP supplies due to a shortage or interstate request.

Indirect Recovery

Indirect recovery is when stored water is pumped and delivered by a CAP recovery partner from permitted recovery wells to fulfill a portion of a CAP water order that would have otherwise been directly delivered by the partner.

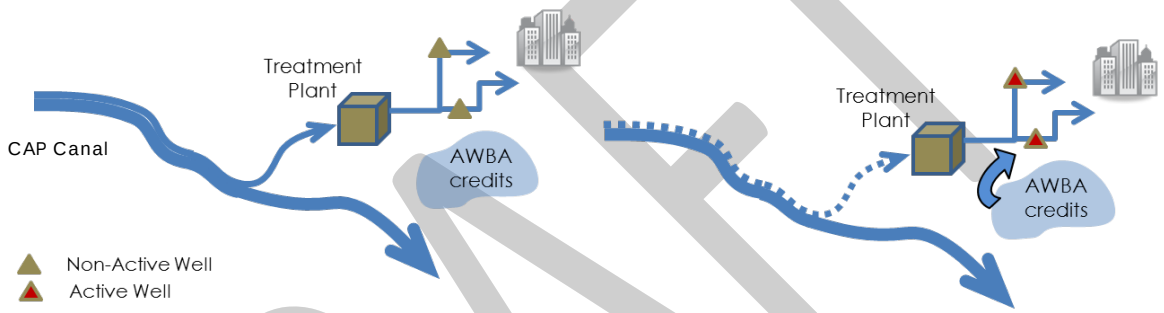

Figure 3 Normal Conditions vs. Indirect Recovery, Municipal

In this method of recovery, recovered water is ***not*** returned directly to the CAP system. Indirect recovery requires a CAP recovery partner or third party to have additional recovery well capacity available to use when CAP deliveries are reduced. Existing wells will most likely be used to perform indirect recovery. Recovered credits could be directly applied to the water use, as in the case of irrigated lands, or could be placed into a conveyance system ***other*** than the CAP system and delivered to the customer.

The following is an example of indirect recovery with an irrigation district that receives Ag Pool water. This method was used successfully under normal supply conditions between 2007 and 2010 for interstate recovery for the Metropolitan Water District of Southern California (MWD). This specific arrangement only works for interstate recovery during a non-shortage and not for recovery triggered by a shortage as the Ag Pool would not be available.

INDIRECT	**Irrigation District using 75 kAF of CAP Ag Pool on their crops**	
	Normal mode	75 kAF CAP water delivered directly to crops
	25 kAF recovery mode	As a recovery partner, the irrigation district voluntarily agrees to a reduced delivery of 50 kAF of CAP water ; the remaining 25 kAF of water is produced from district wells that recover (pump) AWBA LTSCs

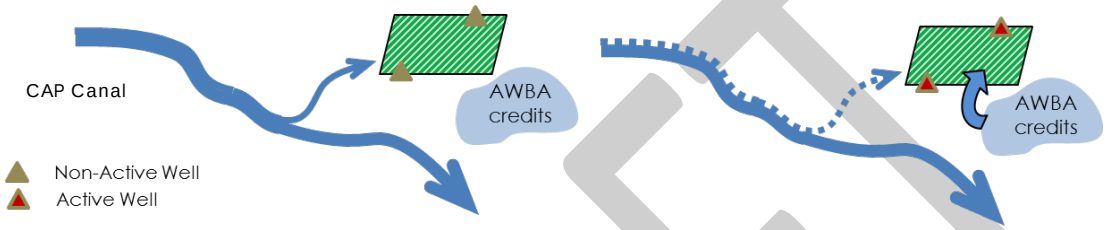

Figure 4 Normal Conditions vs. Indirect Recovery, Ag Pool

Credit Exchange

Credit exchange is when a CAP recovery partner has scheduled CAP water for delivery to an Underground Storage Facility (USF) and instead agrees to receive a portion of that water order as previously accrued storage credits.

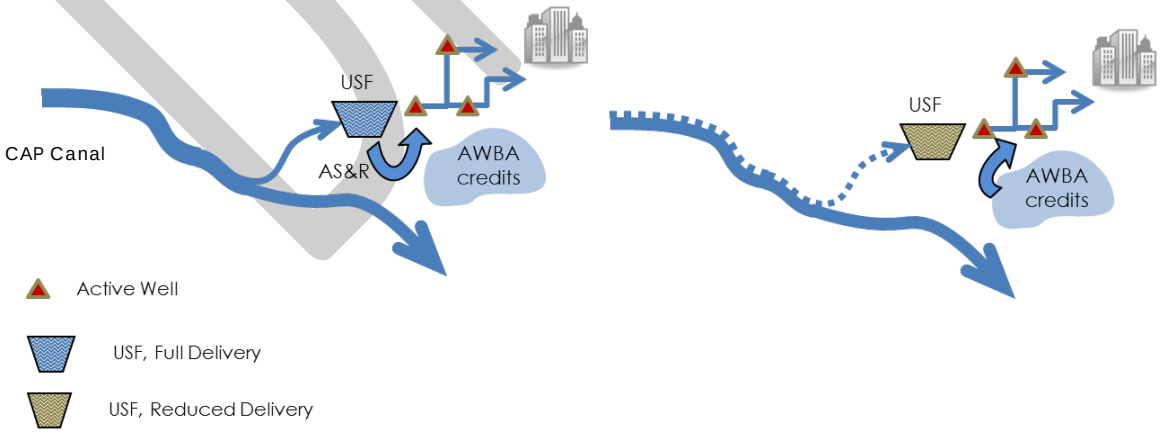

Figure 5 Normal Conditions vs. Credit Exchange

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CAP customers performing annual storage and recovery (ASR) or replenishment are ideal recovery partners for using the credit exchange method, especially if those customers are storing at or near a USF where the AWBA has previously accrued credits. This method has also been identified as an option for developing ICUA for meeting interstate requests and has previously been used to make water available for MWD.

The following is an example of the credit exchange method with an M&I subcontractor.

	M&I Subcontractor performing 75 kAF of Annual Storage & Recovery	
CREDIT EXCHANGE	**Normal mode**	75 kAF of CAP water is delivered to USF; 75 kAF recovered into M&I subcontractor's service area and reported to ADWR as Annual Recovery
	25kAF recovery mode	As a recovery partner, the M&I subcontractor voluntarily agrees to a reduced delivery of 50 kAF of CAP water to the USF; the 50 kAF is recovered and reported to ADWR as Annual Recovery, and 25 kAF of previously stored AWBA LTSCs are transferred, recovered, and reported to ADWR by the recovery partner as recovered CAP water.

Method Flexibility

One of the additional considerations for the selection of a recovery method is how quickly the capacity can be developed, and how that relates to the likelihood it will be needed. If the probability of needing recovery during a specific time period is relatively low, choosing a recovery method such as credit exchange or indirect recovery may make more sense over direct recovery which can require the installation of costly infrastructure that may or may not be used for years. Methods such as credit exchange and indirect recovery allow for flexibility and lower cost options when demand for recovery is highly uncertain. However, as the probability of recovery increases, SNWA's recovery schedule becomes more certain and/or recovery partner agreements do not appear sufficient to meet projected recovery demands, direct recovery options may be needed. Because the construction of direct recovery facilities will likely take considerable time to design, approve and construct, adequate lead time should be built into the planning schedule.

Costs

General cost comparison by method

The overall cost of recovery will depend on the method, or combination of the methods used. Depending on the purpose for which the recovery is taking place, recovery costs may also be apportioned to an overall class of users (e.g., all M&I subcontractors), in

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those cases the per-unit costs may be quite modest. The collection of recovery costs by user class is discussed further in Section 7.

Cost components for **direct recovery** include energy used for pumping recovery wells and operations and maintenance (O&M) costs of the wells and the conveyance system. Capital costs must also be factored into the overall cost of recovery if new wells and conveyance systems need to be constructed. Capital costs would include costs for planning, permitting, design and construction, etc. Costs needed to purchase land and/or easement rights must also be considered, if applicable.

Indirect recovery cost components generally include the same cost components as direct recovery, though likely lower. The cost components would likely include well pumping energy costs and well O&M costs. If the wells permitted for recovery are existing, but in poor condition, additional costs to rehabilitate the well may be incurred. To the extent new infrastructure is needed, capital costs must also be factored into the total cost.

CAP performed indirect recovery for California using existing irrigation district wells in the Pinal AMA between 2007 and 2010. The average costs for recovery was just under $60/acre-foot. Of this total, approximately $20/acre-feet was attributed to well O&M costs and repairs. The remaining costs were associated with energy, which varied between wells and electrical providers. As irrigation districts pump more groundwater in the future, recovery costs could increase because some districts face tiered energy rates that could result in the additional pumping charged at higher rates. In addition to potentially higher energy rates, the total energy required to pump water may increase because of dropping water levels due to increased groundwater pumping caused by shortages to CAP supplies available to the districts.

Costs associated with **credit exchanges** are likely to be even lower than indirect recovery. For example, to fulfill an ICUA request for Nevada, CAP, in partnership with the CAGRD, could forego planned delivery to a USF fulfilling replenishment obligations in exchange for previously stored AWBA interstate credits. No pumping is performed and no direct costs incurred. Avoided storage facility fees would, however, still need to be paid to the recharge facility owner because the facility owner was otherwise going to receive a wet water supply and the associated storage fees. Storage fees typically run between 8-15$/acre-foot.

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Section 5:
Likelihood, Timing & Magnitude of Recovery

Estimating the likelihood, timing and magnitude of future recovery is useful in planning for recovery. Projecting future recovery requires an understanding of the factors affecting recovery, a method for modeling those factors, and an approach to synthesize the results.

Factors Affecting Recovery

The need for recovery can result from shortages on the Colorado River, a CAP outage[23] or a request by Nevada for the creation of ICUA. Requests for ICUA by Nevada may also be tied to shortage, but are primarily expected to be triggered by requests to supplement Nevada's apportionment during non-shortage years.

Shortage Related

Whether or not recovery is triggered by a shortage is dependent on the magnitude of the shortage and the demands by Arizona Colorado River water users at the time of shortage. Recovery of AWBA credits during shortage will be required when the reduction in Arizona's Colorado River supply intersects deliveries to CAP users (pools) and On-river P4 M&I users for which the AWBA has firming responsibilities.

<u>Supply Factors</u>

Each year, the Secretary of the Interior makes a determination on the Colorado River water supply availability conditions for the Lower Division states[24] in terms of Normal, Surplus or Shortage[25]. The factors influencing the water supply determination include the amount of water in reservoir storage, runoff from snowmelt and precipitation, consumptive uses in the Upper Basin, and the policies governing reservoir operations.

The 2007 Colorado River Interim Guidelines for the Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (Interim Guidelines), which are in effect through 2026, outline how and when the Secretary makes the annual water supply determination. Three tiers of shortage are designated and the trigger for each tier is tied to a specific elevation in Lake Mead (see **Table 5**). Arizona water contracts dated after1968, including the entitlement held by CAP, have lower priority than California's apportionment, causing Arizona to bear the majority of the Lower Basin shortage. Nevada also bears a portion of a shortage. In accordance with Minute 319 to the 1944 US-Mexico Treaty, which is in place through 2017, Mexico also takes a defined reduction in water deliveries during shortage.

[23] As noted earlier, emergency CAP outages are not included in the scope of this planning document.
[24] Arizona, Nevada and California make up the Lower Division States
[25] A shortage condition exists when "...insufficient mainstream water is available to satisfy 7.5 million acre-feet of annual consumptive use in the Lower Division states." Record of Decision - 2007 Colorado River Interim Guidelines for the Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead

Table 5 Reduction in deliveries to Lower Division States and Mexico during a declared shortage

Shortage Tier	January 1 Elevation of Lake Mead	Delivery Reductions During Shortage (AF)		
		Nevada	Mexico	Arizona
Tier 1	1075' to 1050'	13,000	50,000	**320,000**
Tier 2	<1050' to 1025'	17,000	70,000	**400,000**
Tier 3	<1025' to 1000'	20,000	125,000	**480,000**
Tier 3+	below 1000'	*Basin States must consult (consultation triggered once Lake Mead drops below 1025')*		

Source: Interim Guidelines (2007) and Minute 319 (2012)

Arizona's reduction as specified in the Interim Guidelines is further shared among the state's P-4 water users. After an extensive public process in 2006, the Director of ADWR proposed a method for sharing Arizona's reduction between on-River P-4 users and CAP, which was sent as a recommendation to the Secretary of the Interior.[26] The recommendation proposes a proportional shortage reduction to P-4 on-River water supplies based on entitlement. Using this method, when on-River P-4 diversions reach full entitlement (164,652 AF), on-River P-4 diversions will reduced by approximately 10% of the shortage volume. The remainder of the reduction will be borne by CAP. However, until on-River P-4 entitlements are fully utilized; CAP will bear most if not all of the delivery reductions to Arizona.

Demand Factors

On-River Demand

More than 90% of Arizona's on-River water use is pursuant to high-priority (P1-3) water entitlements and not affected by shortages on the River, but the P-4 entitlements provide a critically important supply to a variety of water users, including a number of the River communities.[27] In total, these entitlements are currently underutilized (~111,000 AF in 2012 out of a total of 164,652 AF of entitlement), however overall demand is expected to increase over time, particularly as population grows. Since the AWBA only firms P4 M&I water, the amount of recovery also depends on the proportion of entitlements being used for M&I purposes.

CAP Demand

The total volume of supply available for CAP is based on the Colorado River supply available to Arizona, less the use on-River. That available supply is first used to meet CAP long-term contract demands, and then any remainder is Excess Water, which is first used to satisfy the Agricultural Settlement Pool, and then other Excess users, including the AWBA (**Figure 6**).

[26] Arizona Director's Shortage Sharing Workgroup Recommendation from October 2006
[27] Such as Mohave Water Conservation District, Lake Havasu City, Bullhead City

The CAP long-term entitlements total 1.415 MAF, and are grouped into four priority types; P-3, Indian, M&I, and NIA. The delivery volumes, from highest to lowest priority are:

- 68,400 acre-feet of higher priority P-3 water: 47,500 acre-feet for the Ak-Chin Community and 20,900 acre-feet of Salt River Pima-Maricopa Water Rights Settlement exchange water for seven Valley cities[28]

- 981,902 acre-feet[29] of M&I priority subcontracts and Indian priority contracts[30]

- 364,698 acre-feet[31] of NIA priority water for both Indian and non-Indian parties

Long-term entitlement demand is expected to increase over time, primarily driven by population growth and increased industrial use. Full utilization of the NIA priority entitlements depends on the reallocation of163,595 AF; 96,295 AF for M&I uses, and 67,300 AF reserved for Indian water right settlements.[32]

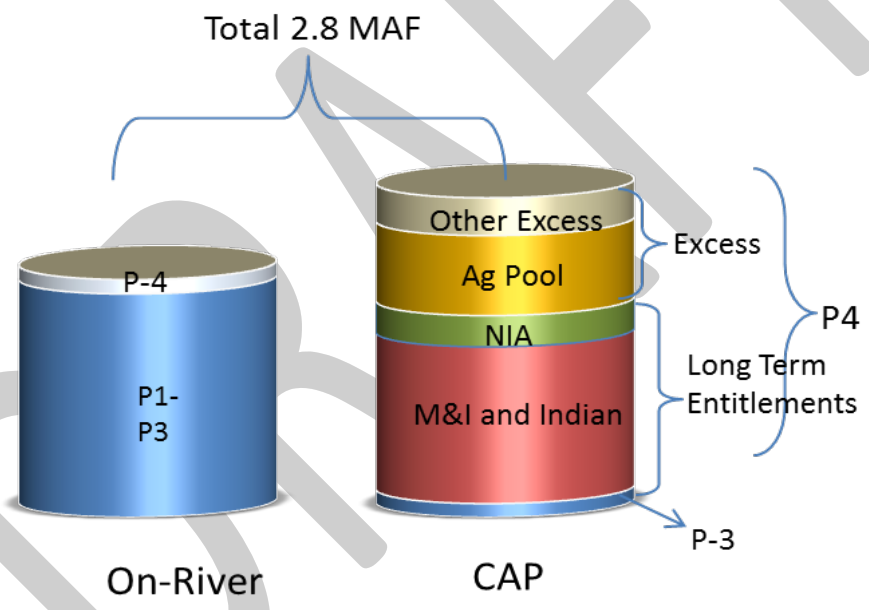


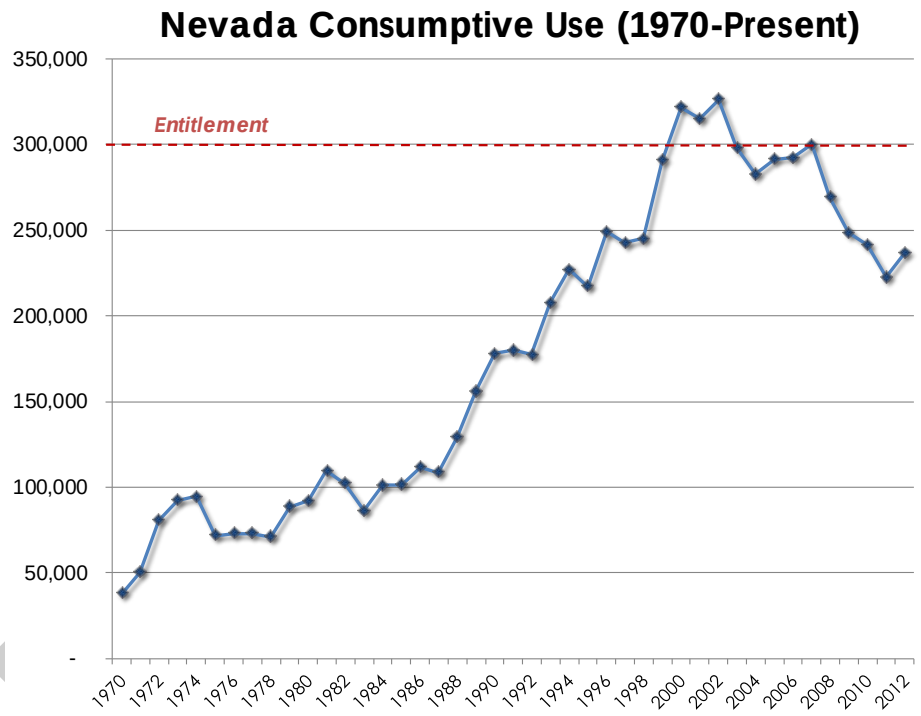
Figure 6 Arizona Colorado River Priorities and CAP Pool (based on 2012 Use)

[28] This water was originally 72,000 AF of on-River P-3 water. Delivery through the CAP system incurs 5% losses resulting in 68,400 AF available.
[29] 1,029,205 acre-feet after 2044 once 47,303 acre-feet of NIA (HIDD) water is converted to M&I priority
[30] Shortage is shared between these two higher priority categories based on the formula developed in the Gila River Indian Community Water Rights Settlement
[31] 317,395 after 2044
[32] 23,782 Af of the 67,300 AF reserved for Indian water right settlements are pending for the White Mtn Apache

Interstate Requests

Recovery of interstate credits and the development of ICUA will be triggered by requests from Nevada for the release of ICUA. The timing and magnitude of these requests can be independent of shortage conditions, and are expected to be driven primarily by Nevada's future demand and the desire to supplement its apportionment of Colorado River water (300,000 acre-feet). Nevada is currently using less than their full entitlement (237,161 AF in 2012[33], see **Figure 7**), but population growth is expected to result in increased future demand.

Figure 7 Nevada's Historic Consumptive Use



The interstate banking program is governed by state statute, and four inter-related agreements.[34] The agreements allow Arizona to store CAP water on behalf of Nevada,[35] as well as develop the mechanisms necessary to enable its recovery and exchange. Upon request of the release of ICUA by Nevada, a portion of Arizona's entitlement will be made available for diversion by Nevada from Lake Mead, and CAP will recover an equal volume of interstate credits and deliver the recovered water to its customers to make up for CAP's reduced diversion.

[33] USBR Degree Accounting Report
[34] Storage and Interstate Release Agreement (SIRA); Agreement for Interstate Water Banking, as amended; Agreement for the Development of Intentionally Created Unused Apportionment (ICUA); and Recovery Agreement, with subsequent amendments
[35] More specifically, the Colorado River Commission of Nevada holds Nevada's Colorado River apportionment. The Southern Nevada Water Authority has several diversion contracts, the largest being 308,000 acre-feet.

Starting in 2015, Nevada is required to annually provide the AWBA and CAP with a schedule of potential ICUA requests for the following ten year period. A minimum lead time of three years is required for any year in which there is an amendment to the schedule. Nevada is also limited in the magnitude of ICUA that can be requested in any single year: 20,000 acre-feet in the initial year, 30,000 acre-feet in the second year and 40,000 acre-feet any year thereafter. During a declared shortage, up to an additional 13,000-20,000 acre-feet per year may be requested (depending on shortage tier), and additional ICUA will be developed to the extent recovery capabilities exist. On an annual basis, the parties may also agree to additional interstate storage, but the 600,651 acre-feet of existing credits must be recovered by 2063.

Modeling Approach

Quantification of the factors described above, and evaluation of potential future recovery, requires the use of models. The analysis in this Plan relied on both existing models, including the Bureau of Reclamation's Colorado River Simulation System (CRSS), as well as a custom recovery model that was used to calculate the probability of specific recovery volumes occurring through time, based on a range of supply and demand conditions.

CRSS was used to generate a range of future Colorado River supplies available to Arizona. The CRSS model incorporates parameters such as basin hydrology, upper basin demands and current operating rules. **Table 6** lists some of the key CRSS assumptions used for this Plan. These assumptions are generally conservative in nature, and are part of a consensus "Arizona Baseline" that is currently being developed jointly by ADWR, CAP and the AWBA. Using these assumptions, CRSS generated over one hundred future water supply scenarios, commonly referred to as traces.

Table 6 Key Modeling Parameters & Assumptions that affect Arizona's Colorado River Supply

Modeling Parameters	Modeling Assumptions
Basin Hydrology	Observed Record (1906-2010)
Upper Basin Demands	ADWR Upper Basin Demand Assumption - 4.8 MAF by 2031, then flat
Operation of Yuma Desalting Plant	No
Mexico Shortage Sharing	Yes, Minute 319, extended
Reservoir Operations	2007 Interim Guidelines, extended[36]
Initial Reservoir Condition	2014 Lake Mead elevation (Projected from August 2013 24-month study)

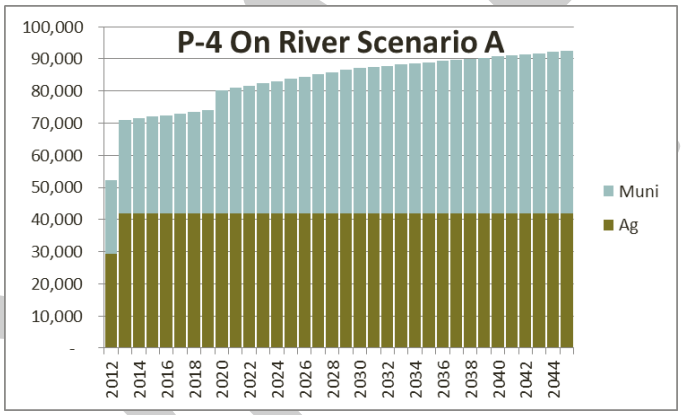
[36] Model does not simulate shortages greater than a Tier 3 (480,000 AF)

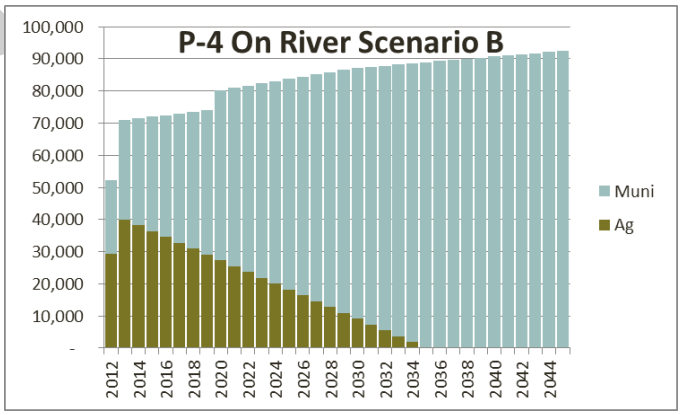
The water supply traces from the CRSS model were incorporated into the recovery model, where the traces were matched against a range of projected on-River and CAP demands. The model determines the instances in which available supplies do not meet the projected demands, and calculates the probability, timing and magnitude of potential recovery of water stored by the AWBA. The recovery model also allows ICUA requests to be analyzed and combined with shortage-based recovery.

To capture the uncertainty of future demand, two different variations were developed for both on-River and CAP utilization.

On-River demand is projected to increase to approximately 1.22 million acre-feet by 2045[37], of which 92,000acre-feet[38] is P-4 on-River. Two variations of the amount of on-River P-4 remaining for agricultural use were developed. In one, the P-4 agricultural demand was held constant through the planning horizon (at 42,000 acre-feet of consumptive use) and in the second, the P-4 agricultural demand is converted entirely to M&I use by 2035 (See **Figure 8**). This later assumption increases the amount of P-4 supply that would potentially require recovery during a shortage.

Figure 8 Projected On-River P-4 Consumptive Use (Scenarios A & B)[39]





[37] This is the same assumption that ADWR called "Scenario A" in its recent NIA reallocation process modeling
[38] 92,000 AF of consumptive use correlates to approximately 146,000 AF of diversion. On-River P-4 entitlements are capped at 164,652 AF of diversion
[39] 2012 actuals

The two variations in CAP utilizations differ in how quickly full utilization of long-term entitlements is achieved; one achieves full-use by 2045(See **Figure 9**), the other achieves full use ten years sooner (**Figure 10**) (See **Appendix A** for detailed assumptions).

Figure 9 CAP Demand Schedule for Scenario A

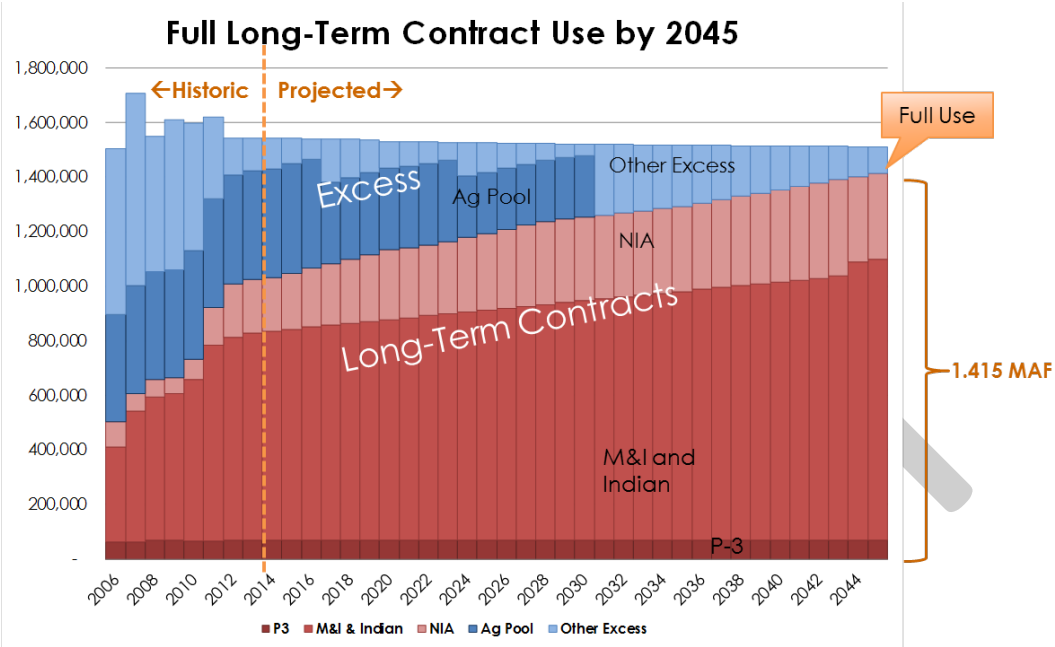
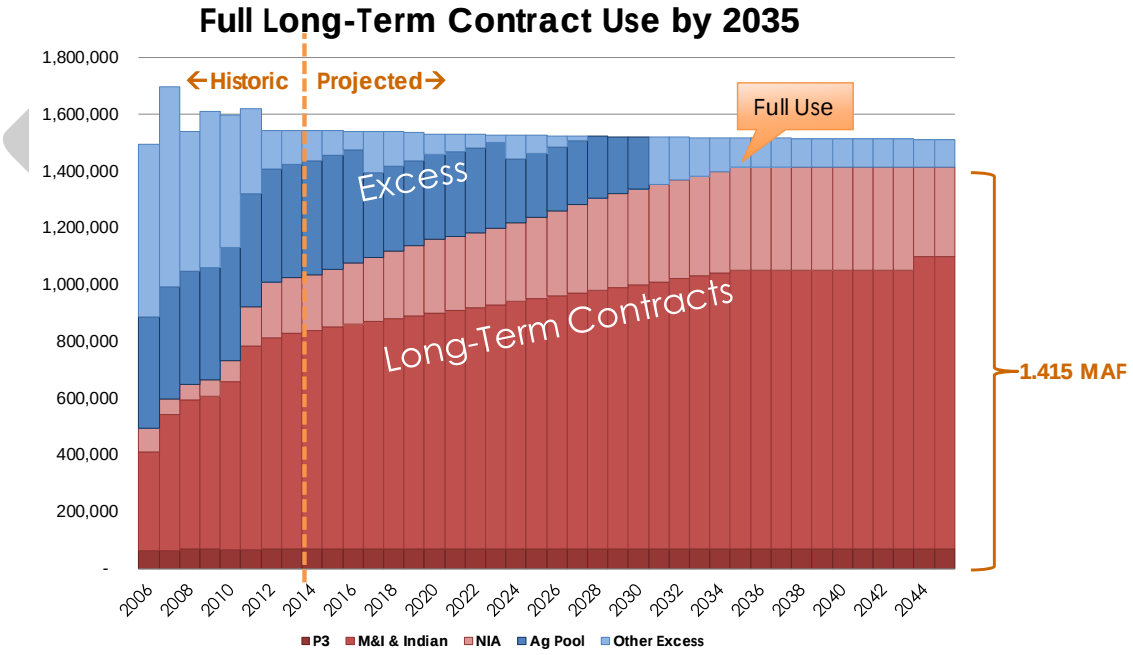


Figure 10 CAP Demand Schedule for Scenario B



For interstate recovery, a larger number of potential outcomes were modeled. The variations included the timing of the first request for ICUA (2025 or 2035), the magnitude of request

(maximum or evenly distributed to 2063), and whether an additional request for ICUA during shortage was made.

Modeling Results

Synthesizing Results

Even with a relatively small number of factors and variations, a large number of model results can be generated. To make these results manageable, two approaches were taken. First, composite scenarios were developed based on specific sets of assumptions. Six combinations of assumptions where chosen to represent a plausible range of future intrastate and interstate demands: Scenario A with No Interstate, Scenario A with Early Steady Interstate, Scenario A with Later Steady Interstate, Scenario B with No Interstate, Scenario B with Early Max Interstate, and Scenario B with Later Max Interstate (See **Table 7**). In comparison to Scenario B, Scenario A assumes less on-River P-4 M&I use by 2045, slower utilization rates of CAP entitlements as well as smaller volumes of future interstate requests.

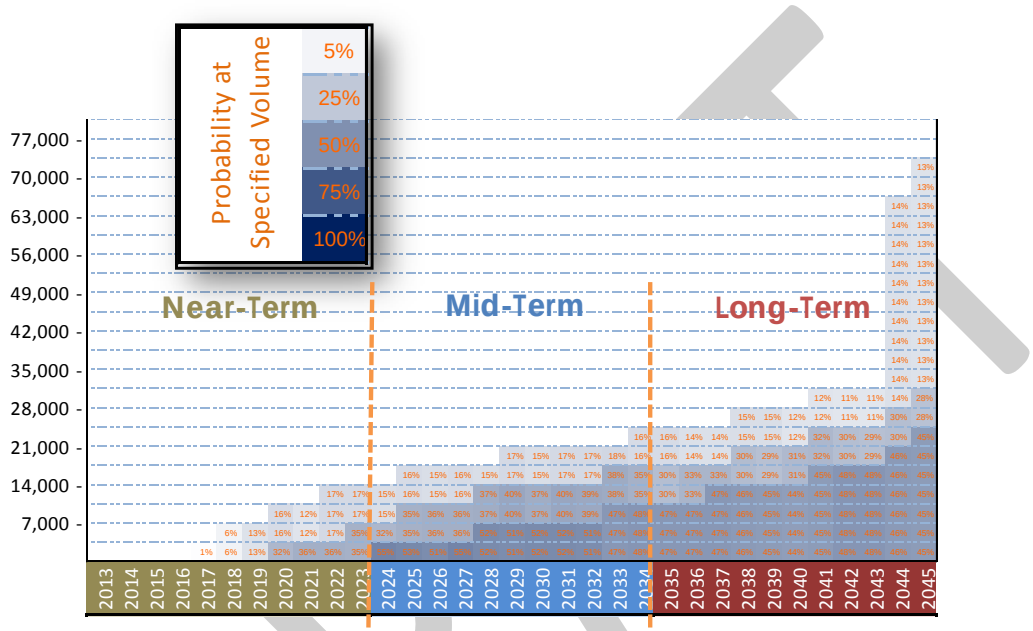
Table 7 Scenario Assumptions

Scenarios	Intrastate Assumptions		Interstate Assumptions
	On-River Demand	CAP Demand	Nevada Request
Scenario A	Increase to 1.22 MAF by 2045; no conversion of P-4 agricultural use (ADWR's Scenario A for NIA reallocation)	Full long-term contract use by 2045	**Early Steady:** Start in 2025; steady to 2063 (~15 kAF/yr); no shortage request
			Later Steady: Start in 2035; steady to 2063 (~21 kAF/yr); no shortage request
Scenario B	Increase to 1.22 MAF by 2045; full conversion of P-4 agricultural use to M&I by 2035	Full long-term contract use by 2035	**Early Max:** Start in 2025; max request; additional shortage request
			Later Max: Start in 2035; max request; additional shortage request

Second, the recovery model was developed to display probabilistic results of the underlying shortage traces. The recovery modeling tool generates graphs which depict the probabilities that a specific annual recovery volume will be needed, for each year in the planning horizon (see **Figures 11 and 12**). The shade of the cell indicates the probability that the specific volume of recovery will be needed at a particular time. The darker the cell, the higher the

probability is that recovery at that volume will be needed. For instance, for a given year the very pale blue at the top may indicate a 15% probability that 20,000 AF of recovery may be necessary, but the darker blue below indicates there is a 30% probability of 5,000 AF of recovery for that same year. To further aid in the discussion of the results as well as future planning efforts, the planning horizon was divided into three different periods: Near-term (2013-2023), Mid-term (2024-2034) and Long-term (2035-2045). These planning periods are depicted as gold, blue and red on the chart's timeline.

Figure 11 Example of graph generated by the Recovery Modeling Tool



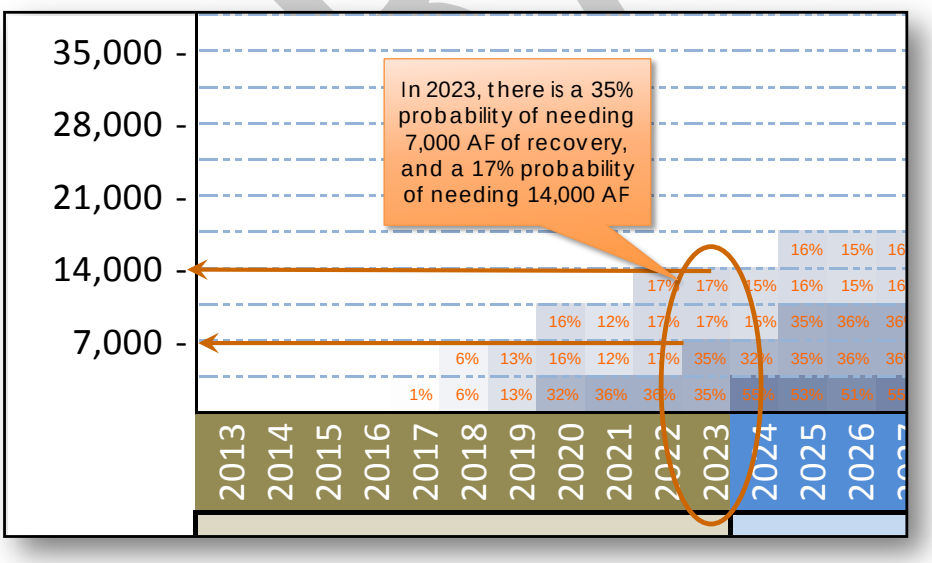


Figure 12

Modeling Results

Intrastate Recovery

Modeling results suggest that the earliest intrastate recovery may be triggered sometime around 2017, though the annual volume and probability is very low. Recovery for on-River users and the state's portion of Indian NIA water are projected to occur first and well before recovery for M&I firming which is not projected until at least 2035.

It is important to note that CRSS modeling done in September, 2013 shows a high probability (>50%) that a level 1 shortage could occur in 2016, but the recovery modeling indicates that the potential shortage would not intersect with projected on-river or NIA priority pool demands. Figure 13 shows projected CAP water orders for 2016 and the approximate impact a level 1 shortage would likely have on the projected delivery schedule. Excess CAP including Ag Pool water would be significantly impacted; however no intrastate recovery would be triggered.

Figure 13 2016 Level 1 Shortage

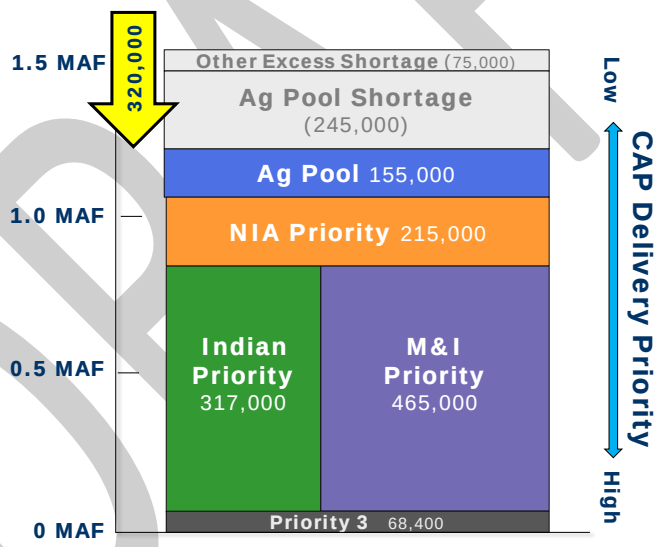
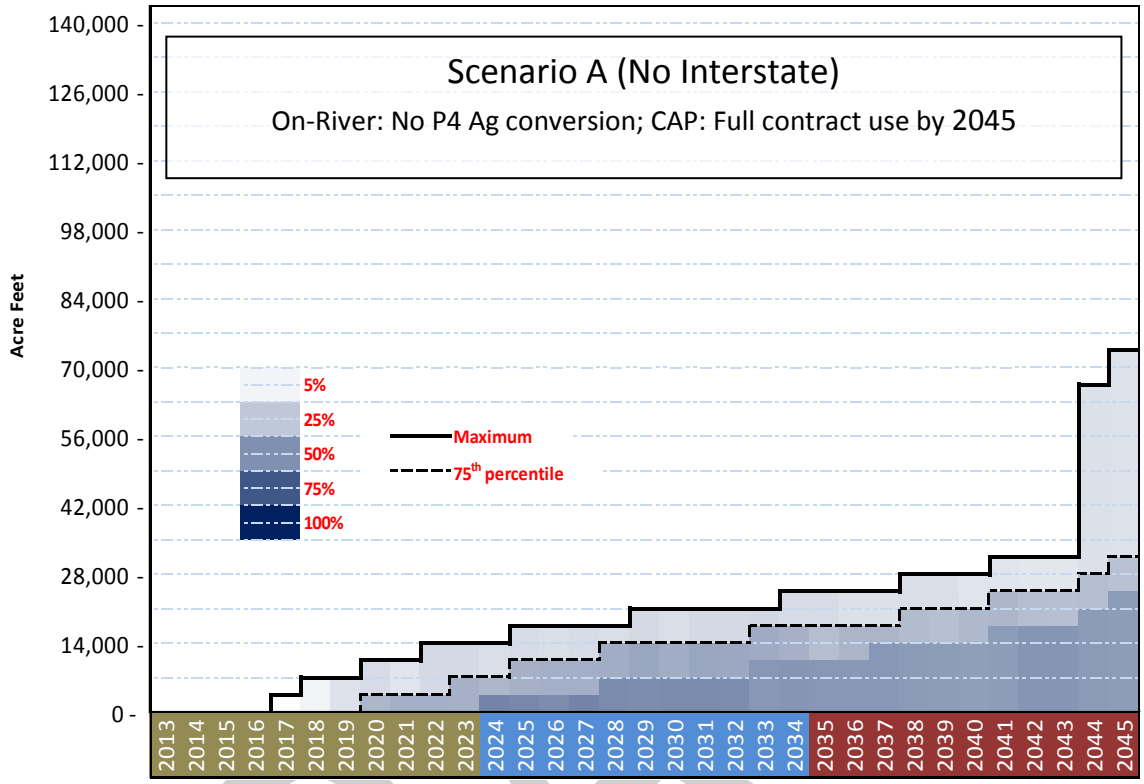
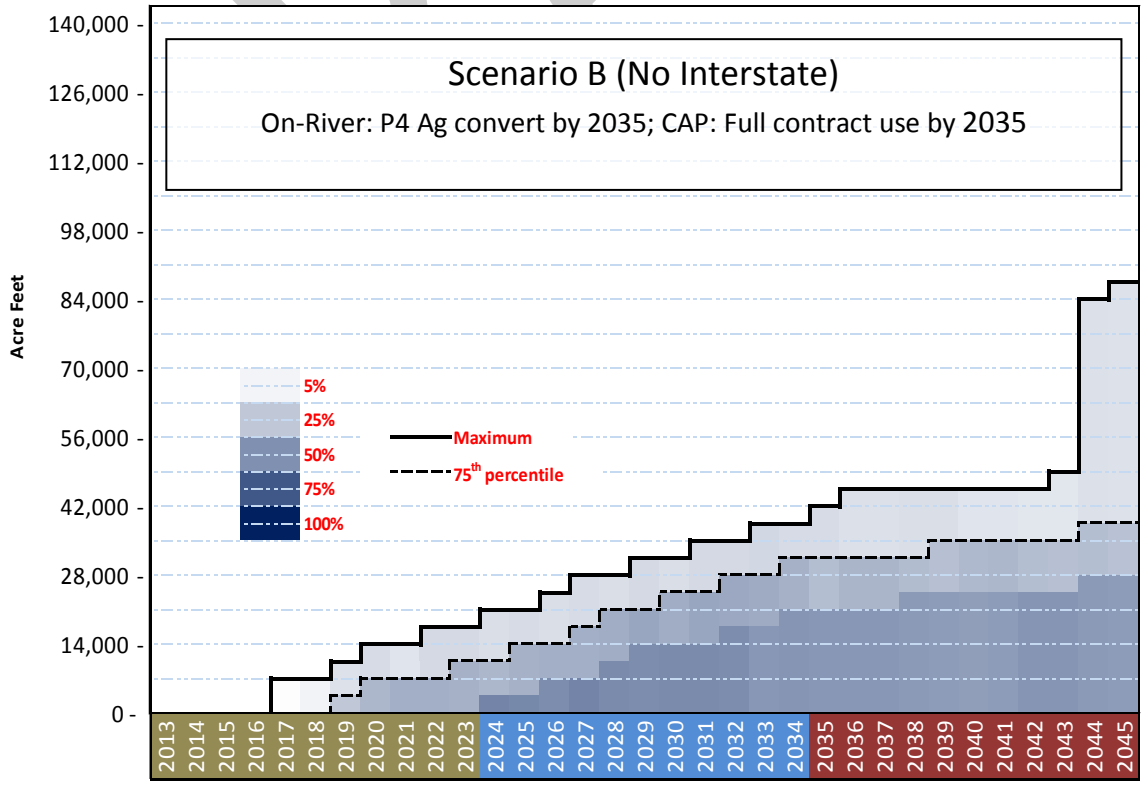


Figure 14 illustrates that the magnitude and likelihood of annual recovery, in both Scenario A & B, gradually increases through the planning horizon as the use of on-River P-4 and CAP long-term entitlements increases. Shading of the graph indicates the underlying shortage tiers and probability that the annual recovery volume will be necessary. Potential recovery during the Near Term (2013-2023) and Mid Term planning period (2024-2034) consists of a combination of on-River and Indian NIA recovery (see **Appendix B** for more details). Recovery in the Long Term planning period consists of on-River, Indian NIA and M&I firming. The spike in 2044 is due to the conversion of 47,303 acre-feet of water from the NIA priority pool to the M&I user pool in 2044. This increases the volume of firmed water for the M&I pool. Scenario B shows higher recovery volumes due to the faster utilization rate of long-term entitlements.

Figure 14 Scenario A & B (No Interstate)





Interstate

Interstate recovery could occur as early as 2018 but is not expected to occur until the Mid-Term (2024-2034) or Long-Term planning period (2025 or later) and the maximum volume could be up as much as 40,000 acre-feet plus up to 20,000 acre-feet during shortages. Four different interstate assumptions were created to represent a plausible range of future interstate recovery: early (2025) and steady (15KAF/Y), later (2035) and steady (21KAF/Y), early (2025) and max (40KAF/Y plus shortage if applicable) and later (2035) and max (40kAF/Y plus shortage if applicable).

Combined Results

When the intrastate recovery results (graphs previously shown) were combined with the interstate recovery assumptions mentioned above, four additional scenarios were generated: Scenario A with Early Steady Interstate, Scenario A with Later Steady Interstate, Scenario B with Early Max Interstate, and Scenario B with Later Max Interstate (See **Figures 15-16**).

Modeling Highlights

- Earliest projected intrastate recovery is 2017 (at 1% probability; Indian NIA and On-River)
- Total intrastate recovery during Near-Term Period is projected to be no greater than 17,000 acre-feet per year, during Mid-Term no greater than 38,200 acre-feet per year and in the Long-Term no greater than 84,500 per year.
- 36% or less probability of needing to recover in any given year during the Near-Term planning period (2013-2023)
- 55% or less probability of needing to recover in any given year during the Mid-Term planning period (2024-2034)
- No M&I recovery projected until the Long-Term planning period (2035-2045) and even then less than 17% probability of needing to recover in any given year
- Timing and magnitude of Nevada's request plays a significant role in Mid-Term and Long-Term planning period volumes. Nevada will submit its first 10 year plan in 2015

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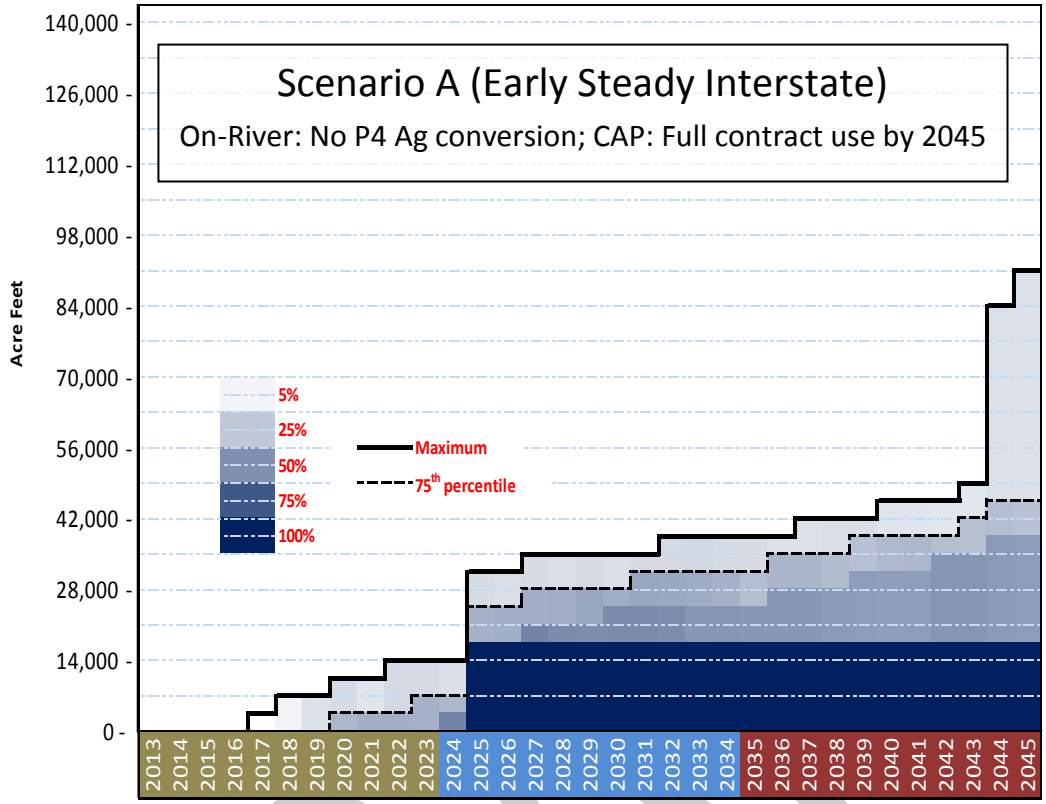
Figure 15


Scenario A (Early Steady Interstate)
On-River: No P4 Ag conversion; CAP: Full contract use by 2045
Acre Feet
140,000
126,000
112,000
98,000
84,000
70,000
56,000
42,000
28,000
14,000
0
5%
25%
50%
75%
100%
Maximum
75th percentile
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045

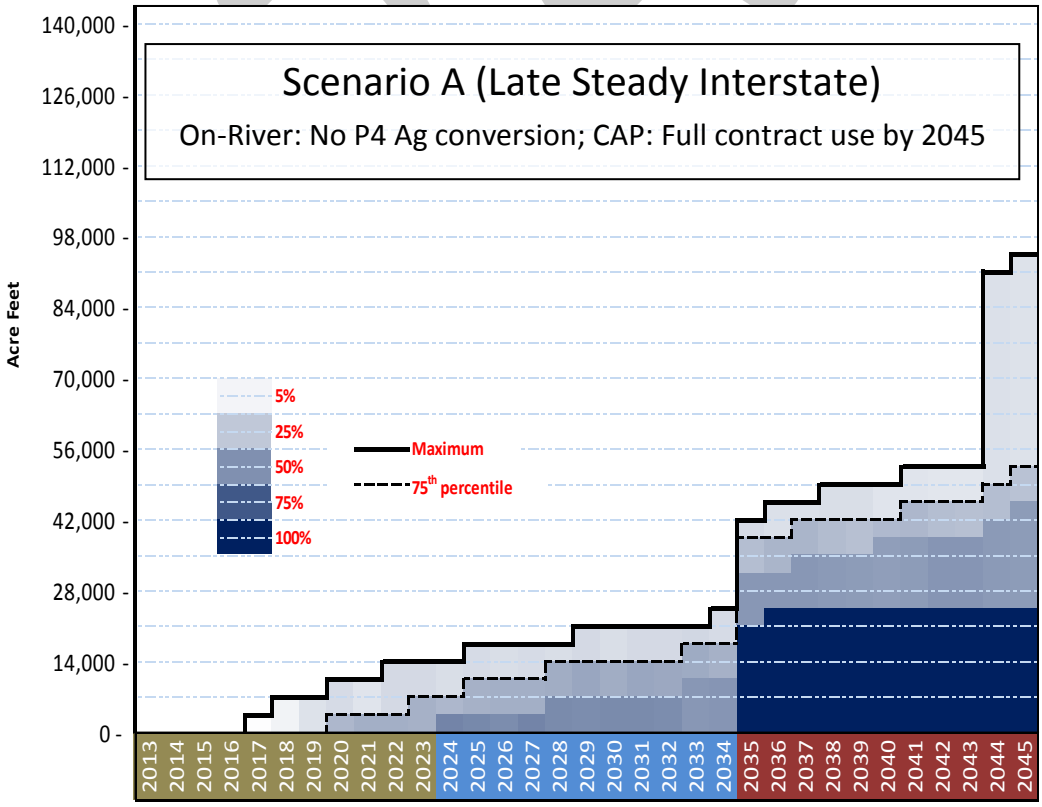
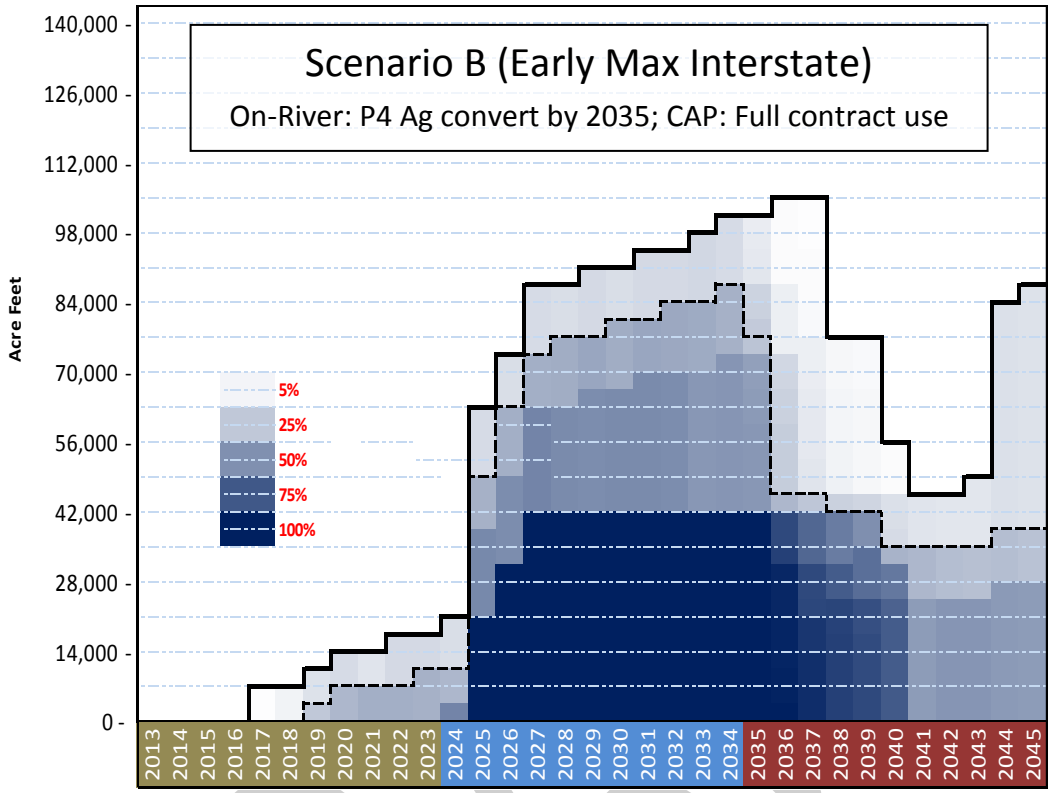
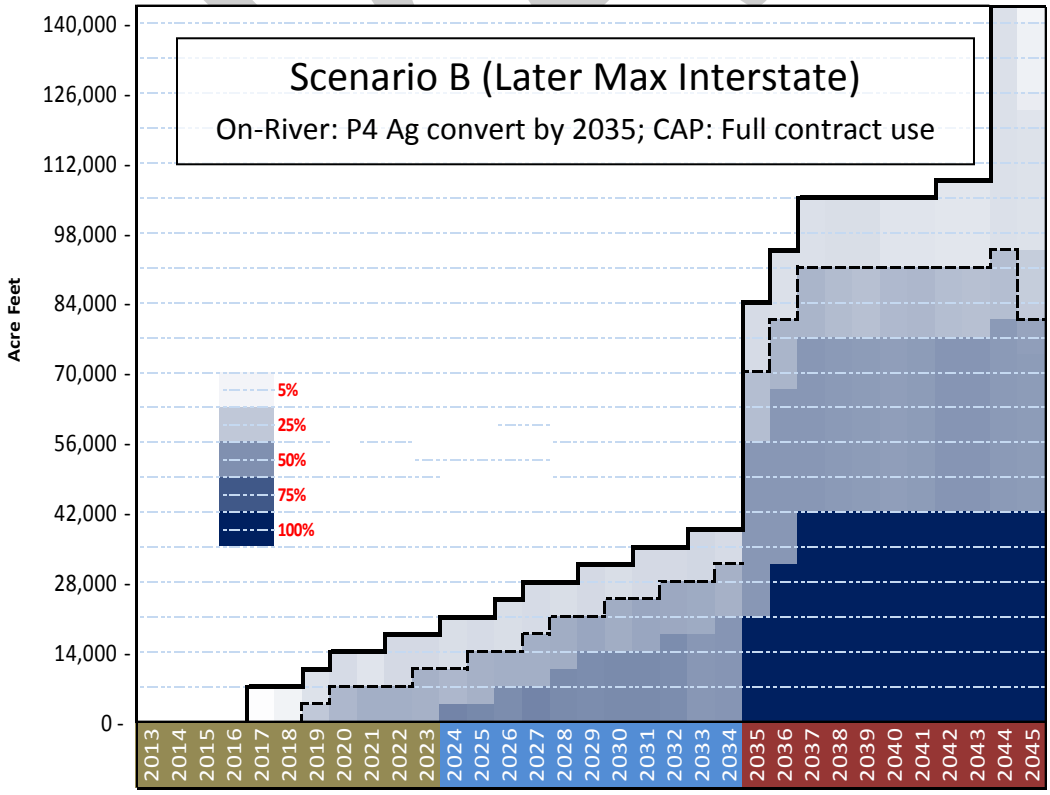

Scenario A (Late Steady Interstate)
On-River: No P4 Ag conversion; CAP: Full contract use by 2045
Acre Feet
140,000
126,000
112,000
98,000
84,000
70,000
56,000
42,000
28,000
14,000
0
5%
25%
50%
75%
100%
Maximum
75th percentile
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045

Figure 16

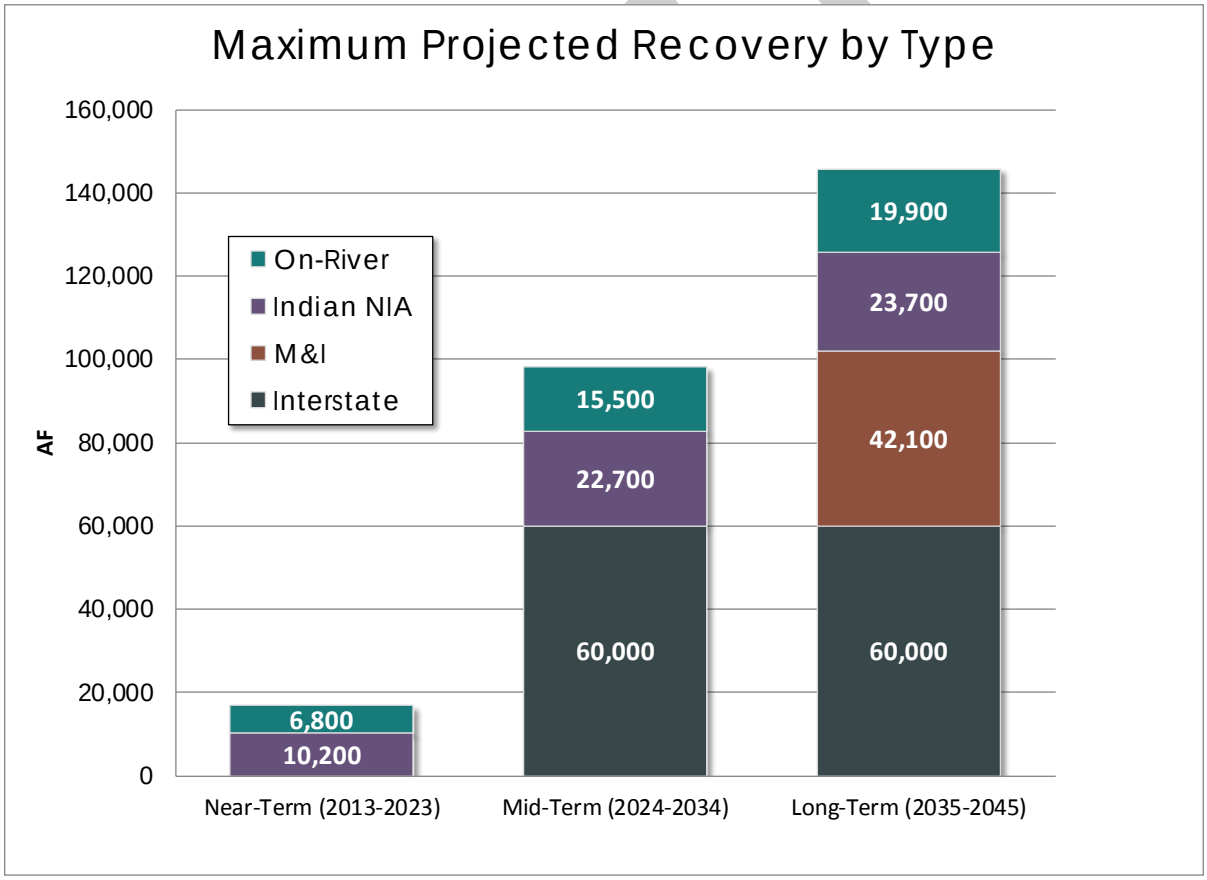

Scenario B (Early Max Interstate)
On-River: P4 Ag convert by 2035; CAP: Full contract use
Acre Feet
140,000
126,000
112,000
98,000
84,000
70,000
56,000
42,000
28,000
14,000
0
5%
25%
50%
75%
100%
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045


Scenario B (Later Max Interstate)
On-River: P4 Ag convert by 2035; CAP: Full contract use
Acre Feet
140,000
126,000
112,000
98,000
84,000
70,000
56,000
42,000
28,000
14,000
0
5%
25%
50%
75%
100%
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045

It is evident from the modeling results that the timing and magnitude of Nevada's request plays a significant role in projecting future recovery volumes. The AWBA, CAP and ADWR should have a better idea of future requests from Nevada when SNWA submits its first 10 year plan to the AWBA in 2015.

Figure 17 takes the maximum total projected recovery in each planning period from all scenarios and disaggregates it by recovery type. Note that M&I recovery is not projected until the Long Term planning period. Of the intrastate recovery needs, only On-River and Indian NIA are projected in the first two planning periods. Requests for interstate recovery are not expected to occur until at least the Mid Term period.

Figure 17



Section 6:
Credit Request, Distribution & Recovery Opportunities

The range of possible future recovery identified in the previous section frames the general likelihood, timing and magnitude of potential recovery activity. This section applies that information to the AMA level by considering potential future credit requests by CAP, credit distribution by the AWBA and the potential opportunities to accomplish that recovery.

Credit Request

During shortage on the Colorado River, the volume of AWBA credits needed for recovery will be based on requests for firming by on-River P4 contractors pursuant to recovery and exchange agreements (currently only with MCWA); the difference between supply and demand for the M&I priority class of CAP water and up to 23,724 AF for NIA Indian priority CAP water firmed by the AWBA; and up to 40,000 acre-feet per year of request for ICUA by Nevada (up to 60,000 acre-feet during shortage).

Prior to a year in which recovery is required, CAP, in consultation with the AWBA, will use the projected recovery volumes to develop a recovery schedule that identifies the number and purpose of credits needed, by AMA and storage facility (See Section 7 for a detailed operational timeline). By statute, recovery must occur within the AMA where the original storage took place. Current statutes allow water stored at any USF or GSF in an AMA to be recovered anywhere in the same AMA under a valid recovery permit, but there are often hydrologic and policy advantages for recovery to take place in the vicinity of the specific storage facility, which is a view many potential recovery partners and water managers have expressed.

CAP's credit requests to the AWBA will need to consider credit funding sources. As discussed in Section 3, a credit's funding source dictates the allowable use(s) of that credit. **Table 8** shows total credits accrued through 2012 by funding source and the percentage stored in each AMA.

Table 8 Credits (AF) accrued by funding source and percentage by AMA[40]

Acre-feet		PHOENIX	PINAL	TUCSON
1,907,724	Ad Valorem	70%	10%	20%
787,316	Withdrawal Fee	37%	50%	13%
403,830	General Fund	10%	76%	14%
82,376	Shortage Reparations	25%	73%	1%
600,651	Interstate	8%	73%	18%

[40] Not all funding source percentages add up to 100% due to rounding

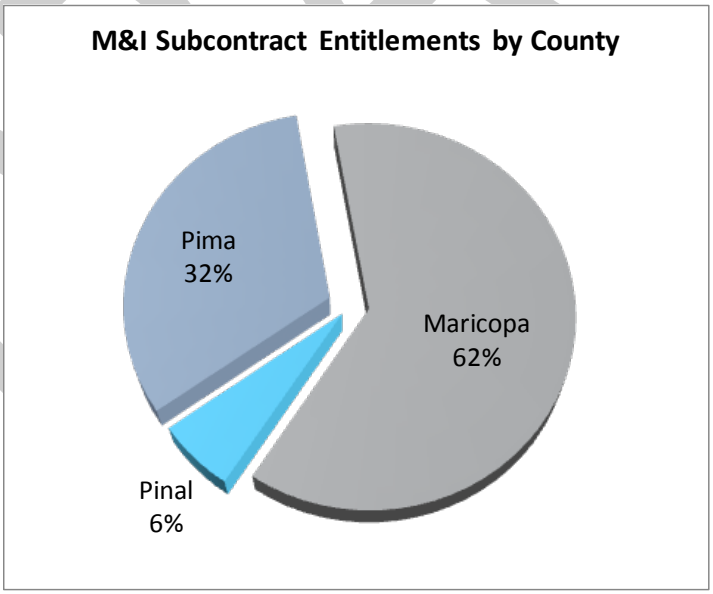
CAP will also consider AWBA resolutions, statues and contractual obligations when developing its request to the AWBA. For instance, based on current AWBA direction, this Plan assumes that recovery for Indian NIA obligation will be met using withdrawal fee credits (pending further legislative appropriations) and on-River P-4 M&I recovery will be met with General Fund credits.

Due to the anticipated shortfall in achieving the M&I firming goal in the Tucson AMA however, this Plan assumes that CAP will not request Tucson AMA credits accrued with withdrawal fees during the planning horizon, in order to preserve the option of using them for M&I firming in the future. The AWBA will need to make a policy decision on this issue at the appropriate time.

This Plan also affirms the statutory provisions that ad valorem credits will be used for CAP M&I recovery, and interstate credits will be used for interstate ICUA requests based on contractual obligations.

By statute and policy, ad valorem credits are to be distributed for the benefit of the county from which monies were collected. To date, Maricopa County funds have been expended exclusively in the Phoenix AMA; Pinal County funds in the Pinal AMA; and Pima County funds have generated Tucson AMA credits. This Plan assumes that the proportion of total M&I subcontract entitlements by county (62% in Maricopa, 6% in Pinal and 32% in Tucson)[41] will form the basis of CAP's request for credits from each of the associated AMAs.[42] (**Figure 18**)

Figure 18



[41] These proportions will change slightly in 2044 when 47,303 of NIA priority water allocated in Maricopa County converts to M&I priority

[42] There has been periodic interest in the concept of inter-AMA firming in which 4-cent funds collected in Maricopa County, for instance, are used to accrue credits in the Tucson AMA. In this Plan, it is assumed that any inter-AMA credits would be used to benefit the County that funded the credits (i.e., the inter-AMA credits in the Tucson AMA would be used to satisfy Maricopa County firming needs).

To help illustrate what a CAP credit request (i.e. recovery schedule) might look like from the AMA perspective, the general credit use assumptions made above and summarized in **Table 9** were applied to the maximum annual projected recovery volumes for each user type (see **Table 10** below), maximum annual recovery volumes by AMA were then calculated and graphed (see **Figure 19**).

Table 9 General Credit Request Assumptions

TYPE	FUNDING	DISTRIBUTION			BASIS OF DISTRIBUTION
		PHX	PIN	TUC	
Indian NIA	Withdrawal Fee	43%	57%	0%	Based on Phoenix and Pinal storage only
On-River	General Fund	10%	76%	14%	Based on AMA storage (see Table 8)
M&I	Ad Valorem	62%	6%	32%	Based on entitlement by county (see Figure 16)
Interstate	Interstate Funding	9%	73%	18%	Based on AMA storage (see Table 8)

Table 10 Maximum Annual Recovery for each User Pool

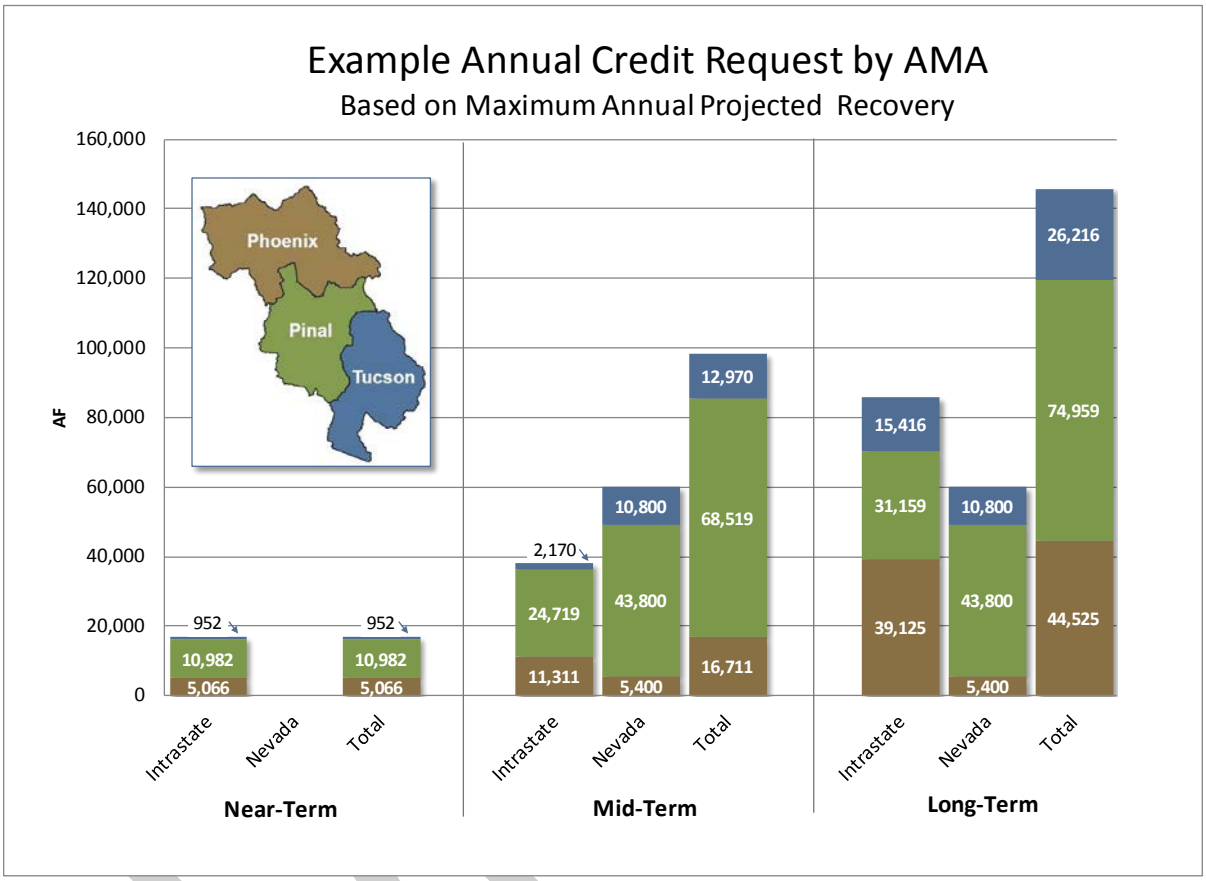
Recovery Type	Maximum Annual Volume (AF)		
	Near-Term (2013-2023)	Mid-Term (2024-2034)	Long-Term (2035-2045)
Indian NIA	10,200	22,700	23,700
On-River	6,800	15,500	19,900
M&I	0	0	42,100
Total Intrastate	**17,000**	**38,200**	**84,200**[43]
Interstate	0	60,000	60,000
TOTAL	**17,000**	**98,200**	**144,200**

Based on this credit request method, the Pinal AMA appears to be the focus of recovery for a significant portion of the planning horizon. This is because the majority of the credits (withdrawal fee credits, general fund credits and interstate credits) needed for much of the

[43] Total generated by the Recovery Model is slightly less than sum of its individual parts

recovery projected in the planning horizon (Indian NIA, On-River P-4 M&I users and interstate requests), are located in the Pinal AMA. Recovery in the Phoenix and Tucson AMAs will become more significant in the Long-Term planning period when recovery for M&I users is needed and credits generated with ad valorem credits are recovered.

Figure 19 Estimated Credit Request by AMA - Projected Intrastate & Interstate Recovery



Credit Distribution

The AWBA and ADWR will review CAP's proposed recovery schedule for consistency with State laws as well as conformance with the AWBA's goals and obligations. With the exception of the statutory provisions regarding the distribution of credits earned with Ad Valorem taxes, and as provided in any agreements entered into by the AWBA, the decision to distribute (or extinguish) any AWBA credits is at the complete discretion of the AWBA (A.R.S. § 45-2457(D)). Consequently, it is imperative that CAP and the AWBA work in close cooperation on the request of recovery credits.

The distribution of ad valorem credits has been a source of some uncertainty in previous recovery planning efforts. In order to provide clarity on this issue, CAP, AWBA and ADWR staff have developed the following proposal:

For shortages to the M&I priority pool, the AWBA will distribute credits earned with ad valorem funds to CAP, provided the following conditions exist;

- *AWBA has credits available to firm the supply*
- *CAP's recovery schedule is consistent with statutes, rules and policies*
- *Credits will be used to benefit the county for which they were accrued*
- *The shortage to the M&I priority pool is less than 20%*

Modeling suggests that shortages to M&I priority pool rarely exceeds 20%. However, in the event real-time projections indicate that shortages are anticipated to exceed 20%, the AWBA, CAP, and ADWR will initiate a consultation process, with input from stakeholders, to determine the most appropriate way to address the portion of the shortage that exceeds 20%. It is expected that the drought exemption provisions in the State's Assured Water Supply program, which have a similar 20% threshold, will be included in that discussion.[44]

Recovery Opportunities by AMA

In addition to the factors described above, CAP's recovery opportunities will also play a large role in where recovery will occur. CAP has, and will continue to, focus its efforts on developing recovery partnerships that will meet recovery where and when it is needed. This Plan identifies the primary recovery opportunities in each AMA that CAP is actively pursuing. Many of these opportunities have been mentioned in past planning efforts and CAP has commissioned a number of technical studies related to these options to further guide its planning efforts.

Phoenix AMA

The primary recovery opportunities in the Phoenix AMA are:

- **Credit Exchange with the CAGRD**

  The CAGRD currently holds a 7,996 acre-foot M&I subcontract that is prioritized for replenishment in the Phoenix AMA.[45] The CAGRD's use of that subcontract makes it a good candidate for credit exchange. The CAGRD could agree to forego planned deliveries to a USF and, instead, have credits previously stored by the AWBA assigned to the CAGRD's Conservation District Account (CDA), where the credits would satisfy replenishment obligations and are then considered extinguished. The CAGRD would receive the credits it needs to fulfill its replenishment obligations and CAP deliveries would have been reduced.[46] The credit exchange method with the CAGRD was successfully used by CAP to develop a portion of ICUA for Metropolitan Water District of Southern California (MWD).

[44] [AWS Rule citation]
[45] The CAGRD's subcontract was established as a result of several voluntary transfer/relinquishment actions, some of which included provisions governing where portions of the subcontract are to be used.
[46] In the case of replenishment, CAGRD Member pumping has occurred prior to the credit exchange, so the use of permitted recovery wells is not required.

The CAGRD has also applied for an allocation of NIA priority CAP water and is awaiting finalization of a 2,500 AFY lease of NIA priority CAP water from the White Mountain Apache Tribe. Depending on the level of shortage and demand for higher priority CAP supplies, the CAGRD may be able to perform credit exchange with its NIA priority water as well (i.e. if some NIA supply is still available during shortage).

This Plan recommends that the credit exchange method be used with the CAGRD when possible.

- **Credit Exchange with Subcontractors performing ASR at USFs**

  Subcontractors conducting ASR at a USF in the Phoenix AMA would also make good recovery partners using the exchange method. The physical operation of their recovery wells would be identical. The only difference would be that instead of receiving and storing water at a USF facility, the recovery partner would recover water previously stored by the AWBA.

  To date, 22 of the 36 M&I subcontractors in the Phoenix AMA store CAP water in the same recharge facilities where the AWBA has stored water. Additionally, 24 of the 36 M&I subcontractors have a combined total of 485 recovery wells.[47] In 2012, approximately 30,000 AF of annual storage and recovery took place in the Phoenix AMA. Note that under limited circumstances, such as for the development of ICUA during a non-shortage year, there may also be opportunities to do credit exchange with a CAP subcontractor that was storing to accrue long-term storage credits.

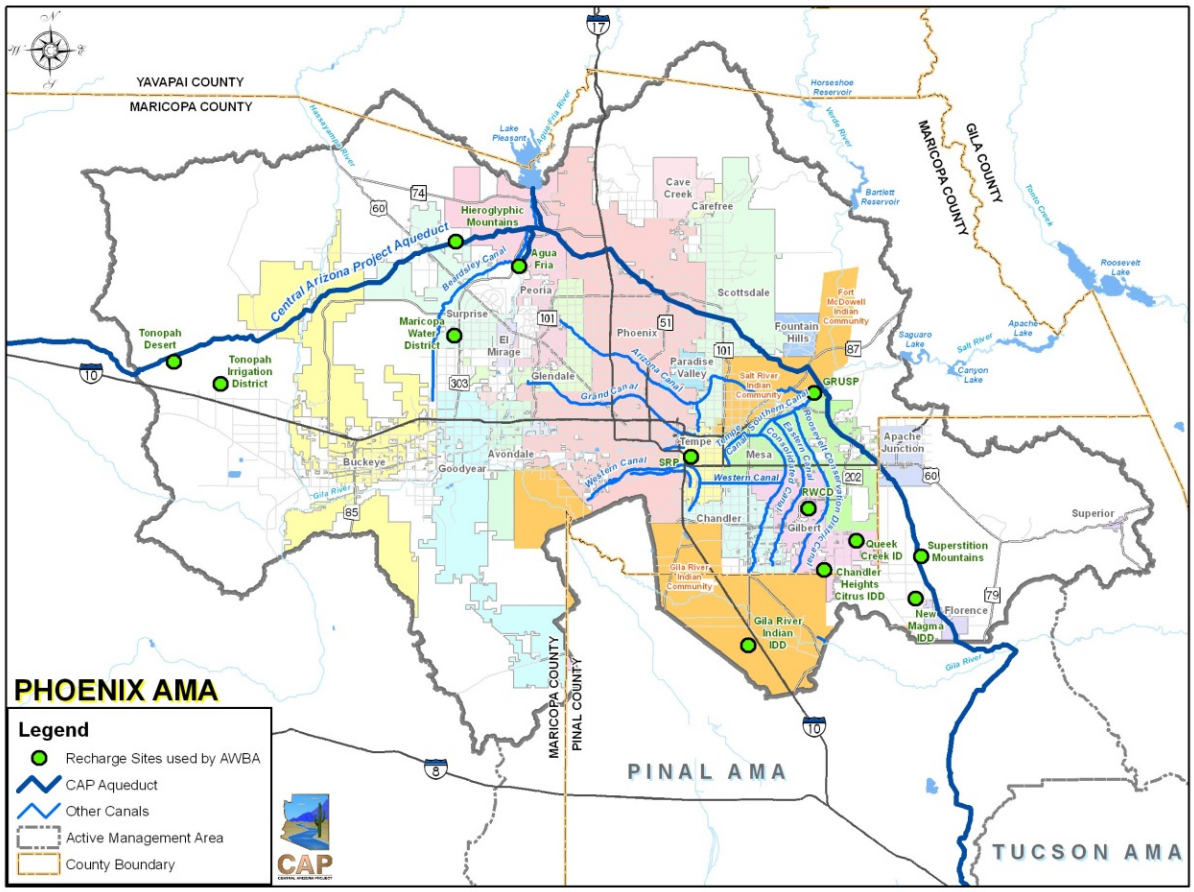
  This Plan recommends that CAP pursue recovery partnerships with subcontractors in the Phoenix AMA that are currently conducting Annual Storage and Recovery (ASR).

- **Indirect Recovery using Third Party Recovery Partners and Regional Water Delivery Systems**

  Many of the M&I subcontractors in the Phoenix AMA, and some of the Indian contractors, are served by regional water delivery systems other than CAP. These include canals and related infrastructure operated by SRP, MWCD and RWCD. There are existing arrangements in which CAP water is wheeled or exchanged, and in each case, the regional systems include permitted recovery wells. These factors provide an opportunity to enter into agreements with the long-term CAP contractors and the third party partners to recover AWBA credits. As discussed in Section 4, indirect recovery requires a CAP recovery partner or in this case a third party recovery partner to have additional recovery well capacity available to use when CAP deliveries are reduced.

[47] Draft Planning for Recovery, CAWCD, February, 2012

Figure 20 Phoenix AMA



With appropriate agreements among all parties, AWBA credits could be recovered by third party recovery partners and delivered to their customers to make up for a reduction in CAP deliveries. Preliminary discussions have occurred between CAP and the primary water districts, and there appears to be initial interest in developing these partnerships.

This Plan recommends that CAP pursue recovery partnerships with subcontractors and the districts operating regional infrastructure to make up for reduced CAP deliveries by recovering AWBA credits.

- **<u>Other Opportunities in the Phoenix AMA</u>**

  CAP performed an initial investigation of a potential large-scale direct recovery well field at the Tonopah Desert Recharge Project (TDRP). The Phase 1 study reached a preliminary conclusion that large-scale recovery at TDRP is hydrologically feasible. However, careful analysis of the timing and purpose of recovery from that facility would be required before the potentially large capital expenditure could be justified.

Pinal AMA

The primary recovery opportunities in the Pinal AMA are:

- **Indirect Recovery using Irrigation District wells and the Ag Pool**

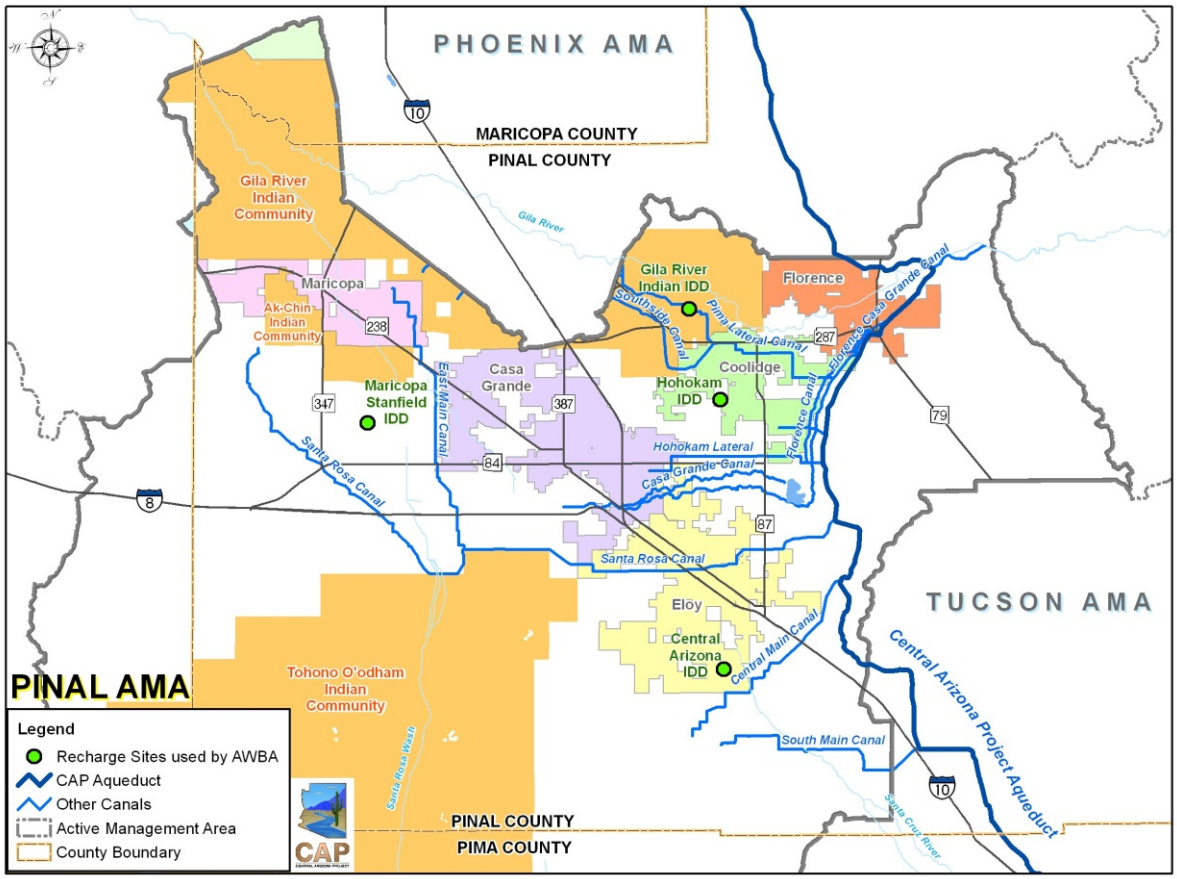
  The Agricultural Settlement Pool (Ag Pool), which is a category of excess CAP water allocated to specific irrigation districts and users, provides a good opportunity for indirect recovery for interstate recovery in non-shortage years. In this arrangement, irrigation district wells are permitted for recovery, and the districts agree to additional pumping (i.e., recovery of AWBA credits) in exchange for a reduced delivery of their Ag Pool water. Since most of the Ag Pool water is used in the Pinal AMA (~80%), the opportunity in this AMA is significant.

  Indirect recovery with the Ag Pool in the Pinal AMA was successfully employed by CAP, in partnership with MSIDD, CAIDD and HIDD, to recover 74,026 acre feet of water on behalf of California (MWD) between 2007 and 2010.[48] To help maintain that partnership, CAP has had a recovery incentive program in place with the three Pinal AMA irrigation districts since 2007. The participants have been compensated annually in order to maintain specific recovery wells. Program expenditures to date have been approximately $1.7 million and are associated with approximately 30,000-40,000 AFY of potential recovery capacity.

  CAP and the irrigation districts have also started to explore options for expanding the existing recovery capacity and developing the associated agreements. The timing is favorable because the districts are already working to increase their well capacity in preparation for potential shortages that will affect excess CAP water supplies, and in anticipation of the first step-down in the size of Ag Pool, from 400,000 AFY to 300,000 AFY in 2017.[49] However, precisely because the Ag Pool is scheduled for reduction over time, and its susceptibility to reduction or elimination in shortage, the opportunity to use this water supply for indirect recovery is time sensitive. Though the irrigation districts may still receive CAP water from GSF partners during shortage and after 2030, the lack of a CAP supply of their own would preclude indirect recovery with the districts.

[48] An additional 6,883 acre feet of ICUA was developed via the credit exchange method with the CAGRD
[49] In 2024 the Ag Pool will be reduced to 225,000 AFY, and in 2030 it reduces to zero.

Figure 21 Pinal AMA



This Plan recommends that CAP increase and formalize its recovery capacity with the three Pinal AMA irrigation districts that participate in the current Recovery Incentive Program.

- **<u>Indirect recovery using Third Party Recovery Partners and Regional Water Conveyance Systems</u>**

  There is an extensive network of canals and other water conveyance infrastructure in the Pinal AMA that may be useful for recovery of stored water. For instance, previous planning efforts have identified the potential opportunity for MSIDD to act as a third party recovery partner for delivering recovered water to the Ak-Chin Indian Community. The Community holds a large entitlement of high priority CAP water[50] that is delivered through the Santa Rosa canal, which first passes through MSIDD. The Santa Rosa canal is currently used to make agricultural deliveries that include both CAP water and groundwater pumped by MSIDD.[51] It might be useful to begin dialogue with both the Ak-Chin Indian Community and MSIDD to evaluate the potential for some type of arrangement whereby a portion of the Ak-Chin Community's full order would be satisfied

[50] In Normal supply conditions, 47,500 acre-feet of former Yuma-Mesa Priority 3 water and 27,500 acre-feet of Indian Priority supply.
[51] In 2012, 311,464 AF of CAP water was delivered to the Santa Rosa turnout.

with the combination of the recovered water and Colorado River water. Collaboration with all relevant parties would be critical to fully inform any such agreement.

Further analysis suggests there may be opportunities to explore similar concepts utilizing CAIDD wells, and there may be options to satisfy a portion of the deliveries of Indian priority CAP water to the Gila River Indian Irrigation and Drainage District (GRIIDD) that originate in the Pinal AMA.[52]

This Plan recommends that CAP pursue cooperative agreements with subcontractors and contractors in the Pinal AMA for indirect recovery using the districts wells and regional conveyance systems, especially the Santa Rosa Canal.

- **Development of a Direct Recovery Well field**

  In 2009, CAP commissioned a study to evaluate four potential sites in Pinal County located reasonably near to the CAP canal where a large capacity groundwater production well field could be developed. It also identified underutilized wells adjacent to the CAP canal that could be used to recover AWBA credits for delivery to CAP customers.

  Three of the four sites were located in Pinal AMA. Two of these sites were found to have potential for practical and sustainable groundwater development for recovery operations. One ranged from 12,000-17,000 AFY, the other from 12,000-18,000 AFY.

  This Plan recommends that this study and its recommendations be pursued in a Phase II study. Siting and building direct recovery sites would require significant lead time and should be considered well in advance of the need.

- **Partnering with Potential USF Developers to Create Future Credit Exchange Opportunities**

  Currently there are no USFs in the Pinal AMA and, therefore, credit exchange would not be a viable option until one was operational. In 2009, CAP commissioned a study to investigate the feasibility of developing a USF at a previously identified site in the Pinal AMA. Preliminary results indicated that the site was not ideal for recharge and CAP has not pursued the project. However, there are other potentially suitable recharge sites in the Pinal AMA, and there are CAP M&I subcontracts (totaling 15,103 AFY) that may be interested in utilizing such a facility.

  This Plan encourages the development of USFs in the Pinal AMA for CAP storage by M&I subcontractors. To the extent that subcontractors wish to pursue the USF option, CAP has expressed interest in developing recovery partnerships with these storers.

Tucson AMA

The primary recovery opportunities in the Tucson AMA are:

[52] The GRIIDD itself spans both the Pinal and Phoenix AMAs, but the district's primary deliveries (74,303 AF in 2012) came through the Pima Lateral turnout, which is in the Pinal AMA.

- **Credit Exchange with Tucson Water performing ASR at Clearwater**

  In 2012, approximately 110,000 AF of annual storage and recovery (ASR) took place in the Tucson AMA. The majority of this ASR was done by Tucson Water, the largest CAP M&I subcontractor, at their Clearwater Renewable Resource Facility (CAVSRP, SAVSRP and associated recovery infrastructure). Tucson Water has also been entering into agreements for the storage and wheeling of other subcontract water, notably with the Town of Oro Valley. The AWBA has stored approximately 25% of all its Tucson credits in these recharge facilities, setting up the ideal situation for credit exchange.

  This Plan recommends that CAP pursue a recovery partnership with Tucson Water.

- **Credit Exchange with Metro Water performing ASR at Avra Valley USF**

  The Metropolitan Domestic Water Improvement District ("Metro Water") also relies on ASR for a majority of its annual deliveries. Metro stores approximately half of their 13,460 AFY CAP subcontract water at the Avra Valley Recharge Project in Marana, which it purchased from CAP. Currently, Metro's recovery is taking place outside of the Area of Impact of storage; however, Metro Water has plans to develop on-site recovery and conveyance infrastructure. In either case, the AWBA has accrued over half of its TAMA credits at Avra Valley and the near-by Lower Santa Cruz Recharge Project, setting up another ideal situation for credit exchange.

  This Plan recommends that CAP pursue a recovery partnership with Metro Water.

- **Credit Exchange with Town of Marana performing ASR at Lower Santa Cruz USF**

  The Town of Marana has a 1,528 AF M&I CAP subcontract, which it currently recharges at the Lower Santa Cruz USF. With more than half of the AWBA's credits residing in the Marana area (including 45% in Lower Santa Cruz), the Town is an obvious candidate for credit exchange recovery. Marana has also applied for an allocation of NIA priority CAP water, and there may be shortage and non-shortage circumstances in which the Town can perform credit exchange with NIA water, if they are successful in receiving an allocation.

  This Plan recommends that CAP pursue a recovery partnership with Marana.

- **Other Opportunities in the Tucson AMA**

  There have been several other recovery concepts considered in the Tucson AMA over the years, including a potential direct recovery facility in the vicinity of the Kai Red Rock GSF. This remains an option though, as is the case with the proposed TDRP facility in the Phoenix AMA, the potential capital costs of a well field remain a significant hurdle.

DRAFT

Figure 22 Tucson AMA

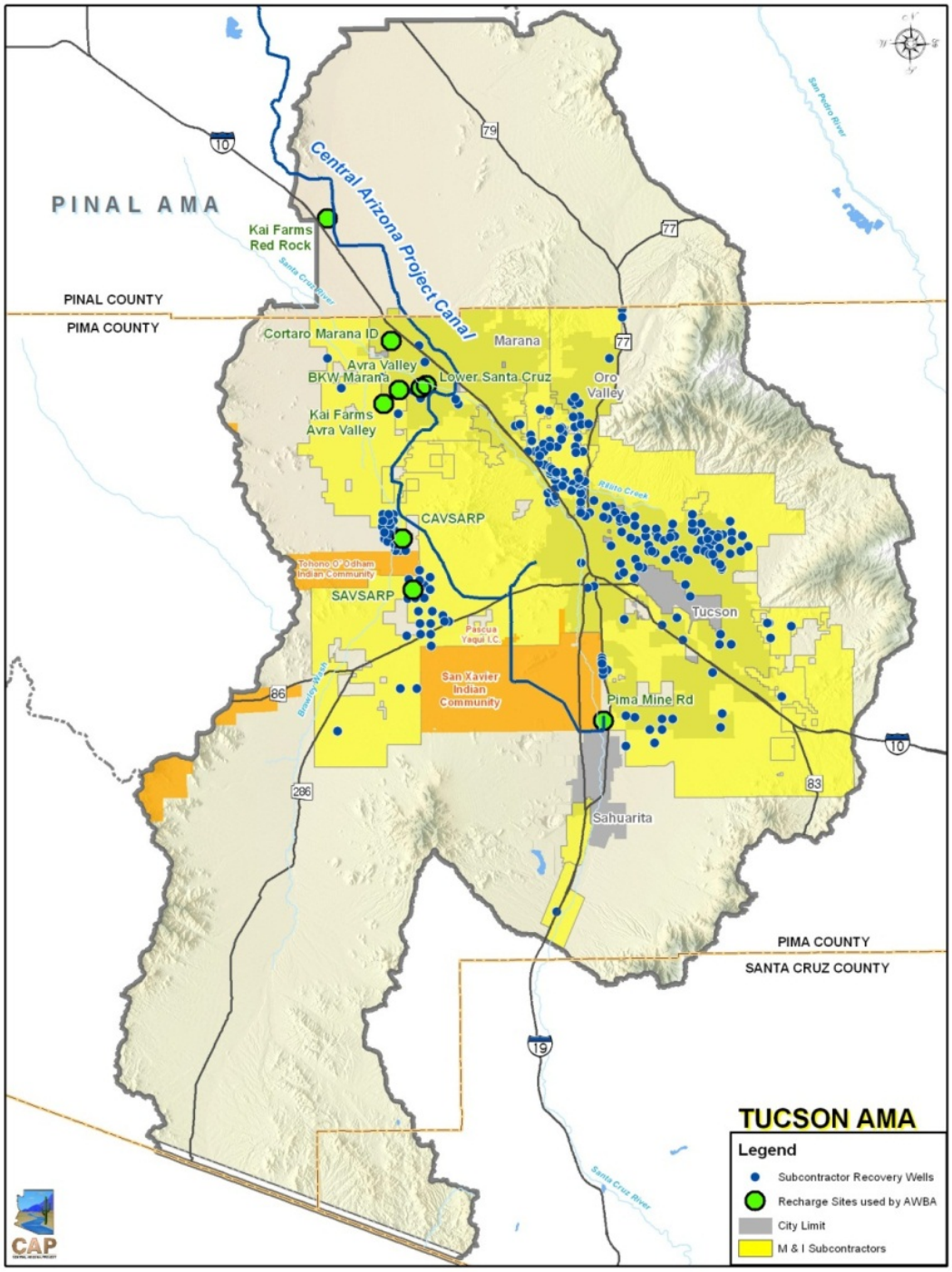


Table 11 Summary of Potential Recovery Opportunities by AMA

Method	Phoenix	Pinal	Tucson
Direct	Possible future well field at TDRP (potentially large capacity)	Possible future well fields, more analysis necessary (12,000-18,000 AFY)	Possible future well field, Red Rock area, more analysis necessary
Indirect	Irrigation Districts – when Ag Pool water is available M&I subcontractors, contractors, and/or third party (i.e. water districts like SRP, MCMWCD, and RWCD)with additional well capacity (quantity unknown but could be large)	Irrigation Districts – (30-40kAF current potential capacity) when Ag Pool is available M&I Subcontractors and Contractors and third party with additional well capacity	
Credit Exchange	CAGRD subcontract at USFs Subcontractors performing ASR at USFs (approximately 30kAF) During non-shortage years with subcontractors earning LTSCs		Subcontractors performing ASR at USFs (approximately 110 kAF) During non-shortage years with subcontractors earning LTSCs

Each of these potential opportunities will require additional steps before the recovery capacity can be relied on. Most of these opportunities (summarized in **Table 11**) will require further analysis, technical studies, and the development of specific agreements. Those steps are discussed in the final section of this Plan, "Future Activities & Commitments." However, successful recovery planning also requires consideration of the issues associated with implementation, the focus of the next section of this Plan.

Section 7: Implementation

Successful recovery depends on the effective implementation of the kinds of recovery opportunities identified in the previous section. While some aspects of implementation may be premature for consideration in this Plan (e.g., terms of yet-to-be developed contracts or agreements), there are important process steps that can be identified, including critical points in the operational timeline and issues related to the collection of recovery costs.

Operational Timeline

The need to recover AWBA credits will be evident prior to the year in which it is required. For the creation of ICUA on behalf of Nevada for instance, there is a requirement for annual submission of a 10-year recovery request schedule, and notification from Nevada three years in advance of recovery. The timing of shortage-related recovery is less predictable, but is triggered by reservoir conditions—specifically Lake Mead elevations—that develop over a number of years. As the forecasted probabilities of shortage increase, the level of preparation should increase. In the year immediately preceding shortage-related recovery, there are specific provisions of existing agreements that are triggered (e.g., MCWA must notify CAP of its intent to exchange LTSCs), and CAP expects to include similar triggers in the agreements it develops with recovery partners.

Before Recovery Year

In the latter part of a year immediately before the expected recovery, there will be a number of process steps that will involve CAP, AWBA and ADWR (see **Table 12**). In particular, CAP will request credits from the AWBA by submitting a recovery schedule. The recovery schedule will identify the projected number of credits needed, purpose of recovery and the preferred locations of that recovery. The AWBA and ADWR will review CAP's recovery schedule for consistency with State laws as well as in conjunction with the AWBA's Plan of Operation and other goals and obligations. If any changes to the schedule are proposed, the AWBA, ADWR and CAP will work in cooperation to modify the schedule. The AWBA will incorporate the final recovery schedule into its Annual Plan of Operation (APO)as part of its requirement to identify the projected amount, location , purpose, and recipient of credits that will be distributed in that year.

During Recovery Year

By statute,[53] recovery of long-term storage credits requires that the credits be in the account of the entity doing the recovery (e.g., CAP's recovery partner) by the end of the same calendar year. That provides some flexibility for the timing of credit transfers. Both parties are committed to the judicious use of the AWBA's credits, and ensuring that the credits are only used to accomplish the obligations of the AWBA.

[53] ARS§ 45-852.01(E)(1) and (F)

After Recovery Year

Final accounting of credits recovered in the previous year can only occur after the recovery year has ended and after all Annual Water Use Reports have been submitted to, and reviewed by, ADWR. If necessary, reconciliation of annual reporting will occur and the final accounting of credits will be produced by ADWR and identified in the AWBA's Annual Report.

Collection of Recovery Costs

Beneficiaries of recovery are expected to pay the associated costs. Interstate recovery costs are borne by SNWA, while intrastate recovery costs are borne by the class of users whose supplies are made firm by virtue of the recovery.

Interstate

Recovery costs for interstate banking with Nevada are assigned to SNWA. These costs include energy, O&M, and any capital for recovery facilities. The existing Interstate Recovery Agreement, executed on June 9, 2010, sets forth the development of recovery facilities and payment responsibilities. The recovery costs for the first 50,000 acre-feet of credits were pre-paid to CAP, who shall be responsible for the cost of recovery of that water; SNWA will pay for the recovery of the remaining credits. If new facilities are constructed solely to recover water for SNWA, SNWA is required to pay all of the associated costs. If new facilities are constructed for multiple purposes, including recovery for SNWA, then SNWA will pay the proportional share of costs associated with interstate recovery. SNWA will pay its share of operating costs associated with recovery for its benefit. The development of a recovery schedule for SNWA should not unreasonably allocate the higher recovery costs to SNWA. Likewise, SNWA may also benefit from cost saving measures, such as transfer of credits in-lieu of deliveries of water, so long as these opportunities do not burden Arizona water users.

On-River P4 Users - Mohave County Water Authority (MCWA) Agreement

The on-River P4 users are obligated by existing agreements and statutes to pay the recovery costs borne by CAP and to either pay the AWBA the replacement costs for the LTSCs or by mutual approval, assign credits to the AWBA in lieu of paying the replacement costs. The cost components for recovery will reflect the mix of recovery methods used to firm P4 on-River uses. The agreement with MCWA adds additional cost provisions for the contracts included in that agreement; including a provision that MCWA shall not be required to pay more than the cost of recovering credits for delivery to CAP customers.

M&I

The cost of recovery for M&I firming will be collected from all M&I subcontractors. CAP anticipates including those costs in the calculation of fixed OM&R that is applied to municipal & industrial subcontractors (i.e., non-Federal deliveries). This approach is consistent with Section 4(a) the Revised Stipulation, which provides CAP with the authority to use an alternate method for calculating Fixed OM&R charged to M&I priority water. The M&I priority pool is quite large, and the percentage reductions to the pool are expected to be small (maximum of 6% in 2045 in Scenario B), the recovery costs are likely to have a very

modest impact on the overall costs. For example, 20,000 acre-feet of recovery at $90/AF, collected over 600,000 AF of M&I priority deliveries, would translate to about $3/AF. However, that 20,000 AF reduction to the M&I pool would only occur if the overall CAP supply had been reduced by at least 25%, which would have much larger cost implications as fixed costs are spread over a smaller delivery volume. The actual impact of these costs would be determined by the CAP Board as part of its rate setting process.

Indian NIA

The cost collection method associated with the State's obligation to firm up to 23,724 AF of NIA priority water pursuant to the Arizona Water Settlement Act has not been determined. It is generally expected that these costs will be collected from the non-Federal CAP customers in a manner similar to the M&I priority described above.

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Table 12 Recovery Operational Timeline

Year	Month	Task
Before (Preparation)	April	-24 Month Study from USBR provides likely water availability (i.e., Normal, Surplus or Shortage) for the upcoming year
	June	-SNWA provides preliminary request for ICUA for the upcoming year and an estimate for the two succeeding years
	August	-USBR indicates water availability for the upcoming year (i.e., Normal, Surplus or Shortage) based on 24 Month Study -CAP advises customers of expected CAP water availability for upcoming year
	September	-CAP sends AWBA a preliminary Recovery Schedule -AWBA and ADWR review the preliminary Recovery Schedule -SNWA makes final request to the Secretary for the release of the ICUA -Preliminary Annual Plan of Operation (APO), which includes preliminary Recovery Schedule, is presented to the AWBA Commission
	October	-Deadline for customers to submit CAP water orders for the upcoming year and estimates for the two succeeding years -Deadline for MCWA to notify CAP its intent to exchange LTSCs -CAP sends AWBA a draft Recovery Schedule
	November	-AWBA presents its preliminary APO to the GUACs -CAP holds annual customer workshop -CAP and AWBA work cooperatively on any adjustments to draft Recovery Schedule
	December	-Final Draft APO is presented to the AWBA Commission for adoption -Deadline for MCWA to transfer credits to CAP prior to Exchange Year -USBR makes official determination of water availability for next year in their Annual Operating Plan (AOP) signed in December
During (Recovery)	During Year	-CAP works with recovery partners to monitor and ensure compliance with contractual responsibilities
	Quarterly	-CAP sends AWBA any substantive changes to the Recovery Schedule -AWBA incorporates the changes in their quarterly reports
	December	-CAP sends AWBA a recovery report with accounting of credit utilization
	By End of Year	-AWBA credits must be transferred to recovery partner (or 3rd party partner)
After (Reporting)	March	-Deadline for CAP and recovery partners to submit annual reports to ADWR
	June	-Reconciliation of annual reporting, if necessary
	June	-Final accounting of credits recovered in previous year in AWBA's Annual Report

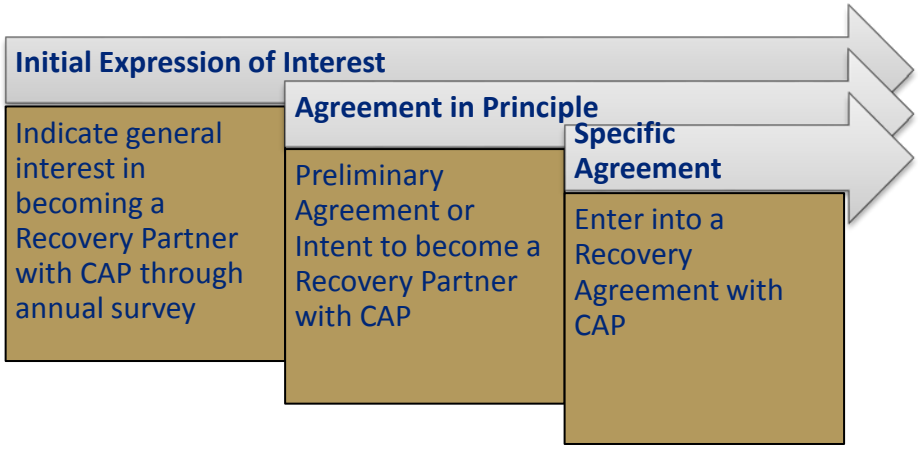
Section 8:
Future Activities & Commitments

In order to prepare for the potential recovery identified in this Plan, CAP is committed to entering into long term recovery agreements with recovery partners to meet projected recovery capacities. CAP is also committed to commissioning the technical studies required to develop the infrastructure for new recovery projects if necessary. And finally, ADWR, AWBA, and CAP are committed to ongoing collaboration, monitoring and analysis to ensure that recovery modeling assumptions remain reasonable and up to date.

Recovery Agreements

CAP is working to find interested CAP contractors and subcontractors to enter into long-term recovery agreements to meet potential projected recovery demands. To identify interested parties, CAP will periodically send out recovery partner surveys (see example Survey in **Appendix C**). Because the planning horizon spans over thirty years, there may be varying levels of interest and commitment between recovery partners and CAP through the planning periods (**Figure 23**). Agreements must have the flexibility required to accommodate customer's changing operations through time, yet provide enough certainty that recovery can be met when needed.

Figure 23 Varying Levels of Commitment between CAP and Recovery Partners



CAP will annually assess and compare its existing and planned recovery capacity (by method and location) with projected needs within the short-term, mid-term and long-term planning horizon. Possible actions for CAP to take to increase recovery capacity if needed include:

-entering into new recovery partner agreements, increasing specificity of agreements through time (Figure above)

-increasing capacity on existing agreements,

-developing new direct recovery facilities if necessary (sufficient lead time necessary)

Technical Studies and Future Project Feasibility

New direct recovery projects may also be necessary, depending on number and volume of recovery agreements secured versus the potential projected recovery capacity needed. There have been a number of technical studies already conducted (see Section 6) and the findings of these studies will be used to guide next steps. In the short-term, CAP will focus its technical efforts in the Pinal AMA to evaluate increasing recovery capacity with the irrigation districts during non-shortage and shortage years, with special attention to water quality issues. CAP will also continue to evaluate potential recovery well field locations in the Pinal AMA and Phoenix AMA.

Monitoring & Updating

CAP, ADWR and AWBA will continually monitor factors influencing Colorado River supplies available to Arizona, as well as Arizona demands, in order to ensure that the modeling assumptions used in any future recovery projections remain reasonable. If anything significant has changed or is expected to change that could significantly alter the recovery projections, the three entities will update the model and analyze the new results.

Colorado River Status

CAP, ADWR and the AWBA will regularly monitor shortage probability and available supplies to Arizona using the USBR's 24 month water forecast and CRSS modeling. The organizations will use the latest versions of the official CRSS model when available. This includes the version due out soon by the Bureau of Reclamation that incorporates alternative hydrologies (paleo resampled and downscaled climate) in order to conduct a sensitivity analysis with the hydrology (observed record resampled) used in this Plan. CRSS runs will be periodically updated and input into the model in order to stay as current as possible.

CAP & On-River Utilization and how potential shortages might impact firmed supplies

CAP and ADWR will regularly monitor on-River and CAP system demand and update future demand projections in the Recovery Modeling Tool when appropriate. Each October, CAP receives customers' water orders for the following year as well as estimates for the next two years. Using this data, as well as analyzing historical trends, CAP will update modeling demand assumption inputs when necessary.

Discussions with Nevada

As part of a cooperative planning effort, SNWA, AWBA and CAP have agreed to meet annually beginning in 2015, or sooner, if elevations in Lake Mead are expected to be at or below the1075 ft. elevation, to discuss Nevada's plans for requesting ICUA and the associated recovery costs. Because the timing and magnitude of Nevada's request for ICUA will play a significant role in Mid-Term and Long-Term planning period volumes,

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AWBA and CAP will encourage these discussions to occur earlier and include efforts to better understand SNWA's long-term plans beyond the 10 year planning horizon currently required and work collaboratively with them on ways to best meet both intrastate and interstate recovery needs.

AWBA Credit Balances

Although this Plan's primary focus is recovery of AWBA credits, many stakeholders have wanted this effort to confirm if previous firming targets were accurate, .i.e. have a sufficient number of credits been stored to offset potential shortages for a hundred years. Outside of this process, the AWBA has begun conducting an analysis to answer these questions given updated assumptions. The modeling and assumptions for this Plan show that even with the maximum projected recovery, three-fourths of the AWBA's intrastate credits accrued through 2012 will still be available after 2045. (**Figure 24** below)

Future Storage Decisions

Based on the findings of this Plan, the AWBA may want to initiate discussions to decide whether or not it should make any changes to where future water is stored.

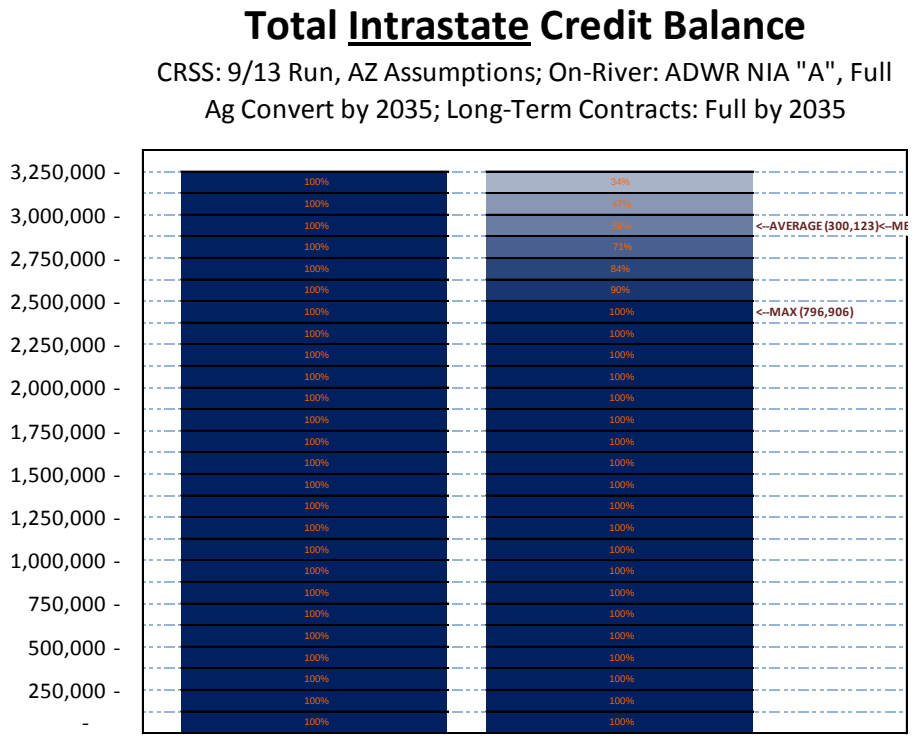

Figure 24

Appendix A

Assumptions for 'Full CAP Build-Out by 2045' Scenario

1. **Ag Settlement Pool**: Assumes full usage of the tiered Ag Settlement Pool allocation (400,000 AFY through 2016, 300,000 AFY from 2017 through 2023, and 225,000 AFY from 2024 through 2030).
2. **P3 Priority**: Assumes continued full utilization of P3 contracts by Indian and M&I users across the entire period (68,400 AFY).
3. **Indian Priority, used by M&I**: Any existing (as of 2013) long-term leases or exchanges of Indian water will be fully utilized by 2045. Assumes an additional 55,000 AF of Indian Priority water is leased and fully utilized by 2045. The White Mountain Apache Tribe's Indian priority allocation (1,218 AF) is assumed to be leased and fully utilized by 2045.
4. **Indian Priority, used by Indians**: Assumes full usage of all remaining Indian Priority water by Indian users, after leases and exchanges have been subtracted, by 2045.
5. **M&I Priority, used by M&I**: By 2045, assumes full utilization of M&I subcontracts (620,678 AF) as well as full utilization by Scottsdale of their 12,500 AF San Carlos Apache lease (which is M&I priority water allocated to the San Carlos Apache Tribe). It also assumes full utilization of former Hohokam assignment water in 2044 and 2045 after it converts from NIA priority.
    a. **M&I Priority, used by Indians**: Assumes full utilization of the remaining M&I priority water allocated to the San Carlos Apache Tribe that is not used by Scottsdale (18,145 – 12,500 = 5,645 AF) by 2045. This volume is included in the "M&I" pool, not differentiated by User.
6. **NIA Priority, used by M&I**: Assumes White Mountain Apache Tribe has been allocated 23,782 AF of NIA water, and that it is leased by 2016 and fully utilized by M&I lessees by 2045. Also assumes continued full use of former Hohokam assignment water through 2043 until it converts to M&I Priority (47,303 AF), and continued full use of former RWCD water (5,000 AF) through 2045. The first round (55,255 AF) of currently unallocated NIA water (totaling 96,295 AF) is assumed to be allocated to M&I users by 2015 and fully utilized by 2020. The second round up for reallocation (41,040 AF) is assumed to be allocated to M&I users by 2023 and fully utilized by 2028.
7. **NIA Priority, used by Indians**: Assumes full usage of all remaining NIA pool water by Indian users (including GRIC and Tohono O'odham), after leases and exchanges have been subtracted, by 2045. Also assumes the remaining pool volume (43,518 AF) reserved for future Indian Settlements is allocated by 2036 and fully utilized by 2045.

Assumptions for 'Full CAP Build-Out by 2035' Scenario

1. **Ag Settlement Pool**: Assumes full usage of the tiered Ag Settlement Pool allocation (400,000 AFY through 2016, 300,000 AFY from 2017 through 2023, and 225,000 AFY from 2024 through 2030).
2. **P3 Priority**: Assumes continued full utilization of P3 contracts by Indian and M&I users across the entire period (68,400 AFY).
3. **Indian Priority, used by M&I**: Any existing (as of 2013) long-term leases or exchanges of Indian water will be fully utilized by 2035. Assumes an additional 55,000 AF of Indian Priority water is leased and fully utilized by 2035. The White Mountain Apache Tribe's Indian priority allocation (1,218 AF) is assumed to be leased and fully utilized by 2035.
4. **Indian Priority, used by Indians**: Assumes full usage of all remaining Indian Priority water by Indian users, after leases and exchanges have been subtracted, by 2035.
5. **M&I Priority, used by M&I**: By 2035, assumes full utilization of M&I subcontracts (620,678 AF) as well as full utilization by Scottsdale of their 12,500 AF San Carlos Apache lease (which is M&I priority water allocated to the San Carlos Apache Tribe). It also assumes full utilization of former Hohokam assignment water in 2044 and 2045 after it converts from NIA priority.
    a. **M&I Priority, used by Indians**: Assumes full utilization of the remaining M&I priority water allocated to the San Carlos Apache Tribe that is not used by Scottsdale (18,145 – 12,500 = 5,645 AF) by 2035. This volume is included in the "M&I" pool, not differentiated by User.
6. **NIA Priority, used by M&I**: Assumes White Mountain Apache Tribe has been allocated 23,782 AF of NIA water, and that it is leased by 2016 and fully utilized by M&I lessees by 2035. Also assumes continued full use of former Hohokam assignment water through 2043 until it converts to M&I Priority (47,303 AF), and continued full use of former RWCD water (5,000 AF). The first round (55,255 AF) of currently unallocated NIA water (totaling 96,295 AF) is assumed to be allocated to M&I users within the CAP service area by 2015 and fully utilized by 2020. The second NIA reallocation round (41,040 AF) is assumed to be allocated to M&I users within the CAP service area by 2023 and fully utilized by 2028.
7. **NIA Priority, used by Indians**: Assumes full usage of all remaining NIA pool water by Indian users (including GRIC and Tohono O'odham), after leases and exchanges have been subtracted, by 2035. Also assumes the remaining pool volume (43,518 AF) reserved for future Indian Settlements is allocated by 2026 and fully utilized by 2035.

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Appendix B

On-River P-4 M&I Modeling Results

Modeling results for on-River P-4 users (see **Appendix B-1**) show that the magnitude and likelihood of recovery gradually increases through the planning horizon as the use of P4 contracts increases. The rate of increase is more pronounced in Scenario B, which assumes that P4 contracts currently used for agriculture are converted to M&I use, thus qualifying for AWBA firming.

In both Scenario A & B, the earliest recovery occurs in 2017, though the volume and probability is low. The CRSS modeling (done September, 2013) does show shortages occurring before 2017, but based on the projected on-River P-4 M&I use, and the formula developed by the Director's Storage Sharing Recommendation, no shortage would be taken by the on-River P-4 M&I users. During the entire Near-term planning period, the probability of recovery in a given year is ≤36% and the maximum volume is approximately 6,800 acre-feet per year (12-17% probability).

During the Mid-term period the maximum annual probability of recovery is 55% for both A & B and the maximum volume per year is approximately 6,800 acre-feet per year in Scenario A and just over 15,500 acre-feet per year in Scenario B. The probability of needing to recover these maximum volumes in any given year is 15-18%.

In the Long-term period, the maximum annual probability that recovery will be necessary is 47% for both A & B and the maximum volume per year is approximately 8,400 acre-feet in Scenario A and 19,900 acre-feet in Scenario B. The probability of needing to recovery these maximum volumes is between 11-15%. Scenario B shows higher recovery volumes due to the conversion of P-4 agricultural uses to M&I users which have a firming obligation.

Indian NIA Modeling Results

Modeling results for Indian NIA users (see **Appendix B-2**) show that the magnitude and likelihood of recovery gradually increases through the planning horizon as the use of CAP long-term entitlements increases. The rate of increase is more pronounced in Scenario B.

Modeling results for Indian NIA users show that recovery is not likely before 2017. The probability of needing any recovery in a given year is ≤36% through the Near-term planning period. The maximum annual volume is approximately 7,900 acre-feet per year in Scenario A and 10,200 acre-feet in Scenario B. The CRSS modeling does show that there is a high probability of shortages occurring before 2017, but up until 2017 the potential shortages do not intersect with the NIA priority pool.

The maximum annual probability that any recovery will be necessary during the Mid-term period is 55% for both A & B and the maximum volume per year is approximately 14,300 acre-feet in Scenario A and 22,700 acre-feet in Scenario B. The probability of needing to recover these maximum volumes in any given year is 15-18%.

In the Long-term period, the maximum annual probability of any Indian NIA recovery is 47% (in both A & B) and a maximum volume per year of 22,300 acre-feet in Scenario A and 23,700 acre-feet in Scenario B, which is close to the maximum firming obligation under the Settlements Act. Scenario B shows higher recovery volumes due to the faster utilization rate of Long-term entitlements.

M&I Recovery Results

Modeling results for M&I users (see **Appendix B-3**) show that recovery is not likely before the Long-term planning period in both Scenario A & B. The maximum probability of needing any recovery in a year is ≤16% for the entire period in both Scenarios. In Scenario A, recovery for M&I is first possible in 2044. In Scenario B, it is possible sooner (in 2035) due to a more rapid utilization rate than in Scenario A. In Scenario B, the maximum recovery volume is less than 5,000 acre-feet per year until 2044. In 2044, the maximum recovery volume jumps to approximately 42,100 acre-feet per year at 13-14% probability for both Scenario A & B due to the conversion of 47,303 acre-feet of NIA water to the M&I priority pool in that same year.

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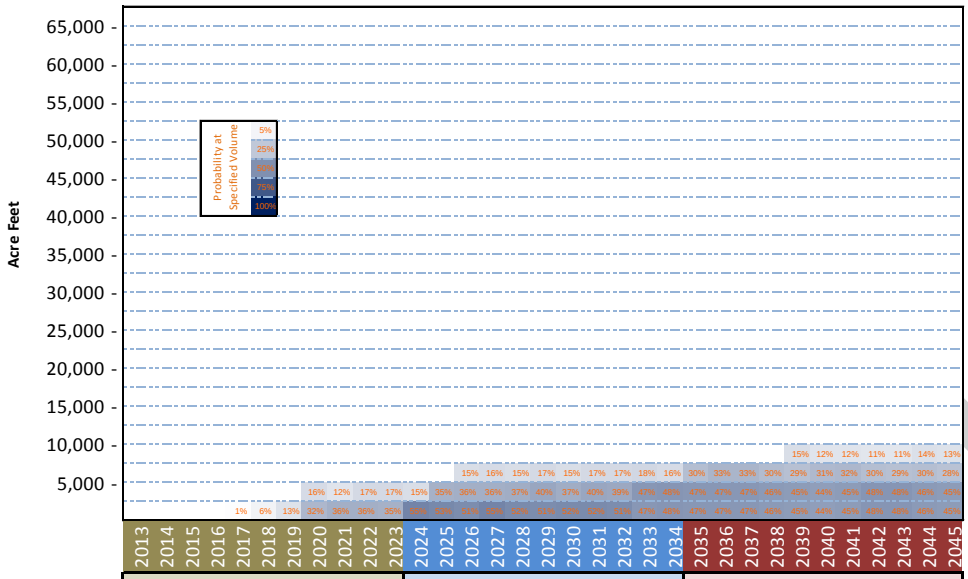
Appendix B-1 Modeling Results – On-River P-4

Scenario A

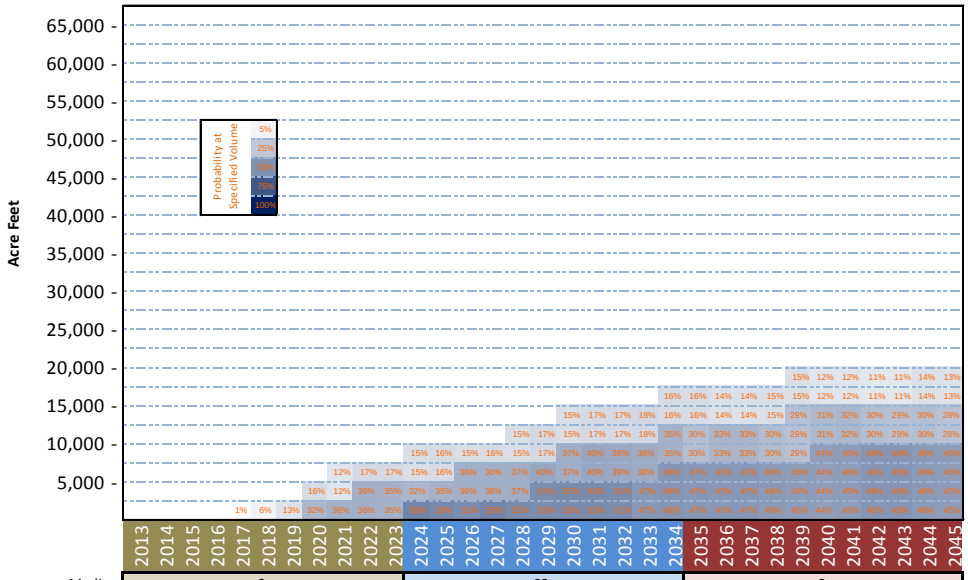
CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A", No Ag Convert



	2013–2023	2024–2034	2035–2045
Median	0	22	0
Average	327	1,941	2,638
Maximum	4,099	6,745	8,417

Scenario B

CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A", Full Ag Convert by 2035

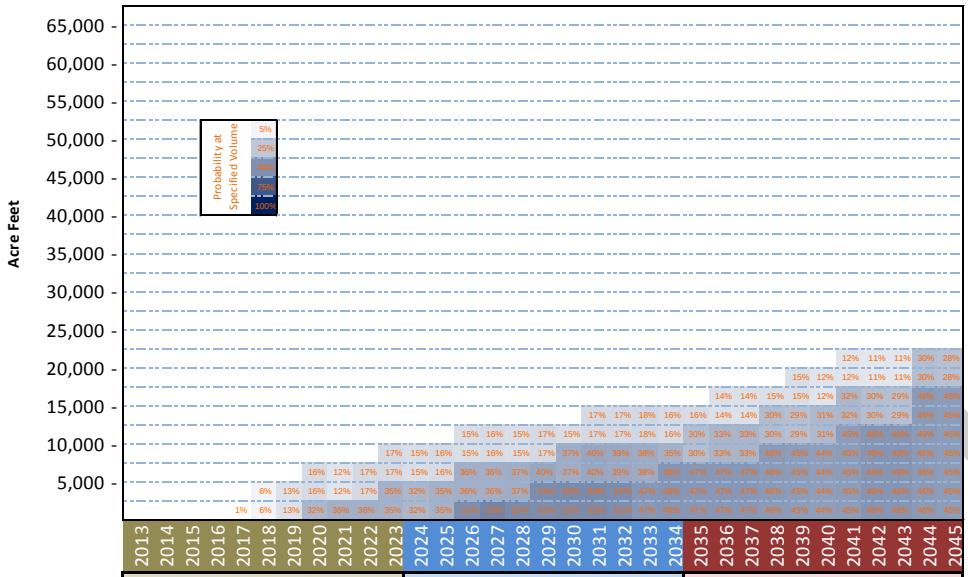


	2013–2023	2024–2034	2035–2045
Median	0	33	0
Average	503	3,791	5,824
Maximum	6,755	15,504	19,865

Appendix B-2 Modeling Results – Indian NIA Recovery

Scenario A

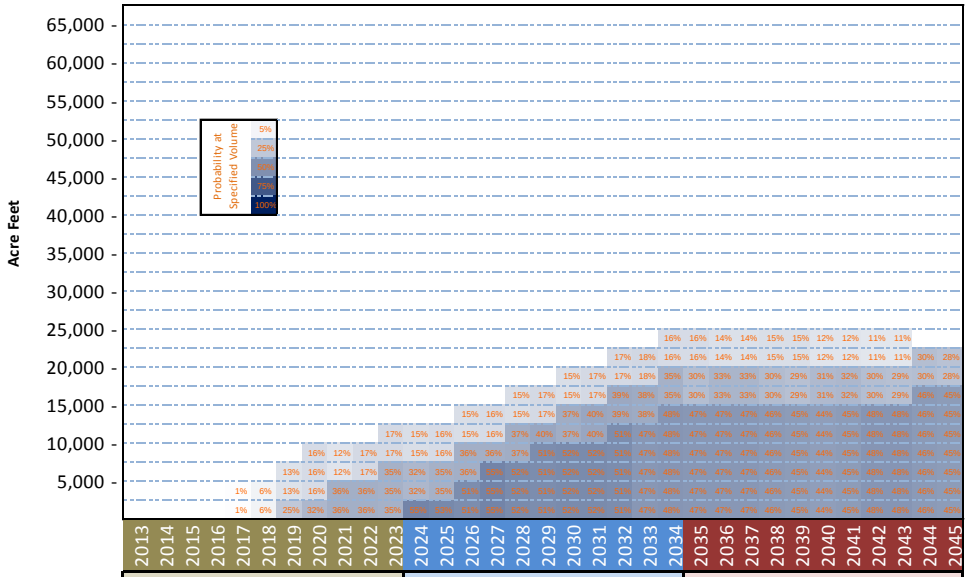
CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A"; Long-Term Contracts: Full by 2045



Median	0	0	0
Average	568	3,731	6,718
Maximum	7,889	14,267	22,269

Scenario B

CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A"; Long-Term Contracts: Full by 2035

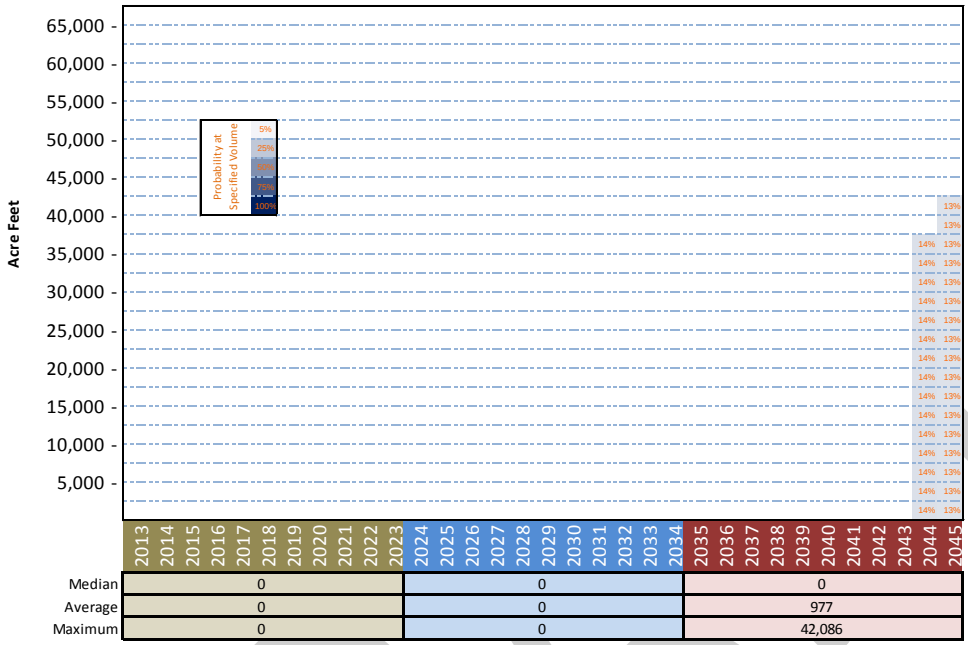


Median	0	1,108	0
Average	868	6,265	8,729
Maximum	10,249	22,691	23,667

Appendix B-3 Modeling Results – M&I Recovery

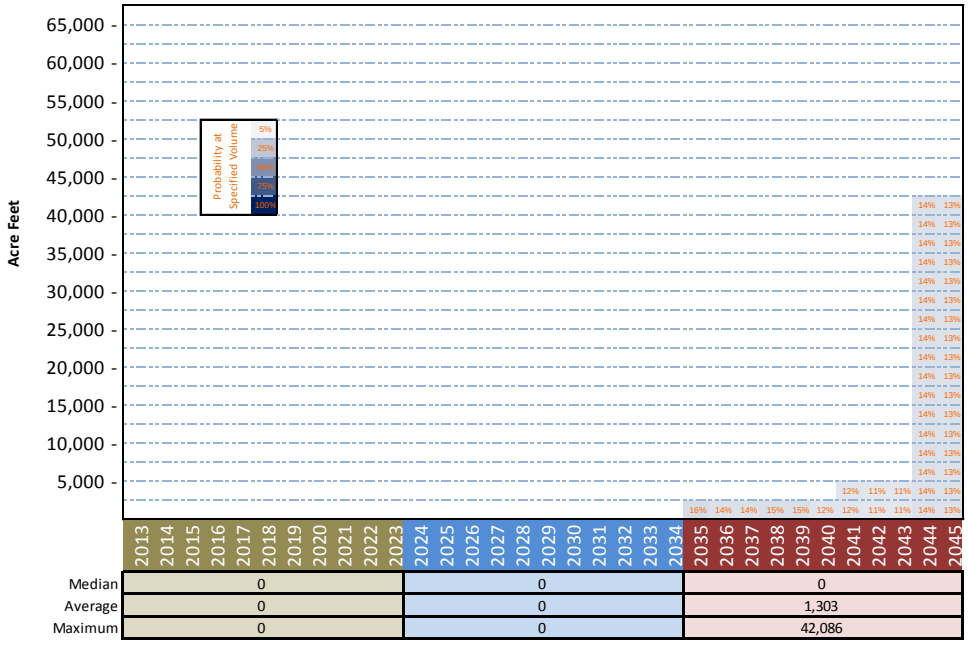
Scenario A

CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A"; Long-Term Contracts: Full by 2045



Scenario B

CRSS: 9/13 Run, AZ Assumptions; On-River: ADWR NIA "A"; Long-Term Contracts: Full by 2035



Appendix C – Example Recovery Partner Survey

Please take a few minutes to complete this annual survey and help CAP in its recovery planning efforts:

1. **Do you currently recharge some or all of your CAP entitlement at an Underground Storage Facility (USF)?**
   a) Yes
   b) No

2. **Are you anticipating recharging some or all of your CAP entitlement at a USF in the next 10 to 20 years?**
   a) Yes
   b) No
   c) Maybe

3. **If you answered "Yes" or "Maybe" to questions 1 or 2, under what circumstances would you consider accepting previously earned credits in exchange for a reduced delivery to the USF?**

   A. **During <u>SHORTAGE</u> conditions on the Colorado River:**
      a) Under no circumstances
      b) For compensation, and credits stored at the same facility
      c) For compensation, and credits stored in the same sub-basin
      d) For compensation, and credits stored in the same AMA
      e) Unsure
      f) Other_____

   B. **During <u>NORMAL</u> conditions on the Colorado River:**
      a) Under no circumstances
      b) For compensation, and credits stored at the same facility
      c) For compensation, and credits stored in the same sub-basin
      d) For compensation, and credits stored in the same AMA
      e) Unsure
      f) Other_____

4. **Are you currently treating and directly delivering CAP water?**
   a) Yes
   b) No

5. **Are you anticipating treating and directly delivering CAP water in the next 10 to 20 years?**
   c) Yes
   a) No
   b) Maybe

6. **Do you have potentially underutilized well capacity?**
   a) Yes
   b) No

7. **If you answered "Yes" or "Maybe" to questions 4, 5 & 6, under what circumstances would you consider accepting previously earned credits in exchange for a reduced delivery to your treatment plant?**

   A. **During <u>SHORTAGE</u> conditions on the Colorado River:**
      a) Under no circumstances
      b) For compensation, and credits stored at specific recharge facilities
      c) For compensation, and credits stored in the same sub-basin
      d) For compensation, and credits stored in the same AMA
      e) Unsure
      f) Other_____

   B. **During <u>NORMAL</u> conditions on the Colorado River:**
      a) Under no circumstances
      b) For compensation, and credits stored at specific recharge facilities
      c) For compensation, and credits stored in the same sub-basin
      d) For compensation, and credits stored in the same AMA
      e) Unsure
      f) Other_____

8. **Do you currently receive some or all of your CAP water through a regional provider other than CAP (e.g., through an exchange with SRP)?**
   a) Yes
   b) No

9. **If you answered "Yes" to question 8, and the regional provider was considering becoming a recovery partner with CAP, what level of involvement would you expect?**
   c) None; as long as my full order is received and the quality is acceptable
   d) Some; to ensure my operations are unaffected
   e) Substantial; to help decide how specific aspects were implemented
   f) Unsure; would depend on the particular proposal
   g) Other_____

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