

Colorado Main Stem North Planning Area

Background

The Colorado Main Stem North Planning Area consists of two basins adjacent to the Colorado River along the western border of the state. The Planning Area contains the Lake Mohave Groundwater Basin in the North and the Lake Havasu Groundwater Basin in the South. The Planning Area is entirely within Mohave County. The principal municipal demand centers in the Colorado Main Stem North Planning Area are Lake Havasu City and Bullhead City. The Fort Mojave Indian Reservation also lies within the Planning Area south of Bullhead City.



The largest land owner within the Planning Area is the federal government (see *Figure P.A. 7-1*). The US Bureau of Land Management (BLM) manages approximately 49 percent of the lands in the Lake Mohave Basin and 57 percent of the lands in the Lake Havasu Basin, primarily for recreation and grazing purposes. The National Park Service (NPS) manages approximately 35 percent of the land in the Lake Mohave Basin including portions of the Lake Mead National Recreation Area. The remaining federally-owned lands are held by the U.S. Fish and Wildlife Service (FWS) at the Havasu National Wildlife Refuge and by the Fort Mojave Indian Tribe. Private lands primarily include lands in the vicinity of Bullhead City, the Mohave Valley and Lake Havasu City. Nearly 14 percent of the land in the Lake Havasu Basin and three percent of the land in the Lake Mohave Basin are State Trust Lands, used primarily for recreation and livestock grazing. The Arizona Game and Fish Department (Colorado River Nature Center) and Arizona State Parks also manage a small portion of the lands in the Planning Area.

Water Supply Conditions

Groundwater

The Colorado Main Stem North Planning Area is located in the Basin and Range Physiographic Province. This province is characterized by long broad alluvial valleys separated by mountain ranges, typically with thick productive regional alluvial aquifers.

Groundwater in storage within the Lake Mohave Basin is estimated to range from 1.2 to 8.0 MAF. Groundwater levels in the basin are generally rising at an average rate of 1.2 feet per year, although water level change data from the early 1990s to the mid-2000s show slight declines south of Bullhead City and an increase north of the city (see *Figure P.A. 7-2*). The water level in these wells ranged between 337 and 427 feet below land surface. Groundwater in storage within the Lake Havasu basin is estimated to be up to 2.0 MAF. Groundwater levels in the Basin are generally rising at an average rate of 1.3 feet per year. Lake Mead, created by Hoover Dam, has affected groundwater conditions in the adjacent basins in the watershed. There is outflow from the lake into the surrounding aquifers. There is also outflow from the Colorado River, Lake Mohave, and Lake Havasu into the surrounding aquifers. Groundwater use within the Planning Area includes municipal, industrial (associated with golf course use, small mines and quarries), and agricultural.

Colorado River Water

Colorado River water is the primary water supply in the Planning Area (see *Figure P.A. 7-3*). There are three large dams located in this Planning Area: 1) Hoover Dam - located at the northern end of the Lake

Mohave Basin, with a maximum storage capacity in Lake Mead of 29,755,000 acre-feet (most of Lake Mead is located in the northern extent of the Northeast Basin Planning Area and the State of Nevada); 2) Davis Dam – located just north of Bullhead City with a maximum storage capacity in Lake Mohave of 1,818,300 acre-feet; and 3) Parker Dam - located south of Lake Havasu City at the southern boundary of the Planning Area, with a maximum storage capacity in Lake Havasu of 651,000 acre-feet. The dams and the reservoirs also provide recreation, hydroelectric power, environmental habitat, and are the primary water operation features for the Lower Colorado River. The vast majority of Colorado River diversions in the Planning Area are associated with agricultural irrigation on the Fort Mojave Indian Reservation and within the Mohave Valley Irrigation and Drainage District (MVIDD). Other uses of Colorado River water include recreation, environmental, municipal and industrial demands (including electrical power generation).

The right or authorization to beneficially use Colorado River water is defined as an entitlement created by decree of the United States Supreme Court in *Arizona v. California*¹ (Decree), through a contract with the U.S. Secretary of the Interior under Section 5 of the Boulder Canyon Project Act (1928), or by Secretarial Reservation². Because the direction and occurrence of groundwater is strongly influence by the amount of streamflow in the Colorado River, the US Bureau of Reclamation (Reclamation) has made a preliminary delineation of the lateral and vertical extent of the Colorado River aquifer to provide a basis for accounting of withdrawals against river water allocations. On July 16, 2008, Reclamation proposed to develop a rule for *Regulating Non-Contract Use of Colorado River Water in the Lower Basin* (Federal Register 40916, et. seq.) to prevent non-contract Colorado River water use from depleting the river and taking water from holders of Colorado River entitlements. Reclamation's most current assessment indicates that most existing non-contract use results from water withdrawn from wells located in the hydraulically connected aquifer of the Colorado River or from river pumps. The proposed rule would establish a methodology that Reclamation would use to determine if a well is pumping Colorado River water and a process for a water user to appeal a subsequent finding. At present, Reclamation has not adopted the proposed rule.

Reclaimed Water

Population centers in the Planning Area, Bullhead City and Lake Havasu City, produced the majority of the reclaimed water in this Planning Area. Approximately 3,100 acre-feet per year of reclaimed water is produced in the Lake Mohave Basin, and 33,000 acre-feet per year is produced in the Lake Havasu Basin. In 2005, Lake Havasu City reused approximately 2,400 acre-feet of treated reclaimed water to irrigate two golf courses and landscaping and in 2006, reclaimed water deliveries began to the Refuge Golf Course. Additionally, Lake Havasu City is engaged in an aggressive wastewater system expansion program to convert the majority of residences within the city limits from septic systems to a conventional sewer system. Similar actions in Bullhead City are also being explored.

Ecological Resources

Environmental and recreational resources are also important in this Planning Area (see *Figure P.A. 7-3*). The Havasu National Wildlife Refuge (NWR) is located in the Lake Havasu Basin. Managed by the FWS, the Havasu NWR was established in 1941 at the time of construction of Parker Dam as a refuge for

¹ 373 U.S. 546 (1963)

² Secretarial Reservation" means water rights created by the Interior Secretary for the use of federal establishments under federal law. Examples of Secretarial Reservations are mainstem water rights reserved for National Wildlife Refuges, Indian Tribes and certain public lands administered by the Bureau of Land Management.

migratory birds and other wildlife. The refuge protects 30 river miles of the Colorado River from Needles, CA to Lake Havasu City. Suitable habitat within Havasu NWR adjacent to Topock Marsh is maintained for southwestern willow flycatcher and Yuma clapper rail. In addition, Beal Lake, just west of Topock Marsh, is managed as a refuge for native razorback sucker and bonytail chub. There is experimental planting to create cottonwood-willow habitat suitable for southwest willow flycatcher and other riparian obligate species on lands adjacent to Beal Lake.

The Lake Mead National Recreation Area (LMNRA), created in 1964 and administered by the NPS, is located in the northwestern portion of the Planning Area. The LMNRA stretches from Davis Dam at Bullhead City in the Lake Mohave Basin to the western boundary of Grand Canyon National Park in Meadview Basin and includes Lake Mead, Lake Mohave, the Colorado River and adjacent areas.

Lake Mohave functions as a genetic refuge for razorback sucker. Under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), funded by a partnership of State, federal and other public and private stakeholders in Arizona, California and Nevada, for the Lake Mohave area, razorback sucker larvae are collected and reared prior to release back into the lake or elsewhere, including Lake Havasu.

Water Demands

Table P.A. 7-1 illustrates the baseline and projected water demands in the Colorado Main Stem North Planning Area. Based on water demand projections prepared during the WRDC process, it is estimated that the largest increases may occur in the municipal sector. Agricultural irrigation occurs in the Lake Mohave Basin in the Mohave Valley on the Fort Mojave Indian Reservation and on private lands located within the MVIDD. These uses are projected to continue through the planning period. In the southern end of the valley, tribal and district lands are interspersed in a checkerboard pattern. Additionally, because of the large tracts of federal lands, it was assumed that there was a high potential for future renewable energy development, although this would need to be balanced with the ecological priorities in the region.

Characteristics Affecting Projected Water Demands and Supply Availability

Land Ownership

Because of the large areas of land in federal ownership, it is not anticipated that significant development will occur outside of the current population centers. There is some potential for growth on the remaining undeveloped private lands and State Trust Lands. Additionally, many of the federally-owned lands provide habitat for both listed and non-listed species as well as recreational opportunities that are important to the economy of this region. As projected growth occurs, it will have to do so in a manner that is compatible with these uses.

Colorado River Entitlement Priority

Rights to Colorado River water in Arizona are based on the following priority levels:

- a. 1st Priority: Satisfaction of Present Perfected Rights as defined in the Arizona v. California decree (pre-1928);
- b. 2nd Priority: Satisfaction of Secretarial Reservations and Perfected Rights established prior to September 30, 1968;

- c. 3rd Priority: Satisfaction of entitlements pursuant to contracts between the United States and water users in Arizona executed on or before September 30, 1968 (2nd and 3rd priority are coequal);
- d. 4th Priority: i) Contracts, Secretarial Reservations and other arrangements between the U.S. and water users in Arizona entered into after September 30, 1968, for a total quantity not to exceed 164,652 acre-feet of diversions annually and ii) contract No. 14-06-W-245, dated December 15, 1972, as amended, between the United States and the Central Arizona Project (CAP). Entitlements having a 4th priority as described in (i) and (ii) are coequal;
- e. 5th Priority: Unused Arizona entitlement; and
- f. 6th Priority: Surplus water

Table P.A. 7-1. Projected Water Demands (in acre feet) – Colorado Mainstem-North Planning Area

Sector	2010	2035	2060
Agriculture	81,500	81,500	81,500
Dairy	0	0	0
Feedlot	0	0	0
Municipal	37,990	67,420	84,140
Other Industrial	0	0	0
Mining	0		
High		0	0
Low		0	0
Power Plants	4,000		
High		19,383	24,307
Low		14,097	16,874
Rock Production	137		
High		2,459	3,076
Low		1,024	1,281
Turf	882		
High		1,261	1,337
Low		882	1,128
Total (High)	124,509	172,023	194,360
Total (Low)	124,509	164,923	184,923

Within the Planning Area, entitlement holders with a first priority or present perfected rights include the Fort Mojave Indian Reservation and several private entities within the MVIDD. Second and third priority entitlement holders (which are coequal during a shortage), include Havasu National Wildlife Refuge, Bureau of Reclamation (Davis Dam), and the NPS. Fourth priority entitlement holders include Arizona-American Water Company (Lake Havasu), Bullhead City, Golden Shores Water Conservation District, Lake Havasu City, Mohave Water Conservation District, MVIDD, and the Mohave County Water

Authority and are, like the CAP, junior in priority to California and subject to possible reductions in the event of a shortage on the River. Lake Havasu City and the Mohave County Water Authority also have fifth and sixth priority entitlements –which are only available when excess water is available.

Lower priority holders (4th, 5th and 6th Priority) in the Colorado River Mainstem North Planning Area primarily serve municipal purposes making those uses more vulnerable to supply shortage than any other users in the Planning Area and highlighting the need for reserves. In general, the lower priority entitlements will be the first to be impacted when the US Secretary of the Interior declares a shortage on the Colorado River system.

Proactive Environmental Compliance

Actions related to operation of the Lower Colorado River water delivery and electrical power generation systems by both federal and non-federal entities may affect listed species and habitat, or contribute to the listing of additional species in the future. The Endangered Species Act (ESA) directs federal agencies to support the conservation of listed threatened and endangered species and to make sure that their actions do not jeopardize the continued existence of listed species or result in adverse modification of critical habitat. To comply with the requirements of the ESA, state and federal water, power and wildlife interests voluntarily created the LCR MSCP. The LCR MSCP is a cooperative, habitat conservation program (HCP) that identifies specific measures to address the needs of 26 threatened, endangered and other species that rely on habitat associated with the lower Colorado River. Its purposes include: 1) protection of habitat while ensuring current River water and power operations; 2) addressing the needs of listed species under the ESA; and 3) reduction of the likelihood of listing additional species along the River.

Implementation of the LCR MSCP began in 2005. The program area extends from the full pool elevation of Lake Mead to the Southerly International Boundary with Mexico, a distance of 400 river miles, and includes the historical floodplain of the Colorado River. The LCR MSCP is intended to serve as a coordinated and comprehensive conservation approach for a 50-year period and, therefore, includes measures for species not currently listed that may become listed in the future. Implementation of the program is funded by a partnership of State, federal and other public and private stakeholders in Arizona, California and Nevada. The plan will create riparian, marsh and backwater habitat for six federally listed species, and 20 other native species, including conservation programs for razorback sucker and bonytail chub, both federally listed endangered species.

Strategies for Meeting Future Water Demands

Development of Water Supplies to Meet Projected Municipal Growth

The municipalities are seeking additional sources of water since their Colorado River entitlements may be insufficient to meet future increases in demands. Because of the hydrologic connection between the Colorado River and the groundwater supplies along the river, water withdrawn from wells in this area may not be considered groundwater, but rather Colorado River water for which an entitlement is required. Therefore, expansion of groundwater development may be limited and because the Colorado River entitlement in Arizona is largely fully allocated, other sources may need to be acquired to meet these projected increases.

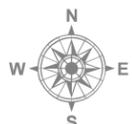
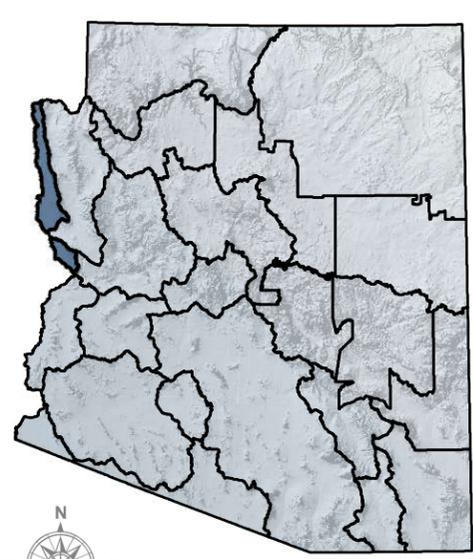
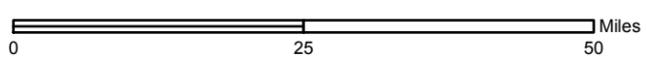
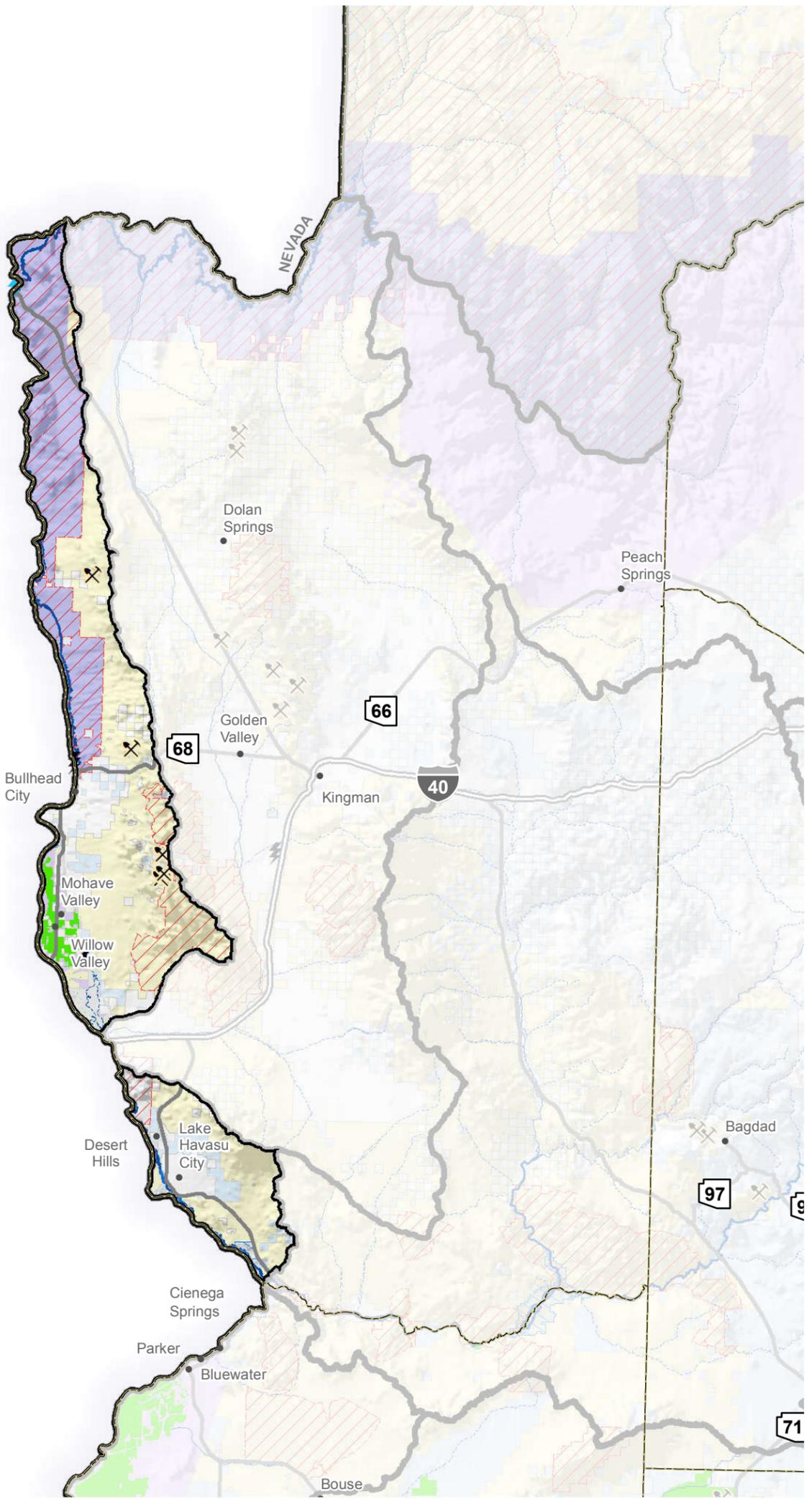
The Mohave County Water Authority (MCWA) was organized in 1995 pursuant to A.R.S. § 45-2201 primarily for the purpose of acquiring the city of Kingman's unused 18,500 acre-feet Colorado River entitlement and making it available to other authority members for municipal and industrial water uses. MCWA members include Bullhead City, Golden Shores Water Conservation District, Kingman, Lake Havasu City, Mohave County, MVIDD and Mohave Water Conservation District. As well as providing other services and functions, MCWA can acquire additional water supplies, including reclaimed water, and it may store, recharge and recover these supplies for the benefit of Mohave County water users. The MCWA can also assist members with the development and operation of water diversion, conveyance, treatment, storage and recharge facilities and the development of augmentation and conservation programs.

MCWA is actively evaluating the future potential of existing supplies to meet the needs of the water users in this Planning Area. Through membership in the MCWA, expansion of existing water conservation programs and expanding the use of reclaimed water either through direct delivery or artificial recharge and recovery for future supplies, this Planning Area is making strides towards meeting its future water supply needs.

Firming of Low Priority Water Supplies

Water supply availability during shortages on the Colorado River is a major concern for communities in this Planning Area as many do not have access to alternative supplies. One of the duties of the Arizona Water Banking Authority (AWBA) was to store Colorado River water within the CAP service area for the benefit of on-river communities during declared shortages on the Colorado River. By resolution, the AWBA established on-river firming as the highest priority for use of credits accrued from expenditure of general fund appropriations. On behalf of its members and subcontractors, the MCWA entered into agreements with the AWBA that transferred a total of 256,174 acre-feet of long-term storage credits to them for use by their subcontractors during these shortages. The AWBA should continue to evaluate the long-term shortage probabilities to ensure that sufficient supplies are being stored such that supplies will be available to meet the needs of these communities. Additionally, funding should be appropriated as needed to meet the firming needs for the communities.

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered. The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.



MAP LOCATION
(Planning Area Boundaries)

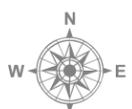
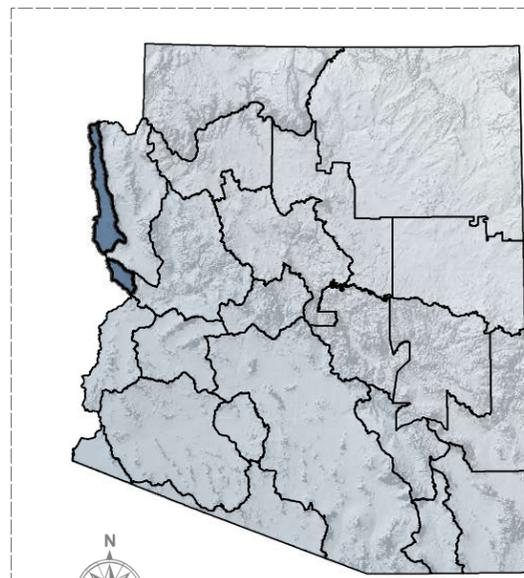
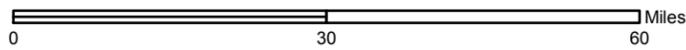
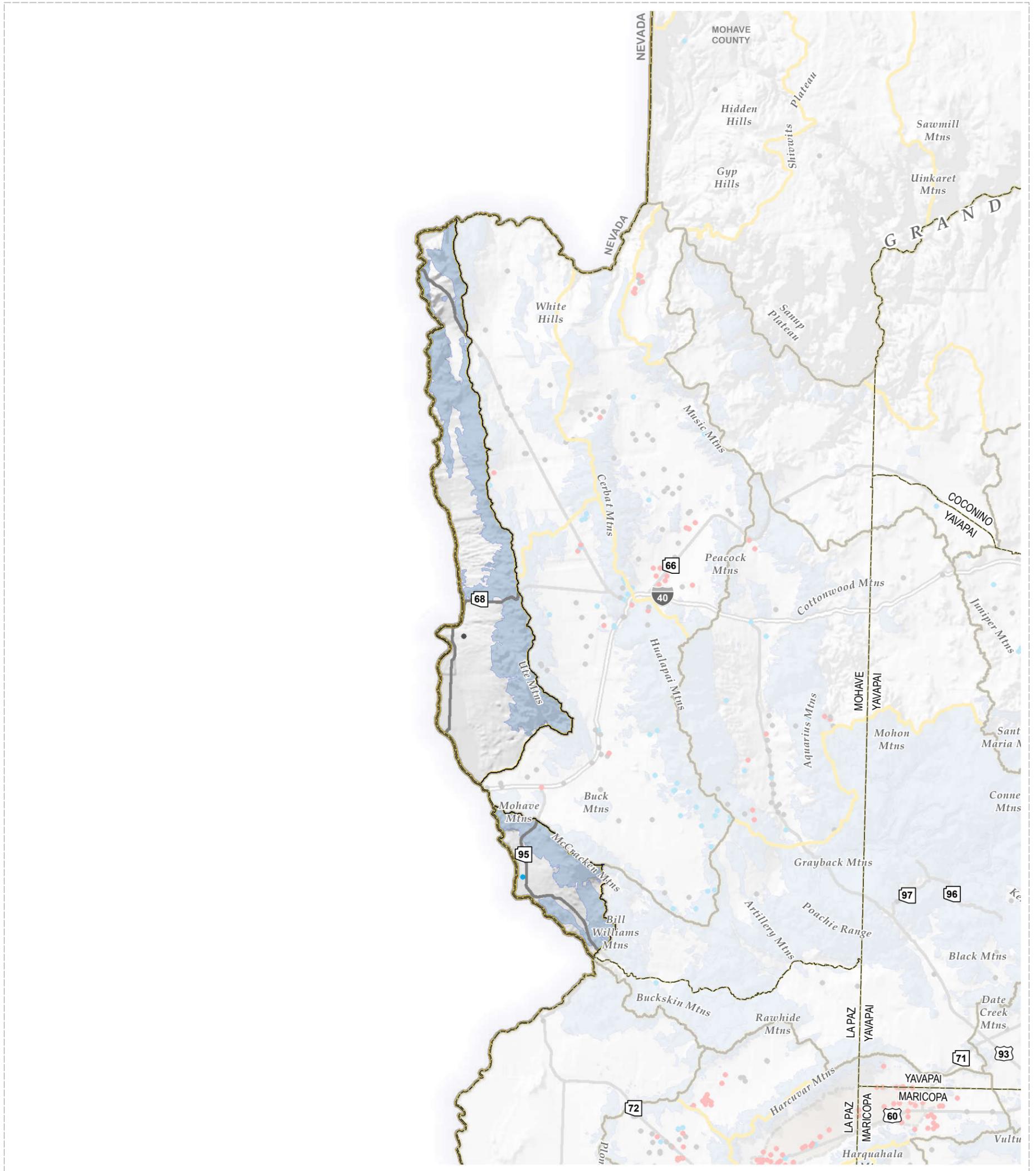
- | | |
|---|---|
| Planning Area (ADWR) | Agriculture (SWReGAP, 2004) |
| State (ALRIS) | Federal Conservation Land (USFS, BLM, NPS) |
| County (ALRIS) | State Managed Conservation Land (AZGFD, AZSP) |
| River or Stream (ASLD) | BLM Land |
| Interstate (ADOT) | National Forest |
| Population Center (GNIS) | National Park |
| Mine (ADMMR, ADWR) | Military Reserve |
| Hydroelectric Power Plant (ADEQ, ADWR) | Private and Other Land |
| Thermoelectric Power Plant (ADEQ, ADWR) | State Trust Land |
| | Tribal Land |



Colorado Main Stem North Land Ownership

Figure P.A.7-1

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered. The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.



MAP LOCATION
(Planning Area Boundaries)

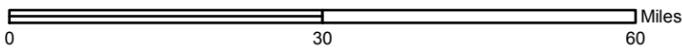
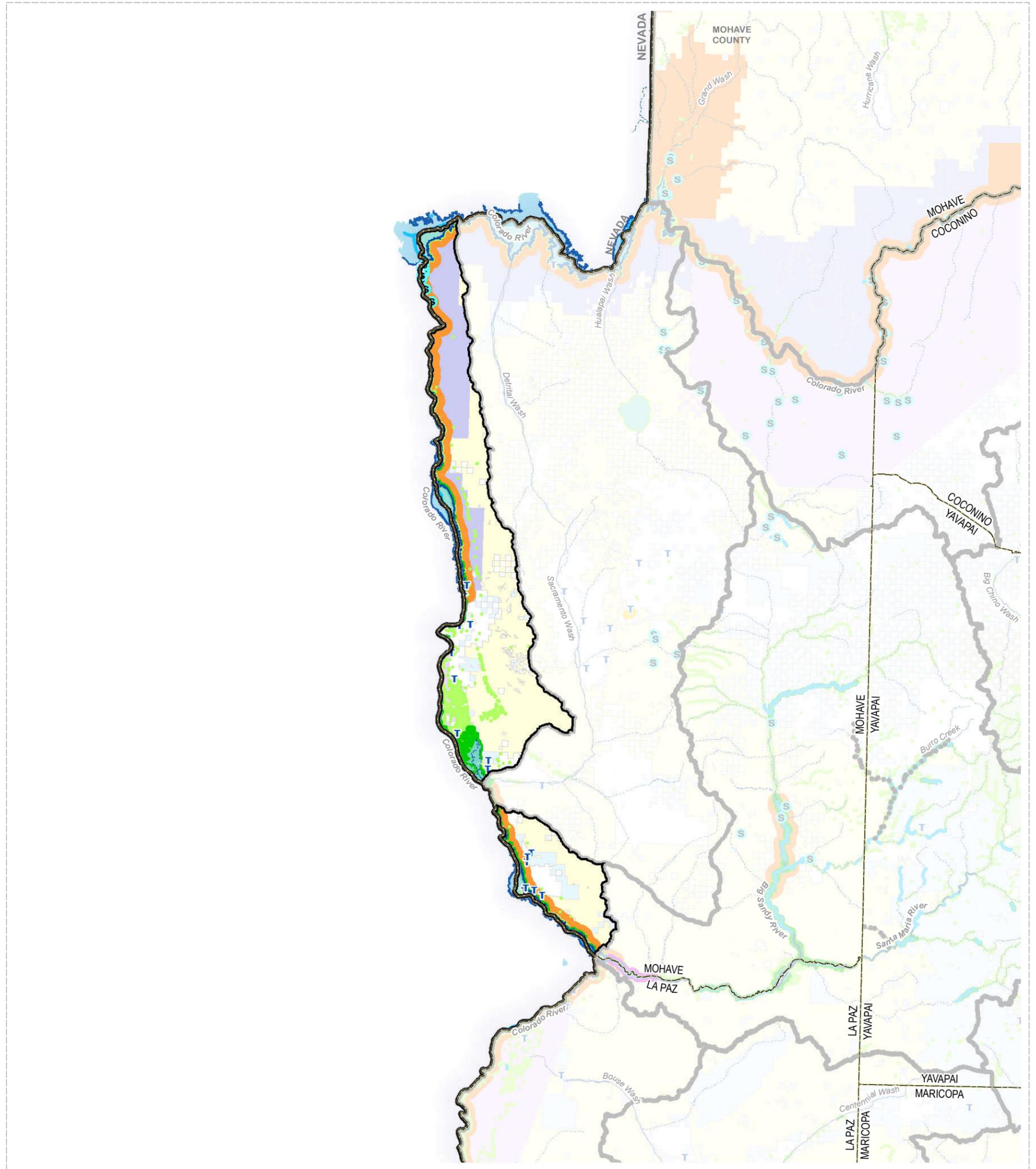
- Planning Area (ADWR)
 - State (ALRIS)
 - County (ALRIS)
 - Groundwater Basin (ADWR)
 - Area of Active Land Subsidence (ADWR)
 - Hard Rock Geology (AZ Bureau of Mines, UofA)
 - Interstate (ADOT)
- Recent Water Level Change * (1990's through 2000's)
 - Minor WL Change +5' to -5'
 - Negative
 - Positive
- * Data provided by ADWR



Figure P.A.7-2

Colorado Main Stem North Groundwater Hydrology

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered. The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.



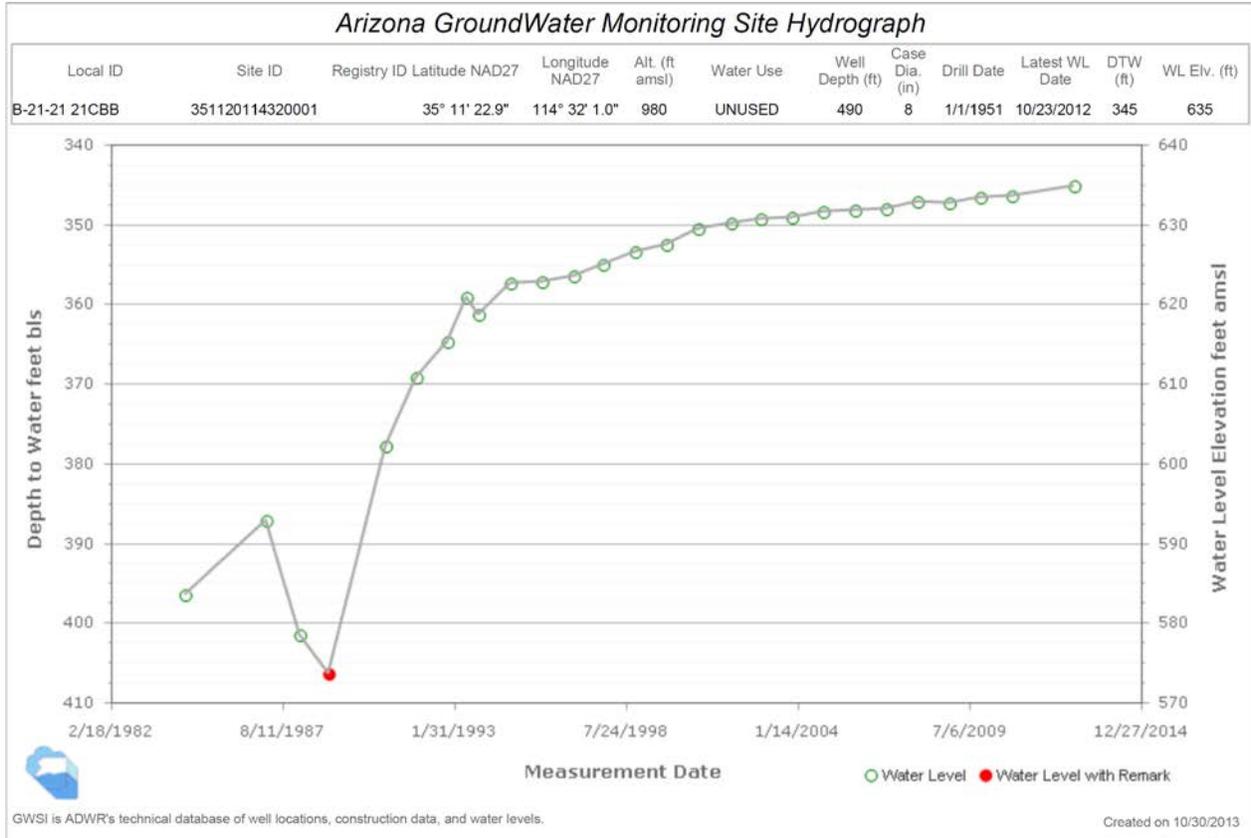
MAP LOCATION
(Planning Area Boundaries)

- | | |
|--|---|
| Planning Area (ADWR) | 1993 Riparian Inventory (AZGFD) |
| State (ALRIS) | Modeled Riparian Habitat (AZGFD) |
| County (ALRIS) | Designated ESA Critical Habitat (USFWS) |
| Reservoir or Lake (NHD) | Proposed ESA Critical Habitat (USFWS) |
| Waste Water Treatment Plant (ADEQ) | Federally Designated Wild and Scenic River (USFS) |
| Major Spring (ADWR, Pima County) | BLM Land |
| Perennial Flow (ADEQ, USGS) | National Forest |
| River or Stream (ASLD) | National Park |
| Outstanding Arizona Water (ADEQ) | Military Reserve |
| Effluent Dependent Stream (ADWR, NEMO) | Private and Other Land |
| Instream Flow Certificate (ADWR) | State Trust Land |
| | Tribal Land |

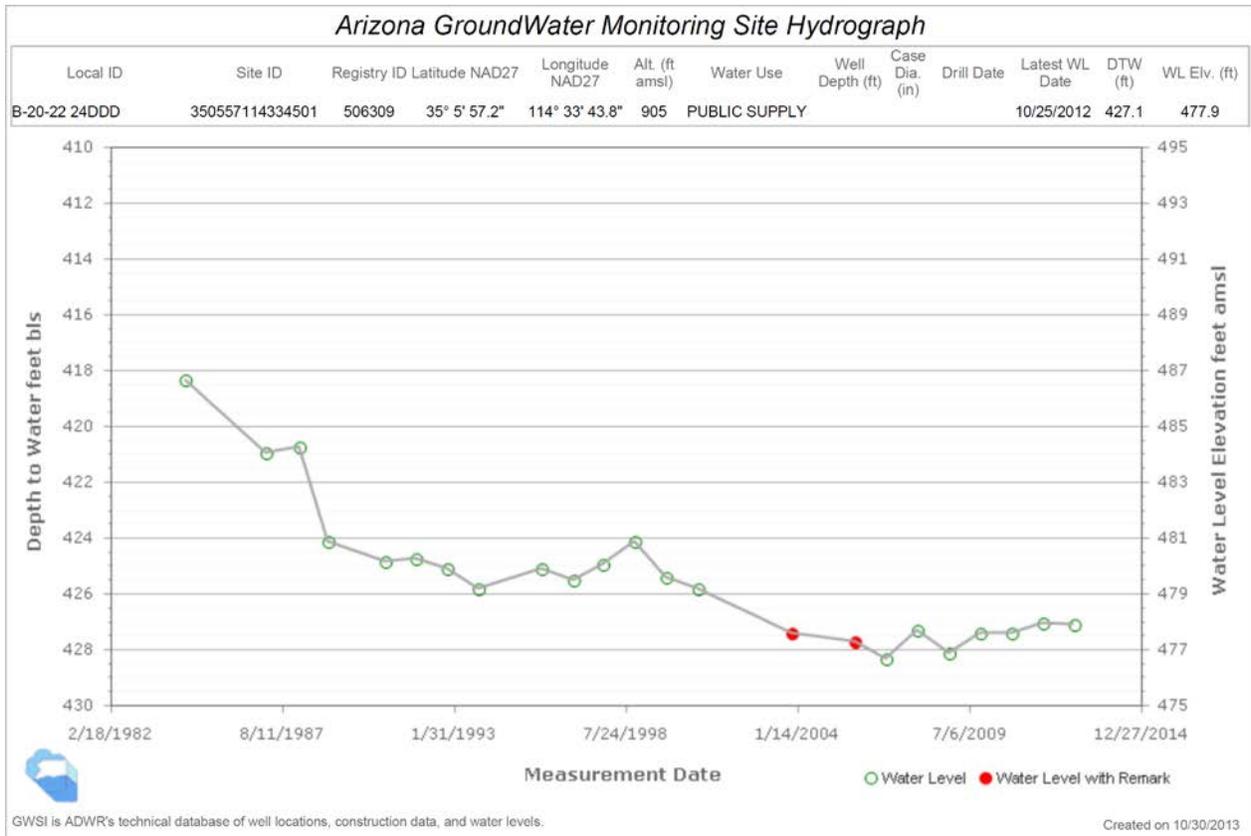


Figure P.A.7-3 Colorado Main Stem North Surface Water and Natural Features

Lake Mohave Basin – Colorado River Main Stem North

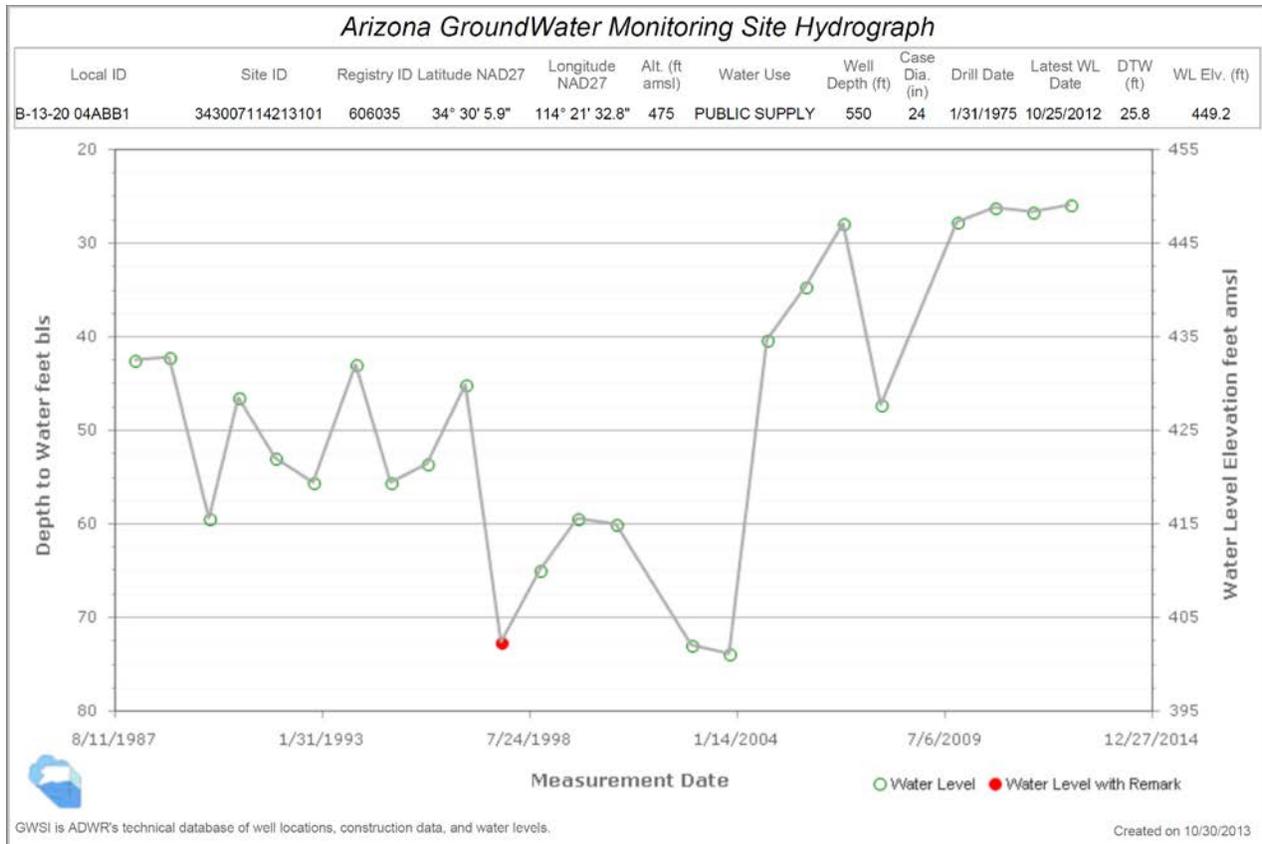


B-21-21 21CBB Lake Mohave basin 2 miles east of Colorado River, 3.5 miles NE of Bullhead City.



B-20-22 24DDD Lake Mohave basin about 4.5 miles due east of Big Bend on Colorado River near Riviera.

Lake Havasu Basin – Colorado River Main Stem North



B-13-20 04ABB1 Lake Havasu basin at Lake Havasu, about 2.2 miles north of London Bridge.