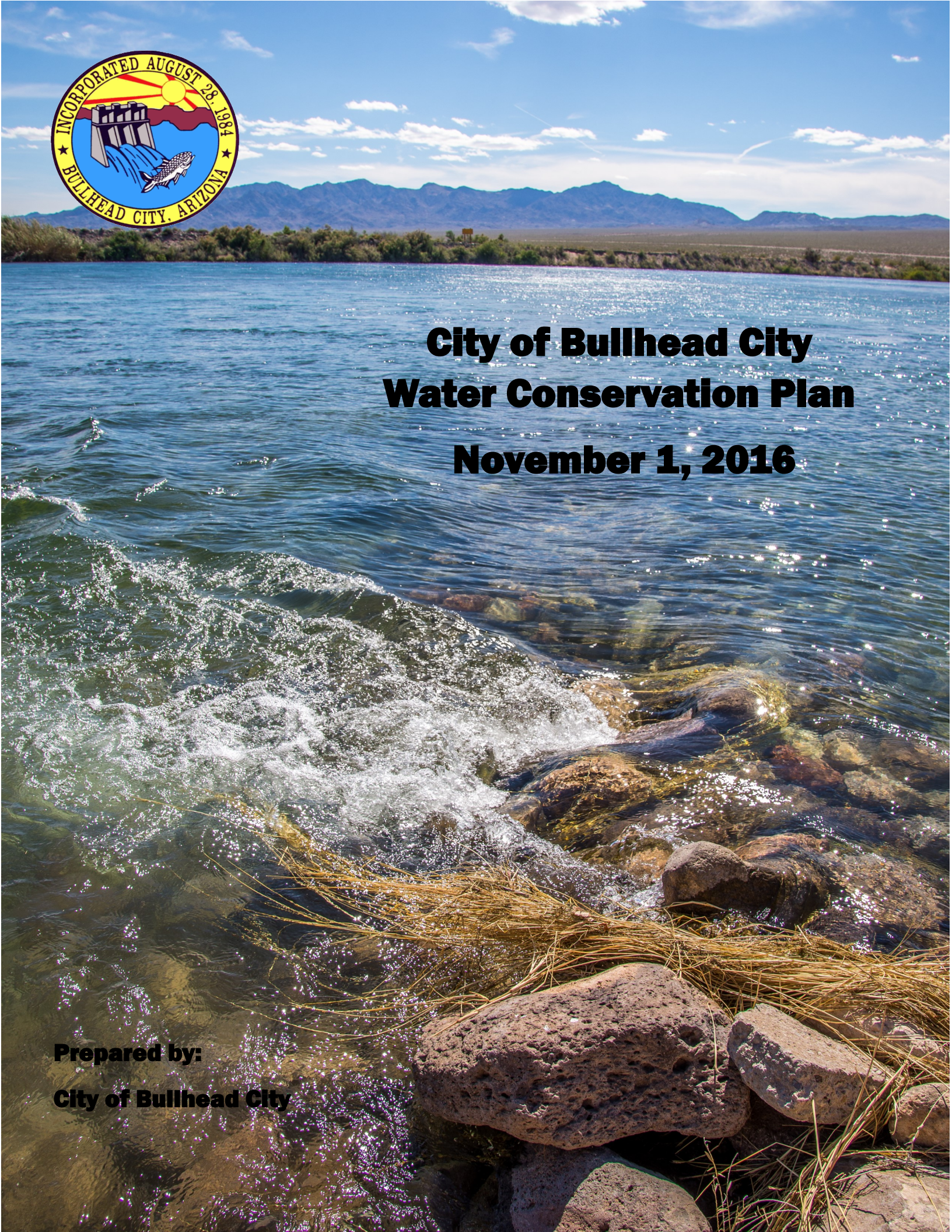

City of Bullhead City
Water Conservation Plan
November 1, 2016

Prepared by:

City of Bullhead City

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Acknowledgments

This plan will provide the foundation upon which Bullhead City can build its water resource future. The overall management goal is to maintain a dependable and safe water supply in order to support the planning area's economic base and to enhance the quality of life for existing and future residents. This plan will provide the supporting basis to achieve this goal.

Bullhead City Council

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Step 1 - Description of the Contract Area

A. History

Unlike other areas throughout the State of Arizona, which utilize both surface water and ground water to serve their potable water needs, Bullhead City is currently exclusively dependent on the Colorado River. The Colorado River Compact of 1922 provides the framework from which the State of Arizona receives its allocation of river water. Subsequent federal enabling legislation and court cases have affirmed the principles of the Compact. In addition, City representatives continue to work with the Bureau of Reclamation (Reclamation) to delineate the water accounting surface (WAS). The WAS represents the extent of the Colorado River aquifer and the relationship with the withdrawals of Bullhead City's Colorado River supplies through groundwater wells. The WAS formally distinguishes Colorado River water from non-Colorado River groundwater sources.

During the initial deliberations for allocating water among various river entities, the Secretary of Interior agreed to reserve a block of water as part of the original contract between the federal government and the Mohave Valley Irrigation and Drainage District (MVIDD). It was anticipated that this water would be used to "service additional lands."

On July 7, 1982, Reclamation entered into contract number 2-07-30-W0027 with Mohave County for 10,000 acre-feet of the MVIDD block of water. The City then incorporated in August 1984 and Mohave County subsequently assigned, transferred, and conveyed all of its rights, titles, interests, and obligations under the Reclamation contract to the City. In particular, this action was finalized on December 2, 1985.

Under the Mohave County Contract and Assignment Agreement, Bullhead City was entitled to 8,200 acre feet of Colorado River water annually and the Mohave Water Conservation District (MWCD) was granted 1,800 acre feet. The City then requested that Reclamation grant an additional allocation of 7,010 acre-feet annually of Colorado River water. This request was formally approved on November 9, 1994 and became effective under contract number 2-07-30-W0273 as shown on **Table 1.1, *Water Contract Amounts***.

On December 12, 1995, the City entered into an Intergovernmental Agreement (IGA) with the Mohave County Water Authority (MCWA) for the delivery of an additional 6,000 acre feet of Colorado River water (fourth priority). This additional water is referred to as the "Kingman" water. This water was assigned to the MCWA after a lengthy negotiation process with Reclamation. The MCWA administers the contract with Reclamation and has entered into subcontract arrangements with Bullhead City and other Mohave County entities for the ultimate use of the water. The City must pay the Authority an annual holding fee and purchase the water at an established rate. The 6,000 acre-feet of water must be purchased by the City prior to January 1, 2020.

In November of 2004 the City entered into a second IGA with the MCWA to purchase 2,999 additional acre-feet of Colorado River water. This water is referred to as the "Cibola" water. Of

the 2,999 acre-feet, Reclamation and LaPaz County had an option on 860 acre-feet, thus leaving the City with a total of 2,139 acre-feet.

On December 1, 2009, the City Council entered into an agreement with the MCWA to purchase 1,000 acre-feet of Colorado River water. The amendment designated the 3,500 acre-feet of 5th and 6th Priority water as new water and returned it to the Authority as 4th Priority water. Bullhead City requested 1,000 acre-feet of the holding. The City made a $250,000 down payment on the water in December 2010. The balance will have to be paid in full by December 31, 2024. Holding fees similar to those already in place will also have to be paid to the Authority on an annual basis.

The City, as the assignee, has the right to subcontract for the delivery of Colorado River water to entities and individuals in the contract area on a first come-first serve basis. Currently, the City has subcontracts with EPCOR and Utilities, Inc. Respectively, these purveyors were assigned their original certificated service areas by the Arizona Corporation Commission (ACC) in 1969 and 1972.

Table 1.1 Colorado River Water Contract Amounts

Bullhead City	Date	Total Acre-Feet
Initial Reclamation Contract	12/2/85	8,200
Contract Amendment	11/9/94	7,010
Water Purchase – Kingman 1995	12/95 *	6,000
Water Purchase – Cibola	11/04	2,139
Water Purchase – Kingman 2009	12/09**	1,000
Total	---	24,349

Source: City of Bullhead City; January 2016
* Date of agreement stating Bullhead City's rights to purchase (actual purchase must occur prior to 2020)
** Date of agreement stating Bullhead City's rights to purchase (actual purchase must occur prior to 2024)

B. Location

Bullhead City's Reclamation contract area is located in northwestern Arizona in Mohave County as shown on **Figure 1-1, *Regional Location Map***. The Town of Laughlin, Nevada is located to the west across the Colorado River and the City of Kingman, Arizona is located approximately 35 miles to the east. The specific boundaries of the contract area include the majority of the incorporated area of the City, as well as additional lands located adjacent to, and to the east of the City as shown on **Figure 1-2, *Contract Area***. The providers serve the City with potable water. The boundaries of their certificated areas are shown on ***Figure 1-3, Water Utility Service Areas.***

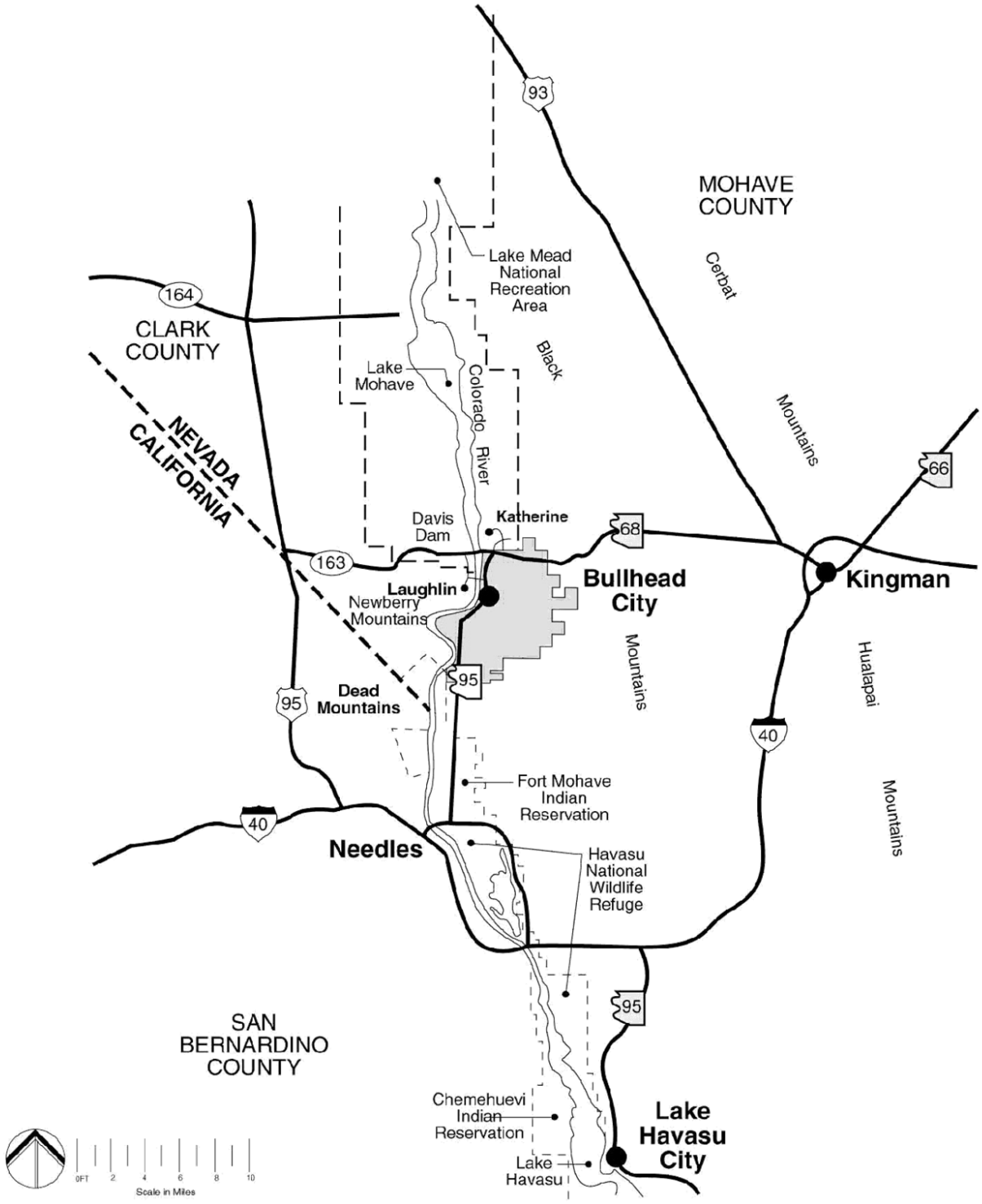


Figure1-1 Regional Location Map

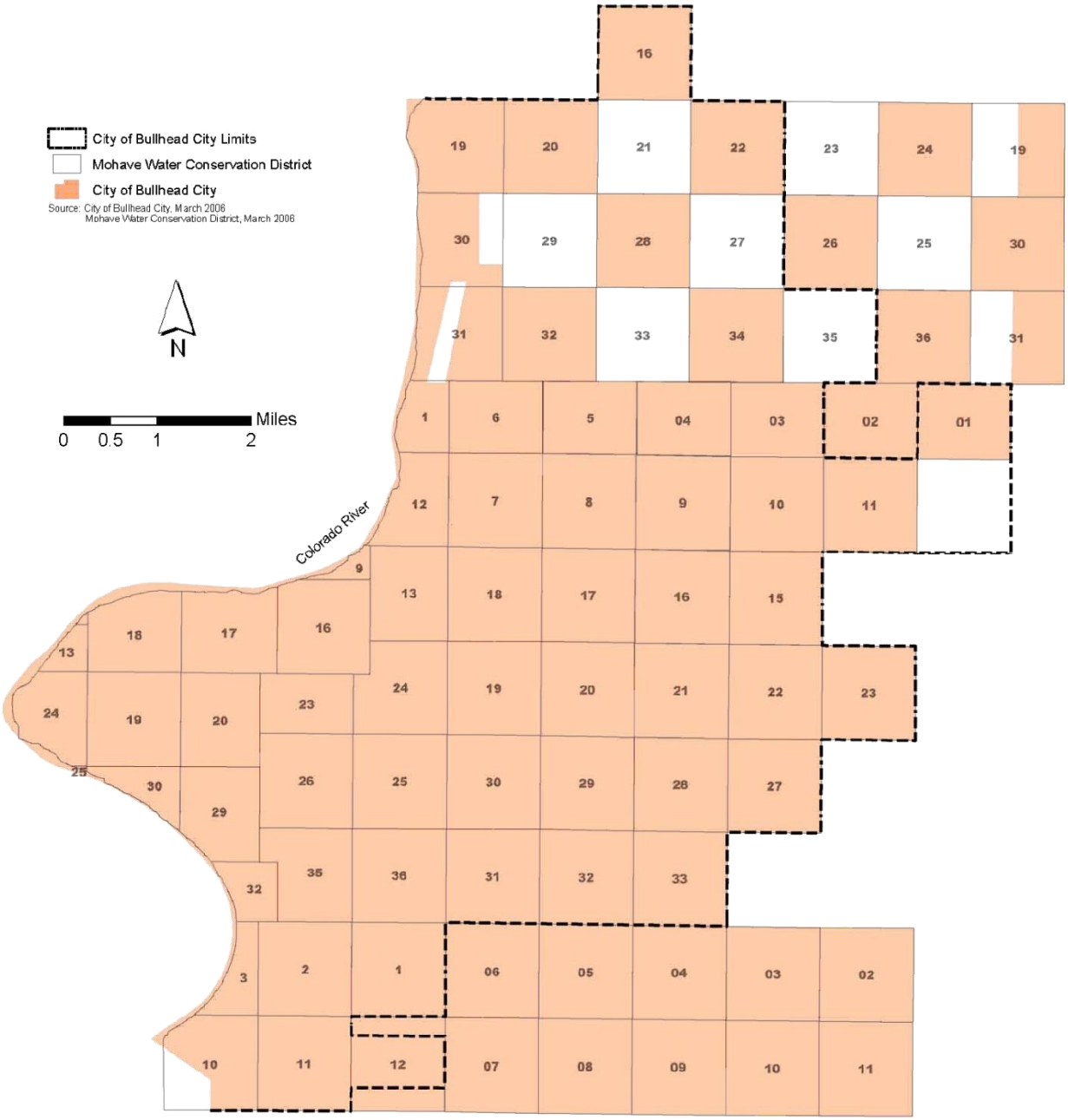


Figure 1-2 Contract Area

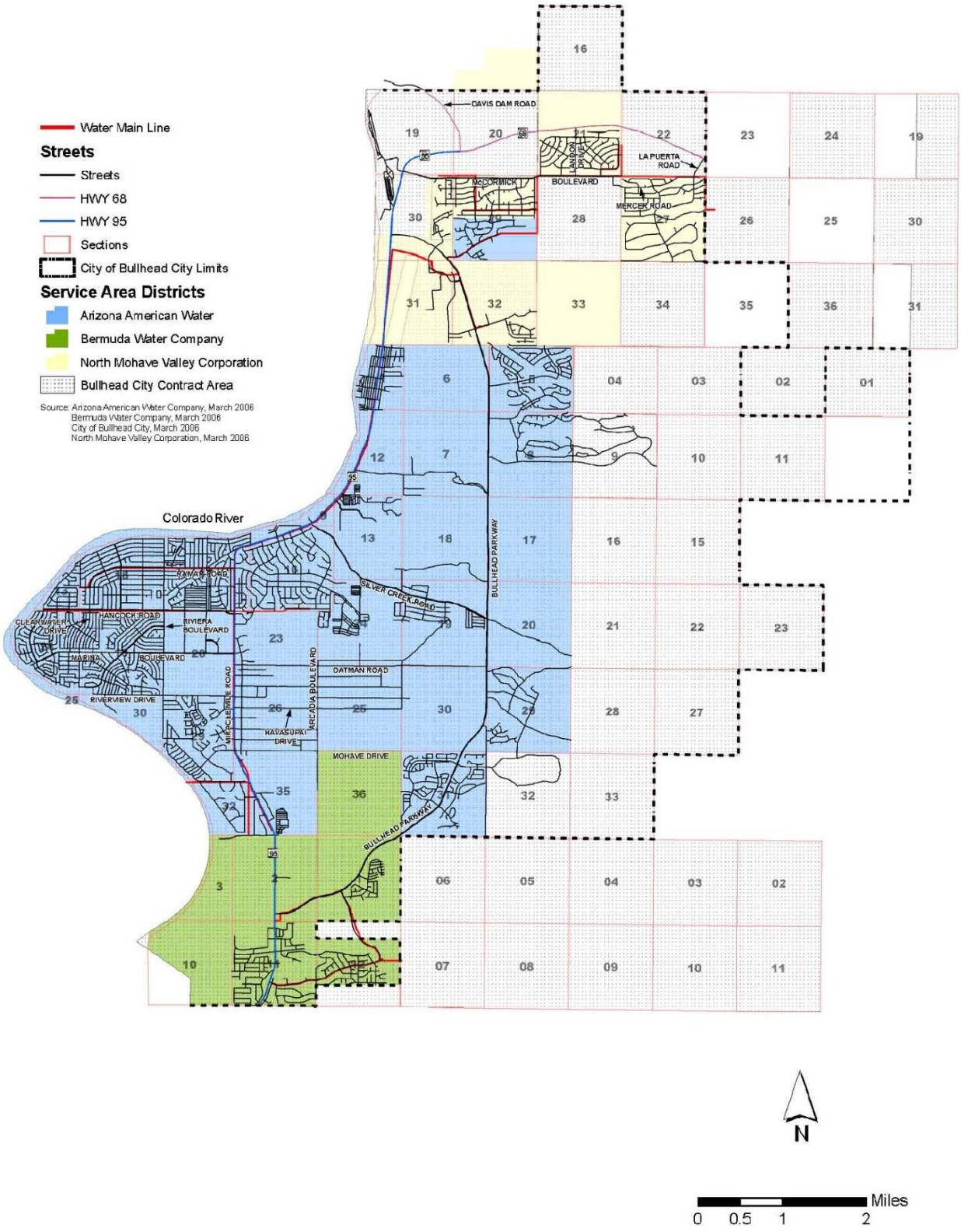


Figure 1-3 Water Utility Service Areas

C. Size

The Bullhead City contract area encompasses approximately 71.9 square miles or 76 partial and whole sections of land. Of this area, 53.0 square miles are located within the 57.3 square mile incorporated limits of Bullhead City. The remaining 14.6 square miles lie within Mohave County. **Table 1.2, *Contract Area Size & Population Served*** and **Table 1.3, *Water Provider Service Area Size & Population Served*** summarizes the size and service of the Bullhead City contract area and that of each water provider.

Table 1.2 Contract Area Size & Population Served

Year	Bullhead City Corporate Limits		Bullhead City Beyond the Corporate Limits	
	Size (Square Miles)	Population Served	Size (Square Miles)	Population Served
1990	36.1	21,951	29.0	0
2000	38.6	33,769	29.0	0
2006	57.3	38,210	14.6	0
2010	57.3	39,540	14.6	0
2015	57.3	40,088	14.6	0

Source: City of Bullhead City, January 2016

Table 1.3 Water Provider Service Area Size & Population Served

Year	EPCOR		Utilities, Inc.	
	Size (Square Miles)	Population Served	Size (Square Miles)	Population Served
1990	25.0	20,007	6.0	1,778
2000	26.0	30,392	6.0	2,710
2005	26.0	33,502	6.0	2,978
2010	26.0	35,586	6.0	3,163
2015	33.0	36,079	6.0	3,207

Source: City of Bullhead City, EPCOR, and Utilities, Inc. January 2016. Note: Balance of population between Bullhead City and the two private water companies is served by private wells located within the Bullhead City or MWCD service areas.

D. Topography

The existing topography of the Bullhead City incorporated area rises from an elevation of approximately 500 feet above sea level, at the Colorado River, to more than 1,400 feet above sea level at the eastern boundary of the contract area. The contract area is surrounded by the Black Mountains to the north and east, the Dead Mountains to the southwest, and the Newberry Mountains and the Colorado River to the west.

Topography of the region is characterized by extensive alluvial fans, dissected fan terraces, inset fans and wide alluvial washes which drain the Black Mountain range into the Colorado River. These washes form short side slope ridges (up to 50 percent slope), which are located in an east to west orientation and exhibit slopes generally ranging from one to seven percent.

In order to develop the land exhibiting these characteristics, the ridges have historically been leveled and terraced to provide unobstructed views. Drainage washes have remained in their indigenous state or channelized to provide adequate storm drainage capacity and efficiency for the substantial storm water increases produced by the developed impermeable area.

E. Soils

The soils located within the contract area include three distinct associations and are summarized in **Table 1.4, *Soil Characteristics***. This information was compiled in 1974 by the US Department of Agriculture, Soil Conservation Service. The soils have a wide range of properties which provide opportunities for certain types of development and potential constraints in terms of permeability, runoff, erosion, septic tank usage, caving and flooding. General locations where these characteristics impact the contract area are illustrated on **Figure 1-4, *Soil Associations***.

F. Natural Environment

1. Vegetation

The majority of the Bullhead City contract area lies within the Mohave Desert Scrub Biome. Based on dominant vegetation, the area is divided into four plant communities or habitats: Creosote Bush Scrub, Mohave Wash Scrub, Mohave Interior Strand and Disturbed. All of these habitats have been impacted to some degree by grazing and human activity such as off-road vehicle use and trash dumping. Each habitat is described below.

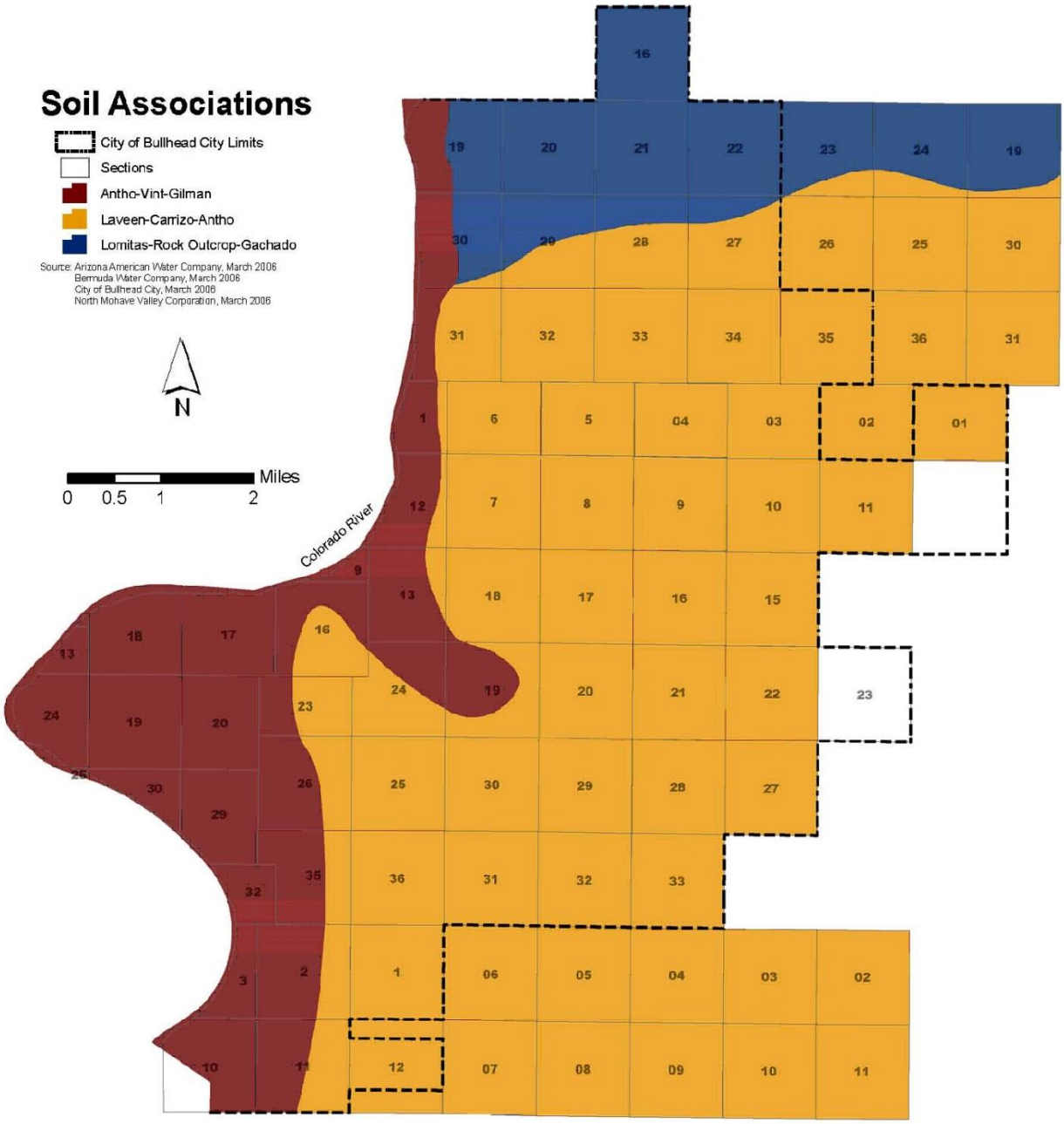
- *Creosote Bush Scrub habitat* - This sparsely vegetated habitat is associated with rocky ridges and slopes. Creosote bush (*Larrea tridentata*) is the dominant plant species as well as the tallest vegetative element throughout the habitat. In certain ridge top areas characterized by desert pavement and large boulders, creosote bush may be the only

Table 1.4 Soil Characteristics

Soils	Location	Characteristics	Permeability	Runoff	Erosion	Slope (Percent)	Elevation (Feet Above Sea Level)	Development Constraints
Antho-Vint-Gilman	Floodplain Low Terraces	Deep Well Drained	Moderate Rapid	Slow	Moderate	0-3	480-200	Soil Blowing Flooding Sewer Seepage
Laveen-Carrizo-Antho	Floodplains Alluvial	Deep Excess	Very Rapid	Slow	High	0-4	480-1,200	Flooding Caving of Cut Stones in Utility Lines Seepage
Lomitas-Rock Outcrop-Gachado	Hills and Mountains	Moderate-Deep Well	Moderate	Rapid	High	15-75	480-1,600	Shallow Bedrock Gravel in Utility Lines No Septic Tanks

Source: Soil Survey - A Special Report - Parts of Mohave County, Arizona, U.S. Department of Agriculture, Soil Conservation Service, December 1980

Figure 1-4 Soil Associations



perennial species present. In other areas the evenly spaced creosote will be interspersed with other perennial and herbaceous species including: Brittlebush (*Encelia farinosa*), Diamond Cholla (*Opuntia ramosissima*), Beavertail Cactus (*Opuntia basilaris*), Silver Cholla (*Opuntia echinocarpa*), Barrel Cactus (*Ferocactus acanthodes*), White Bursage (*Ambrosia dumosa*) and Mormon Tea (*Ephedra nevadensis*). Creosote Bush Scrub is the most prevalent habitat type within the entire contract area.

- *Mohave Wash Scrub habitat* - This habitat is associated with the ephemeral drainages and sandy washes. The scrub habitat supports a mix of upland species (Creosote Bush Scrub) and species typically requiring more water. Species associated with these washes include: Catclaw Acacia (*Acacia greggii*), Desert Lavender (*Hyptis emoryi*), Bebbia (*Bebbia juncea*). Ratany (*Krameria sp.*), Desert Milkweed (*Asclepias subulata*), Mormon Tea and Brittlebush. Catlaw is generally the dominant species by volume in the numerous smaller drainages that dissect the area. The larger drainages and associated historic floodway contain Mohave Interior Strand and Creosote Bush Scrub habitat. In addition, these larger drainages are predominated by high densities of Bebbia, interspersed with relatively large Creosote and Catclaw.
- *Mohave Interior Strand habitat* - Mohave Interior strand habitat is characterized by sandy wash channels and related sparsely vegetated areas. The sparse vegetation within the Mohave Interior Strand is typically Bebbia. There is a transition from the strand habitat to the Mohave Wash Scrub and Creosote Bush Scrub habitats within wash floodways.
- *Disturbed habitat* - Disturbed areas are those that are affected by grading, off-road vehicles, roadway construction, trash dumping, and other human activities.

2. Wildlife

The vegetative habitats described above can be arranged into three categories based upon their value to wildlife. The value to wildlife is a function of the projected number of individuals a habitat may support. Vegetative volume can be used as an overall indicator of habitat value. The general habitat value must be considered in combination with habitat requirements for special interest species.

The Mohave Wash Scrub habitat is likely to support the greatest amount of wildlife. This is a function of the high volume of vegetation relative to other habitat types. The Creosote Bush Scrub and the Mohave Interior Strand have a relatively moderate to low wildlife value depending on the localized vegetative volume. Strand areas devoid of vegetation and disturbed areas have minimal or no value for wildlife.

Some of the wildlife that are known to, or that possibly could occur in the area, are described below.

- *Mammals* - Numerous small species and two large species may occur in the area. Several mice species (*Permyscus sp.* and *Perognathus sp.*), Desert Woodrat (*Neotoma lepida*), Coyote (*Canis lantrans*) and Desert Bighorn Sheep (*Ovis canadensis nelsoni*) may occur as casual visitors or inhabitants of the area. Overall densities for mammals are expected to be low.
- *Birds* - Approximately 25 bird species potentially could occur in the area, including Verdins (*Auriparus flaviceps*), Black-Throated Sparrows (*Amphispiza bilineata*) and Black-Tailed Gnatcatchers (*Polioptila melanura*). Densities for bird species are expected to be low.
- Reptiles - Numerous reptile species are likely to occur in the area, including Side-Blotched Lizard (Uta stansburiana), Western Brush Lizard (Urosaurus graciosus), and Mohave Rattlesnake (Crotalus scutulatus).

3. Protected Wildlife Species

In Arizona, the Desert Tortoise is listed as a Category 2 by the United States Fish and Wildlife Service (USFWS) and a candidate species by the Arizona Game and Fish Department (AGFD). As such, guidelines for handling tortoises encountered during the development process and potential relocation areas have been prepared by each of these agencies. Other special-interest species known to occur in the immediate area are addressed in Step 8, *Environmental Review*.

G. Cultural Environment

As part of the City's request for an additional allocation of Colorado River water, an Environmental Assessment of the contract area was completed. This report confirmed the existence of bust, pots, trails, and small encampments. All of these findings are indicators of trade routes and/or exploration of the natural resources.

H. Climate

The elevation and natural characteristics of the contract area produces a mild climate in the winter and a hot climate in the summer. **Table 1.5, *Contract Area Climate Data*** summarizes the average temperatures and precipitation by month.

Table 1.5 Contract Area Climate Data

Month	Temperature Average Daily Maximum	Temperature Average Daily Minimum	Total Precipitation (Inches)
January	65.9	43.7	1.03
February	71.2	45.9	1.00
March	78.9	49.8	.84
April	88.1	56.3	.19
May	97.8	65.3	.07
June	107.7	73.0	.01
July	112.0	79.9	.34
August	110.1	79.5	.73
September	103.7	71.8	.35
October	90.3	59.9	.44
November	75.3	49.7	.41
December	65.3	43.0	.58
Annual	**88.9**	**59.8**	**5.99**

Source: Western Regional Climate Center, Bullhead City, Arizona, 1977-2015 Monthly Climate Summary

I. Water Supplies

A summary of the water supplies available within the Bullhead City contract area is shown on **Table 1.6, *Historic and Existing Water Supply by Source***. The supply data provides a 25-year review of the sources and amounts of potable water available to the City's two providers. The data was compiled using information from each of the water providers and a review of the private wells.

Table 1.6 Historic and Existing Water Supply by Source

Water Source	1990 Acre-Feet	2000 Acre-Feet	2005 Acre-Feet	2010 Acre-Feet	2015 Acre-Feet
Reclamation M&I Water	15,210	15,210	15,210	15,210	15,210
Local Surface Water	0	0	0	0	0
Groundwater	0	0	0	0	0
Transferred Water – Kingman 1995	0	6,000	6,000	6,000	6,000
Transferred Water – Cibola 2004	0	0	2,139	2,139	2,139
Transferred Water – Kingman 2009	0	0	0	1,000	1,000
Reclaimed Water	0	0	490	769	645
Other Water	0	0	0	0	0
TOTAL	**15,210**	**21,210**	**23,839**	**25,118**	**24,994**

In addition, a summary of contract information has been provided to illustrate the amounts and restrictions on existing potable supplies for the area. This information is presented on **Table 1.7, *Water Supply Contract Information***.

Table 1.7 Water Supply Contract Information

Water Source	Acre Feet Year	Contract #	Notes
Reclamation M&I water	15,210	2-07-30-WO273	None
Other (Kingman 1995)	6,000	None	Water to be purchased 1/1/2020
Other (Cibola Water)	2,139	None	None
Other (Kingman 2009)	1,000	Amendment 2 – Mohave County Water Authority	Water to be purchased 1/1/2024

Source: City of Bullhead City; January 2016

1. Contract Area Operated Wells

A list of the existing wells located within the Bullhead City contract area is included in **Appendix A.** This list was obtained from the Arizona Department of Water Resources (ADWR) and it includes information on over 700 active, inactive and monitoring wells. Based on field inspections of the well locations and discussions with the water providers

and well owners, City staff believes that approximately 250 of the wells are in operation. Twenty-six of these wells are used for commercial and industrial purposes. These wells pump more than 20 gallons per minute and report their usage to the City on a monthly basis. The remaining wells serve residential uses and pump less than 20 gallons per minute. For accounting purposes, the City reports a monthly use of 6.9 acre-feet.

2. Ground Water Basins, Ground Water Recharge Areas, or Conjunctive Use Programs

In October 2014, Reclamation issued a letter inviting certain entities along the Colorado River to participate in the "Pilot Program for Colorado River System Water Conservation". The purpose of this pilot program is find ways to be able to retain as much flow as possible behind Hoover Dam, while still maintaining system flows downstream to the maximum extent possible. Reclamation entered into a funding agreement with four municipal entities (the Metropolitan Water District of Southern California, the Central Arizona Water Conservation District, the Southern Nevada Water Authority and Denver Water) to provide funding for this pilot program, which would in turn fund the pilot program projects. The City's project consists of the construction of two injection wells, piping and pump improvements to convey the effluent from the Section 10 Wastewater Treatment Plant (WWTP) to the two wells. The City proposes to inject 2,200 acre-feet of effluent into the Colorado River aquifer annually. Reclamation has the rights to the first 8,800 acre-feet of effluent injected.

Currently, there are not any ground water basins or conjunctive use programs within the Bullhead City contract area. City representatives continue to work with Reclamation regarding the possibility of other injection wells.

J. Water Uses

The data in **Table 1.8, *Water Provider Usage by Land Use Type, Year 2015***, and **Table 1.9, *Contract Area Water Usage, 1990-2015***, was compiled using information from each of the water providers and a review of the metered and nonmetered wells. The water providers do not monitor water uses per the categories requested by Reclamation. As such, the data has been lumped together as single and multiple family residential or commercial and industrial.

Table 1.8 Water Provider Usage by Land Use Type, Year 2015

Water Provider	Single Family & Multiple Family (by acre feet)	Single Family & Multiple Family (by provider percentage)	Commercial, Industrial & Construction (by acre feet)	Commercial, Industrial & Construction (by provider percentage)
EPCOR	5,649	96%	236	4%
Utilities, Inc.	544	84%	104	16%
Metered & Nonmetered Wells	146	5%	2,770	95%
TOTAL	**6,339**		**3,110**	

Sources: City of Bullhead City, January 2016
EPCOR Water, January 2016
Utilities, Inc., January 2016

Table 1.9 Contract Area Water Usage, 1990-2015

Customer Type	1990 Acre Feet	2000 Acre Feet	2005 Acre Feet	2010 Acre Feet	2015 Acre Feet
Single Family & Multiple Family	NA	5,998	6,181	7,588	6,321
Commercial &Industrial	NA	1,206	4,314	2,282	2,887
Institutional	NA	0	0	0	0
M&I	NA	0	420	420	0
Wholesale	NA	0	0	0	0
Construction	NA	0	0	21	241
Reclaimed water	NA	0	490	490	645
Unaccounted for	NA	801	985	943	879
TOTAL	**NA**	**8,005**	**12,390**	**12,164**	**11,007**

Sources: City of Bullhead City, January 2016
EPCOR Water, January 2016
Utilities, Inc., January 2016

K. Storage

The data in **Table 1.10, *Water Storage Location and Capacity*** was compiled using information provided by each of the water providers. **Figure 1-5, *Major Water Facilities and Features*** shows the location of potable water tanks, wells and wastewater treatment plants.

L. Distribution Facilities

There are not any distribution facilities located within the Bullhead City contract area that are owned and operated by Bullhead City. Each of the water providers has advised the City that future plans include the installation of additional booster facilities, storage tanks and wells. The exact locations and specific details of the improvements have not been determined at this point in time.

M. Water Measurement and Accounting Procedures

1. Water Measurement

The City of Bullhead City is responsible for the overall water measurement and accounting needs associated within the contract area. In accordance with the Reclamation master contract and City regulations, the City monitors water pumped from the Colorado River on a monthly basis. The resulting report is then transmitted to Reclamation for their records.

The water providers and metered well users submit a report to the City by the 5th of each month. Their report includes a listing of the wells and the amount of water pumped by each provider during the previous month. In addition, a calculation of the nonmetered wells is prepared. Staff then compiles the data into a single report, which is forwarded to Reclamation by the 15th of each month. The Finance Department receives a copy of the report, which they use to bill users on a quarterly basis. Currently, the City charges $0.1583 per 1,000 gallons. Water pumped directly from the Colorado River for construction purposes, is charged a fee of $1.50 per 1,000 gallons. The City regulations that address the metering of wells are found in **Appendix B**.

The City monitors the amount of water allocated within the contract area. A thorough review of the existing subdivisions and developments has been completed and an amount of water has been assigned to each based on the type of use. In addition, when new subdivisions and certain other types of development are submitted to the City for approval, an application for a water allocation must be included with the request. Once the amount of water requested is agreed upon, the City Council considers making an allocation either at the time of building permit issuance or final plat approval.

Figure 1-5 Major Water Facilities and Features

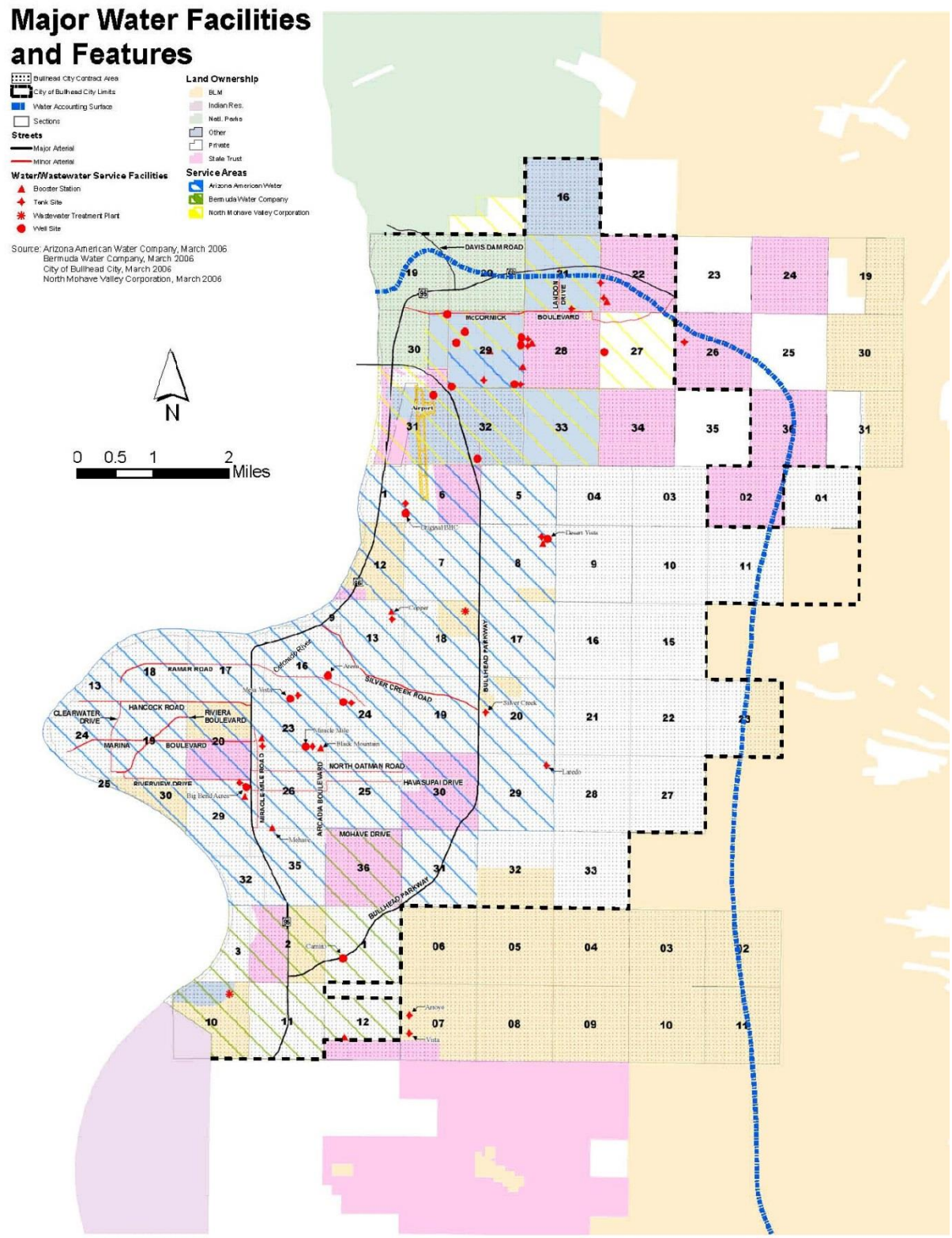


Table 1.10 Water Storage Location and Capacity

Storage Facility	Capacity (Gallons)	Location
EPCOR Water		
Tank (Original Bullhead City)	123,000	Section 1, T20N R22W
Tank (Desert Foothills Estates/ Desert Vista Drive)	500,000 & 500,000	Section 5, T20N R21W
Tank (Desert Glen/Copper Drive)	200,000	Section 13, T20N R22W
Tank (Buena Vista/Arriba Drive)	500,000	Section 16, T20N R22W
Tank (Buena Vista/Arriba Drive)	1,000,000	Section 16, T20N R22W
Tank (Buena Vista/Mesa Vista)	1,000,000	Section 16, T20N R22W
Tank (Buena Vista/Mesa Vista)	1,424,000	Section 16, T20N R22W
Tank (Silver Creek)	300,000 + 300,000	Section 20, T20N R21W
Tank (Miracle Mile)	35,000	Section 23, T20N R22W
Tank (Black Mountain)	1,000,000	Section 24, T20N R22W
Tank (Laredo Village)	500,000 & 750,000	Section 29, T20N R21W
Tank (Big Bend Acres)	250,000	Section 29, T20N R22W
Tank (Tank Site #1-Pegasus Ranch Road)	300,000	Section 29, T20N R21W
Tank (Tank Site #1-Pegasus Ranch Road)	500,000	Section 29, T21N R21W
Tank (Tank Site #2A-McCormick Blvd)	300,000	Section 21, T21N R21W
Tank (Tank Site #2B-McCormick Blvd)	300,000	Section 21, T21N R21W
Tank (Tank Site #3A-Indian Hill Drive)	300,000	Section 21, T21N R21W
Tank (Tank Site #3B-Indian Hill Drive)	300,000	Section 21, T21N R21W
Tank (Tank Site #4)	500,000	Section 26, T21N R21W
Total	**10,632,000**	
Utilities, Inc.		
Tank (Arroyo Vista #1)	372,000	Section 7, T19N R22W
Tank (Arroyo Vista #2)	372,000	Section 7, T19N R22W
Tank (El Rodeo #1)	500,000	Section 30, T19N R22W
Tank (El Rodeo #2)	500,000	Section 30, T19N R22W
Tank (El Rodeo #3)	500,000	Section 30, T19N R22W
Tank (El Rodeo #4)	500,000	Section 30, T19N R22W
TOTAL	**2,744,000**	

Sources: EPCOR Water, January 2016
Utilities, Inc., January 2016

A list of projects to which an allocation of Colorado River water has been assigned is included in **Appendix C**. The various City regulations addressing the allocation of Colorado River water to a development or subdivision is included in **Appendix D**.

Table 1.11, *Water Provider Metering Data* summarizes information obtained from the two water providers regarding their water measurement and accounting procedures. A total of 19,524 meters exist within the City and are administered by the two water providers. EPCOR Water has a total of 17,819 metered customers and Utilities, Inc. has 1,705.

2. Accounting Procedures

Under the jurisdiction of the ACC, accounting procedures are the individual responsibility of each water provider for their particular certificated area. All water delivered by the providers is billed on the basis of metered volume per 1,000 gallons. Meter readings are scheduled on a monthly basis using an “Itron” system. This information is then uploaded into a meter read interface system. The readings are merged with the customer information system where they are posted to the customer’s service history and calculated for billing. The data is backed up daily. Records are stored electronically on a monthly basis for a period of thirteen months. Water use data is available at each provider’s office upon receipt of a request by a customer.

N. Water Pricing and Billing Procedures

Under the jurisdiction of the ACC, water pricing and billing is the individual responsibility of each water provider for their particular certificated area. In particular, this Commission is responsible for approving the rates that water providers charge, as well as any increases thereto.

Each provider transmits a bill monthly for the services rendered. Meter readings are scheduled for periods of not less than 25 days or more than 35 days. If the company is unable to read the meter on the scheduled day, the amount of water consumption is estimated. All bills are due out no later than 15 days after the bill date. The bill is considered delinquent if payment is not made within 17 days of the bill date. Late penalties are assessed per month.

Table 1.11 Water Provider Metering Data

Provider Meter Size	Number	Accuracy (percentage)	Reading	Calibration (months)	Maintenance (months)
EPCOR Water					
M&I meters - 5/8"	16,921	100%	Monthly	Upon Request	Upon Request or Every 10 to 15 Years
M&I meters - 1"	353	"	"	"	"
M&I meters – 1 ½ "	29				
M&I meters – 2"	429	"	"	"	"
M&I meters – 3"	27	"	"	"	"
M&I meters – 4"	3	"	"	"	"
M&I meters – 6"	5	"	"	"	"
TOTAL	**17,819**				
Utilities, Inc.					
M&I meters - 5/8"	1,600	100%	Monthly	Upon Request	Upon Request or Every 10 Years
M&I meters - 1"	70	"	"	"	"
M&I meters- 2"	34	"	"	"	"
Compound	1	"	"	"	"
TOTAL	**1,705**				

Sources: EPCOR Water, January 2016
Utilities, Inc., January 2016

O. Water Shortage Allocation Policies

Bullhead City has been participating in the Arizona Water Banking Authority (AWBA) through the MCWA. Due to this program, shortage severity can be reduced in future years. In the event of a water shortage, the current allocation strategy is to provide the remaining resources equally to all customers. Exceptions would be facilities such as clinics, hospitals, and other users where reductions in water delivery would cause a potential threat to public health and safety.

Bullhead City has developed a Drought/Water Shortage Contingency Plan that is specific to the Bullhead City contract area. The plan includes short-term and long-term drought/water shortage stages and the associated response measures and considerations based on the Seven Basin States Agreement. The City actively enforces regulations that prohibit the flow of water onto streets from irrigation systems. Adopted municipal codes also require that all landscaped areas and irrigation systems are to be designed, constructed, and maintained in a manner that promotes water conservation and prevents the loss of water through overflow or seepage. In 2010 the City adopted new regulations to address water restrictions during times of shortage. Last, the City is committed to the use of reclaimed water for irrigation purposes and is planning for the expansion of future reclaimed water use.

P. Operation and Maintenance Program

Operation and maintenance programs are the individual responsibility of each of the water providers for their specific certificated areas.

Step 2 - Inventory of Water Resources

A. Water Budget Tables

The inventory of water resources considers the quantity and quality of water sources that could be available to serve the contract area. The supply of water is shown on **Table 2.1, *Monthly Contract Area Water Supply (2015)***.

Table 2.1 Monthly Contract Area Water Supply (2015)

Month	Surface Water (Colorado River) (acre feet)*	Ground Water	Treated Wastewater Discharged (acre feet)	Precipitation **	TOTAL ** (acre feet)
January	860.0	0	53.9	1.05	915.0
February	860.0	0	51.1	1.13	912.2
March	860.0	0	59.7	0.96	920.7
April	910.0	0	58.5	0.17	968.7
May	1210.0	0	43.5	0.08	1253.6
June	1260.0	0	66.2	0.01	1326.2
July	1260.0	0	60.9	0.29	1321.2
August	1260.0	0	53.9	0.75	1314.7
September	1210.0	0	42.7	0.36	1253.1
October	1010.0	0	48.1	0.47	1058.6
November	1010.0	0	56.2	0.45	1066.7
December	1010.0	0	50.7	0.52	1061.2
TOTAL	**12,720**	**0**	**645.4**	**6.24**	**13,371.9**

Source: City of Bullhead City, July 2016
* Amount budgeted for in the annual water order submitted to the Reclamation of Reclamation.
** Precipitation is NOT included in total contract area water supply

As shown above, the supply of surface water comprises 95 percent of the total supply. The use of treated wastewater comprises the remaining five percent. The use of available water supply is shown on **Table 2.2, *Contract Area Water Use (2015)***.

Table 2.2 Contract Area Water Use (2015)

Month	Municipal & Industrial Use (Colorado River) (acre feet)*	Ground Water Recharge	Water Exchanges or Transfers	Treated Wastewater Discharged (acre feet)	TOTAL (acre feet)
January	597.7	0	0	53.9	651.6
February	596.6	0	0	51.1	647.7
March	739.2	0	0	59.7	798.9
April	828.6	0	0	58.5	887.1
May	894.9	0	0	43.5	938.4
June	897.1	0	0	66.2	963.3
July	920.3	0	0	60.9	981.2
August	964.7	0	0	53.9	1,018.6
September	913.3	0	0	42.7	956.0
October	795.6	0	0	48.1	843.7
November	690.3	0	0	56.2	746.5
December	610.8	0	0	50.7	661.5
TOTAL	**9,449.1**	**0**	**0**	**645.4**	**10,094.5**

Source: City of Bullhead City, September 2016
*Actual water pumped and reported to the Reclamation of Reclamation in 2015.

At the present time, the City utilizes 38 percent (9,449.1 AFY out of 24,871 AFY contracted) of its available surface water resources and all of the available reclaimed water (approximately twenty percent of its treated wastewater).

B. Quality of Water Sources

In terms of the quality of the water pumped, the Arizona Department of Environmental Quality (ADEQ) completed a Groundwater Quality Study for Northern Mohave Valley (now EPCOR) in April 1999. Twenty wells located within the Bullhead City contract area were tested for compliance with Safe Drinking Water standards for inorganics and metals. Of these test wells, a total of four were found to exceed the minimum standards allowed for arsenic and nitrates. The study concluded that the arsenic in the area was produced by natural factors, but there was not sufficient data to determine its origin and the magnitude of the levels in the groundwater. Secondly, the high concentration of nitrates were attributed to the densely populated areas and their use of on-site septic systems. These densely populated areas have been on a municipal sewer system since 2003. A copy of the complete study can be obtained from Hydrologic Support and Assessment Division, Water Quality Division of ADEQ.

The two water providers administer ongoing programs to monitor the quality of the water pumped. Water from different well sites is blended as necessary to achieve compliance with state and federal standards for domestic consumption.

C. Water Uses Within the Contract Area

The data in **Table 2.3, *Contract Area Municipal & Industrial (M & I) Water Uses (2015)*** was compiled using information from each of the water providers and a review of the metered and nonmetered wells. The water providers do not monitor water uses relative to the categories requested by Reclamation. As such, the data has been organized by single family and multiple family residential, commercial and industrial uses, and other miscellaneous uses.

Table 2.3 Contract Area Municipal & Industrial (M & I) Water Uses (2015)

Customer Type	Number of Connections	Year 2015 Use (Acre Feet)
Single Family & Multiple Family	18,521	6,336
Commercial & Industrial	933	2,906
Institutional	0	0
M&I Irrigation	0	0
Wholesale	0	0
Construction	0	241
Reclaimed water	0	645
Unaccounted for	0	879
Other	0	0
TOTAL	**19,454**	**11,007**

Sources: EPCOR Water, January 2016
Utilities, Inc., January 2016

The data in **Table 2.4, *Contract Area M & I Wastewater Collection and Treatment*** summarizes the location, level, amount and disposal of treated effluent from municipal and industrial uses. The City has been diverting reclaimed water within the contract area for approximately twenty years. Upon completion of the necessary infrastructure, flows from the Section 10 plant to Rotary Park were initiated in July 2000. The Bullhead Sanitary District originally owned the Section 18 plant and began diverting reclaimed water to the Laughlin Ranch Golf Course in July 1996. The City assumed operation of the plant in December 1999 and continues to convey reclaimed water for turf irrigation use.

The Bullhead City contract area has one recharge project that is currently under construction adjacent to the Section 10 WWTP. There has not been any water or reclaimed water exchanges or transfers into or out of the contract area.

Table 2.4 Contract Area M&I Wastewater Collection & Treatment

Treatment Plant	Treatment Level	2015 Acre Feet	Disposal To:
Section 10 Plant	3	181.0	Rotary Park
Section 18 Plant	3	464.4	Laughlin Ranch Golf Course
TOTAL		**645.4**	

Source: City of Bullhead City Public Works Department Wastewater Division, January 2016

Step 3 Water Management Problems, Opportunities, and Conservation Goals

A. Water Management Problems and Challenges

During the public hearing process, the Bullhead City Water Resources Advisory Committee and the water providers did not identify any water management problems and challenges associated with the operation of the contract area. The current challenge involves a continuing 100% reliance on the Colorado River. Bullhead City will continue to investigate and evaluate other water supply sources and options.

B. Water Management Goals

The Bullhead City Water Resources Advisory Committee and the water providers agreed that within the contract area a primary focus should be the accountability of water. In particular, each provider has established a goal whereby not more than 10% of their water will be unaccounted. The goals selected for this plan, insure the success of this effort.

There is also a continued opportunity during the next five years to decrease the amount of water used for irrigation purposes and increase the amount of reclaimed water used for the same purpose. As described above, a network of reclaimed water distribution lines now connect each of the wastewater treatment facilities to a golf course or park. Laughlin Ranch Golf Course and Rotary Park are currently using reclaimed water. Their demand for irrigation water will only continue to increase in the near future. The City will be able to meet these demands through the provision of reclaimed water rather than the use of Colorado River water.

Step 4 Existing Water Conservation Measures

A. Practices and Expected Results

In September 1995, the City entered into subcontract agreements with EPCOR Water and Utilities, Inc. These subcontracts identify specific water conservation practices that the water providers agreed to implement in order to assist the City in their efforts to enhance water conservation and efficiency measures. The programs included in the subcontracts are listed below.

- Restrictions on the acreage of proposed turf or other water intensive landscaping irrigated with potable water delivered by the water provider.
- Restrictions on the size of proposed lakes, ponds, and other bodies of potable water delivered by the water provider.
- An incentive program to use reclaimed water for turf and landscape irrigation as well as for lakes, ponds, and other bodies of water.
- A program designed to detect and eliminate water leakage from the water provider's distribution facilities.
- Mandatory installation and use of "low flow" plumbing fixtures in new residential and commercial construction.
- An incentive program to retrofit existing homes and commercial buildings with "low flow" plumbing fixtures.
- A requirement that withdrawals of water from wells be measured with appropriate measuring devices.

Table 4.1, *Practice and Expected Results* summarizes the programs and measures that were identified and implemented in accordance with the 2011 Bullhead City Water Conservation Plans.

Table 4.1 Practices and Results

Practice	Results
Residential and Government Audit and Incentive Programs	Each water provider supported, promoted, and implemented interior and exterior water audits. The program was proactive and available to all customers. Each water provider supported incentive programs to encourage customers to perform retrofits that were identified as cost-effective measures in the audit. Water savings of 7% to 10% were expected annually.
Commercial and Industrial Audit and Incentive Programs	Each water provider supported, promoted, and implemented interior and exterior water audits. The program was proactive and available to all customers. Each water provider supported incentive programs to encourage customers to perform retrofits that were identified as cost-effective measures in the audit. Water savings of 7% to 10% were expected annually.
Distribution System Audit Program	At least once every ten years the water provider will complete a distribution system water audit using methodology such as that described in the American Water Works Association's "Manual of Water Supply Practices, Water Audits and Leak Detection", and perform distribution system leak detection and repair whenever the audit reveals that it would be cost effective. Each water provider also implemented a program to advise customers whenever the possibility of a leak was detected on the customer's side of the meter. Water savings of 7% to 10% were expected annually.
Landscape Programs	The City adopted ordinances requiring the use of drought tolerant landscape materials in all new multiple family, commercial, and industrial projects and ordinances that prohibit the flow of water onto streets. The City addresses water conservation on our Web site. Water savings of 1% to 5% were expected annually. The City offered rebates to replace turf and/or water features with artificial turf and/or desert landscaping.
Drought/Water Shortage Plan	The City adopted water restriction regulations that are triggered when Lake Mead reaches certain elevations.
Wastewater Reclamation and Recycling Programs	The City evaluated various sites for their reception of reclaimed water. As funding permits, the City will design and implement wastewater reclamation systems to receive reclaimed water for irrigation purposes. The goal of this program is to increase the amount of reclaimed water used for irrigation purposes by 10% during this planning period.
Plumbing Regulations	The City enforced applicable federal, state, and local requirements for the sale and installation of water-efficient plumbing products. The City addressed this water conservation topic on our Web site.
Fixture Replacement Programs	The water providers supported the implementation of programs to retrofit low consumption toilets and/or high efficiency showerheads in existing buildings. The City addressed this water conservation topic on our Web site. The City obtained funding for retrofit kits and made them available to the Bullhead City community. The City also offered rebates to replace less efficient irrigation controllers, toilets, and washers with more efficient equipment.
Conjunctive Use	The City reviewed the need for a groundwater management plan that addressed the increased conjunctive use of surface and ground water within the contract area to determine if changes specific to the Bullhead City contract area were necessary.

Source: Bullhead City Water Conservation Plan, November 2011

B. Program Design and Results of Implemented Practices

Table 4.2, *Program Design and Results* summarizes the actual program design and results of the practices that were identified and implemented in accordance with the 2011 Bullhead City Water Conservation Plan.

Table 4.2 Program Design and Results

Goal	Measures	Target Dates For Implementation	Water Savings
Residential and Government Audit and Incentive Programs	Itron Metering System	On-Going	7% - 10% Annually
	Meter Testing Program	On-Going	
	Meter Replacement	On-Going	
Commercial and Industrial Audit and Incentive Programs	Itron Metering System	On-Going	7% - 10% Annually
	Meter Testing Program	On-Going	
	Meter Replacement	On-Going	
Distribution System Audit Program	Pumped/Sold/Measured	On-Going	7% - 10% Annually
	Emergency Response	On-Going	
	Team/Reaction Time	On-Going	
	Line Replacement	On-Going	
Landscape Programs	Adopt Drought Tolerant Landscape Materials Ordinance	Adopted	1% - 5% Annually
	Adopt Water Restrictions	Adopted	
	Provide Information	On-Going	
Drought/Water Shortage Plan	Review Policies and Procedures	On-Going	
Wastewater Management and Recycling Programs	Cut back on irrigation water use through reclaimed water use.	On-Going	5% - 7% Annually
	Install reclaimed water lines from Wastewater Treatment Facilities to allow use of reclaimed water for irrigation purposes.	On-Going	
Plumbing Regulations	Enforce Applicable Regulations	On-Going	1% - 5% Annually
	Provide Information	On-Going	
Fixture-Replacement Programs	Provide Retrofit Kits	On-Going	1% - 5% Annually
	Provide Rebates	On-Going	
	Provide Information	On-Going	
Conjunctive Use	Review Policies and Procedures	On-Going	

Source Bullhead City Water Conservation Plan, November 2011

Step 5 - Fundamental Water Conservation Measures

A. Water Measurement and Accounting System

As described in Step 1 - M of this document, a system that measures/accounts for the volume of water conveyed is in place. Bullhead City is responsible for the overall water measurement and accounting needs associated with the contract area. In accordance with the Reclamation master contract and City regulations, the City monitors water pumped from the Colorado River on a monthly basis. The resulting report is then transmitted to Reclamation for their records.

More specifically, the water providers and metered well users must submit a report to the City by the 5th of each month. Their report includes a listing of the wells and the amount of water pumped by each provider during the previous month. Additionally, a calculation of the nonmetered wells is prepared. Staff then compiles the data into a single report, which is forwarded to Reclamation by the 15th of each month.

The City also monitors the amount of water allocated within the contract area. A thorough review of the existing subdivisions and developments has been completed and an amount of water has been assigned to each project based on the type of use. Secondly, when new subdivisions and certain other types of development are submitted to the City for approval, an application for a water allocation must be included with the request. Once the amount of water requested is agreed upon, the City Council considers making an allocation either at the time of building permit issuance or final plat approval.

Under the jurisdiction of the ACC, accounting procedures are the individual responsibility of each of the water providers for their specific certificated areas. All water delivered by the providers is billed on the basis of metered volume per 1,000 gallons. Meter readings are scheduled on a monthly basis by manually inputting data into an Itron hand held unit. This information is then uploaded into a meter read interface system. The readings are merged with the customer information system where they are posted to the customer's service history and calculated for billing. The data is backed up daily. Records are stored electronically on a monthly basis for a period of thirteen months. Water use data is available at each provider office upon receipt of a request by a customer.

B. Water Pricing Structure

As described in Step 1 - N of this document, a pricing structure encouraging the efficient use of water is in place. Under the jurisdiction of the ACC, water pricing and billing is the individual responsibility of each water provider for their particular certificated area. In particular, this Commission is responsible for approving the rates that utility companies charge, as well as any increases thereto.

A private water company's ACC-approved tariff will state the basis of how a customer's monthly bill is to be calculated (i.e. flat rate, tiered rate, $/1000 gal., $/100 gal., etc.) The tariff also specifies all new customer charges such as connection fees and turn-on/turn/off charges. The

specifics listed below in terms of how the utility reads meters, data is managed and stored and bills are calculated is specific to each utility. The ACC has standard policies common to all tariffs regarding requirements to make the information available to the customer upon request and data storage.

Each provider transmits a bill monthly for the services rendered. Meter readings are scheduled for periods of not less than 25 days or more than 35 days. If the company is unable to read the meter on the scheduled day, the amount of water consumption is estimated. All bills are due out no later than 15 days after the bill date. The bill is considered delinquent if payment is not made within 17 days of the bill date. Late penalties are assessed per month. EPCOR Water and Utilities, Inc. utilize a pricing structure that encourages water use efficiency.

C. Information and Education Program

The City uses its Web site to provide water conservation information. The City also enforces the water saving methods required by the International Construction Codes, installation of low-water usage plants in all landscaped areas, water restrictions during times of shortage, and water flow in the streets. Information materials on the City's landscaping requirements and water restrictions are included in **Appendix E**.

In October 2015 the City Council authorized $200,000 to be used for rebate programs. Rebates are available to applicants who replace grass and/or water features with drought tolerant plants and/or artificial turf. At this time the program offers rebates up to $2,500, $5,000, and $10,000 depending on the replacement product type and the land use. The City also offers rebates for switching to more efficient irrigation controllers, toilets and washing machines. Respectively, the rebates offered are $175, $50 and $150. To date the programs have been successful and the City Council set aside another $200,000 for FY 2017.

EPCOR Water and Utilities, Inc. also have water conservation education materials that they offer to their customers.

Water Conservation Coordinator

The Administrative Analyst in the City Manager's Office will serve as the designated "Water Conservation Coordinator" for the Bullhead City contract area. She can be contacted at:

Name: Janice D. Paul Title: Administrative Analyst
Phone: (928) 763-0122 Fax: (928) 763-0131
E-mail: jpaul@bullheadcity.com

Step 6 - Additional Water Conservation Measures

A. Municipal and Industrial Water Conservation Measures

Bullhead City has evaluated water conservation measures and the "Best Management Practices" (BMP's) described below to improve water management and water use efficiency within the contract area. These practices were also reviewed by the Bullhead City Water Resources Advisory Committee and the water providers during a hearing process.

1. Residential and Governmental Audit and Incentive Programs

Provide interior and exterior water audits and incentive programs for single family residential, multiple family residential, and governmental/institutional customers - The water providers will continue to conduct interior and exterior water audits for single family residential, multiple family residential, and governmental/institutional customers, upon request. Currently, the providers do not have a program in place to randomly audit a percentage of customers on a set schedule. The providers will use a pricing system that provides an incentive for the efficient use of water. An Itron Metering System, meter testing program, and meter replacement program will be used to account for and monitor water usage. In accordance with ACC standards, the goal of this program is to account for 90% of the water distributed. Bullhead City will continue enhance its web site with information about water conservation.

2. Commercial and Industrial Audit and Incentive Programs

Conduct commercial and industrial water conservation audits, water use reviews, and incentive programs - The water providers will continue to conduct commercial and industrial water conservation audits and water use reviews, upon request. Currently, the providers do not have a program in place to randomly audit a percentage of customers on a set schedule. The providers will use a pricing system that provides an incentive for the efficient use of water. An "Itron" Metering System, meter testing program, and meter replacement program will be used to monitor water usage. In accordance with Arizona Corporation Commission standards, the goal of this program is to account for 90% of the water distributed. Bullhead City will continue enhance its web site with information about water conservation.

3. Landscape Programs

Provide landscape and water conservation audit and incentive programs for new and existing customers - The water providers will continue to conduct landscape water conservation audit programs for new and existing customers as part of the programs discussed in numbers 1 and 2 above. They will support the use of water saving technologies and methods in the design and installation of new landscaping to maximize water efficiency. The providers will encourage existing businesses to upgrade or retrofit

irrigation systems to improve efficiency and use a pricing system that also provides an incentive for the efficient use of water.

The City has adopted ordinances requiring the use of drought tolerant landscape materials in all new multiple family, commercial, and industrial projects and ordinances that prohibit the flow of water onto streets. The City will continue to address these water conservation topics on its web site.

4. Distribution System Audit Program

Conduct distribution system water audits, leak detection, and repair at regular intervals - The water providers will continue to conduct distribution system water audits, leak detection, and repairs, upon request. Currently, the providers do not have a program in place to randomly audit a percentage of customers on a set schedule. "Pumped water" versus "delivered water" measurement tracking system, rapid emergency response to water breaks, and line replacement programs will be used to monitor water usage. In accordance with Arizona Corporation Commission standards, the goal of this program is to account for 90% of the water distributed.

5. Drought/Water Shortage Contingency Plan

Develop a drought/water shortage contingency plan for the contract area that outlines policies and procedures for operation and allocation during water supply shortages - The entire Bullhead City water supply is provided by the Colorado River and is governed by the rules and regulations of Reclamation, ADWR, and the AWBA. The City has developed a Drought/Water Shortage Contingency Plan specific to the Bullhead City contract area. The plan includes short-term and long-term drought/shortage stages and the associated response measures and considerations in accordance with the Seven Basin States Agreement. In addition, ordinances that address water restrictions in times of a shortage have been adopted.

6. Wastewater Reclamation and Recycling Programs

Design and implement wastewater reclamation and recycling programs - The City will continue to evaluate various sites for their potential to receive reclaimed water instead of potable water. As funding permits, the City will design and implement wastewater reclamation systems to receive reclaimed water for irrigation purposes. The goal of this program is to increase the amount of reclaimed water used for irrigation purposes by 10% during this planning period. The City will continue to seek new uses and users of reclaimed water through the planning period and work with Reclamation regarding additional injection wells.

7. Plumbing Regulations

Enforce applicable federal, state, and local requirements for the sale and installation of water-efficient plumbing products - The City will continue to enforce applicable federal, state, and local requirements for the sale and installation of water-efficient plumbing products. These regulations apply to all new construction projects in the contract area. The City will address this water conservation topic on our web site. Since one half to two thirds of Bullhead City's future residents are yet to come, the greatest potential for water conservation is with the future population and through specification and design of the future constructed environment that ensures less water is used. This effort includes the specification of low water use fixtures in all new buildings and retrofits of existing fixtures with lower use fixtures.

8. Fixture Replacement Programs

Implement programs to retrofit irrigation controllers, toilets and washing machines in existing buildings - In October 2015 the City Council authorized $200,000 to be used for rebate programs. Rebates are available to applicants who replace less efficient irrigation controllers, toilets and washing machines with those that are more efficient. Rebates are respectively available in the amounts of $175, $50, and $150.

9. Conjunctive Use

Where appropriate, increase conjunctive use of surface and groundwater within the contract area, and work with appropriate entities to develop a groundwater management plan - The entire Bullhead City water supply is provided by the Colorado River. During this planning period, the City will increase the conjunctive use of reclaimed water within the contract area.

In October 2014, Reclamation issued a letter inviting certain entities along the Colorado River to participate in the "Pilot Program for Colorado River System Water Conservation". The purpose of this pilot program is to find ways to be able to retain as much flow as possible behind Hoover Dam, while still maintaining system flows downstream to the maximum extent possible. Reclamation entered into a funding agreement with four municipal entities (the Metropolitan Water District of Southern California, the Central Arizona Water Conservation District, the Southern Nevada Water Authority and Denver Water) to provide funding for this pilot program, which would in turn fund the pilot program projects. The City's project consists of the construction of two injection wells, piping and pump improvements to convey the effluent from the Section 10 WWTP to the two wells. The City expects to inject 2,200 acre-feet of effluent into the Colorado River aquifer annually. Reclamation has the rights to the first 8,800 acre-feet of effluent injected.

Step 7 - Selected Measures and Projected Results and Step 9 - Implementation Schedule and Budget for Each Selected Measure

A. Contract Area Implementation and Monitoring Measures

Bullhead City has evaluated the BMP's described herein to improve water management and water use efficiency within the contract area. These practices were also reviewed by the Bullhead City Water Resources Advisory Committee and the water providers during a hearing process. Based on these discussions, the City proposes to implement the measures as described in **Table 7.1, *Best Management Practices Implementation Schedule and Budget***.

Table 7.1 Best Management Practices & Implementation Schedule and Budget

BMP/Measure	Proposed Work	Monitoring Activity	Target Dates For Implementation	Staff Hours & Budget
1. Water Measurement and Accounting System	Meter and account for water delivered to the water providers customers.	Use Itron metering system to measure water usage.	On-Going	Not Available*
2. Incentive Pricing and Billing	Administer a pricing structure that provides an incentive for the efficient use and management of water.	Review pricing system.	On-Going	Not Available*
3. Information/ Education Programs	Include material on water conservation topics on public information channel.	Confirm the inclusion of water conservation topics on public information channel.	On-Going	40 Hours $2,625 Annually
	City web site enhancements to water conservation page to provide links to other conservation web sites.	Track use of web site.	On-Going	24 Hours $2,625 Annually
4. Water Conservation Coordinator	City staff person to act as the Water Conservation Coordinator and monitor implementation of the plan.	Conduct annual bench marking of conservation plan.	On-Going	40 Hours $2,625 Annually
	Water providers to prepare an annual report describing their water conservation efforts to City.	Review the annual report and offer comments.	On-Going	250 Hours $7,875 Annually
5. Residential and Governmental Audit and Incentive Programs	Conduct interior and exterior water audits, upon request.	Use an Itron metering system to measure water usage.	Implemented	Not Available*
	Use a pricing system that provides an incentive for the efficient use of water.	Test and replace meters.	Upon Request	Not Available*
		Review pricing system.	Implemented	Not Available*

BMP/Measure	Proposed Work	Monitoring Activity	Target Dates for Implementation	Staff Hours & Budget
6. Commercial and Industrial Audit and Incentive Programs	Conduct commercial and industrial water conservation audits and water use reviews, upon request.	Use an Itron metering system to measure water usage.	On-Going	Not Available*
		Test and replace meters.	Upon Request	Not Available*
	Use a pricing system that provides an incentive for the efficient use of water.	Review pricing system.	Implemented	Not Available*
7. Distribution System and Audit Program	Conduct distribution system water audits, leak detection, and repairs, upon request.	Use a pumped versus delivered system to measure water.	Implemented	Not Available*
		Record emergency response times.	Implemented	Not Available*
		Track the replacement of lines.	Implemented	Not Available
8. Drought/Water Shortage Contingency Plan	During this planning period update, as necessary, the plan that considers short-and long-term staged responses in accordance with the Seven Basin States Agreement.	Develop and present updated plan to the appropriate City representatives and Water Resources Advisory Committee.	TBD	120 Hours $10,500 One Year
9. Wastewater Reclamation Programs	Evaluate various sites for the receipt of reclaimed water.	Discuss progress with appropriate City representatives.	Implemented	120 Hours $10,500 Annually
	Design wastewater reclamation systems to deliver reclaimed water for irrigation purposes.	Continue to identify additional demands and users for reclaimed water. with reclaimed water.	On-Going	TBD
	As funding permits construct wastewater reclamation systems.	Oversee construction.	TBD	TBD
10. Plumbing Regulations	Enforce applicable federal, state, and local requirements for the sale and installation of water-efficient plumbing products.	Monitor enforcement applicable codes.	On-Going	40 Hours $5,250 Annually
11. Fixture Replacement Programs	Support the implementation of programs to use water more efficiently.	Include information on this topic on City's web site.	On-Going	Included in Information /Education Program
	Offer rebates for the use of more efficient irrigation controllers, toilets, and washing machines.	Monitor rebate program.	On-Going	75 Hours $3,000 Annually $100,000 allocated to Program

BMP/Measure	Proposed Work	Monitoring Activity	Target Date for Implementation	Staff Hours & Budget
	Offer rebates for the conversion of grass and/or water features to artificial turf and/or desert landscaping.	Monitor rebate program.	On-Going	75 Hours $3,000 Annually $100,000 allocated to Program
12. Conjunctive Use	Increase the conjunctive use of reclaimed water within the contract area.	Construct two injection wells that pump 2,200 acre-feet of effluent into the Colorado River aquifer annually.	On-Going	TBD
13. Landscape Programs	Conduct landscape water conservation audit programs for new and existing customers as part of the programs discussed in numbers 1 and 2 above.	Use an Itron metering system to measure water usage.	On-Going	Not Available*
	Support the use of water saving technologies and methods in the design and installation of new landscaping to maximize water efficiency.	Include information on this topic on our public information channel.	On-Going	Included in Information /Education Program
	Use a pricing system that provides an incentive for the efficient use of water.	Review pricing system.	On-Going	5 Hours $525 Annually
	Require the use of drought tolerant landscape materials in all new multiple family, commercial, and industrial projects.	Monitor enforcement of applicable codes.	On-Going	40 Hours $2,500 Annually
	Implement water restrictions during times of a shortage.	Monitor enforcement of applicable codes.	On-Going	40 Hours $2,625 Annually
	Prohibit the flow of water onto streets.	Monitor enforcement of applicable codes.	On-Going	40 Hours $2,625 Annually

Source: City of Bullhead City; September 2016
* Not Available - The water providers monitor their water conservation efforts in their entirety and do not manage their data for each “best management practice.”

Step 8 - Environmental Review

A. Existing Environmental Planning Studies

Implementation of the Water Conservation Plan may create effects on the surrounding environment of Bullhead City. A review of the existing documentation that may impact the City's achievement of water conservation includes the results of an existing environmental assessment for additional Colorado River water and the Lower Colorado River Multi-Species Conservation Program (LCMSCP).

The existing Environmental Assessment was prepared in January 1991 in support of the City's request for an additional 7,010 acre-feet of Colorado River water. The proposed action would allow the conversion of existing vacant desert land into urban uses within the existing incorporated boundaries. The transition of land uses would result in the generation of increased air pollution, light and glare, as well as a reduction in overall open space. The proposed action would also result in a loss of some habitat.

An area that had previously been identified as an Area of Critical Environmental Concern (ACEC) by the Reclamation of Land Management (BLM) has nearly 320 acres that are located within the incorporated boundaries of the City. The ACEC designation was based primarily on the presence of biologic (i.e., Desert Tortoise) and archaeological sensitivity. However, this area is designated as Park/Open Space on the adopted Bullhead City General Plan and will be protected by the BLM. In addition, a total of nearly 11 square miles of adjacent lands are designated as an ACEC within the water contract area as identified in **Figure 8-1, *Environmental Characteristics*.**

While archaeological resources exist in the contract area, it is possible that some sites may be disturbed or artifacts could be damaged during the process to urbanize land. It was identified that appropriate mitigation measures, especially during grading and infrastructure construction, could reduce artifact destruction significantly. In terms of recreation, the urbanization of the land, based on the provision of additional water, will produce an increase in the demand for public facilities and services. It was noted that regional and state recreational facilities could accommodate the increased demand. However, the provision of sewer and flood control extensions and improvements may be required depending on the location of the new development within the City. The anticipated increase in population served with the new allocation of water was determined not to produce negative socioeconomic impacts within the region.

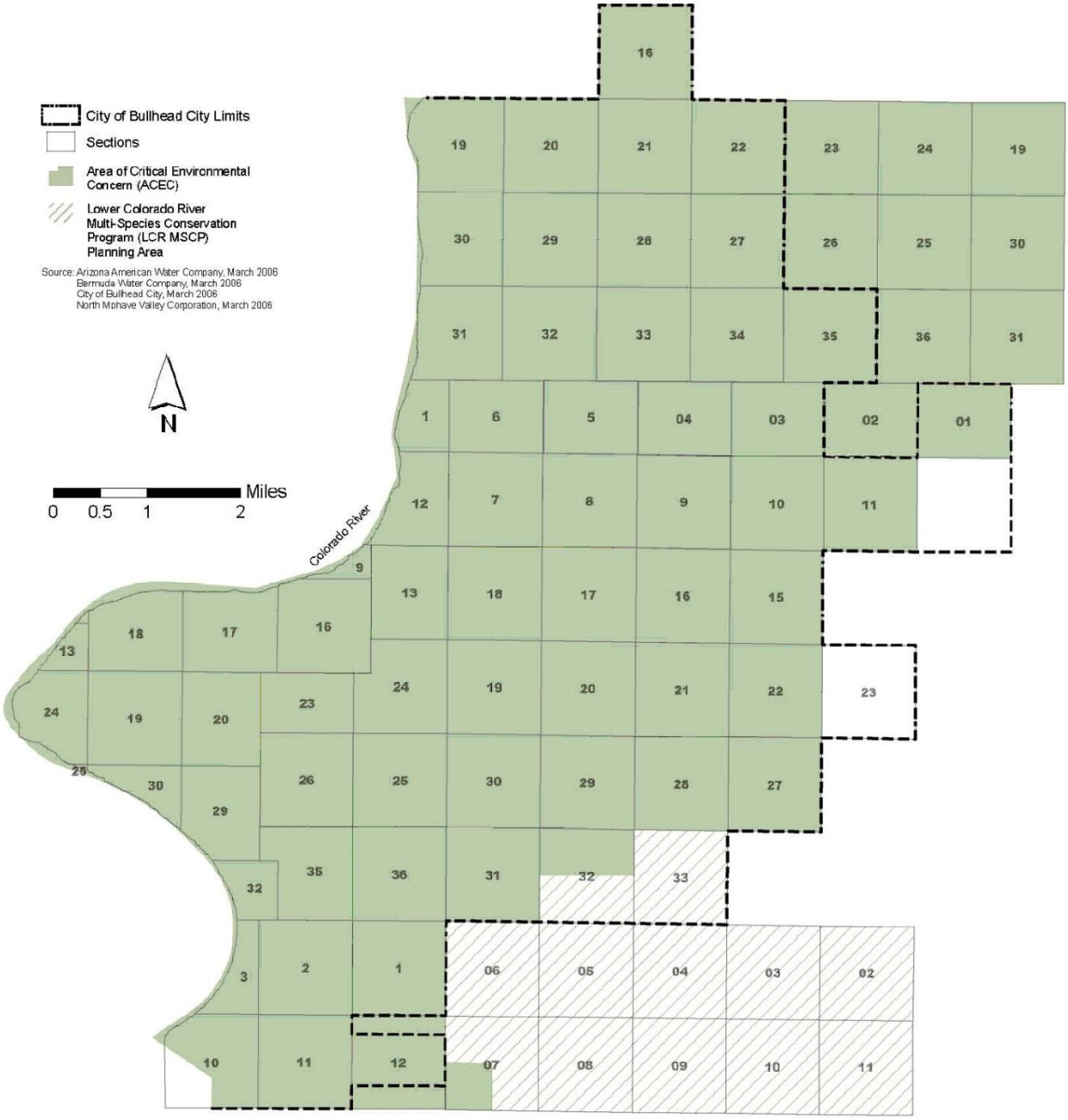


Figure 8-1 Environmental Characteristics

The Colorado River forms the western boundary of the City for more than 15 miles from a point south of Davis Dam. In 1994, the United States Fish and Wildlife Service (USFWS) designated the Colorado River Basin as a critical habitat for four endangered species (i.e., razorback sucker, ponytail chub, southwestern willow flycatcher, and Yuma clapper rail). In 1995, the Department of the Interior and the States of Arizona, Nevada and California entered into a Memorandum of Agreement and a Memorandum of Clarification for the development of a LCRMSCP. The program is intended to:

- Conserve habitat and work toward the recovery of threatened and endangered species as well as reduce the likelihood of additional species listings under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA).
- Accommodate current water diversions and power production and optimize opportunities for future water and power development, to the extent consistent with the law.
- Provide the basis for take authorization pursuant to ESA and CESA.

The LCRMSCP is a partnership of state, Federal, tribal and other public and private stakeholders with an interest in managing the water and related resources of the Lower Colorado River basin. The program will serve as a coordinated, comprehensive conservation approach within the 100-year floodplain and reservoir full-pool elevations extending south from Glen Canyon Dam to the international boundary of Mexico for a period of 50 years. The partnership agreed to pursue an ecosystem-based approach to developing the LCRMSCP for interim and long-term compliance with applicable endangered species and environmental laws. It also will implement both conservation and protection measures for identified species and habitats. Program development costs are estimated at approximately $6.7 million to be utilized over a three to five year program for planning and interim conservation measure implementation.

Step 10 – Future Strategic Planning and Recommendations

A. Future Supply and Demand

Step 10 was added as part of the 2006 Water Conservation Plan to address long term water supply and water conservation strategies associated with growth in the City. Several high and low population forecasts and water supply requirements were considered. However, since 2005, the local and regional economy has seen a dramatic slowdown in growth, requiring the City to revisit projected long term water supply and wastewater disposal needs.

The existing City population was estimated at 39,540 people per the 2010 US Census. As part of the City's 2016 General Plan preparation, population was updated using the forecasts prepared by the Arizona Department of Administration, Employment and Population Statistics (ADOA-EPS). They project Bullhead City's population to be 54,806 in 2025.

The City of Bullhead City has secured a valuable renewable water supply of Colorado River water through contracts with Reclamation, MCWA, and the Cibola water acquisitions. The buildout conditions of the community are based upon land use and density scenarios set forth in the 2016 General Plan. The purpose of this section is to evaluate demand and supply scenarios (normal hydrologic conditions), identify additional potential water supplies and conservation opportunities, and provide recommendations to reliably meet demands. **Table 10.1, *Future Water Supply by Source*** lists 2016 water supplies and anticipated/potential future water supplies.

Table 10.1 Future Water Supply by Source

Water Source	2016 Acre-Feet	2025 Acre-Feet
Reclamation, M&I Water	15,210	15,210
Groundwater	0	0
Transferred Water – Cibola	2,139	2,139
Transferred Water – Kingman 1995	6,000	6,000
Transferred Water – Kingman 2009	1,000	1,000
Reclaimed Water	645	4,800
TOTAL	**24,994**	**29,149**

Source: City of Bullhead City; September 2016

Figure 10-1, *Water Resources Portfolio* represents the City's portfolio of water resources, in terms of volume and percentage, for a normal year of water supply (no reductions due to shortages). The reclaimed water volume of 4,800 acre-feet per year (AFY) is based upon an assumed reclaimed water production rate of 75 gallons per person per day (gallons per capita per day, gpcd). Note that buildout is limited by the amount of raw water supplies currently available and planned. The unit water demand at buildout, regardless of when buildout occurs, is assumed to be 215 gpcd.

The ratio of 75 gpcd to 215 gpcd is used to determine the reclaimed water production of 4,800 AFY. The difference between the water and wastewater per capita use is accounted for due to the relatively higher outdoor water needs in Bullhead City. The total volume of currently available and planned raw water resources (not including reclaimed water) is 24,349 AFY. Reclaimed water would represent an additional supply of 4,800 AFY. If additional raw water supplies are secured, a comparable additional quantity of reclaimed water will be available as population increases.

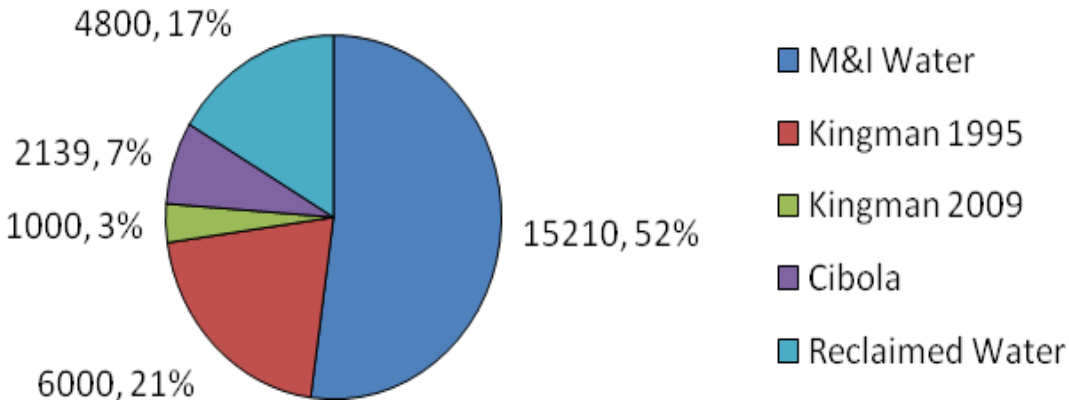


Figure 10.1 Water Resources Portfolio

The daily water demand per person (total demand divided by total population) utilized in 2015 was 217 gpcd. The unit demand rate is considered low for Bullhead City, but is explained by the community's slow recovery from the recession. Water use associated with construction has been slow to pick up. Total water demand includes demands for potable sources and reclaimed water, although historical demands for reclaimed water are negligible for this analysis. It is anticipated that reclaimed water will be used to supplant future potable supplies and that the total demand and unit demand (gpcd) would not increase as a result of using reclaimed water. Therefore, it is expected that as reclaimed water use increases, the proportion of total and unit demand that is met with reclaimed water will increase and the proportion met with potable resources will decrease.

B. Reclaimed Water

Reclaimed water is considered a reliable water supply even during a drought or shortage declaration. Available water that is used inside homes and businesses and discharged to the sewer is subsequently treated to become reclaimed water. Water reuse is the practice of using reclaimed water, and has become a widely accepted strategy nationwide for supplanting or replacing potable water for demands that do not require water treated to drinking water standards. However, reuse programs must be tailored to specific water resources management circumstances.

Bullhead City has one physical supply of raw water (Colorado River surface water) to be used for delivery of potable water service by two private water utilities and approximately 20 entities that have over 40 wells that pump more than 20 gpm. Colorado River water that is not withdrawn to meet immediate demand continues to flow down the river for use by other Colorado River water users. Currently, Bullhead City does not have the physical ability to divert and store river water that it has the legal right to use. Essentially, Bullhead City has a "use it or lose it" water supply.

If there are reductions in available supply due to shortages on the river, Bullhead City will be subject to corresponding reductions. To date, there have been no drought conditions that have required Bullhead City to implement and enforce corresponding demand reductions. However, as total demands of the river water increase, the likelihood for such measures will increase. In support of conservation, the City adopted Chapter 8.14, Water Conservation and Restrictions, of the Municipal Code in 2010. The regulations mirror the Seven Basin States Shortage Sharing Agreement in terms of when the restrictions are triggered. The Basin States Agreement calls for various cut backs in water usage depending on the elevation of Lake Mead.

Bullhead City is committed to using reclaimed water as a water resource to supplant potable demands and reserve raw water resources for drinking water purposes. At present, the plan is to make direct deliveries of reclaimed water from the City's two main reclamation facilities (Section 10 and Section 18 Waterwater Treatment Plants) to customers who have non-potable demands (turf irrigation associated with parks, homeowner association common areas, schools, and golf courses). Currently the City delivers approximately 575,800 gpd (average annual) of recycled water to the Laughlin Ranch Golf Course (Section 18 WRP) and the Rotary Park (Section 10 WRP). This section provides considerations regarding the development of a water reuse program to meet the present and future water resources needs of Bullhead City.

Figure 10-2, *Reclaimed Water with Normal Hydrologic Conditions* represents the demand sectors within Bullhead City. There are indoor and outdoor residential uses of water (making up the majority of demand), industrial/commercial uses, and recreational, construction, and other uses of water such as turf irrigation. Assuming a normal year of sufficient water supply from the Colorado River, the implementation of conservation practices, and direct delivery of reclaimed water for non-potable demands, Bullhead City's water resources will meet the demands of its customers.

During shortage conditions where Colorado River supplies are reduced, reclaimed water could be used to meet turf irrigation demands.

Figure 10-3, *Shortage Condition Reduction (Reclaimed Water for Turf Only)* represents the demand sectors in Bullhead City with shortage caused reductions and with reclaimed water being dedicated to meet turf demands. If there are no other means by which reclaimed water can be managed (other than discharge), the grass at turf related facilities will be green while demand reductions will have to be imposed upon the other sectors. For some of these sectors, the economic impacts of water demand reductions could be substantial, especially if required for a long period of time.

Public perception issues will also arise as homeowners and businesses begin asking why the golf courses and parks are green while they are forced to reduce water use.

Reclaimed water represents a second viable renewable supply for Bullhead City and it is drought resistant. It is recommended that the reclaimed water be viewed and managed in accordance with the high value it represents. In addition, it is recommended that Bullhead City plan for direct delivery and recharge of the reclaimed water. In this manner, reclaimed water can be leveraged to meet potable or non-potable demands as conditions require. In Arizona, reclaimed water can be stored underground and recovered from the aquifer and used for a variety of purposes.

Figure 10-2
Reclaimed Water with Normal Hydrologic Conditions

Figure 10-3 Shortage Condition Reductions (Reclaimed Water for Turf Only)

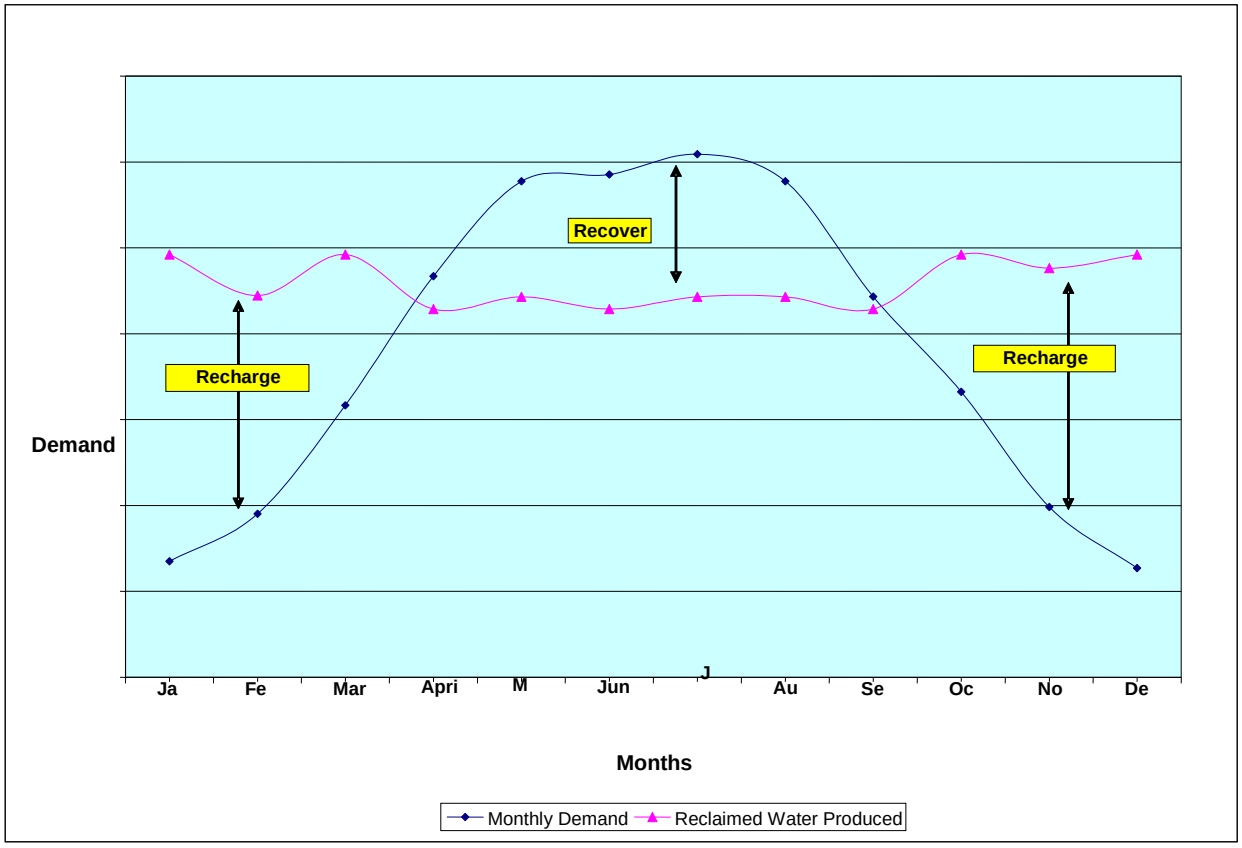
Figure 10-4, *Shortage Condition Reduction (Reclaimed Water for Turf and Recharge)* represents the demand sectors and how water resources might be allocated in a year when reductions in use of Colorado River water are required due to shortages. It is important for homeowners and businesses to have water in sufficient quantities to maintain quality of life and a healthy economy. The community needs to determine which water demands (whether they are met with Colorado River water or reclaimed water) can be reduced during a shortage to ensure quality of life and the economy do not suffer.

In **Figure 10-4**, ***Shortage Condition Reduction (Reclaimed Water for Turf and Recharge),*** turf related demands are targeted, but the community needs to decide which demands would actually be reduced or eliminated. If reclaimed water can either be directly delivered or recharged (a hybrid management strategy), water can then be allocated for the highest and best uses determined by the community (which may change over time). If a direct delivery reuse system is installed and becomes the only means of managing reclaimed water, the end uses associated with it become the highest and best use of reclaimed water under both normal and shortage conditions and the situation depicted by **Figure 10-3, *Shortage Condition Reduction (Reclaimed Water for Turf Only)*** will prevail.

Figure 10-4 Shortage Condition Reductions (Reclaimed Water for Turf and Recharge)

In addition to the benefits recharge offers in total water resource management, recharge is also a useful mechanism to capture reclaimed water during times of low daily and seasonal demand. This would allow reclaimed water to be recovered and delivered during times of high daily and seasonal demand. **Figure 10-5, *Typical Yearly Reclaimed Water Demand and Production Curve*** is a representation of supply and demand for reclaimed water deliveries dominated by landscape demands. Supply quantities rarely match demand quantities on a monthly or seasonal basis. The extent to which reclaimed water can be directly delivered on a daily basis is therefore limited to the daily available supply, unless storage facilities of significant capacity are used to capture reclaimed water when there is no demand for it.

Figure 10-5 Typical Yearly Reclaimed Water Demand and Production Curve



In the Bullhead City area, seasonal peaking factors related to irrigation demands are high. Therefore, both the customers and Bullhead City will need to make use of large storage facilities to ensure optimum efficient use of the reclaimed water. Lakes consume valuable real estate and constructed reservoirs are expensive. Large volumes of water that are stored in surface or in-ground tanks or open air reservoirs are more susceptible to undesirable chemical transformations and biological growth, and increases in salinity are common for open-air reservoirs in an arid environment. Recharge is a solution which protects the stored water and often provides additional polishing (treatment) of the water that is stored.

In October 2014, Reclamation issued a letter inviting certain entities along the Colorado River to participate in the "Pilot Program for Colorado River System Water Conservation". The purpose of this pilot program is to find ways to be able to retain as much flow as possible behind Hoover Dam, while still maintaining system flows downstream to the maximum extent possible. Reclamation had entered into a funding agreement with four municipal entities (the Metropolitan Water District of Southern California, the Central Arizona Water Conservation District, the Southern Nevada Water Authority and Denver Water) to provide funding for this pilot program, which would in turn fund the pilot program projects. The City's project consists of the construction of two injection wells, piping and pump improvements to convey the effluent from the Section 10 WWTP to the two wells. The City proposes to inject 2,200 acre-feet of effluent into the Colorado River aquifer annually. Reclamation has the rights to the first 8,800 acre-feet of effluent injected.

C. Water Supply Relationship with Water Accounting Surface (WAS) and Hydrogeology

Bullhead City has developed a long-range drought/water shortage contingency plan, and a key component is to make the most effective use of all water resources legally and physically available. The recharge, storage, and recovery of reclaimed water and unused Colorado River allocations into the Colorado River Aquifer represents a significant opportunity for the City to increase the reliability and shortage resistance of their water supplies.

The recharge, storage, and recovery of reclaimed water below the WAS elevation of the Colorado River aquifer is considered "commingling" by Reclamation. Reclamation has held that commingling of reclaimed water with the Colorado River aquifer below the WAS is not allowed, and has cited the 1960 Special Master report as having language prohibiting commingling. The sections of the report cited (pages 184 and 317) discuss commingling of tributary surface water, but do not specifically address reclaimed water. Reclamation has responded that any reclaimed water that is recharged and commingles (below the WAS) with the Colorado River aquifer becomes part of the river and is no longer owned by the entity that diverted, used, treated, and recharged the water. Recharging of reclaimed water outside the WAS boundary would be more expensive and potential recharge sites outside the WAS are limited.

Until the City of Bullhead City receives written documentation regarding the prohibition against recharging and storing reclaimed water in the Colorado River aquifer below the WAS, recharging reclaimed water should be considered a potential viable future option. The City of Bullhead City understands there are several other Colorado River communities that have the same question regarding this point, and the recharge and storage of reclaimed water is a critical component of future community growth and drought/shortage protection. Regional cooperation and communication regarding this option should be pursued.

References

Arizona Department of Water Resources (ADWR). August 11, 2006. Final System Water Plan Guidance Document.

Arizona Department of Water Resources (ADWR). 2006. Adequate water supply rules.

Arizona Department of Water Resources (ADWR), 2015. ADWR 55-well registry database.

Arizona Department of Water Resources (ADWR), October 8, 2004. Arizona Drought Preparedness Plan. Operational Drought Plan. Governor's Drought Task Force.

Arizona Department of Water Resources (ADWR), October 8, 2004. Arizona Statewide Conservation Strategy. Governor's Drought Task Force.

City of Bullhead City. May 17, 2016. General Plan.

City of Bullhead City. November 2011. Water Conservation Plan.

http://www.awwa.org/

http://www.amwua.org/conservation_main.htm

http://www.bullheadcity.com/

http://www.cap-az.com/

http://www.Reclamation.gov/lc/region/g4000/

http://www.azwater.gov/dwr/content/Hot_Topics/Agency-Wide/Drought_Planning/default.htm

http://www.snwa.com/html/index.html

http://www.wateruseitwisely.com/index.shtml

http://www.watereducation.org/

Appendices

The Appendices that provide the supportive background information for the Water Conservation Plan may be reviewed or obtained by contacting the City's Water Conservation Coordinator as identified below:

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City of Bullhead City
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jpaul@bullheadcity.com (E-mail)

The Appendices are listed as follows:

Appendix A	List of Wells Located in Bullhead City
Appendix B	Well Metering Ordinances
Appendix C	Water Allocations
Appendix D	Water Allocation Ordinances
Appendix E	Landscape & Water Restriction Ordinances