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Water Resources Development Commission

FINAL DRAFT

Final Report

October 1, 2011

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WATER RESOURCES DEVELOPMENT COMMISSION MEMBERS

Member	Representing
Bas Aja	Agriculture - Statewide
Steve Olson	Arizona Municipal Water Users Association
David Modeer	Central Arizona Water Conservation District
Pat Call	Cochise County/Southern Arizona
Lyn White	Industry - Statewide
John Lewis	Inter Tribal Council of Arizona, Inc.
Maureen George	Mohave County/Northwest Arizona
Ray Benally	Navajo Nation
David Brown (Co-chair)	Northeastern Arizona
Ron Doba	Northern Arizona Municipal Water Users Association
David Snider	Pinal County
John Sullivan	Salt River Project
Warren Tenney	Southern Arizona Water Users Association
Wade Noble	Southwest Colorado River Communities
Pat Graham	The Nature Conservancy
Chris Avery	Tucson, City of (Tucson Water Department)

WATER RESOURCES DEVELOPMENT COMMISSION *EX OFFICIO* MEMBERS

Steve Olea	Arizona Corporation Commission
Don Butler	Arizona Department of Agriculture
Michael Fulton	Arizona Department of Environmental Quality
Sandra Fabritz-Whitney (Chair)	Arizona Department of Water Resources
Larry Voyles	Arizona Game and Fish Department
Maria Baier	Arizona State Land Department
Kevin Kinsall	Governor Jan Brewer's Office
Jim Kenna	U.S. Bureau of Land Management
Randy Chandler	U.S. Bureau of Reclamation

FORMER WATER RESOURCES DEVELOPMENT COMMISSION MEMBERS

Herb Guenther (Chair)	Arizona Department of Water Resources
Tom Buschatzke (Co-chair)	City of Phoenix

WATER RESOURCES DEVELOPMENT COMMISSION ADVISORS

Chris Udall	Agri-Business Council
Tom Farley	Arizona Association of REALTORS
Jim Klinker	Arizona Farm Bureau
Gary Hix	Arizona Water Well Association
Craig Sullivan	County Supervisors Association of Arizona
Spencer Kamps	Home Builders Association of Central Arizona
Ray Jones	Water Utility Association of Arizona

EXECUTIVE SUMMARY

Arizona has an unusually long history of successful water management practices. Arizona's leaders were, and continue to be, forward thinkers with respect to water resources management and are recognized for their long-term vision in this arena. Arizonans have been willing to aggressively take action as needed to insure that sufficient water supplies are available to secure long-term economic viability and provide a high quality of life for Arizona's current and future generations. The current challenge facing Arizona is that, although the state has a solid water foundation, future economic development is anticipated to increase demand for water. Arizona is not unique among the arid states in facing this challenge to identify water supplies to meet future demands. By example, both Texas and California are currently developing solutions to meet this challenge.

The inherent diversity, variability and complexity within Arizona makes meeting this challenge difficult. Some areas of the state have extensive water-dependent natural resources including perennial streams and springs, while others have few of these features. In some areas, water users may only have access to surface water from rivers and streams. In others, they rely completely on groundwater. Other regions have access to both groundwater and surface water, which can be conjunctively managed to provide renewable and redundant supplies for the benefit of local water users. Some areas may have elaborate and far reaching water transmission and delivery systems, while others have no infrastructure and rely entirely on local wells. Some areas may have experienced rapid growth and others may have not. Some areas of the state have water supplies available that far exceed projected demands. In others, the currently developed supplies may not be sufficient to meet projected future demands, however, there are locally available supplies that can be developed in volumes adequate to meet those needs. Absent development of supply acquisition and transportation projects, some portions of this arid state may struggle to meet projected water demands with locally available supplies. Reclaimed water is used to meet non-potable demands and augment aquifers in many areas. These supplies are anticpated to increase with growth and can be used to stretch available groundwater and surface water supplies.

In 2010, the Arizona State Legislature passed House Bill 2661 that established the Water Resources Development Commission (WRDC). The WRDC was given the task of assessing Arizona's demand for water and the supplies available to meet those demands for the next 25, 50, and 100 years. The WRDC is comprised of 17 commission members selected because they possessed knowledge regarding a variety of water resource and water management issues in the state, and because they provided representation for a regional and geographic cross-section of the state. The WRDC also has nine ex officio members representing state and federal agencies and the Governor's office. There are seven advisors to the commission.

There were five committees formed in order to meet the statutory obligations of the WRDC: the Population Committee, the Water Supply and Demand Committee, the Environmental Committee, the Finance Committee, and the Legislative Recommendations Committee. Each WRDC committee prepared detailed written reports that describe the various methods and assumptions used to develop the data. These reports were based on an examination of the existing data and information only and do not represent independent research. However, the

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reports represent an exploration of the water demands, supplies and water dependent natural resources throughout the state with the purpose of creating a broad synopsis of conditions in each county. Information, data and recommendations from these reports were utilized by the WRDC in developing this final report. The committee reports are available in their entirety in Volume 2 of this report and available at http:/infoshare.azwater.gov/docushare/dsweb/View/Collection-123.

This report projects that total statewide demand will range from a low of 8.1 million AF in 2035 to a high of 10.6 million AF in 2110. Potential future water supplies to meet that demand include groundwater, surface water (both in-state rivers and the Colorado River), reclaimed water, and other water such as brackish or poor quality groundwater, mine and agricultural drainage, desalinated water, and water made available through weather modification. However, there are numerous hydrologic, technical, legal, and economic challenges in developing such supplies that may limit their practical feasibility or actual development. These challengers are generally detailed within this report.

The WRDC completed the legislated task of analyzing Arizona's water needs for 100 years and has made progress in evaluating the issues associated with those needs. It is now known that portions of the state have sufficient supplies developed to meet future needs, while other areas within the state will require development of additional supplies for the future. However, due to the variability in Arizona's geology, climate, precipitation patterns, water use patterns, population growth and land ownership, evaluation of the issues and development of comprehensive solutions is extremely difficult. Arizona must develop a broad portfolio of solutions to meet the myriad of challenges that are inherent in this diverse state. Finally, decisions must be made regarding what solutions will be most effective in discrete regions, how those solutions will be funded, and whether implementation of the solutions require legislative changes.

Due to the time constraints associated with preparation of this final report, the WRDC has not been able to fully consider all of these issues. Pursuant to House Bill 2661, the WRDC does not sunset until September 30, 2012. Therefore, it is the recommendation of the WRDC that it be given until the sunset date to continue development, evaluation and prioritization of potential solutions and/or legislative proposals.

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ACRONYMS AND ABBREVIATIONS

ADWR	Arizona Department of Water Resources
AF	Acre-feet; the volume of water needed to cover one acre of land, one foot deep; 325,851 gallons
AMA	Active Management Area
CAP	Central Arizona Project
SWAG	Statewide Water Advisory Group
WIFA	Water Infrastructure Finance Authority
WRDC	Water Resources Development Commission
WS&D Committee	Water Supply and Demand Committee
WSDR Fund	Water Supply Development Revolving Fund

INTRODUCTION AND BACKGROUND

In 2010, the Arizona State Legislature passed House Bill 2661 that established the Water Resources Development Commission (WRDC). The WRDC was given the task of assessing Arizona's demand for water and the supplies available to meet those demands for the next 25, 50, and 100 years.

Arizona has an unusually long history of successful water management practices. Nearly two millennia ago, tribal people developed a variety of techniques to create productive communities in this desert environment. The early irrigation systems used in the late 19th century in the Salt River Valley were built by restoring some of the canals constructed much earlier by tribal people. Arizonans have continued to make significant contributions to developing water supplies for agricultural, industrial and domestic uses. Arizona's leaders were, and continue to be, forward thinkers with respect to water resources management and are recognized for their long-term vision in this arena. Arizonans have been willing to aggressively take action as needed to insure that sufficient water supplies are available to secure long-term economic viability and provide a high quality of life for Arizona's current and future generations. Historically, the actions have been varied and include: developing dams and reservoirs such as those developed as part of the Salt River Project, the San Carlos Irrigation Project, and the present day Maricopa Water District to utilize surface water supplies negotiating and litigating for rights to the Colorado River; obtaining authorization for construction of the Central Arizona Project (CAP) canal; passage of the Groundwater Management Act; and development of the Arizona Water Banking Authority. While diverse, they have shared the common theme of being solutions that were developed to meet the future water resource challenges the state faced.

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Arizona has been successful at managing its water resources because it has continually planned and invested in them for well over a century. In fact, without the past efforts in the state, the magnitude of our current challenge would be even greater.

Deleted: Identification of the need for the WRDC is a continuation of that long-standing tradition. Under the direction of the Legislature, the WRDC was tasked with completing an analysis of Arizona's future water needs and identifying issues that needed to be addressed in order to insure strong water management throughout the state in the future.¶

The current challenge facing Arizona is that, although the state has a solid water foundation, future economic development is anticipated to increase demand for water. Water is an essential element to Arizona's prosperity. Arizona has grown, in a relatively short time frame, from a population of 2.7 million people with an economy of $30 billion in 1980 to nearly 6.6 million people with an economy of $260 billion in 2009. Annual water use in the state is projected to grow from current levels of about 7.1 million acre-feet to between 9.9 to 10.6 million acre-feet per year in 2110. Arizona's further growth will occur during a period of supply uncertainty. Consequently, the economic future of the state is dependent upon a resource for which it is facing a potential period of limits. The issue of limits is further exacerbated when the complexity that exists within Arizona is taken into consideration.

The state of Arizona includes widely diverse geographic regions ranging from forested mountain areas to arid desert areas. These areas have dissimilar climates and precipitation patterns, resulting in variability in, and accessibility to, surface water supplies. Arizona is also geologically complex, which impacts the availability, quality and accessibility of groundwater supplies. Areas of water demand are also unevenly distributed across the state. Central Arizona exhibits the highest concentration of urban/municipal uses and growth and much of this use is located on retired farmlands. While no longer the dominant use in Central Arizona, agricultural irrigation is still significant and is the most prevalent water use sector in other portions of the state, such as the Gila Bend Basin and along the main-stem of the Colorado River. Industrial uses, such as copper mining remain regionally significant water use in isolated portions of the state.

Arizona is also unique in its land ownership pattern. Less than 18 percent of the land within the state is under private ownership. State trust land comprises almost 13 percent of the land, with the remainder either federal or Indian trust land. This variability in land ownership adds additional complexity and challenges that must be met. These challenges range from: the need to appropriately involve tribal entities to insure that Indian water supplies, demands and water rights settlements are accurately portrayed and considered; and insuring that the mandates of state trust and federal lands are fulfilled.

Additionally, Arizona has a bifurcated water law system, with groundwater and surface water largely regulated under separate statutes and rules. Reclaimed water is managed under a completely different set of regulations and policies. This legal complexity adds to the challenge of ensuring that adequate supplies exist to meet the demands across the state.

A direct result of the diversity, variability and complexity within Arizona is that it makes definition of the issue difficult. In some areas, water users may only have access to surface water from rivers and streams. In others, they rely completely on groundwater. Other regions have access to both groundwater and surface water, which can be conjunctively managed to provide renewable and redundant supplies for the benefit of local water users. Some areas may have elaborate and far reaching water transmission and delivery systems, while other have no infrastructure and rely entirely on local wells. Some areas may have experienced rapid growth and others may have not. Some areas of the state have water supplies available that far exceed projected demands. In others, the currently developed supplies may not be sufficient to meet projected future demands, however, there are locally available supplies that can be developed in volumes adequate to meet those needs. Absent development of supply acquisition and transportation projects, some portions of this arid state may struggle to meet projected water demands with locally available supplies.

It should be noted that Arizona is not unique among the arid states in the challenge to identify water supplies to meet future demands. In 2009, Texas completed an evaluation of the progress being made within the state to secure water supplies to meet future demand through 2060 (Texas Comptroller of Public Accounts, 2009). The report stated the following:

> *Texas does not have enough water now to fulfill all of its estimated future needs. If new management and conservation strategies are not implemented, water needs will increase from 3.7 million acre-feet in 2010 to 8.8 million acre-feet in 2060. These water shortages would leave 85 percent of the Texas population in 2060 with insufficient supplies.*

The report also recognized the potential fiscal impact of insufficient supplies.

According to the Texas Water Development Board…if demand is not met it could cost businesses and workers in the state approximately $9.1 billion per year by 2010 and $98.4 billion per year by 2060.

In California's Update 2009, there is a chapter entitled *Imperative to Act* that details why California is "facing one of the most significant water crises in its history" and "lays out the urgent course that California must take to ensure that we have enough safe and clean water through year 2050 for California's cities and towns, farms and businesses, and plants and animals when and where they need it" (California Department of Water Resources, 2009). In his introduction for Update 2009, Lester Snow, California Secretary for Natural Resources, stated "Our new reality is one in which we must manage a resource characterized by uncertainty and vulnerability due to climate change and changing ecosystem needs. Our past hydrology is no longer an accurate indicator of the future." While Arizona water managers have long recognized the uncertainty and vulnerability of the state's water supplies it is known that additional water supply development solutions will be needed to ensure Arizona's water supplies will be sustainable for future generations.

It is clear that meeting the demand for additional water supplies in the 21st century requires inventive action to be taken and consideration of new ways to expand supplies. As the idea of limits loomed on the horizon, Arizona's proactive water planners recognized the need for action. The result was creation of the WRDC that could: (1) assist in identifying future water supply needs throughout the state; (2) assist in identifying and developing proposals for projects to meet those supply needs; and (3) provide recommendations to the Legislature and Governor regarding development of additional water supplies. Stakeholders in Arizona strongly believe that these prudent steps are necessary to insure a sustainable economic and environmental future for the state.

The WRDC is comprised of 17 commission members selected because they possessed knowledge regarding a variety of water resource and water management issues in the state, and because they provided representation for a regional and geographic cross-section of the state. The WRDC also has nine ex officio members representing state and federal agencies and the Governor's office. There are seven advisors to the commission. Information regarding commission membership is presented on page i.

The WRDC held its first meeting on August 13, 2010 and adopted a work plan developed by ADWR staff that was designed to meet the October, 2011 deadline. The underpinning of the work plan was the creation of committees that were chaired by commissioners and tasked with specific objectives. The Population Committee was tasked with developing population forecasts through 2110. This committee had the earliest deadline for completion of projections because a majority of the water use demands are based on population. The Water Supply and Demand Committee (WS&D) was tasked with utilizing the population projections and developing forecasted water demands and current and projected water supplies to meet those demands. The Environmental Committee was tasked with preparing an inventory of Arizona's water-dependent natural resources so that an evaluation could be made regarding the relationship between the

Deleted: Arizona's WRDC process began late in 2009 with distribution of a draft concept paper and convening of a stakeholder's meeting. The meeting was attended by 29 entities representing 14 different water users, three law firms and one consultant, as well as the Arizona Department of Water Resources (ADWR), the U.S. Bureau of Reclamation, and representatives from various municipalities and counties. House Bill 2661, which created the WRDC for the purpose of assessing the current and future water needs of Arizona, developed out of that stakeholder meeting. The bill was signed by Governor Jan Brewer on May 11, 2010 and established the WRDC, which will serve until September 30, 2012. The report of the WRDC's findings and recommendations must be submitted to the Governor, the Speaker of the House of Representatives and the President of the Senate on or before October 1, 2011.¶

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state's water supplies and the environmental resources they support. The Finance Committee was tasked with identifying potential mechanisms to finance development of additional water supplies and development of related infrastructure. The Legislative Recommendations Committee was tasked with preparing the WRDC's recommendations, including recommendations for future legislative action. Membership and participation on the various committees was open to all interested stakeholders.

Each WRDC committee prepared detailed written reports that describe the various methods and assumptions used to develop the data. These reports were based on an examination of the existing data and information only and do not represent independent research. However, the reports represent an exploration of the water demands, supplies and water dependent natural resources throughout the state with the purpose of creating a broad synopsis of conditions in each county. None of the committee reports have been independently verified by the WRDC and the work products represent the viewpoints of the individual committees and not the WRDC as a whole. The reports are intended to present the information as requested by the legislature and a not intended to be utilized in a regulatory manner. Information, data and recommendations from these reports were utilized by the WRDC in developing this final report. The committee reports are available in their entirety in Volume 2 of this report and available at http:/infoshare.azwater.gov/docushare/dsweb/View/Collection-123.

POPULATION COMMITTEE

Table 1 (see *Appendix I Page 15*) contains the projected populations by county for 2035, 2060, and 2110 utilized by the WS&D Committee to develop demand projections. In 2110, population was projected using two different population estimates: the Census Block projection and the Area Split projection. The two population estimates differ in their assumptions regarding where future population growth will occur. The Census Block method assumes that future population will distribute in the same manner as current population. The Area Split method assumes that future population growth will occupy available land. The Area Split population projection is only presented in 2110 because the Area Split projections did not appear to be reasonable projections to the WS&D Committee in the shorter-term. For more detailed information regarding development of population projections, see the Population Committee final report.

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ENVIRONMENTAL COMMITTEE

The Environmental Committee developed *The Inventory of Arizona's Water-Dependent Natural Resources.* The inventory is a document that required extensive review of the existing data and compilation of that data into a single resource that is detailed, yet accessible to readers. The inventory is presented in Volume 2. This inventory was organized by groundwater basin with references to the applicable county to be consistent with water supply and demand information. This inventory is intended to be a tool that may support local, regional and statewide decision makers when making decisions on issues involving natural resources. The committee also provided the WRDC with recommendations for additional research and data collection and a

Deleted: to comply with the requirements of House Bill 2661 recommendation that potential impacts and risks to water-dependent natural resources be included in the evaluation of future water supply options.

WATER SUPPLY AND DEMAND COMMITTEE

Projected Future Water Demands

Projected water demands were estimated for 2035, 2060 and 2110. Water demand in 2110 is projected using both the Census Block and Area Split projections. Water demand information is found summarized in Table 2 (see *Appendix I, Pages 16-18*). Water demand data was available to the WS&D Committee by groundwater basin. In order to meet the requirements of House Bill 2661, demand data was analyzed on the basis of individual groundwater basins and then associated with the applicable county(ies) geographically coincident with the applicable basin. Figure 1 shows the spatial relationship between counties and basins. Appendix A contains individual maps for each county with the basins within that county identified.

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The total water demand is composed of three use sectors: municipal, agriculture and industrial. Industrial demand was comprised of demand for mining, power, turf and sand and gravel that were not met by a water provider. Industrial demands met by municipal providers were not included within the industrial demand sector. Tribal water demands for each sector were included and based on the best available data. Demand projections for each water use sector were developed separately using different methods and assumptions. For detailed information regarding the demand projections see the appropriate use sector report in Volume 2. For each year, a high and low demand projection is given, which reflects the methodology utilized by the subcommittee that evaluated industrial subsector demands.

Total statewide demand projections in 2035 range from a low of 8,191,191 AF to a high of 8,595,266 AF. Total projected demand in 2060 ranges from a low of 8,637,438 AF to a high of 9,092,987 AF. Total demand in 2110, for both the Census Block and Area Split population projections, ranges from a low of 9,930,628 AF to a high of 10,605,563 AF.

Currently Developed Water Supplies

The currently developed water supplies (baseline supplies) were identified and quantified for each basin. This information is found in the *WRDC Supply Subcommittee Report* that is included as Appendix 5 and 6 in the *WRDC Water Supply and Demand Working Group Report* and summarized in Table 3 (see *Appendix I, pages 19-21*). As with water demands, the supply data was available to the WS&D Committee by groundwater basin. Supply data was analyzed on the basis of groundwater basin and then associated with the county(ies) that geographically coincide with the basins.

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The baseline water supply information was developed to catalogue water sources currently utilized throughout Arizona. The water sources include groundwater, instate surface water diversions, reclaimed water, and Colorado River water, both in the form of main-stem Colorado River entitlements and CAP subcontracts. In general, the baseline water supply inventory identified the sources of water used to meet demand in the baseline condition using the best available data. The baseline supply is maintained throughout the projection period with the exception of instate surface water supplies. To account for potential water supply stresses due to drought and/or climate change, baseline instate surface water supplies were decreased 5 percent in 2035, 10 percent in 2060 and then held constant through 2110.

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Baseline water supply is provided for Colorado River supplies for both normal and shortage years. The shortage year supply is based on the first tier shortage on the Colorado River and at that level of shortage, CAP and Priority 4 consumptive use entitlements are reduced by a total of 320,000 AF. In the baseline supply projections utilized in this report, 90 percent of the shortage is allocated to CAP and 10 percent is allocated to Priority 4 on-river users. Shortages could be allocated using a different method, for example shortage sharing pursuant to the Director's Shortage Sharing Workgroup Recommendation, which may impact the supplies available to Priority 4 on-river users. For more detailed information regarding the sources of data and methods used to establish the baseline water supplies, see the *WRDC Supply Subcommittee Report* in Volume 2.

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Statewide, the total volume of currently developed water supplies ranges from 6,446,394 AF to 6,750,704 AF. The WS&D Committee recognized that there are currently water supplies, such as groundwater, surface water and reclaimed water that are considered developed but that are not currently being used. Additionally, it should be recognized that there are water supplies that are not yet developed, but should be considered available to meet demands. Examples of these supplies are: (1) reclaimed water for which there is not yet delivery or storage infrastructure constructed to put it to direct or indirect use, and (2) a portion of water in aquifer storage.

Currently, the ADWR concurs with projections that adjusted water in aquifer storage within the state to a depth of 1,000 to 1,200 feet below land surface (or bedrock) is just over 1.2 billion AF. Adjusted water in aquifer storage is equal to 80 percent of the actual volume. If this groundwater was utilized over a 100 year period, the annual volume available would be 12,584,400 AF. However, care should be taken when looking at water in storage as a potential future supply. In many instances, the largest volumes of water are located in areas that do not have the greatest projected increases in demand. For example, the adjusted water in aquifer storage in the Little Colorado River Plateau basin is 763,200,000 AF and the projected demand in 2110 ranges from 300,000 to 400,000 AF. Additionally, this aquifer underlies a significant area of Indian reservation and, while potentially available for on-reservation uses, is not likely available to off-reservation users. Also at issue is the potential for undesirable consequences associated with utilizing large volumes of water in aquifer storage. These may include, but are not limited to: declining water tables; dewatering of certain areas; declining well yields; increased pumping costs; land subsidence and earth fissuring; diminished water availability to water dependent natural resources; and deterioration of water quality.

ADWR has also projected potential volumes of reclaimed water to be generated by future populations. These projections were conservatively derived by holding constant the current percentage of the population that currently discharges to a sewer system in each groundwater basin and applying a constant reclaimed water volume generated in gallons per capita per day to the projected population. In 2035, the estimated volume of reclaimed water that can be generated statewide is 740,572 AF. In 2060, the volume is estimated at 935,270 AF and just under 1.3 million AF in 2110. These supplies were not included in the evaluation documented in the

WRDC Supply Subcommittee Report. It should be noted that significant investment may be required to put this non-potable water to use locally, or move the supply to areas with projected supply shortfalls. Impediments to increased utilization of reclaimed water supplies have been evaluated by the Governor's Blue Ribbon Panel on Water Sustainability. Work plans to implement the recommendations of this panel are under development by the applicable state agencies, ADWR, Arizona Department of Environmental Quality and the Arizona Corporation Commission.

FIGURE 1. STATEWIDE COUNTIES AND GROUNDWATER BASINS

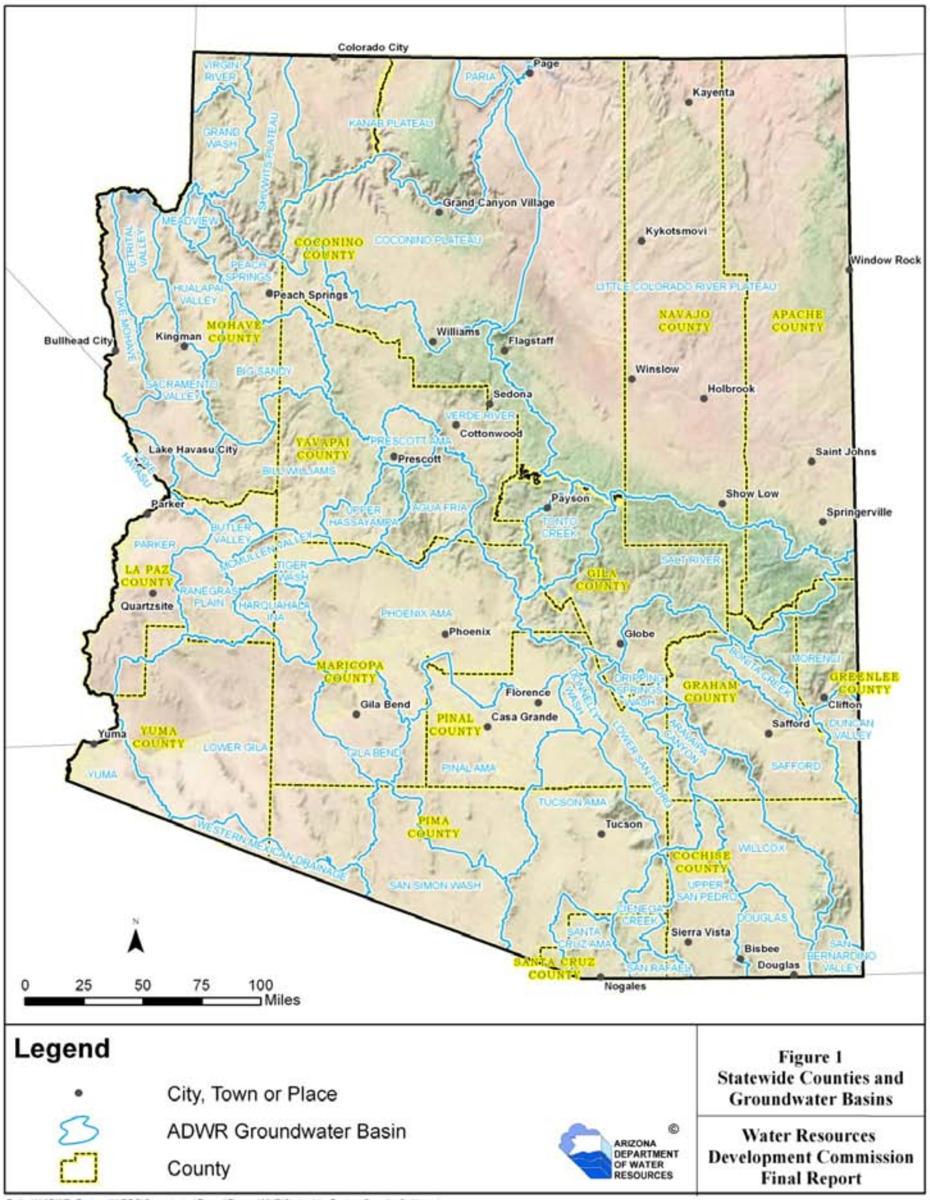

**Figure 1
Statewide Counties and Groundwater Basins**

Identification of Potential Future Water Supplies

Prior to evaluating potential future water supplies, the WS&D Committee first identified the areas in the state where development of additional water supplies may be considered necessary to meet projected future demands. This was achieved by comparing baseline supplies against projected future demands. Table 4(a) identifies the basins that may require supplies to meet increased future demand by 2035. The additional basins that may require additional supplies to meet increased future demand by 2060 and 2110 are identified in Tables 4(b) and 4(c), respectively. Once areas potentially requiring additional water supplies were identified, the committee evaluated potential future water supplies that may be available within those basins. This information is also included in Tables 4(a) through 4(c). Table 4(d) identifies the basins that may require additional supplies to be developed to meet increased future demands by 2110 using the alternative population estimate method. *Tables 4(a) through 4(d) are available in Appendix I on pages 22-27.*

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The water supplies evaluated as potential future water supplies included: groundwater; surface water (both in-state rivers and the Colorado River); reclaimed water; and other. This information is included in Tables 4(a) through (d). The "other" category included the following: currently undevelopable or under-utilized sources of water such as brackish or poor quality groundwater, mine drainage, and agricultural drainage; desalinated water; and water made available through weather modification. In all basins, the "other" category is identified as unknown as no analysis regarding availability within a basin, or feasibility of development of the source, was completed within the available timeframe. Further, it was recognized that there are potentially additional sources that could be included beyond those listed above, but were not evaluated in the context of the WS&D Committee's work or this report.

Although not listed as an additional supply in this report, the WS&D Committee recognized that water conservation is one of the most simple and effective methods to stretch existing supplies. The WS&D Committee stated that it was assumed that water conservation in all water use sectors will be an ever increasing practice in future years in all basins within the state.

Deleted: Although not necessarily an additional supply, water conservation is one of the most simple and effective methods to stretch existing supplies to meet future water demands, decreasing the need for development of additional water resources. It was assumed that water conservation in all water use sectors will be an ever-increasing practice in future years in all basins within the state.¶

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Identification of Legal and Technical Issues Associated with Utilization of Additional Water Supplies

Additional water supplies are potentially available for any given groundwater basin. However, there are numerous hydrologic, technical, legal, and economic issues related to developing such supplies that may limit their practical feasibility or actual development. Table 5 (see *Appendix I, page 28*) provides a summary of the legal and technical issues that may limit the development and use of potential supplies, and general infrastructure requirements associated with developing those water supplies throughout the state. As demonstrated in Table 5, there are some legal and technical issues that are common to almost all of the additional water supplies.

Deleted: Again, although conservation was not listed as an additional supply, it too has some implementation issues, including: the potential for conservation savings in individual basins; willing participation among currently non-regulated water users; and the cost to implement conservation measures.

FINANCE COMMITTEE

Identification of Potential Mechanisms to Finance Acquisition of Water Supplies Infrastructure

Identifying the full array of potential funding mechanisms is particularly challenging because of the widely varying nature of water resource projects, and the potential beneficiaries of those projects. The traditional forms of financing available to municipalities and private water providers, such as revenue bonds, government obligation bonds, impact fees, standard bank loans, and other financial vehicles have been, and will continue to be, adequate for developing certain supplies. However, in some locations, it may be necessary to develop large scale water supply projects capable of serving entire regions within the state. The magnitude of the cost of regional water supply projects is such that many rural Arizona cities and even some larger metropolitan cities may not be able to finance them though the traditional funding or financing mechanism. Currently conceived regional water supply projects in Arizona have estimated costs between $34 million and $1 billion.

Potential options to finance water supply infrastructure projects that were identified and evaluated include:

- Federal loans, federal loan guarantees used in conjunction with private lending or state/local/district bond issuance and federal agency debt issued specifically to finance infrastructure provision at the state and local level (i.e. possible national infrastructure bank).
- State loans, state revolving funds that serve as infrastructure banks, and state loan guarantees used in conjunction with private lending or local/district bond issuance.
- Municipal debt in the form of bonds, or in loans to municipalities from private lenders, including debt issued directly by municipal water utilities and debt issued by municipalities to finance water improvement districts.
- Special district debt in the form of bonds or in loans to districts from private lenders, including bonds issued by community facility districts with private property being used as collateral.
- Private water utility or other corporate and private-sector debt, including short-term paper, bonds, or borrowing from investment banks, commercial banks or private sources.

Table 6, below, compares and contrasts the traditional financing sources identified. Some of the traditional forms of financing water infrastructure projects include revenue bonds, whose repayment is linked to project-generated cash flow, general obligation bonds issued by the local political entity, general funds of political entities, or loans from the Water Infrastructure Finance Authority (WIFA). In addition to these traditional financing sources, the Water Supply Development Revolving Fund (WSDR Fund) was created in 2007 to enhance Arizonan's ability to finance such projects, but is not currently financially viable. Public-Private Partnerships may also provide a viable method to plan, finance, and construct water infrastructure.

Table 6. Comparison of Traditional Financing Sources for Water Resource Projects

Revenue Bonds	General Obligation Bonds	Other Sources
Relies on revenues from a specific project	Relies on taxes; requires public approval	*U.S. government or state government loans* - Currently very limited if even available; generally comes with a 50 year repayment

Higher cost than general obligation bonds, but after-tax cost not higher Projects can be sized properly and built rapidly May potentially impact a municipality's credit rating Can't be used for new project development financing due to need for regular bond payments and no revenues generated during project development; may be an option for expansion of existing project	May potentially impact the credit rating and borrowing capability of the municipality Revenue generated dictated by the amount of taxes Can be used for project development normally done by the government entity Cost fluctuates with the economy and issuer financial rating; may be unavailable or economically unfeasible	provision and subject to Congressional approvals *Bureau of Reclamation funds* - Funds are limited and subject to annual appropriations resulting in project delays or downsizing *WIFA financing* - Limited to water and wastewater treatment projects *Water Supply Development Revolving Fund* - This fund not yet funded, overseen by WIFA *Public-Private Partnerships* - Relies on cash flow from a specific project, after-tax cost equal to municipal bond cost, requires source of development equity to conduct engineering and due diligence

Water Supply Development Revolving Fund

The WSDR Fund was created by the Arizona legislature in 2007 after multi-year discussions by the Statewide Water Advisory Group (SWAG). The purpose of the WSDR Fund administrated by WIFA, is to provide low interest rate loans to water providers for the acquisition of water supplies and development of water infrastructure. The legislation identified six sources of revenue for the WSDR Fund but, to date, it has not been funded. If the WSDR Fund is to be a primary source of financing for the acquisition and development of water supply projects, one or more sources of dedicated funding will need to be established.

Evaluation of Potential Revenue Sources and Funding Mechanisms

The Committee evaluated a number of potential revenue sources with respect to the advantages and disadvantages they would have as a revenue source for individual projects or the WSDR Fund. This information is summarized in Table 7 (see *Appendix I, page 29-30*). For more detailed information regarding the summarized revenue sources, see the Finance Work Group Report found in Volume 2 of this report.

The committee also evaluated the projected ranges of revenue that might be generated by certain revenue sources. Table 8, below, provides the potential cumulative revenues that could be generated by 2020, 2035, 2060 and 2110. These projections assume the revenue source is initiated in 2011 and incorporates a three percent rate of return for loans made from the WSDR Fund. The projections also assume that all revenues received annually are appropriated to various water resource projects. The projected cumulative revenues generated by 2020 were included because the committee assumed funding might be needed within the next five to 25 years to assist some water providers in meeting their water demands.

Table 8. Range of Projected Potential Revenue by Source if Implemented in 2011

Deleted: The following four conceptual principles were identified by the Finance Committee to evaluate potential sources of revenue for the WSDR Fund:¶
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1. Dependability and Predictability¶
The revenue source must be dependable and predictable over the long-term. This is necessary to allow the fund to increase with modest investments over time, be available for projects that will be proposed in the 20 year or longer timeframe, and to create capacity for revenue bonding. Income from these revenue sources should not be subject to large fluctuations so that bonding agencies and communities planning water supply projects can be reasonably assured that predicted revenue will be available to meet financial commitments.
Page Break
¶
2. Adequate Funding¶
The revenue source must generate sufficient funding so that within seven to 10 years significant revolving fund loans may be made. ¶
¶
3. Mix of Revenue Sources¶
A mix of revenue sources is preferred to keep the size of payments from any source or economic sector low and reasonable. A mix of revenue sources also allows equitable distribution of the burden of repayment. The mix of revenue may include sources of funds that are broadly based across all sectors, in addition to sources from parties directly benefiting from the fund.¶
¶
4. Beneficiaries Should Contribute¶
As much as possible, some portion of the revenues must be tied to the benefit received. Several considerations need to be made regarding this principle. The beneficiaries of the projects will eventually pay for the use of the fund because it is a revolving fund from which loans will be made and future loans supported by the revenues generated by repayment of earlier loans. Others who contribute initially to the fund may benefit in the future. By continually having funds available for loans over time, a large number of water providers statewide may potentially benefit. In situations where specific water providers do not directly benefit, the citizens of the state may collectively benefit if the fund results in the development of secure long-term water supplies for other communities. This principle requires consideration of how the costs and benefits will be balanced between regions and economic sectors based on the anticipated uses of the WSDR Fund.

Deleted: In determining the manner in which the WSDR Fund is funded, the four principles previously discussed should be considered for each revenue source. With these principles in mind, a number of potential revenue sources were evaluated

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Revenue Source	2020 ($ billion)	2035 ($ billion)	2060 ($ billion)	2110 ($ billion)
Bottled Water Tax[1]	0.239-0.596	0.759-1.9	2.3-5.9	12.6-31.6
Transaction Privilege Tax[2]	0.285-0.570	0.907-1.8	2.8-5.6	15-30.2
Statewide New Development Tax[3]	0.018-0.035	0.056-0.113	0.174-0.349	0.938-1.9
New or Existing Well Fees[4]	0.019-0.039	0.062-0.124	0.192-0.383	1.0-2.0
General Fund Appropriation[5]	0.118	0.376	1.2	6.3
Total	0.68-1.36	2.16-4.31	6.67-13.4	35.8-72

[1]Range represents tax at 2¢ per bottle and 5¢ per bottle, respectively
[2] Range represents tax at 5¢ per 1,000 gallons and 10¢ per 1,000 gallons, respectively
[3]Range represents tax for 6,000 lots at $250 per lot and $500 per lot, respectively
[4]Range represents fees at $50 per new well and $10 for existing well and $100 per new well and $20 for existing well, respectively
[5]Assumes $10 million annual general fund appropriation

Public-Private Partnerships

Public-private partnerships are becoming an increasingly common method to finance large infrastructure projects. Public-private partnerships are joint ventures that:

- Combine project elements into a single purpose entity whose cash flows will repay the principal and interest required to build and operate the project,
- Clearly define the separate roles of the public and private sector by means of a joint venture contract that is specific to the project and its special requirements,
- Assign appropriate risks to each group, and
- Use private funds and companies as determined through joint venture agreements to finance, build and often operate projects, but with some public sector assets at risk

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With conceived projects ranging in cost from $34 million to more than $1 billion, public-private partnerships may be a viable option. The use of these partnerships may also reduce the size of the WSDR Fund or other funds needed to assist in the financing of water supply projects.

Deleted: Research has shown that the greater the cost of the infrastructure project, the greater the interest from the private sector in participating due to the increased return on investment.

Deleted: Utilization of these partnerships to construct water supply projects would result in the public sector bearing a significantly smaller portion of project costs.

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For more detailed information regarding public-private partnerships, see the Finance Work Group Report found in Volume 2 of this report.

The Finance Committee recommends that further examination of these funding sources and financing mechanisms, including the WSDR Fund, be conducted to determine what options will best enable water users throughout the State to meet their future water needs taking into consideration the political, fiscal, legal, and hydrological ramifications for the State and for the individual water users.

Deleted: The Finance Committee recognized that Arizona's current leaders must begin identifying solutions and allocating funds to plan, acquire and develop additional water resources to ensure a sufficient supply of water is available for Arizona's future. As a result of this recognition, the

Deleted: water supply development fund

RECOMMENDATIONS

Committee Recommendations with Respect to Supplemental Data Analyses

Deleted: COMMITTEE RECOMMENDATIONS¶

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In general, the primary limiting factor identified with respect to the data analyses that serve as the basis for this report was time. With the WRDC convening its first meeting in August 2010, there was less than one year to collect and analyze population, water demand and water supply data statewide. If more time were available, more in-depth data analysis could be completed. The three committee recommendations related to the time limitations imposed when preparing this report were:

- The potential for water conservation to reduce future water demand was not addressed and should be evaluated and taken into account in further analysis of future water demand and supply needs.

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- There are three potential Colorado River shortage conditions pursuant to the Interim Guidelines for the Operation of Lake Powell and Lake Mead. The supply data included in this report only includes the condition where Arizona is shorted 320,000 AF. Additional analyses should be completed that include the other two Colorado River shortage conditions in addition to the evaluation of potential climate change impacts on other water supplies.
- When population projections were completed the 2010 U.S. Census data had not been updated. To obtain the best possible population projections (which drive demand), the population numbers should be re-calculated in 2012 using the updated 2010 U.S. Census data as a baseline for professional demographers to conduct population projections using a cohort-component method. This should be done as part of a larger process that includes full participation from the cities, Associations of Governments, county planners, professional demographers, universities, and other state agencies.

One other recommendation was made with respect to the data analyses included in this report:

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- The final committee reports are a compilation of the existing water-related data and information for the state. As such, they may serve as a source of information for decision makers. There are final committee reports for the Population Committee, the WS&D Committee, the Environmental Committee, the Finance Committee and the Legislative Recommendations Committee. There was an extensive data collection effort associated with this report. To insure that the integrity of the data is maintained and that data can be updated, a central repository for the data should be created. The WRDC should support a continuing ADWR effort to refine and update data.

Committee Recommendations Regarding Further Studies and Evaluations

In general, in most areas outside of the state's Active Management Areas (AMA), insufficient data was the limiting factor when completing data analysis for this report or when contemplating future efforts. The following recommendations regarding further studies and evaluations were made by the various committees in the respective committee reports.

- The WRDC should create and support a continuing ADWR effort to refine and update all information generated by the committees in this process.
- Future efforts should focus on voluntary collection and analysis of water use data, particularly within rural areas.
- Future efforts should focus on collection and analysis of hydrogeologic data in order to better estimate basin and local area recharge, groundwater storage, water level trends and other basin characteristics and water budget components in all basins.

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- Future efforts should include research and data collection regarding water supplies that support water-dependent natural resources and that information should be utilized in future evaluations of water supply and demand.

ADWR staff provided some additional evaluation of supplies and demands by basin to further the efforts of the WS&D Committee. This evaluation included a comparison of demands in each basin to other statistics of interest, including: estimated net natural Recharge and groundwater in storage; permitted well capacity in the basin; and relationships between the groundwater and surface water systems within each basin. Table 9 (see Appendix I, pages 31-32) summarizes these evaluations and is presented as a suggested preliminary analysis further evaluating supply/demand relationships in each basin.

Recommendation of Legislative Recommendations Committee

This committee was tasked with evaluating the findings of the other committees in an effort to determine if legislative action was warranted or required as a result of their conclusions. The committee met on four occasions and discussion was primarily focused on potential funding or financing mechanisms Fund and consideration of a statewide or regional water authority.

CONCLUSIONS AND NEXT STEPS

The WRDC completed the legislated task of analyzing Arizona's water needs for 100 years and evaluating the issues associated with those needs. It is now known that portions of the state have sufficient supplies developed to meet future needs, while other areas within the state will require development of additional supplies for the future. However, due to the variability in Arizona's geology, climate, precipitation patterns, water use patterns, population growth and land ownership, evaluation of the issues and development of comprehensive solutions is extremely difficult. Arizona must develop a broad portfolio of solutions to meet the myriad of challenges that are inherent in this diverse state. Finally, decisions must be made regarding what solutions will be most effective in discrete regions, how those solutions will be funded, and whether implementation of the solutions require legislative changes.

Due to the time constraints associated with preparation of this final report, the WRDC has not been able to fully consider all of these issues. Pursuant to House Bill 2661, the WRDC does not sunset until September 30, 2012. Therefore, it is the recommendation of the WRDC that it be given until the sunset date to continue development, evaluation and prioritization of potential solutions or legislative proposals. This framework could assist in increasing the degree of standardization in the WRDC's efforts and result in identification of a broader array of funding alternatives and potential legislative changes to achieve those solutions.

Comment [g3]: Possible alternative language suggested for this bullet:
Option 1: Leave as is.
Option 2: Future efforts should include research and data collection regarding water supplies that support water-dependent natural resources. Methods should be developed to incorporate risks to water-dependent natural resources in future evaluations of water supply and demands.
Option 3: Substitute "could" for "should" in number 2.
Option 4: Future efforts should include research and data collection regarding water supplies that support water-dependent natural resources to update and refine previously compiled information.

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Deleted: The recommendation of this committee is discussed in the section below.

Deleted: The WRDC was tasked with completing an analysis of Arizona's water needs for 100 years and evaluating the issues associated with those needs. It is now known that portions of the state have sufficient supplies developed to meet future needs, but that other areas within the state will require development of additional supplies for the future. However, due to the variability in Arizona's geology, climate, precipitation patterns, water use patterns, population growth and land ownership, evaluation of the issues and development of comprehensive solutions is extremely difficult. Further, Arizona must develop a broad portfolio of solutions to meet the myriad of challenges that are inherent in this diverse state. Finally, decisions must be made regarding what solutions will be most effective in what areas, how those solutions will be funded, and whether implementation of the solutions require legislative changes. ¶

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Comment [g4]: There is not consensus on whether or not this final sentence should be included or removed. The two potential alternatives are: Remove Sentence or Include Sentence.

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TABLES

Table 1. Census Block Population Projections

Groundwater Basin	2035	2060	2110 (Census Block)	2110 (Area Split)
Agua Fria	16,671	20,036	27,703	373,613
Aravaipa Canyon	123	136	188	935
Big Sandy	2,607	3,251	4,495	16,536
Bill Williams	6,858	7,850	10,987	36,976
Bonita Creek	30	35	49	2,116
Butler Valley	0	0	0	0
Cienega Creek	7,467	9,130	12,624	10,903
Coconino Plateau	14,987	18,000	24,887	28,757
Detrital Valley	2,750	3,421	4,730	6,367
Donnelly Wash	0	0	7,897	7,897
Douglas	41,635	49,327	68,201	64,767
Dripping Springs Wash	245	272	375	9,161
Duncan Valley	3,659	4,252	5,879	6,307
Gila Bend	11,390	14,302	19,775	187,503
Grand Wash	0	0	0	574
Harquahala INA	1,491	2,155	3,974	27,886
Hualapai Valley	65,017	80,729	111,620	101,677
Kanab Plateau	12,553	15,675	21,674	24,719
Lake Havasu	108,522	137,859	190,609	189,359
Lake Mohave	96,942	119,141	164,728	154,868
Little Colorado River	375,183	444,449	614,513	612,095
Lower Gila	16,685	19,850	27,446	107,863
Lower San Pedro	19,984	32,360	44,742	50,158
McMullen Valley	7,741	9,362	12,679	18,670
Meadview	1,674	2,079	2,875	466
Morenci	4,724	5,477	7,572	8,482
Paria	673	762	1,053	379
Parker	20,438	22,722	30,753	29,528
Peach Springs	3,146	3,799	5,253	12,384
Phoenix AMA	6,443,884	8,096,058	11,170,234	10,540,458
Pinal AMA	674,968	1,071,653	1,465,914	1,457,753
Prescott AMA	211,763	259,600	358,933	325,885
Ranegras Plain	1,096	1,346	1,662	1,232
Sacramento Valley	36,116	45,574	63,012	65,281
Safford	48,905	56,139	77,261	77,621
Salt River	33,400	37,506	51,856	62,964
San Bernardino Valley	96	104	143	3,461
San Rafael	183	211	291	1,224
San Simon Wash	10,603	13,337	18,441	19,971
Santa Cruz AMA	68,887	84,828	117,287	118,918
Shivwits Plateau	13	16	23	4,777
Tiger Wash	0	0	0	3,173
Tonto Creek	19,473	24,202	33,463	46,284
Tucson AMA	1,430,910	1,772,729	2,482,634	2,477,858
Upper Hassayampa	21,270	26,335	36,412	11,942
Upper San Pedro	124,419	147,360	203,746	201,083
Verde River	154,999	185,477	256,448	266,661
Virgin River	4,950	6,444	8,909	1,208
Western Mexican Drainage	40	50	69	753
Willcox	16,738	19,153	26,482	24,569
Yuma	307,963	377,462	521,894	519,087

Table 2. Total Water Demand by Groundwater Basin for 2035, 2060 and 2110 and Identification of Counties that Overlay Basins

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Groundwater Basins	Counties that Overlay Basins and Percent of Basin in County[1]	2035 Low Demand (AF)	2035 High Demand (AF)	2060 Low Demand (AF)	2060 High Demand (AF)	2110 Census Block Low Demand (AF)	2110 Census Block High Demand (AF)	2110 Area Split Low Demand (AF)	2110 Area Split High Demand (AF)
Agua Fria	Maricopa (5%) Yavapai (95)	4,772	4,888	5,371	5,511	6,738	6,931	75,504	71,004
Aravaipa Canyon	Graham (85%) Pinal (15%)	1,013	1,014	1,014	1,015	1,020	1,021	1,098	1,105
Big Sandy	Mohave (71%) Yavapai (29%)	509	528	635	658	879	910	3,232	3,347
Bill Williams	La Paz (12%) Mohave (29%) Yavapai (59%)	14,298	34,346	14,529	34,584	15,260	35,337	21,541	41,574
Bonita Creek	Graham (100%)	5	5	6	6	8	8	342	357
Butler Valley	La Paz (100%)	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500
Cienega Creek	Cochise (4%) Pima (48%) Santa Cruz (47%)	1,755	2,007	1,968	2,232	2,415	2,703	2,195	2,471
Coconino Plateau	Coconino (100%)	1,596	1,701	1,917	2,043	2,651	2,824	3,063	3,264
Detrital Valley	Mohave (100%)	410	430	511	534	706	739	950	995
Donnelly Wash	Pinal (100%)	0	0	0	0	850	906	850	906
Douglas	Cochise (100%)	55,841	56,344	57,291	57,847	60,845	61,533	60,198	60,862
Dripping Springs Wash	Gila (43%) Graham (7%) Pinal (49%)	16	17	17	19	24	27	587	651
Duncan Valley	Cochise (3%) Greenlee (97%)	17,969	17,994	18,060	18,090	18,311	18,352	18,377	18,421
Gila Bend	Maricopa (100%)	377,271	384,396	390,492	400,591	404,603	418,574	428,755	440,191
Grand Wash	Mohave (100%)	0	0	0	0	0	0	79	83
Harquahala INA	La Paz (36%) Maricopa (64%)	136,670	136,910	137,516	137,944	138,374	138,953	142,642	143,163
Hualapai Valley	Mohave (100%)	14,919	15,584	18,524	19,299	25,612	26,603	23,331	24,252
Kanab Plateau	Coconino (56%) Mohave (44%0	5,075	5,163	6,057	6,166	7,943	8,095	8,901	9,074
Lake Havasu	Mohave (100%)	31,577	32,545	40,113	41,286	55,754	57,242	55,390	56,870
Lake Mohave	Mohave (100%)	140,846	146,977	152,311	160,574	171,905	183,569	168,155	179,670
Little Colorado River	Apache (38%) Coconino (29%) Navajo (33%)	218,219	259,566	249,821	307,246	292,195	372,121	291,806	371,709
Lower Gila	La Paz (4%) Maricopa (19%) Pima (19%) Yuma (58%)	497,669	516,115	490,312	509,041	502,324	521,304	517,200	535,164
Lower San Pedro	Cochise (16%) Gila (4%) Graham (9%) Pima (16%) Yuma (55%)	20,948	37,087	22,961	39,054	24,843	41,023	25,666	42,123

Table 2 Continued

Groundwater Basins	Overlay Basins and Percent of Basin in County[1]	2035 Low Demand (AF)	2035 High Demand (AF)	2060 Low Demand (AF)	2060 High Demand (AF)	2110 Census Block Low Demand (AF)	2110 Census Block High Demand (AF)	2110 Area Split Low Demand (AF)	2110 Area Split High Demand (AF)
McMullen Valley	La Paz (51%) Maricopa (35%) Yavapai (13%)	72,008	72,062	72,220	72,285	72,652	72,740	73,432	73,562
Meadview	Mohave (100%)	251	263	312	326	431	451	70	73
Morenci	Apache (6%) Graham (23%) Greenlee (71%)	14,150	50,183	14,481	50,519	15,401	51,454	15,801	51,860
Paria	Coconino (100%)	9,483	12,988	11,342	16,267	12,901	19,728	12,750	19,572
Parker	La Paz (92%) Yuma (8%)	654,752	656,521	659,696	662,584	665,105	668,894	664,775	668,556
Peach Springs	Coconino (27%) Mohave (64%) Yavapai (9%)	810	832	916	942	1,151	1,188	2,307	2,394
Phoenix AMA	Maricopa (84%) Pinal (15%) Yavapai (1%)	2,985,423	3,097,639	3,356,261	3,489,538	4,279,621	4,484,942	4,078,593	4,291,514
Pinal AMA	Maricopa (9%) Pima (36%) Pinal (55%)	985,887	1,007,978	902,124	925,757	983,096	1,015,930	981,227	1,016,058
Prescott AMA	Yavapai (100%)	36,863	38,478	44,762	46,581	60,736	63,463	55,423	57,797
Ranegras Plain	La Paz (99%) Yuma (1%)	29,398	29,405	29,488	29,498	29,603	29,615	29,447	29,456
Sacramento Valley	Mohave (100%)	20,005	26,067	22,996	29,797	27,462	35,495	27,938	35,987
Safford	Cochise (27%) Gila (17%) Graham (55%)	183,181	205,523	184,388	206,780	187,971	210,513	187,911	210,451
Salt River	Apache (19%) Gila (45%) Graham (4%) Greenlee (3%) Maricopa (7%) Navajo (20%) Pinal (2%)	39,460	55,850	40,148	56,630	42,332	59,001	43,971	60,718
San Bernardino Valley	Cochise (100%)	25	26	27	28	38	39	906	930
San Rafael	Cochise (33%) Santa Cruz (67%)	26	28	30	32	42	44	176	185
San Simon Wash	Maricopa (1%) Pima (99%)	2,042	2,116	2,440	2,533	3,182	3,311	3,405	3,544
Santa Cruz AMA	Pima (20%) Santa Cruz (80%)	25,541	26,336	28,921	29,530	34,906	36,116	35,207	36,460
Shivwits Plateau	Mohave (100%)	2	2	3	3	4	4	820	853
Tiger Wash	Maricopa (100%)	0	0	0	0	0	0	1,285	1,307
Tonto Creek	Coconino (1%) Gila (99%)	7,418	7,765	8,856	9,236	11,670	12,115	15,567	16,340
Tucson AMA	Pima (79%) Pinal (18%) Santa Cruz (3%)	425,148	472,395	486,427	535,325	627,088	685,279	627,766	684,268
Upper	Maricopa (12%)	5,551	5,699	6,685	6,869	8,943	9,197	3,460	3,545

Table 2 Continued

Groundwater Basins	Overlay Basins and Percent of Basin in County[1]	2035 Low Demand (AF)	2035 High Demand (AF)	2060 Low Demand (AF)	2060 High Demand (AF)	2110 Census Block Low Demand (AF)	2110 Census Block High Demand (AF)	2110 Area Split Low Demand (AF)	2110 Area Split High Demand (AF)
Hassayampa	Yavapai (88%)								
Upper San Pedro	Cochise (93%) Pima (1%) Santa Cruz (6%)	39,528	50,520	44,660	55,686	56,827	68,577	56,252	67,957
Verde River	Coconino (35%) Gila (8%) Maricopa (6%) Yavapai (52%)	53,750	58,275	59,459	63,748	71,347	76,836	73,058	78,793
Virgin River	Mohave (100%)	2,705	2,740	2,953	2,998	3,363	3,426	2,083	2,091
Western Mexican Drainage	Pima (50%) Yuma (50%)	6	7	8	8	11	12	123	128
Willcox	Cochise (79%) Graham (21%)	177,569	180,182	179,443	183,085	182,216	187,264	181,770	186,805
Yuma	Yuma (100%)	864,329	867,271	854,466	858,157	891,449	896,657	890,740	895,925

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TABLE 3. CURRENTLY DEVELOPED WATER SUPPLY BY GROUNDWATER BASIN AND IDENTIFICATION OF COUNTIES THAT OVERLAY BASINS

Groundwater Basins	Counties that Overlay Basins and Percent of Basin in County[1]	Currently Developed Groundwater (AF)	Currently Developed Surface Water (in-state) (AF)	Currently Developed Reclaimed Water (AF)	Normal Year Non-CAP Colorado River Water (AF)	Normal Year CAP Supply (AF)	Shortage Year Non-CAP Colorado River Water (AF	Shortage Year CAP Supply (AF)	Supply Currently Developed (AF)
Agua Fria	Maricopa (5%) Yavapai (95)	3,602	0	30					3,632
Aravaipa Canyon	Graham (85%) Pinal (15%)	514	500	NR					1,014
Big Sandy	Mohave (71%) Yavapai (29%)	15,028	0	NR					15,028
Bill Williams	La Paz (12%) Mohave (29%) Yavapai (59%)	3,251	500	200	417		299		4,250 to 4,368
Bonita Creek	Graham (100%)	0	0	NR					0
Butler Valley	La Paz (100%)	14,503	0	NR					14,503
Cienega Creek	Cochise (4%) Pima (48%) Santa Cruz (47%)	1,101	0	100					1,201
Coconino Plateau	Coconino (100%)	500	358	1,700					2,558
Detrital Valley	Mohave (100%)	159	50	NR	150		150		359
Donnelly Wash	Pinal (100%)	19	0	NR					19
Douglas	Cochise (100%)	53,300	0	1,400					54,700
Dripping Springs Wash	Gila (43%) Graham (7%) Pinal (49%)	11	0	NR					11
Duncan Valley	Cochise (3%) Greenlee (97%)	8,054	9,900	50					18,004
Gila Bend	Maricopa (100%)	295,323	55,417	800					351,540
Grand Wash	Mohave (100%)	2	0	NR					2
Harquahala INA	La Paz (36%) Maricopa (64%)	66,178	0	NR					66,178
Hualapai Valley	Mohave (100%)	9,109	0	1,800					10,909
Kanab Plateau	Coconino (56%) Mohave (44%0	2,799	800	500	45		32		4,131 to 4,144
Lake Havasu	Mohave (100%)	47	0	3,400	23,432		16,796		20,243 to 26,879
Lake Mohave	Mohave (100%)	2,007	0	3,100	103,654		90,250		95,357 to

Table 3 Continued

Groundwater Basins	Counties that Overlay Basins and Percent of Basin in County[1]	Currently Developed Groundwater (AF)	Currently Developed Surface Water (in-state) (AF)	Currently Developed Reclaimed Water (AF)	Normal Year Non-CAP Colorado River Water (AF)	Normal Year CAP Supply (AF)	Shortage Year Non-CAP Colorado River Water (AF	Shortage Year CAP Supply (AF)	Supply Currently Developed (AF)
									108,761
Little Colorado River	Apache (38%) Coconino (29%) Navajo (33%)	95,812	14,717	36,100	50,000		50,000		196,629
Lower Gila	La Paz (4%) Maricopa (19%) Pima (19%) Yuma (58%)	110,296	473	300	260,780		260,645		371,714 to 371,849
Lower San Pedro	Cochise (16%) Gila (4%) Graham (9%) Pima (16%) Yuma (55%)	23,677	833	700					25,211
McMullen Valley	La Paz (51%) Maricopa (35%) Yavapai (13%)	71,500	0	NR					71,500
Meadview	Mohave (100%)	145	0	NR					145
Morenci	Apache (6%) Graham (23%) Greenlee (71%)	9,126	1,627	200					10,953
Paria	Coconino (100%)	120	0	NR					120
Parker	La Paz (92%) Yuma (8%)	1,787	0	2,100	403,437		395,349		399,236 to 407,324
Peach Springs	Coconino (27%) Mohave (64%) Yavapai (9%)	351	0	100					451
Phoenix AMA	Maricopa (84%) Pinal (15%) Yavapai (1%)	673,754	727,402	315,000		895,395		703,579	2,419,735 to 2,611,551
Pinal AMA	Maricopa (9%) Pima (36%) Pinal (55%)	431,290	73,830	6,900		166,269		116,073	628,093 to 678,289
Prescott AMA	Yavapai (100%)	17,679	2,067	6,900					26,645
Ranegras Plain	La Paz (99%) Yuma (1%)	29,350	0	NR					29,350
Sacramento Valley	Mohave (100%)	3,765	0	300					4,065
Safford	Cochise (27%) Gila (17%)	87,958	74,183	2,600					164,741

Table 3 Continued

Groundwater Basins	Counties that Overlay Basins and Percent of Basin in County[1]	Currently Developed Groundwater (AF)	Currently Developed Surface Water (in-state) (AF)	Currently Developed Reclaimed Water (AF)	Normal Year Non-CAP Colorado River Water (AF)	Normal Year CAP Supply (AF)	Shortage Year Non-CAP Colorado River Water (AF	Shortage Year CAP Supply (AF)	Supply Currently Developed (AF)
	Graham (55%)								
Salt River	Apache (19%) Gila (45%) Graham (4%) Greenlee (3%) Maricopa (7%) Navajo (20%) Pinal (2%)	12,611	12,011	2,600					27,222
San Bernardino Valley	Cochise (100%)	19	0	NR					19
San Rafael	Cochise (33%) Santa Cruz (67%)	22	0	NR					22
San Simon Wash	Maricopa (1%) Pima (99%)	1,500	0	400					1,900
Santa Cruz AMA	Pima (20%) Santa Cruz (80%)	20,980	0	16,311					37,291
Shivwits Plateau	Mohave (100%)	2	0	NR					2
Tiger Wash	Maricopa (100%)	2	0	NR					2
Tonto Creek	Coconino (1%) Gila (99%)	3,000	1,000	500					4,500
Tucson AMA	Pima (79%) Pinal (18%) Santa Cruz (3%)	216,997	506	74,235		220,106		188,519	480,257 to 511,844
Upper Hassayampa	Maricopa (12%) Yavapai (88%)	3,286	0	600					3,886
Upper San Pedro	Cochise (93%) Pima (1%) Santa Cruz (6%)	23,957	4,450	5,300					33,707
Verde River	Coconino (35%) Gila (8%) Maricopa (6%) Yavapai (52%)	28,549	16,494	6,200					51,243
Virgin River	Mohave (100%)	1,585	1,618	10					3,213
Western Mexican Drainage	Pima (50%) Yuma (50%)	6	0	NR					6
Willcox	Cochise (79%) Graham (21%)	175,714	150	500					176,364
Yuma	Yuma (100%)	108,570	973	13,500	493,807		491,490		614,533 to 616,850

Table 4(a). Basins that May Require Development of Additional Water Supplies[1] and Potential Future Water Supplies Available to that Basin

Basin	County	Potential Future Water Supplies Available
Agua Fria	Maricopa (5%) Yavapai (95)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Bill Williams	La Paz (12%) Mohave (29%) Yavapai (59%)	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Cienega Creek	Cochise (4%) Pima (48%) Santa Cruz (47%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Douglas	Cochise (100%)	In-basin Groundwater – Unknown[3], Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Duncan Valley	Cochise (3%) Greenlee (97%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Gila Bend	Maricopa (100%)	In-basin Groundwater – Unknown[3], In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Harquahala INA	La Paz (36%) Maricopa (64%)	In-basin Groundwater – Unknown[3], CAP Water[4], Development of Other Supplies-Unknown
Hualapai Valley	Mohave (100%)	In-basin Groundwater – Unknown[3], Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Kanab Plateau	Coconino (56%) Mohave (44%0	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lake Havasu	Mohave (100%)	In-basin Groundwater unlikely, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lake Mohave	Mohave (100%)	In-basin Groundwater unlikely, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Little Colorado River	Apache (38%) Coconino (29%) Navajo (33%)	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lower Gila	La Paz (4%) Maricopa (19%) Pima (19%) Yuma (58%)	In-basin Groundwater, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
McMullen Valley	La Paz (51%) Maricopa (35%) Yavapai (13%)	In-basin Groundwater – Unknown[3], Development of Other Supplies-Unknown
Morenci	Apache (6%) Graham (23%) Greenlee (71%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown

[1]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non agricultural uses supplied by the Colorado River.

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Table 4(a) Continued

Basin	County	Potential Future Water Supplies Available
Paria	Coconino (100%)	In-basin Groundwater, In-state Surface Water, Colorado River[2]-Unlikely, Development of Other Supplies-Unknown
Parker	La Paz (92%) Yuma (8%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Peach Springs	Coconino (27%) Mohave (64%) Yavapai (9%)	In-basin Groundwater, In-state Surface Water, Colorado River[2]-Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Phoenix AMA	Maricopa (84%) Pinal (15%) Yavapai (1%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Pinal AMA	Maricopa (9%) Pima (36%) Pinal (55%)	In-basin Groundwater, Transported Groundwater, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Prescott AMA	Yavapai (100%)	In-basin Groundwater – Unknown[3], Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Sacramento Valley	Mohave (100%)	In-basin Groundwater, Colorado River[2]-Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Safford	Cochise (27%) Gila (17%) Graham (55%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Salt River	Apache (19%) Gila (45%) Graham (4%) Greenlee (3%) Maricopa (7%) Navajo (20%) Pinal (2%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Tonto Creek	Coconino (1%) Gila (99%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Tucson AMA	Pima (79%) Pinal (18%) Santa Cruz (3%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Upper Hassayampa	Maricopa (12%) Yavapai (88%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Upper San Pedro	Cochise (93%) Pima (1%) Santa Cruz (6%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Verde River	Coconino (35%) Gila (8%) Maricopa (6%) Yavapai (52%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Willcox	Cochise (79%) Graham (21%)	In-basin Groundwater – Unknown[3], In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown

[1]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non agricultural uses supplied by the Colorado River.

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[2]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non

Table 4(b). 2060 – New Basins[1] that May Require Development of Additional Water Supplies[2] and Potential Future Water Supplies Available to that Basin

Basin	County	Potential Future Water Supplies Available
San Simon Wash	Maricopa (1%) Pima (99%)	In-basin Groundwater, Reclaimed Water, Development of Other Supplies-Unknown

[1] These basins are in addition to the basins previously listed in Table X.
[2]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non-agricultural uses supplied by the Colorado River.

Table 4(c). 2110 (Census Block) – New Basins[1] that May Require Development of Additional Water Supplies[2] and Potential Future Water Supplies Available to that Basin

Basin	County	Potential Future Water Supplies Available
Coconino Plateau	Coconino (100%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Colorado River[3] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Detrital Valley	Mohave (100%)	In-basin Groundwater, Colorado River[2] – Unlikely, Development of Other Supplies-Unknown,
Donnelly Wash		In-basin Groundwater, In-state Surface Water, Development of Other Supplies-Unknown
Meadview	Mohave (100%)	In-basin Groundwater, Colorado River[2] – Unlikely, Development of Other Supplies-Unknown
Virgin River	Mohave (100%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Yuma	Yuma (100%)	In-basin Groundwater, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown

[1] These basins are in addition to the basins previously listed in Tables X and X-1.
[2]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non-agricultural uses supplied by the Colorado River.
[3]Potential additional Colorado River supply identified for basins having reaches of Colorado River bordering or within the basin. Actual development is unlikely unless flow of river is augmented.
[4]Basin currently in overdraft; long-term groundwater sustainability issues at baseline rate of consumption

Table 4(d). 2110 – Basins that May Require Development of Additional Water Supplies[1] based on the Area Split Population Estimation and Potential Future Water Supplies Available to that Basin

Basin	County	Potential Future Water Supplies Available
Agua Fria	Maricopa (5%) Yavapai (95)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Bonita Creek	Graham (100%)	
Bill Williams	La Paz (12%) Mohave (29%) Yavapai (59%)	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Cienega Creek	Cochise (4%) Pima (48%) Santa Cruz (47%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Coconino Plateau	Coconino (100%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Colorado River[3] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Donnelly Wash	Pinal (100%)	In-basin Groundwater, In-state Surface Water, Development of Other Supplies-Unknown
Douglas	Cochise (100%)	In-basin Groundwater – Unknown[3], Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Dripping Springs Wash	Gila (43%) Graham (7%) Pinal (49%)	In-basin Groundwater, In-state Surface Water, Development of Other Supplies-Unknown
Duncan Valley	Cochise (3%) Greenlee (97%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Gila Bend	Maricopa (100%)	In-basin Groundwater – Unknown[3], In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Harquahala INA	La Paz (36%) Maricopa (64%)	In-basin Groundwater – Unknown[3], CAP Water[4], Development of Other Supplies-Unknown
Hualapai Valley	Mohave (100%)	In-basin Groundwater – Unknown[3], Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Kanab Plateau	Coconino (56%) Mohave (44%0	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lake Havasu	Mohave (100%)	In-basin Groundwater, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lake Mohave	Mohave (100%)	In-basin Groundwater, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Little Colorado River	Apache (38%) Coconino (29%) Navajo (33%)	In-basin Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown

[1]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non-agricultural uses supplied by the Colorado River. [2]Potential additional Colorado River supply identified for basins having reaches of Colorado River bordering or within the basin. Actual development is unlikely unless flow of river is augmented. [3]Basin currently in overdraft; long-term groundwater sustainability

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Table 4(d) Continued

issues at baseline rate of consumption		Potential Future Water Supplies Available
Lower Gila	La Paz (4%) Maricopa (19%) Pima (19%) Yuma (58%)	In-basin Groundwater, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Lower San Pedro	Cochise (16%) Gila (4%) Graham (9%) Pima (16%) Yuma (55%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
McMullen Valley	La Paz (51%) Maricopa (35%) Yavapai (13%)	In-basin Groundwater – Unknown[3], Development of Other Supplies-Unknown
Morenci	Apache (6%) Graham (23%) Greenlee (71%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Paria	Coconino (100%)	In-basin Groundwater, In-state Surface Water, Colorado River[2]-Unlikely, Development of Other Supplies-Unknown
Parker	La Paz (92%) Yuma (8%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Colorado River[2] – Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Peach Springs	Coconino (27%) Mohave (64%) Yavapai (9%)	In-basin Groundwater, In-state Surface Water, Colorado River[2]-Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Phoenix AMA	Maricopa (84%) Pinal (15%) Yavapai (1%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Pinal AMA	Maricopa (9%) Pima (36%) Pinal (55%)	In-basin Groundwater, Transported Groundwater, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Prescott AMA	Yavapai (100%)	In-basin Groundwater – Unknown[3], Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Sacramento Valley	Mohave (100%)	In-basin Groundwater, Colorado River[2]-Unlikely, Reclaimed Water, Development of Other Supplies-Unknown
Safford	Cochise (27%) Gila (17%) Graham (55%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Salt River	Apache (19%) Gila (45%) Graham (4%) Greenlee (3%) Maricopa (7%) Navajo (20%) Pinal (2%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown

[1]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non agricultural uses supplied by the Colorado River. [2]Potential additional Colorado River supply identified for basins having reaches of Colorado River

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Table 4(d) Continued

		Potential Future Water Supplies Available
bordering or within the basin. Actual development is unlikely unless flow of river is augmented.[3]Basin currently in overdraft; longterm groundwater sustainability issues at baseline rate of consumption		
San Bernardino Valley	Cochise (100%)	In-basin Groundwater, In-state Surface Water, Development of Other Supplies-Unknown
San Simon Wash	Maricopa (1%) Pima (99%)	In-basin Groundwater, Reclaimed Water, Development of Other Supplies-Unknown
Shivwits Plateau	Mohave (100%)	In-basin Groundwater, In-state Surface Water, Colorado River[2]-Unlikely, Development of Other Supplies-Unknown
Tiger Wash	Maricopa (100%)	In-basin Groundwater, Development of Other Supplies-Unknown
Tonto Creek	Coconino (1%) Gila (99%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Tucson AMA	Pima (79%) Pinal (18%) Santa Cruz (3%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, CAP Water[4], Reclaimed Water, Development of Other Supplies-Unknown
Upper San Pedro	Cochise (93%) Pima (1%) Santa Cruz (6%)	In-basin Groundwater, Transported Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Verde River	Coconino (35%) Gila (8%) Maricopa (6%) Yavapai (52%)	In-basin Groundwater, In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown
Willcox	Cochise (79%) Graham (21%)	In-basin Groundwater – Unknown[3], In-state Surface Water, Reclaimed Water, Development of Other Supplies-Unknown

[1]All basins that may require development of additional supplies in this year are included. Some may require additional supplies only in the High Demand scenario, when there are shortages on the Colorado River, or for non-agricultural uses supplied by the Colorado River. [2]Potential additional Colorado River supply identified for basins having reaches of Colorado River bordering or within the basin. Actual development is unlikely unless flow of river is augmented. [3]Basin currently in overdraft; long-term groundwater sustainability issues at baseline rate of consumption. [4]Potential additional CAP supply identified for basins currently receiving CAP water.

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Table 5. Potential Legal and Technical Issues Associated with Additional Water Supplies

Type of Supply	Potential Legal and Technical Issues
In-basin Groundwater	Available groundwater in storage Current groundwater basin overdraft Aquifer heterogeneity and productivity Water quality Earth Fissures and Land Subsidence Groundwater/surface water impacts Colorado River accounting surface impacts Environmental Tribal rights and claims Groundwater rights and well drilling rules Costs to drill wells and to pump, treat and transport groundwater Data limitations
Transported Groundwater	All in-basin groundwater issues Inter- basin transfer restrictions
In-state Surface Water	Physical availability Physical availability of new dam and reservoir sites Cost to construct and operate new diversions and transportation infrastructure Water quality Environmental Cost to treat and acquire surface water rights Tribal rights and claims
Colorado River	Physical availability Water quality Cost to treat and acquire entitlements Environmental Tribal rights and claims
CAP	Physical availability Proximity to CAP canal Tribal rights and claims Treatment cost Low priority in times of shortage
Reclaimed Water	Water quality Cost to treat and transport
Mine and Agricultural Drainage	Groundwater/surface water impacts Water quality Treatment cost
Desalination of Ocean Water	International and interstate water transfer issues Cost to treat and construct infrastructure Ownership of water Availability of electric power
Desalination of Brackish Water	Cost Federal regulations Availability of electric power
Weather Modification	Cost

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	Technical feasibility

Table 7. Comparison of Various Funding Sources for WSDR Fund

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Revenue Source	Advantages	Disadvantages
Federal Grants and Loans	·Long history of federal funding for water projects in addition to involvement with assessment, design, construction and management ·May be only source available for federal holdings and Indian Communities ·May be available for project start-up ·Dependable once granted	·Available funding extremely limited ·Difficult to obtain funds in a timely manner ·Costs associated with obtaining grants and loans ·Costs associated with mandatory compliance activities
General Fund Appropriations	·Central funding source benefits from economy of scale ·Funding based on diverse range of revenue sources	·Available funding extremely limited ·Future funding determined by economic climate and subject to reappropriation by legislature ·Revenue does not come directly from benefiting parties ·Potential opposition by those who do not benefit
Statewide Specific Taxes		
Bottled Water Tax	·Tax rate negligible with little economic impact ·Dependable as long as patterns of use remain constant	·Revenue does not come directly from benefiting parties ·No nexus between tax and water projects to be funded ·Does not itself generate sufficient revenue ·May require supermajority or public vote
Transaction Privilege Tax	·Dependable ·Statewide base for funding source	·Revenue does not come directly from benefiting parties ·No nexus between tax and water projects to be funded ·Magnitude of revenue tied to rate tax is levied. ·May require supermajority or public vote
New or Existing Well Fees	·Dependable if applied to existing wells ·Statewide base for funding source	·Less dependable if applied to new wells ·Revenue does not come directly from benefiting parties ·No nexus between fee and water projects to be funded ·May be inequitable if all well types assessed the same fee
Statewide New Development Tax	·Revenue levels somewhat tied to demands ·Statewide base for funding source ·Revenue could be significant	·May be inequitable if a similar fee already charged ·Revenue does not come directly from benefiting parties ·Not dependable because tied to economy
Local Area Development Impact Fees	·Revenue levels somewhat tied to demands ·Revenue could be significant ·Nexus between fee and water projects to be funded ·Funding comes directly from benefiting parties ·Can be set by city, town or county governing body	·May require amendment to existing law ·Narrow base for funding source; only new development pays the fee ·Not dependable because tied to economy ·Requires action be taken by user before fee implemented
Specific Area Taxes, Assessments, Levies or Volumetric Charges		
Special District Assessment or Charge	·Revenue levels somewhat tied to demands ·Revenue could be significant	·May require amendment to existing law ·Narrow base for funding source

Table 7 Continued

	·Assessments could be charged over time, reducing economic impact ·Nexus between assessment and water projects to be funded ·Funding comes directly from benefiting parties ·Equitable ·Can be used to finance operation and maintenance costs in addition to initial capital costs	·Not dependable because tied to economy ·May not itself generate sufficient revenue ·Formation of special districts can be difficult ·May require property owners to use property as collateral
Public or Private Utility Connection and Volumetric Charges	·Dependable · Revenue could be significant ·Rate could be charged over time, reducing economic impact ·Nexus between charges and water projects to be funded ·Funding comes directly from benefiting parties ·All users can be required to pay ·Can be used to finance operation and maintenance costs in addition to initial capital costs	·Narrow base for funding source
Local/Regional Ad Valorem Taxes	·Taxes are charged over time, reducing economic impact ·Nexus between tax and water projects to be funded ·Funding comes primarily from benefiting parties ·Equitable ·Less volatile than other taxes ·Revenue could be significant	· May tax water users in an inequitable manner ·Narrow base for funding source ·May require legislative action
Groundwater Withdrawal Fees	·Fees are charged over time, reducing economic impact ·Nexus between fees and water projects to be funded ·Dependable	·May not itself generate sufficient revenue ·Requires legislative action

Table 9. Current Groundwater Supply for All Basins (4/5/2011)

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All Basins Current Groundwater Supply Analysis[1] Rev 4_5_2011

Basin	Sub-Basins	2006 GW Demand [2] (AF)	2006 AG Drainage Pumping [2] (AF)	Estimated Natural Recharge [3] (AF/YR)	Estimated Groundwater in Storage [4] (AF)	Adjusted Groundwater in Storage [5] (AF)	No. of Non-Cancelled, Non-abandoned, Production wells including	Sum of tested pump capacity of wells in column to the left (gpm)	Maximum Current Pump Capacity (AF/YR)[21]	Historical Committed Demand (Since 1973) (AF/YR)	Committed Demand Since 1995 (AF/YR)	Adjusted GW in Storage divided by 100 years (AF/YR)	2006 GW Demand Exceeds Natural Recharge?	Ratio 2006 GW Demand: Storage [6]	Recent Negative Water Level Change Rate [7] (Ft/Yr)	Available Supply [8] (Assumption 1) Long-Term GW Supply >= Current GW Demand	Available Supply [9] (Assumption 2) Long-Term GW Supply ≈ Current GW Demand	Available Supply [10] (Assumption 3) Long-Term GW Supply < Current GW Demand	Available Supply [11] (Assumption 4) For AMAs Provided By CR Basin Model Projections	Available Supply [12] (Assumption 5) Long-Term GW Supply >= Current GW Demand For Basins with Direct or Potential Colorado River Connections	Documented Historic or Current GW/SW Impacts?[13]	Perennial Stream[14] (Miles)
Agua Fria	None	3,600		9,000	600,000	480,000	1,168	16,157	26,061	1	0	4,800	No	1:150	-0.1	3,600					?	107
Aravaipa Canyon	None	500		7,000	5,000,000	4,000,000	190	10,941	17,648	0	0	40,000	No	1:8,000	-0.1	500					N	50
Big Sandy	Fort Rock	15,000		22,000	9,500,000	7,600,000	2,074	23,506	37,915	110	110	76,000	No	1:500	-0.4	15,000					?	49
	Wikieup														-0.5							
Bill Williams [16]	Burro Creek	3,300		32,000	10,000,000	8,000,000	4,970	196,310	316,649	8	8	80,000	No	1:2,400	NA					3,300	N	152
	Alamo Reservoir														-0.2							
	Clara Peak														NA							
	Skull Valley														-1.3							
	Santa Maria														-0.1							
Bonita Creek	None	3,300		9,000	1,000,000	800,000	4	650	1,048	0	0	8,000	No	1:250	NA	3,300					N	14
Butler Valley	None	14,500		1,000	2,000,000	1,600,000	1	14,270	23,018	0	0	16,000	Yes	1:100	-1		14,500				N	
Cienega Creek	None	1,100		8,500	5,100,000	4,080,000	1,050	11,731	18,922	427	427	40,800	No	1:3,700	-0.3	1,100					?	46
Coconino Plateau	None	500		NA	3,000,000	2,400,000	84	3,486	5,623	67	67	24,000	UNK	1:4,800	-0.5	500					Y	197
Detrital Valley [16]	None	150		1,000	1,000,000	800,000	187	2,212	3,568	19,181	19,129	8,000	No	1:5,300	-0.8					150	N	27
Donnelly Wash	None	19		3,000	140,000	112,000	53	1,356	2,187	0	0	1,120	No	1:5,900	NA	19					N	3
Douglas	Douglas	53,500		15,500	20,800,000	16,640,000	1,382	319,410	515,211	0	0		Yes	1:300	-1.2		53,500				?	2
	Douglas INA[15]														-1.3							
Dripping Springs Wash	None	11		3,000	150,000	120,000	56	5,441	8,776	0	0	1,200	No	1:10,900	-0.4	11					N	7
Duncan Valley	None	8,100		6,000	9,000,000	7,200,000	351	44,090	71,117	0	0	72,000	Yes	1:900	-0.2	8,100					?	26
Gila Bend	None	295,300		10,000	17,000,000	13,600,000	382	464,411	749,098	36,645	36,645	136,000	Yes	1:50	-4.3			< 295,300			Y	
Grand Wash	None	2		NA	NA	NA	6	40	65	0	0	N/A	NA	NA	NA	2					N	4
Harquahala	None	66,200		1,000	13,000,000	10,400,000	255	239,697	386,633	22,986	22,986	104,000	Yes	1:150	-1.1		66,200				?	
Hualapai Valley	None	8,800		2,000	3,000,000	2,400,000	843	15,138	24,418	96,702	83,785	24,000	Yes	1:250	-0.9		8,800				N	21
Kanab Plateau [16]	None	1,300		NA	NA	NA	178	3,176	5,123	412	412	N/A	NA	NA	-0.1					1,300	N	139
Lake Havasu [16]	None	0		35,000	1,000,000	800,000	69	3,695	5,960	209	209	8,000	No	NA	NA					0	Y	38
Lake Mohave [16]	None	3,500		183,000	1,200,000	960,000	900	32,981	53,199	24,053	23,925	9,600	No	1:250	-0.1					3,500	Y	122
Little Colorado River Plateau [16,17]	C-aquifer	98,700		319,000	413,000,000	330,400,000	5,742	224,777	362,567	38,764	34,145	7,632,000	No	1:3,300	-1.4					98,700	Y	884
	D-aquifer			5,400	15,000,000	12,000,000																
	N-aquifer			20,200	526,000,000	420,800,000																
	Joseph City INA[15]			NA	NA	NA									NA							
Lower Gila [16]	Childs Valley	110,350	104000	9,000	100,000,000	80,000,000	2,199	998,628	1,610,794	0	0	800,000	Yes	1:700	NA					110,350	Y	11
	Dendora Valley														-1.7							
	Wellton-Mohawk														-0.4							
Lower San Pedro	Camp Grant Wash	23,700		24,000	11,000,000	8,800,000	1,382	111,318	179,557	1,265	1,203		No	1:350	-0.2	23,700					Y	77
	Mammoth														-0.6							
McMullen Valley	None	71,500		1,000	14,000,000	11,200,000	335	50,896	82,096	36,351	36,103	112,000	Yes	1:150	-2.2		71,500				?	
Meadview	None	150		4,000	1,000,000	800,000	38	651	1,050	0	0	8,000	No	1:5,300	-1.1	150					N	7
Morenci	None	9,200		15,000	3,000,000	2,400,000	331	35,094	56,607	0	0	24,000	No	1:250	-0.6	9,200					?	355
Paria	None	100		NA	15,000,000	12,000,000	10	1,060	1,710	452	0	120,000	UNK	1:120,000	-1.2		100				N	27
Parker [16]	Cibola Valley	1,800		241,000	14,000,000	11,200,000	4,410	80,607	130,020	985	909	112,000	No	1:6,200	NA					1,800	Y	147
	Colorado River Indian Reservation														-0.1							
	La Posa Plains														-0.9							
Peach Springs	None	350		NA	1,000,000	800,000	27	1,628	2,626	0	0	8,000	UNK	1:2,300	-0.1		350				N	14
Phoenix[18,19]	Carefree	689,300		172,300	80,400,000	64,320,000	86,793	15,103,060	24,361,344	631,935	594,224	643,200	Yes	1:93	NA				TBD		Y	
	East Salt River														-1.1							
	Fountain Hills														-2.1							
	Hassayampa														-0.2							
	Lake Pleasant														-0.4							
	Rainbow Valley														-0.6							
	West Salt River														-1							
Pinal[18,20]	Aguirre Valley	434,700		96,300	35,200,000	28,160,000	11,580	3,555,490	5,735,031	235,237	232,175	281,600	Yes	1:65	-0.8				TBD		Y	
	Eloy														-1.8							
	Maricopa-Stanfield														-1							
	Santa Rosa														NA							
	Vekol Valley														-0.1							
Prescott[18,19]	Little Chino	20,300		8,200	3,000,000	2,400,000	14,556	233,594	376,789	25,052	22,381	24,000	Yes	1:100	-1.4		20,300				Y	
	Upper Agua Fria														-1.4							
Ranegras Plain	None	29,350		1,000	9,000,000	7,200,000	403	55,092	88,864	312	312	72,000	Yes	1:250	-0.9		29,350				N	
Sacramento Valley	None	4,000		1,000	3,600,000	2,880,000	911	13,349	21,532	31,807	30,805	28,800	Yes	1:700	-0.5	4,000					N	5
Safford	Gila Valley	84,900		105,000	27,000,000	21,600,000	5,820	781,140	1,259,984	7,438	3,433	216,000	No	1:250	-0.2	84,900					Y	157
	San Carlos Valley														NA							
	San Simon Valley														-1.2							
Salt River	Black River	12,500		178,000	8,700,000	6,960,000	4,260	147,064	237,215	0	0	69,600	No	1:550	NA	12,500					?	1187
	Salt River Canyon														-0.3							
	Salt River Lakes														-2.2							
	White River														NA							
San Bernardino Valley	None	19		9,000	1,600,000	1,280,000	74	2,050	3,307	0	0	12,800	No	1:67,400	-0.4	19					?	2
San Rafael	None	22		5,000	4,000,000	3,200,000	102	6,048	9,755	0	0	32,000	No	1:145,500	-0.4	22					?	14
San Simon Wash	None	1,500		11,000	6,700,000	5,360,000	4	5	8	0	0	53,600	No	1:3,600	NA	1,500					?	
Santa Cruz [18,19]	None	20,600		50,800	160,000	128,000	774	69,058	111,391	22,100	21,920	1,280	No	1:6	-0.5	20,600					Y	
Shiwits Plateau	None	2		NA	NA	NA	9	5	8	0	0	NA	UNK	UNK	NA		2				N	61
Tiger Wash	None	2		1,000	700,000	560,000	6	140	226	0	0	5,600	No	1:280,000	NA	2					N	
Tonto Creek	None	3,000		17,000	2,000,000	1,600,000	1,301	15,969	25,758	25	25	16,000	No	1:550	-0.4	3,000					?	129
Tucson [18,19]	Avra Valley	216,900		99,100	61,000,000	48,800,000	12,080	1,083,028	1,746,932	141,606	135,095	488,000	Yes	1:200	-1.5				TBD		Y	52
	Upper Santa Cruz														-1.6							
Upper Hassayampa	None	3,800		8,000	1,000,000	800,000	1,219	18,050	29,115	2,696	2,306	8,000	No	1:200	-0.4	3,800					Y	52
Upper San Pedro	Allen Flat	24,000		35,800	19,800,000	15,840,000	8,198	363,864	586,915	27,570	20,881	158,400	No	1:650	-0.4	24,000					Y	101
	Sierra Vista														-0.5							
Verde River	Big Chino	29,000		107,000	13,000,000	10,400,000	25,143	474,255	764,977	56,219	53,816	104,000	No	1:350	-0.2	29,000					Y	475
	Verde Canyon														-2.4							
	Verde Valley														-1.2							
Virgin River	None	1,600		30,000	1,700,000	1,360,000	309	16,831	27,149	11,310	11,301	13,600	No	1:850	-0.1	1,600					Y	47
Western Mexican Drainage	None	6		1,000	3,000,000	2,400,000	9	274	442	0	0	24,000	No	1:400,000	-0.5	6					N	
Willcox	None	175,700		15,000	42,000,000	33,600,000	2,310	261,777	422,248	2,007	2,007	336,000	Yes	1:200	-2		175,700				Y	32
Yuma [16]	None	104,200	99,000	213,000	34,000,000	27,200,000	1,522	165,668	267,224	16,377	12,311	272,000	No	1:250	-0.4					104,200	Y	53

Table 9 Notes:

NA - Not Available

1 Natural recharge estimates, groundwater-in-storage from ADWR Arizona Water Atlas report and AMA Assessment reports.

2 2006 Groundwater demand and drainage pumping for non-AMA basins from unpublished USGS data. Drainage pumpage for Lower Gila and Yuma basins provided by USGS estimates. Please note that drainage pumpage may occur in other basins but is not differentiated from other groundwater withdrawals. A portion of current drainage pumping is used to satisfy US/Mexico Colorado River water settlements. Some drainage pumpage may be available to supply additonal future water demands. 2006 Groundwater demand totals and related ratios not rounded if less than 100 AF, rounded to nearest 50 acre-feet if >100AF and <1000AF, rounded to nearest 100 AF if > 1,000AF.

3 See Atlas Volumes 2 through 7 for non-AMA natural recharge data sources. Where more than one estimate of natural recharge was available the lowest estimate is shown here.

Note: Natural recharge for AMAs taken from most recent AMA Water Demand and Supply Assessments.

AMA natural recharge assessments generally include stream channel infiltration from natural flows and reclaimed water discharged to natural channels not associated with recharge projects, mountain front recharge and basin groundwater underflow (inflow only).

4 See Atlas Volumes 2 through 8 for groundwater-in-storage data sources. Where more than one estimate of groundwater-in-storage was avaialable the lowest estimate is shown here. All groundwater-in-storage is to 1,200 feet below land surface (BLS) unless otherwise indicated.

5 Value shown is 80% of estimated groundwater-in-storage. Adjustment reflects hydrologic, practical and other limitations on actual volume of groundwater that may be produced from a groundwater basin. (Adjustment percentage is not based on basin specific data or analysis)

6 A low ratio of demand to storage is of less concern in basins where the natural recharge exceeds demand.

7 Recent water level decline rate is based on (circa 1990 to mid to late 2000's) groundwater level data for wells showing declines in each basin. Many basins also have wells that show rises over the same period. A complete analysis of basinwide water level change is available by reviewing maps and tables found in WRDC Water Supply Infoshare directory.

8 Available Supply Assumption 1 - Long-term (at least 100-years) basinwide groundwater supply is at least equal to current groundwater demand. Any local or basinwide groundwater overdraft that may be indicated by basin wl negative change rate or from water budget data, is not considered likely to impact future available groundwater supply within next 100 years (at current rate of demand).

9 Available Supply Assumption 2 - Long-term (at least 100 years) basinwide groundwater supply is about equal to current groundwater demand. Any local or basinwide groundwater overdraft that is indicated by basin wl negative change rate or from water budget data, is significant and may impact future available groundwater supply within next 100 years (at current rate of demand).

Basins lacking natural recharge estimates were placed in this Available Supply Assumption (ie, Paria, Peach springs, and Shivwitz Plateau) however it is likely that these basins could have been grouped in Assumption 1.

10 Available Supply Assumption 3 - Long-term (at least 100-years) basinwide groundwater supply is less than current groundwater demand. Any local or basinwide groundwater overdraft that is indicated by basin wl negative change rate or from water budget data, is significant and will impact future available groundwater supply within next 100 years (at current rate of demand).

11 Available Supply Assumption 4 - Long-term (at least 100 years) basinwide groundwater supply will be analyzed using Colorado River basin model (work in progress, results to be determined, as of 3/7/2011).

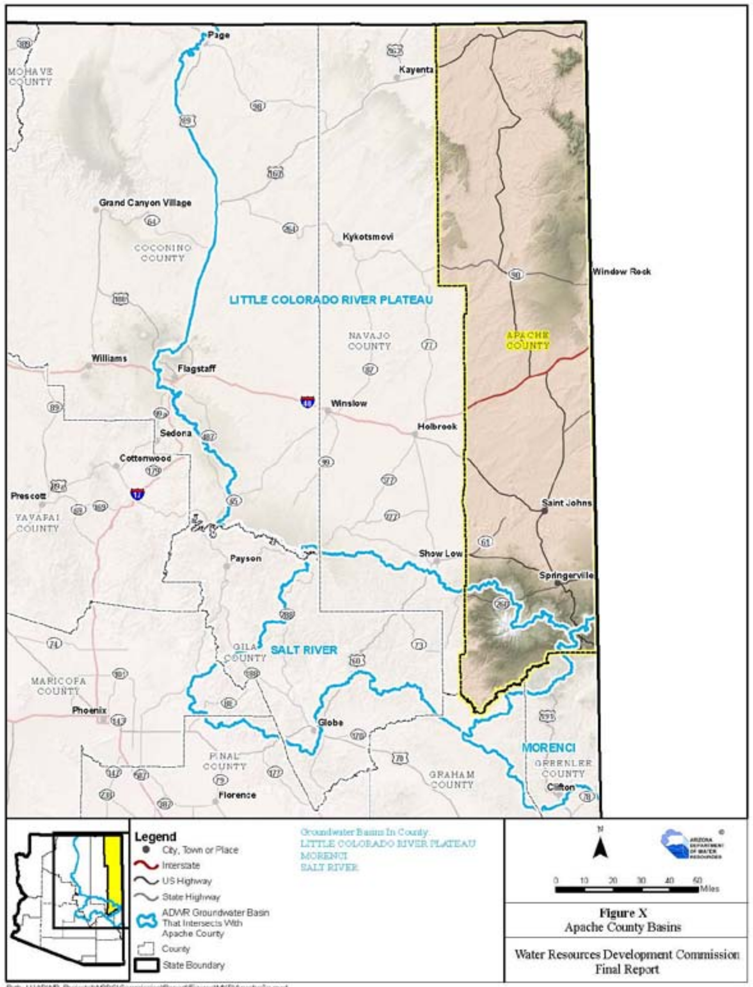
12 Available Supply Assumption 5 - Long-term (at least 100 years) basinwide groundwater supply (for basins with direct or potential Colorado River hydraulic connection) is at least equal to current groundwater demand. However, estimated basin groundwater storage has not been dis-aggregated into separate Colorado River and non-Colorado River components, and some future well withdrawal volumes greater than current demands could be disallowed due to potential Colorado River impacts.

13 Statewide assessment of documented historic or current groundwater/surface water impacts is preliminary and subject to additional review for completeness and accuracy. Identification and administration of any historic or current gw/sw impacts identified for Colorado River basins may be subject to federal procedures, rules and regulations that would not apply to in-state river systems.

14 Perennial stream miles per groundwater basin from ADEQ_USGS Perennial River Miles database

15 The Douglas INA and the Joseph City INA are political divides within the Douglas and Little Colorado River basins and are not sub-basins per se.
16 2006 Groundwater demand for Colorado River Basins has been analyzed to exclude any Colorado River water or other surface water that is produced from wells (4/5/11 update).
17 The C-, N-, and D-aquifers are not sub-basins, however separate recharge and storage data were available for them so they are included here
18 2006 Groundwater demand for AMAs from AMA Assessments (includes all demands identified as "Groundwater". However, does not include "In-Lieu" groundwater)
19 Storage is to a depth of 1,000 feet
20 Storage to a depth of 1,100 feet
21 Based on a query of all wells in the Gila Bend basin, using the water production, exempt, exempt-domestic, other and non-exempt categories, non-cancelled and a 100% duty cycle. See sheet "SQL."

FIGURES MAPS OF COUNTIES AND GROUNDWATER BASINS



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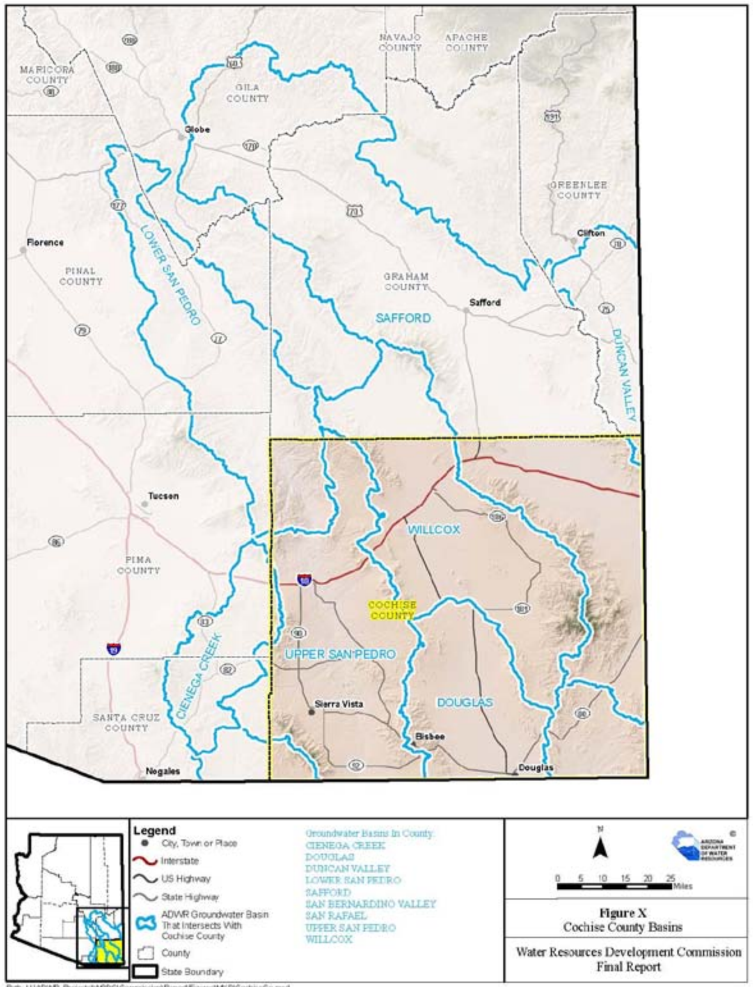
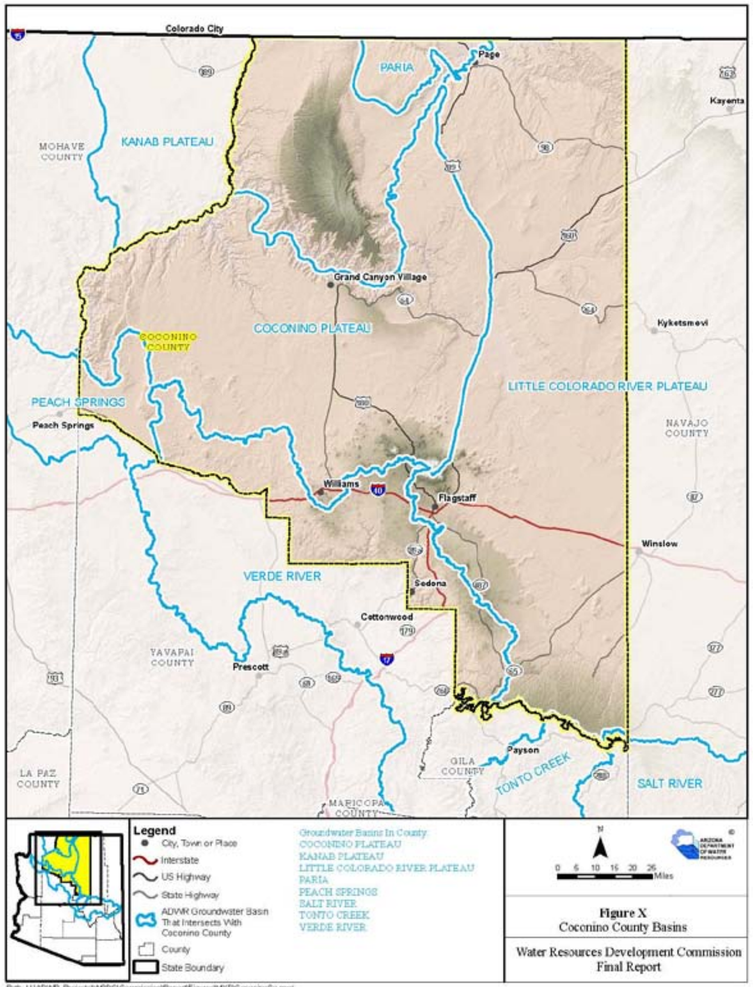


Figure X
Cochise County Basins



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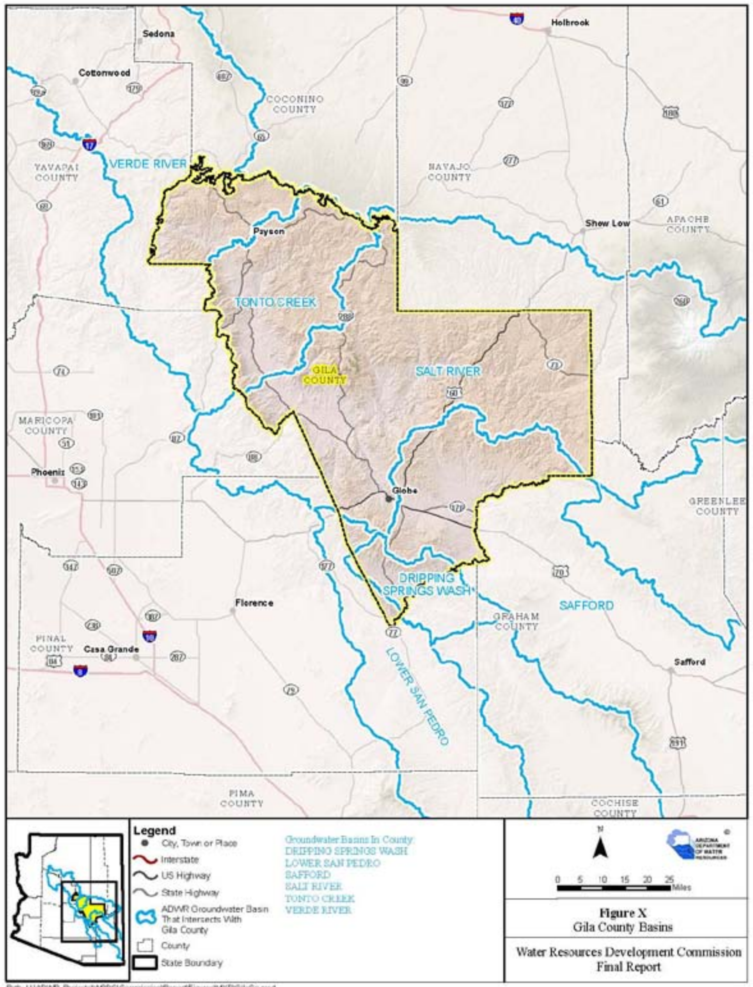
Sedona
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Holbrook
COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
VERDE RIVER
Payson
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APACHE COUNTY
TONTO CREEK
GILA COUNTY
SALT RIVER
MARICOPA COUNTY
Phoenix
Globe
GREENLEE COUNTY
DRIPPING SPRINGS WASH
Florence
GRAHAM COUNTY
SAFFORD
PINAL COUNTY
Casa Grande
Safford
LOWER SAN PEDRO
PIMA COUNTY
COCHISE COUNTY
Legend
City, Town or Place
Interstate
US Highway
State Highway
ADWR Groundwater Basin That Intersects With Gila County
County
State Boundary
Groundwater Basins In County
DRIPPING SPRINGS WASH
LOWER SAN PEDRO
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Gila County Basins
Water Resources Development Commission
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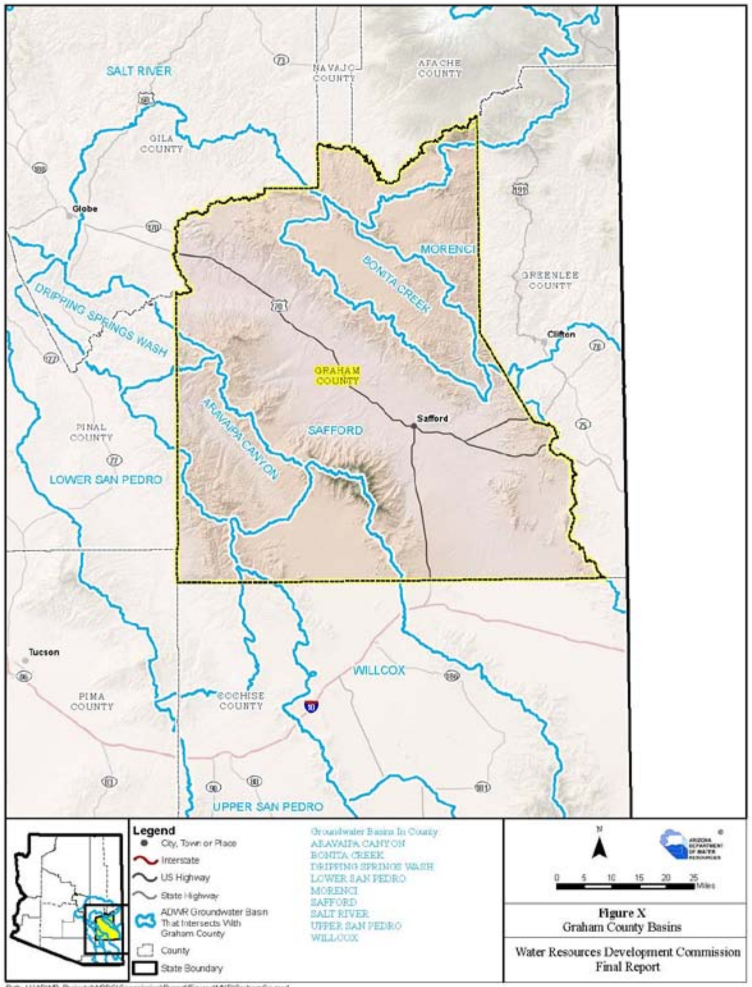

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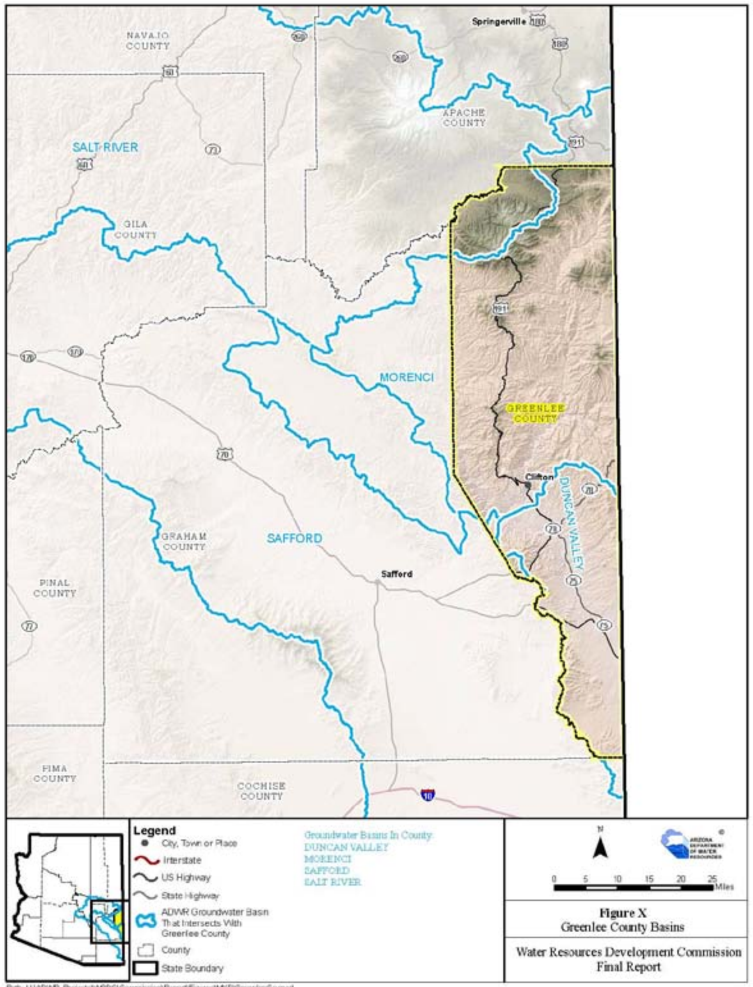

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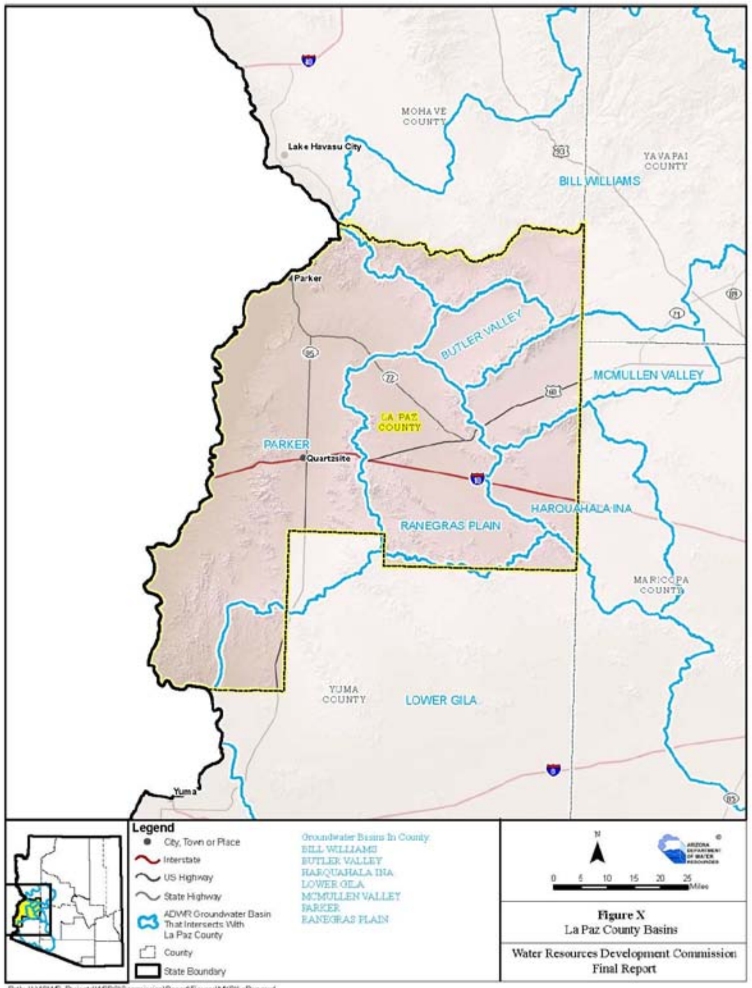

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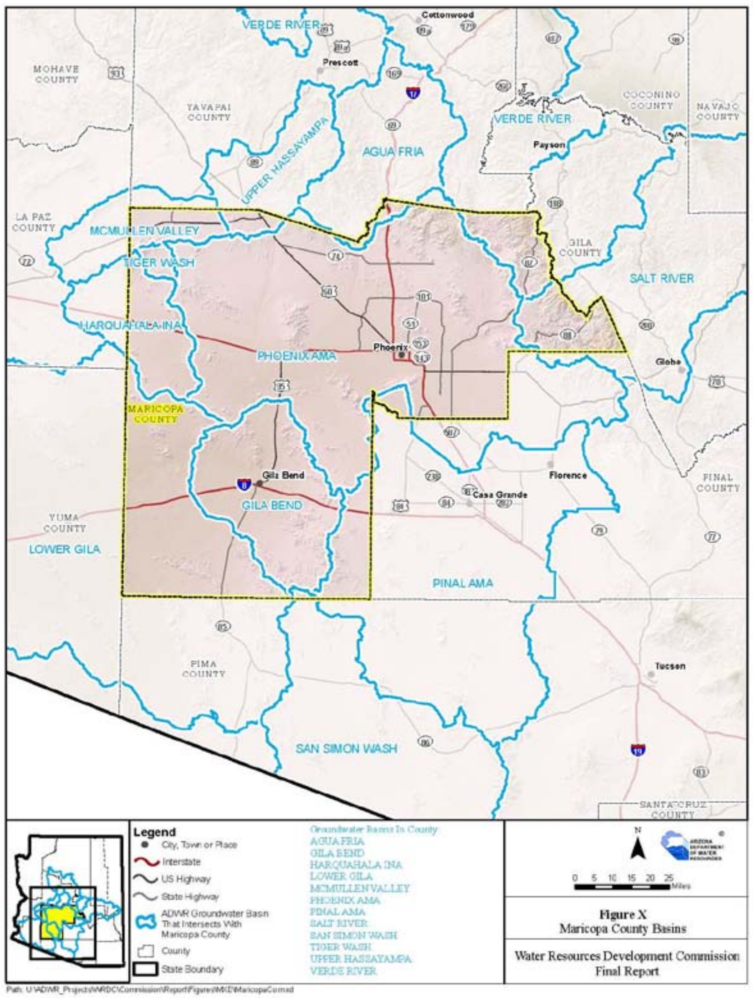

VERDE RIVER
Cottonwood
Prescott
MOHAVE COUNTY
YAVAPAI COUNTY
COCONINO COUNTY
NAVAJO COUNTY
UPPER HASSAYAMPA
AGUA FRIA
VERDE RIVER
Payson
LA PAZ COUNTY
MCMULLEN VALLEY
TIGER WASH
GILA COUNTY
SALT RIVER
HARQUAHALA INA
PHOENIX AMA
Phoenix
Globe
MARICOPA COUNTY
Gila Bend
GILA BEND
Florence
Casa Grande
PINAL COUNTY
YUMA COUNTY
LOWER GILA
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AGUA FRIA
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Figure X
Maricopa County Basins
Water Resources Development Commission
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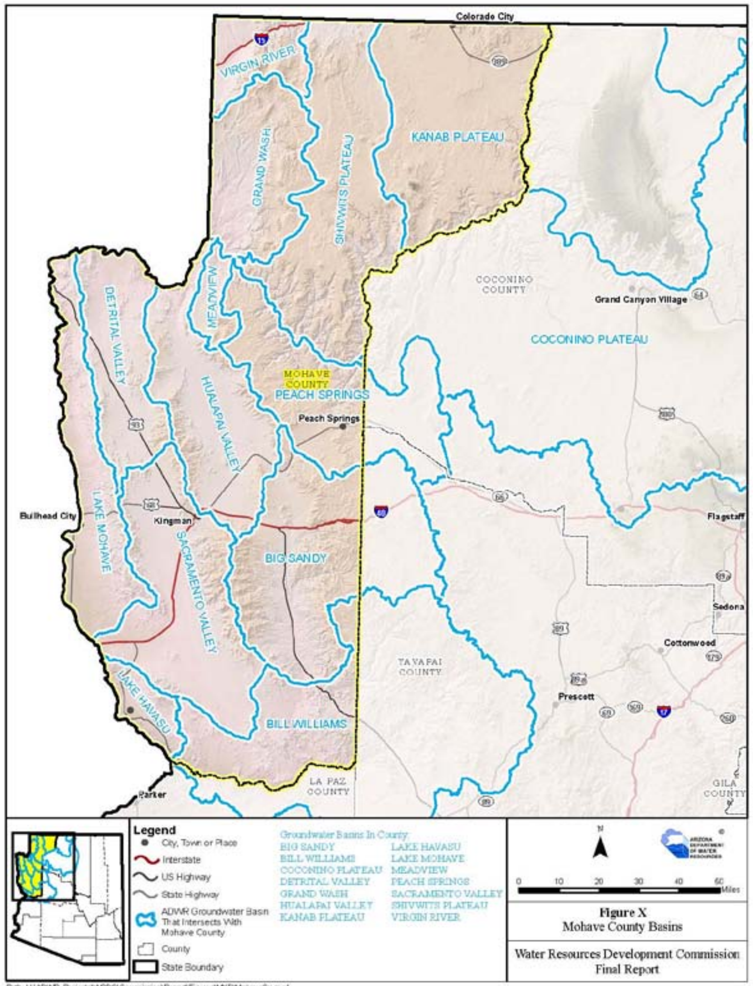
Colorado City
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SHIVWITS PLATEAU
MEADVIEW
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HUALAPAI VALLEY
MOHAVE COUNTY
PEACH SPRINGS
Peach Springs
COCONINO COUNTY
Grand Canyon Village
COCONINO PLATEAU
Bullhead City
LAKE MOHAVE
Kingman
SACRAMENTO VALLEY
BIG SANDY
Flagstaff
Sedona
Cottonwood
YAVAPAI COUNTY
Prescott
LAKE HAVASU
BILL WILLIAMS
LA PAZ COUNTY
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BILL WILLIAMS
COCONINO PLATEAU
DETRITAL VALLEY
GRAND WASH
HUALAPAI VALLEY
KANAB PLATEAU
LAKE HAVASU
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Mohave County Basins
Water Resources Development Commission
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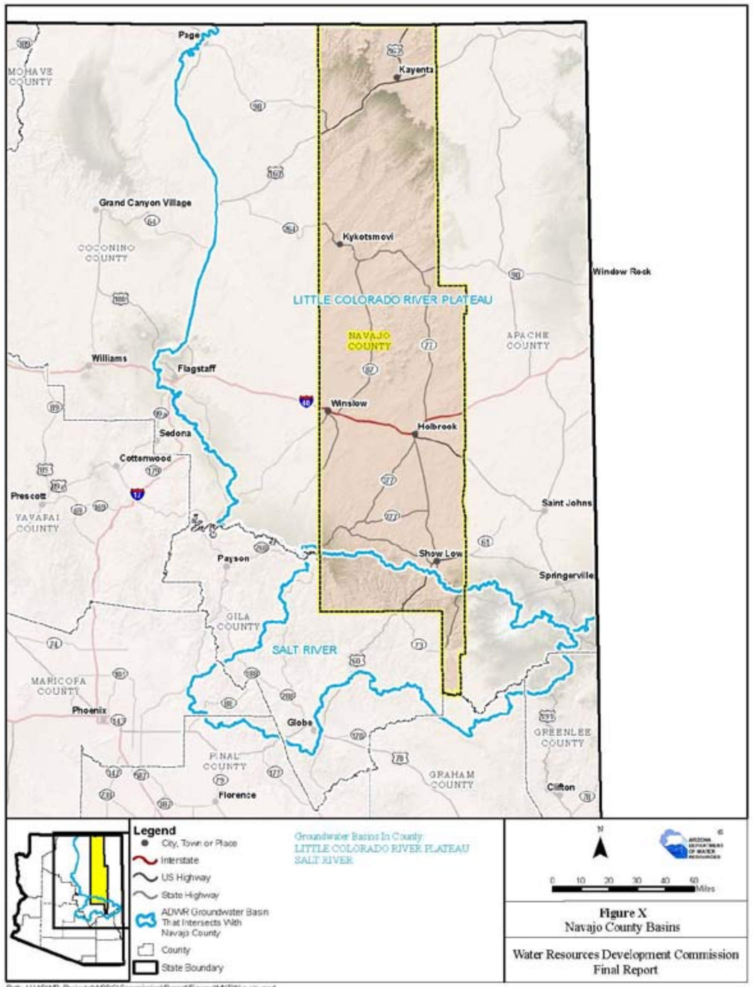
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Grand Canyon Village
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LITTLE COLORADO RIVER PLATEAU
NAVAJO COUNTY
APACHE COUNTY
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Flagstaff
Winslow
Holbrook
Sedona
Cottonwood
Prescott
YAVAPAI COUNTY
Saint Johns
Payson
Show Low
Springerville
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ADWR Groundwater Basin That Intersects With Navajo County
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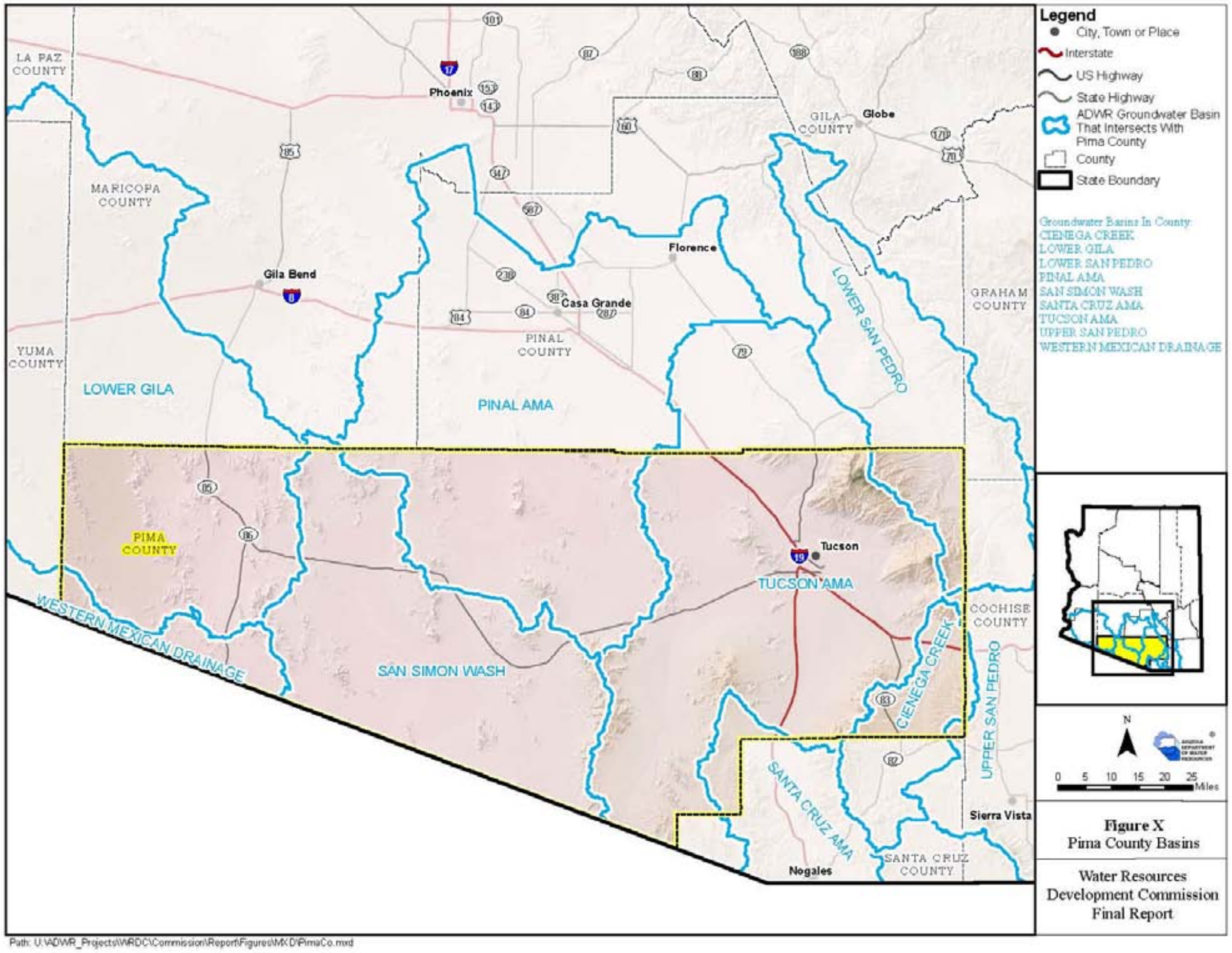
Navajo County Basins
Water Resources Development Commission
Final Report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Groundwater Basins In County:
CIENEGA CREEK
LOWER GILA
LOWER SAN PEDRO
PINAL AMA
SAN SIMON WASH
SANTA CRUZ AMA
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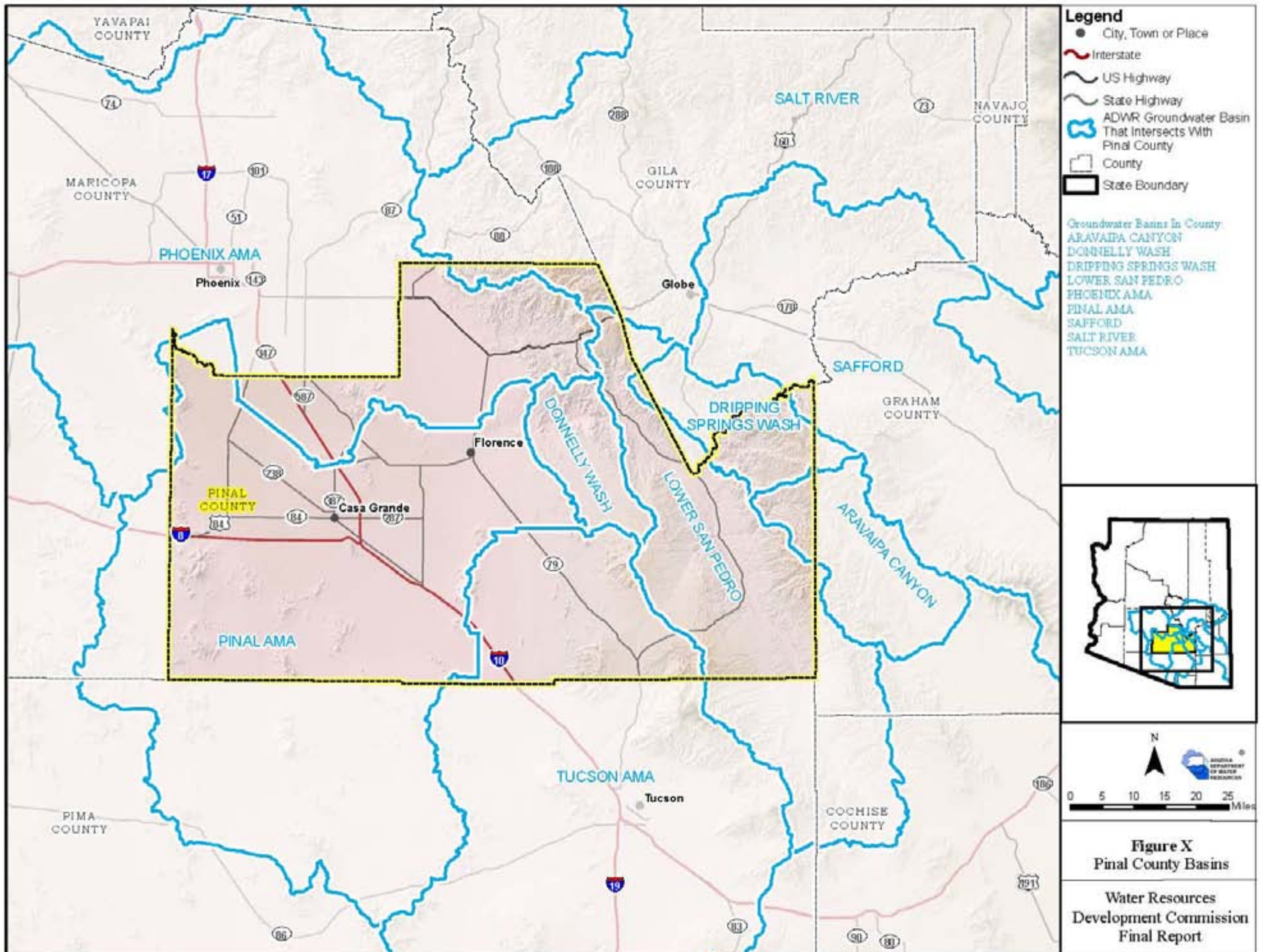

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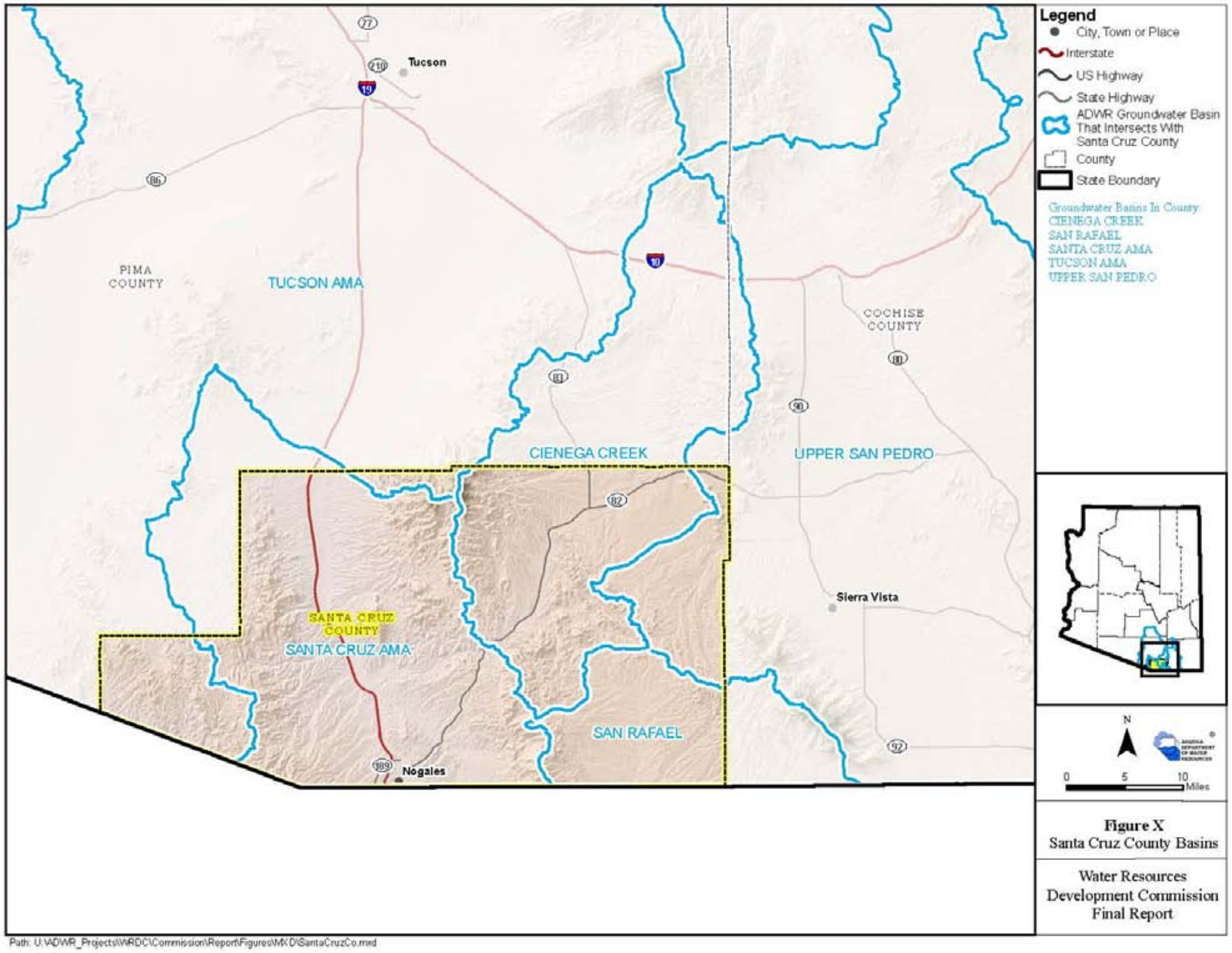
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US Highway
State Highway
ADWR Groundwater Basin That Intersects With Santa Cruz County
County
State Boundary
Groundwater Basins In County:
CIENEGA CREEK
SAN RAFAEL
SANTA CRUZ AMA
TUCSON AMA
UPPER SAN PEDRO
Tucson
PIMA COUNTY
TUCSON AMA
COCHISE COUNTY
CIENEGA CREEK
UPPER SAN PEDRO
SANTA CRUZ COUNTY
SANTA CRUZ AMA
Sierra Vista
SAN RAFAEL
Nogales
N
0 5 10 Miles
Figure X
Santa Cruz County Basins
Water Resources Development Commission Final Report
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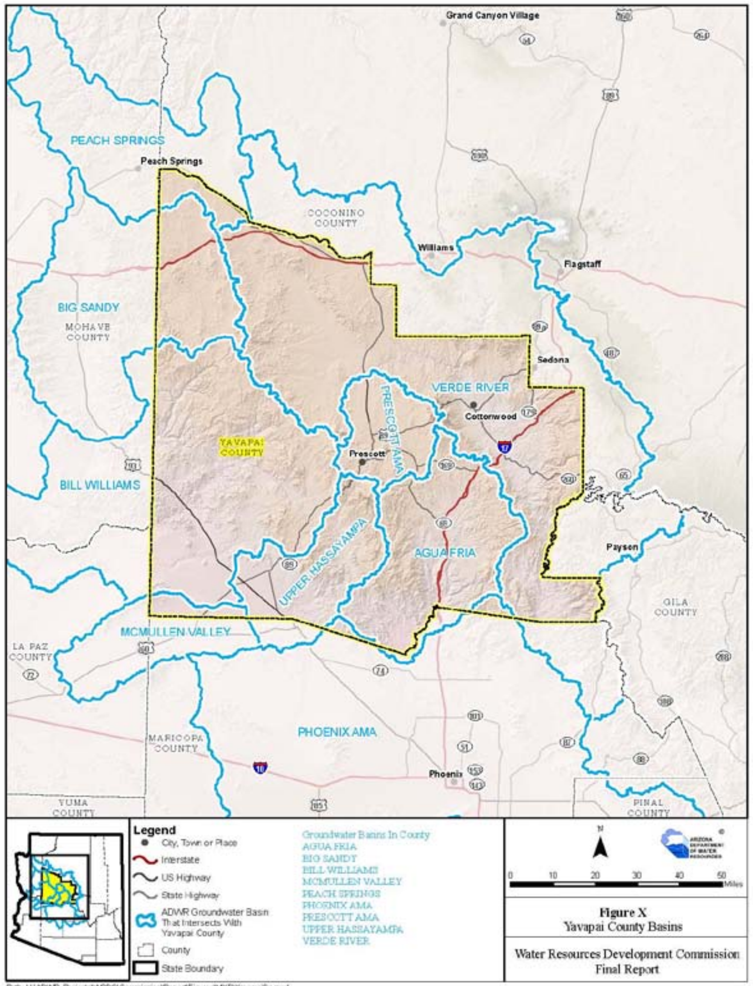

Figure X
Yavapai County Basins

Water Resources Development Commission
Final Report

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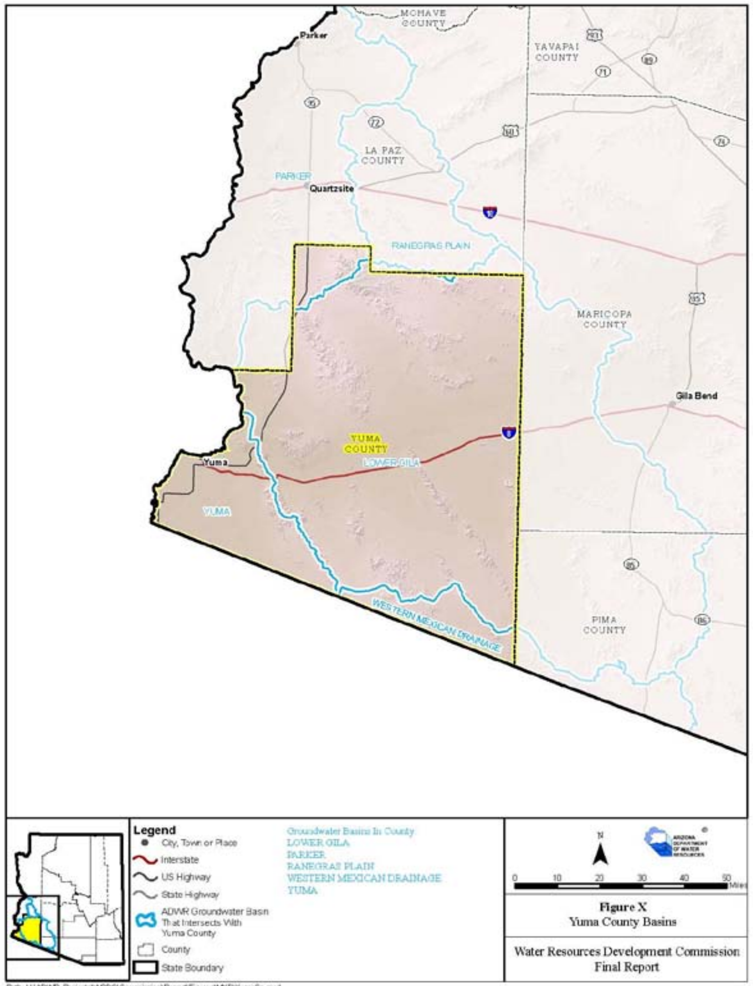
MOHAVE COUNTY
Parker
YAVAPAI COUNTY
LA PAZ COUNTY
PARKER
Quartzsite
RANEGRAS PLAIN
MARICOPA COUNTY
Gila Bend
YUMA COUNTY
LOWER GILA
Yuma
YUMA
WESTERN MEXICAN DRAINAGE
PIMA COUNTY
Legend
City, Town or Place
Interstate
US Highway
State Highway
ADWR Groundwater Basin That Intersects With Yuma County
County
State Boundary
Groundwater Basins In County
LOWER GILA
PARKER
RANEGRAS PLAIN
WESTERN MEXICAN DRAINAGE
YUMA
N
0 10 20 30 40 50
Miles
Figure X
Yuma County Basins
Water Resources Development Commission
Final Report
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APPENDIX II. LIST OF COMMITTEE PARTICIPANTS

Comment [g5]: Added per Sandra Fabritz-Whitney, suggested by others

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Name	Affiliation	Committee ENV – Environmental FIN – Finance LEGREC – Legislative Recommendations POP – Population WS&D – Water Supply and Demand
Senator Allen		LEGREC
Bas Aja	Arizona Cattle Feeder's Association	ENV, WS&D
Robert Anderson	Fennemore Craig	LEGREC
Cynthia Aragon	Arizona State Legislative Liaison	ENV
Chris Avery	City of Tucson	LEGREC
Robin Bain	City of Peoria	LEGREC
William Baker		LEGREC
Jason Baran	Arizona Municipal Water Users Association	ENV, FIN, POP, WS&D
Celia Barotz	City of Flagstaff	ENV
Phil Bashaw	Arizona Farm Bureau	ENV, POP, WS&D
Rhett Billingsley	Ryley, Carlock and Applewhite	WS&D
Bill Brandau	Water Resources Research Center	ENV
Patrick Bray	Arizona Cattle Feeder's Association	POP
Steve Brophy		LEGREC
Katja Brundiers	Arizona State University	ENV
Brenda Burman	The Nature Conservancy	ENV (co-chair), LEGREC, WS&D
Tom Buschatzke	City of Phoenix	ENV, LEGREC, POP, WS&D
Jean Calhoun	U.S. Fish and Wildlife Service	ENV
Supervisor Call	Cochise County Board of Supervisors	LEGREC (co-chair)
Jorge Canaca	Arizona Game and Fish Department	ENV, POP, WS&D
Luana Capponi	Arizona State Land Department	POP, WS&D
Greg Capps	City of Chandler	WS&D
Cliff Cauthen	Hohokam Irrigation and Drainage District	ENV, LEGREC, WS&D
Cynthia Chandley	Snell and Wilmer	WS&D
Jim Chang	Arizona Department of Commerce	POP
Aaron Citron	Arizona Land and Water Trust	ENV, LEGREC
Tom Collazo	The Nature Conservancy	LEGREC, WS&D
Karen Collins	Salt River Project	FIN, LEGREC, POP (chair)

LIST OF COMMITTEE PARTICIPANTS (continued)

Rebecca Comstock	Freeport McMoran Corporation	WS&D
Peter Culp	Squire, Sanders and Dempsey	ENV, WS&D
Kevin Davidson	Mohave County	POP
Rebecca Davidson	Salt River Project	ENV, LEGREC, POP, WS&D
Val Danos	Arizona Municipal Water Users Association	ENV, FIN, LEGREC, WS&D
Tom Davis	Yuma County Water Users Association	LEGREC, WS&D
Christine Dawe	U.S. Forest Service	ENV, WS&D
Henry Day	Arizona Public Service Company	WS&D
Julie Decker	Bureau of Land Management	WS&D
Tony DeMarco		LEGREC
Norm DeWeaver	Inter Tribal Council of Arizona	POP, LEGREC, WS&D
Ron Doba	Northern Arizona Municipal Water Users Association	FIN, LEGREC, WS&D (co-chair)
Wimberly Doran	Arizona State Land Department	LEGREC
Alan Dulaney	City of Peoria	WS&D
Eric Duthie	Town of Taylor	LEGREC, WS&D
Jeff Ehlers	Salt River Project	FIN
Sandy Elder	City of Tucson	LEGREC
Nicole Eiden	Arizona Game and Fish Department	ENV
Craig Engler		LEGREC
Tom Farley		LEGREC
Sean Ferris	Golf Industry Association	LEGREC, WS&D
Tiffanie Figueroa	Freeport McMoran Corporation	LEGREC
Cecilio Flores	City of Tucson	FIN
Brandon Forbes	U.S. Geological Survey	WS&D
Doug Frost	City of Phoenix	FIN
Mike Fulton	Arizona Department of Environmental Quality	ENV
Santiago Garcia	U.S. Bureau of Reclamation	ENV, LEGREC, POP
Maureen George	Mohave County/Northwest Arizona	LEGREC, POP, WS&D
Jocelyn Gibbon	Environmental Defense Fund	ENV, LEGREC, WS&D
Tim Gibson	Freeport McMoran Corporation	LEGREC, WS&D
Supervisor Gomez	Greenlee County Board of Supervisors	WS&D
Vivian Gonzales	U.S. Bureau of Reclamation	LEGREC, WS&D
Angela Gotto	Central Arizona Association of Governments	POP
Jeff Gray		LEGREC
Willie Grayeyes		LEGREC
Wofgang Grunberg	Arizona Game and Fish Department	LEGREC
Simone Hall	The Nature Conservancy	ENV, LEGREC, WS&D
Bruce Hallin	Salt River Project	LEGREC

LIST OF COMMITTEE PARTICIPANTS (continued)

Eve Halper	U.S. Bureau of Reclamation	WS&D
Robert Hardy	City of Cottonwood	LEGREC, WS&D
Jim Hartdegen		FIN, LEGREC, WS&D
Adam Hawkins	Rio Tinto	WS&D
Todd Henderson	Town of Marana	LEGREC
Paul Hendricks	Consultant	FIN, WS&D
Brad Hill	City of Flagstaff	LEGREC, WS&D
Gary Hix	Arizona Water Well Association	WS&D
Mark Holmes	City of Mesa	WS&D
Thomas Homan	Gila County	POP
Amelia Homewytewa	Gila River Indian Community	WS&D
Chip Howard	Turf Science	WS&D
Scott Hughes	Cal Portland Cement	LEGREC, WS&D
John Hunt	Department of Agriculture	POP
Shilpa Hunter-Patel	Freeport McMoran Corporation	LEGREC
Robin Interpreter	Montgomery Interpreter	LEGREC
Dave Iwanski	City of Goodyear	POP
James Jayne	Navajo Nation	ENV
Jeff Johnson	Town of Taylor	POP, WS&D
Russ Jones		LEGREC
Spencer Kamps	Homebuilders Association of Central Arizona	LEGREC, WS&D
Reland Kane	Tucson Electric Power	WS&D
Wanda Kartchner	Pinal County	LEGREC
Jim Kenna	Bureau of Land Management	WS&D
Robert Kirk	Navajo Nation	LEGREC, POP
Jim Klinker	Arizona Farm Bureau	ENV
Dee Korich	City of Tucson	ENV, WS&D
Doug Kupel	City of Phoenix	ENV, FIN, LEGREC, WS&D
Lucius Kyyitan	Gila River Indian Community	ENV, WS&D
Rick Lavis	Arizona Cotton Growers Association	LEGREC, WS&D
Michael Liberti	City of Tucson	POP
Brett Lindsay	Salt River Materials Group	WS&D
Cheryl Lombard	The Nature Conservancy	LEGREC, WS&D
Gus Lundberg	Town of Taylor	FIN
Supervisor Lunt	Greenlee County Board of Supervisors	LEGREC, WS&D
Robert Lynch		LEGREC
Todd Madeksza	County Supervisors	LEGREC
Dean Mair	Collie Canyon	WS&D
Ralph Marra	City of Tucson	WS&D

LIST OF COMMITTEE PARTICIPANTS (continued)

Rob Marshall	The Nature Conservancy	ENV, LEGREC
Brad Martin	Montgomery and Interpreter, PLC	ENV
Verle Martz	Salt River Materials Group	LEGREC, WS&D
Sharon Masek-Lopez	Northern Arizona University	ENV, LEGREC
Tom McCann	Central Arizona Project	LEGREC
Ed McGavock	Errol Montgomery and Associates	WS&D
Colleen McVey	La Paz County	POP
Sharon Megdal		LEGREC
Leslie Meyers	U.S. Bureau of Reclamation	WS&D (co-chair)
Adam Miller	City of Phoenix	POP, WS&D
Beth Miller	City of Scottsdale	LEGREC, WS&D
Susan Montgomery	Montgomery Interpreter	LEGREC
Colette Moore	City of Mesa	WS&D
John Munderloh	Town of Prescott Valley	FIN, LEGREC (co-chair), POP
Brian Munson	ASARCO	WS&D
Shawn Murray	City of Mesa	LEGREC, POP
Scot Mussi		LEGREC
Joanna Nadeau	Water Resources Research Center	ENV
Karen Nally	Representing Hohokam Irrigation and Drainage District and Central Arizona Irrigation and Drainage District	ENV, FIN, POP, WS&D
Lauren Neu	Strand Engineering	FIN, WS&D
Jade Neville	U.S. Geological Survey	WS&D
Wade Noble	Nobel Law Office	ENV, LEGREC, WS&D
Christine Nunez	City of Surprise	ENV, WS&D
Steve Olea	Arizona Corporation Commission	FIN, LEGREC
Steve Olson	Arizona Municipal Water Users Association	ENV, LEGREC, POP, WS&D
Krishna Parameswaran	ASARCO	WS&D
Chris Payne	Snell and Wilmer	WS&D
Yvonne Pearson	Greenlee County	LEGREC, WS&D
Senator Pierce		LEGREC
David Plane	University of Arizona	POP
Bill Plummer	Agri-Business Council of Arizona	ENV, WS&D
Kathy Rall	Town of Gilbert	WS&D
John Rasmussen	Yavapai County	ENV, LEGREC, POP, WS&D
Jim Renthal	Bureau of Land Management	ENV, LEGREC, WS&D
Janet Regner	Husk Partners	ENV, WS&D
Robyne Richards		LEGREC
Dave Roberts	Salt River Project	ENV

LIST OF COMMITTEE PARTICIPANTS (continued)

Carl Roby	Cochise County	LEGREC, WS&D
Sandra Rode	City of Goodyear	LEGREC, WS&D
Brad Ross	Resolution Copper Mining	WS&D
Rod Ross	County Supervisors Association	LEGREC, WS&D
Steve Rossi	City of Phoenix	LEGREC, POP, WS&D
Stephen Rot	City of Glendale	LEGREC
Dennis Rule	Central Arizona Project	ENV, LEGREC, WS&D
Bill Schooling	Arizona Department of Commerce	POP
Nancy Scott	Arizona Corporation Commission	FIN
John Sellers	Yavapai Regional Capital Group	FIN, WS&D
Richard Seigel	Salt River Project	FIN, LEGREC
Chip Sherrill	Mohave County	WS&D
Robert Shuler	Consultant	LEGREC, WS&D
Tim Skarupa	Salt River Project	WS&D
Dave Slick	Salt River Project	WS&D
Supervisor Snider	Pinal County Board of Supervisors	FIN (co-chair), LEGREC
Ron Solomon	Town of Taylor	ENV, LEGREC
Stu Spaulding	Town of Taylor	LEGREC, WS&D
Jerry Stabley	Pinal County	POP
Cynthia Stefanovic	Arizona State Land Department	WS&D
Robin Stinnett	City of Avondale	LEGREC, WS&D
Linda Stitzer	Western Water Resource Advocates	ENV, LEGREC, WS&D
Bob Strain		LEGREC
Raymond Suazo	Bureau of Land Management	WS&D
Saeid Tadayon	U.S. Geological Survey	LEGREC, WS&D
Warren Tenney	Metro Water District	LEGREC, ENV (co-chair)
Dick Thompson	City of Tucson	LEGREC
Doug Toy	City of Chandler	WS&D
Dean Trammel	City of Tucson	ENV, POP, WS&D
Steve Trussell	Salt River Materials Group	LEGREC, WS&D
Matt Tsark	Strand Engineering	WS&D
Shelly Tunis		LEGREC
Chris Udall	Agri-Business Council of Arizona	ENV
Sue Urso	Central Arizona Project	LEGREC
Bill Victor	Errol Montgomery and Associates	WS&D
Tom Victory	City of Tucson	LEGRECD
Diane Vosick	Northern Arizona University	ENV
Robert Wagner	Yavapai Regional Capital	ENV, FIN, LEGREC, WS&D
Summer Waters	University of Arizona, Cooperative Extension,	ENV, LEGREC

LIST OF COMMITTEE PARTICIPANTS (continued)

	Maricopa County	
Dave Weedman	Arizona Game and Fish Department	ENV
Bill Wells	Bureau of Land Management	ENV, WS&D
Lyn White	Freeport McMoran Company	WS&D
Ron Whitler	Town of Buckeye	LEGREC
Doyle Wilson	Lake Havasu City	WS&D
Joe Wilson	U.S. Bureau of Reclamation	WS&D
Wally Wilson	City of Tucson	ENV, LEGREC, WS&D

APPENDIX III. LIST OF ARIZONA DEPARTMENT OF WATER RESOURCES STAFF PARTICIPANTS IN WRDC PROCESS

Perri Benemelis	Wes Hipke	Sharon Morris
Fred Breedlove **	Marie Horn	Kelly Mott-Lacroix**
Rich Burtell **	Deanna Ikeya	Pam Nagel
Tom Buschatzke	David Johnson	Syndia Reeder
Jorge Cano	Michael Johnson	Luis Sanchez
Paul Charman	Michael Lacey	Ken Slowinski
Frank Corkhill	Colleen Lane	Linda Stitzer**
Karen Fisher	Alan Leaf	Tom Whitmer
Laura Grignano**	Andrew Metcalf**	Gerry Wildeman
Don Gross	Michelle Moreno	Dianne Yunker

** Denotes former ADWR employee

Comment [g6]: Added per Sandra Fabritz-Whitney

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