Appendix C6
Arizona Water Demand Scenario Quantification

Appendix C6—Arizona Water Demand Scenario Quantification

1.0 Introduction

This appendix summarizes the data sources used in scenario quantification for Colorado River[1] demand for the state of Arizona and presents the results of quantification. As presented in figure C6-1, Arizona is divided into six planning areas, all of which are in the Colorado River hydrologic basin: Mainstem, Central Arizona, North Central, Central Yavapai Highlands, Upper San Pedro, and San Juan. Data collection and development were completed at the planning-area level.

The following sections present background information that summarizes the state's planning areas as well as data sources used to quantify demand scenarios by category. Following the background section, results of demand scenario quantification are presented. The results section is broken out into an Arizona Study Area summary, followed by Colorado River demand by geography, and finally by category.

2.0 Background

The Arizona Department of Water Resources (ADWR) is the agency given authority to protect the interests and rights of the State and its citizens in matters pertaining to interstate waters. ADWR developed information intended to capture Arizona's demands on the Colorado River for use in the Colorado River Basin Water Supply and Demand Study (Study). In order to develop demands for the Study, ADWR used data from the *Arizona Water Atlas* (ADWR, 2010a), groundwater active management area assessments, the Water Resources Development Commission, Arizona Department of Commerce population projections, Reclamation's Mainstem Water Use Accounting Reports, and Reclamation's planning studies for the North Central, Central Yavapai Highlands, and Upper San Pedro areas. Quantification of the Basin Study scenarios used these base data.

2.1 Data Sources for Quantification

This section discusses data sources for demand quantification by use category. Some category projections were based on relevant parameter data, while other category projections were developed directly as water demand. Sources included state, regional, and national agency reports.

- **Agricultural Demand:** Irrigated acreage, consumptive factors, and agricultural demands were derived by ADWR using various studies and reports shown in section 4.0, References (ADWR, 2005, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008, 2003–2009, 2006, 2007a, 2009; USGS, 2007, 2009). Agricultural applied water use was calculated based on irrigated acreage, consumptive factors, and consumptive demands.

[1] Colorado River demand as computed by Study Area demand minus other supplies.

FIGURE C6-1
Colorado River Hydrologic Basin and Export Service Areas in Arizona

- **Municipal and Industrial (M&I):** Population estimates were disaggregated from Arizona state population (ADWR, 2011a). Demand and consumptive factors were derived by ADWR using various studies and reports (ADWR, 2005, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008, 2003–2009, 2006, 2007a, 2009; USGS, 2007, 2009), and per capita usage was calculated based on population estimates, demand, and consumptive factors.
- **Energy:** Energy demands were derived by ADWR using various studies and reports (Water Resources Development Commission, 2011).
- **Minerals:** Minerals demands were derived by ADWR using various studies and reports (ADWR, 2010b, 2010c, 2011b).
- **Fish, Wildlife, and Recreation:** Fish, wildlife, and recreation demands were derived by ADWR using various studies and reports (ADWR, 2005; Reclamation, 1964–2002, 2003–2009, 2006; USGS, 2007, 2009).
- **Tribal:** Tribal demands were derived with input from the tribes and ADWR (ADWR, 2010b, 2010c, 2011b; Reclamation, 1964–2002, 1996–2008; Reclamation, 2003–2009, 2006).

3.0 Results of Water Demand Scenario Quantification[2]

This section summarizes Arizona's Colorado River water demand trends by category across the scenarios. The purpose of this section is to describe changes in demands, both temporally and geographically, parameters that influence changes in demands, and how the parameters and demands differ amongst scenarios.

Demands were first developed for areas that may be potentially served by Colorado River water ("Study Area" demands); independent of the source of supply. However, a portion of the Study Area demand, particularly in the Central Arizona planning area, is satisfied from other supplies such as surface water, groundwater, and reclaimed water/effluent. To develop estimates of the Colorado River demand, the Study Area demand was reduced by estimates of available supply from other sources. This appendix focuses on Colorado River demands, but includes discussion of the Study Area parameters that led to these demands. Gila River Basin demands are not included. The Colorado River Simulation System model would need to be extended, and natural flow data sets would need to be developed in order to include the Gila River Basin tributaries in the analysis.

Sections 3.1 through 3.3 summarize the results of demand scenario quantification, with section 3.1 presenting Study Area demand and Colorado River water demand, section 3.2 presenting Colorado River Demand for the state and individual planning areas across the six scenarios, and section 3.3 presenting Colorado River water demand by category across the six scenarios. Parameters and demands for all categories and all scenarios, along with references for data sources, are detailed in tables C6-2 to C6-7 in section 3.4.

[2] By definition, scenarios representing future, projected, estimated, or potential demands are uncertain and are only one possible realization of unknown events. All scenarios represent potential Colorado River Water demand. However, for readability purposes, potential Colorado River water demand will also be varyingly referred to as Colorado River demand, or in some cases, just demand.

3.1 Summary Results of Scenario Quantification

Values were developed for Study Area parameters to quantify Study Area demand for each of the scenarios. Colorado River demand was calculated as Study Area demand minus other supplies. Tables C6-1A, B, and C present summary results for the demand scenarios considered in the Study for Arizona's Study Area, the Upper Basin, and Lower Basin in Arizona, respectively. The tables present agricultural and M&I demand parameters for the entire Study Area that distinguish the scenarios, the resulting Study Area demands, and finally the Colorado River demands by category. Because other supplies may vary among scenarios, trends observed in the parameters and Study Area demands may not be reflected identically in Colorado River demand trends.

Arizona estimates that about 7 million people will be in Arizona's Study Area by 2015. This number is expected to increase to 9.8 to 16.0 million by 2060. The greatest population growth is associated with the Rapid Growth (C1 and C2) scenarios and the Enhanced Environment (D2) scenario. The Slow Growth (B) scenario has the lowest population growth of the scenarios (9.8 million by 2060), but still represents a growth of about 45 percent over 2015 estimates.

The growing municipal population, however, will continue to be more efficient in its per capita water use than today. Per capita water use, based solely on passive or existing conservation targets, is expected to be 4 to 23 percent less in 2060 than in 2015 in all scenarios except for Slow Growth (B) scenario, where it is expected to increase by about 1 percent. Usage rates and per capita reductions vary across Arizona's planning areas.

Irrigated acreage is projected to decrease through 2060 under all scenarios. Decrease in irrigated acreage varies by scenario, and ranges from a 30 percent decrease in the Slow Growth (B) scenario to a 48 percent decrease in the Rapid Growth (C1 and C2) and Enhanced Environment (D2) scenarios. The effect of decreased irrigated acreage is offset by an increase in water delivery per acre across all scenarios. The increase in water delivery per acre ranges from 14 percent Slow Growth (B) scenario to 25 percent Rapid Growth (C2) scenario.

Study Area demand for energy is projected to increase under all scenarios due to the growing need for electricity generation, including solar. Most of the energy demands are met by local supplies. The portion of Study Area demand for energy met by the Colorado River is forecast to increase modestly, from about 1,100 acre-feet per year (afy) in 2015 to between 1,500 and 1,900 afy in 2060.

Study Area demand for minerals is projected to increase across all scenarios, from 40,000 afy in 2015 to between 53,000 and 58,000 afy in 2060.

Study Area demand for tribal use is projected to increase across all scenarios, with demand increasing between 21 and 34 percent by 2060.

TABLE C6-1A
Summary Results of Arizona Water Demand Scenario Quantification by 2060

Key Study Area Demand Scenario Parameters							
	2015[1]	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	6.7 - 7.5	12.5	9.8	16.0	16.0	12.5	16.0
Change in per capita water usage (%), from 2015	--	-4%	+1%	-5%	-22%	-23%	-23%
Irrigated acreage (millions of acres)	0.62	0.36	0.45	0.31	0.31	0.36	0.31
Change in per acre water delivery (%), from 2015	--	+16%	+14%	+21%	+25%	+16%	+19%
Study Area Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	2056 - 2342	1,314	1,759	1,161	1,196	1,314	1,101
M&I demand	1,857	3,100	2,588	3,858	3,159	2,476	3,111
Energy demand	78 - 87	137	109	188	133	123	133
Minerals demand	40	58	58	58	58	58	58
FWR demand	27 - 91	27.0	27.7	27.0	30.2	89.7	90.9
Tribal demand	1017 - 1144	1,317	1,227	1,460	1,428	1,329	1,477
Total Study Area Demand[2]	**5,318**	**5,953**	**5,769**	**6,753**	**6,004**	**5,390**	**5,971**
Colorado River Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	1,124	703	724	703	763	703	668
M&I demand	750 - 827	1,465	1,170	2,068	1,363	1,381	1,614
Energy demand	1.1	1.6	1.6	1.9	1.6	1.5	1.6
Minerals demand	40	55	58	54	53	55	55
FWR demand	16 - 80	15.9	16.6	15.9	19.1	78.6	79.8
Tribal demand	924 - 1051	1,258	1,143	1,408	1,406	1,259	1,409
Total Colorado River Demand[2]	**2,972**	**3,498**	**3,113**	**4,251**	**3,606**	**3,478**	**3,828**

1. If range across scenarios is less than 10%, Current Projected (A) is presented. Otherwise, range (min - max) is presented.
2. Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state

TABLE C6-1B
Summary Results of Arizona Water Demand Scenario Quantification by 2060 for the Upper Basin

Key Study Area Demand Scenario Parameters							
	2015[1]	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	0.012	0.020	0.020	0.020	0.020	0.020	0.020
Change in per capita water usage (%), from 2015	--	-30%	-30%	-30%	-30%	-30%	-30%
Irrigated acreage (millions of acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in per acre water delivery (%), from 2015	--	--	--	--	--	--	--
Study Area Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	0	0	0	0	0	0	0
M&I demand	1.68	1.96	1.96	1.96	1.96	1.96	1.96
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Tribal demand	38 - 44	43.3	43.3	70.9	70.9	43.3	70.9
Total Study Area Demand[2]	**40 - 46**	**46**	**46**	**73**	**73**	**46**	**73**
Colorado River Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	0	0	0	0	0	0	0
M&I demand	1.68	1.96	1.96	1.96	1.96	1.96	1.96
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Tribal demand	38 - 44	43.3	43.3	70.9	70.9	43.3	70.9
Total Colorado River Demand[2]	**40 - 46**	**46**	**46**	**73**	**73**	**46**	**73**

1. If range across scenarios is less than 10%, Current Projected (A) is presented. Otherwise, range (min - max) is presented.
2. Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state

TABLE C6-1C
Summary Results of Arizona Water Demand Scenario Quantification by 2060 for the Lower Basin

Key Study Area Demand Scenario Parameters							
	2015[1]	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	6.7 - 7.5	12.5	9.8	16.0	16.0	12.5	16.0
Change in per capita water usage (%), from 2015	--	-4%	+1%	-5%	-22%	-23%	-23%
Irrigated acreage (millions of acres)	0.62	0.36	0.45	0.31	0.31	0.36	0.31
Change in per acre water delivery (%), from 2015	--	+16%	+14%	+21%	+25%	+16%	+19%
Study Area Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	2056 - 2342	1,314	1,759	1,161	1,196	1,314	1,101
M&I demand	1,856	3,098	2,586	3,856	3,157	2,474	3,109
Energy demand	78 - 87	137	109	188	133	123	133
Minerals demand	40	58	58	58	58	58	58
FWR demand	27 - 91	26.7	27.4	26.7	29.9	89.4	90.6
Tribal demand	973 - 1106	1,274	1,183	1,389	1,357	1,286	1,406
Total Study Area Demand[2]	**5,272**	**5,907**	**5,723**	**6,679**	**5,931**	**5,344**	**5,898**
Colorado River Demand (thousand acre-ft)							
	2015[1]	2060 Scenario Demands					
		A	B	C1	C2	D1	D2
Ag demand	1,124	703	724	703	763	703	668
M&I demand	748 - 826	1,463	1,168	2,066	1,361	1,379	1,612
Energy demand	1.1	1.6	1.6	1.9	1.6	1.5	1.6
Minerals demand	40	55	58	54	53	55	55
FWR demand	16 - 79	15.5	16.3	15.5	18.8	78.3	79.5
Tribal demand	881 - 1013	1,215	1,100	1,337	1,335	1,215	1,338
Total Colorado River Demand[2]	**2,926**	**3,453**	**3,068**	**4,178**	**3,533**	**3,433**	**3,755**

1. If range across scenarios is less than 10%, Current Projected (A) is presented. Otherwise, range (min - max) is presented.
2. Excludes potential losses (reservoir evaporation, phreatophytes, and/or operational inefficiencies) that may be charged to state

Figure C6-2 presents demands across the scenarios in three panels as follows: 1) Study Area demand with other supplies and Colorado River demand identified, 2) Colorado River demand, and 3) change in Colorado River demand by demand category.

From panel one it can be seen that Study Area demand increases from about 5.3 million acre-feet (maf) in 2015 to between 5.4 and 6.8 maf in 2060. The range in Study Area demand growth across scenarios in 2060, however, is projected to be as low as 53 thousand acre-feet (kaf) or as high as 1,390 kaf. About 35 to 46 percent of the Study Area demand is expected to be met by other supplies.

Panel two provides a view of the range across scenarios of Colorado River demand. This demand changes from about 3.0 maf in 2015 to between 3.1 and 4.3 maf in 2060 (or 5 percent to 41 percent) depending on the scenario. This difference results in a Colorado River demand range of about 1.1 maf across the scenarios in 2060, or about 37 percent.

Panel three shows how specific categories affect the projected change in Colorado River demand by scenario. Growth in M&I demand across all scenarios results in the greatest increase in demand, followed by tribal demand and minerals demand. Agricultural demand decreases across all scenarios.

Figure C6-3 ties historical water use to the range of Colorado River demand in the quantified scenarios. The 1.1 maf range across scenarios in 2060 is easily discernable, with a relatively even spread over the range across the scenarios.

FIGURE C6-2
Study Area, Colorado River, and Change in Colorado River Demand

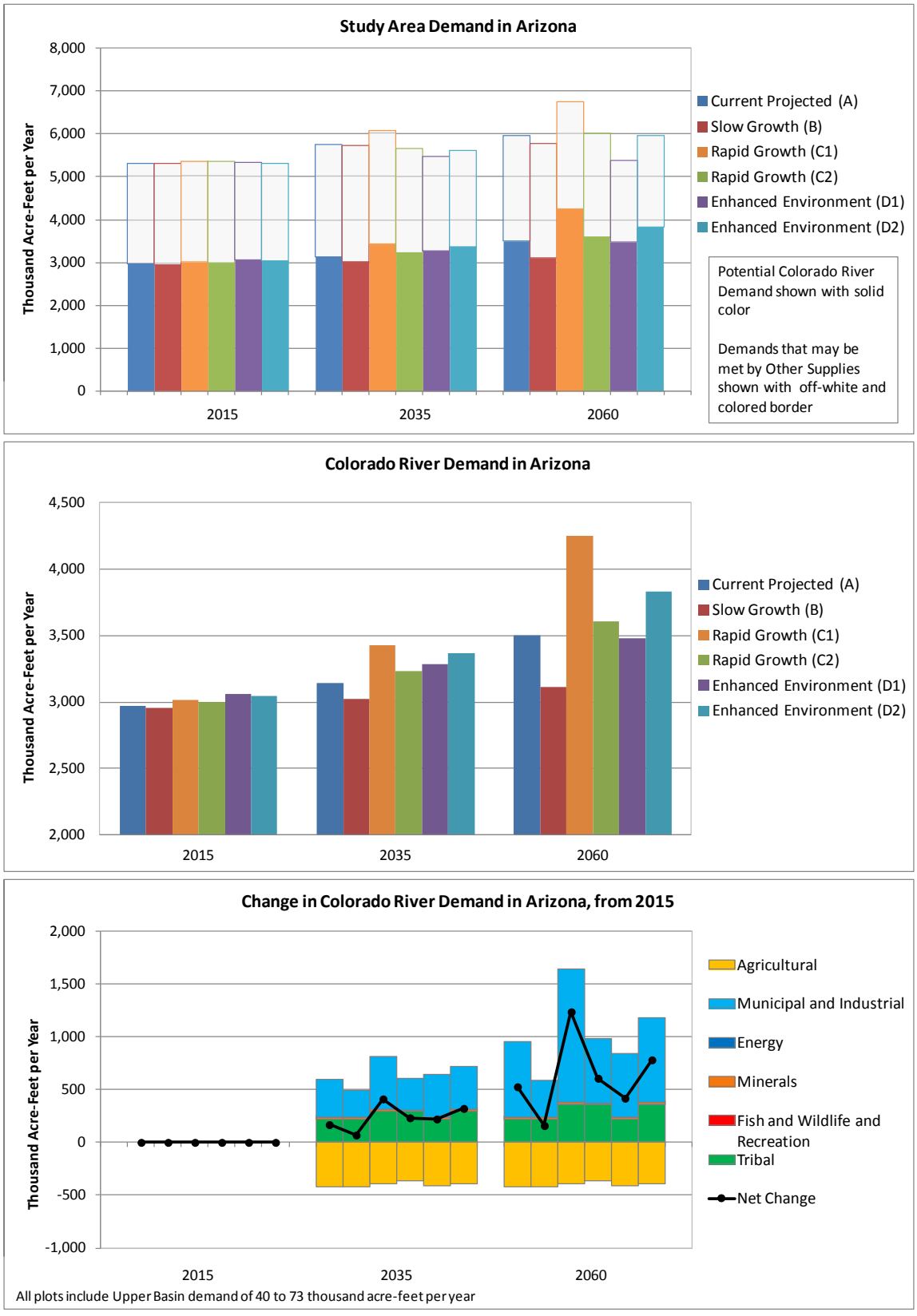
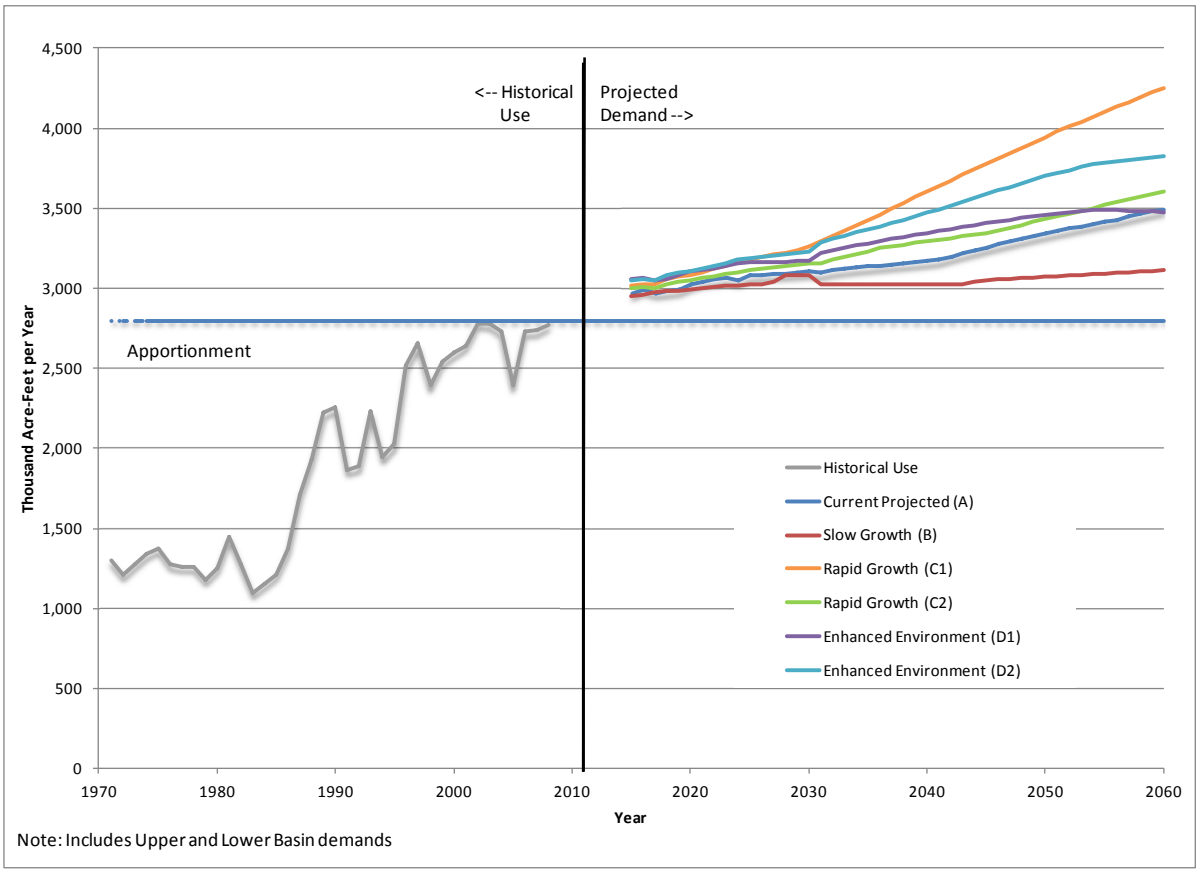


FIGURE C6-3
Historical Use and Future Projected Demand



Note: Includes Upper and Lower Basin demands

3.2 Colorado River Water Demand by Geography

Colorado River water demand for areas served by the Colorado River is presented in figures C6-4 and C6-5. These figures show two geographic levels: Study Area in Arizona, and individual planning areas. Demands at each geographic level are shown across the scenarios. The columns to the right show Colorado River demand at a point in time (2015, 2035, or 2060) by relative contribution of the categories.

Colorado River demand[3] in Arizona is primarily in the Mainstem and Central Arizona planning areas. Demands in the Mainstem are primarily agricultural and tribal, whereas demands in Central Arizona are primarily M&I, with some tribal and agricultural.

Figure C6-6 shows the change in Colorado River demand by category from 2015 across the scenarios. Change in Colorado River demand is dominated by the Central Arizona planning area, with a large increase in M&I demands and a smaller increase in tribal demands, offset by a decrease in agricultural demands.

[3] Potential Colorado River demand is based on changes in parameters such as population and for the purpose of the Study is not limited by apportionment.

FIGURE C6-4
Colorado River Demand in Arizona

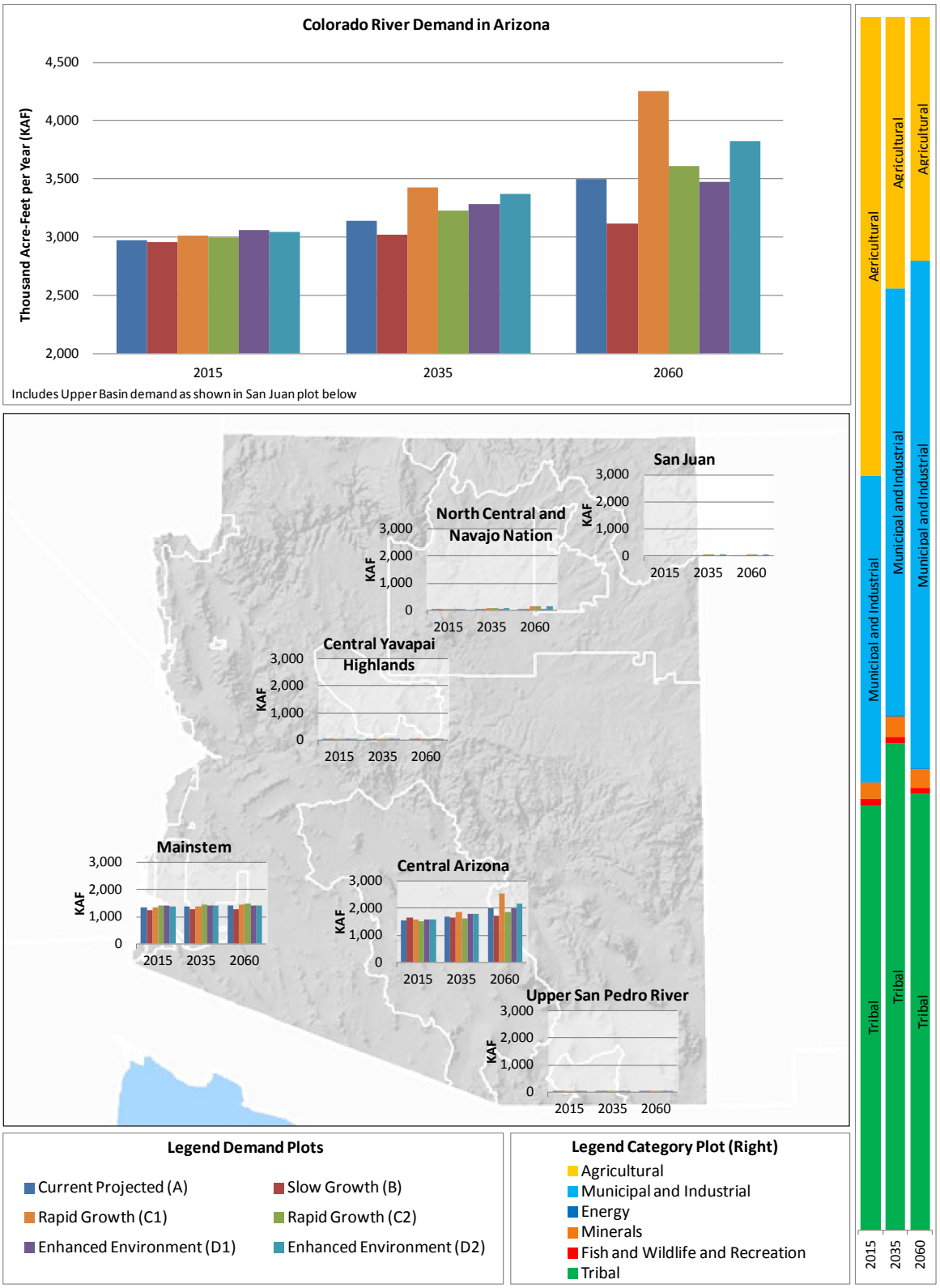


FIGURE C6-5
Colorado River Demand by Category

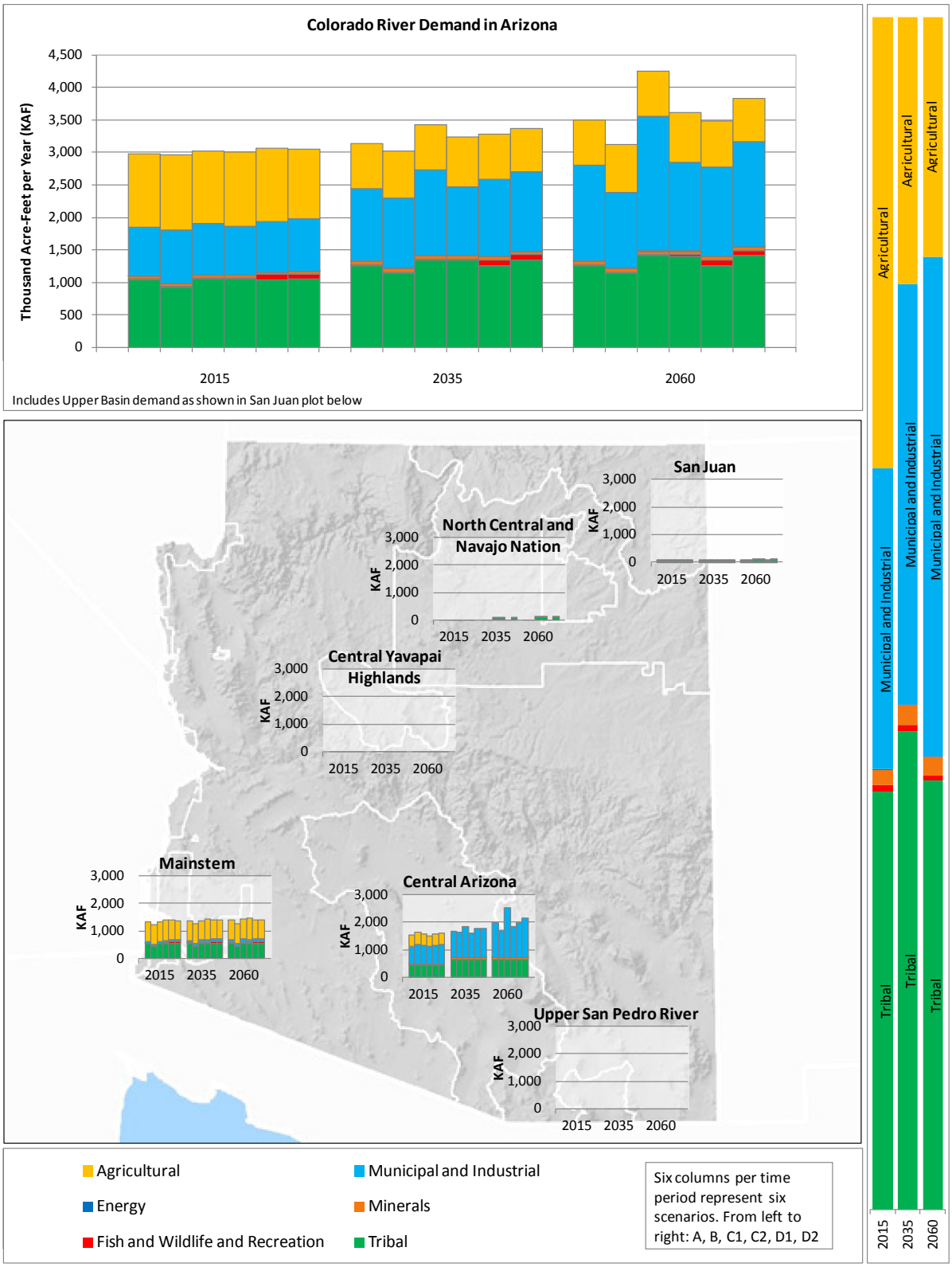
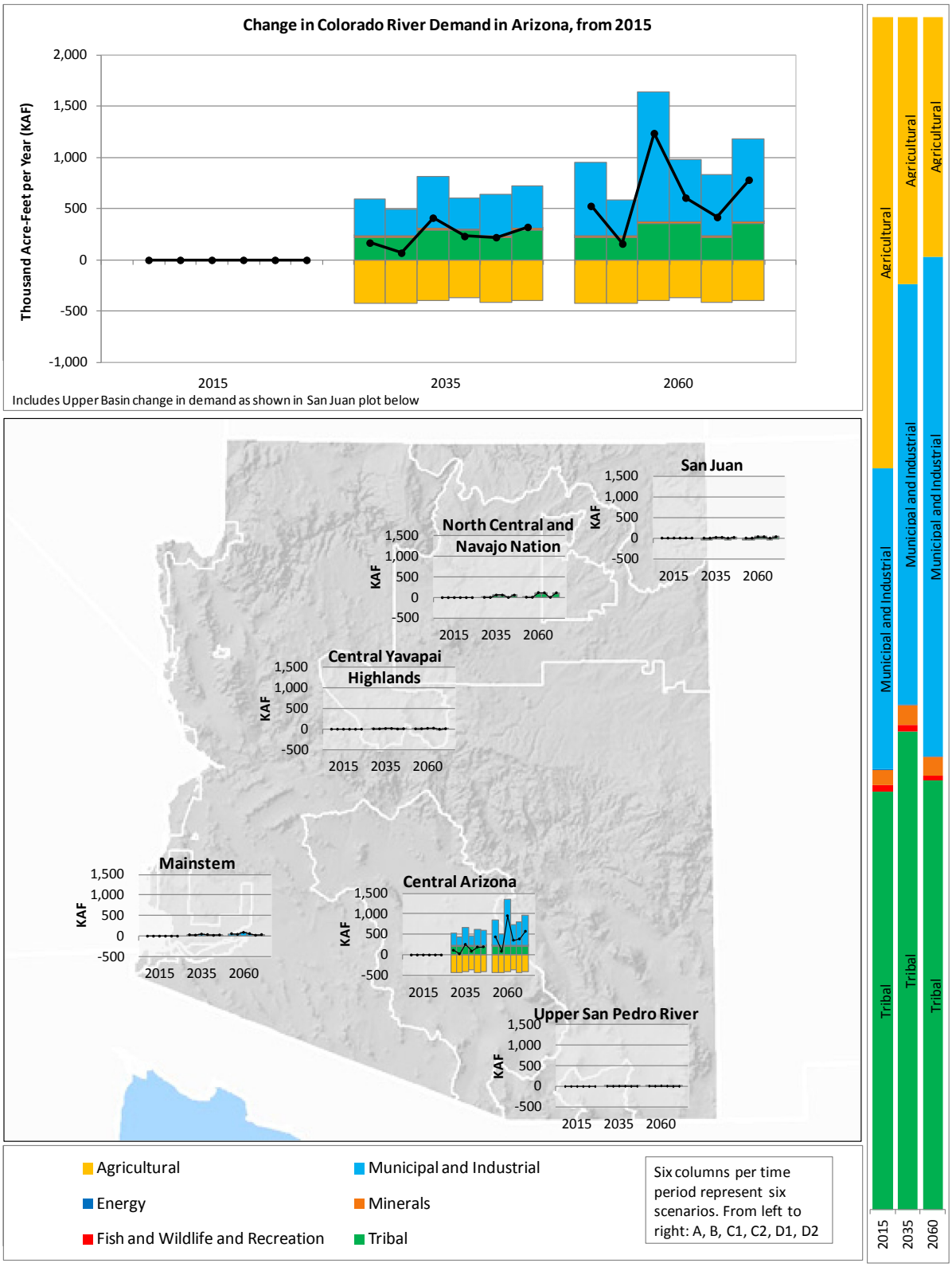


FIGURE C6-6
Change in Colorado River Demand in Arizona from 2015 by Category



3.3 Colorado River Demand by Category

3.3.1 Agricultural

Agricultural water demand is driven by irrigated acreage and water delivery per acre. Water delivery per acre is the amount of water diverted per irrigated acre. Components of this use include transmission and delivery losses (surface evaporation, riparian demand, and seepage), and on-farm losses that are made up of evaporation, crop irrigation requirements, and tail water (return). Each of these factors (precipitation, growing season, etc.) will vary by location, irrigation method, and crop type.

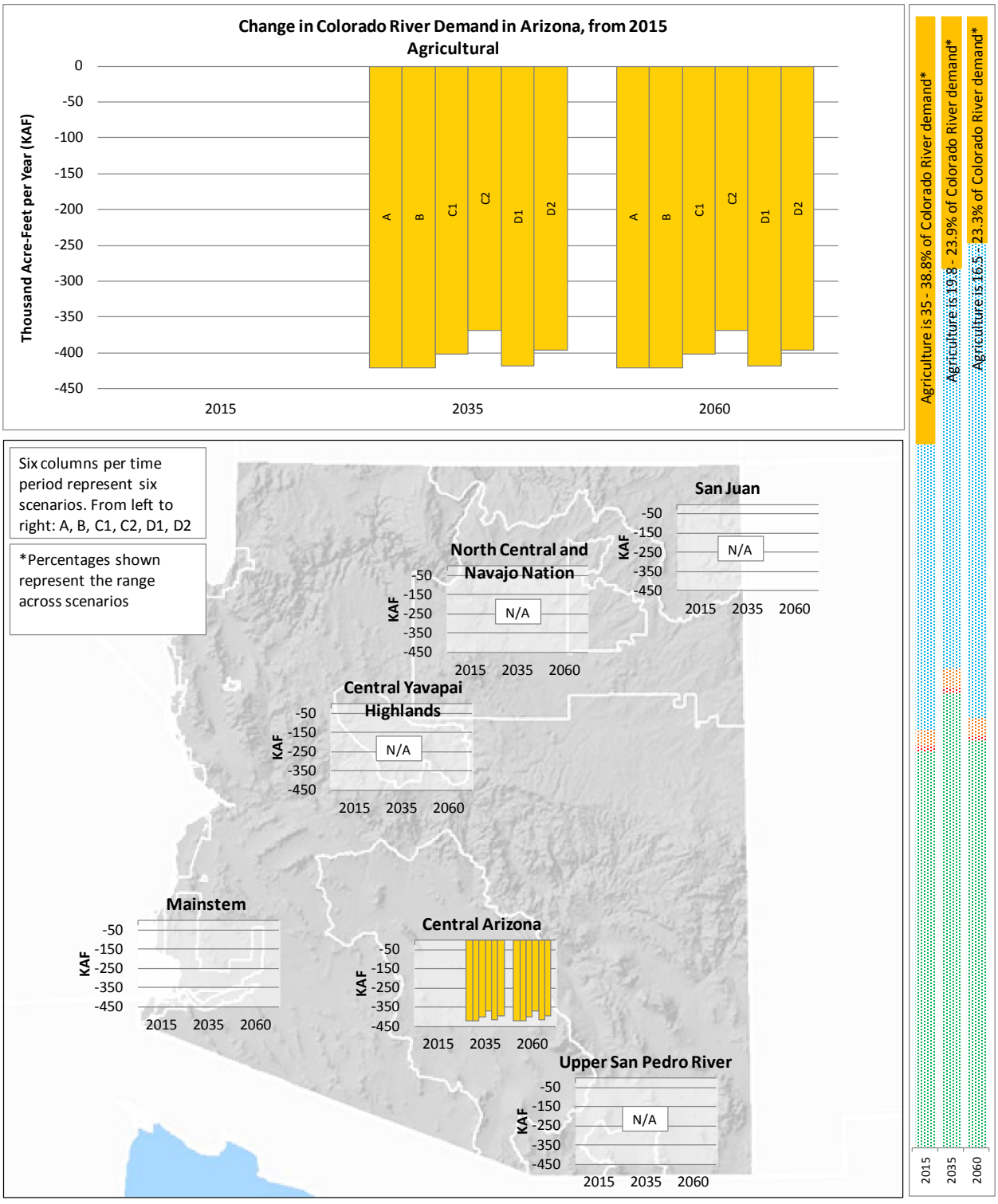
Figure C6-7 presents the following by scenario in 2015, 2035, and 2060:

- Change in agricultural demand for Colorado River water
- Change in agricultural demand for Colorado River water by planning area
- Agricultural demand as a portion of Colorado River water demand (right hand side of graph)

As can be seen from figure C6-7, agricultural water demand makes up about 35 to 39 percent of Colorado River demand in Arizona in 2015, and drops to about 17 to 23 percent of Colorado River demand in 2060. This drop results from both a decrease in agricultural water demand and an increase in other categories of demand.

There are two Arizona planning areas with significant agricultural water use: the Mainstem, and the Central Arizona planning areas. Mainstem users hold senior water rights and have the greatest demand. Lower priority water rights supply the Central Arizona planning area. Agricultural demand is forecast to decrease over the Study period by varying amounts in the Central Arizona planning area, ranging from about 370 kaf to 420 kaf, depending on the efficiency and acreage assumptions in each scenario. Some decreases are assumed to result from the conversion of agricultural lands to urban development as the Central Arizona Project agricultural pool decreases over time until it is eliminated in 2030.

FIGURE C6-7
Change in Colorado River Demand in Arizona from 2015 for Agriculture



3.3.2 Municipal and Industrial

M&I water demand can be estimated from population and M&I per capita water use, with the addition of self-served industrial (SSI) demand. Municipal per capita water demand calculations include industrial, commercial, institutional, and residential water demand. A number of factors may influence the M&I per capita water use of a given community, including the amount of industrial demand, climate, number of institutional facilities, and number of visitors.

SSI users are industries located in a given area that have their own water supply systems and are therefore not directly related to local measures of population and M&I per capita water use.

Figure C6-8 presents the following by scenario in 2015, 2035, and 2060:

- Change in M&I demand for Colorado River water
- Change in M&I demand for Colorado River water in individual planning areas
- M&I demand as a portion of Colorado River water demand (right hand side of graph)

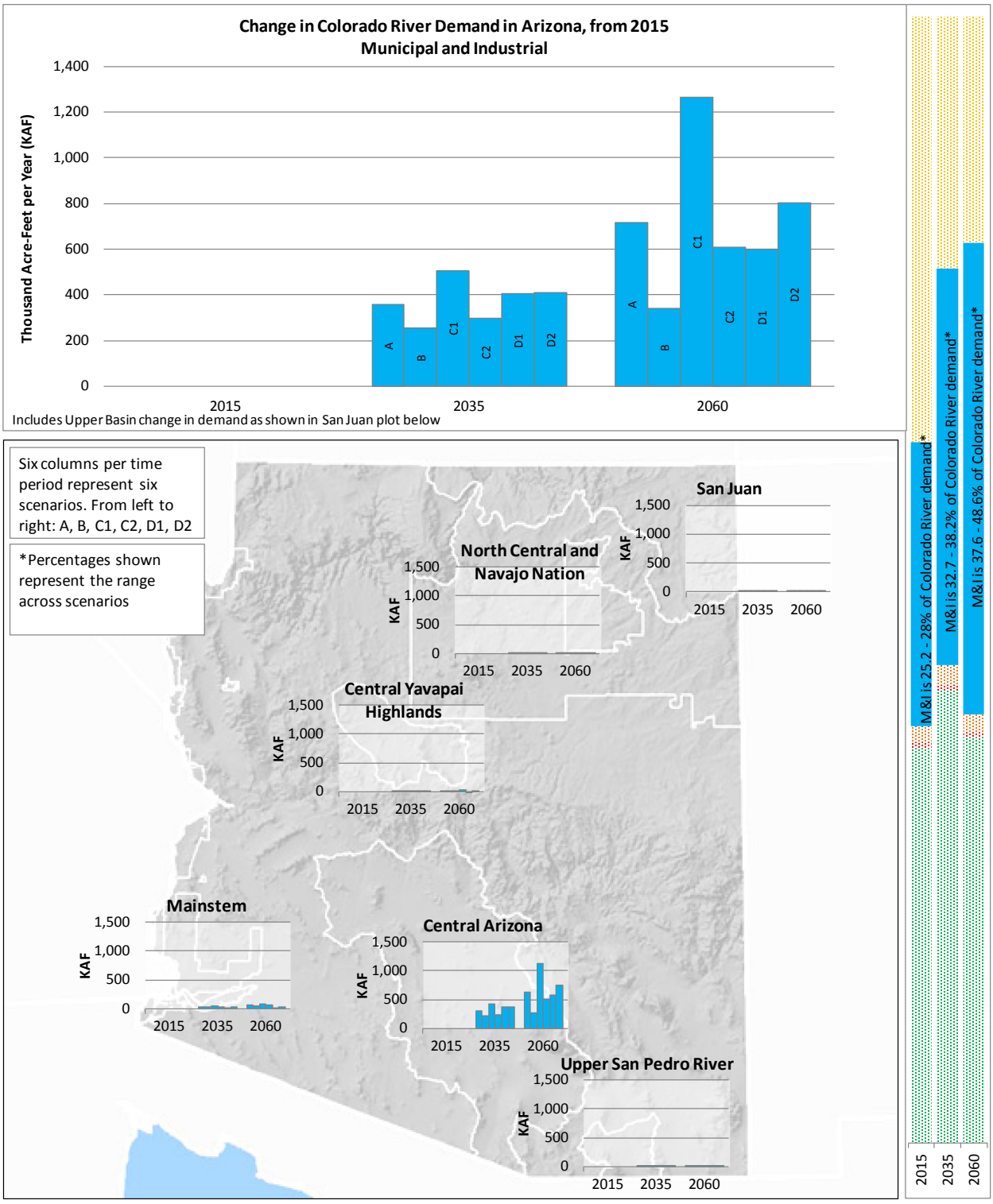
As can be seen from figure C6-8, M&I water demand is the one of the largest components of Colorado River demand, changing from about 25 to 28 percent in 2015 to between 38 and 49 percent of Colorado River demand in 2060, depending on which scenario is considered.

Colorado River demand for M&I use increases over time from 2015 to 2060 across all scenarios. The increase is primarily due to population increase as M&I per capita water use decreases over time across all scenarios; SSI demand also increases across all scenarios.

In examining the planning areas, population growth from 2015 to 2060 drives the increase in M&I demand for Colorado River water in the Central Arizona planning area and to a lesser extent in the Mainstem planning area. Colorado River water allocations and the availability of other supplies also affect M&I Colorado River water demand.

Increases in population are somewhat tempered by decreases in M&I per capita water use. Per capita water use is expected to be 4 to 23 percent less in 2060 than in 2015 in all scenarios except for Slow Growth (B) scenario, where it is expected to increase by about 1 percent.

FIGURE C6-8
Change in Colorado River Demand in Arizona from 2015 for M&I



3.3.3 Energy

Water demand for energy can be estimated through known plans for new power plants or through applying a per capita energy water use factor. Power facilities often serve areas remote from their locations and therefore potentially represent exports or imports of water from the Study Area to meet these distributed needs.

Figure C6-9 presents the following by scenario in 2015, 2035, and 2060:

- Change in energy demand for Colorado River water
- Change in energy demand for Colorado River water in individual planning areas
- Energy demand as a portion of Colorado River water demand (right hand side of graph)

As can be seen from figure C6-9, energy water demand is a small fraction of Colorado River demand, making up less than 0.1 percent of Colorado River demand in 2060.

Energy demand for Colorado River water increases over time from 2015 to 2060 across all scenarios, with the increase ranging from about 0.3 to 0.7 kaf.

Water use associated with energy demand is estimated on a per capita basis for the Mainstem and Central Arizona planning areas, and is estimated to increase as the population increases over time. Other planning area water use related to energy demand is estimated based on existing power generation facilities use.

FIGURE C6-9
Change in Colorado River Demand in Arizona from 2015 for Energy

3.3.4 Minerals Extraction

Water demand for mineral production can be estimated through existing uses and known plans for extraction in the Study Area. Water demand for mineral production can vary significantly, based on market prices for a given product.

Figure C6-10 presents the following by scenario in 2015, 2035, and 2060:

- Change in mineral production demand for Colorado River water
- Change in mineral production demand for Colorado River water in individual planning areas
- Minerals production demand as a portion of Colorado River demand (right hand side of graph)

As can be seen from figure C6-10, minerals water demand is a small fraction of Colorado River demand, changing from about 1.3 percent in 2015 to between 1.3 and 1.9 percent of Colorado River demand in 2060, depending on which scenario is considered.

Minerals demand for Colorado River water increases through time by about 15,000 afy from 2015 to 2060 across all scenarios.

Demand for Colorado River water for minerals extraction is present only in the Central Arizona planning area; accordingly, all of the increase occurs in the Central Arizona planning area.

FIGURE C6-10
Change in Colorado River Demand in Arizona from 2015 for Minerals

3.3.5 Fish, Wildlife, and Recreation

Water demand for fish, wildlife, and recreation is estimated from existing agreements or known consumptive use associated with this demand category. Non-consumptive demands associated with fish, wildlife, and recreation, including in-stream flow requirements, are represented through the metrics portion of the Study presented in *Technical Report D – System Reliability Metrics* (Reclamation, 2012).

Fish, wildlife, and recreation demands are forecast to remain constant through time, although the demands are variable among different scenarios. All scenarios have fish, wildlife, and recreation demands between about 16,000 afy and 19,000 afy, except the Enhanced Environment (D1 and D2) scenarios which have demands at 79,000 afy. All fish, wildlife, and recreation demands are in the Mainstem planning area.

3.3.6 Tribal

Water demand for federally recognized tribes in Arizona with rights to Colorado River water relied on information submitted by the Ten Tribes Partnership for use in the *Colorado River Interim Surplus Criteria Final Environmental Impacts Statement* (Reclamation, 2000) and used in the more recent *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final EIS* (Reclamation, 2007b), information from ADWR, input from the individual tribes, and Reclamation's 2005 to 2009 Decree Accounting Report (Reclamation, 2007 and 2010). The projected Navajo Nation demands were provided by the Navajo Nation Department of Water Resources and modified to fit the storyline narratives regarding tribal use under each scenario.

Figure C6-11 presents the following by scenario in 2015, 2035, and 2060:

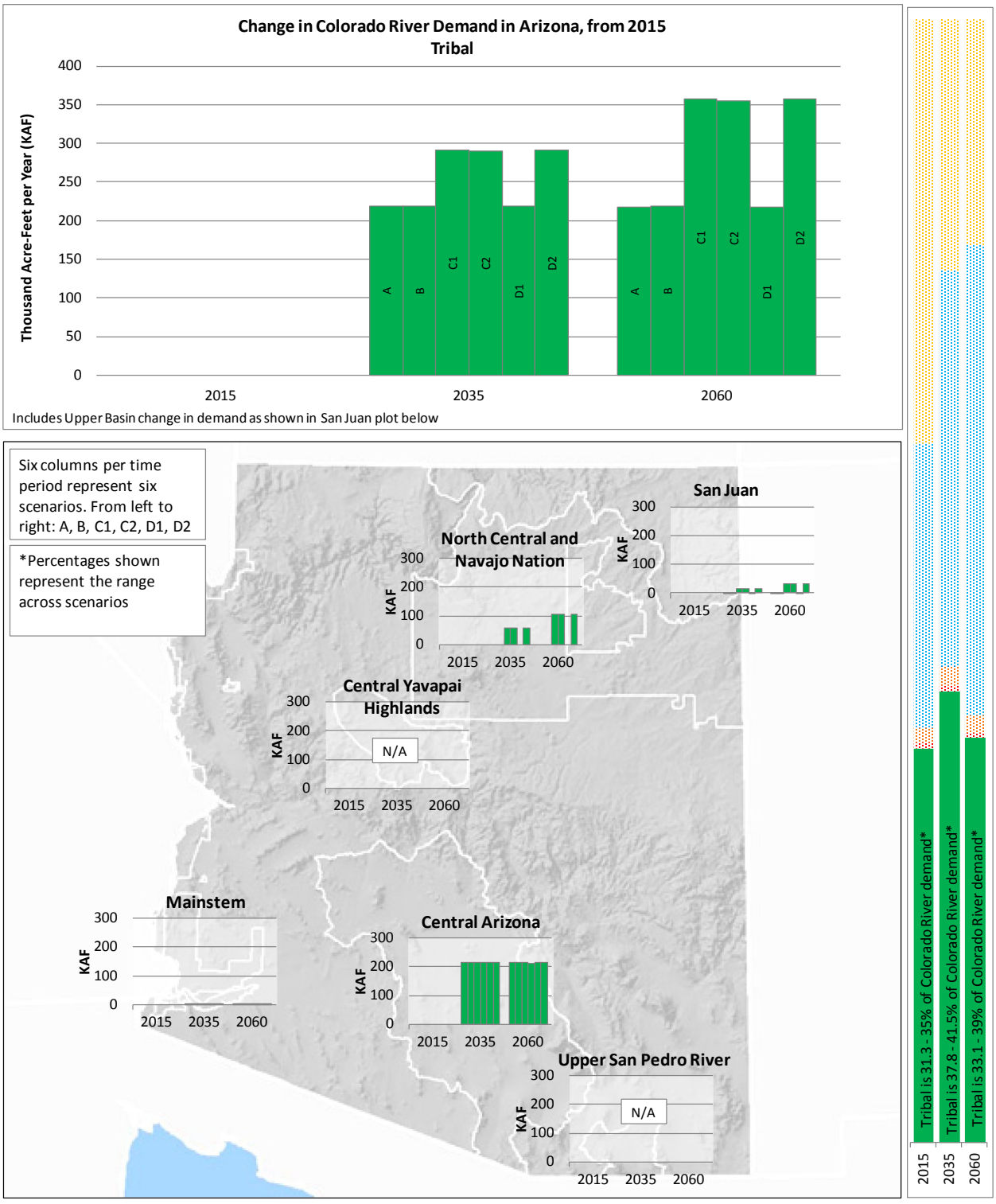
- Change in tribal demand for Colorado River water
- Change in tribal demand for Colorado River water in individual planning area
- Tribal demand as a portion of Colorado River demand (right hand side of graph)

As can be seen from figure C6–11, tribal water demand is one of the larger components of Colorado River demand in Arizona, increasing slightly from about 31 to 35 percent in 2015 to between about 33 and 39 percent of Colorado River demand in 2060, depending on which scenario is considered.

Colorado River tribal demand increases over time by about 217 to 358 kaf (about 21 to 34 percent) from 2015 to 2060 across all scenarios. These increases are primarily due to development of demands under existing water rights and the realization of new tribal claims and settlements. Increases occur mostly in the Central Arizona planning area, but there is also some increase in the Mainstem planning area. The rate of increase is greatest in Rapid Growth (C1 and C2) and Enhanced Environment (D2) scenarios.

For additional information on tribal demands, see appendix C9.

FIGURE C6-11
Change in Colorado River Demand in Arizona from 2015 for Tribal



3.4 Summary Tables of Parameters and Demands by Category

Tables C6-2 to C6-7 present the specific parameter data collected by planning area. Each table is a complete set of data for a given scenario. These data were used to develop Study Area demands and subsequently Colorado River demands once other supplies were considered. These tables provide the specific information used in the creation of the summary and category plots previously discussed and provide reference information for the data provided.

TABLE C6-2
Total Demand within Study Area under Current Projected (A) Scenario

999 From States
999 Calculated
999 From State Plans
999 From Study Team

			ARIZONA																								
	Planning Area		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	446,610	288,100	188,740	0	0	0	7,440	5,920	4,010	129	129	129	622,519	462,489	361,219	0	0	0	0	0	0	622,519	462,489	361,219	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	6.85	6.85	6.85	3.2	3.2	3.2				3.6	3.6	3.6	2.9	2.9	2.9	4.22	4.54	4.88							4.22	4.54	4.88	
	Consumptive factor	%	61%	61%	61%	100%	100%	100%				100%	100%	100%	100%	100%	100%	83%	79%	75%							83%	79%	75%	2)
	Demand (Consumptive)	af/yr	703,200	703,200	703,200	1,448,800	923,690	595,980	0	0	0	27,090	21,540	14,610	380	380	380	**2,179,470**	**1,648,810**	**1,314,170**	0	0	0	**0**	**0**	**0**	**2,179,470**	**1,648,810**	**1,314,170**	3)
Municipal and Industrial	Population		297,620	433,790	527,800	6,348,470	9,085,770	11,305,200	100,580	118,010	131,450	249,730	340,370	401,680	94,070	115,620	133,900	7,090,470	10,093,560	12,500,030	12,110	15,760	20,320	12,110	15,760	20,320	7,102,580	10,109,320	12,520,350	4)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	271	271	277	215	209	207	126	126	127	151	138	121	187	187	187	214	208	206	123	111	86	123	111	86	214	208	206	5), 6)
	Consumptive factor	%	66%	68%	70%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	2)
	Municipal and Industrial Demand (Consumptive)	af/yr	59,460	89,640	114,830	1,532,280	2,130,800	2,622,280	14,200	16,720	18,770	42,270	52,570	54,630	19,700	24,220	28,050	1,667,910	2,313,950	2,838,560	1,675	1,955	1,955	1,675	1,955	1,955	1,669,585	2,315,905	2,840,515	
	Self Served Industrial Demand (Consumptive)	af/yr	5,260	5,960	6,400	171,820	220,320	232,620	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	187,690	241,560	259,010	0	0	0	0	0	0	187,690	241,560	259,010	3)
	Demand (Consumptive)	af/yr	**64,720**	**95,600**	**121,230**	**1,704,100**	**2,351,120**	**2,854,900**	**14,200**	**16,720**	**18,770**	**51,480**	**65,550**	**72,320**	**21,100**	**26,520**	**30,350**	**1,855,600**	**2,555,510**	**3,097,570**	**1,675**	**1,955**	**1,955**	**1,675**	**1,955**	**1,955**	**1,857,275**	**2,557,465**	**3,099,525**	
Energy	**Demand (Consumptive)**	af/yr	410	560	700	80,870	112,230	136,480	0	0	0	0	0	0	0	0	0	**81,280**	**112,790**	**137,180**	0	0	0	**0**	**0**	**0**	**81,280**	**112,790**	**137,180**	7)
Minerals	**Demand (Consumptive)**	af/yr	0	0	0	39,520	58,000	58,000	0	0	0	0	0	0	0	0	0	**39,520**	**58,000**	**58,000**	0	0	0	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	8)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	15,510	15,530	15,530	0	0	0	320	320	320	0	0	0	10,800	10,800	10,800	**26,630**	**26,650**	**26,650**	338	338	338	**338**	**338**	**338**	**26,968**	**26,988**	**26,988**	9)
Tribal	**Demand (Consumptive)**	af/yr	552,066	555,566	555,566	534,600	737,230	713,420	3,100	4,060	4,540	0	0	0	0	0	0	**1,089,766**	**1,296,856**	**1,273,526**	43,597	43,317	43,317	**43,597**	**43,317**	**43,317**	**1,133,363**	**1,340,173**	**1,316,843**	10)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,335,906**	**1,370,456**	**1,396,226**	**3,807,890**	**4,182,270**	**4,358,780**	**17,620**	**21,100**	**23,630**	**78,570**	**87,090**	**86,930**	**32,280**	**37,700**	**41,530**	**5,272,266**	**5,698,616**	**5,907,096**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**5,317,876**	**5,744,226**	**5,952,706**	
Adjacent Areas																														
Agricultural	Irrigated Acreage	acres																												
	Per-Acre Water Delivery (Diversion)	af/ac/yr																												
	Consumptive factor	%																												
	Demand (Diversion)	af/yr																												
	Demand (Consumptive)	af/yr																												
Municipal and Industrial	Population																													
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																												
	Consumptive factor	%																												
	Municipal and Industrial Demand (Diversion)	af/yr																												
	Self Served Industrial Demand (Diversion)	af/yr																												
	Demand (Diversion)	af/yr																												
	Demand (Consumptive)	af/yr																												
Energy	**Demand (Diversion)**	af/yr																												
Minerals	**Demand (Diversion)**	af/yr																												
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																												
Tribal	**Demand (Diversion)**	af/yr																												
Total Adjacent Areas	Demand (Diversion)	af/yr																**0**	**0**	**0**				**0**	**0**	**0**	**0**	**0**	**0**	
Total Demand in the Study Area		af/yr	**1,335,906**	**1,370,456**	**1,396,226**	**3,807,890**	**4,182,270**	**4,358,780**	**17,620**	**21,100**	**23,630**	**78,570**	**87,090**	**86,930**	**32,280**	**37,700**	**41,530**	**5,272,266**	**5,698,616**	**5,907,096**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**5,317,876**	**5,744,226**	**5,952,706**	11)
Demand that may be met by Other Supplies		af/yr	0	0	0	2,249,581	2,509,130	2,361,110	10,773	9,418	7,530	72,099	72,084	72,094	13,796	13,802	13,802	2,346,249	2,604,434	2,454,536	0	0	0	0	0	0	2,346,249	2,604,434	2,454,536	12)
Potential Colorado River Demand		af/yr	**1,335,906**	**1,370,456**	**1,396,226**	**1,558,309**	**1,673,140**	**1,997,670**	**6,847**	**11,682**	**16,100**	**6,471**	**15,006**	**14,836**	**18,484**	**23,898**	**27,728**	**2,926,017**	**3,094,182**	**3,452,560**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**2,971,627**	**3,139,792**	**3,498,169**	13)
Agricultural	Colorado River Demand	af/yr	703,200	703,200	703,200	421,053	0	0	0	0	0	0	0	0	0	0	0	1,124,253	703,200	703,200	0	0	0	0	0	0	1,124,253	703,200	703,200	
Municipal and Industrial	Colorado River Demand	af/yr	64,720	95,600	121,230	651,963	957,921	1,282,781	6,847	11,682	16,100	6,471	15,006	14,836	18,484	23,898	27,728	748,485	1,104,107	1,462,675	1,675	1,955	1,955	1,675	1,955	1,955	750,160	1,106,062	1,464,630	
Energy	Colorado River Demand	af/yr	410	560	700	724	916	932	0	0	0	0	0	0	0	0	0	1,134	1,476	1,632	0	0	0	0	0	0	1,134	1,476	1,632	
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	53,853	54,760	0	0	0	0	0	0	0	0	0	39,520	53,853	54,760	0	0	0	0	0	0	39,520	53,853	54,760	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	15,510	15,530	15,530	0	0	0	0	0	0	0	0	0	0	0	0	15,510	15,530	15,530	338	338	338	338	338	338	15,848	15,868	15,868	
Tribal	Colorado River Demand	af/yr	552,066	555,566	555,566	445,049	660,450	659,197	0	0	0	0	0	0	0	0	0	997,115	1,216,016	1,214,763	43,597	43,317	43,317	43,597	43,317	43,317	1,040,712	1,259,333	1,258,080	

Source and Comments

1) Personal communication, ADWR, Aug. 26, 2011.
2) Mainstem: 61% based Personal communication, ADWR, Oct. 21, 2011; Nonmainstem: 100% based on consumptive need equaling diversion from Mainstem.
3) Personal communication, ADWR, Aug. 26, 2011; nonmainstem areas
4) Personal communication, ADWR, Aug. 26, 2011. Population figures for each planning area are disaggregated from total Arizona state population. See Draft Arizona Demand Narrative, Aug. 2011
5) In Mainstem, GPCD increase due to the addition of Arizona's unallocated Priority 4 entitlement, which are assumed to be allocated after 2020, no population has been associated with this allocation
6) In North Central, municipal GPCD's based on non-Tribal population estimates; 2015 - 100,580; 2035 - 118,010; and 2060 - 131,450. Tribal population estimates are: 2015 - 17,890; 2035 - 20,990; and 2060 - 23,380.
7) Personal communication, ADWR, Aug. 26, 2011. Mainstem and Central based on per-capita energy factor of 18.4 MWH per person per year, and 650 gallons per MWH.
8) Personal communication, ADWR, Aug. 26, 2011
9) Personal communication, ADWR, Aug. 26, 2011. Mainstem: 2005-2009 average. Upper San Pedro: Use based on Water Management of the Regional Aquifer in the Sierra Vista Subwatershed, Arizona-2007 Report to Congress.
10) Personal communication, ADWR, Oct. 21, 2011. Tribal demands include agricultural, municipal and industrial, and other uses. There are approximately 82,000 acres of tribal agricultural lands in the mainstem, and 180 acres in North Central.
11) Calculated from the sum of Hydrologic Basin (Consumptive) Demand and Adjacent Areas (Diversion) Demand.
12) Personal communication, ADWR, Oct. 21, 2011. Other local supplies include surface water, groundwater, groundwater mining, and effluent re-use.
13) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

TABLE C6-3
Total Demand within Study Area under Slow Growth (B) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			ARIZONA																											
	Planning Area		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	464,480	345,790	273,430	0	0	0	7,440	5,920	4,010	129	129	129	640,389	520,179	445,909	0	0	0	0	0	0	640,389	520,179	445,909	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	7.18	7.18	7.18	3.41	3.73	3.72	0.00	0.00	0.00	4.37	4.37	4.37	3.57	3.57	3.57	4.41	4.86	5.03	0.00	0.00	0.00	0.00	0.00	0.00	4.41	4.86	5.03	2)
	Consumptive factor	%	60%	60%	60%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	81%	78%	0%	0%	0%	0%	0%	0%	83%	81%	78%	
	Demand (Consumptive)	af/yr	**724,140**	**724,140**	**724,140**	**1,585,120**	**1,290,680**	**1,016,990**	**0**	**0**	**0**	**32,500**	**25,850**	**17,530**	**460**	**460**	**460**	**2,342,220**	**2,041,130**	**1,759,120**	**0**	**0**	**0**	**0**	**0**	**0**	**2,342,220**	**2,041,130**	**1,759,120**	
Municipal and Industrial	Population		282,500	366,630	412,290	6,026,070	7,679,070	8,831,000	95,470	99,740	102,680	237,050	287,680	313,770	89,290	97,720	104,410	6,730,380	8,530,840	9,764,150	12,110	15,760	20,320	12,110	15,760	20,320	6,742,490	8,546,600	9,784,470	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	274	282	302	219	220	218	128	133	140	156	162	171	189	196	207	218	219	219	123	111	86	123	111	86	217	219	219	4)
	Consumptive factor	%	66%	67%	69%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	Municipal and Industrial Demand (Consumptive)	af/yr	56,940	77,950	96,240	1,480,010	1,890,140	2,155,860	13,641	14,831	16,051	41,400	52,290	59,950	18,890	21,510	24,160	1,610,881	2,056,721	2,352,261	1,675	1,955	1,955	1,675	1,955	1,955	1,612,556	2,058,676	2,354,216	
	Self Served Industrial Demand (Consumptive)	af/yr	5,430	5,950	6,260	167,560	204,750	207,720	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	183,600	225,980	233,970	0	0	0	0	0	0	183,600	225,980	233,970	5)
	Demand (Consumptive)	af/yr	**62,370**	**83,900**	**102,500**	**1,647,570**	**2,094,890**	**2,363,580**	**13,641**	**14,831**	**16,051**	**50,610**	**65,270**	**77,640**	**20,290**	**23,810**	**26,460**	**1,794,481**	**2,282,701**	**2,586,231**	**1,675**	**1,955**	**1,955**	**1,675**	**1,955**	**1,955**	**1,796,156**	**2,284,656**	**2,588,186**	
Energy	**Demand (Consumptive)**	af/yr	**390**	**470**	**540**	**77,170**	**96,100**	**108,360**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**77,560**	**96,570**	**108,900**	**0**	**0**	**0**	**0**	**0**	**0**	**77,560**	**96,570**	**108,900**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**16,230**	**16,250**	**16,250**	**0**	**0**	**0**	**320**	**320**	**320**	**0**	**0**	**0**	**10,800**	**10,800**	**10,800**	**27,350**	**27,370**	**27,370**	**338**	**338**	**338**	**338**	**338**	**338**	**27,688**	**27,708**	**27,708**	8)
Tribal	**Demand (Consumptive)**	af/yr	**435,860**	**439,360**	**439,360**	**534,600**	**740,260**	**740,260**	**3,030**	**3,560**	**3,690**	**0**	**0**	**0**	**0**	**0**	**0**	**973,490**	**1,183,180**	**1,183,310**	**43,597**	**43,317**	**43,317**	**43,597**	**43,317**	**43,317**	**1,017,087**	**1,226,497**	**1,226,627**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,238,990**	**1,264,120**	**1,282,790**	**3,883,980**	**4,279,930**	**4,287,190**	**16,991**	**18,711**	**20,061**	**83,110**	**91,120**	**95,170**	**31,550**	**35,070**	**37,720**	**5,254,621**	**5,688,951**	**5,722,931**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**5,300,231**	**5,734,561**	**5,768,541**	
Adjacent Areas																														
Agricultural	Irrigated Acreage	acres																												
	Per-Acre Water Delivery (Diversion)	af/ac/yr																												
	Consumptive factor	%																												
	Demand (Diversion)	af/yr																												
	Demand (Consumptive)	af/yr																												
Municipal and Industrial	Population																													
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																												
	Consumptive factor	%																												
	Municipal and Industrial Demand (Diversion)	af/yr																												
	Self Served Industrial Demand (Diversion)	af/yr																												
	Demand (Diversion)	af/yr																												
	Demand (Consumptive)	af/yr																												
Energy	**Demand (Diversion)**	af/yr																												
Minerals	**Demand (Diversion)**	af/yr																												
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																												
Tribal	**Demand (Diversion)**	af/yr																												
Total Adjacent Areas	Demand (Diversion)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Total Demand in the Study Area		af/yr	**1,238,990**	**1,264,120**	**1,282,790**	**3,883,980**	**4,279,930**	**4,287,190**	**16,991**	**18,711**	**20,061**	**83,110**	**91,120**	**95,170**	**31,550**	**35,070**	**37,720**	**5,254,621**	**5,688,951**	**5,722,931**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**5,300,231**	**5,734,561**	**5,768,541**	
Demand that may be met by Other Supplies		af/yr	0	0	0	2,249,520	2,616,271	2,562,646	10,427	8,436	6,760	72,080	72,088	72,085	13,803	13,800	13,800	2,345,830	2,710,595	2,655,291	0	0	0	0	0	0	2,345,830	2,710,595	2,655,291	10)
Potential Colorado River Demand		af/yr	**1,238,990**	**1,264,120**	**1,282,790**	**1,634,460**	**1,663,659**	**1,724,544**	**6,564**	**10,275**	**13,301**	**11,030**	**19,032**	**23,085**	**17,747**	**21,270**	**23,920**	**2,908,791**	**2,978,356**	**3,067,640**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**45,610**	**2,954,401**	**3,023,966**	**3,113,250**	
Agricultural	Colorado River Demand	af/yr	724,140	724,140	724,140	421,053	0	0	0	0	0	0	0	0	0	0	0	1,145,193	724,140	724,140	0	0	0	0	0	0	1,145,193	724,140	724,140	11)
Municipal and Industrial	Colorado River Demand	af/yr	62,370	83,900	102,500	728,027	944,026	1,004,922	6,564	10,275	13,301	11,030	19,032	23,085	17,747	21,270	23,920	825,738	1,078,503	1,167,728	1,675	1,955	1,955	1,675	1,955	1,955	827,413	1,080,458	1,169,683	
Energy	Colorado River Demand	af/yr	390	470	540	830	1,024	1,013	0	0	0	0	0	0	0	0	0	1,220	1,494	1,553	0	0	0	0	0	0	1,220	1,494	1,553	
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	58,000	58,000	0	0	0	0	0	0	0	0	0	39,520	58,000	58,000	0	0	0	0	0	0	39,520	58,000	58,000	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	16,230	16,250	16,250	0	0	0	0	0	0	0	0	0	0	0	0	16,230	16,250	16,250	338	338	338	338	338	338	16,568	16,588	16,588	
Tribal	Colorado River Demand	af/yr	435,860	439,360	439,360	445,030	660,609	660,609	0	0	0	0	0	0	0	0	0	880,890	1,099,969	1,099,969	43,597	43,317	43,317	43,597	43,317	43,317	924,487	1,143,286	1,143,286	

Source and Comments

1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: higher utilization rate (up < 10%), slower land conversion (driven by population); Other areas: no change from Current Projected
2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona and Mainstem: 5% increase relative to Current Projected (note that 5% is applied to each of 3 different AMA's in Central Arizona, which combined with changes in acreage results in an average difference from Current Projected that does not equal 5%). Other areas: 20% increase from Current Projected.
3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is reduced by 35% relative to current projected.
4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: increase system loss to 10% (cannot exceed 10% in AMAs); All other areas: increase gpcd by 10% to 2060 due to increased system loss.
5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population
6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change in per-capita energy water use values from Current Projected (WRDC "moderate"). However, total energy use is reduced due to population reduction.
7) No change from Current Projected
8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges increased use of 5% relative to Current Projected; Other areas: no change from Current Projected
9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: use ADWR tribal projection, which is less than the "Ten Tribes Partnership" assumption used in Current Projected; Central Arizona: no change from Current Project; North Central and Navajo Nation: based on population estimates for the portions of the Navajo and Hopi Reservations located within the North Central portion of the study area
10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate their demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
11) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

TABLE C6-4
Total Demand within Study Area under Rapid Growth (C1) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

Hydrologic Basin	Planning Area		ARIZONA			Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			LOWER BASIN SUBTOTAL			San Juan			UPPER BASIN SUBTOTAL			STATE TOTAL			Source and comments
	Year		2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	428,890	230,810	141,070	0	0	0	7,440	5,920	4,010	129	129	129	604,799	405,199	313,549	0	0	0	0	0	0	604,799	405,199	313,549				1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	6.85	6.85	6.85	3.24	3.17	3.14	0.00	0.00	0.00	3.64	3.64	3.64	2.95	2.95	2.95	4.25	4.70	5.14	0.00	0.00	0.00	0.00	0.00	0.00	4.25	4.70	5.14				2)
	Consumptive factor	%	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	83%	76%	72%	0%	0%	0%	0%	0%	0%	83%	76%	72%				
	Demand (Consumptive)	af/yr	**703,200**	**703,200**	**703,200**	**1,389,280**	**731,230**	**443,180**	**0**	**0**	**0**	**27,090**	**21,540**	**14,610**	**380**	**380**	**380**	**2,119,950**	**1,456,350**	**1,161,370**	**0**	**0**	**0**	**0**	**0**	**0**	**2,119,950**	**1,456,350**	**1,161,370**				
Municipal and Industrial	Population		313,400	512,670	674,730	6,685,110	10,737,910	14,452,430	105,910	139,470	168,050	262,970	402,270	513,500	99,060	136,640	170,870	7,466,450	11,928,960	15,979,580	12,110	15,760	20,320	12,110	15,760	20,320	7,478,560	11,944,720	15,999,900				3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	271	269	272	214	206	203	126	126	127	151	138	121	187	187	187	213	205	203	123	111	86	123	111	86	213	205	202				4)
	Consumptive factor	%	66%	70%	72%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	100%	100%	100%	100%	100%	100%	98%	98%	98%				
	Municipal and Industrial Demand (Consumptive)	af/yr	62,670	107,610	148,620	1,603,450	2,480,940	3,290,020	14,951	19,761	24,002	44,500	62,130	69,830	20,750	28,620	35,790	1,746,321	2,699,061	3,568,262	1,675	1,955	1,955	1,675	1,955	1,955	1,747,996	2,701,016	3,570,217				
	Self Served Industrial Demand (Consumptive)	af/yr	5,380	6,340	6,970	176,120	237,060	260,810	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	192,110	258,680	287,770	0	0	0	0	0	0	192,110	258,680	287,770				5)
	Demand (Consumptive)	af/yr	**68,050**	**113,950**	**155,590**	**1,779,570**	**2,718,000**	**3,550,830**	**14,951**	**19,761**	**24,002**	**53,710**	**75,110**	**87,520**	**22,150**	**30,920**	**38,090**	**1,938,431**	**2,957,741**	**3,856,032**	**1,675**	**1,955**	**1,955**	**1,675**	**1,955**	**1,955**	**1,940,106**	**2,959,696**	**3,857,987**				
Energy	**Demand (Consumptive)**	af/yr	**440**	**730**	**970**	**86,230**	**143,170**	**186,980**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**86,670**	**143,900**	**187,950**	**0**	**0**	**0**	**0**	**0**	**0**	**86,670**	**143,900**	**187,950**				6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**				7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**15,510**	**15,530**	**15,530**	**0**	**0**	**0**	**320**	**320**	**320**	**0**	**0**	**0**	**10,800**	**10,800**	**10,800**	**26,630**	**26,650**	**26,650**	**338**	**338**	**338**	**338**	**338**	**338**	**26,968**	**26,988**	**26,988**				8)
Tribal	**Demand (Consumptive)**	af/yr	**552,066**	**555,566**	**555,566**	**534,600**	**734,210**	**705,250**	**19,325**	**76,538**	**128,613**	**0**	**0**	**0**	**0**	**0**	**0**	**1,105,991**	**1,366,314**	**1,389,429**	**38,041**	**54,836**	**70,865**	**38,041**	**54,836**	**70,865**	**1,144,032**	**1,421,150**	**1,460,294**				9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,339,266**	**1,388,976**	**1,430,856**	**3,829,200**	**4,384,610**	**4,944,240**	**34,596**	**96,619**	**152,935**	**80,800**	**96,650**	**102,130**	**33,330**	**42,100**	**49,270**	**5,317,192**	**6,008,955**	**6,679,431**	**40,054**	**57,129**	**73,158**	**40,054**	**57,129**	**73,158**	**5,357,246**	**6,066,084**	**6,752,589**				
Adjacent Areas																																	
Agricultural	Irrigated Acreage	acres																															
	Per-Acre Water Delivery (Diversion)	af/ac/yr																															
	Consumptive factor	%																															
	Demand (Diversion)	af/yr																															
	Demand (Consumptive)	af/yr																															
Municipal and Industrial	Population																																
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																															
	Consumptive factor	%																															
	Municipal and Industrial Demand (Diversion)	af/yr																															
	Self Served Industrial Demand (Diversion)	af/yr																															
	Demand (Diversion)	af/yr																															
	Demand (Consumptive)	af/yr																															
Energy	**Demand (Diversion)**	af/yr																															
Minerals	**Demand (Diversion)**	af/yr																															
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																															
Tribal	**Demand (Diversion)**	af/yr																															
Total Adjacent Areas	Demand (Diversion)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				
Total Demand in the Study Area		af/yr	**1,339,266**	**1,388,976**	**1,430,856**	**3,829,200**	**4,384,610**	**4,944,240**	**34,596**	**96,619**	**152,935**	**80,800**	**96,650**	**102,130**	**33,330**	**42,100**	**49,270**	**5,317,192**	**6,008,955**	**6,679,431**	**40,054**	**57,129**	**73,158**	**40,054**	**57,129**	**73,158**	**5,357,246**	**6,066,084**	**6,752,589**				
Demand that may be met by Other Supplies		af/yr	0	0	0	2,245,359	2,542,890	2,407,519	11,310	11,014	8,130	72,088	72,085	72,086	13,801	13,798	13,799	2,342,558	2,639,787	2,501,534	0	0	0	0	0	0	2,342,558	2,639,787	2,501,534				10)
Potential Colorado River Demand		af/yr	**1,339,266**	**1,388,976**	**1,430,856**	**1,583,841**	**1,841,720**	**2,536,721**	**23,286**	**85,605**	**144,805**	**8,712**	**24,565**	**30,044**	**19,529**	**28,302**	**35,471**	**2,974,634**	**3,369,168**	**4,177,897**	**40,054**	**57,129**	**73,158**	**40,054**	**57,129**	**73,158**	**3,014,688**	**3,426,297**	**4,251,055**				
Agricultural	Colorado River Demand	af/yr	703,200	703,200	703,200	400,923	0	0	0	0	0	0	0	0	0	0	0	1,104,123	703,200	703,200	0	0	0	0	0	0	1,104,123	703,200	703,200				11)
Municipal and Industrial	Colorado River Demand	af/yr	68,050	113,950	155,590	697,624	1,127,010	1,822,669	7,211	13,807	21,902	8,712	24,565	30,044	19,529	28,302	35,471	801,126	1,307,634	2,065,676	1,675	1,955	1,955	1,675	1,955	1,955	802,801	1,309,589	2,067,631				
Energy	Colorado River Demand	af/yr	440	730	970	744	910	925	0	0	0	0	0	0	0	0	0	1,184	1,640	1,895	0	0	0	0	0	0	1,184	1,640	1,895				
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	53,508	54,360	0	0	0	0	0	0	0	0	0	39,520	53,508	54,360	0	0	0	0	0	0	39,520	53,508	54,360				
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	15,510	15,530	15,530	0	0	0	0	0	0	0	0	0	0	0	0	15,510	15,530	15,530	338	338	338	338	338	338	15,848	15,868	15,868				
Tribal	Colorado River Demand	af/yr	552,066	555,566	555,566	445,030	660,292	658,767	16,075	71,798	122,903	0	0	0	0	0	0	1,013,171	1,287,656	1,337,236	38,041	54,836	70,865	38,041	54,836	70,865	1,051,212	1,342,492	1,408,101				

Source and Comments

1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected
2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in acreage results in an average applied water rate that is slightly different from Current Projected).
3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35% relative to current projected.
4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: no change relative to current projected (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in population results in an average gpcd that is slightly different from Current Projected; similarly in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slight change from Current Projected.)
5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population
6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. WRDC "high" energy use value used -- increased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population
7) No change from Current Projected
8) No change from Current Projected
9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Project; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules
10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate their demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
11) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

TABLE C6-5
Total Demand within Study Area under Rapid Growth (C2) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			ARIZONA																					
	Planning Area		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			San Juan			STATE TOTAL			Source and
Hydrologic Basin	Year		2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	428,890	230,810	141,070	0	0	0	7,440	5,920	4,010	129	129	129	0	0	0	604,799	405,199	313,549	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	7.92	7.92	7.92	3.19	3.01	2.98	0.00	0.00	0.00	2.91	2.91	2.92	2.33	2.33	2.33	0.00	0.00	0.00	4.50	5.05	5.63	2)
	Consumptive factor	%	57%	57%	57%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	0%	0%	0%	79%	72%	68%	
	Demand (Consumptive)	af/yr	**763,420**	**763,420**	**763,420**	**1,366,130**	**694,670**	**421,020**	**0**	**0**	**0**	**21,670**	**17,230**	**11,690**	**300**	**300**	**300**	**0**	**0**	**0**	**2,151,520**	**1,475,620**	**1,196,430**	
Municipal and Industrial	Population		313,400	512,670	674,730	6,685,110	10,737,910	14,452,430	105,910	139,470	168,050	262,970	402,270	513,500	99,060	136,640	170,870	12,110	15,760	20,320	7,478,560	11,944,720	15,999,900	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	280	251	228	209	177	162	123	113	101	151	138	124	183	167	150	123	111	86	208	178	163	4)
	Consumptive factor	%	66%	69%	71%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	Municipal and Industrial Demand (Consumptive)	af/yr	65,280	99,680	122,260	1,562,930	2,124,220	2,628,130	14,651	17,671	19,061	44,480	62,300	71,220	20,300	25,630	28,700	1,675	1,955	1,955	1,709,316	2,331,456	2,871,326	
	Self Served Industrial Demand (Consumptive)	af/yr	5,180	6,100	6,690	176,120	237,060	260,810	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	0	0	0	191,910	258,440	287,490	5a), 5b)
	Demand (Consumptive)	af/yr	**70,460**	**105,780**	**128,950**	**1,739,050**	**2,361,280**	**2,888,940**	**14,651**	**17,671**	**19,061**	**53,690**	**75,280**	**88,910**	**21,700**	**27,930**	**31,000**	**1,675**	**1,955**	**1,955**	**1,901,226**	**2,589,896**	**3,158,816**	
Energy	**Demand (Consumptive)**	af/yr	**410**	**530**	**670**	**81,660**	**106,550**	**132,020**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**82,070**	**107,080**	**132,690**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**18,760**	**18,775**	**18,775**	**0**	**0**	**0**	**320**	**320**	**320**	**0**	**0**	**0**	**10,800**	**10,800**	**10,800**	**338**	**338**	**338**	**30,218**	**30,233**	**30,233**	8)
Tribal	**Demand (Consumptive)**	af/yr	**551,917**	**555,417**	**555,417**	**534,600**	**713,440**	**673,130**	**19,255**	**76,468**	**128,543**	**0**	**0**	**0**	**0**	**0**	**0**	**38,041**	**54,836**	**70,865**	**1,143,813**	**1,400,161**	**1,427,955**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,404,967**	**1,443,922**	**1,467,232**	**3,760,960**	**3,933,940**	**4,173,110**	**34,226**	**94,459**	**147,924**	**75,360**	**92,510**	**100,600**	**32,800**	**39,030**	**42,100**	**40,054**	**57,129**	**73,158**	**5,348,367**	**5,660,990**	**6,004,124**	
Adjacent Areas																								
Agricultural	Irrigated Acreage	acres																						
	Per-Acre Water Delivery (Diversion)	af/ac/yr																						
	Consumptive factor	%																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Municipal and Industrial	Population																							
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																						
	Consumptive factor	%																						
	Municipal and Industrial Demand (Diversion)	af/yr																						
	Self Served Industrial Demand (Diversion)	af/yr																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Energy	**Demand (Diversion)**	af/yr																						
Minerals	**Demand (Diversion)**	af/yr																						
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																						
Tribal	**Demand (Diversion)**	af/yr																						
Total Adjacent Areas	Demand (Diversion)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Total Demand in the Study Area		af/yr	**1,404,967**	**1,443,922**	**1,467,232**	**3,760,960**	**3,933,940**	**4,173,110**	**34,226**	**94,459**	**147,924**	**75,360**	**92,510**	**100,600**	**32,800**	**39,030**	**42,100**	**40,054**	**57,129**	**73,158**	**5,348,367**	**5,660,990**	**6,004,124**	
Demand that may be met by Other Supplies		af/yr	0	0	0	2,252,243	2,333,192	2,304,121	11,061	10,049	7,920	72,086	72,089	72,092	13,799	13,792	13,787	0	0	0	2,349,189	2,429,122	2,397,920	10)
Potential Colorado River Demand		af/yr	**1,404,967**	**1,443,922**	**1,467,232**	**1,508,717**	**1,600,748**	**1,868,989**	**23,165**	**84,410**	**140,004**	**3,274**	**20,421**	**28,508**	**19,001**	**25,238**	**28,313**	**40,054**	**57,129**	**73,158**	**2,999,178**	**3,231,868**	**3,606,204**	
Agricultural	Colorado River Demand	af/yr	763,420	763,420	763,420	368,390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,131,810	763,420	763,420	11)
Municipal and Industrial	Colorado River Demand	af/yr	70,460	105,780	128,950	655,075	890,073	1,158,227	7,090	12,612	17,101	3,274	20,421	28,508	19,001	25,238	28,313	1,675	1,955	1,955	756,575	1,056,079	1,363,054	
Energy	Colorado River Demand	af/yr	410	530	670	702	861	898	0	0	0	0	0	0	0	0	0	0	0	0	1,112	1,391	1,568	
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	50,616	52,787	0	0	0	0	0	0	0	0	0	0	0	0	39,520	50,616	52,787	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	18,760	18,775	18,775	0	0	0	0	0	0	0	0	0	0	0	0	338	338	338	19,098	19,113	19,113	
Tribal	Colorado River Demand	af/yr	551,917	555,417	555,417	445,030	659,198	657,077	16,075	71,798	122,903	0	0	0	0	0	0	38,041	54,836	70,865	1,051,063	1,341,249	1,406,262	
						996,947	1,214,615	1,212,494	1,013,022	1,286,413	1,335,397													

Source and Comments

1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected
2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: 5% decrease in water duties, but overall higher water duties result from consumptive use being higher for the same acreage. Central Arizona: 5% decrease relative to Current Projected (note that 5% is applied to each of 3 different AMA's in Central Arizona, which combined with changes in acreage results in an average difference from Current Projected that does not equal 5%). Other areas: 20% decrease from Current Projected.
3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35% relative to current projected.
4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.44% (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in population results in an average gpcd that changes at a slightly different rate than 0.44%; similarly in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44%)
5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population
6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. WRDC "low" energy use value used -- decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population
7) No change from Current Projected
8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: recreation contractors use full entitlement, no change to National Wildlife Refuges; Other areas: no change from Current Projected
9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Project; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules
10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate their demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
11) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

TABLE C6-6
Total Demand within Study Area under Enhanced Environment (D1) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			ARIZONA																				
	Planning Area		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			San Juan			STATE TOTAL			Source and
Hydrologic Basin	Year		2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	446,610	288,100	188,740	0	0	0	7,440	5,920	4,010	129	129	129	0	0	0	622,519	462,489	361,219	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	6.85	6.85	6.85	3.24	3.21	3.16	0.00	0.00	0.00	3.64	3.64	3.64	2.95	2.95	2.95	0.00	0.00	0.00	4.22	4.54	4.88	2)
	Consumptive factor	%	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	0%	0%	0%	83%	79%	75%	
	Demand (Consumptive)	af/yr	**703,200**	**703,200**	**703,200**	**1,448,800**	**923,690**	**595,980**	**0**	**0**	**0**	**27,090**	**21,540**	**14,610**	**380**	**380**	**380**	**0**	**0**	**0**	**2,179,470**	**1,648,810**	**1,314,170**	
Municipal and Industrial	Population		297,620	433,790	527,800	6,348,470	9,085,770	11,305,200	100,580	118,010	131,450	249,730	340,370	401,680	94,070	115,620	133,900	12,110	15,760	20,320	7,102,580	10,109,320	12,520,350	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	260	221	186	210	181	163	121	101	94	148	124	100	179	150	120	123	111	86	208	179	161	4)
	Consumptive factor	%	66%	67%	67%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	Municipal and Industrial Demand (Consumptive)	af/yr	56,810	71,980	73,620	1,496,570	1,843,160	2,064,283	13,611	13,381	13,842	41,310	47,190	44,990	18,850	19,420	18,000	1,675	1,955	1,955	1,628,826	1,997,086	2,216,690	
	Self Served Industrial Demand (Consumptive)	af/yr	5,260	5,960	6,400	171,820	220,320	232,620	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	0	0	0	187,690	241,560	259,010	5a), 5b)
	Demand (Consumptive)	af/yr	**62,070**	**77,940**	**80,020**	**1,668,390**	**2,063,480**	**2,296,903**	**13,611**	**13,381**	**13,842**	**50,520**	**60,170**	**62,680**	**20,250**	**21,720**	**20,300**	**1,675**	**1,955**	**1,955**	**1,816,516**	**2,238,646**	**2,475,700**	
Energy	**Demand (Consumptive)**	af/yr	**390**	**450**	**520**	**77,960**	**105,945**	**122,832**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**78,350**	**106,395**	**123,352**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**78,245**	**78,258**	**78,258**	**0**	**0**	**0**	**320**	**320**	**320**	**0**	**0**	**0**	**10,800**	**10,800**	**10,800**	**338**	**338**	**338**	**89,703**	**89,716**	**89,716**	8)
Tribal	**Demand (Consumptive)**	af/yr	**552,066**	**555,566**	**555,566**	**534,600**	**736,760**	**725,520**	**3,100**	**4,060**	**4,540**	**0**	**0**	**0**	**0**	**0**	**0**	**43,597**	**43,317**	**43,317**	**1,133,363**	**1,339,703**	**1,328,943**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,395,971**	**1,415,414**	**1,417,564**	**3,769,270**	**3,887,875**	**3,799,235**	**17,031**	**17,761**	**18,702**	**77,610**	**81,710**	**77,290**	**31,430**	**32,900**	**31,480**	**45,610**	**45,610**	**45,610**	**5,336,922**	**5,481,270**	**5,389,880**	
Adjacent Areas																								
Agricultural	Irrigated Acreage	acres																						
	Per-Acre Water Delivery (Diversion)	af/ac/yr																						
	Consumptive factor	%																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Municipal and Industrial	Population																							
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																						
	Consumptive factor	%																						
	Municipal and Industrial Demand (Diversion)	af/yr																						
	Self Served Industrial Demand (Diversion)	af/yr																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Energy	**Demand (Diversion)**	af/yr																						
Minerals	**Demand (Diversion)**	af/yr																						
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																						
Tribal	**Demand (Diversion)**	af/yr																						
Total Adjacent Areas	Demand (Diversion)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Total Demand in the Study Area		af/yr	**1,395,971**	**1,415,414**	**1,417,564**	**3,769,270**	**3,887,875**	**3,799,235**	**17,031**	**17,761**	**18,702**	**77,610**	**81,710**	**77,290**	**31,430**	**32,900**	**31,480**	**45,610**	**45,610**	**45,610**	**5,336,922**	**5,481,270**	**5,389,880**	
Demand that may be met by Other Supplies		af/yr	0	0	0	2,180,480	2,105,884	1,820,074	10,422	7,985	5,802	72,084	72,091	72,086	13,798	13,804	13,804	0	0	0	2,276,784	2,199,764	1,911,766	10)
Potential Colorado River Demand		af/yr	**1,395,971**	**1,415,414**	**1,417,564**	**1,588,790**	**1,781,991**	**1,979,161**	**6,609**	**9,776**	**12,900**	**5,526**	**9,619**	**5,204**	**17,632**	**19,096**	**17,676**	**45,610**	**45,610**	**45,610**	**3,060,138**	**3,281,506**	**3,478,115**	
Agricultural	Colorado River Demand	af/yr	703,200	703,200	703,200	417,683	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,120,883	703,200	703,200	11)
Municipal and Industrial	Colorado River Demand	af/yr	62,070	77,940	80,020	685,827	1,065,969	1,263,033	6,609	9,776	12,900	5,526	9,619	5,204	17,632	19,096	17,676	1,675	1,955	1,955	779,339	1,184,355	1,380,788	
Energy	Colorado River Demand	af/yr	390	450	520	730	930	942	0	0	0	0	0	0	0	0	0	0	0	0	1,120	1,380	1,462	
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	54,666	55,352	0	0	0	0	0	0	0	0	0	0	0	0	39,520	54,666	55,352	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	78,245	78,258	78,258	0	0	0	0	0	0	0	0	0	0	0	0	338	338	338	78,583	78,596	78,596	
Tribal	Colorado River Demand	af/yr	552,066	555,566	555,566	445,030	660,426	659,834	0	0	0	0	0	0	0	0	0	43,597	43,317	43,317	1,040,693	1,259,309	1,258,717	
						997,096	1,215,992	1,215,400																

Source and Comments

1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: no change from Current Projected
2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in acreage results in an average applied water rate that is slightly different from Current Projected).
3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from current projected.
4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.88%, with lower limit of 100 gpcd (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in population results in an average gpcd that changes at a slightly different rate than 0.44%; similarly in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44%). There is an exception for Central Arizona and North Central and Navajo Nation in 2060 where gpcd was determined as a 22.5% reduction from 2015 levels.
5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population
6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. WRDC "low" energy use value used -- decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population. There is an exception for Central Arizona where a 5.6% reduction from the Scenario A is realized in 2035 and a 10% reduction in 2060.
7) No change from Current Projected
8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges use full entitlement; Other areas: no change from Current Projected
9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. No change from Current Projected
10) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate their demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
11) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

TABLE C6-7
Total Demand within Study Area under Enhanced Environment (D2) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			ARIZONA																				
	Planning Area		Mainstem			Central Arizona			North Central and Navajo Nation			Central Yavapai Highlands			Upper San Pedro River			San Juan			STATE TOTAL			Source and
Hydrologic Basin	Year		2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	168,340	168,340	168,340	428,890	230,810	141,070	0	0	0	7,440	5,920	4,010	129	129	129	0	0	0	604,799	405,199	313,549	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	6.51	6.51	6.51	3.19	3.01	2.98	0.00	0.00	0.00	2.91	2.91	2.92	2.33	2.33	2.33	0.00	0.00	0.00	4.11	4.46	4.87	2)
	Consumptive factor	%	61%	61%	61%	100%	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	0%	0%	0%	83%	76%	72%	
	Demand (Consumptive)	af/yr	**668,190**	**668,190**	**668,190**	**1,366,130**	**694,670**	**421,020**	**0**	**0**	**0**	**21,670**	**17,230**	**11,690**	**300**	**300**	**300**	**0**	**0**	**0**	**2,056,290**	**1,380,390**	**1,101,200**	
Municipal and Industrial	Population		313,400	512,670	674,730	6,685,110	10,737,910	14,452,430	105,910	139,470	168,050	262,970	402,270	513,500	99,060	136,640	170,870	12,110	15,760	20,320	7,478,560	11,944,720	15,999,900	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	261	220	182	209	177	162	121	101	100	148	124	100	179	150	120	123	111	86	207	175	160	4)
	Consumptive factor	%	66%	68%	69%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	98%	98%	
	Municipal and Industrial Demand (Consumptive)	af/yr	60,260	85,300	94,300	1,562,930	2,124,220	2,628,130	14,331	15,821	18,821	43,510	55,770	57,520	19,850	22,950	23,000	1,675	1,955	1,955	1,702,556	2,306,016	2,823,726	
	Self Served Industrial Demand (Consumptive)	af/yr	5,150	6,070	6,650	176,120	237,060	260,810	0	0	0	9,210	12,980	17,690	1,400	2,300	2,300	0	0	0	191,880	258,410	287,450	5a), 5b)
	Demand (Consumptive)	af/yr	**65,410**	**91,370**	**100,950**	**1,739,050**	**2,361,280**	**2,888,940**	**14,331**	**15,821**	**18,821**	**52,720**	**68,750**	**75,210**	**21,250**	**25,250**	**25,300**	**1,675**	**1,955**	**1,955**	**1,894,436**	**2,564,426**	**3,111,176**	
Energy	**Demand (Consumptive)**	af/yr	**410**	**530**	**670**	**81,660**	**106,550**	**132,020**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**82,070**	**107,080**	**132,690**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39,520**	**58,000**	**58,000**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**79,456**	**79,469**	**79,469**	**0**	**0**	**0**	**320**	**320**	**320**	**0**	**0**	**0**	**10,800**	**10,800**	**10,800**	**338**	**338**	**338**	**90,914**	**90,927**	**90,927**	8)
Tribal	**Demand (Consumptive)**	af/yr	**551,917**	**555,417**	**555,417**	**534,600**	**724,920**	**722,400**	**19,255**	**76,468**	**128,543**	**0**	**0**	**0**	**0**	**0**	**0**	**38,041**	**54,836**	**70,865**	**1,143,813**	**1,411,641**	**1,477,225**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**1,365,383**	**1,394,976**	**1,404,696**	**3,760,960**	**3,945,420**	**4,222,380**	**33,906**	**92,609**	**147,684**	**74,390**	**85,980**	**86,900**	**32,350**	**36,350**	**36,400**	**40,054**	**57,129**	**73,158**	**5,307,043**	**5,612,464**	**5,971,218**	
Adjacent Areas																								
Agricultural	Irrigated Acreage	acres																						
	Per-Acre Water Delivery (Diversion)	af/ac/yr																						
	Consumptive factor	%																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Municipal and Industrial	Population																							
	Municipal and Industrial Per Capita Use (Diversion)	gpcd																						
	Consumptive factor	%																						
	Municipal and Industrial Demand (Diversion)	af/yr																						
	Self Served Industrial Demand (Diversion)	af/yr																						
	Demand (Diversion)	af/yr																						
	Demand (Consumptive)	af/yr																						
Energy	**Demand (Diversion)**	af/yr																						
Minerals	**Demand (Diversion)**	af/yr																						
Fish, Wildlife, and Recreation	**Demand (Diversion)**	af/yr																						
Tribal	**Demand (Diversion)**	af/yr																						
Total Adjacent Areas	Demand (Diversion)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Total Demand in the Study Area		af/yr	**1,365,383**	**1,394,976**	**1,404,696**	**3,760,960**	**3,945,420**	**4,222,380**	**33,906**	**92,609**	**147,684**	**74,390**	**85,980**	**86,900**	**32,350**	**36,350**	**36,400**	**40,054**	**57,129**	**73,158**	**5,307,043**	**5,612,464**	**5,971,218**	
Demand that may be met by Other Supplies		af/yr	0	0	0	2,164,138	2,149,578	2,049,556	10,871	9,258	7,980	72,091	72,089	72,093	13,794	13,799	13,790	0	0	0	2,260,894	2,244,724	2,143,419	10)
Potential Colorado River Demand		af/yr	**1,365,383**	**1,394,976**	**1,404,696**	**1,596,822**	**1,795,842**	**2,172,824**	**23,035**	**83,351**	**139,704**	**2,299**	**13,891**	**14,807**	**18,556**	**22,551**	**22,610**	**40,054**	**57,129**	**73,158**	**3,046,149**	**3,367,740**	**3,827,800**	
Agricultural	Colorado River Demand	af/yr	668,190	668,190	668,190	396,459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,064,649	668,190	668,190	11)
Municipal and Industrial	Colorado River Demand	af/yr	65,410	91,370	100,950	715,054	1,079,775	1,457,015	6,960	11,553	16,801	2,299	13,891	14,807	18,556	22,551	22,610	1,675	1,955	1,955	809,954	1,221,095	1,614,139	
Energy	Colorado River Demand	af/yr	410	530	670	759	941	939	0	0	0	0	0	0	0	0	0	0	0	0	1,169	1,471	1,609	
Minerals	Colorado River Demand	af/yr	0	0	0	39,520	55,323	55,200	0	0	0	0	0	0	0	0	0	0	0	0	39,520	55,323	55,200	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	79,456	79,469	79,469	0	0	0	0	0	0	0	0	0	0	0	0	338	338	338	79,794	79,807	79,807	
Tribal	Colorado River Demand	af/yr	551,917	555,417	555,417	445,030	659,803	659,670	16,075	71,798	122,903	0	0	0	0	0	0	38,041	54,836	70,865	1,051,063	1,341,854	1,408,855	
						996,947	1,215,220	1,215,087	1,013,022	1,287,018	1,337,990													

Source and Comments

1) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona: faster land conversion (driven by population); Other areas: no change from Current Projected
2) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Central Arizona and Mainstem: 5% decrease relative to Current Projected (note that 5% is applied to each of 3 different AMA's in Central Arizona, which combined with changes in acreage results in an average difference from Current Projected that does not equal 5%). Other areas: 20% decrease from Current Projected.
3) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Annual population change is increased by 35% relative to current projected.
4) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. All areas: gpcd reduced annually by 0.88%, with lower limit of 100 gpcd (note that this is applied to each of 3 different AMA's in Central Arizona, which combined with changes in population results in an average gpcd that changes at a slightly different rate than 0.44%; similarly in Mainstem it is applied to individual contractors, so changes in population of individual contractors results in a slightly different rate than 0.44%)
5) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. SSI is a function of population
6) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. WRDC "low" energy use value used -- decreased energy water use values from Current Projected. Note that these are per capita, so energy use is also affected by population
7) No change from Current Projected
8) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem: National Wildlife Refuges use full entitlement; Other areas: no change from Current Projected
9) Personal communication, ADWR, Dec 3, 2011, and Feb 22, 2012. Mainstem and Central Arizona: no change from Current Project; Personal communication, Navajo Nation, Apr 16, 2012. North Central and Navajo Nation and San Juan: Nation provided demand schedules
10) Personal communication, ADWR Dec 3, 2011, and Feb 22, 2012. North Central: local supplies were calculated as the difference between the total demand and unmet demand; Central Yavapai Highlands and Upper San Pedro Study: based on information from Reclamation appraisal reports. Central AZ: AZ used internal models to estimate their demands met by Other Supplies and CAP deliveries. The remaining or unmet demands are represented as Potential Colorado River Basin demands, where CAP deliveries are a portion of potential Colorado River Demands in the Central AZ planning area.
11) For planning areas other than Central AZ, all CR demand is municipal. For Central AZ, based on recent distribution of CAP water (20110510 Basin Study AZCAPBreakout.xlsx). Approach was to start with recent distribution, and then make the change in distribution the same as the change in overall demands. This was done for current projected only. The values for all categories but M&I were then applied to all other scenarios, with M&I used as the makeup term. The formulas also check to make sure CR demand isn't greater than total demand for each category - if so, M&I makes up the difference.

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