Appendix C8
Nevada Water Demand Scenario Quantification

Appendix C8—Nevada Water Demand Scenario Quantification

1.0 Introduction

This appendix summarizes the data sources used in scenario quantification for Colorado River demand[1] for the state of Nevada and presents the results of quantification. As presented in figure C8-1, Nevada is divided into planning areas that correspond to the Southern Nevada Water Authority (SNWA) service area and other service areas where Colorado River water is delivered. Data collection and development were completed at the planning area level, and the compiled water demands are discussed in Section 3.0.

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 a Nevada Study Area summary, followed by Colorado River demand by geography and finally by category.

2.0 Background

The SNWA was formed in 1991 by cooperative agreement among seven Las Vegas area water and wastewater agencies. SNWA is responsible for the water treatment and delivery as well as acquiring and managing the long-term water resources for Southern Nevada. SNWA has produced a number of planning reports over time that examine long-term water resources for Southern Nevada.

SNWA, with support from member agencies, coordinated Nevada's efforts to provide information for water demand scenario quantification. These efforts largely relied on information previously generated through SNWA water resource planning, including SNWA's current plan, which was developed in 2009 (SNWA, 2009). Adjustments from the 2009 plan reflect the development of the range of scenarios established in support of the Study.

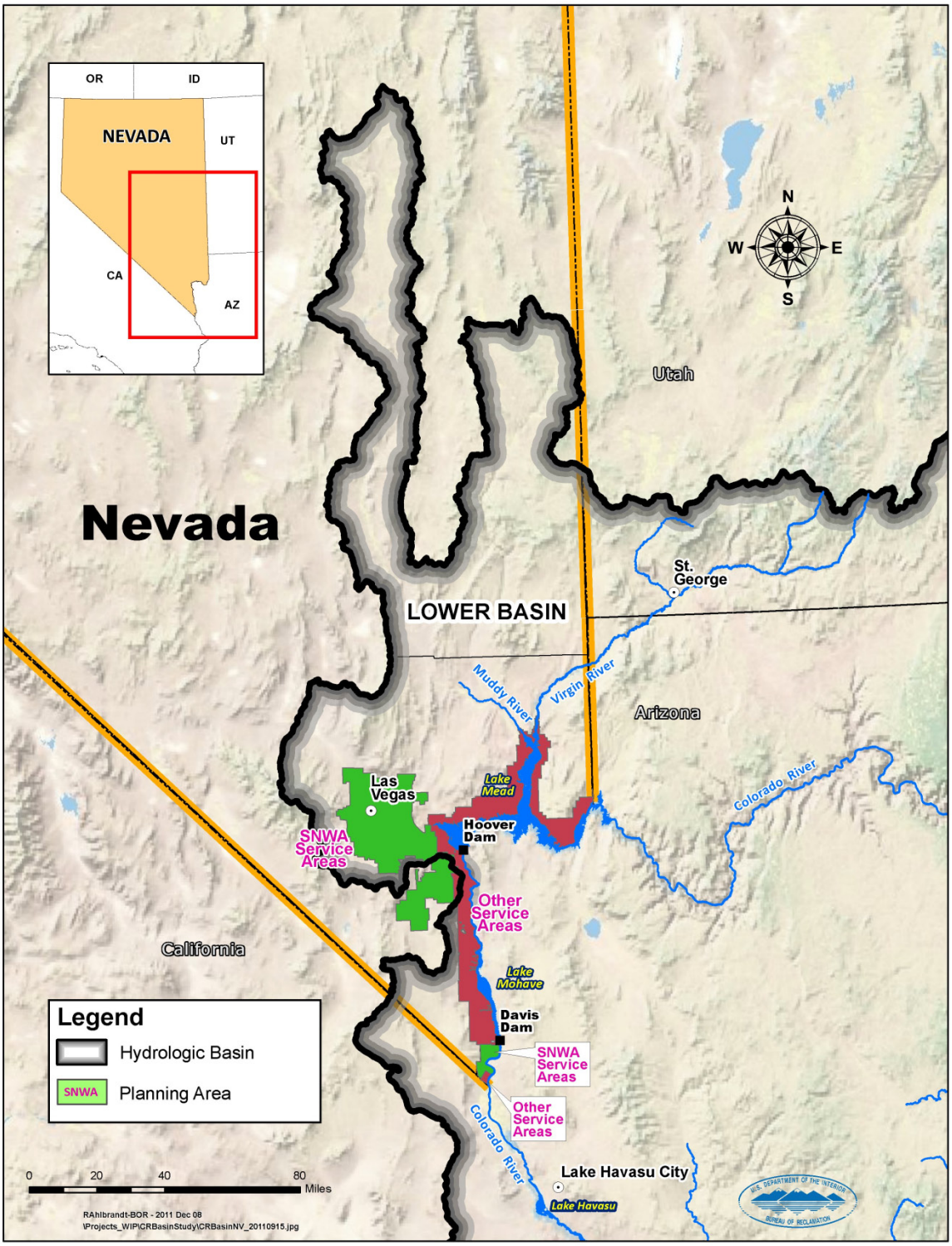
2.1 Data Sources for Quantification

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 include state, regional, and national agency reports.

- **Agricultural Demand:** There are no reported Colorado River agricultural demands in Nevada.

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

FIGURE C8-1
Colorado River Hydrologic Basin and Export Service Areas in Nevada



- **Energy:** There are no reported Colorado River energy demands in Nevada.
- **Minerals:** There are no reported Colorado River minerals demands in Nevada.
- **Fish, Wildlife, and Recreation:** Fish, wildlife, and recreation demands were provided by SNWA based on contracted recreation use outside of SNWA's service area.
- **Tribal:** The quantification of tribal demands relied on information submitted by the Ten Tribes Partnership for use in the *Colorado River Interim Surplus Criteria Final Environmental Impact 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), and Reclamation's 2005 to 2009 *Decree Accounting Report* (Reclamation, 2007 and 2010). Tribal diversion-based demands reflect full use of Fort Mojave water rights.

3.0 Results of Water Demand Scenario Quantification[2]

This section summarizes Nevada's Colorado River water demand trends by category across the initial 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. The communities within the Colorado River Basin, including the SNWA service area and other service areas, also rely on other sources of supply, including local non-tributary and imported Nevada groundwater supplies; banked resources created through local and interstate agreements (for example, Arizona Water Bank, California Water Bank, and Southern Nevada Water Bank); and projects that result in Intentionally Created Surpluses (ICS) (for example, Virgin/Muddy Rivers, Tributary Conservation ICS, Coyote Spring Valley Groundwater Imported ICS, and Brock Reservoir System Efficiency ICS).

The SNWA 2009 plan includes imported Nevada groundwater to help meet future SNWA demands, and the SNWA is pursuing development of this resource by securing related Nevada groundwater right permits and corresponding federal environmental permits for this project. Nevada's Colorado River demand for the Study includes water for the long term as temporary resources (for example, System Efficiency ICS and banked resources) are exhausted without use of imported Nevada groundwater. This approach is being applied for the Study to analyze Nevada's potential future Colorado River water demands for planning purposes. If SNWA is successful in obtaining these permits for imported Nevada groundwater, this resource, along with existing and future Colorado River resources, would be integrated in local planning efforts. The subsequent Nevada Colorado River water demand may or may not differ, depending upon the application of the available resources in meeting future demands.

To develop estimates of the Colorado River demand, the Study Area demand was reduced by estimates of available supply from other sources, as discussed above. This appendix focuses on Colorado River demands, but includes discussion of the Study Area parameters that led to these

[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.

demands. For the purpose of the study, additional Virgin River Basin demands in Nevada are not included. The SNWA is currently not seeking to develop its Virgin River surface water rights under Permit No. 58591 as agreed to under the Agreement Concerning Colorado River Management and Operations signed April 23, 2007, by the Seven Basin States which is a key agreement supporting the 2007 Interim Guidelines.

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 C8-2 to C8-7 in section 3.4.

3.1 Summary Results of Scenario Quantification

Values were developed for parameters to quantify Study Area demand for each of the scenarios. Colorado River demand was calculated as Study Area demand minus other supplies. Table C8-1 presents summary results for the demand scenarios considered in the Study. The table presents 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.

Nevada estimates that between 2.3 and 2.6 million people will reside in Nevada's Study Area by 2015. Population is expected to increase to 4.2 to 5.1 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 smallest population in 2060 of the scenarios (4.2 million by 2060), but still represents a growth of about 73 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 on passive and active conservation to achieve existing conservation targets, is expected to be 20 percent less in 2060 than in 2015. M&I is the largest component of Colorado River demand, and is the only component of change in Colorado River demand. The increase in M&I demand is driven by an increase in population that outpaces a decrease in per capita usage.

Figure C8-2 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 377 thousand acre-feet (kaf) in 2015 to between 514 and 624 kaf in 2060. The range in Study Area demand growth across scenarios in 2060 is projected to be about 110 kaf.

Panel two provides a view of the range across scenarios of Colorado River demand. This demand increases from about 300 kaf in 2015 to between 490 and 600 kaf in 2060 (or growth of 63 to 100 percent), depending on the scenario. This difference results in a Colorado River demand range of about 110 kaf across the scenarios in 2060, or about 20 percent.

Panel three shows how specific categories affect the projected change in Colorado River demand by scenario. Growth in M&I demand is the only factor affecting Colorado River demand across the scenarios.

Figure C8-3 ties historical water use to the range of Colorado River demand in the quantified scenarios. The scenarios of future Colorado River demand provided in figure C8-3 do not show a smooth growth pattern, primarily due the influence of replacing temporary resources with Colorado River water. The 110 kaf range across scenarios in 2060 is easily discernible, with a relatively even spread over the range across the scenarios. In addition, it appears that the quantified scenarios track well with the peaks in historical uses that likely represent the least supply limited conditions or actual demand.

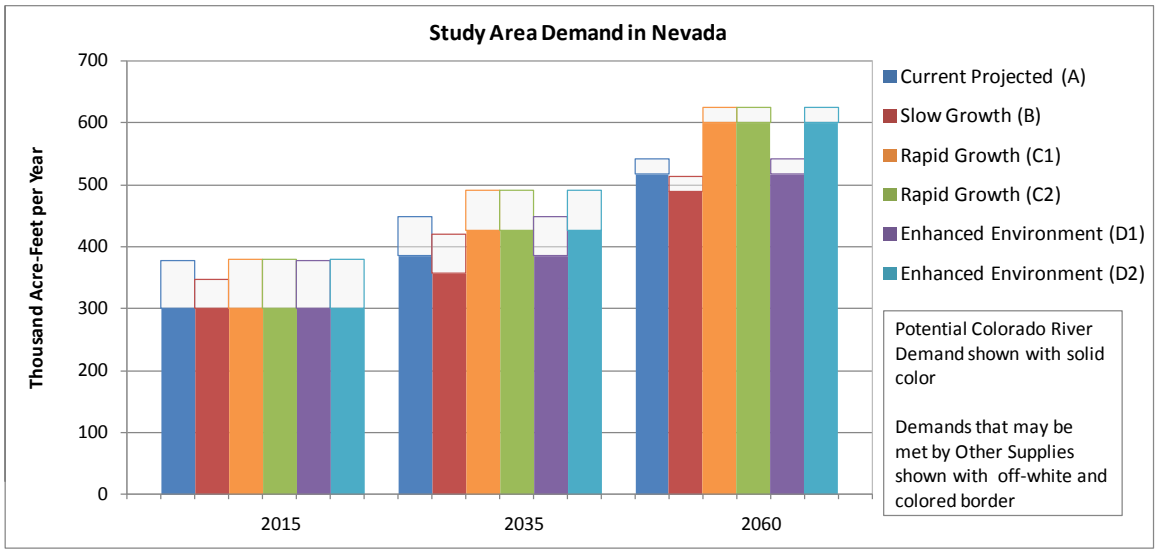
TABLE C8-1
Summary Results of Nevada Water Demand Scenario Quantification by 2060

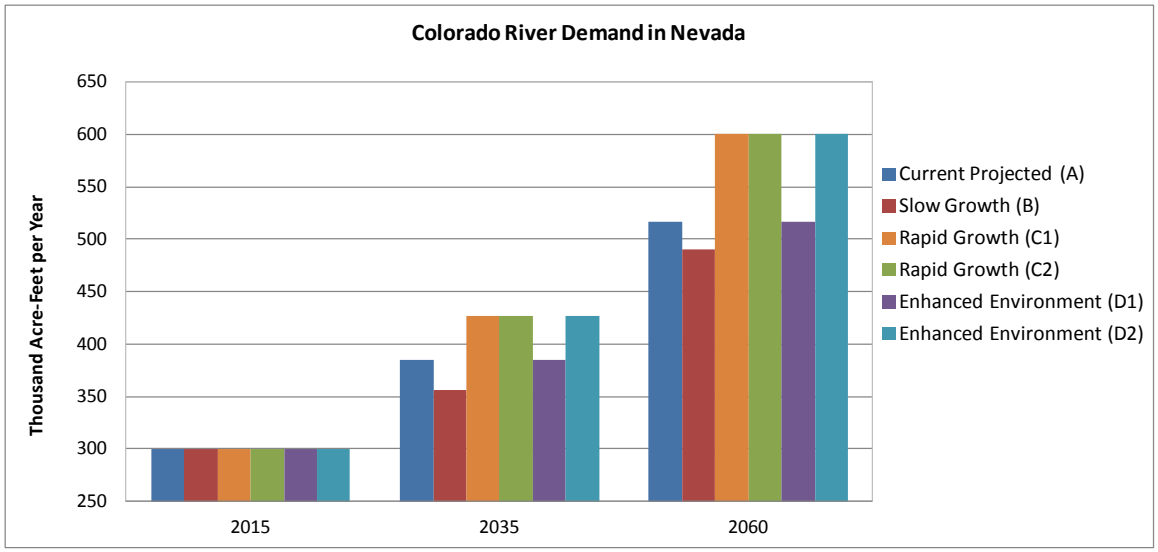
Key Study Area Demand Scenario Parameters							
	2015[1]	2060 Scenario Parameters					
		A	B	C1	C2	D1	D2
Population (millions)	2.6	4.4	4.2	5.1	5.1	4.4	5.1
Change in per capita water usage (%), from 2015	–	-20%	-20%	-20%	-20%	-20%	-20%
Irrigated acreage (millions of acres)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in per acre water delivery (%), from 2015	–	n/a	n/a	n/a	n/a	n/a	n/a
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	366	530	503	613	613	530	613
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Tribal demand	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Study Area Demand[2]	**377**	**541**	**514**	**624**	**624**	**541**	**624**
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	289	506	479	589	589	506	589
Energy demand	0	0	0	0	0	0	0
Minerals demand	0	0	0	0	0	0	0
FWR demand	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Tribal demand	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Colorado River Demand[2]	**300**	**517**	**490**	**600**	**600**	**517**	**600**

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 C8-2
Study Area, Colorado River, and Change in Colorado River Demand





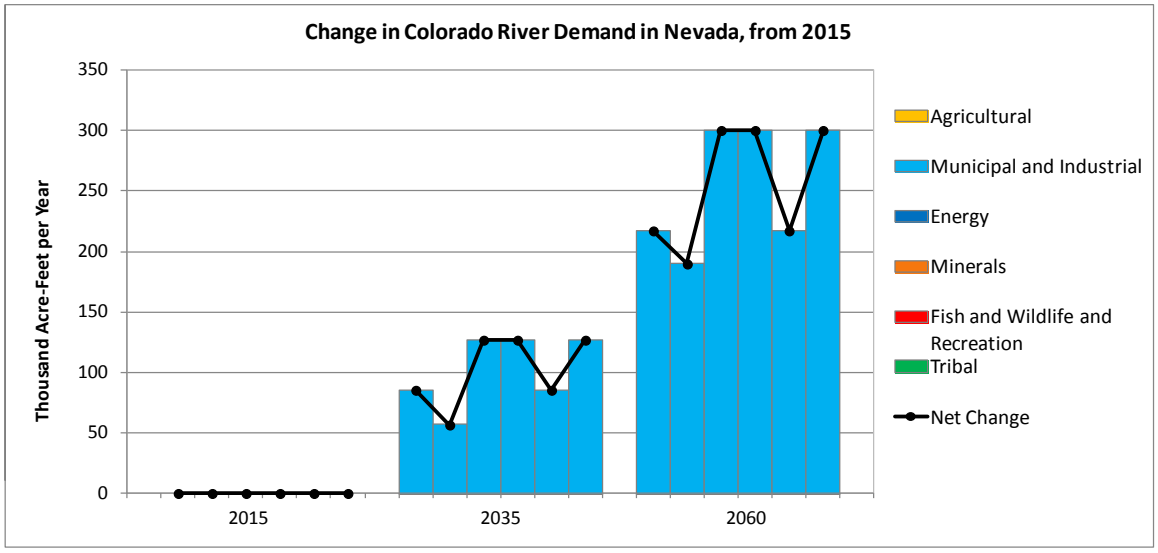
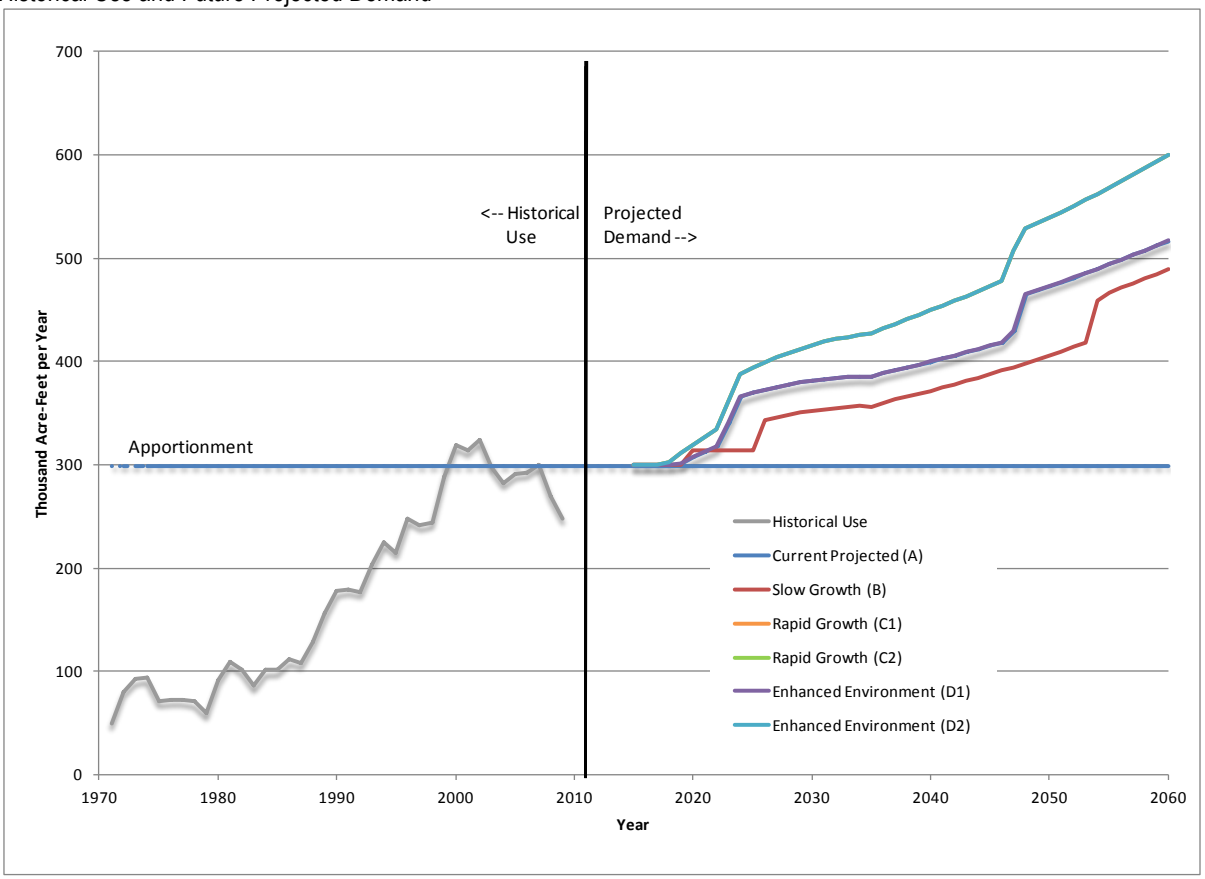


FIGURE C8-3
Historical Use and Future Projected Demand[1]



[1]This figure presents the range of potential scenarios. However, some of the scenarios overlap and are not discernible on this format.

3.2 Colorado River Water Demand by Geography

Colorado River water demand for areas served by the Colorado River is presented in figures C8-4 and C8-5. These figures show two geographic levels: Study Area in Nevada, and individual planning areas. Demands at each geographic level are shown across the scenarios. The columns to the right show the Colorado River demand at a point in time (2015, 2035, or 2060) by relative contribution of the categories.

The change in both magnitude and percentage of Colorado River demand varies considerably across scenarios. Colorado River demand[3] in Nevada is primarily in the SNWA service area. The primary demand category in the other service areas is tribal, with a small amount of fish, wildlife, and recreation demand.

Figure C8-6 shows the change in Colorado River demand by category from 2015 across the scenarios. All change in Colorado River demand is due to change in M&I demand in the SNWA service area.

[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 C8-4
Colorado River Demand in Nevada

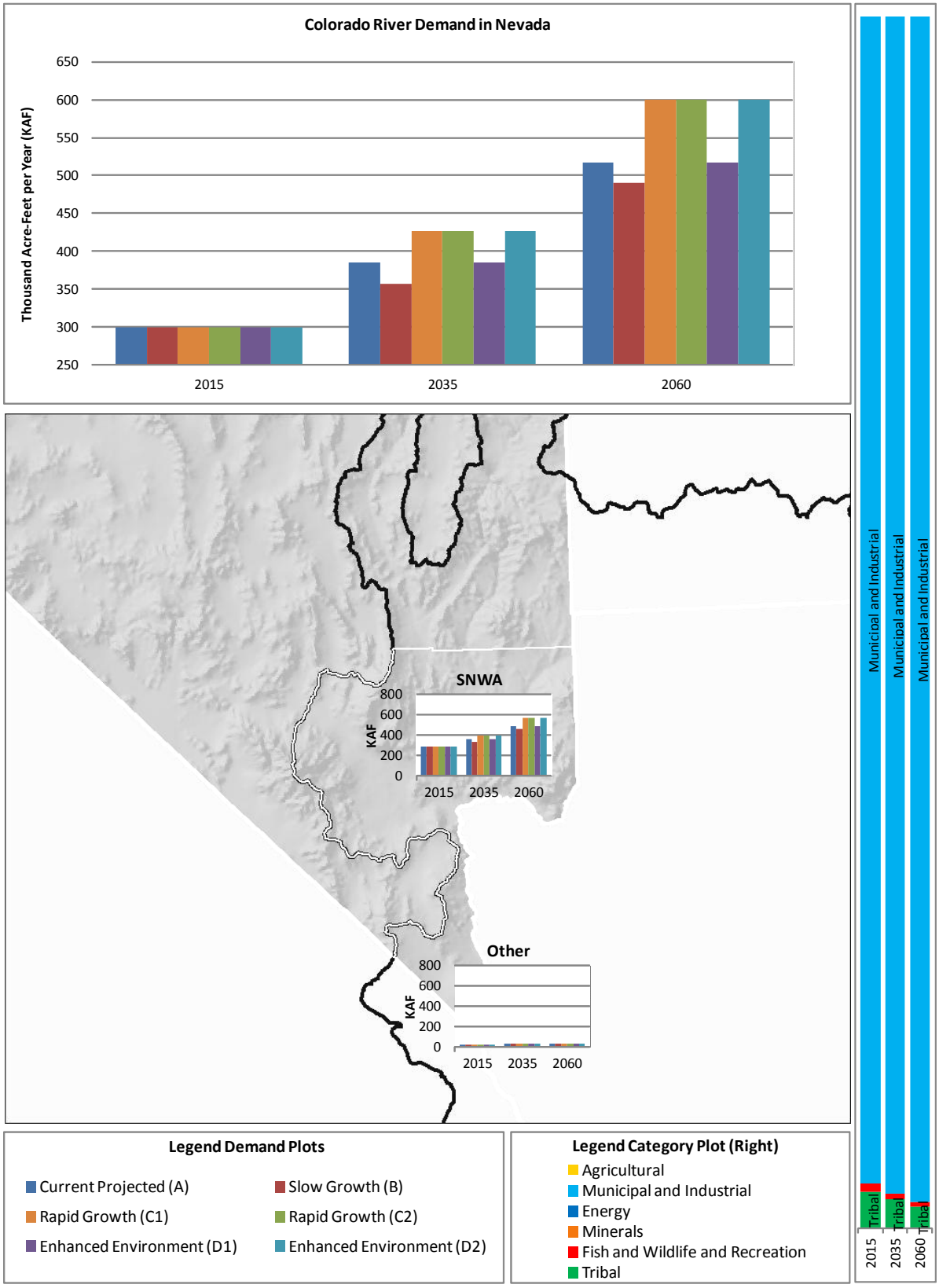


FIGURE C8-5
Colorado River Demand by Category

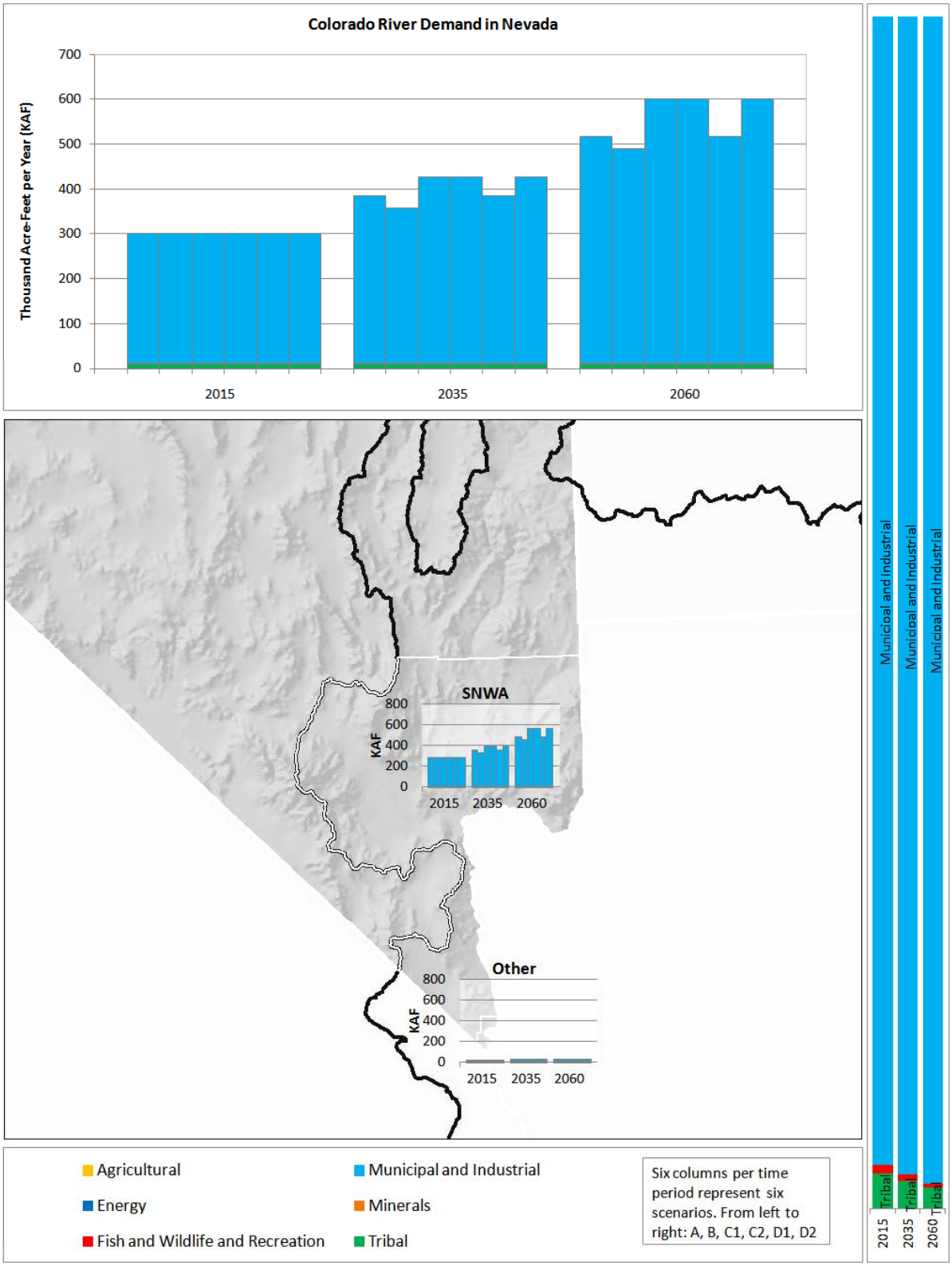
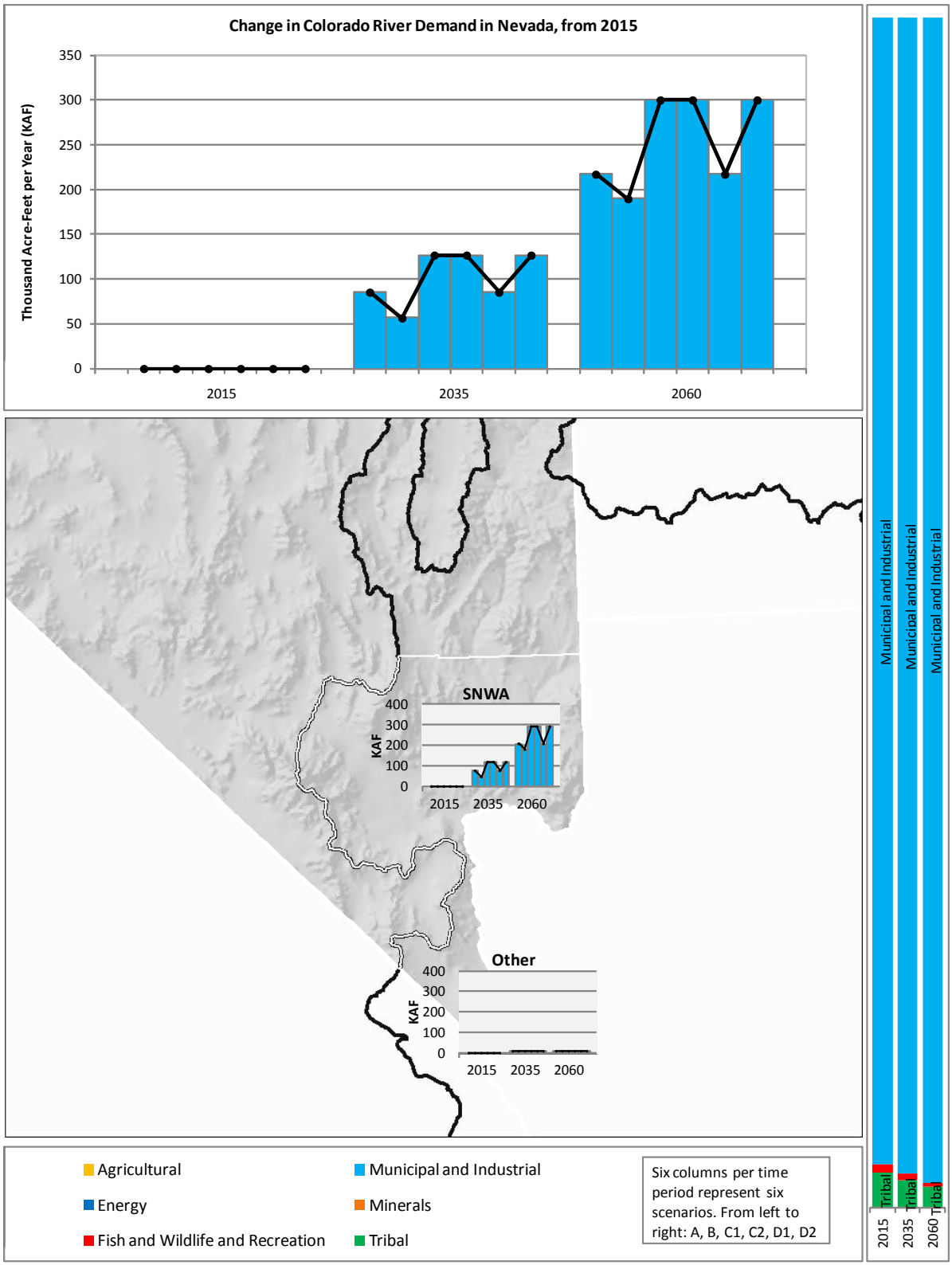


FIGURE C8-6
Change in Colorado River Demand in Nevada from 2015 by Category



3.3 Colorado River Demand by Category

3.3.1 Agricultural

Agricultural demand includes demand from irrigated agriculture, livestock, and stock ponds. No agricultural demands are projected for Nevada under any of the scenarios. The only agricultural demand is included in the Colorado River water supplied for the Fort Mojave Indian Reservation and is accounted for in the tribal category.

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. M&I per capita water use is a measure of the amount of water produced or diverted per person in a given municipality. Because this measure examines all water produced by a given municipality, it often includes industrial, commercial, and institutional demand as well as residential 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 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 C8-7 presents the following by scenario in 2015, 2035, and 2060:

- Change in M&I demand for Colorado River water in the Study Area
- 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)

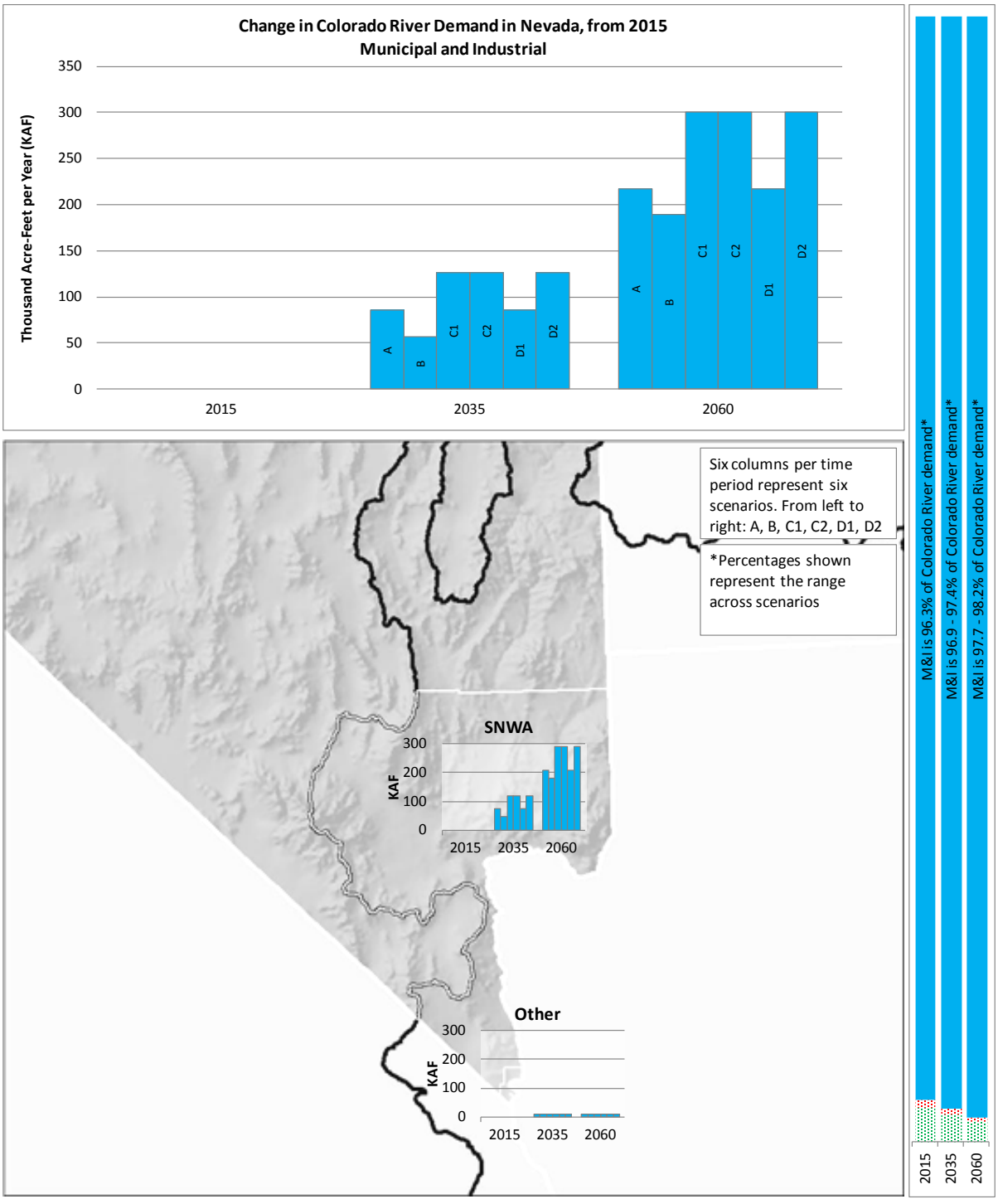
As can be seen from figure C8-7, M&I water demand is by far the largest component of Colorado River demand, increasing from about 96 percent in 2015 to about 98 percent of Colorado River demand in 2060, depending on which scenario is considered.

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 and SSI is relatively small.

In examining the planning areas, nearly all of the increase in M&I demand for Colorado River water from 2015 to 2060 over time is due to population increase in the SNWA service area across all scenarios. The remaining increase in demand is primarily from a small increase in SSI demand in the other areas.

Increases in population are somewhat tempered by decreases in M&I per capita water use of 20 percent by 2060.

FIGURE C8-7
Change in Colorado River Demand in Nevada from 2015 for M&I



3.3.3 Energy

SNWA member agencies provide some retail water service for energy production. This water usage is captured in the SNWA M&I demand.

3.3.4 Minerals Extraction

Nevada does not currently use or plan to use Colorado River Water for minerals extraction.

3.3.5 Fish, Wildlife, and Recreation

Recreational demands were included to account for the Lake Mead National Recreation Area. Total fish, wildlife, and recreation demands are estimated at about 2,000 feet per year and are constant through time and across scenarios. No additional future environmental or non-consumptive demands were included.

3.3.6 Tribal

The Fort Mojave Indian Tribe diverts Colorado River water under water rights assigned to reservation land in Nevada.

The Tribe does not currently use its full diversion right as established by the Consolidated Decree of the United States Supreme Court in *Arizona* v. *California*, 547 U.S. 150 (2006); however, it is expected that it will fully use the right in the future. Associated projected tribal demands are constant over time and across scenarios. Fort Mojave use from 2015 to 2060 is represented as a constant demand at its right of 12.5 kaf with 9 kaf of consumptive use.

For additional information on tribal demand, see appendix C9.

3.4 Summary Tables of Parameters and Demands by Category

Tables C8-2 to C8-7 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 C8-2
Total Demand within Study Area under Current Projected (A) Scenario

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

		Planning Area	SNWA			Other			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	**comments**
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0	0	0	0	0	0	0	0	0	
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	0	0	0	0	0	0	0	0	0	
Municipal and Industrial	Population		2,561,053	3,524,953	4,433,745				2,561,053	3,524,953	4,433,745	1)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	2)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	3)
	Municipal and Industrial Demand (Consumptive)	af/yr	357,564	420,904	512,637				357,564	420,904	512,637	4)
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**357,564**	**420,904**	**512,637**	**8,153**	**17,380**	**17,380**	**365,717**	**438,284**	**530,017**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	2,025	2,025	2,025	**2,025**	**2,025**	**2,025**	6)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	9,000	9,000	9,000	**9,000**	**9,000**	**9,000**	7)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**357,564**	**420,904**	**512,637**	**19,178**	**28,405**	**28,405**	**376,742**	**449,309**	**541,042**	8)
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	**357,564**	**420,904**	**512,637**	**19,178**	**28,405**	**28,405**	**376,742**	**449,309**	**541,042**	9)
Demand that may be met by Other Supplies		af/yr	76,742	64,000	24,000	0	0	0	76,742	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**356,904**	**488,637**	**19,178**	**28,405**	**28,405**	**300,000**	**385,309**	**517,042**	11)
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Municipal and Industrial	Colorado River Demand	af/yr	280,822	356,904	488,637	8,153	17,380	17,380	288,975	374,284	506,017	12)
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

Source and Comments

1) Center for Business and Economic Research, 2008 (June 30, 2008), beyond 2035 annual absolute annual growth of 37,600. SNWA services ~96.68% of Clark County's Population
2) SNWA, Water Resource Plan, 2009, personal communication SNWA, 2011; STATE TOTAL only based on SNWA planning area
3) SNWA, Water Resource Plan, 2009
4) Consistent with methodologies in the SNWA, Water Resources Plan, 2009, municipal SNWA demand (computed as population times per capita use) is reduced by groundwater supply and reclaimed waters before multiplying by 1/1.7 (59%) to determine consumptive municipal demand.
5) M&I demand in "Other" Category provided by SNWA based on contracted build-out of development outside of SNWA's service area.
6) FWR demand in "Other" Category provided by SNWA based on contracted recreation use outside of SNWA's service area.
7) Tribal demand in "Other" Category based on the Ten Tribes Partnership Schedule included in the Interim Surplus Criteria Final Environmental Impact Statement (Reclamation 2000).
8) Total Hydrologic Basin in "Other" Category based on contracted amount. Users will grow into their contract amount (28,405) by 2031.
9) Calculated from the sum of Hydrologic Basin (Consumptive) Demand and Adjacent Areas (Diversion) Demand.
10) Includes potential consumptive use banked water through ICS (Coyote Spring, Muddy/Virgin, Drop 2) and AZ groundwater bank.
11) Calculated as total demand minus other sources.
12) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

TABLE C8-3
Total Demand within Study Area under Slow Growth (B) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			NEVADA									
	Planning Area		SNWA			Other			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2)
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	
Municipal and Industrial	Population		2,375,047	3,306,300	4,215,092				2,375,047	3,306,300	4,215,092	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	4)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	
	Municipal and Industrial Demand (Consumptive)	af/yr	328,513	392,163	485,263	0	0	0	328,513	392,163	485,263	
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**328,513**	**392,163**	**485,263**	**8,153**	**17,380**	**17,380**	**336,666**	**409,543**	**502,643**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	8)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**328,513**	**392,163**	**485,263**	**19,178**	**28,405**	**28,405**	**347,691**	**420,568**	**513,668**	
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	**328,513**	**392,163**	**485,263**	**19,178**	**28,405**	**28,405**	**347,691**	**420,568**	**513,668**	
Demand that may be met by Other Supplies		af/yr	47,691	64,000	24,000	0	0	0	47,691	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**328,163**	**461,263**	**19,178**	**28,405**	**28,405**	**300,000**	**356,568**	**489,668**	
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	11)
Municipal and Industrial	Colorado River Demand	af/yr	280,822	328,163	461,263	8,153	17,380	17,380	288,975	345,543	478,643	
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

Source and Comments

1) No change from current projected
2) No change from current projected
3) 2009 Water Resource Plan - Clark County Short Term Adjustment to Center for Business and Economic Research (CBER) Population (11/13/2008). SNWA services ~96.68% of Clark County's Population.
4) No change from current projected
5) No change from current projected
6) No change from current projected
7) No change from current projected
8) No change from current projected
9) No change from current projected
10) No change from current projected
11) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

TABLE C8-4
Total Demand within Study Area under Rapid Growth (C1) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			NEVADA									
			SNWA			Other			STATE TOTAL			
Hydrologic Basin	Planning Area	Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	**Source and comments**
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2)
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	
Municipal and Industrial	Population		2,575,996	3,839,942	5,096,782				2,575,996	3,839,942	5,096,782	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	4)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	
	Municipal and Industrial Demand (Consumptive)	af/yr	359,898	462,308	595,644	0	0	0	359,898	462,308	595,644	
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**359,898**	**462,308**	**595,644**	**8,153**	**17,380**	**17,380**	**368,051**	**479,688**	**613,024**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	8)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
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	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
Demand that may be met by Other Supplies		af/yr	79,076	64,000	24,000	0	0	0	79,076	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**398,308**	**571,644**	**19,178**	**28,405**	**28,405**	**300,000**	**426,713**	**600,049**	
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	11)
Municipal and Industrial	Colorado River Demand	af/yr	280,822	398,308	571,644	8,153	17,380	17,380	288,975	415,688	589,024	
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

Source and Comments

1) No change from current projected
2) No change from current projected
3) Clark County population: for 2011 used 2008 CBER Population (June 30, 2008) from 2012 to 2030 marginally increased population projection by the 2008 CBER annual growth rates to illustrate an Expansive Scenario, then a fixed absolute annual growth of ~52,000 annually. SNWA services ~96.68% of Clark County's Population.
4) No change from current projected
5) No change from current projected
6) No change from current projected
7) No change from current projected
8) No change from current projected
9) No change from current projected
10) No change from current projected
11) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

TABLE C8-5
Total Demand within Study Area under Rapid Growth (C2) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			NEVADA									
		Planning Area	SNWA			Other			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2)
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	
Municipal and Industrial	Population		2,575,996	3,839,942	5,096,782				2,575,996	3,839,942	5,096,782	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	4)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	
	Municipal and Industrial Demand (Consumptive)	af/yr	359,898	462,308	595,644	0	0	0	359,898	462,308	595,644	
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**359,898**	**462,308**	**595,644**	**8,153**	**17,380**	**17,380**	**368,051**	**479,688**	**613,024**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	8)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
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	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
Demand that may be met by Other Supplies		af/yr	79,076	64,000	24,000	0	0	0	79,076	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**398,308**	**571,644**	**19,178**	**28,405**	**28,405**	**300,000**	**426,713**	**600,049**	
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	11)
Municipal and Industrial	Colorado River Demand	af/yr	280,822	398,308	571,644	8,153	17,380	17,380	288,975	415,688	589,024	
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

Source and Comments

1) No change from current projected
2) No change from current projected
3) CBER annual growth rates to illustrate an Expansive Scenario, then a fixed absolute annual growth of ~52,000 annually. SNWA services ~96.68% of Clark County's Population.
4) No change from current projected
5) No change from current projected
6) No change from current projected
7) No change from current projected
8) No change from current projected
9) No change from current projected
10) No change from current projected
11) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

TABLE C8-6
Total Demand within Study Area under Enhanced Environment (D1) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			NEVADA									
		Planning Area	SNWA			Other			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2)
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	
Municipal and Industrial	Population		2,561,053	3,524,953	4,433,745				2,561,053	3,524,953	4,433,745	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	4)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	
	Municipal and Industrial Demand (Consumptive)	af/yr	357,564	420,904	512,637	0	0	0	357,564	420,904	512,637	
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**357,564**	**420,904**	**512,637**	**8,153**	**17,380**	**17,380**	**365,717**	**438,284**	**530,017**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	8)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**357,564**	**420,904**	**512,637**	**19,178**	**28,405**	**28,405**	**376,742**	**449,309**	**541,042**	
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	**357,564**	**420,904**	**512,637**	**19,178**	**28,405**	**28,405**	**376,742**	**449,309**	**541,042**	
Demand that may be met by Other Supplies		af/yr	76,742	64,000	24,000	0	0	0	76,742	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**356,904**	**488,637**	**19,178**	**28,405**	**28,405**	**300,000**	**385,309**	**517,042**	
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	11)
Municipal and Industrial	Colorado River Demand	af/yr	280,822	356,904	488,637	8,153	17,380	17,380	288,975	374,284	506,017	
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

Source and Comments

1) No change from current projected
2) No change from current projected
3) No change from current projected
4) No change from current projected
5) No change from current projected
6) No change from current projected
7) No change from current projected
8) No change from current projected
9) No change from current projected
10) No change from current projected
11) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

TABLE C8-7
Total Demand within Study Area under Enhanced Environment (D2) Scenario

From Current Projected Data Sheet
Input Parameter
Computed

			NEVADA									
		Planning Area	SNWA			Other			STATE TOTAL			Source and
Hydrologic Basin		Year	2015	2035	2060	2015	2035	2060	2015	2035	2060	comments
Agricultural	Irrigated Acreage	acres	0	0	0	0	0	0	0	0	0	1)
	Per-Acre Water Delivery (Diversion)	af/ac/yr	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2)
	Consumptive factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Demand (Consumptive)	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	
Municipal and Industrial	Population		2,575,996	3,839,942	5,096,782				2,575,996	3,839,942	5,096,782	3)
	Municipal and Industrial Per Capita Use (Diversion)	gpcd	237	199	190				237	199	190	4)
	Consumptive factor	%	59%	59%	59%				59%	59%	59%	
	Municipal and Industrial Demand (Consumptive)	af/yr	359,898	462,308	595,644	0	0	0	359,898	462,308	595,644	
	Self Served Industrial Demand (Consumptive)	af/yr	0	0	0	8,153	17,380	17,380	8,153	17,380	17,380	5)
	Demand (Consumptive)	af/yr	**359,898**	**462,308**	**595,644**	**8,153**	**17,380**	**17,380**	**368,051**	**479,688**	**613,024**	
Energy	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6)
Minerals	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7)
Fish, Wildlife, and Recreation	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	**2,025**	8)
Tribal	**Demand (Consumptive)**	af/yr	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	9)
Total Hydrologic Basin	**Demand (Consumptive)**	af/yr	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
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	**359,898**	**462,308**	**595,644**	**19,178**	**28,405**	**28,405**	**379,076**	**490,713**	**624,049**	
Demand that may be met by Other Supplies		af/yr	79,076	64,000	24,000	0	0	0	79,076	64,000	24,000	10)
Potential Colorado River Demand		af/yr	**280,822**	**398,308**	**571,644**	**19,178**	**28,405**	**28,405**	**300,000**	**426,713**	**600,049**	
Agricultural	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	11)
Municipal and Industrial	Colorado River Demand	af/yr	280,822	398,308	571,644	8,153	17,380	17,380	288,975	415,688	589,024	
Energy	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Minerals	Colorado River Demand	af/yr	0	0	0	0	0	0	0	0	0	
Fish, Wildlife, and Recreation	Colorado River Demand	af/yr	0	0	0	2,025	2,025	2,025	2,025	2,025	2,025	
Tribal	Colorado River Demand	af/yr	0	0	0	9,000	9,000	9,000	9,000	9,000	9,000	

1) No change from current projected
2) No change from current projected
3) Clark County population: for 2011 used 2008 CBER Population (June 30, 2008) from 2012 to 2030 marginally increased population projection by the 2008 CBER annual growth rates to illustrate an Expansive Scenario, then a fixed absolute annual growth of ~52,000 annually. SNWA services ~96.68% of Clark County's Population.
4) No change from current projected
5) No change from current projected
6) No change from current projected
7) No change from current projected
8) No change from current projected
9) No change from current projected
10) No change from current projected
11) Colorado River demand is distributed amongst categories according to distribution of total study area demand in that planning area.

4.0 References

Center for Business and Economic Research. 2008. *Population Forecasts: Long-Term Projections for Clark County, Nevada 2008–2035*.

Consolidated Decree of the United States Supreme Court. 2006. *Arizona* v. *California*, 547 U.S. 150.

Reclamation. 2000. *Colorado River Interim Surplus Criteria Final Environmental Impacts Statement*.

Reclamation. 2007b. *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final Environmental Impact Statement*. Bureau of Reclamation, U.S. Department of the Interior, 40 pp.

Reclamation. 2007 and 2010. 5 year reports. *Provisional Upper Colorado River Basin Consumptive Uses and Losses Report 2001–2008*. (http://www.usbr.gov/uc/library/envdocs/reports/crs/crsul.html)

Southern Nevada Water Authority (SNWA), 2009. *SNWA. Water Resource Plan.*