2021 RIO GRANDE REGIONAL WATER PLAN

Prepared by: Rio Grande Regional Water Planning Group
With administration by: Lower Rio Grande Valley Development Council

NOVEMBER 5, 2020

RIO GRANDE REGIONAL WATER PLANNING GROUP

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Acknowledgements

The table below acknowledges the Rio Grande Regional (Region M) Water Planning Group, including current and former members who contributed to the 2021 Regional Water Plan:

INTEREST	NAME	RESIDENT COUNTY
Public	Tomas Rodriguez - Chairman* Laredo	Webb
Counties	Joe Rathmell, County Judge Zapata County	Zapata
	David L. Fuentes, Precinct 1 Commissioner Weslaco	Hidalgo
Municipalities	Jorge Flores, Eagle Pass Water Works Eagle Pass	Maverick
	John Bruciak, Brownsville Public Utility Board Brownsville	Cameron
	Riazul Mia Laredo	Webb
Industries	Donald K. McGhee - Secretary*, Hydro Systems, Inc. Harlingen	Cameron
Agriculture	Neal Wilkins, Ph.D. East Wildlife Foundation	Jim Hogg
	Dale Murden, Texas Citrus Mutual Mission	Hidalgo
Environmental	Jaime Flores The Arroyo Colorado Watershed	Hidalgo
Small Business	Carlos Garza, AEC Engineering, LLC Edinburg	Hidalgo
	Nick Benavides* Nick Benavides Co.	Webb
River Authorities	Mayor Jim Darling Rio Grande Regional Water Authority	Hidalgo
Water Districts	Sonny Hinojosa - Vice-Chairman*, Hidalgo County Irrigation District (ID) No. 2	Hidalgo

INTEREST	NAME	RESIDENT COUNTY
	San Juan	
	Tom McLemore, Harlingen ID	Cameron
	Harlingen	
Water Utilities	Dennis Goldsberry	Hidalgo
	North Alamo Water Supply Corporation (WSC)	
Groundwater Management Area	Armando Vela	Hidalgo
	Red Sands Groundwater Conservation District	
Other	Glenn Jarvis	Hidalgo
	McAllen	
	Frank Schuster*	Hidalgo
	Val Verde Vegetable Co.	
Electric Generating Utilities	VACANT	VACANT
*Executive Committee		

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Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
ASR	Aquifer Storage and Recovery
BMP	Best Management Practices
BRACS	Brackish Resource Aquifer Characterization System
CONAGUA	Water Commission of Mexico
DCP	Drought Contingency Plan
DMI	Domestic, Municipal, and Industrial
DOR	Drought of Record
GCD	Groundwater Conservation District
HB4	House Bill 4
IBT	Interbasin Transfer
IBWC	International Boundary and Water Commission
ID	Irrigation District
LLM	Lower Laguna Madre
LRGVDC	Lower Rio Grande Valley Development Council
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MWP	Major Water Provider
psi	Pounds per Square Inch
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SB1	State Bill 1
SWIFT	State Water Implementation Fund for Texas
SWP	State Water Plan
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TWDB	Texas Water Development Board
USFWS	United States Fish and Wildlife Service
WAM	Water Availability Model
WCP	Water Conservation Plan
WMS	Water Management Strategy
WSC	Water Supply Corporation
WWP	Wholesale Water Provider
WUG	Water User Group

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EXECUTIVE SUMMARY

ES.1 WATER PLANNING IN TEXAS

The Texas Water Development Board (TWDB) is charged with preparing a comprehensive and flexible long-term plan for the development, conservation, and management of the state's water resources. Historically, the state water plan (SWP) had been prepared by the TWDB with input from other state and local agencies and the public. Senate Bill 1 (SB1) that was enacted in 1997 by the 75th Legislature established a "bottom up" approach whereby SWPs are based on regional water plans (RWPs) prepared and adopted by the 16 appointed Regional Water Planning Groups (RWPGs). SB1 states that the purpose of regional water planning is the following:

" … provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of that particular region."

SB1 also provides that future regulatory and financing decisions of the Texas Commission on Environmental Quality (TCEQ) and the TWDB be consistent with the current SWP. In 2013, House Bill 4 (HB4) was enacted, which lends greater weight to the SWP by committing an additional funding pool to implementing projects recommended in the plan by way of the State Water Implementation Fund for Texas (SWIFT).

Each RWPG member is appointed to serve without pay; the group represents a range of stakeholders and acts as the decision-making body for the regional water planning effort. The Rio Grande RWPG (Region M) members are listed in Table ES-1. The Lower Rio Grande Valley Development Council (LRGVDC) has served as the political subdivision to administer the regional water planning grant, and Black & Veatch Corporation was selected as the prime consultant for the planning and engineering tasks required to develop the plan.

Table ES-1 Region M Water Planning Group Members

INTEREST	NAME	RESIDENT COUNTY
Public	Tomas Rodriguez - Chairman*	Webb
	Laredo	
Counties	Joe Rathmell, County Judge	Zapata
	Zapata County	
	David L. Fuentes, Precinct 1 Commissioner	Hidalgo
	Weslaco	
Municipalities	Jorge Flores, Eagle Pass Water Works	Maverick
	Eagle Pass	
	John Bruciak, Brownsville Public Utility Board	Cameron

INTEREST	NAME	RESIDENT COUNTY
	Brownsville	
	Riazul Mia	Webb
	Laredo	
Industries	Donald K. McGhee - Secretary*, Hydro Systems, Inc.	Cameron
	Harlingen	
Agriculture	Neal Wilkins, Ph.D.	Jim Hogg
	East Wildlife Foundation	
	Dale Murden, Texas Citrus Mutual	Hidalgo
	Mission	
Environmental	Jaime Flores	Hidalgo
	The Arroyo Colorado Watershed	
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	Edinburg	
	Nick Benavides*	Webb
	Nick Benavides Co.	
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	McAllen	
	Frank Schuster*	Hidalgo
	Val Verde Vegetable Co.	

INTEREST	NAME	RESIDENT COUNTY
Electric Generating Utilities	VACANT	VACANT
*Executive Committee		

The RWPs are updated every 5 years, and a year after their adoption, an updated SWP is released. This RWP covers a 50-year planning horizon from 2020 to 2070.

The RWPGs work with the TWDB to evaluate current demands and project future water demands for each category of water user group (WUG): municipal, irrigation, livestock, steam-electric power generation, manufacturing, and mining. Measured quantities, conservation goals, and modeling are used to develop availability data for all major water resources which indicate how much water can be relied on in a drought year within the management goals for each resource. In Region M, these values are largely based on the firm yield from the Amistad-Falcon Reservoir system and the modeled available groundwater (MAG) values for the Gulf Coast, Yegua-Jackson, and Carrizo-Wilcox aquifers.

For each WUG, the currently available water supplies are evaluated and projected over the planning horizon. Estimated future needs are identified and quantified by comparing the reliable, drought year supplies with the drought year demands. These projections for needs drive the development of specific recommendations for water management strategies (WMSs). WMSs include approaches to reduce demands, increase supplies, and minimize losses.

The plan also contains policy recommendations at the state and local level as follows, including environmental protection, drought response, and resource management.

The chapters of the RWP are listed below:

Chapter 1. Description of the Regional Water Planning Area
Chapter 2. Population and Water Demand Projections
Chapter 3. Water Supply Analysis
Chapter 4. Identification of Water Needs
Chapter 5. Water Management Strategies
Chapter 6. Impacts of Regional Water Plan and Protection of Resource
Chapter 7. Drought Response Information, Activities, and Recommendations
Chapter 8. Policy Recommendations and Unique Sites
Chapter 9. Infrastructure Financing Analysis
Chapter 10. Public Participation and Plan Adoption
Chapter 11. Implementation and Comparison to the Previous Regional Water Plan

Appendix A: Reports from the 2022 Regional and State Water Planning Database

1 WUG Population Projections
2 WUG Water Demands
3 WUG Category - Summary
4 Source Water Availability
5 WUG Existing Water Supplies
6 WUG Identified Water Needs/Surpluses

ES.2 THE RIO GRANDE REGIONAL WATER PLANNING AREA

ES.2.1 Population, Economy, and Natural Resources

The Rio Grande Regional Water Planning Area (Region M) consists of the eight counties along the middle and lower Rio Grande up to the river's mouth at the Gulf of Mexico. From the earliest settlement, this area has been tied to the waters of the Rio Grande for domestic and agricultural uses. The tropical or subtropical climate allows a long growing season most years. The amount of rainfall varies across the Lower Rio Grande Region from an average of 28 inches at the coast to 18 inches in the northwestern portion of the region, primarily from thunderstorms in the spring and occasional hurricanes in the late summer and fall. These storms can generate tremendous amounts of rainfall over a short period of time and cause extensive flooding because of the region's relatively flat terrain.

Figure ES-1 shows population centers in Region M. The population of the region is expected to grow to over 4 million people by the end of the current planning horizon, which represents a 106 percent population increase from 2020 to 2070. Chapter 2 describes the population and municipal demand projections in detail.

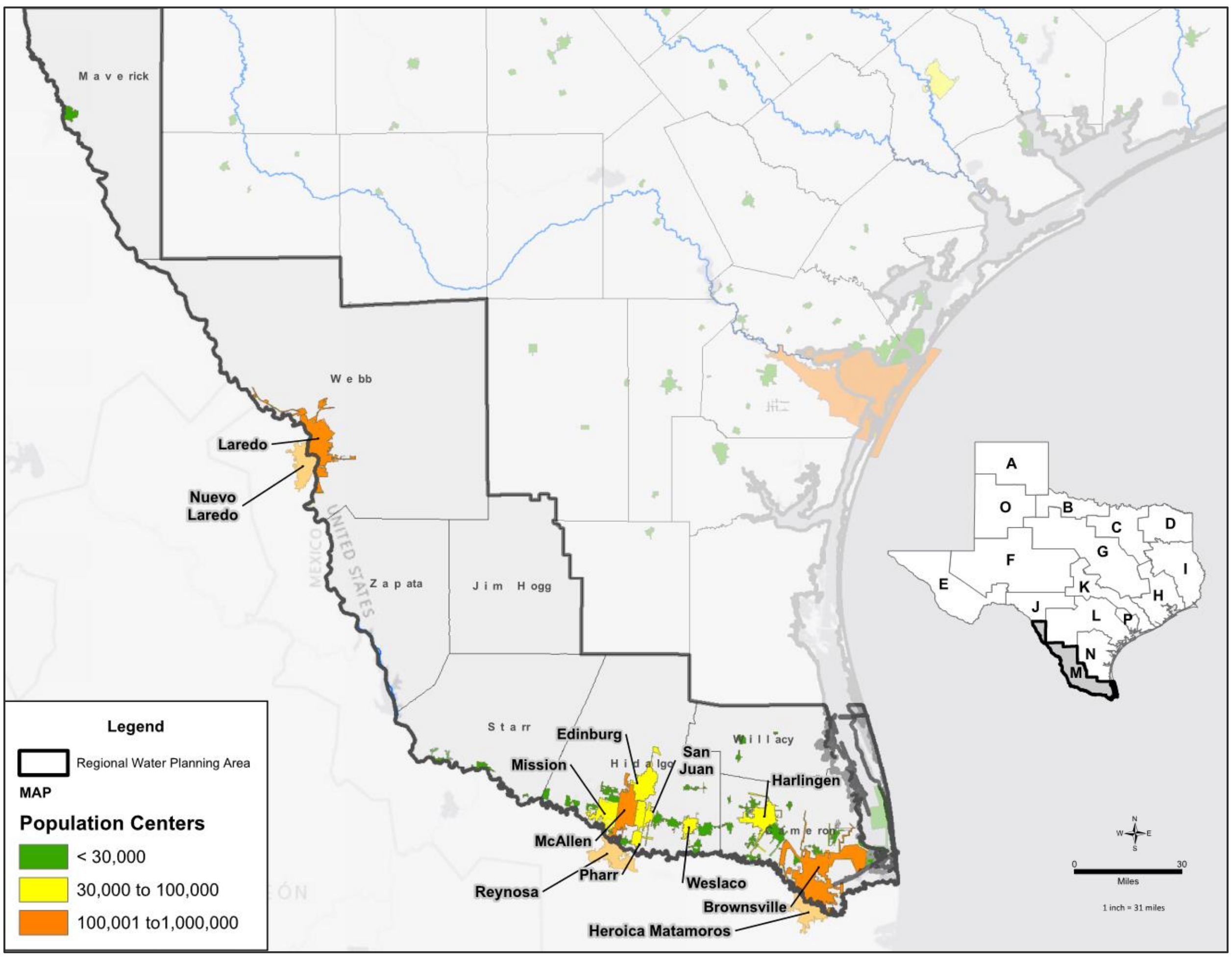

Figure ES-1 Population Centers of Region M

Region M's population is concentrated in Cameron, Hidalgo, and Webb counties, accounting for 90.5 percent of the regional total in 2010. The US Census Bureau estimates the total population of Region M in 2013 at 1,237,942, up 4.8 percent from 2010 (compared with 5.2 percent growth statewide). Figure ES-2 shows historical and projected population in each county, according to US census historical data. Detailed population projections for each WUG are included in Appendix A.1.

An important factor driving rapid population growth in the Rio Grande Region is its cultural, social, and economic relationship with Mexico. Nationwide, Mexico's population growth rate in 2013 was 1.2 percent, compared with 0.7 percent for the United States.[1]

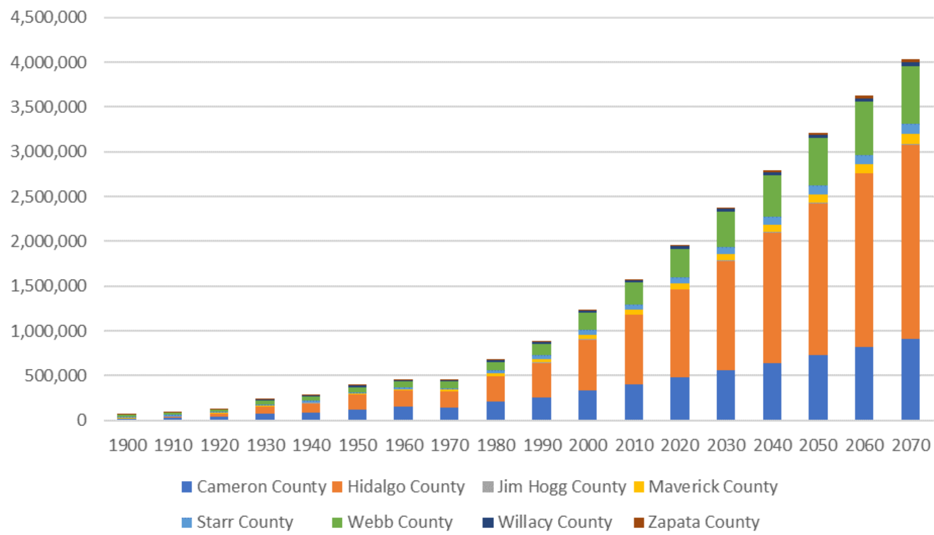

Figure ES-2 Region M Historical and Projected Population, US Census Bureau and TWDB

The Mexican portion of the Rio Grande watershed was home to approximately 10.31 million people in 2005 and is anticipated to have 12.67 million inhabitants by 2025, which is a higher rate of growth than the nation as a whole. Using the growth rate identified by the National Water Commission of Mexico (CONAGUA) for the Rio Grande watershed, the population in 2070 would be over 20 million people. Table ES-2 shows Region M population projections by county.

Table ES-2 Population Projections by County

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	478,974	559,593	641,376	729,461	820,068	912,941
Hidalgo	981,890	1,219,225	1,457,502	1,696,257	1,935,015	2,167,137
Jim Hogg	5,853	6,356	6,790	7,274	7,694	8,082
Maverick	63,107	72,491	81,243	90,304	98,988	107,327
Starr	70,803	80,085	88,633	97,107	104,687	111,555
Webb	318,028	393,284	464,960	530,330	591,945	647,433

[1] World Bank Population Growth Data. http://data.worldbank.org/indicator/SP.POP.GROW. Visited 10/10/14.

COUNTY	2020	2030	2040	2050	2060	2070
Willacy	25,264	28,479	31,559	34,840	38,012	41,121
Zapata	16,819	19,709	22,876	26,365	29,976	33,742
Total	**1,960,738**	**2,379,222**	**2,794,939**	**3,211,938**	**3,626,385**	**4,029,338**

Aquifers in Mexico's Rio Grande watershed are overextended; the growth on both sides of the border will continue to put pressure on the capabilities of both surface and groundwater. Historically, agriculture has dominated the economy of the Rio Grande Region. Increased pressure on water available for irrigation, combined with the way that water is allocated in drought years, has been difficult for farmers across the region, especially those with perennial crops and citrus or pecan trees. Grain sorghum, sugarcane, cotton, citrus, and onions make up the bulk of the agriculture receipts in the region; agriculture is centered in Hidalgo and Cameron counties (Figure ES-3). Cattle and farmland accounted for just under 6 million acres, almost 80 percent of the region's land area.

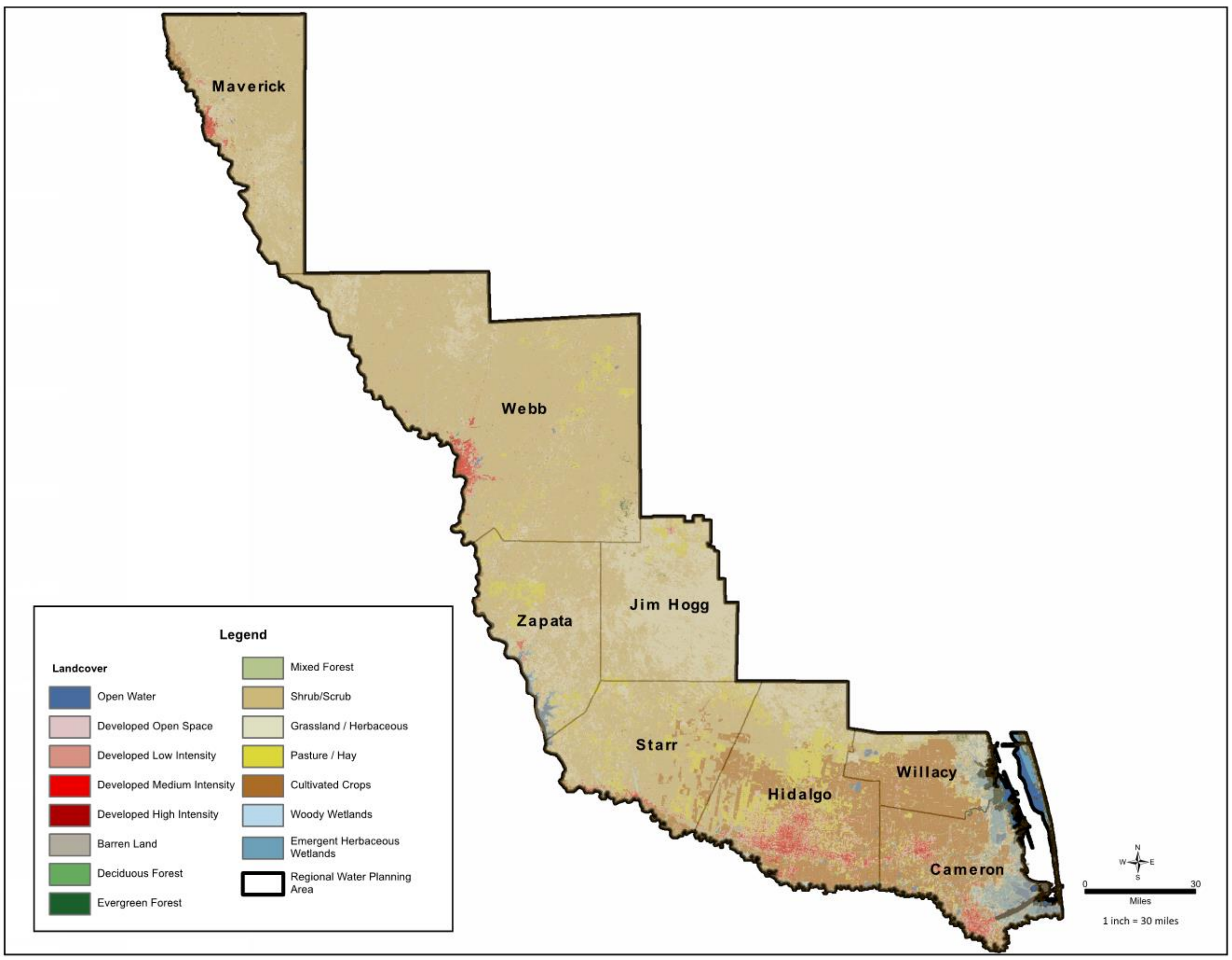

Figure ES-3 Region M Land Use Map

A shift has occurred toward urbanization and diversification of the economy, but agriculture still plays a major role. The Texas labor market forecasts showed growth in the Lower Rio Grande associated with health care services, administration, service industry, professional, scientific, and technical services, as well as local government between 2012 and 2015.

Some areas of Cameron and Willacy counties have seen recent growth of wind power generation, which may allow some farmers to maintain farmlands that were otherwise not economically viable.

Oil and gas production in the region have changed considerably from traditional oil drilling to hydraulic fracturing and nontraditional development, which has a significant impact on the regional economy and associated water demands. Webb and Maverick counties experienced significant oil and gas activity in the Eagle Ford Shale region. Mining water demands are discussed further in Chapter 2.

Region M experiences lower income and higher unemployment than the rest of Texas (Table ES-3). A clear division exists between the urban growth centers (Brownsville, McAllen, Harlingen, Laredo) and smaller rural towns and colonias. According to the TWDB, seven out of the eight counties in Region M are labeled as eligible for funds through the Economically Distressed Areas Program.

Table ES-3 Median Household Income, Poverty, and Unemployment Rate, by County

COUNTY	MEDIAN HOUSEHOLD INCOME, 2008-2012 ($/YEAR)[2]	PERSONS BELOW POVERTY LEVEL, 2008-2012 (%)[3]	UNEMPLOYMENT RATE, 2013 (%)[4]
Cameron	$32,558	34.9%	10.1%
Hidalgo	$33,218	35.00%	10.8%
Jim Hogg	$36,919	12.00%	5.4%
Maverick	$30,959	31.20%	12.6%
Starr	$24,653	39.90%	15.4%
Webb	$38,421	30.60%	6.7%
Willacy	$26,369	37.70%	13.8%
Zapata	$28,617	33.40%	6.2%

Colonias are semirural subdivisions that are often developed with substandard or no potable water and sanitary sewer systems. Without potable waterlines, many colonia residents rely on buckets or drums of water, which may become contaminated. Improper wastewater disposal can add to the health and safety concerns. There are colonias across Texas, Arizona, New Mexico, and California, but south Texas has the largest number (2,294) and the largest population living in them (estimated at 400,000 people).

Efforts have been made at the state, county, and local levels to provide basic services in many of the colonias in Region M. These efforts are complicated by the fact that, when sewer and waterlines are brought into a colonia, many of the homes do not meet building codes and are therefore unable to pass inspections to qualify for water or sewer hookups. Some areas of Region M have been successful in

[2] US Census Bureau State & County QuickFacts. https://www.census.gov/. 8/27/14.
[3] US Census Bureau State & County QuickFacts. https://www.census.gov/. 8/27/14.
[4] Texas Counties: Unemployed Rate. Texas Association of Counties.

improving services to colonias, but growth in the colonia population is still a challenge to residents, state, county, and local government.[5]

ES.2.2 Surface Water Resources

ES.2.2.1 The Rio Grande

Region M draws most of its water from the Rio Grande, via the Amistad-Falcon Reservoir system, which is shared with Mexico. The waters of the Middle and Lower Rio Grande are managed by the International Boundary and Water Commission (IBWC) and the TCEQ's Rio Grande Watermaster.

Most of the inflows in this section of the river are from the Mexican watershed. Two major agreements between Mexico and the US (in 1906 and 1944) establish how these waters are shared. Annually, Mexico is to deliver a minimum of 350,000 acre-feet (acft) to the United States, on average, over a 5-year cycle, except for years of extraordinary drought, when the watershed in Mexico cannot provide enough runoff water, or in cases of serious accident to hydraulic systems.

Releases from Amistad and Falcon reservoirs are coordinated to deliver water to users throughout the region. The US system of water rights is unique to the Rio Grande: a tiered system prioritizes municipal, domestic, and industrial (DMI) water rights and establishes two classes (A and B) of mining and irrigation water rights. Each tier of water rights has a dedicated "storage pool" in the reservoir accounting system, and at the end of each month, the DMI pool is replenished to ensure that those water rights can be delivered in full. After this and an operational reserve have been set aside, what remains, if any, is available to the Class A and B accounts. In a severe drought, there may be no water after the DMI and operational reserves are met, and Class A and B rights can be completely curtailed. This affects both farmers and the functionality of the delivery systems, many of which rely on irrigation water for the operational baseline flows.

Water in the Rio Grande is normally of suitable quality for irrigation, livestock, and industrial uses; however, salinity, nutrients, and fecal coliform bacteria are of concern throughout the basin. Salinity concentrations in the Rio Grande are the result of both human activities and natural conditions. Untreated or poorly treated discharges from inadequate wastewater treatment facilities, primarily in Mexico, and nonpoint source pollution on both sides of the river, including poorly constructed or malfunctioning septic and sewage collection systems and improperly managed animal wastes, contribute to fecal coliform levels. Nutrient levels are a concern in the Rio Grande, but current levels do not represent a severe threat to human health, nor have they supported excessive aquatic plant growth.

ES.2.2.2 Drought of Record

The Rio Grande Basin and the Amistad-Falcon Reservoir system refer to the drought spanning from February 1993 to October of 2000 as the drought of record (DOR). This 7.75 year period is the most severe hydrologic drought, according to the Rio Grande Water Availability Model (WAM), and is used to predict firm yield, the supply that could be expected in the most severe historical drought scenario, over the planning horizon, as shown in Table ES-4.

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[5] Texas Secretary of State website. https://www.sos.state.tx.us/border/. Accessed 2/25/2015.

Table ES-4 Firm Yield Projections for the Amistad-Falcon Reservoir System 2020 to 2070 (acft/yr)

SOURCE	2020	2030	2040	2050	2060	2070
Amistad-Falcon Reservoir	1,079,381	1,079,175	1,078,968	1,078,762	1,078,555	1,078,349

The current DOR extends through the year 2000 and is limited by the extent of naturalized flow data in the WAM. The actual drought extended through approximately 2002; if the WAM were updated to include those years, the DOR might be affected. Recent years have also seen severe drought in the region, and 2011 and 2012 data could similarly affect the DOR and, therefore, the firm yield projections. The 2011 RWP recommended, and it is the opinion of the RWPG, that the Rio Grande WAM should be updated regularly. The DOR is discussed in detail in Chapter 7.

The Nueces-Rio Grande Basin and the Arroyo Colorado

Within the Rio Grande Region, the Nueces-Rio Grande Coastal Basin encompasses the southeastern portion of Webb County, nearly two-thirds of Jim Hogg County, the majority of Hidalgo and Cameron counties, and all of Willacy County (Figure ES-4). Two major drainage courses are in the basin: the main floodway and the Arroyo Colorado.

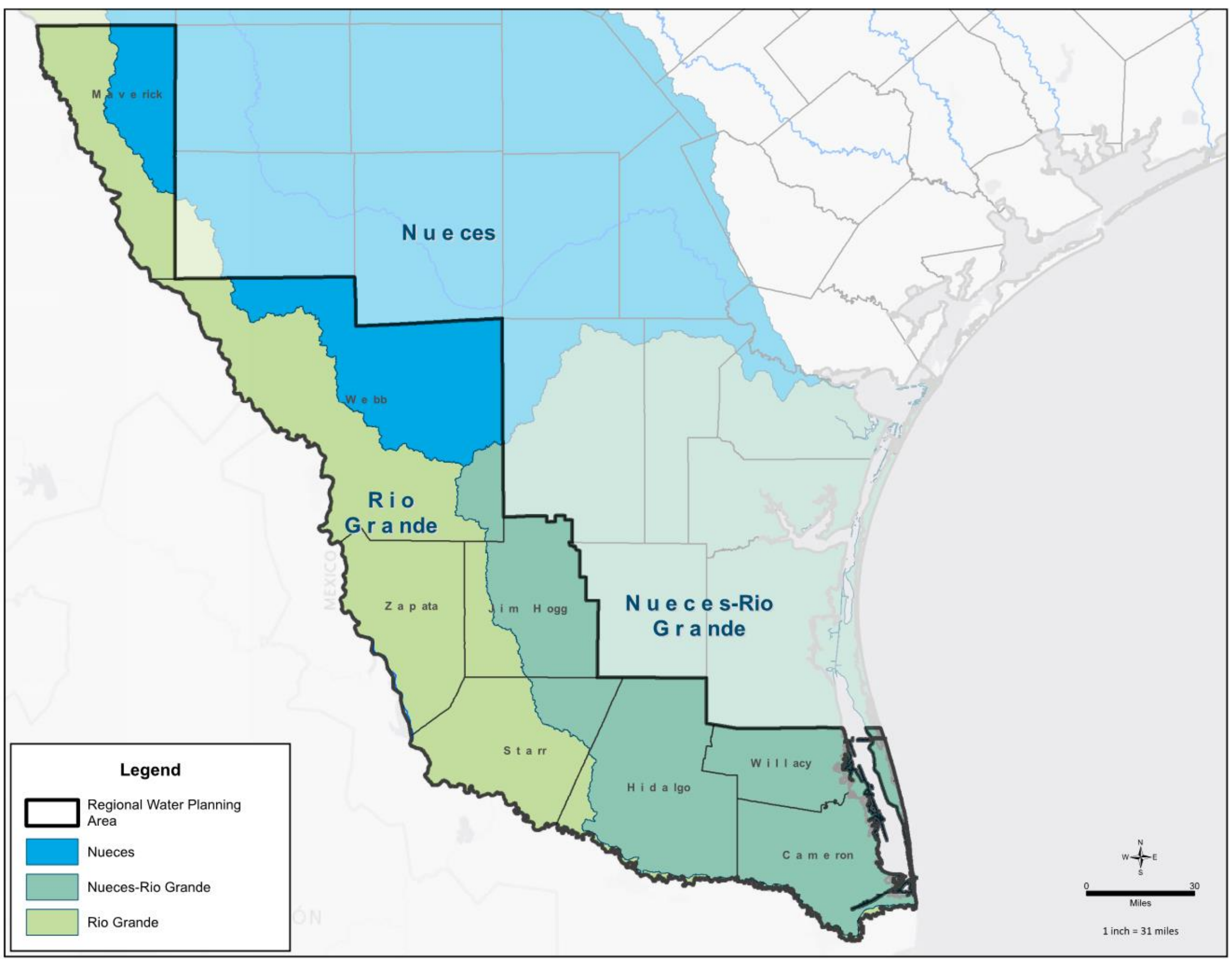

Figure ES-4 River Basins in Region M

The Arroyo Colorado is an ancient distributary channel of the Rio Grande River that drains an area of approximately 706 square miles, or 500,000 acres, covering portions of three Texas counties (Hidalgo, Cameron, and Willacy), and over 25 municipalities in the Lower Rio Grande Valley. In addition to natural drainage, most of the surface water diverted from the Lower Rio Grande is pumped into this basin and discharges into the Arroyo Colorado. The Arroyo Colorado River is the primary source of freshwater for the Lower Laguna Madre (LLM) estuary. It is imperative that adequate amounts of fresh water flow into the LLM and that water quality meets the needs of the various uses, including irrigation, recreation, industrial, municipal, and aquatic life uses.

ES.2.3 Groundwater Resources

The major aquifer underlying Region M is the Gulf Coast, which runs the extent of the Texas coast and Hidalgo, Starr, Jim Hogg, and the western portions of Willacy and Cameron counties. This aquifer is predominantly brackish, with irregular pockets of fresh and very saline water. The Carrizo-Wilcox Aquifer also spans Texas and extends through Webb and part of Maverick counties. Refer to Table ES-5.

Table ES-5 Groundwater Data for Significant Aquifers in Region M (acft/yr)

AQUIFER	DATA	2020	2030	2040	2050	2060	2070
Carrizo-Wilcox Aquifer	MAG	2,958	2,958	2,917	2,830	2,485	2,447
Gulf Coast Aquifer	MAG	106,389	114,973	123,560	132,140	140,293	140,293
Gulf Coast Aquifer	Non-MAG	40,806	44,574	48,342	52,111	55,877	55,877
Yegua-Jackson Aquifer	Non-MAG	36,000	36,000	36,000	36,000	36,000	36,000
	Total	186,153	198,505	210,819	223,081	234,655	234,617

The minor and alluvial aquifers in the region, including the Rio Grande Alluvium, the Laredo Formation, and the Yegua-Jackson aquifer, may produce significant quantities of water that supply relatively small areas. Figure ES-5 shows the major and minor aquifers in the region.

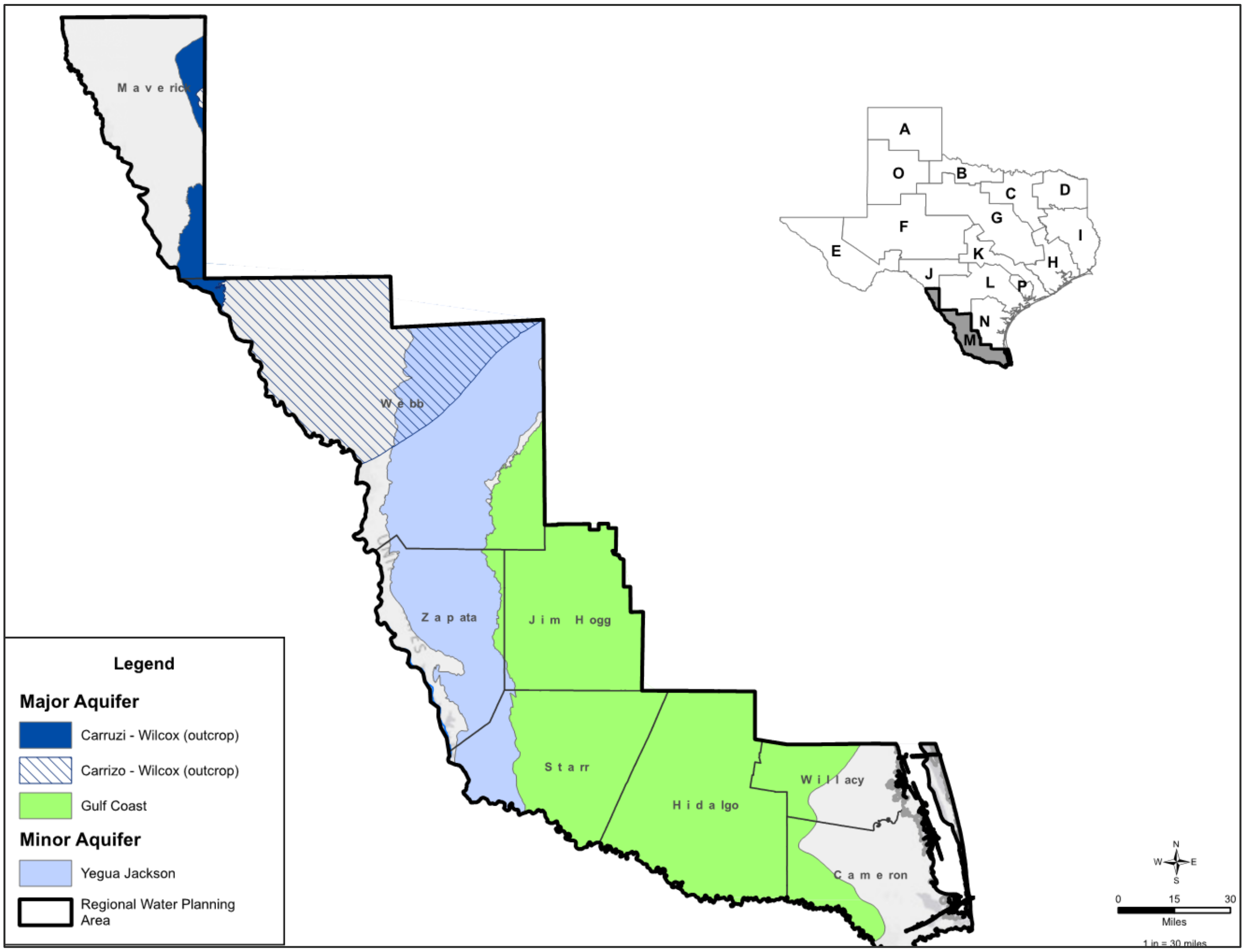

Figure ES-5 Major and Minor Aquifers in Region M

In general, groundwater from the major aquifers in the region has total dissolved solids concentrations exceeding 1,000 milligrams per liter (mg/L) (slightly saline) and often exceeds 3,000 mg/L (moderately saline). However, some areas of fresh and useable groundwater constitute a critical supply for many towns, domestic needs in rural areas, and livestock. Localized areas of high boron content occur throughout the study area.

A 2014 report from TWDB's Brackish Resource Aquifer Characterization System (BRACS) program presented information on the brackish groundwater resources of the Lower Rio Grande Valley (), in response to increased development of these resources.[6] Chapter 3 presents a detailed description of groundwater quality in the Gulf Coast Aquifer, Carrizo Wilcox Aquifer, Laredo Formation, Rio Grande Alluvium, and other aquifers in the Rio Grande Region.

[6] http://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R383_BrackishGW.pdf?d=22146.57000000443.

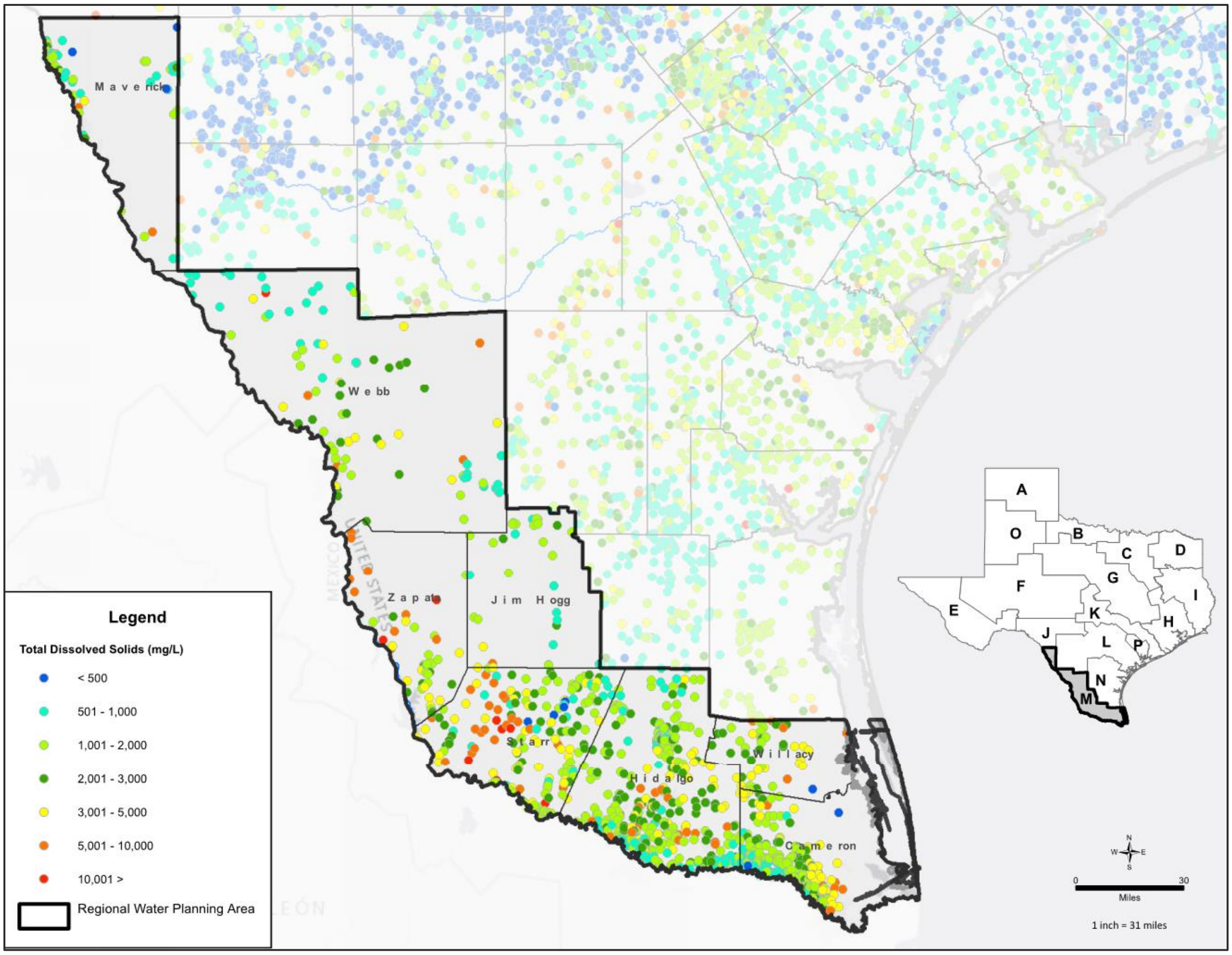

Figure ES-6 Brackish Groundwater Data in Region M (TWDB)

ES.3 CURRENT AND PROJECTED WATER USE

Both irrigation and municipal demands are greatest in the Lower Rio Grande, which is primarily served by a network of irrigation districts (IDs) that divert water to farmers and municipal utilities from the Rio Grande. Demand in other WUGs is comparatively small, as shown on Figure ES-7.

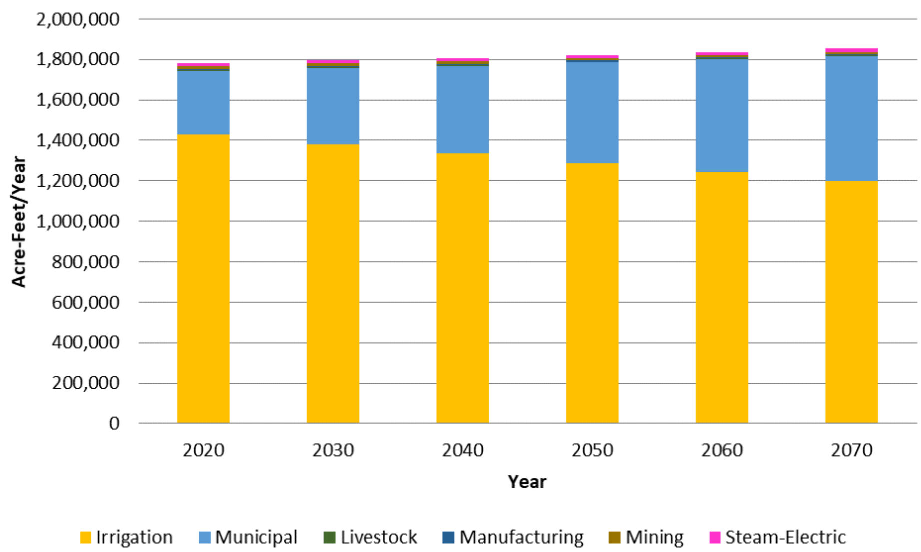

Figure ES-7 Water Demand Projections for Each WUG Type in Region M (acft/yr)

ES.3.1 Wholesale Water Providers

Region M has two general types of wholesale water providers (WWPs): those that provide raw water, mostly IDs, and those who provide treated water to municipal and industrial users.

IDs (Figure ES-8) divert and deliver raw water to irrigated farmland, municipalities, and industrial or livestock users. There are 25 IDs in Region M that operate under the Texas Water Code, but each one has its own internal operating policies. The districts are mostly earthen canal, some concrete lined canals, and some pipeline. The losses within IDs, as a result of seepage, evaporation, and operational losses, are anywhere between 10 percent and 40 percent. Water districts are discussed in more detail in Chapter 3.

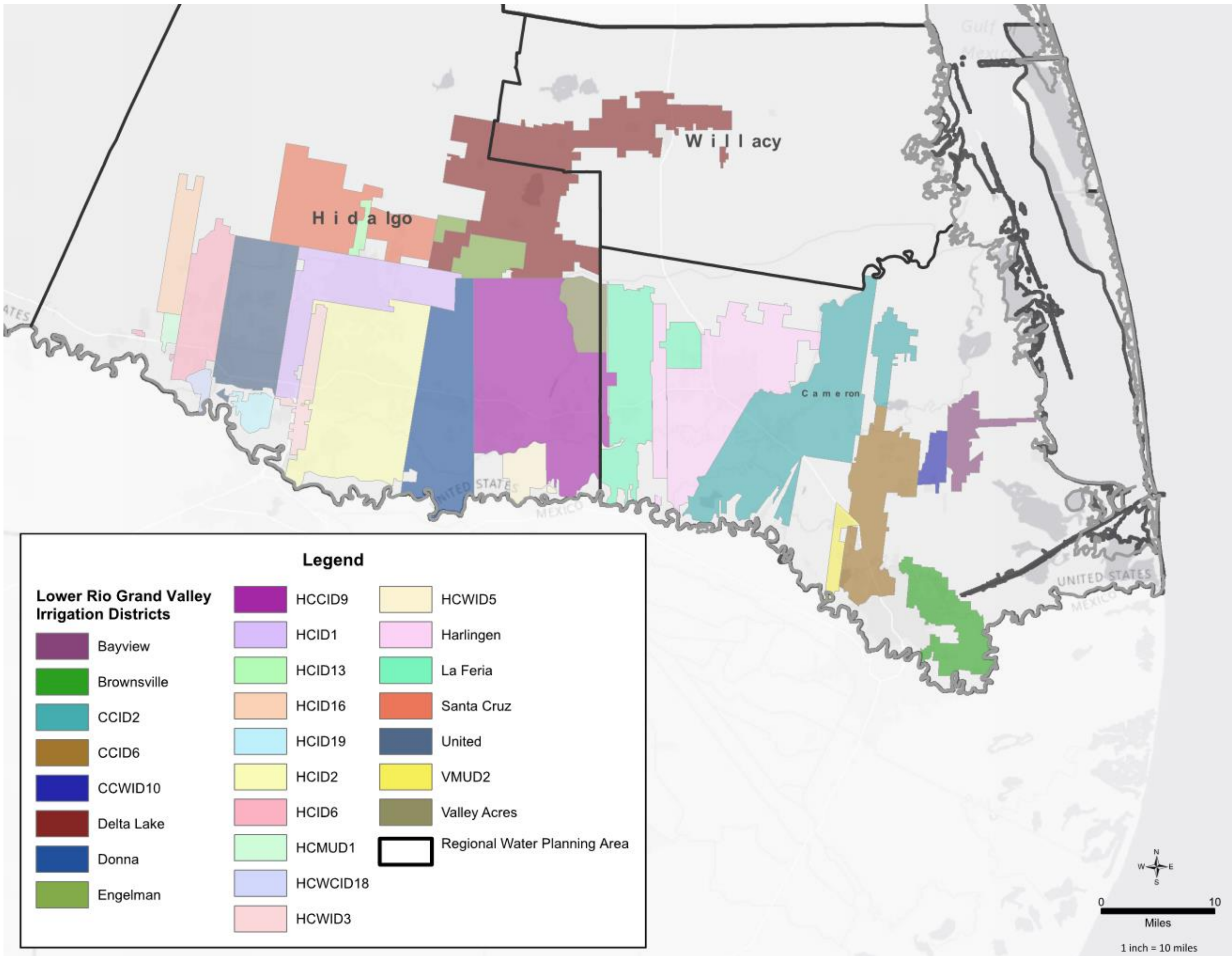

Figure ES-8 Lower Rio Grande Valley Irrigation Districts

WSCs cover most of the rural area in the Lower Rio Grande Valley. The largest are North Alamo WSC, East Rio Hondo WSC, Sharyland WSC, and Military Highway WSC, all of which treat and deliver both surface and groundwater to significant unincorporated and rural areas and edges of cities. Other WSCs in the region include Southmost Regional Water Authority, Valley Municipal Utility District 2, Webb County Water Utility, and Laguna Madre Water District. Brownsville, Eagle Pass, Harlingen, Laredo, Rio Grande City, and Weslaco also sell water to other WUGs in sufficient quantity to be considered WWPs.

Major Water Providers

Major Water Provider (MWP) is a new designation in the 2021 planning cycle; an MWP is any WUG or wholesale water provider (WWP) of particular significance to a region's water supply, as determined by the RWPG. At the April 10, 2018, Region M meeting, the planning group approved the definition of an MWP as any entity that provides 3,000 acft or more of municipal water per year. According to current estimates of 2020 municipal supplies, the entities listed in Table ES-6 have been designated as MWP in the 2021 RWP. Population and demand projections associated with the MWPs and their customers are included in Appendix B.

Table ES-6 Region M Major Water Providers

MAJOR WATER PROVIDERS	
Agua Special Utility District (SUD)	Hidalgo County Irrigation District No. 16
Alamo	Hidalgo County Irrigation District No. 2
Bayview Irrigation District No. 11	Hidalgo County Irrigation District No. 6
Brownsville	Hidalgo County Water Improvement District (WID) No. 3
Brownsville Irrigation District	Laguna Madre Water District
Cameron County Irrigation District No. 2	Laredo
Cameron County Irrigation District No. 3 - La Feria	McAllen
Cameron County Irrigation District No. 6 - Los Fresnos	Military Highway Water Supply Corporation (WSC)
Cameron County WID No. 10	Mission
Delta Lake Irrigation District	North Alamo WSC
Donna Irrigation District-Hidalgo County No. 1	Pharr
Eagle Pass	Rio Grande City
East Rio Hondo WSC	San Benito
Edinburg	San Juan
Harlingen	Sharyland WSC
Harlingen Irrigation District-Cameron County No. 1	Southmost Regional Water Authority
Hidalgo and Cameron Counties Irrigation District No. 9	United Irrigation District
Hidalgo County Irrigation District No. 1	Weslaco

ES.3.2 Municipal Demands

Municipal demands (Figure ES-7) are expected to increase regionally from a projected 315,689 acft/yr in 2020 to 620,040 acft/yr in 2070.

Table ES-7 Municipal Demand by County (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	81,779	93,300	105,461	119,091	133,640	148,708
Hidalgo	160,751	195,306	230,701	266,966	304,047	340,317
Jim Hogg	796	834	867	917	967	1,015
Maverick	10,362	11,621	12,832	14,169	15,524	16,840
Starr	11,680	12,877	14,012	15,222	16,379	17,445
Webb	44,013	52,898	61,561	69,702	77,655	84,883
Willacy	3,263	3,571	3,886	4,250	4,627	5,001
Zapata	3,045	3,489	3,992	4,570	5,183	5,831
Total	**315,689**	**373,896**	**433,312**	**494,887**	**558,022**	**620,040**

Most of this demand is currently met by surface water from the Rio Grande, most commonly delivered by IDs. However, eight brackish groundwater desalination plants have been built since 2000 and supply approximately 24,000 acft/yr of potable water. Fresh groundwater availability is limited in the region and is used mostly as a backup water supply for utilities or for individual homes, particularly in rural and unincorporated areas, with a few exceptions.[7] Refer to Figure ES-9.

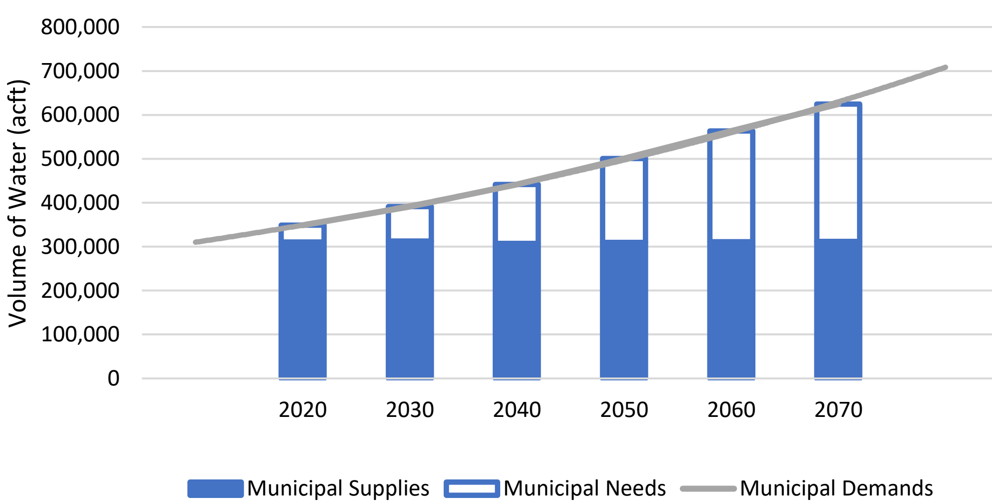

Figure ES-9 Municipal Supplies Shown Relative to Municipal Demands

[7] Military Highway WSC and the City of Hidalgo both have significant sources of well water.

The surface water rights of every municipal utility that is diverted by an ID are reduced by the estimated conveyance losses for that ID. These losses represent regular losses through seepage, evaporation, and operations in a drought year but not a scenario where push water is required. For those IDs that primarily serve irrigation users, there can be long periods between irrigations in drought years, especially when the district goes on allocation and limits irrigation water use. Because the ID conveyance systems generally require an operational minimum of water to charge the canals, there can be periods of time when municipal water rights are not sufficient to meet operational requirements and additional water, or push water, is required. Cities in Region M have been alerted that they may need push water but have not yet had to use this water as of April 2015.

ES.3.3 Irrigation Demands

Irrigation represents the largest water demand in Region M (1.14 million acft/yr in 2020 and 0.9 million acft/yr in 2070) but is projected to decrease as a result of both urbanization and increasing pressure on the region's water resources. Supplies available to irrigators are curtailed significantly in drought years because irrigation and mining water rights are treated as residual users of stored water from the reservoirs and, therefore, bear the brunt of water supply shortages. In essence, irrigation and mining water use must adjust to the available water supply. Refer to Figure ES-10.

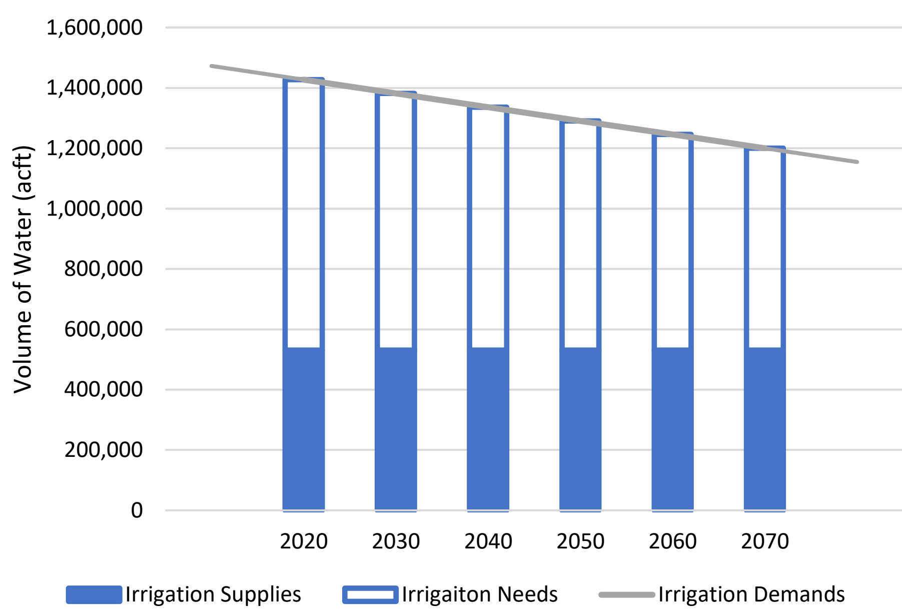

Figure ES-10 Irrigation Supplies as a Portion of Irrigation Demands (acft/yr)

Irrigation demands shown in this plan represent the worst-case scenario, wherein the demands are based on a dry year, and the supplies are what can be expected in the worst drought year. The difference between drought year demand and actual use in a particular year for agricultural users can be significant. If a drought year is anticipated, farmers can prepare by planting crops and vegetables with lower water demands, which are often of lower value, but may require fewer or no irrigations. Increases in farming efficiency can also allow irrigators to maintain higher value crops or higher yields in times with less available water.

ES.3.4 Industrial Demands

Livestock, mining, steam-electric power generation, and manufacturing demands make up a small portion of the region's water use. However, a localized analysis revealed that mining demands represent a significant portion of water usage in Webb and Zapata counties, and livestock demand is almost 25 percent of the county total in Jim Hogg. These industrial uses are illustrated on Figure ES-11through Figure ES-14.

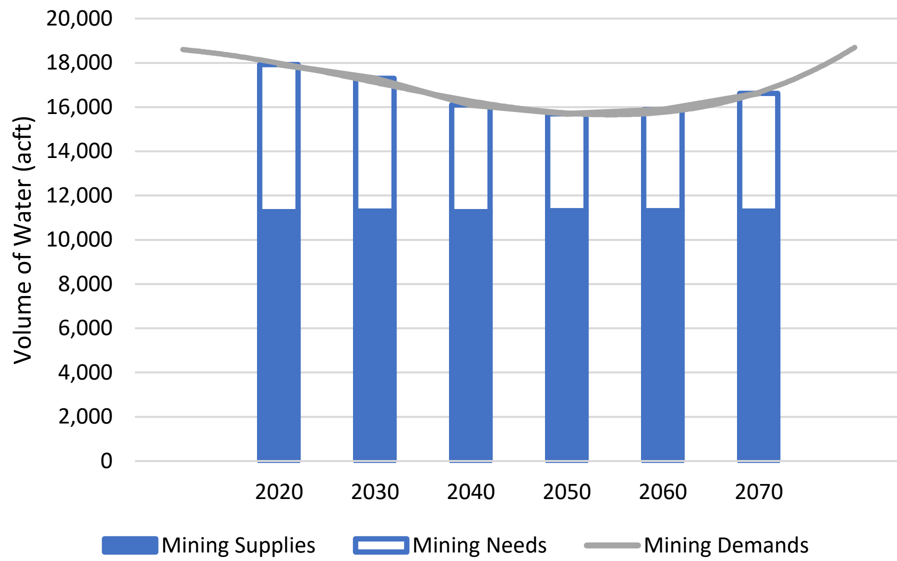

Figure ES-11 Mining Supplies as a Portion of Mining Water Demands (acft/yr)

Mining supplies are shown to decrease slightly over the planning horizon because the demands and supplies presented here are aggregated over the region. In reality, supplies and demands are associated with each other within specific counties and river basins. Regionally, the total supplies exceed the total demand, but because surpluses are shown as zero in the needs calculation, the counties that still have needs (Hidalgo in particular) cause the region to show an overall need. A local supply in one county does not meet needs in a different county without additional measures taken, such as selling or moving water, which are discussed separately as WMSs. The supplies shown here are supplies that are already in the right place/ownership to meet a demand; as the demands decrease, so do the supplies.

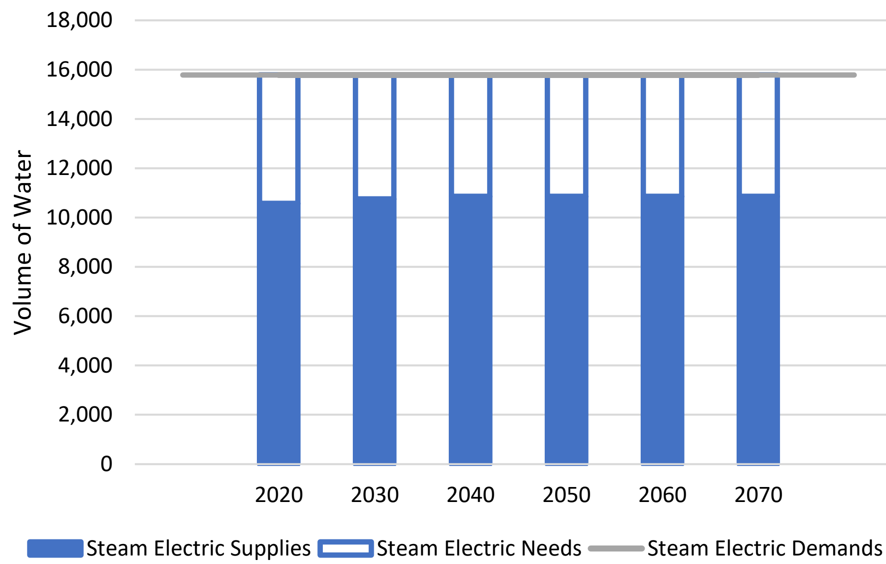

Figure ES-12 Steam-Electric Supplies as a Portion of Steam-Electric Water Demands (acft/yr)

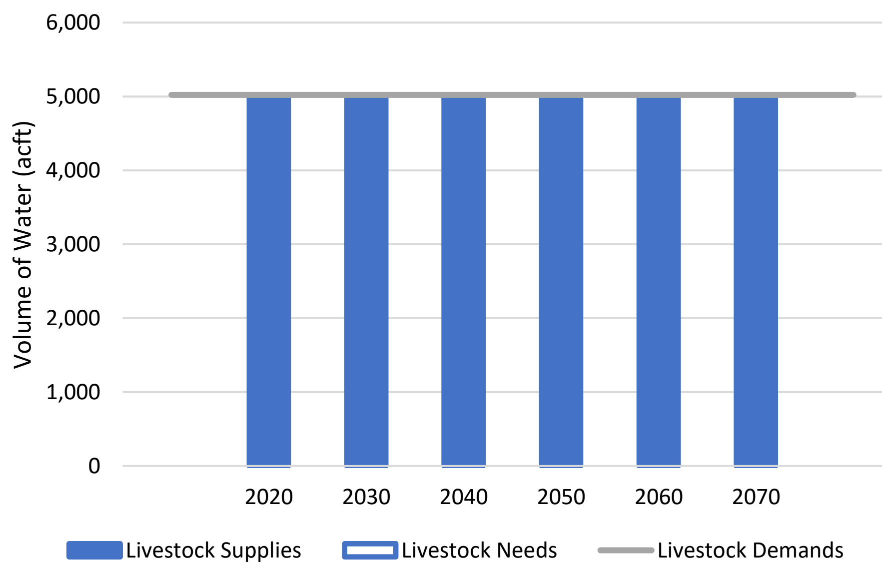

Figure ES-13 Livestock Water as a Portion of Livestock Water Demands (acft/yr)

Livestock demands are shown as being 100 percent met by existing supplies. Livestock is managed so that drought year demands are limited to the supplies known to be available. Livestock demands are met with Rio Grande water, groundwater, and some local supplies of surface water reserved particularly for livestock.

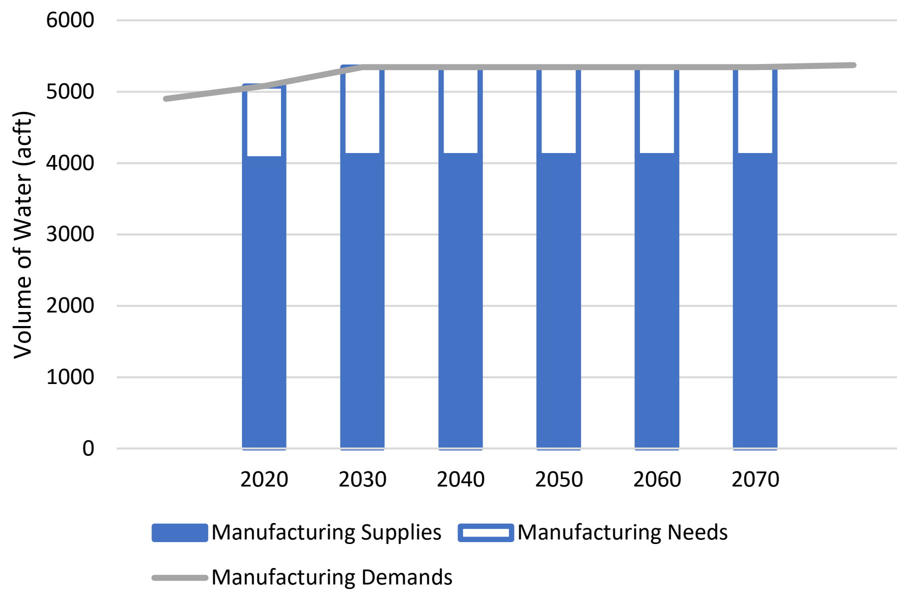

Figure ES-14 Manufacturing Supplies as a Portion of Manufacturing Water Demands (acft/yr)

Appendix A.3 summarizes the decadal population, demand, supply, and needs for each WUG category within Region M.

ES.3.5 Source Balance

The source water balance data for the water resources of Region M are shown in Appendix A.9. The portion of each source availability not supplied to a WUG is shown by county and river basin. For surface water, this includes the portion of Rio Grande water that is lost in the conveyance systems or water that IDs can divert but otherwise do not deliver to an end user, such as unused water rights. For groundwater sources, this water is considered available for development from the MAG.

ES.4 WATER MANAGEMENT STRATEGIES

The RWPG is tasked with evaluating all potentially feasible WMSs and recommending selected strategies to meet current and future needs in the region. The potentially feasible WMSs came from three major sources:

1. The recommended WMS from the 2016 Region M Plan;
2. Responses to requests sent to all water providers and stakeholders for project and strategy descriptions; and
3. The list of WMS for consideration listed in the water planning guidance documents provided by the TWDB.

All of the WMSs received, and some developed by the RWPG, were compiled to form the list of potentially feasible WMSs. The costs, projected yield, feasibility, and impacts were evaluated for accuracy, consistency, and compliance with TWDB rules and guidance where that information was available; where information was not available, assumptions were made and documented.

The WMS components included in this RWP are limited to the infrastructure and costs that are required to develop and convey increased water supplies from water supply sources and to treat the water for end WUG requirements. Conservation WMSs that are needed to address water loss or infrastructure bottlenecks in an existing water supply conveyance system and result in increased supplies or decreased demands are also included. Infrastructure components associated with internal water distribution networks that do not convey an additional water supply volume or address current losses are not included in the RWP.

For every WUG, the projected water saved through ID Improvements and Advanced Municipal Water Conservation that affects the WUG was subtracted from the original need to obtain a revised need after conservation. If a need still existed, additional WMSs were considered for the WUG.

The WMS or portfolio of strategies with sufficient yield to meet the needs after conservation were recommended for each WUG, and any additional viable WMS that ranked well were listed as alternative recommended strategies. Only WMSs with insufficient information or major feasibility concerns were evaluated but not recommended.

Environmental impacts of each WMS were evaluated and categorized according to the type of WMS. The categories of impacts that were quantified include:

- Acres impacted permanently;
- Construction impacted acreage;
- Inundation acreage;
- Agricultural resources impacted*;
- Wetland impact;
- Habitat impacted acreage;
- Threatened and endangered species count;

- Cultural resources impact;
- Environmental water needs*;
- Effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico*;
- Reduction in WWTP effluent;
- Volume of brine;
- TDS of brine; and
- Reliability*.

The assessments noted with an Asterisk (*) are new this planning cycle and further described in Section 5.2.

ES.4.1 Water Infrastructure and Distribution Systems, Assumptions and Methodology

Water infrastructure distribution systems addresses both municipal improvements and ID improvements that reduce losses or enable increased supplies.

ES.4.1.1 Irrigation District Conservation

IDs carry over 85 percent of the water that is used from the Rio Grande system in Region M. These districts were initially built to deliver water for agricultural use, but many districts now serve municipal and industrial users as well. Most of these systems have similar components, with initial pump stations to divert water from the river, some storage in either off-channel reservoirs or in the main canals, and canal or pipeline networks that deliver water to municipal utilities for treatment and distribution or to farmlands. Black & Veatch worked with Texas A&M AgriLife Research to develop expected water conservation and costs for conservation WMSs for all 27 IDs in Region M.

Stakeholder meetings were held with IDs to discuss potential WMSs, estimated costs, water savings, and implementation feasibility. This effort included a review and analysis of the water conservation strategies submitted by IDs and development of WMSs for the IDs that did not submit specific projects.

It is intended that these IDs could implement any water conservation or storage improvements, including, but not limited to, metering, control automation, gates, canal lining, repair of canal lining, pipeline installation, district interconnects, new reservoirs, reservoir improvements, or any other strategy that provides beneficial, measurable conservation improvements to the ID.

ES.4.1.2 Municipal Infrastructure Improvements

Operational, treatment, and distribution projects that allow a WUG to either access a new supply, eliminate known losses, or develop new supplies are included as municipal infrastructure improvements. Municipal infrastructure improvements focus on problem-specific WMSs that relate to treatment, storage, or distribution and transmission. Insufficient treatment capacity or capability can be a supply limitation, inadequate storage can disrupt operations, and transmission and distribution projects may be required for entities that are experiencing significant water losses due to eroded pipelines, or leaking water tanks. Because these projects are particular to the municipal utility systems, they were evaluated individually from the available information.

ES.4.2 Wastewater Reuse

With increasing pressure statewide on water resources, Texas water users are considering and pursuing reuse or recycling of wastewater. Wastewater can be treated and reused for either potable or non-potable uses and can include a step that returns water to the environment for a period of time (indirect) or not (direct). All approaches to reuse have been evaluated, and the most appropriate alternatives recommended.

ES.4.2.1 Non-Potable Reuse

Wastewater reuse is most commonly used for agriculture, landscape, public parks, and golf course irrigation; industrial uses; dust control; and construction activities. This WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential users of reclaimed water, (2) the level of treatment and quality of the reclaimed water, (3) the water quality requirements of particular users, and (4) the public acceptance of reuse.

Non-potable reuse was evaluated for those entities that identified it as a desired WMS. In each case, the end user's demands were evaluated to verify that the supply was considered only where a demand would have otherwise been filled by municipal water, limited to meeting 25 percent of demands.

ES.4.2.2 Potable Reuse

Highly treated wastewater effluent can be used as a supplemental water supply for potable use. Indirect potable reuse is commonly practiced in Texas when surface water supplies are deliberately augmented with treated wastewater effluent. Direct potable reuse has become a feasible alternative in recent years, because of advances in technology and public acceptance as well as precedent in regulatory acceptance.

This WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential surface waters and water treatment facilities, (2) the level of treatment and quality of the reclaimed water, (3) the water quality requirements for potable water, and (4) the public acceptance of reuse.

TCEQ is currently in the process of establishing the requirements for both indirect and direct potable reuse. There are two full-scale direct potable reuse projects, and one pilot-scale testing to date in Texas. The City of Wichita Falls and the City of Big Spring have both implemented direct potable reuse projects. Both of the cities were issued permits from the TCEQ following extensive testing of the drinking water. In 2016, El Paso Water Utilities conducted testing and has completed plans for a 10 MGD facility, which is currently under review by TCEQ. Until official requirements are set by the TCEQ, indirect and direct potable reuse projects are being approved on a case-by-case basis pending testing and confirmation of the drinking water quality.

All the potable reuse strategies recommended in this RWP are considered direct reuse because none of them have sufficient evidence that the reuse water would be retained in a natural environmental buffer for what would be considered an extended amount of time. By TWDB definition, indirect reuse refers to water that is returned to a natural water body so that an additional permit is required to access that water after buffering. In addition to the submitted potable reuse WMSs, an evaluation of wastewater treatment plants in the region was performed to determine other entities that could benefit from potable reuse.

Many of the locations where potable reuse was recommended are in the Nueces-Rio Grande Basin, but the source waters are predominantly from the Rio Grande. Wastewater reuse projects will primarily impact the flows into the drainage network, including the Arroyo Colorado. There are water rights holders along the Arroyo Colorado and other drainage canals in the Nueces Rio-Grande Basin that could potentially be impacted, including irrigators, some shrimp farming, and other aquaculture.

ES.4.3 Aquifer Storage and Recovery

HB807 requires that aquifer storage and recovery (ASR) be considered in each RWP. ASR is typically a way to capture water when there are excess surface water flows, similar to a surface reservoir. However, the water is then pumped to a confined aquifer where it can be pumped back out as needed. The benefits compared with surface water reservoirs include that there are no losses to evaporation, and that ASR is likely to be simpler in terms of permitting and construction. The drawbacks include very specific requirements for the local geology to make ASR feasible, and the potential for losses.

At this time, no recommended ASR projects are in the region. Few entities have run-of-the-river water rights for the Rio Grande, which enable higher withdrawals when the river is full. It is possible that water right holders could potentially use water during “no-charge pumping” periods to charge an ASR system, but this would need to be evaluated. Additionally, much more information is required about the suitability of the geology and hydrogeology of the region.

ES.4.4 Desalination

Several desalination methods are used to treat brackish and saline groundwater and seawater, the most common of which is membrane technology. The most prevalent membrane technology is reverse osmosis (RO). Brackish or saline water is highly pressurized and pushed through semipermeable membranes that separate the brackish or saline water into fresh water and a concentrated byproduct. For higher TDS found in seawater, RO becomes significantly more energy intensive and has a lower yield of permeate, or fresh water. A typical pressure for seawater with 35,000 mg/L could be in excess of 1000 pounds per square inch (psi). That compares to less than 200 psi for 3,000 mg/L TDS groundwater. The higher TDS plants yield less than 50 percent of the water supplied. The remaining 50 percent is the concentrated byproduct, which generally requires disposal and can add significant costs to a project. This compares to approximately 80 percent with the lower salinity brackish water facilities. Surface water intakes will require additional pretreatment of suspended solids prior to the RO treatment.

ES.4.4.1 Local Brackish Groundwater Development and Treatment

Texas currently has more than 40 municipal brackish desalination plants, with a combined capacity of about 123 million gallons per day (mgd). That includes 73 mgd of brackish groundwater desalination and

50 mgd of brackish surface water desalination.[8] The average cost to produce desalinated water from brackish groundwater ranges from approximately $350 to $780 per acft.

The disposal of concentrate from desalination facilities will increase levels of TDS in the receiving streams. Many of the facilities that are currently treating brackish groundwater dispose of concentrate in the drainage canal network in the Nueces-Rio Grande Basin, which is a part of why desalination is affordable for some utilities in the region. This network of canals is usually brackish and discharges into the Laguna Madre, parts of which are naturally hypersaline. The greatest recent threat to wildlife in the Lower Laguna Madre has been increased inflows of low-salinity water.

As with any groundwater development project, there is potential to affect the quality of the aquifer as more water is drawn from it. Land subsidence may be a byproduct of increased groundwater pumping.

ES.4.4.2 Seawater Desalination

Texas does not yet have a seawater desalination plant. Charged with developing the first seawater desalination plant in Texas, the TWDB has completed three feasibility studies and two pilot-plant studies. To this date, two desalination plants have been proposed – one by the Brownsville Public Utilities Board and the other by the Laguna Madre Water District.

Seawater desalination remains one of the higher cost WMSs, but costs have declined over the years as technology advances. The average cost to produce desalinated water from seawater ranges from $820 to over $1,300 per acft. When placed in conjunction with power generation facilities, power costs can be lower, and a combined water intake and discharge will lower, capital costs. Assessing the actual cost should be included in a feasibility analysis.

ES.4.5 Fresh Groundwater

Although Region M relies mostly on surface water, numerous entities and individuals rely on minimally treated groundwater to meet their needs. Cities that are farther from the Rio Grande and surface water distribution networks have few alternative sources and have identified portions of the aquifer(s) that produce acceptable water for municipal use without advanced treatment technology.

In some cases, where there appears to be additional available fresh groundwater, further development of that source is recommended within the MAG values for the applicable aquifer. In many cases, this is the recommendation for County-Other entities, where domestic wells are distributed over a large area and pump small amounts for a single household.

ES.4.6 Advanced Municipal Water Conservation

Advanced Municipal Water Conservation is recommended for every municipal WUG in Region M. A variety of conservation measures are recommended as described in the TWDB best management

[8] Texas Water Development Board Desalination Plant Database. http://www2.twdb.texas.gov/apps/desal/default.aspx. Updated in 2011, accessed 4/14/2015. Only public water supply plants with a capacity greater than 0.025 mgd are reported in the database.

practices (BMPs), any combination of which can be used to meet the specific goals for a municipality or utility.[9]

In addition to some specific WMSs submitted, advanced municipal conservation is recommended for every WUG. For every municipal WUG with a projected need or a per capita water use rate greater than 140 gallons per capita per day, municipal conservation yield and costs were estimated. The amount of water that can be conserved by implementing advanced municipal conservation measures and associated costs were estimated with the assistance of the Unified Costing Model tool.

ES.4.7 On-Farm Conservation

On-Farm Conservation measures can be grouped into the following categories: water use management practices, land management systems, on-farm water delivery systems, water district delivery systems, and tailwater recovery systems. Water district delivery system improvements, including conveyance infrastructure, metering, and telemetry, are discussed in detail in Subsection 5.2.1 and addressed as a separate WMS, although the operational effectiveness and efficiency of the IDs are necessary to reap the full benefits of on-farm measures. On-farm efficiency depends on timely delivery of water, adequate head to push water across a field, and an available supply whether on farm or from the ID.

These measures are considered on-farm conservation measures, but in most cases, implementation in a drought year increases the potential yield of a crop per acft of water but may not reduce the irrigator's overall demand for water. When water is available in a drought year, farmers are likely to use it. Making better use of the water that is available is critical to helping farmers through drought, and the Region M Planning Group recommends continued research, education, demonstration, and large-scale implementation of these and any other irrigation conservation measures that farmers find to be appropriate.

A select subset of On-Farm Conservation strategies that were developed based on input from stakeholders and ID are discussed in detail in Subsection 5.2.8. These strategies are of particular interest to the region, although the full range of BMP described in TWDB literature is recommended where appropriate.[10] On-farm conservation is recommended for all irrigators in the planning area.

ES.4.8 Implementation of Best Management Practices for Industrial Users

Implementation of BMPs for Industrial Users is recommended for every manufacturing, mining, and steam electric power user in Region M. The TWDB Water Implementation Task Force recommended strategies for industrial users to conserve water in the "Best Management Practices for Industrial Water Users" guidance.[11] The guide provides BMPs for specific industries, as well as general BMPs that are recommended for any type of industrial user.

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[9] Water Conservation Implementation Task Force. "Water Conservation Best Management Practices Guide." November 2004.

[10] Texas Water Development Board. Best Management Practices for Agricultural Water Users. http://www.twdb.texas.gov/conservation/BMPs/Ag/index.asp. Accessed 4/21/2015.

[11] Water Conservation Implementation Task Force. "Water Conservation Best Management Practices: Best Management Practices for Industrial Water Users." February 2013.

ES.4.9 Conversion/Purchase of Surface Water Rights

Urbanization of agricultural lands within Region M is projected to increase throughout the planning period. As areas that are currently farmed are developed, the water associated with irrigating that land will become available for other uses. For the purpose of this plan, it was assumed that the increase in municipal water demand is proportional to the decrease in irrigation demand due to urbanization and estimates for urbanization rates were made for each county.

Purchase of water rights through urbanization was recommended for all municipal WUGs, with recommended strategies that required additional water rights to be feasible (such as expansion of a surface water treatment plant) to accompany those strategies. Additionally, the strategy for acquisition of water rights through urbanization was evaluated for all municipal, manufacturing, and steam-electric power WUGs with needs prior to 2070.

ES.5 DROUGHT PLANNING AND THREATS TO RESOURCES

TCEQ requires WCPs to be developed, implemented, and submitted by municipal, industrial/mining, and other non-agricultural water right holders of 1,000 acft of water per year, and agricultural water right holders of 10,000 acft/yr or more. Additionally, all wholesale and retail public water suppliers and IDs are required to develop a drought contingency plan (DCP). WCPs are required to include quantified 5- and 10-year targets for water savings, and DCPs outline entity responses to drought, including triggers for conservation stages and the restrictions of water use in each drought stage.

The drought response varies from entity to entity, primarily between those who serve customers, including irrigators, with raw water and those who deliver treated water. For those entities, such as IDs, that deliver water to irrigators, the response to drought is focused on the allocation system and how agricultural water rights are fulfilled when supplies are limited by the TCEQ Watermaster. Each water district responds slightly differently, in some cases allowing water to be sold between farmers in their district, or for farmers to consolidate their allocations on a portion of their land, leaving other areas for dry land farming or to fallow.

Those entities who deliver treated water generally developed triggers that were based either on the remaining municipal water rights available to the city for that year or the capacities of their treatment plants, so that high demands on the plants trigger a conservation stage. The conservation stages for cities included limitations on car washing and lawn watering, ranging from voluntary in early stages to some fines or other penalties in later stages.

ES.5.1 Threats to Agricultural and Natural Resources

As described in detail in Chapter 3, under the existing water rights system, irrigation water use is a “residual” claimant to available water supplies from the Rio Grande. During periods of low inflows to the reservoir system, when there are little or no allocations made to irrigation and mining storage accounts, these users deplete their storage accounts and may suffer shortages.

An additional threat to the region’s water supplies is unchecked development of groundwater resources. Only a small portion of the region is in a groundwater conservation district (GCD), and none of the GCDs in the region are actively managing groundwater development. Without a GCD, the conservation goals described in the desired future conditions for each aquifer cannot be implemented or monitored.

Pumping groundwater in some locations may impact surface water, especially near the Amistad Dam. Water marketing companies are actively seeking water sources to be sold to entities in need of new water sources. In and around Val Verde County, there is strong evidence of interaction between groundwater and surface water. The pumping of groundwater in the Devils and Pecos river basins has been shown to directly impact these streamflows and the flows in Goodenough Springs, which play a significant role in supplying water for Region M. Any reduction in the water supply in the Amistad Reservoir presents a threat to the whole region.

Another threat to agricultural and natural resources of the region is the impact of urbanization on currently undeveloped areas and the loss of water and habitat availability for wildlife. This would have a negative impact on ecotourism. Urbanization plays a major role in determining how water resources will be used in the future. Particularly in Cameron and Hidalgo counties, projected urbanization is expected to significantly reduce the area of irrigable farmland. In addition to the direct reduction of irrigable farmland acreage due to change in land use, urbanization also impacts adjacent farmland by increasing property values and restricting some types of agricultural activities (e.g., use of pesticides).

The conservation WMS discussed in this plan aims to assist water users in making the most of what water is available in drought years. IDs play a major role in the delivery of water, and improvements of their operations and efficiency represent a significant portion of the strategy for meeting future demands. Given the uncertainty associated with irrigation water rights for all of the reasons described above, it will become increasingly critical for all users in Region M to carefully manage their water.

FINAL PLAN

CHAPTER 1: DESCRIPTION OF THE REGIONAL WATER PLANNING AREA

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

BLACK & VEATCH

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acft	Acre-Feet
acft/yr	Acre-Feet per Year
BRACS	Brackish Resource Aquifer Characterization System
CONAGUA	Water Commission of Mexico
CRP	Clean Rivers Program
DCP	Drought Contingency Plan
DMI	Domestic/Municipal/Industrial
DOR	Drought of Record
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FWS	Fish and Wildlife Service
HB4	House Bill 4
HCID	Hidalgo County Irrigation District
IBWC	International Boundary and Water Commission
IWRP	Integrated Water Resources Plan
LRGVDC	Lower Rio Grande Valley Development Council
mg/L	Milligrams per Liter
MUD	Municipal Utility District
MWP	Major Water Provider
NPDES	National Pollutant Discharge Elimination System
NWR	National Wildlife Refuge
PUB	Public Utilities Board
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SB1	Senate Bill 1
SP	State Park
SUD	Special Utility District
SWIFT	State Water Implementation Fund for Texas
SWP	State Water Plan
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
USDA	United States Department of Agriculture

USFWS	United States Fish and Wildlife Service
WAM	Water Availability Model
WID	Water Improvement District
WMA	Wildlife Management Area
WMS	Water Management Strategy
WPP	Watershed Protection Plan
WSC	Water Supply Corporation
WUG	Water User Group

CHAPTER 1: DESCRIPTION OF THE REGIONAL WATER PLANNING AREA

1.1 PLANNING BACKGROUND

The Texas Water Development Board (TWDB) was established in 1957 through a state constitutional amendment and is charged with preparing a comprehensive and flexible long-term plan for the development, conservation, and management of the state's water resources. Historically, the State Water Plan (SWP) had been prepared by the TWDB with input from other state and local agencies and the public. Senate Bill 1 (SB1) was enacted in 1997 by the 75th Legislature; the bill established a "bottom up" approach whereby SWPs would be based on Regional Water Plans (RWPs) prepared and adopted by the 16 Regional Water Planning Groups (RWPGs). SB1 states the purpose of regional water planning:

"…provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of that particular region."

SB1 also provides that future regulatory and financing decisions of the Texas Commission on Environmental Quality (TCEQ) and the TWDB be consistent with the current SWP. In 2013, House Bill 4 (HB4) was enacted, which lends greater weight to the SWP by committing an additional funding pool to the implementation of projects recommended in the plan by way of the State Water Implementation Fund for Texas (SWIFT).

The Rio Grande Regional Water Planning Group (Region M) members, listed in Table 1-1, act as the decision-making body for the regional water planning effort. The Lower Rio Grande Valley Development Council (LRGVDC) serves as the political subdivision to administer the regional water planning grant, and Black & Veatch Corporation was selected as the prime consultant for the planning and engineering tasks required for development of the RWP.

Table 1-1 Region M Water Planning Group

INTEREST	NAME	RESIDENT COUNTY
Public	Tomas Rodriguez - Chairman*	Webb
	Laredo	
Counties	Joe Rathmell, County Judge	Zapata
	Zapata County	
	David L. Fuentes, Precinct 1 Commissioner	Hidalgo
	Weslaco	
Municipalities	Jorge Flores, Eagle Pass Water Works	Maverick
	Eagle Pass	
	John Bruciak, Brownsville Public Utility Board	Cameron

INTEREST	NAME	RESIDENT COUNTY
	Brownsville	
	Riazul Mia	Webb
	Laredo	
Industries	Donald K. McGhee - Secretary*, Hydro Systems, Inc.	Cameron
	Harlingen	
Agriculture	Neal Wilkins, Ph.D.	Jim Hogg
	East Wildlife Foundation	
	Dale Murden, Texas Citrus Mutual	Hidalgo
	Mission	
Environmental	Jaime Flores	Hidalgo
	The Arroyo Colorado Watershed	
Small Business	Carlos Garza, AEC Engineering, LLC	Hidalgo
	Edinburg	
	Nick Benavides*	Webb
	Nick Benavides Co.	
River Authorities	Mayor Jim Darling	Hidalgo
	Rio Grande Regional Water Authority	
Water Districts	Sonny Hinojosa - Vice-Chairman*, Hidalgo County Irrigation District (ID) No. 2	Hidalgo
	San Juan	
	Tom McLemore, Harlingen ID	Cameron
	Harlingen	
Water Utilities	Dennis Goldsberry	Hidalgo
	North Alamo Water Supply Corporation (WSC)	
Groundwater Management Area	Armando Vela	Hidalgo
	Red Sands Groundwater Conservation District	
Other	Glenn Jarvis	Hidalgo
	McAllen	
	Frank Schuster*	Hidalgo
	Val Verde Vegetable Co.	

INTEREST	NAME	RESIDENT COUNTY
Electric Generating Utilities	VACANT	VACANT
*Executive Committee		

The RWPs are updated every five years and used as a part of the update to the SWP. The RWPs, which are based on an assessment of future water demands and currently available water supply, include specific recommendations for meeting identified water needs through the end of a 50-year planning horizon (2020 through 2070 for this plan). The plans also include recommendations regarding policy at the state and local level, including environmental protection, drought response, and resource management.

1.2 THE RIO GRANDE REGIONAL WATER PLANNING AREA

The Rio Grande Regional Water Planning Area (Region M) consists of the eight counties along the middle and lower Rio Grande up to the mouth of the river at the Gulf of Mexico (Figure 1-1).

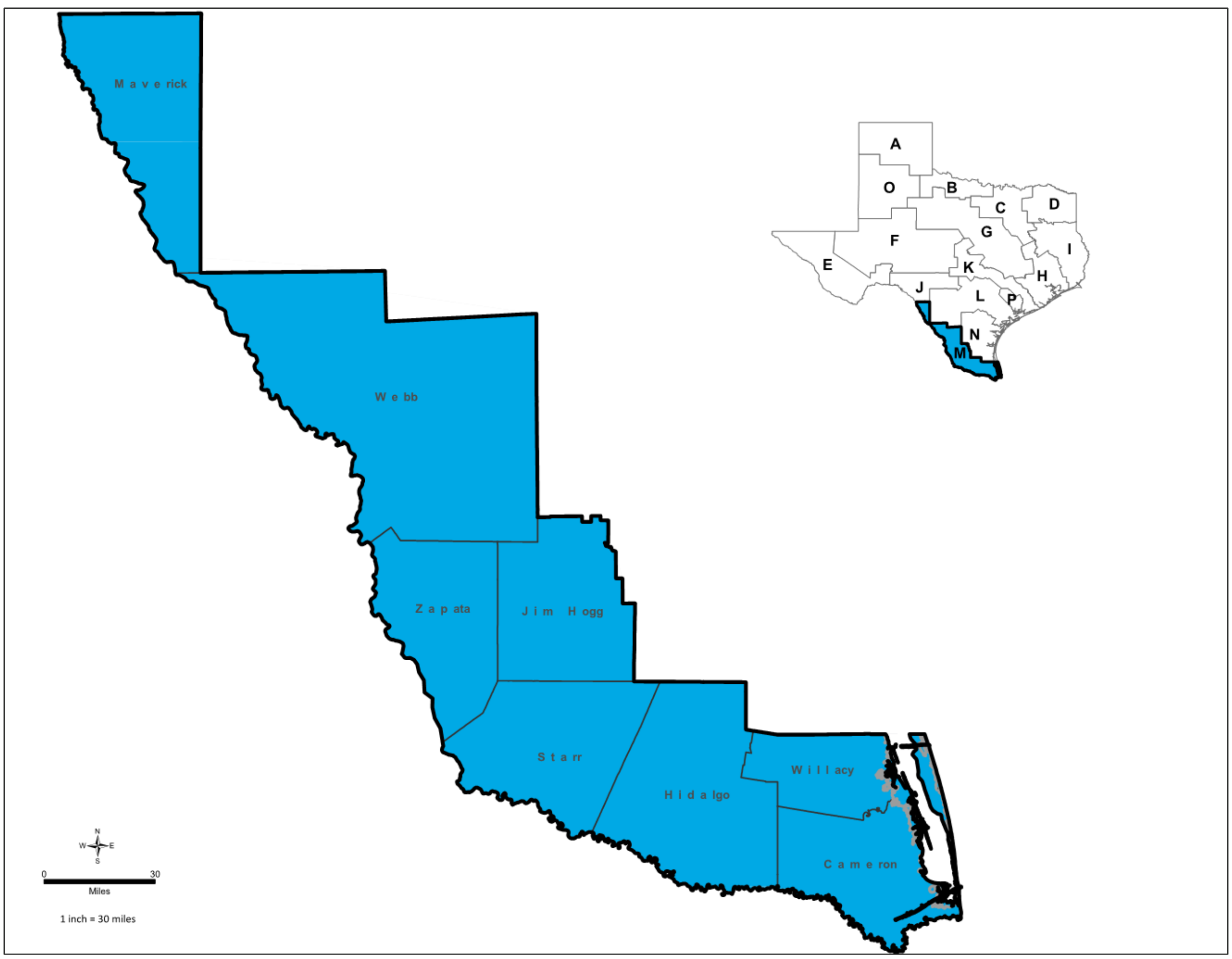

Figure 1-1 Rio Grande Regional Planning Area (Region M)

1.2.1 Climate

The climate ranges from humid subtropical in the eastern portion, nearest to the Gulf Coast, and drier tropical to subtropical in the west. The number of frost-free days varies from 320 days at the coast to 230 days in the northwestern portion of the region near Maverick County, resulting in a long growing season most years.[1] The amount of rainfall varies across the Lower Rio Grande Region from an average of 28 inches at the coast to 18 inches in the northwestern portion of the region; rainfall is primarily from thunderstorms in the spring and occasional hurricanes in the late summer and fall. These storms can generate tremendous amounts of rainfall over a short period of time and cause extensive flooding because of the region's relatively flat terrain. The fall storms provide a large portion of the surface water runoff captured in water supply reservoirs within the Rio Grande basin.

1.2.2 Population and Economy

The population of Region M is concentrated in Cameron, Hidalgo, and Webb counties, accounting for 90.5 percent of the regional total in 2010. Figure 1-2 shows the historical population in each county (US census historical data).

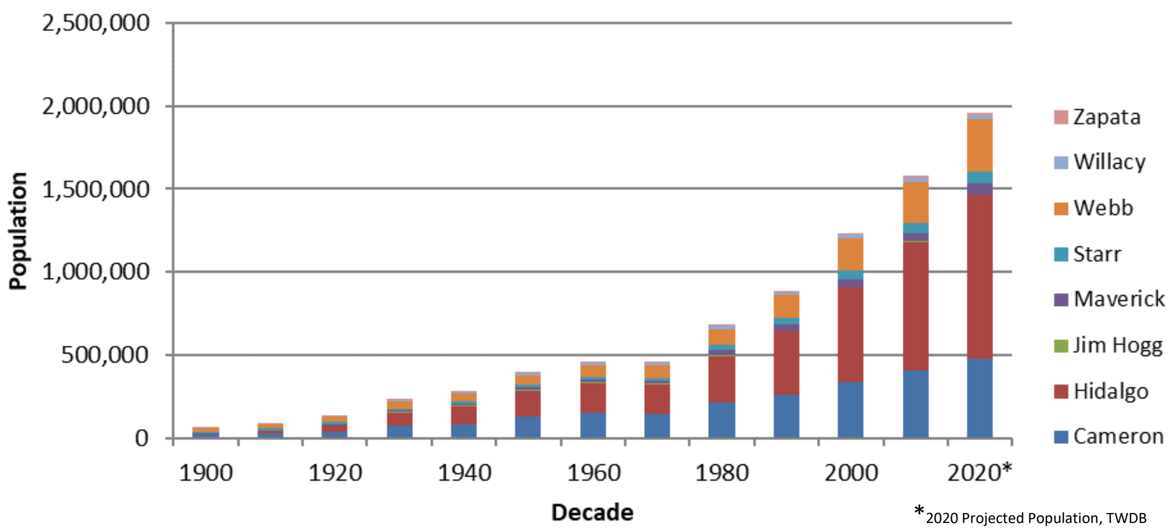

Figure 1-2 Region M Historical Populations, US Census Bureau

Figure 1-3 shows current population centers in Region M. The population of the region is expected to grow to over 4-million people by the end of the current planning horizon, which represents a 106 percent population increase from 2020 to 2070. Chapter 2 describes the population and municipal demand projections in detail.

An important factor driving rapid population growth in the Rio Grande Region is its cultural, social, and economic relationship with Mexico. Nationwide, Mexico's population growth rate in 2017 was

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[1] "Texas Interactive Average Last Frost Date Map." Plantmaps.com, www.plantmaps.com/interactive-texas-last-frost-date-map.php.

1.3 percent, compared with 0.6 percent for the United States.[2] The Mexican portion of the Rio Grande watershed (known as the Rio Bravo in Mexico) was home to approximately 12.61 million people in 2017 and is anticipated to have 14.4 million inhabitants by 2030.[3] An annual growth rate of 1.01 percent is projected by the World Bank between 2017 and 2030; using this growth rate, the projected population in 2070 would be over 21 million people. Growth on both sides of the border will continue to put pressure on the capabilities of surface and groundwater to meet the region's needs.

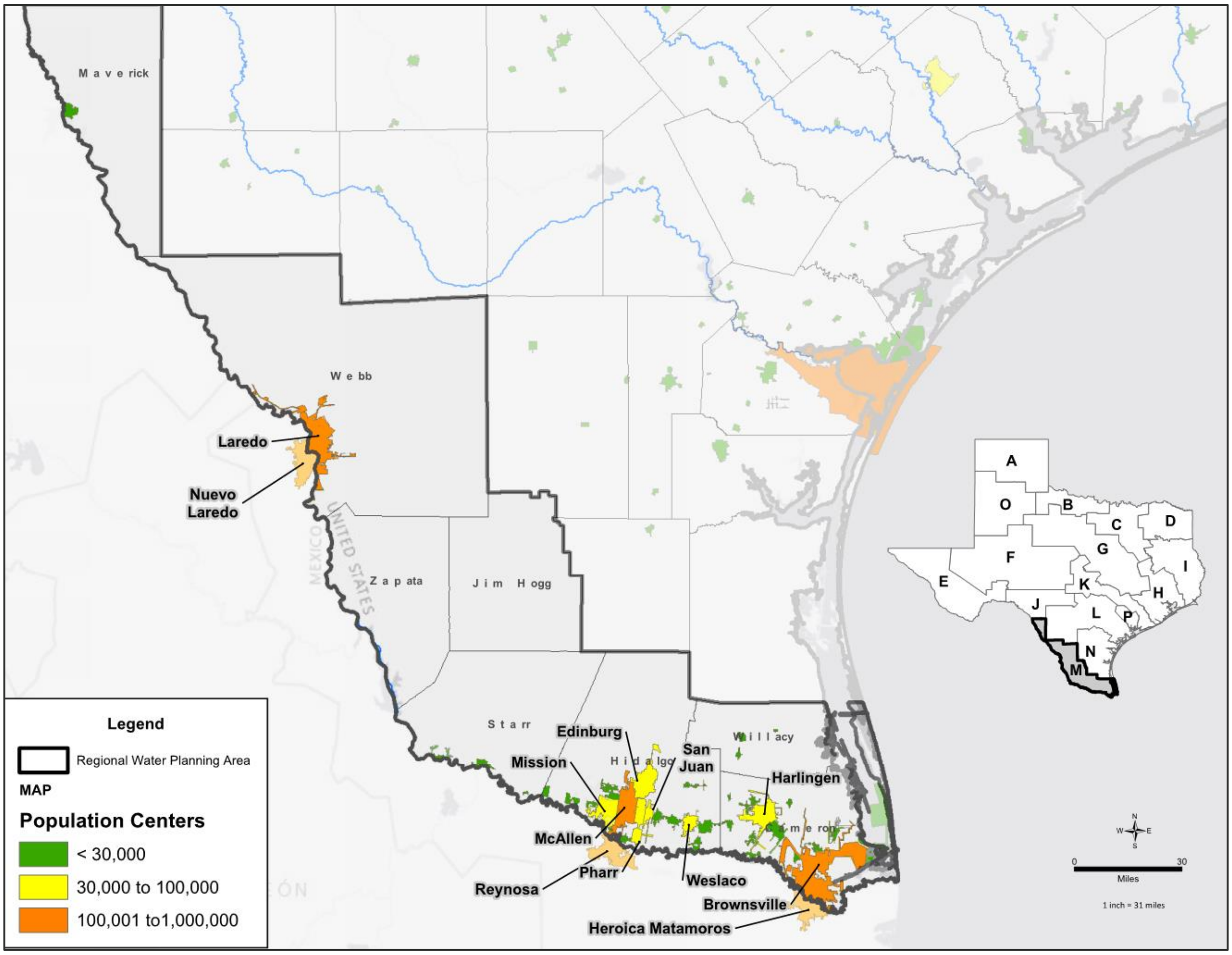

Figure 1-3 Population Centers of Region M

Historically, agriculture has dominated the economy of the Rio Grande Region. There has been a shift toward urbanization and diversification of the economy, but agriculture still plays a major role.

The 2017 United States Department of Agriculture (USDA) Census of Agriculture lists the total pre-tax income from farm-related sources as $46.02 million for Region M, of $1.19 billion across Texas. Grain

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[2] World Bank Population Growth Data. http://data.worldbank.org/indicator/SP.POP.GROW accessed 4/29/19.

[3] Estadísticas del Agua en Mexico, 2018. Gobierno de la República de México, Secretaría de Medio Ambiente y Recursos Naturales, Comission Nacional del Agua https://files.conagua.gob.mx/conagua/publicaciones/Publicaciones/EAM2018.pdf. Accessed 06/10/2019.

sorghum, sugarcane, cotton, citrus, and onions make up the bulk of the agriculture receipts in the region, and most of this is centered in Hidalgo and Cameron counties (Figure 1-4).[4] Cattle and farmland accounted for just under six million acres, almost 80 percent of the region's land area.

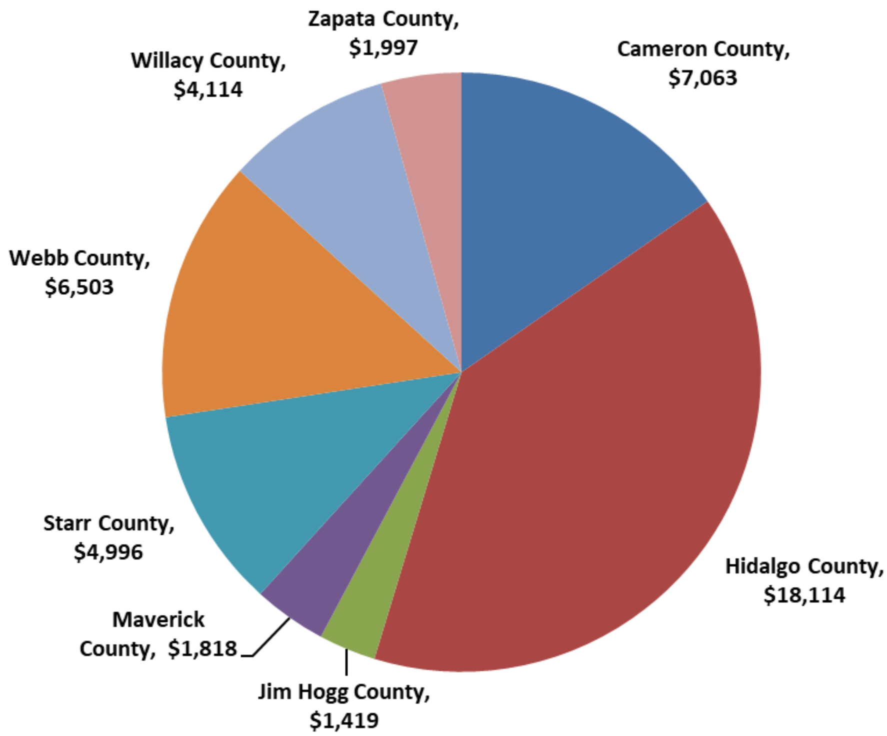

Figure 1-4 Pre-Tax Gross Farm Income by County ($1,000), USDA 2017 Agriculture Census

The Texas labor market forecasts for 2016 to 2026 predict 17.8 percent employment growth in the planning area. The major economic growth areas are construction, professional and business services, education and health services, and leisure and hospitality; information technology and mining show little to no growth.[5]

Oil and gas production in the region changed considerably in the 2000s from traditional oil drilling to hydraulic fracturing and nontraditional development, which had a significant impact on the regional economy and associated water demands. Mining water demands are discussed further in Chapter 2.

Nature tourism contributes considerably to the Rio Grande Valley economy. The Economic Impact of Travel on Texas report from 2018 shows that travel and visitor spending within the Rio Grande Valley is

[4] USDA. *2017 Agricultural Census*. www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/st48_2_0006_0006.pdf. Accessed 4/29/2019.

[5] Texas Labor Market and Career Information, Texas Workforce Commission. https://texaslmi.com/LMIbyCategory/Projections accessed May 14. Accessed 4/29/2019.

steadily increasing (Figure 1-5).[6] The quality of the river and its adjacent wildlife habitat will directly affect the number of ecotourists visiting the region in the future.

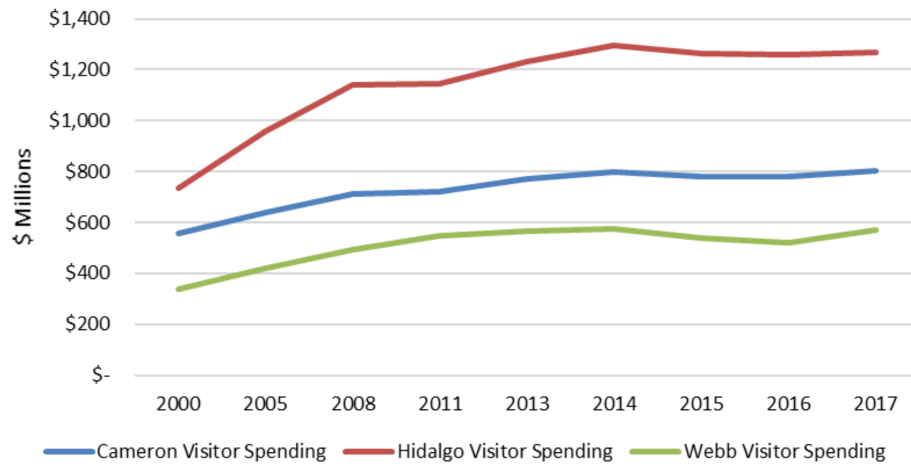

Figure 1-5 Direct County Travel Spending ($ Millions)

In spite of growth in some sectors of the economy, the region as a whole experiences significantly lower income and higher unemployment than the rest of Texas and the nation as a whole (Table 1-2). A clear division exists between the urban growth centers, (Brownsville, McAllen, Harlingen, and Laredo) and smaller rural towns and colonias. Colonias are semi-rural subdivisions that are often built with substandard potable water and sanitary sewer systems. The properties are often sold through a contract for deed, which is a loan from the seller to the buyer that is paid in installments while the seller retains the title. This arrangement does not allow the homeowner to access traditional home ownership financing. There have been efforts at the state, county, and local levels to provide basic services in many of the colonias in Region M.[7]

Table 1-2 Median Household Income, Poverty, and Unemployment Rate, by County

COUNTY	MEDIAN HOUSEHOLD INCOME, 2013-2017 ($/YEAR)[8]	PERSONS BELOW POVERTY LEVEL, 2013-2017 (%)[8]	UNEMPLOYMENT RATE, 2019 (%)[9]
Cameron	$36,095	27.70%	6.30%
Hidalgo	$37,097	29.50%	6.60%
Jim Hogg	$31,403	27.30%	5.90%
Maverick	$37,734	27.00%	9.40%

[6] Dean Runyan Associates. The Economic Impact of Travel on Texas. http://www.deanrunyan.com/doc_library/TXImp.pdf. Accessed 4/29/2019.
[7] Texas Secretary of State website. http://www.sos.state.tx.us/border/colonias/faqs.shtml. Accessed 2/25/2015.
[8] US Census Bureau State & County, *QuickFacts*. https://www.census.gov/quickfacts/fact/table/tx/INC110217. Accessed 4/29/2019.
[9] Bureau of Labor Statistics, Unemployment. https://data.bls.gov/map/MapToolServlet. Accessed 4/29/2019.

COUNTY	MEDIAN HOUSEHOLD INCOME, 2013-2017 ($/YEAR)[8]	PERSONS BELOW POVERTY LEVEL, 2013-2017 (%)[8]	UNEMPLOYMENT RATE, 2019 (%)[9]
Starr	$27,133	32.00%	10.40%
Webb	$40,442	27.30%	4.20%
Willacy	$29,104	35.00%	9.50%
Zapata	$34,550	30.00%	5.50%

As of 2019, seven out of the eight counties in Region M are labeled as eligible for funds through the Economically Distressed Areas Program.[10]

1.2.3 Surface Water Resources

Region M draws the majority of its water from the Rio Grande via the Amistad-Falcon Reservoir system, which is jointly operated with Mexico. Inflows to the watershed come from both the US and Mexican watersheds. Two major treaties between Mexico and the US (1906 and 1944) establish how these waters are shared. Annually, Mexico is to deliver a minimum of 350,000 acre-feet (acft) to the United States on average over a 5-year cycle. Exceptions are provided for years of extraordinary drought, when the watershed in Mexico cannot provide sufficient runoff water, or in cases of serious accident to hydraulic systems. The International Boundary and Water Commission (IBWC) manages the accounting of water in Mexican and US storage.

Releases from Amistad and Falcon reservoirs to deliver water to users are coordinated by the Rio Grande Watermaster. Amistad-Falcon reservoir system water rights are apportioned using classes of water rights (different from prior appropriation, which is used on most rivers in Texas). The three classes are domestic/municipal/industrial (DMI), and Class A and Class B, which are typically designated for irrigation and mining. Each water right holder has an annual maximum diversion, and each withdrawal of water is "charged to" their account. The exception to this is when the system is operating in excess flow and/or storage, so the Watermaster may declare a period of "no charge pumping."

The US portion of reservoir storage capacity is divided into storage pools that are designated for reservoir operations or fulfillment of water rights; each class of water rights has a dedicated storage pool in the reservoir accounting system as outlined in the Texas Administrative Code Chapter Subchapter C §303.22.[11] At the end of each month, dead storage (4,600 acft) and the DMI reserve pool (225,000 acft) are deducted from the US water storage. What water remains is divided among the

[10] Texas Water Development Board. Economically Distressed Areas Program Quarterly Report. March 1, 2019 – May 31, 2019. http://www.twdb.texas.gov/publications/reports/edap_reports/doc/Status.pdf?d=38112.29000001913. Accessed 7/8/2019.

[11] Texas Administrative Code https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=303&rl=22. Accessed 2/12/2020.

Class A and B end-of-month account balances, and, finally, 75,000 acft is set aside as the operating reserve.

When less water is available to Class A and B irrigation and mining accounts than the account balances, the pool is divided proportionately among the end-of-month account balances. However, Class A accounts receive 1.7 times the water available to Class B accounts. In a severe drought, there may not be any water remaining after the DMI and operational reserves are met, and Class A and B pools may not have water to allocate. This impacts not only farmers but also the functionality of the delivery systems, which rely on irrigation water for the operational baseline flows.

The Arroyo Colorado (Figure 1-6) flows approximately 90 miles from its headwaters southwest of the City of Mission, to its confluence with the Lower Laguna Madre in the northeast portion of Cameron County. The Arroyo Colorado is an ancient distributary channel of the Rio Grande River. The land area that drains into the Arroyo Colorado is known as the Arroyo Colorado Watershed. This area is approximately 706 square miles or 500,000 acres covering portions of three Texas counties (Hidalgo, Cameron, and Willacy) and over 25 municipalities in the Lower Rio Grande Valley. Approximately 330,000 acres of the watershed are used for agriculture. Agricultural producers in the watershed grow cotton, grain sorghum, corn, sugar cane, citrus, and vegetables because of the fertile soil, temperate climate, and access to irrigation water. Almost all the irrigation return flows and urban runoff from these areas are discharged into drainage canals which flow to the Arroyo Colorado and are the main source of excess nutrients entering the waterbody. Perennial (year-round) flow is sustained mainly by flows from municipal wastewater treatment facilities.

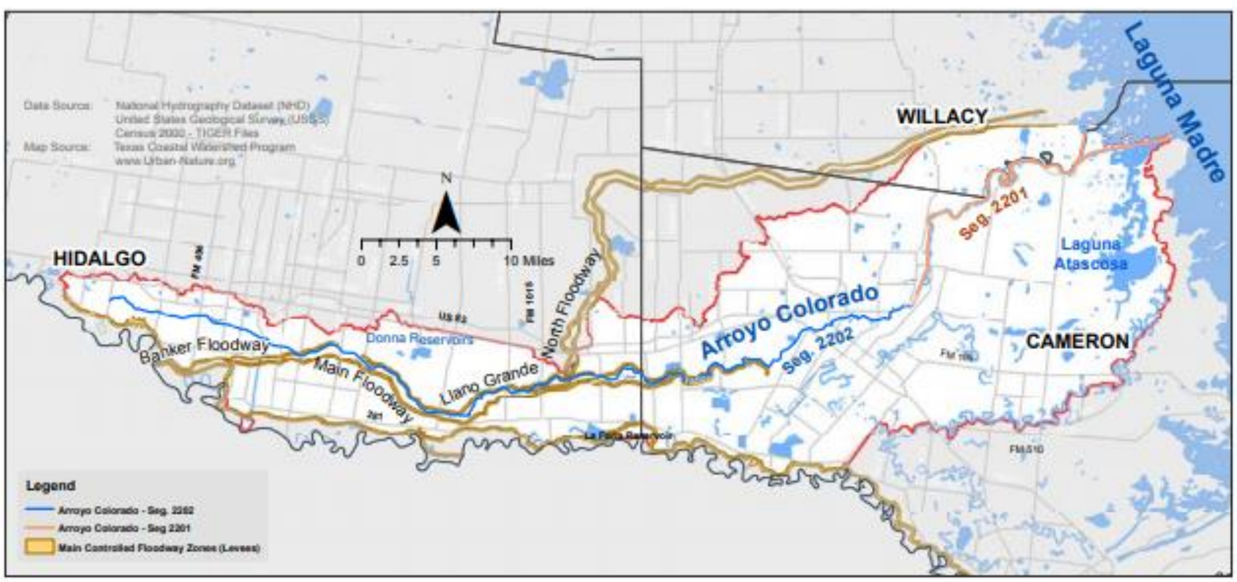

Figure 1-6 **Hydrologic Map of the Arroyo Colorado Showing Floodway Systems (Arroyo Colorado Watershed Protection Plan, 2017 update)[12]**

[12] Arroyo Colorado Watershed Protection Plan. https://arroyocolorado.org/.

The Arroyo Colorado River is the primary source of freshwater for the Lower Laguna Madre, which is one of only three hypersaline lagoons (i.e. saltier than the ocean) in the world and is considered the most productive hypersaline lagoon system. As a result of this, it is imperative not only that adequate amounts of fresh water flow into the Lower Laguna Madre but that the water quality meets the needs of the various uses of the water body including irrigation, recreation, industrial, municipal, and aquatic life. Having water of good quality not only improves the uses of the Arroyo Colorado but also improves the economy in the region. The Rio Grande and the Arroyo Colorado are discussed in detail in Chapter 3.

The three river basins in Region M are shown on Figure 1-7. The Rio Grande basin in Hidalgo and Cameron counties is a very narrow strip of land as a result of the river delta. The majority of water that is used in these counties is transported through irrigation districts from the Rio Grande basin for use in the coastal Nueces-Rio Grande basin and drains to the Gulf through drainage channels and the Arroyo Colorado.

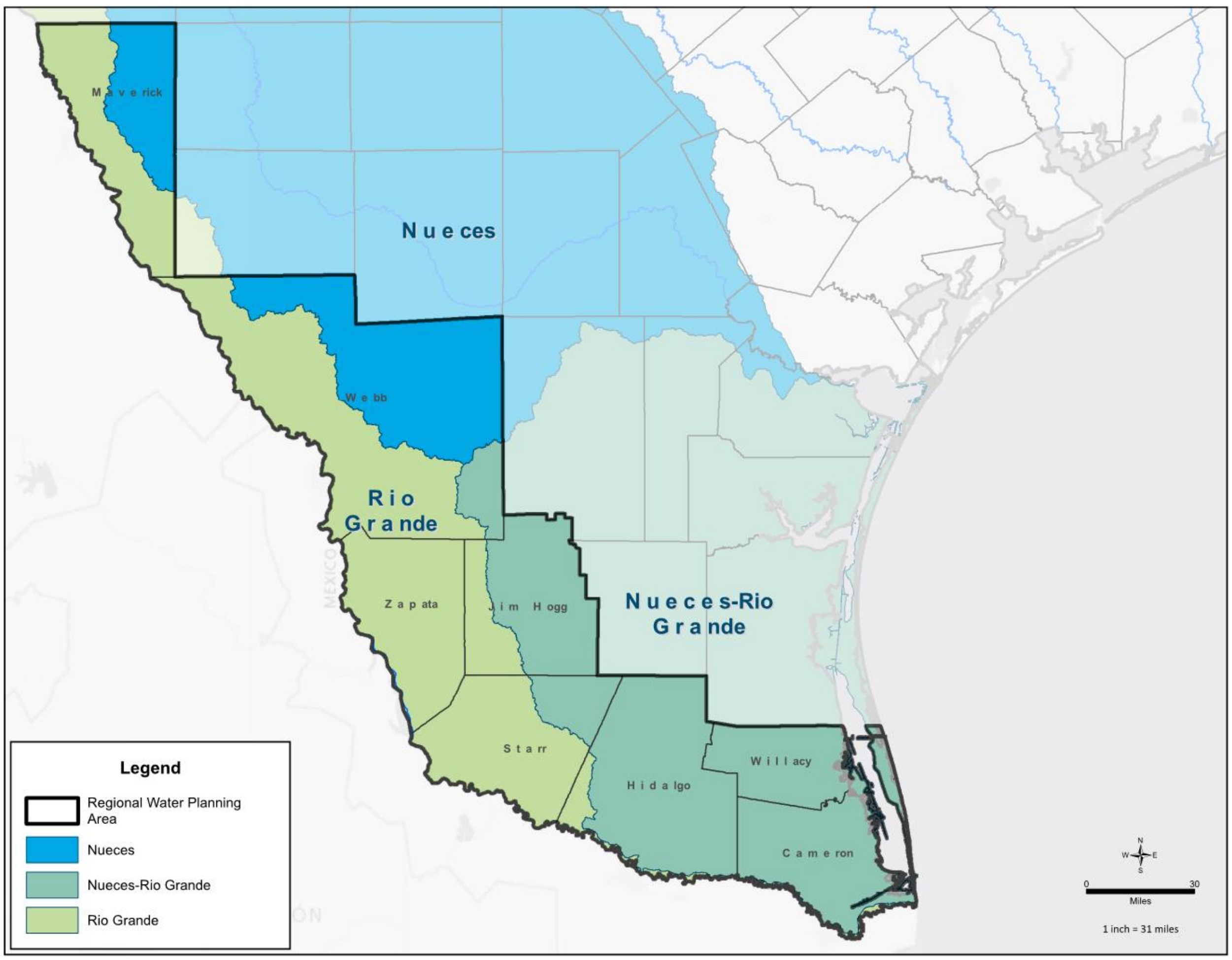

Figure 1-7 River Basins in Region M

1.2.4 Surface Water Quality

Surface water quality is addressed in this section for portions of two basins: the Rio Grande, which flows directly into the Gulf of Mexico, and the Arroyo Colorado, which discharges into the Laguna Madre and then into the Gulf of Mexico. In 1991, the Texas Legislature created the Texas Clean Rivers Program (CRP) to address water quality concerns in a coordinated manner.[13] The CRP conducts water quality monitoring, assessment, and public outreach across the state through partnerships between TCEQ and local agencies. The IBWC administers the CRP in the Rio Grande basin, and the Nueces River Authority administers both the Nueces and Nueces-Rio Grande basins. The programs include regular water sampling and coordinating with other agencies and residents to identify and evaluate water quality issues. The Region M Planning Group has considered the issues identified through the Texas CRP and Clean Water Act, which are discussed below.

The 1972 Federal Water Pollution Control Act, now called the Clean Water Act, is the federal law that establishes the framework for monitoring and control of point-source discharges through the National Pollutant Discharge Elimination System (NPDES), requires cities to obtain permits for stormwater or non-point-source discharges, and authorizes federal assistance for publicly owned treatment works.[14] The Clean Water Act has a national goal of "fishable, swimmable" water bodies, and states are required to identify any waters that do not meet this goal and develop total maximum daily loads (TMDLs) for the water bodies. TMDLs are intended to guide watershed management and are the basis of the monitoring and identification of river segments as impaired that is undertaken in the CRP.

Rio Grande water quality within Region M is evaluated in four segments over the Middle Rio Grande sub-basin and three segments in the Lower Rio Grande sub-basin. From Amistad Dam south to the confluence with the Rio Salado from Mexico, the river is impaired for contact recreation because of high bacteria, nitrates and low dissolved oxygen, and concern for toxicity and bacteria near Laredo as a result of urban runoff and discharges outside of US jurisdiction. Manadas Creek, an unclassified water body northwest of Laredo, has high bacteria and chlorophyll-a caused by urban runoff and high metal content from industrial activity. Falcon Reservoir is not impaired, but there is concern for toxicity near Zapata. San Felipe Creek is impaired for bacteria but has a positive effect on the Rio Grande water quality. The Lower Rio Grande sub-basin is separated into the freshwater stream and the stream impacted by tidal flows. The freshwater portion, which runs from Falcon Reservoir to downstream of Brownsville, is impaired in small reaches from consistently high bacteria counts near urban areas. Additionally, there are concerns across the entire segment for fish consumption because of elevated mercury levels. The tidal stream portion has no impairments but there can be high chlorophyll-a levels.

The Arroyo Colorado is the major drainage waterway for approximately two dozen cities in this area and almost 300,000 acres of farmland. The Arroyo Colorado includes the TCEQ Classified Stream Segments 2201 and 2202, which are impaired for high bacteria and experience high nutrient concentrations. Segment 2201 is also impaired for low dissolved oxygen.

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[13] International Boundary and Water Commission, US Section Texas Clean Rivers Program. *2015 Basin Highlights Report, Texas Rio Grande Basin Program Update*. http://www.ibwc.state.gov/CRP/Publications.html.
[14] United States Environmental Protection Agency (USEPA). Clean Water Act, http://www.epa.gov/agriculture/lcwa.html. Accessed 4/29/2019.

Regular monitoring of water quality as a result of these programs draws attention to the need for continued assessment and evaluation of water data and integrated regional approaches to managing the watersheds to meet quality goals.

1.2.5 Drought of Record

The drought of record (DOR) is the basis of the firm yield projection for each river basin. The DOR identifies the worst drought on record, and the firm yield is the supply that can be expected from that river or system in that most severe drought scenario. The firm yield and DOR are determined using the Rio Grande Water Availability Model (WAM), which models the existing system and demands under historical hydrologic flows. The Rio Grande WAM has a period of record from January 1940 to December 2000.

Typically, the DOR is defined as the longest period between full reservoir storage with firm-yield demands applied to the system over the period of record. The Amistad-Falcon Reservoir system is used to store water for Mexico and the United States using a storage pool accounting system. The total storage capacity and reservoir stages under firm yield demands are shown on Figure 1-8 for the combined storage (United States and Mexico) and the portion belonging to the United States. Critical drought start and end dates are shown, as well as the storage minima and the date they occurred.

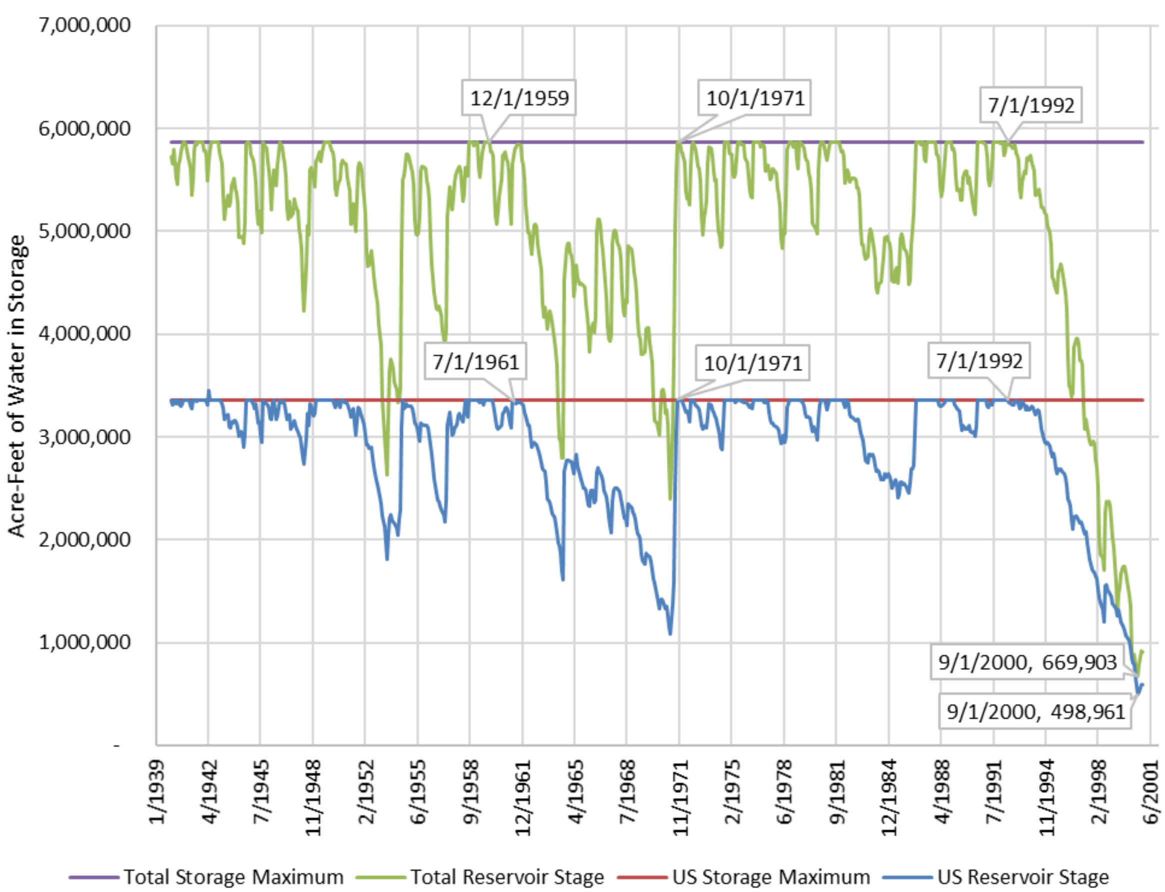

Figure 1-8 Modeled Reservoir Storage for the Amistad-Falcon System, US and Combined

The longest duration drought modeled for both the combined reservoir system and the US portion spans the 1960s: December 1959 (12/1959) to October 1971 (10/1971) for the combined system and June 1961 (6/1961) to October 1971 (10/1971) for the US portion.

The drought spanning from July 1992 to the end of the modeled period includes the minimum storage events for both the United States and combined systems, and the extent of the model does not include the end of the drought. The duration shown is shorter than the 1960s drought but is not a complete record.

The hydrologic record in the Rio Grande WAM, including all of the drought periods discussed, is used to predict firm yield over the planning horizon, given in Table 1-3.

Table 1-3 Firm Yield Projections, Amistad-Falcon Reservoir System 2020-2070 (acft/yr)

SOURCE	2020	2030	2040	2050	2060	2070
Amistad-Falcon Reservoir	1,079,381	1,079,175	1,078,968	1,078,762	1,078,555	1,078,349

The actual drought of the 2000s extended through approximately 2003, and if the WAM were updated to include those years, it might impact the DOR. Recent years have also seen severe drought in the region, and 2011 and 2012 data could similarly impact the DOR and, therefore, the firm yield projections. It was recommended in the 2016 RWP, and is the opinion of the RWPG, that the Rio Grande WAM should be updated regularly. The DOR is discussed in detail in Chapter 7.

1.2.6 Groundwater Resources

The major aquifer that underlies Region M is the Gulf Coast, which runs the extent of the Texas coast and Hidalgo, Starr, Jim Hogg, and the western portions of Willacy and Cameron counties. This aquifer is predominantly brackish, with irregular pockets of fresh and very saline water. The Carrizo-Wilcox Aquifer also spans Texas and extends through Webb and part of Maverick counties.

The minor aquifers in the region, including the Rio Grande Alluvium, the Laredo Formation, and the Yegua-Jackson Aquifer, may produce significant quantities of water that supply relatively small areas. Figure 1-9 shows the major and minor aquifers in Region M. A more detailed discussion of each of these groundwater sources is presented in Chapter 3.

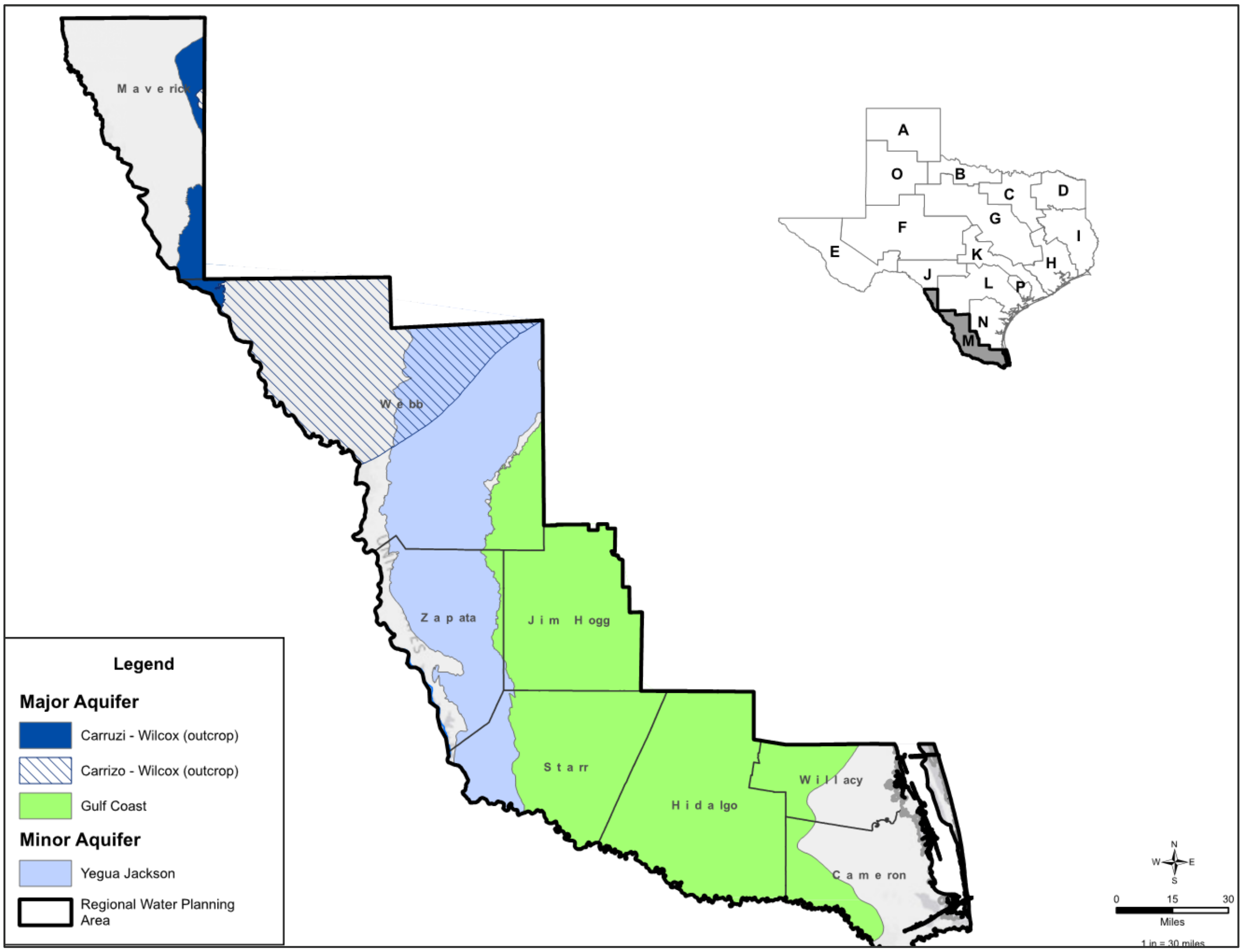

Figure 1-9 Major and Minor Aquifers in Region M

1.2.7 Groundwater Quality

In general, groundwater from the major aquifers in the region has total dissolved solids concentrations exceeding 1,000 milligrams per liter (mg/L) (slightly saline) and often exceeds 3,000 mg/L (moderately saline). There are, however, some areas of fresh and useable groundwater that constitute a critical supply for many towns, domestic needs in rural areas, and livestock. Localized areas of high boron content occur throughout the study area. In response to increased development of these resources, a 2014 report from TWDB's Brackish Resource Aquifer Characterization System (BRACS) program presented information on the brackish groundwater resources of the Lower Rio Grande Valley. Chapter 3 presents a detailed description of groundwater quality of the significant aquifers in the Rio Grande Region.

1.3 CURRENT WATER USE

The water user group (WUG) with the largest demand in Region M is irrigation, followed by municipal. Demand in other WUGs is comparatively small, as shown on Figure 1-10. Regional demand is concentrated in the Lower Rio Grande Valley, specifically Cameron, Hidalgo, and Willacy counties, with a significant municipal demand in the Laredo area of Webb County. Lower Rio Grande Valley users are primarily served by a network of irrigation districts that divert water to farmers and municipal utilities from the Rio Grande.

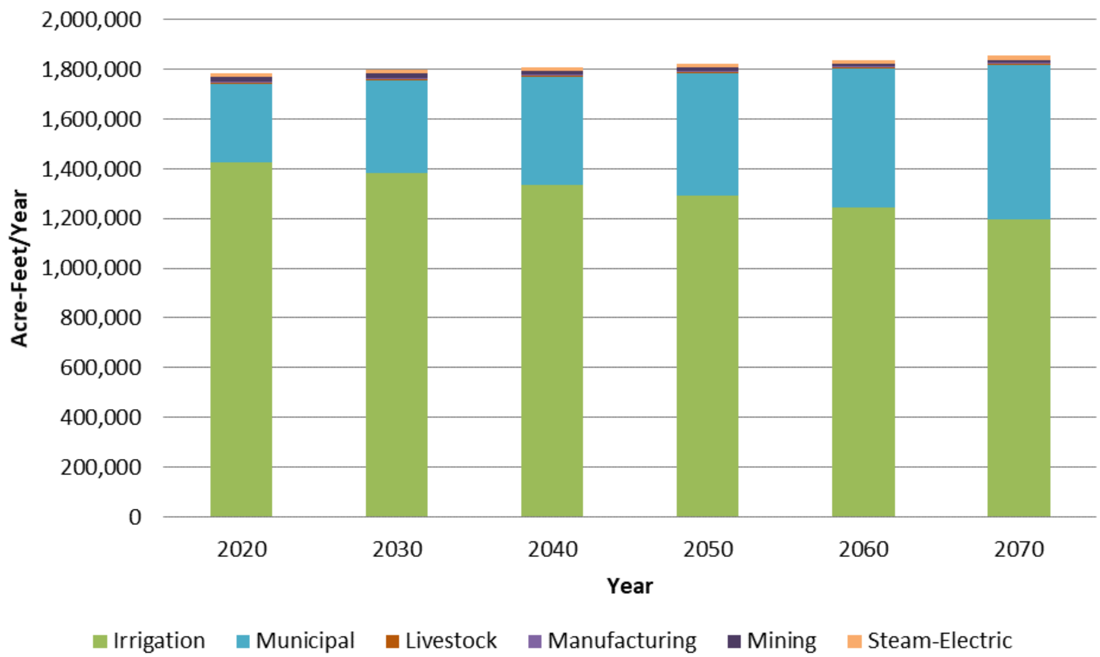

Figure 1-10 Water Demand Projections for Each WUG Type in Region M (acft/yr)

1.3.1 Demands

Municipal demands are expected to increase regionally from a projected 315,689 acre-feet/year (acft/yr) in 2020 to 620,040 acft/yr in 2070. Most municipal demand is currently met by treated surface water from the Rio Grande; however, eight brackish groundwater desalination plants have been built since 2000, supplying a total of approximately 24,000 acft/yr of treated potable water. Fresh groundwater availability is limited in the region and is used mostly as a backup water supply for utilities or for individual homes, particularly in rural and unincorporated areas, with a few exceptions.[15]

Projected irrigation demands are significantly greater than municipal demands (1.4 million acft/yr in 2020 and 1.1 million acft/yr in 2070) but are projected to decrease as a result of both urbanization of lands and increasing pressure on the water resources of the region. Supplies available to irrigators are curtailed significantly in drought years because irrigation and mining water rights are treated as residual users of stored water from the reservoirs.

[15] Military Highway Water Supply Corporation and the City of Hidalgo both have significant sources of well water.

The difference between drought year demand and use in a particular year for agricultural users can be significant. If a drought year is anticipated, farmers can prepare by planting crops and vegetables with lower water demands, which are often of lower value. Increases in farming efficiency can also allow irrigators to maintain higher value crops or higher yields in times with less available water. This RWP represents the worst-case scenario, wherein the demands are based on a dry year, and on-farm conservation is discussed as a water management strategy (WMS).

Livestock, mining, steam-electric power generation, and manufacturing demands make up a small portion of the total water use of the region. However, in some counties (Webb and Zapata), mining demands represent a significant portion of water usage.

1.3.2 Major Water Providers

Major Water Provider (MWP) is a new designation in the 2021 planning cycle; an MWP is any WUG or wholesale water provider of particular significance to a region's water supply, as determined by the RWPG. At the April 10, 2018, Region M meeting, the planning group approved the definition of an MWP as any entity that provides 3,000 acft or more of municipal water per year. According to current estimates of 2020 municipal supplies, the entities listed in Table 1-4 have been designated as MWP in the 2021 RWP.

Table 1-4 Region M Major Water Providers

MAJOR WATER PROVIDERS	
Agua Special Utility District (SUD)	Hidalgo County Irrigation District No. 16
Alamo	Hidalgo County Irrigation District No. 2
Bayview Irrigation District No. 11	Hidalgo County Irrigation District No. 6
Brownsville	Hidalgo County Water Improvement District (WID) No. 3
Brownsville Irrigation District	Laguna Madre Water District
Cameron County Irrigation District No. 2	Laredo
Cameron County Irrigation District No. 3 - La Feria	McAllen
Cameron County Irrigation District No. 6 - Los Fresnos	Military Highway Water Supply Corporation (WSC)
Cameron County WID No. 10	Mission
Delta Lake Irrigation District	North Alamo WSC
Donna Irrigation District-Hidalgo County No. 1	Pharr
Eagle Pass	Rio Grande City
East Rio Hondo WSC	San Benito
Edinburg	San Juan
Harlingen	Sharyland WSC
Harlingen Irrigation District-Cameron County No. 1	Southmost Regional Water Authority
Hidalgo and Cameron Counties Irrigation District No. 9	United Irrigation District

MAJOR WATER PROVIDERS	
Hidalgo County Irrigation District No. 1	Weslaco

1.3.3 Agricultural and Natural Resources

1.3.3.1 Topography, Geology, and Soils

The Rio Grande Region is located entirely within the Western Gulf Coastal Plains of the United States, an elevated sea bottom with low topographic relief. Topography in the region ranges from a rolling, undulating relief in the northwestern portion and becomes progressively flatter near the Gulf Coast. The lower portion of the region consists of a broad, flat plain that rises gently from sea level at the Gulf of Mexico in the east to an elevation of approximately 960 feet in the northern part of Maverick County at the upper end of the region. The western edge of this plain culminates in a westward-facing escarpment known as the Bordas Escarpment. Drainage in the region is by the Rio Grande and Nueces river basins and their tributaries. The Rio Grande River flows southeasterly through the region before turning east to its confluence with the Gulf of Mexico.

Geologic formations exposed in the region include Cretaceous, Tertiary, and Quaternary-aged deposits. In general, the geologic strata of the Rio Grande Region decrease in age from west to east across the area. The oldest strata, which are of Cretaceous age, outcrop in northwestern Maverick County and consist of chalky limestone and marl. The most recent sediments are located in Cameron County. In general, soils in the Rio Grande Region generally consist of calcareous to neutral clays, clay loams, and sandy loams.

1.3.3.2 Vegetation Areas (Biotic Communities)

Located within the Matamoran District of the Tamaulipan Biotic Province,[16] the Lower Rio Grande Valley is the northern boundary of much of the semitropical biota of Mexico. A number of plant and animal species from the more xeric and mesic areas to the west and northeast, respectively, converge in the Lower Rio Grande area.

Terrestrial Vegetative Types

The predominant vegetation type in this area is thorny brush, but there is overlap with the vegetative communities of the Chihuahuan Desert to the west, the Balconian Province to the north (Texas Hill Country), and the tropical plant communities of Mexico to the south. The result is unique and varied flora and fauna. Xeric plants such as mesquite (*Prosopis glandulosa*), leatherstem (*Jatropha dioica*), lotebrush (*Ziziphus obtusifolia*), and brasil (*Condalia hookeri*) are found in this area. Sugar hackberry (*Celtis laevigata*) and Texas persimmon (*Diospyra texana*), more prevalent to the north, are also located in the Lower Rio Grande Valley. Other common species such as lantana (*Lantana horrida*), Mexican olive (*Cordia boisierri*), and Texas ebony (*Pithecellobium ebano*) are typically more tropical in location. Montezuma bald cypress (*Taxodium mucronatum*), Gregg wild buckwheat (*Eriogonum greggi*), Texas ebony and anacahuita (*Mexican olive*) have their northernmost extension in the Lower Rio Grande Valley. More than 90 percent of total riparian vegetation and 95 percent of Tamaulipan thornscrub have

[16] Blair, F. W. 1950. The biotic provinces of Texas. The Texas Journal of Science 1(2):93-117.

been cleared since the 1900s. Surface water remains only briefly in arroyos following substantial rainfall. Because of this scarcity of water the resulting vegetation types are closely correlated to topographic characteristics.[17]

Eleven distinct biotic communities compose the Lower Rio Grande Valley, stretching from Falcon Reservoir to the Gulf of Mexico.[18] The communities to the northwest are arid, semi-desert, thorny brush. Vegetation communities toward the coast are comprised of more wetlands, marshes and saline environments (refer to Figure 1-11).

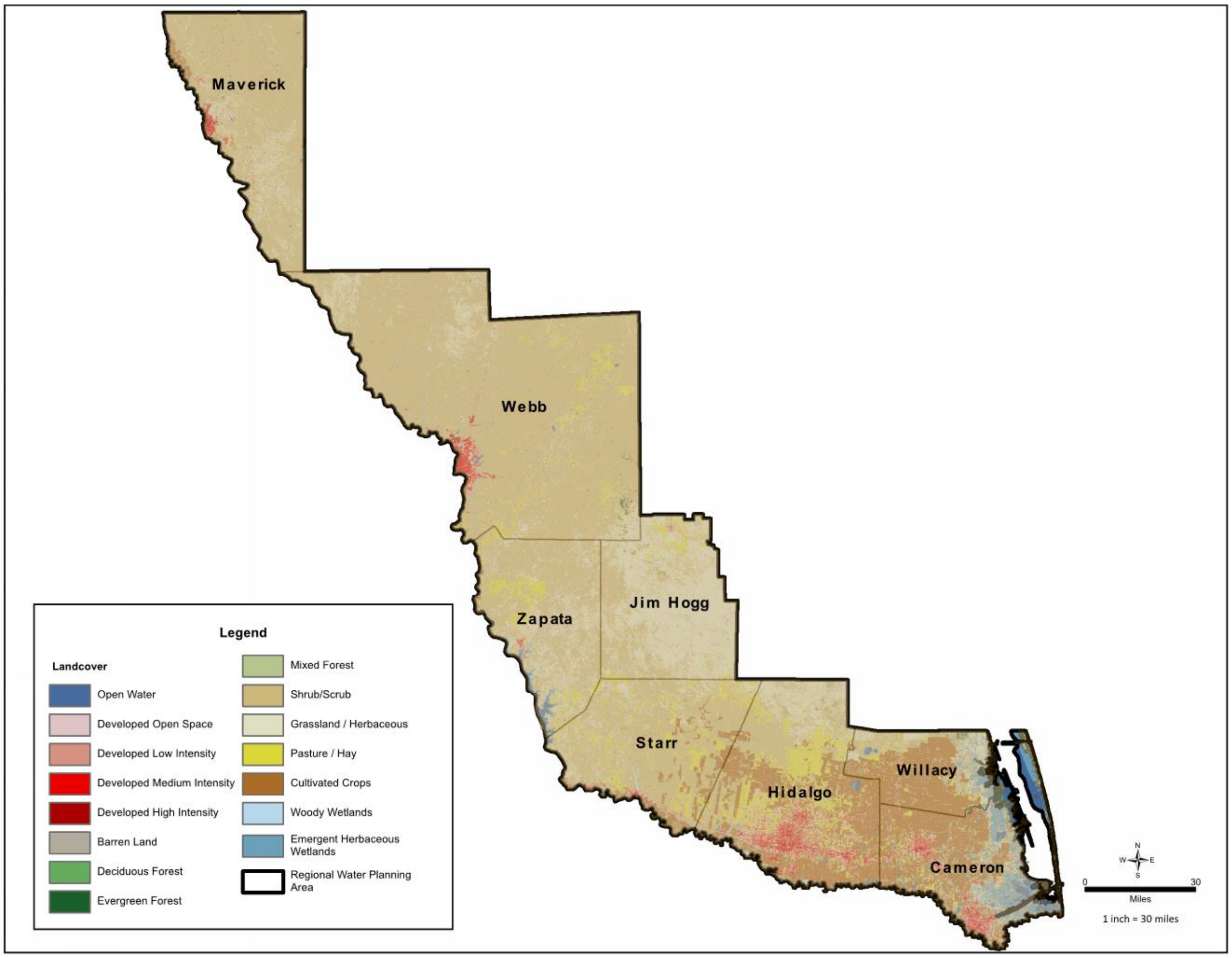

Figure 1-11 Region M Land Use Map

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[17] South Texas Sand Sheet, William R. Carr, Plant Resources Center, The University of Texas at Austin. http://w3.biosci.utexas.edu/prc/DigFlora/WRC/Carr-SandSheet.html

[18] U.S. Fish and Wildlife Service, 1997, Final Lower Rio Grande Valley and Santa Ana national wildlife refuges comprehensive conservation plan: U.S. Fish and Wildlife Service, Region 2, Albuquerque, N. Mex.

Ramaderos

This region, which occupies west-central Starr County, consists of arroyos that provide wildlife habitat.

Chihuahuan Thorn Forest

Located below Falcon Dam along the Rio Grande, the Chihuahuan Thorn Forest includes a narrow riparian zone and an upland desert shrub community. Rare plants such as the Montezuma bald cypress and the federally endangered Johnston's frankenia (*Frankenia johnstonii*) are found here, as well as such uncommon birds as the brown jay (*Cyanocorax morio*), ringed kingfisher (*Ceryle torquata*), and red-billed pigeon (*Columba flavirostris*).

Upper Valley Flood Forest

This community is located along the Rio Grande from south-central Starr County to the western border of Hidalgo County. The floodplain narrows in this region, with typical riverbank trees including Rio Grande ash (*Fraxinus berlandieriana*), sugar hackberry, black willow (*Salix nigra*), and cedar elm (*Ulmus crassifolia*). Only a short distance from the river, the dominant species shift to honey mesquite, granjeno (*Celtis pallida*), and prickly pear (*Opuntia lindheimeri*).

Barretal

The Barretal community occurs in southeastern Starr County, just north of the Upper Valley Flood Forest. Barreta (*Helietta parvifolia*), a small tree located on gravelly caliche hilltops, paloverde (*Parkinsonia texana*), guajillo (*Acacia berlandieri*), blackbrush (*Acacia rigidula*), anacahuita, yucca (*Yucca treculeana*), and many species of cacti are typical of this community.

Upland Thorn Scrub

Upland Thorn Scrub, the most common community in the Tamaulipan Biotic Province, occurs in southwestern Hidalgo County. Typical woody plants include anacahuita, cenizo (*Leucophyllum frutescens*), and paloverde.

Mid-Valley Riparian Woodland

This community is located along the Rio Grande from western Hidalgo County eastward to the Sabal Palm Forest. This tall, dense, closed-canopy bottomland hardwood forest is favored by chachalacas (*Ortalis vetula*) and green jays (*Cyanocorax yncas*), birds more typical of Mexico. Trees of this community include Rio Grande ash, sugar hackberry, black willow, cedar elm, Texas ebony, and anaqua (*Ehretia anacua*).

Woodland Potholes and Basins

Central Hidalgo County and western Willacy County contain this community of seasonal wetlands and playa lakes. Additionally, three hypersaline lakes are present, attracting migrating shorebirds. The federally endangered ocelot (*Leopardus pardalis*) occupies dense thickets in this area. Wetlands are located in low woodlands of honey mesquite, granjeno, prickly pear, lotebush, elbow bush (*Forestiera angustifolia*), and brasil.

Mid-Delta Thorn Forest

The Mid-Delta Thorn Forest originally covered eastern Hidalgo County, the western two-thirds of Cameron County, and southwest Willacy County. Conversion of land for agricultural and urban uses has left only isolated pockets of native vegetation remaining. Typical plants include honey mesquite, Texas ebony, coma (*Bumelia lanuginosa*), anacua, granjeno, colima (*Zanthoxylum fagara*), and other thicket-forming species. This region provides excellent wildlife habitat and is a preferred area for white-winged dove (*Zenaida asiatica*).

Sabal Palms Forest

This area of riparian forest contains the last remaining acreage of original Sabal Palm Forest in south Texas. It is located on the Rio Grande at the southernmost tip of Texas. Vegetation in this region includes Texas sabal palm (*Sabal texana*), Texas ebony, tepeguaje (*Leucaena pulverulenta*), anacua, brasil, and granjeno. The National Audubon Society's Sabal Palm Grove Sanctuary is located in this area.

Loma Tidal Flats

Located at the mouth of the Rio Grande, this community consists of clay dunes, saline flats, marshes, and shallow bays along the Gulf of Mexico. Sea ox-eye (*Borrichia frutescens*), saltwort (*Batis maritima*), glasswort (*Salicornia sp.*), gulf cordgrass (*Spartina spartinae*), Berlandier's fiddlewood (*Citharexylum berlandieri*), Texas ebony, and yucca are typical plants of this region.

Coastal Brushland Potholes

This community comprises dense brushy woodland around freshwater ponds, changing to low brush and grasslands around brackish ponds, and saline estuaries nearer the Gulf of Mexico. Typical plants include honey mesquite, granjeno, barbed-wire cactus (*Acanthocereus pentagonus*), and gulf cordgrass. Area wetlands provide important habitat for migratory wildlife.

Lower Laguna Madre

The Lower Laguna Madre is a hypersaline bay in the eastern portions of Cameron and Willacy counties. The Lower Laguna Madre is characterized by its shallow depth, approximately two feet on average, extensive seagrass meadows, and tidal flats. Small portions of the Lower Laguna Madre are estuarine in nature with more moderate to brackish salinities. The Arroyo Colorado and Rio Grande rivers provide most of the freshwater inflow to the bay; other drainage canals and floodways have smaller contributions. Freshwater from these sources aid in moderating salinities in the bay and are vital to the success of estuarine dependent aquatic species. The Lower Laguna Madre supports a wide variety of marine aquatic organisms and wildlife. It also supports considerable water-related recreational activities (boating, sport fishing, bird watching, etc.) and commercial fisheries.

1.3.3.3 Protected Areas

Public and private interests have created several refuges and preserves in the Lower Rio Grande Valley to protect remaining vegetation and the habitats of endangered and threatened species. These include the Lower Rio Grande Valley National Wildlife Corridor/Refuge, Laguna Atascosa National Wildlife Refuge (NWR), Santa Ana NWR, Anzalduas County Park, Falcon State Park (SP), Bentsen-Rio Grande Valley SP, Boca Chica SP, Las Palomas Wildlife Management Area (WMA), Arroyo Colorado WMA, Sabal

Palm Audubon Center and Sanctuary, the Nature Conservancy's Chihuahua Woods Preserve, the South Bay Coastal Preserve, Estero Llano Grande, and Resaca de la Palma.[19]

Nine local communities, United States Fish and Wildlife Service (USFWS), and the Texas Parks and Wildlife Department (TPWD) developed and completed the final stages of the World Birding Center in 2009.[20] The promotion of ecotourism and activities from wildlife watchers accounts for $125 million in commerce. These nine sites are considered world class birding destinations and attract thousands of visitors to view migratory birds and learn about conservation of natural resources.[21]

Lower Rio Grande Valley National Wildlife Refuge and Wildlife Corridor

The USFWS, with the support and assistance of the TPWD and several private organizations and individuals, is creating a wildlife corridor along the Rio Grande from Falcon Dam to the Gulf of Mexico. The wildlife refuge serves as the largest component of the Lower Rio Grande Wildlife Corridor and it currently includes 115 individual tracts totaling 91,000 acres. The completed refuge is projected to total 132,500 acres in fee and conservation easements. The wildlife refuges described below are part of this system. Additional acreage is purchased from willing sellers at fair market value or obtained through conservation easements.

Laguna Atascosa National Wildlife Refuge

Laguna Atascosa NWR contains more than 88,378 acres of land, providing essential habitat for a variety of south Texas wildlife. It is located north of the Rio Grande and south of the Arroyo Colorado along the Laguna Madre.

Santa Ana National Wildlife Refuge

This 2,088-acre refuge receives extensive bird watching attention because it is located at the convergence of two major migratory waterfowl flyways, the Central and the Mississippi. More than half of all butterfly species in the United States are found in this refuge.

Falcon State Park

This park, managed by the TPWD, contains over 500 acres above Falcon Dam. It is popular with bird watchers because of its diversity of bird species.

Sabal Palm Audubon Center and Sanctuary

This sanctuary, owned by the National Audubon Society, is located in the southernmost point of Texas on the Rio Grande. It is a 527-acre forested area that includes a substantial portion of the remaining sabal palm forest. The sanctuary is popular with bird watchers and other nature enthusiasts for its wildlife. The state threatened southern yellow bat (*Lasiurus ega*) is a year-round resident. The ocelot and jaguarundi (*Herpailurus yagouaroundi*) are believed to inhabit parts of the sanctuary.

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[19] Fish and Wildlife Service. Endangered and threatened species. https://www.fws.gov/. Accessed 4/11/2019.
[20] Glusac, Elaine. "The Texas Border Draws Frequent Fliers." *The New York Times*. 6 Apr. 2010. www.nytimes.com/2010/04/11/travel/11explorer.html. Accessed 4/11/2019.
[21] World Birding Center. http://www.worldbirdingcenter.org/. Accessed 4/11/2019 and https://pubs.usgs.gov/sir/2016/5078/sir20165078.pdf.

Bentsen-Rio Grande Valley State Park

This park, managed by the TPWD, is located west of Mission in Hidalgo County. It consists of almost 600 acres of subtropical resaca woodlands and brushland and is a popular bird-watching area. Boca Chica State Park, administered by Bentsen-Rio Grande Valley SP, is located in Southeastern Cameron County. Endangered and rare birds, such as brown pelicans, reddish egrets, osprey, peregrine falcons, and several others, are commonly found in the park area.

East Wildlife Foundation Ranchland

The East Wildlife Foundation is a nonprofit tax-exempt organization, the mission of which is to support wildlife conservation and other public benefits of ranching and private land stewardship. The foundation includes management of over 215,000 acres of native South Texas rangeland. This land is operated as six separate ranches in parts of Jim Hogg, Starr, Willacy, and Kenedy counties. Traditionally maintained as native rangeland and as working cattle ranches, the lands operated by the foundation are now managed as a field laboratory for discovery and problem solving.

1.3.3.4 Rare, Threatened, or Endangered Plant and Animal Species

The federal Endangered Species Act (ESA) of 1973, with amendments, provides a means to conserve endangered and threatened species and the ecosystems on which these species depend. The ESA provides for conservation programs for endangered and threatened species and indicates that agencies are to take steps as may be appropriate for achieving the purposes of conserving species of fish and wildlife protected by international treaty. Federal agencies are required to ensure that no actions that an agency would undertake will jeopardize the continued existence of any endangered or threatened species, except as provided by the ESA. Any federal permits required to implement components of this water plan would be subject to the terms of the ESA. Federally listed species present in Region M are shown in Table 1-5.

Table 1-5 Federally Threatened and Endangered Species in Region M [22]

TAXONOMY	SCIENTIFIC NAME	COMMON NAME	FEDERAL DESIGNATION
Birds	*Sternula antillarum athalassos*	Interior Least Tern	Endangered
Birds	*Falco femoralis septentrionalis*	Northern Aplomado Falcon	Endangered
Birds	*Charadrius melodus*	Piping Plover	Threatened
Birds	*Calidris canutus rufa*	Red Knot	Threatened
Birds	*Numenius borealis*	Eskimo Curlew	Endangered
Birds	*Setophaga chrysoparia*	Golden-Cheeked Warbler	Endangered
Mammals	*Leopardus pardalis*	Ocelot	Endangered

[22] Texas PWD Rare Threatened, and Endangered Species of Texas by County. https://tpwd.texas.gov/gis/rtest/. Accessed 7/9/2019.

TAXONOMY	SCIENTIFIC NAME	COMMON NAME	FEDERAL DESIGNATION
Mammals	*Megaptera novaeangliae*	Humpback Whale	Endangered
Plants	*Thymophylla tephroleuca*	Ashy Dogweed	Endangered
Plants	*Astrophytum asterias*	Star Cactus	Endangered
Plants	*Physaria thamnophila*	Zapata Bladderpod	Endangered
Plants	*Manihot walkerae*	Walker's Manioc	Endangered
Plants	*Ayenia limitaris*	Texas Ayenia	Endangered
Plants	*Ambrosia cheiranthifolia*	South Texas Ambrosia	Endangered
Mollusks	*Popenaias popeii*	Texas Hornshell	Endangered
Reptiles	*Caretta caretta*	Loggerhead Sea Turtle	Threatened
Reptiles	*Chelonia mydas*	Green Sea Turtle	Threatened
Reptiles	*Eretmochelys imbricata*	Atlantic Hawksbill Sea Turtle	Endangered
Reptiles	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle	Endangered
Reptiles	*Dermochelys coriacea*	Leatherback Sea Turtle	Endangered
Fish	*Dionda diaboli*	Devils River Minnow	Threatened
Fish	*Pristis pectinata*	Smalltooth Sawfish	Endangered

There are 14 USFWS federally listed threatened or endangered animal species. The Texas-Fish and Wildlife Service (FWS) lists 45 species as threatened or endangered.

1.3.4 Threats to Agricultural and Natural Resources

The Region M planning area is experiencing urbanization and growing demands on water on both sides of the border with Mexico and in neighboring regions.

1.3.4.1 Drought and Inflows from Mexico

Under DOR conditions, hydrologic simulations of reservoir operations indicate that surface water rights for irrigation will only be fulfilled between 30 and 45 percent of their authorized diversion. Irrigation and mining supplies are structured to vary along with availability and bear the associated economic costs of such shortages. In addition to drought, variability in deliveries from Mexico can impact the US water supplies and, therefore, water available for irrigation. The terms of the 1944 treaty grant 350,000 acft/yr to the US storage from Mexico, but this annual target is not always met (Figure 1-12). Figure 1-12 was the most recent graphic available with data through June 29, 2019. More specific (e.g. reservoir levels), and recent data and reports can be found at ibwc.gov.

The irrigation conservation WMSs discussed in this plan aim to assist farmers in making the most of what water is available in drought years. Agricultural shortages are managed through efficient water use, low water demand crop selection, and other irrigation best management practices, which are recommended in Chapter 5. Additionally, the RWPG has advocated for Mexico to meet the 1944 treaty water delivery obligation, described in Chapter 7.

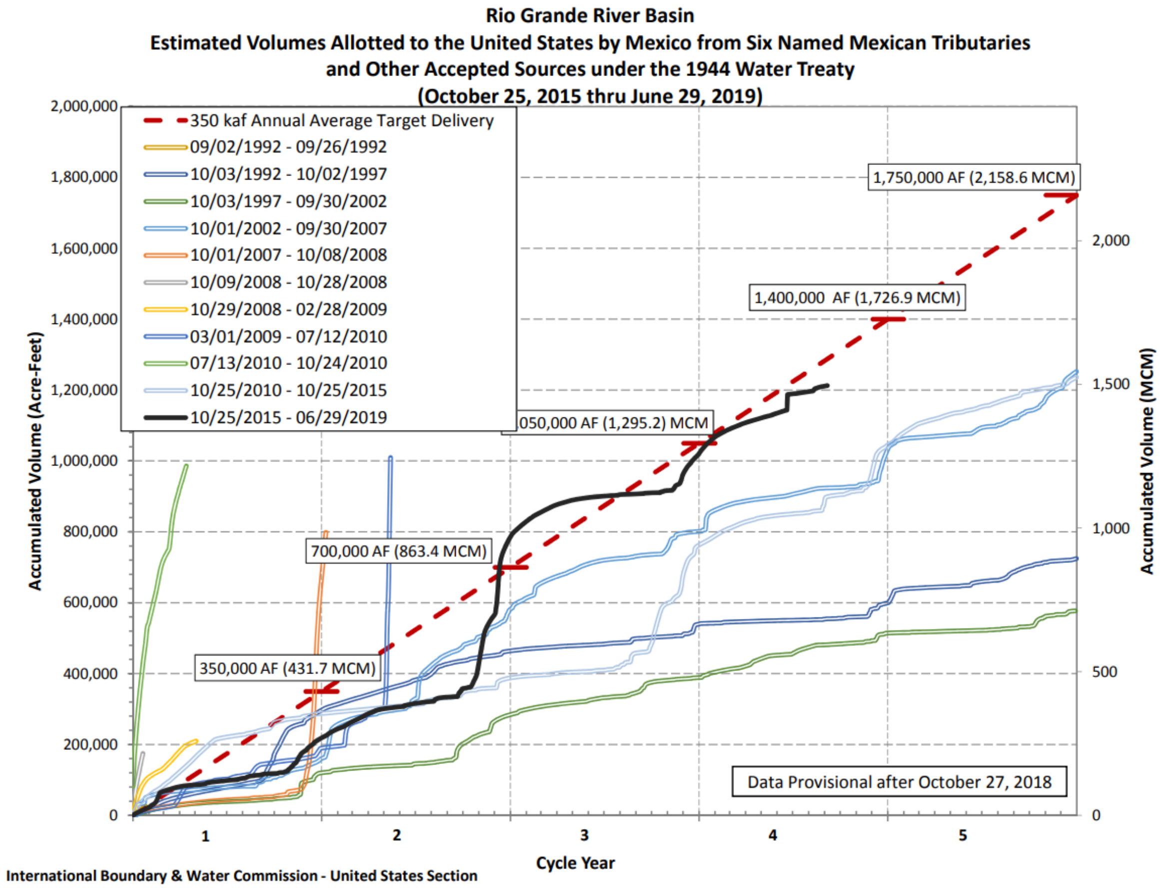

Figure 1-12 Water Delivered to the United States from Mexico, 1992 to 2019[23]

1.3.4.2 Groundwater Marketing

Drilling and marketing of groundwater in locations that may impact surface water, especially near the Amistad Dam, can impact stream and spring flows and reduce availability. Water marketing companies are actively seeking water sources to be sold to entities in need of new water sources. Recently, there has been substantial interest in groundwater in and around Val Verde County. In this particular area, strong evidence suggests interaction between groundwater and surface water. A 2017 study indicated that any commercial harvesting of groundwater for exportation in northern Val Verde County will have an adverse effect on the necessary environmental flows to maintain the unique fauna of the special and

[23] Mexico Deliveries During the Current 5-Year Cycle. https://ibwc.gov/Water_Data/mexico_deliveries.html. Accessed 9/28/2020.

threatened Devils River.[24] The pumping of groundwater in the Devils and Pecos river basins have been shown to directly impact these streamflows and the flows in Goodenough Springs, which play a significant role in supplying water for Region M. Any reduction in the water supply in the Amistad Reservoir presents a threat to the region. Policy recommendations from Region M have included further study into groundwater and surface water interactions.

1.3.4.3 Urbanization

Another threat to agricultural and natural resources of the region is the impact of ongoing and projected urbanization on currently undeveloped areas and the loss of water and habitat availability for wildlife. Increased pumping of groundwater from the Gulf Coast Aquifer and the Rio Grande Alluvium may threaten riparian habitats fringing resacas and potholes. This effect would have a negative impact on ecotourism. The lowering of Falcon Lake level due to reduced inflow could negatively impact the diversity of bird species that currently exists. WMSs in this plan that recommend groundwater use will be limited to the managed available groundwater for each aquifer.

Urbanization plays a major role in determining future demand. The impact can be quantified from previous rates of urbanization (loss of flat-rate acres and loss of irrigated acres) and the separation of water rights from the land as a part of the development process. Particularly in Cameron and Hidalgo counties, projected urbanization is expected to significantly reduce the area of irrigable farmland. Within the Lower Rio Grande Valley, urbanization is expected to be concentrated in corridors along State Highways 77 and 83, with some additional development through agricultural areas.

In addition to the direct reduction of irrigable farmland acreage due to change in land use, urbanization also impacts adjacent farmland by increasing property values and restricting some types of agricultural activities (e.g., use of pesticides). Urbanization impacts the effectiveness of irrigation district distribution networks by shifting land use to a patchwork of farmland and developed areas.

Irrigation districts play a critical role in the delivery of almost 85 percent of the water used in the region, including irrigation and municipal water. The improvements discussed in this plan for irrigation districts are intended not only to reduce the losses in their systems but also to allow for better management and controls over their systems and improved service to utilities.

1.4 EXISTING LOCAL AND REGIONAL WATER PLANS

1.4.1 Drought Planning

TCEQ requires water conservation plans to be developed, implemented, and submitted by municipal, industrial/mining, and other non-agricultural water right holders of 1,000 acft of water per year and agricultural water right holders of 10,000 acft/yr or more. Additionally, all wholesale and retail public water suppliers and irrigation districts are required to develop a drought contingency plan (DCP). Water conservation plans are required to include quantified 5- and 10-year targets for water savings, and DCPs

[24] Devils River Conservancy. "Study Links Groundwater and Surface Water in Devils River Basin." www.devilsriverconservancy.org/news-articles/2017/9/26/study-links-groundwater-and-surface-water-in-devils-river-basin. Accessed 4/15/2019.

outline entity responses to drought, including triggers for conservation stages and the restrictions of water use in each drought stage.

Because of these requirements and recent drought conditions, many communities in the Rio Grande Region have addressed drought preparedness and water conservation planning. A review of TCEQ records shows that many communities and irrigation districts in the region have water conservation and DCPs. Table 1-6 lists the date of the most recently filed water conservation and DCPs. It should be noted that smaller public water systems (i.e., those with fewer than 3,300 connections) were required to prepare drought plans but do not have to file their drought plans with the TCEQ.

Table 1-6 Local Water Plans Filed with TCEQ

ENTITY	WATER CONSERVATION PLAN DATE	DROUGHT CONTINGENCY PLAN DATE
Agua SUD	4/25/2019	4/25/2019
Alamo	-	3/28/2014
Bayview Irrigation District No. 11	5/6/2019	5/6/2019
Brownsville Irrigation District	5/15/2009	4/1/2014
Brownsville PUB	4/24/2019	4/24/2019
Bruni Rural WSC	1/24/2011	1/24/2011
Cameron County Irrigation District No. 2	4/24/2019	4/24/2019
Cameron County Irrigation District No. 6	-	3/14/2016
Delta Lake Irrigation District	9/19/2014	9/19/2014
Donna	-	9/1/2007
Donna Irrigation District	-	-
Eagle Pass Water Works System	9/15/2017	9/15/2017
East Rio Hondo WSC	6/25/2019	6/25/2019
Harlingen Irrigation District	5/19/2003	5/19/2003
Harlingen Waterworks System	6/15/2015	6/15/2015
Hidalgo	8/5/2019	-
Hidalgo Co. Drainage District No. 1	8/25/2014	8/25/2014
Hidalgo Co. Irrigation District No. 1	-	2/22/2007
Hidalgo Co. Irrigation District No. 2	4/18/2019	8/28/2014
Hidalgo Co. Irrigation District No. 5	4/30/2019	4/30/2019
Hidalgo Co. Irrigation District No. 6	4/30/2019	4/30/2019

ENTITY	WATER CONSERVATION PLAN DATE	DROUGHT CONTINGENCY PLAN DATE
Hidalgo Co. Irrigation District No. 9	-	-
Hidalgo Co. Irrigation District No. 13	-	4/22/2019
Hidalgo Water Improvement District No. 3	5/20/2019	5/20/2019
Jim Hogg County Irrigation District No. 2	3/31/2011	3/31/2011
Kenedy County	5/9/2017	-
La Feria Irrigation District	5/20/2019	5/20/2019
Laguna Madre Water District	3/13/2019	3/3/2019
Laredo	8/9/2019	8/9/2019
Los Fresnos	8/23/2019	8/23/2019
Lyford	-	7/24/2000
Maverick County Water Control and Improvement District No. 1	4/29/2019	4/29/2019
McAllen, McAllen Public Utility	6/4/2018	6/4/2018
Military Highway Water Supply Corporation	5/5/2014	5/5/2014
Mission Public Works Department	9/25/2019	9/25/2019
North Alamo WSC	9/17/2019	9/17/2019
North Cameron Regional WSC	-	9/11/2014
Olmito WSC	3/11/2019	3/11/2019
Pharr	4/22/2019	4/22/2019
Raymondville	8/28/2014	8/28/2014
Rio Grande City	-	5/1/2014
Rockwall	4/15/2019	4/15/2019
Roma	6/17/2014	6/17/2014
San Benito	8/1/2014	8/1/2014
San Juan	8/17/2011	-
San Ygnacio Municipal Utility District (MUD)	-	4/8/2014
Santa Cruz Irrigation District No. 15	-	5/31/2019
Sharyland WSC	7/16/2019	7/16/2019

ENTITY	WATER CONSERVATION PLAN DATE	DROUGHT CONTINGENCY PLAN DATE
Southmost Regional Water Authority	4/24/2019	4/24/2019
Union WSC	-	11/29/2011
United Irrigation District	8/31/2015	8/31/2015
Valley MUD No. 2	-	6/18/2013
Valley Acres Irrigation District	-	-
Weslaco	5/1/2009	5/1/2009
Zapata County Waterworks	7/13/2014	5/28/2013

The drought response varies from entity to entity, primarily between those who serve customers, including irrigators, with raw water and those who deliver treated water. For those entities, such as irrigation districts, that deliver water to irrigators, the response to drought is focused on the allocation system and how agricultural water rights are fulfilled when supplies are limited by the TCEQ Watermaster. Each water district responds slightly differently, in some cases allowing water to be sold between farmers in their district or for farmers to consolidate their allocation on a portion of their land, leaving other areas for dry land farming.

The entities that deliver treated water generally developed triggers that were either based on the balance remaining in municipal water rights accounts for that year or the capacities of their treatment plants, so that high demands on the plants trigger a conservation stage. The conservation stages for cities included limitations on car washing and lawn watering, ranging from voluntary in early stages to some fines or other penalties in later stages.

1.4.2 Existing Regional Water Plans

Immediately prior to the initiation of the SB1 regional water planning program, two regional water supply planning projects were conducted within the Rio Grande Region. In February 1998, Phase I of the South Texas Regional Water Supply Plan was completed under the sponsorship of the South Texas Development Council, with funding assistance from the TWDB. This plan addressed water supply needs in Jim Hogg, Starr, Webb, and Zapata counties. The report for this initial planning phase provided background data and identified key issues that need to be addressed in future water planning. Specific recommendations regarding water supply strategies were not developed.

In February 1999, the Integrated Water Resources Plan (IWRP) for the Lower Rio Grande Valley was completed. This planning effort was sponsored by the Lower Rio Grande Valley Development Council with funding from the TWDB, the US Economic Development Administration, the US Bureau of Reclamation, and local sources. This plan addressed water planning issues in Cameron, Hidalgo, and Willacy counties. In addition to comparing projected water supplies and demand, the IWRP makes specific recommendations for meeting future demands, including “improvements to the irrigation canal delivery system; aggressive water conservation efforts in all areas of consumption; and implementation of wastewater reuse, desalination of brackish groundwater and desalination of seawater where cost effective."

The Arroyo Colorado Watershed Protection Plan (WPP) is a comprehensive watershed-based strategy to improve water quality and aquatic and riparian habitat in the Arroyo Colorado River in South Texas. The Arroyo Colorado WPP was last updated in 2017 and is intended to be updated every 5 years.[25] The Arroyo Colorado Watershed Partnership, which is composed of stakeholders, has grown to over 720 members. In collaboration with the Lower Rio Grande Valley Texas Pollutant Discharge Elimination System (TPDES) stormwater task force and local citizens, the Arroyo Partnership installed more than 1,000 storm drains that read "No Dumping, Drains to Laguna Madre." Education and outreach activities occur on a daily basis, and over 32,000 individuals have experienced the watershed model, a hands-on water quality education tool that demonstrates the impact of pollution within the watershed. Numerous agriculture and wastewater infrastructure best management practices have been implemented.

The Lower Rio Grande Water Quality Initiative was formed to address persistent high bacteria and salinity levels in the Lower Rio Grande. The group led a bi-national effort to identify all potential discharges and develop a hydrologic model with the data, collected in 2014 and 2015.

The Texas Rio Grande Basin Clean Rivers Program includes regular water quality monitoring, special studies as needed, annual Basin Highlight Reports since 2011, and Basin Summary Reports every 5 years. The program also includes outreach and educational components that help volunteers, students, and partner organizations monitor, collect, and analyze samples.[26]

In 2013, the Bureau of Reclamation and the Rio Grande Regional Water Authority evaluated the impacts of climate change on the Lower Rio Grande Valley in a Basin Study and recommended brackish groundwater desalination as the best alternative water source to ensure reliability in the face of uncertain supplies. The study, funded by a grant through the WaterSMART program, reviewed a range of climate scenarios and identified a median of 84,000 acft/yr less water being available. In response to this reduction, the Basin Study proposed four brackish groundwater desalination facilities and a trunk line to connect three clusters of municipalities, centering around McAllen, Weslaco, and Harlingen. The concept was sized and phased using the Southmost Regional Water Authority model, which was designed to meet 40 percent of the demands of the member cities. The Basin Study has been used, in conjunction with detailed groundwater data gathered by the TWDB in the BRACS report, to inform other studies.

1.4.3 Public Water Supply Systems

The TWDB conducts water loss audits annually for retail water utilities. The breakdown of the aggregated water loss audits from Region M is summarized in Table 1-7. Since the 2016 RWP, the system input volume has increased from 62,947 million gallons to 74,376 million gallons, water losses have

[25] Arroyo Colorado Watershed Partnership. Update to the Arroyo Colorado Watershed Protection Plan, August 2017. http://arroyocolorado.org/media/671263/arroyo-colorado-wppfinaloptimized.pdf.
[26] IBWC. Clean Rivers Program. https://www.ibwc.gov/CRP/Index.htm.

dropped from 17.5 percent to 12.1 percent of total system input volume, and non-revenue water has decreased from 19.8 percent to 14.1 percent.

Table 1-7 Summary of Region M Water Loss Audit Data, 2017 (million gallons)

REGION M								
31 Audits Submitted								
System Input Volume								
74,376								
Authorized Consumption				Water Loss				
65,367				9,009				
87.9%				12.1%				
Billed Consumption		Unbilled Consumption		Apparent Loss			Real Loss	
63,905		1,463		1,763			7,246	
85.92%		1.97%		2.37%			9.74%	
Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Unauthorized Consumption	Customer Meter Accuracy Loss	Systematic Data Handling Discrepancy	Reported Breaks and Leaks	Unreported Loss
63,811	94	644	818	175	1,535	53	1,043	6,204
85.8%	0.1%	0.9%	1.1%	0.2%	2.1%	0.1%	1.4%	8.3%
Revenue Water		Non-Revenue Water						
63,905		10,472						
85.9%		14.1%						

FINAL PLAN

CHAPTER 2: POPULATION AND WATER DEMAND PROJECTIONS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

acft/yr	Acre-Feet per Year
BEG	Bureau of Economic Geology
DMI	Domestic/Municipal/Industrial
GPCD	Gallons per Capita per Day
MUD	Municipal Utility District
MWP	Major Water Provider
NASS	National Agricultural Statistical Service
PUD	Public Utility District
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SUD	Special Utility District
SWP	State Water Plan
TSDC	Texas State Data Center
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
WAM	Water Availability Model
WCID	Water Control & Improvement District
WID	Water Improvement District
WMS	Water Management Strategy
WSC	Water Supply Corporation
WUG	Water User Group
WWP	Wholesale Water Providers

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CHAPTER 2: POPULATION AND WATER DEMAND PROJECTIONS

2.1 INTRODUCTION

To plan for future growth, current water demands must be quantified, and trends must be identified in the change in demand. Region M has experienced changes in both the quantity and type of demands as a result of population growth, changes in irrigated farmland and the type of crops that are grown in any given year, changes in oil and gas mining operations, and other factors.

The Texas Water Development Board (TWDB) collaborated with the Regional Water Planning Groups (RWPGs) to develop demand projections for the region's water users, shown on Figure 2-1 and in Table 2-1. Population and municipal demands were estimated for cities and unincorporated areas for municipal water user group (WUG) projections. Other users were aggregated into geographical areas defined by county and river basin boundaries, such as irrigation and steam-electric power generation, to form the demand projections for all other WUGs. TWDB estimated demands using historical data and recent studies for each category to establish the base year. The base year was used with a rate of change to project decadal estimates over the 50-year planning horizon.

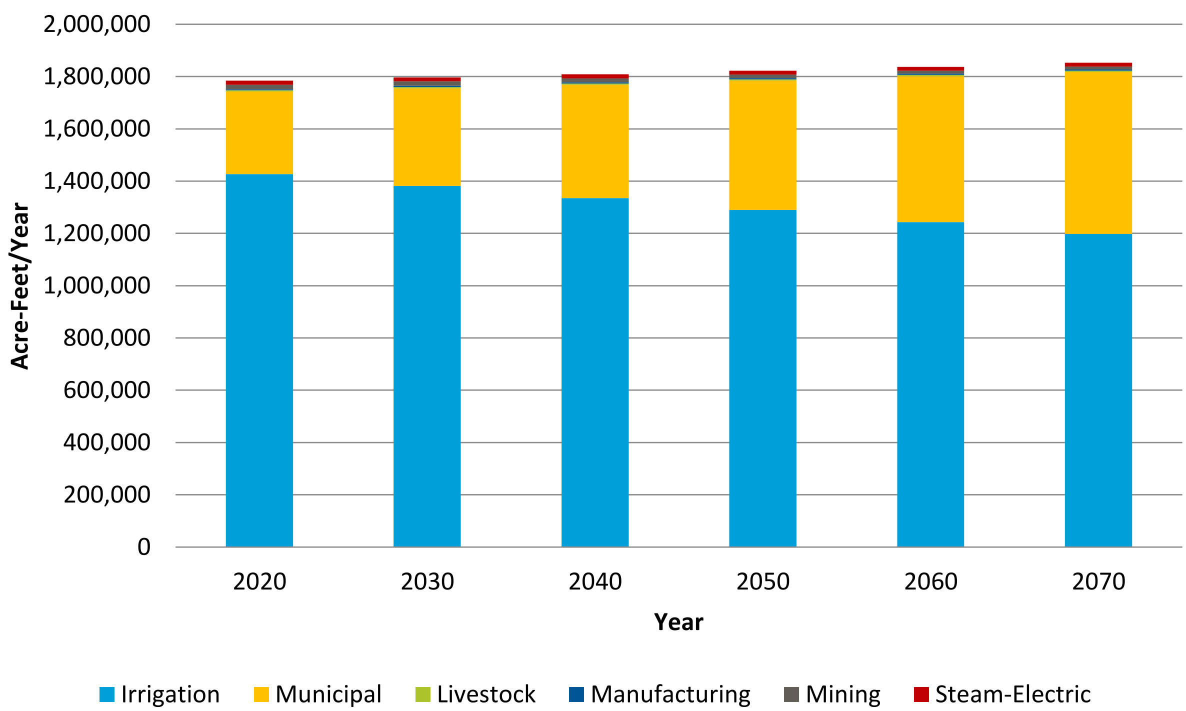

Figure 2-1 Aggregated Demands for Each Water User Group in Region M (acft/yr)

The TWDB draft demand projections were distributed to the RWPGs for review and were revised where necessary on the basis of local information. The Region M Planning Group adopted the TWDB estimates for manufacturing, steam-electric, and livestock demand. Revisions were requested and adopted for population, municipal demand, and irrigation demands.

Table 2-1 Regional Demand Projections by Water User Group (acft/yr)

WATER USER GROUP TYPE	2020	2030	2040	2050	2060	2070
Municipal	315,689	373,896	433,312	494,887	558,022	620,040
Irrigation	1,426,960	1,381,152	1,335,343	1,289,533	1,243,724	1,197,914
Livestock	4,748	4,748	4,748	4,748	4,748	4,748
Manufacturing	4,305	5,055	5,055	5,055	5,055	5,055
Mining	17,051	16,480	14,952	12,823	10,458	10,361
Steam-Electric	15,240	15,240	15,240	15,240	15,240	15,240
TOTAL	**1,783,993**	**1,796,571**	**1,808,650**	**1,822,286**	**1,837,247**	**1,853,358**

2.2 MUNICIPAL DEMANDS

2.2.1 Population Projections

The TWDB generated draft projections for population and municipal demand, which were reviewed by the RWPG and WUGs in the region. Proposed revisions were sent to the TWDB on behalf of the RWPG on December 15, 2017; an updated request followed on January 8, 2018. The TWDB reviewed the request and recommended adoption of the proposed changes on January 10, 2018; the changes were adopted by the Board on April 5, 2018.

The population of Region M has been growing at a slightly higher rate than the rest of the state of Texas. Figure 2-2 shows the major population centers within the region. Table 2-2 shows the population forecasted by county over the planning horizon.

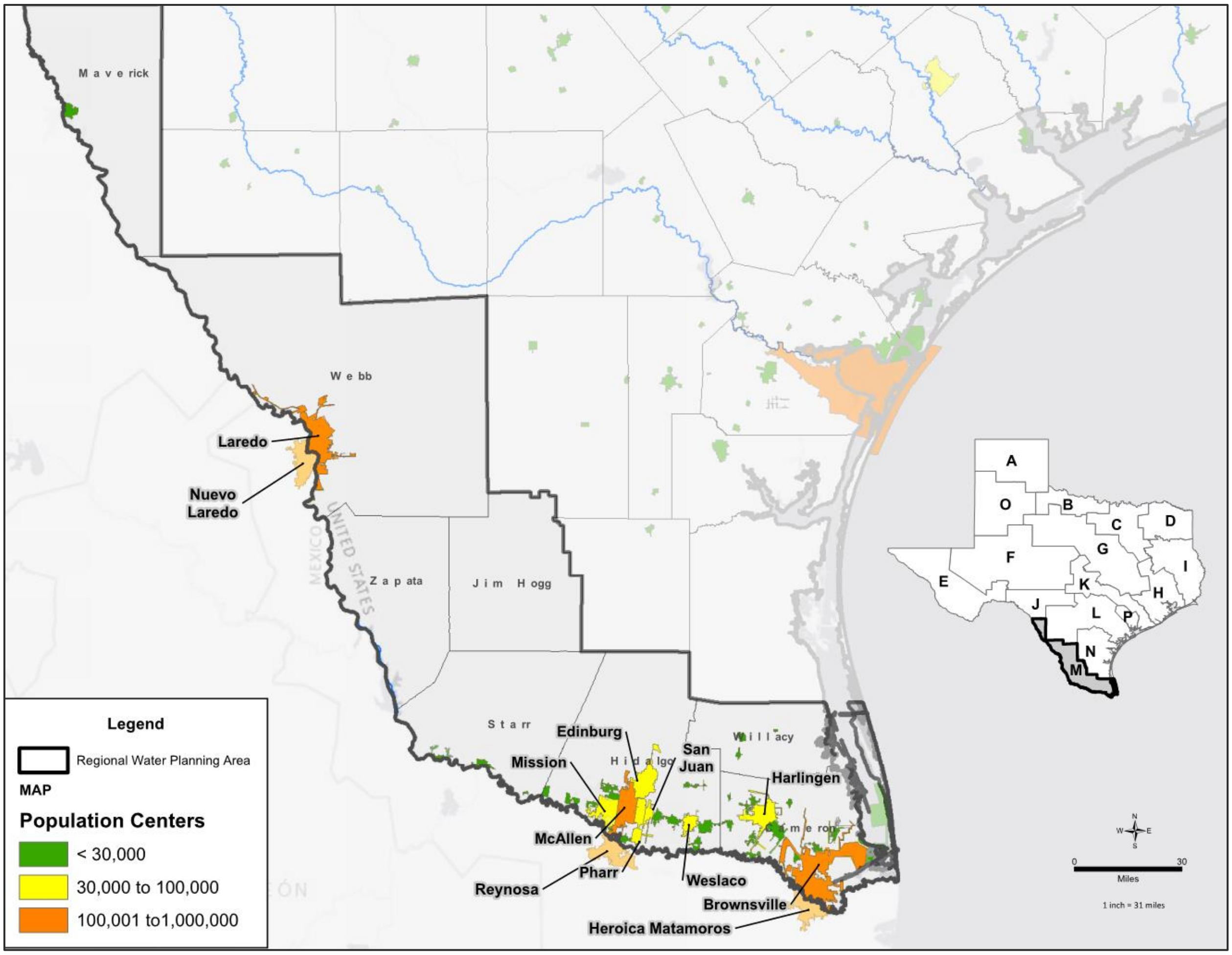

Figure 2-2 **Population Projections for Region M by County**

Table 2-2 **Population Growth Projections for Region M**

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	478,974	559,593	641,376	729,461	820,068	912,941
Hidalgo	981,890	1,219,225	1,457,502	1,696,257	1,935,015	2,167,137
Jim Hogg	5,853	6,356	6,790	7,274	7,694	8,082
Maverick	63,107	72,491	81,243	90,304	98,988	107,327
Starr	70,803	80,085	88,633	97,107	104,687	111,555
Webb	318,028	393,284	464,960	530,330	591,945	647,433
Willacy	25,264	28,479	31,559	34,840	38,012	41,121
Zapata	16,819	19,709	22,876	26,365	29,976	33,742
Total	**1,960,738**	**2,379,222**	**2,794,939**	**3,211,938**	**3,626,385**	**4,029,338**

County-level population projections are based on Texas State Data Center (TSDC) Office of the State Demographer county-level population estimates. The base year projections are based on the 2010 census, and projections were developed using demographic trends including birth rates, survival rates, and net migration rates for population cohorts separated by age, gender, and race/ethnicity. TSDC's projections extend to 2050, and the TWDB staff has extended the projection through 2070 by using the trend average annual growth rates of the 2011 to 2050 TSDC projections and the population projections in the 2017 State Water Plan as reassembled by utility service areas. Refer to Figure 2-3.

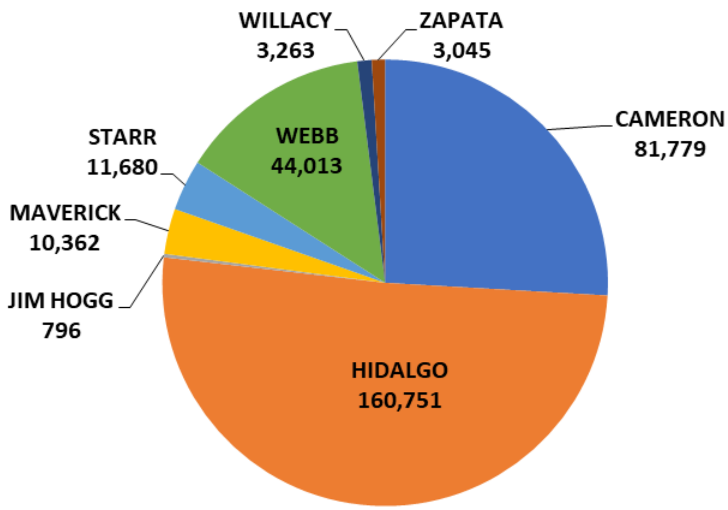

Figure 2-3 2020 Municipal Demand Distribution Among the Eight Counties of Region M (acft/yr)

The county-level projections were then distributed to a municipal utility level. Since the 2016 Regional Water Plan (RWP), TWDB rules re-defined WUGs based on utility service. Draft projections for the 2021 RWPs transitioned 2017 State Water Plan (SWP) population projections and the associated water demand projections from political boundary-based WUGs to utility service area boundaries. Municipal WUGs in the 2021 RWPs are defined as follows:

A. Privately-owned utilities that provide an average of more than 100 acre-feet per year (acft/yr) for municipal use for all owned water systems;
B. Water systems serving institutions or facilities owned by the state or federal government that provide more than 100 acft/yr for municipal use;
C. All other retail public utilities not covered in sections (A) and (B) that provide more than 100 acft/yr for municipal use;
D. Collective reporting units, or groups of retail public utilities that have a common association and are requested for inclusion by the RWPG; and
E. Municipal and domestic water use, referred to as "County-Other," not included in paragraphs (A) through (D) of this subsection.

The list of WUGs for the 2021 RWPs was prepared using the rules listed above and TWDB Water Use Survey data for 2010 to 2014.

The population projections (Table 2-3) for each WUG were developed by allocating growth from the county projections to each of the cities, utilities, and rural areas within that county. All county population not accounted for in a WUG is aggregated into a County-Other WUG, which represents unincorporated areas and utilities that do not meet WUG criteria. A combination of factors influences the allocation of growth, including the historical growth of a WUG or historical population and instances where a WUG is expected to have a constant population, such as a prison or military base. Where WUGs are split between counties, they are listed under each county with the portion of their population in that county and indicated by an asterisk. Detailed population projections split between county and river basin is included in Appendix A.1.

Table 2-3 Historical and Projected Population, by Decade

COUNTY; CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
CAMERON COUNTY							
Brownsville	167,647	207,603	247,009	286,983	330,172	374,323	419,718
Combes	2,892	3,411	3,986	4,567	5,195	5,840	6,501
County-Other, Cameron	35,975	24,051	22,713	26,714	29,660	33,841	34,621
East Rio Hondo Water Supply Corporation (WSC)*	23,728	27,978	32,687	33,340	37,155	40,906	45,540
El Jardin WSC	10,524	13,521	15,797	18,106	20,593	23,150	25,773
Harlingen	75,625	89,171	104,179	118,211	131,729	145,037	161,462
La Feria	7,302	8,610	10,059	11,530	13,113	14,742	16,411
Laguna Madre Water District	14,151	18,783	21,944	25,150	28,603	32,157	35,798
Los Fresnos	5,574	6,573	7,679	8,801	10,009	11,253	12,528
Military Highway WSC*	15,560	23,459	28,233	33,048	38,028	43,073	48,101
North Alamo WSC*	3,631	4,578	5,661	6,747	7,837	8,926	9,986
Olmito WSC	5,322	6,275	7,331	8,404	9,558	10,746	11,962
Palm Valley	1,304	1,350	1,364	1,377	1,391	1,405	1,419
Primera	4,036	4,758	5,560	6,373	7,247	8,148	9,070
Rio Hondo	2,355	2,777	3,244	3,718	4,229	4,755	5,292
San Benito	25,105	29,602	34,583	39,638	45,082	50,682	56,421
Santa Rosa	2,889	3,407	3,981	4,563	5,189	5,833	6,493
Valley Municipal Utility District (MUD) 2	2,600	3,067	3,583	4,106	4,671	5,251	5,845
Cameron County Total	**406,220**	**478,974**	**559,593**	**641,376**	**729,461**	**820,068**	**912,941**
HIDALGO COUNTY							
Agua Special Utility District (SUD)*	54,292	68,778	85,371	102,026	118,714	135,400	151,619

COUNTY; CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
Alamo	18,353	23,259	28,881	34,525	40,181	45,837	51,335
County-Other, Hidalgo	12,144	23,700	29,741	37,213	44,342	51,516	58,872
Donna	15,798	20,021	24,860	29,719	34,587	39,456	44,189
Edcouch	3,028	3,837	4,765	5,696	6,629	7,562	8,469
Edinburg	76,285	96,678	120,046	143,507	167,015	190,523	213,378
Elsa	5,809	7,362	9,140	10,927	12,717	14,508	16,248
Hidalgo	11,198	14,191	17,621	21,065	24,516	27,967	31,322
Hidalgo County MUD No. 1	6,242	7,909	8,937	9,912	10,843	11,737	12,576
La Joya	3,985	5,050	6,271	7,496	8,724	9,952	11,146
La Villa	1,979	2,508	3,114	3,723	4,332	4,942	5,536
McAllen	157,338	169,099	209,972	251,008	292,126	333,245	373,221
Mercedes	14,934	19,732	24,501	29,290	34,088	38,886	43,551
Military Highway WSC*	12,898	19,447	23,404	27,395	31,525	35,707	39,874
Mission	76,521	96,978	120,418	143,951	167,532	191,114	214,039
North Alamo WSC*	129,228	162,960	201,502	240,156	278,948	317,715	355,415
Pharr	66,692	89,220	110,785	132,436	154,131	175,826	196,917
San Juan	17,757	34,508	42,849	51,223	59,614	68,005	76,163
Sharyland WSC	57,176	72,459	89,974	107,558	125,178	142,798	159,928
Weslaco	33,112	44,194	57,073	68,676	80,515	92,319	103,339
Hidalgo County Total	***774,769***	***981,890***	***1,219,225***	***1,457,502***	***1,696,257***	***1,935,015***	***2,167,137***
JIM HOGG COUNTY							
County-Other, Jim Hogg	1,145	1,264	1,372	1,466	1,571	1,662	1,746
Jim Hogg County Water Control & Improvement District (WCID) 2	4,155	4,589	4,984	5,324	5,703	6,032	6,336
Jim Hogg County Total	**5,300**	**5,853**	**6,356**	**6,790**	**7,274**	**7,694**	**8,082**
MAVERICK COUNTY							
County-Other, Maverick	8,540	4,317	3,964	3,634	3,294	2,967	2,651
Eagle Pass	44,358	57,119	66,607	75,457	84,618	93,399	101,833
Maverick County	1,360	1,671	1,920	2,152	2,392	2,622	2,843
Maverick County Total	**54,258**	**63,107**	**72,491**	**81,243**	**90,304**	**98,988**	**107,327**
STARR COUNTY							
Agua SUD*	250	317	393	470	547	623	698

COUNTY; CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
County-Other, Starr	5,087	5,341	6,007	6,610	7,215	7,744	8,219
El Sauz WSC	1,504	1,617	1,829	2,025	2,218	2,391	2,548
El Tanque WSC	1,850	1,858	2,102	2,326	2,548	2,747	2,928
La Grulla	6,297	7,314	8,273	9,158	10,031	10,815	11,522
Rio Grande City	17,484	20,304	22,966	25,418	27,848	30,022	31,991
Rio WSC	5,468	6,224	7,040	7,791	8,535	9,202	9,806
Roma	17,748	20,613	23,314	25,803	28,271	30,476	32,476
Union WSC	5,280	7,215	8,161	9,032	9,894	10,667	11,367
Starr County Total	**60,968**	**70,803**	**80,085**	**88,633**	**97,107**	**104,687**	**111,555**
WEBB COUNTY							
County-Other, Webb	1,981	2,585	3,199	3,781	4,312	4,813	5,265
Laredo	237,000	301,124	372,380	440,247	502,142	560,482	613,020
Mirando City WSC	541	620	766	906	1,033	1,153	1,261
Webb County	10,782	13,699	16,939	20,026	22,843	25,497	27,887
Webb County Total	**250,304**	**318,028**	**393,284**	**464,960**	**530,330**	**591,945**	**647,433**
WILLACY COUNTY							
County-Other, Willacy	3,977	416	472	525	579	629	684
East Rio Hondo WSC*	31	37	41	46	50	55	59
Lyford	2,671	2,981	3,360	3,723	4,110	4,485	4,851
North Alamo WSC*	3,676	6,406	7,220	8,000	8,832	9,637	10,424
Port Mansfield Public Utility District (PUD)	277	592	668	740	817	891	964
Raymondville	9,564	12,619	14,224	15,762	17,401	18,986	20,538
Sebastian Mud	1,938	2,213	2,494	2,763	3,051	3,329	3,601
Willacy County Total	**22,134**	**25,264**	**28,479**	**31,559**	**34,840**	**38,012**	**41,121**
ZAPATA COUNTY							
County-Other, Zapata	434	866	981	1,138	1,304	1,538	1,701
Falcon Rural WSC	794	863	990	1,119	1,225	1,321	1,408
San Ygnacio MUD	835	1,002	1,174	1,363	1,571	1,786	2,010
Siesta Shores WCID	1,373	1,617	1,910	2,240	2,582	2,936	3,304
Zapata County	10,132	12,126	14,250	16,547	19,142	21,780	24,627
Zapata County WCID-Hwy 16 East	450	345	404	469	541	615	692
Zapata County Total	**14,018**	**16,819**	**19,709**	**22,876**	**26,365**	**29,976**	**33,742**

COUNTY; CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
*WUGs are in more than one county; population splits are shown.							

2.2.2 Municipal Water Demand Projections

Municipal water demand projections utilize the population projections and a per-person water use volume (gallons per capita per day, GPCD). The base year uses a dry year (most commonly 2011) GPCD values for water utility and rural areas (county-other). Over the planning horizon, GPCD gradually declines based on natural replacement rates for adoption of water-efficient fixtures and appliances known as "passive conservation." For each municipal WUG, the projected GPCD is multiplied by the projected population for each future decade to develop municipal water demand projections. When calculating the base (2011) or projected GPCD values, TWDB staff applied a minimum of 60 GPCD.[1]

The efficiency gains that are applied to GPCD are based on new construction and gradual replacement of fixtures and appliances in existing homes. The fixtures that were included in this estimate are toilets, showerheads, dishwashers, and clothes washers. Total water savings are based on the phased implementation of federal efficiency requirements for each of these kinds of fixtures/appliances and assumptions about the rate at which new homes are constructed and old fixtures are replaced.[2] This is considered passive conservation and measures beyond those described above are included in the discussion of advanced water conservation as a water management strategy (WMS) in later chapters. The regional average GPCD for 2020 is 143.4 and in 2070 is 123.9, which is a 13.6 percent reduction in per-capita daily demand over 50 years. GPCD for all Region M WUGs is shown in Table 2-4.

Table 2-4 GPCD and Projected Municipal WUG Demands by County (Acre-Feet/year)

COUNTY; CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
CAMERON COUNTY							
Brownsville	162	35,477	41,198	47,168	53,886	60,982	68,336
Combes	94	321	357	396	444	497	553
County-Other, Cameron	155	3,931	3,618	4,176	4,590	5,226	5,343
East Rio Hondo WSC	132	3,895	4,452	4,483	4,963	5,452	6,065
El Jardin WSC	109	1,526	1,729	1,945	2,191	2,456	2,732

[1] The 60 GPCD minimum was based on the "Standard New Homes Retrofitted…" estimate of 39 GPCD for indoor use (Analysis of Water Use in New Single Family Homes, Prepared by William B. DeOreo of Aquacraft Water Engineering & Management for the Salt Lake City Corporation and the USEPA, 2011) and an estimate that indoor use accounts for 69 percent of total household use (The Grass is Always Greener…Outdoor Residential Water Use in Texas, Sam Marie Hermitte and Robert Mace, TWDB Technical Note 12-01, 2012). The total of 56.5 GPCD is rounded up to account for additional local government and commercial water use.

[2] For details regarding the way efficiency improvements were calculated, refer to the Regional Water Planning Documentation, Projection Methodology for Draft Population and Municipal Demands, TWDB.

COUNTY; CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
Harlingen	168	15,797	17,992	20,088	22,212	24,412	27,160
La Feria	126	1,125	1,274	1,432	1,612	1,808	2,011
Laguna Madre Water District	386	7,930	9,179	10,461	11,865	13,330	14,835
Los Fresnos	60	442	516	592	673	756	842
Military Highway WSC	144	3,556	4,177	4,821	5,509	6,227	6,950
North Alamo WSC	153	742	900	1,062	1,227	1,395	1,560
Olmito WSC	175	1,159	1,321	1,490	1,682	1,888	2,100
Palm Valley	176	250	246	244	244	246	248
Primera	87	418	467	521	585	655	728
Rio Hondo	75	203	224	250	284	320	356
San Benito	123	3,733	4,195	4,688	5,267	5,906	6,570
Santa Rosa	88	296	326	360	402	450	500
Valley MUD 2	294	978	1,129	1,284	1,455	1,634	1,819
Cameron County Total		**81,779**	**93,300**	**105,461**	**119,091**	**133,640**	**148,708**
HIDALGO COUNTY							
Agua SUD	104	7,375	8,883	10,449	12,064	13,724	15,355
Alamo	133	3,230	3,908	4,607	5,326	6,064	6,786
County-Other, Hidalgo	121	2,873	3,562	4,439	5,274	6,114	6,982
Donna	127	2,610	3,126	3,659	4,218	4,802	5,374
Edcouch	91	343	401	463	531	603	675
Edinburg	128	12,974	15,730	18,573	21,484	24,459	27,374
Elsa	112	832	987	1,150	1,322	1,504	1,683
Hidalgo	125	1,858	2,253	2,661	3,079	3,505	3,923
Hidalgo County MUD 1	100	816	896	979	1,063	1,147	1,228
La Joya	125	651	783	919	1,060	1,207	1,350
La Villa	108	277	332	388	448	509	570
McAllen	220	39,787	48,510	57,403	66,492	75,765	84,820
Mercedes	111	2,222	2,648	3,090	3,558	4,048	4,530
Military Highway WSC	144	2,948	3,462	3,996	4,567	5,162	5,761

COUNTY; CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
Mission	193	20,070	24,532	29,086	33,717	38,414	43,002
North Alamo WSC	153	26,417	32,031	37,785	43,670	49,653	55,513
Pharr	108	9,923	11,933	14,020	16,182	18,415	20,606
San Juan	137	4,947	5,990	7,063	8,166	9,298	10,407
Sharyland WSC	169	12,901	15,628	18,421	21,302	24,263	27,160
Weslaco	165	7,697	9,711	11,550	13,443	15,391	17,218
Hidalgo County Total		**160,751**	**195,306**	**230,701**	**266,966**	**304,047**	**340,317**
JIM HOGG COUNTY							
County-Other, Jim Hogg	118	153	159	165	174	184	193
Jim Hogg County WCID 2	135	643	675	702	743	783	822
Jim Hogg County Total		**796**	**834**	**867**	**917**	**967**	**1,015**
MAVERICK COUNTY							
County-Other, Maverick	128	576	514	463	416	374	334
Eagle Pass	159	9,545	10,839	12,074	13,429	14,795	16,122
Maverick County	138	241	268	295	324	355	384
Maverick County Total		**10,362**	**11,621**	**12,832**	**14,169**	**15,524**	**16,840**
STARR COUNTY							
Agua SUD	104	34	41	48	56	63	71
County-Other, Starr	124	679	734	785	846	906	961
El Sauz WSC	99	163	177	191	207	222	237
El Tanque WSC	142	276	305	332	360	388	413
La Grulla	169	1,308	1,445	1,575	1,712	1,842	1,962
Rio Grande City	223	4,850	5,386	5,889	6,413	6,905	7,355
Rio WSC	100	643	706	767	832	894	952
Roma	117	2,466	2,681	2,890	3,124	3,359	3,577
Union WSC	164	1,261	1,402	1,535	1,672	1,800	1,917
Starr County Total		**11,680**	**12,877**	**14,012**	**15,222**	**16,379**	**17,445**

COUNTY; CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
WEBB COUNTY							
County-Other, Webb	116	302	356	414	471	525	573
Laredo	134	42,028	50,530	58,812	66,591	74,190	81,096
Mirando City WSC	109	69	83	96	108	121	132
Webb County	115	1,614	1,929	2,239	2,532	2,819	3,082
Webb County Total		**44,013**	**52,898**	**61,561**	**69,702**	**77,655**	**84,883**
WILLACY COUNTY							
County-Other, Willacy	118	52	58	65	71	77	84
East Rio Hondo WSC	132	5	6	6	7	7	8
Lyford	96	290	314	338	367	399	431
North Alamo WSC	153	1,038	1,148	1,259	1,383	1,506	1,628
Port Mansfield PUD	358	231	259	285	313	342	369
Raymondville	115	1,490	1,618	1,747	1,904	2,072	2,239
Sebastian MUD	73	157	168	186	205	224	242
Willacy County Total		**3,263**	**3,571**	**3,886**	**4,250**	**4,627**	**5,001**
ZAPATA COUNTY							
County-Other, Zapata	138	122	136	157	180	211	233
Falcon Rural WSC	177	163	183	205	222	240	255
San Ygnacio MUD	179	189	216	247	283	321	361
Siesta Shores WCID	132	222	254	291	333	377	424
Zapata County	175	2,247	2,582	2,956	3,396	3,857	4,359
Zapata County WCID-Hwy 16 East	275	102	118	136	156	177	199
Zapata County Total		**3,045**	**3,489**	**3,992**	**4,570**	**5,183**	**5,831**

2.2.3 Major Water Provider Demands

Major Water Provider (MWP) is a new designation in the 2021 planning cycle; an MWP is any WUG or wholesale water provider (WWP) of particular significance to the water supply of a region, as determined by the RWPG. At the April 10, 2018, Region M meeting, the planning group approved the definition of an MWP as any entity that provides 3,000 acft or more of municipal water per year. According to current estimates of 2020 municipal supplies, the entities listed in Table 2-5 have been designated as MWP in the 2021 RWP. Appendix B includes the population and demand projections for the MWPs.

Table 2-5 Region M Major Water Providers

MAJOR WATER PROVIDERS	
Agua Special Utility District (SUD)	Hidalgo County Irrigation District No. 16
Alamo	Hidalgo County Irrigation District No. 2
Bayview Irrigation District No. 11	Hidalgo County Irrigation District No. 6
Brownsville PUB	Hidalgo County Water Improvement District (WID) No. 3
Brownsville Irrigation District	Laguna Madre Water District
Cameron County Irrigation District No. 2	Laredo
Cameron County Irrigation District No. 3 - La Feria	McAllen
Cameron County Irrigation District No. 6 - Los Fresnos	Military Highway Water Supply Corporation (WSC)
Cameron County Water Improvement District No. 10	Mission
Delta Lake Irrigation District	North Alamo WSC
Donna Irrigation District-Hidalgo County No. 1	Pharr
Eagle Pass	Rio Grande City
East Rio Hondo WSC	San Benito
Edinburg	San Juan
Harlingen	Sharyland WSC
Harlingen Irrigation District-Cameron County No. 1	Southmost Regional Water Authority
Hidalgo and Cameron Counties Irrigation District No. 9	United Irrigation District
Hidalgo County Irrigation District No. 1	Weslaco

Irrigation districts[3] divert and deliver raw water to irrigated farmland, municipalities, and some industrial and livestock water users. There are 24 irrigation districts in Region M that operate under the Texas Water Code, each of which has its own internal operating policies (Figure 2-4). The physical distribution networks are earthen canals, concrete lined canals, and pipeline. Irrigation districts are discussed in more detail in Chapter 3.

[3] For simplicity, the following designations will be referred to collectively as irrigation districts in this plan: irrigation districts, water control and improvement districts, water improvement districts, and other similar designations.

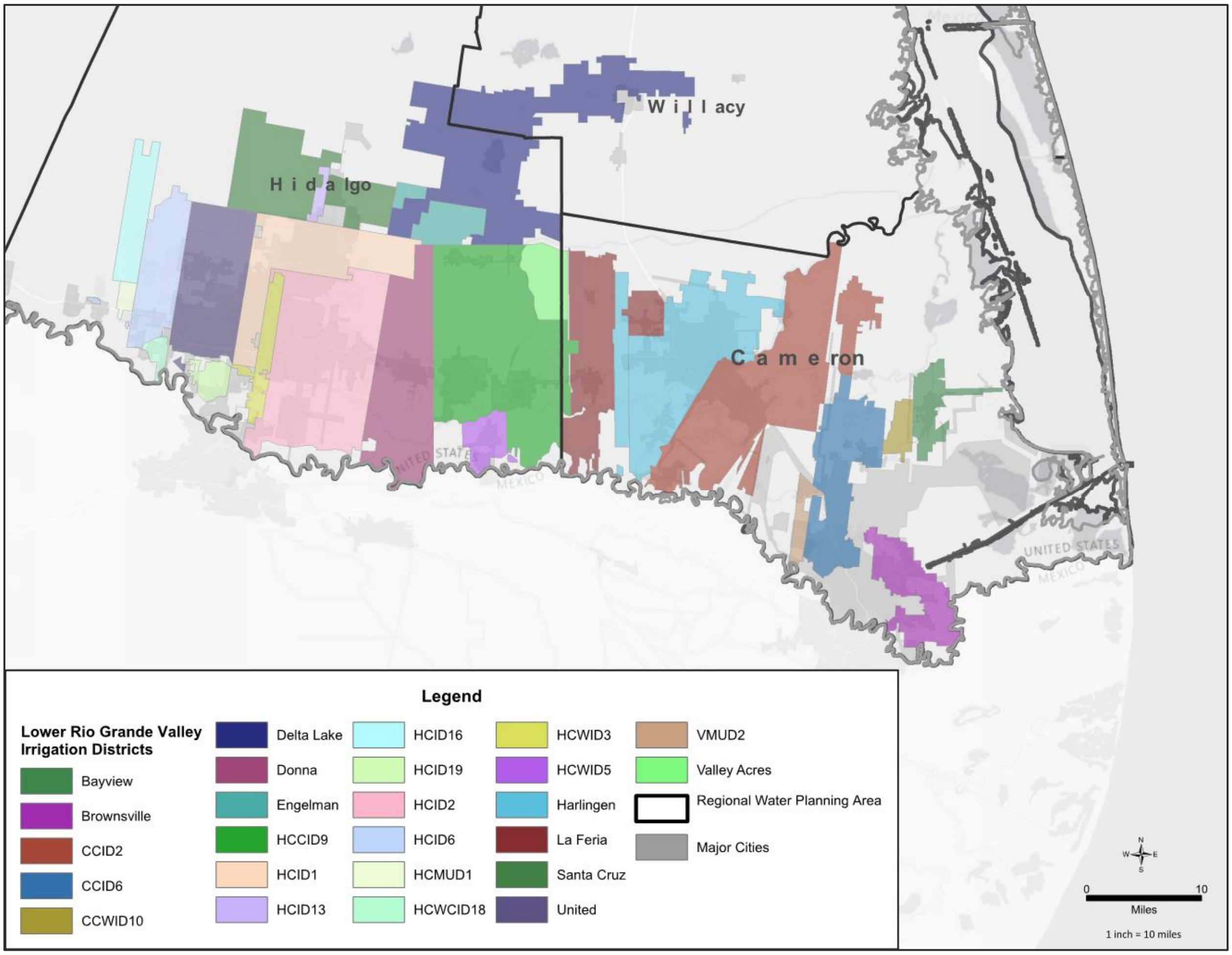

Figure 2-4 Lower Rio Grande Valley Irrigation Districts

WSCs cover most of the rural area in the Lower Rio Grande Valley and supply many of the populated rural areas in the western counties. The largest are North Alamo WSC, East Rio Hondo WSC, Sharyland WSC, and Military Highway WSC, which all treat and deliver both surface and groundwater to significant unincorporated and rural areas and portions of cities. Additionally, the larger municipal utilities in the region are considered MWPs, which include Alamo, Brownsville PUB, Eagle Pass, Edinburg, Harlingen, Laredo, McAllen, Pharr, Rio Grande City, San Benito, San Juan, and Weslaco.

2.3 MANUFACTURING WATER DEMAND PROJECTIONS

The primary manufacturing water users in Region M are related to the agriculture industry and the fishing industry, including sugar and vegetable processing. As detailed in Table 2-6, manufacturing projections show an increase from 4,305 acft/yr in decade 2020 to 5,055 acft/yr in decade 2030, which remains constant to decade 2070. The increase in demand occurs primarily in Cameron and Hidalgo counties. These 2021 RWP projections represent an approximate 59 percent to 66 percent reduction in demand from the 2016 RWP manufacturing projections. However, the 2016 RWP projections were based on 2004 to 2008 data, which predates the recession of the late 2000s and, therefore, overestimated economic growth.

Table 2-6 Manufacturing Demand Projections by County (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	1,647	1,846	1,846	1,846	1,846	1,846
Hidalgo	2,236	2,721	2,721	2,721	2,721	2,721
Jim Hogg	2	2	2	2	2	2
Maverick	65	65	65	65	65	65
Starr	95	116	116	116	116	116
Webb	251	296	296	296	296	296
Willacy	0	0	0	0	0	0
Zapata	9	9	9	9	9	9
TOTAL	4,305	5,055	5,055	5,055	5,055	5,055

Manufacturing water demand projections were developed using 2010 through 2014 data from the TWDB Annual Water Use Survey, historical water use at individual facilities, and Texas Workforce Commission (TWC) employment projections. The 2020 water demand projections are based on the highest annual water use, aggregated by county, over the most recent 5 years of data.

TWDB staff focuses on facilities that use large volumes of water (more than 10 million gallons), relative to the area of the state and/or are self-supplied by groundwater or surface water. Smaller-use facilities are generally supplied by public utilities as commercial accounts and, thus, are part of the municipal water demands. TWDB staff conducted additional reviews of Texas Commission on Environmental Quality industrial water right usage reports and contacted WWPs and groundwater conservation districts who are not otherwise surveyed to ensure that all large-water use manufacturing facilities are included in the historical estimates.

TWC 10-year employment growth projections were used as a proxy for growth of water use in the manufacturing sectors between 2020 and 2030. After 2030, the manufacturing water demands were held constant through 2070. Because of the increasing reliance on water reuse as a significant source to meet future manufacturing water demands, water reuse volumes have been included in industrial projections. The 2009 through 2014 average volume of reuse water reported statewide by surveyed manufacturing facilities was 21,904 acft, or 2 percent of the total average freshwater manufacturing water use in that same period.

2.4 STEAM-ELECTRIC POWER GENERATION WATER DEMAND PROJECTIONS

Steam-electric power water use estimates include volumes reported to the TWDB Annual Water Use Survey by large power generation plants that sell power on the open market but generally do not include cogeneration plants that generate power for manufacturing or mining processes. Steam-electric power water use volumes that were reported by surveyed municipal water sellers rather than the power generators are included in these estimates.

Steam-electric power generation water demand is projected to remain below 1 percent the overall non-population-related water demands in Region M throughout the planning horizon. The steam-electric water demands are projected to be a constant 15,240 acft/yr from 2020 to 2070, as shown in Table 2-7 by county for the planning horizon.

Table 2-7 Steam-Electric Power Generation Demands by County (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	3,550	3,550	3,550	3,550	3,550	3,550
Hidalgo	11,538	11,538	11,538	11,538	11,538	11,538
Jim Hogg	0	0	0	0	0	0
Maverick	0	0	0	0	0	0
Starr	0	0	0	0	0	0
Webb	152	152	152	152	152	152
Willacy	0	0	0	0	0	0
Zapata	0	0	0	0	0	0
TOTAL	**15,240**	**15,240**	**15,240**	**15,240**	**15,240**	**15,240**

The 2020 water demand projections for each county are based on the highest county-aggregated historical steam-electric power water use in the most recent 5 years (2010 through 2014). The anticipated water use of future facilities and the reported water use of facilities scheduled for retirement, as listed in the state and federal reports, were taken into account in the demand projections. Demand projections were held constant throughout the planning period.

As is the case for the manufacturing demand projections previously described, power generation is expected to rely on water reuse to meet future water demands; estimated water reuse volumes have been included in steam-electric power projection demands. The 2009 through 2014 average volume of reuse water reported statewide by surveyed power facilities was 31,009 acft, or 6 percent of the total average freshwater steam-electric water use. Landfill gas, wood waste biomass, and battery power plants, as well as any power generating facilities using renewable energy sources, are not included in the water demand projections.

2.5 MINING WATER DEMAND PROJECTIONS

Mining water usage in Region M is dominated by hydraulic fracturing, with some aggregate operations in Hidalgo, Starr, and Webb counties. One of the major hurdles in evaluating mining water usage is the lack of consistent reporting, especially for groundwater usage. In Region M, the use of surface water from the Rio Grande allowed the Region M Planning Group to further inform water demand projections for mining.

Mining water use estimates were based on the TWDB Annual Water Use Survey and additional oil and gas water use estimates provided by the TWDB using the FracFocus database. Oil and gas water use estimates were then broken down by water source based on a TWDB contracted study, Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report,[4] with the Bureau of Economic Geology (BEG). The BEG estimated recent mining water use and projected the water use across the planning horizon using data collected from trade organizations, government agencies, and other industry representatives. County-level projections were compiled as the sum of individual projections for four sub-sector mining categories: oil and gas, aggregates, coal and lignite, and other. Mining water demand projections are displayed in Table 2-8 by county for the planning horizon.

Table 2-8 Mining Water Demand Projections (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	264	277	191	126	61	28
Hidalgo	2,844	3,620	4,198	4,819	5,532	6,434
Jim Hogg	93	97	72	53	34	22
Maverick	1,988	2,737	2,933	2,302	1,674	1,217
Starr	571	697	775	858	961	1,091
Webb	10,331	8,047	6,038	4,112	1,846	1,343
Willacy	49	51	38	28	18	12
Zapata	911	954	707	525	332	214
TOTAL	**17,051**	**16,480**	**14,952**	**12,823**	**10,458**	**10,361**

Statewide, a major shift from gas to oil production significantly changed the spatial distribution of production in a relatively short time. Within Region M, accelerated development of the Eagle Ford Shale reflected this trend in Webb and Maverick counties. Adoption of operating practices that allowed for more water recycling and use of brackish water also changed patterns of water consumption and usage at the same time that overall water usage was increasing.

Water usage was estimated for the upstream segment of the oil and gas industry, that is, water used to extract the commodity until it leaves the wellhead. For the aggregate industry, estimates included washing but no further processing, for coal mostly pit dewatering and aquifer depressurization, or mining as defined in the Standard Industrial Classification/North American Industry Classification System codes. Therefore, cement factories, in spite of large quarries, are grouped with manufacturing and not mining.

Reuse or recycling was taken into account in water-use values, as well as opportunity usages such as stormwater collection for aggregate mining. Usage numbers mostly represent consumption. The division of water between surface and groundwater sources is not well documented. Some facilities provided

[4] Bureau of Economic Geology. Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report. http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/0904830939_2012Update_MiningWaterUse.pdf.

this information directly, but no consistent information is available because of the reporting exemption for the oil and gas industry. The BEG estimated approximately 56 percent of water used in mining statewide was groundwater, and regional estimates varied from 7 percent in Zapata County to 86 percent in Maverick County.

The BEG report estimated water usage for the oil and gas, coal, aggregate, and other mineral sectors for a base year and projected through 2060. The data were linearly interpolated through 2070 by TWDB staff. The base year for the 2011 BEG report is 2008; the base year for the 2012 update is 2011. Water usage from the different sectors was calculated variously (only the oil and gas sector was considered in the 2012 report). In general, the data used were collected from reports submitted to the state for permitting (e.g., information about wells submitted to Railroad Commission of Texas), surveys distributed by TWDB, and communication with operators and industry trade groups.

For the oil and gas sector, estimates of water use for water-flooding and drilling operations were developed through consultation with operators. There is not a single directly reported source for this information. As noted, one major objective of the 2012 update was to better differentiate between total water usage, which is the volume of water needed for operations regardless of source, and water consumption or "new" water usage, i.e., the portion of demand not met by recycled or reused water. Estimates from operators regarding water sources and current and anticipated future levels of recycling were used to further quantify demand met from various sources for current and projected water use.

Oil and gas sector water usage was projected in the 2012 update using a resource-based approach. Estimates of quantity of developable resources, quantity of operations needed for extraction, and amount of water used by these operations were developed for each major production region. Concentration of future operations was distributed spatially by characteristics of each major play. Temporal distribution was accomplished by modeling production with a hyperbolic decline curve, once again parameterized by data specific to each play.

No comprehensive data set exists for aggregate mining. Surveys were distributed to operators, but despite collaboration with industry trade groups, response rates were low. Some data from similar historical water-use surveys distributed by TWDB were available. Records of aggregate production coupled with water-use coefficients from previous studies were also utilized in the attempt to quantify aggregate industry water use. The product of aggregate mining is used locally, so population projections were used to predict future production and water use for this sector as well.

2.6 IRRIGATION WATER DEMAND PROJECTIONS

Irrigation use within Region M is largely dependent on available supply from the Amistad-Falcon Reservoir system; however, it is important for regional planning that irrigation estimates make a distinction between irrigation water use and irrigation water demand. Since the RWP process permits only a single demand scenario and is intended to represent a drought year, irrigation demand is best developed assuming a dry year in which regional irrigation water needs are met, rather than limiting demand to the availability of surface water supplies.

In most actual drought years, some farmers can respond to anticipated limited water supplies by selecting crops that require less water or no "applied" water (dry land farming); such plants are often lower in value. Similarly, citrus and pecan trees can tolerate minimal water for a limited time period, but their true demand is greater than the minimum water required to survive. To address the long-term needs of the farmers in Region M, demands are based on the "worst-case" scenario, where there is minimal rainfall.

Various methodologies have been proposed for estimating irrigation demand. The 2016 RWP established a base year utilizing TWDB water use estimates, by county, from 2005 through 2009 and aggregating the maximum year for each county to assemble a new representative demand year. The demand was expected to decline over the planning horizon, and the rate of decline was correlated with the increase in demand for municipal water. For 2030 through 2070, the decadal increase in municipal demands was subtracted from the irrigation demand to estimate the impact of urbanization. For this round of planning, the TWDB initially established a base year on the average use, by county, between 2010 and 2014. These demands are held constant through the planning horizon (2020 through 2070).

The Region M RWPG proposed an alternate methodology using 2011 as a base year for the irrigation demand projections because of the little rainfall (high demand) and full reservoirs (minimal supply constraints) experienced, for an annual irrigation water use of 1,426,960 acft. Additionally, the Region M RWPG requested a rate of change over the planning horizon using the combined influences of sedimentation and the historical rate at which irrigation water rights have been converted to municipal use. This methodology and resultant demand projections were approved by TWDB staff on January 10, 2018, and applied to this planning cycle (Table 2-9).

Table 2-9 Irrigation Demand Projections by County (acft/yr)

COUNTY	HISTORICAL USE ESTIMATE 2011	IRRIGATION PROJECTIONS					
		2020	2030	2040	2050	2060	2070
Cameron	537,217	537,217	519,972	502,725	485,479	468,233	450,987
Hidalgo	688,667	688,667	666,560	644,451	622,343	600,236	578,127
Jim Hogg	360	360	348	337	325	314	302
Maverick	61,706	61,706	59,725	57,744	55,763	53,782	51,801
Starr	23,875	23,875	23,109	22,342	21,576	20,809	20,043
Webb	10,425	10,425	10,090	9,756	9,421	9,086	8,752
Willacy	99,610	99,610	96,412	93,215	90,017	86,819	83,621
Zapata	5,100	5,100	4,936	4,773	4,609	4,445	4,281
Total	**1,426,960**	**1,426,960**	**1,381,153**	**1,335,342**	**1,289,532**	**1,243,725**	**1,197,914**

Supply from the Amistad-Falcon Reservoir system is expected to decrease as a result of sedimentation, which reduces the overall storage capacity. A sediment loading rate was estimated for each reservoir and the reduction in storage is incorporated into the Water Availability Model (WAM). The WAM projections predict a 2020 firm yield of 1,060,616 acft and a 2070 firm yield of 1,053,834 acft.

As land use changes from agricultural, the water rights are typically converted to municipal use rights. When a Class A or B water right is converted to a domestic/municipal/industrial (DMI), it is reduced to 50 or 40 percent of the maximum diversion, respectively. The distribution of Rio Grande water rights associated with all DMI, Class A, and Class B was evaluated from 2010 through 2017 and used to estimate how water right distribution could be expected to change over the planning horizon (Figure 2-5).

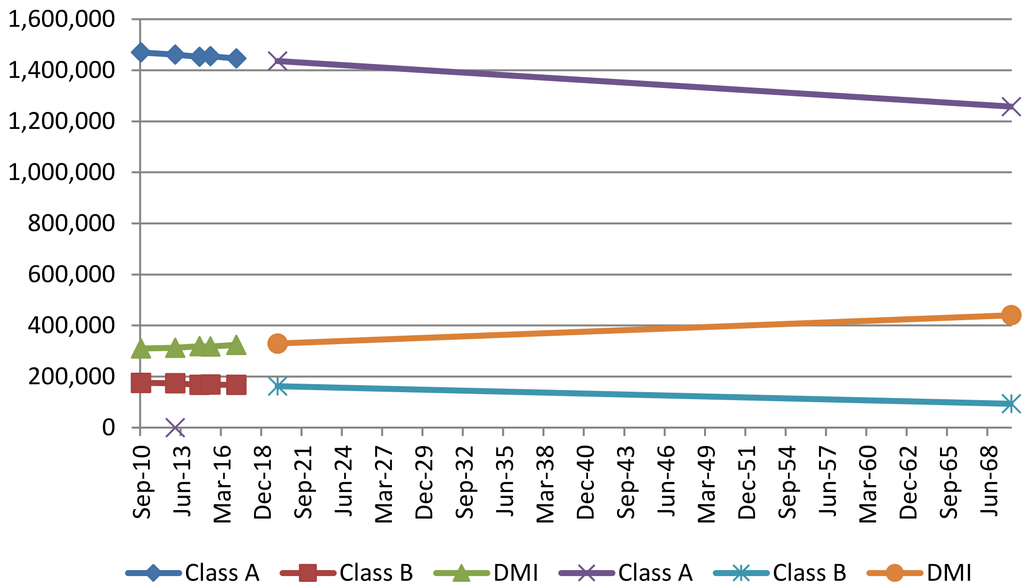

Figure 2-5 **Distribution of Water Right Types (Maximum Diversion)**

As detailed in Table 2-10, an estimated delivery volume was projected for the planning horizon using the rules for how water is allocated to water right holder accounts according to water right class. A decadal rate of change from the delivery volume was applied to the 2011 supply, which resulted in an overall reduction in demand that follows the reduction in availability and irrigable acreage. These trends were applied to surface water and assumed for groundwater-based demands.

Table 2-10 Projected Distribution of Water Rights and Supplies

MIDDLE BASIN AUTHORIZED DIVERSION		LOWER BASIN AUTHORIZED DIVERSION		TOTAL AUTHORIZED DIVERSION		FIRM YIELD	
						2020	2070
MUNILWR	253,428	MUNIMID	74,216	MUNI	327,643	327,643	327,643
LOW-A-IRR	1,411,050	MID-A-IRR	156,946	A-IRR	1,567,996	686,976	686,032
LOW-A-MIN	1,077	MID-A-MIN	9,173	A-MIN	10,250	4,491	4,485
LOW-A-MUN	465	MID-A-MUN	2,051	A-MUN	2,515	1,102	1,100
LOW-B-IRR	131,682	MID-B-IRR	18,051	B-IRR	149,733	52,481	52,409
LOW-B-MIN	5,020	MID-B-MIN	10,177	B-MIN	15,196	5,326	5,319
LOW-B-MUN	3,823	MID-B-MUN	63	B-MUN	3,885	1,362	1,360

2.7 LIVESTOCK WATER DEMAND PROJECTIONS

Livestock water use estimates are a combination of the TWDB Annual Water Use Survey data and additional estimates provided by the TWDB livestock inventory data from the National Agricultural Statistical Service (NASS) and the Texas Department of Agriculture and per head water use consumptions by animal class. Table 2-11 displays the livestock category and per head daily water use information.

Table 2-11 Livestock Category and Estimated Per Head Daily Water Use

TWDB CATEGORY	NASS DATA TYPE	PER HEAD DAILY WATER USE (GALLONS)
Cattle	Milk	75
	Fed and Other	15
Poultry	Hens	86*
	Broilers	66*
Horses	Horses, Ponies, and Burros	12
Hogs	Hogs	11
Sheep	Sheep	2
Goats	Milk, Meat, Angora	0.5

* "How Much Water Does a Broiler House Use?", (https://www.poultryventilation.com/sites/default/files/tips/2009/vol21n5.pdf). "Water Consumption Rates for Chickens", (http://www.poultryhub.org/nutrition/nutrientrequirements/water-consumption-rates-for-chickens/).

Livestock is expected to make up less than 1 percent of the overall non-population-related water demands in Region M throughout the planning horizon. The livestock water demand projections show a constant demand of 4,748 acft/yr for decade 2020 through decade 2070. The regionwide livestock projections are shown in Table 2-12 by county for the planning horizon.

Table 2-12 Livestock Demand Projections (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	436	436	436	436	436	436
Hidalgo	777	777	777	777	777	777
Jim Hogg	376	376	376	376	376	376
Maverick	371	371	371	371	371	371
Starr	1,192	1,192	1,192	1,192	1,192	1,192
Webb	963	963	963	963	963	963
Willacy	235	235	235	235	235	235
Zapata	398	398	398	398	398	398
TOTAL	**4,748**	**4,748**	**4,748**	**4,748**	**4,748**	**4,748**

The 2020 water demand projections for each county were based on the average of the most recent 5 years (2010 through 2014) of water use estimates. The same growth trend from the 2017 SWP was applied to project livestock water demand for 2030 through 2070. Additionally, the TWDB updated livestock water use estimates for 2010 through 2014 using new per head daily water use for chickens (Table 2-11); these figures were used in developing the livestock water demand projections.

The rate of change for projections from the 2016 RWP was then applied to the updated base year. During the last RWP cycle, many counties, including all of those within Region M, chose to hold the base constant throughout the planning horizon.

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FINAL PLAN

CHAPTER 3: WATER SUPPLY ANALYSIS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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acft	Acre-Feet
acft/yr	Acre-Feet per Year
BRACS	Brackish Resource Aquifer Characterization System
CEAT	Comisión Estatal del Agua en Tamaulipas
CILA	Comisión Internacional de Límites y Aguas
CONAGUA	Comisión Nacional del Agua
DFC	Desired Future Conditions
DMI	Domestic/Municipal/Industrial
DOR	Drought of Record
GAM	Groundwater Availability Model
GCD	Groundwater Conservation District
GMA	Groundwater Management Area
GPCD	Gallons per Capita per Day
gpm	Gallons per Minute
HB1763	House Bill 1763
HCWID	Hidalgo County Water Improvement District
IBWC	International Boundary and Water Commission
JAC	Joint Advisory Committee
KCGCD	Kenedy County Groundwater Conservation District
LRGWQI	Lower Rio Grande/Río Bravo Water Quality Initiative
LRGVDC	Lower Rio Grande Development council
MAG	Modeled Available Groundwater
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MUD	Municipal Utility District
MWP	Major Water Provider
PUB	Public Utilities Board
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SEDUMA	Secretaría de Desarrollo Urbano y Medio Ambiente
SUD	Special Utility District
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TWDB	Texas Water Development Board

WAM	Water Availability Model
WCID	Water Control and Improvement District
WID	Water Improvement District
WMS	Water Management Strategy
WRAP	Water Rights Analysis Package
WSC	Water Supply Corporation
WUG	Water User Group
WWP	Wholesale Water Providers
WWTP	Wastewater Treatment Plant

CHAPTER 3: WATER SUPPLY ANALYSIS

The planning effort requires a detailed understanding of current and potential water supplies. Region M water users rely mainly on surface water from the Rio Grande River, although both fresh and brackish groundwater is used across the region for primary or supplementary water supplies. Increasingly, sources that require additional treatment, such as brackish groundwater, are being considered in the face of increasing demands. Reuse of water for both potable and non-potable uses is expected to increase in the region as demands on existing surface and groundwater increase and the technology, permitting, and public acceptance processes become more commonplace. Figure 3-1 displays the 2020 estimates of available water resources in Region M.

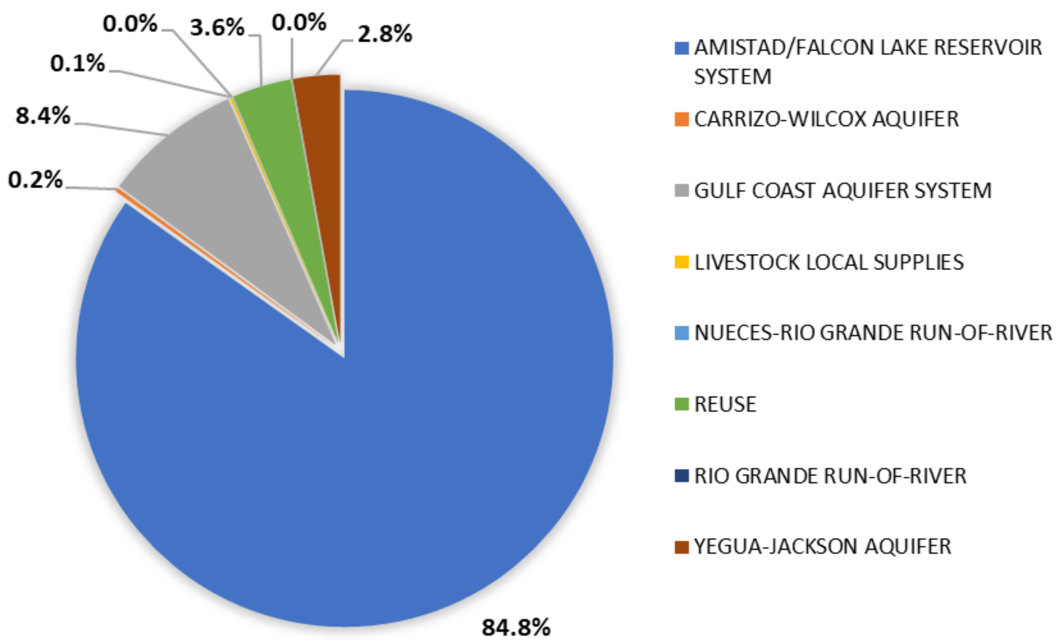

Figure 3-1 Major Groundwater, Surface Water, and Reuse Water Source Projections in Region M

In 2017, surveys were sent to entities in the region, contacted individually and/or through the irrigation district and utility managers associations, asking for information about current supplies. Other resources documenting the allocation of groundwater and surface water resources from the Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB) have been used to estimate current reliable supplies. A table detailing the demands, supplies, needs, and second tier needs for Major Water Providers (MWP) is included in Appendix B and further summarized in Section 3.4 of this Chapter.

3.1 SURFACE WATER AVAILABILITY

3.1.1 Rio Grande

The Rio Grande is the fifth longest river in the United States and among the top 20 in the world. It extends from 12,000 feet above sea level in the San Juan Mountains of Colorado to the Gulf of Mexico (1,901 miles) and forms a 1,255 mile segment of the border between the United States and Mexico.

The entire Rio Grande basin (Figure 3-2) covers an area approximately 336,000 square miles, with approximately half the watershed in the United States and the other half in Mexico.[1] Approximately 182,000 square miles of the basin contribute flow; the remainder includes numerous endorheic, or closed, basins. Roughly 54,000 square miles of the total watershed are within Texas, about 8,100 square miles of which are endorheic basins.

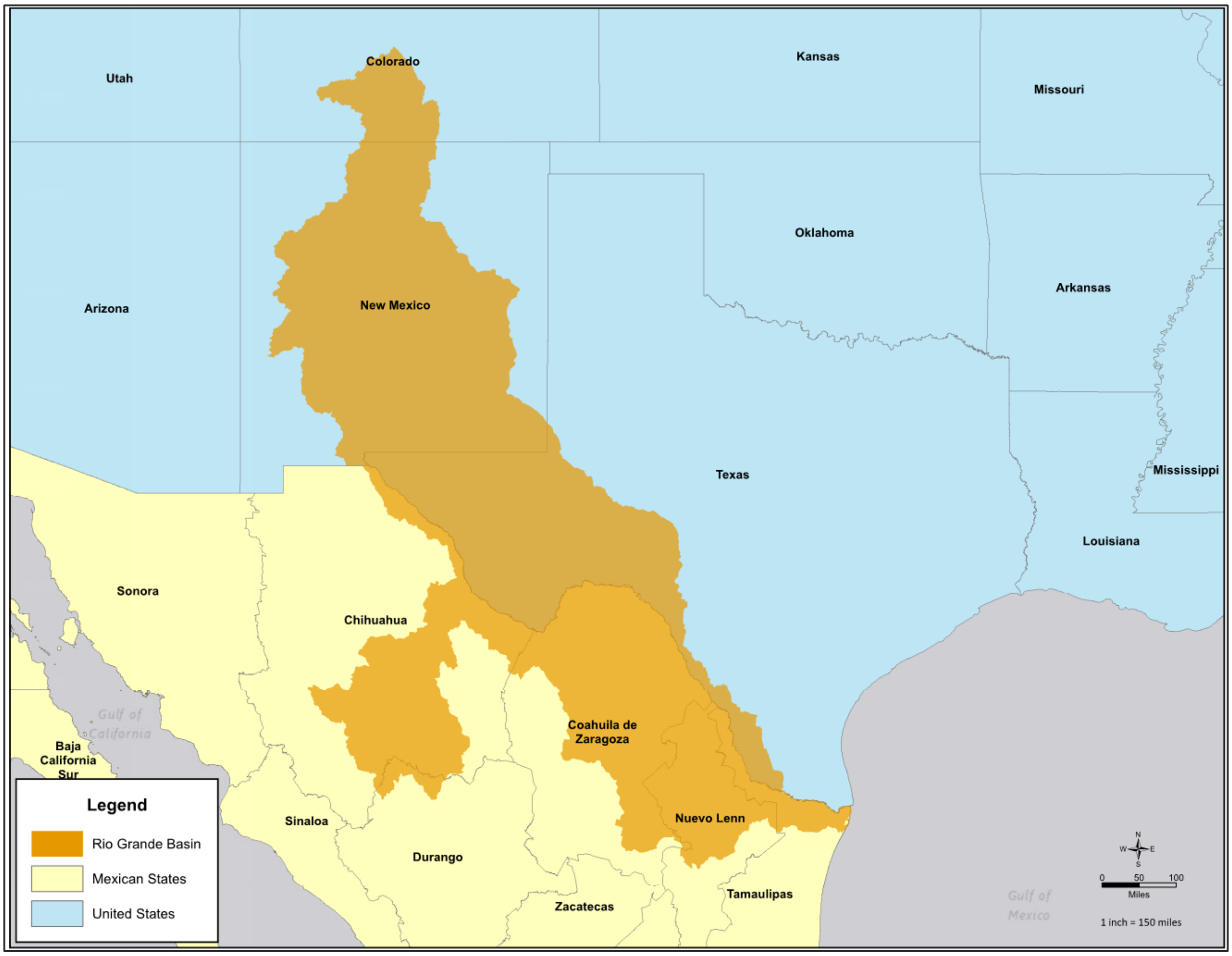

Figure 3-2 Rio Grande Basin

[1] In Mexico, the Rio Grande is referred to as the Rio Bravo.

The two major international reservoirs on the Rio Grande, Falcon and Amistad, are operated as a system by the International Boundary and Water Commission (IBWC) for flood control and water supply purposes. The Amistad Reservoir is located in Val Verde County (in Region J) at the confluence of the Devils River, 12 miles northwest of Del Rio. Falcon Reservoir is located between the cities of Laredo, Texas, and Rio Grande City, Texas, about 275 river miles upstream from the Gulf of Mexico.

In addition to the two international reservoirs on the Rio Grande (Amistad and Falcon), Mexico has constructed an extensive system of reservoirs on tributaries of the Rio Grande. Figure 3-3 shows the location of these reservoirs noted by text.

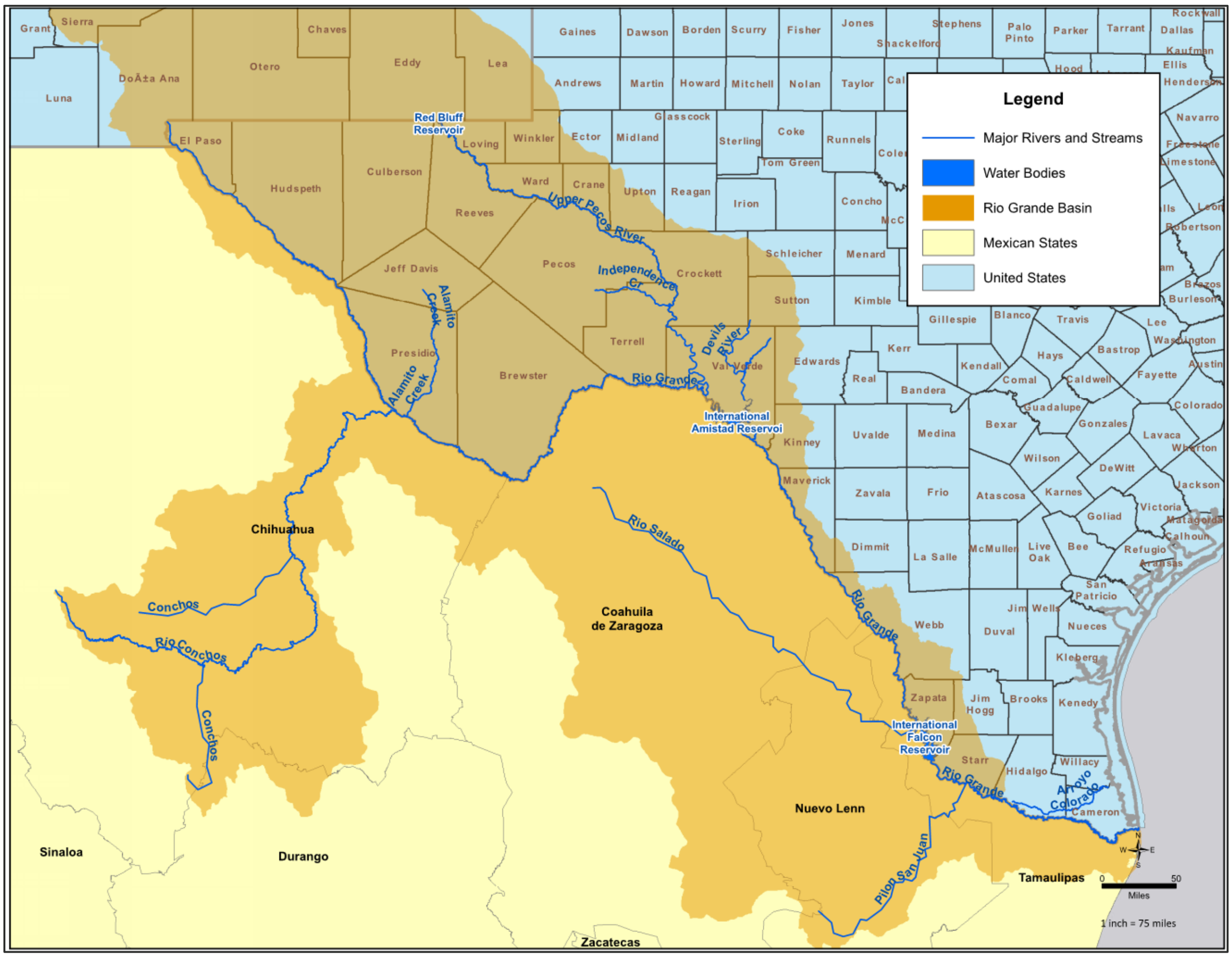

Figure 3-3 Rio Grande Basin Hydrography, Showing Tributaries and Major Reservoirs in Texas and Mexico

3.1.1.1 Drought of Record

The drought of record (DOR) is the basis of the firm yield projection for each river basin. The DOR identifies the worst drought on record, and the firm yield is the supply that can be expected from that river or system in that most severe drought scenario. The firm yield and DOR are determined using the Rio Grande Water Availability Model (WAM), which models the existing system and demands under historical hydrologic flows. The Rio Grande WAM has a period of record from January 1940 to December 2000.

Typically, a the DOR is defined as the longest period between full reservoir storage with firm-yield demands applied to the system over the period of record. The Amistad-Falcon reservoir system is used to store water for Mexico and the United States using a storage pool accounting system. The total storage capacity and reservoir stages under firm yield demands are shown on Figure 3-4 for the combined storage (United States and Mexico) and the portion belonging to the United States. Critical drought starting and ending dates are shown, as well as the storage minima and the date they occurred.

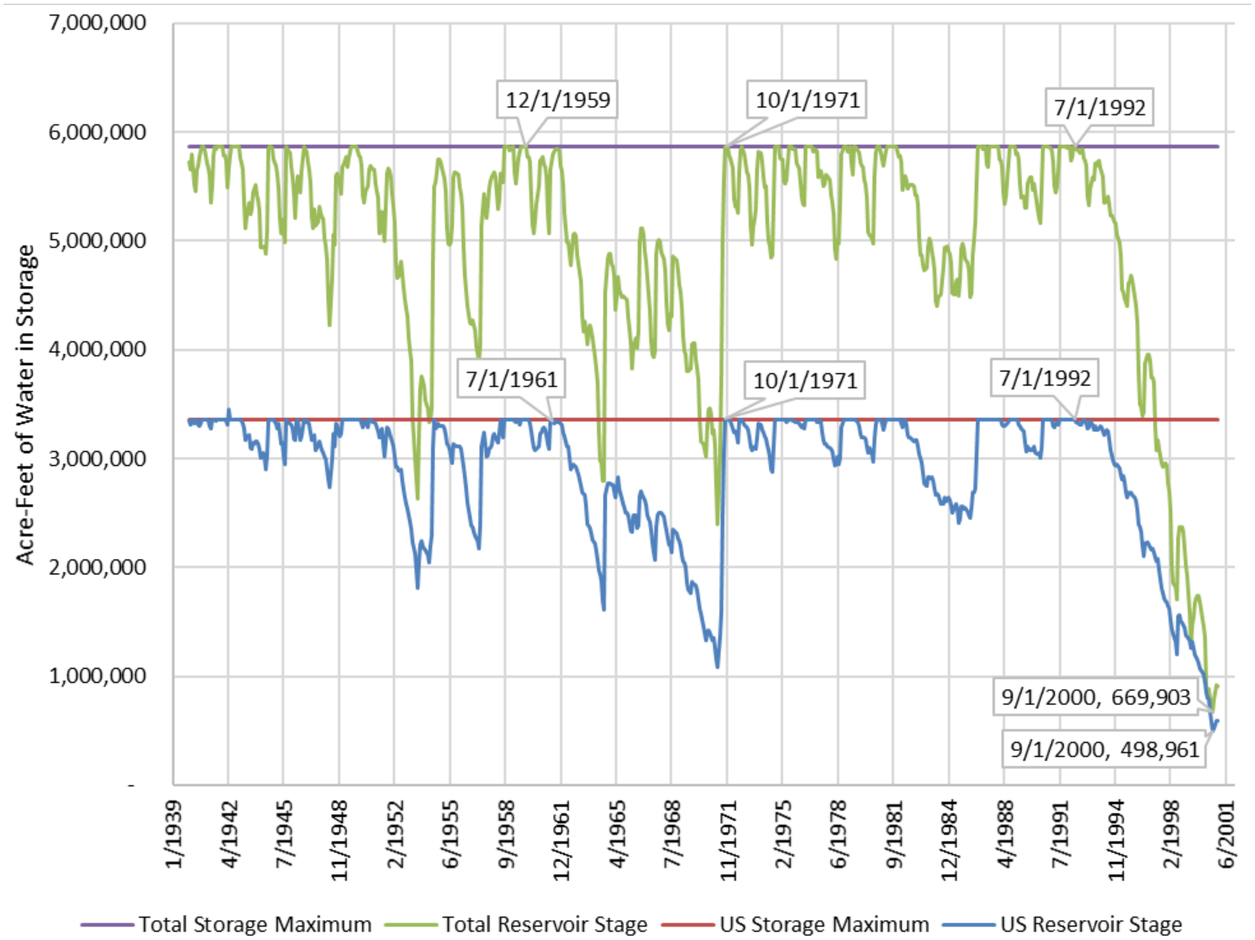

Figure 3-4 Reservoir Storage for the Amistad-Falcon System, U.S. and Combined

The longest duration drought modeled for both the combined reservoir system and the U.S. portion spans the 1960s: December 1959 to October 1971 for the combined system and June 1961 to October 1971 for the U.S. portion.

The drought spanning from July of 1992 to the end of the modeled period includes the minimum storage events for both the United States and combined systems, and the extent of the model does not include the end of the drought. The duration shown is shorter than the 1960s drought but is not a complete record.

The actual drought of the 2000s extended through approximately 2003, and if the WAM were updated to include those years, the DOR might be affected. Recent years have also seen severe drought in the region, and 2011 and 2012 data could similarly affect the DOR and, therefore, the firm yield projections. It was recommended in the 2021 Regional Water Plan (RWP), and it is the opinion of the Regional Water Planning Group (RWPG), that the Rio Grande WAM should be updated regularly. The DOR and drought responses are discussed in detail in Chapter 7.

3.1.1.2 Shared Resources with Mexico

Two treaties between the United States and Mexico contain basic provisions regarding the development and use of Rio Grande waters by the two countries. The 1906 convention provides for delivery to Mexico by the United States of 60,000 acre-feet (acft) of water annually in the El Paso-Juarez Valley upstream from Fort Quitman, Texas. If shortages occur in the water supply for United States, deliveries to Mexico are to be reduced in the same proportion as deliveries to the United States. Region M interprets from the 1906 convention and 1944 treaty that the flows in the Rio Grande at Fort Quitman are owned 100 percent by the United States because Mexico waived any and all claims to the waters of the Rio Grande for any purpose whatever between the head of the present Mexican Canal and Fort Quitman, Texas. All other flows occurring in the main channel of the Rio Grande downstream from Fort Quitman are owned 50 percent by the United States and 50 percent by Mexico.

The treaty of February 3, 1944, for "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande" described how Mexico and the United States would divide the waters of the Rio Grande from Fort Quitman to the Gulf of Mexico and the waters of the Colorado River. Of the waters of the Rio Grande, the treaty allots to Mexico: (1) all of the waters reaching the main channel of the Rio Grande from the San Juan and Alamo rivers, including the return flows from the lands irrigated from those two rivers; (2) two-thirds of the flow in the main channel of the Rio Grande from the measured Conchos, San Diego, San Rodrigo, Escondido, and Salado rivers, and the Las Vacas Arroyo, subject to certain provisions; and (3) one-half of all other flows occurring in the main channel of the Rio Grande downstream from Fort Quitman. The treaty allots to the United States: (1) all of the waters reaching the main channel of the Rio Grande from the Pecos and Devils rivers, Goodenough Spring, and Alamito, Terlingua, San Felipe, and Pinto Creeks; (2) one-third of the flow reaching the main channel of the river from the six named measured tributaries from Mexico (the treaty provides that this third shall not be less, as an average amount in cycles of five consecutive years, than 350,000 acft annually); and (3) one-half of all other flows occurring in the main channel of the Rio Grande downstream from Fort Quitman.[2]

The treaty allows exceptions for years of extraordinary drought or serious accident to the hydraulic systems on the Mexican tributaries; however, extraordinary drought is not defined. As a result, Mexico often runs a deficit for up to four consecutive years and repays the debt in years of high precipitation. This significantly impacts the reliability of supplies and is especially difficult for farmers whose water rights are the most vulnerable to reduced system availability.

Although the term "extraordinary drought" is not expressly defined in the treaty, as other terms are defined in Article 1, it is implicitly defined in the second subparagraph of Article 4B(d) as an event which makes it difficult for Mexico "…to make available the run off of 350,000 acft (431,721,000 cubic meters) annually." In other words, it is a drought condition when there is less than 1,050,000 acft (350,000 U.S.

[2]The International Boundary and Water Commission. Its Mission, Organization, and Procedures for Solution of Boundary and Water Problems. http://ibwc.gov/.html.

share and 700,000 Mexico share) of "run-off waters in the watersheds of the named Mexican tributaries" to allow Mexico to deliver the required amount of 1,050,000 acft to the Rio Grande. This amount is measured at the Rio Grande, without regard to conveyance losses in Mexico, and so Mexico must assume conveyance losses in Mexico and deliver to the Rio Grande the full amount. If there is sufficient run-off water in the watershed of the Mexican tributaries, an extraordinary drought does not exist.

The IBWC tracks the deliveries of water from Mexico to the United States. Figure 3-5 depicts the amount of water that has been delivered from Mexico in each of the previous cycles since 1988. The cycles last either five years or until the conservation pools in the two reservoirs are full. Figure 3-5 was the most recent graphic available with data through July 27, 2019. More specific (e.g. reservoir levels), and recent data and reports can be found at ibwc.gov. Figure 3-6 displays the deliveries for this current cycle compared with the target delivery rate as described in the 1944 treaty.

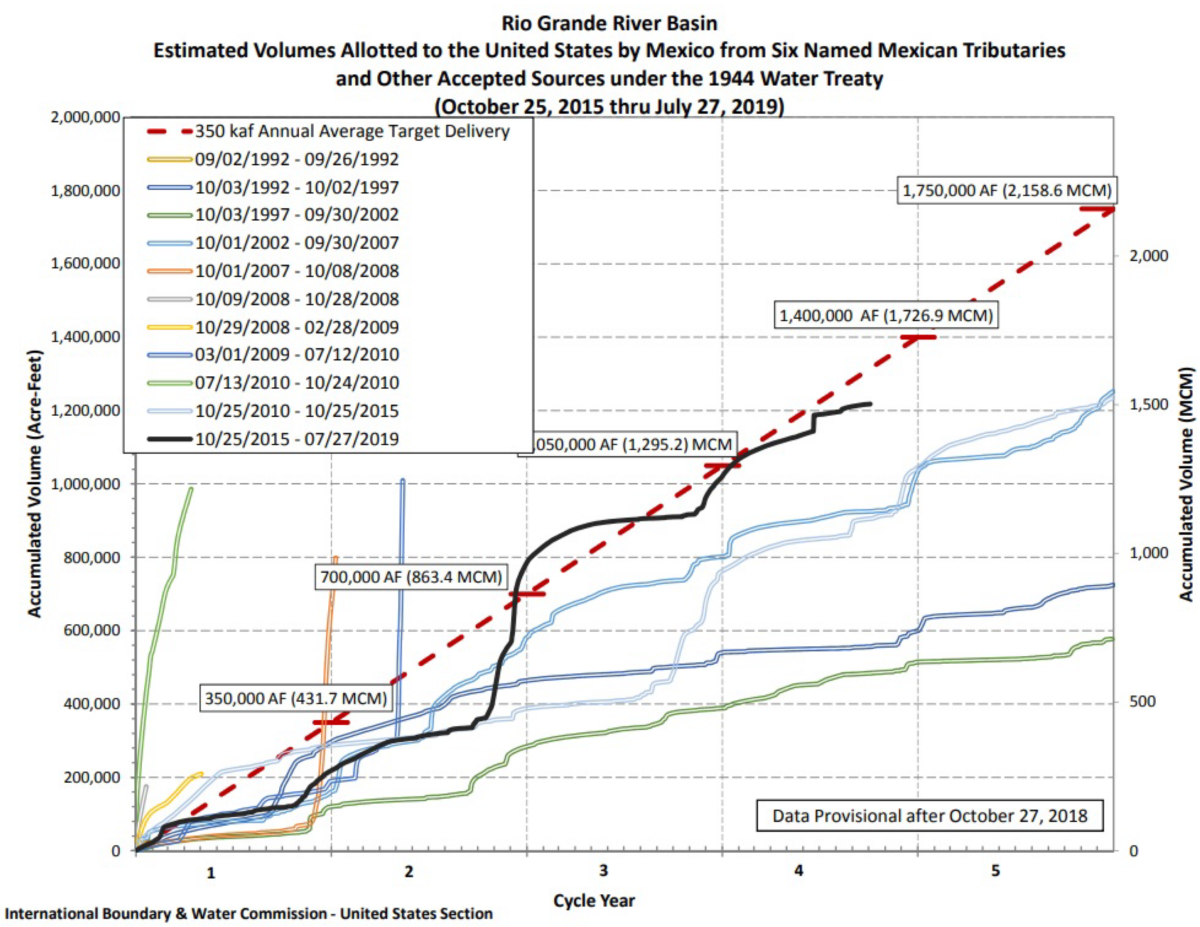

Figure 3-5 Water Delivered to the United States from Mexico, 1992 to 2019 (IBWC)[3]

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[3] IBWC. "Mexico Deliveries". Note, graph unavailable since mid 2019. https://ibwc.gov/Water_Data/mexico_deliveries.html; Accessed July 2019.

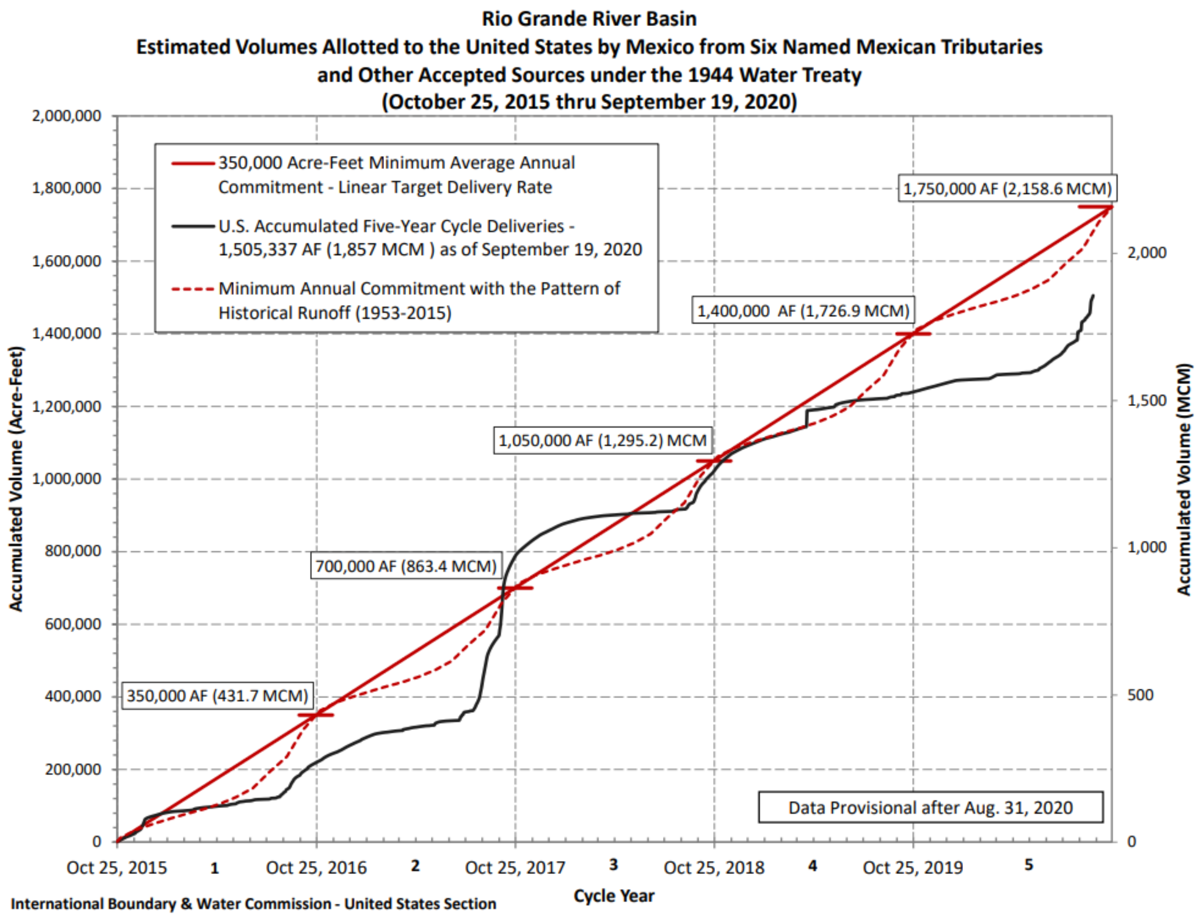

Figure 3-6 Water Delivered to the United States from Mexico, Current Cycle (IBWC)[4]

3.1.1.3 Rio Grande Water Availability Model

Availability in the Rio Grande for the U.S. use is determined by the Rio Grande WAM, maintained by the TCEQ. Estimated historical streamflow conditions are developed, including typical wet, dry, and normal flow periods, as they would be without the influence of manmade diversions, dams, and other influence on the watershed, called naturalized flows. The current Rio Grande WAM includes data from 1940 to 2000 from control points, or locations where contributing streams have gauging data, in both Texas and Mexico. The Rio Grande WAM extends to the New Mexico state line and includes data from both the Rio Grande and the Pecos rivers at the state line, according to the provisions of existing compacts between the states.

The 1940 to 2000 historical period includes the droughts of the 1950s and 1990s, both of which represent extreme drought conditions for most of the Rio Grande basin. To estimate the firm yield, the Rio Grande WAM is run with parameters intended to approximate a drought scenario, called Run 3. This model run assumes that all water rights are fully diverted and that there are no return flows into the Rio Grande. The simplified Rio Grande WAM Run 3 is the current WAM Run 3, according to TCEQ.[5] Firm

[4] IBWC. “Mexico Deliveries”. https://ibwc.gov/Water_Data/mexico_deliveries.html; Accessed September 2020
[5] TCEQ letter. "Region M changes to the Rio Grande WAM," Dated January 14, 2014, from Dr. Kathy Alexander, Water Availability Division, to Ms. Connie Townsend. TWDB.

yield values for 2020 and 2070 were estimated by the WAM Run 3 and show a reduction in availability over time because of sedimentation. These two projections were linearly interpolated over the intermediate decades. The annual firm yield, averaged for each planning decade, is shown in Table 3-1.

Table 3-1 Firm Yield Projections for the Amistad-Falcon Reservoir System 2020-2070 (acft/yr)

SOURCE	2020	2030	2040	2050	2060	2070
Amistad-Falcon Reservoir	1,079,381	1,079,175	1,078,968	1,078,762	1,078,555	1,078,349

The Rio Grande WAM then simulates the monthly ability of individual water right holders to make diversions in accordance with the TCEQ's Rio Grande operating rules. The simulations are performed using the Water Rights Analysis Package (WRAP) program.[6] The results of this simulation indicate that there is no water in the Rio Grande basin that is not already appropriated and include an estimated reliability for each of the different types of water rights.[7] These monthly simulations are aggregated into decadal averages for planning purposes.

All of the Rio Grande Basin below the New Mexico state line, including the Mexican portion of the basin, is included in the Rio Grande WAM. The 1944 treaty provision requiring a minimum of 350,000 acre-feet per year (acft/yr) to be delivered to the United States from the six named Mexican tributaries has not been incorporated as a rule into the WAM because shortages are allowed to accumulate over up to a 5-year period in times of drought. The transfer of Mexican water from the six named Mexican tributaries of the Rio Grande to the United States is modeled after Mexico's demands and reservoirs on these tributaries have been simulated. The United States is allotted one-third of the remaining flow at the mouths of each of the six named Mexican tributaries. Demands for water along the Rio Grande by both U.S. and Mexican water users downstream of these Mexican tributaries are then simulated in the model.

Kennedy Resource Company, Inc. was asked to review and revise the 2007 Rio Grande WAM as a part of the 2021 update to the Region M plan, which resulted in the development of a simplified version of the WAM that used aggregated totals to represent the approximately 1,500 individual water rights. A hydrologic variance was requested by the Region M planning group and approved by Mr. Jeff Walker on September 18, 2018 (Appendix C.1).

Table 3-2 summarizes the results of Run 3 of the Rio Grande WAM, which evaluated the firm yield associated with the aggregated middle- and lower-basin water rights that are used in the simplified WAM. The table shows the maximum authorized diversion associated with each type of water right and the firm yield that can be expected in a drought similar to the worst historical DOR.

[6] "Water Rights Analysis Package (WRAP) Users and Reference Manual." Texas Water Resources Institute at Texas A&M University. Revised August 2018 by Ralph A. Wurbs (Wurbs, 2018). The version of the WRAP program dated August 2018 was used for the 2018 Rio Grande WAM (Wurbs, 2018).
[7] There are water rights that are not considered in the RWP, including those held by state and federal government agencies that are not used in meeting the needs of any of the WUGs that are planned for in this process.

The table displays the water rights separated into middle and lower basin, and by user designations for "MUNI" - municipal (most commonly raw water for municipal treatment plants), "IRR" - irrigation, and "MIN" - mining, Class A and B. A full list of Rio Grande active water rights is included in Appendix C.2.

Table 3-2 Rio Grande WAM Modeled Water Rights, Firm Yield Results (acft/yr)

AUTHORIZED DIVERSION						FIRM YIELD	
MIDDLE BASIN		LOWER BASIN		TOTAL		2020	2070
MUNILWR	253,428	MUNIMID	74,216	MUNI	327,643	327,643	327,643
LOW-A-IRR	1,411,050	MID-A-IRR	156,946	A-IRR	1,567,996	686,976	686,032
LOW-A-MIN	1,077	MID-A-MIN	9,173	A-MIN	10,250	4,491	4,485
LOW-A-MUN	465	MID-A-MUN	2,051	A-MUN	2,515	1,102	1,100
LOW-B-IRR	131,682	MID-B-IRR	18,051	B-IRR	149,733	52,481	52,409
LOW-B-MIN	5,020	MID-B-MIN	10,177	B-MIN	15,196	5,326	5,319
LOW-B-MUN	3,823	MID-B-MUN	63	B-MUN	3,885	1,362	1,360

There are various run-of-river water rights on the Rio Grande which are exceptions to typical operations, three of which have been evaluated for firm yields (Table 3-3).

Table 3-3 Rio Grande Run-of-River Water Rights

WATER RIGHT NO.	WATER RIGHT HOLDER	AUTHORIZED DIVERSION	FIRM YIELD
952-001	City of Eagle Pass Water Works System	4,600	1,138
952-002	City of Laredo	2,818	525
952-003	Maverick County	641	111

3.1.1.4 Rio Grande Operations

Waters of the Rio Grande are treated as a "stock resource" that is accumulated in the Amistad-Falcon reservoir system and released on demand in accordance with water rights set by law. The TCEQ administers the United States' share of water stored in Amistad and Falcon reservoirs in compliance with the decision of the Thirteenth Court of Civil Appeals in the case "State of Texas, et al. vs. Hidalgo County Water Control and Improvement District No. 18, et al.," commonly referred to as the Valley Water Suit, and the Adjudication Decree in the Middle Rio Grande under the Water Rights Adjudication act of 1967. The TCEQ Rio Grande Watermaster program is responsible for allocating, monitoring, and controlling the use of surface water in the Rio Grande basin from Ft. Quitman to the Gulf of Mexico.

Since the 1960s, the U.S. portion of the Rio Grande below Amistad has been fully adjudicated, so that no "unclaimed" water is regularly available in the system. Water rights on the river are divided into two major types: domestic/municipal/industrial (DMI) rights, and irrigation and mining rights (which are sub-divided into Class A and Class B). These rights represent the annual allowable maximum diverted, but because demand exceeds supply in a drought year, only the highest priority (i.e. DMI) water rights are guaranteed to receive the full amount of their water rights. Class A and B irrigation and mining accounts are allocated water on a pro-rata basis but are not necessarily able to access their maximum authorized diversion each year.

To determine the amount of water to be allocated to various accounts, the Watermaster makes the following computations at the beginning of each month:

1. From the amount of water in usable storage, 225,000 acft are deducted to reestablish the DMI storage pool. These uses are given the highest priority.
2. From the remaining storage, the total end-of-month account balances for all lower and middle Rio Grande irrigation and mining water right holders are deducted. If there is not sufficient water to fill the total end-of-month account balances, water is added to accounts proportionally according to the end-of-month balance, weighted to Class A accounts by a factor of 1.7 more than Class B accounts.
3. From the remaining storage, the operating reserve is deducted to account for evaporation, seepage, conveyance losses, and emergencies.
4. Any remaining storage is allocated to the irrigation and mining accounts.

Steps 2 through 4 are iterative and are all based on the reservoir volume. When there is insufficient water to fulfill the account balances for irrigation and mining, the requirement for operating reserve can be reduced.

Water that has been designated for municipal use must be used for municipal purposes, and similarly, irrigation water rights for irrigation, etc., unless it is permanently converted through TCEQ. When irrigation and mining water rights are converted to municipal water rights, the maximum diversions for Class A are reduced by 50 percent and Class B by 60 percent. The main mechanism for this conversion is urbanization.

Generally, under the current TCEQ rules and regulations, all U.S. water that is diverted from the lower and middle Rio Grande by authorized diverters is accounted for by the Rio Grande Watermaster, with appropriate charges against annual authorized diversion accounts in accordance with existing individual water rights and against individual storage accounts in Falcon and Amistad reservoirs.

When there are substantial flows in the river from high runoff conditions, the Rio Grande Watermaster may allow water rights holders along the lower and middle Rio Grande to divert water without those diversions being charged to their accounts. These are referred to as "no-charge pumping" periods, and diversions during such periods are authorized by an order issued by the Texas Water Commission on August 4, 1981. When no-charge pumping is declared by the Rio Grande Watermaster, authorized water rights holders can divert to the extent it is available, without their respective annual water use and storage accounts being charged.

DMI water right accounts are not allowed to roll over any water each year; they are limited to diverting no more than their water right in each year. Class A and B water right accounts can accumulate up to

1.41 times the annual authorized diversion right in storage. If an allottee does not use any water for two consecutive years, its account is reduced to zero.

3.1.1.5 Irrigation Districts

Irrigation districts operate under rules and regulations in the Texas Water Code and within the TCEQ operational rules that resulted in part from the Valley Water Suit. Among other things, this judgment allocated specific amounts of water in the Lower Rio Grande Valley to individual DMI water users (typically cities) with documented historical water usage, and it assigned these DMI water rights to specific irrigation districts, which had pumping facilities on the river, for the subsequent diversion and delivery of river water to the DMI users. In effect, the irrigation districts were assigned municipal water rights that were specifically designated for certain individual DMI water users. Most of the DMI water users in the Lower Rio Grande Valley continue to obtain their water supplies from the irrigation districts under the original water rights that are owned by the irrigation districts but that have specific assignments to the DMI users.

Most water in the Lower Rio Grande is diverted and delivered by irrigation districts, although some farmers, entities, and individuals divert their own water directly, including most users in the Middle Rio Grande. Water right holders request diversion certifications from the Watermaster and then divert water from the Rio Grande into their storage and delivery systems. Water is metered as it is pumped out of the river, according to TCEQ Watermaster rules, but most districts do not meter any water provided to irrigators or "domestic" water usage for lawn watering and livestock.

In some cases, there are written contracts between the DMI users and the irrigation districts for water delivery; however, often there are only general agreements between the DMI users and the irrigation districts that water will be delivered pursuant to the requirements of the original water rights that specifically assigned water to the DMI users. When these delivery contracts or agreements expire, they are often extended with revised rates to cover pumping costs. Sometimes when the annual allotment for DMI water as stipulated in a water right is exceeded by an individual DMI water user, the irrigation district will continue to supply DMI water to the DMI user under the district's own water right, to the extent that a district has these rights available, and then charge the DMI user for this additional water. If the district does not have available municipal water rights, the city or the district can acquire municipal use water from third parties to deliver to the city. This one-time delivery of water is referred to as "contract water," which means that water is being delivered to a DMI user on a short-term contractual basis, governed by the Watermaster rules.

The DMI water users are guaranteed the maximum diversion of the water rights, and it is these water rights, rather than the condition of the reservoirs, that determine the extent of the overall DMI supply.

Some municipal water users have their own water rights, and some that have specific contracts for DMI water from the irrigation districts under the districts' water rights exclusive of the original allotments from the Rio Grande Valley Water Suit.

Irrigation water rights are also generally held by the irrigation district. Farmers pay an annual flat rate assessment that entitles them to receive irrigation water according to acreage. Each district operates somewhat differently with respect to if and how water can be sold and purchased within and outside of the district. For instance, during a drought period, some districts allow farmers to consolidate their allocation of water on one portion of their land, some allow for sales within the district, and some allow for sales outside of the district. When the district is not on allocation, most water will be delivered to farmers on a "first-come, first-served" basis.

The drought year projections for 2020 water rights, 2020 diverted, and 2020 delivered to end users (drought year diversion impacted by irrigation district delivery losses) are shown in Table 3-4.

Column 2020 Water Right lists the authorized diversion;

Column 2020 Diverted lists how much can be reliably diverted in a drought year (Class A and B reliability); and

Column 2020 Delivered lists how much an end user can expect (the 2020 diverted less any conveyance losses from the irrigation district).

Each irrigation district is described in two sections: current water rights with their estimated conveyance efficiency and associated customers. Water rights are listed by: 1) priority (i.e. DMI, Class A, and Class B); 2) if owned by the irrigation district; and 3) alphabetical order by users that hold their own water rights and are under contract with each irrigation district.

Table 3-4 Irrigation District Water Rights, Water Diversions, and Water Deliveries (acft/yr)

USER	2020 WATER RIGHT	2020 DIVERTED	2020 DELIVERED
Bayview Irrigation District No. 11			
DMI Municipal	183	183	124
Irrigation Class A, Cameron County	16,978	7,504	5,103
Brownsville Irrigation District			
DMI Municipal	3,834	3,834	3,727
Irrigation Class A, Cameron County	33,949	15,005	10,204
Cameron County Irrigation District No. 2			
DMI Municipal	8,914	8,914	7,131
DMI Industrial	192	192	154
DMI East Rio Hondo Water Supply Corporation (WSC)	3,422	3,422	2,738
DMI San Benito	1,532	1,532	1,226
Irrigation Class A, Cameron County	151,537	65,338	53,583
Irrigation Class B, Cameron County	14	4	4
Cameron County Irrigation District No. 6 - Los Fresnos			

USER	2020 WATER RIGHT	2020 DIVERTED	2020 DELIVERED
DMI Industrial	20	20	14
DMI Los Fresnos	1,051	1,051	715
DMI Olmito DMI	1,546	1,546	1,051
Irrigation Class A, Cameron County	49,565	21,908	14,983
Cameron County Water Improvement District No. 10			
Irrigation Class A, Cameron County (From CCID #6)	7,953	3,515	2,390
Mining Class A, Cameron County	35	15	11
Delta Lake Irrigation District			
DMI Municipal	8,110	8,110	5,272
DMI Industrial	100	100	65
DMI Lyford	980	980	638
DMI North Alamo WSC	8,577	8,577	5,575
DMI Port Mansfield PUD	150	150	98
DMI Willacy County Navigation District	100	100	65
Irrigation Class A, Hidalgo County	99,268	43,876	28,520
Irrigation Class B, Hidalgo County	256	81	36
Irrigation Class A, Willacy County	75,808	33,507	21,780
Irrigation Class B, Willacy County	196	61	40
Donna Irrigation District			
DMI Municipal	4,190	4,190	2,975
DMI Domestic & Livestock	2,690	2,690	1,910
Irrigation Class A, Hidalgo County	94,064	41,576	29,519
Irrigation Class A, City of Donna	480	212	151
Engelman Irrigation District			
Irrigation Class A, Hidalgo County (From Delta Lake ID)	17,231	7,616	5,407
Harlingen Irrigation District			
DMI Municipal	692	692	588
DMI Harlingen Water Works System	22,528	22,528	19,149
DMI Military Highway WSC	632	632	537
DMI Palm Valley	313	313	266
DMI Primera	400	400	340

USER	2020 WATER RIGHT	2020 DIVERTED	2020 DELIVERED
Irrigation Class A, Cameron County	116,106	51,369	43,664
Irrigation Class A, Harlingen Water Works System	2,829	1,250	1,063
Irrigation Class A, Town of Progreso (delivered to Mlitary Highway WSC)	174	77	77
Hidalgo and Cameron County Irrigation District No. 9			
DMI Municipal	13,454	13,454	9,418
DMI Industrial	3,174	3,174	2,222
DMI Mercedes	1,015	1,015	711
DMI Weslaco	736	736	515
DMI Town of La Blanca	13	13	9
Irrigation Class A, Cameron County	12,395	5,631	3,942
Irrigation Class B, Cameron County	4	1	1
Irrigation Class A, Hidalgo County	159,757	70,460	49,322
Irrigation Class B, Hidalgo County	55	17	12
Irrigation Class A, Edcouch	226	100	70
Irrigation Class A, Elsa	698	309	216
Irrigation Class A, La Villa	63	28	19
Hidalgo County Irrigation District No. 1			
DMI Municipal	13,003	13,003	9,102
DMI Edinburg	2,591	2,591	1,840
DMI Hidalgo Municipal Utility District (MUD)	631	631	448
DMI Sharyland WSC	4,458	4,458	3,165
Irrigation Class A, Hidalgo County	74,079	32,743	23,247
Irrigation Class B, Edinburg	10	3	2
Irrigation Class B, Hidalgo MUD	700	220	156
Hidalgo County Irrigation District No. 2			
DMI Municipal	27,857	27,857	20,893
DMI Alamo	83	83	62
DMI North Alamo WSC	1,229	1,229	922
DMI Pharr	4,450	4,450	3,338
DMI San Juan	316	316	237
Irrigation Class A, Hidalgo County	130,500	57,681	43,261

USER	2020 WATER RIGHT	2020 DIVERTED	2020 DELIVERED
Irrigation Class A, HCWID #3	552	244	183
Irrigation Class B, North Alamo WSC	3,750	1,178	884
Irrigation Class B, San Juan	148	47	35
Hidalgo County Irrigation District No. 5			
Irrigation Class A, Hidalgo County	14,235	6,292	4,467
Irrigation Class B, Hidalgo County	403	126	90
Hidalgo County Irrigation District No. 6			
DMI Municipal	6,816	6,816	4,839
DMI Agua Special Utility District (SUD)	1,513	1,513	1,074
Irrigation Class A, Hidalgo County	32,913	14,548	10,329
Hidalgo County Irrigation District No. 13 / Baptist Seminary			
Irrigation Class A, Hidalgo County	4,357	1,926	1,367
Hidalgo County Irrigation District No. 16			
DMI Municipal	1,500	1,500	1,065
DMI Domestic & Livestock	100	100	71
DMI Agua SUD	3,166	3,166	2,276
DMI La Joya	13	13	9
DMI Los Ebanos (delivered to Agua SUD)	13	13	9
DMI Penitas (delivered to Agua SUD)	13	13	9
DMI Sullivan City (delivered to Agua SUD)	13	13	9
Irrigation Class A, Hidalgo County	30,749	13,591	9,650
Mining Class A, Hidalgo County	200	88	63
Hidalgo County Water Improvement District No. 3 / McAllen			
DMI Municipal	13,980	13,980	12,582
DMI McAllen	3,229	3,229	2,906
Irrigation Class A, Hidalgo County	8,553	3,780	3,402
Mining Class A, Hidalgo County	100	44	40
Irrigation Class A, HCID#2	552	183	183
Hidalgo County Water Control and Improvement District No. 18			
Irrigation Class B, Hidalgo County	2,599	817	580
Hidalgo County Water Control and Improvement District No. 19			

USER	2020 WATER RIGHT	2020 DIVERTED	2020 DELIVERED
Irrigation Class A, Hidalgo County	8,016	3,543	2,516
La Feria, Cameron County Irrigation District No. 3			
DMI Municipal	5,212	5,212	3,544
DMI Siesta Shores Water Control Improvement District (WCID)	200	200	136
Irrigation Class A, Cameron County	85,808	37,927	25,790
Irrigation Class B, Siesta Shores WCID	63	20	13
Maverick County WID			
Irrigation Class A, Maverick County	134,900	59,626	39,949
Irrigation Class A, Maverick County - Municipal	2,049	906	607
Santa Cruz Irrigation District No. 15			
DMI Municipal	120	120	72
DMI North Alamo WSC	749	749	449
Irrigation Class A, Hidalgo County	74,873	33,094	19,856
United Irrigation District			
DMI Municipal	26,115	26,115	22,198
DMI Mission	2,755	2,755	2,342
DMI Sharyland WSC	4,458	4,458	3,789
Irrigation Class A, Hidalgo County	49,374	21,823	18,550
Irrigation Class A, Mission	215	95	81
Irrigation Class B, Mission	75	24	20
Valley Acres Irrigation District			
Irrigation Class A, Cameron County	2,177	962	683
Irrigation Class A, Hidalgo County	13,947	6,165	4,377
Manufacturing Class A, Cameron County	200	88	63

As the basis of the supply analysis, diversions were projected to 2070 to reflect the gradually decreasing yield from the reservoirs due to sedimentation. The deliveries were projected with the combined impacts of conveyance losses and the reduction in reliability from lower reservoir yields. These supply projections are intended to show what supplies are currently available and project what supplies would continue to be available if no water management strategies (WMSs) are implemented.

In Chapter 5, irrigation district conservation is evaluated, which will reduce the impact of conveyance losses on the delivery projections. Also, urbanization is considered, which is expected to reduce irrigation use and make some additional water available to meet growing municipal demands through conversion of water rights.

3.1.1.6 Drought and Push Water

The Rio Grande water rights system fulfils DMI water rights using a portion of the reservoir storage that is replenished monthly, which is much more reliable than irrigation and mining water rights. The impacts of drought on DMI water right holders are not reduced diversions but are likely increased demand because of low rainfall and increased outdoor water use, so the main concern is ownership or long-term contracts for sufficient water rights to meet demands for the entire year. Municipal conservation can help a utility to stay within its annual water budget. To date, there has not been a drought severe enough to impact municipal water rights, so they are considered 100 percent reliable.

Agricultural water users are not guaranteed their full authorized diversion each year and must adapt to the water that is available for Class A and B water rights under the Amistad-Falcon system. In the worst historical drought, Class A water right holders could expect about 44 percent of their authorized diversion, and Class B water right holders could expect about 31 percent. Conservation for irrigators (not the only Class A and B water right uses, but the largest by far) is more about maximizing the water that is available for irrigation and the ability to adapt to drought years through changing crops or limiting irrigated acreage.

Severe reductions in irrigation water do impact the operations of irrigation districts, so that "push water" may not be available. Many of the water districts deliver water primarily for irrigation and use this water to charge their networks of canals, and municipal water rights are effectively "carried on" the irrigation water. In years of severe drought, there may be periods when little to no irrigation water is delivered, so municipalities may need to purchase additional water to provide a minimum operational amount of water in the system. This is in addition to the regular water losses experienced by districts as a result of seepage, evaporation, and operational losses.

To date, a few cities have purchased water in anticipation of the need for push water, but none have had to use it. When an irrigation district goes on allocation, agricultural usage slows dramatically. This reduction of usage has historically allowed the reservoirs and irrigators' useable account balances to re-charge, and for the system to go back to normal operations with irrigation deliveries to charge the canals and make municipal water available. Although the system does have a self-righting tendency, push water is still a concern that may be exacerbated by urbanization. The recommendations for addressing this concern include the construction or expansion of storage capacity for cities so that a city has sufficient supply between deliveries, and increasing inter-connectedness between both raw and treated water systems for increased flexibility and resilience in times of shortage. Irrigation districts may be able to adapt their systems to meet the needs of a customer base that is shifting from irrigation customers to municipal customers.

3.1.1.7 Water Quality

Water in the Rio Grande is normally of suitable quality for irrigation, livestock, industrial uses, and basic treatment for municipal supplies; however, salinity, nutrients, and fecal coliform bacteria are of concern throughout the basin. Salinity concentrations in the Rio Grande are the result of both human activities and natural conditions. For example, the naturally salty waters of the Pecos River are a major source of the salts that flow into Amistad Reservoir and continue downstream. One possible source is nonpoint source pollution on both sides of the river, including poorly constructed or malfunctioning septic and sewage collection systems and improperly managed animal wastes. Nutrient levels are a concern in the Rio Grande, but current levels do not represent a severe threat to human health, however biennial water quality assessments conducted by TCEQ consistently show elevated levels of chlorophyll a and depressed dissolved oxygen in portions of the Rio Grande downstream of Falcon Dam, possibly indicating eutrophication occurring in the river as a result of excessive nutrients, such as ammonia and nitrate.

In addition to natural sources of salinity in the Rio Grande watershed, human activities also increase the loading of salts to the river. Several major agricultural drains which contribute flow to the Rio Grande below Falcon Dam contain seasonally high levels of chlorides and sulfates.[8] These drains receive irrigation return flows from an estimated 1,115 km^2 of irrigated land, 4/5 of which are located in Mexico (888 km^2). Trend analyses conducted on historical water quality data collected in the portion of the Rio Grande downstream of Falcon Reservoir showed increasing trends in chlorides, sulfate and total dissolved solids over time.[9] The same trend analyses also showed increasing trends in nutrients, fecal indicator bacteria, and biochemical oxygen demand.

With active sources of pollution on both sides of the river and separate US and Mexican institutional frameworks in place to control them, coordinated binational efforts to protect water quality in the Rio Grande are necessary to improve water quality. In 2013, the State of Texas (TCEQ) partnered with two US federal agencies (IBWC and EPA) and two Mexican federal agencies (Comisión Internacional de Límites y Aguas (CILA) and Comisión Nacional del Agua (CONAGUA)) and the Mexican State of Tamaulipas (Secretaría de Desarrollo Urbano y Medio Ambiente (SEDUMA) / Comisión Estatal del Agua en Tamaulipas (CEAT)) to begin a binational initiative to restore and protect water quality in the Lower Rio Grande below Falcon Dam. The Lower Rio Grande/Río Bravo Water Quality Initiative (LRGWQI) began under the auspices of the International Boundary and Water Commission and follows the protocols established under the US/Mexico Water Treaty of 1944. An official exchange of letters signed on September 10, 2013 by the Principal Engineers of the two sections of the IBWC includes the official Terms of Reference for the initiative, which established the study area, goals, and objectives of the project, as well as the structure of the binational core group and working groups.

The objectives of the initiative, as described in the LRGWQI Terms of Reference, are to:

- Address current and future water quality issues;
- Evaluate management strategies for point sources;
- Evaluate other mechanisms and strategies to improve water quality under steady-state conditions, including salinity management; and

[8] International Boundary and Water Commission (IBWC). 2000-2006. Water Bulletins. http://www.ibwc.state.gov/water_data/water_bulletins.html; Accessed October 2016.
[9] Miranda, R.M. & Harper, H.D. (2017). Watershed Characterization Report: Lower Rio Grande/Río Bravo Water Quality initiative. Texas Commission on Environmental Quality Report prepared for the Texas General Land Office and US Fish and Wildlife Service as a deliverable to TGLO Contract No. 13-096-000-7128 – Coastal Impact Assistance Program USFWS Financial Assistance Award Number F12AF01188.

- Suggest implementation strategies.

The most important goal of the initiative is the development of a binational watershed-based plan to restore and protect water quality in the river. The Terms of Reference for the LRGWQI also described the technical approach that was to be used for the initiative, which included:

- Binational Data Exchange;
- Historical Data Review;
- Identification of Data Gaps;
- Data Collection; and
- Data Analysis and Modeling.

All technical tasks listed in the Terms of Reference for the LRGWQI were completed in August 2018. As of 2020, the work products of the LRGWQI include a detailed watershed characterization report containing a historical data review and analysis, a point source analysis, and a geospatial analysis of steady state nonpoint sources. Between 2016 and 2018, the LRGWQI also developed binational models of water quality in the Lower Rio Grande, which are incorporated into a decision support system designed to help resource managers and decision makers incorporate water quality planning into their efforts.

The participants in the LRGWQI are currently working to develop a binational watershed-based plan to restore and protect water quality in the Lower Rio Grande. In order to achieve this goal, the involvement of local stakeholders on both sides of the international border is essential. Beginning in 2020, the TCEQ will work with the Lower Rio Grande Valley Development Council (LRGVDC) and other organizations in the Rio Grande Valley to organize a series of informational meetings, which will also serve as a forum to receive input from local stakeholders on what should be included in a binational watershed-based plan. The data collected as part of the LRGWQI, as well as the findings of the initiative to date and other information will be presented to stakeholders to ensure all recommendations and decisions are based on the best available data and information. Successful watershed-based plans are developed with broad stakeholder input and, in the case of the Lower Rio Grande, those efforts entail the participation of Mexican, as well as US stakeholders. Local stakeholders can also help establish a local connection with Mexican stakeholders.

The establishment of a local binational forum for information exchange on water quality issues has been suggested as a means for local stakeholders to engage in a binational platform. A potential model for such a forum is the Joint Advisory Committee (or JAC) on Air Quality Issues in the El Paso/Juarez region, which has successfully met to discuss air quality issues in that region and is credited with helping to reduce air pollution in the area. In a similar fashion, a binational forum to address water quality issues in the Lower Rio Grande could be utilized to develop binational recommendations to improve water quality in the Lower Rio Grande; recommendations that could be incorporated into a binational watershed-based plan. A binational forum of this type could also be used to identify and solicit sources of funding for implementation projects associated with the binational watershed-based plan.

A binational plan to restore and protect water quality in the Lower Rio Grande Below Falcon Dam could be institutionalized under the US/Mexico Water Treaty as a Joint Engineering Report, an Exchange of Letters, or even a Treaty Minute.

3.1.2 Nueces River Basin

The Nueces River basin is bounded by the Rio Grande and Nueces-Rio Grande basins on its southern boundary and by the Colorado, San Antonio, and San Antonio-Nueces basins on its northern boundary. The basin extends from Edwards County in Texas to its discharge point in Nueces Bay, which flows into Corpus Christi Bay and ultimately to the Gulf of Mexico. Only a small portion of the Nueces Basin in Webb and Maverick counties is located within the Rio Grande Region. The Nueces River does not pass through Region M, and the Nueces basin does not contribute significant surface water supply to the region.

3.1.3 Nueces-Rio Grande Basin

The Nueces-Rio Grande basin is bounded on the north by the Nueces River basin and on the west and south by the Rio Grande basin. The drainage area of the Nueces-Rio Grande basin is 10,442 square miles, terminating at the Laguna Madre Estuary. Within the Rio Grande Region the basin encompasses the southeastern portion of Webb County, nearly two-thirds of Jim Hogg County, the majority of Hidalgo and Cameron counties, and all of Willacy County (Figure 3-7).

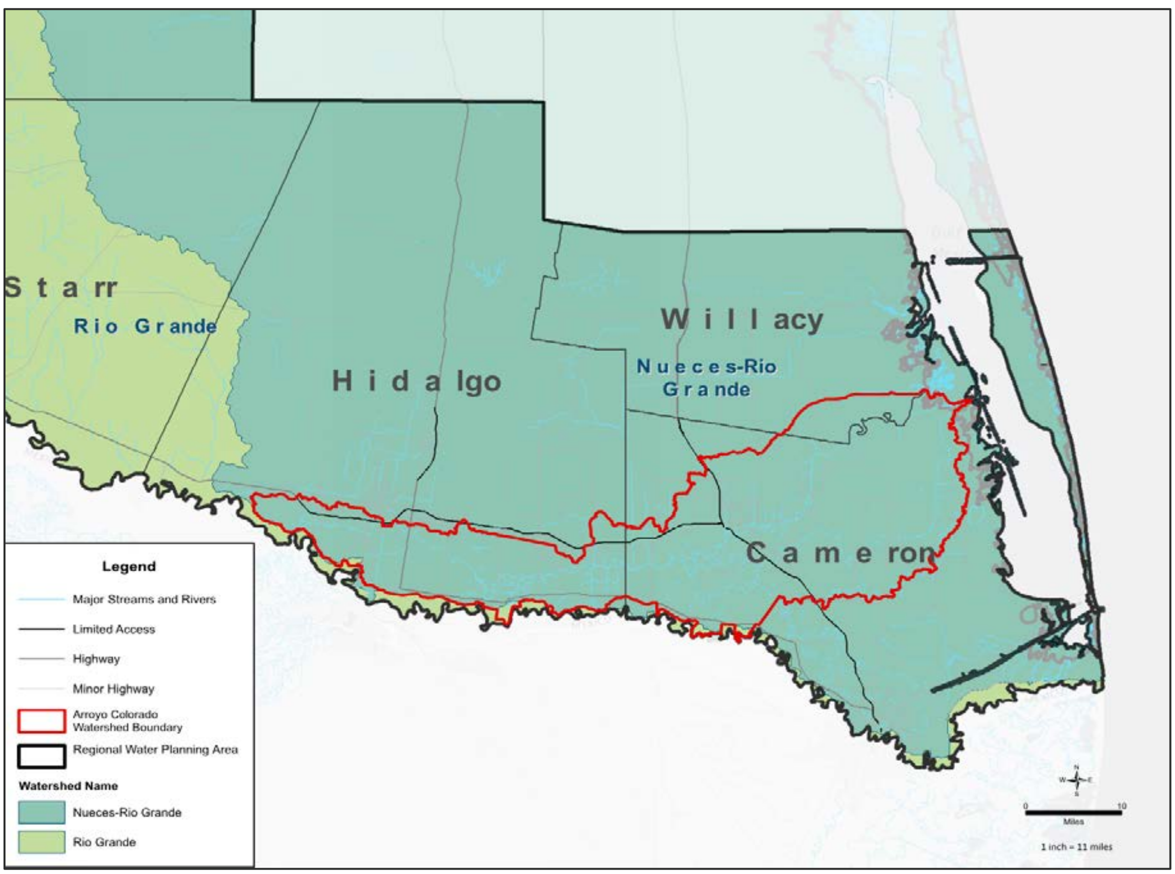

Figure 3-7 Nueces-Rio Grande Basin Including Major Drainage-Ways

Two major drainage courses are in the basin: the main floodway and the Arroyo Colorado. Inflows from the Arroyo Colorado are critical to the ecological health of the Laguna Madre Estuary. In addition to natural drainage, most of the surface water diverted from the Lower Rio Grande is pumped into this basin and discharges into the Arroyo Colorado. There are no natural perennial streams and no significant water supplies from this basin.

The TWDB evaluated the Lower Laguna Madre Estuary and noted that the combined freshwater inflows to the estuary between 1977 and 2010 averaged 523,602 acft/yr and ranged from a minimum of 234,158 acft in 1990 to 2,726,325 acft in 2010. The two gauging stations are on the North Floodway at the town of Sebastian and the Arroyo Colorado at Harlingen. Gauged inflow to the Lower Laguna Madre accounted for 60 percent of the inflows, ungauged flows (estimated using precipitation data over ungauged watershed areas) accounted for approximately 38 percent of the combined inflow, and the net diversions and return flows accounted for the remaining 2 percent.

The Arroyo Colorado traverses Willacy, Cameron, and Hidalgo counties and is the major drainage-way for approximately two dozen cities in this area, with the notable exception of Brownsville. Almost 500,000 acres in these three counties are irrigated for cotton, citrus, vegetables, grain sorghum, corn, and sugar cane production, and much of the runoff and return flows from these areas are discharged into the Arroyo Colorado. The Arroyo Colorado and the Brownsville Ship Channel both discharge into the Laguna Madre near the northern border of Willacy County.

Use of the water in the Arroyo Colorado for municipal, industrial, and/or irrigation purposes is somewhat limited because of the water quality conditions that exist there. The Arroyo Colorado has two TCEQ classified stream segments: a freshwater segment (Segment 2202) and a tidally influenced marine segment (Segment 2201). Segments 2201 and 2202 are listed as impaired for high bacteria levels. Segment 2201 is also listed as impaired for low dissolved oxygen. Nutrient concentrations (nitrogen and phosphorus compounds) are high in both segments.

According to available publications and literature, existing springs within the Nueces-Rio Grande Coastal Basin of the Region M planning area (Cameron, Hidalgo, and Willacy counties) are few and small in terms of their discharge. No major springs are extensively relied upon for water supply purposes. Many of the small springs do provide water for livestock and wildlife when they are flowing.

3.1.4 Livestock Local Supplies

Livestock local supplies are disbursed supplies that are available only at the point of use and do not impact firm yield. These supplies are generally runoff collection, such as livestock supply ponds, and are assumed to be fresh water. Livestock is managed in such a way that populations will be maintained at a level that can be supported by a combination of known groundwater supplies and livestock local supplies; available during drought conditions. Livestock local supplies are shown in Table 3-5.

Table 3-5 Livestock Local Supplies (acft/yr)

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Jim Hogg	Nueces-Rio Grande	222	222	222	222	222	222
Jim Hogg	Rio Grande	49	49	49	49	49	49
Maverick	Nueces	49	49	49	49	49	49
Maverick	Rio Grande	147	147	147	147	147	147
Starr	Rio Grande	65	65	65	65	65	65
Webb	Nueces	413	413	413	413	413	413
Webb	Nueces-Rio Grande	55	55	55	55	55	55
Webb	Rio Grande	451	451	451	451	451	451
Zapata	Rio Grande	249	249	249	249	249	249

3.1.5 Allocation of Surface Water Supplies

Water from the Amistad-Falcon Reservoir system is the primary surface water supply. This subsection discusses the established supplies that can be considered reliable within the context of the Rio Grande operations. TCEQ annual water rights records were used to establish most supplies. Short term contracts for water were not considered to be reliable supplies, although longer term contracts and those anticipated to be renewed were considered reliable.

Class A and B water rights were reduced according to the volume reliability anticipated in a drought year, which decreases over the planning horizon because of sedimentation in the reservoirs. DMI water rights were expected to be 100 percent reliable.

In the supply data, irrigation districts are shown as directly accessing the Rio Grande and as delivering the water that they divert to end users. These data show the physical relationships between the districts and the users that they serve. The delivery losses in the districts were estimated and tracked, and irrigation district conservation is recommended as a WMS to access the water that is currently lost in these systems. Delivery losses that were based on estimated conveyance efficiency were applied to all water supplied by each district. Those water rights that are not diverted by irrigation districts were shown to directly supply the end user, in some cases public supply utilities and in other cases individuals. According to the use designation, this water was counted as supplying county-other demand, irrigation, mining, livestock, or industrial demand. Where the TCEQ data were insufficient to understand the supplies associated with the Rio Grande, entities were contacted individually.

Livestock local surface water supplies were assumed for all counties with livestock demand. Because the demands are based on a drought year scenario, it was assumed that ranchers will manage their livestock so that reliable water sources will be sufficient. These supplies were assumed to be used only for livestock and independent of other surface water sources listed.

3.2 GROUNDWATER AVAILABILITY

The major aquifer that underlies Region M is the Gulf Coast, which underlies Hidalgo, Starr, Jim Hogg, and the western portions of Willacy and Cameron counties. The Carrizo-Wilcox extends through Webb and part of Maverick counties; however, only the outcrop has fresh water, and the subsurface water tends to be slightly to moderately saline. The minor aquifers in the region may produce significant quantities of water that supply relatively small areas, including the Rio Grande Alluvium, the Laredo Formation, and the Yegua-Jackson Aquifer. The majority of groundwater is slightly or moderately saline.

3.2.1 Groundwater Planning

On September 1, 2005, the Texas Legislature passed House Bill 1763 (HB1763) that presented changes in how groundwater availability is determined in Texas. HB1763 includes the following: (1) regionalizes decisions on groundwater availability; (2) requires regional water planning groups to use groundwater availability numbers from the groundwater conservation districts; and (3) defines a permitting target/cap for groundwater production.

The joint groundwater planning process involves various stakeholders to determine how much water can be withdrawn annually and still meet desired future conditions (DFC). This process is undertaken for each of the groundwater management areas (GMAs) by representatives of groundwater conservation districts (GCDs) and members of the public. The modeled available groundwater (MAG) values are the result of this process, which become the groundwater availabilities for the regional water planning process.

The GMAs work with a model of the aquifers in that region to establish estimates of current and future pumping, recharge, and other aquifer characteristics. The MAG for each part of the aquifer indicates how much groundwater pumping should occur in future decades in order to maintain the DFC. The most recent reports from GMA 16 (GR17-025 MAG) and GMA 13 (GR17-027 MAG) were used along with the DFC-compatible non-relevant aquifer availabilities provided by TWDB to establish the MAG availabilities for each decade of the planning horizon.

In some cases, there are aquifers or parts of aquifers within a GMA that are locally important but are not planned for in the same way. Availabilities for these aquifers are developed through the aquifer models but are considered non-MAG availabilities because they are not included in the joint groundwater planning process. One such example was the approval and inclusion of the non-MAG Gulf Coast Aquifer in Cameron and Willacy Counties of GMA 16. Pumping in these areas were not initially included in the MAG and could not be considered as sources within the TWDB database. Intera completed preliminary modeling results for the GMA 16 Joint Planning Cycle 2019-2022 in January 2020 which incorporated current pumping data from various sources in the area. These preliminary results were brought to TWDB and approved on May 21, 2020. Table 3-6 summarizes the aquifer availabilities in Region M, including MAG and new non-MAG.

Table 3-6 Available Groundwater for Significant Aquifers in Region M (acft/yr)

AQUIFER	DATA	2020	2030	2040	2050	2060	2070
Carrizo-Wilcox Aquifer	MAG	2,958	2,958	2,917	2,830	2,485	2,447

AQUIFER	DATA	2020	2030	2040	2050	2060	2070
Gulf Coast Aquifer	MAG	106,389	114,973	123,560	132,140	140,293	140,293
Gulf Coast Aquifer	Non-MAG	40,806	44,574	48,342	52,111	55,877	55,877
Yegua-Jackson Aquifer	Non-MAG	36,000	36,000	36,000	36,000	36,000	36,000
	Total	186,153	198,505	210,819	223,081	234,655	234,617

Currently, four GCDs exist in the region: Brush Country, Kenedy County, Red Sands, and Starr County (Figure 3-8).

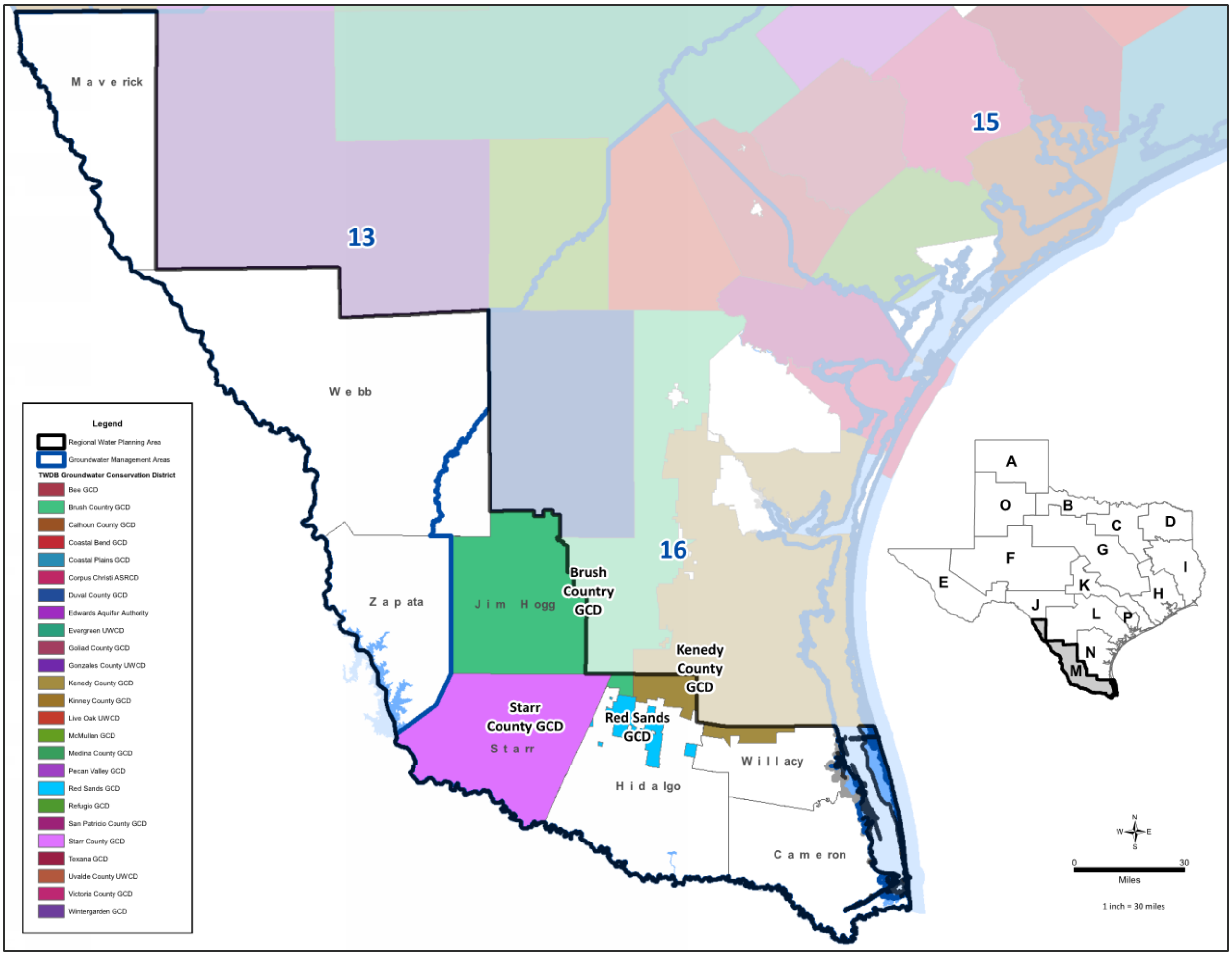

Figure 3-8 Groundwater Conservation Districts and Groundwater Management Areas in Region M

3.2.1.1 Brush Country Groundwater Conservation District

The Brush Country Groundwater Conservation District (Brush Country GCD) was created by legislative enactment in 2009 and was confirmed by voters at a confirmation election held on November 3, 2009. On August 26, 2013, the Brush Country Board of Directors adopted comprehensive rules to manage, protect, and conserve the groundwater resources within its district boundaries. The Brush Country GCD territory includes all of Jim Hogg County, the area of Jim Wells County outside of the City of Alice and outside the Kenedy County GCD, the area of Brooks County outside of the Kenedy County GCD, and a small area in northern Hidalgo County. The current Brush County GCD Management Plan identifies the Gulf Coast Aquifer as the only major aquifer within the district's boundaries and has established a DFC, valid for the next 10 years, of a GMA-wide average drawdown of approximately 94 feet. The Groundwater Availability Model (GAM) Run 09-008, Scenario 10, was used to establish this DFC.

Brush Country GCD has been actively participating in GMA 16 meetings and is considered fully operational.

3.2.1.2 Kenedy County Groundwater Conservation District

The Kenedy County Groundwater Conservation District (KCGCD) covers 1,686,889 acres, including all land within Kenedy County and parts of Brooks, Hidalgo, Jim Wells, Kleberg, Nueces, and Willacy counties. The district includes 44,311 acres of northern Willacy County and 73,006 acres of northeastern Hidalgo County. The district's mission is to develop and implement an efficient, economical, and environmentally sound groundwater management program to protect and enhance the groundwater resources of the district.

The KCGCD adopted new amendments to its Groundwater Conservation Plan since the 2016 RWP on January 20, 2016, and March 21, 2018. Below are a few of the new amendments:

Wells exempt from obtaining an operating permit (exempt wells) include, but are not limited to, the following:

- Used solely for domestic or livestock use;
- Temporary rig supply wells for active drilling or exploration operations;
- Supply water for secondary recovery of oil or gas;
- Authorized under a permit issued by the Railroad Commission of Texas; and
- Solely used for aquifer testing and monitoring water levels or water quality.

More details required for permit applications, processing, issuance, change in well conditions or operations, and replacing a well;

- Increased civil enforcement and penalties with the violation of any district rule;
- Increased required information, rules, and restrictions for contested wells; and
- Calculated production limits for new non-exempt wells based on contiguous acres owned or have production rights over.

The DFC established for the Kenedy County GCD was a drawdown of 101 feet in 2060.

3.2.1.3 Red Sands Groundwater Conservation District

The majority of the Red Sands GCD is located in Hidalgo County and in the southern parts of Willacy County. The district comprises an area of land in the northwestern corner of Hidalgo County, an adjacent area in north central Hidalgo County, and an area along the border between Hidalgo and Willacy counties.

In March 2018, the Red Sands GCD management plan detailed the historical and current state of its district and its plans to adhere to TWDB and groundwater conservation. Red Sands is in the process of registering all wells in the district and issuing permits for those wells. Many inactive wells are in the district, and Red Sands is in the process of plugging those inactive wells in accordance with the goals in its conservation plan. There is a limited water supply in the Red Sands GCD, the DFC identifies a target of 40 feet of average drawdown. According to the most recent groundwater modeling; this allows for 584 acft/yr of pumping. Because of this limited water supply and location restrictions, Red Sands has maintained community engagement goals to remain active in groundwater conservation.

3.2.1.4 Starr County Groundwater Conservation District

Starr County GCD consists entirely of Starr County, bounded by Zapata, Jim Hogg, Brooks, and Hidalgo counties, and the Rio Grande River. Starr County GCD is governed by a five-member Board of Directors that was appointed at the inception of the district; all members were re-elected in the county elections in November of 2012 and serve for 2 years. As of June 2018, Starr County GCD was found to be non-compliant by the state auditor's office.[10] The Starr County GCD had been inactive due to lack of funds, but held a meeting in January of 2020 in an effort to regain compliant status.

Starr County GCD overlies parts of both the Gulf Coast Aquifer and the Yegua-Jackson Aquifer. The Portion of the Gulf Coast has low water availability and a total dissolved solids (TDS) ranging from 1,000 to more than 10,000 mg/L. The Yegua Jackson Aquifer has low yield with water quality between 50 and 10,000 mg/L TDS. Starr county GCD has adopted the drawdown goal of 94-foot area-wide for GMA 16. These conditions result in an estimated 127 feet of drawdown in the Gulf Coast Aquifer. The portion of the Yegua-Jackson Aquifer in Starr County is not included in the MAG process.

3.2.2 Gulf Coast Aquifer

The Gulf Coast Aquifer exists in an irregular band along the Texas coast from the Texas-Louisiana border to Mexico. Historically, the Gulf Coast Aquifer has been used to supply varying quantities of water in Cameron, Hidalgo, Jim Hogg, eastern Starr, southeastern Webb, and southern Willacy counties (Figure 3-9).

The Gulf Coast Aquifer consists of interbedded clays, silts, sands, and gravels, which are hydrologically connected to form a leaky aquifer system. In general, there are four components of this system: the deepest zone is the Catahoula; above the Catahoula is the Jasper Aquifer located within the Oakeville Sandstone; the Evangeline Aquifer contained within the Fleming and Goliad sands is separated from the Jasper by the Burkeville confining layer; and the uppermost aquifer, the Chicot, consists of the Lissie, Willis, Bentley, Montgomery, Beaumont, and overlying alluvial deposits. In Region M, these overlying

[10] Starr County Groundwater Conservation District found Non-Compliant, June 2018 https://www.themonitor.com/2018/06/01/starr-county-groundwater-conservation-district-found-non-compliant/.

alluvial deposits include portions of the Rio Grande alluvium. These zones extend into Zapata and Webb counties but produce smaller quantities of water in these areas.

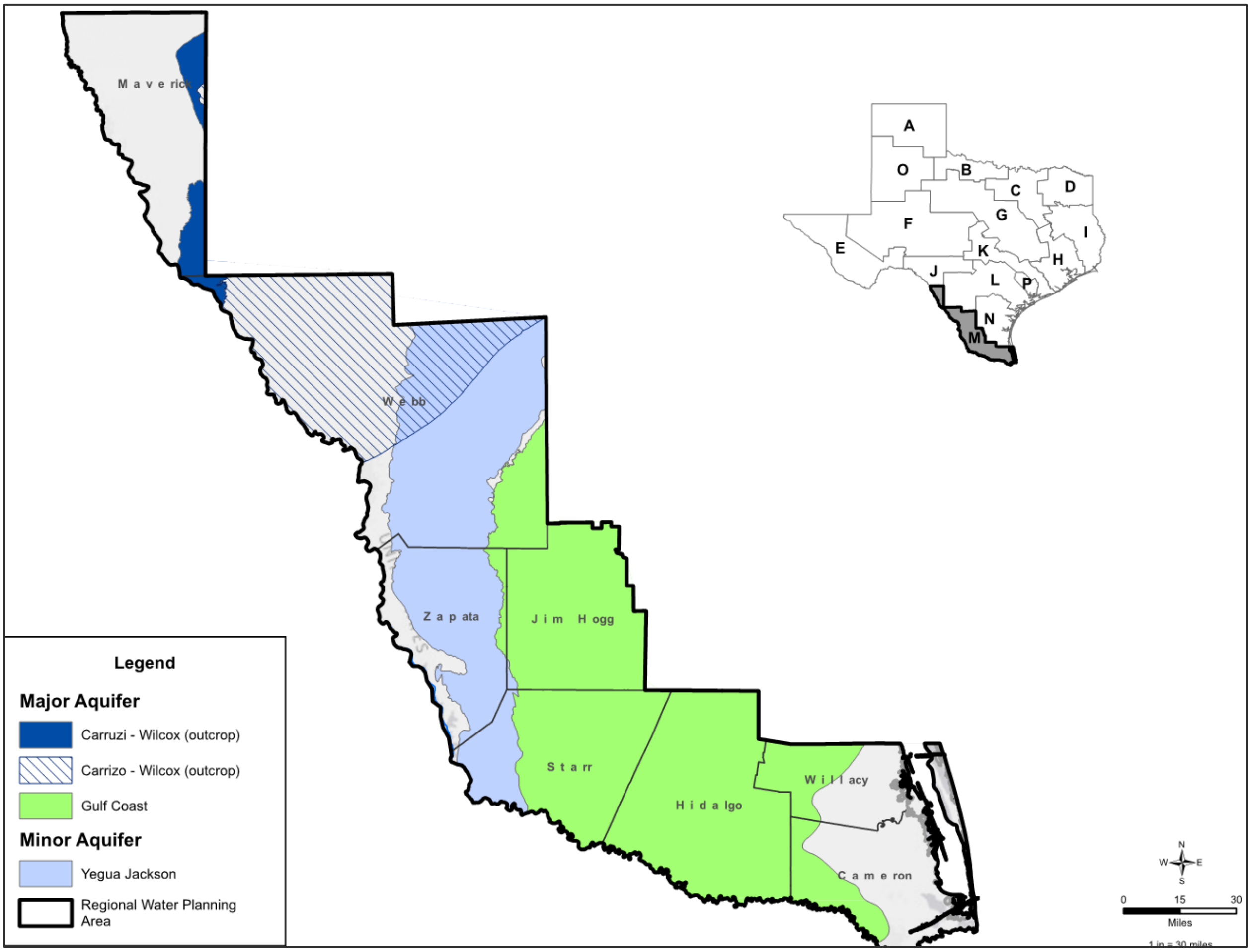

Figure 3-9 Major and Minor Aquifers in Region M

The primary water-producing zone varies from one area of the region to another. The Chicot Aquifer is the primary water-producing zone in western Cameron and eastern Hidalgo counties. The Evangeline Aquifer produces significant quantities of water in Cameron, Hidalgo, and Willacy counties. The Oakville Sandstone produces significant quantities of water in northeastern Starr County, northwestern Hidalgo County, and a portion of Jim Hogg County. The Catahoula formation produces small to moderate quantities of water in Webb County (Table 3-7).

Recharge to the Gulf Coast Aquifer occurs primarily through percolation of precipitation. This may be supplemented in some areas by the addition of irrigation water from the Rio Grande, which may have negative impacts on water quality in localized areas. In some areas, recharge may be limited by shallow subsurface drainage systems designed to control the buildup of salts resulting from continued irrigation operations.

Table 3-7 Gulf Coast Aquifer MAG and Non-MAG Availability Projections by County and River Basin (acft/yr)

SOURCE COUNTY	SOURCE BASIN	2020	2030	2040	2050	2060	2070
Cameron	Nueces-Rio Grande	6,301	7,536	8,771	10,005	11,241	11,241
Cameron	Rio Grande	387	463	540	615	691	691
Cameron (Non-MAG)	Nueces-Rio Grande	38,969	42,395	45,821	49,247	52,673	52,673
Cameron (Non-MAG)	Rio Grande	646	772	899	1,026	1,151	1,151
Hidalgo	Nueces-Rio Grande	86,405	91,810	97,216	102,620	107,784	107,784
Hidalgo	Rio Grande	1,634	2,041	2,447	2,854	3,260	3,260
Jim Hogg	Nueces-Rio Grande	5,236	5,236	5,236	5,236	5,236	5,236
Jim Hogg	Rio Grande	938	938	938	938	938	938
Starr	Nueces-Rio Grande	1,497	1,891	2,285	2,678	3,072	3,072
Starr	Rio Grande	2,225	2,810	3,396	3,981	4,567	4,567
Webb	Nueces	18	22	27	32	37	37
Webb	Nueces-Rio Grande	504	642	780	918	1,056	1,056
Webb	Rio Grande	98	125	152	179	206	206
Willacy	Nueces-Rio Grande	1,146	1,459	1,772	2,084	2,205	2,205
Willacy (Non-MAG)	Nueces-Rio Grande	1,191	1,407	1,622	1,838	2,053	2,053
	Total	147,195	159,547	171,902	184,251	196,170	196,170

Although significant quantities of groundwater are available, recent pumping has resulted in dropping groundwater levels in some areas. Anecdotally, northern Hidalgo and western Willacy counties are experiencing dropping water levels in recent drought years of up to 80 feet.

Well yields can vary significantly. In the Oakville Sandstone, average production is about 120 gallons per minute (gpm), while in the Chicot Aquifer the average well yield is about 10 times this rate, or 1,200 gpm. In the Catahoula Formation, yields range from 30 to 150 gpm. Availability from the Gulf Coast Aquifer is based on GAM Run 17-025 MAG: GMA 16 Model Runs to Estimate Drawdowns under Assumed Future Pumping for the Gulf Coast Aquifer, finalized May 19, 2017. As described in Section 3.2.1, non-MAG availability in the Gulf Coast Aquifer is based on GMA 16 Joint Planning Cycle 2019-2022 preliminary modeling data, approved by the TWDB to be included in the RWP on May 21, 2020.

3.2.2.1 Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas

The TWDB initiated a study of the groundwater resources in the Lower Rio Grande Valley under the Brackish Resources Aquifer Characterization System (BRACS) program. Most of the groundwater in the study area (parts of Cameron, Willacy, Hidalgo, and Starr counties) has concentrations of TDS greater than 1,000 mg/L and does not meet drinking water quality standards (refer to Figure 3-10). The Gulf Coast Aquifer and overlying quaternary geologic units underlie an area of about 3,900 square miles in the study area, and it is the primary source of groundwater in the area.

Seven desalination plants treat brackish groundwater for municipal use in the area, and an additional seven desalination projects were recommended by the 2021 Rio Grande RWP.

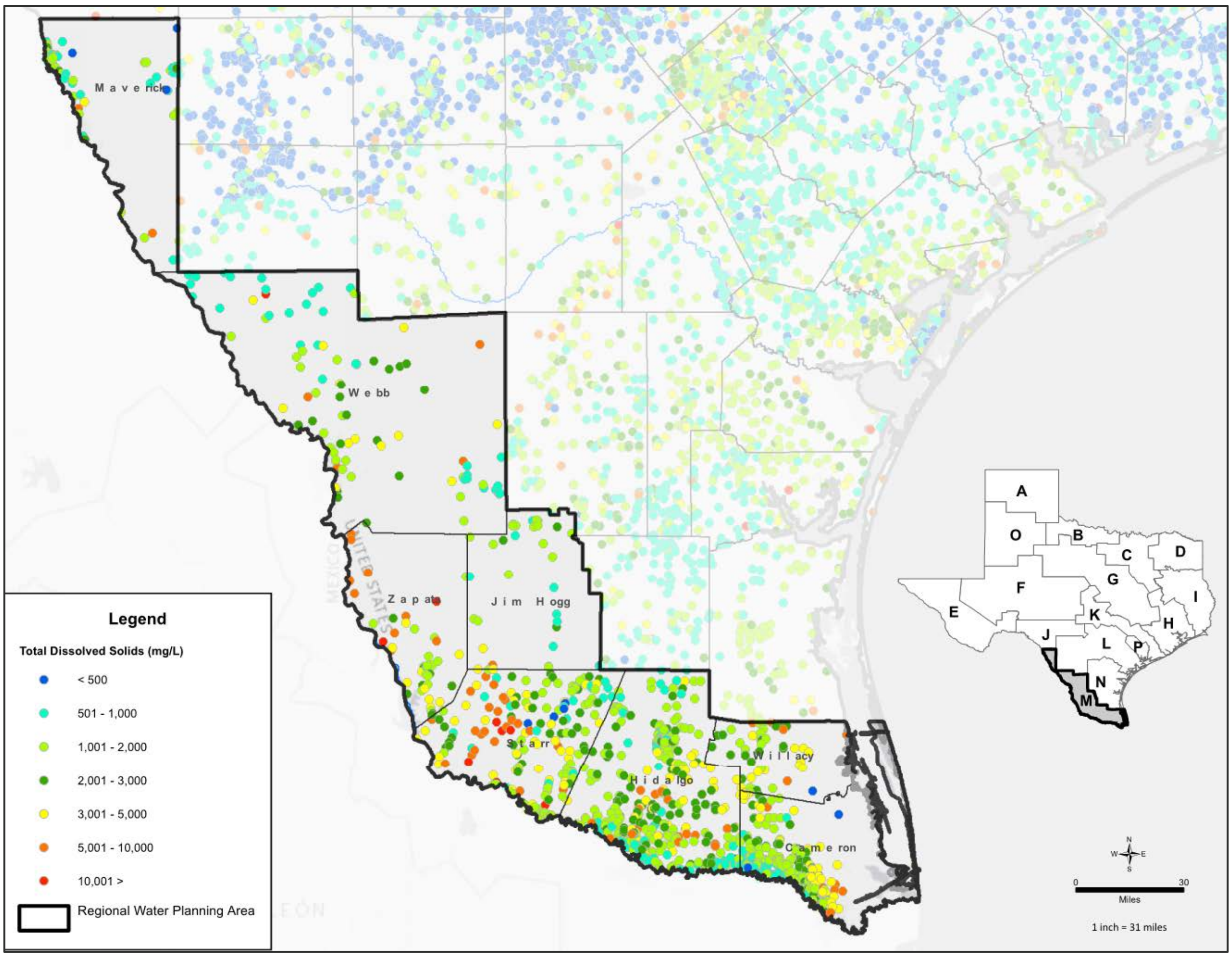

Figure 3-10 Distribution of Wells Sampled for TDS, BRACS Report

The BRACS study used thousands of water well and geophysical logs for geologic, water chemistry, water level, and aquifer test data from a wide variety of sources to characterize the groundwater in the Gulf Coast Aquifer. From this information, three-dimensional salinity zones were mapped within the aquifer containing groundwater of a similar salinity range shown in Table 3-8.

Table 3-8 Salinity Ranges for Groundwater as Defined in BRACS

SALINITY	RANGE OF TOTAL DISSOLVED SOLIDS (MG/L)
Fresh Water	0 – 1,000
Slightly Saline Water	1,000 – 3,000
Moderately Saline Water	3,000 – 10,000
Very Saline Water	10,000 – 35,000
Brine	greater than 35,000

TWDB estimated that the Gulf Coast Aquifer in the study area contains a significant volume of brackish groundwater: more than 40 million acft of slightly saline groundwater; 112 million acft of moderately saline groundwater; and 123 million acft of very saline groundwater. Not all of the brackish groundwater can be produced or economically extracted and treated, but the estimates provide an indication of the potential availability of this important resource.

The study delineated 21 separate geographic areas that each have a unique salinity zone profile from ground surface to the base of the Gulf Coast Aquifer. Some of the salinity zones are quite complex, with intermingled groundwater of different salinity ranges that could not be classified into unique, mapped zones. Placement of these boundaries represents best professional judgment and can undoubtedly be refined with more data from future drilling and testing. The use of these boundaries accordingly requires caution when evaluating future well fields near one of them.

3.2.3 Carrizo-Wilcox Aquifer

The Carrizo Sand, or Carrizo-Wilcox Aquifer, outcrops in a very small area in northwest Webb County, approximately 60 miles to the north-northwest of Laredo (see “Carrizo-Wilcox (outcrop)” in Figure 3-9). The formation continues north into Dimmit, Zavala, and Maverick counties, roughly parallel in orientation to those formations occurring to the east and south.

The Carrizo-Wilcox Aquifer is the principal and most prolific aquifer within the northern portion of Region M. The Carrizo-Wilcox Aquifer is a coarse to fine grained, massive, loosely cemented, cross-bedded sandstone with some interbedded thinner sandstones and shales. It yields moderate to large quantities of groundwater, but the yield decreases with distance from the outcrop as the formation dips southeastward. Recharge occurs primarily through exposure of the Carrizo-Wilcox sands to precipitation at the outcrop and where the outcrop is incised by creeks or streams.

The projected quantities of water available from the Carrizo-Wilcox Aquifer are presented in Table 3-9. These estimates were derived by assessing GAM Run 17-027 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson Aquifers in GMA 13 from October 27, 2017.

Table 3-9 Carrizo-Wilcox Aquifer MAG Availability Projections by County and River Basin (acft/yr)

SOURCE COUNTY	SOURCE BASIN	2020	2030	2040	2050	2060	2070
Maverick	Nueces	777	777	777	777	472	472
Maverick	Rio Grande	1,265	1,265	1,224	1,137	1,097	1,059
Webb	Nueces	92	92	92	92	92	92
Webb	Rio Grande	824	824	824	824	824	824
	Total	**2,958**	**2,958**	**2,917**	**2,830**	**2,485**	**2,447**

3.2.4 Yegua-Jackson Aquifer

The Yegua-Jackson Aquifer extends in a narrow band from the Rio Grande and Mexico across the state to the Sabine River and Louisiana. In Region M, the Yegua-Jackson Aquifer extends in a narrow band from the Rio Grande through Starr, Zapata, and Webb counties (Figure 3-9). The amount and type of use from the Yegua-Jackson Aquifer vary across the region.

The Yegua-Jackson aquifer consists of complex associations of sand, silt, and clay deposited during the Tertiary Period. Net sand thickness is generally less than 200 feet at any location within the aquifer. Water quality varies greatly within the aquifer, and shallow occurrences of poor-quality water are not uncommon; this is especially true in the Region M planning area. In general, however, small to moderate amounts of usable quality water can be found within shallow sands (less than 300 feet deep) over much of the Yegua-Jackson Aquifer. Although the occurrence, quality, and quantity of water from this aquifer are erratic, domestic and livestock supplies are available from shallow wells over most of its extent. Locally, water for municipal, industrial, and irrigation purposes is available. Yields of most wells are small, less than 50 gpm, but in some areas, yields of adequately constructed wells may be as high as 500 gpm. Availabilities in the Yegua-Jackson Aquifer are based on GAM Run 17-027 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson Aquifers in GMA 13 from October 27, 2017. The Yegua-Jackson aquifer availabilities are DFC compatible non-relevant availability estimates, generated in the GR17-027 MAG model run, as reported in the "NonRelevantGroundwaterDFCCompatibleWaterVolumes" workbook provided by TWDB dated 5/2/2018. Note - GR17-030_MAG is also listed in the non-relevant workbook for the Region M counties with Yegua-Jackson, but that model, from GMA12, does not cover any counties in Region M. Table 3-10 summarizes non-MAG availability projections in the Yegua-Jackson Aquifer, separated by basin.

Table 3-10 Yegua-Jackson Aquifer Non-MAG Availability Projections by County and River Basin (acft/yr)

SOURCE COUNTY	SOURCE BASIN	2020	2030	2040	2050	2060	2070
Webb	Nueces	11,969	11,969	11,969	11,969	11,969	11,969
Webb	Rio Grande	8,031	8,031	8,031	8,031	8,031	8,031
Zapata	Rio Grande	7,987	7,987	7,987	7,987	7,987	7,987
	Total	**27,987**	**27,987**	**27,987**	**27,987**	**27,987**	**27,987**

3.2.5 Rio Grande Alluvium

The alluvial aquifer of the lower Rio Grande Valley consists of terrace, flood-plain, and delta deposits of the Rio Grande. These deposits are made up of unconsolidated gravel, sand, silt, and clay. The aquifer also includes some clay, silt, sand, and gravel of the Goliad, Lissie, and Beaumont Formations, which underlie the alluvium. The aquifer extends along the Rio Grande from below Falcon Dam in Starr County for about 100 miles to Brownsville in Cameron County. In southern Starr County and southwestern Hidalgo County, the aquifer follows a narrow strip along the river 5 to 10 miles wide. From eastern Hidalgo County, the aquifer extends northward into Willacy County, where its maximum width in Texas is about 28 miles. The alluvial aquifer also covers the western half of Cameron County. The productive area of the aquifer convers about 950 square miles, most of which is in or around the Rio Grande basin in Hidalgo, Cameron, and Willacy counties. This additional area adjacent to the Rio Grande basin has been included in this discussion because of its hydrologic connection with the aquifer in the basin. The potential yield of the aquifer in the Rio Grande basin depends on the amount of water recharged by the infiltration of precipitation and by seepage from the Rio Grande and the amount of water withdrawn from the aquifer in the area north of the basin.

Groundwater in the upper part of the aquifer generally is under water-table conditions. However, local artesian conditions exist where the water passes under relatively impermeable clays. The maximum thickness of the aquifer is about 700 feet. Its thickness is irregular and is generally less than 500 feet. The best quality of water in the aquifer occurs near the Rio Grande at depths of less than 75 feet in southeastern Starr County, between 50 and 250 feet in southern Hidalgo County, and between 100 and 300 feet in western Cameron County.

Recharge to the aquifer is from the percolation of water from the land surface. This water is from precipitation, canals and drains, irrigation return water, and the Rio Grande. Water normally flows from the Rio Grande into the aquifer, except when the river is at its lowest level.

Although a number of entities pump Rio Grande Alluvial groundwater, there is no MAG for this aquifer. The Rio Grande alluvium intermingles with the Gulf Coast Aquifer, and in many cases it is difficult to delineate these two aquifers. The wells at Southmost Regional Water Authority and Military Highway WSC have been identified in some cases as drawing from Gulf Coast and in other cases drawing from Rio Grande Alluvium.

3.2.6 Allocation of Groundwater Supplies

Groundwater usage records were gathered from the TWDB groundwater database, from the Water User Group Entity detailed gallons per capita per day (GPCD) reports, from the municipal and industrial water uses surveys, and from entities themselves. Municipal groundwater supplies were based on information from the municipalities/utilities and considered to be consistent over the planning horizon.

For county-wide Water User Groups (WUGs), such as irrigation, mining, and county-other, the TWDB groundwater database was used. For each type of user, an average horsepower and well depth were used to estimate the yield from each well. These values were compared against the stated demands. For each type of user, a well yield and a percentage of wells reporting was assumed and extrapolated over the data for each county. For instance, a domestic well was assumed to yield 0.4 acft, on the basis of 140 GPCD, 2.5 people per household; these wells were assumed to be reported 50 percent of the time. The 2017 database includes notes indicating the well count for each county and river basin split, as well as the assumptions used to develop pumping estimates.

In each of these resources, the aquifers identified were checked against availability information including, but not limited to, the MAG values. The RWP processes relies on MAG as the annual amount of groundwater that can reliably be extracted from an aquifer in a given area while still meeting conservation goals set out by the GMAs.

There has been a significant change in MAG projections for the counties in Region M between the past two cycles of groundwater management planning. The total groundwater availability projections for Region M decreased by almost 20 percent and was dramatically reduced in three counties to volumes significantly below current groundwater pumping. However, the groundwater in Hidalgo County was doubled (refer to Figure 3-11 and Figure 3-12).

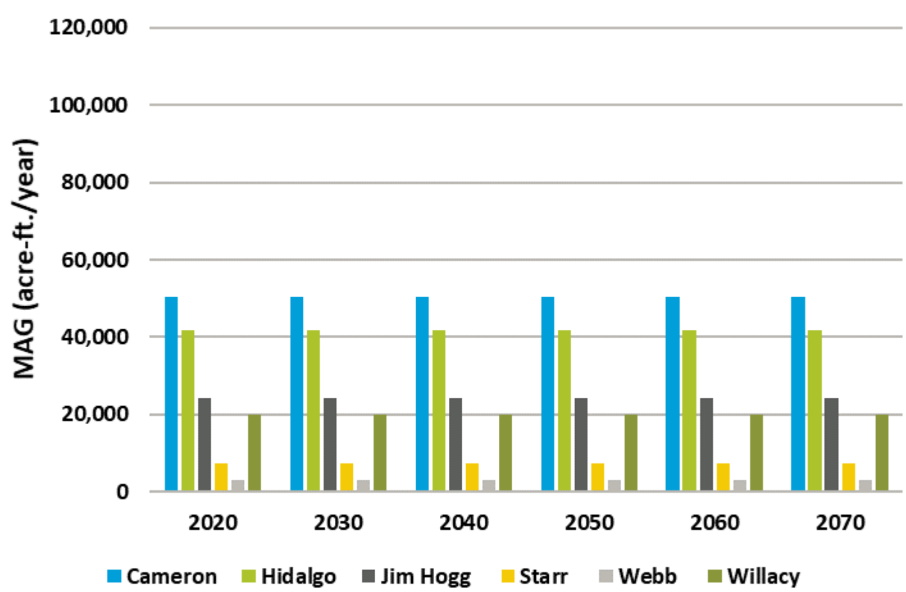

Figure 3-11 2016 Regional Water Plan Gulf Coast Aquifer MAG

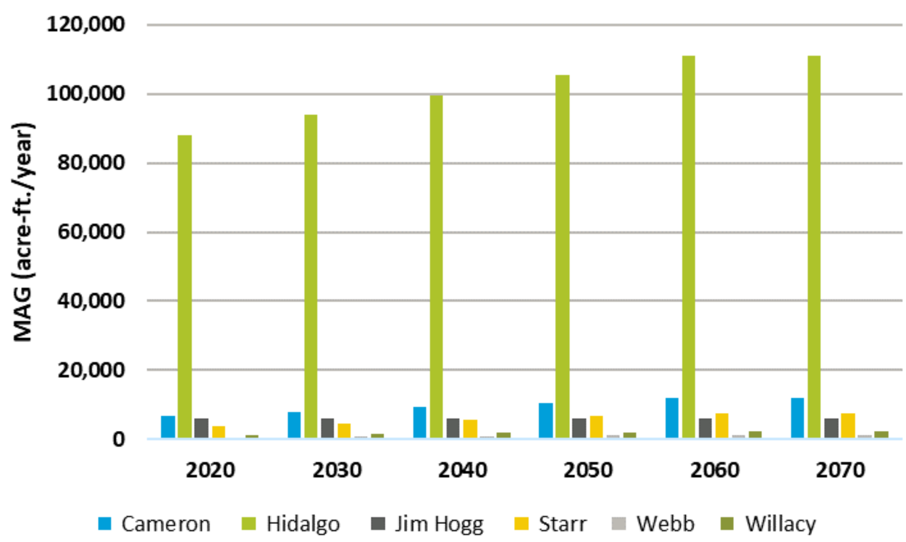

Figure 3-12 2021 Regional Water Plan Gulf Coast Aquifer MAG

The RWP is required to present only supplies and recommended projects within the MAG volume totals. Thus, the total existing supplies plus any recommended groundwater projects must be no greater than the MAG for that county.

Because current supplies are larger than the MAG in some counties, the RWP will need to cite existing supplies in the plan as less than the water that is actually being supplied. All counties with current supplies that are less than the MAG will be unaffected, and existing supplies will be shown in full.

The planning group used a weighted assessment of all municipal users of aquifers that have a MAG less the current supplies, and ranked WUGs according to reliance on groundwater. Entities that rely on groundwater as their sole source are shown to have their full supply, if possible. The planning data will show the remainder of the MAG availability proportionally distributed among municipal users first, and then among non-municipal users. The municipal users who are not solely dependent on groundwater are ranked according to the percentage of their supply from groundwater, and the supply will be weighted to favor WUGs that rely more heavily on groundwater. This alternative is detailed in Table 3-11 and Table 3-12 and depicted on Figure 3-13.

Table 3-11 Percentage Reliance of Groundwater, Municipal WUGs

WUG	SOURCE NAME	COUNTY	BASIN	% GW SUPPLY
Alamo	Gulf Coast	Hidalgo	Nueces-Rio Grande	12%
Brownsville PUB	Gulf Coast	Cameron	Nueces-Rio Grande	22%
East Rio Hondo WSC	Gulf Coast	Cameron	Nueces-Rio Grande	6%
Los Fresnos	Gulf Coast	Cameron	Nueces-Rio Grande	20%
McAllen	Gulf Coast	Hidalgo	Nueces-Rio Grande	8%
Mercedes	Gulf Coast	Hidalgo	Nueces-Rio Grande	16%
Military Highway WSC	Gulf Coast	Cameron	Nueces-Rio Grande	57%
Military Highway WSC	Gulf Coast	Hidalgo	Nueces-Rio Grande	30%
North Alamo WSC	Gulf Coast	Cameron	Nueces-Rio Grande	3%
North Alamo WSC	Gulf Coast	Hidalgo	Nueces-Rio Grande	26%
North Alamo WSC	Gulf Coast	Willacy	Nueces-Rio Grande	4%
Pharr	Evangeline Aquifer	Hidalgo	Nueces-Rio Grande	8%
Primera	Gulf Coast	Cameron	Nueces-Rio Grande	34%
Raymondville	Gulf Coast	Willacy	Nueces-Rio Grande	0%
San Juan	Gulf Coast	Hidalgo	Nueces-Rio Grande	19%
Valley MUD	Gulf Coast	Cameron	Nueces-Rio Grande	8%
Webb County Water Utility	Carrizo-Wilcox Aquifer	Webb	Nueces	0%

Table 3-12 Allocation of Available Groundwater

WUG	SOURCE NAME	COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Hidalgo	Gulf Coast	Hidalgo	Nueces-Rio Grande	1,617	1,782	1,782	1,782	1,782	1,782
Jim Hogg WCID 2	Gulf Coast	Jim Hogg	Nueces-Rio Grande	1,412	1,412	1,412	1,412	1,412	1,412
Mirando City WSC	Gulf Coast	Webb	Rio Grande	70	70	70	70	70	70
Webb County Other	Yegua-Jackson	Webb	Nueces	6	6	6	6	6	6
Webb County Other	Gulf Coast	Webb	Nueces-Rio Grande	121	121	121	121	121	121
Webb County Other	Yegua-Jackson	Webb	Rio Grande	100	100	100	100	100	100
Webb County Other	Gulf Coast	Webb	Rio Grande	75	75	75	75	75	75
Brownsville PUB	Gulf Coast	Cameron	Nueces-Rio Grande	9,991	9,991	9,991	9,991	9,991	9,991
East Rio Hondo WSC	Gulf Coast	Cameron	Nueces-Rio Grande	376	376	376	376	376	376
Los Fresnos	Gulf Coast	Cameron	Nueces-Rio Grande	267	267	267	267	267	267
Military Highway WSC	Gulf Coast	Cameron	Nueces-Rio Grande	2,352	2,352	2,352	2,352	2,352	2,352
North Alamo WSC	Gulf Coast	Cameron	Nueces-Rio Grande	912	912	912	912	912	912
North Alamo WSC	Gulf Coast	Willacy	Nueces-Rio Grande	1,142	1,344	1,344	1,344	1,344	1,344
Primera	Gulf Coast	Cameron	Nueces-Rio Grande	205	205	205	205	205	205
Raymondville	Gulf Coast	Willacy	Nueces-Rio Grande	4	5	5	5	5	5
Valley MUD 2	Gulf Coast	Cameron	Nueces-Rio Grande	371	391	410	430	450	450

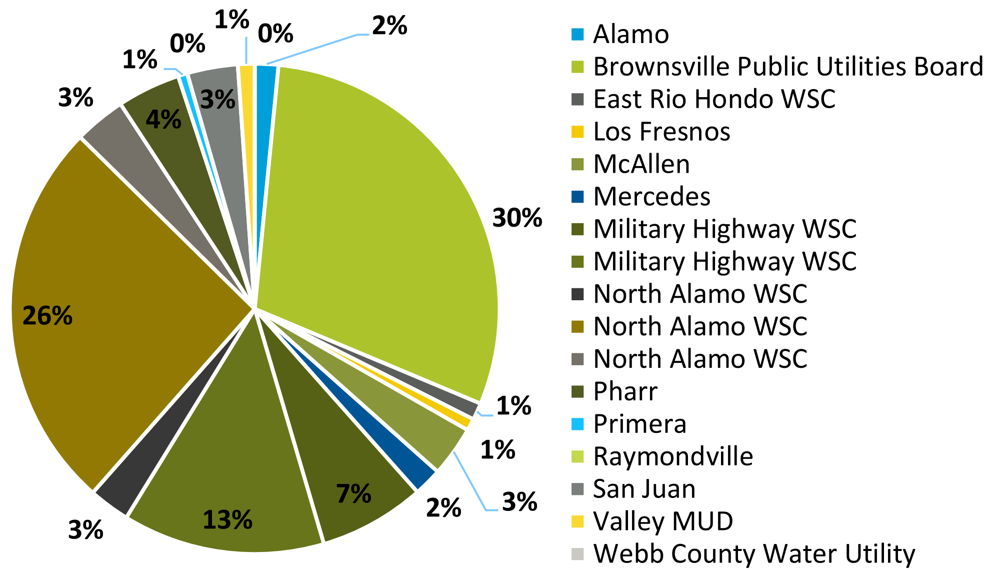

Figure 3-13 Weighted Allocation of 2020 Gulf Coast Aquifer, Cameron County

3.3 RECYCLED WATER

The use of wastewater treatment plant (WWTP) effluent as reclaimed water is becoming increasingly common as an alternative water supply. Water reuse is classified as direct or indirect and potable or non-potable. Direct reuse is defined as the use of reclaimed water that is piped directly from the WWTP to the place where it is utilized. Indirect reuse is defined as the use of reclaimed water by discharging to a water supply source, such as surface water or groundwater, where it blends with the water supply and may be further purified before being removed for non-potable or potable uses. Potable water is suitable for direct consumption, and non-potable is used to meet a range of other demands. This gives four classes of reuse:

1. Direct potable;
2. Direct non-potable;
3. Indirect potable; and
4. Indirect non-potable.

The most common class is direct non-potable for irrigation or industrial type uses. Irrigation use may include turf irrigation, or in some cases, crop irrigation. Many forms of indirect reuse have been implemented through the years as discharges from one water user contribute to streamflow or groundwater recharge and are then diverted by a downstream water user. In unique cases involving groundwater-based return flows or inter-basin transfers, a discharger may retain a right to its return flows. For planning purposes, indirect reuse is considered water that would require a permit to access after it has been discharged into the environment. This form of indirect reuse is limited by the legal complexity required to demonstrate that a discharge increases water availability.

The Texas Administrative Code (TAC) Chapter 210 authorizes individual producers of reclaimed water to implement water reuse in Texas. Many individual WUGs in Region M have 210 authorizations with water reuse in various stages of implementation. Two classes of water are authorized:

Type I Reclaimed Water – suitable for use where contact between humans and the reclaimed water is likely; and

Type II Reclaimed Water – suitable for use where contact between humans and the reclaimed water is unlikely.

Currently, 11 municipalities in Region M use reclaimed water to satisfy municipal demands. Table 3-13 presents data and information provided by the associated WUGs. All uses are for non-potable purposes, such as service water at WWTPs and landscape irrigation and ponds.

Table 3-13 Current Reuse Water Usage in the Lower Rio Grande Valley

MUNICIPALITY	WWTP	AVERAGE REUSE		MAXIMUM REUSE CAPACITY		INTENDED USE
		(MGD)	(ACFT/YR)	(MGD)	(ACFT/YR)	
Brownsville PUB	Robindale WWTP	6	6,721	7.25	8,120	Irrigation
Brownsville PUB	Southside WWTP	3.57	4,000	6.4	7,168	Potable
Eagle Pass	Eagle Pass WWTP	0.58	650	3.0	3,360	Dust Control and Golf Course Irrigation, Ponds
Edinburg	Edinburg WWTP	3	3,360	6.15	6,888	Power Plant Process Water
Harlingen	Harlingen WWTP No. 2	1.0	1,120	3.63	4,060	Golf Course; Sports Fields; Watering Ponds
La Feria	La Feria WWTP	0.16	174	1.0	1,120	Irrigation
Laguna Madre Water District	Isla Blanca WWTP	0.06	67	1.3	1,456	Irrigation
Laguna Madre Water District	Laguna Vista WWTP	0.1	112	0.3	336	Golf Course Irrigation and Lagoons
Laredo	North Laredo WWTP	0.53	594	1.46	1,639	Plant Water, Golf Course Irrigation
Laredo	United Water Laredo Southside WWTP	0.08	90	6.0	6,720	Plant Water, Irrigation, Belt Press
Laredo	Zacate Creek WWTP	0.08	90	7.0	7,840	Plant Water, Irrigation, Process Water
McAllen	McAllen North WWTP	8	8,961	5.63	6,300	Plant Water; Master Plan Community
McAllen	McAllen South WWTP	3.12	3,500	5.0	5,600	Golf Course Irrigation
Pharr	Pharr WWTP	2.0	2,240	4.0	4,480	Parks; Golf Course Irrigation

MUNICIPALITY	WWTP	AVERAGE REUSE		MAXIMUM REUSE CAPACITY		INTENDED USE
		(MGD)	(ACFT/YR)	(MGD)	(ACFT/YR)	
Valley MUD No. 2	Rancho Viejo WWTP	0.1	112	0.21	235	Golf Course Pond
Weslaco	Weslaco North WWTP	0.7	770	2.45	2,744	Plant Water; Direct Reuse
Weslaco	Weslaco South WWTP	0.94	1,053	1.25	1,400	Plant Water; Golf Course Irrigation

Availability of reuse water is limited by the treatment capacity and actual flow of the WWTPs that supply the effluent. It is assumed that half of a WWTP's average effluent is available on a consistent basis to be used for reuse water.

Reuse water has the potential to supply 58.5 mgd to satisfy the municipal demand in Region M. Currently, the area uses reclaimed water for non-potable purposes; however, there is likely to be increased focus on potential potable reuse water. Ten municipalities have been identified as feasible candidates to implement potable reuse systems, discussed further in Chapter 5.

3.3.1 Allocation of Recycled Water Supplies

Existing recycled water supplies were evaluated and projected to continue through the planning horizon. Non-potable reuse supplies were limited to one-third of a municipal demand because, in many cases, the volume of water that can be recycled is significantly larger than the limited demands that can be met with non-potable water.

Future supplies are based on the capacities of existing WWTPs. This methodology is discussed further in Chapter 5 under the reuse WMS.

3.4 MAJOR WATER PROVIDERS

A new category for this round of planning, an MWP is defined as any wholesale water provider (WWP) or municipal WUG that has demands greater than 20,000 acft/yr by 2070.

A summary of existing supplies for MWPs by decade and category of use is included in Appendix B.

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FINAL PLAN

CHAPTER 4: IDENTIFICATION OF WATER NEEDS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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acft/yr	Acre-Feet per Year
GMA	Groundwater Management Area
MAG	Modeled Available Groundwater
MUD	Municipal Utility District
MWP	Major Water Provider
PUD	Public Utility District
RWP	Regional Water Plan
SB1	Senate Bill 1
SUD	Special Utility District
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
WCID	Water Control and Improvement District
WMS	Water Management Strategy
WSC	Water Supply Corporation
WUG	Water User Group
WWP	Wholesale Water Provider

CHAPTER 4: IDENTIFICATION OF WATER NEEDS

4.1 INTRODUCTION

The primary emphasis of the regional water supply planning process established by Senate Bill 1 (SB1) is the identification of current and future water needs and the development of strategies for meeting those needs. This chapter describes the projected needs determined from the demands described in Chapter 2 and supplies discussed in Chapter 3.

The objective is to identify which Water User Groups (WUGs) will have a need, here defined as a shortage between projected demands and supplies. Drought year needs may be the result of any combination of the following scenarios, among others:

- High drought year demand;
- Long-term demand growth;
- Limited supplies, either:
  - Contractually, as in municipal water rights, or
  - Hydraulically, as with irrigation water rights,
  - Limitations of existing infrastructure, as with well-field or treatment plan capacity; or
- Unreliable supplies.

WUG needs are shown here, and an evaluation of Major Water Provider (MWP) demand, supply, and need is included in Appendix B.

Needs were identified for each of the six types of WUG: municipal, irrigation, livestock, manufacturing, steam-electric power generation, and mining. Chapter 2 describes the methodology for demand projections for each WUG type, and Chapter 3 discusses the approach for determining existing supplies. For each WUG (each municipal utility WUG and each county-wide aggregate for the other five types of users), the supplies and the demands are compared to estimate the needs. Surpluses, where the currently available supplies exceed demands, are shown as a zero in the needs evaluations. This ensures that a surplus for one location does not automatically cancel out a shortage for another entity. For any surplus that is moved from one entity/geographical area to another, a Water Management Strategy (WMS) will be identified in Chapter 5.

A second-tier needs analysis, which shows needs remaining after the recommended conservation and direct reuse WMS are accounted for, is included in Appendix A.7 and a summary of the results in A.8.

For Wholesale Water Providers (WWPs) that are also WUGs, their needs are shown according to the supplies or portions of supplies that have been identified to meet their WUG needs. WWP supplies to other WUGs are included as a supply for that WUG. WWPs that do not have a demand associated with them independent of the WUG they supply are not shown here.

4.2 REGIONAL NEEDS SUMMARY

4.2.1 Regional Needs by WUG Category

Figure 4-1 displays the total regional needs for Region M, where most needs are from irrigation. This is to be expected, as the irrigation demand projections are based on estimated use in a year where supplies are limited from the reservoirs and there is little rainfall, or the highest demand scenario; whereas, the supplies are based on the drought of record. This shortage will be partially addressed with supply increase through improvements to the irrigation district conveyance systems. Growers also manage low water years through on-farm efficiency measures. Both strategies are discussed in detail in Chapter 5. Table 4-1 summarizes the water needs by WUG type.

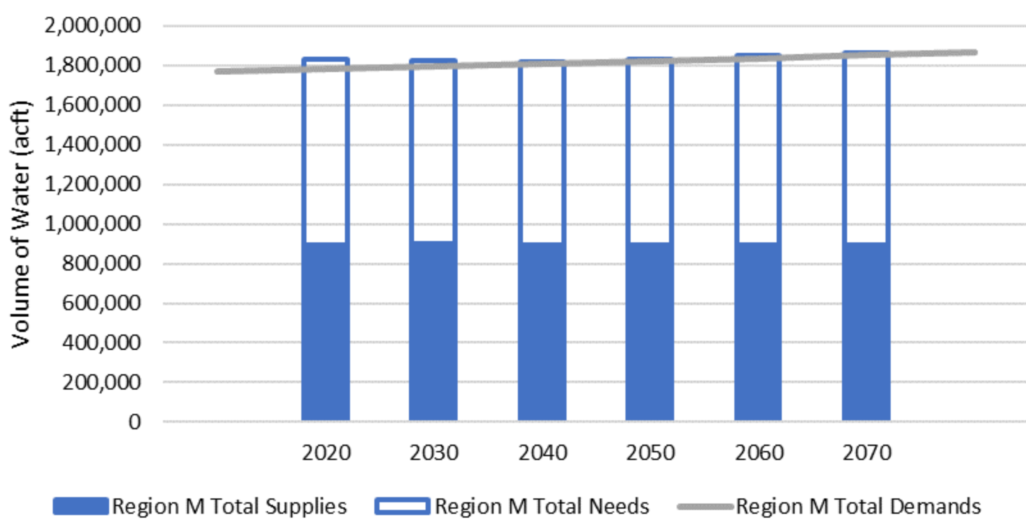

Figure 4-1 Total Regional Needs, Shown as a Portion of Total Demands (acft/yr)

Table 4-1 Water Needs by WUG Type (acft/yr)

WUG	2020	2030	2040	2050	2060	2070
Irrigation Needs	888,896	843,532	798,075	753,082	707,399	662,060
Municipal Needs	35,487	69,080	117,113	174,131	235,515	296,472
Mining Needs	6,662	6,007	4,834	4,386	4,566	5,318
Steam-Electric Power Needs	5,217	5,028	4,928	4,928	4,928	4,928
Manufacturing Needs	632	851	851	851	851	851
Livestock Needs	--	--	--	--	--	--
Total Needs	**936,894**	**924,498**	**925,801**	**937,378**	**953,259**	**969,629**
Dash (--) indicates surplus for the associated WUG type decade						

Municipal needs are significant and increase as the population increases over the planning horizon. While one-time purchases of water, rather than contractual agreements or purchase of water rights, are often used as a stopgap measure, this is not a reliable drought year supply strategy. Chapter 5 recommends the purchase of water rights, as well as development of new sources, conservation, and other strategies to address current and future needs of municipal WUG and WWPs.

Industrial users (mining, steam-electric, and manufacturing) supplies were evaluated using data provided to the Texas Water Development Board (TWDB) and the Texas Commission on Environmental Quality (TCEQ) regarding groundwater wells, surface water use, and purchase of water from public water supplies. Needs in these categories will likely also require increased cooperation with municipalities for reuse of wastewater effluent as well as conservation and water efficiency measures. Strategies for meeting future water needs are discussed in Chapter 5.

4.2.2 Regional Needs by County

The needs in Region M follow a similar distribution as the demands, focused heavily in Cameron and Hidalgo Counties, as shown in Table 4-2. Some needs are anticipated in each county in 2020, which will be evaluated individually in following sections. Jim Hogg and Webb County exhibit surplus supplies, as noted with the dashes in Table 4-2.

Table 4-2 Needs by County (acft/yr)

COUNTY	2020	2030	2040	2050	2060	2070
Cameron	365,992	350,391	339,940	333,920	330,325	327,675
Hidalgo	440,889	449,869	466,839	481,789	496,952	511,851
Jim Hogg	8	--	38	--	--	--
Maverick	18,686	17,630	17,041	15,750	14,477	13,514
Starr	23,774	24,131	24,370	24,663	24,923	25,335
Webb	4,922	2,658	675	7,075	15,028	22,256
Willacy	79,374	76,385	73,231	70,215	67,214	64,211
Zapata	3,249	3,434	3,667	3,966	4,340	4,787
Total Needs	**936,894**	**924,498**	**925,801**	**937,378**	**953,259**	**969,629**
Dash (--) indicates surplus for the associated county decade						

4.2.3 Modeled Available Groundwater Analysis

As discussed in Chapter 3.2, the Regional Water Plan (RWP) process relies on Modeled Available Groundwater, or MAG, as the annual amount of groundwater that can be reliably extracted from an aquifer in a given area while still meeting conservation goals set out by the Groundwater Management Areas (GMAs). For this planning cycle, there has been a significant change in MAG projections for the counties in Region M between the last two cycles of groundwater management planning as more information and studies have become available. Figure 4-2 and Figure 4-3 compare the 2016 and 2021 availability projections for the Gulf Coast Aquifer MAGs.

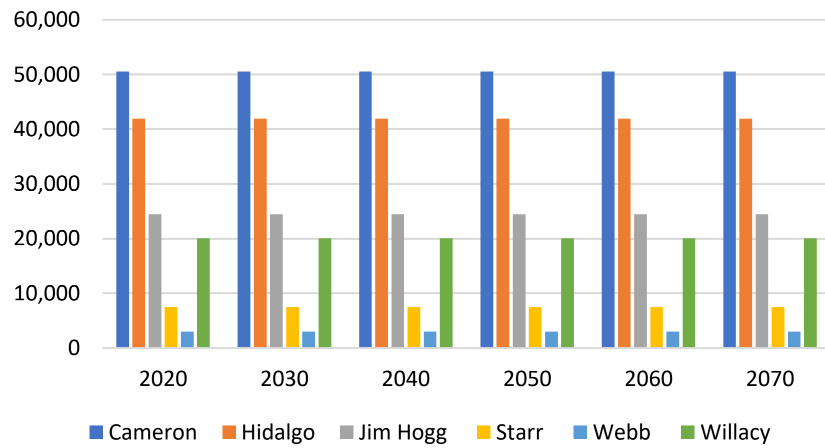

Figure 4-2 2016 Regional Water Plan Gulf Coast Aquifer MAG

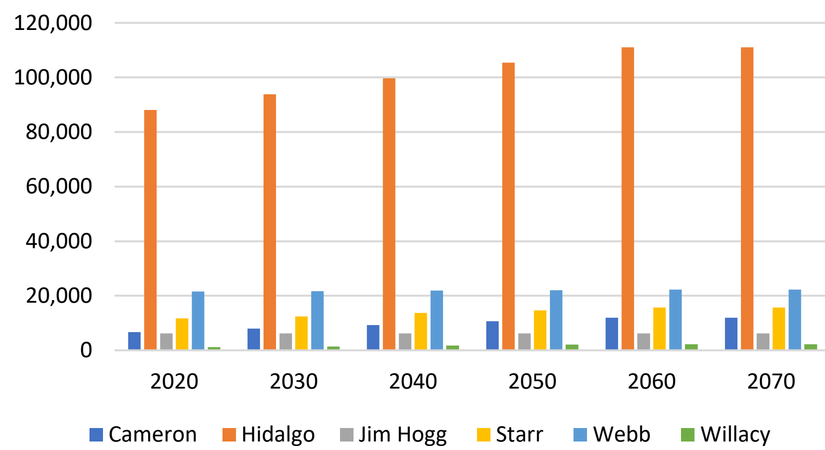

Figure 4-3 2021 Regional Water Plan Gulf Coast Aquifer MAG

The RWP is required to show only supplies and recommended projects within the MAG volume totals. Therefore, the total existing supplies plus any recommended projects must be no greater than the MAG for that county.

Because current supplies are larger than the MAG in some counties, the RWP will need to show existing supplies in the RWP as less than the water that is actually being supplied. All counties with current supplies that are less than the MAG will be unaffected, and existing supplies will be shown in full.

4.3 MUNICIPAL NEEDS

The population of Region M has been growing at a slightly higher rate than the rest of Texas. The demand distribution is heavily concentrated in Cameron and Hidalgo counties and in the Laredo area in Webb County. Current supplies are estimated to be less than the 2020 demands for municipalities. As noted earlier, in some cases, this indicates that drought-year demands exceed normal supplies, and that need is regularly met by short-term contracts for water. Other municipalities may experience persistent shortage, especially those communities that rely solely on groundwater or utilities with infrastructure limitations.

The need for municipal water is depicted in the blue outline box on Figure 4-4 and increases to 50 percent of the total demand by 2070. The population centers are shown on Figure 4-5. Figure 4-6 displays each county's portion of the total regional municipal needs. Municipal demands for each county are discussed in the following sections. Chapter 5 will discuss WMSs that have been identified to address projected municipal needs.

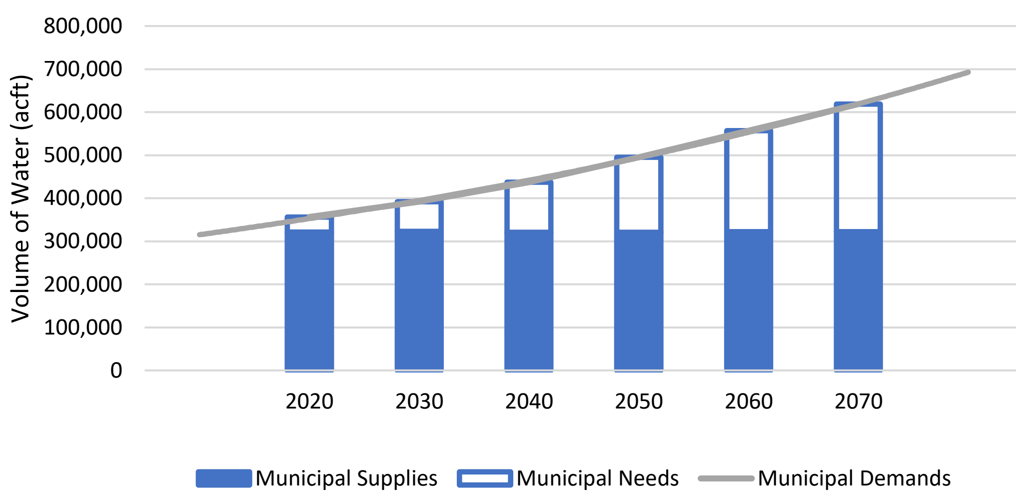

Figure 4-4 Municipal Needs, Shown as a Portion of Municipal Demands (acft/yr)

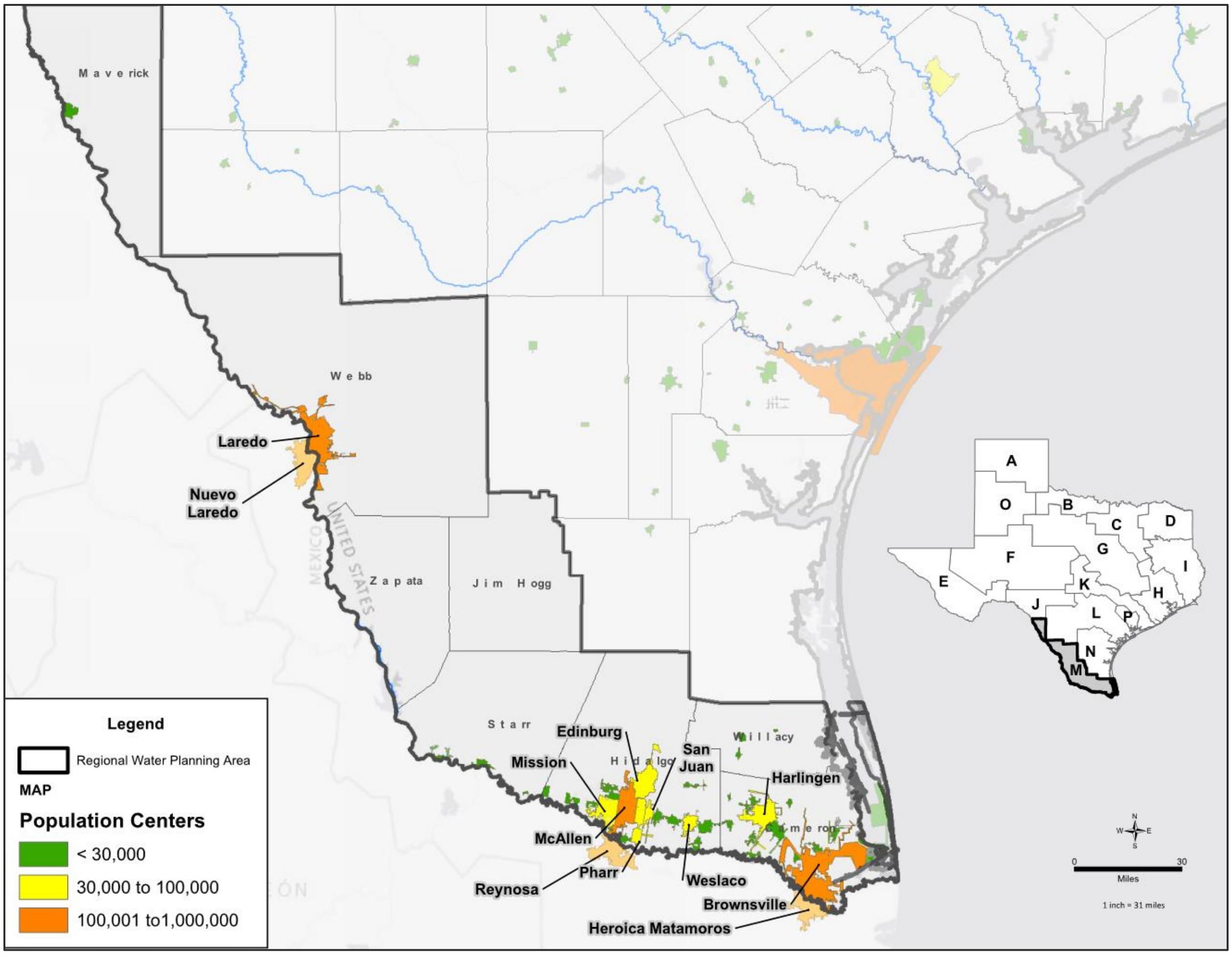

Figure 4-5 **Population and Municipal Demand Centers**

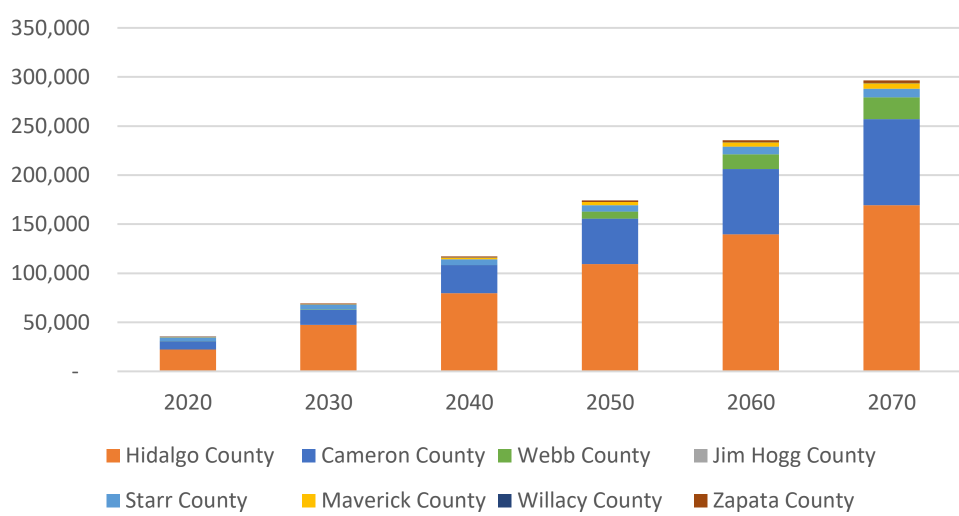

Figure 4-6 **Municipal Needs, Shown by County (acft/yr)**

4.3.1 Major Water Providers

MWP needs are based on the WUG demands of the MWP, if applicable, and the contract demand of customers, which may not be representative of the customer's full demand. MWP supplies are based on what is available for use, but in some cases supply surplus may be representative of system losses, as in the case of irrigation districts.

Detailed MWP needs information is included in Appendix B.

4.3.2 Cameron County Municipal Needs

Cameron County is projected to have the second-largest share of municipal needs, behind Hidalgo County, shown in Table 4-3.

Most of the entities within Cameron County are at least in part served by irrigation districts and surface water. For this source, the most common limiting factor is water rights and the efficiency of conveyance infrastructure. There has been increased groundwater development in Cameron County, which in many cases requires advanced treatment such as reverse osmosis. In these cases, the cost of extraction and treatment of groundwater can be a limiting factor, which impacts the rate of development of new well fields and treatment facilities.

The adopted MAG for Cameron County in this planning cycle was decreased significantly from the availability in the previous (2016) Region M water plan. This plan shows reduced supplies for some WUGs because supplies are required to be limited by the MAG in the RWP. There is not any planned or expected reduction in actual supplies for Cameron County groundwater users, and the joint groundwater planning process has not indicated any known concern about a reduction in groundwater availability in Cameron County.

Table 4-3 Cameron County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
Brownsville PUB	--	--	3,734	10,452	17,548	24,903
Combes	--	--	--	--	--	--
County-Other, Cameron	2,141	1,828	2,386	2,800	3,436	3,553
East Rio Hondo Water Supply Corporation (WSC)	--	--	--	--	427	1,041
El Jardin WSC	26	229	445	691	956	1,232
Harlingen	--	--	--	1,252	3,452	6,201
La Feria	--	--	--	--	--	--
Laguna Madre Water District	417	1,666	2,948	4,352	5,817	7,322
Los Fresnos	--	--	--	--	--	--
Military Highway WSC	--	97	1,275	2,534	3,847	5,169
North Alamo WSC	5,809	11,489	17,517	23,691	29,965	36,112
Olmito WSC	--	70	239	431	637	849
Palm Valley	--	--	--	--	--	--
Primera	--	--	--	--	--	--
Rio Hondo	--	--	--	--	--	--
San Benito	--	--	--	--	280	944
Santa Rosa	--	--	--	--	--	--
Valley Municipal Utility District (MUD) 2	--	--	--	115	274	459
Total (MAG Limited)	**8,393**	**15,379**	**28,544**	**46,318**	**66,639**	**87,785**
Dash (--) indicates surplus for the associated WUG decade						

Cameron "County-Other" includes public water supplies in Brownsville Navigation District, Indian Lake, and La Mirada Country Estates.

4.3.3 Hidalgo County Municipal Needs

Hidalgo County has the largest share of municipal needs in the region, shown in Table 4-4. Within the county, almost all the municipalities are served by irrigation districts, with some groundwater. Therefore, the majority of the supplies are limited by the water rights that are held by each entity, as well as the efficiency of the conveyance infrastructure.

Table 4-4 Hidalgo County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
Agua SUD	--	379	1,952	3,575	5,242	6,881
Alamo	1,014	1,692	2,391	3,110	3,848	4,570
County-Other, Hidalgo	604	1,293	2,170	3,005	3,845	4,713
Donna	--	1	534	1,093	1,677	2,249
Edcouch	81	139	201	269	341	413
Edinburg	6,835	9,591	14,351	17,262	20,237	23,152
Elsa	264	419	582	755	937	1,116
Hidalgo	104	334	742	1,160	1,586	2,004
Hidalgo County MUD 1	212	292	375	459	543	624
La Joya	287	419	555	696	843	986
La Villa	41	96	152	212	273	334
McAllen	2,872	11,595	22,288	31,377	40,650	49,705
Mercedes	--	--	197	665	1,155	1,637
Mission	8,514	12,976	17,530	22,161	26,858	31,446
Pharr	--	1,360	3,238	5,184	7,193	9,165
San Juan	--	1,042	2,115	3,218	4,350	5,459
Sharyland WSC	--	2,433	5,226	8,107	11,068	13,965
Weslaco	1,519	3,332	5,090	6,983	8,931	10,758
Total	**22,347**	**47,393**	**79,689**	**109,291**	**139,577**	**169,177**
Dash (--) indicates surplus for the associated WUG decade						

Hidalgo County-Other includes the public water systems in Llano Grande Lake Park East, Llano Grande Lake Park West, Trails End Mobile Home Park, and Quiet Village II.

4.3.4 Jim Hogg County Municipal Needs

Jim Hogg County has very little municipal demand and shows no municipal need. WUGs in Jim Hogg County do not have direct access to Rio Grande water with current infrastructure. The current municipal WUGs are Jim Hogg County Water Control and Improvement District (WCID) 2 and the aggregated Jim Hogg County-Other. Small towns and villages that comprise Jim Hogg County-Other include Guerra, Agua Nueva, Las Lomitas, Randado, South Fork Estates, and Thompsonville. The limiting factor for groundwater supplies can be both the existing well-field capacities as well as the characteristics of the aquifer(s).

4.3.5 Maverick County Municipal Needs

The Maverick County WUG does have municipal need from 2020 through 2070, as detailed in Table 4-5. Eagle Pass is the only incorporated city in Maverick County, but there are eight census-designated places that are included in the county-other projections (Edison Road, Elm Creek, El Indio, Las Quintas Fronterizas, Rosita North, and Rosita South). The total population of Maverick County according to the 2010 census, was 54,258 persons. Maverick County WCID No. 1 serves some of these unincorporated areas. Maverick County's population is concentrated along the Rio Grande, so the limiting factor on supplies is typically water rights.

Table 4-5 Maverick County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
County-Other, Maverick	395	333	282	235	193	153
Eagle Pass	--	226	1,461	2,816	4,182	5,509
Maverick County	--	--	--	--	--	--
Total	**395**	**559**	**1,743**	**3,051**	**4,375**	**5,662**
Dash (--) indicates surplus for the associated WUG decade						

4.3.6 Starr County Municipal Needs

Municipal needs in Starr County are shown in Table 4-6. Starr County's population is concentrated along the Rio Grande, so the limiting factor on supplies is likely to be water rights. The primary need in Starr County is Rio Grande City, which is more than double some of the other entities needs from this county. Some areas in northeastern Starr County are experiencing dropping water levels, which require new or deepened wells.

Table 4-6 Starr County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
County-Other, Starr	545	600	651	712	772	827
El Sauz WSC	58	72	86	102	117	132
El Tanque WSC	99	128	155	183	211	236
Falcon Rural WSC	--	--	--	--	--	--
La Grulla	708	845	975	1,112	1,242	1,362
Rio Grande City	1,732	2,268	2,771	3,295	3,787	4,237
Rio WSC	27	90	151	216	278	336
Roma	--	--	--	--	--	200
Union WSC	719	860	993	1,130	1,258	1,375
Total	**3,888**	**4,876**	**5,808**	**6,750**	**7,665**	**8,705**

ENTITY	2020	2030	2040	2050	2060	2070
Dash (--) indicates surplus for the associated WUG decade						

4.3.7 Webb County Municipal Needs

Webb County is the largest county in Region M but is relatively sparsely populated outside of Laredo and the cities south of Laredo along the Rio Grande. The population of Webb County, according to the 2010 census is approximately 250,304, of which 94 percent is in Laredo. Limitations on access to water in this county are related to water rights, availability of groundwater, and infrastructure with which to access groundwater. Table 4-7 summarizes municipal need projections in Webb County.

Table 4-7 Webb County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
County-Other, Webb	67	119	175	224	278	326
Laredo	--	--	--	6,592	14,191	21,097
Mirando City WSC	--	13	26	38	51	62
Webb County	--	--	--	221	508	771
Total	67	132	201	7,075	15,028	22,256
Dash (--) indicates surplus for the associated WUG decade						

Webb county-other includes public water systems in Bruni Rural WSC and Oilton Rural WSC.

4.3.8 Willacy County Municipal Needs

Willacy County, although not on the Rio Grande, is primarily supplied by water diverted from the river in Cameron and Hidalgo counties and delivered to users in Willacy County via irrigation districts. Need projections for Willacy County are shown in Table 4-8.

Table 4-8 Willacy County Municipal Needs Projections (acft/yr)

ENTITY	2020	2030	2040	2050	2060	2070
County-Other, Willacy	--	--	--	--	--	--
Lyford	--	--	--	--	--	--
Port Mansfield Public Utility District (PUD)	133	161	187	215	244	271
Raymondville	--	--	--	--	--	--
Sebastian MUD	--	--	--	1	20	38
Total	133	161	187	216	264	309
Dash (--) indicates surplus for the associated WUG decade						

4.3.9 Zapata County Municipal Needs

Zapata County accounts for a small portion of the region's municipal needs, but Zapata County's need accounts for almost all of its demands projected for 2020, shown in Table 4-9. There is very little groundwater pumping documented in Zapata County.

Table 4-9 Zapata County Municipal Needs Projections (Acre-feet/year)

ENTITY	2020	2030	2040	2050	2060	2070
County-Other, Zapata	56	70	91	114	145	167
San Ygnacio MUD	--	--	--	--	37	77
Siesta Shores WCID	--	--	--	--	8	55
Zapata County	163	498	872	1,312	1,773	2,275
Zapata County WCID-Hwy 16 East	--	--	--	--	--	--
Total	**219**	**568**	**963**	**1,426**	**1,963**	**2,574**
Dash (--) indicates surplus for the associated WUG decade						

4.4 IRRIGATION NEEDS

Irrigation is the largest water user in Region M and also has the largest need. This is because of how the needs are calculated: using a year with maximum demand and minimum supply because irrigation surface water rights are filled only after all domestic, municipal, and industrial water is set aside. The portion of demands that is met and the resulting needs are shown on Figure 4-7. A detailed discussion on how Irrigation demands are estimated is included in Chapter 2, and more information about how water is allocated on the Rio Grande is included in Chapter 3.

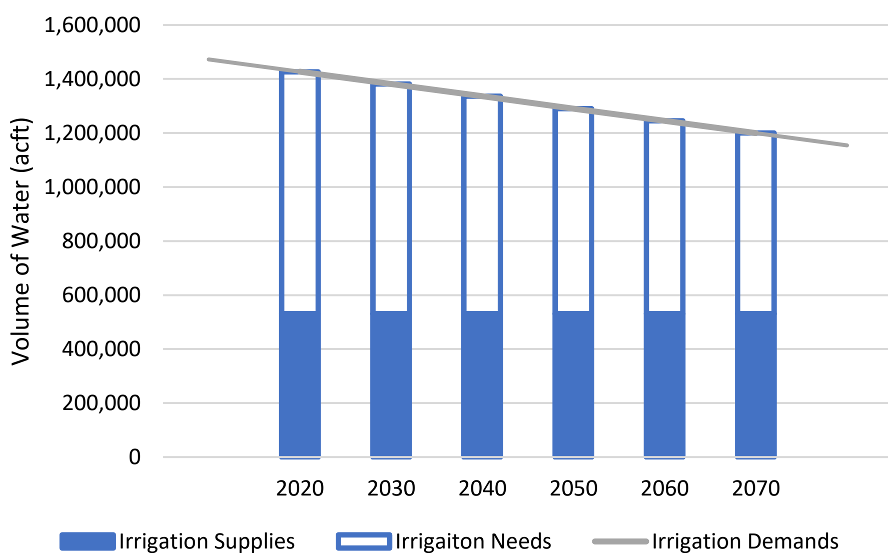

Figure 4-7 Irrigation Needs, shown as a Portion of Irrigation Demands (Acre-feet/year)

Irrigation needs, shown in Table 4-10, are the highest in Cameron and Hidalgo counties, where there is the most heavily irrigated farmland. Needs are projected to decrease slightly as a result of decreasing demand. Increased efficiency and conservation on-farm may alleviate some of the impacts of drought on productivity for farmers. These needs represent the extent of shortage anticipated by farmers in years of limited supply.

Table 4-10 Irrigation Needs Projections, by County and River Basin (acft/yr)

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Cameron	Nueces-Rio Grande	337,871	321,689	305,505	289,324	273,138	256,956
Cameron	Rio Grande	21,341	20,311	19,282	18,250	17,222	16,191
Hidalgo	Nueces-Rio Grande	394,005	372,832	351,678	330,853	309,369	288,215
Hidalgo	Rio Grande	16,391	15,511	14,630	13,765	12,870	11,989
Jim Hogg	Nueces-Rio Grande	8	--	--	--	--	--
Jim Hogg	Rio Grande	--	--	--	--	--	--
Maverick	Rio Grande	17,694	15,725	13,755	11,786	9,817	7,848
Starr	Rio Grande	19,581	18,816	18,050	17,285	16,519	15,754
Webb	Rio Grande	--	--	--	--	--	--
Willacy	Nueces-Rio Grande	78,979	75,786	72,475	69,283	66,091	62,898
Zapata	Rio Grande	3,026	2,862	2,700	2,536	2,373	2,209
Total		**888,896**	**843,532**	**798,075**	**753,082**	**707,399**	**662,060**
Dash (--) indicates surplus for the associated Irrigation decade							

4.5 STEAM-ELECTRIC POWER GENERATION NEEDS

The current supplies for steam-electric power generation meet approximately 67 percent of the 2020 demands (Figure 4-8). This stems, in part, from the anticipated near-term growth of power generation demands, the likelihood of some short-term contractual water, and from increasingly efficient power generation in terms of consumptive water use. This will be discussed in Chapter 5 as part of the Industrial Implementation of Best Management Practices Water Management Strategy for addressing the needs of steam-electric power generation. Table 4-11 shows steam-electric needs projections.

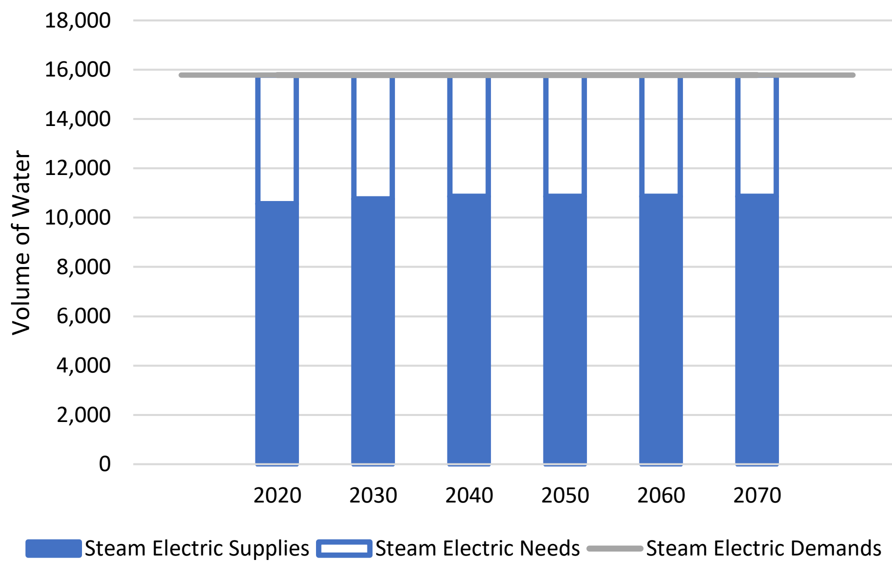

Figure 4-8 Steam-Electric Needs, Shown as a Portion of Steam Electric Demands (acft/yr)

Table 4-11 Steam-Electric Needs Projections, by County and River Basin (acft/yr)

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Cameron	**Nueces-Rio Grande**	3,302	3,302	3,302	3,302	3,302	3,302
Cameron	**Rio Grande**	123	123	123	123	123	123
Hidalgo	**Nueces-Rio Grande**	1,137	1,014	948	948	948	948
Hidalgo	**Rio Grande**	655	589	555	555	555	555
Webb	**Rio Grande**	--	--	--	--	--	--
Total		**5,217**	**5,028**	**4,928**	**4,928**	**4,928**	**4,928**
Dash (--) indicates surplus for the associated Steam-Electric Power decade							

4.6 MINING NEEDS

Current mining supplies appear to meet about 68 percent of the 2020 demands for mining water (Figure 4-9). This is in part because mining water rights to Rio Grande water are subject to decreased reliability in drought years, so the estimates of availability are significantly lower than what is available in a normal year. Because of reporting limitations, there may be additional mining supplies from groundwater that would exceed the MAG values for some aquifer/county/river basin areas. Mining needs are shown in Table 4-12.

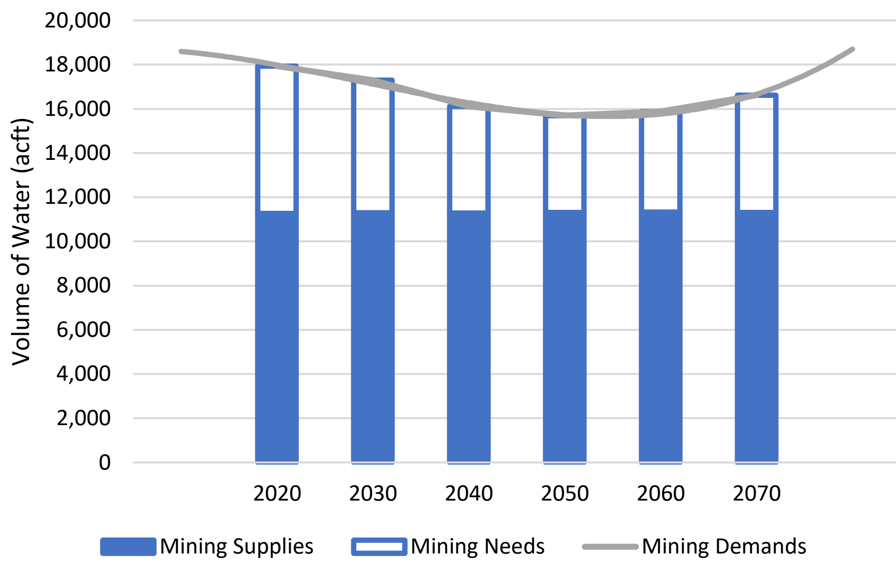

Figure 4-9 Mining Needs, Shown as a Portion of Mining Demands (acft/yr)

Table 4-12 Mining Needs Projections, by County and River Basin (acft/yr)

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Cameron	Nueces-Rio Grande	--	--	--	--	--	--
Hidalgo	Nueces-Rio Grande	798	1,517	2,054	2,630	3,290	4,127
Hidalgo	Rio Grande	113	170	212	257	310	376
Jim Hogg	Nueces-Rio Grande	--	--	34	--	--	--
Jim Hogg	Rio Grande	--	--	4	--	--	--
Maverick	Nueces	119	269	308	182	56	--
Maverick	Rio Grande	475	1,074	1,232	727	225	--
Starr	Nueces-Rio Grande	85	114	132	151	174	204
Starr	Rio Grande	210	307	367	431	511	611
Webb	Nueces	1,463	770	161	--	--	--
Webb	Nueces-Rio Grande	243	128	26	--	--	--

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Webb	Rio Grande	3,107	1,607	286	--	--	--
Willacy	Nueces-Rio Grande	49	51	18	8	--	--
Zapata	Rio Grande	--	--	--	--	--	--
Total		6,662	6,007	4,834	4,386	4,566	5,318
Dash (--) indicates surplus for the associated Mining decade							

As discussed in Chapter 2, the mining, oil, and gas industry has very few requirements for reporting the volumes of groundwater used. This is an impediment to evaluating current and future availabilities and may result in over-allocation of some aquifers.

4.7 MANUFACTURING NEEDS

Manufacturing needs are shown on Figure 4-10 and in Table 4-13. Water demand associated with manufacturing is met by both groundwater and surface water and comprises a relatively small portion of the regional demand and need. Current supplies meet 80 percent of 2020 projected demands. The need likely results, in part, because the date of most recent supply data (2015) is 5 years from the first date of demand data (2020) and because some portion of supplies are from short-term contracts for water.

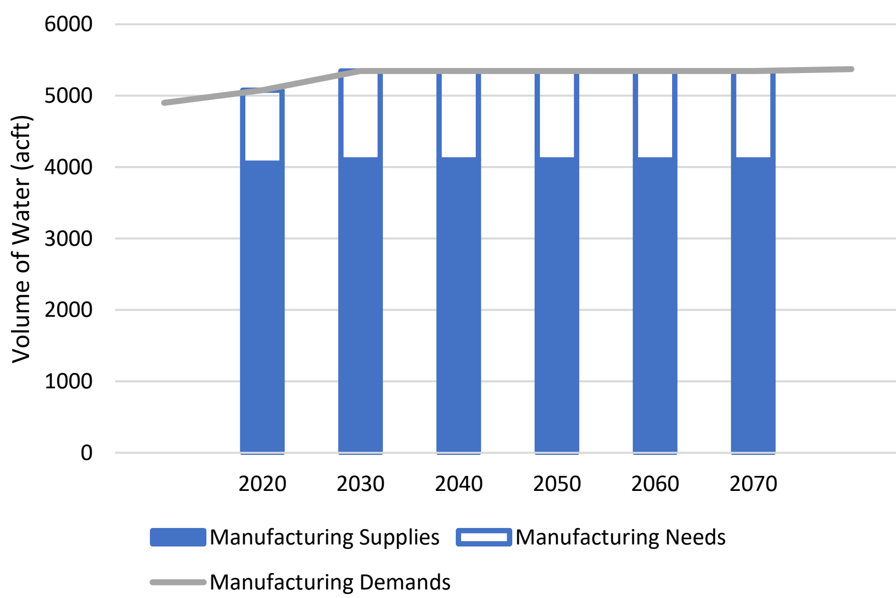

Figure 4-10 Manufacturing Needs, Shown as a Portion of Manufacturing Demands (acft/yr)

Table 4-13 Manufacturing Needs Projections, by County and River Basin (acft/yr)

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Cameron	Nueces-Rio Grande	268	354	354	354	354	354

COUNTY	BASIN	2020	2030	2040	2050	2060	2070
Cameron	Rio Grande	350	463	463	463	463	463
Hidalgo	Nueces-Rio Grande	--	--	--	--	--	--
Jim Hogg	Nueces-Rio Grande	--	--	--	--	--	--
Maverick	Rio Grande	--	--	--	--	--	--
Starr	Rio Grande	10	30	30	30	30	30
Webb	Nueces	--	--	--	--	--	--
Webb	Rio Grande	--	--	--	--	--	--
Zapata	Rio Grande	4	4	4	4	4	4
Total		**632**	**851**	**851**	**851**	**851**	**851**
Dash (--) indicates surplus for the associated Manufacturing decade							

4.8 LIVESTOCK NEEDS

Livestock demands are met by numerous groundwater wells, ephemeral streams and ponds, as well as surface water diversions, often classified together with lawn watering contracts or referred to here as livestock local supplies. These supplies are expected to be sufficient to meet the needs of the (stable) livestock demand, and therefore, there is not a need for livestock (Figure 4-11). In particular areas, there may be some difficulty providing sufficient water in a drought year, but overall, ranchers are expected to manage their livestock within the available supplies.

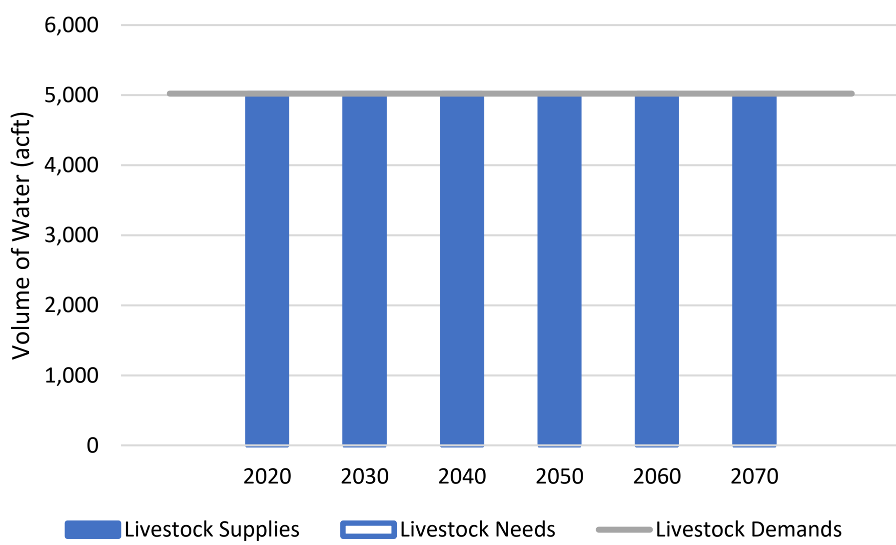

Figure 4-11 Livestock Needs, shown as a Portion of Livestock Demands (acft/yr)

4.9 SECONDARY NEEDS ANALYSIS

Needs that remain after conservation, drought management, and reuse WMS have been applied are considered second tier needs. Detailed secondary needs estimates for WUGs are included in Appendices A.7 and A.8. An evaluation of Major Water Provider (MWP) second tier needs is included in Appendix B.

A TBWD social and economic impacts evaluation of projected water shortages if no WMS are implemented can be found in Chapter 6.

FINAL PLAN

CHAPTER 5: EVALUATION AND RECOMMENDATION OF WATER MANAGEMENT STRATEGIES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

BLACK & VEATCH

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List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
AMI	Advanced Metering Infrastructure
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASR	Aquifer Storage and Recovery
ASR	Aquifer Storage and Recovery
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
CCID	Cameron County Irrigation District
CFU	Colony-Farming Unit
DFC	Desired Future Conditions
DMI	Domestic, Municipal, and Industrial
EMST	Ecological Mapping System of Texas
EPA	Environmental Protection Agency
ERHWSC	East Rio Hondo Water Supply Corporation
GCD	Groundwater Conservation District
GIS	Geographic Information System
GMA	Groundwater Management Area
GPCD	Gallons per Capita per Day
HB	House Bill
HCID	Hidalgo County Irrigation District
ID	Irrigation District
MAG	Modeled Available Groundwater
MF	Microfiltration
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MUD	Municipal Utility District
NAWSC	North Alamo Water Supply Corporation
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory

O&M	Operations and Maintenance
ppm	Parts per Million
psi	Pounds per Square Inch
PUB	Public Utilities Board
RGRWPG	Rio Grande Regional Water Planning Group
RO	Reverse Osmosis
ROW	Right-of-Way
RWP	Regional Water Plan
RWPA	Regional Water Planning Area
RWPG	Regional Water Planning Group
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SUD	Special Utility District
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TML	Texas Municipal League
TPWD	Texas Parks and Wildlife Department
TSSWCB	Texas State Soil and Water Conservation Board
TWDB	Texas Water Development Board
UCM	Unified Cost Model
UF	Ultrafiltration
USDA	United States Department of Agriculture
UV	Ultraviolet
WAM	Water Availability Model
WCAC	Water Conservation Advisory Council
WCID	Water Control and Improvement District
WMS	Water Management Strategy
WR	Water Rights
WSC	Water Supply Corporation
WSOC	Water Supply Option Contracts
WTP	Water Treatment Plant
WUG	Water User Group
WWP	Wholesale Water Provider

WWTP	Wastewater Treatment Plant

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FINAL PLAN

CHAPTER 5.1: POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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LIST OF TABLES

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5.1 POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES

Water management strategies (WMSs) were evaluated and updated in this Region M Regional Water Plan (RWP). The following chapter describes the process to identify potentially feasible WMSs, the evaluation of potentially feasible WMS, and selection of recommended WMSs to meet future needs.

Subsection 5.1.1 describes this process for identifying potentially feasible WMSs, Section 5.2 describes how potentially feasible WMSs were evaluated (e.g., desalination or advanced municipal conservation). Section 5.3 describes all of the WMSs that were recommended for each water user group (WUG), sorting by county, the irrigation districts (IDs) and wholesale water providers (WWPs) strategies first, municipal WUGs second, and non-municipal WUGs third. Section 5.4 describes alternative strategies, which are also considered potentially feasible and should be considered alternative recommendations. Section 5.5 describes projects of interest that do not meet the Texas Water Development Board (TWDB) criteria to be a WMS, but are general recommendations by the Rio Grande Regional Water Planning Group (RGRWPG). These projects were submitted by sponsors with the potential to be part of suitable WMSs in the future.

5.1.1 Process to Identify Potentially Feasible WMSs

A Regional Water Planning Group (RWPG) is tasked with evaluating all potentially feasible WMSs and recommending selected strategies to meet current and future needs in the region. Before a RWPG begins the process of identifying potentially feasible WMSs, RWPGs must document the process by which it will list all possible WMSs and identify the strategies that are potentially feasible for meeting a need in the region. The RGRWPG adopted the process to identify potentially feasible WMSs on January 24, 2018.

The Region M potentially feasible WMSs were identified using the following documented process:

1. Current water planning information, including specific WMS of interest, will be solicited from WUGs and WWPs in Summer 2018.
    a. Solicitation of planning information will include a draft list of WMS deemed potentially feasible to meet projected needs.
    b. Draft list will generally include the recommended WMS in the 2016 Region M Plan, WMSs in local water plans, and/or other strategies perceived to be of interest to WUGs/WWPs.
    c. WUGs/WWPs will be encouraged to classify each WMS on their draft list as recommended, alternative, or rejected, and provide comments.
2. A list of potentially feasible WMSs will be prepared based on an initial technical evaluation and the comments received, which will be available for consideration by the RWPG by early 2019.
3. Additional WMS may be brought forth to the RWPG for consideration until March of 2019.
4. Potentially feasible WMS will then be evaluated by metrics developed and weighted by the RWPG.

The request for WMS from stakeholders took place beginning in October of 2018, with follow-up taking place over the next 18 months. Municipal utilities and IDs submitted most of the projects and strategies, and some additional WMSs were submitted by the United States Department of Agriculture (USDA). The submitted costs, projected yield, feasibility, and impacts were evaluated for accuracy, consistency, and compliance with TWDB rules and guidance where that information was available; where information was not available, assumptions were made and documented.

The WMS components that are included in this RWP are limited to projects that increase water supplies or reduce water losses. Infrastructure components associated with internal system improvements that do not make any additional water available to meet needs are not included in the RWP as WMSs.

Using the documented process identified above, the RGRWPG identified Potentially Feasible WMSs for the 2021 RWP. Table 5.1-1 includes a list of the potentially feasible WMSs and includes a reference to the sub-section of Section 5.2 where detailed evaluation information can be found.

Table 5.1-1 List of Potentially Feasible WMSs

POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES	FOR DETAILED EVALUATION, SEE SECTION:
Water Infrastructure and Distribution Systems • Irrigation District Improvements / Conservation • Municipal Infrastructure Improvements ▪ Distribution and Transmission ▪ Storage ▪ Surface Water Treatment	5.2.1 5.2.1.1 5.2.1.2
Wastewater Reuse • Non-Potable Reuse • Potable Reuse	5.2.2
Desalination • Local Brackish Groundwater Development and Treatment • Seawater Desalination	5.2.3
Fresh Groundwater	5.2.4
Advanced Municipal Water Conservation	5.2.5
Municipal Drought Management	5.2.6
Implementation of Best Management Practices for Industrial Users	5.2.7
Conversion/Purchase of Surface Water Rights	5.2.8
On-Farm Irrigation Conservation	5.2.9
Biological Control of *Arundo donax*	5.2.10
Aquifer Storage and Recovery	5.2.11

The potentially feasible WMSs were evaluated using the Unified Cost Model (UCM), which was updated in February of 2019 and checked for accuracy, consistency, and compliance with source availability limitations. When specific project cost estimates were available, that was processed through the UCM and used.

ID Conservation, Advanced Municipal Conservation, and Municipal Drought Management were considered as potentially feasible WMSs for any WUG with an identified need. These WMSs were subsequently recommended across the region on the basis of criteria described in those sections. The projected water saved through ID conservation improvements and Advanced Municipal Conservation was first subtracted from each WUG's need to obtain a revised need after conservation. If a need still existed, additional WMSs were considered for the WUG. In cases where two or more alternatives were available without significant negative impacts, an evaluation process was used to select the most appropriate WMS.

The WMS or portfolio of strategies, with sufficient yield to meet the needs after conservation, were recommended for each WUG and any additional viable WMS was listed as alternative recommended strategies. Only WMSs with insufficient information or major feasibility concerns were evaluated but not recommended.

In accordance with Chapter 31 of the Texas Administrative Code (TAC), Chapter 358.3 (19), the plan development was guided by the principal that designated water quality and related uses as shown in the state water quality management plan shall be improved or maintained. The state water quality management plan is developed and maintained by the Texas Commission on Environmental Quality (TCEQ) and can be found at the following weblink: https://www.tceq.texas.gov/permitting/wqmp.

5.1.2 Potential for ASR Projects to Meet Significant Identified Needs

In accordance with 31 TAC Section 357.34(h), if a Regional Water Planning Area (RWPA) has significant identified water needs, the RWPG shall provide a specific assessment of the potential for ASR projects to meet those needs. At the July 1, 2020, RWPG meeting, the RGRWPG defined the threshold of significant water needs to be a municipal WUG with an identified need of 10,000 acre-feet per year (acft/yr) or greater. WUGs meeting this definition in the 2021 RWP in 2070 include Brownsville, Edinburg, Laredo, McAllen, Mission, North Alamo WSC, Sharyland WSC, and Weslaco. At this point in time, the respective WUGs above and RWPG have determined that ASR is an infeasible and cost-prohibitive strategy to increase water supplies in the region. During this planning cycle, only Eagle Pass submitted an ASR Project to meet their needs. However, due to the reasons noted above, the Eagle Pass ASR Project is an alternative WMS, which is further described in Section 5.2.11 and in Section 5.4.

FINAL PLAN

CHAPTER 5.2: WATER MANAGEMENT STRATEGY EVALUATIONS AND CONSERVATION

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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5.2 WATER MANAGEMENT STRATEGY EVALUATIONS AND CONSERVATION

Each potentially feasible WMS was evaluated on the basis of net quantity of water, reliability, financial costs, and environmental factors, which includes environmental and cultural considerations. Environmental considerations also includes impacts to agricultural resources.

Subsections in Chapter 5.2 include detailed evaluations for each of the potentially feasible WMSs. Only projects that increase supplies to users can be included as potentially feasible WMSs.

Net Quantity of Water

Analyses of WMSs yields were performed under drought of record conditions. Firm yields were determined by taking into account Senate Bill 3 environmental flow standards adopted in 30 TAC §298 and other recommended WMSs to ensure that no WMSs relied on the same water availability volume or rendered multiple WMSs mutually exclusive.

Strategy Water Loss

Anticipated strategy water losses are taken into account and reported for each WMS type. For some WMSs, the percent water loss was calculated and the information is included in each WMS evaluation. The following provides a summary of anticipated strategy water losses.

- Conservation: Water conservation strategies are assumed to have no associated water losses. In some instances, projects are intended to decrease the water loss for existing infrastructure.
- Drought Management: Drought management strategies are assumed to have no associated water losses.
- Conversion of Water Rights: Strategies involving conversions, transfers, or purchases of water rights are assumed to have no additional water losses associated with the use of existing infrastructure.
- Facilities Expansion: Facilities expansion or new infrastructure such as pump stations and transmission pipelines are assumed to have negligible water losses.
- Direct Reuse: Direct reuse or recycled water strategies are assumed to have minimal water losses.
- Indirect Reuse: Indirect reuse is assumed to have minimal losses since the yield already incorporates any water lost due to transportation, evaporation, seepage, and channel or other associated carriage losses.
- New or Expanded Groundwater Development: Groundwater expansion strategies that assume additional yield from existing infrastructure have no additional water losses associated with them. Groundwater expansion, development, and importation strategies that require new infrastructure are assumed to have negligible water losses.
- Aquifer Storage and Recovery: ASR strategies have losses due to recovery efficiency from the aquifer. Due to minimal specific studies completed at this point in Region M, this water management strategy is assumed to have negligible water losses. However, modeling and feasibility studies are recommended for entities interested in ASR.
- On/Off-channel Reservoirs: Surface water strategies that include new on/off-channel reservoirs have water losses associated with evaporation. If water is transmitted via open channel canals, there are also water losses associated with evaporation.

- Desalination strategies include water loss associated with desalination treatment technologies and disposal of brine concentrate. Each desalination WMS has a calculated percent water loss indicated in the WMS evaluation.
- Brush Control: Brush control water management strategies are intended to increase available surface and groundwater supplies through the selective control of brush species that are detrimental to water conservation, thus significantly reducing water losses.
- Water Infrastructure and Distribution Systems: Infrastructure and distribution systems increase supplies through reducing water losses. This water management strategy is assumed to have negligible water losses.

Financial Costs

Financial costs were evaluated using the UCM developed by the TWDB. Capital costs, debt service, annual O&M costs, and unit costs of water are shown in the 2021 RWP in September 2018 dollars. Costs do not include distribution of water within a WUG after treatment.

Costs were evaluated using the UCM, and certain assumptions were made in each project unless specifically listed otherwise. The debt service is the application of capital budgeting to service the debt over the life of the loan. The loan period used for a reservoir was 40 years and the loan period for all other types of strategies was 20 years. An annual interest rate for project financing was assumed to be 3.5 percent in accordance with TWDB guidance.

For the Drought Management WMS (Refer to Section 5.2.6), the costs were evaluated using the TWDB Drought Management Tool, which estimates the economic costs of foregone water use.

Environmental Impacts

Environmental impacts were evaluated for each potentially feasible WMS based on information provided by sponsors, available published information, maps and recent aerial photography, including available geographic information system (GIS) shapefiles. The project locations shown on maps in this chapter are conceptual in nature and are not meant to represent actual locations of facilities. Siting of facilities are subject to studies, designs, engineering, and/or contract negotiations to be determined by the project's sponsor later. Therefore, as projects enter the detailed design phases, it should be noted that potential environmental impacts identified in this analysis could be avoided or reduced through such approaches as facility layout or alignment adjustments, changes in construction methods, and construction timing. Environmental considerations assessed, where applicable, include:

- Acres impacted permanently;
- Construction impacted acreage;
- Inundation acreage;
- Agricultural resources impacted*;
- Wetland impact;
- Habitat impacted acreage;
- Threatened and endangered species count;

- Cultural resources impact;
- Environmental water needs*;
- Effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico*;
- Reduction in WWTP effluent;
- Volume of brine;
- TDS of brine; and
- Reliability*.

The assessments noted with an Asterisk (*) are new this planning cycle and further described below or otherwise detailed in each WMS.

Impacts to Agricultural Resources

Data was obtained from the Texas Parks and Wildlife Department (TPWD) Ecological Mapping System of Texas (EMST) and compiled with WMS projects into a GIS using ArcGIS software. Environmental datasets were overlaid on defined conceptual project boundaries or alignments for each WMS to determine potential project effects on vegetation and land use. For Region M, the vegetation and land use from the TPWD EMST was identified as: (1) row crops; (2) grass farms; and (3) orchards.

Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The RGRWPG developed a reliability evaluation matrix (Table 5.2-1) that was used in conjunction with other implementation considerations to quantify the reliability of WMSs. Each WMS evaluation includes an assessment of reliability.

Table 5.2-1 Reliability Evaluation Matrix

SCORE	RELIABILITY
1	Low
2	Low to Medium
3	Medium
4	Medium to High
5	High

Environmental Water Needs

The TCEQ has established environmental flow standards in 30 TAC §298 relating to the management of water resources in the state for the purpose of supporting a sound ecological environment in river basins and bay systems. The TCEQ has adopted environmental flow standards for the Rio Grande and its associated tributaries and bays to ensure environmental water needs are met. These adopted environmental flow standards are incorporated into the TCEQ's full authorization water availability model (WAM), which also includes all water rights and permitted reservoir capacities. Potentially feasible WMSs in the 2021 RWP were evaluated to determine water availability(s) and WMS firm yield(s)/firm diversion(s) using an unmodified TCEQ WAM. This analysis reflects conditions under which an associated permit application would be evaluated by the TCEQ. As such, potentially feasible water management strategies included in this plan are assumed to have little to no effect (score of zero on a 0-5 scale) on environmental water needs, as they are already taken into consideration as part of the adopted environmental flow standards in the WAM analysis and will not compromise the environmental flow standards as established by 30 TAC §298.

Third-Party Social and Economic Impacts from Voluntary Redistribution of Water

The 2021 RWP is based, in part, on voluntary transfer or redistribution of water resources to meet projected needs. Voluntary redistribution is the acquisition of water by willing buyers from willing sellers, subject to conditions of existing groundwater management plans and rules of applicable groundwater conservation districts (GCDs), in the case of groundwater supplies, and subject to existing surface water permits and water available from such permits. Refer to Chapters 3.1 and 3.2 for descriptions of methods used in determining quantities of groundwater and surface water available to meet projected water demands in the 2021 RWP.

Voluntary transfers of water include the underlying principles that (1) projected needs of a local area are met before consideration is given to movement of water from rural and agricultural areas to meet projected needs at more distant locations; (2) compensation will be made to water owners for water to meet projected needs of others; and (3) an evaluation is made of the social and economic impacts of voluntary transfers of water from rural and agricultural areas.

In the development of the 2021 RWP, the following principles have been followed: (1) water conservation has been the first WMS recommended to meet projected needs (shortages) of WUGs; and (2) all other recommended WMSs including movement of water from rural and agricultural areas must be based on the voluntary transfer concept and principles. The WMSs of the 2021 RWP were selected and sized in compliance with desired future conditions (DFCs) and modeled available groundwater (MAG) requirements to limit impacts upon the supplies of water projected to be needed for use in rural and agricultural areas. In addition, the costing of each WMS includes estimated payments to landowners from which groundwater would be obtained and to holders of surface water rights to clearly reflect that implementation of these WMSs would include compensation of the owners of the water by those who would obtain and use the water (i.e., the willing seller-willing buyer condition underlying the voluntary transfer concept).

Counties that have projected needs for additional water supply (or have projected surpluses less than the volume associated with the recommended WMS); therefore, third-party economic impacts of redistribution may occur as future supplies alternatives to local groundwater are developed. Implementation of the recommended WMSs could result in (1) drawdown of the water table, increasing local area pump lifts in the aquifer areas from which groundwater would be obtained; and would (2) provide payments to landowners for groundwater and to holders of surface water permits for use of surface water at rates negotiated between buyer and seller. Voluntary redistribution of water from rural and agricultural areas is likely to result in reduction of areas engaged in active crop production, and/or changes in crop species and productivity.

In addition, implementation of recommended WMSs can be expected to result in construction and associated expenditures in local areas where such projects are constructed, but neither the economic benefits of such expenditures, nor the subsequent economic development that might result from such expenditures, are estimated in this plan.

The following subsections provide evaluations for each potentially feasible WMS in the 2021 RWP.

5.2.1 Water Infrastructure and Distribution Systems

Infrastructure and distribution systems increase supplies through reduction of losses and removing infrastructure bottlenecks that have limited the amount of water that can be supplies (water treatment plant [WTP] capacity, system storage, etc.).

5.2.1.1 Irrigation District Improvements

IDs carry over 85 percent of the water that is used from the Rio Grande system in Region M. These districts deliver water for all categories of water user. Most IDs have similar components: initial pump stations to divert water from the river, some storage in either off-channel reservoirs or in the main canals, and canal and/or pipeline networks that deliver water to farmland and municipal utilities for treatment and distribution. Most systems measure the water supplied to farmers using a flow rate estimate from delivery pipe rather than metering, which makes accurate volumetric pricing difficult.

The ID systems require significant regular maintenance to mitigate losses and can benefit from more proactive improvements like gate and meter automation. Districts may experience losses in the range of 10 to 40 percent of the water that they divert. ID improvements include conservation measures, which directly reduce measurable losses, and operational improvements like automated gates and increased off-channel storage. According to TWDB rules, ID conservation yield is estimated for a drought year. ID improvements represent a group of low-cost WMS for Region M that decrease losses and improve service.

Many of the IDs submitted projects to the RWPG. A survey to collect information on new projects and completed projects was sent to the IDs in February of 2018. From this survey, 10 WMSs were submitted, and 43 were maintained from the previous planning cycle for a total of 18 IDs, representing a consistent approach to improving operations and reducing losses. Stakeholder meetings were held with representatives from the ID to discuss strategies, estimated costs, water savings, and implementation feasibility. The ID conservation WMSs that were submitted were used to form the basis of a general ID conservation WMS for those IDs that did not submit any specific project information. ID conservation strategies include the following:

- Canal lining (new linings and replacement of damaged linings);
- Installation or replacement of pipeline;
- General repairs and improvements, including new metering installation;

- Metering and controls, including installation of automated system controls, meters and supervisory control and data acquisition (SCADA) systems where implementation leads to measurable efficiency gains;
- Interconnects between IDs where IDs are capable of serving new WUG or measurable efficiency gains are achieved; and
- New reservoirs and reservoir improvements or expansions, including dredging, are included as WMS improvements that are not classified as "conservation." Where drought year water losses from insufficient or malfunctioning storage are measurably reduced, these projects have been included with an associated firm yield.

All of the submitted WMS were assumed to apply to the first decade of planning, 2020, unless noted otherwise. The total annual estimated potential water savings in 2020 for all of the WMSs submitted was approximately 76,000 acft. The amount of water that can be conserved per ID was calculated based on estimates of current conveyance efficiency and a maximum efficiency of 90 percent.[1]

Table 5.2-2 shows the estimated cost per acft of water conserved or stored by WMS Category. ID improvements decrease costs associated with operations and maintenance (O&M) of facilities, so O&M costs are shown as $0.

Table 5.2-2 Estimated Cost per Acre-Foot of Water Conserved by Water Management Strategy

	CANAL LINING	PIPELINE INSTALLATION	GENERAL REPAIRS AND IMPROVEMENTS
O&M Cost per acft	$0	$0	$0
Capita Cost per acft	$6,840	$4,323	$7,570

It is intended that these IDs should implement any water conservation strategies, including, but not limited to: metering; control automation; gates; canal lining; repair of canal lining; pipeline installation; district interconnects; new reservoirs; reservoir improvements; or any other strategy that provides provide beneficial, measurable conservation improvements to the ID.

Metering and Controls

In accordance with TCEQ Watermaster rules, IDs in Region M meter water from the Rio Grande as it is pumped out of the river, but do not typically meter water provided to irrigators or for domestic water use for lawn watering and livestock. Canal riders, employees of the district, drive along the canals to verify that only users who requested water are withdrawing from the canals and estimate the amount of water delivered. In many cases the canal riders are also responsible for manually opening and closing headgates and turning pumps on and off.

In most districts agricultural water deliveries are measured in "irrigations," which are considered to be between 4- to 8-inches of water over each irrigated acre, depending on the district, and are monitored by canal riders on the basis of the estimated flow rate and time that a headgate is open and/or

[1] For comparison, the public water supply systems in Region M average approximately 86 percent efficiency, with about 14 percent losses caused by leaks and breakage in their systems.

measured water depths at some point in the field. There are significant losses associated with manual operations of district conveyance systems and the inaccuracies associated with visual observations of how much water is diverted. Additionally, metering could provide an incentive for (and data to support) conservation through charging a volumetric rate for water.

One analysis of water conservation implications of meters was conducted as part of the Rio Grande Initiative in cooperation with the Harlingen Irrigation District.[2] This project consisted of installing meters at farm irrigation delivery site locations serving 50 percent of the irrigated acreage in the district. The information generated by the meters provided flow data used for volumetric pricing and to improve the management of water delivery to end users. Installation and applications of meters at farm gate suggested annual water savings of 27 percent of the average annual water delivered to the affected area at a cost per acre-foot of $25.87. Implementation of volumetric pricing enabled the district not only to manage the system and charge end users more accurately, but also to create an incentive for farmers to reduce their water use.

Another component of this analysis focused on the installation and use of meters and telemetry equipment in the district canals. The information generated by the meters and telemetry system provided flow data required to balance the distribution of water within the delivery canals. That is, information was generated regarding what areas were being irrigated and how much water was being supplied to each of these areas. The resulting improved management sought to minimize the over-delivery of water (i.e., waste), which has been estimated as high as 40 percent. Reducing the amount of water pumped also reduces the energy required and associated costs. This strategy was projected to save 3 percent of water diverted annually with associated cost of $93.10/acft. Table 5.2-3 presents the water conservation and economic implications of meter installation.

Table 5.2-3 Water Conservation and Economic Implications of Installation of Meters

	FARM GATE	CANAL
Water Saved	27%	3%
Cost per acre-foot	$25.87	$93.10

Canal Lining and Installation or Replacement of Pipeline

Most district conveyance systems are predominantly earthen or lined canals, which can vary significantly in their efficiency depending on how well they are maintained and the type of soil or lining. Buried pipelines may also vary in efficiency depending on their condition. Many of the WMSs that were submitted cited studies by Dr. Guy Fipps and Dr. Rister at AgriLife, which attempted to measure seepage

[2] Texas Water Resources Institute Report TR-202. October 2002. *Efficient Irrigation for Water Conservation in the Rio Grande Basin*, (also known as the Rio Grande Basin Initiative, or RGBI). 2001. The initiative is administered through the US Department of Agriculture's National Institute of Food and Agriculture under Agreement No. 2010-34461-20677 and Agreement No. 2010-45049-20713, and the Texas Water Resources Institute, which is part of the Texas A&M AgriLife Extension Service, Texas A&M AgriLife Research, and the College of Agriculture and Life Sciences at Texas A&M University.

losses in a number of the IDs in the Lower Rio Grande Valley. As a part of our evaluation, the submitted WMSs were compared to AgriLife research where available and checked for accuracy.

To determine a unit amount of water conserved per mile for canal lining and pipeline replacement strategies, results from seepage tests performed in the region were used. Seepage rates were obtained from TWRI Technical Reports that described seepage tests performed on canals for each of the IDs that submitted a canal lining or pipeline replacement strategy. Seepage results for both concrete-lined canals and earthen canals were averaged and used as the annual water conserved per mile for IDs that did not have any applicable seepage tests performed. It was assumed that the amount of water loss caused by evaporation is negligible; therefore, the same values for water conserved per mile were used for both canal lining and pipeline replacement strategies.

General Repairs and Improvements

All repairs that result in increased supplies available to end users, reduced losses, and/or improved operations are recommended for all IDs.

New Reservoir or Reservoir Improvements

Storage capacity is critical to efficient operations of IDs. Between the time that an end user requests water from the Amistad-Falcon Reservoir System and when it becomes available to divert can be up to 7 days. If there is any significant precipitation between the time water is requested and when it is available to be diverted, the district may not have sufficient storage capacity to pump the requested water for delivery, but the account of the end user is still charged 90 percent of the requested amount. Additionally, when there is significant rainfall in the area for the Watermaster to designate a time of no-charge pumping, the ability of the district to divert water for later use is limited by storage. Environmental flow requirements were considered for all potentially feasible reservoirs.

Increased storage is recommended for districts that have documented their water losses as a result of insufficient storage. These loss rates were applied to drought year conditions to estimate increased supply. Costs for reservoirs were estimated using the UCM.

Education and Evaluation

The process of evaluating existing infrastructure for efficiency is ongoing in the IDs. There is a need for more data and a more consistent approach to measuring system losses across districts for comparison purposes. There is a significant opportunity for increased education of the staff, management, and leadership of each district. A comprehensive review of existing policies, rules, funding mechanisms, and programs that can or do address IDs may be useful.

Although water savings as a result of education and evaluation programs have not been quantified, and are therefore not included as a recommended WMS, the RGRWPG recognizes the importance of education for all parties operating and depending on IDs, and continued efforts to evaluate the existing infrastructure. Various education and evaluation recommendations are further discussed in Chapter 8.

5.2.1.2 Municipal Infrastructure Improvements

Operational, treatment, and distribution projects that allow a WUG to either access a new supply, eliminate known losses, or develop new supplies are included as municipal infrastructure improvements. Municipal infrastructure improvements focus on problem-specific WMSs that relate to treatment, storage, or distribution and transmission. Insufficient treatment capacity or capability can be a supply limitation, inadequate storage can disrupt operations, and transmission and distribution projects may be required for entities that are experiencing significant water losses because of eroded pipelines or leaking water tanks. Because these projects are particular to the municipal utility systems, these projects were evaluated individually on the basis of available information. The following WMSs were submitted to the RWPG for municipal infrastructure improvements:

Distribution and Transmission

Recommended WMS

1. East Rio Hondo Water Supply Corporation (ERHWSC) – Bean Road Transmission Line (Part of the North Cameron Regional WTP Well Field Expansion).
2. ERHWSC – FM 2925 Transmission Line.
3. El Jardin WSC – Distribution Pipe Replacement.
4. McAllen – Raw Water Line Project.
5. Rio Hondo – Emergency Interconnects.
6. Union WSC – Water Line Replacement and Meter Reading System.

Alternative WMS and Additional Recommendations

1. North Alamo Water Supply Corporation (NAWSC) – 1 MG Water Tower, Edinburg/Pharr.
2. NAWSC – 1 MG Water Tower, Mid Valley.
3. NAWSC – Plant No. 5, 16-inch Waterline Expansion (Part of the NAWSC – WTP No. 5 Expansion).
4. Weslaco – Emergency Transfers of Surface Water or Interconnects Between Systems.

Storage

Recommended WMS

1. Brownsville Public Utilities Board (PUB) – Banco Morales Reservoir.
2. Brownsville PUB – Resaca Restoration.
3. Donna – New Raw Water Reservoir and Raw Water Pump Station (Part of Donna - WTP Expansion evaluation).

Alternative WMS and Additional Recommendations

1. Brownsville PUB – Brownsville-Matamoros Weir and Reservoir.

Surface Water Treatment

Recommended WMS

1. Donna - WTP Expansion.
2. ERHWSC – Surface WTP (Phase I).
3. Laguna Madre Water District – WTP No. 1 Process Improvements.

4. Los Fresnos – WTP Expansion (1.0 to 1.5 mgd).
5. NAWSC – Delta WTP Expansion.
6. Olmito WSC – WTP Expansion.
7. Roma – Regional WTP.

Alternative WMS and Additional Recommendations

1. ERHWSC – Surface WTP Phase II with Inter-Basin Transfer of Surface Water.
2. Elsa – WTP Expansion and Interconnect to Engleman ID.
3. Laredo – El Pico WTP Expansion (Phase 1-4).
4. NAWSC – WTP No. 5 Expansion.

5.2.1.3 Environmental Impacts

Potential environment impacts for water infrastructure and distribution systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-4.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.
- It is assumed that ID conservation projects have no permanently impacted acreage.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

For ID conservation, impacted acreage was calculated with the following assumptions:

- The acreage impacted for pipelines and canal linings is equivalent to the ROW easements required; it is assumed 50-feet for ROW unless otherwise known.
- Unless otherwise known, the length of pipeline and canal lining projects is assumed using the calculated average value of 411 AF-conserved/mile of improvement.
- General improvements (canal gate replacements, SCADA, and other improvements) have an assumed 50-feet ROW and 50-feet project construction length.

C. Inundation Acreage

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

D. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

E. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

F. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

G. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

H. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

I. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

J. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative ID improvements projects is presented in Table 5.2-4.

Table 5.2-4 Environmental Impacts of Irrigation District Improvements Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Bayview ID	ID Conservation	1,750	0	28	0	0	1	0	17	0	5	1
Brownsville ID	ID Conservation	1,500	0	16	0	0	1	0	17	0	5	1
Cameron County ID No. 2, San Benito	ID Conservation	8,486	0	230	0	0	1	0	17	0	5	1
Cameron County ID No. 6, Los Fresnos	ID Conservation	4,902	0	80	0	0	1	0	17	0	5	1
Cameron County Water Improvement District No. 10, Rutherford Harding	ID Conservation	395	0	6	0	0	1	0	17	0	5	1
Delta Lake ID	ID Conservation	5,583	0	281	0	0	1	0	15	0	5	1
Donna ID Hidalgo Co. No. 1	ID Conservation	989	0	109	0	0	1	0	8	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Engelman ID	ID Conservation	831	0	13	0	0	1	0	8	0	5	1
Harlingen ID No. 1	ID Conservation	4,760	0	27	0	0	1	0	17	0	5	1
Hidalgo and Cameron Counties ID No. 9, Mercedes	ID Conservation	4,000	0	168	0	0	1	0	19	0	5	1
Hidalgo County ID No. 1, Edinburg	ID Conservation	6,167	0	26	0	0	1	0	8	0	5	1
Hidalgo County ID No. 2, San Juan	ID Conservation	456	0	2	0	0	1	0	8	0	5	1
Hidalgo County ID No. 5, Progresso	ID Conservation	1,215	0	31	0	0	1	0	8	0	5	1
Hidalgo County ID No. 6, Mission 6	ID Conservation	2,787	0	59	0	0	1	0	8	0	5	1
Hidalgo County ID No. 13	ID Conservation	102	0	20	0	0	1	0	8	0	5	1
Hidalgo County ID No. 16, Mission	ID Conservation	1,985	0	45	0	0	1	0	8	0	5	1
Hidalgo County Water Improvement District No. 3	ID Conservation	2,291	0	2	0	0	1	0	8	0	5	1
Hidalgo County Water Improvement District No. 18	ID Conservation	119	0	9	0	0	1	0	8	0	5	1
Hidalgo County Water Improvement District No. 19, Sharyland	ID Conservation	554	0	55	0	0	1	0	8	0	5	1
La Feria ID, Cameron County No. 3	ID Conservation	11,041	0	89	0	0	1	0	17	0	5	1
Maverick County Water Improvement District	ID Conservation	8,659	0	140	0	0	1	0	2	0	5	1
Santa Cruz ID No. 15	ID Conservation	3,599	0	61	0	0	1	0	8	0	5	1
United ID	ID Conservation	7,093	0	124	0	0	1	0	8	0	5	1
Valley Acres ID	ID Conservation	510	0	8	0	0	1	0	19	0	5	1

*First decade of implementation yield in acft/yr.

A summary of the identified and quantified environmental impacts for recommended and alternative municipal infrastructure is presented in Table 5.2-5.

Table 5.2-5 Environmental Impacts of Municipal Infrastructure Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Distribution and Transmission												
Recommended												
ERHWSC	FM 2925 Water Transmission Line	30	142	156	0	32	0	142	17	0	5	0
El Jardin WSC	Distribution Pipeline Replacement	11	790	869	0	0	0	790	17	0	5	0
McAllen	Raw Water Line Project	800	15	17	0	2	0	15	8	0	5	0
Rio Hondo	Emergency Interconnects	70	40	44	0	0	0	40	17	0	5	0
Union WSC	Water Line Replacement and Meter Reading	88	0	0	0	0	0	0	0	0	5	0
Storage												
Recommended												
Brownsville PUB	Banco Morales Reservoir	1,700	60	66	60	0	0	60	17	0	5	1
Brownsville PUB	Resaca Restoration	877	40	44	40	0	0	40	17	0	5	1
Alternative												
Brownsville PUB	Brownsville/Matamoros Weir and Reservoir	19,176	300	330	300	0	0	300	17	0	5	1
Surface Water Treatment												
Recommended												
Donna	WTP Expansion**	950	31	34	0	1	0	31	8	0	5	1
ERHWSC	Surface WTP Phase I	800	68	75	0	4	0	68	17	0	5	1
Laguna Madre Water District	WTP No. 1 Expansion and Process Improvements	2,352	2	3	0	0	0	2	17	0	5	1
Los Fresnos	WTP Expansion (1.0 to 1.5 mgd)	560	1	2	0	0	0	2	17	0	5	1
NAWSC	Delta WTP Expansion	4,480	2	3	0	0	0	2	8	0	5	1
Olmito WSC	WTP Expansion	1,120	1	2	0	0	0	1	17	0	5	1
Roma	Regional WTP	5,600	73	80	0	0	1	73	8	0	5	1
Alternative												
ERHWSC	Surface WTP Phase II with Inter-Basin Transfer of Surface Water	2,500	2	3	0	0	0	1	17	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Elsa	WTP Expansion and Interconnect to Engleman ID	2,240	1	2	0	0	0	1	8	0	5	1
Laredo	El Pico WTP Expansion (Phase 1-4)	28,000	13	14	0	0	0	13	4	0	5	1
NAWSC	Expansion of WTP No. 5	1,120	2	3	0	0	0	2	8	0	5	1

*First decade of implementation yield (acft/yr).
** Donna – WTP Expansion includes New Raw Water Reservoir and Raw Water Pump Station

5.2.2 Wastewater Reuse

Wastewater reuse is defined as the types of projects that utilize treated wastewater effluent as a replacement for water supply, reducing the overall demand for fresh water supply. Wastewater reuse can be classified into two major types, defined by how the reuse water is handled. Direct reuse involves introducing treated wastewater directly from a wastewater plant to the place of use. For example, piping treated wastewater from a wastewater treatment plant (WWTP) to a golf course. Indirect reuse involves discharging treated wastewater to an environmental buffer like a river, aquifer, or lake for subsequent use. Virtually any water supply entity with a WWTP could pursue a reuse alternative, provided that downstream water rights do not have a claim for the entire return flow. Both direct and indirect wastewater reuse can be applied to potable and non-potable uses.

5.2.2.1 Non-Potable Reuse

Wastewater reuse is most commonly used for non-potable (not for drinking) purposes, such as agriculture, landscape, public parks, and golf course irrigation. Other non-potable applications include cooling water for power plants and oil refineries, industrial process water, toilet flushing, dust control, construction activities, concrete mixing, and artificial lakes. For the purposes of this plan, non-potable supplies are limited to meeting 25 percent of municipal need but can be sold to non-municipal WUGs to meet up to 100 percent of their demands.

The wastewater reuse WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential users of reclaimed water; (2) the level of treatment and quality of the reclaimed water; (3) the water quality requirements for particular use; and (4) the public acceptance of reuse.

State regulatory requirements for non-potable reuse of reclaimed water place constraints on both the types of uses considered acceptable and the manner in which reclaimed water is managed and used. Wastewater reuse quality and system design requirements are regulated by TCEQ by 30 TAC Section 210. TCEQ allows the following two types of non-potable reuse as defined by the use of the water and the required water quality:

- Type I – Use of reclaimed water where contact between humans or food crops and the reclaimed water is likely; and

- Type II – Use of reclaimed water where contact between humans or food crops and the reclaimed water is unlikely.

Current TCEQ criteria for non-potable reuse water are shown in Table 5.2-6.

Table 5.2-6 Quality Standards for Reclaimed Water on a 30-Day Average

PARAMETER	ALLOWABLE LEVEL
Type I Reuse	
BOD_5 or $CBOD_5$	5 mg/L
Turbidity	3 NTU
Fecal Coliform	20 CFU/100 mL* 75 CFU/100 mL**
Enterococci	4 CFU/100 mL* 9 CFU/100 mL**
Type II Reuse – For a system other than a pond	
BOD_5	20 mg/L
Or $CBOD_5$	15 mg/L
Fecal Coliform	200 CFU/100 mL* 800 CFU/100 mL**
Enterococci	35 CFU/100 mL* 89 CFU/100 mL**
Type II Reuse – For a pond	
BOD_5	30 mg/L
Fecal Coliform	200 CFU/100 mL* 800 CFU/100 mL**
Enterococci	35 CFU/100 mL* 89 CFU/100 mL**

BOD - biochemical oxygen demand
CBOD - carbonaceous biochemical oxygen demand
CFU - colony-farming unit
mg/L - milligrams per liter
mL - milliliter
NTU - nephelometric turbidity units
* 30-day geometric mean
** Maximum single grab sample

Non-potable reuse was evaluated for those entities that identified it as a desired WMS, and for some WUGs where no other water supplies were available to meet needs. In each case, the demands of the end user were evaluated to verify that the supply was only considered where a demand would have otherwise been filled by municipal water, either raw or treated. The yield was limited to meet no more than 25 percent of the WUG's demand in any decade. The following seven potential wastewater non-potable reuse projects were evaluated as potentially feasible WMS by the sponsor:

- Agua Special Utility District (SUD) – Non-Potable Wastewater Effluent Reuse.
- Brownsville Public Utilities Board/Cameron County Steam Electric – Non-Potable Water Reuse Pipeline.
- City of Edinburg – Reuse Water for Cooling Tower and Landscaping Usage.
- City of La Feria – Non-Potable Wastewater Effluent Reuse.
- City of Mission – Use of Treated Sewer Effluent to Irrigate City Parks.
- Olmito WSC - Biolac® WWTP
- City of Rio Hondo – Non-Potable Wastewater Effluent Reuse.
- City of San Benito – Non-Potable Wastewater Effluent Reuse.

5.2.2.2 Potable Reuse

Potable reuse of reclaimed water refers to the intentional reuse of highly treated wastewater effluent as a supplemental source of water supply for potable use. Indirect potable reuse is practiced in Texas where surface water supplies are deliberately augmented with wastewater effluent. The general steps in indirect potable reuse are as follows:

1. Wastewater is treated at a conventional WWTP.
2. The water is again treated through microfiltration (MF), ultrafiltration (UF) and/or reverse osmosis (RO).
3. The treated water is returned to the natural environment and mixes with other waters for an extended period of time.
4. The blended water is sent to a WTP for conventional water treatment.
5. The water is stored and pumped to distribution.

The TCEQ is currently in the process of establishing the requirements for both indirect and direct potable reuse. In 2012, TWDB funded a study to assess the potential for direct potable reuse in Texas and develop a resource document that provides scientific and technical information for the implementation of direct potable reuse.[3] The final version of the report was released in April 2015. There are three direct potable reuse projects to date in Texas. The City of Wichita Falls, the City of Big Spring, and El Paso Water Utilities[4] have all implemented direct potable reuse projects. Each of the three cities were issued permits from the TCEQ following extensive testing of the drinking water.

All of the potable reuse strategies recommended in this RWP are considered direct reuse because none of the strategies have sufficient evidence that the reuse water would be retained in a natural environmental buffer for what would be considered an extended amount of time. By TWDB definition,

[3] http://www.twdb.texas.gov/innovativewater/reuse/projects/directpotable/index.asp.
[4] http://www.twdb.texas.gov/publications/shells/WaterReuse.pdf.

indirect reuse refers to water that is returned to a natural water body such that an additional permit is required to access that water after buffering.

The wastewater reuse WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential surface waters and water treatment facilities; (2) the level of treatment and quality of the reclaimed water; and (3) public acceptance of reuse. The following five potential potable reuse projects were submitted and evaluated as WMS:

- Agua SUD – West WWTP Potable Reuse.
- Agua SUD – East WWTP Potable Reuse.
- City of Pharr – Raw Water Reservoir Augmentation.
- City of San Benito – Potable Wastewater Effluent Reuse.
- City of San Juan – Potable Reuse.
- Laguna Madre Water District – Port Isabel Water Reclamation Facility: Potable Reuse.

In addition to the submitted potable reuse WMSs, an evaluation of WWTPs in the region was performed to determine other entities that could benefit from potable reuse. WWTPs with an average effluent flow greater than 2.0 mgd that were not included in submitted reuse WMS were considered suitable to potentially provide a cost-effective yield of reuse water. It was assumed that half of the average effluent flow could be produced as reuse yield on a consistent basis. The WWTPs that had at least 1.0 mgd of water available after the amount of reclaimed water currently being used and are within reasonable distances to WTPs have been further evaluated for potable reuse strategies. The WWTPs that were recommended for potable reuse include the following:

- Brownsville Public Utilities Board – Southside WWTP.
- City of Laredo – South Laredo Creek WWTP.
- City of McAllen – McAllen North WWTP.
- City of Weslaco – City of Weslaco North WWTP.

5.2.2.3 Environmental Impacts

Potential environment impacts for recommended and alternative reuse strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-7.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific facility was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known; and
- WTP impacts are estimated using UCM, which is based on the plant capacity.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

G. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

H. Reduction in WWTP Effluent (acft/yr)

Environmental impacts may be seen because of lower WWTP effluent flows to the discharge streams for wastewater effluent reuse strategies. These impacts could include the following:

- Decreases to the stream flow/level.
- Change in the water quality by reducing the organic levels.
- Effects to fish and wildlife that inhabit the streams.

I. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Supply amounts for this strategy were developed based on estimates of water use and related return flows to specific wastewater treatment plants. Where applicable, consideration was given for specific minimum by-pass flow requirements where required by water rights. This strategy is considered highly reliable (reliability score = 5). There is potential for the reuse supplies to develop at a faster or slower rate, depending on the volume of return flows.

J. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for reuse projects is presented in Table 5.2-7.

Table 5.2-7 Environmental Impacts of Reuse Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Agua SUD	Non-Potable Wastewater Effluent Reuse**	1,120	140	154	0	0	140	8	0	1,120	5	1
Agua SUD	West WWTP Potable Wastewater Effluent Reuse (Phase 1)	560	140	154	19	0	140	8	0	560	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Agua SUD	West WWTP Potable Wastewater Effluent Reuse (Phase 2)	2,240	140	154	2	0	140	8	0	2,240	5	1
Agua SUD	East WWTP Potable Wastewater Effluent Reuse	2,240	42	47	0	0	42	8	0	2,240	5	1
Brownsville	Non-Potable Water Reuse Pipeline	6,720	116	128	0	0	116	17	0	6,720	5	1
Brownsville	Southside WWTP Potable Wastewater Effluent Reuse (Phase 1)	3,360	43	47	0	0	43	17	0	3,360	5	1
Brownsville	Southside WWTP Potable Wastewater Effluent Reuse (Phase 2)	5,040	43	47	0	0	43	17	0	5,040	5	1
Edinburg	Reuse Water for Cooling Tower and Landscaping Usage	3,920	43	47	1	0	43	8	0	3,920	5	1
La Feria	Non-Potable Wastewater Effluent Reuse**	50	13	15	0	0	13	17	0	50	5	1
Laguna Madre Water District	Port Isabel Potable Water Reclamation Facility	627	87	96	0	1	87	17	0	627	5	1
Laredo	South Laredo WWTP Potable Wastewater Effluent Reuse (Phase 1)	3,360	43	47	0	0	43	4	0	3,360	5	1
Laredo	South Laredo WWTP Potable Wastewater Effluent Reuse (Phase 2)	6,720	43	47	0	0	43	4	0	6,720	5	1
McAllen	North WWTP Potable Wastewater Effluent Reuse (Phase 1)	3,880	45	50	3	0	45	8	0	3,880	5	1
McAllen	North WWTP Potable Wastewater Effluent Reuse (Phase 2)	6,060	45	50	0	0	45	8	0	6,060	5	1
Mission	South WWTP Non-Potable Wastewater Effluent Reuse (Phase 1)	3,920	19	21	0	0	19	8	0	3,920	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Mission	South WWTP Non-Potable Wastewater Effluent Reuse (Phase 2)	7,560	19	21	0	0	19	8	0	280	5	1
Olmito WSC	New Biolac® WWTP	350	40	44	0	1	44	17	0	700	5	1
Pharr	Raw Water Reservoir Augmentation (Potable Reuse)	6,721	38	42	1	0	38	8	0	560	5	1
Rio Hondo	Non-Potable Wastewater Effluent Reuse	450	25	28	0	0	25	17	0	450	5	1
San Benito	Non-Potable Wastewater Effluent Reuse**	1,120	32	35	0	0	32	17	0	2,240	5	1
San Benito	Potable Wastewater Effluent Reuse**	1,120	44	48	0	0	44	17	0	6,720	5	1
San Juan	Potable Reuse	2,240	42	47	0	0	42	17	0	2,240	5	1
Weslaco	North WWTP Potable Wastewater Effluent Reuse	1,120	15	17	0	0	15	8	0	3,360	5	1

* First decade of implementation yield (acft/yr).

** Indicates alternative WMS, and is evaluated in Section 5.4.

5.2.3 Desalination

Desalination is the process of removing dissolved solids and other minerals from brackish and saline groundwater, and seawater. TWDB classifies brackish and groundwater as groundwater with a total dissolved solids (TDS) content between 1,000 and 10,000 parts per million (ppm), while saline groundwater exceeds 10,000 ppm of TDS (TWDB, 2019). The most common method of treatment is membrane technology, but there are other technologies, including thermal processes such as multistage flash distillation, multiple-effect distillation, and vapor compression. Thermal processes are energy intense and are more common in the Middle East where fuels are more abundant.

The prevalent membrane technology is RO, which forces saline water through semi-permeable membranes to separate into fresh water and highly concentrated briny byproduct. For high TDS, RO is more energy intensive and has a lower yield of permeate, or fresh water. A typical pressure for seawater with 35,000 mg/L could be in excess of 1,000 pounds per square inch (psi). This is in contrast to less than 200 psi for 3,000 mg/L TDS groundwater. The higher TDS treatment plants yield less than 50 percent of the water supplied. The remaining 50 percent is highly saline residual, which generally requires disposal and can add significant costs to a project. Conversely, lower salinity brackish water facilities are able to produce an 80 percent to 20 percent, fresh water to residual concentrate. Surface water intakes will require additional pretreatment of suspended solids prior to the RO treatment. The TWDB recommends the following for all desalination projects:

- Feasibility studies;
- Consideration of regional-scale projects;
- Assessment of combined uses of seawater and brackish groundwater sources as a means of enhancing the cost-competitiveness of a desalination project;
- Identification and assessment of regional partnerships, including local entities experienced in desalination research;
- Identification and assessment of water transfers resulting from net new water created by a desalination project that could enhance the benefits of the project to other large water users/municipalities;
- Consider approaches to structuring such transfers and draft agreements that would be required to secure their implementation;
- Identification and assessment of likely power sources and potential for co-located facility; and
- Assessment of project funding and development alternatives.

5.2.3.1 Local Brackish Groundwater Development and Treatment

Texas currently has more than 45 municipal brackish desalination plants, with a combined capacity of about 139 mgd. That includes 85 mgd of brackish groundwater desalination and 54 mgd of brackish surface water desalination. The average cost to produce desalinated water from brackish groundwater ranges from approximately $380 to $850 per acft (adjusted to 2018 dollars).

Table 5.2-8 details the 15 potential brackish groundwater desalination projects that were submitted and evaluated this cycle. Based on limitations to the associated county MAGs, seven projects are recommended by the RWPG. The remaining projects are evaluated as alternatives.

Table 5.2-8 Evaluated Region M Groundwater Desalination Projects

ENTITY	COUNTY	WMS NAME	DECADE OF NEED	YIELD (ACFT/YR)
Recommended Projects				
Alamo	Hidalgo	Brackish Groundwater Desalination Plant	2030	896
ERHWSC	Cameron	North Cameron Regional WTP Wellfield Expansion	2030	400
La Feria	Cameron	Water Well with RO Unit	2030	1,120
Lyford	Willacy	Brackish Groundwater Well and Desalination	2030	1,120
McAllen	Hidalgo	Brackish Groundwater Desalination Plant	2030	2,688
Mission	Hidalgo	Brackish Groundwater Desalination Plant	2030	2,688

ENTITY	COUNTY	WMS NAME	DECADE OF NEED	YIELD (ACFT/YR)
NAWSC	Cameron	Delta Area Brackish Groundwater Desalination Plant	2020	2,240
NAWSC	Cameron	North Cameron Regional WTP Wellfield Expansion	2030	800
Primera	Cameron	RO WTP with Groundwater Well	2030	1,120
San Benito	Cameron	New Groundwater Supply	2030	1,120
San Juan	Hidalgo	Brackish Groundwater Well	2030	1,120
San Juan	Hidalgo	WTP No. 1 Upgrade, Expansion, and Brackish Groundwater Desalination	2030	1,792
Sharyland WSC	Hidalgo	Water Well and RO Unit at WTP No. 2	2030	900
Sharyland WSC	Hidalgo	Water Well and RO Unit at WTP No. 3	2030	900

5.2.3.2 Seawater Desalination

Texas does not yet have an operating seawater desalination plant. At the time of this RWP, a 15 mgd industrial seawater desalination plant is finishing construction. Two other desalination plants have been proposed – one by the Brownsville PUB and the other by the Laguna Madre Water District.

Seawater desalination still remains one of the more expensive WMSs, but costs have declined over the years as technology has advanced. The average cost to produce desalinated water from seawater ranges from $800 to over $1,400 per acft[5]. When placed in conjunction with power generation facilities, power costs can be lower and a combined water intake and discharge will lower capital costs.

Table 5.2-9 includes the two potential seawater desalination projects that were submitted and evaluated.

Table 5.2-9 Evaluated Region M Seawater Desalination Projects

WUG	COUNTY	WMS NAME	DECADE OF NEED	YIELD (ACFT/YR)
Recommended				
Laguna Madre Water District	Cameron	Seawater Desalination Plant	2050	1,120
Alternative				
Brownsville PUB	Cameron	Seawater Desalination Demonstration	2030	2,800

[5] http://www.twdb.texas.gov/innovativewater/desal/facts.asp.

WUG	COUNTY	WMS NAME	DECADE OF NEED	YIELD (ACFT/YR)
Brownsville PUB	Cameron	Seawater Desalination Implementation	2060	28,000

5.2.3.3 Environmental Impacts

Potential environment impacts for recommended and alternative brackish groundwater and seawater desalination strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-11.

A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.
- The impact of wells and wellfields are given by the UCM, which includes 0.5 acre per well.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

G. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

H. Volume of Brine (acft)

The volume of brine quantifies the amount of brine concentrate from the desalination process that is released as surface water discharge. It is assumed that brackish groundwater desalination plants are 80 percent efficient, so 20 percent of the amount of water pumped from the aquifer is discharged as brine concentrate. An efficiency of 50 percent was assumed for seawater desalination.

I. TDS of Brine (mg/L)

The TDS of brine provides the concentrate of the brine discharge. This number was calculated by assuming that the raw brackish groundwater has a TDS of 3,500 mg/L and the TDS of the seawater is 35,000 mg/L. A TDS of 500 mg/L was used for the finished water for both types of desalination.

J. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Each desalination water management strategy was assessed on their reliability, varying between medium to high, contingent on factors such as the ability to desalinate and dispose reject water or availability of hydrogeologic studies in the area to determine suitability of formations for new wells.

K. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for desalination projects is presented in Table 5.2-10.

Table 5.2-10 Environmental Impacts of Desalination Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J	K
Alamo	Brackish Groundwater Desalination Plant	896	6	7	0	0	6	8	0	179	19,375	3	0
Brownsville	Seawater Desalination Demonstration – Pilot**	2,800	8	9	0	1	8	17	0	1,400	86,500	4	1
Brownsville	Seawater Desalination Demonstration – Buildout**	28,000	28	31	0	1	28	17	0	14,000	86,500	5	1
ERHWSC	North Cameron Regional WTP Wellfield Expansion	400	1	2	1	0	1	17	0	80	19,375	5	0
La Feria	Water Well with RO Unit	1,120	1	2	0	0	1	17	0	224	19,375	5	0
Laguna Madre Water District	Seawater Desalination Plant	1,120	8	9	0	0	8	17	0	560	86,500	4	1
Lyford	Brackish Groundwater Well and Desalination	560	5	6	0	0	5	10	0	112	19,375	5	0
McAllen	Brackish Groundwater Desalination Treatment	2,688	18	20	0	0	18	8	0	538	19,375	5	0

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J	K
Mission	Brackish Groundwater Desalination Plant	2,688	18	20	0	0	18	8	0	538	19,375	5	0
NAWSC	Delta Area Brackish Groundwater Desalination Plant	2,240	3	4	1	0	3	17	0	448	38,750	5	0
NAWSC	North Cameron Regional WTP Wellfield Expansion	800	1	2	0	0	1	17	0	160	19,375	5	0
Primera	RO WTP with Groundwater Well	1,120	1	1	0	0	1	8	0	896	19,375	3	0
San Benito	New Groundwater Supply	1,120	1	2	5	0	1	17	0	896	19,375	3	0
San Juan	Brackish Groundwater Well	1,120	1	2	0	0	7	8	0	224	19,375	5	0
San Juan	WTP No. 1 Upgrade, Expansion and Brackish Groundwater Desalination	1,792	7	8	2	0	7	8	0	358	19,375	3	0
Sharyland WSC	Water Well and RO Unit at WTP No. 2	900	7	8	0	0	7	8	0	180	19,375	5	0
Sharyland WSC	Water Well and RO Unit at WTP No. 3	900	7	8	1	0	7	8	0	180	19,375	5	0

*First decade of implementation yield (acft/yr).
** Indicates alternative WMS, and is evaluated in Section 5.4.

5.2.4 Fresh Groundwater

While there is not abundant fresh groundwater available in Region M, there are numerous entities and individuals that rely on minimally treated groundwater to meet their needs. For example, this includes cities that are farther from the Rio Grande and with surface water distribution networks that have few alternative sources, and have identified portions of the aquifer(s) that produce acceptable water for municipal use without advanced treatment technology.

In some cases, where there appears to be additional available fresh groundwater, further development of that source is recommended, within the MAG values for the applicable aquifer. In many instances this is the recommendation for County-Other entities, where domestic wells are distributed over a large area and pump small amounts for a single household.

Table 5.2-11 details the 14 potential fresh groundwater projects that were submitted and evaluated this cycle. Based on limitations to the associated county MAGs, 11 projects are recommended by the RWPG. The remaining projects were evaluated as alternatives.

Table 5.2-11 Evaluated Region M Fresh Groundwater Projects

WUG	COUNTY	WMS NAME	DECADE OF NEED	YIELD (ACFT/YR)
Recommended Projects				
Alamo	Hidalgo	New Groundwater Well	2020	1,120
County-Other, Cameron	Cameron	Expand Groundwater Supply	2020	1,000
County-Other, Starr	Starr	Additional Groundwater Wells	2020	400
County-Other, Webb	Webb	Additional Groundwater Wells	2020	350
Edcouch	Hidalgo	New Groundwater Supply	2020	725
Hidalgo	Hidalgo	Expand Existing Groundwater Wells	2040	300
Irrigation, Jim Hogg	Jim Hogg	Additional Groundwater Wells	2020	300
Rio Hondo	Cameron	New Groundwater Supply	2020	1,120
Weslaco	Hidalgo	Groundwater Blending	2020	560
Webb County Water Utility	Webb	Expanded Groundwater Supply (MAG limited)	2030	76
Zapata County	Zapata	New Groundwater Supply	2020	1,120
Alternative Projects				
McAllen	Hidalgo	Expand Existing Groundwater Supply (Phase I-II)	2030	500
Mercedes	Hidalgo	Expand Existing Groundwater Supply	2020	560
Military Highway WSC	Cameron	Expand Existing Groundwater Wells (Hidalgo County)	2020	250

5.2.4.1 Environmental Impacts

Potential environment impacts for fresh groundwater strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-12.

A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.
- The impact of wells and wellfields are given by the UCM, which includes 0.5 acre per well.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

G. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations, buildings, and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

H. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. These strategies were developed in accordance with MAG values for the appropriate aquifer and county. As such, most are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the relevant GCD (where applicable) and groundwater management area (GMA). Some of the strategies may score slightly lower in reliability due to availability of hydrogeologic information from existing nearby wells, potential of differing well productivity and water quality, potential impacts to natural resources and aquifer competition or restrictions.

I. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative fresh groundwater projects is presented in Table 5.2-12.

Table 5.2-12 Environmental Impacts of Fresh Groundwater Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I
Alamo	Groundwater Well	1,120	5	6	0	0	5	8	0	5	0
County-Other, Cameron	Expand Groundwater Supply	1,000	4	4	1	0	4	8	0	5	0
County-Other, Starr	Additional Groundwater Wells	400	8	9	0	0	8	7	0	5	0

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I
County-Other, Webb	Additional Groundwater Wells	350	8	9	0	0	8	4	0	5	0
Edcouch	New Groundwater Supply	500	61	67	0	0	61	8	0	4	0
Hidalgo	Expand Existing Groundwater Wells	300	5	6	1	0	5	8	0	4	0
Irrigation, Jim Hogg	Additional Groundwater Wells	300	3	3	0	0	3	4	0	5	0
McAllen	Expand Existing Groundwater Supply (Phase I-II)**	500	1	2	0	0	1	8	0	5	0
Mercedes	Expand Existing Groundwater Supply**	560	1	2	0	0	1	8	0	5	0
Military Highway WSC	Expand Existing Groundwater Wells (Hidalgo County)**	250	1	1	0	0	1	8	0	5	0
Rio Hondo	New Groundwater Supply	1,120	1	1	0	0	1	8	0	5	0
Webb County Water Utility	Expanded Groundwater Supply	76	1	1	0	0	1	4	0	4	0
Weslaco	Groundwater Blending	560	5	6	0	0	5	8	0	4	0
Zapata County	New Groundwater Supply	1,120	9	10	0	0	9	8	0	5	0

*First decade of implementation yield (acft/yr)

** Indicates alternative WMS, and is evaluated in Section 5.4.

5.2.5 Advanced Municipal Water Conservation

Water conservation is defined as methods and practices that reduce demand for water supply, increase the efficiency of supply, or use facilities so that available supply is conserved and made available for future use. Water conservation is typically a non-capital intensive alternative that any water supply entity can and should pursue. All public water suppliers are required by the TAC Rule Section 288.2 to submit a Drought Contingency and Water Conservation Plan to the TCEQ for approval. These plans must include a utility profile including population and water use data (total gallons per capita per day [GPCD] and residential), 5-year and 10-year target-specific water savings goals, and conservation strategies to meet those goals. Such strategies include, but are not limited to: metering devices to measure and account for the amount of water diverted from the supply source; a program for universal metering of both customer and public uses of water through maintenance and repair; means to determine and control water loss; and programs for continuing public education.

In 2001, the Texas Legislature amended the Texas Water Code to require RWPGs to consider water conservation and drought management strategies for every entity with a projected water shortage (need). The Water Conservation Implementation Task Force was created by Senate Bill (SB) 1094 to identify water conservation best management practices (BMPs) and develop a BMP Guide for use by RWPGs and utilities.[6] In 2007, the task force was succeeded by the Water Conservation Advisory Council (WCAC) by the 80th Texas Legislature with the passage of SB 3 and House Bill (HB) 4. The primary roles of the WCAC include monitoring trends in water conservation implementation and technologies for potential inclusion as BMPs. Since its inception, the WCAC has continually worked with TWDB and TCEQ to update the "Best Management Practices Guide." BMPs contained in the BMP Guide are voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and can be implemented within a specific time frame. [7]

The current TWDB municipal water demand projections account for expected water savings caused by the implementation of the 1991 State Water Efficient Plumbing Act, which established minimum standards for plumbing fixtures sold in Texas. The standards for new plumbing fixtures, as specified by the State Water Efficient Plumbing Act and updated by the TCEQ, are shown in Table 5.2-13. The TCEQ has established rules requiring the labeling of both plumbing fixtures and water-using appliances sold in Texas. The labels must specify the rates of flow for plumbing fixtures and lawn sprinklers, and the amounts of water used per cycle for clothes washers and dishwashers.

In 2009, the Texas Legislature enacted HB 2667, establishing new minimum standards for plumbing fixtures sold in Texas beginning in 2014. HB 2667 clarifies and sets out the national standards of the American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI) by which plumbing fixtures will be produced and tested. This bill establishes a phase-in of high efficiency plumbing fixtures brought into Texas, which allowed manufacturers the time to change their production and retailers the opportunity to turn over their inventory. HB 2667 creates an exemption for those manufacturers that volunteer to register their products with the United States Environmental Protection Agency's (EPA's) WaterSense Program, which should result in additional water savings. This bill also repeals the TCEQ certification process for plumbing fixtures since the plumbing fixtures must meet national certification and testing procedures.

TCEQ has established rules to reflect this new change in law. The 2009 law required that by January 2014, all toilets use no more than 1.28 gallons per flush (20 percent savings from the 1991, 1.6 gallons per flush standard). Assuming an average frequency of per-person toilet use in households of 5.1

[6] Water Conservation Implementation Task Force. Report to the 79th Legislature, Texas Water Development Board, Special Report. Austin, Texas. November 2004.
[7] "Best Management Practices for Municipal Water Users." Texas Water Development Board. Austin, Texas. May 2019.

and a per-use savings of 0.32 gallons per use, the supplementary savings of adopting high-efficiency toilets is 1.63 GPCD. This change is also reflected in Table 5.2-13 .

Table 5.2-13 Standards for Plumbing Fixtures[8]

FIXTURE	STANDARD
Toilets*	1.28 gallons per flush
Shower Heads	2.50 gpm at 80 psi
Urinals	0.50 gallons per flush
Faucet Aerators	2.20 gpm at 60 psi
Drinking Water Fountains	Self-closing valve
* Bill 2667 of the 81st Texas Legislature, 2009	

The TWDB has estimated that the effect of the new plumbing fixtures in dwellings, offices, and public places will be a reduction in per capita water use of approximately 20 GPCD, in comparison to what would have occurred with previous generations of plumbing fixtures.[9] The estimated water conservation effect of 20 GPCD was obtained using the data found in Table 5.2-14.

Table 5.2-14 Water Conservation Potentials of Low Flow Plumbing Fixtures

PLUMBING FIXTURE	WATER SAVINGS (GPCD)
Toilets and Showerheads	16.0
Additional Savings (High Efficiency Toilet)*	1.63
Faucet Aerators – 2.2 gpm	2.0
Urinals – 1.0 gpm	0.3
Total	**20.03 (~20)**
* TWDB, 2013	

With respect to the RWP, any additional projected water savings from conservation programs must be listed as a separate WMS. The savings projected by the TWDB include complete replacement of existing plumbing fixtures to water-efficient fixtures by the year 2045. The projections also assume that all new construction includes water-efficient plumbing fixtures. It is important when including a retrofit program as a WMS to not double-count water savings, as savings caused by retrofits are already included in the base water demand projections.

[8] Title 30, Texas Administrative Code Section 290.252; 30 TAC, Chapter 290, Subchapter G; and Texas Health and Safety Code 372.

[9] "Water Conservation Impacts on Per Capita Water Use." Water Planning Information, Texas Water Development Board. Austin, Texas. 1992.

A variety of conservation measures are recommended as described in the TWDB BMP Guide; any combination of which can be used to meet the specific goals for a municipality or utility. Conservation can be achieved using a variety of strategies, including the following:

- Conservation Analysis and Planning
  - Conservation Coordinator.
  - Cost-Effectiveness Analysis.
  - Water Survey for Single-Family and Multi-Family Customers.
  - Customer Characterization.
- Financial
  - Water Conservation Pricing.
  - Wholesale Agency Assistance Programs.
- System Operations
  - Metering of all New Connections and Retrofitting of Existing Connections.
  - System Water Audit and Water Loss.
- Landscaping
  - Athletic Field Conservation.
  - Golf Course Conservation.
  - Landscape Irrigation Conservation and Incentives.
  - Park Conservation.
  - Residential Landscape Irrigation Evaluations.
  - Outdoor Watering Schedule.
- Education and Public Awareness
  - Public Information.
  - School Education.
  - Public Outreach and Education.
  - Partnerships with Nonprofit Organizations.
- Rebate, Retrofit, and Incentive Programs
  - Conservation Programs for Industrial, Commercial, and Institutional Accounts.
  - Residential Clothes Washer Incentive Program.
  - Residential Toilet Replacement Programs.
  - Showerhead, Aerator, and Toilet Flapper Retrofit Program.
  - Water-Wise Landscape Design and Conversion Programs.
  - Customer Conservation Rebates.

- Plumbing Assistance Programs for Economically Disadvantaged Customers.
- Conservation Technology
  - New Construction Graywater.
  - Rainwater Harvesting and Condensate Reuse.[10]
  - Reuse of Reclaimed Water.
- Regulatory Enforcement
  - Prohibition on Wasting Water.
  - Conservation Ordinance Planning and Development.

In addition to the BMP Guide, entities must submit a water conservation plan if the following occur: [11]

- The entity is a retail public water supplier with 3,300 or more connections;
- The entity is applying to the TWDB for financial assistance of more than $500,000; or
- The entity has certain surface water rights through the TCEQ.

Table 5.2-15 lists specific WMSs submitted to the RWPG that fall within Advanced Municipal Water Conservation.

Table 5.2-15 Submitted Advanced Municipal Water Conservation WMSs

ENTITY	WATER MANAGEMENT STRATEGY	YIELD (ACFT/YR)
Hidalgo County Water Improvement District No. 3	Renewal of Lawn Irrigation Systems	300
McAllen	Advanced Metering Infrastructure (AMI) Project	1,140
Rio Grande City*	Water Meter Replacement	370 Total / 300 Yield
Rio WSC*	Water Meter Replacement (Rio Grande City)	70
* Indicates Rio WSC is supplied with 70 acft/yr from the 370 acft/yr total from Rio Grande City.		

5.2.5.1 Outdoor Water Use

In 2018, the Texas Living Waters Project published the “Water Conservation by the Yard: A Statewide Analysis of Outdoor Water Savings Potential,” which detailed regional and statewide projected conservation savings based on effective outdoor watering education, technology, and restrictions. According to the Texas Living Waters Project, restricting outdoor water use to no more than twice per

[10] While Rainwater Harvesting, Condensate Reuse, and Reuse of Reclaimed Water are included in the WCAC Municipal BMP Guide as water conservation measures, they are not classified as water conservation measures by the TWDB for regional water planning purposes or in DB22.

[11] “Evaluation of Best Management Practices in Certain Water Conservation Plans,” Biennial Report to the Texas Legislature, 85th Legislative Session. Texas Water Development Board. 2017.

week can alone achieve much of the projected conservation savings in the 2017 State Water Plan efficiently utilizing the following limits:

- Number of days/week residents can water;
- Hours during which residents can irrigate; and
- Specific water delivering technologies.

In Region M, the Texas Living Waters Project reported through WUG level calculations an estimated savings potential of twice per week outdoor watering restrictions ranges from 3.5 (low effort) to 8.5 (high effort) percent of total municipal demand. The Texas Living Waters Project research indicates that education and enforcement have a direct impact on the effectiveness of outdoor watering restrictions. The Texas Living Waters Project calculations applied to the 2016 Region M Water Plan are detailed in Table 5.2-16 and

Table 5.2-17.

Table 5.2-16 Projected Municipal Savings Based on Municipal Demands Identified in the 2016 Region M Water Plan

PLANNING DECADE	WATER SAVINGS (ACFT/YR)		MUNICIPAL DEMAND (ACFT/YR)
	LOW EFFORT	HIGH EFFORT	
2016	8,623	20,941	246,359
2020	10,906	26,485	311,591
2030	12,915	31,365	368,997
2040	14,967	36,357	427,611
2050	17,096	41,518	488,449
2060	19,279	46,820	550,830
2070	21,424	52,031	612,127

Table 5.2-17 Projected Municipal Savings as a Percentage of Municipal (Unmet) Needs Identified in the 2016 Region M Water Plan

PLANNING DECADE	WATER SAVINGS (% OF NEEDS)		MUNICIPAL (UNMET) NEEDS (ACFT/YR)
	LOW EFFORT	HIGH EFFORT	
2020	22%	54%	49,145
2030	15%	36%	87,027
2040	11%	27%	132,941

PLANNING DECADE	WATER SAVINGS (% OF NEEDS)		MUNICIPAL (UNMET) NEEDS (ACFT/YR)
	LOW EFFORT	HIGH EFFORT	
2050	9%	22%	191,749
2060	8%	19%	252,940
2070	7%	17%	313,374

5.2.5.2 Municipal Water Conservations Goals

In addition to the specific WMS submitted, Advanced Municipal Water Conservation is recommended for every municipal WUG in Region M. For every municipal WUG with a projected need or a per capita water use rate greater than 140 GPCD, municipal conservation yield and costs were estimated.

For entities that have projected needs, the usage reduction rate was based on the current GPCD. Entities with needs and a GPCD greater than 140 GPCD were assigned a 1 percent usage reduction per year. After the 140 GPCD goal was achieved, or for entities with a need and a GPCD below 140, the annual reduction was set to 0.5 percent. A minimum value of 60 GPCD was fixed based on the "Projection Methodology – Draft Population and Municipal Water Demands" memo from the TWDB referencing the "Analysis of Water Use in New Single-Family Homes study and internal report, The Grass Is Always Greener…Outdoor Residential Water Use In Texas." Once the minimum value was reached, entities were projected to stop reducing their GPCD. For municipal entities that have needs starting later than 2020 and base year GPCD below 140, the advanced water conservation strategy is projected to begin in the first decade with needs.

Entities that are not projected to have a need but have per capita usage above 140 GPCD in 2016 are recommended to implement advanced conservation at a rate of 1 percent reduction per year beginning in 2020. Once these entities reach a GPCD of 140, it was assumed that advanced conservations would continue to yield a steady volume without an additional cost, but that additional reductions in use are not anticipated.

It is recommended that entities without needs that have a 2016 per capita water use rate under 140 GPCD implement advanced water conservation, but they were not recommended a specific advanced conservation WMS, as goals were not assigned to them, and no yield or costs were determined.

The calculations use the GPCD estimated for each municipality on the basis of projected population and water demands, which can be found in Subsection 2.2, Municipal Demands. For every decade, the base GPCD was calculated from the projected water demands before reductions caused by advanced water conservation strategies are implemented (Table 5.2-18). A base per capita goal was determined by reducing the per capita water use in the decade of implementation annually by the reduction rates discussed above (Table 5.2-19). The yield of advanced water conservation, or the amount of water conserved in each decade, is the difference between the per capita water use and the base per capita goal, converted to acft/yr (Table 5.2-20).

The initial GPCD projections do include reductions caused by passive conservation, and in some instances the per capita water use may be lower than the base per capita goal. In this case, the advanced water conservation is shown as zero. This may occur if the base GPCD rates projected by the TWDB decreases at a greater rate than the rates assumed for Advanced Municipal Water Conservation. One possible reason may be that if a municipality is projected to have high growth rates, the GPCD would lower because of an increase in more efficient appliances that come with new construction.

Table 5.2-18 2021 Region M Per-Capita Demand Projections Including Passive Conservation (GPCD)

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD					
				2020	2030	2040	2050	2060	2070
1	Los Fresnos	Cameron	60	60	60	60	60	60	60
2	Sebastian Municipal Utility District (MUD)	Willacy	73	63	60	60	60	60	60
3	Rio Hondo	Cameron	75	65	62	60	60	60	60
4	Primera	Cameron	87	78	75	73	72	72	72
5	Santa Rosa	Cameron	88	78	73	70	69	69	69
6	Edcouch	Hidalgo	91	80	75	73	72	71	71
7	Combes	Cameron	94	84	80	77	76	76	76
8	Lyford	Willacy	96	87	83	81	80	79	79
9	El Sauz WSC	Starr	99	90	86	84	83	83	83
10	Hidalgo County MUD No. 1	Hidalgo	100	92	90	88	88	87	87
11	Rio WSC	Starr	100	92	90	88	87	87	87
12	Agua SUD	Hidalgo	104	96	93	91	91	90	90
13	Pharr	Hidalgo	108	99	96	95	94	94	93
14	La Villa	Hidalgo	108	99	95	93	92	92	92
15	Mirando City WSC	Webb	109	99	97	95	93	94	93
16	El Jardin WSC	Cameron	109	101	98	96	95	95	95
17	Mercedes	Hidalgo	111	101	96	94	93	93	93
18	Elsa	Hidalgo	112	101	96	94	93	93	92
19	Webb County	Webb	115	105	102	100	99	99	99
20	Raymondville	Willacy	115	105	102	99	98	97	97
21	Roma	Starr	117	107	103	100	99	98	98
22	San Benito	Cameron	123	113	108	106	104	104	104
23	Hidalgo	Hidalgo	125	117	114	113	112	112	112

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD					
				2020	2030	2040	2050	2060	2070
24	La Joya	Hidalgo	125	115	111	109	108	108	108
25	La Feria	Cameron	126	117	113	111	110	109	109
26	Donna	Hidalgo	127	116	112	110	109	109	109
27	Edinburg	Hidalgo	128	120	117	116	115	115	115
28	ERHWSC	Cameron	132	124	122	120	119	119	119
29	Siesta Shores Water Control and Improvement District (WCID)	Zapata	132	123	119	116	115	115	115
30	Alamo	Hidalgo	133	96	93	91	91	90	90
31	Laredo	Webb	134	125	121	119	118	118	118
32	Jim Hogg County WCID 2	Jim Hogg	135	125	121	118	116	116	116
33	San Juan	Hidalgo	137	128	125	123	122	122	122
34	Maverick County	Maverick	138	129	125	122	121	121	121
35	El Tanque WSC	Starr	142	133	130	127	126	126	126
36	Military Highway WSC	Cameron	144	135	132	130	129	129	129
37	NAWSC	Cameron	153	145	142	140	140	140	139
38	Eagle Pass	Maverick	159	149	145	143	142	141	141
39	Brownsville	Cameron	162	153	149	147	146	145	145
40	Union WSC	Starr	164	156	153	152	151	151	151
41	Weslaco	Hidalgo	165	155	152	150	149	149	149
42	Harlingen	Cameron	168	158	154	152	151	150	150
43	La Grulla	Starr	169	160	156	154	152	152	152
44	Sharyland WSC	Hidalgo	169	159	155	153	152	152	152
45	Olmito WSC	Cameron	175	165	161	158	157	157	157
46	Zapata County	Zapata	175	165	162	159	158	158	158
47	Palm Valley	Cameron	176	165	161	158	157	156	156
48	Falcon Rural WSC	Zapata	177	169	165	164	162	162	162
49	San Ygnacio MUD	Zapata	179	168	164	162	161	160	160
50	Mission	Hidalgo	193	185	182	180	180	179	179
51	McAllen	Hidalgo	220	210	206	204	203	203	203
52	Rio Grande City	Starr	223	213	209	207	206	205	205
53	Zapata County WCID-Highway 16 East	Zapata	275	264	261	259	257	257	257

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD					
				2020	2030	2040	2050	2060	2070
54	Valley MUD 2	Cameron	294	285	281	279	278	278	278
55	Port Mansfield PUD	Willacy	358	348	346	344	342	343	342
56	Laguna Madre Water District	Cameron	386	377	373	371	370	370	370

Conservation potentials were calculated for additional plumbing fixtures, clothes washer retrofits, and lawn irrigation conservation for each WUG of Region M. The low flow plumbing fixtures effects that are already included in the water demand projections are deducted from the 20 GPCD plumbing fixtures potentials for municipal water demand reduction before additional conservation measures are suggested. In Table 5.2-19, the per capita water conservation needed by each WUG to meet the Region M goals are tabulated for indoor (plumbing fixtures and clothes washer retrofits) and outdoor (lawn watering) water conservation.

Table 5.2-19 2021 Region M Advanced Municipal Water Conservation Goals (GPCD)

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD GOALS					
				2020	2030	2040	2050	2060	2070
1	Los Fresnos	Cameron	60	60	60	60	60	60	60
2	Sebastian MUD	Willacy	73	63	60	60	60	60	60
3	Rio Hondo	Cameron	75	65	62	60	60	60	60
4	Primera	Cameron	87	78	75	73	72	70	66
5	Santa Rosa	Cameron	88	78	73	70	69	69	67
6	Edcouch	Hidalgo	91	80	75	73	72	71	69
7	Combes	Cameron	94	84	80	77	76	75	72
8	Lyford	Willacy	96	87	83	81	80	77	73
9	El Sauz WSC	Starr	99	90	86	84	83	79	76
10	Hidalgo County MUD No. 1	Hidalgo	100	92	90	88	84	80	76
11	Rio WSC	Starr	100	92	90	88	84	80	76
12	Agua SUD	Hidalgo	104	96	93	91	88	83	79
13	Pharr	Hidalgo	108	99	96	95	91	87	82
14	La Villa	Hidalgo	108	99	95	93	91	87	82
15	Mirando City WSC	Webb	109	99	97	95	92	87	83
16	El Jardin WSC	Cameron	109	101	98	96	92	87	83
17	Mercedes	Hidalgo	111	101	96	94	93	89	85
18	Elsa	Hidalgo	112	101	96	94	93	90	85
19	Webb County	Webb	115	105	102	100	97	92	88
20	Raymondville	Willacy	115	105	102	99	97	92	88

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD GOALS					
				2020	2030	2040	2050	2060	2070
21	Roma	Starr	117	107	103	100	99	94	89
22	San Benito	Cameron	123	113	108	106	104	99	94
23	Hidalgo	Hidalgo	125	117	114	111	105	100	95
24	La Joya	Hidalgo	125	115	111	109	105	100	95
25	La Feria	Cameron	126	117	113	111	106	101	96
26	Donna	Hidalgo	127	116	112	110	107	102	97
27	Edinburg	Hidalgo	128	120	117	113	108	103	98
28	ERHWSC	Cameron	132	124	122	117	111	106	101
29	Siesta Shores WCID	Zapata	132	123	119	116	111	106	101
30	Alamo	Hidalgo	133	96	93	91	88	83	79
31	Laredo	Webb	134	125	121	119	113	107	102
32	Jim Hogg County WCID 2	Jim Hogg	135	125	121	118	114	108	103
33	San Juan	Hidalgo	137	128	125	121	116	110	105
34	Maverick County	Maverick	138	129	125	122	116	111	105
35	El Tanque WSC	Starr	142	133	130	125	119	113	107
36	Military Highway WSC	Cameron	144	135	132	126	120	114	108
37	NAWSC	Cameron	153	145	136	130	123	117	112
38	Eagle Pass	Maverick	159	149	139	132	126	119	114
39	Brownsville	Cameron	162	153	141	133	127	120	115
40	Union WSC	Starr	164	156	142	134	128	121	115
41	Weslaco	Hidalgo	165	155	143	134	128	121	116
42	Harlingen	Cameron	168	158	146	135	129	122	116
43	La Grulla	Starr	169	160	147	136	130	123	117
44	Sharyland WSC	Hidalgo	169	159	147	136	130	123	117
45	Olmito WSC	Cameron	175	165	152	138	131	125	119
46	Zapata County	Zapata	175	165	152	138	131	125	119
47	Palm Valley	Cameron	176	165	153	139	132	126	120
48	Falcon Rural WSC	Zapata	177	169	154	139	132	126	120
49	San Ygnacio MUD	Zapata	179	168	156	141	133	127	120
50	Mission	Hidalgo	193	185	168	152	139	132	125
51	McAllen	Hidalgo	220	210	191	173	156	141	134
52	Rio Grande City	Starr	223	213	194	175	158	143	134
53	Zapata County WCID-Highway 16 East	Zapata	275	264	239	216	195	177	160
54	Valley MUD 2	Cameron	294	282	255	231	209	189	171
55	Port Mansfield PUD	Willacy	358	344	311	281	254	230	208

NO.	WUG	COUNTY	BASELINE (GPCD)	PROJECTED GPCD GOALS					
				2020	2030	2040	2050	2060	2070
56	Laguna Madre Water District	Cameron	386	371	335	303	274	248	224

The amount of water that can be conserved by implementing Advanced Municipal Water Conservation measures and associated costs were estimated with the assistance of the UCM tool. The total volume of water that could be conserved (demand reduction) from the Advanced Municipal Water Conservation WMS is summarized by WUG in Table 5.2-20. The methodology is based on the "Quantifying the Effectiveness of Various Water Conservation Techniques in Texas" study conducted for the TWDB (GDS Associates, 2003).

Table 5.2-20 2021 Region M Projected Total Demand Reduction from Advanced Municipal Water Conservation (acft/yr)

NO.	WUG	COUNTY	ADVANCED WATER CONSERVATION DEMAND REDUCTION (ACFT/YR)					
			2020	2030	2040	2050	2060	2070
1	Los Fresnos	Cameron	0	0	0	0	0	0
2	Sebastian MUD	Willacy	0	0	0	0	0	0
3	Rio Hondo	Cameron	0	0	0	0	0	0
4	Primera	Cameron	0	0	0	0	18	54
5	Santa Rosa	Cameron	0	0	0	0	0	12
6	Edcouch	Hidalgo	0	0	0	0	0	16
7	Combes	Cameron	0	0	0	0	4	31
8	Lyford	Willacy	0	0	0	0	12	33
9	El Sauz WSC	Starr	0	0	0	0	9	21
10	Hidalgo County MUD No. 1	Hidalgo	0	0	0	39	93	153
11	Rio WSC	Starr	0	0	0	26	67	114
12	Agua SUD	Hidalgo	0	0	0	404	1,077	1,890
13	Pharr	Hidalgo	0	0	0	458	1,354	2,433
14	La Villa	Hidalgo	0	0	0	6	29	59
15	Mirando City WSC	Webb	0	0	0	2	8	15
16	El Jardin WSC	Cameron	0	0	0	71	189	331
17	Mercedes	Hidalgo	0	0	0	0	170	399
18	Elsa	Hidalgo	0	0	0	0	44	128
19	Webb County	Webb	0	0	0	51	185	342
20	Raymondville	Willacy	0	0	0	14	110	221
21	Roma	Starr	0	0	0	0	155	330

NO.	WUG	COUNTY	ADVANCED WATER CONSERVATION DEMAND REDUCTION (ACFT/YR)					
			2020	2030	2040	2050	2060	2070
22	San Benito	Cameron	0	0	0	29	305	640
23	Hidalgo	Hidalgo	0	0	46	184	364	577
24	La Joya	Hidalgo	0	0	0	30	89	159
25	La Feria	Cameron	0	0	0	51	139	244
26	Donna	Hidalgo	0	0	0	69	300	578
27	Edinburg	Hidalgo	0	0	329	1,290	2,549	4,035
28	ERHWSC	Cameron	0	0	112	331	601	930
29	Siesta Shores WCID	Zapata	0	0	0	11	29	51
30	Alamo	Hidalgo	0	0	46	278	587	952
31	Laredo	Webb	0	0	221	3,030	6,713	10,902
32	Jim Hogg County WCID 2	Jim Hogg	0	0	0	16	51	91
33	San Juan	Hidalgo	0	0	93	451	928	1,491
34	Maverick County	Maverick	0	0	0	12	30	49
35	El Tanque WSC	Starr	0	0	7	22	41	61
36	Military Highway WSC	Cameron	0	0	302	757	1,350	2,048
37	NAWSC	Cameron	0	1,346	3,089	5,449	8,378	11,743
38	Eagle Pass	Maverick	0	481	914	1,525	2,299	3,163
39	Brownsville	Cameron	0	2,258	4,355	7,038	10,466	14,463
40	Union WSC	Starr	0	100	178	258	350	447
41	Weslaco	Hidalgo	0	547	1,219	1,924	2,829	3,844
42	Harlingen	Cameron	0	960	2,164	3,215	4,519	6,097
43	La Grulla	Starr	0	84	178	257	350	450
44	Sharyland WSC	Hidalgo	0	831	2,016	3,143	4,560	6,172
45	Olmito WSC	Cameron	0	73	189	275	383	507
46	Zapata County	Zapata	0	155	395	578	807	1,079
47	Palm Valley	Cameron	0	12	30	38	48	58
48	Falcon Rural WSC	Zapata	0	12	31	41	54	66
49	San Ygnacio MUD	Zapata	0	12	32	49	68	90
50	Mission	Hidalgo	0	1,916	4,635	7,721	10,209	12,958
51	McAllen	Hidalgo	0	3,558	8,804	15,340	22,992	28,889
52	Rio Grande City	Starr	0	402	901	1,470	2,086	2,544
53	Zapata County WCID-Highway 16 East	Zapata	0	10	22	38	55	75

NO.	WUG	COUNTY	ADVANCED WATER CONSERVATION DEMAND REDUCTION (ACFT/YR)					
			2020	2030	2040	2050	2060	2070
54	Valley MUD 2	Cameron	8	104	222	362	523	700
55	Port Mansfield PUD	Willacy	3	26	52	80	112	144
56	Laguna Madre Water District	Cameron	129	936	1,917	3,077	4,395	5,840

The cost to implement advanced water conservation was calculated by multiplying a unit cost of $681/acft for suburban areas and $770/acft for rural areas, by the amount of water conserved. Suburban and rural area designations were determined based on population density and land use. The estimated annual unit cost for advanced water conservation is $2.20 per 1,000 gallons. Specific conservation measure used to determine the unit cost in the study include toilet, showerheads, aerator retrofit, clothes washer rebate, irrigation audit, rainwater harvesting, rain barrels, and commercial general rebate. Estimated costs to implement the Advanced Municipal Water Conservation WMS are detailed in Table 5.2-21.

Table 5.2-21 Estimated Costs for Advanced Municipal Water Conservation WMS ($/yr)

NO.	WUG	AREA	COST PER ACRE FOOT ($)	ADVANCED WATER CONSERVATION WMS COSTS ($/YEAR)					
				2020	2030	2040	2050	2060	2070
1	Los Fresnos	Suburban	$681	$0	$0	$0	$0	$0	$0
2	Sebastian MUD	Suburban	$681	$0	$0	$0	$0	$0	$0
3	Rio Hondo	Suburban	$681	$0	$0	$0	$0	$0	$0
4	Primera	Suburban	$681	$0	$0	$0	$0	$12,338	$36,577
5	Santa Rosa	Suburban	$681	$0	$0	$0	$0	$0	$7,997
6	Edcouch	Suburban	$681	$0	$0	$0	$0	$0	$11,197
7	Combes	Suburban	$681	$0	$0	$0	$0	$2,582	$20,982
8	Lyford	Suburban	$681	$0	$0	$0	$0	$8,286	$22,511
9	El Sauz WSC	Rural	$770	$0	$0	$0	$0	$7,185	$16,514
10	Hidalgo County MUD No. 1	Suburban	$681	$0	$0	$0	$26,385	$62,993	$104,439
11	Rio WSC	Rural	$770	$0	$0	$0	$19,838	$51,786	$87,827
12	Agua SUD	Suburban	$681	$0	$0	$0	$274,922	$733,646	$1,286,845
13	Pharr	Suburban	$681	$0	$0	$0	$311,669	$922,295	$1,656,859
14	La Villa	Suburban	$681	$0	$0	$0	$4,122	$20,069	$40,244
15	Mirando City WSC	Rural	$770	$0	$0	$0	$1,261	$6,227	$11,202
16	El Jardin WSC	Rural	$770	$0	$0	$0	$54,411	$145,468	$255,213
17	Mercedes	Suburban	$681	$0	$0	$0	$0	$115,783	$271,809
18	Elsa	Suburban	$681	$0	$0	$0	$0	$30,051	$87,149
19	Webb County	Suburban	$681	$0	$0	$0	$34,409	$125,735	$232,604

NO.	WUG	AREA	COST PER ACRE FOOT ($)	ADVANCED WATER CONSERVATION WMS COSTS ($/YEAR)					
				2020	2030	2040	2050	2060	2070
20	Raymondville	Suburban	$681	$0	$0	$0	$9,330	$75,151	$150,327
21	Roma	Suburban	$681	$0	$0	$0	$0	$105,853	$224,800
22	San Benito	Suburban	$681	$0	$0	$0	$19,738	$207,857	$435,734
23	Hidalgo	Suburban	$681	$0	$0	$31,213	$125,442	$247,996	$393,180
24	La Joya	Suburban	$681	$0	$0	$0	$20,354	$60,840	$108,583
25	La Feria	Suburban	$681	$0	$0	$0	$34,907	$94,764	$166,194
26	Donna	Suburban	$681	$0	$0	$0	$46,783	$204,295	$393,927
27	Edinburg	Suburban	$681	$0	$0	$224,314	$878,438	$1,735,719	$2,747,925
28	ERHWSC	Rural	$770	$0	$0	$86,321	$254,793	$462,974	$715,800
29	Siesta Shores WCID	Suburban	$681	$0	$0	$0	$7,525	$19,618	$34,950
30	Alamo	Suburban	$681	$0	$0	$0	$274,922	$733,646	$1,286,845
31	Laredo	Suburban	$681	$0	$0	$150,681	$2,063,512	$4,571,547	$7,424,304
32	Jim Hogg County WCID 2	Suburban	$681	$0	$0	$0	$10,712	$34,991	$62,026
33	San Juan	Suburban	$681	$0	$0	$63,546	$307,234	$631,636	$1,015,165
34	Maverick County	Suburban	$681	$0	$0	$34	$8,297	$20,370	$33,195
35	El Tanque WSC	Rural	$770	$0	$0	$5,582	$16,668	$31,612	$47,181
36	Military Highway WSC	Rural	$770	$0	$0	$232,722	$582,825	$1,039,256	$1,576,981
37	NAWSC	Rural	$770	$0	$1,036,308	$2,378,403	$4,195,846	$6,450,913	$9,042,385
38	Eagle Pass	Suburban	$681	$0	$327,634	$622,124	$1,038,842	$1,565,322	$2,154,169
39	Brownsville	Suburban	$681	$0	$1,537,797	$2,965,421	$4,792,550	$7,127,058	$9,849,022
40	Union WSC	Rural	$770	$0	$76,670	$136,893	$198,613	$269,497	$344,486
41	Weslaco	Suburban	$681	$0	$372,563	$830,459	$1,310,055	$1,926,322	$2,617,492
42	Harlingen	Suburban	$681	$0	$654,018	$1,473,961	$2,189,583	$3,077,210	$4,151,736
43	La Grulla	Suburban	$681	$0	$57,507	$121,330	$174,888	$238,200	$306,419
44	Sharyland WSC	Rural	$770	$0	$639,959	$1,551,997	$2,419,740	$3,511,340	$4,752,794
45	Olmito WSC	Suburban	$681	$0	$49,413	$128,805	$187,169	$261,020	$345,205
46	Zapata County	Suburban	$681	$0	$105,747	$268,778	$393,523	$549,739	$734,930
47	Palm Valley	Suburban	$681	$0	$8,437	$20,182	$25,907	$32,784	$39,456
48	Falcon Rural WSC	Rural	$770	$0	$9,610	$23,631	$31,191	$41,467	$51,046
49	San Ygnacio MUD	Suburban	$681	$0	$7,833	$21,984	$33,231	$46,147	$61,246
50	Mission	Suburban	$681	$0	$1,304,815	$3,156,671	$5,258,215	$6,952,298	$8,824,385
51	McAllen	Suburban	$681	$0	$2,422,887	$5,995,418	$10,446,484	$15,657,808	$19,673,281
52	Rio Grande City	Suburban	$681	$0	$273,928	$613,282	$1,001,235	$1,420,491	$1,732,563

NO.	WUG	AREA	COST PER ACRE FOOT ($)	ADVANCED WATER CONSERVATION WMS COSTS ($/YEAR)					
				2020	2030	2040	2050	2060	2070
53	**Zapata County WCID-Highway 16 East**	Suburban	$681	$0	$6,733	$15,317	$25,597	$37,633	$51,154
54	**Valley MUD 2**	Suburban	$681	$5,290	$70,765	$150,915	$246,509	$355,993	$476,917
55	**Port Mansfield PUD**	Suburban	$681	$2,013	$17,899	$35,311	$54,619	$76,540	$98,293
56	**Laguna Madre Water District**	Suburban	$681	$87,646	$637,619	$1,305,711	$2,095,723	$2,993,126	$3,976,769

5.2.5.3 Environmental Impacts

Potential environment impacts for Advanced Municipal Water Conservation strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-22.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive location.

G. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

A summary of the identified and quantified environmental impacts for recommended and alternative Advanced Municipal Water Conservation projects is presented in Table 5.2-22. Additionally, it should be noted that because conservation reduces demand, this type of strategy decreases the amount of water that is discharged from a WWTP.

H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative fresh groundwater projects is presented in Table 5.2-22.

Table 5.2-22 Environmental Impacts for Advanced Municipal Water Conservation Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
Agua SUD	Advanced Municipal Water Conservation	404	0	0	0	0	0	0	5	1
Alamo	Advanced Municipal Water Conservation	46	0	0	0	0	0	0	5	1
Brownsville	Advanced Municipal Water Conservation	2,258	0	0	0	0	0	0	5	1
Combes	Advanced Municipal Water Conservation	4	0	0	0	0	0	0	5	1
Donna	Advanced Municipal Water Conservation	69	0	0	0	0	0	0	5	1
Eagle Pass	Advanced Municipal Water Conservation	481	0	0	0	0	0	0	5	1
ERHWSC	Advanced Municipal Water Conservation	112	0	0	0	0	0	0	5	1
ERHWSC	FM 2925 Water Transmission Line	30	142	178	32	0	142	0	5	1
Edcouch	Advanced Municipal Water Conservation	16	0	0	0	0	0	0	5	1
Edinburg	Advanced Municipal Water Conservation	329	0	0	0	0	0	0	5	1
El Jardin WSC	Advanced Municipal Water Conservation	71	0	0	0	0	0	0	5	1
El Jardin WSC	Distribution Pipeline Replacement	11	0	394	0	0	0	0	5	1
El Sauz WSC	Advanced Municipal Water Conservation	9	0	0	0	0	0	0	5	1
El Tanque WSC	Advanced Municipal Water Conservation	7	0	0	0	0	0	0	5	1
Elsa	Advanced Municipal Water Conservation	44	0	0	0	0	0	0	5	1
Falcon Rural WSC	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
Harlingen	Advanced Municipal Water Conservation	960	0	0	0	0	0	0	5	1
Hidalgo	Advanced Municipal Water Conservation	46	0	0	0	0	0	0	5	1
Hidalgo County MUD No. 1	Advanced Municipal Water Conservation	39	0	0	0	0	0	0	5	1
Jim Hogg County WCID 2	Advanced Municipal Water Conservation	16	0	0	0	0	0	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
La Feria	Advanced Municipal Water Conservation	51	0	0	0	0	0	0	5	1
La Grulla	Advanced Municipal Water Conservation	84	0	0	0	0	0	0	5	1
La Joya	Advanced Municipal Water Conservation	30	0	0	0	0	0	0	5	1
La Villa	Advanced Municipal Water Conservation	6	0	0	0	0	0	0	5	1
Laguna Madre Water District	Advanced Municipal Water Conservation	129	0	0	0	0	0	0	5	1
Laredo	Advanced Municipal Water Conservation	221	0	0	0	0	0	0	5	1
Lyford	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
Maverick County	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
McAllen	Advanced Municipal Water Conservation	3,558	0	0	0	0	0	0	5	1
McAllen	Advanced Metering Infrastructure (AMI) Project	560	0	1	0	0	0	0	5	1
Mercedes	Advanced Municipal Water Conservation	170	0	0	0	0	0	0	5	1
Military Highway WSC	Advanced Municipal Water Conservation	302	0	0	0	0	0	0	5	1
Mirando City WSC	Advanced Municipal Water Conservation	2	0	0	0	0	0	0	5	1
Mission	Advanced Municipal Water Conservation	1,916	0	0	0	0	0	0	5	1
NAWSC	Advanced Municipal Water Conservation	1,346	0	0	0	0	0	0	5	1
Olmito WSC	Advanced Municipal Water Conservation	73	0	0	0	0	0	0	5	1
Palm Valley	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
Pharr	Advanced Municipal Water Conservation	458	0	0	0	0	0	0	5	1
Port Mansfield PUD	Advanced Municipal Water Conservation	3	0	0	0	0	0	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
Primera	Advanced Municipal Water Conservation	18	0	0	0	0	0	0	5	1
Raymondville	Advanced Municipal Water Conservation	14	0	0	0	0	0	0	5	1
Rio Grande City	Advanced Municipal Water Conservation	402	0	0	0	0	0	0	5	1
Rio Grande City**	Water Meter Replacement	300	0	1	0	0	0	0	5	1
Rio WSC	Advanced Municipal Water Conservation	26	0	0	0	0	0	0	5	1
Rio WSC**	Water Meter Replacement (Rio Grande City)	70	0	1	0	0	0	0	5	1
Roma	Advanced Municipal Water Conservation	155	0	0	0	0	0	0	5	1
San Benito	Advanced Municipal Water Conservation	29	0	0	0	0	0	0	5	1
San Juan	Advanced Municipal Water Conservation	93	0	0	0	0	0	0	5	1
San Ygnacio MUD	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
Santa Rosa	Advanced Municipal Water Conservation	12	0	0	0	0	0	0	5	1
Sharyland WSC	Advanced Municipal Water Conservation	831	0	0	0	0	0	0	5	1
Siesta Shores WCID	Advanced Municipal Water Conservation	11	0	0	0	0	0	0	5	1
Union WSC	Advanced Municipal Water Conservation	100	0	0	0	0	0	0	5	1
Valley MUD 2	Advanced Municipal Water Conservation	8	0	0	0	0	0	0	5	1
Webb County	Advanced Municipal Water Conservation	51	0	0	0	0	0	0	5	1
Weslaco	Advanced Municipal Water Conservation	547	0	0	0	0	0	0	5	1
Zapata County	Advanced Municipal Water Conservation	155	0	0	0	0	0	0	5	1
Zapata County WCID-Highway 16 East	Advanced Municipal Water Conservation	10	0	0	0	0	0	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
* Indicates first decade of implementation yield (acft/yr). ** Indicates Rio WSC is supplied with 70 acft/yr from the 370 acft/yr total from Rio Grande City.										

5.2.5.4 Recent and Recommended Water Conservation Legislation and Policies

Since the last "Water Conservation Advisory Council Report to the 85th Texas Legislature (2016)," three of WCAC's recommendations have been enacted as new legislation and policies: (1) the need for trained water loss auditors – HB 1573; (2) designation of a water conservation coordinator – HB 1648; and (3) addition of non-voting member to RWPGs – SB 1511. The recent report, "Water Conservation Advisory Council Report to the 86th Texas Legislature (2018)," has recommended the following five additional legislations:

1. **Enhanced data collection, management, and accessibility** – via increased available appropriations to the TWDB;
2. **Funding a statewide water conservation public awareness program** – via available appropriation of up to $3 million per year to the TWDB;
3. **Maintain funding for agricultural water conservation and research programs** – via funding for research, education, and training with BMPs that reduce evapotranspiration, and financial assistance programs focused on improving water use efficiency in agricultural irrigation;
4. **Funding to enhance the accuracy and value of water loss audits** – via $500,000 appropriation to the TWDB for an expanded water loss program to assist utilities in the design and conduct of water loss audits and another $500,000 for competitive grants for up to six utilities to conduct pilot projects for validating water loss audits; and
5. **Continue funding for the Texas Agriculture Water Efficiency Education and Demonstration Project** – via funding for the education, research, and development of agricultural water conservation initiatives.

5.2.6 Municipal Drought Management

TAC, Chapter 357 Regional Water Planning Guidelines, states that "Regional water plan development shall include an evaluation of all WMSs the regional water planning group determines to be potentially feasible, including drought management measures including water demand management [357.7(a)(7)(B)]." Region M defines drought management as the periodic activation of approved drought contingency plans resulting in short-term demand reduction. An entity may make the conscious decision not to develop firm water supplies greater than or equal to projected water demands with the understanding that demands will have to be reduced or go unmet during times of drought. Using this rationale, an economic impact of not meeting projected water demands can be estimated and compared with the costs of other potentially feasible WMSs in terms of annual unit costs.

Figure 5.2-1 is a water supply planning example of the visual methodology completed in the 2017 State Water Plan and 2016 RWPs. For each municipal WUG with an identified shortage or need during the planning period, a future water supply plan was developed consisting of one or more WMSs. In each case, the planned future water supply was greater than the projected dry weather demand to allow for drought more severe than the drought of record, uncertainty in water demand projections, and/or available supply from recommended WMSs. This difference between planned water supply and projected dry weather demand is called management supply in Region M.

Figure 5.2-2 illustrates how a drought management WMS could alter the planning paradigm for WUGs with projected needs. Instead of identifying WMSs to meet the projected need, planned water supply remains below the projected dry weather water demand. The difference between these two lines represents the drought management WMS. Under this concept, the water demand of a WUG would be reduced by activating a drought contingency plan to reduce demands, resulting in unmet needs. This strategy of demand reduction could negate the need for WMSs to meet the full projected need of the WUG. Using this approach, the WUG is planning to manage water shortages through drought contingency plan activation if needed. This concept is more fully illustrated on Figure 5.2-3, which depicts that, in any given year, the actual demand may be above or below the planned supply. During times where the demand exceeds supply, the WUG would experience shortages and incur associated economic impacts.

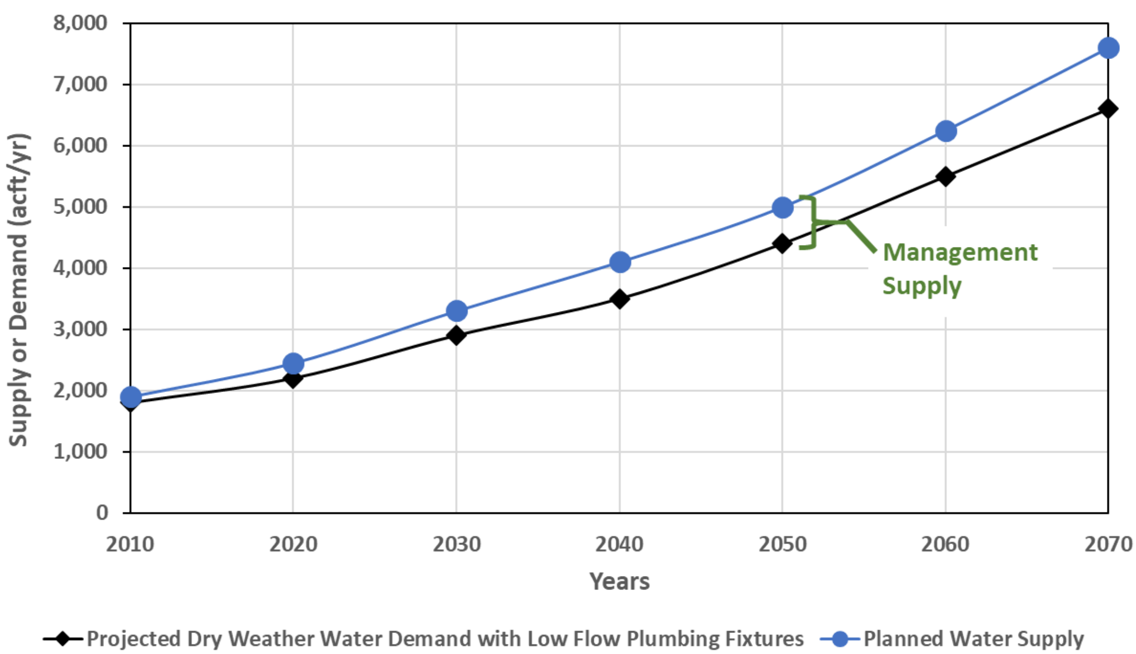

Figure 5.2-1 Example - Typical Water Supply Planning

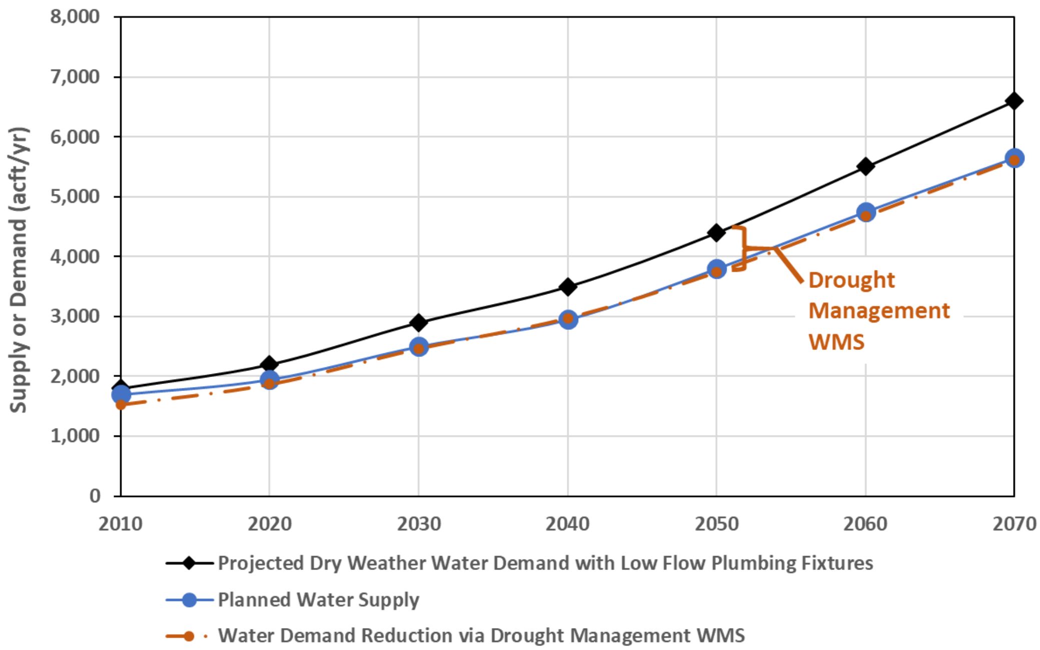

Figure 5.2-2 Example - Drought Management Water Management Strategy Planning Application

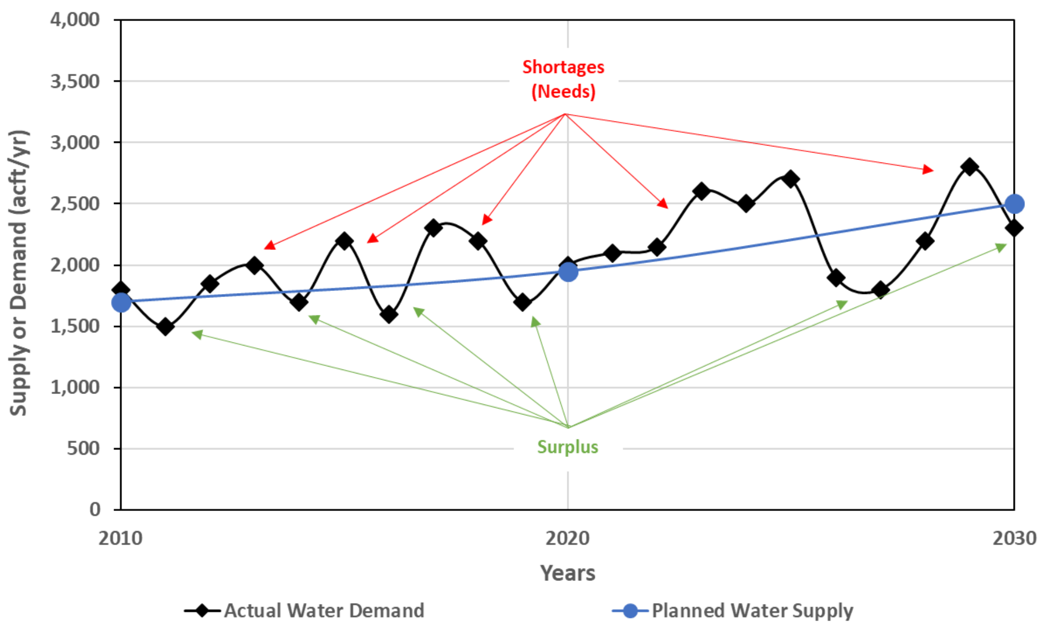

Figure 5.2-3 Example - Annual Water Demand and Planned Water Supply

5.2.6.1 Municipal Drought Management Strategy Methodology

On October 3, 2019, the TWDB released the Drought Management Costing Tool to estimate socioeconomic impacts and evaluate economic impact of the water volumes reduced by implementation of drought management strategies for the 2021 RWPs. As described in the TWDB provided Drought Management Costing Tool User Manual, "…the primary purpose of the tool is to provide WUG level costs and the expected household level residential water savings associated with policy-imposed restrictions or reduction on residential water use." The tool utilizes various inputs – *user supplied percentage reductions in use; census household size data; population projections; and Texas Municipal League (TML) price and quantity data* – to estimate reductions in water use and consumer costs (Figure 5.2-4). The following subsections summarize the components and features that comprise the drought management costing tool. More details can be found in the TWDB user manual.

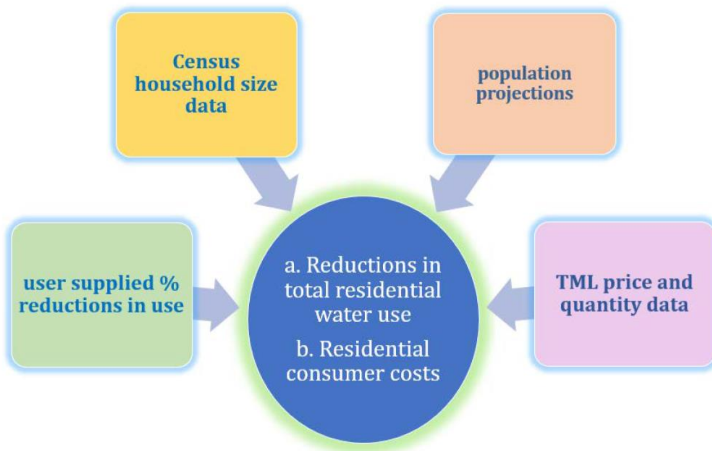

Figure 5.2-4 Costing Data and Output (TWDB, 2019)

5.2.6.2 Texas Municipal League Data

The TML generated water demand curves for WUGs from the 2016 annual cost and usage surveys. Parameters that were used included population, fees for 5,000 and 10,000 gallons of usages, and average monthly gallon usage for each household in the WUGs associated cities. This data was compiled to determine the expected price for the average monthly water use for the WUGs.

5.2.6.3 Analysis Assumptions

The following are the key assumptions in the development of the drought management costing tool (TWDB, 2019):

1. The relevant demand functions are only for residential outdoor water use. Historical studies have revealed that approximately 30 percent of residential use within the state is for outdoor water use. Therefore, this tool only allows potential reductions less than or equal to 30 percent of normal water use because of drought management strategies.
2. Only residential water use reductions are examined. Available data did not support similar estimates for commercial water use.
3. County-Other WUGs are not included in this costing tool.

4. Year 2010 household size data (WUG-specific where possible) are employed to determine the number of households in each decade, based on the Board-adopted projected populations. These baseline household sizes are not assumed to adjust over time.
5. Baseline data from TML for average monthly prices and quantities (per household) from the year 2016 was used in developing the demand functions for the various WUGs. Where possible, WUG-specific data were used. Proxy values based on planning region and three city size classifications were assigned to WUGs with no TML survey results.
6. Final cost estimates are expressed in 2018 dollars to be consistent with the WMS costing requirements in the 2022 State Water Plan.

5.2.6.4 Use of the Costing Tool

The Microsoft Excel based tool is composed of the following three major components (tabs within the Excel workbook; TWDB, 2019):

1. **Data Entry:** User data entry form for decade-specific desired reductions in water use by region and WUG;
2. **Final Summary:** A summary of the key parameters and final cost (economic impact) and water savings estimates; and
3. **Population and Households:** Reference tab with background information on the number of households based on the 2010 census data and the Board-adopted 2020-2070 WUG and region level population projections.

For the intents and purposes of the RGRWPG and the Drought Management WMS, only total annual water reduction (acft) and total annual cost (in 2018 dollars) data for the Region M WUGs were obtained from the drought management costing tool. Total annual water reduction by WUG is described in Subsection 5.2.2.3 and detailed in Table 5.2-23. Total annual cost is described in Subsection 5.2.2.4 and detailed in Table 5.2-24.

5.2.6.5 Yield from Drought Management Strategy

TWDB defines *Total Annual Water Reduction* in the costing tool user manual as "… all household water use due to drought management plan implementation based on percentage of reduction," which is estimated via the following:

$$\frac{\left[\left(\frac{population}{household\ size}\right) * 12 * (monthly\ reduction\ in\ gallons)\right]}{325{,}851\,\frac{gal}{acft}}\ [\mathbf{in\ acft}].$$

The RGRWPG selected 5 percent demand reduction for applicable WUGs beginning in the decade of exhibited needs; water savings (demand reduction) are summarized in Table 5.2-23.

Table 5.2-23 2021 Region M Drought Management 5 Percent Demand Reduction (acft/yr)

WUG	COUNTY	5% DEMAND REDUCTION (ACFT/YR)					
		2020	2030	2040	2050	2060	2070
Agua SUD	Hidalgo	-	348	415	483	551	617
Alamo	Hidalgo	118	146	175	203	232	260
Brownsville	Cameron	-	817	949	1,091	1,237	1,388
Donna	Hidalgo	-	123	147	171	195	218
Eagle Pass	Maverick	256	298	338	379	419	456
ERHWSC	Cameron	-	149	152	170	187	208
Edcouch	Hidalgo	13	16	19	23	26	29
Edinburg	Hidalgo	488	606	724	843	961	1,076
El Jardin WSC	Cameron	50	58	66	75	85	94
El Sauz WSC	Starr	7	8	9	10	10	11
El Tanque WSC	Starr	6	7	7	8	9	9
Elsa	Hidalgo	30	38	45	52	60	67
Hidalgo	Hidalgo	43	54	64	74	85	95
Hidalgo County MUD No. 1	Hidalgo	60	68	75	82	89	96
La Grulla	Starr	36	41	45	50	54	57
La Joya	Hidalgo	17	21	25	29	33	36
La Villa	Hidalgo	8	10	12	14	16	18
Laguna Madre Water District	Cameron	130	152	174	198	223	248
Laredo	Webb	-	-	-	2,406	2,686	2,938
McAllen	Hidalgo	1,071	1,330	1,589	1,850	2,110	2,363
Mercedes	Hidalgo	-	-	128	150	171	191
Military Highway WSC	Cameron	-	198	231	266	301	336
Mirando City WSC	Webb	-	4	4	5	6	6
Mission	Hidalgo	949	1,178	1,408	1,639	1,870	2,094
NAWSC	Cameron	759	935	1,112	1,290	1,467	1,640
Olmito WSC	Cameron	-	31	35	40	45	50
Pharr	Hidalgo	-	556	665	774	883	989
Port Mansfield PUD	Willacy	7	8	9	10	11	11
Primera	Cameron	-	-	-	27	30	34

WUG	COUNTY	5% DEMAND REDUCTION (ACFT/YR)					
		2020	2030	2040	2050	2060	2070
Rio Grande City	Starr	70	80	88	97	104	111
Rio WSC	Starr	26	29	32	35	38	40
San Benito	Cameron	-	-	-	-	-	174
San Juan	Hidalgo	-	128	153	179	204	228
Sebastian MUD	Willacy	-	-	-	11	12	13
Sharyland WSC	Hidalgo	287	356	425	495	565	633
Siesta Shores WCID	Zapata	7	8	9	11	12	14
Union WSC	Starr	29	33	37	40	43	46
Webb County	Webb	-	-	-	44	49	53
Weslaco	Hidalgo	258	333	401	470	539	603
Zapata County	Zapata	62	73	85	98	112	126
Dash (-) indicates no needs, thus no demand reduction.							

5.2.6.6 Drought Management Strategy Costs

TWDB defines *Total Annual Cost* in the costing tool user manual as "… adverse monetary impacts of possible restrictions on water use for the residential water user," which is estimated via the following:

$$(average\ unit\ cost\ per\ acft) * (yield)\ [\textbf{in 2018}\ \$].$$

Total annual cost can also be defined as the economic impact of not meeting projected water demands. The RGRWPG selected 5 percent demand reduction for applicable WUGs beginning in the decade of exhibited needs; total annual costs are summarized in Table 5.2-24.

Table 5.2-24 2021 Region M Drought Management 5 Percent Demand Reduction Total Annual Cost (2018 dollars)

WUG	COUNTY	5% DEMAND REDUCTION ANNUAL COSTS ($/YEAR)					
		2020	2030	2040	2050	2060	2070
Agua SUD	Hidalgo	$-	$24,099	$28,801	$33,512	$38,222	$42,801
Alamo	Hidalgo	$9,131	$11,338	$13,554	$15,775	$17,995	$20,153
Brownsville	Cameron	$-	$60,637	$70,450	$81,052	$91,891	$103,034
Donna	Hidalgo	$-	$-	$10,179	$11,846	$13,514	$15,135
Eagle Pass	Maverick	$17,744	$20,692	$23,441	$26,287	$29,015	$31,635
ERHWSC	Cameron	$-	$10,351	$10,560	$11,767	$12,955	$14,422

WUG	COUNTY	5% DEMAND REDUCTION ANNUAL COSTS ($/YEAR)					
		2020	2030	2040	2050	2060	2070
Edcouch	Hidalgo	$1,038	$1,289	$1,541	$1,794	$2,046	$2,292
Edinburg	Hidalgo	$25,446	$31,596	$37,771	$43,959	$50,146	$56,161
El Jardin WSC	Cameron	$3,432	$4,009	$4,596	$5,227	$5,876	$6,542
El Sauz WSC	Starr	$553	$626	$693	$759	$818	$872
El Tanque WSC	Starr	$467	$528	$585	$640	$690	$736
Elsa	Hidalgo	$1,333	$1,654	$1,978	$2,302	$2,626	$2,941
Hidalgo	Hidalgo	$2,097	$2,604	$3,113	$3,623	$4,133	$4,629
Hidalgo County MUD No. 1	Hidalgo	$4,164	$4,705	$5,219	$5,709	$6,179	$6,621
La Grulla	Starr	$2,510	$2,839	$3,142	$3,442	$3,711	$3,954
La Joya	Hidalgo	$1,312	$1,629	$1,948	$2,267	$2,586	$2,896
La Villa	Hidalgo	$638	$792	$947	$1,101	$1,257	$1,408
Laguna Madre Water District	Cameron	$9,022	$10,540	$12,080	$13,738	$15,446	$17,194
Laredo	Webb	$-	$-	$-	$108,613	$121,232	$132,596
McAllen	Hidalgo	$41,266	$51,241	$61,255	$71,289	$81,324	$91,080
Mercedes	Hidalgo	$-	$-	$4,987	$5,804	$6,621	$7,415
Military Highway WSC	Cameron	$-	$13,693	$16,028	$18,444	$20,890	$23,329
Mirando City WSC	Webb	$-	$301	$356	$406	$453	$495
Mission	Hidalgo	$41,165	$51,115	$61,105	$71,114	$81,125	$90,856
NAWSC	Cameron	$36,236	$44,660	$53,101	$61,583	$70,053	$78,292
Olmito WSC	Cameron	$-	$2,125	$2,436	$2,770	$3,114	$3,467
Pharr	Hidalgo	$-	$35,153	$42,023	$48,907	$55,791	$62,484
Port Mansfield PUD	Willacy	$559	$630	$698	$771	$841	$910
Primera	Cameron	$-	$-	$-	$1,802	$2,026	$2,255
Rio Grande City	Starr	$6,102	$6,901	$7,638	$8,369	$9,022	$9,614
Rio WSC	Starr	$1,775	$2,008	$2,222	$2,435	$2,625	$2,797
San Benito	Cameron	$-	$-	$-	$-	$-	$16,635
San Juan	Hidalgo	$-	$8,435	$10,084	$11,735	$13,387	$14,993
Sebastian MUD	Willacy	$-	$-	$-	$863	$941	$1,018
Sharyland WSC	Hidalgo	$19,869	$24,671	$29,493	$34,325	$39,156	$43,853

WUG	COUNTY	5% DEMAND REDUCTION ANNUAL COSTS ($/YEAR)					
		2020	2030	2040	2050	2060	2070
Siesta Shores WCID	Zapata	$538	$635	$745	$859	$976	$1,099
Union WSC	Starr	$2,026	$2,292	$2,536	$2,779	$2,996	$3,192
Webb County	Webb	$-	$-	$-	$3,019	$3,370	$3,686
Weslaco	Hidalgo	$20,311	$26,230	$31,562	$37,003	$42,428	$47,493
Zapata County	Zapata	$4,317	$5,073	$5,890	$6,814	$7,753	$8,767
Dash ($-) indicates no needs, thus no demand reduction annual costs.							

5.2.6.7 Environmental Impacts

Potential environment impacts for municipal drought management have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-25. A 5 percent demand reduction was identified as a base drought management scenario for the applicable WUGs.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. There is no physical project associated with this WMS, and therefore no impacted acreage.

B. Construction Impacted Acreage

There is no anticipated construction associated with municipal drought management, and therefore no impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

This strategy would have no impact on wetlands.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. This strategy would have no impact on habitat.

F. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. This strategy would have no impact on cultural resources.

G. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The reliability of these water management strategies is considered to be medium (reliability score = 3).

H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for municipal drought management is presented in Table 5.2-25. Additionally, it should be noted that because drought management reduces demand, this type of strategy decreases the amount of water that is discharged from a WWTP.

Table 5.2-25 Environmental Impacts for Municipal Drought Management

ENTITY	WMS NAME	5% DEMAND REDUCTION*	A	B	C	D	E	F	G	H
Agua SUD	Drought Management	348	0	0	0	0	0	0	3	1
Alamo	Drought Management	118	0	0	0	0	0	0	3	1
Brownsville	Drought Management	817	0	0	0	0	0	0	3	1
Donna	Drought Management	147	0	0	0	0	0	0	3	1
Eagle Pass	Drought Management	256	0	0	0	0	0	0	3	1

ENTITY	WMS NAME	5% DEMAND REDUCTION*	A	B	C	D	E	F	G	H
ERHWSC	Drought Management	149	0	0	0	0	0	0	3	1
Edcouch	Drought Management	13	0	0	0	0	0	0	3	1
Edinburg	Drought Management	488	0	0	0	0	0	0	3	1
El Jardin WSC	Drought Management	50	0	0	0	0	0	0	3	1
El Sauz WSC	Drought Management	7	0	0	0	0	0	0	3	1
El Tanque WSC	Drought Management	6	0	0	0	0	0	0	3	1
Elsa	Drought Management	30	0	0	0	0	0	0	3	1
Hidalgo	Drought Management	43	0	0	0	0	0	0	3	1
Hidalgo County MUD No. 1	Drought Management	60	0	0	0	0	0	0	3	1
La Grulla	Drought Management	36	0	0	0	0	0	0	3	1
La Joya	Drought Management	17	0	0	0	0	0	0	3	1
La Villa	Drought Management	8	0	0	0	0	0	0	3	1
Laguna Madre Water District	Drought Management	130	0	0	0	0	0	0	3	1
Laredo	Drought Management	2,406	0	0	0	0	0	0	3	1
McAllen	Drought Management	1,071	0	0	0	0	0	0	3	1
Mercedes	Drought Management	128	0	0	0	0	0	0	3	1
Military Highway WSC	Drought Management	198	0	0	0	0	0	0	3	1
Mirando City WSC	Drought Management	4	0	0	0	0	0	0	3	1
Mission	Drought Management	949	0	0	0	0	0	0	3	1
NAWSC	Drought Management	759	0	0	0	0	0	0	3	1
Olmito WSC	Drought Management	31	0	0	0	0	0	0	3	1
Pharr	Drought Management	556	0	0	0	0	0	0	3	1
Port Mansfield PUD	Drought Management	7	0	0	0	0	0	0	3	1
Primera	Drought Management	27	0	0	0	0	0	0	3	1
Rio Grande City	Drought Management	70	0	0	0	0	0	0	3	1
Rio WSC	Drought Management	26	0	0	0	0	0	0	3	1
San Benito	Drought Management	174	0	0	0	0	0	0	3	1
San Juan	Drought Management	128	0	0	0	0	0	0	3	1

ENTITY	WMS NAME	5% DEMAND REDUCTION*	A	B	C	D	E	F	G	H
Sebastian MUD	Drought Management	11	0	0	0	0	0	0	3	1
Sharyland WSC	Drought Management	287	0	0	0	0	0	0	3	1
Siesta Shores WCID	Drought Management	7	0	0	0	0	0	0	3	1
Union WSC	Drought Management	29	0	0	0	0	0	0	3	1
Webb County	Drought Management	44	0	0	0	0	0	0	3	1
Weslaco	Drought Management	258	0	0	0	0	0	0	3	1
Zapata County	Drought Management	62	0	0	0	0	0	0	3	1

*Indicates demand reduced by 5 percent for first decade of implementation (acft/yr).

5.2.7 Implementation of Best Management Practices for Industrial Users

Implementation of BMPs for industrial users is recommended for every manufacturing, mining, and steam electric power user in Region M. The TWDB Water Conservation Implementation Task Force recommended strategies for industrial users to conserve water in the "Best Management Practices for Industrial Water Users" guidance.[12] The guide provides BMPs for specific industries, as well as general BMPs that are recommended for any type of industrial user. The BMPs provided include the following:

- Conservation Analysis and Planning
  - Cost Effectiveness Analysis.
  - Industrial Site-Specific Conservation.
  - Industrial Water Audit.
- Educational Practices
  - Management and Employee Programs.
- System Operations
  - Boiler and Stream Systems.
  - Industrial Alternative Sources and Reuse of Process Water.
  - Industrial Sub-metering.
  - Industrial Water Waste Reduction.
  - Refrigeration.
  - Rinsing/Cleaning.
  - Water Treatment.

[12] Water Conservation Implementation Task Force, "Water Conservation Best Management Practices: Best Management Practices for Industrial Water Users," February 2013.

- Cooling Systems Management
  - Cooling Systems (Other than Cooling Towers).
  - Cooling Towers.
  - Once-Through Cooling.
- Landscaping
  - Industrial Facility Landscaping.

The BMP guidance describes water audits as the initial way for industrial water users to increase water efficiency. It is assumed that all of the users for which this strategy is recommended will, at a minimum, perform a water audit. On average, the range of water savings from implementing water audits is between 10 to 35 percent. Therefore, 10 percent of the water demand of each manufacturing, mining, and steam electric power WUG is used to estimate the amount of water conserved per decade by implementing BMPs. Industrial water conservation values are summarized in Table 5.2-26.

Table 5.2-26 2021 Region M Water Conservation from Implementation of Industrial BMPs (acft/yr)

WUG	INDUSTRIAL WATER CONSERVATION (ACFT/YR)					
	2020	2030	2040	2050	2060	2070
Cameron Manufacturing	165	185	185	185	185	185
Cameron Mining	26	28	19	13	6	3
Cameron Steam-Electric Power	355	355	355	355	355	355
Hidalgo Manufacturing	224	272	272	272	272	272
Hidalgo Mining	284	362	420	482	553	643
Hidalgo Steam-Electric Power	1,154	1,154	1,154	1,154	1,154	1,154
Jim Hogg Mining	9	10	7	5	3	2
Maverick Manufacturing	7	7	7	7	7	7
Maverick Mining	199	274	293	230	167	122
Starr Manufacturing	10	12	12	12	12	12
Starr Mining	57	70	78	86	96	109
Webb Manufacturing	25	30	30	30	30	30
Webb Mining	1,033	805	604	411	185	134
Webb Steam-Electric Power	15	15	15	15	15	15
Willacy Mining	5	5	4	3	2	1
Zapata Manufacturing	1	1	1	1	1	1
Zapata Mining	91	95	71	53	33	21

The unit cost for this strategy has been estimated at $3,000/acft to match the cost of purchasing a water right for 1 acft. This unit cost was chosen because it is assumed that an industrial user would only implement BMP if they cost less than or equal to purchasing additional surface water. Estimated total annual costs are summarized in Table 5.2-27.

Table 5.2-27 2021 Region M Total Annual Costs from Implementation of Business Management Practices (2018 dollars)

WUG	TOTAL ANNUAL COSTS ($/YEAR)					
	2020	2030	2040	2050	2060	2070
Cameron Manufacturing	$494,100	$553,800	$553,800	$553,800	$553,800	$553,800
Cameron Mining	$79,200	$83,100	$57,300	$37,800	$18,300	$8,400
Cameron Steam-Electric Power	$1,065,000	$1,065,000	$1,065,000	$1,065,000	$1,065,000	$1,065,000
Hidalgo Manufacturing	$670,800	$816,300	$816,300	$816,300	$816,300	$816,300
Hidalgo Mining	$853,200	$1,086,000	$1,259,400	$1,445,700	$1,659,600	$1,930,200
Hidalgo Steam-Electric Power	$3,461,400	$3,461,400	$3,461,400	$3,461,400	$3,461,400	$3,461,400
Jim Hogg Mining	$27,900	$29,100	$21,600	$15,900	$10,200	$6,600
Maverick Manufacturing	$19,500	$19,500	$19,500	$19,500	$19,500	$19,500
Maverick Mining	$596,400	$821,100	$879,900	$690,600	$502,200	$365,100
Starr Manufacturing	$28,500	$34,800	$34,800	$34,800	$34,800	$34,800
Starr Mining	$171,300	$209,100	$232,500	$257,400	$288,300	$327,300
Webb Manufacturing	$75,300	$88,800	$88,800	$88,800	$88,800	$88,800
Webb Mining	$3,099,300	$2,414,100	$1,811,400	$1,233,600	$553,800	$402,900
Webb Steam-Electric Power	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600
Willacy Mining	$14,700	$15,300	$11,400	$8,400	$5,400	$3,600
Zapata Manufacturing	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700
Zapata Mining	$273,300	$286,200	$212,100	$157,500	$99,600	$64,200

5.2.7.1 Environmental Impacts

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- No permanent acres are impacted for industrial conservation because the strategy will occur on land already used for industrial purposes.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 1 acre.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

G. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended industrial conservation projects is presented in Table 5.2-28.

Table 5.2-28 Environmental Impacts for Implementation of Best Management Practices for Industrial Users

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
Cameron Manufacturing	Implementation of BMPs	165	0	1	0	0	0	0	5	1
Cameron Mining	Implementation of BMPs	26	0	1	0	0	0	0	5	1
Cameron Steam-Electric Power	Implementation of BMPs	355	0	1	0	0	0	0	5	1
Hidalgo Manufacturing	Implementation of BMPs	224	0	1	0	0	0	0	5	1
Hidalgo Mining	Implementation of BMPs	284	0	1	0	0	0	0	5	1
Hidalgo Steam-Electric Power	Implementation of BMPs	1,154	0	1	0	0	0	0	5	1
Jim Hogg Mining	Implementation of BMPs	9	0	1	0	0	0	0	5	1
Maverick Manufacturing	Implementation of BMPs	7	0	1	0	0	0	0	5	1
Maverick Mining	Implementation of BMPs	199	0	1	0	0	0	0	5	1
Starr Manufacturing	Implementation of BMPs	10	0	1	0	0	0	0	5	1
Starr Mining	Implementation of BMPs	57	0	1	0	0	0	0	5	1
Webb Manufacturing	Implementation of BMPs	25	0	1	0	0	0	0	5	1

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H
Webb Mining	Implementation of BMPs	1,033	0	1	0	0	0	0	5	1
Webb Steam-Electric Power	Implementation of BMPs	15	0	1	0	0	0	0	5	1
Willacy Mining	Implementation of BMPs	5	0	1	0	0	0	0	5	1
Zapata Manufacturing	Implementation of BMPs	1	0	1	0	0	0	0	5	1
Zapata Mining	Implementation of BMPs	1	0	1	0	0	0	0	5	1
* Indicates first decade of implementation yield (acft/yr)										

5.2.8 Conversion/Purchase of Surface Water Rights

Over the planning horizon it is expected that there will be increased urban and suburban development and increased pressure on the existing water supplies. Irrigation demands are expected to decrease as a result of these pressures and associated urbanization of land. In some cases, where water is owned by an individual farmer, there may be a point at which the conversion of irrigated farmland to dry-land farming will make economic sense based on the price of water. According to the TCEQ rules, if an irrigation water right is converted to a domestic, municipal, and industrial (DMI) water right, the maximum authorized diversion is reduced to 50 percent for Class A and 40 percent for Class B.

For the purpose of this plan, it was assumed that the historical rate of conversion of water rights from irrigation to municipal is indicative of the decrease in irrigation demand. The urbanization rate was calculated for each county based on the rate at which irrigation demand decreases per decade beginning with 2020 to 2030. The water rights made available via reduction of agricultural supplies – defined as exclusion – were assumed to be converted for DMI use.

Table 5.2-29 details the projected agricultural demands, the rate at which water rights are converted in each county, the reduction in irrigation supplies, and the reduction in irrigated acreage, assuming that each acre of land that is irrigated has an associated 2.5 acft of water rights. Although there is measured historical urbanization for Jim Hogg and Webb Counties, these measurements were not considered statistically reliable based on the amount of total urbanization water rights.

Table 5.2-29 Urbanization Rates and Available Converted Water Rights Per County

	2020	2030	2040	2050	2060	2070
Cameron County						
Agricultural Demands	537,217	519,972	502,725	485,479	468,233	450,987
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%

	2020	2030	2040	2050	2060	2070
Reduction in Agricultural Supplies (Cumulative)	7,535	15,068	22,599	30,128	37,656	44,893
Reduction in Irrigated Acreage (Cumulative)	6,919	13,840	20,759	27,679	34,599	41,254
Hidalgo County						
Agricultural Demands	688,667	666,560	644,451	622,343	600,236	578,127
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	11,126	22,249	33,370	44,486	55,601	66,288
Reduction in Irrigated Acreage (Cumulative)	10,236	20,473	30,709	40,945	51,182	61,027
Jim Hogg County						
Agricultural Demands	360	348	337	325	314	302
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	0	0	0	0	0	0
Reduction in Irrigated Acreage (Cumulative)	0	0	0	0	0	0
Maverick County						
Agricultural Demands	61,706	59,725	57,744	55,763	53,782	51,801
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	2,128	4,256	6,384	8,510	10,637	12,681
Reduction in Irrigated Acreage (Cumulative)	1,961	3,922	5,882	7,843	9,804	11,690
Starr County						
Agricultural Demands	23,875	23,109	22,342	21,576	20,809	20,043
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	130	261	391	521	651	777
Reduction in Irrigated Acreage (Cumulative)	153	305	458	610	763	909
Webb County						
Agricultural Demands	10,425	10,090	9,756	9,421	9,086	8,752
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	296	591	887	1,182	1,477	1,761

	2020	2030	2040	2050	2060	2070
Reduction in Irrigated Acreage (Cumulative)	307	614	921	1,227	1,534	1,829
Willacy County						
Agricultural Demands	99,610	96,412	93,215	90,017	86,819	83,621
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	2,589	5,177	7,764	10,351	12,937	15,423
Reduction in Irrigated Acreage (Cumulative)	2,350	4,699	7,049	9,399	11,748	14,008
Zapata County						
Agricultural Demands	5,100	4,936	4,773	4,609	4,445	4,281
Exclusion Rate	3.32%	3.43%	3.55%	3.68%	3.82%	3.82%
Reduction in Agricultural Supplies (Cumulative)	66	132	198	264	331	394
Reduction in Irrigated Acreage (Cumulative)	79	159	238	318	397	474
Region M, Total Reduction in Agricultural Supplies (Cumulative)	**23,870**	**47,735**	**71,593**	**95,443**	**119,289**	**142,217**
Region M, Total Reduction in Irrigated Acreage (Cumulative)	**22,005**	**44,011**	**66,016**	**88,021**	**110,027**	**131,192**

All municipal WUGs with recommended strategies that required additional water rights to be feasible (such as expansion of a surface WTP) were allocated urbanized water rights to accompany those strategies. Additionally, the strategy for acquisition of water rights through urbanization was evaluated for all municipal WUGs with needs prior to 2070. In situations where a municipality is currently served by an ID that is expected to be urbanized, water rights from the specific ID were identified to be sold, if sufficient water rights were available.

A unit capital cost of approximately $3,000/acft has been estimated as the market value for this planning cycle. However, under Subchapter O of Chapter 49 Texas Water Code, a municipal supplier can buy water rights to the net irrigable acres in a subdivision at 68 percent of the market value. Therefore, if a strategy calls for a municipal water provider to purchase water rights from an ID that serves them, it is assumed that the urbanized land is within the jurisdiction of the provider and this reduced rate would apply. In those cases, a unit capital cost of approximately $2,040/acft is used to estimate the capital costs. Any costs associated with the delivery of water rates are assumed to be insignificant and are not included.

Each converted water right sold to an entity through a recommended WMS has been identified as either being sold through an ID from urbanized land within their service area or through converted water rights from land within a part of a county that is not served by an ID (unaffiliated). It should be noted that this one possible method for entities to receive urbanized water rights; however, there are multiple ways each user could purchase them. Table 5.2-30 through Table 5.2-34 present an example distribution of converted water rights through the Conversion/Purchase of Surface Water Rights WMS. This table does not obligate any user to convert/purchase from another user.

Table 5.2-30 EXAMPLE - Cameron County Irrigation Districts Converted Water Rights Distribution (acft/yr)

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Bayview ID						
DMI Supplies from Conversion	225	462	710	969	1,239	1,511
Purchased DMI Supplies						
County-Other, Cameron	2	0	0	0	0	0
Laguna Madre Water District	223	462	710	969	1,239	1,511
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
Brownsville ID						
DMI Supplies from Conversion	428	890	1,385	1,892	2,449	3,021
Purchased DMI Supplies						
El Jardin WSC	23	114	219	329	458	553
Hidalgo	23	42	86	129	182	219
McAllen	382	733	1,080	1,434	1,809	2,249
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
Cameron County Irrigation District (CCID) No. 2						
DMI Supplies from Conversion	2,262	4,524	6,786	9,048	11,310	13,485
Purchased DMI Supplies						
County-Other, Cameron	8	0	0	0	0	0
San Benito	0	0	0	0	0	304
NAWSC	2,254	4,524	6,786	9,048	11,310	13,181
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
CCID No. 6 (Los Fresnos)						
DMI Supplies from Conversion	649	1,332	2,071	2,828	3,617	4,410
Purchased DMI Supplies						
Hidalgo	17	93	255	426	1,040	543

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Laguna Madre Water District	632	1,225	1,751	2,229	2,170	1,818
Olmito WSC	0	13	66	172	270	358
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***137***	***1,691***
CCWID No. 10						
DMI Supplies from Conversion	92	195	309	433	567	708
Purchased DMI Supplies						
Laguna Madre Water District	*92*	*195*	*309*	*433*	*567*	*708*
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
Harlingen ID						
DMI Supplies from Conversion	1,358	2,913	4,605	6,455	8,463	10,560
Purchased DMI Supplies						
Military Highway WSC	0	844	1,457	1,998	2,455	3,079
Primera	0	0	0	40	92	129
Remaining Unassigned DMI Supplies	***1,358***	***2,069***	***3,148***	***4,417***	***5,915***	***7,352***
La Feria ID (CCID No. 3)						
DMI Supplies from Conversions	1,323	2,561	3,842	5,123	6,404	7,635
Purchased DMI Supplies						
County-Other, Cameron	1,321	1,028	1,569	1,970	2,586	2,700
Sebastian MUD	0	0	0	1	20	38
Siesta Shores WCID	2	34	71	102	128	153
Remaining Unassigned DMI Supplies	***0***	***1,499***	***2,202***	***3,050***	***3,669***	***4,745***

Table 5.2-31 EXAMPLE - Hidalgo County Irrigation Districts Converted Water Rights Distribution (acft/yr)

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Donna ID / Hidalgo County Irrigation District (HCID) No. 1						
DMI Supplies from Conversion	1,145	2,383	3,763	5,205	6,820	8,413
Purchased DMI Supplies						

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
County-Other, Hidalgo	249	429	213	0	0	0
Donna	0	0	0	0	0	0
NAWSC	895	1,954	1,854	605	0	0
Remaining Unassigned DMI Supplies	***0***	***0***	***1,696***	***4,600***	***6,820***	***8,413***
Engleman ID						
DMI Supplies from Conversion	234	480	729	994	1,257	1,533
Purchased DMI Supplies						
County-Other, Hidalgo	234	480	729	777	683	502
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***217***	***575***	***1,031***
HCID No. 9						
DMI Supplies from Conversion	2,125	4,423	6,979	9,650	12,494	15,410
Purchased DMI Supplies						
Edcouch	23	68	121	180	248	315
Elsa	75	205	349	505	649	784
Hidalgo	7	41	104	163	222	283
County-Other, Hidalgo	78	0	0	0	0	0
La Villa	12	47	91	138	177	218
Mercedes	0	0	118	445	716	983
Mission	1,217	2,702	3,871	4,832	6,049	7,338
NAWSC	279	0	0	0	0	0
Weslaco	434	1,361	2,324	3,386	4,434	5,489
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCID No. 1 (Edinburg)						
DMI Supplies from Conversion	966	1,981	3,082	4,209	5,447	6,642
Purchased DMI Supplies						
Edinburg	510	1,076	1,722	2,719	2,809	3,293
Hidalgo County MUD 1	26	48	57	94	101	125
McAllen	106	455	665	177	1,132	1,465

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
NAWSC	237	0	0	0	0	0
Sharyland WSC	87	402	639	1,219	1,404	1,760
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCID No. 2 (San Juan)						
DMI Supplies from Conversion	1,669	3,471	5,407	7,476	9,679	11,939
Purchased DMI Supplies						
Alamo	245	581	810	1,041	1,223	1,315
Edinburg	569	1,277	2,022	2,672	3,460	4,216
McAllen	118	540	781	937	1,395	1,876
NAWSC	265	0	0	0	0	0
Pharr	0	305	962	1,682	2,441	3,175
Rio Grande City	471	686	665	881	783	867
San Juan	0	83	167	263	377	490
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCID No. 6 (Mission No. 6)						
DMI Supplies from Conversion	464	951	1,443	1,946	2,488	3,000
Purchased DMI Supplies						
Agua SUD	0	685	1,304	1,740	2,206	2,641
County-Other, Hidalgo	312	0	0	0	0	0
Hidalgo	30	97	67	106	150	191
Hidalgo County MUD 1	122	169	72	100	133	167
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCID No. 13 (Baptist Seminary)						
DMI Supplies from Conversion	61	124	189	254	322	388
Purchased DMI Supplies						
County-Other, Hidalgo	61	124	0	0	0	0
Remaining Unassigned DMI Supplies	***0***	***0***	***189***	***254***	***322***	***388***

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
HCID No. 16 (Mission No. 16)						
DMI Supplies from Conversion	377	785	1,224	1,693	2,218	2,736
Purchased DMI Supplies						
Agua SUD	0	376	940	1,273	1,644	2,008
County-Other, Hidalgo	0	0	0	0	0	0
La Joya	377	266	153	211	275	337
San Juan	0	143	130	208	299	391
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCWID No. 3 (McAllen No. 3)						
DMI Supplies from Conversions	136	272	408	544	679	810
Purchased DMI Supplies						
McAllen	136	272	408	544	679	810
County-Other, Hidalgo	0	0	0	0	0	0
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
HCWID No. 19 (Sharyland)						
DMI Supplies from Conversions	116	231	351	473	592	713
Purchased DMI Supplies						
County-Other, Hidalgo	116	3	0	0	0	0
Remaining Unassigned DMI Supplies	***0***	***228***	***351***	***473***	***592***	***713***
Santa Cruz ID						
DMI Supplies from Conversion	882	1,838	2,906	4,073	5,339	6,662
Purchased DMI Supplies						
County-Other, Hidalgo	0	0	0	0	0	0
NAWSC	644	444	0	0	0	0
San Juan	0	205	529	734	956	1,190
Sharyland WSC	237	1,188	2,376	3,339	4,383	5,473
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
United ID						
DMI Supplies from Conversion	741	1,482	2,223	2,964	3,705	4,418
Purchased DMI Supplies						
McAllen	64	255	435	499	705	886
Mission	625	961	1,277	1,639	1,936	2,236
San Juan	0	39	93	149	191	231
Sharyland WSC	53	227	418	678	874	1,065
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***

Table 5.2-32 EXAMPLE - Maverick County Irrigation Districts Converted Water Rights Distribution (acft/yr)

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Maverick County ID						
DMI Supplies from Conversion	1,840	3,770	5,791	7,903	9,993	12,186
Purchased DMI Supplies						
City of Donna	0	0	533	1,023	1,376	1,670
Remaining Unassigned DMI Supplies	***1,840***	***3,770***	***5,258***	***6,880***	***8,617***	***10,516***

Table 5.2-33 EXAMPLE - Willacy County Irrigation Districts Converted Water Rights Distribution (acft/yr)

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Delta Lake ID						
DMI Supplies from Conversion	2,039	4,311	6,817	9,555	12,526	15,631
Purchased DMI Supplies						
NAWSC	1,901	4,169	6,674	9,412	11,038	11,948
Port Mansfield PUD	138	143	143	143	140	135
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***1,349***	***3,548***

Table 5.2-34 EXAMPLE - Unaffiliated Converted Water Rights Distribution (acft/yr)

	CONVERTED WR					
	2020	2030	2040	2050	2060	2070
Cameron County (Unaffiliated)						
DMI Supplies from Conversion	588	1,177	1,765	2,353	2,942	3,507
Purchased DMI Supplies						
County-Other, Cameron	0	500	826	1,124	1,488	1,687
County-Other, Hidalgo	264	677	938	1,229	1,454	1,820
Remaining Unassigned DMI Supplies	***324***	***0***	***0***	***0***	***0***	***0***
Hidalgo County (Unaffiliated)						
DMI Supplies from Conversion	710	1,419	2,129	2,838	3,548	4,230
Purchased DMI Supplies						
County-Other, Hidalgo	710	1,419	2,129	2,838	3,548	4,230
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***0***	***0***
Webb County (Unaffiliated)						
DMI Supplies from Conversion	1,802	1,905	2,007	2,109	2,212	2,226
Purchased DMI Supplies						
County-Other, Webb	104	135	168	216	270	318
Remaining Unassigned DMI Supplies	***1,698***	***1,770***	***1,839***	***1,893***	***1,942***	***1,908***
Starr County (Unaffiliated)						
DMI Supplies from Conversion	161	322	482	643	804	958
Purchased DMI Supplies						
County-Other, Starr	161	322	482	643	772	827
Remaining Unassigned DMI Supplies	***0***	***0***	***0***	***0***	***32***	***131***
Zapata County (Unaffiliated)						
DMI Supplies from Conversion	82	165	247	330	412	491
Purchased DMI Supplies						
County-Other, Zapata	56	70	91	114	145	167
Remaining Unassigned DMI Supplies	***26***	***95***	***156***	***216***	***267***	***324***

5.2.8.1 Environmental Impacts

Potential environment impacts for Conversion/Purchase of Surface Water Rights WMSs have been identified below. The largest impact from urbanization of irrigation water rights is the land that is no longer irrigated. Table 5.2-29 quantifies the reduction of irrigated acreage per county. The reduction of irrigated acreage was estimated as the amount of urbanized water rights divided by 2.5, based on the standard authorization per acre. It was assumed that the permanent acreage impacted is the same as would impact habitats in the local area.

Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy. Given that the Conversion/Purchase of Surface Water Rights WMS is an acquisition of water rights with no infrastructure, this WMS as a whole has zero acres agricultural resources impacted.

Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The reliability of conversion and purchase of surface water rights strategies is expected to be medium (reliability score = 3) because of uncertainty involved in purchasing existing permits and changing the type of use to municipal use. There could be competing development that may impact the reliability of securing sufficient permits from willing sellers.

Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of conversion/purchase of surface water rights on bays, estuaries, and arms of the Gulf of Mexico are quantitatively are not expected to directly impact inflows into a classified water body. Therefore, these WMS projects are assumed to have a score of zero.

5.2.9 On-Farm Irrigation Conservation

On-farm conservation measures can be grouped into the following categories: water use management practices, land management systems, on-farm water delivery systems, water district delivery systems, and tailwater recovery systems. Water district delivery system improvements, including conveyance infrastructure, metering, and telemetry, are discussed in detail in Subsection 5.2.1 and addressed as a separate WMS. However, for farmland in IDs, the operational effectiveness and efficiency of the IDs are necessary to reap the full benefits of on-farm measures. On-farm efficiency depends on timely delivery of water and adequate head to push water across a field. For these farmers, the incentive to conserve water is largely based on the ID, and their ability to volumetrically price water.

Water use management practices include scheduling irrigations and measuring water used or soil moisture, including on-farm audits. For irrigators relying on Rio Grande water, scheduling irrigations on the basis of soil moisture metering is difficult because of the delay between when a farmer requests water and the time that it is actually available to use, which can be up to 5 to 7 days. However, metering of irrigation water, either short-term as a part of an on-farm water audit or long-term as a management strategy, is recommended where physically and economically feasible. Common practice currently is for districts to send an employee to monitor diversions, estimating the amount of water used based on how long a headgate is open or measuring water depth at certain locations. Where metering is implemented by the ID so that water can be volumetrically priced, farmers have an incentive for reducing their use of water and both the districts and the farmer can manage water more carefully.

Land management systems include laser leveling, brush control, conversion of irrigated farmland to dry-land farmland, and furrow dikes or narrow-border citrus, which is discussed in more detail below. Each of these strategies addresses how to manage farmland so that available water is used to maximum effect. Conversion of irrigated farmland to dry land farming generally equates to lower value and/or yield but can be a valuable tool if drought is anticipated and the water available to a farm is consolidated on a high-value crop. Crop selection based on market values, water demand, and acreage can be made so that farmers are best able to respond to drought.

On-farm water delivery system improvements limit losses in the conveyance of water to the crop and apply water precisely where it is needed for each type of plant. This includes surge valves, which can increase the uniformity of water application across a field, lining on-farm canals or use of poly-pipe, and drip or sprinkler systems. For irrigators using surface water in Region M, the lack of pressure head on irrigation water is a significant barrier to implementing many water delivery system improvements. Soil type can be a limitation for the use of surge valves, as well as limited pressure head or storage at or near the point of use. Research and demonstration projects on drip irrigation have shown significant increases in yield for some vegetables.

Tailwater recovery systems allow for excess water applied to farmland to be put to beneficial use. In place in much of the Lower Rio Grande Valley, tailwaters are collected in drainage canals, which discharge to the Arroyo Colorado, which may be utilized by other users downstream. Although this water tends to have high dissolved solids content, it is used for crops that can withstand high salinity and for other uses, including aquaculture. Treatment of tailwaters to potable standards is generally costly but may be appropriate where there are few alternatives.

These measures are considered on-farm conservation measures, but in most cases implementation of these measures in a drought year increases the potential yield of a crop per acre-foot of water but may not reduce irrigator's overall demand for water. When water is available in a drought year, farmers are likely to use it. Making better use of the water that is available is critical to helping farmers through drought, and the Region M Planning Group recommends continued research, education, demonstration, and large-scale implementation of these and any other irrigation conservation measures that farmers find to be appropriate.

A select subset of on-farm water conservation strategies, which were developed based on input from stakeholders and ID, are discussed in detail below. These are strategies that are of particular interest to the region, although the full range of BMP described in TWDB literature are recommended where appropriate.[13] On-farm conservation is recommended for all irrigators in the planning area (Table 5.2-35). Using an estimated cost of $1,392/acft, the On-farm Irrigation Conservation WMS was developed based on the above described categories.

- Water use management practices (e.g., scheduling, moisture metering, and on-farm audits) were assumed to be implemented across the region such that 25 percent of potential water savings have already been made. Five (5) percent efficiency gains were estimated for the remaining 75 percent over the planning horizon.
- Land management systems (e.g., laser leveling, narrow border citrus, and furrow dikes) were assumed to be 25 percent implemented, and the strategy estimates a 10 percent efficiency gain over the remaining 75 percent of irrigation water use over the planning horizon.
- On-farm water delivery systems (e.g., poly-pipe, surge valves, drip, sprinkler) were estimated to impart a 10 percent efficiency gain on 10 percent of irrigation water usage in 2020, for which that technology is appropriate and not already in place.

Capture of tailwaters and ID conveyance improvements were not included in the general on-farm conservation WMS but are addressed elsewhere in this chapter.

Table 5.2-35 Decadal On-Farm Conservation Water Savings by County and River Basin

COUNTY	BASIN	2020 DEMAND PROJECTIONS	MANAGEMENT PRACTICES	LAND MANAGEMENT SYSTEMS	ON-FARM WATER DELIVERY SYSTEMS	DECADAL SAVINGS
Cameron	Nueces-Rio Grande	505,075	2,841	5,682	758	9,281
Cameron	Rio Grande	32,142	181	362	48	591
Hidalgo	Nueces-Rio Grande	661,160	3,719	7,438	992	12,149
Hidalgo	Rio Grande	27,507	155	309	41	505
Jim Hogg	Nueces-Rio Grande	288	2	3	0	5
Jim Hogg	Rio Grande	72	0	1	0	1
Maverick	Nueces	61,706	347	694	93	1,134
Starr	Rio Grande	23,875	134	269	36	439
Webb	Rio Grande	10,425	59	117	16	192
Willacy	Nueces-Rio Grande	99,610	560	1,121	149	1,830
Zapata	Rio Grande	5,100	29	57	8	94

[13] Texas Water Development Board. BMPs for Agricultural Water users. http://www.twdb.texas.gov/conservation/BMPs/Ag/index.asp. Accessed 4/21/2015.

5.2.9.1 Narrow-Border Citrus Irrigation

Narrow border flood irrigation provides an alternative to the traditional pan flooding method of irrigation commonly used by citrus growers in the Lower Rio Grande Valley. This method is a cost-effective and easy to implement alternative that involves erecting narrow berms of soil between existing rows of citrus trees to direct and contain irrigation water directly in the root-zone of trees. This method can save about 35 percent of the water required for traditional flood irrigation. Currently, it is estimated that 10 percent of citrus growers in the Lower Rio Grande Valley have implemented the narrow border flood irrigation practice.

This practice has many benefits in addition to water and cost savings, including faster water channeling rates, higher water use efficiency in trees, reduced water in areas prone to weed growth, and fertilizer retention in the root-zone. The potential economic benefits also exceed that of traditional flood irrigation, with higher average net cash farm projected income of $1,730 per acre compared to $820 per acre with traditional flood. The narrow border flood method can also be used in conjunction with other practices such as raised beds, denser plantings, and mesh groundcover than can enhance water use efficiency and water savings.

Based on TWDB irrigation water use records by crop, between 2008 and 2017, the overall orchard acreage (assumed to be all citrus in Region M) increased by approximately 6,545 acres, and water use averaged 3.3 feet per acre. Assuming 10 percent increase in implementation per decade, the following on-farm conservation gains could be made in the counties where citrus is a prevalent crop (Table 5.2-36). Because these gains are more easily quantifiable, they were used as a component in the estimates for the general on-farm WMS in Table 5.2-36.

Table 5.2-36 Narrow Border Citrus Water Savings

COUNTY	10-YEAR AVERAGE OF AC	10-YEAR AVERAGE OF FT/AC	FIRST DECADE IMPLEMENTATION ACREAGE	IMPLEMENTATION ACREAGE CURRENT WATER USE	WATER CONSERVED IN 2020
Cameron	3,984	3.6	359	1,291	839
Hidalgo	5,572	3.8	501	1,910	1,241
Maverick	5,430	3.2	489	1,568	1,019
Webb	280	2.6	25	66	43
Willacy	425	3.4	38	129	84
Total	15,691	16.6	1,412	4,964	3,226

5.2.9.2 Drip Irrigation

Texas A&M AgriLife Research worked with producers and others to estimate the conservation and economic implications of drip irrigation for onions, cotton, sugarcane, and citrus. Based on farmer experience and surveys, drip irrigation is expected to reduce the water demand for certain crops, ranging from 2.5 acre-inches for cotton, 11 acre-inches for sugarcane, 17.8 acre-inches for onions, and up to 45 acre-inches for citrus. However, drip irrigation is expensive to install with very limited life resulting in the expected net returns to a farmer being negative for all except citrus. Additionally, the ID must maintain a fully charged canal for a longer period of time to supply a farmer for drip irrigation, which can cause additional losses in the overall system. The irrigation method used for comparison for this analysis was typical irrigation or gravity flow and flood. Table 5.2-37 shows water savings and impact on farmer net returns associated with drip irrigation compared to flood irrigation.

Table 5.2-37 Water Savings and Impact on Farmer Net Returns Associated with Drip Irrigation Compared to Flood Irrigation

	ONIONS	COTTON	SUGARCANE	GRAPEFRUIT
Water Saved (acre-inches)	17.8	2.5	11.0	45.1
Change in Net returns per acre ($)	-935.63	-47.74	-86.17	415.63

Drip irrigation is only an economically effective irrigation practice for citrus. Citrus conserved water and increased net revenue, as compared to flood-irrigated acres.[14] It was assumed that only water delivery improvements that were less expensive than the cost of water would be considered as composite costs in the general on-farm conservation WMS.

5.2.9.3 Dry Year Option Contracts

An approach to water marketing known as "dry year options" or "water supply option contracts" (WSOC) may reduce the impact on agricultural production while providing drought supplies for other uses. This concept involves temporary transfers of irrigation water to provide secure water supplies to non-agricultural users during droughts. This option would transfer water to other users when needed while preserving the water for agriculture during normal water supply situations. In Texas, WSOC is typically practiced in the Edwards Aquifer area to provide water for endangered species and San Antonio water users during drought. However, the implementation of this type of strategy would require significant changes to the current operating system of the Rio Grande, and the possibility of unintended consequences should be thoroughly evaluated before moving forward.

A WSOC as defined here is a formal contract or agreement between a farmer or a group of farmers and an urban water provider or authority to transfer water temporarily from agriculture to urban or another use, during occasional critical drought periods so that the purchaser secures a source of drought water supply. The farmer or ID does not relinquish ownership of the water right and retains access to the water supply during normal supply situations. In financial exchange market terminology, the holder of an option contract has the right to buy the commodity or stock (in this case, water) at a specified price, termed the striking or exercise price, from the seller of the option. The seller of the option is guaranteeing future delivery under specified conditions and price. In exchange for guaranteeing future

[14] Wilbourn, Brant 1987- (2012). Economic Analysis of Alternative Irrigation Technologies: Texas Lower Rio Grande Valley. Master's thesis, Texas A&M University. Available electronically from https://oaktrust.library.tamu.edu/handle/1969.1/148057.

delivery of the commodity at a set price, a further premium above the exercise price, called the option price, may be paid to the seller.[15] WSOC requirements are as follows:

- The water supply must be reliable enough to provide sufficient water for the option use in drought years and plentiful enough in average years to supply the agricultural use.
- Property rights must be definable and transferrable for market exchange. As with water right purchases, the amount of water transferred must be adjusted for conveyance and field losses to protect third parties (return flow water users).
- Agricultural operations must be capable of being temporarily suspended or crop production under dryland conditions. This requirement limits option contracts primarily to annual crop operations and will exclude most livestock operations, perennial crops such as orchards, and contract crops such as sugar cane.
- Both buyer and seller must have realistic knowledge of water use values and alternative water supply costs.
- The probability and severity of drought (the expected frequency of exercising the option) must be able to be estimated within acceptable limits of risk for both parties.
- Total option contract costs, including both transaction costs of negotiating and adjudicating the temporary transfer of water, and the costs of transporting the water to the point of intake of the purchaser, must be less than the costs of the next most costly water supply alternative of the purchaser.

The Lower Rio Grande Valley and Region M have some unique institutional, hydrologic, and economic conditions that would need to be addressed to provide seller and buyer incentives to enter into WSOC. Unlike many other areas of the Western United States, water rights are held by the IDs rather than farmers. Given this and the generally low price of agricultural water farmers have little incentive to conserve water (except in drought) and lack the ability to sell water conserved by more efficient

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[15] Contract Terms and Provisions: *Contract terms and provisions are important to identify and protect the rights of both parties. The exercise price is the cost each time (season/year) the option is exercised. This represents the payment to the farmer or the ID for the net value of foregone agricultural production or loss in district revenue. The present value cost of a water-option contract is the sum of the costs to exercise the option (take the water) multiplied by the expected number of times of option exercise plus any cost appreciation/depreciation of the value of the alternative source plus any payments to the seller to hold the option (option price), each discounted to present value.*
Agricultural enterprise and water valuation models can be used to estimate foregone benefits to the farmer or ID. Actual exercise payments need to be negotiated based on both party's perceptions of transfer losses and benefits. Advance notification that the option is to be exercised should be given to the seller for planning purposes so that certain variable production costs can be avoided. Shorter advance notice raises seller costs with an associated higher level of reimbursement required. A flexible quantity provision may be required because of variations in drought water allocation, but the minimum acceptable delivery should be specified. Escalator clauses can be used to adjust contract prices protecting sellers from the effects of inflation.
Option exercise cost is the farmer's offering price for water delivery/foregoing delivery and would be site-specific, depending on the types of crops grown, quantity and cost of irrigation water, production costs, yields, and crop prices on the specific farms. The exercise cost also needs to be sufficient to cover any fixed production costs that might be incurred because the water supply was temporarily relinquished, and irrigated crop production ceased. These additional costs include the opportunity costs of family labor and management, taxes, depreciation on durable equipment, and cash overhead.

irrigation methods or fallowing land such as for WSOC payments. While there is the potential for IDs to enter into a WSOC with another user, IDs would need to work with farmers and pass through exercise payments to make WSOCs feasible from the point of view of the farmer. Also, with the generally low cost of ID water, the purchase of this water may be the lowest cost to urban providers and other users compared to alternative sources such as desalination or reuse.

Urban demand has the highest priority in drought conditions and therefore urban communities may feel little need to have WSOCs unless there is concern about the agricultural community and/or ID welfare.

The program involves a target time early enough that a farmer can make cropping decisions for the growing season and an option price is offered to secure that if needed water can be called. Then during the year, if the drought is sufficient that water is needed from the farmer, a preset price for delivery is paid and the farmer forgoes irrigation. In the event the water is not needed, it is available to the farmer. This suggests a cropping decision that can be irrigated but also can be produced dryland (rain-fed) in case the option is exercised.

5.2.9.4 Environmental Impacts

Potential environment impacts for on-farm conservation have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-38.

A. Acres Impacted

Acres impacted permanently refers to the total amount of area that will be impacted because of the implementation of a strategy. It was assumed that the acreage impacted was equal to the number of acres irrigated in the most recent year of data, which would be 2017 for this planning cycle.

B. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

C. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a 1 if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland. It is possible that excess runoff from irrigation could augment wetlands.

D. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. It is assumed that no habitat will be affected by on-farm conservation because the land is already irrigated; therefore, there is no habitat to be affected.

E. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

F. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

G. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended on-farm irrigation conservation projects is presented in Table 5.2-22.

Table 5.2-38 Environmental Impacts of On-Farm Conservation

ENTITY	TOTAL SAVINGS (ACFT/YR)	A	B	C	D	E	F	G	H
Irrigation, Cameron	9,871	135,510	0	0	0	17	0	5	1
Irrigation, Hidalgo	12,654	168,410	0	0	0	8	0	5	1
Irrigation, Jim Hogg	7	240	0	0	0	4	0	5	1
Irrigation, Maverick	1,134	19,050	0	0	0	2	0	5	1
Irrigation, Starr	439	5,450	0	0	0	7	0	5	1
Irrigation, Webb	192	1,210	0	0	0	4	0	5	1
Irrigation, Willacy	1,830	21,670	0	0	0	10	0	5	1
Irrigation, Zapata	94	700	0	0	0	6	0	5	1

5.2.10 Biological Control of *Arundo Donax*

Brush control is the process of removing non-native brush from the banks along rivers and streams and upland areas to reduce water consumption by vegetation and increase stream flows and groundwater availability. In 2017, the Texas State Soil and Water Conservation Board (TSSWCB) published the Water Supply Enhancement Program Annual Report, which detailed the efforts and execution of the TSSWCB projects throughout Texas. The annual report includes: the revised State Water Supply Enhancement Plan; feasibility studies; project allocations and request for proposals; conservation planning and program outreach; and assessment of Regional Water Planning Groups and the State Water Plan. Following initial successful brush control treatments, the TSSWCB found through 12 status reviews that the various target species did not grow above the 5 percent canopy requirement and thus did not warrant further treatment. The next review will be conducted in 8 to 9 years. According to the annual report, implementation of the Water Supply Enhancement Program for Texas projects that removal of approximately 30,200 acres of non-native brush will enhance water yield by 9,364 acft/yr.[16] For Region M, brush control is recommended generally, but the removal of *Arundo donax* (*A. donax;* Carrizo

[16] Texas State Soil and Water Conservation Board. "Water Supply Enhancement Program – 2017 Annual Report." TSSWCB. https://www.tsswcb.texas.gov/programs/water-supply-enhancement-program. 2018.

cane/giant reed) has been the focus in saving water and increasing supply to waterways in the Rio Grande.

A. donax is an invasive water-using weed that infests the riparian areas of the Lower Rio Grande Basin. It grows up to 30 feet tall (typically 18 to 24 feet) and at a rate of up to 4 inches per day. This invasive weed is native to Mediterranean Europe, where various insect species naturally control the reed's growth. *A. donax* is a heavy water user, with estimates of up to 5.0 acft of water per acre per year.

Most control measures, including fire and mechanical, accelerated the spread of the plant. Chemicals can be temporarily effective but are very costly ($5,000 per acre) and may impact water quality for both U.S. and Mexican supplies. *A. donax* specific insects have been imported by USDA, evaluated, permitted and released in the United States and Mexico for biological control: *Tetramesa romana* (gall wasp); *Rhizaspidiotus donacis* (scale); and *Lasioptera donacis* (leafminer). Research studies conducted by USDA and Texas A&M University showed that moderate levels of attack by the biocontrol agents should reduce water use of *A. donax*.

Research conducted in 2009 by Emily Seawright (Texas A&M, Dept of Ag. Economics) was based on a 50-year program of biological releases of insects targeting *A. donax* and thus reducing the water consumption of the plant. The analysis was based on increasing levels of biological control agents over time reaching an equilibrium much as exists in Spain today. The agents were expected to achieve 67 percent control of size and acreage of Arundo over the 50-year period. The reduction in water consumption by *A. donax* was offset somewhat by water use of emerging native riparian vegetation, and the additional water would be shared equally between the United States and Mexico. For cost analysis, it was assumed that the saved water would be used for irrigation purposes based on the Rio Grande Watermaster rules.

Five (5) years post release of the *A. donax* gall wasp, *Tetramesa romana*, into the riparian habitats of the lower Rio Grande River, changes in the health of *A. donax* have been documented. These changes in plant attributes are fairly consistent along the study area of 558 river miles between Del Rio and Brownsville, Texas, and support the hypothesis that the *A. donax* wasp has had a significant impact as a biological control agent. Plant attributes were measured prior to release in 10 quadrats at each of 10 field sites in 2007, and measured again at the same undisturbed sites, 5 years after the release of *T. romana*, in 2014. Aboveground biomass of *A. donax* decreased on average by 22 percent across the 10 sites. This decline in biomass was negatively correlated to increased total numbers of *T. romana* exit holes in main and lateral shoots per site in 2014 compared to 2007. Changes in biomass, live shoot density and shoot lengths (especially the positive effect of galling on main and lateral shoot mortality), appear to be leading to a consistent decline of *A. donax*. Economically, this reduction in *A. donax* biomass is estimated to be saving $4.4 million per year in agricultural water. Measurements in 2015, 2017, and 2019 showed additional reduction in biomass up to 44 percent, especially between Laredo and Brownsville where annual temperatures are high.[17] A conservative 32 percent reduction in biomass has been estimated for Region M as a whole. Additional impacts are expected as populations of the

[17] Goolsby et al. 2015, Moran et al. 2017, Marshall et al. 2018.

wasp increase and as other biological control agents such as the *A. donax* scale, *Rhizaspidiotus donacis*, become more widespread.[18]

The establishment of *A. donax* wasp in the lower Rio Grande River is producing multiple environmental, political, and water conservation benefits. The wasp has also been established in Mexico, including the tributary rivers in Mexico.[19] The reduction in *A. donax* biomass will likely allow native flora and fauna to return, which has many multi-trophic benefits environmentally.[20] Reduction in biomass increases within stand visibility, which allows for safer and more effective law enforcement activities along the international border.[21]

Potential water conservation benefits were estimated at the start of the program by Seawright et al. (2009). A current estimate was calculated using the Seawright model for water conservation and value attributable to the 22 percent reduction in biomass. This suggests a water savings of 6,593 acft because of reduced consumptive use by *A. donax*, accounting for water used by regrowth of native riparian plants. Since the United States receives about 2/9 of this water, availability to the United States would be 2,183 acft. This water, available annually, will increase over time, as will the effectiveness and expansion of the biological control agents. It is assumed that 80 percent of the total water saved through biological control will be above the Amistad or Falcon Reservoirs in the Rio Grande Watershed, thus making that water available as a supply for irrigators; estimated for drought of record conditions (Table 5.2-39).

Table 5.2-39 Firm Yield of Biological Control of *A. donax*, and Resulting Supplies (acft/year)

FIRM YIELD	2020	2030	2040	2050	2060	2070
Total Region M Savings	*3,175*	*3,175*	*3,175*	*3,175*	*3,175*	*3,175*
Savings Upstream of Reservoirs	*2,539*	*2,539*	*2,539*	*2,539*	*2,539*	*2,539*
Irrigation Supply Distribution						
Irrigation, Cameron	955	955	955	955	955	955
Irrigation, Hidalgo	1,226	1,226	1,226	1,226	1,226	1,226
Irrigation, Maverick	110	110	110	110	110	110
Irrigation, Starr	43	43	43	43	43	43
Irrigation, Webb	19	19	19	19	19	19
Irrigation, Willacy	178	178	178	178	178	178
Irrigation, Zapata	9	9	9	9	9	9

[18] Goolsby et al. 2019.
[19] Martinez Jimenez et al. 2017.
[20] Racelis 2012a.
[21] Goolsby et al. 2017.

The annual value of the water in agriculture for the Bi-National Rio Grande Valley is an estimated $917,808, where the US portion is $303,848 and 1 acft is valued at $139. Given increasing water issues in the region, and a current market price of $3,000/acft, the value of the water savings for the United States would be approximately $4.4 million per year. Impacts from the *A. donax* wasp and other biological control agents are expected to increase the environmental, political, and economic benefits realized by the biological control program. The costs for operating and monitoring the biological controls program are estimated in Table 5.2-40.

Table 5.2-40 Biological Control of *A. donax* Estimated Costs

	2020	2030	2040	2050	2060	2070
Water Saved (acft/yr)	2,539	2,539	2,539	2,539	2,539	2,539
Cost per acre-foot ($)	$10	$10	$10	$10	$10	$10
Total Cost (2020)	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000

5.2.10.1 Environmental Impacts

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. For Brush Control/Bio-Control of *A. Donax,* the acres impacted are the acres removed of the invasive species.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. Based on the release of the bio-control agents and minimal capacity to measure and monitor the brush control process, the construction impacted acreage was estimated to be 10 percent of the acres impacted permanently.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

G. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The supplies from these strategies are considered to be of low reliability since the brush must be continually treated to continue to provide additional supplies.

H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended Biological Control of *A. Donax* is presented in Table 5.2-41.

Table 5.2-41 Environmental Impacts for Implementation of Biological Control of A. Donax

ENTITY	YIELD*	A	B	C	D	E	F	G	H
Irrigation, Cameron	955	191	19	0	1	191	0	1	0

ENTITY	YIELD*	A	B	C	D	E	F	G	H
Irrigation, Hidalgo	1,226	245	25	0	1	245	0	1	0
Irrigation, Jim Hogg	1	0	0	0	1	0	0	1	0
Irrigation, Maverick	110	22	2	0	1	22	0	1	0
Irrigation, Starr	43	9	1	0	1	9	0	1	0
Irrigation, Webb	19	4	0	0	1	4	0	1	0
Irrigation, Willacy	178	35	4	0	1	35	0	1	0
Irrigation, Zapata	9	2	0	0	1	2	0	1	0

* Indicates first decade of implementation yield (acft/yr).

5.2.11 Aquifer Storage and Recovery

ASR can be an effective way to assist a water user in management of its water resources and to access a reliable water supply during times of drought. The concept is a water storage system located in an underground aquifer. Water can be pumped into the aquifer when there is excess available and recovered through the same wellfield when it is needed. ASR has benefits over surface water storage because there are no evaporative losses, it does not lose storage capacity because of sedimentation, it requires a smaller footprint, and environmental issues associated with land inundation are minimized. The TAC requires water to meet primary drinking water standards prior to injection and continue to meet the standards while in storage. Therefore, in many circumstances, the water can be pumped straight to the distribution system to meet peak demands and cost savings can be realized by sizing other water facilities to meet average demands.

In 2019, the 86th Texas Legislature passed HB 721, which directs the TWDB to conduct a statewide survey of various aquifers to identify suitability for ASR projects. Additionally, the 86th Texas Legislature passed HB 720, which allows unappropriated water, including storm water and floodwater, to be appropriated for aquifer and ASR projects.[22] ASR is growing to be popular across the state of Texas. Figure 5.2-5 illustrates the locations for 20 ASR projects that were recommended in the 2017 State Water Plan, and there are currently three ASR projects operating in Corpus Christi, New Braunfels, and Victoria.

[22] Texas Water Development Board. "Aquifer Storage and Recovery." http://www.twdb.texas.gov/innovativewater/asr/index.asp. 2019.

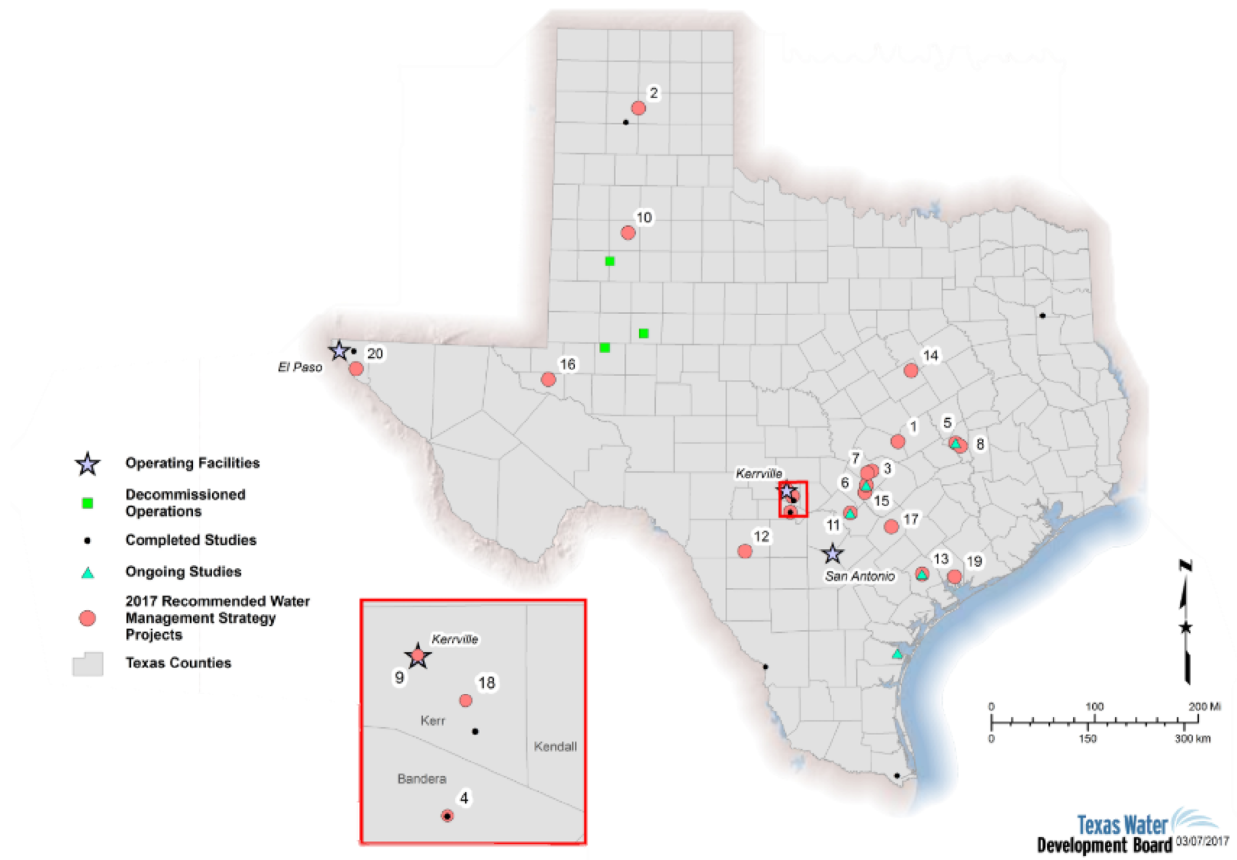

Figure 5.2-5 Aquifer Storage and Recovery in Texas[23]

Determination of the specific ASR location is important because an aquifer with suitable storage conditions must be identified and permitted. Geologic assessments must be performed for the proposed wellfield site to determine its suitability. Also, it is preferable to locate the ASR near the water source and/or distribution system to minimize conveyance costs.

Only one ASR project was submitted during the 2021 regional water planning process: Eagle Pass ASR Project. However, due to costs and minimal studies near Eagle Pass, this project remains an alternative WMS. The full write-up for the Eagle Pass ASR Project can be found in Section 5.4.

Although there are no specific ASR strategies recommended in the 2021 Regional Water Plan, the RGRWPG does recommend that municipalities consider ASR in the future. Studies on groundwater in Region M, including the Brackish Water in the Gulf Coast Aquifer; Lower Rio Grande Valley, Texas (BRACS) report, should be used to determine the feasibility of ASR for entities that are considering the strategy.[24] The BRACS study contains preliminary evaluations of hydraulic characteristics of the Gulf

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[23] Texas Water Development Board. "Aquifer Storage and Recovery." http://www.twdb.texas.gov/innovativewater/asr/index.asp. 2019.

[24] John E. Meyer, P.G., Andrea Croskrey, Matthew R. Wise, P.G., Sanjeev Kalaswad, Ph.D., P.G. "Brackish Water in the Gulf Coast Aquifer; Lower Rio Grande Valley, Texas." Texas Water Development Board. 2013.

Coast Aquifer at certain locations in the Lower Rio Grande Valley. the TWDB has funded preliminary ASR feasibility studies for the Brownsville PUB (1997) and the City of Laredo (1999)[25] and Eagle Pass has indicated their interest in a study. Although the studies indicated that ASR is feasible and recommended further investigation, the municipalities chose not to continue evaluation of the technology. The RGRWPG encourages Brownsville and Laredo to continue to assess ASR and other municipalities to consider the strategy.

5.2.11.1 Environmental Impacts

Though there are no recommended ASR projects in Region M for the 2021 planning cycle, the environmental impacts that could be expected if the alternative Eagle ASR project was implemented is discussed below.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific facility was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known;
- WTP impacts are estimated using UCM, which is based on the plant capacity; and
- Wellfield impacts are estimated using the UCM, which is based on the proposed wellfield.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards – identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the

[25] Matthew Webb. "Aquifer Storage and Recovery in Texas: 2015." TWDB Technical Note 15-04. 2015.

exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

G. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

H. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Successful ASR development is highly reliable (reliability score = 5). It is normally possible to achieve 90-95% recovery efficiency. Challenges to reliability include natural groundwater flow away from the ASR site and the associated drift of the storage bubble, thus reducing available supplies. Flat hydraulic gradients are not typical in Texas, especially in shallow aquifers. This migration of stored water is an important consideration in determining the reliability and viability of an ASR project. Also, since withdrawal of groundwater is a property right, competition with other nearby users could reduce the reliability of this water. One way to address the issue of other competing wells is to own the property rights over the storage bubble but that will drive up the strategy costs. If the water is recharged and recovered over a relatively short period (e.g., one year), the likelihood of reduced reliability is low. However, short-term ASR operations are highly dependent on the local aquifer hydrogeological features and that may impact reliability as well.

I. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for ASR strategies is presented in Table 5.2-42.

Table 5.2-42 Environmental Impacts of ASR Strategies

ENTITY	WMS NAME	YIELD *	A	B	C	D	E	F	G	H	I
Eagle Pass	Eagle Pass ASR Project*	3,360	2	3	0	0	22	2	0	5	0
*Indicates alternative WMS, and evaluated in Section 5.4.											

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FINAL PLAN

CHAPTER 5.3: RECOMMENDED WATER MANAGEMENT STRATEGIES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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5.3 Recommended Water Management Strategies

This chapter describes all of the WMSs that were recommended for each water user group (WUG), sorting first by county, IDs and WWPs strategies, then by municipal WUGs, and then by non-municipal WUGs. Management Supply Factors are also summarized at the end of this section.

5.3.1 Cameron County

5.3.1.1 Irrigation District/Wholesale Water Provider

All the IDs in Cameron County are recommended to implement ID improvement WMSs. Figure 5.3-1 shows a map of the Cameron County ID.

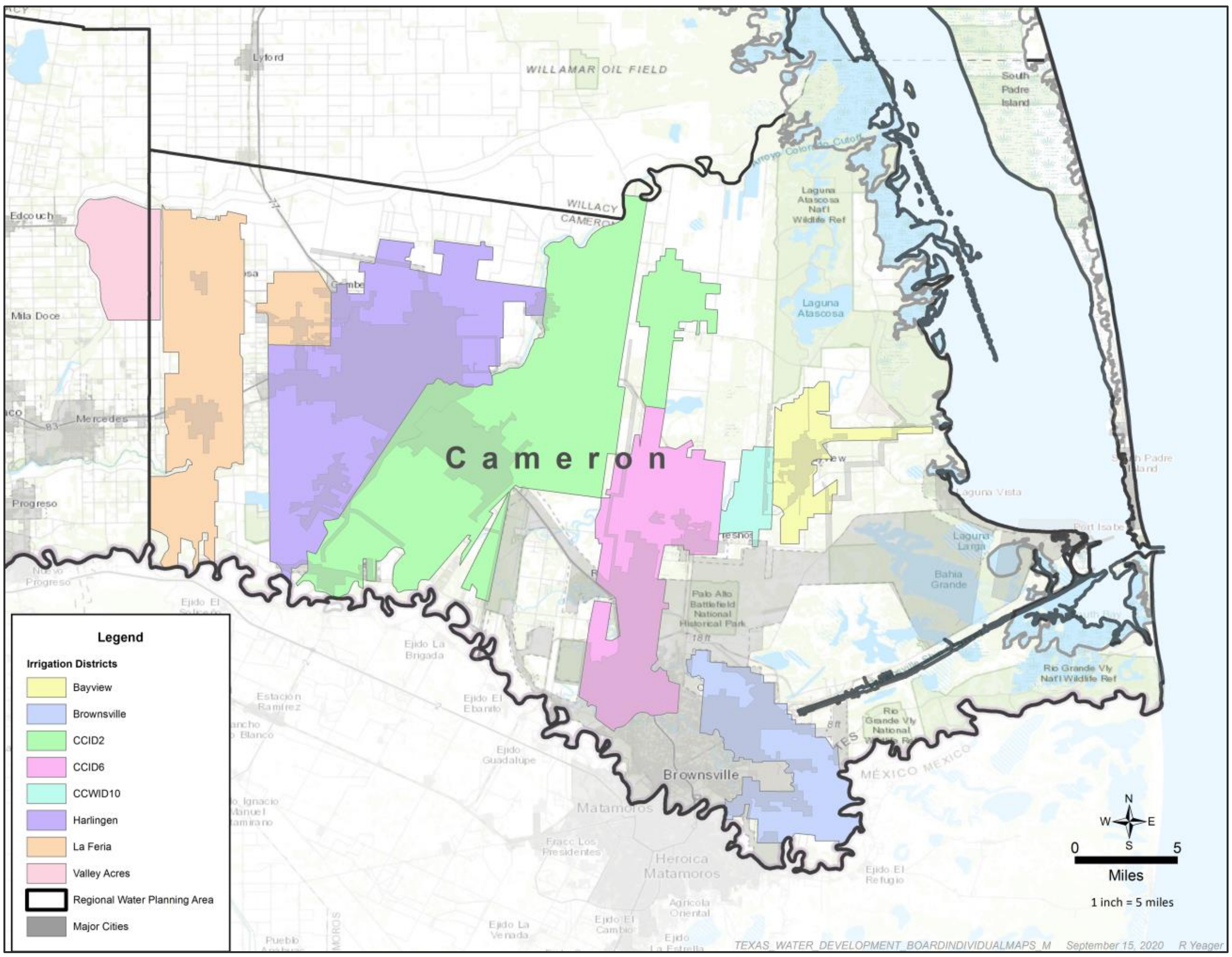

Figure 5.3-1 Irrigation, Cameron District Conservation WMS

Bayview Irrigation District No. 11

Bayview ID serves only irrigators directly (Table 5.3-1). The conveyance system is primarily open canals with an estimated current efficiency of 68 percent. A general ID improvement plan was created for Bayview ID which includes canal lining, installation of pipeline, and general repairs and improvements (Table 5.3-3). Increased customer supplies are shown in Table 5.3-2.

Table 5.3-1 Bayview ID No. 11 WWP Water Supply Balance

BAYVIEW ID NO. 11	2020	2030	2040	2050	2060	2070
County-Other, Cameron Contract Demand	124	124	124	124	124	124
Irrigation, Cameron – Contract Demand	5,103	5,102	5,100	5,099	5,097	5,096
Demand	**5,227**	**5,226**	**5,225**	**5,223**	**5,222**	**5,220**
Supplies	**7,687**	**7,685**	**7,683**	**7,681**	**7,679**	**7,677**
Need/Surplus	**2,460**	**2,459**	**2,459**	**2,458**	**2,457**	**2,457**

Table 5.3-2 Supplies from Bayview ID No. 11 WMS

BAYVIEW ID NO. 11	2020	2030	2040	2050	2060	2070
County-Other, Cameron	14	17	19	22	25	27
Irrigation, Cameron	588	694	801	908	1,014	1,121
New Supplies from WMS	**602**	**711**	**820**	**930**	**1,039**	**1,148**
WUG Balance After WMS	**3,062**	**3,170**	**3,279**	**3,388**	**3,496**	**3,605**

Table 5.3-3 Bayview ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$10,125,384
TOTAL ANNUAL COST	$688,341
Available Project Yield (acft/yr)	1,750
Annual Cost of Water ($ per acft)	$393
Annual Cost of Water ($ per 1,000 gallons)	$1.21

Brownsville Irrigation District

Brownsville ID only delivers water to irrigators, but the district holds 3,500 municipal water rights, which are sold to McAllen and diverted Hidalgo County Water Improvement District No. 3 (Table 5.3-4). The conveyance system in this district is primarily pipeline and has a current estimated system efficiency estimated at 68 percent.

The district is approximately 20,000 acres (31.25 square miles) with off channel storage of 2,000 acft in resacas. The conveyance system has 162 miles of underground pipeline that delivers water to the field by 14-inch alfalfa valves. There are three pumps at the river, two 40 cubic feet per second (cfs) and one 80 cfs, that deliver water to the resacas. The water is delivered to the fields through pipeline by nine pump stations located on the resaca banks throughout the district. Recipients of the Brownsville ID improvements are listed in Table 5.3-5.

Table 5.3-4 Brownsville ID Water Supply Balance

BROWNSVILLE ID	2020	2030	2040	2050	2060	2070
Irrigation, Cameron – Contract Demand	10,204	10,201	10,198	10,195	10,193	10,190
County-Other, Cameron – Contract Demand	227	227	227	227	227	227
El Jardin – Contract Demand	1,500	1,500	1,500	1,500	1,500	1,500
McAllen– Contract Demand	2,000	2,000	0	0	0	0
Demand	**13,931**	**13,928**	**11,925**	**11,923**	**11,920**	**11,917**
Supplies	**18,839**	**18,835**	**18,831**	**18,827**	**18,823**	**18,819**
Need/Surplus	**4,909**	**4,907**	**6,906**	**6,905**	**6,903**	**6,902**

Table 5.3-5 Supplies from Brownsville ID WMS

BROWNSVILLE ID	2020	2030	2040	2050	2060	2070
El Jardin WSC	119	162	204	246	288	330
Irrigation, Cameron	812	1,099	1,385	1,671	1,956	2,242
New Supplies from WMS	**911**	**1,261**	**1,589**	**1,917**	**2,244**	**2,572**
WUG Balance After WMS	**14,803**	**13,902**	**12,718**	**11,485**	**10,208**	**8,897**

Proposed improvement projects for Brownville ID include installation and improvement of pipelines lining the Wyrick Canal, replace Canal No. 6 with pipeline, replace and pressurize the Taylor Pipeline, and replace the river pump discharge flume. Brownsville ID estimates that the implementation of these projects will result in 1,500 acft of water saved per year (Table 5.3-6).

Table 5.3-6 Brownsville ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$7,637,457
TOTAL ANNUAL COST	$519,207
Available Project Yield (acft/yr)	1,500
Annual Cost of Water ($ per acft)	$346

ITEM	ESTIMATED COSTS FOR FACILITIES
Annual Cost of Water ($ per 1,000 gallons)	$1.06

Cameron Irrigation District No. 2

Cameron County ID (CCID) No. 2 is in the central portion of Cameron County, and has a network of main canals and pipelines, and lateral canals and pipelines with an estimated current efficiency of 80 percent. The system consists of unlined canals, lined canals, and enclosed pipelines. Current reservoir capacity is approximately 5,000 acft. The earthen canals experience water losses through both seepage and evaporation. Strategies submitted by CCID No. 2 to the RWPG include three pipeline installations and lining of five canals. CCID No. 2 estimates that the implementation of these projects will result in 8,486 acft of water saved per year (Table 5.3-9).

CCID No. 2 delivers water to irrigators and power generation in Cameron County and raw water to ERHWSC; the cities of San Benito and Rio Hondo; and County-Other, Cameron. Customers that benefit from the WMSs are listed in Table 5.3-7.

Table 5.3-7 CCID No. 2 WWP Water Supply Balance

CCID NO. 2	2020	2030	2040	2050	2060	2070
County-Other, Cameron – Contract Demand	600	600	600	600	600	600
East Rio Hondo WSC – Contract Demand	4,086	4,086	4,086	4,086	4,086	4,086
Irrigation, Cameron – Contract Demand	53,587	53,573	53,558	53,544	53,529	53,515
Rio Hondo – Contract Demand	712	712	712	712	712	712
San Benito – Contract Demand	5,626	5,626	5,626	5,626	5,626	5,626
Manufacturing, Cameron – Contract Demand	154	154	154	154	154	154
Demand	**65,064**	**65,049**	**65,035**	**65,020**	**65,006**	**64,991**
Supplies	**81,044**	**81,026**	**81,007**	**80,989**	**80,971**	**80,953**
Need/Surplus	**15,980**	**15,976**	**15,973**	**15,969**	**15,965**	**15,962**

Table 5.3-8 Supplies from CCID No. 2 Improvements

CCID NO. 2	2020	2030	2040	2050	2060	2070
County-Other, Cameron	63	62	62	61	61	60
ERHWSC	427	424	420	416	412	409

CCID NO. 2	2020	2030	2040	2050	2060	2070
Irrigation, Cameron	5,637	5,586	5,534	5,483	5,432	5,381
Rio Hondo	75	74	73	73	72	71
San Benito	588	583	578	573	568	563
Steam-Electric Power, Cameron	16	16	16	16	16	15
New Supplies from WMS	**6,806**	**6,745**	**6,683**	**6,622**	**6,561**	**6,499**
WUG Balance After WMS	**5,604**	**5,583**	**5,481**	**5,420**	**5,359**	**5,297**

Recommended improvements include canal replacement, pipeline installation, canal lining, and general improvements, with estimated costs shown in Table 5.3-9.

Table 5.3-9 CCID No. 2 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$79,856,194
TOTAL ANNUAL COST	$5,428,761
Available Project Yield (acft/yr)	8,486
Annual Cost of Water ($ per acft)	$669
Annual Cost of Water ($ per 1,000 gallons)	$2.05

Cameron Irrigation District No. 6 (Los Fresnos)

CCID No. 6 is predominantly open canal with an estimated current efficiency of 68 percent. This district provides water to irrigation users in Cameron County and to the cities of Los Fresnos, Olmito, and Brownsville Public Utilities Board (BPUB) (Refer to Table 5.3-10 and Table 5.3-11). In addition, the district passes water through for Bayview ID, and CCWID No. 10. A general ID improvement plan was created for CCID No. 6 (Table 5.3-12).

Table 5.3-10 CCID No. 6 WWP Water Supply Balance

CCID NO. 6	2020	2030	2040	2050	2060	2070
Brownsville PUB – Contract Demand	370	370	370	370	370	370
Irrigation, Cameron – Contract Demand	18,412	18,407	18,402	18,397	18,392	18,387
Los Fresnos – Contract Demand	715	715	715	715	715	715
Manufacturing, Cameron – Contract Demand	14	14	14	14	14	14

CCID NO. 6	2020	2030	2040	2050	2060	2070
Olmito WSC – Contract Demand	1,051	1,051	1,051	1,051	1,051	1,051
Demand	**20,562**	**20,557**	**20,552**	**20,547**	**20,542**	**20,537**
Supplies	**36,271**	**36,262**	**36,253**	**36,244**	**36,235**	**36,227**
Need/Surplus	**335**	**335**	**335**	**335**	**335**	**335**

Table 5.3-11 Supplies form CCID No. 6 Improvements

CCID NO. 6	2020	2030	2040	2050	2060	2070
Brownsville	41	49	57	65	73	81
Irrigation, Cameron	1,668	1,989	2,310	2,631	2,952	3,273
Los Fresnos	80	95	111	126	142	157
Manufacturing, Cameron	1	2	2	2	3	3
Olmito WSC	118	140	163	186	209	231
New Supplies from WMS	**1,908**	**2,275**	**2,641**	**3,010**	**3,379**	**3,745**
WUG Balance After WMS	**20,624**	**20,988**	**21,353**	**21,717**	**22,082**	**22,447**

Table 5.3-12 CCID No. 6 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$28,752,120
TOTAL ANNUAL COST	$1,954,618
Available Project Yield (acft/yr)	4,902
Annual Cost of Water ($ per acft)	$399
Annual Cost of Water ($ per 1,000 gallons)	$1.22

Cameron County Water Improvement District No. 10

CCWID No. 10 is a predominantly open canal with an estimated current efficiency of 68 percent. This district provides water to irrigation users in Cameron County and passes water from Bayview ID. A general ID improvement plan was created for CCWID No. 10 (Table 5.3-15).

Table 5.3-13 CCWID No. 10 WWP Water Supply Balance

CCWID NO. 10	2020	2030	2040	2050	2060	2070
Irrigation, Cameron – Contract Demand	2,390	2,390	2,389	2,388	2,388	2,387
Mining, Cameron – Contract Demand	11	11	11	11	11	11
Demand	**2,401**	**2,400**	**2,400**	**2,399**	**2,398**	**2,398**
Supplies	**11,218**	**11,215**	**11,212**	**11,209**	**11,206**	**11,203**
Need/Surplus	**8,817**	**8,815**	**8,812**	**8,810**	**8,808**	**8,805**

Table 5.3-14 Supplies from CCWID No. 10 Improvements

CAMERON COUNTY ID NO. 10	2020	2030	2040	2050	2060	2070
County-Other, Cameron	50	145	240	335	430	525
New Supplies from WMS	**50**	**145**	**240**	**335**	**430**	**525**
WUG Balance After WMS	**15,236**	**15,329**	**15,422**	**15,515**	**15,608**	**15,701**

Table 5.3-15 CCWID No. 10 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$2,361,772
TOTAL ANNUAL COST	$160,557
Available Project Yield (acft/yr)	395
Annual Cost of Water ($ per acft)	$406
Annual Cost of Water ($ per 1,000 gallons)	$1.25

Harlingen Irrigation District No. 1

Harlingen ID's conveyance system is both pipeline and canal, with slightly more canals with an estimated current efficiency of 68 percent. This system serves both irrigators in Cameron County and the cities of Harlingen, Palm Valley, Primera, Combes, ERHWSC, and the Military Highway WSC. Harlingen ID No. 1 submitted two strategies converting earthen canal into pipeline, one strategy converting a concrete-lined canal into pipeline, and improvements to Simmons Spur area. Harlingen ID No. 1 estimates that the implementation of these projects will result in 1,637 acft of water saved per year Table 5.3-18. The yield to each customer is shown in Table 5.3-17.

Table 5.3-16 Harlingen ID No. 1 WWP Water Supply Balance

HARLINGEN ID NO. 1	2020	2030	2040	2050	2060	2070
Combes – Contract Demand	677	677	677	677	677	677
Harlingen – Contract Demand	20,212	20,211	20,211	20,211	20,211	20,210
Irrigation, Cameron – Contract Demand	43,621	43,609	43,597	43,585	43,574	43,562
Palm Valley – Contract Demand	266	266	266	266	266	266
Primera – Contract Demand	340	340	340	340	340	340
ERHWSC – Contract Demand	189	189	189	189	189	189
Military Highway WSC – Contract Demand	614	614	614	614	614	614
Nueces-Rio Grande Run-of-River (RoR) – Irrigation – Contract Demand	43	43	43	43	43	43
Demand	**66,177**	**66,165**	**66,153**	**66,029**	**66,016**	**66,004**
Supplies	**77,211**	**77,197**	**77,182**	**77,168**	**77,154**	**77,140**
Need/Surplus	**11,034**	**11,032**	**11,030**	**11,140**	**11,137**	**11,135**

Table 5.3-17 Supplies from Harlingen ID No. 1 Improvements

HARLINGEN ID NO. 1	2020	2030	2040	2050	2060	2070
Combes	42	63	85	106	127	149
ERHWSC	18	27	37	46	55	65
Harlingen	1,250	1,889	2,528	3,168	3,807	4,446
Irrigation, Cameron	2,700	4,080	5,459	6,838	8,216	9,593
Military Highway WSC	38	57	77	96	116	135
Palm Valley	16	25	33	42	50	59
Primera	21	32	43	53	64	75
New Supplies from WMS	**4,085**	**6,173**	**8,262**	**10,349**	**12,435**	**14,522**
WUG Balance After WMS	**4,347**	**6,435**	**8,524**	**10,611**	**12,697**	**14,784**

Table 5.3-18 Harlingen ID No. 1 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$3,814,870
TOTAL ANNUAL COST	$259,341
Available Project Yield (acft/yr)	4,760
Annual Cost of Water ($ per acft)	$54
Annual Cost of Water ($ per 1,000 gallons)	$0.17

La Feria Irrigation District, Cameron County No. 3

La Feria ID has a 2,000 acft storage capacity reservoir that is supplied by an unlined main canal from the primary pump station. A secondary pump station transfers the water from the reservoir through a network of canals, laterals, and pipelines; the conveyance system includes lined canals, unlined canals, and pipeline. The district has an estimated current efficiency of 68 percent. La Feria ID delivers water to irrigators in Cameron County, Sebastian MUD, Santa Rosa, La Feria, Siesta Shores, and other Cameron County users. WMSs submitted by La Feria ID to the RWPG, including lining of the Main Canal and replacement of the Wilson Canal lateral, estimate an annual water savings of 11,041 acft/yr.

Table 5.3-19 La Feria ID WWP Water Supply Balance

LA FERIA ID	2020	2030	2040	2050	2060	2070
County-Other, Cameron – Contract Demand	612	612	612	612	612	612
Irrigation, Cameron – Contract Demand	25,790	25,783	25,776	25,769	25,762	25,755
La Feria – Contract Demand	1,300	1,400	1,500	1,700	2,000	2,200
Santa Rosa – Contract Demand	612	612	612	612	612	612
Sebastian MUD – Contract Demand	204	204	204	204	204	204
Siesta Shores WCID – Contract Demand	149	149	149	149	149	149
Demand	**28,668**	**28,761**	**28,854**	**29,047**	**29,340**	**29,533**
Supplies	**43,359**	**43,349**	**43,338**	**43,328**	**43,318**	**43,307**
Need/Surplus	**14,691**	**14,588**	**14,484**	**14,281**	**13,978**	**13,775**

Table 5.3-20 Supplies from La Feria ID Improvements

LA FERIA ID	2020	2030	2040	2050	2060	2070
County-Other, Cameron	156	156	156	156	156	156
Irrigation, Hidalgo	6,567	6,567	6,567	6,567	6,567	6,567
La Feria	383	383	383	383	383	383
Santa Rosa	156	156	156	156	156	156
Siesta Shores	38	38	38	38	38	38
New Supplies from WMS	**7,300**	**7,300**	**7,300**	**7,300**	**7,300**	**7,300**
WUG Balance After WMS	**7,412**	**7,412**	**7,411**	**7,412**	**7,412**	**7,411**

Table 5.3-21 La Feria ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$59,989,636
TOTAL ANNUAL COST	$4,078,198
Available Project Yield (acft/yr)	11,041
Annual Cost of Water ($ per acft)	$428
Annual Cost of Water ($ per 1,000 gallons)	$1.31

Valley Acres Irrigation District

Valley Acres ID is located primarily in Cameron County, with 13.5 percent of the total district area in Hidalgo County. Valley Acres delivers water to irrigators in both counties. This conveyance system is primarily pipelines and has several resacas and reservoirs that constitute a significant source of evaporative losses. The district has an estimated current efficiency of 71 percent.

Table 5.3-22 Valley Acres ID WWP Water Supply Balance

VALLEY ACRES ID	2020	2030	2040	2050	2060	2070
Irrigation, Cameron – Contract Demand	683	683	683	683	682	682
Irrigation, Hidalgo – Contract Demand	4,377	4,376	4,375	4,373	4,372	4,371
Industrial, Cameron – Contract Demand	63	63	63	63	63	63
Demand	**5,123**	**5,121**	**5,120**	**5,119**	**5,117**	**5,116**

VALLEY ACRES ID	2020	2030	2040	2050	2060	2070
Supplies	7,215	7,213	7,211	7,209	7,207	7,205
Need/Surplus	2,092	2,092	2,091	2,091	2,090	2,090

Table 5.3-23 Supplies from Valley Acres ID Improvements

VALLEY ACRES ID	2020	2030	2040	2050	2060	2070
Irrigation, Cameron	49	65	82	98	115	131
Irrigation, Hidalgo	313	419	524	630	735	841
Total	362	484	606	728	850	972

WMSs submitted by Valley Acres ID to the RWPG include canal lining and conversion from open channel to pipeline and result in an estimated an annual water savings of 510 acft/yr.

Table 5.3-24 Valley Acres ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$2,846,479
TOTAL ANNUAL COST	$193,509
Available Project Yield (acft/yr)	510
Annual Cost of Water ($ per acft)	$379
Annual Cost of Water ($ per 1,000 gallons)	$1.16

5.3.1.2 Cameron County Water User Groups and Water User Groups/Wholesale Water Provider's Water Management Strategy

Cameron County WUGs and WUGs/WWPs that have recommended strategies with capital costs are depicted on Figure 5.3-2. A list of these WMSs and their map numbers is given in Table 5.3-25.

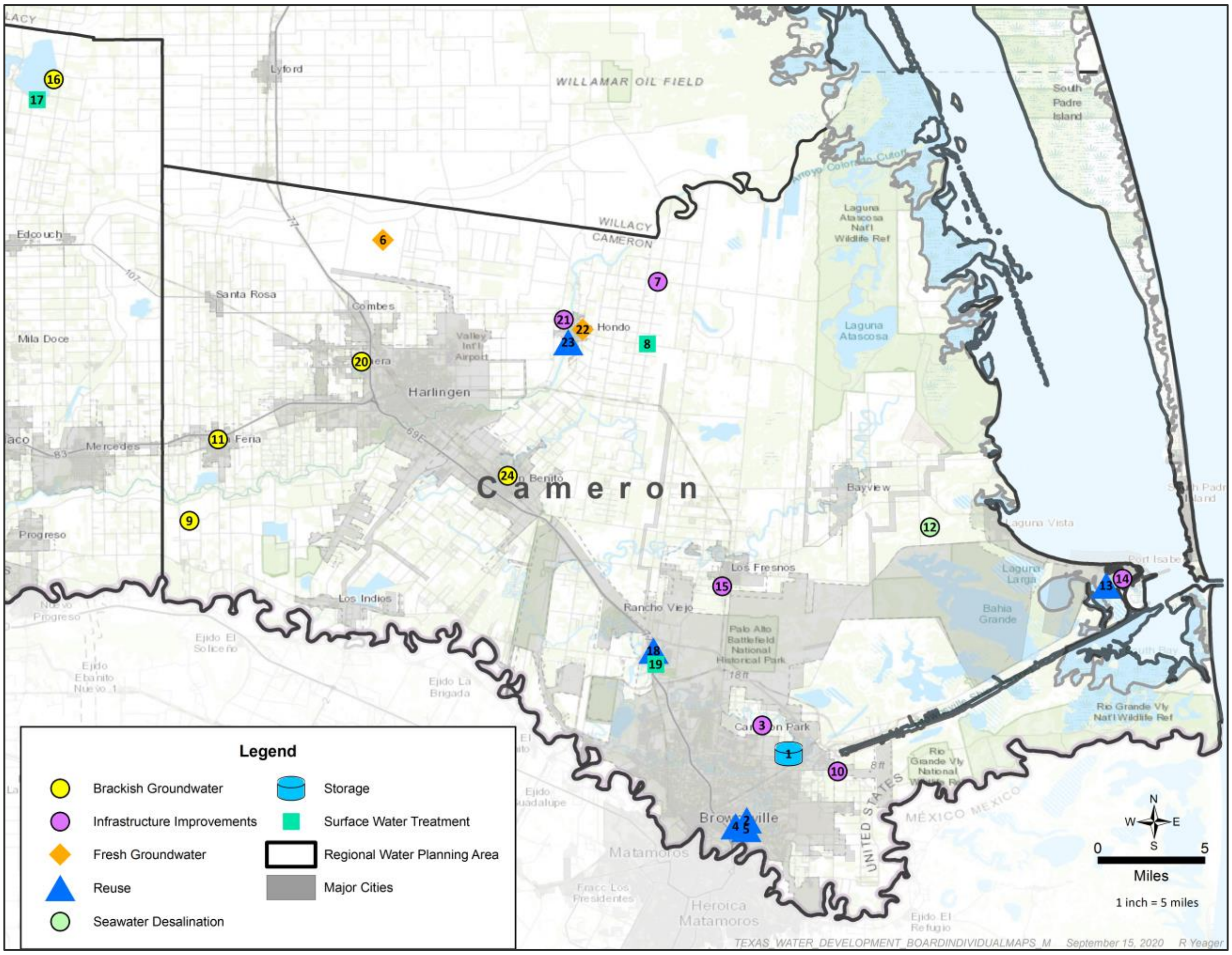

Figure 5.3-2 Cameron County Recommended and Regional WMS

Table 5.3-25 Map Legend: Cameron County Recommended and Regional Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Brownsville Public Utilities Board	Banco Morales Reservoir	Storage
2	Brownsville Public Utilities Board	Non-Potable Reuse Pipeline	Reuse
3	Brownsville Public Utilities Board	Resaca Restoration	Infrastructure Improvements
4	Brownsville Public Utilities Board	Brownsville Southside WWTP Potable Reuse	Reuse

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
5	Brownsville Public Utilities Board	Brownsville Southside WWTP Potable Reuse	Reuse
6	County-Other, Cameron	Expanded Groundwater Supply	Fresh Groundwater
7	East Rio Hondo WSC	FM 2925 Transmission Line	Infrastructure Improvements
8	East Rio Hondo WSC	Surface WTP Phase I	Surface Water Treatment
9	East Rio Hondo WSC & NAWSC	North Cameron Region WTP Well Field Expansion	Brackish Groundwater
10	El Jardin WSC	Distribution Pipeline Replacement	Infrastructure Improvements
11	La Feria	Water Well and RO Unit	Brackish Groundwater
12	Laguna Madre Water District	Seawater Desalination Plant	Seawater Desalination
13	Laguna Madre Water District	Port Isabel Potable Reuse	Reuse
14	Laguna Madre Water District	WTP No.1 Expansion and Process Improvements	Infrastructure Improvements
15	Los Fresnos	WTP Expansion	Infrastructure Improvements
16	NAWSC	Delta Area Brackish Groundwater Desalination Plant	Brackish Groundwater
17	NAWSC	Delta WTP Expansion Phase I/II	Surface Water Treatment
18	Olmito WSC	New Biolac WWTP	Reuse
19	Olmito WSC	WTP Expansion	Surface Water Treatment
20	Primera	RO WTP with Groundwater Well	Brackish Groundwater
21	Rio Hondo	Emergency Interconnect	Infrastructure Improvements
22	Rio Hondo	New Groundwater Supply	Fresh Groundwater
23	Rio Hondo	Non-Potable WWTP Effluent Reuse	Reuse
24	San Benito	New Groundwater Supply	Brackish Groundwater

Brownsville

Brownsville (i.e. Brownsville Public Utilities Board; BPUB) has projected needs from 2030 onward (Table 5.3-26); recommended WMSs are listed in Table 5.3-27. Projected needs are largely a result of understated supplies in the plan because of MAG limitations.

Table 5.3-26 Brownsville Existing Supply Balance (acft/yr)

BROWNSVILLE	2020	2030	2040	2050	2060	2070
WUG Demand	35,477	41,198	47,168	53,886	60,982	68,336

BROWNSVILLE	2020	2030	2040	2050	2060	2070
El Jardin WSC – Contract Demand	1,500	1,500	1,500	1,500	1,500	1,500
Irrigation, Cameron – Contract Demand	825	825	825	825	825	825
Manufacturing, Cameron – Contract Demand	220	220	220	220	220	220
Steam Electric Power Generation, Cameron County – Contract Demand	125	125	125	125	125	125
Demand	**38,147**	**43,868**	**49,838**	**56,556**	**63,652**	**71,006**
Supplies	**44,934**	**44,934**	**44,934**	**44,933**	**44,933**	**44,933**
Need/Surplus	**6,787**	**1,066**	**(4,904)**	**(11,622)**	**(18,718)**	**(26,072)**

Table 5.3-27 Brownsville WMS Supplies (acft/yr)

BROWNSVILLE	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	2,258	4,355	7,038	10,466	14,463
Banco Morales Reservoir	0	1,700	1,700	1,700	1,700	1,700
Conversion of Water Rights	0	0	0	0	338	1,841
ID Improvements - CCID No. 6	41	49	57	65	73	81
Resaca Restoration	877	877	877	877	877	877
Municipal Drought Management	0	817	949	1,091	1,237	1,388
Southside WWTP (Potable)	0	0	0	3,360	3,360	5,040
New Supplies from WMS	**918**	**5,701**	**7,937**	**14,131**	**18,051**	**25,389**
WUG Balance After WMS	**8,875**	**7,937**	**4,203**	**3,679**	**503**	**486**
Alternative WMS*						
Matamoros Weir and Reservoir	0	19.176	19.176	19.176	19.176	19.176
Seawater Desalination Demonstration and Implementation	0	2,800	2,800	2,800	28,000	28,000
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Brownsville's 2011 GPCD was estimated at 162, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Banco Morales Reservoir

Project Source

This strategy was submitted by Brownsville to the RWPG during the 2016 Regional Water Planning process.

Description

This strategy is for the construction of an off-channel raw water reservoir to capture excess water from the lower Rio Grande that currently flows into the Gulf of Mexico. Water is currently released from the Falcon Dam with no opportunity to capture water at a downstream location in the event of rain or changed conditions. The reservoir would be located between the existing International Boundary and Water Commission (IBWC) levee system and the City of Brownsville's levee along the Rio Grande, adjacent to BPUB's WTP No. 1.

Available Supply

In addition to other water rights, BPUB currently has authorization to divert up to 40,000 acft/yr of excess flows from the Rio Grande under TCEQ Permit No. 1838. Excess flows are defined as all U.S. waters passing the Brownsville stream flow gauging station above a base flow rate of 25 cfs. This proposed strategy would add an additional 400 million gallons of storage capacity for the excess flows, resulting in a total storage capacity of 616 million gallons. The Rio Grande Water Availability Model (WAM) includes an evaluation of the drought year reliability for the Permit No. 1838. The estimated firm yield of 1,700 acft/yr is based on the firm yield modeled using the Rio Grande WAM Run 3. Planned implementation in the 2030 decade.

Environmental Issues

Banco Morales Reservoir has several environmental issues that have been raised as concerns. Most notable include impacts on water quality (i.e., increased salinity) within the reservoir caused by evaporative losses, increased risk of flooding, and potential impacts to habitat from reservoir construction and inundation. However, many of the environmental issues that have been raised regarding the Banco Morales Reservoir may be addressed through the Section 404/10 Federal permitting process and preparation of an Emergency Action Plan (EAP) through the TCEQ.

Engineering and Costing

The UCM was used to determine estimate costs for construction and maintenance of the reservoir. It is assumed that the construction period for this strategy is 1 year. Table 5.3-28 outlines the project requirements and estimated costs.

Per section 8.2.4 of the UCM User Guide, dated November 2018, for all project components except pipelines, the UCM assumes the Environmental/Mitigation Costs are 100 percent of land costs. The recommended value for environmental studies and mitigation costs for pipelines is $25,000/mile of pipeline. This cost estimate is representative of 60 acres for the Reservoir foot-print and conservation pool.

Implementation Issues

BPUB will need complete the environmental compliance requirements and obtain a federal 404 permit authorization. BPUB would operate this project in conjunction with their existing flows diversion Permit No. 1838, which authorizes diversions of excess flows from the Rio Grande of 40,000 acft/yr.

Table 5.3-28 Brownsville - Banco Morales Reservoir Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE – BANCO MORALES RESERVOIR	
Item	Estimated Costs for Facilities
CAPITAL COST	
Off-Channel Storage/Ring Dike (conservation pool 1,700 acft, 60 acres)	$8,729,000
TOTAL COST OF FACILITIES	**$8,729,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$3,055,000
Environmental and Archaeology Studies and Mitigation	$197,000
Land Acquisition and Surveying (60 acres)	$200,000
Interest During Construction (3 percent for 1 year with a 0.5 percent Return on Investment [ROI])	$335,000
TOTAL COST OF PROJECT	**$12,516,000**
ANNUAL COST	
Reservoir Debt Service (3.5 percent, 40 years)	$586,000
O&M	
Dam and Reservoir (1.5 percent of cost of facilities)	$131,000
Pumping Energy Costs (1,608,390 kWh at 0.08 $/kWh)	$129,000
TOTAL O&M	$260,000
TOTAL ANNUAL COST	**$846,000**
Available Project Yield (acft/yr)	**1,700**
Annual Cost of Water ($ per acft)	**$498**
Annual Cost of Water After Debt Service ($ per acft)	**$153**
Annual Cost of Water ($ per 1,000 gallons)	**$1.53**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.47**

Non-Potable Water Reuse Pipeline

Project Source

This strategy was submitted by Brownsville to the RWPG during the 2016 Regional Water Planning process.

Description

The Brownsville Generating Station power plant requires cooling water to operate. This direct non-potable reuse strategy involves BPUB sending the power plant treated wastewater effluent, in lieu of providing potable water to be used for cooling water demand. The BPUB Robindale WWTP is located near the Brownville Generating Station and has sufficient capacity to provide reuse water. A map of the Non-Potable Water Reuse Pipeline is shown on Figure 5.3-3.

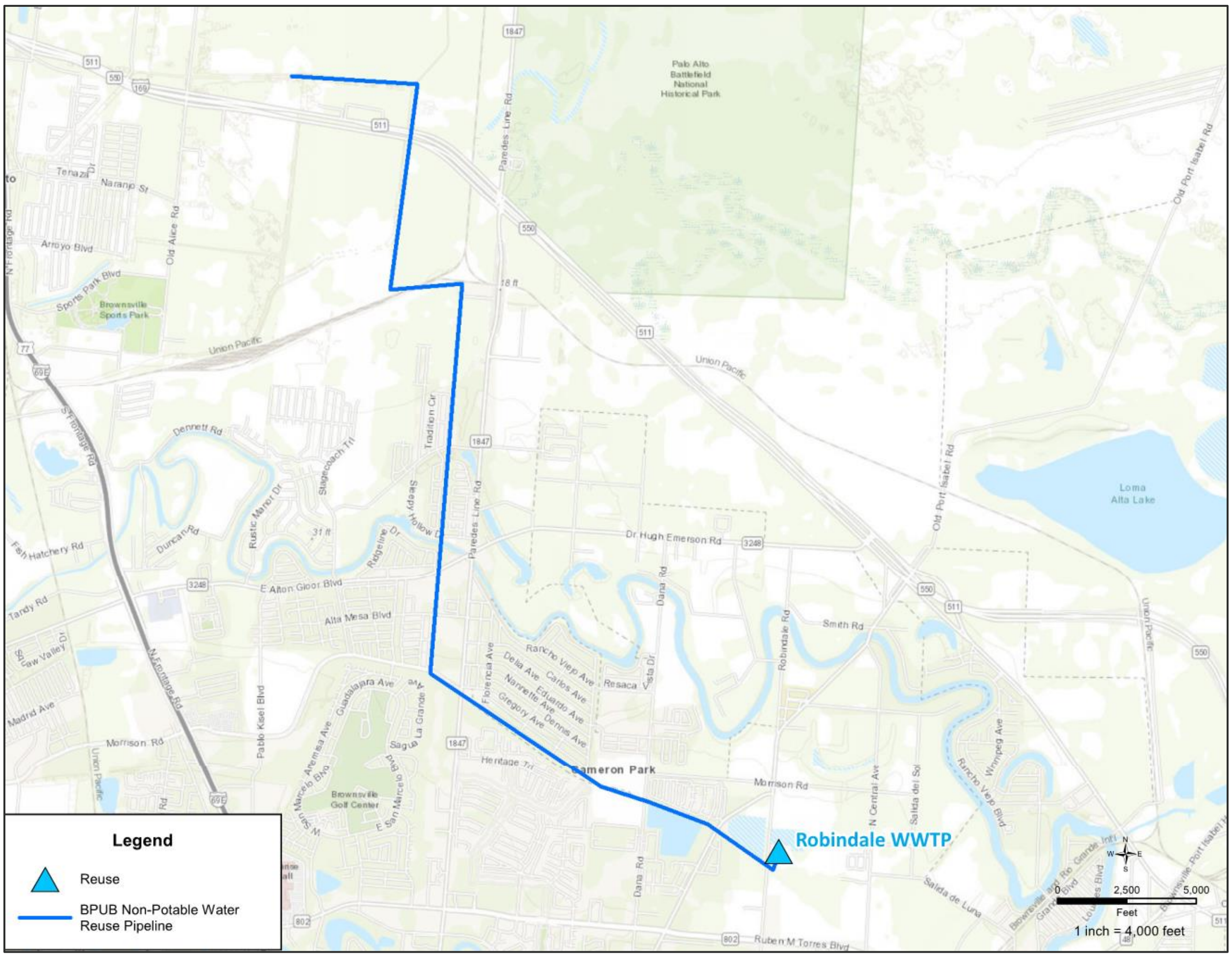

Figure 5.3-3 Brownsville Non-Potable Water Reuse Pipeline Location

Available Supply

In a drought year, 6 mgd of reclaimed wastewater will be sent to the Brownsville Generating Station; however, the project will be sized for a peak flow of 12 mgd, or 13,442 acft/yr. Planned for implementation in the 2030 decade.

Engineering and Costing

The Brownsville non-potable reuse project would consist of pumping and pipeline infrastructure to transfer the reclaimed water to the power plant, a storage tank, and additional treatment facilities to treat the wastewater effluent to the water quality needed for cooling water. It is assumed that the construction period would be 1.5 years.

Table 5.3-29 summarizes the project requirements and costs estimated in UCM. It was assumed that additional filtration at the WWTPs will be needed; therefore, Treatment Level 2, Simple Filtration, was used in UCM.

Implementation Issues

The Brownsville Generating Station is still a proposed facility that has not begun construction at this time. When the facility is planned for construction, it will be critical for Brownsville to evaluate the appropriate costs for any additional treatment and conveyance facilities, and for a full environmental assessment to be performed.

Table 5.3-29 Brownsville - Non-Potable Reuse Pipeline Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE – NON-POTABLE WATER REUSE PIPELINE	
Item	**Estimated Costs for Facilities**
Primary Pump Station	$16,352,000
Transmission Pipeline (40 in. diameter, 8.5 miles)	$26,494,000
Storage Tanks (other than at booster pump stations)	$1,297,000
WTP (12 mgd)	$27,941,000
TOTAL COST OF FACILITIES	**$72,084,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$23,905,000
Environmental and Archaeology Studies and Mitigation	$213,000
Land Acquisition and Surveying (116 acres)	$390,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$2,657,000
TOTAL COST OF PROJECT	**$99,249,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$6,983,000

COST ESTIMATE SUMMARY	
BROWNSVILLE – NON-POTABLE WATER REUSE PIPELINE	
Item	**Estimated Costs for Facilities**
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$278,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$409,000
WTP	$1,956,000
Pumping Energy Costs (1,923,871 kWh at 0.08 $/kWh)	$154,000
TOTAL O&M	$2,797,000
TOTAL ANNUAL COST	**$9,780,000**
Available Project Yield (acft/yr)	**6,720**
Annual Cost of Water ($ per acft), based on PF=2	**$1,455.14**
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	**$416.16**
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	**$4.46**
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	**$1.28**

Resaca Restoration

Project Source

This strategy was submitted by Brownsville to the RWPG during the 2016 Regional Water Planning process.

Description

This strategy is for restoration resacas within the boundaries of the City of Brownsville. The three main systems to be restored are the Town Resaca, Resaca de la Guerra, and Resaca Del Rancho Viejo. Restoring the resacas will increase raw water storage and storm water capacity, improve water quality, restore habitat, stabilize the bank, and improve aesthetics.

Available Supply

This strategy is estimated to save 877 acft/yr beginning in the 2020 decade.

Environmental Issues

The environmental impact of this strategy will be predominantly related to water quality and disposal of solids during dredging activities. Solids generated during the process are either organic or non-organic in nature. Often, the disposal method of choice entails drying of removed solids with either mechanical dewatering or evaporative methods. Once the solids are of a certain quality, the material is then hauled to a landfill. In terms of water quality, a temporary decrease in water quality because of dredging activities will occur. In particular, total organic carbon (TOC) and total suspended solids (TSS) will increase temporarily.

The resacas that are considered in the Resaca Restoration WMS are oxbow lakes in the former channel of the Rio Grande, which have been cut off from the river for decades and are outside of the Rio Grande basin as a result of the levees that have since been constructed to control flood waters along the Rio Grande. They do not have flowing inlets or outlets to either the Rio Grande or the Arroyo Colorado and are therefore not subject to TCEQ environmental flow standards.

For this project, TCEQ, TPWD, U.S. Fish and Wildlife Service (USFWS), and any other appropriate agencies will assist in developing and implementing an acceptable mitigation plan for the project. Further, this project will most likely need to obtain a 404 Corps of Engineers' Permit with subsequent coordination with other agencies and land owners.

During the dredging activities, special care should be taken to minimize the on-site storage of sediment. By developing a system of dredging concurrent with drying and removal of solids, the short-term storage of dredging byproducts should be minimized.

Engineering and Costing

Total construction costs for the project are estimated at $10,379,000 per the submitted strategy. This construction cost was entered into the UCM to determine other cost metrics. Table 5.3-30 outlines the estimate project costs.

Implementation Issues

Obtaining funding for these activities is typically the main hurdle for implementation. Equipment purchase is often expensive and having knowledgeable staff to operate the machinery is critical.

The location for temporary disposal of the solids removed from the storage reservoir must also be considered to minimize the chances of offensive odors and storm water runoff of the solids.

Table 5.3-30 Brownsville - Resaca Restoration Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE – RESACA RESTORATION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Resaca Restoration	$10,379,000
TOTAL COST OF FACILITIES	**$10,379,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$3,633,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$386,000
TOTAL COST OF PROJECT	**$14,398,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,013,000
TOTAL ANNUAL COST	**$1,013,000**
Available Project Yield (acft/yr)	**877**
Annual Cost of Water ($ per acft)	**$1,155**
Annual Cost of Water After Debt Service ($ per acft)	**$0.00**
Annual Cost of Water ($ per 1,000 gallons)	**$3.54**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.00**

Brownsville Southside WWTP Potable Reuse

Project Source
This strategy was identified by the RWPG.

Description
This direct potable reuse strategy is to pump treated effluent from the Brownville Southside WWTF to the Brownsville WTP No. 2. A map of the recommended potable reuse strategy is shown on Figure 5.3-4.

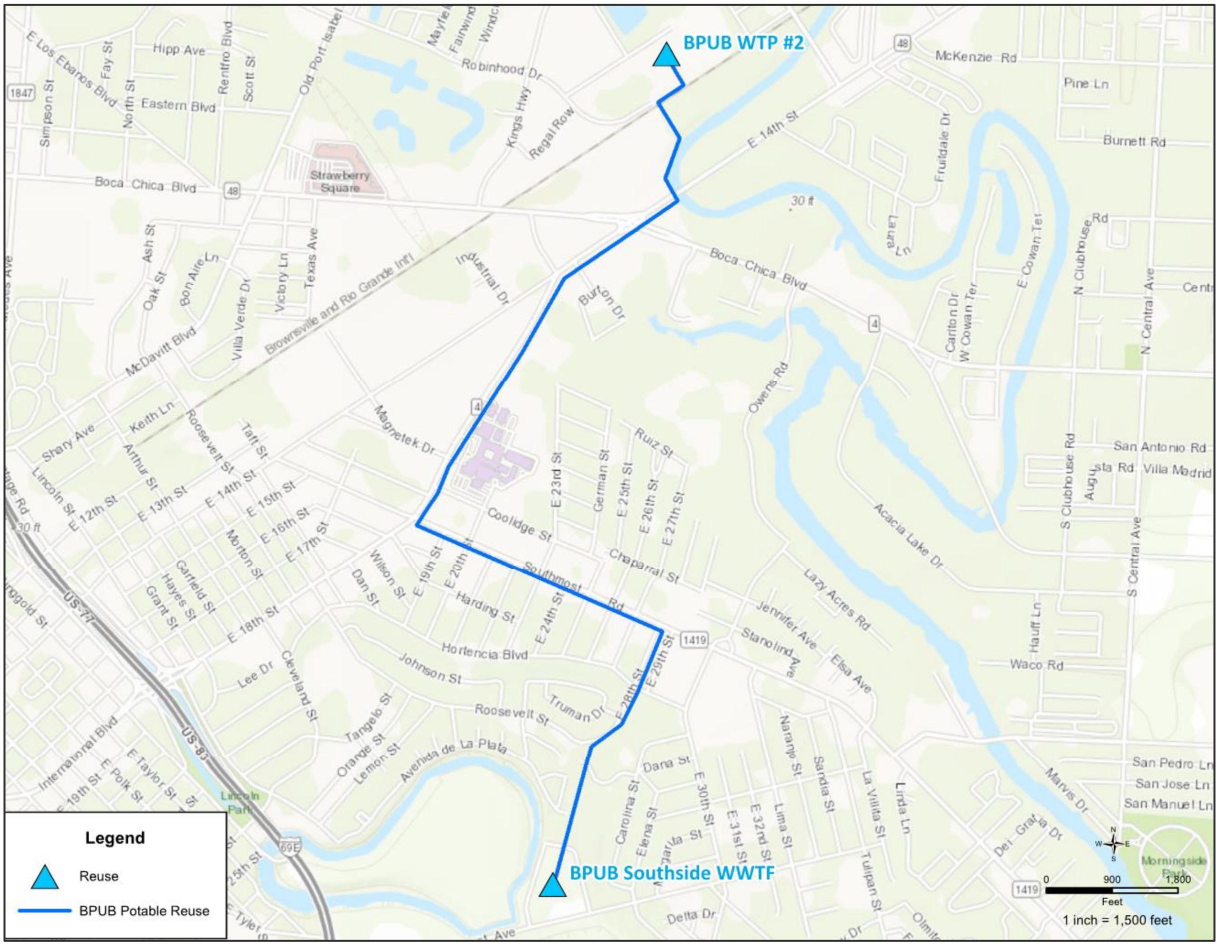

Figure 5.3-4 Brownsville Southside WWTP Potable Reuse Pipeline Location

Available Supply
Based on recorded WWTP flows, the annual average flow for Brownsville Southside WWTP is 12.8 mgd. Approximately half of that flow is assumed to be available on a consistent basis; therefore, 6.4 mgd, or 7,168 acft/yr, would be the maximum volume to be produced for potable reuse in 2020. For this two phased WMS, Brownsville's Southside WWTP will produce 3,360 acft/yr of potable water in 2050 and expand to produce a total of 5,040 acft/yr in 2070.

Engineering and Costing
Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station at the WWTP site and a pipeline to convey the reuse water to Brownsville

WTP No. 2 would be constructed. The pipeline and pump station would be built to handle the full build out flow during the first phase, but the treatment facilities would be expanded during Phase II construction. It is assumed that the construction period would be 2 years. Table 5.3-31 and Table 5.3-32 outline the estimated costs and project requirements used to develop the cost estimate.

Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be considered and a public relations campaign may be required.

Table 5.3-31 Brownsville – Southside WWTP Potable Reuse (Phase I) Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE – SOUTHSIDE WWTP POTABLE REUSE PROJECT (PHASE 1)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$5,381,000
Transmission Pipeline (18 in. diameter, 3 miles)	$3,480,000
Advanced Water Treatment Facility (3 mgd)	$22,651,000
TOTAL COST OF FACILITIES	**$31,512,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$10,855,000
Environmental and Archaeology Studies and Mitigation	$92,000
Land Acquisition and Surveying (43 acres)	$156,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,172,000
TOTAL COST OF PROJECT	**$43,787,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,081,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$35,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$135,000
Advanced Water Treatment Facility	$2,898,000
Pumping Energy Costs (965,929 kWh at 0.08 $/kWh)	$77,000
TOTAL O&M	$3,145,000
TOTAL ANNUAL COST	**$6,226,000**

COST ESTIMATE SUMMARY	
BROWNSVILLE – SOUTHSIDE WWTP POTABLE REUSE PROJECT (PHASE 1)	
Item	Estimated Costs for Facilities
Available Project Yield (acft/yr)	**3,360**
Annual Cost of Water ($ per acft)	**$1,853**
Annual Cost of Water After Debt Service ($ per acft)	**$936**
Annual Cost of Water ($ per 1,000 gallons)	**$5.69**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.87**

Table 5.3-32 Brownsville – Southside WWTP Potable Reuse (Phase 2) Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE – SOUTHSIDE WWTP POTABLE REUSE PROJECT (PHASE 2)	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$3,226,000
Advanced Water Treatment Facility (1.5 mgd)	$13,102,000
TOTAL COST OF FACILITIES	**$16,328,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$5,715,000
Environmental and Archaeology Studies and Mitigation	$92,000
Land Acquisition and Surveying (42 acres)	$14,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$610,000
TOTAL COST OF PROJECT	**$22,759,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,601,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$81,000
Advanced Water Treatment Facility	$1,614,000
Pumping Energy Costs (208,088 kWh at 0.08 $/kWh)	$17,000
TOTAL O&M	$1,712,000
TOTAL ANNUAL COST	**$3,313,000**
Available Project Yield (acft/yr)	**1,680**

COST ESTIMATE SUMMARY	
BROWNSVILLE – SOUTHSIDE WWTP POTABLE REUSE PROJECT (PHASE 2)	
Item	**Estimated Costs for Facilities**
Annual Cost of Water ($ per acft)	**$1,972**
Annual Cost of Water After Debt Service ($ per acft)	**$1,019**
Annual Cost of Water ($ per 1,000 gallons)	**$6.05**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.13**

Combes

Combes does not have a needs in any decade (Table 5.3-33); however, WMSs are recommended in Table 5.3-34.

Table 5.3-33 Combes Existing Supply Balance (acft/yr)

COMBES	2020	2030	2040	2050	2060	2070
Supplies	569	569	569	569	569	569
Demand	321	357	396	444	497	553
Need(-)/Surplus(+)	**248**	**212**	**173**	**125**	**72**	**16**

Table 5.3-34 Combes WMS Supplies (acft/yr)

COMBES	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	4	31
ID Improvements - Harlingen ID No. 1	42	63	85	106	127	149
New Supplies from WMS	**42**	**63**	**85**	**106**	**131**	**180**
WUG Balance After WMS	**398**	**383**	**366**	**339**	**311**	**304**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Combes 2011 GPCD was estimated at 94, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

East Rio Hondo Water Supply Corporation (ERHWSC)

ERHWSC has projected needs from 2050 onward (Table 5.3-35); recommended WMSs are shown in Table 5.3-36.

Table 5.3-35 ERHWSC Existing Supply Balance (acft/yr)

ERHWSC	2020	2030	2040	2050	2060	2070
WUG Demand	3,900	4,458	4,489	4,970	5,459	6,073
County-Other, Cameron – Contract Demand	182	182	182	182	182	182
Military Highway WSC - Contract Demand	33	33	33	33	33	33
Demand	**4,115**	**4,673**	**4,704**	**5,185**	**5,674**	**6,288**
Supplies	**4,846**	**4,846**	**4,846**	**4,734**	**4,734**	**4,734**
Need/Surplus	**731**	**173**	**142**	**(451)**	**(940)**	**(1,554)**

Table 5.3-36 ERHWSC WMS Supplies (acft/yr)

ERHWSC	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	112	331	601	930
CCID No. 2 Conservation	427	424	420	416	412	409
Conversion of Water Rights Only	0	0	0	0	150	400
Drought Management	0	148	152	170	187	208
Harlingen ID Conservation	18	27	37	46	55	65
ERHWSC FM 2925 Water Transmission Line	0	30	30	30	30	30
North Cameron Regional WTP Wellfield Expansion	0	400	400	400	400	400
Surface WTP Phase I – Requires Conversion of Water Rights	0	800	800	800	800	800
New Supplies from WMS	**445**	**1,829**	**1,951**	**2,193**	**2,485**	**2,842**
WUG Balance After WMS	**1,451**	**2,308**	**2,431**	**2,223**	**2,058**	**1,801**
Alternative WMS*						
Surface WTP Phase II with Inter-Basin Transfer of Surface Water – Requires Conversion of Water Rights	0	0	0	2,500	2,500	2,500
*Alternative WMS are evaluated in Section 5.4						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. ERHWSC's 2011 GPCD was estimated at 132, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

FM 2925 Transmission Line

Project Source

This strategy was submitted by ERHWSC to the RWPG during the 2016 Regional Water Planning Process.

Description

This strategy is for the installation of a potable water line from the ERHWSC distribution system to Arroyo City. The existing Arroyo Water Supply Corporation (AWSC) WTP has been decommissioned because of cryptosporidium BIN2 categorization. Construction of this waterline would provide treated water to Arroyo City, replacing the supply from the decommissioned WTP. This strategy was identified in the ERHWSC Master Plan to decommission the AWSC WTP and provide a potable water source to Arroyo City. The approximate location of the FM 2825 Transmission Main is shown on Figure 5.3-5.

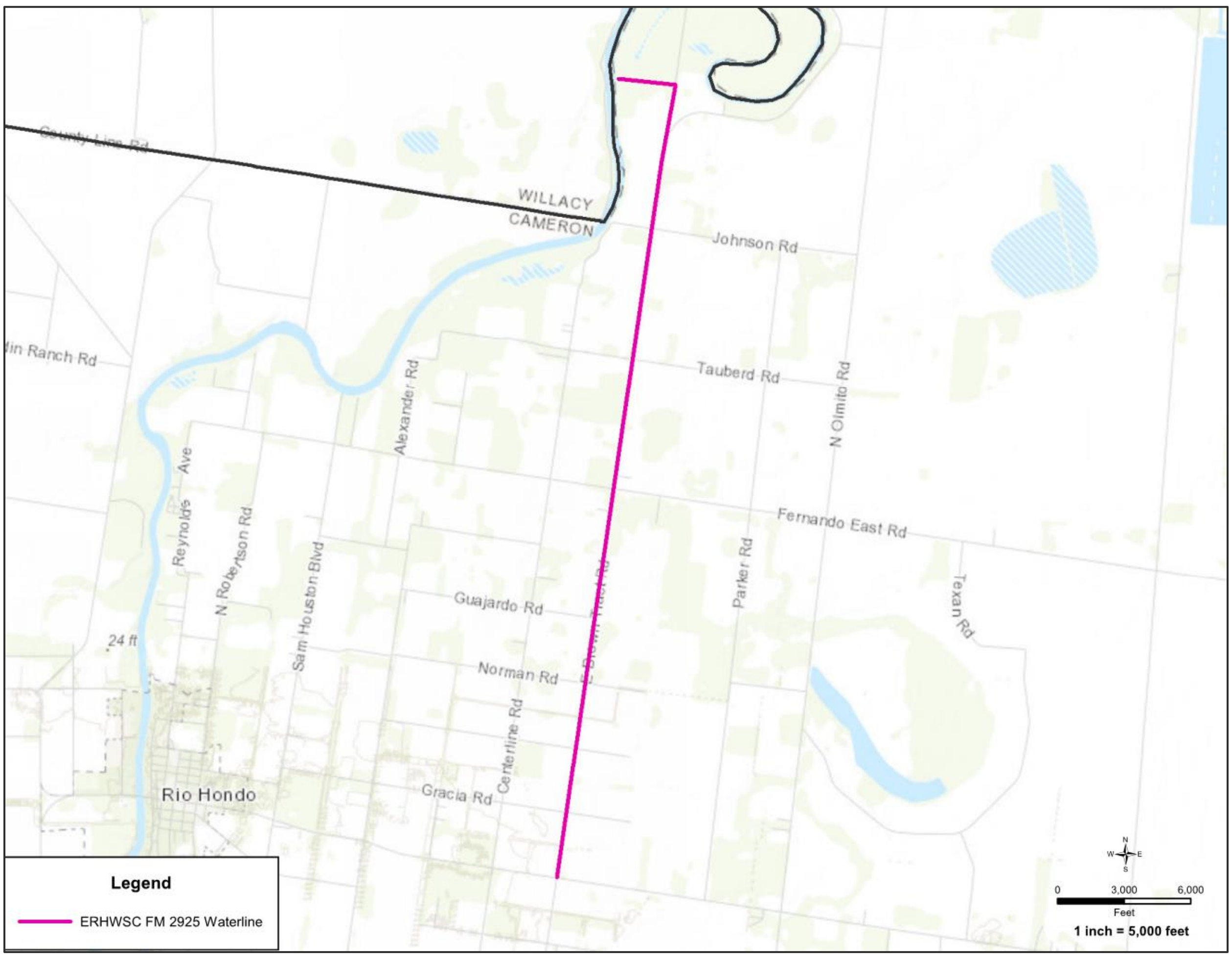

Figure 5.3-5 ERHWSC FM 2925 Transmission Line

Available Supply

This strategy will eliminate the losses associated with the current conveyance of supplies to Arroyo City. The drought year water savings is estimated at 30 acft/yr.

Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, land acquisition, and pipeline ROW. It is assumed that the construction period for this strategy is one year. Table 5.3-37 outlines the estimated project requirements and costs.

Implementation Issues

No major implementation issues are anticipated for this strategy. Utility crossing permits and easements would be required for several entities including Texas Department of Transportation (DOT), Cameron County, Cameron County Drainage District, and Cameron County ID.

Table 5.3-37 ERHWSC - FM 2925 Transmission Line Project Requirements and Costs

COST ESTIMATE SUMMARY	
ERHWSC - FM 2925 WATER TRANSMISSION LINE	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station (0 mgd)	$885,000
Transmission Pipeline (12 in. diameter, 11 miles)	$4,476,000
TOTAL COST OF FACILITIES	**$5,361,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$1,653,000
Environmental and Archaeology Studies and Mitigation	$298,000
Land Acquisition and Surveying (142 acres)	$511,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$216,000
TOTAL COST OF PROJECT	**$8,039,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$566,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$45,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$22,000
Pumping Energy Costs (1,723,673 kWh at 0.08 $/kWh)	$138,000
TOTAL O&M	$205,000
TOTAL ANNUAL COST	**$771,000**

COST ESTIMATE SUMMARY	
ERHWSC - FM 2925 WATER TRANSMISSION LINE	
Item	**Estimated Costs for Facilities**
Available Project Yield (acft/yr)	**30**
Annual Cost of Water ($ per acft)	**$25,700**
Annual Cost of Water After Debt Service ($ per acft)	**$6,833**
Annual Cost of Water ($ per 1,000 gallons)	**$78.86**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$20.97**

Surface WTP Phase I

Project Source

This strategy was submitted by ERHWSC to the RWPG during the 2016 Regional Water Planning process.

Description

This strategy is to construct a new surface WTP just west of Rio Hondo and pipeline so that raw water would be pumped from Harlingen ID. The pipeline would reduce losses currently experienced in conveyance to treatment, and treatment capacity will be sufficient to handle current and future surface water rights.

Available Supply

The pump station and treatment plant would be designed for 5 mgd capacity. The plant will treat approximately 3,200 acft/yr of water rights currently owned by ERHWSC, and an estimated 800 acft/yr of additional water rights available through conversion of irrigation water rights. For the intents and purposes of the plan, the 800 acft/yr is accounted for in the supply balance.

Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, land acquisition, and pipeline ROW and water treatment for Phase I of the strategy. It is assumed that the construction period for this strategy is 1 year for Phase I. Table 5.3-38 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

The availability of surface water rights required to supply the treatment plant is a potential implementation issue.

Table 5.3-38 ERHWSC - Surface WTP Phase I Project Requirements and Costs

COST ESTIMATE SUMMARY	
ERHWSC - Surface WTP Phase I	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station (3.8 mgd)	$3,827,000
Transmission Pipeline (36 in. diameter, 5 miles)	$6,702,000
WTP Upgrade	$22,317,000
TOTAL COST OF FACILITIES	**$32,846,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$11,161,000
Environmental and Archaeology Studies and Mitigation	$150,000
Land Acquisition and Surveying (68 acres)	$246,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,222,000
TOTAL COST OF PROJECT	**$45,625,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,210,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$67,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$96,000
WTP	$1,666,000
Pumping Energy Costs (416,843 kWh at 0.08 $/kWh)	$35,000
Purchase of Water (800 acft/yr at 2040 $/acft)	$1,632,000
TOTAL O&M	$3,496,000
TOTAL ANNUAL COST	**$6,706,000**
Available Project Yield (acft/yr)	**4,000**
Annual Cost of Water ($ per acft)	**$1,677**
Annual Cost of Water After Debt Service ($ per acft)	**$874**
Annual Cost of Water ($ per 1,000 gallons)	**$5.14**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.68**

North Cameron Regional WTP Well Field Expansion

Project Source

This strategy was submitted by ERHWSC to the RWPG on behalf of ERHWSC and North Alamo Water Supply Corporation (NAWSC).

Description

This strategy is for the addition of a groundwater well and a 16-inch, 10.5 mile transmission line to increase the brackish water supply to the existing North Cameron Regional RO WTP. The WTP would be located between the cities of Santa Rosa and Combes, increasing supplies to both the NAWSC and ERHWSC systems. ERHWSC's share of the supply would be delivered by the Bean Road Transmission Line.

Available Supply

The North Cameron WSC desalination plant currently treats 1.15 mgd of brackish water supplied by one groundwater well. The WTP has the capacity to treat 2.30 mgd raw water, and this strategy would supply the additional 1.15 mgd of brackish water needed to bring the plant to full capacity. No additional treatment is necessary. ERHWSC would receive 400 acft/yr from the expansion and NAWSC would receive 800 acft/yr. Assuming an RO efficiency of 80%, this strategy would require pumping 1,500 acft/yr of raw water, resulting in the 1,200 acft/yr yield (20% water loss).

Engineering and Costing

Capital costs from the UCM for this strategy include groundwater well pumping, well field piping, transmission line, land acquisition, and permitting. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Table 5.3-39 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

Table 5.3-39 ERHWSC and NAWSC - North Regional WTP Well Field Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
ERHWSC AND NAWSC - NORTH CAMERON REGIONAL WSC WELL FIELD EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
Transmission Pipeline (16 in dia., 10.5 miles)	$5,790,000
Well Fields (wells, pumps, and piping)	$1,257,000
Integration	$300,000

COST ESTIMATE SUMMARY	
ERHWSC AND NAWSC - NORTH CAMERON REGIONAL WSC WELL FIELD EXPANSION	
TOTAL COST OF FACILITIES	**$7,347,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$2,282,000
Environmental and Archaeology Studies and Mitigation	$294,000
Land Acquisition and Surveying (6 acres)	$489,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$287,000
TOTAL COST OF PROJECT	**$10,699,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$753,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$73,000
Water Treatment Plant	$1,080,000
Pumping Energy Costs (352,615 kW-hr @ 0.08 $/kW-hr)	$28,000
TOTAL O&M	$1,181,000
TOTAL ANNUAL COST	**$1,934,000**
Available Project Yield (acft/yr)	**1,200**
Annual Cost of Water ($ per acft)	**$1,612**
Annual Cost of Water After Debt Service ($ per acft)	**$984**
Annual Cost of Water ($ per 1,000 gallons)	**$4.95**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.02**

El Jardin Water Supply Corporation

El Jardin WSC shows a need in every decade (Table 5.3-40); recommended WMSs are shown in Table 5.3-41.

Table 5.3-40 El Jardin WSC Existing Supply Balance (acft/yr)

EL JARDIN WSC	2020	2030	2040	2050	2060	2070
Supplies	1,500	1,500	1,500	1,500	1,500	1,500
Demand	1,526	1,729	1,945	2,191	2,456	2,732

Need(-)/Surplus(+)	(26)	(2290	(445)	(691)	(956)	(1,232)

Table 5.3-41 El Jardin WSC WMS Supplies (acft/yr)

EL JARDIN WSC	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	71	189	331
Conversion of Water Rights	23	114	219	329	458	553
ID Improvements – Brownsville ID	119	162	204	246	288	330
Distribution Pipeline Replacement	11	11	11	11	11	11
Municipal Drought Management	50	58	66	75	85	94
New Supplies from WMS	**163**	**313**	**476**	**715**	**1,022**	**1,320**
WUG Balance After WMS	**176**	**116**	**55**	**41**	**74**	**88**
Alternative WMS*						
Brownsville – Seawater Desalination Demonstration and Implementation	0	108	108	108	1,081	1,081
*Alternative WMS are evaluated in Section 5.4						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. El Jardin WSC's 2011 GPCD was estimated at 109, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Distribution Pipeline Replacement

Project Source

This strategy was submitted by El Jardin WSC to the RWPG.

Description

This strategy is to replace approximately 313,910 linear feet of substandard water mains within the existing distribution system. The corporation's distribution system was constructed in the mid-1960s and many of the original pipes are still being used today. This strategy would replace many of the 2, 3, 4, and 6-inch pipes that are leaking and possibly broken with 8-inch polyvinyl chloride (PVC) pipe.

Available Supply

El Jardin WSC estimates that at least 3.6 million gallons of treated water could be saved each year with this strategy.

Engineering and Costing

Costs for this strategy from the UCM only include the cost of pipeline. It is assumed that the construction period for this strategy is 1 year. Table 5.3-42 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No significant implementation issues are associated with this strategy. Permits would be required by Cameron County and TX DOT.

Table 5.3-42 El Jardin WSC - Distribution Pipeline Replacement Project Requirements and Costs

COST ESTIMATE SUMMARY	
EL JARDIN WSC – DISTRIBUTION PIPELINE REPLACEMENT	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Transmission Pipeline (8 in. diameter, 65 miles)	$13,579,000
TOTAL COST OF FACILITIES	**$13,579,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,074,000
Environmental and Archaeology Studies and Mitigation	$1,619,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$530,000
TOTAL COST OF PROJECT	**$19,802,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,393,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$136,000
Pumping Energy Costs (1,609,567 kWh at 0.08 $/kWh)	$129,000
TOTAL O&M	$265,000
TOTAL ANNUAL COST	**$1,658,000**
Available Project Yield (acft/yr)	**11**
Annual Cost of Water ($ per acft)	**$150,727**
Annual Cost of Water After Debt Service ($ per acft)	**$24,091**
Annual Cost of Water ($ per 1,000 gallons)	**$463**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$73.92**

Harlingen

Harlingen (i.e. Harlingen Water Works System) shows a need from 2050 onward (Table 5.3-43); recommended WMSs are shown in Table 5.3-44.

Table 5.3-43 Harlingen Existing Supply Balance (acft/yr)

HARLINGEN	2020	2030	2040	2050	2060	2070
WUG Demand	15,797	17,992	20,088	22,212	24,412	27,160
East Rio Hondo WSC – Contract Demand	244	244	244	244	244	244
East Rio Hondo WSC – Interconnect	112	112	112	0	0	0
Manufacturing, Cameron – Contract Demand	150	150	150	150	150	150
Harlingen ID	30	30	30	30	30	30
Demand	**16,313**	**18,508**	**20,604**	**22,616**	**24,816**	**27,564**
Supplies	**21,444**	**21,443**	**21,443**	**21,331**	**21,331**	**21,330**
Need/Surplus	**5,131**	**2,935**	**839**	**(1,285)**	**(3,485)**	**(6,234)**

Table 5.3-44 Harlingen WMS Supplies (acft/yr)

HARLINGEN	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	960	2,164	3,215	4,519	6,097
ID Improvements - Harlingen ID No. 1	1,250	1,889	2,528	3,168	3,807	4,446
Conversion of Water Rights	0	0	0	275	675	1,325
New Supplies from WMS	**1,250**	**2,849**	**4,692**	**6,658**	**9,001**	**11,868**
WUG Balance After WMS	**6,411**	**5,814**	**5,561**	**5,406**	**5,549**	**5,667**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Harlingen's 2011 GPCD was estimated at 168, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

La Feria

The City of La Feria does not have projected needs in any decade (Table 5.3-45); however, recommended WMSs are shown in Table 5.3-46.

Table 5.3-45 La Feria Existing Supply Balance (acft/yr)

LA FERIA	2020	2030	2040	2050	2060	2070
Supplies	1,300	1,400	1,500	1,700	2,000	2,200
Demand	1,125	1,274	1,432	1,612	1,808	2,011
Need(-)/Surplus(+)	**175**	**126**	**68**	**88**	**192**	**189**

Table 5.3-46 La Feria WMS Supplies (acft/yr)

LA FERIA	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	51	139	244
ID Improvements - La Feria ID	383	383	383	383	383	383
Water Well with RO Unit	0	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**383**	**1,503**	**1,503**	**1,554**	**1,642**	**1,747**
WUG Balance After WMS	**558**	**1,629**	**1,571**	**1,642**	**1,834**	**1,936**
Alternative WMS*						
Non-Potable Wastewater Effluent Reuse	0	50	200	400	600	800
*Alternative WMS are evaluated in Section 5.4						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. La Feria's 2011 GPCD was estimated at 126, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Water Well with RO Unit

Project Source

This strategy was submitted by the City of La Feria to the RWPG.

Description

This strategy is to provide additional drinking water supply to the City of La Feria WTP with the installation of a groundwater well and high-pressure RO system. Water produced from the RO system will then go to the city's WTP for conventional treatment. A location adjacent to the WTP is proposed for the well to limit the well field piping that is needed. The city has already drilled a pilot well and confirmed that water supply is available at approximately 500 feet below ground surface. This strategy is anticipated for the 2030 decade.

Available Supply

On the basis of the pilot well information, the city believes the groundwater well can pump 1.25 mgd to produce 1.0 mgd of water from the RO unit. Based on the approval of the Non-MAG portion of Cameron County, La Feria would be able to access 1,120 acft/yr. Assuming an RO efficiency of 80%, this strategy would require pumping 1,400 acft/yr of raw water, resulting in the 1,120 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is one year. Table 5.3-47 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

Table 5.3-47 La Feria - Water Well with RO Unit Project Requirements and Costs

COST ESTIMATE SUMMARY	
LA FERIA – WATER WELL WITH RO UNIT	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$790,000
WTP (1 mgd)	$4,914,000
TOTAL COST OF FACILITIES	**$5,704,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$1,997,000
Environmental and Archaeology Studies and Mitigation	$28,000
Land Acquisition and Surveying (1 acre)	$20,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$214,000
TOTAL COST OF PROJECT	**$7,413,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$560,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$8,000
WTP	$957,000
Pumping Energy Costs (284,452 kW-hr @ 0.08 $/kW-hr)	$23,000
TOTAL O&M	$988,000

COST ESTIMATE SUMMARY	
LA FERIA – WATER WELL WITH RO UNIT	
Item	Estimated Costs for Facilities
TOTAL ANNUAL COST	$1,548,000
Available Project Yield (acft/yr)	1,120
Annual Cost of Water ($ per acft)	$1,382
Annual Cost of Water After Debt Service ($ per acft)	$882
Annual Cost of Water ($ per 1,000 gallons)	$4.24
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$2.71

Laguna Madre Water District

Laguna Madre Water District has needs in all decades (Table 5.3-48); WMSs recommended to address these needs are shown in Table 5.3-49.

Table 5.3-48 Laguna Madre Water District Existing Supply Balance (acft/yr)

LAGUNA MADRE WATER DISTRICT	2020	2030	2040	2050	2060	2070
WUG Demand	7,930	9,179	10,461	11,865	13,330	14,835
Demand	7,930	9,179	10,461	11,865	13,330	14,835
Supplies	7,513	7,513	7,513	7,513	7,513	7,513
Need/Surplus	(417)	(1,666)	(2,948)	(4,352)	(5,817)	(7,322)

Table 5.3-49 Laguna Madre Water District WMS Supplies (acft/yr)

LAGUNA MADRE WATER DISTRICT	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	129	936	1,917	3,077	4,395	5,840
Conversion of Water Rights	373	682	869	980	976	886
Drought Management	130	152	174	198	223	248
Port Isabel Water Reclamation Facility Potable Reuse	0	627	892	892	892	892
Seawater Desalination Plant	0	0	0	1,120	1,120	1,120
WTP No. 1 Expansion and Process Improvements	2,352	2,352	2,352	2,352	2,352	2,352
New Supplies from WMS	2,983	4,749	6,204	8,620	9,958	11,338

LAGUNA MADRE WATER DISTRICT	2020	2030	2040	2050	2060	2070
WUG Balance After WMS	2,566	3,083	3,256	4,268	4,141	4,016

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Laguna Madre Water District's 2011 GPCD was estimated at 386 GPCD, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until it decreases to 140 GPCD.

Port Isabel Water Reclamation Facility Potable Reuse

Project Source

This strategy was submitted by Laguna Madre Water District to the RWPG.

Description

In 2019, Laguna Madre Water District completed modifications to the Port Isabel Wastewater Treatment Facility. Modifications included headworks, conversion of aeration basins from coarse air to fine air bubble diffusers including a new blower, a new pump station to replace air lift pumps and improve process control, & complete replacement of an aged electrical system. Improvements also included an Outfall extension from the sewer plant to discharge directly to the Laguna Madre Bay. Prior to the outfall extension, the sewer plant discharged to a tidal mud flat that had strict effluent limitations for zinc and copper. Once the outfall extension was complete, zinc and copper effluent limitations were removed from the permit entirely. These improvements are intended to produce a suitable effluent to feed a proposed advanced water treatment facility. A potential benefit is that an outfall extension is now available in Port Isabel to receive future industrial discharge for concentrate disposal via a desalination process. The submitted strategy includes a proposed advanced water treatment facility to recycle the WWTF effluent. Figure 5.3-6 depicts the location of the Port Isabel Water Reclamation Facility and connection with Laguna Madre Water District's WTP No. 2.

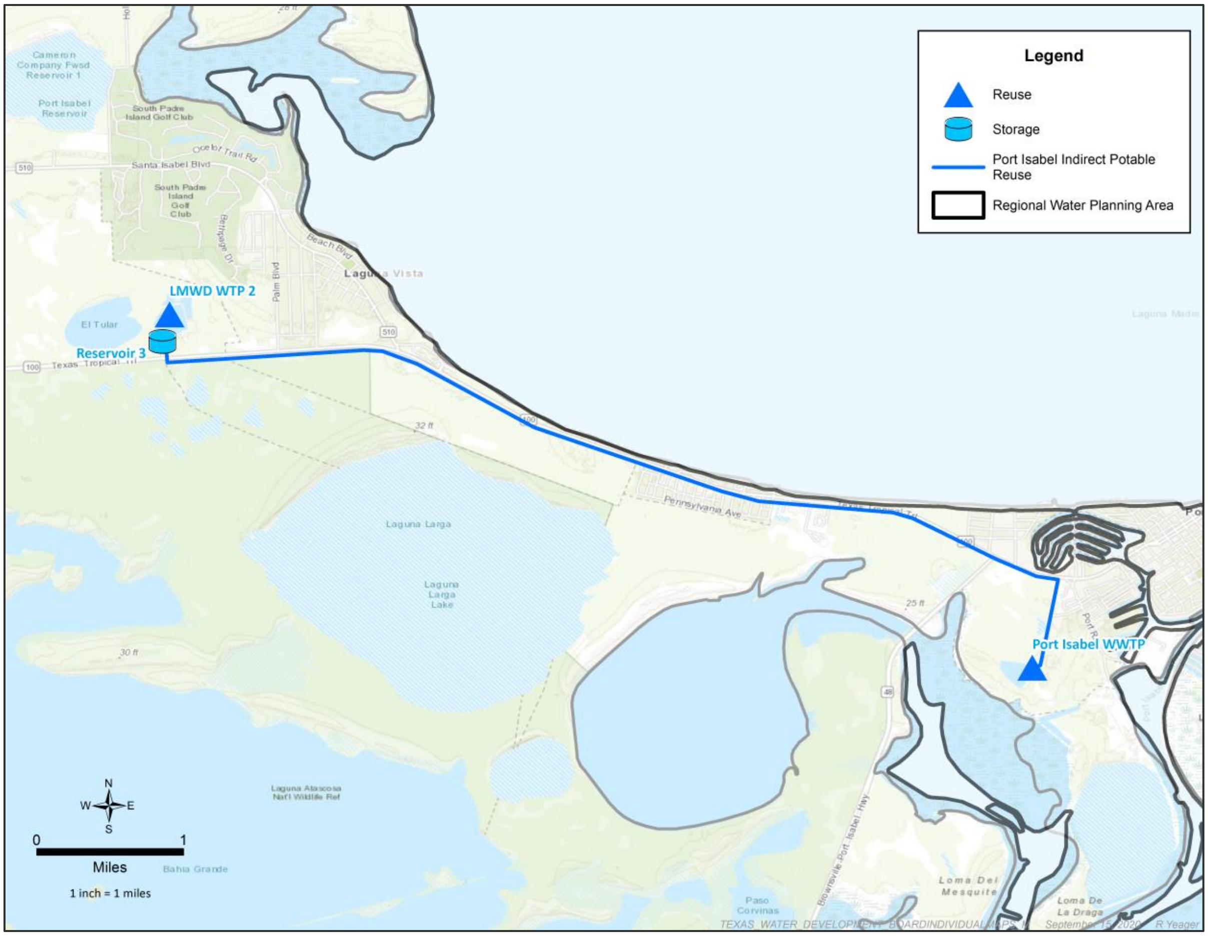

Figure 5.3-6 Port Isabel Water Reclamation Facility Location

Available Supply

Laguna Madre Water District anticipates the advanced water treatment facility will supply 627 acft/yr of water in the 2030 decade, increasing to 892 acft/yr in the 2040 decade. The initial supply of 627 acft/yr is based on existing discharge at the Port Isabel WWTP, and 892 acft/yr is based on 2040 population demand and water treatment plant expansion from 1.1 mgd to 2.0 mgd (not included in the RWP).

Engineering and Costing

This strategy includes the proposed advanced water treatment facility. Costs were provided by Laguna Madre Water District and processed through the UCM. Table 5.3-50 outlines the estimated costs and project requirements for this strategy.

Implementation Issues

Implementation of a direct potable reuse project would require approval of treatment goals and proposed treatment process by the TCEQ, and determining the feasibility of treatment residuals disposal at each site. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met.

Table 5.3-50 Laguna Madre Water District - Port Isabel Water Reclamation Facility Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAGUNA MADRE WATER DISTRICT – PORT ISABEL WATER RECLAMATION FACILITY POTABLE REUSE	
Item	**Estimated Costs for Facilities**
Upgrade to WWTF for Advanced Water Treatment	$3,025,000
TOTAL COST OF FACILITIES	**$3,025,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$1,059,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$113,000
TOTAL COST OF PROJECT	**$4,197,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$295,000
O&M	
Wastewater Treatment Facility	$30,000
TOTAL O&M	$30,000
TOTAL ANNUAL COST	**$325,000**
Available Project Yield (acft/yr)	**892**
Annual Cost of Water ($ per acft)	**$364**
Annual Cost of Water After Debt Service ($ per acft)	**$34**
Annual Cost of Water ($ per 1,000 gallons)	**$1.12**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.10**

Seawater Desalination Plant

Project Source

This strategy was submitted by Laguna Madre Water District during the 2021 regional water planning process.

Description

This strategy is for the full implementation of the 1.0 mgd seawater desalination pilot study conducted and completed in August 2010. This strategy includes full-scale components like the intake system, concentrate disposal system, and land acquisition. Due to other projects and financial priorities, these project is anticipated for the 2050 decade.

Available Supply

This strategy would improve the seawater desalination pilot study facility to provide a supply of 1.0 mgd of drinking water.

Engineering and Costing

This strategy includes an intake structure, piping, land acquisition, and treatment with the capacity to expand to 2.0 mgd. Table 5.3-51 outlines the estimated costs and project requirements for the Seawater Desalination Treatment Plant.

Implementation Issues

Financing a full-scale seawater desalination facility is a major implementation issue. A 12-month, 1 mgd pilot plant study was completed in December 2009 with a final report published in August 2010 by NRS Engineering Water Solutions (TWDB, 2019).

Table 5.3-51 Laguna Madre Water District - Seawater Desalination Plant Cost Estimate Summary

COST ESTIMATE SUMMARY	
LAGUNA MADRE WATER DISTRICT – SEAWATER DESALINATION	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station (2.1 mgd)	$3,366,000
Transmission Pipeline (12 in. diameter, 0.19 miles)	$68,000
Seawater Treatment Plants (1 mgd)	$25,190,000
TOTAL COST OF FACILITIES	**$28,624,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$10,015,000
Environmental and Archaeology Studies and Mitigation	$24,000
Land Acquisition and Surveying (8 acres)	$30,000
Interest During Construction (3 percent for 1.5 years with a 0.5 percent ROI)	$1,597,000
TOTAL COST OF PROJECT	**$40,290,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,835,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$1,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$84,000
WTP	$3,467,000
Pumping Energy Costs (242,199 kWh at 0.08 $/kWh)	$19,000

COST ESTIMATE SUMMARY	
LAGUNA MADRE WATER DISTRICT – SEAWATER DESALINATION	
Item	**Estimated Costs for Facilities**
TOTAL O&M	$3,571,000
TOTAL ANNUAL COST	**$6,406,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$5,720**
Annual Cost of Water After Debt Service ($ per acft)	**$3,188**
Annual Cost of Water ($ per 1,000 gallons)	**$17.55**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$9.78**

WTP No. 1 Expansion and Process Improvements

Project Source

This strategy was submitted during the 2021 regional water planning process.

Description

Laguna Madre Water District WTP No. 2 is currently struggling to meet demands, and Laguna Madre Water District requires the out-of-service WTP No. 1 to be upgraded to assist in meeting current and future demands. WTP No. 1 is expected to return to service once chlorine dioxide disinfection is implemented but does not have the filtration units to match the water quality of WTP No. 2. This strategy is to upgrade the water treatment process for WTP No. 1 with: a new filtration system; replacement of raw water transfer pump station; replacement of raw water and high service pumps; rehabilitation of two solids contact clarifiers; replacement of existing rapid san filtration basins with a membrane filtration system; and replacement of two existing ground storage tanks with a single prestressed concrete tank. Lastly, improvements would increase capacity of WTP No. 1 from 2.9 to 5.0 mgd to meet future demands.

Available Supply

This strategy would enable an additional supply of 2,352 acft/yr in the 2020 decade. However, during drought conditions would require Conversion of Water Rights.

Engineering and Costing

This strategy includes a WTP expansion, a pump station, raw water and high service pumps, facility rehabilitation, sand filtration basins, and a prestressed concrete tank. Costs were provided by Laguna Madre Water District and processed through the UCM. It is assumed that the construction period for each phase is one year. A unit capital cost of $3,000 per acft has been estimated as the market value for water rights. Table 5.3-51 outlines the estimated costs and project requirements for the WTP No. 1 Process Improvements.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-52 Laguna Madre Water District – WTP No. 1 Expansion and Process Improvements Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAGUNA MADRE WATER DISTRICT – WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Water Treatment Improvements (Described Above)	$15,100,000
TOTAL COST OF FACILITIES	**$15,100,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$5,285,000
Environmental and Archaeology Studies and Mitigation	$3,000
Land Acquisition and Surveying (8 acres)	$4,000
Interest During Construction (3 percent for 1.5 years with a 0.5 percent ROI)	$561,000
TOTAL COST OF PROJECT	**$20,953,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,474,000
O&M	
Water Treatment Plant and Associated Facilities	$751,000
Pumping Energy Costs (1,608,390 kWh at 0.08 $/kWh)	$129,000
TOTAL O&M	$880,000
Purchase of Water (2,352 acft/yr @ 3,000 $/acft)	$7,056,000
TOTAL ANNUAL COST	**$9,410,000**
Available Project Yield (acft/yr)	**2,352**
Annual Cost of Water ($ per acft)	**$4,001**
Annual Cost of Water After Debt Service ($ per acft)	**$3,374**
Annual Cost of Water ($ per 1,000 gallons)	**$12.28**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$10.35**

Los Fresnos

Los Fresnos does not have a need (Table 5.3-53); however, WMSs are listed in Table 5.3-54. Advanced Municipal Water Conservation is technically recommended for all WUGs, however the target savings is 0 acft/yr for all decades.

Table 5.3-53 Los Fresnos Existing Supply Balance (acft/yr)

LOS FRESNOS	2020	2030	2040	2050	2060	2070
Supplies	981	981	981	981	981	981
Demand	442	516	592	673	756	842
Need(-)/Surplus(+)	**539**	**465**	**389**	**308**	**225**	**139**

Table 5.3-54 Los Fresnos WMS Supplies (acft/yr)

LOS FRESNOS	2020	2030	2040	2050	2060	2070
ID Improvements - CCID No. 6	80	95	111	126	142	157
WTP Expansion (1.0 to 1.5 mgd) – Requires Conversion of Water Rights	560	560	560	560	560	560
New Supplies from WMS	**640**	**655**	**671**	**686**	**702**	**717**
WUG Balance After WMS	**1,180**	**1,121**	**1,061**	**995**	**928**	**857**

WTP Expansion (1.0 to 1.5 mgd)

Project Source

This strategy was submitted during the 2021 regional water planning process.

Description

Los Fresnos is currently not in compliance with the TCEQ and this strategy is to resolve that issue with process improvements and expanding the WTP from 1.0 mgd to 1.5 mgd. Facilities that will need to be replaced or upgraded include: transfer pump replacement between Reservoir 1 and Reservoir 2; raw water pump replacement from the sedimentation basin to the multi-media filters; additional flocculator between rapid mix basin and existing flocculator; two additional dual media filters; rehabilitation of the 128,000-gallon storage tank; and replacement of three distribution pump.

Available Supply

This strategy would enable an additional supply of 560 acft/yr in the 2020 decade. Los Fresnos reported that they do not need additional water rights at this time. However, if needed, they confirmed options to purchase from local IDs (CCID#6; CCID#10; and Bayview ID).

Engineering and Costing

This strategy includes a WTP expansion. Costs were provided by Los Fresnos and processed through the UCM. It is assumed that the construction period for each phase is one year. A unit capital cost of $3,000 per acft has been estimated as the market value for water rights, if needed. Table 5.3-55 outlines the estimated costs and project requirements for the WTP Expansion.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-55 Los Fresnos – WTP Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
LOS FRESNOS – WTP EXPANSION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Water Treatment Improvements (Described Above)	$2,770,000
TOTAL COST OF FACILITIES	**$2,770,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$970,000
Environmental and Archaeology Studies and Mitigation	$1,000
Land Acquisition and Surveying (8 acres)	$1,000
Interest During Construction (3 percent for 1.5 years with a 0.5 percent ROI)	$103,000
TOTAL COST OF PROJECT	**$3,845,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$270,000
O&M	
Water Treatment Plant	$375,000
Pumping Energy Costs (1,608,390 kWh at 0.08 $/kWh)	$129,000
TOTAL O&M	$504,000
Purchase of Water (560 acft/yr @ 3,000 $/acft)	$1,680,000
TOTAL ANNUAL COST	**$2,454,000**
Available Project Yield (acft/yr)	**560**
Annual Cost of Water ($ per acft)	**$4,382**
Annual Cost of Water After Debt Service ($ per acft)	**$3,900**
Annual Cost of Water ($ per 1,000 gallons)	**$13.45**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$11.97**

Military Highway Water Supply Corporation

Military Highway WSC has needs beginning in 2030 (Table 5.3-56); recommended WMSs are listed in Table 5.3-57.

Table 5.3-56 Military Highway WSC Existing Supply Balance (acft/yr)

MILITARY HIGHWAY WSC	2020	2030	2040	2050	2060	2070
WUG Demand	6,504	7,639	8,817	10,076	11,389	12,711
San Juan - Contract Demand	35	35	35	35	35	35
Demand	**6,539**	**7,674**	**8,852**	**10,111**	**11,424**	**12,746**
Supplies	**7,654**	**7,654**	**7,654**	**7,654**	**7,654**	**7,654**
Need/Surplus	**1,115**	**(20)**	**(1,198)**	**(2,457)**	**(3,770)**	**(5,092)**

Table 5.3-57 Military Highway WSC WMS Supplies (acft/yr)

MILITARY HIGHWAY WSC	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	302	757	1,350	2,048
Conversion of Water Rights	100	844	1,457	1,998	2,455	3,079
ID Improvements - Harlingen ID No. 1	38	57	77	96	116	135
Municipal Drought Management	0	198	231	266	301	336
New Supplies from WMS	**138**	**1,099**	**2,067**	**3,117**	**4,222**	**5,598**
WUG Balance After WMS	**1,176**	**1,002**	**792**	**583**	**375**	**429**
Alternative WMS*						
Expand Existing Groundwater Wells (Hidalgo County)	247	247	247	617	617	617
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Military Highway WSC's 2011 GPCD was estimated at 144, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

North Alamo Water Supply Corporation (NAWSC)

NAWSC has a need in every decade (Table 5.3-58); recommended WMSs are listed in Table 5.3-59.

Table 5.3-58 NAWSC Existing Supply Balance (acft/yr)

NAWSC	2020	2030	2040	2050	2060	2070
WUG Demand	28,197	34,079	40,106	46,280	52,554	58,701
Port Mansfield PUD - Contract Demand	98	98	98	98	98	98
Primera - Contract Demand	205	205	205	205	205	205
San Juan - Contract Demand	1,687	1,687	1,687	1,687	1,687	1,687
Demand	**30,187**	**36,069**	**42,097**	**48,270**	**54,544**	**60,691**
Supplies	**24,378**	**24,579**	**24,579**	**24,579**	**24,579**	**24,579**
Need/Surplus	**(5,809)**	**(11,489)**	**(17,516)**	**(23,691)**	**(29,965)**	**(36,112)**

Table 5.3-59 NAWSC WMS Supplies (acft/yr)

NAWSC	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	1,346	3,089	5,449	8,378	11,743
Conversion of Water Rights Only	5,061	6,678	8,872	16,605	19,572	21,981
Delta Area Brackish Groundwater Desalination Plant	0	2,240	2,240	2,240	2,240	2,240
Delta WTP Expansion – Requires Conversion of Water Rights	0	0	4,480	6,160	6,160	6,160
ID Improvements - H&CCID No. 9	165	290	414	538	662	786
ID Improvements - HCID No. 1	69	92	117	141	165	189
ID Improvements - HCID No. 2	13	88	164	239	314	390
ID Improvements - Santa Cruz ID	48	65	83	100	117	135
Municipal Drought Management	759	935	1,112	1,290	1,467	1,640
North Cameron Regional WTP Wellfield Expansion	0	800	800	800	800	800
New Supplies from WMS	**6,115**	**12,534**	**21,370**	**33,561**	**39,875**	**46,064**
WUG Balance After WMS	**565**	**1,045**	**3,853**	**9,870**	**9,910**	**9,952**
Alternative WMS*						
Expansion of WTP No. 5	1,120	4,480	4,480	4,480	4,480	4,480
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. NAWSC's 2011 GPCD was estimated at 153, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Delta Area Brackish Groundwater Desalination Plant

Project Source

This strategy was originally recommended during the 2016 regional water planning process, which initially had an implementation decade of 2060. NAWSC submitted this strategy for recommendation after the submission of the 2021 Region M Initially Prepared Plan due to expedited implementation by the 2030 decade.

Description

As provided by NAWSC, the Delta Area Brackish Groundwater Desalination Plant will pump 2,800 acft/yr from the Gulf Coast Aquifer in Willacy County. This strategy will serve the residents of Hargill, Monte Alto, La Sara, and surrounding areas in NAWSC's service area.

Available Supply

Assuming an 80% membrane recovery rate – pumping 2,800 acft/yr of raw water, the Delta Area Brackish Groundwater Desalination Plant would produce 2,240 acft/yr beginning in the 2030 decade.

Engineering and Costing

Costs for this strategy from the UCM include the desalination plant and well field. It is assumed that the construction period for each phase is two years. Table 5.3-61 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of groundwater well(s) and piping may also include purchase of land and a TXDOT right-of-way permit.

Table 5.3-60 NAWSC - Delta Area Brackish Groundwater Desalination Plant Project Requirements and Costs

COST ESTIMATE SUMMARY	
NAWSC – DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$2,097,000
water Treatment Plant (2 MGD)	$18,313,000
TOTAL COST OF FACILITIES	**$20,410,000**

COST ESTIMATE SUMMARY	
NAWSC – DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	
Item	**Estimated Costs for Facilities**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$7,143,000
Environmental & Archaeology Studies and Mitigation	$34,000
Land Acquisition and Surveying (8 acres)	$27,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$760,000
TOTAL COST OF PROJECT	**$28,374,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,996,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$21,000
Water Treatment Plant	$2,454,000
TOTAL O&M	$2,475,000
TOTAL ANNUAL COST	**$4,471,000**
Available Project Yield (acft/yr)	**2,240**
Annual Cost of Water ($ per acft)	**$1,996**
Annual Cost of Water After Debt Service ($ per acft)	**$1,105**
Annual Cost of Water ($ per 1,000 gallons)	**$6.12**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.39**

Delta WTP Expansion (Phase I/II)

Project Source

This strategy was submitted by NAWSC to the RWPG during the 2016 Regional Water Planning Process.

Description

This strategy is for the expansion of Delta WTP. The expansion would serve residents within the Edcouch, Elsa, La Villa, Monte Alto, and surrounding areas. It would also provide the NAWSC the ability to utilize other water districts as a source of push water for delivery of water in times of drought.

Available Supply

The expansion of Delta WTP would provide NAWSC with the ability to treat an additional 4,480 acft/yr of drinking water in Phase I, and 6,160 acft/yr in Phase II. Phase I would be constructed in 2040 and Phase II would occur in 2050. Conversion of Water Rights is required for this supply.

Engineering and Costing

Costs for this strategy from the UCM include the WTP expansion and purchase of water rights. It is assumed that the construction period for each phase is one year. A unit capital cost of $3,000 per acft has been estimated as the market value for water rights. Table 5.3-61 outlines the project requirements and cost estimate developed in UCM for Phase I, and Phase II is presented in Table 5.3-62.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-61 NAWSC - Delta WTP Expansion Phase I Project Requirements and Costs

COST ESTIMATE SUMMARY	
NAWSC – DELTA WTP EXPANSION PHASE I	
Item	Estimated Costs for Facilities
CAPITAL COST	
WTP Upgrade	$12,109,000
TOTAL COST OF FACILITIES	**$12,109,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,238,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$450,000
TOTAL COST OF PROJECT	**$16,797,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,182,000
O&M	
WTP	$972,000
TOTAL O&M	$972,000
Purchase of Water (4,480 acft/yr at 3,000 $/acft)	$13,440,000
TOTAL ANNUAL COST	**$15,594,000**
Available Project Yield (acft/yr)	**4,480**
Annual Cost of Water ($ per acft)	**$3,481**
Annual Cost of Water After Debt Service ($ per acft)	**$3,217**
Annual Cost of Water ($ per 1,000 gallons)	**$10.68**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$9.87**

Table 5.3-62 NAWSC - Delta WTP Expansion Phase II Project Requirements and Costs

COST ESTIMATE SUMMARY	
NAWSC – DELTA WTP EXPANSION PHASE II	
Item	Estimated Costs for Facilities
CAPITAL COST	
WTP Upgrade	$7,211,000
TOTAL COST OF FACILITIES	**$7,211,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$2,524,000
Environmental and Archaeology Studies and Mitigation	$2,000
Land Acquisition and Surveying (1 acres)	$3,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$268,000
TOTAL COST OF PROJECT	**$10,008,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$704,000
O&M	
WTP	$681,000
TOTAL O&M	$681,000
Purchase of Water (6160 acft/yr @ $3000/acft)	$18,480,000
TOTAL ANNUAL COST	**$19,865,000**
Available Project Yield (acft/yr)	**6,160**
Annual Cost of Water ($ per acft)	**$3,225**
Annual Cost of Water After Debt Service ($ per acft)	**$3,111**
Annual Cost of Water ($ per 1,000 gallons)	**$9.90**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$9.54**

North Cameron Regional WTP Wellfield Expansion

Project Source

This strategy was submitted by ERHWSC on behalf of both ERHWSC and NAWSC. See ERHWSC for details.

Olmito Water Supply Corporation

Olmito WSC has needs beginning in 2030 (Table 5.3-63); recommended WMSs are shown in Table 5.3-64.

Table 5.3-63 Olmito WSC Existing Supply Balance (acft/yr)

OLMITO WSC	2020	2030	2040	2050	2060	2070
Supplies	1,299	1,299	1,299	1,299	1,299	1,299
Demand	1,159	1,321	1,490	1,682	1,888	2,100
Need(-)/Surplus(+)	**92**	**(70)**	**(239)**	**(431)**	**(637)**	**(849)**

Table 5.3-64 Olmito WSC WMS Supplies (acft/yr)

OLMITO WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	73	189	275	383	507
ID Improvements - CCID No. 6	118	140	163	186	209	231
Municipal Drought Management	0	31	35	40	45	50
New Biolac WWTP	290	330	373	421	472	525
WTP Expansion – Requires Conversion of Water Rights	1,120	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**1,528**	**1,707**	**1,946**	**2,213**	**2,499**	**2,791**
WUG Balance After WMS	**1,620**	**1,637**	**1,707**	**1,782**	**1,862**	**1,942**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Olmito WSC's 2011 GPCD was estimated at 175, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

New Biolac WWTP

Project Source

This strategy was submitted by Olmito WSC to the RWPG during the 2021 regional water planning process.

Description

This strategy is to construct a new Biolac® WWTP (1.25 mgd) to replace the current Lagoon Wastewater Treatment System (0.75 mgd). As described by Parkson, the Biolac® system "eliminates" several wastewater processes and steps to: 1) increase hydraulic retention times; 2) produce "single-digit effluent" parameters; 3) "simplifies nitrogen removal"; and 4) produces minimal stable biosolids that need no further treatment. Converse to the lagoon, the Biolac® WWTP would not only increase Olmito WSC's wastewater capacity from 2,854 to 4,166 connections, but also enable treatment for non-potable use.

Available Supply

While the new Biolac® WWTP enables treatment of 1.25 mgd of wastewater, based on demand, the WWTP would generate approximately 290 acft/yr of non-potable reuse beginning in the 2020 decade, increasing to 525 acft/yr by 2070.

Engineering and Costing

Costs for this strategy from the UCM include the Biolac® WWTP (1.25 mgd). Costs were provided by Olmito WSC, adjusted to 2018-dollars, and have been processed through the UCM as summarized in Table 5.3-65.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-65 Olmito WSC – New Biolac WWTP Project Requirements and Costs

COST ESTIMATE SUMMARY	
OLMITO WSC – NEW BIOLAC WWTP	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
New Biolac WWTP	$8,154,000
TOTAL COST OF FACILITIES	**$8,154,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,854,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$303,000
TOTAL COST OF PROJECT	**$11,311,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$796,000
O&M	
Wastewater Treatment Plant	$82,000
TOTAL O&M	$82,000
TOTAL ANNUAL COST	**$878,000**
Available Project Yield (acft/yr)	**525**
Annual Cost of Water ($ per acft)	**$1,672**
Annual Cost of Water After Debt Service ($ per acft)	**$156**

COST ESTIMATE SUMMARY	
OLMITO WSC – NEW BIOLAC WWTP	
Item	Estimated Costs for Facilities
Annual Cost of Water ($ per 1,000 gallons)	**$5.13**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.48**

WTP Expansion

Project Source

This strategy was submitted by Olmito WSC to the RWPG during the 2021 regional water planning process.

Description

This strategy is for the expansion of Olmito WSC's WTP from 2 mgd to 3 mgd. The WTP is currently at an estimated 82% capacity with 2,830 connections. Before Olmito WSC reaches a TCEQ violation of 85% capacity (2,951 connections), Olmito WSC plans to expand their WTP.

Available Supply

The expansion of the WTP would provide Olmito WSC with an additional 1,120 acft/yr, which would require Conversion of Water Rights for this supply. Olmito WSC plans to expand before they reach 85% capacity and so this strategy has an implementation decade of 2020.

Engineering and Costing

Costs for this strategy from the UCM include the WTP expansion and purchase of water rights. It is assumed that the construction period is one year. A unit capital cost of $3,000 per acft has been estimated as the market value for water rights. Table 5.3-66 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-66 Olmito WSC - WTP Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
OLMITO WSC – WTP EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
WTP Expansion (1MGD to 2MGD)	$6,231,000
TOTAL COST OF FACILITIES	**$6,231,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,181,000

COST ESTIMATE SUMMARY	
OLMITO WSC – WTP EXPANSION	
Item	Estimated Costs for Facilities
Environmental & Archaeology Studies and Mitigation	$2,000
Land Acquisition and Surveying (1 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$232,000
TOTAL COST OF PROJECT	**$8,648,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$608,000
O&M	
Water Treatment Plant	$623,000
Pumping Energy Costs (1,608,390 kW-hr @ 0.08 $/kW-hr)	$129,000
TOTAL O&M	$752,000
Purchase of Water (1,120 acft/yr @ 3,000 $/acft)	$3,360,000
TOTAL ANNUAL COST	**$4,720,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$4,214**
Annual Cost of Water After Debt Service ($ per acft)	**$3,671**
Annual Cost of Water ($ per 1,000 gallons)	**$12.93**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$11.27**

Palm Valley

Palm Valley has projected needs in 2070 (Table 5.3-67); WMSs are recommended (Table 5.3-68).

Table 5.3-67 Palm Valley Existing Supply Balance (acft/yr)

PALM VALLEY	2020	2030	2040	2050	2060	2070
Supplies	266	266	266	266	266	213
Demand	250	246	244	244	246	248
Need(-)/Surplus(+)	**16**	**20**	**22**	**22**	**20**	**(35)**

Table 5.3-68 Palm Valley WMS Supplies (acft/yr)

PALM VALLEY	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	12	30	38	48	58

PALM VALLEY	2020	2030	2040	2050	2060	2070
ID Improvements - Harlingen ID No. 1	16	25	33	42	50	59
New Supplies from WMS	**16**	**37**	**63**	**80**	**98**	**117**
WUG Balance After WMS	**32**	**57**	**85**	**102**	**118**	**135**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Palm Valley's 2011 GPCD was estimated at 176, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Primera

Primera has no needs over the planning horizon (Table 5.3-69); however, recommended WMSs are shown in Table 5.3-70.

Table 5.3-69 Primera Existing Supply Balance (acft/yr)

PRIMERA	2020	2030	2040	2050	2060	2070
Supplies	545	545	545	925	995	1,068
Demand	418	467	521	585	655	728
Need(-)/Surplus(+)	**127**	**78**	**24**	**340**	**340**	**340**

Table 5.3-70 Primera WMS Supplies (acft/yr)

PRIMERA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	18	54
Conversion of Water Rights	0	0	0	40	92	129
ID Improvements - Harlingen ID No. 1	21	32	43	53	64	75
Municipal Drought Management	0	0	0	27	30	34
RO WTP with Groundwater Well	0	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**21**	**1,152**	**1,163**	**1,240**	**1,324**	**1,412**
WUG Balance After WMS	**148**	**1,230**	**1,187**	**1,240**	**1,324**	**1,412**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Primera's 2011 GPCD was estimated at 87, and therefore the conservation WMS includes a 0.5 percent annual reduction through the planning horizon.

RO WTP with Groundwater Well

Project Source

This strategy was submitted by the City of Primera to the RWPG.

Description

This strategy is for the construction of a new RO WTP with ground storage and a groundwater well. The City of Primera is currently supplied with drinking water from the North Cameron Regional Water Project WTP and the City of Harlingen. This strategy would allow the City of Primera to have its own drinking water source.

Available Supply

Due to the approval and increased availability of the Non-MAG portion in Cameron County, Primera is able to access up to 1,120 acft/yr through this strategy. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 acft/yr of raw water, resulting in the 1,120 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include well field pumping, well field piping, water treatment, and land acquisition. More information on the proposed location of the plant and existing distribution system is needed to include costs for pipelines. Membrane treatment efficiency is assumed to be 80 percent, so the wells and well field piping are designed to 1,400 acft/yr. It is assumed that the construction period would be 1.5 years. Table 5.3-71 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

A pilot well and water quality study will be needed.

Table 5.3-71 Primera - RO WTP with Groundwater Well Project Requirements and Costs

COST ESTIMATE SUMMARY	
PRIMERA - RO WTP WITH GROUNDWATER WELL	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,532,000
Storage Tanks (other than at booster pump stations)	$1,297,000
Two WTPs (1 mgd and 1 mgd)	$4,914,000
TOTAL COST OF FACILITIES	**$7,743,000**

COST ESTIMATE SUMMARY	
PRIMERA - RO WTP WITH GROUNDWATER WELL	
Item	Estimated Costs for Facilities
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$2,710,000
Environmental and Archaeology Studies and Mitigation	$34,000
Land Acquisition and Surveying (3 acres)	$290,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$290,000
TOTAL COST OF PROJECT	**$10,804,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$760,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$28,000
WTP	$957,000
Pumping Energy Costs (285,722 kW-hr @ 0.08 $/kW-hr)	$23,000
TOTAL O&M	$1,008,000
TOTAL ANNUAL COST	**$1,768,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$1,579**
Annual Cost of Water After Debt Service ($ per acft)	**$900**
Annual Cost of Water ($ per 1,000 gallons)	**$4.84**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.76**

Rio Hondo

Rio Hondo does not have identified needs (Table 5.3-72); however, WMSs are recommended (Table 5.3-73), including Advanced Municipal Water Conservation, which is recommended as a zero-yield project.

Table 5.3-72 Rio Hondo Existing Supply Balance (acft/yr)

RIO HONDO	2020	2030	2040	2050	2060	2070
Supplies	712	712	712	712	712	712
Demand	203	224	250	284	320	356
Need(-)/Surplus(+)	**509**	**488**	**462**	**428**	**392**	**356**

Table 5.3-73 Rio Hondo WMS Supplies (acft/yr)

RIO HONDO	2020	2030	2040	2050	2060	2070
ID Improvements - CCID No. 2	75	74	73	73	72	71
Non-Potable WWTP Effluent Reuse	450	450	450	450	450	450
Emergency Interconnects	70	70	70	70	70	70
New Groundwater Supply	1,120	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**1,715**	**1,714**	**1,713**	**1,713**	**1,712**	**1,711**
WUG Balance After WMS	**2,224**	**2,202**	**2,175**	**2,141**	**2,104**	**2,067**

Non-Potable WWTP Effluent Reuse Project

Project Source

This strategy was submitted by Rio Hondo to the RWPG.

Description

Rio Hondo proposes a non-potable reuse project to utilize effluent from its WWTP. The proposed pipeline alignment is shown on Figure 5.3-7.

Figure 5.3-7 Rio Hondo Non-Potable WWTP Effluent Reuse Project

Available Supply

The project is expected to have a capacity of 450 acft/yr; however, the supply expected to meet Rio Hondo's needs is limited to 25 percent of demands.

Engineering and Costing

Additional treatment for the WWTP effluent would include treatment to Type 2 standards. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station at the WWTP site, transmission pipeline, and ground storage thank would be constructed. It is assumed that the construction period would be 2 years. Table 5.3-74 outline the estimated costs and project requirements used to develop the cost estimate.

Implementation Issues

Implementation of a non-potable reuse project would require approval by TCEQ.

Table 5.3-74 Rio Hondo - Non-Potable WWTP Effluent Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
RIO HONDO – NON-POTABLE WWTP EFFLUENT REUSE PROJECT	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$2,904,000
Transmission Pipeline (6 in. diameter, 1.5 miles)	$246,000
Storage Tanks (other than at booster pump stations)	$583,000
Advanced Water Treatment Facility (0.4 mgd)	$3,985,000
TOTAL COST OF FACILITIES	**$7,718,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$2,689,000
Environmental and Archaeology Studies and Mitigation	$60,000
Land Acquisition and Surveying (25 acres)	$90,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$291,000
TOTAL COST OF PROJECT	**$10,848,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$763,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$8,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$73,000
Advanced Water Treatment Facility	$477,000
Pumping Energy Costs (64,929 kWh at 0.08 $/kWh)	$5,000

COST ESTIMATE SUMMARY	
RIO HONDO – NON-POTABLE WWTP EFFLUENT REUSE PROJECT	
Item	**Estimated Costs for Facilities**
TOTAL O&M	$563,000
TOTAL ANNUAL COST	**$1,326,000**
Available Project Yield (acft/yr)	**450**
Annual Cost of Water ($ per acft)	**$2,947**
Annual Cost of Water After Debt Service ($ per acft)	**$1,251**
Annual Cost of Water ($ per 1,000 gallons)	**$9.04**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.84**

Emergency Interconnects

Project Source

This strategy was submitted by City of Rio Hondo to the RWPG during the 2016 Regional Water Planning process.

Description

This strategy is to construct a treated water delivery source to ERHWSC and a raw water pipeline to Harlingen ID to alleviate shortages in dry months caused by push water issues.

Available Supply

The emergency interconnect would have the capacity to provide 1 mgd of treated water from ERHWSC, and 1 mgd of raw water from Harlingen ID. However, Rio Hondo is only expected to use the emergency interconnect for a portion of each drought year and so supplies are based on 30 days of raw water and 30 days of treated water per year.

Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, land acquisition, and pipeline ROW. It is assumed that the construction period for this strategy is 1 year. Table 5.3-75 outlines the estimated project requirements and costs.

Implementation Issues

Impacts typical of distribution and transmission projects are discussed in Section 5.2.

Table 5.3-75 Rio Hondo - Emergency Interconnects Project Requirements and Costs

COST ESTIMATE SUMMARY	
RIO HONDO – EMERGENCY INTERCONNECTS	
Item	Estimated Costs for Facilities
CAPITAL COST	
Transmission Pipeline (18 in. diameter, <1 miles and 16 in. diameter, 1.1 miles)	$1,921,000
Transmission Pump Station(s) and Storage Tank(s)	$308,000
TOTAL COST OF FACILITIES	**$2,229,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$529,000
Environmental and Archaeology Studies and Mitigation	$96,000
Land Acquisition and Surveying (40 acres)	$146,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$69,000
TOTAL COST OF PROJECT	**$3,069,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$179,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$14,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$8,000
Pumping Energy Costs (1,608,390 kWh at 0.08 $/kWh)	$129,000
TOTAL O&M	$151,000
TOTAL ANNUAL COST	**$330,000**
Available Project Yield (acft/yr)	**70**
Annual Cost of Water ($ per acft)	**$4,714**
Annual Cost of Water After Debt Service ($ per acft)	**$2,157**
Annual Cost of Water ($ per 1,000 gallons)	**$14.47**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$6.62**

New Groundwater Supply

Project Source

This strategy was submitted by Rio Hondo to the RWPG.

Description

This strategy is for the construction of two alternating 750 gpm wells for redundancy and O&M purposes. The well sites are in the Gulf Coast Aquifer and there is no GCD at present. The well siting will be on City property based on the area hydrogeology, acquisition feasibility, construction feasibility, regulatory compliance, hydraulic considerations, environmental factors, and cost. A water transmission line will be routed from the new wells to the existing Raw Water Reservoirs.

Available Supply

Due to the approval of the Non-MAG portion in Cameron County, Rio Hondo can access 1 mgd (1,120 acft) of fresh groundwater.

Engineering and Costing

Costs for this strategy from the UCM include groundwater wells, well field piping, and land acquisition. It is assumed that the construction period for this strategy is 1 year. Table 5.3-76 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

Impacts typical of groundwater projects are discussed in Section 5.2.

Table 5.3-76 Rio Hondo - New Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
RIO HONDO – NEW GROUNDWATER SUPPLY	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$375,000
Pilot Well Development	$160,000
TOTAL COST OF FACILITIES	**$535,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$187,000
Environmental and Archaeology Studies and Mitigation	$17,000
Land Acquisition and Surveying (26 acres)	$5,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$21,000
TOTAL COST OF PROJECT	**$765,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$54,000

COST ESTIMATE SUMMARY	
RIO HONDO – NEW GROUNDWATER SUPPLY	
Item	Estimated Costs for Facilities
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$5,000
Pumping Energy Costs (468,557 kWh at 0.08 $/kWh)	$37,000
TOTAL O&M	$41,000
TOTAL ANNUAL COST	**$405,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$86**
Annual Cost of Water After Debt Service ($ per acft)	**$38**
Annual Cost of Water ($ per 1,000 gallons)	**$0.26**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.12**

San Benito

San Benito has a need beginning in 2060 (Table 5.3-77); recommended WMSs are shown in Table 5.3-78.

Table 5.3-77 San Benito Existing Supply Balance (acft/yr)

SAN BENITO	2020	2030	2040	2050	2060	2070
Supplies	3,733	4,195	4,688	5,267	5,906	6,570
Demand	5,626	5,626	5,626	5,626	5,626	5,626
Need(-)/Surplus(+)	**1,893**	**1,431**	**938**	**359**	**(280)**	**(944)**

Table 5.3-78 San Benito WMS Supplies (acft/yr)

SAN BENITO	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	29	305	640
ID Improvements - CCID No. 2	588	583	578	573	568	563
Municipal Drought Management	0	0	0	0	0	174
New Groundwater Supply	0	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**588**	**1,703**	**1,698**	**1,722**	**1,993**	**2,497**
WUG Balance After WMS	**701**	**1,854**	**2,336**	**1,881**	**1,713**	**1,553**

SAN BENITO	2020	2030	2040	2050	2060	2070
Alternative WMS*						
Non-Potable Wastewater Effluent Reuse	1,120	1,120	1,120	1,120	1,120	1,120
Potable Wastewater Effluent Reuse	1,120	1,120	1,120	1,120	1,120	3,360
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. San Benito's 2011 GPCD was estimated at 123, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

New Groundwater Supply

Project Source

This strategy was submitted by the City of San Benito to the RWPG.

Description

This strategy is for the construction of two groundwater wells and raw water collection lines to supplement the water supply of San Benito. The brackish groundwater will be mixed with the current surface water source at 10 percent to 15 percent the average daily demand. The city plans to construct the wells in phases, with the first well installed within 5 years at the WTP No. 2 site. It is anticipated that a pilot well and water quality study will be needed to implement this strategy.

Available Supply

Based on the approval of the Non-MAG portion of Cameron County, the City of San Benito is able to access a total of 1 mgd for both wells operating at 500 gpm each. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 acft/yr of raw water, resulting in the 1,120 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater wells, well field piping, and pipeline right-of-way. It is assumed that the construction period for this strategy is 1 year. Table 5.3-79 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

Impacts typical of distribution and transmission projects are discussed in Section 5.2.

Table 5.3-79 San Benito – New Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN BENITO – NEW GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,545,000
TOTAL COST OF FACILITIES	**$1,545,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$541,000
Environmental & Archaeology Studies and Mitigation	$40,000
Land Acquisition and Surveying (8 acres)	$28,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$60,000
TOTAL COST OF PROJECT	**$2,214,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$156,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$15,000
Pumping Energy Costs (168372 kW-hr @ 0.08 $/kW-hr)	$13,000
TOTAL O&M	$28,000
TOTAL ANNUAL COST	**$184,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$164**
Annual Cost of Water After Debt Service ($ per acft)	**$25**
Annual Cost of Water ($ per 1,000 gallons),	**$0.50**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.08**

Santa Rosa

Santa Rosa does not have any projected needs (Table 5.3-80); however, WMSs are recommended (Table 5.3-81).

Table 5.3-80 Santa Rosa Existing Supply Balance (acft/yr)

SANTA ROSA	2020	2030	2040	2050	2060	2070
Supplies	612	612	612	612	612	612
Demand	296	326	360	402	450	500
Need(-)/Surplus(+)	**316**	**286**	**252**	**210**	**162**	**112**

Table 5.3-81 Santa Rosa WMS Supplies (acft/yr)

SANTA ROSA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	0	12
ID Improvements - La Feria ID	156	156	156	156	156	156
New Supplies from WMS	**156**	**156**	**156**	**156**	**156**	**156**
WUG Balance After WMS	**472**	**442**	**408**	**366**	**318**	**280**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Santa Rosa's 2011 GPCD was estimated at 88, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Southmost Regional Water Authority

Southmost Regional Water Authority (SRWA) operates a brackish groundwater desalination plant and serves five WUGs in Cameron County. The facility is currently able to produce 10,753 acft/yr. There are no recommended WMSs for SRWA.

Table 5.3-82 SRWA Existing Supply Balance (acft/yr)

SRWA	2020	2030	2040	2050	2060	2070
Brownsville PUB - Contract Demand	9,991	9,991	9,991	9,991	9,991	9,991
Valley MUD - Contract Demand	270	270	270	270	270	270
Brownsville Navigation District - Contract Demand	226	226	226	226	226	226
Los Fresnos	245	245	245	245	245	245

SRWA	2020	2030	2040	2050	2060	2070
Indian Lake (sells to Los Fresnos)	22	22	22	22	22	22
Demand	**10,753**	**10,753**	**10,753**	**10,753**	**10,753**	**10,753**
Supplies	**4,306**	**5,151**	**5,995**	**6,839**	**7,684**	**7,684**
Need/Surplus	**(6,447)**	**(5,602)**	**(4,758)**	**(3,914)**	**(3,069)**	**(3,069)**

Valley Municipal Utility District 2

Valley MUD 2 has needs beginning in 2050 (Table 5.3-83); recommended WMSs are shown in Table 5.3-84.

Table 5.3-83 Valley MUD 2 Existing Supply Balance (acft/yr)

VALLEY MUD 2	2020	2030	2040	2050	2060	2070
Supplies	1,267	1,301	1,320	1,340	1,360	1,360
Demand	978	1,129	1,284	1,455	1,634	1,819
Need(-)/Surplus(+)	**289**	**172**	**36**	**(115)**	**(274)**	**(459)**

Table 5.3-84 Valley MUD 2 WMS Supplies (acft/yr)

VALLEY MUD 2	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	8	104	222	362	523	700
New Supplies from WMS	**8**	**104**	**222**	**362**	**523**	**700**
WUG Balance After WMS	**297**	**276**	**258**	**247**	**249**	**241**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Valley MUD 2's 2011 GPCD was estimated at 294, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use till it decreased to 140 GPCD.

County-Other, Cameron

County-Other, Cameron has needs in every decade (Table 5.3-85); recommended WMSs are shown in Table 5.3-86.

Table 5.3-85 County-Other, Cameron Existing Supply Balance (acft/yr)

COUNTY-OTHER, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	1,790	1,790	1,790	1,790	1,790	1,790
Demand	3,931	3,618	4,176	4,590	5,226	5,343
Need(-)/Surplus(+)	**(2,141)**	**(1,828)**	**(2,386)**	**(2,800)**	**(3,436)**	**(3,553)**

Table 5.3-86 County-Other, Cameron WMS Supplies (acft/yr)

COUNTY-OTHER, CAMERON	2020	2030	2040	2050	2060	2070
Conversion of Water Rights	952	602	948	1,365	2,004	2,119
Expanded Groundwater Supply	1,000	1,000	2,000	2,000	3,000	3,000
ID Improvements - Bayview ID No. 11	14	17	20	22	25	27
ID Improvements - CCID No. 2	178	176	175	173	172	170
ID Improvements - La Feria ID	156	156	156	156	156	156
New Supplies from WMS	**2,185**	**1,837**	**3,185**	**3,604**	**5,246**	**5,362**
WUG Balance After WMS	**44**	**9**	**799**	**804**	**1,810**	**1,809**

Expanded Groundwater Supply

Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

Description

This strategy is to provide additional supply to County-Other, Cameron with the installation of fresh groundwater wells.

Available Yield

Based on the approval of the Non-MAG portion in Cameron County, this strategy enables the access to 1,000 acft/yr beginning in the 2020 decade, increasing to 3,000 acft/yr by 2070.

Engineering and Costing

The UCM was utilized to develop estimated costs for this strategy based on assumptions about the individual wells. The wells were costed with a capacity of 350 gpm. Well piping and land acquisition were also included in the cost estimate. The estimated costs and project requirements for this strategy are presented in Table 5.3-87.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater wells and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit.

Table 5.3-87 County-Other, Cameron – Expanded Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
COUNTY-OTHER, CAMERON - EXPANDED GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$6,981,000
TOTAL COST OF FACILITIES	**$6,981,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$2,444,000
Environmental & Archaeology Studies and Mitigation	$76,000
Land Acquisition and Surveying (36 acres)	$20,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$262,000
TOTAL COST OF PROJECT	**$9,783,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$688,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$70,000
Pumping Energy Costs (764,059 kW-hr @ 0.08 $/kW-hr)	$61,000
TOTAL O&M	$131,000
TOTAL ANNUAL COST	**$819,000**
Available Project Yield (acft/yr)	**3,000**
Annual Cost of Water ($ per acft)	**$251**
Annual Cost of Water After Debt Service ($ per acft)	**$40**
Annual Cost of Water ($ per 1,000 gallons)	**$0.77**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.12**

Irrigation, Cameron

Irrigation, Cameron has a need in every decade (Table 5.3-88); WMSs recommended to reduce projected needs are shown in Table 5.3-89.

Table 5.3-88 Irrigation, Cameron Existing Water Supply Balance

IRRIGATION, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	178,005	177,972	177,938	177,905	177,873	177,840
Demand	537,217	519,972	502,725	485,479	468,233	450,987
Need(-)/Surplus(+)	**(359,212)**	**(342,000)**	**(324,787)**	**(307,574)**	**(290,360)**	**(273,147)**

Table 5.3-89 Irrigation, Cameron WMS Supplies (acft/yr)

IRRIGATION, CAMERON	2020	2030	2040	2050	2060	2070
On-Farm Conservation	9,872	9,872	9,872	9,872	9,872	9,872
Bio Control Arundo Donax	955	955	955	955	955	955
ID Improvements - Bayview ID No. 11	588	694	801	908	1,015	1,121
ID Improvements - Brownsville ID	812	1,099	1,385	1,671	1,956	2,242
ID Improvements - CCID No. 2	5,637	5,586	5,534	5,483	5,432	5,381
ID Improvements - CCID No. 6	1,668	1,989	2,310	2,631	2,952	3,273
ID Improvements - CCID No. 10	50	145	240	335	430	525
ID Improvements - H&CCID No. 9	166	291	415	539	663	787
ID Improvements - Harlingen ID No. 1	2,700	4,080	5,459	6,838	8,216	9,593
ID Improvements - Valley Acres ID	49	65	82	98	115	131
New Supplies from WMS	**22,497**	**24,775**	**27,053**	**29,330**	**31,605**	**33,880**
WUG Balance After WMS	**(336,715)**	**(317,225)**	**(297,734)**	**(278,244)**	**(258,755)**	**(239,267)**

Irrigation needs in Cameron County reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Cameron County are partially met by ID conservation strategies and decrease over the planning period. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Irrigation, Cameron is left with shortages in years of limited supply.

Livestock, Cameron

There are no projected needs for livestock in Cameron County over the planning period (Table 5.3-90); therefore, no WMSs were identified for this WUG.

Table 5.3-90 Livestock, Cameron Existing Supply Balance (acft/yr)

LIVESTOCK, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	436	436	436	436	436	436
Demand	436	436	436	436	436	436
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Manufacturing, Cameron

Manufacturing in Cameron County has a need in every decade (Table 5.3-91); BMPs are recommended in Table 5.3-92.

Table 5.3-91 Manufacturing, Cameron Existing Supply Balance (acft/yr)

MANUFACTURING, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	1,029	1,029	1,029	1,029	1,029	1,029
Demand	1,647	1,846	1,846	1,846	1,846	1,846
Need(-)/Surplus(+)	**(618)**	**(817)**	**(817)**	**(817)**	**(817)**	**(817)**

Table 5.3-92 Manufacturing, Cameron WMS Supplies (acft/yr)

MANUFACTURING, CAMERON	2020	2030	2040	2050	2060	2070
Recommended WMS						
ID Improvements - CCID No. 2	16	16	16	16	16	15
ID Improvements - CCID No. 6	1	2	2	2	3	3
Implementation of Industrial BMPs	165	185	185	185	185	185
New Supplies from WMS	**182**	**203**	**203**	**203**	**204**	**203**
WUG Balance After WMS	**(436)**	**(614)**	**(614)**	**(614)**	**(613)**	**(614)**
Alternative WMS*						
Seawater Desalination Demonstration and Implementation	0	56	56	56	565	565
*Alternative WMS are evaluated in Section 5.4						

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Mining, Cameron

There are no needs projected for mining in Cameron County (Table 5.3-93); WMSs are nonetheless recommended in Table 5.3-94.

Table 5.3-93 Mining, Cameron Existing Supply Balance (acft/yr)

MINING, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	661	661	661	661	661	661
Demand	264	277	191	126	61	28
Need(-)/Surplus(+)	**397**	**384**	**470**	**535**	**600**	**633**

Table 5.3-94 Mining, Cameron WMS Supplies (acft/yr)

MINING, CAMERON	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	26	28	19	13	6	3
New Supplies from WMS	**26**	**28**	**19**	**13**	**6**	**3**
WUG Balance After WMS	**423**	**412**	**489**	**548**	**606**	**636**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Steam-Electric Power, Cameron

Steam electric-power generation in Cameron County has needs in every decade (Table 5.3-95); WMSs recommended to meet these needs are in Table 5.3-96.

Table 5.3-95 Steam-Electric Power, Cameron NRG Basin Water Supply and Demand Analysis (acft/yr)

STEAM-ELECTRIC POWER, CAMERON	2020	2030	2040	2050	2060	2070
Supplies	125	125	125	125	125	125
Demand	3,550	3,550	3,550	3,550	3,550	3,550

STEAM-ELECTRIC POWER, CAMERON	2020	2030	2040	2050	2060	2070
Need(-)/Surplus(+)	(3,425)	(3,425)	(3,425)	(3,425)	(3,425)	(3,425)

Table 5.3-96 Steam-Electric Power, Cameron WMS Supplies (acft/yr)

STEAM-ELECTRIC POWER, CAMERON	2020	2030	2040	2050	2060	2070
Recommended WMS						
Brownsville Non-Potable Water Reuse Pipeline	0	6,720	6,720	6,720	6,720	6,720
Edinburg Non-Potable Water Reuse for Cooling Tower	677	0	0	0	0	0
Implementation of Industrial BMPs	355	355	355	355	355	355
New Supplies from WMS	**1,032**	**7,075**	**7,075**	**7,075**	**7,075**	**7,075**
WUG Balance After WMS	**(2,393)**	**3,650**	**3,650**	**3,650**	**3,650**	**3,650**
Alternative WMS*						
Brownsville - Seawater Desalination Demonstration and Implementation	0	33	33	33	332	332
*Alternative WMS evaluated in Section 5.4						

Brownsville Non-Potable Water Reuse Pipeline

In a drought year, Brownsville's non-potable water reuse pipeline would deliver 6,720 acft/yr to Cameron Steam-Electric Power beginning in the 2030 decade. See Brownsville Non-Potable Water Reuse Pipeline.

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.2 Hidalgo County

5.3.2.1 Irrigation District/Wholesale Water Provider

All the IDs in Hidalgo County are recommended to implement ID improvement WMSs (Figure 5.3-8).

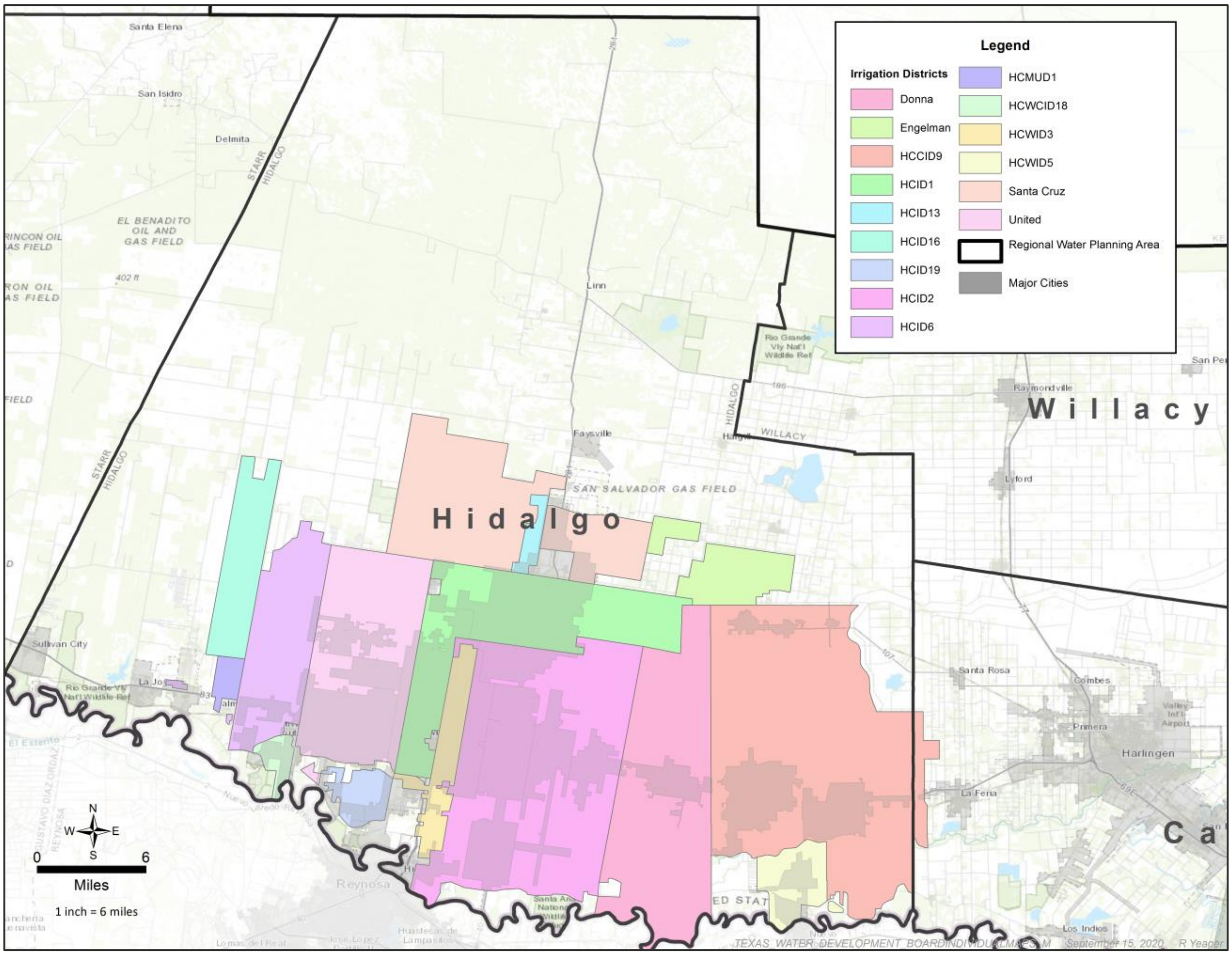

Figure 5.3-8 Map of Irrigation Districts in Hidalgo County

Donna Irrigation District, Hidalgo County No. 1

Donna ID serves irrigators and livestock users in Hidalgo County, and the City of Donna. This system is predominantly open canals with an estimated system efficiency of 71 percent. Donna ID plans to replace open lateral canals with pipelines that will save an estimated 989 acft annually (Table 5.3-99). Supplies from the improvements are shown in Table 5.3-98, and estimated costs are included in Table 5.3-99.

Table 5.3-97 Donna ID Existing Supply Balance (acft/yr)

DONNA ID	2020	2030	2040	2050	2060	2070
Livestock, Hidalgo – Contact Demand	1,910	1,910	1,910	1,910	1,910	1,910
Donna - Contract Demand	2,975	2,975	2,975	2,975	2,975	2,975
Irrigation, Hidalgo – Contract Demand	29,670	29,662	29,654	29,646	29,637	29,629
Demand	**34,554**	**34,546**	**34,538**	**34,530**	**34,522**	**34,514**
Supplies	**48,668**	**48,657**	**48,646**	**48,634**	**48,623**	**48,612**
Need/Surplus	**14,114**	**14,111**	**14,107**	**14,104**	**14,101**	**14,097**

Table 5.3-98 Supplies from Donna ID WMS (acft)

DONNA ID	2020	2030	2040	2050	2060	2070
County-Other, Hidalgo	39	104	168	233	298	363
Donna	64	170	276	382	488	594
Irrigation, Hidalgo	600	1,601	2,602	3,602	4,602	5,601
New Supplies from WMS	**703**	**1,875**	**3,046**	**4,217**	**5,388**	**6,558**
WUG Balance After WMS	**14,817**	**15,986**	**17,153**	**18,321**	**19,489**	**20,655**

Table 5.3-99 Donna ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$7,459,530
TOTAL ANNUAL COST	$507,112
Available Project Yield (acft/yr)	989
Annual Cost of Water ($ per acft)	$513
Annual Cost of Water ($ per 1,000 gallons)	$1.57

Engelman Irrigation District

The conveyance system of Engelman ID is predominantly open canals with an estimated current efficiency of 71 percent. Engelman ID supplies water to irrigators in to Hidalgo County. Supplies from the improvements are shown in Table 5.3-101, and estimated costs are included in Table 5.3-102. The strategies by Engelman ID to the RWPG include canal lining, leak prevention, and connectivity improvements and will conserve an estimated 831 acft/yr (Table 5.3-102).

Table 5.3-100 Engelman ID Existing Supply Balance (acft/yr)

ENGLEMAN ID	2020	2030	2040	2050	2060	2070
Supplies	7,616	7,614	7,612	7,610	7,608	7,606
Demand	5,407	5,406	5,404	5,403	5,401	5,400
Need(-)/Surplus(+)	2,209	2,208	2,208	2,207	2,207	2,206

Table 5.3-101 Supplies from Engelman ID WMS (acft)

ENGLEMAN ID	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	590	677	765	852	939	1,026
Total	590	677	765	852	939	1,026

Table 5.3-102 Engelman ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$5,262,249
TOTAL ANNUAL COST	$357,737
Available Project Yield (acft/yr)	831
Annual Cost of Water ($ per acft)	$430
Annual Cost of Water ($ per 1,000 gallons)	$1.32

Hidalgo and Cameron Irrigation District No. 9 (Mercedes)

Hidalgo and Cameron County ID (H&CCID) No. 9 serves irrigators in Cameron and Hidalgo Counties, with 92.6 percent of the acreage in Hidalgo and only 7.4 percent in Cameron. In addition to irrigation water, this district supplies raw water to the cities of La Villa, Mercedes, Elsa, Weslaco, Edcouch, and NAWSC. The conveyance system consists of canals that are both lined and unlined and a large portion of pipelines with an overall estimated current system efficiency of 70 percent. Supplies from the improvements are shown in Table 5.3-104.

Table 5.3-103 H&CCID No. 9 Existing Supply Balance (acft/yr)

H&CCID NO. 9	2020	2030	2040	2050	2060	2070
Supplies	94,937	94,917	94,896	94,875	94,854	94,834
Demand	66,427	66,413	66,398	66,383	66,369	66,354
Need(-)/Surplus(+)	28,510	28,504	28,498	28,492	28,485	28,480

Table 5.3-104 Supplies from H&CCID No. 9 WMS (acft)

H&CCID NO. 9	2020	2030	2040	2050	2060	2070
Edcouch	14	25	35	45	56	66
Elsa	33	58	82	107	132	157
Irrigation, Cameron	116	290	415	539	663	787
Irrigation, Hidalgo	2,079	3,635	5,191	6,746	8,300	9,853
La Villa	11	19	27	35	43	51
Mercedes	95	167	239	310	382	453
NAWSC	165	290	414	538	662	786
Weslaco	235	411	588	764	940	1,117
Total	**2,798**	**4,894**	**6,991**	**9,084**	**11,178**	**13,270**

Projects submitted by H&CCID No. 9 to the RWPG include canal lining, river lift pump modernization, SCADA for canal gates and pumping, and installation of pipeline. It is estimated that implementation of these projects will conserve an estimated 4,000 acft/yr when implemented (Table 5.3-105).

Table 5.3-105 H&CCID No. 9 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$63,146,985
TOTAL ANNUAL COST	$4,292,840
Available Project Yield (acft/yr)	4,000
Annual Cost of Water ($ per acft)	$1,073
Annual Cost of Water ($ per 1,000 gallons)	$3.29

Hidalgo Irrigation District No. 1 (Edinburg)

Hidalgo County ID (HCID) No. 1 has a conveyance system of mostly open canals with an estimated system efficiency of 71 percent, serving irrigators in Hidalgo County and the cities of Edinburg, McAllen, and Sharyland WSC, Hidalgo MUD No. 1, and NAWSC. Additionally, HCID No. 1 passes water through their system to HCID No. 13, and Santa Cruz ID. The strategies submitted by HCID No. 1 to the RWPG include relining canals and installation of pipeline. These improvements are estimated to conserve 6,167 acft/yr when implemented (Table 5.3-108). Supplies from the improvements are shown in

Table **5.3-107**, and estimated costs are included in Table 5.3-108.

Table 5.3-106 HCID No. 1 Existing Supply Balance (acft/yr)

HCID NO. 1	2020	2030	2040	2050	2060	2070
Edinburg – Contract Demand	3,759	3,759	1,842	1,842	1,842	1,842

HCID NO. 1	2020	2030	2040	2050	2060	2070
Hidalgo County MUD 1 – Contract Demand	604	604	604	604	604	604
Irrigation, Hidalgo – Contract Demand	23,247	23,241	23,235	23,229	23,222	23,216
McAllen – Contract Demand	2,840	2,840	2,840	2,840	2,840	2,840
NAWSC - Contract Demand	994	994	994	994	994	994
Sharyland WSC – Contract Demand	7,016	7,016	7,016	7,016	7,016	7,016
Demand	**38,460**	**38,453**	**36,530**	**36,524**	**36,517**	**36,511**
Supplies	**89,537**	**89,519**	**89,500**	**89,482**	**89,464**	**89,445**
Need/Surplus	**51,078**	**51,065**	**52,970**	**52,958**	**52,946**	**52,934**

Table 5.3-107 Supplies from HCID No. 1 WMS (acft)

HCID NO. 1	2020	2030	2040	2050	2060	2070
Edinburg	259	350	216	261	305	350
Hidalgo County MUD 1	42	56	71	85	100	115
Irrigation, Hidalgo	1,601	2,164	2,726	3,288	3,850	4,411
McAllen	196	264	333	402	471	540
NAWSC	69	92	117	141	165	189
Sharyland WSC	483	653	823	993	1,163	1,333
New Supplies from WMS	**2,650**	**3,579**	**4,286**	**5,170**	**6,054**	**6,938**
WUG Balance After WMS	**53,728**	**54,644**	**57,256**	**58,128**	**59,000**	**59,872**

Table 5.3-108 HCID No. 1 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$26,418,956
TOTAL ANNUAL COST	$1,796,006
Available Project Yield (acft/yr)	6,167
Annual Cost of Water ($ per acft)	$291
Annual Cost of Water ($ per 1,000 gallons)	$0.89

Hidalgo Irrigation District No. 2 (San Juan)

HCID No. 2 delivers water to irrigators in Hidalgo County, NAWSC, the cities of Alamo, McAllen, Pharr, San Juan, Edinburg, and Falcon Rural WSC. The district's conveyance network consists of pipeline, lined canals, and unlined canals. There is one 1,800 acft storage reservoir and two pump stations. The district estimates its current system efficiency to be 75 percent. Strategies submitted by Hidalgo County ID No. 2 to the RWPG include flood protection improvements, canal relining, and installation of pipeline. These improvements are estimated to conserve 456 acft/yr when implemented (Table 5.3-109). Supplies from the improvements are shown in Table 5.3-110, and estimated costs are included in Table 5.3-111.

Table 5.3-109 HCID No. 2 Existing Supply Balance (acft/yr)

HCID NO. 2	2020	2030	2040	2050	2060	2070
Alamo – Contract Demand	1,694	1,694	1,694	1,694	1,694	1,694
Edinburg – Contract Demand	2,325	2,325	2,325	2,325	2,325	2,325
Irrigation, Hidalgo – Contract Demand	43,261	43,249	43,237	43,226	43,214	43,202
McAllen – Contract Demand	6,008	6,008	6,008	6,008	6,008	6,008
NAWSC - Contract Demand	2,782	2,782	2,782	2,782	2,782	2,782
Pharr – Contract Demand	7,980	7,980	7,980	7,980	7,980	7,980
San Juan – Contract Demand	2,106	2,106	2,106	2,106	2,106	2,106
Demand	**66,155**	**66,143**	**66,131**	**66,119**	**66,107**	**66,155**
Supplies	**93,085**	**93,069**	**93,053**	**93,037**	**93,021**	**93,005**
Need/Surplus	**26,930**	**26,926**	**26,922**	**26,918**	**26,914**	**26,930**

Table 5.3-110 Supplies from HCID No. 2 WMS (acft/yr)

HCID NO. 2	2020	2030	2040	2050	2060	2070
Alamo	8	57	107	156	205	254
Edinburg	11	79	146	214	281	349
Falcon Rural WSC	1	2	3	4	5	7
Irrigation, Hidalgo	212	1,467	2,721	3,975	5,228	6,480
McAllen	29	204	378	553	727	901
NAWSC	13	88	163	239	314	390
Pharr	39	271	502	734	965	1,197
San Juan	10	71	133	194	255	316
New Supplies from WMS	**323**	**2,239**	**4,153**	**6,068**	**7,980**	**9,894**
WUG Balance After WMS	**27,253**	**29,165**	**31,075**	**32,986**	**34,894**	**36,804**

Table 5.3-111 HCID No. 2 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$12,825,016
TOTAL ANNUAL COST	$871,867
Available Project Yield (acft/yr)	456
Annual Cost of Water ($ per acft)	$1,912
Annual Cost of Water ($ per 1,000 gallons)	$5.87

Hidalgo Irrigation District No. 5 (Progreso)

The conveyance system of HCID No. 5 is predominantly pipelines, with some canals. Its current estimated system efficiency is 71 percent. There are three pump stations and three reservoirs, with a combined storage capacity of 200 acft Progresso ID only serves irrigation users in Hidalgo County. Strategies submitted by HCID No. 5 to the RWPG include canal dredging and gate control improvements. These improvements are estimated to conserve 1,215 acft/yr when implemented (Table 5.3-112). Supplies from the improvements are shown in Table 5.3-113, and estimated costs are included in Table 5.3-114.

Table 5.3-112 HCID No. 5 Existing Supply Balance (acft/yr)

HCID NO. 5	2020	2030	2040	2050	2060	2070
Supplies	6,418	6,416	6,415	6,413	6,411	6,409
Demand	4,557	4,556	4,554	4,553	4,552	4,551
Need(-)/Surplus(+)	**1,861**	**1,860**	**1,861**	**1,860**	**1,859**	**1,858**

Table 5.3-113 Supplies from HCID No. 5 WMS (acft)

HCID NO. 5	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	863	863	863	864	864	865
Total	**863**	**863**	**863**	**864**	**864**	**865**

Table 5.3-114 HCID No. 5 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$6,092,515
TOTAL ANNUAL COST	$414,180
Available Project Yield (acft/yr)	1,215
Annual Cost of Water ($ per acft)	$341
Annual Cost of Water ($ per 1,000 gallons)	$1.05

Hidalgo Irrigation District No. 6 (Mission)

HCID No. 6 delivers to irrigators and Agua SUD with an estimated system efficiency of 71 percent. The conveyance system has pipelines, lined canals, and some unlined canals. The district has four pump stations and reservoir storage capacity of 1,050 acft. A general ID improvement plan was created for HCID No. 6 ID (Table 5.3-115). Supplies from the improvements are shown in Table 5.3-116, and estimated costs are included in Table 5.3-117.

Table 5.3-115 HCID No. 6 Existing Supply Balance (acft/yr)

HCID NO. 6	2020	2030	2040	2050	2060	2070
Agua SUD - Contract Demand	5,914	5,914	5,914	5,914	5,914	5,914
Irrigation, Hidalgo – Contract Demand	10,329	10,326	10,323	10,320	10,318	10,315
Demand	**16,242**	**16,240**	**16,237**	**16,234**	**16,231**	**16,228**
Supplies	**22,877**	**22,873**	**22,869**	**22,865**	**22,861**	**22,857**
Need/Surplus	**6,634**	**6,633**	**6,632**	**6,631**	**6,630**	**6,628**

Table 5.3-116 Supplies from HCID No. 6 WMS (acft)

HCID NO. 6	2020	2030	2040	2050	2060	2070
Agua SUD	720	800	881	961	1,041	1,122
Irrigation, Hidalgo	1,259	1,399	1,540	1,680	1,820	1,960
New Supplies from WMS	**1,979**	**2,199**	**2,421**	**2,641**	**2,861**	**3,082**
WUG Balance After WMS	**8,613**	**8,832**	**9,053**	**9,272**	**9,491**	**9,710**

Table 5.3-117 HCID No. 6 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$16,160,527
TOTAL ANNUAL COST	$1,098,620
Available Project Yield (acft/yr)	2,787
Annual Cost of Water ($ per acft)	$394
Annual Cost of Water ($ per 1,000 gallons)	$1.21

HCID No. 6 Service Area Expansion

In addition to general ID improvements, HCID No. 6 has plans to expand its service area in order to continue delivering to Agua SUD's customers as development occurs in the area. New supplies that will be delivered via this WMS Project are included in the Conversion of Water Rights WMS for Agua SUD (See Section 5.3.2.2). Infrastructure included in the service area expansion include a 400 acft reservoir for storage, a raw water pump station, and expanding the existing HCID No. 6 conveyance system. Costs associated with this WMS Project are summarized in Table 5.3-118.

Table 5.3-118 HCID No. 6 - Service Area Expansion WMS Project Requirements and Costs

COST ESTIMATE SUMMARY	
HCID#6 – EXPANSION OF SERVICE AREA	
Item	Estimated Costs for Facilities
CAPITAL COST	
Off-Channel Storage/Ring Dike (Conservation Pool 400 acft, 26 acres)	$4,292,000
Primary Pump Station	$1,750,000
Transmission Pipeline	$8,000,000
TOTAL COST OF FACILITIES	**$14,042,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$4,515,000
Environmental & Archaeology Studies and Mitigation	$102,000
Land Acquisition and Surveying (31 acres)	$105,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$517,000
TOTAL COST OF PROJECT	**$19,281,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$925,000
Reservoir Debt Service (3.5 percent, 40 years)	$287,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$80,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$44,000
Dam and Reservoir (1.5% of Cost of Facilities)	$64,000
Pumping Energy Costs (1608390 kW-hr @ 0.08 $/kW-hr)	$129,000
TOTAL O&M	$317,000
Purchase of Water (1120 acft/yr @ 3000 $/acft)	$3,360,000
TOTAL ANNUAL COST	**$4,889,000**

Hidalgo Irrigation District No. 13 (Baptist Seminary)

HCID No. 13 serves only irrigators in Hidalgo County through a conveyance system of primarily pipeline with a current estimated system efficiency of 80 percent. A general ID improvement plan was created for HCID No. 13 (Table 5.3-119). Supplies from the improvements are shown in Table 5.3-120, and estimated costs are included in Table 5.3-121.

Table 5.3-119 HCID No. 13 Existing Supply Balance (acft/yr)

HCID NO. 13	2020	2030	2040	2050	2060	2070
Supplies	1,926	1,925	1,925	1,924	1,924	1,923
Demand	1,367	1,367	1,367	1,366	1,366	1,365
Need(-)/Surplus(+)	**559**	**558**	**558**	**558**	**558**	**558**

Table 5.3-120 Supplies from HCID No. 13 WMS

HCID NO. 13	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	72	85	98	111	124	136
Total	**72**	**85**	**98**	**111**	**124**	**136**

Table 5.3-121 HCID No. 13 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$772,193
TOTAL ANNUAL COST	$52,495
Available Project Yield (acft/yr)	102
Annual Cost of Water ($ per acft)	$515
Annual Cost of Water ($ per 1,000 gallons)	$1.58

Hidalgo Irrigation District No. 16 (Mission)

HCID No. 16 serves irrigation users, Agua SUD, and the city of La Joya. This conveyance system is predominantly lined and open canals, with some pipelines, and has a current estimated efficiency of 71 percent. Strategies submitted by HCID No. 16 to the RWPG consist of two canal relining projects. These projects are estimated to conserve 1,985 acft/yr when implemented (Table 5.3-122). Supplies from the improvements are shown in Table 5.3-123, and estimated costs are included in Table 5.3-124.

Table 5.3-122 HCID No. 16 Existing Supply Balance (acft/yr)

HCID NO. 16	2020	2030	2040	2050	2060	2070
Agua SUD – Contract Demand	2,986	2,986	2,986	2,986	2,986	2,986
Irrigation, Hidalgo – Contract Demand	9,650	9,647	9,644	9,642	9,639	9,637

HCID NO. 16	2020	2030	2040	2050	2060	2070
La Joya – Contract Demand	366	366	366	366	366	366
Livestock, Hidalgo – Contract Demand	71	71	71	71	71	71
Hidalgo County Mining – Contract Demand	63	63	63	63	63	63
Demand	**13,133**	**13,131**	**13,128**	**13,125**	**13,123**	**13,120**
Supplies	**18,497**	**18,494**	**18,490**	**18,486**	**18,483**	**18,479**
Need/Surplus	**5,364**	**5,363**	**5,362**	**5,361**	**5,360**	**5,359**

Table 5.3-123 Supplies from HCID No. 16 WMS (acft/yr)

HCID NO. 16	2020	2030	2040	2050	2060	2070
Agua SUD	282	326	369	413	456	500
Irrigation, Hidalgo	1,088	1,255	1,423	1,590	1,757	1,924
La Joya	39	45	51	57	63	69
New Supplies from WMS	**1,409**	**1,626**	**1,843**	**2,060**	**2,276**	**2,493**
WUG Balance After WMS	**6,773**	**6,989**	**7,205**	**7,421**	**7,636**	**7,852**

Table 5.3-124 HCID No. 16 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$9,801,872
TOTAL ANNUAL COST	$666,348
Available Project Yield (acft/yr)	1,985
Annual Cost of Water ($ per acft)	$336
Annual Cost of Water ($ per 1,000 gallons)	$1.03

Hidalgo County Water Improvement District No. 19 (Sharyland)

HCWCID No. 19 delivers irrigation water within Hidalgo County and has a current estimated efficiency of 71 percent. Projects submitted to the RWPG consist of cleaning out and lining canals. These projects are estimated to conserve 554 acft/yr when implemented (Table 5.3-125). Supplies from the improvements are shown in Table 5.3-126, and estimated costs are included in Table 5.3-127.

Table 5.3-125 Hidalgo County WID No. 19 Existing Supply Balance (acft/yr)

HCWID NO. 19	2020	2030	2040	2050	2060	2070
Supplies	816	816	816	816	816	816
Demand	580	580	579	579	579	579
Need(-)/Surplus(+)	**236**	**236**	**237**	**237**	**237**	**237**

Table 5.3-126 Supplies from Hidalgo County ID No. 19 WMS (acft)

HCWID NO. 19	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	393	410	427	444	460	477
Needs	**393**	**410**	**427**	**444**	**460**	**477**

Table 5.3-127 Hidalgo County WCID No. 19 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$3,789,099
TOTAL ANNUAL COST	$257,589
Available Project Yield (acft/yr)	554
Annual Cost of Water ($ per acft)	$465
Annual Cost of Water ($ per 1,000 gallons)	$1.43

Hidalgo County Water Improvement District No. 3 (McAllen)

HCWID No. 3 is predominantly open canals, which serve irrigation users in Hidalgo County as well as the City of McAllen. The district maintains a 189 acft of storage off-channel reservoir and approximately 30 miles of canals and pipelines and has a current estimated efficiency of 90 percent. Strategies submitted by HCWID No. 3 to the RWPG include canal lining, portable drip systems, and renewal of lawn irrigation systems. These projects are estimated to conserve 2,291 acft/yr when implemented (Table 5.3-128). Supplies from the improvements are shown in Table 5.3-129, and estimated costs are included in Table 5.3-130.

Table 5.3-128 HCWCID No. 3 Existing Supply Balance (acft/yr)

HCWID NO. 3	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo – Contract Demand	3,585	3,585	3,585	3,585	3,585	3,585
McAllen - Contract Demand	15,488	15,488	15,488	15,488	15,488	15,488
Mining, Hidalgo – Contract Demand	40	40	40	40	40	40
Demand	**19,113**	**19,112**	**19,111**	**19,110**	**19,109**	**19,108**

HCWID NO. 3	2020	2030	2040	2050	2060	2070
Supplies	21,217	21,216	21,214	21,213	21,212	21,211
Need/Surplus	2,103	2,103	2,103	2,103	2,103	2,103

Table 5.3-129 Supplies from Hidalgo County WCID No. 3 WMS (acft)

HCID NO. 3	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	391	391	391	391	391	391
McAllen	1,672	1,672	1,672	1,672	1,672	1,672
New Supplies from WMS	2,064	2,064	2,064	2,064	2,064	2,064
WUG Balance After WMS	4,167	4,167	4,167	4,167	4,167	4,167

Table 5.3-130 Hidalgo County WID No. 3 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$70,572,603
TOTAL ANNUAL COST	$4,797,647
Available Project Yield (acft/yr)	2,291
Annual Cost of Water ($ per acft)	$2,094
Annual Cost of Water ($ per 1,000 gallons)	$6.43

Hidalgo County Water Control and Improvement District No. 18 (Monte Grande)

HCWCID No. 18 delivers irrigation water within Hidalgo County and has a current estimated efficiency of 71 percent. Projects submitted to the RWPG consist of canal lining and installation of pipeline. These projects are estimated to conserve 119 acft/yr when implemented (Table 5.3-131). Supplies from the improvements are shown in Table 5.3-132, and estimated costs are included in Table 5.3-133.

Table 5.3-131 HCWCID No. 18 Existing Supply Balance (acft/yr)

HCWID NO. 18	2020	2030	2040	2050	2060	2070
Supplies	816	816	816	816	816	816
Demand	580	580	579	579	579	579
Need(-)/Surplus(+)	236	236	237	237	237	237

Table 5.3-132 Supplies from HCWCID No. 18 WMS (acft)

HCWID NO. 18	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	84	90	95	100	105	110
Total	**84**	**90**	**95**	**100**	**105**	**110**

Table 5.3-133 Hidalgo County WCID No. 18 Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$665,437
TOTAL ANNUAL COST	$45,238
Available Project Yield (acft/yr)	119
Annual Cost of Water ($ per acft)	$380
Annual Cost of Water ($ per 1,000 gallons)	$1.17

Santa Cruz Irrigation District No. 15

Santa Cruz ID delivers irrigation water within Hidalgo County and has a current estimated efficiency of 60 percent (Table 5.3-134). Projects submitted to the RWPG consist of canal relining, pump station upgrades, and two conversions from open canal to pipeline. These projects are estimated to conserve 3,599 acft/yr when implemented. Supplies from the improvements are shown in Table 5.3-135, and estimated costs are included in Table 5.3-136.

Table 5.3-134 Santa Cruz ID Existing Supply Balance (acft/yr)

SANTA CRUZ ID	2020	2030	2040	2050	2060	2070
Supplies	33,963	33,954	33,945	33,936	33,927	33,918
Demand	21,505	21,500	21,495	21,489	21,484	21,478
Need(-)/Surplus(+)	**12,458**	**12,454**	**12,450**	**12,447**	**12,443**	**12,440**

Table 5.3-135 Supplies from Santa Cruz ID WMS (acft)

SANTA CRUZ ID	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	2,104	2,874	3,643	4,412	5,181	5,949
NAWSC	48	65	83	100	117	135
Sharyland WSC	127	174	220	267	313	360
Total	**2,279**	**3,113**	**3,946**	**4,779**	**5,611**	**6,444**

Table 5.3-136 Santa Cruz ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$5,356,629
TOTAL ANNUAL COST	$364,153
Available Project Yield (acft/yr)	3,599
Annual Cost of Water ($ per acft)	$101
Annual Cost of Water ($ per 1,000 gallons)	$0.31

United Irrigation District

United ID delivers irrigation water within Hidalgo County, and the cities of Mission, Sharyland, and McAllen. United ID has a current estimated efficiency of 85 percent (Table 5.3-137). Projects submitted to the RWPG consist of cleaning out and lining canals. These projects are estimated to conserve 7,093 acft/yr when implemented. Supplies from the improvements are shown in Table 5.3-138, and estimated costs are included in Table 5.3-139.

Table 5.3-137 United ID Existing Supply Balance (acft/yr)

UNITED ID	2020	2030	2040	2050	2060	2070
Supplies	55,270	55,264	55,258	55,252	55,246	55,240
Demand	46,148	46,143	46,138	46,133	46,128	46,123
Need(-)/Surplus(+)	**9,122**	**9,121**	**9,120**	**9,119**	**9,118**	**9,118**

Table 5.3-138 Supplies from United ID WMS (acft)

UNITED ID	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo	2,381	2,381	2,381	2,381	2,381	2,381
McAllen	1,227	1,227	1,227	1,227	1,227	1,227
Mission	1,483	1,483	1,483	1,483	1,483	1,483
Sharyland WSC	639	639	639	639	639	639
Total	**5,730**	**5,730**	**5,730**	**5,730**	**5,730**	**5,730**

Table 5.3-139 United ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$23,387,772
TOTAL ANNUAL COST	$1,589,941
Available Project Yield (acft/yr)	7,093
Annual Cost of Water ($ per acft)	$575
Annual Cost of Water ($ per 1,000 gallons)	$1.77

5.3.2.2 Water User Groups and Water User Groups/Wholesale Water Providers

Hidalgo County WUGs and WUGS/WWPs that have recommended strategies with associated capital costs and locations are represented in Figure 5.3-9. A list of these WMSs and their map numbers is given in Table 5.3-140.

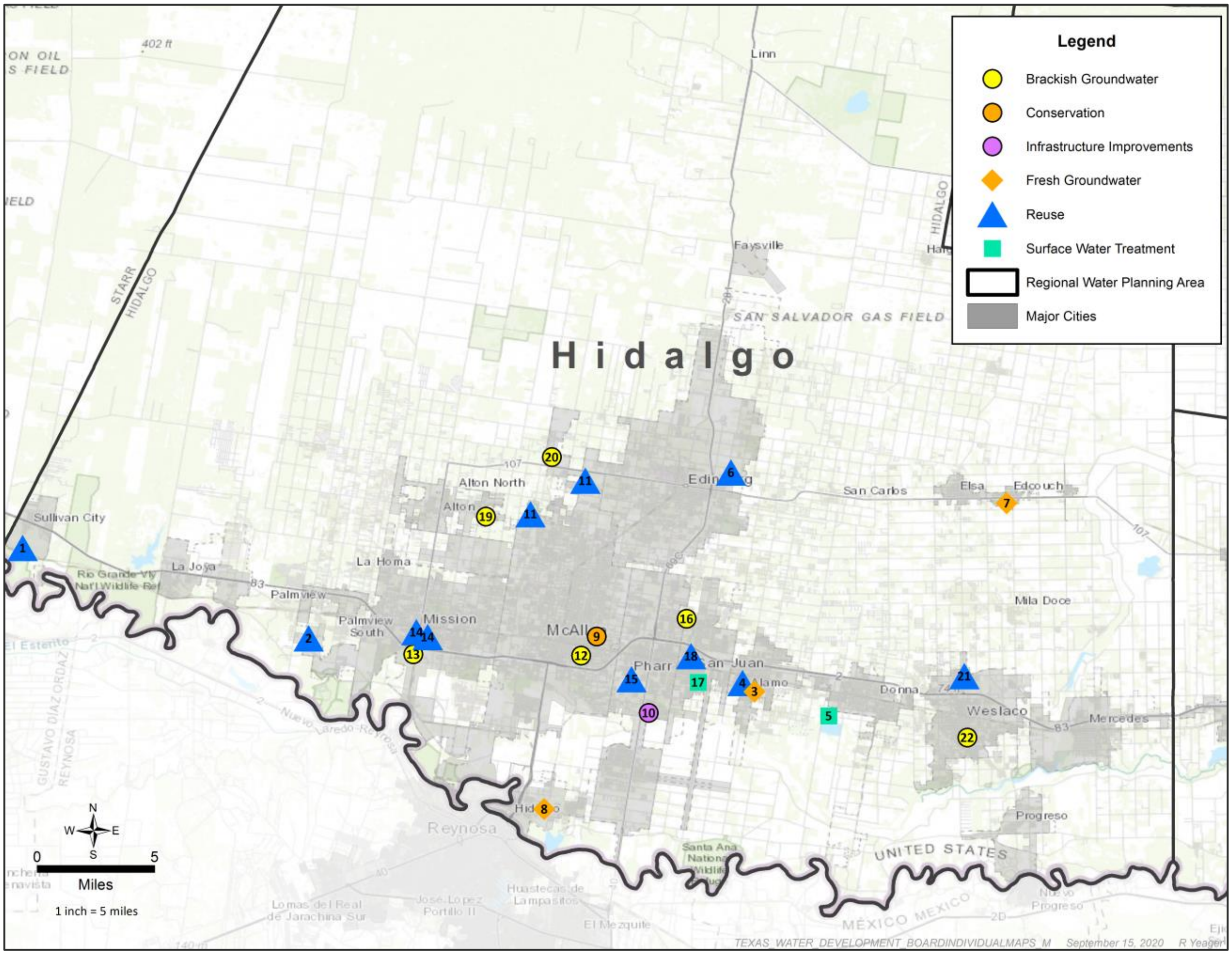

Figure 5.3-9 Hidalgo County Recommended WMS

Table 5.3-140 Map Legend: Hidalgo County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Agua SUD	West WWTP Potable Reuse	Reuse
2	Agua SUD	East WWTP Potable Reuse	Reuse
3	Alamo	Fresh Groundwater Well	Fresh Groundwater
4	Alamo	New Brackish Groundwater Treatment	Brackish Groundwater
5	Donna	WTP Expansion	Surface Water Treatment
6	Edcouch	New Groundwater Supply	Fresh Groundwater

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
7	Edinburg	Non-Potable Reuse Water for Cooling and Landscaping	Reuse
8	Hidalgo	Expand Existing Groundwater Wells	Fresh Groundwater
9	McAllen	AMI Project	Conservation
10	McAllen	Raw Water Line Project	Infrastructure Improvements
11	McAllen	North WWTP Potable Reuse	Reuse
12	McAllen	Brackish Groundwater Desalination Plant	Brackish Groundwater
13	Mission	Brackish Groundwater Desalination Plant	Brackish Groundwater
14	Mission	Direct Potable Reuse	Reuse
15	Pharr	Potable Reuse and Raw Water Reservoir	Reuse
16	San Juan	Brackish Groundwater Well	Brackish Groundwater
17	San Juan	WTP No. 1 Upgrade, Expansion, and BGD	Surface Water Treatment
18	San Juan	Potable Reuse	Reuse
19	Sharyland WSC	WTP No. 2 Brackish Groundwater Desalination	Brackish Groundwater
20	Sharyland WSC	WTP No. 3 Brackish Groundwater Desalination	Brackish Groundwater
21	Weslaco	North WWTP Potable Reuse	Reuse
22	Weslaco	Groundwater Development and Blending	Brackish Groundwater

Agua Special Utility District (SUD)

Agua SUD has needs in all decades except 2020 (Table 5.3-141); recommended WMSs are shown in Table 5.3-142. Agua SUD has a contract for supplies from HCID No. 6 that will expire in 2038, but it is assumed for planning purposes that the contract will renew.

Table 5.3-141 Agua SUD Existing Supply Balance (acft/yr)

Agua SUD	2020	2030	2040	2050	2060	2070
WUG Demand	7,409	8,924	10,497	12,120	13,787	15,426
Steam Electric Power Generation, Hidalgo – Contract Demand	355	355	355	355	355	355
Demand	**7,764**	**9,279**	**10,852**	**12,475**	**14,142**	**15,781**
Supplies	**8,902**	**8,902**	**8,902**	**8,902**	**8,902**	**8,902**
Need/Surplus	**1,138**	**(377)**	**(1,950)**	**(3,573)**	**(5,240)**	**(6,879)**

Table 5.3-142 Agua SUD Water WMS Supplies (acft/yr)

AGUA SUD	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	404	1,077	1,890
Agua SUD East WWTP Potable Reuse	0	0	2,240	2,240	2,240	2,240
Agua SUD West WWTP Potable Reuse	560	560	2,240	2,240	2,240	2,240
Conversion of Water Rights	0	0	1,421	2,500	3,353	4,042
Drought Management	0	348	415	483	551	617
HCID No. 16 Conservation	282	326	369	413	456	500
HCID No. 6 Conservation	720	800	881	961	1,041	1,122
New Supplies from WMS	**1,562**	**2,034**	**7,566**	**9,241**	**10,959**	**12,651**
WUG Balance After WMS	2,698	1,655	5,614	5,666	5,717	5,770
Alternative WMS*						
Non-Potable Wastewater Effluent Reuse	1,120	1,120	1,120	1,120	1,120	1,120
*Alternative WMS evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Agua SUD's 2011 GPCD was estimated at 104, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use.

West WWTP Direct Potable Reuse

Project Source

This strategy was submitted by Agua SUD to the RWPG.

Description

The Agua SUD owns the West Agua WWTP, located in Sullivan City, Texas. Currently there is no reuse water supplied from the existing WWTP. This direct potable reuse strategy involves reuse water being pumped from the WWTP to the water supply reservoirs located at Agua SUD's Abram's WTP to supplement raw water from the Rio Grande. Tertiary treatment would be required at the WWTP prior to pumping the treated effluent to the water supply reservoir. A map of the approximate locations of the Agua SUD reuse lines is shown on Figure 5.3-10.

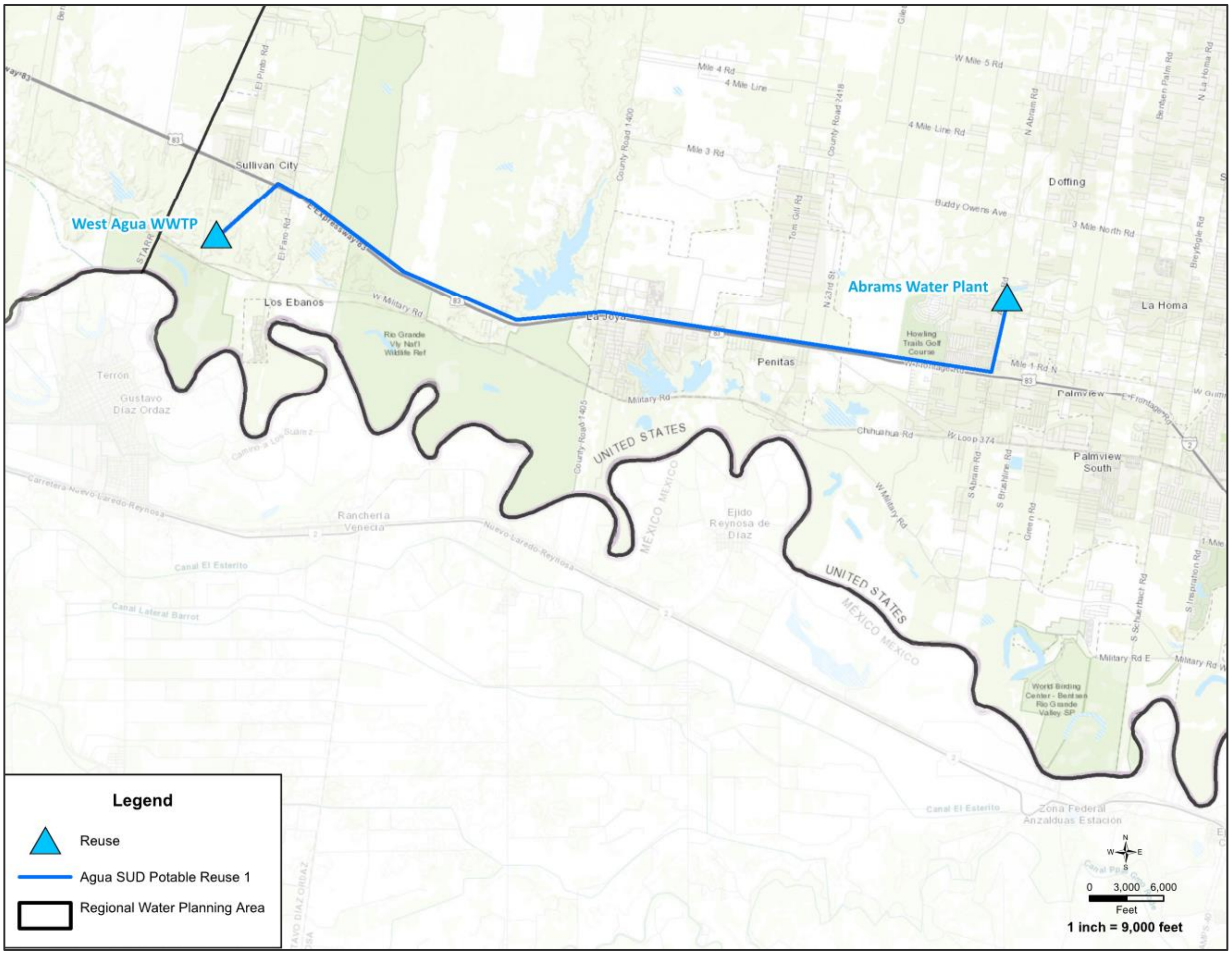

Figure 5.3-10 Agua SUD West Potable Reuse Project Location

Available Supply

The West Agua WWTP produces 1.4 mgd of reclaimed water. Based on demand projections for Agua SUD, it is anticipated that the effluent flow will increase to 3 mgd by 2040. Project calculations assume 60 percent of the effluent stream will be treated and that the maximum produced water volume is 50 percent of the effluent stream, considering membrane recovery rates. The resulting supply for the project was decided to be 560 acft/yr in Phase I (2020 to 2030) and 2,240 acft/yr in Phase II (2040 to 2070).

Engineering and Costing

The Agua SUD potable reuse option would include two new pump stations and pipelines to transfer the treated effluent from both WWTPs to the water supply reservoirs. Additional treatment would be needed at each WWTP. Because the pipelines would transfer the reuse water into existing reservoirs. It is assumed that the construction period would be 2 years.

Table 5.3-143 and

Table 5.3-144 outline the estimated project requirements and costs for Phase I and II of the project. It was assumed that filtration at the WWTPs will be needed in addition to membrane treatment; therefore, Treatment Level 2, Simple Filtration, was used in the UCM. The existing plant footprints were assumed to have adequate space for the additional treatment and pump stations, so land acquisition is not required at the WWTP.

The pipeline and pump station to transfer the treated effluent to the water supply reservoirs was sized for buildout capacities and included in the 2020 phase. The treatment plant costs and O&M in Phase II are limited to the additional capacity.

Implementation Issues

Implementation of an indirect potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipelines may also include any of the following permits: U.S. Army Corps of Engineers (USACE) Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of potable reuse would have to be considered and a public relations campaign may be required.

Table 5.3-143 Agua SUD - West WWTP Potable Reuse (Phase 1) Project Requirements and Costs

COST ESTIMATE SUMMARY	
AGUA SUD – WEST WWTP POTABLE REUSE (PHASE 1)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$2,853,000
Transmission Pipeline (12 in. diameter, 11 miles)	$7,799,000
Storage Tanks (other than at booster pump stations)	$1,736,000
Advanced Water Treatment Facility (0.5 mgd)	$4,959,000
TOTAL COST OF FACILITIES	**$17,347,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$5,682,000
Environmental and Archaeology Studies and Mitigation	$299,000
Land Acquisition and Surveying (141 acres)	$530,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$657,000
TOTAL COST OF PROJECT	**$24,515,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,725,000

COST ESTIMATE SUMMARY	
AGUA SUD – WEST WWTP POTABLE REUSE (PHASE 1)	
Item	Estimated Costs for Facilities
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$95,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$71,000
Advanced Water Treatment Facility	$593,000
Pumping Energy Costs (48,082 kWh at 0.08 $/kWh)	$4,000
TOTAL O&M	$763,000
TOTAL ANNUAL COST	**$2,488,000**
Available Project Yield (acft/yr)	**560**
Annual Cost of Water ($ per acft)	**$4,443**
Annual Cost of Water After Debt Service ($ per acft)	**$1,363**
Annual Cost of Water ($ per 1,000 gallons)	**$13.63**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$4.18**

Table 5.3-144 Agua SUD - West WWTP Potable Reuse (Phase 2) Project Requirements and Costs

COST ESTIMATE SUMMARY	
AGUA SUD – WEST WWTP POTABLE REUSE (PHASE 2)	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station (0 mgd)	$4,213,000
Advanced Water Treatment Facility (1.5 mgd)	$13,102,000
TOTAL COST OF FACILITIES	**$17,315,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$6,060,000
Environmental and Archaeology Studies and Mitigation	$292,000
Land Acquisition and Surveying (139 acres)	$47,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$653,000
TOTAL COST OF PROJECT	**$24,367,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
AGUA SUD – WEST WWTP POTABLE REUSE (PHASE 2)	
Item	Estimated Costs for Facilities
Debt Service (3.5 percent, 20 years)	$1,714,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$105,000
Advanced Water Treatment Facility	$1,614,000
Pumping Energy Costs (537,512 kWh at 0.08 $/kWh)	$43,000
TOTAL O&M	$1,762,000
TOTAL ANNUAL COST	**$3,476,000**
Available Project Yield (acft/yr)	**1,680**
Annual Cost of Water ($ per acft)	**$2,069**
Annual Cost of Water After Debt Service ($ per acft)	**$1,049**
Annual Cost of Water ($ per 1,000 gallons)	**$6.35**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.22**

East WWTP Potable Reuse

Project Source

This strategy was submitted by Agua SUD to the RWPG.

Description

The Agua SUD is building a second plant, East Agua WWTP, located near Palmview, Texas. This direct potable reuse strategy involves reuse water being pumped from the WWTP to the water supply reservoirs located at Agua SUD 429 WTP to supplement raw water from the Rio Grande. Tertiary treatment would be required at the WWTP prior to pumping the treated effluent to the WTP storage reservoir.

Available Supply

Phase 1 of the East Agua WWTP was completed in 2016. Phase 1 of this WWTP is capable of producing 2.5 mgd of reclaimed water, with 75 percent of capacity produced by 2021 and 90 percent of capacity produced by 2025. Project calculations assume 60 percent of the effluent stream will be treated and that the maximum produced water volume is 50 percent of the effluent stream, considering membrane recovery rates. Based on demands, availability and population growth, supplies available for reuse in 2040 when the project comes online could be 2,240 acft/yr. A map of the approximate pipeline alignment is shown on Figure 5.3-11.

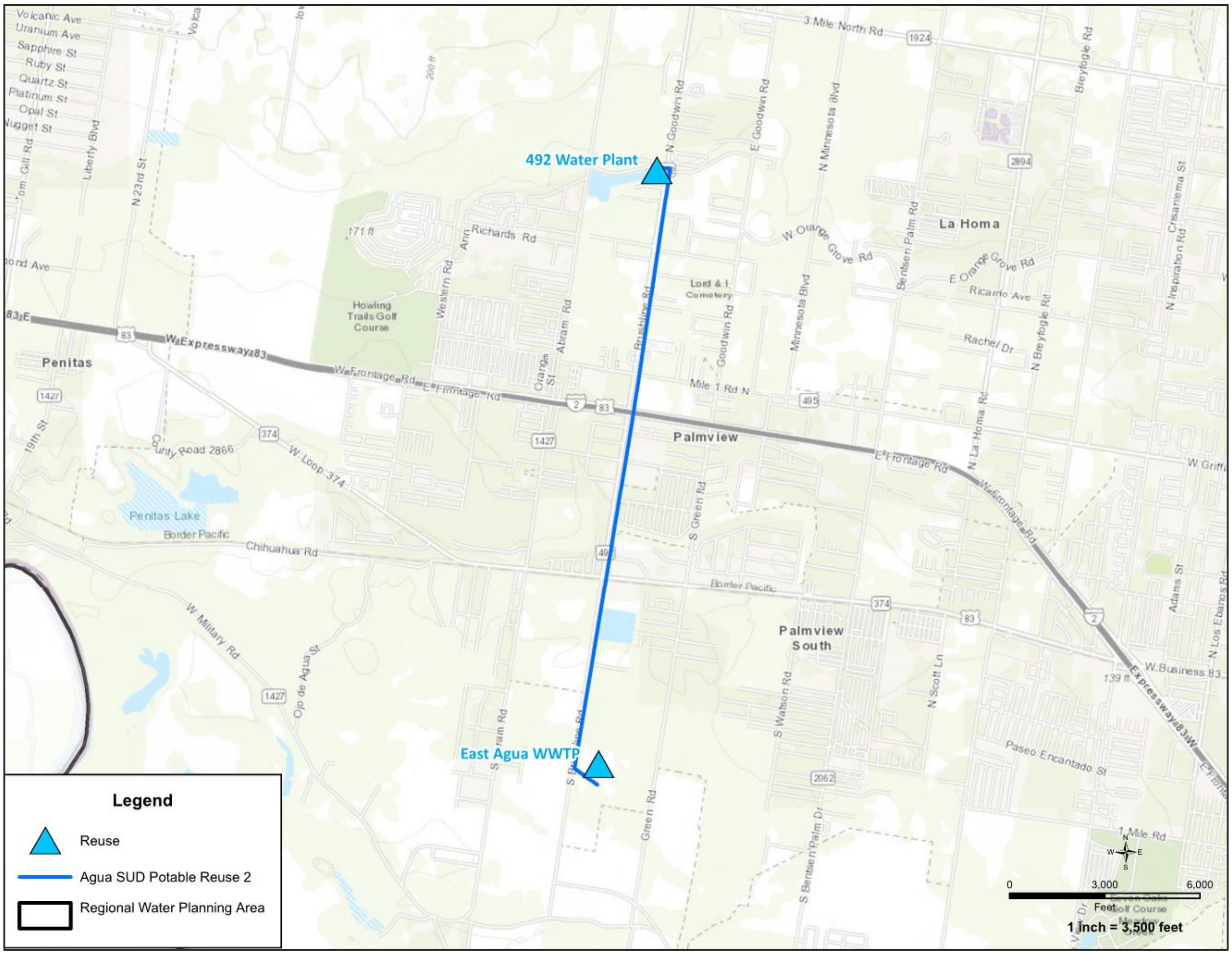

Figure 5.3-11 Agua SUD East Potable Reuse Project Location

Engineering and Costing

Table 5.3-145 outlines the estimated project requirements and costs. It was assumed that advance water treatment was used on the UCM spreadsheet. The existing plant footprints were assumed to have adequate space for the additional treatment and pump stations, so land acquisition is not required at the WWTP.

Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipelines may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-145 Agua SUD - East WWTP Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
AGUA SUD – EAST WWTP REUSE	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$4,010,000
Advanced Water Treatment Facility (2 mgd)	$16,285,000
TOTAL COST OF FACILITIES	**$20,295,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$7,103,000
Environmental and Archaeology Studies and Mitigation	$92,000
Land Acquisition and Surveying (42 acres)	$14,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$757,000
TOTAL COST OF PROJECT	**$28,261,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,989,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$100,000
Advanced Water Treatment Facility	$2,042,000
Pumping Energy Costs (459,242 kWh at 0.08 $/kWh)	$37,000
TOTAL O&M	$2,179,000
TOTAL ANNUAL COST	**$4,168,000**
Available Project Yield (acft/yr)	**2,240**
Annual Cost of Water ($ per acft)	**$1,861**
Annual Cost of Water After Debt Service ($ per acft)	**$973**
Annual Cost of Water ($ per 1,000 gallons)	**$5.71**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.98**

Alamo

The City of Alamo has needs in all decades (Table 5.3-146); recommended WMSs are shown in Table 5.3-147.

Table 5.3-146 Alamo Existing Supply Balance (acft/yr)

ALAMO	2020	2030	2040	2050	2060	2070
Supplies	2,215	2,215	2,215	2,215	2,215	2,215
Demand	3,230	3,908	4,607	5,326	6,064	6,786
Need(-)/Surplus(+)	**(1,015)**	**(1,693)**	**(2,392)**	**(3,111)**	**(3,849)**	**(4,571)**

Table 5.3-147 Alamo WMS Supplies (acft/yr)

ALAMO	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	46	278	587	952
Conversion of Water Rights	245	606	1,185	1,591	1,948	2,230
Brackish Groundwater Desalination (BGD) Plant	0	896	896	896	896	896
New Groundwater Well	1,120	1,120	1,120	1,120	1,120	1,120
ID Improvements - HCID No. 2	8	57	107	156	205	254
Municipal Drought Management	118	146	175	203	232	260
New Supplies from WMS	**1,491**	**2,825**	**3,529**	**4,244**	**4,988**	**5,712**
WUG Balance After WMS	**477**	**1,133**	**1,138**	**1,134**	**1,140**	**1,142**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Alamo's 2011 GPCD was estimated at 133, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Fresh Groundwater Well

Project Source

This strategy was submitted by the City of Alamo to the RWPG.

Description

This strategy is to provide additional groundwater to the City of Alamo with the installation of a groundwater well. The city operates a 5 mgd conventional WTP supplied by an existing well. The new well will be located approximately 1,000 feet from the existing well. It is assumed that the salinity of the new well will be similar to the existing well, so desalination treatment will not be needed.

Available Supply

It is estimated that the new groundwater well could provide an additional 1 mgd to the WTP of the city.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and operations and maintenance. It is assumed that the construction period for this strategy is 1 year. Table 5.3-148 outlines project elements and estimated costs.

Implementation Issues

No implementation issues have been identified.

Table 5.3-148 Alamo – Fresh Groundwater Well Project Requirements and Costs

COST ESTIMATE SUMMARY	
ALAMO – FRESH GROUNDWATER WELL	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,010,000
TOTAL COST OF FACILITIES	**$1,010,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$354,000
Environmental and Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (5 acres)	$3,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$38,000
TOTAL COST OF PROJECT	**$1,416,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$100,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$10,000

COST ESTIMATE SUMMARY	
ALAMO – FRESH GROUNDWATER WELL	
Item	**Estimated Costs for Facilities**
Pumping Energy Costs (258,379 kWh at 0.08 $/kWh)	$21,000
TOTAL O&M	$31,000
TOTAL ANNUAL COST	**$131,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$117**
Annual Cost of Water After Debt Service ($ per acft)	**$28**
Annual Cost of Water ($ per 1,000 gallons)	**$0.36**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.08**

New Brackish Groundwater Treatment Plant

Project Source

This strategy was recommended in the 2011 RWP and updated by the RWPG.

Description

This strategy is to drill a new brackish groundwater well and constructing a new RO WTP to treat the brackish water to potable drinking water standards.

Available Supply

Based on preliminary needs estimates for Alamo, the new brackish groundwater plant is sized to pump 1,120 acft/yr and supply 896 acft/yr starting and 2020. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 acft/yr of raw water, resulting in the 1,120 acft/yr yield (20% water loss).

Environmental Issues

The primary environmental issue associated with brackish groundwater supply is the disposal of concentrate. It is assumed that the concentrate will be disposed of via surface water discharge; however, a specific location and TDS limits will need to be determined during preliminary design.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5.3-149 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit.

Table 5.3-149 Alamo - Brackish Groundwater Treatment Plant Project Requirements and Costs

COST ESTIMATE SUMMARY	
ALAMO – BRACKISH GROUNDWATER DESALINATION PLANT	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$960,000
Two WTPs (1 mgd and 1 mgd)	$11,146,000
TOTAL COST OF FACILITIES	**$12,106,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,237,000
Environmental and Archaeology Studies and Mitigation	$29,000
Land Acquisition and Surveying (6 acres)	$22,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$451,000
TOTAL COST OF PROJECT	**$16,845,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,185,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$10,000
WTP	$1,580,000
Pumping Energy Costs (172,814 kWh at 0.08 $/kWh)	$14,000
TOTAL O&M	$1,604,000
TOTAL ANNUAL COST	**$2,789,000**
Available Project Yield (acft/yr)	**896**
Annual Cost of Water ($ per acft)	**$3,113**
Annual Cost of Water After Debt Service ($ per acft)	**$1,790**
Annual Cost of Water ($ per 1,000 gallons)	**$9.55**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$5.49**

Donna

Donna has a need beginning in 2030 (Table 5.3-150); recommended WMSs are shown in Table 5.3-151.

Table 5.3-150 Donna Existing Supply Balance (acft/yr)

DONNA	2020	2030	2040	2050	2060	2070
Supplies	3,126	3,125	3,125	3,125	3,125	3,125
Demand	2,610	3,126	3,659	4,218	4,802	5,374
Need(-)/Surplus(+)	**516**	**(1)**	**(534)**	**(1,093)**	**(1,677)**	**(2,249)**

Table 5.3-151 Donna WMS Supplies (acft/yr)

DONNA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	69	300	578
ID Improvements - Donna ID	64	170	276	382	488	594
WTP Expansion* - Requires Conversion of Water Rights	950	950	2,240	2,240	2,240	2,240
Municipal Drought Management	0	0	147	171	195	218
New Supplies from WMS	**1,014**	**1,120**	**2,663**	**2,862**	**3,223**	**3,631**
WUG Balance After WMS	**1,530**	**1,119**	**2,129**	**1,769**	**1,546**	**1,382**
* Includes *New Raw Water Reservoir and Raw Water Pump Station* storage improvements						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Donna's 2011 GPCD was estimated at 127 and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

WTP Expansion

Project Source

This strategy was submitted by the City of Donna to the RWPG.

Description

This strategy is for the expansion of the WTP of the City of Donna. The treatment plant is currently under violation for capacity with TCEQ and needs to be expanded. The WMS includes increased WTP capacity, acquisition of water rights, new storage reservoir (approximately 260 acft), and new raw water pump station (i.e., new raw water reservoir and raw water pump station storage improvements).

The existing WTP currently relies on an existing irrigation canal for raw water, but the canal is unreliable, and the plant has seen recent raw water shortages. Constructing a raw water reservoir, primarily for storage, at the plant and a raw water pump station for conveyance to the proposed reservoir will supply the city with a reliable raw water source.

Available Supply

This strategy would expand the WTP from 4 mgd to 6 mgd, supplying an additional 2,240 acft/yr of drinking water. Based on projected demands, the WTP would initially supply 950 acft/yr from 2020 through 2030, and increase to full capacity from 2040 onward.

Engineering and Costing

Costs for this strategy from the UCM include WTP expansion, storage, and pump station. The plant has enough land area for expansion, so land acquisition for the WTP was not included in the costing model. It is assumed that the construction period for this strategy is 2 years.

Costs include the purchase of water rights available through voluntary conversion of irrigation rights, which are limited to 995 acft in the first year of implementation and the remaining water rights as they become available through voluntary conversion from irrigation to DMI. A unit capital cost of $2,500 per acft has been estimated as the market value for water rights, which applies to 468 acft purchased outside the Donna ID. Under Subchapter O of Chapter 49 Texas Water Code, a municipal supplier can buy water rights to the net irrigable acres in a subdivision at 68 percent of the market value. It is assumed that a portion of the urbanized land is within Donna's jurisdiction and this reduced rate would apply to 527 acft, purchased at a unit capital cost of $1,700 per acft.

Per section 8.2.4 of the UCM User Guide, dated November 2018, for all project components except pipelines, the UCM assumes the Environmental/Mitigation Costs are 100 percent of land costs. The recommended value for environmental studies and mitigation costs for pipelines is $25,000/mile of pipeline. This cost estimate is representative of 25 acres for the Reservoir foot-print and conservation pool. Table 5.3-152 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-152 Donna - WTP Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
DONNA – WTP EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
Terminal Storage (conservation pool 258 acft, 25 acres)	$7,883,000
Primary Pump Station (2.1 mgd)	$3,349,000
WTP (2 mgd)	$8,190,000
TOTAL COST OF FACILITIES	**$19,422,000**

COST ESTIMATE SUMMARY	
DONNA – WTP EXPANSION	
Item	**Estimated Costs for Facilities**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$6,798,000
Environmental and Archaeology Studies and Mitigation	$102,000
Land Acquisition and Surveying (31 acres)	$105,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$728,000
TOTAL COST OF PROJECT	**$27,155,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,129,000
Reservoir Debt Service (3.5 percent, 40 years)	$520,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$84,000
Dam and Reservoir (1.5 percent of cost of facilities)	$118,000
WTP	$739,000
TOTAL O&M	$941,000
Pumping Energy Costs (1,845,812 kWh at 0.08 $/kWh)	$148,000
TOTAL ANNUAL COST	**$2,738,000**
Available Project Yield (acft/yr)	**2,240**
Annual Cost of Water ($ per acft)	**$1,222**
Annual Cost of Water After Debt Service ($ per acft)	**$486**
Annual Cost of Water ($ per 1,000 gallons)	**$3.75**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$1.49**

Edcouch

Edcouch has a need in every decade (Table 5.3-153); recommended WMSs are shown in Table 5.3-154.

Table 5.3-153 Edcouch Existing Supply Balance (acft/yr)

EDCOUCH	2020	2030	2040	2050	2060	2070
Supplies	262	262	262	262	262	262
Demand	343	401	463	531	603	675
Need(-)/Surplus(+)	**(81)**	**(139)**	**(201)**	**(269)**	**(341)**	**(413)**

Table 5.3-154 Edcouch WMS Supplies (acft/yr)

EDCOUCH	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	0	16
New Groundwater Supply	725	725	725	725	725	725
ID Improvements - H&CCID No. 9	14	24	35	45	56	66
Municipal Drought Management	13	16	19	23	26	29
New Supplies from WMS	**752**	**765**	**779**	**793**	**807**	**836**
WUG Balance After WMS	**671**	**626**	**578**	**524**	**466**	**423**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Edcouch's 2011 GPCD was estimated at 91, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

New Groundwater Supply

Project Source

This strategy was submitted by the City of Edcouch to the RWPG in the 2016 planning cycle.

Description

This strategy is for the construction of a groundwater well and raw water transmission line to deliver water to the existing 1.5 mgd WTP. The City of Edcouch currently receives raw water from the Rio Grande through the canal system operated by HCID No. 9. This strategy would ensure a reliable secondary source of raw water for the City of Edcouch in case of limited supplies through the ID.

This city anticipates drilling a pilot well and conducting a water quality study to ensure that the present water treatment processes at the existing WTP can treat the new water supply. After testing, the city will identify if additional treatment would be needed at the WTP.

Available Supply

The project submitted includes two 500 gpm wells, which are assumed to operate approximately 50 percent of the time. This well would supply 725 acft of groundwater per year to supplement the existing raw surface water supply.

Engineering and Costing

Costs for this strategy from the UCM include a well pump, well field piping, and land acquisition. It is assumed that the construction period for this strategy is 2 years. Table 5.3-155 outlines the estimated project requirements and costs.

Implementation Issues

No major implementation issues are associated with this strategy. The City of Edcouch would need to receive permits from the TCEQ.

Table 5.3-155 Edcouch - New Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
EDCOUCH – NEW GROUNDWATER SUPPLY	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station (0 mgd)	$3,132,000
Transmission Pipeline (0 in. diameter, miles)	$771,000
Well Fields (wells, pumps, and piping)	$819,000
WTP (0.6 mgd)	$63,000
TOTAL COST OF FACILITIES	**$4,785,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$1,636,000
Environmental and Archaeology Studies and Mitigation	$115,000
Land Acquisition and Surveying (61 acres)	$209,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$186,000
TOTAL COST OF PROJECT	**$6,931,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$488,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$16,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$78,000
WTP	$38,000
Pumping Energy Costs (297,620 kWh at 0.08 $/kWh)	$24,000
TOTAL O&M	$156,000
TOTAL ANNUAL COST	**$644,000**
Available Project Yield (acft/yr)	**725**
Annual Cost of Water ($ per acft)	**$888**
Annual Cost of Water After Debt Service ($ per acft)	**$215**
Annual Cost of Water ($ per 1,000 gallons)	**$2.73**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.66**

Edinburg

Edinburg has projected demands in every planning decade (Table 5.3-156); recommended WMSs are shown in Table 5.3-157.

Table 5.3-156 Edinburg Existing Supply Balance (acft/yr)

EDINBURG	2020	2030	2040	2050	2060	2070
WUG Demand	12,974	15,730	18,573	21,484	24,459	27,374
Demand	**12,974**	**15,730**	**18,573**	**21,484**	**24,459**	**27,374**
Supplies	**6,139**	**6,139**	**4,222**	**4,222**	**4,222**	**4,222**
Need/Surplus	**(6,835)**	**(9,591)**	**(14,351)**	**(17,262)**	**(20,237)**	**(23,152)**

Table 5.3-157 Edinburg WMS Supplies (acft/yr)

EDINBURG	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	329	1,290	2,549	4,035
Conversion of Water Rights	3,236	5,072	10,758	12,411	13,824	14,969
ID Improvements - HCID No. 1	259	350	216	261	305	350
ID Improvements - HCID No. 2	11	79	146	214	281	349
Municipal Drought Management	488	606	724	843	961	1,076
Non-Potable Reuse	3,243	3,920	3,920	3,920	3,920	3,920
New Supplies from WMS	**7,237**	**10,027**	**16,093**	**18,938**	**21,840**	**24,700**
WUG Balance After WMS	**402**	**436**	**1,742**	**1,676**	**1,603**	**1,548**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Edinburg's 2011 GPCD was estimated at 128, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Non-Potable Reuse Water for Cooling Tower and Landscaping Usage

Project Source

This strategy was submitted by the City of Edinburg to the RWPG.

Description

For this direct non-potable reuse strategy, the City of Edinburg would provide the University of Texas Pan America (UTPA) with reuse water from their WWTP. UTPA would use the reclaimed water for non-potable needs such as cooling water makeup and landscape irrigation. A map of the approximate alignment for the Edinburg WWTP non-potable reuse line is shown on Figure 5.3-12.

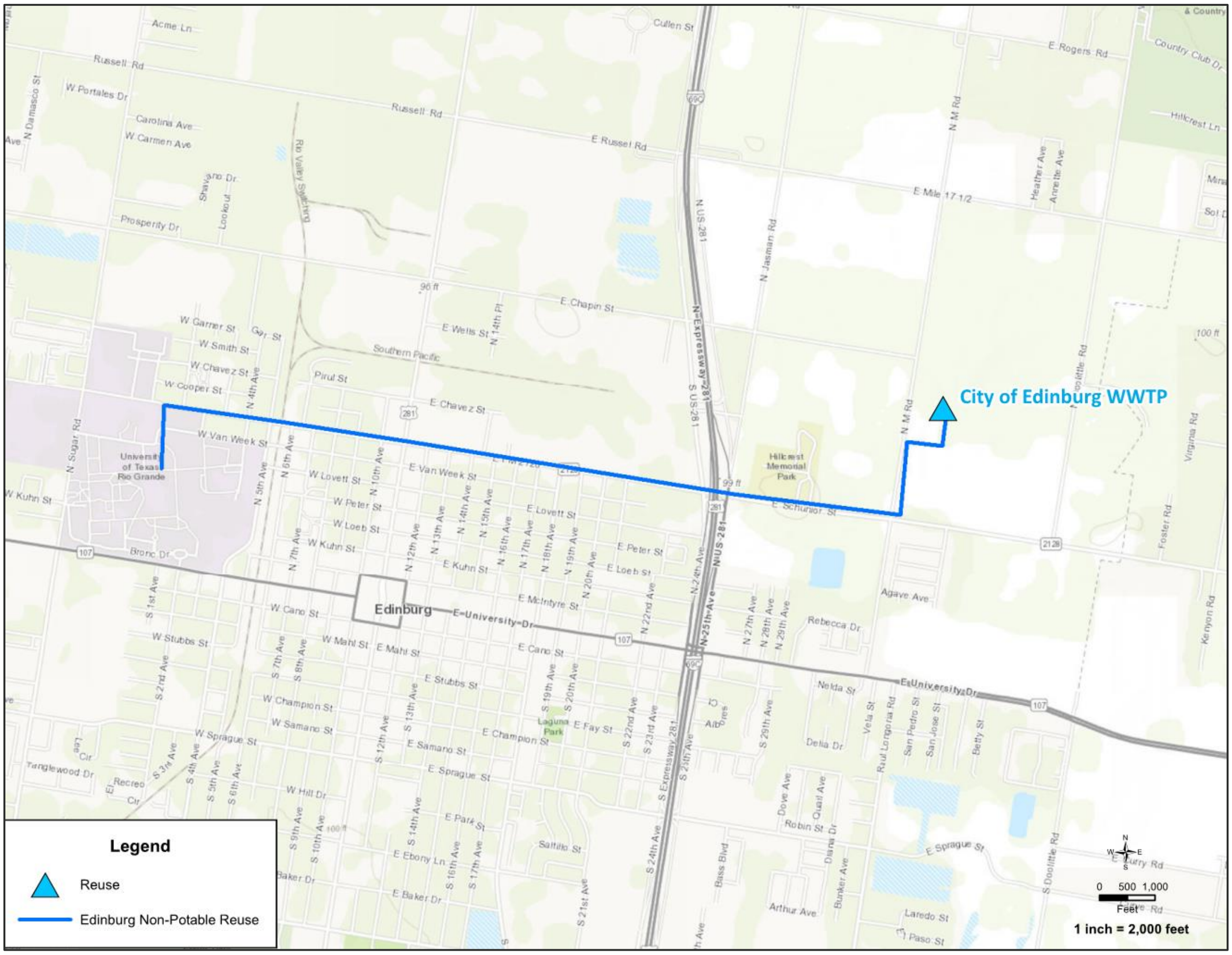

Figure 5.3-12 Edinburg WWTP Non-Potable Reuse Project Location

Available Supply

The City of Edinburg WWTP currently supplies approximately 3.5 mgd of reuse water. It has the capacity to provide an additional 3.5 mgd, or 3,920 acft/yr, of reclaimed water to be used by UTPA. It is likely that additional reuse water would be available in future years; however, that is outside of the scope of this specific strategy. Non-potable water in this RWP is accounted for as addressing a maximum of 25 percent of the city's demands, and the remainder is sold to manufacturing.

Engineering and Costing

This strategy involves construction of a pump station and pipeline to convey the reclaimed water from the WWTP to the UTPA campus. It was assumed that some additional tertiary treatment at the plant would also be installed. It is assumed that the construction period would be 1.5 years.

Table 5.3-158 outlines the project requirements and cost estimates developed in UCM. Treatment Level 1 was used in UCM to provide a cost estimate for the small amount of additional treatment that may be required.

Implementation Issues

Approval for a reclaimed water system is needed from TCEQ. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit.

Table 5.3-158 Edinburg - Non-Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
EDINBURG – NON-POTABLE REUSE PROJECT	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$5,793,000
Transmission Pipeline (14 in. diameter, 3 miles)	$4,384,000
WTP (3.5 mgd)	$2,175,000
TOTAL COST OF FACILITIES	**$12,352,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,104,000
Environmental and Archaeology Studies and Mitigation	$98,000
Land Acquisition and Surveying (43 acres)	$163,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$460,000
TOTAL COST OF PROJECT	**$17,177,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,209,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$44,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$145,000
WTP	$718,000
Pumping Energy Costs (1,095,673 kWh at 0.08 $/kWh)	$88,000
TOTAL O&M	$995,00
TOTAL ANNUAL COST	**$2,204,000**
Available Project Yield (acft/yr)	**3,920**
Annual Cost of Water ($ per acft)	**$562**
Annual Cost of Water After Debt Service ($ per acft)	**$254**
Annual Cost of Water ($ per 1,000 gallons)	**$1.73**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.78**

Elsa

Elsa is predicted to have a need in every decade (Table 5.3-159); recommended WMSs are recommended in Table 5.3-160.

Table 5.3-159 Elsa Existing Supply Balance (acft/yr)

ELSA	2020	2030	2040	2050	2060	2070
Irrigation, Hidalgo – Contract Demand	216	216	216	216	216	216
Demand	**832**	**987**	**1,150**	**1,322**	**1,504**	**1,683**
Supplies	**784**	**784**	**784**	**783**	**783**	**783**
Need/Surplus	**(264)**	**(419)**	**(582)**	**(755)**	**(937)**	**(1,116)**

Table 5.3-160 Elsa WMS Supply (acft/yr)

ELSA	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	0	44	128
Conversion of Water Rights	225	355	499	655	799	934
ID Improvements - H&CCID No. 9	33	58	82	107	132	157
Municipal Drought Management	30	38	45	52	60	67
New Supplies from WMS	**289**	**450**	**627**	**815**	**1,035**	**1,286**
WUG Balance After WMS	**25**	**31**	**45**	**60**	**98**	**170**
Alternative WMS*						
WTP Expansion and Interconnect to Engleman ID	2,240	2,240	2,240	2,240	2,240	2,240
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Elsa's 2011 GPCD was estimated at 112, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Hidalgo

The City of Hidalgo shows a need in every decade (Table 5.3-161); recommended WMSs are listed in Table 5.3-162.

Table 5.3-161 Hidalgo Existing Supply Balance (acft/yr)

HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	1,767	1,932	1,932	1,932	1,932	1,932
Demand	1,858	2,253	2,661	3,079	3,505	3,923
Need(-)/Surplus(+)	**(91)**	**(321)**	**(729)**	**(1,147)**	**(1,573)**	**(1,991)**

Table 5.3-162 Hidalgo WMS Supplies (acft/yr)

HIDALGO	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	46	184	364	577
Conversion of Water Rights	78	298	662	924	1,594	1,352
Expand Existing Groundwater Wells	0	0	300	300	300	300
Municipal Drought Management	43	54	64	74	85	95
New Supplies from WMS	**121**	**351**	**1,072**	**1,483**	**2,343**	**2,324**
WUG Balance After WMS	**17**	**17**	**330**	**323**	**757**	**320**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Hidalgo's 2011 GPCD was estimated at 125, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Groundwater Supply Expansion

Project Source

This strategy was recommended in the 2016 RWP and updated by the RWPG.

Description

This strategy is to provide additional supply to Hidalgo with the installation of additional fresh groundwater wells.

Available Supply

The proposed groundwater wells would provide 300 acft/yr in 2030.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water disinfection. It is assumed that the construction period for this strategy is 1 year. Table 5.3-163 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Varying groundwater quality in the Gulf Coast Aquifer is a concern, but freshwater wells are productive in the area near Hidalgo. All recommended groundwater pumping is guided by the MAG values. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a Texas DOT ROW permit.

Table 5.3-163 Hidalgo - Groundwater Supply Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
HIDALGO – GROUNDWATER SUPPLY EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$553,000
WTP (0.3 mgd)	$35,000
TOTAL COST OF FACILITIES	**$588,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$206,000
Environmental and Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (5 acres)	$3,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$23,000
TOTAL COST OF PROJECT	**$831,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$59,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$6,000
WTP	$21,000
Pumping Energy Costs (138,118 kWh at 0.08 $/kWh)	$11,000
TOTAL O&M	$38,000
TOTAL ANNUAL COST	**$97,000**
Available Project Yield (acft/yr)	**300**

COST ESTIMATE SUMMARY	
HIDALGO – GROUNDWATER SUPPLY EXPANSION	
Item	**Estimated Costs for Facilities**
Annual Cost of Water ($ per acft)	**$323**
Annual Cost of Water After Debt Service ($ per acft)	**$127**
Annual Cost of Water ($ per 1,000 gallons)	**$0.99**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.39**

Hidalgo County Municipal Utility District No. 1

Hidalgo County MUD No. 1 has projected needs in every decade (Table 5.3-164); recommended WMSs are shown in Table 5.3-165.

Table 5.3-164 Hidalgo County MUD No. 1 Existing Supply Balance (acft/yr)

HIDALGO COUNTY MUD NO. 1	2020	2030	2040	2050	2060	2070
Supplies	604	604	604	604	604	604
Demand	816	896	979	1,063	1,147	1,228
Need(-)/Surplus(+)	**(212)**	**(292)**	**(375)**	**(459)**	**(543)**	**(624)**

Table 5.3-165 Hidalgo County MUD No. 1 WMS Supplies (acft/yr)

HIDALGO COUNTY MUD NO. 1	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	39	93	153
Conversion of Water Rights	148	218	254	293	284	292
ID Improvements - HCID No. 1	42	56	71	85	100	115
Municipal Drought Management	60	68	75	82	89	96
New Supplies from WMS	**250**	**342**	**400**	**499**	**566**	**656**
WUG Balance After WMS	**38**	**50**	**25**	**40**	**23**	**32**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Hidalgo County MUD No. 1's 2011 GPCD was estimated at 82, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use.

La Joya

The City of La Joya has needs projected for every decade (Table 5.3-166); recommended WMSs are shown in Table 5.3-167.

Table 5.3-166 La Joya Existing Supply Balance (acft/yr)

LA JOYA	2020	2030	2040	2050	2060	2070
Supplies	364	364	364	364	364	364
Demand	651	783	919	1,060	1,207	1,350
Need(-)/Surplus(+)	**(287)**	**(419)**	**(555)**	**(696)**	**(843)**	**(986)**

Table 5.3-167 La Joya WMS Supplies (acft/yr)

LA JOYA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	30	89	159
Conversion of Water Rights	377	391	503	611	675	737
ID Improvements - HCID No. 16	39	45	51	57	63	69
Municipal Drought Management	17	21	25	29	33	36
New Supplies from WMS	**433**	**457**	**579**	**727**	**860**	**1,002**
WUG Balance After WMS	**146**	**38**	**24**	**31**	**17**	**16**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. La Joya's 2011 GPCD was estimated at 125, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

La Villa

La Villa shows projected needs in every decade (Table 5.3-168); recommended WMSs are in Table 5.3-169.

Table 5.3-168 La Villa Existing Supply Balance (acft/yr)

LA VILLA	2020	2030	2040	2050	2060	2070
Supplies	256	256	256	256	256	256
Demand	277	332	388	448	509	570
Need(-)/Surplus(+)	**(21)**	**(76)**	**(132)**	**(192)**	**(253)**	**(314)**

Table 5.3-169 La Villa WMS Supply (acft/yr)

LA VILLA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	6	29	59
Conversion of Water Rights	37	97	141	188	202	218
ID Improvements - H&CCID No. 9	11	19	27	35	43	51
Municipal Drought Management	8	10	12	14	16	18
New Supplies from WMS	**56**	**126**	**180**	**243**	**290**	**346**
WUG Balance After WMS	**15**	**30**	**28**	**31**	**17**	**12**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. La Villa's 2011 GPCD was estimated at 108, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

McAllen

The City of McAllen has projected needs in every decade (Table 5.3-170); recommended WMSs are shown in Table 5.3-171.

Table 5.3-170 McAllen Existing Supply Balance (acft/yr)

MCALLEN	2020	2030	2040	2050	2060	2070
WUG Demand	39,787	48,510	57,403	66,492	75,765	84,820
Edinburg - Contract Demand	55	55	55	55	55	55
Manufacturing, Hidalgo – Contract Demand	300	300	300	300	300	300
Demand	**40,142**	**48,865**	**57,758**	**66,847**	**76,120**	**85,175**
Supplies	**37,270**	**37,270**	**37,270**	**37,270**	**37,270**	**37,270**
Need/Surplus	**(2,872)**	**(11,595)**	**(20,488)**	**(29,577)**	**(38,850)**	**(47,905)**

Table 5.3-171 McAllen Water WMS Supplies (acft/yr)

MCALLEN	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	3,558	8,804	15,340	22,992	28,889
AMI Project	1,140	1,140	1,140	1,140	1,140	1,140
Brackish Groundwater Desalination Plant	0	2,688	2,688	2,688	2,688	2,688
Conversion of Water Rights	0	0	2,968	3,622	5,223	8,370
ID Improvements - HCID No. 1	196	264	333	402	471	540
ID Improvements - HCID No. 2	29	204	378	552	727	901
ID Improvements - HCWID No. 3	1,672	1,672	1,672	1,672	1,672	1,672
ID Improvements - United ID	1,227	1,227	1,227	1,227	1,227	1,227
Raw Waterline Project	800	800	800	800	800	800
Municipal Drought Management	1,071	1,330	1,589	1,850	2,110	2,363
North WWTP Potable Reuse	0	3,880	3,880	6,060	6,060	6,060
New Supplies from WMS	**6,135**	**16,762**	**25,479**	**35,353**	**45,110**	**54,650**
WUG Balance After WMS	**3,263**	**5,167**	**3,191**	**3,976**	**4,460**	**4,945**
Alternative WMS*						
Expand Existing Groundwater Supply	0	500	500	500	1,500	1,500
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. McAllen's 2011 GPCD was estimated at 220, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use.

AMI Project

Project Source

This strategy was submitted by McAllen to the RWPG during the 2021 regional water planning process.

Description

This strategy is to replace all existing manual meters that may be broken, malfunctioning, or inactive for two years with automated meter reading equipment within McAllen's distribution system.

Available Supply

McAllen estimates 360 to 385 million gallons of their current water losses can be conserved. For the intents and purposes of this plan, 380 million gallons or 1,140 acft/yr was used as the WMS yield.

Engineering and Costing

McAllen estimated the capital cost of this strategy at $25,043,000 in 2020, which is converted to 2018 dollars $24,206,000. Table outlines the project requirements and other cost metrics developed in the UCM, assuming one year of construction and standard financing parameters.

Implementation Issues

No implementation issues have been identified. Metering is recommended across the region to reduce system losses.

Table 5.3-172 McAllen – AMI Project Cost Summary

COST ESTIMATE SUMMARY	
McALLEN – AMI PROJECT	
Item	**Estimated Costs for Facilities**
Automated Metering Infrastructure	$24,206,000
CAPITAL COST	**$24,206,000**
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$666,000
TOTAL COST OF PROJECT	**$24,872,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,750,000
O&M	
Automated Metering Infrastructure	$242,000
TOTAL ANNUAL COST	**$1,992,000**
Available Project Yield (acft/yr)	**1,140**
Annual Cost of Water ($ per acft)	**$1,747**
Annual Cost of Water After Debt Service ($ per acft)	**$212**
Annual Cost of Water ($ per 1,000 gallons)	**$5.36**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.65**

Raw Waterline Project with HCID No. 1

Project Source

This strategy was submitted by the City of McAllen to the RWPG.

Description

This strategy is for the construction of a raw waterline from HCID No. 1 to the city's North WTP. The raw waterline would provide the WTP with a second source of raw water from the irrigation canal, an important redundancy that does not currently exist. A map of the proposed pipeline alignment is shown on Figure 5.3-13.

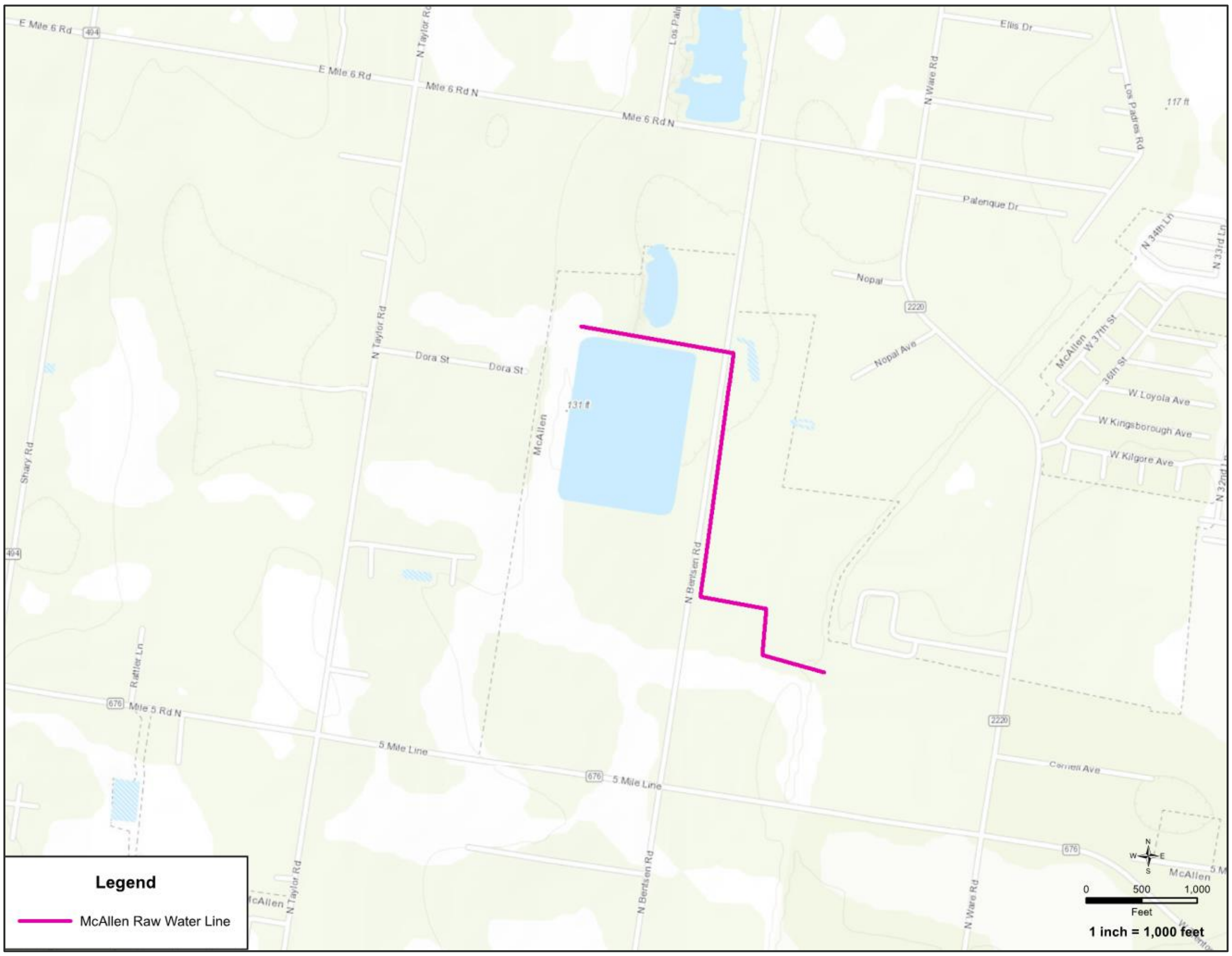

Figure 5.3-13 McAllen HCID No. 1 Raw Water Pipeline Project Location

Available Supply

Executed water rights and the raw waterline will provide the City of McAllen 800 acft/yr beginning in the 2020 decade.

Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, land acquisition, and pipeline ROW. Table 5.3-173 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

The project is completely within the city limits of McAllen and no major issues are known at this time. Construction of the new pipeline may include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, easement acquisition may be required for the pipeline route.

Table 5.3-173 McAllen – Raw Waterline Project Requirements and Costs

COST ESTIMATE SUMMARY	
McALLEN – RAW WATERLINE PROJECT	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$895,000
Transmission Pipeline (8 in. diameter, 1 mile)	$181,000
TOTAL COST OF FACILITIES	**$1,076,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$368,000
Environmental and Archaeology Studies and Mitigation	$36,000
Land Acquisition and Surveying (15 acres)	$53,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$43,000
TOTAL COST OF PROJECT	**$1,576,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$111,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$2,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$22,000
Pumping Energy Costs (1,718,734 kWh at 0.08 $/kWh)	$137,000
TOTAL O&M	$161,000
TOTAL ANNUAL COST	**$272,000**
Available Project Yield (acft/yr)	**800**
Annual Cost of Water ($ per acft)	**$340**
Annual Cost of Water After Debt Service ($ per acft)	**$201**
Annual Cost of Water ($ per 1,000 gallons)	**$1.04**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.62**

McAllen North WWTP Potable Reuse

Project Source

This strategy was identified by the RWPG.

Description

This direct potable reuse strategy is to pump treated effluent from the McAllen North WWTP to the McAllen North WTP. The estimate route for the North WWTP potable reuse pipeline is shown on Figure 5.3-14.

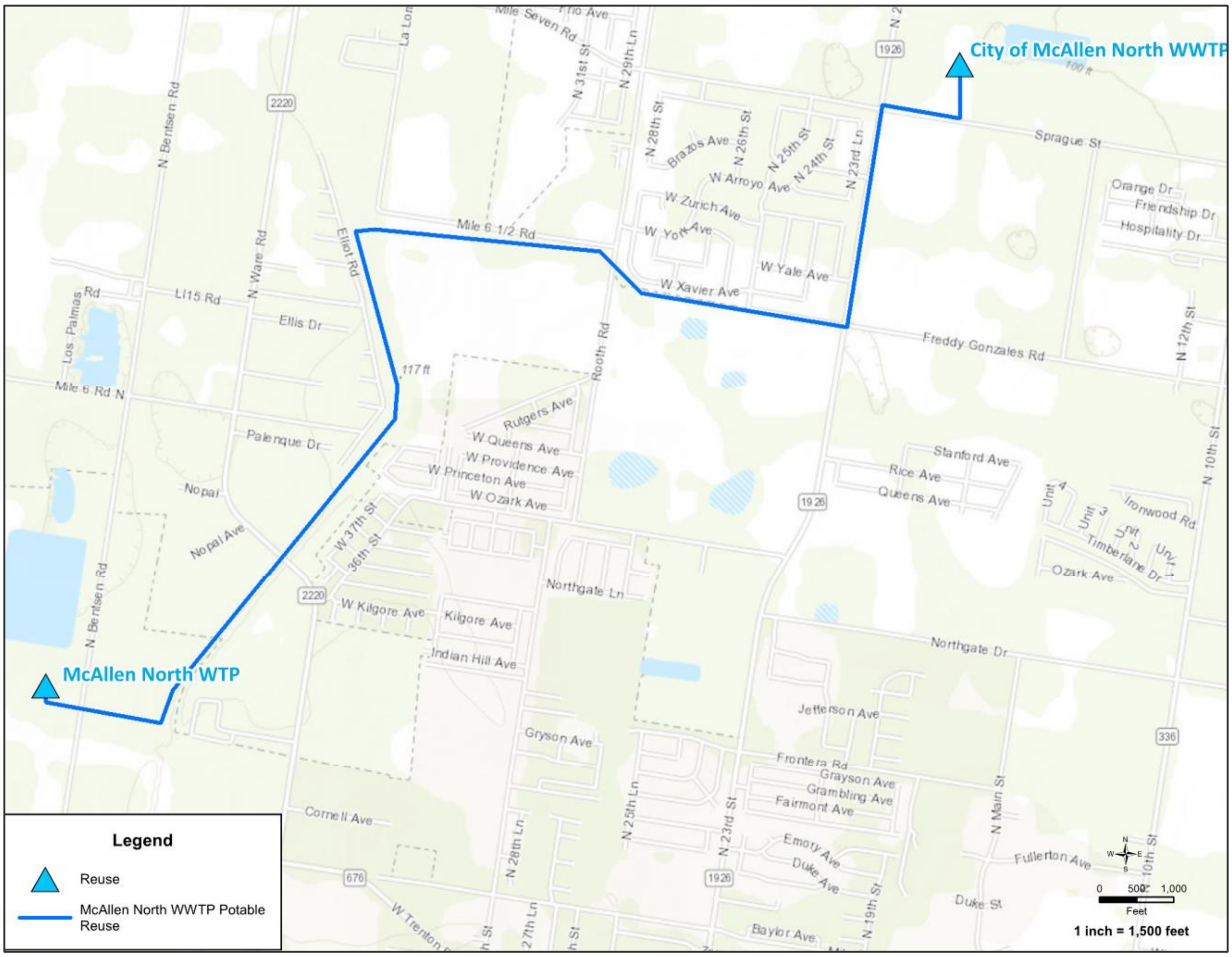

Figure 5.3-14 McAllen North WWTP Potable Reuse Pipeline Project Location

Available Supply

Based on recorded WWTP flows, the current annual average flow for McAllen North WWTP is 11.25 mgd. It is assumed that half of the effluent flow will be produced for potable reuse. Approximately 3,880 acft/yr of potable reuse will be produced in 2030 and expanding to 6,060 acft/yr of potable wastewater effluent in 2050.

Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and ground storage tank at the WWTP site and a pipeline to convey the reuse water to McAllen North WTP would be constructed. It is assumed that the construction period would be 2 years.

Table 5.3-174 and

Table **5.3-175** outline the estimated project requirements and costs for Phases I and II.

Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-174 McAllen - North WWTP Potable Reuse Phase 1 Project Requirements and Costs

COST ESTIMATE SUMMARY	
McALLEN – NORTH WWTP POTABLE REUSE PHASE 1	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$4,431,000
Transmission Pipeline (18 in. diameter, 3 miles)	$2,279,000
Storage Tanks (other than at booster pump stations)	$3,229,000
Advanced Water Treatment Facility (3.5 mgd)	$25,835,000
TOTAL COST OF FACILITIES	**$35,774,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$12,407,000
Environmental and Archaeology Studies and Mitigation	$99,000
Land Acquisition and Surveying (45 acres)	$164,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,333,000
TOTAL COST OF PROJECT	**$49,777,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,502,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$55,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$111,000

COST ESTIMATE SUMMARY	
McALLEN – NORTH WWTP POTABLE REUSE PHASE 1	
Item	**Estimated Costs for Facilities**
Advanced Water Treatment Facility	$3,326,000
Pumping Energy Costs (627,435 kWh at 0.08 $/kWh)	$50,000
TOTAL O&M	$3,542,000
TOTAL ANNUAL COST	**$7,044,000**
Available Project Yield (acft/yr)	**3,880**
Annual Cost of Water ($ per acft)	**$1,815**
Annual Cost of Water After Debt Service ($ per acft)	**$913**
Annual Cost of Water ($ per 1,000 gallons)	**$5.57**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.80**

Table 5.3-175 McAllen - North WWTP Potable Reuse Phase II Project Expansion Requirements and Costs

COST ESTIMATE SUMMARY	
McALLEN – NORTH WWTP REUSE PHASE 2 (EXPANSION)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$3,431,000
Advanced Water Treatment Facility (2 mgd)	$16,285,000
TOTAL COST OF FACILITIES	**$19,716,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$6,901,000
Environmental and Archaeology Studies and Mitigation	$92,000
Land Acquisition and Surveying (42 acres)	$156,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$739,000
TOTAL COST OF PROJECT	**$27,604,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,942,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$86,000
Advanced Water Treatment Facility	$2,042,000

COST ESTIMATE SUMMARY	
McALLEN – NORTH WWTP REUSE PHASE 2 (EXPANSION)	
Item	Estimated Costs for Facilities
Pumping Energy Costs (283,802 kWh at 0.08 $/kWh)	$23,000
TOTAL O&M	$2,151,000
TOTAL ANNUAL COST	**$4,093,000**
Available Project Yield (acft/yr)	**2,180**
Annual Cost of Water ($ per acft)	**$1,878**
Annual Cost of Water After Debt Service ($ per acft)	**$987**
Annual Cost of Water ($ per 1,000 gallons)	**$5.76**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.03**

Brackish Groundwater Desalination Plant

Project Source
This strategy was recommended in the 2011 RWP and updated by the RWPG.

Description
This strategy is for drilling four new groundwater wells and constructing a new RO WTP to treat the brackish water to potable drinking water standards.

Available Supply
Based on preliminary needs estimates for McAllen, the new brackish groundwater plant is sized for 3 mgd of treatment, which will yield 2,688 acft/yr beginning in the 2030 decade. Assuming a RO efficiency of 80%, this strategy would require pumping 3,360 acft/yr of raw water, resulting in the 2,688 acft/yr yield (20% water loss).

Engineering and Costing
Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5.3-176 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues
No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit.

Table 5.3-176 McAllen - Brackish Groundwater Desalination Plant Project Requirements and Costs

COST ESTIMATE SUMMARY	
McALLEN – BRACKISH GROUNDWATER TREATMENT PLANT	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$4,211,000
Two WTPs (3 mgd and 3 mgd)	$25,480,000
TOTAL COST OF FACILITIES	**$29,691,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$10,392,000
Environmental and Archaeology Studies and Mitigation	$88,000
Land Acquisition and Surveying (18 acres)	$66,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,107,000
TOTAL COST OF PROJECT	**$41,344,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,909,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$42,000
WTP	$3,327,000
Pumping Energy Costs (1,003,285 kWh at 0.08 $/kWh)	$80,000
TOTAL O&M	$3,449,000
TOTAL ANNUAL COST	**$6,358,000**
Available Project Yield (acft/yr)	**2,688**
Annual Cost of Water ($ per acft)	**$2,365**
Annual Cost of Water After Debt Service ($ per acft)	**$1,283**
Annual Cost of Water ($ per 1,000 gallons)	**$7.26**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.94**

Mercedes

Mercedes has projected demands from 2040 onward (Table 5.3-177); recommended WMSs are shown in Table 5.3-178.

Table 5.3-177 Mercedes Existing Supply Balance (acft/yr)

MERCEDES	2020	2030	2040	2050	2060	2070
Supplies	2,893	2,893	2,893	2,893	2,893	2,893
Demand	2,222	2,648	3,090	3,558	4,048	4,530
Need(-)/Surplus(+)	**671**	**245**	**(197)**	**(665)**	**(1,155)**	**(1,637)**

Table 5.3-178 Mercedes WMS Supplies (acft)

MERCEDES	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	0	0	170	399
Conversion of Water Rights	0	0	0	220	448	608
ID Improvements - H&CCID No. 9	96	167	239	310	382	453
Municipal Drought Management	0	0	128	150	171	191
New Supplies from WMS	**96**	**167**	**367**	**680**	**1,171**	**1,651**
WUG Balance After WMS	**767**	**412**	**170**	**15**	**16**	**14**
Alternative WMS*						
Expand Existing Groundwater Supply	560	560	560	560	560	560
*Alternative WMS evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Mercedes' 2011 GPCD was estimated at 111, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Military Highway Water Supply Corporation

Refer to Subsection 5.3.1, Cameron County.

Mission

The City of Mission has projected needs in every planning decade (Table 5.3-179); recommended WMSs are shown in Table 5.3-180.

Table 5.3-179 Mission Existing Supply Balance (acft/yr)

MISSION	2020	2030	2040	2050	2060	2070
Supplies	11,556	11,556	11,556	11,556	11,556	11,556
Demand	20,070	24,532	29,086	33,717	38,414	43,002
Need(-)/Surplus(+)	**(8,514)**	**(12,976)**	**(17,530)**	**(22,161)**	**(26,858)**	**(31,446)**

Table 5.3-180 Mission WMS Supplies (acft/yr)

MISSION	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	1,916	4,635	7,721	10,209	12,958
Brackish Groundwater Desalination Plant	0	2,688	2,688	2,688	2,688	2,688
Conversion of Water Rights	2,200	2,587	5,272	4,128	6,287	8,083
ID Improvements - United ID	1,483	1,483	1,483	1,483	1,483	1,483
Municipal Drought Management	949	1,178	1,408	1,639	1,870	2,094
Mission WWTP Reuse	3,920	3,920	3,920	7,560	7,560	7,560
New Supplies from WMS	**8,552**	**13,772**	**19,407**	**25,219**	**30,097**	**34,866**
WUG Balance After WMS	**38**	**796**	**1,877**	**3,058**	**3,239**	**3,420**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Mission's 2011 GPCD was estimated at 193, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use.

Mission Brackish Groundwater Desalination Plant

Project Source

This strategy was recommended in the 2016 RWP.

Description

This strategy is for drilling three new brackish groundwater wells and constructing a new RO WTP to treat the brackish water to potable drinking water standards.

Available Supply

Based on preliminary needs estimates for Mission, the new brackish groundwater plant would treat 3 mgd (3,360 acft/yr) and produce 2,688 acft/yr. Implementation planned for the 2030 decade. Assuming an RO efficiency of 80%, this strategy would require pumping 3,360 acft/yr of raw water, resulting in the 2,688 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5.3-181 outlines the project requirements and cost estimate developed in UCM.

Table 5.3-181 Mission - Brackish Groundwater Desalination Plant Project Requirements and Costs

COST ESTIMATE SUMMARY	
MISSION – BRACKISH GROUNDWATER TREATMENT PLANT	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$4,211,000
Two WTPs (3 mgd and 3 mgd)	$25,480,000
TOTAL COST OF FACILITIES	**$29,691,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$10,392,000
Environmental and Archaeology Studies and Mitigation	$88,000
Land Acquisition and Surveying (18 acres)	$66,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,107,000
TOTAL COST OF PROJECT	**$41,344,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,909,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$42,000
WTP	$3,327,000
Pumping Energy Costs (1,003,285 kWh at 0.08 $/kWh)	$80,000
TOTAL O&M	$3,449,000
TOTAL ANNUAL COST	**$6,358,000**
Available Project Yield (acft/yr)	**2,688**
Annual Cost of Water ($ per acft)	**$2,365**

COST ESTIMATE SUMMARY	
MISSION – BRACKISH GROUNDWATER TREATMENT PLANT	
Item	Estimated Costs for Facilities
Annual Cost of Water After Debt Service ($ per acft)	$1,283
Annual Cost of Water ($ per 1,000 gallons)	$7.26
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$3.94

Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit.

Mission Direct Potable Reuse

Project Source

This strategy was identified by the RWPG.

Description

This strategy is for the City of Mission to use wastewater effluent for direct potable reuse. Effluent from the Mission WWTP will be pumped to the South WTP for conventional treatment after it has gone through advanced treatment. The estimate route of the Mission WWTP Potable Reuse Pipeline is shown on Figure 5.3-15.

Figure 5.3-15 Mission WWTP Potable Reuse Project Location

Available Supply

The Mission WWTP has the capacity currently treats 13.5 mgd on average. It is assumed approximately half of the effluent flow can be produced for potable reuse. The city plans to utilize the available effluent to supply an additional 3.5 mgd, or 3,920 acft/yr, of water starting in 2020. Mission's population is projected to nearly double by the year 2050, allowing for more potable reuse in the future. Phase II supplies the city will be supplied with approximately 7 mgd, or 7,840 acft/yr, of potable reuse water in later decades. It is assumed that 20 percent of the influent water would be lost through the treatment process; therefore, 4,700 to 9,400 acft/yr of wastewater effluent would be used.

Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and ground storage tank at the WWTP site and a pipeline to convey the reuse water to the WTP would be constructed. The pipeline was sized for ultimate buildout during Phase I of the project. It is assumed that the construction period for each phase would be 2 years. Table 5.3-182 and

Table 5.3-183 outline the estimated project requirements used to develop the cost estimates for Phase I and the Phase II Expansion.

Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-182 Mission - WWTP Potable Reuse Phase I Project Requirements and Costs

COST ESTIMATE SUMMARY	
MISSION – WWTP POTABLE REUSE (PHASE 1)	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$3,747,000
Transmission Pipeline (24 in. diameter, 1 miles)	$1,611,000
Advanced Water Treatment Facility (3.5 mgd)	$25,835,000
TOTAL COST OF FACILITIES	**$31,193,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$10,837,000
Environmental and Archaeology Studies and Mitigation	$42,000
Land Acquisition and Surveying (19 acres)	$65,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,159,000
TOTAL COST OF PROJECT	**$43,296,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,046,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$16,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$94,000
Advanced Water Treatment Facility	$3,326,000
Pumping Energy Costs (386,262 kWh at 0.08 $/kWh)	$31,000
TOTAL O&M	$3,467,000
TOTAL ANNUAL COST	**$6,513,000**
Available Project Yield (acft/yr)	**3,920**
Annual Cost of Water ($ per acft)	**$1,661**

COST ESTIMATE SUMMARY	
MISSION – WWTP POTABLE REUSE (PHASE 1)	
Item	**Estimated Costs for Facilities**
Annual Cost of Water After Debt Service ($ per acft)	**$884**
Annual Cost of Water ($ per 1,000 gallons)	**$5.10**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.71**

Table 5.3-183 Mission - WWTP Potable Reuse Phase II Project Expansion Requirements and Costs

COST ESTIMATE SUMMARY	
MISSION – WWTP POTABLE REUSE (PHASE 2, EXPANSION)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$3,619,000
Advanced Water Treatment Facility (3.3 mgd)	$24,561,000
TOTAL COST OF FACILITIES	**$28,180,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$9,863,000
Environmental and Archaeology Studies and Mitigation	$42,000
Land Acquisition and Surveying (19 acres)	$6,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,048,000
TOTAL COST OF PROJECT	**$39,139,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,754,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$90,000
Advanced Water Treatment Facility	$3,155,000
Pumping Energy Costs (356,795 kWh at 0.08 $/kWh)	$29,000
TOTAL O&M	$3,274,000
TOTAL ANNUAL COST	**$6,028,000**
Available Project Yield (acft/yr)	**3,640**
Annual Cost of Water ($ per acft)	**$1,656**
Annual Cost of Water After Debt Service ($ per acft)	**$899**

COST ESTIMATE SUMMARY	
MISSION – WWTP POTABLE REUSE (PHASE 2, EXPANSION)	
Item	Estimated Costs for Facilities
Annual Cost of Water ($ per 1,000 gallons)	**$5.08**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.76**

North Alamo Water Supply Corporation

Refer to Subsection 5.3.1, Cameron County.

Pharr

The City of Pharr has identified needs from 2030 onward (Table 5.3-184); recommended WMSs are shown in Table 5.3-185.

Table 5.3-184 Pharr Existing Supply Balance (acft/yr)

PHARR	2020	2030	2040	2050	2060	2070
WUG Demand	9,923	11,933	14,020	16,182	18,415	20,606
WWP Supplies	10,372	10,573	10,782	10,998	11,222	11,440
Need/Surplus	**449**	**(1,360)**	**(3,238)**	**(5,184)**	**(7,194)**	**(9,166)**

Table 5.3-185 Pharr Water WMS Supplies (acft/yr)

PHARR	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	458	1,354	2,433
Conversion of Water Rights	0	20	20	20	20	20
ID Improvements - HCID No. 2	39	271	502	734	965	1,197
Municipal Drought Management	0	556	665	774	883	989
Raw Water Reservoir Augmentation Potable Reuse	6,721	6,721	6,721	6,721	6,721	6,721
New Supplies from WMS	**6,760**	**7,568**	**7,908**	**8,707**	**9,943**	**11,360**
WUG Balance After WMS	**7,209**	**6,208**	**4,670**	**3,523**	**2,750**	**2,195**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Pharr's 2011 GPCD was estimated at 108, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Raw Water Reservoir Augmentation Potable Reuse

Project Source

This strategy was submitted by the City of Pharr to the RWPG.

Description

This direct potable reuse strategy is to augment the City of Pharr's raw water supply with reuse water. A portion of the WWTP effluent would be treated to near drinking water standards, stored in a buffering pond, and then pumped to a raw water storage pond where it would mix with raw Rio Grande water supplied by Hidalgo County ID No. 2. This strategy was presented to and approved by TWDB in a Water Reuse Priority and Implementation Plan Report, prepared in September 2011. The approximate alignment of the Pharr WWTP potable reuse pipeline for the Raw Water Reservoir Augmentation WMS is shown on Figure 5.3-16.

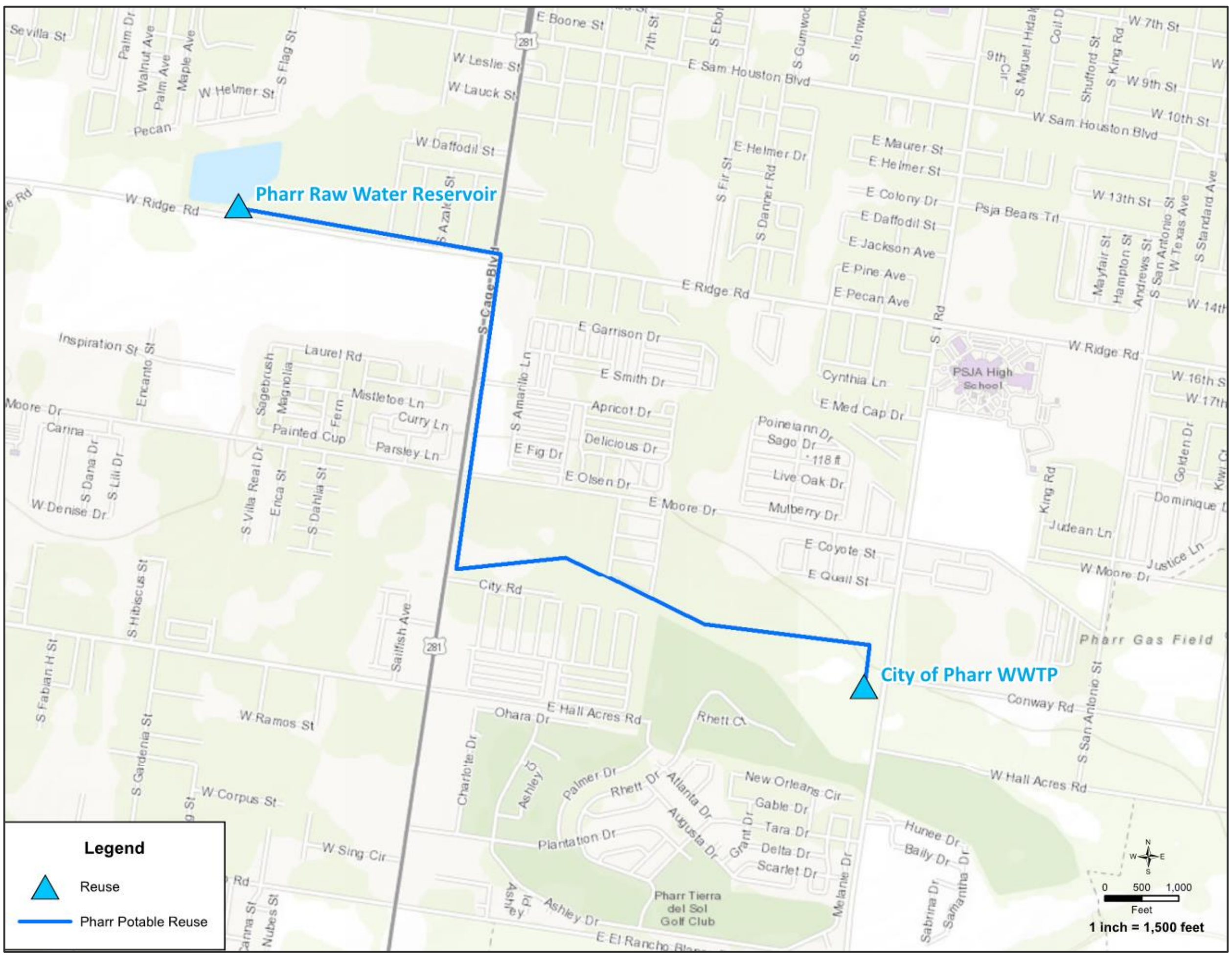

Figure 5.3-16 Pharr Raw Water Reservoir Augmentation Potable Reuse Project Location

Available Supply

The current plant flow of the City of Pharr WWTP is 6 mgd. This project would produce 4 mgd of that flow initially and an additional 2 mgd is anticipated to be available soon. The total available supply for this strategy is 6 mgd, or 6,721 acft/yr. It is assumed that 20 percent of the influent water would be lost through the treatment process; therefore, 5,376 to 8,065 acft/yr of wastewater effluent would be used.

Engineering and Costing

The components of this project include an advanced reclaimed WTP, storage pond, and pump station to be construction next to the existing WWTP on City owned land. A pipeline is also required to convey the reclaimed water to the raw water storage pond near the WTP. The advanced treatment plant will consist of membrane filtration, RO, and UV disinfection. Concentrate disposal from the treatment processes would be discharged to the Arroyo Colorado with the traditional WWTP discharge. It is assumed that the construction period would be 1.5 years.

Per section 8.2.4 of the UCM User Guide, dated November 2018, for all project components except pipelines, the UCM assumes the Environmental/Mitigation Costs are 100 percent of land costs. The recommended value for environmental studies and mitigation costs for pipelines is $25,000/mile of pipeline. This cost estimate is representative of 14 acres for the Reservoir foot-print and conservation pool, 30 acres for the pipeline facilities, and 5 acres for a pump station.

Table 5.3-186 outlines the estimated project requirements and the cost estimate. Treatment Level 3 (new) was used on the UCM spreadsheet to estimate the costs for addition of the advanced treatment facilities.

Implementation Issues

Final design of the direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-186 Pharr – Raw Water Reservoir Augmentation Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
PHARR – RAW WATER RESERVOIR AUGMENTATION POTABLE REUSE	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Off-Channel Storage/Ring Dike (43 acft; 14 acres)	$2,959,000
Primary Pump Station	$6,522,000
Transmission Pipeline (20 in. diameter, 2.5 miles)	$2,354,000
WTP (6 mgd)	$26,339,000
TOTAL COST OF FACILITIES	**$38,174,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$13,244,000

COST ESTIMATE SUMMARY	
PHARR – RAW WATER RESERVOIR AUGMENTATION POTABLE REUSE	
Item	Estimated Costs for Facilities
Environmental and Archaeology Studies and Mitigation	$63,000
Land Acquisition and Surveying (38 acres)	$114,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,420,000
TOTAL COST OF PROJECT	**$53,015,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,441,000
Reservoir Debt Service (3.5 percent, 40 years)	$192,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$24,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$163,000
Dam and Reservoir (1.5 percent of cost of facilities)	$44,000
WTP	$1,927,000
Pumping Energy Costs (1,391,814 kWh at 0.08 $/kWh)	$111,000
TOTAL O&M	$2,269,000
TOTAL ANNUAL COST	$5,902,000
Available Project Yield (acft/yr)	**6,721**
Annual Cost of Water ($ per acft)	**$878**
Annual Cost of Water After Debt Service ($ per acft)	**$338**
Annual Cost of Water ($ per 1,000 gallons)	**$2.69**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$1.04**

San Juan

The City of San Juan shows projected needs from decade 2030 onward (Table 5.3-187); recommended WMSs are shown in Table 5.3-188.

Table 5.3-187 San Juan Existing Supply Balance (acft/yr)

SAN JUAN	2020	2030	2040	2050	2060	2070
Supplies	4,947	5,990	7,063	8,166	9,298	10,407
Demand	4,948	4,948	4,948	4,948	4,948	4,948
Need(-)/Surplus(+)	1	(1,042)	(2,115)	(3,218)	(4,350)	(5,459)

Table 5.3-188 San Juan WMS Supplies (acft/yr)

SAN JUAN	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	93	451	928	1,491
Brackish Groundwater Well	0	1,120	1,120	1,120	1,120	1,120
Conversion of Water Rights Only	0	0	0	612	1,181	1,641
ID Improvements - HCID No. 2	10	71	133	194	255	316
WTP No. 1 Upgrade, Expansion, and Brackish Groundwater Desalination – Requires Conversion of Water Rights	0	1,792	1,792	1,792	1,792	1,792
Municipal Drought Management	0	128	153	179	204	228
San Juan Direct Potable Reuse	0	0	2,240	2,240	2,240	2,240
New Supplies from WMS	**10**	**3,111**	**5,532**	**6,588**	**7,719**	**8,828**
WUG Balance After WMS	**11**	**2,069**	**3,417**	**3,370**	**3,369**	**3,369**
Alternative WMS*						
MHWSC - Expand Existing Groundwater Wells (Hidalgo County)	2	2	2	5	5	5
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. San Juan's 2011 GPCD was estimated at 137, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Brackish Groundwater Well and Desalination

Project Source

This strategy was submitted by the City of San Juan to the RWPG after the submission of the 2021 Region M Initially Prepared Plan.

Description

This strategy is to install a groundwater well and RO membrane water treatment facility to provide an alternate source of water for the City of San Juan.

Available Supply

This strategy would provide an additional 1.0 mgd of drinking water supply to the city in the 2030 decade. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 acft/yr of raw water, resulting in the 1,120 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. Based on the BRACS study, well depth is estimated at 1,000 feet below ground surface. The well is sized to pump 125 percent of the produced water supply to account for treatment efficiency. It is assumed that the construction period for this strategy is 1 year. Table 5.3-296 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land if there is not adequate room at the WTP site.

Table 5.3-189 San Juan - Brackish Groundwater Well and Desalination Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN JUAN – BRACKISH GROUNDWATER WELL AND DESALINATION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,248,000
WTP (0.5 mgd)	$4,914,000
TOTAL COST OF FACILITIES	**$6,162,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,157,000
Environmental & Archaeology Studies and Mitigation	$26,000
Land Acquisition and Surveying (6 acres)	$18,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$231,000
TOTAL COST OF PROJECT	**$8,594,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$805,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$12,000
Water Treatment Plant	$957,000
Pumping Energy Costs (347,071 kWh at 0.08 $/kWh)	$28,000
TOTAL O&M	$997,000
TOTAL ANNUAL COST	**$1,602,000**

COST ESTIMATE SUMMARY	
SAN JUAN – BRACKISH GROUNDWATER WELL AND DESALINATION	
Item	Estimated Costs for Facilities
Available Project Yield (acft/yr)	1,120
Annual Cost of Water ($ per acft)	$1,430
Annual Cost of Water After Debt Service ($ per acft)	$890
Annual Cost of Water ($ per 1,000 gallons)	$4.39
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$2.73

San Juan Direct Potable Reuse

Project Source
This strategy was submitted by the City of San Juan to the RWPG during the 2021 regional water planning process.

Description
This strategy is for the City of San Juan to use wastewater effluent for direct potable reuse. It is assumed effluent from the San Juan WWTP would be pumped to the city's WTP for conventional treatment after it has gone through advanced treatment.

Available Supply
The San Juan WWTP effluent is assumed to produce approximately 2,240 acft/yr for potable reuse. Based on an assessment of the City of San Juan's demands and needs, this strategy is anticipated to be implemented in the 2040 decade.

Engineering and Costing
Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and ground storage tank at the WWTP site and a pipeline to convey the reuse water to the WTP would be constructed. It is assumed that the construction period would be 2 years. Table 5.3-182 outline the estimated project requirements used to develop the cost estimates for this strategy.

Implementation Issues
Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-190 San Juan - Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN JUAN – POTABLE REUSE	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$1,145,000
Transmission Pipeline (12 in. diameter, 1 miles)	$499,000
Storage Tanks	$1,297,000
Advanced Water Treatment Facility (2 mgd)	$14,582,000
TOTAL COST OF FACILITIES	**$17,523,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$6,108,000
Environmental and Archaeology Studies and Mitigation	$25,000
Land Acquisition and Surveying (19 acres)	$46,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$652,000
TOTAL COST OF PROJECT	**$24,354,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,713,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$18,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$29,000
Advanced Water Treatment Facility	$2,009,000
Pumping Energy Costs (849,900 kW-hr @ 0.08 $/kW-hr)	$68,000
TOTAL O&M	$2,124,000
TOTAL ANNUAL COST	**$3,837,000**
Available Project Yield (acft/yr)	**2,240**
Annual Cost of Water ($ per acft)	**$1,713**
Annual Cost of Water After Debt Service ($ per acft)	**$948**
Annual Cost of Water ($ per 1,000 gallons)	**$5.26**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.91**

WTP No. 1 Upgrade, Expansion, and Brackish Groundwater Desalination

Project Source

This strategy was submitted by San Juan to the RWPG.

Description

This strategy consists of expanding and upgrading WTP No. 1, including facilities to manufacture liquid chlorine because of a neighborhood hazard and installing groundwater wells with membrane treatment.

Available Supply

The project as submitted included 3 mgd of brackish groundwater treatment capacity, but because of MAG limitations on the Gulf Coast Aquifer in Hidalgo County, this strategy was scaled down to 1.6 mgd, or 1,792 acft/yr. Assuming an RO efficiency of 80%, this strategy would require pumping 2,240 acft/yr of raw water, resulting in the 1,792 acft/yr yield (20% water loss).

Engineering and Costing

The components of this project include three new groundwater wells, well field piping, and membrane filters. The advanced treatment plant will consist of membrane filtration. It is assumed that concentrate disposal from the treatment processes would be discharged to surface water; it is assumed that the construction period would be 1.5 years.

Table 5.3-191 outlines the estimated project requirements used to develop the cost estimate. Treatment Level 4 was used on the UCM spreadsheet to estimate the costs for addition of the new membrane filters. The total costs for this option are presented in Table 5-176.

Implementation Issues

Approval for concentrate disposal will be needed from TCEQ. Construction of the groundwater well may also include purchase of land and a Texas DOT ROW permit. As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-191 San Juan - WTP No. 1 Upgrade and Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN JUAN – WTP NO. 1 UPGRADE AND EXPANSION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,848,000
Two WTPs (1.5 mgd and 1.5 mgd)	$6,603,000
TOTAL COST OF FACILITIES	**$8,451,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$2,958,000
Environmental and Archaeology Studies and Mitigation	$33,000
Land Acquisition and Surveying (7 acres)	$26,000

COST ESTIMATE SUMMARY	
SAN JUAN – WTP NO. 1 UPGRADE AND EXPANSION	
Item	**Estimated Costs for Facilities**
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$316,000
TOTAL COST OF PROJECT	**$11,784,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$829,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$18,000
WTP	$1,333,000
Pumping Energy Costs (975,936 kWh at 0.08 $/kWh)	$78,000
TOTAL O&M	$1,429,000
TOTAL ANNUAL COST	**$2,258,000**
Available Project Yield (acft/yr)	**1,792**
Annual Cost of Water ($ per acft)	**$1,260**
Annual Cost of Water After Debt Service ($ per acft)	**$797**
Annual Cost of Water ($ per 1,000 gallons)	**$3.87**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.45**

Sharyland Water Supply Corporation

Sharyland WSC shows projected needs beginning in 2030 (Table 5.3-192); recommended WMSs are shown in Table 5.3-193.

Table 5.3-192 Sharyland WSC Existing Supply Balance (acft/yr)

SHARYLAND WSC	2020	2030	2040	2050	2060	2070
Supplies	12,901	15,628	18,421	21,302	24,263	27,160
Demand	13,195	13,195	13,195	13,195	13,195	13,195
Need(-)/Surplus(+)	**294**	**(2,433)**	**(5,226)**	**(8,107)**	**(11,068)**	**(13,965)**

Table 5.3-193 Sharyland WSC WMS (acft)

SHARYLAND WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	831	2,016	3,143	4,560	6,172
Conversion of Water Rights	0	343	1,836	3,475	4,904	6,076
ID Improvements - HCID No. 1	483	653	823	993	1,463	1,333
ID Improvements - Santa Cruz ID	127	174	220	267	313	360
ID Improvements - United ID	639	639	639	639	639	639
Municipal Drought Management	287	356	425	495	565	633
Water Well and RO Unit at WTP No. 2	0	900	900	900	900	900
Water Well and RO Unit at WTP No. 3	0	900	900	900	900	900
New Supplies from WMS	**1,536**	**4,796**	**7,759**	**10,812**	**13,944**	**17,013**
WUG Balance After WMS	**1,830**	**2,363**	**2,533**	**2,705**	**2,876**	**3,048**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Sharyland WSC's 2011 GPCD was estimated at 169, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Water Well and RO Unit at WTP No. 2

Project Source

This strategy was submitted by Sharyland WSC to the RWPG.

Description

This strategy is to provide additional supply to Sharyland WSC WTP No. 2 with the installation of a groundwater well and high-pressure RO system.

Available Supply

The proposed groundwater well is sized to pump 1,125 acft/yr and RO system would provide the WTP No. 2 with 900 acft/yr of supply. This assumes an 80 percent membrane recovery rate. Assuming a RO efficiency of 80%, this strategy would require pumping 1,125 acft/yr of raw water, resulting in the 900 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, water treatment, and land acquisition. It is assumed that the construction period would be 1 year. Table 5.3-194 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of a groundwater well and piping may also include purchase of land and a Texas DOT ROW permit.

Table 5.3-194 Water Well and RO Unit at WTP No. 2 Project Requirements and Costs

COST ESTIMATE SUMMARY	
SHARYLAND WSC – WATER WELL AND RO UNIT AT WTP NO. 2	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$3,065,000
Two WTPs (1 mgd and 1 mgd)	$11,146,000
TOTAL COST OF FACILITIES	**$14,211,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,974,000
Environmental and Archaeology Studies and Mitigation	$52,000
Land Acquisition and Surveying (11 acres)	$37,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$531,000
TOTAL COST OF PROJECT	**$19,805,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,393,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$31,000
WTP	$1,580,000
Pumping Energy Costs (521,578 kWh at 0.08 $/kWh)	$42,000
TOTAL O&M	$1,653,000
TOTAL ANNUAL COST	**$3,046,000**
Available Project Yield (acft/yr)	**900**
Annual Cost of Water ($ per acft)	**$3,384**
Annual Cost of Water After Debt Service ($ per acft)	**$1,837**
Annual Cost of Water ($ per 1,000 gallons)	**$10.38**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$5.64**

Water Well and RO Unit at WTP No. 3

Project Source

This strategy was submitted by Sharyland WSC to the RWPG.

Description

This strategy is to provide additional supply to Sharyland WSC WTP No. 3 with the installation of a groundwater well and high-pressure RO system. WTP No. 3 has been recently completed.

Available Supply

The proposed groundwater well is sized to pump 1,125 acft/yr and RO system would provide the WTP No. 2 with 900 acft/yr of supply. This assumes an 80% membrane recovery rate (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include well field pumping, well field piping, water treatment, and land acquisition. Slightly to moderately saline groundwater was assumed to be available at approximately 800 feet. below ground surface for cost estimation purposes. It is assumed that the construction period would be 1 year. Table 5.3-195 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of a groundwater well and piping may also include purchase of land and a Texas DOT ROW permit.

Table 5.3-195 Water Well and RO Unit at WTP No. 3 Project Requirements and Costs

COST ESTIMATE SUMMARY	
SHARYLAND WSC – WATER WELL AND RO UNIT AT WTP NO. 3	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$3,065,000
Two WTPs (1 mgd and 1 mgd)	$11,146,000
TOTAL COST OF FACILITIES	**$14,211,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$4,974,000
Environmental and Archaeology Studies and Mitigation	$52,000
Land Acquisition and Surveying (11 acres)	$37,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$531,000
TOTAL COST OF PROJECT	**$19,805,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
SHARYLAND WSC – WATER WELL AND RO UNIT AT WTP NO. 3	
Item	**Estimated Costs for Facilities**
Debt Service (3.5 percent, 20 years)	$1,393,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$31,000
WTP	$1,580,000
Pumping Energy Costs (404,745 kWh at 0.08 $/kWh)	$32,000
TOTAL O&M	$1,643,000
TOTAL ANNUAL COST	**$3,036,000**
Available Project Yield (acft/yr)	**900**
Annual Cost of Water ($ per acft)	**$3,373**
Annual Cost of Water After Debt Service ($ per acft)	**$1,826**
Annual Cost of Water ($ per 1,000 gallons)	**$10.35**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$5.60**

Weslaco

The City of Weslaco has needs projected for every planning decade (Table 5.3-196); recommended WMSs are included in Table 5.3-197.

Table 5.3-196 Weslaco Existing Supply Balance (acft/yr)

WESLACO	2020	2030	2040	2050	2060	2070
WUG Demand	7,697	9,711	11,550	13,443	15,391	17,218
Military Highway WSC - Contract Demand	175	175	175	175	175	175
Demand	**7,872**	**9,886**	**11,725**	**13,618**	**15,566**	**17,393**
Supplies	**6,353**	**6,555**	**6,635**	**6,635**	**6,635**	**6,635**
Need/Surplus	**(1,519)**	**(3,331)**	**(5,090)**	**(6,983)**	**(8,931)**	**(10,758)**

Table 5.3-197 Weslaco WMS Supplies (acft/yr)

WESLACO	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	547	1,219	1,924	2,829	3,844
Conversion of Water Rights	0	1,000	1,792	2,735	3,533	4,105

WESLACO	2020	2030	2040	2050	2060	2070
Groundwater Blending	560	560	560	560	560	560
ID Improvements - H&CCID No. 9	235	411	588	764	940	1,117
Municipal Drought Management	258	333	401	470	539	603
Reuse - Weslaco - North WWTP	1,120	1,120	1,120	1,120	1,120	1,120
New Supplies from WMS	**2,173**	**3,971**	**5,680**	**7,572**	**9,520**	**11,348**
WUG Balance After WMS	**654**	**639**	**590**	**589**	**589**	**590**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Weslaco's 2011 GPCD was estimated at 165, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Weslaco North WWTP Potable Reuse

Project Source

This strategy was identified by the RWPG.

Description

This direct potable reuse strategy is to pump treated effluent from the Weslaco North WWTP to the Weslaco WTP. The approximate alignment of the North WWTP potable reuse pipeline is shown on Figure 5.3-17.

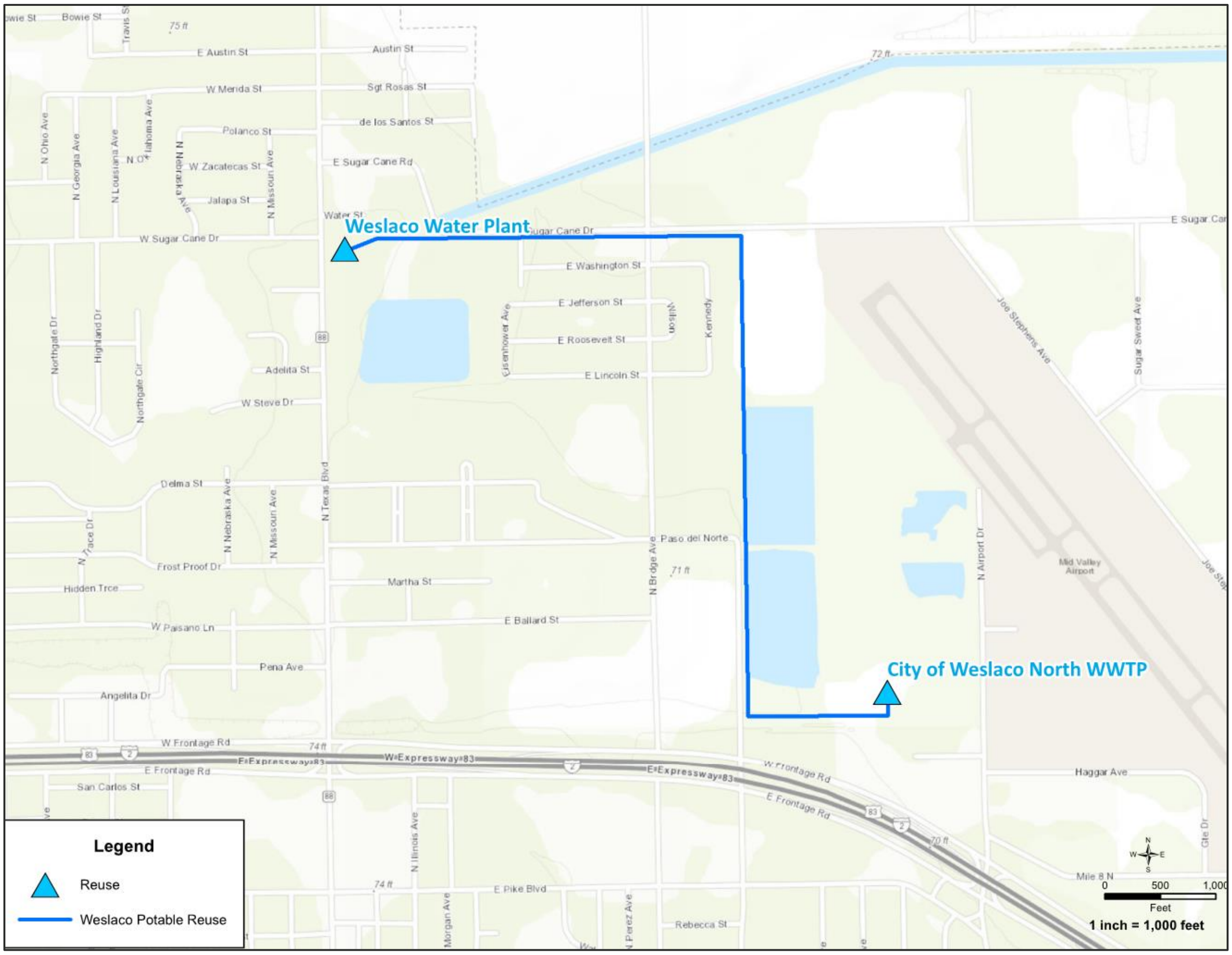

Figure 5.3-17 Weslaco North WWTP Potable Reuse Pipeline Project Location

Available Supply

The annual average flow for Weslaco North WWTP is 4.9 mgd. It is assumed that 60 percent of the effluent flow will be available to treat for potable reuse and produced water supplies could be up to 50 percent of total effluent flows. The project would supply 1,120 acft/yr in 2020.

Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and ground storage tank at the WWTP site and a pipeline to convey the reuse water to the Weslaco WTP would be constructed. It is assumed that the construction period would be 2 years. Table 5.3-198 outline the project requirements and cost estimate developed in UCM. Treatment Level 3 was used to estimate the costs for addition of the advanced treatment facilities.

Implementation Issues

Implementation of a potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met.

Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-198 Weslaco - North WWTP Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
WESLACO – NORTH WWTP REUSE	
Item	Estimated Costs for Facilities
CAPITAL COST	
Transmission Pipeline (6 in. diameter, 500 feet)	$16,000
Storage Tanks (other than at booster pump stations)	$1,297,000
WTP (1 mgd)	$6,231,000
TOTAL COST OF FACILITIES	**$7,544,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$2,639,000
Environmental and Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (4 acres)	$14,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$281,000
TOTAL COST OF PROJECT	**$10,489,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$738,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$13,000
WTP	$623,000
TOTAL O&M	$636,000
TOTAL ANNUAL COST	**$1,374,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$1,227**
Annual Cost of Water After Debt Service ($ per acft)	**$568**
Annual Cost of Water ($ per 1,000 gallons)	**$3.76**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$1.74**

Groundwater Development and Blending

Project Source

This strategy was submitted by the City of Weslaco to the RWPG.

Description

This strategy is for the construction of a groundwater well to supplement the drinking water supply of Weslaco. The city plans to blend the brackish groundwater with treated drinking water. The city is currently supplied with raw water from Hidalgo and Cameron Counties ID No. 9. This strategy would provide the city with an alternate source of water, especially during times of drought. Possible well site locations still need to be evaluated and it is anticipated that a pilot well and water quality study will be required.

Available Supply

It is anticipated that 0.5 mgd would be produced from the well.

Engineering and Costing

Costs for this strategy from the UCM include a well pump, well field piping, and land acquisition. It is assumed that the construction period for this strategy is 1 year. The project requirements and costs for this option are presented in Table 5.3-199.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.3-199 Weslaco - Groundwater Development and Blending Project Requirements and Costs

COST ESTIMATE SUMMARY	
WESLACO – GROUNDWATER DEVELOPMENT AND BLENDING	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$863,000
TOTAL COST OF FACILITIES	**$863,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$302,000
Environmental and Archaeology Studies and Mitigation	$24,000
Land Acquisition and Surveying (5 acres)	$17,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$34,000
TOTAL COST OF PROJECT	**$1,240,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$87,000

COST ESTIMATE SUMMARY	
WESLACO – GROUNDWATER DEVELOPMENT AND BLENDING	
Item	Estimated Costs for Facilities
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$9,000
Pumping Energy Costs (102,737 kWh at 0.08 $/kWh)	$8,000
TOTAL O&M	$17,000
TOTAL ANNUAL COST	**$104,000**
Available Project Yield (acft/yr)	**560**
Annual Cost of Water ($ per acft)	**$186**
Annual Cost of Water After Debt Service ($ per acft)	**$30**
Annual Cost of Water ($ per 1,000 gallons)	**$0.57**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.09**

County-Other, Hidalgo

County-Other, Hidalgo shows projected needs in every planning decade (Table 5.3-200); recommended WMSs are shown in Table 5.3-201.

Table 5.3-200 County-Other, Hidalgo Existing Supply Balance (acft/yr)

COUNTY-OTHER, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	2,269	2,269	2,269	2,269	2,269	2,269
Demand	2,873	3,562	4,439	5,274	6,114	6,982
Need(-)/Surplus(+)	**(604)**	**(1,293)**	**(2,170)**	**(3,005)**	**(3,845)**	**(4,713)**

Table 5.3-201 County-Other, Hidalgo WMS Supplies (acft/yr)

COUNTY-OTHER, HIDALGO	2020	2030	2040	2050	2060	2070
Recommended WMS						
Conversion of Water Rights	575	1,199	2,012	2,782	3,557	4,360
ID Improvements - Donna ID No. 1	39	104	168	233	298	363
New Supplies from WMS	**614**	**1,303**	**2,180**	**3,015**	**3,855**	**4,723**
WUG Balance After WMS	**10**	**10**	**10**	**10**	**10**	**10**
Alternative WMS*						
MHWSC - Expand Existing Groundwater Wells (Hidalgo County)	1	1	1	3	3	3

COUNTY-OTHER, HIDALGO	2020	2030	2040	2050	2060	2070
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. The 2011 GPCD for Hidalgo County-Other was estimated at 121, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Irrigation, Hidalgo

Irrigation in Hidalgo County has needs in every decade (Table 5.3-202); WMSs recommended to address needs are shown in Table 5.3-203.

Table 5.3-202 Irrigation, Hidalgo Existing Supply Balance (acft/yr)

IRRIGATION, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	278,271	278,217	278,143	277,725	277,997	277,923
Demand	688,667	666,560	644,451	622,343	600,236	578,127
Need(-)/Surplus(+)	**(410,396)**	**(388,343)**	**(366,308)**	**(344,618)**	**(322,239)**	**(300,204)**

Table 5.3-203 Irrigation, Hidalgo WMS Supply (acft/yr)

IRRIGATION, HIDALGO	2020	2030	2040	2050	2060	2070
On-Farm Conservation	12,654	12,654	12,654	12,654	12,654	12,654
Bio Control Arundo Donax	1,226	1,226	1,226	1,226	1,226	1,226
ID Improvements - Delta Lake ID	1,445	2,584	3,722	4,860	5,997	7,133
ID Improvements - Donna ID No. 1	600	1,601	2,602	3,602	4,602	5,601
ID Improvements - Engelman ID	590	677	765	852	939	1,026
ID Improvements - H&CCID No. 9	2,079	3,635	5,191	6,746	8,300	9,853
ID Improvements - HCID No. 1	1,601	2,164	2,726	3,288	3,850	4,411
ID Improvements - HCID No. 13	72	85	98	111	124	137
ID Improvements - HCID No. 16	1,088	1,255	1,423	1,590	1,757	1,924
ID Improvements - HCID No. 19	393	410	427	444	461	477
ID Improvements - HCID No. 2	212	1,467	2,721	3,975	5,228	6,480
ID Improvements - HCID No. 5	863	863	863	864	864	865

IRRIGATION, HIDALGO	2020	2030	2040	2050	2060	2070
ID Improvements - HCID No. 6	1,259	1,399	1,540	1,680	1,820	1,960
ID Improvements - HCWCID No. 18	84	90	95	100	105	110
ID Improvements - HCWID No. 3	391	391	391	391	391	391
ID Improvements - La Feria ID	6,567	6,567	6,567	6,567	6,567	6,567
ID Improvements - Santa Cruz ID	2,104	2,874	3,643	4,412	5,181	5,949
ID Improvements - United ID	2,381	2,381	2,381	2,381	2,381	2,381
ID Improvements - Valley Acres ID	313	419	524	630	735	841
New Supplies from WMS	**35,922**	**42,742**	**49,559**	**56,373**	**63,181**	**69,985**
WUG Balance After WMS	**(374,474)**	**(345,601)**	**(316,749)**	**(288,245)**	**(259,058)**	**(230,219)**

Irrigation needs reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Hidalgo County are partially met by ID conservation strategies and decrease over the planning period. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Irrigation, Hidalgo is left with shortages in years of limited supply.

Livestock, Hidalgo

Livestock in Hidalgo County has no needs for the planning horizon (Table 5.3-204).

Table 5.3-204 Livestock, Hidalgo Existing Supply Balance (acft/yr)

LIVESTOCK, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	777	777	777	777	777	777
Demand	777	777	777	777	777	777
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

There are no projected needs for livestock in Hidalgo County over the planning period; therefore, no WMSs were identified for this WUG.

Manufacturing, Hidalgo

Manufacturing in Hidalgo County has no needs for the planning horizon (Table 5.3-205); BMPs are recommended in Table 5.3-206.

Table 5.3-205 Manufacturing, Hidalgo Existing Supply Balance (acft/yr)

MANUFACTURING, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	2,915	2,915	2,915	2,915	2,915	2,915
Demand	2,236	2,721	2,721	2,721	2,721	2,721
Need(-)/Surplus(+)	**679**	**194**	**194**	**194**	**194**	**194**

Table 5.3-206 Manufacturing, Hidalgo WMS (acft/yr)

MANUFACTURING, HIDALGO	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	224	272	272	272	272	272
WUG Balance After WMS	**903**	**466**	**466**	**466**	**466**	**466**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Mining, Hidalgo

There is a need in every decade for Mining, Hidalgo (Table 5.3-207); WMSs recommended are included in Table 5.3-208. The mining needs are partially met by the implementation of BMPs; however, because of the decreased reliability of mining water rights in a drought year, Mining, Hidalgo is left with shortages in years of limited supply. Additionally, there may be further groundwater supplies for mining that exceed the MAG values for the Gulf Coast Aquifer. Because of limited reporting requirements and no active groundwater conservation district, it is not certain that these water sources are currently being used in excess of the MAG.

Table 5.3-207 Hidalgo County Mining Existing Supply Balance (acft/yr)

MINING, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	1,933	1,933	1,932	1,932	1,932	1,931
Demand	2,844	3,620	4,198	4,819	5,532	6,434
Need(-)/Surplus(+)	**(911)**	**(1,687)**	**(2,266)**	**(2,887)**	**(3,600)**	**(4,503)**

Table 5.3-208 Mining, Hidalgo NRG Basin Water Supply and Demand Analysis (acft/yr)

MINING, HIDALGO	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	284	362	420	482	553	643
WUG Balance After WMS	(627)	(1,325)	(1,846)	(2,405)	(3,047)	(3,860)

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Steam-Electric Power, Hidalgo

There is a need in every decade for steam electric power generation in Hidalgo County (Table 5.3-209); WMSs recommended to reduce this need are shown in Table 5.3-210.

Table 5.3-209 Steam-Electric Power, Hidalgo Existing Supply Balance (acft/yr)

STEAM ELECTRIC, HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	9,746	9,935	10,035	10,035	10,035	10,035
Demand	11,538	11,538	11,538	11,538	11,538	11,538
Need(-)/Surplus(+)	(1,792)	(1,603)	(1,503)	(1,503)	(1,503)	(1,503)

Table 5.3-210 Steam-Electric Power, Hidalgo NRG Basin Water Supply and Demand Analysis (acft/yr)

STEAM-ELECTRIC POWER, HIDALGO	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	1,154	1,154	1,154	1,154	1,154	1,154
WUG Balance After WMS	(638)	(449)	(349)	(349)	(349)	(349)

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.3 Jim Hogg County

5.3.3.1 Water User Groups and Water User Groups/Wholesale Water Providers

Jim Hogg County WUGs and WUGs/WWPs that have recommended strategies with associated capital costs and locations are represented in Figure 5.3-18. A list of these WMSs and their map numbers is given in Table 5.3-211.

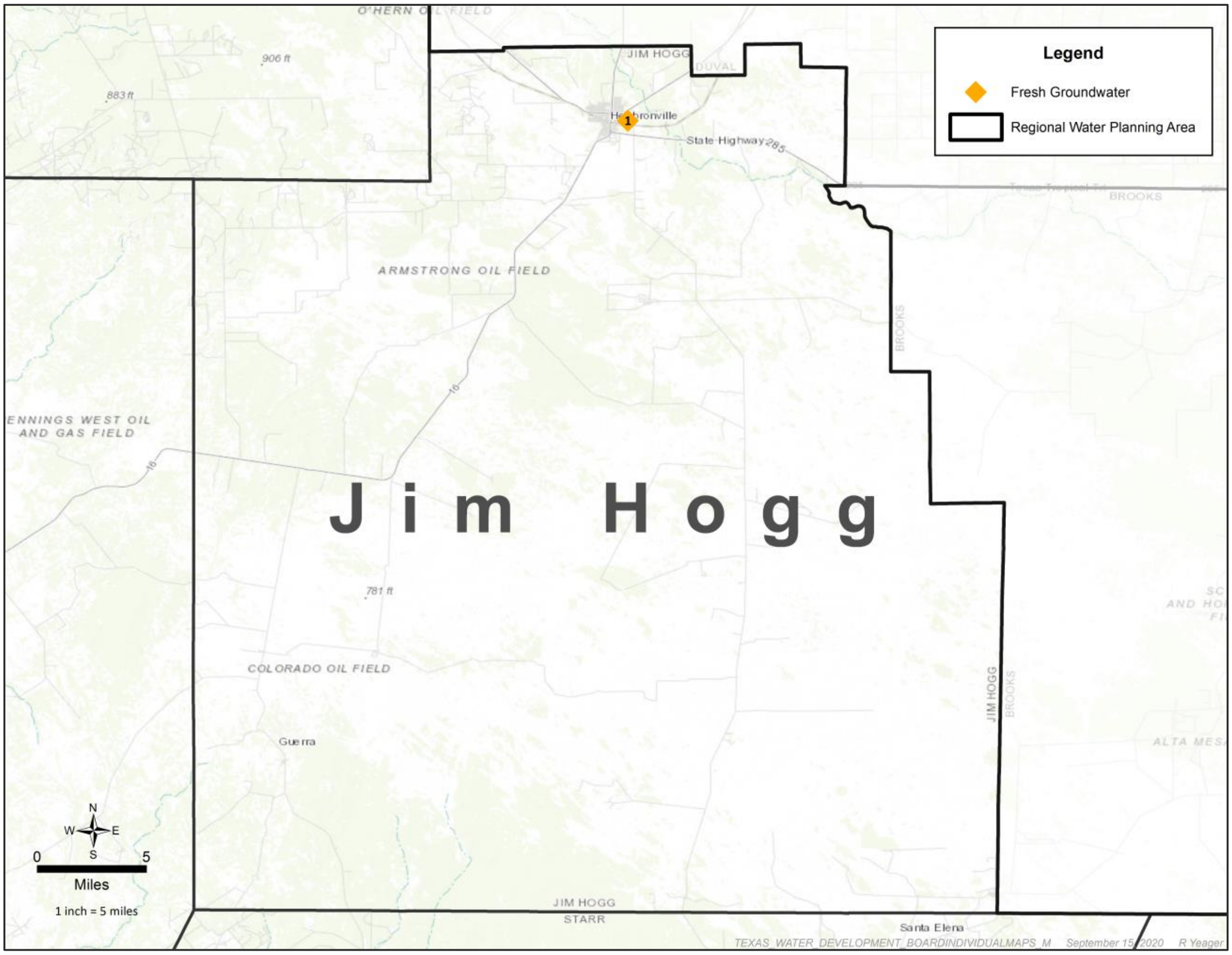

Figure 5.3-18 Jim Hogg County Recommended Water Management Strategies

Table 5.3-211 Map Legend: Jim Hogg County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Irrigation, Jim Hogg	Additional Groundwater Wells	Fresh Groundwater

Jim Hogg Water Control and Improvement District No. 2

Jim Hogg WCID No. 2 does not have needs in any decade (Table 5.3-212); however, Advanced Municipal Water Conservation has been recommended (Table 5.3-213).

Table 5.3-212 Jim Hogg WCID No. 2 Existing Supply Balance (acft/yr)

JIM HOGG WCID NO. 2	2020	2030	2040	2050	2060	2070
Supplies	1,412	1,412	1,412	1,412	1,412	1,412
Demand	643	675	702	743	783	822
Need(-)/Surplus(+)	**769**	**737**	**710**	**669**	**629**	**590**

Table 5.3-213 Jim Hogg Water Control and Improvement District No. 2 WMS supplies (acft/yr)

JIM HOGG WCID NO. 2	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	16	51	91
WUG Balance After WMS	**769**	**737**	**710**	**685**	**680**	**681**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Jim Hogg WCID No. 2's 2011 GPCD was estimated at 135, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

County-Other, Jim Hogg

County-Other, Jim Hogg does not have needs (Table 5.3-214) and thus no recommended WMS.

Table 5.3-214 County-Other, Jim Hogg Existing Supply Balance (acft/yr)

COUNTY-OTHER, JIM HOGG	2020	2030	2040	2050	2060	2070
Supplies	286	286	286	286	286	286
Demand	153	159	165	174	184	193
Need(-)/Surplus(+)	**133**	**127**	**121**	**112**	**102**	**93**

Irrigation, Jim Hogg

Irrigation in Jim Hogg County does not have needs (Table 5.3-215); however, WMSs are recommended and shown in Table 5.3-216.

Table 5.3-215 Irrigation, Jim Hogg Existing Supply Balance (acft/yr)

IRRIGATION, JIM HOGG	2020	2030	2040	2050	2060	2070
Supplies	360	360	360	360	360	360
Demand	360	348	337	325	314	302
Need(-)/Surplus(+)	**0**	**12**	**23**	**35**	**46**	**58**

Table 5.3-216 Irrigation, Jim Hogg WMS Supplies (acft/yr)

IRRIGATION, JIM HOGG	2020	2030	2040	2050	2060	2070
Additional Groundwater Wells	300	300	300	300	300	300
On-Farm Conservation	7	7	7	7	7	7
Need(-)/Surplus(+)	**307**	**319**	**330**	**342**	**353**	**365**

Additional Groundwater Wells

Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

Description

This strategy is to provide additional supply to Irrigation, Jim Hogg with the installation of fresh groundwater wells.

Available Yield

The available supply is 300 acft/yr beginning in 2020.

Engineering and Costing

The UCM was utilized to develop estimated costs for this strategy using assumptions about the individual wells. The wells were costed with a capacity of 50 gpm. Well piping and land acquisition were also included in the cost estimate. The estimated costs and project requirements for this strategy are presented in Table 5.3-217.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit.

Table 5.3-217 Irrigation, Jim Hogg - Additional Groundwater Wells Project Requirements and Costs

COST ESTIMATE SUMMARY	
IRRIGATION, JIM HOGG - ADDITIONAL GROUNDWATER WELLS	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,846,000
TOTAL COST OF FACILITIES	**$1,846,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$646,000
Environmental & Archaeology Studies and Mitigation	$54,000
Land Acquisition and Surveying (25 acres)	$14,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$71,000
TOTAL COST OF PROJECT	**$2,631,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$185,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$18,000
Pumping Energy Costs (59,424 kW-hr @ 0.08 $/kW-hr)	$5,000
TOTAL O&M	$23,000
TOTAL ANNUAL COST	**$208,000**
Available Project Yield (acft/yr)	**300**
Annual Cost of Water ($ per acft)	**$693**
Annual Cost of Water After Debt Service ($ per acft)	**$77**
Annual Cost of Water ($ per 1,000 gallons)	**$2.13**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.24**

Livestock, Jim Hogg

There are no projected needs for livestock in Jim Hogg County over the planning period (Table 5.3-218); therefore, no WMSs were identified for this WUG.

Table 5.3-218 Livestock, Jim Hogg Existing Supply Balance (acft/yr)

LIVESTOCK, JIM HOGG	2020	2030	2040	2050	2060	2070
Supplies	436	436	436	436	436	436
Demand	376	376	376	376	376	376
Need(-)/Surplus(+)	**60**	**60**	**60**	**60**	**60**	**60**

Manufacturing, Jim Hogg

Manufacturing in Jim Hogg County does not have any needs on the planning horizon (Table 5.3-219).

Table 5.3-219 Manufacturing, Jim Hogg Existing Supply Balance (acft/yr)

MANUFACTURING, JIM HOGG	2020	2030	2040	2050	2060	2070
Supplies	2	2	2	2	2	2
Demand	2	2	2	2	2	2
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Mining, Jim Hogg

Mining in Jim Hogg County has needs for the 2040 decade of the planning horizon (Table 5.3-220). WMSs recommended to reduce needs are shown in Table 5.3-221.

Table 5.3-220 Mining, Jim Hogg Existing Supply Balance (acft/yr)

MINING, JIM HOGG	2020	2030	2040	2050	2060	2070
Supplies	93	97	34	53	34	22
Demand	93	97	72	53	34	22
Need(-)/Surplus(+)	**0**	**0**	**(38)**	**0**	**0**	**0**

Table 5.3-221 Mining, Jim Hogg WMS Supplies (acft/yr)

MINING, JIM HOGG	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	9	10	7	5	3	2
WUG Balance After WMS	**9**	**10**	**(31)**	**5**	**3**	**2**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include those described in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.4 Maverick County

5.3.4.1 Irrigation District/WWP

ID improvements WMS is recommended for the ID located in Maverick County. Figure 5.3-19 shows a map of the Maverick County WCID.

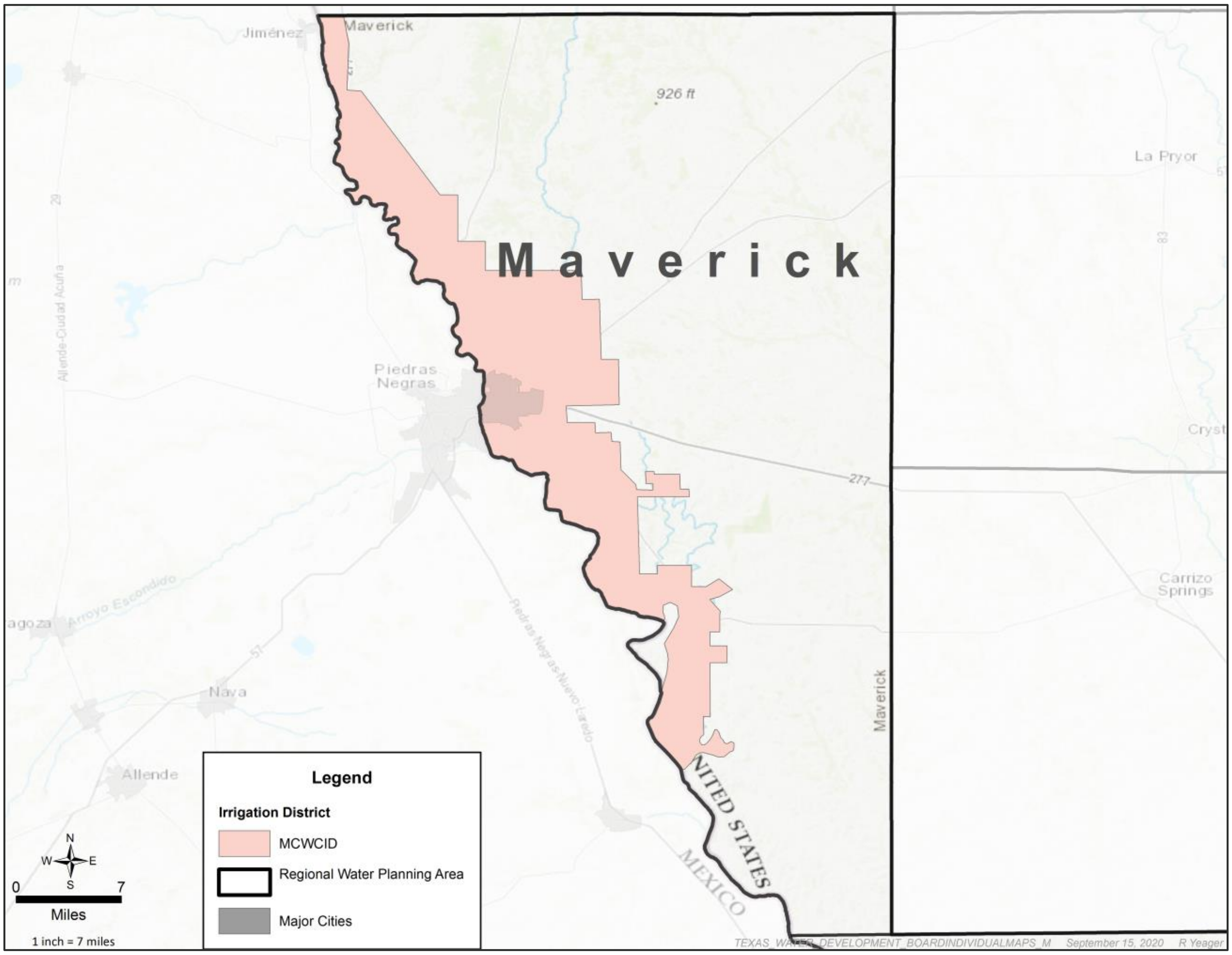

Figure 5.3-19 Map of Irrigation District in Maverick County

Maverick County Water Improvement District

Maverick County WID delivers irrigation water within Hidalgo County and has a current estimated efficiency of 67 percent. A general ID improvement plan was created for HCID No. 13 (Table 5.3-224). The water supplied by improvements is shown in Table 5.3-223.

Table 5.3-222 Maverick County WID Existing WUG Supply Balance

MAVERICK COUNTY WID	2020	2030	2040	2050	2060	2070
Irrigation, Maverick – Contract Demand	39,949	39,938	39,928	39,917	39,906	39,895
Maverick County Municipal – Contract Demand	607	607	606	606	606	606
Maverick County RoR – Contract Demand	111	111	111	111	111	111
Demand	**40,556**	**40,545**	**40,534**	**40,523**	**40,512**	**40,501**
Supplies	**60,642**	**60,626**	**60,610**	**60,593**	**60,577**	**60,560**
Need/Surplus	**20,086**	**20,081**	**20,076**	**20,070**	**20,065**	**20,059**

Table 5.3-223 Maverick County WID WMS Supplies (acft/yr)

MAVERICK COUNTY WID	2020	2030	2040	2050	2060	2070
Irrigation, Maverick	5,802	6,505	7,208	7,911	8,613	9,315
Total	**5,802**	**6,505**	**7,208**	**7,911**	**8,613**	**9,315**

Table 5.3-224 Maverick County WID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$50,136,923
TOTAL ANNUAL COST	$3,408,394
Available Project Yield (acft/yr)	8,659
Annual Cost of Water ($ per acft)	$394
Annual Cost of Water ($ per 1,000 gallons)	$1.21

5.3.4.2 Water User Groups and Water User Groups/Wholesale Water Providers

Eagle Pass

Eagle Pass has needs beginning in the 2030 decade (Table 5.3-225); WMSs recommended to meet these needs include increasing water rights as they become available on the water market and conservation and drought management measures (Table 5.3-226). Eagle Pass would also like to consider ASR as a long-range plan, but there has not been sufficient information gathered at this point to fully develop a WMS.

Table 5.3-225 Eagle Pass Existing Supply Balance (acft/yr)

EAGLE PASS	2020	2030	2040	2050	2060	2070
Supplies	10,613	10,613	10,613	10,613	10,613	10,613
Demand	9,545	10,839	12,074	13,429	14,795	16,122
Need(-)/Surplus(+)	**1,068**	**(226)**	**(1,461)**	**(2,816)**	**(4,182)**	**(5,509)**

Table 5.3-226 Eagle Pass WMS Supplies (acft/yr)

EAGLE PASS	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	481	914	1,525	2,299	3,163
Conversion of Water Rights	370	1,140	1,903	2,605	3,160	3,585
Municipal Drought Management	256	298	338	379	419	456
New Supplies from WMS	**626**	**1,920**	**3,155**	**4,510**	**5,877**	**7,205**
WUG Balance After WMS	**1,694**	**1,694**	**1,694**	**1,694**	**1,695**	**1,696**
Alternative WMS*						
ASR Project	3,360	3,360	3,360	3,360	3,360	3,360
*Alternative WMS are evaluated in Section 5.4						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Eagle Pass' 2011 GPCD was estimated at 182, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

County-Other, Maverick

County-Other, Maverick shows municipal needs in rural Maverick County in every decade (Table 5.3-227); expansion of existing utility service areas and the increase in required surface water rights are recommended (Table 5.3-228).

Table 5.3-227 County-Other, Maverick Existing Supply Balance (acft/yr)

COUNTY-OTHER, MAVERICK	2020	2030	2040	2050	2060	2070
Supplies	181	181	181	181	181	181
Demand	576	514	463	416	374	334
Need(-)/Surplus(+)	(395)	(333)	(282)	(235)	(193)	(153)

Table 5.3-228 County-Other, Maverick WMS Supplies

COUNTY-OTHER, MAVERICK	2020	2030	2040	2050	2060	2070
Conversion of Water Rights	425	350	300	250	225	175
WUG Balance After WMS	30	17	18	15	32	22

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. The 2011 GPCD for County-Other, Maverick was estimated at 128, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Irrigation, Maverick

Irrigation in Maverick County has a need in every decade (Table 5.3-229); on-farm conservation, biological control of *Arundo donax*, and ID improvements somewhat alleviate the need (Table 5.3-230).

Table 5.3-229 Irrigation, Maverick Existing Supply Balance (acft/yr)

IRRIGATION, MAVERICK	2020	2030	2040	2050	2060	2070
Supplies	44,012	44,000	43,989	43,977	43,965	43,953
Demand	61,706	59,725	57,744	55,763	53,782	51,801
Need(-)/Surplus(+)	(17,694)	(15,725)	(13,755)	(11,786)	(9,817)	(7,848)

Table 5.3-230 Irrigation, Maverick WMS Supplies (acft/yr)

IRRIGATION, MAVERICK	2020	2030	2040	2050	2060	2070
Bio Control Arundo Donax	110	110	110	110	110	110
ID Improvements - Maverick Co WCID	5,802	6,505	7,208	7,911	8,613	9,315
On-Farm Conservation	1,134	1,134	1,134	1,134	1,134	1,134
New Supplies from WMS	**7,046**	**7,749**	**8,452**	**9,155**	**9,857**	**10,559**
WUG Balance After WMS	**(10,648)**	**(7,976)**	**(5,303)**	**(2,631)**	**40**	**2,711**

Irrigation needs reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Maverick County are partially met by ID conservation strategies and decrease over the planning period. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Maverick County irrigation is left with shortages in years of limited supply.

Livestock, Maverick

There are no projected needs for livestock in Maverick County over the planning period (Table 5.3-231); therefore, no WMSs were identified for this WUG.

Table 5.3-231 Livestock, Maverick Existing Supply Balance (acft/yr)

LIVESTOCK, MAVERICK	2020	2030	2040	2050	2060	2070
Supplies	388	388	388	388	388	388
Demand	371	371	371	371	371	371
Need(-)/Surplus(+)	**17**	**17**	**17**	**17**	**17**	**17**

Manufacturing, Maverick

There are no projected needs for Manufacturing in Maverick County over the planning period (Table 5.3-232); however, BMPs are recommended as a WMS (Table 5.3-233).

Table 5.3-232 Manufacturing, Maverick Existing Supply Balance (acft/yr)

MANUFACTURING, MAVERICK	2020	2030	2040	2050	2060	2070
Supplies	65	65	65	65	65	65
Demand	65	65	65	65	65	65
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Table 5.3-233 Manufacturing, Maverick WMS Supplies (acft/yr)

MANUFACTURING, MAVERICK	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	7	7	7	7	7	7
WUG Balance After WMS	**7**	**7**	**7**	**7**	**7**	**7**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Mining, Maverick

Mining in Maverick County has needs from 2020 through 2060 (Table 5.3-234); BMPs are recommended (Table 5.3-235).

Table 5.3-234 Mining, Maverick Existing Supply Balance (acft/yr)

MINING, MAVERICK	2020	2030	2040	2050	2060	2070
Supplies	1,394	1,394	1,393	1,393	1,393	1,392
Demand	1,988	2,737	2,933	2,302	1,674	1,217
Need(-)/Surplus(+)	**(594)**	**(1,343)**	**(1,540)**	**(909)**	**(281)**	**175**

Table 5.3-235 Mining, Maverick WMS Supplies (acft/yr)

MINING, MAVERICK	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	199	274	293	230	167	122
WUG Balance After WMS	**(395)**	**(1,069)**	**(1,247)**	**(679)**	**(114)**	**297**

The mining needs are partially met by the implementation of BMPs; however, because of the decreased reliability of mining water rights in a drought year, Maverick County mining is left with shortages in years of limited supply. Additionally, there may be further groundwater supplies for mining that exceed the MAG values for the Gulf Coast Aquifer. Because of limited reporting requirements and no active groundwater conservation district, it is not certain that these water sources are currently being used in excess of the MAG.

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.5 Starr County

5.3.5.1 Water User Groups and Water User Groups/Wholesale Water Providers

Starr County WUGs and WUGs/WWPs that have recommended strategies with associated capital costs and locations are represented on Figure 5.3-20 and listed in Table 5.3-236.

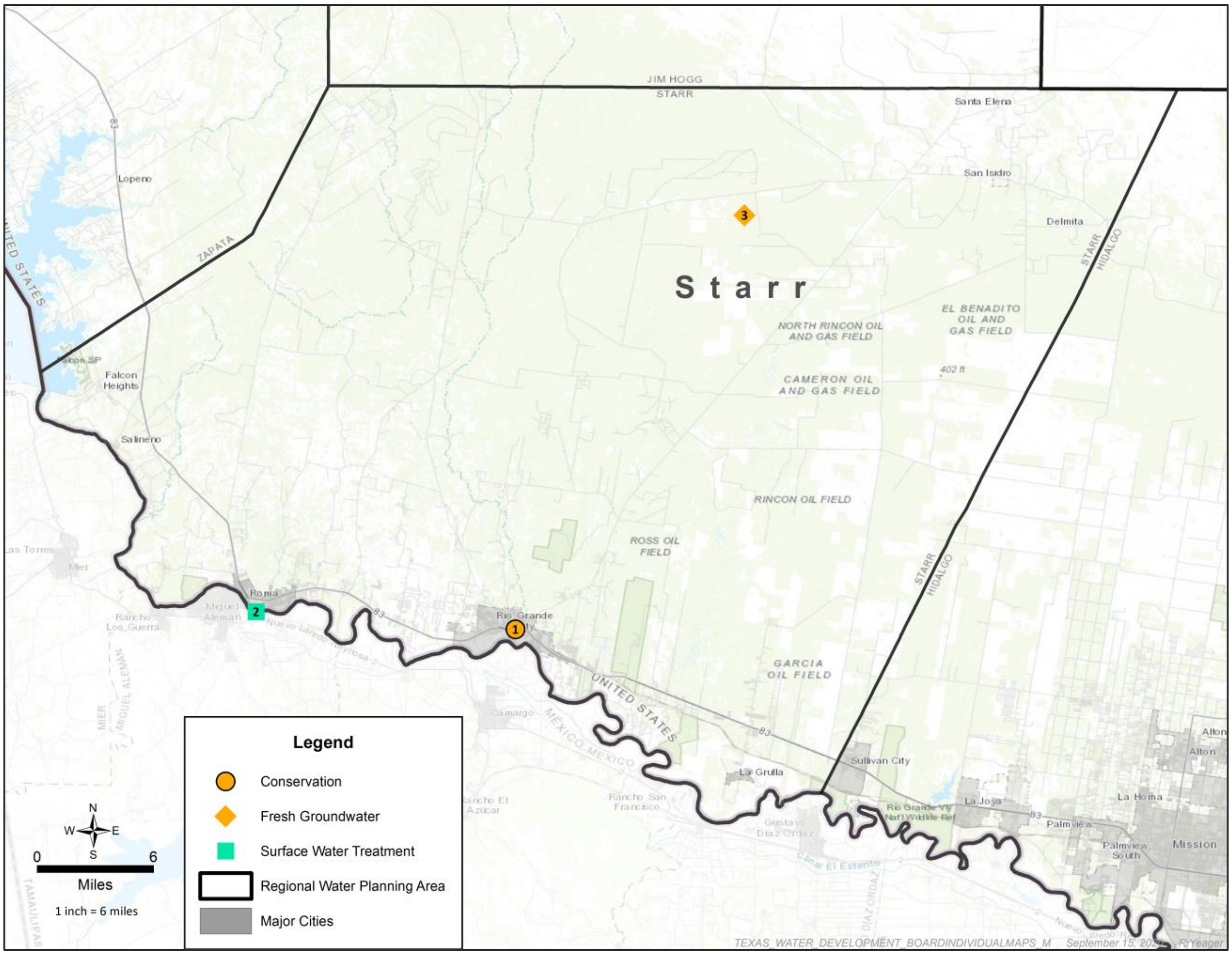

Figure 5.3-20 Starr County Recommended Water Management Strategies

Table 5.3-236 Map Legend: Starr County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Rio Grande City	Water Meter Replacement	Conservation
2	Roma	Regional WTP	Surface Water Treatment
3	County-Other, Starr	Additional Groundwater Wells	Fresh Groundwater

Agua Special Utility District

Refer to Section 5.3.2, Hidalgo County.

El Sauz Water Supply Corporation

El Sauz WSC has a need in all decades (Table 5.3-237); Advanced Municipal Water Conservation, Drought Management, and purchase of any water rights made available through Conversion of Water Rights are all recommended to meet the need (
Table 5.3-238).

Table 5.3-237 El Sauz WSC Existing Supply Balance (acft/yr)

EL SAUZ WSC	2020	2030	2040	2050	2060	2070
Supplies	105	105	105	105	105	105
Demand	163	177	191	207	222	237
Need(-)/Surplus(+)	**(58)**	**(72)**	**(86)**	**(102)**	**(117)**	**(132)**

Table 5.3-238 El Sauz WSC WMS Supplies (acft/yr)

EL SAUZ WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	9	21
Conversion of Water Rights	60	10	10	10	10	10
Municipal Drought Management	7	8	9	10	10	11
Roma - Regional WTP (See section for Roma)	0	150	150	150	150	150
New Supplies from WMS	**67**	**168**	**169**	**170**	**180**	**192**
WUG Balance After WMS	**9**	**96**	**83**	**68**	**63**	**60**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. El Sauz WSC's 2011 GPCD was estimated at 99, and therefore the conservation WMS includes a .5 percent annual reduction in municipal use beginning in 2060.

El Tanque Water Supply Corporation

El Tanque WSC has a need in all decades (Table 5.3-239); Advanced Municipal Water Conservation, Drought Management, and purchase of any water rights made available through Conversion of Water Rights are all recommended to meet the need (Table 5.3-240).

Table 5.3-239 El Tanque WSC Existing Supply Balance (acft/yr)

EL TANQUE WSC	2020	2030	2040	2050	2060	2070
Supplies	177	177	177	177	177	177
Demand	276	305	332	360	388	413
Need(-)/Surplus(+)	**(99)**	**(128)**	**(155)**	**(183)**	**(211)**	**(236)**

Table 5.3-240 El Tanque WSC WMS Supplies (acft/yr)

EL TANQUE WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	7	22	41	61
Conversion of Water Rights	100	20	20	20	20	20
Municipal Drought Management	6	7	7	8	9	9
Roma - Regional WTP (See section for Roma)	0	150	150	150	150	150
New Supplies from WMS	**106**	**177**	**185**	**200**	**220**	**241**
WUG Balance After WMS	**7**	**49**	**30**	**17**	**9**	**5**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. El Tanque WSC's 2011 GPCD was estimated at 142, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reaches 140.

Falcon Rural Water Supply Corporation

Falcon Rural WSC does not have a need (Table 5.3-241), but is recommended to implement Advanced Municipal Water Conservation as a WMS and will benefit from ID improvements (Table 5.3-242).

Table 5.3-241 Falcon Rural WSC Existing Supply Balance (acft/yr)

FALCON RURAL WSC	2020	2030	2040	2050	2060	2070
Supplies	309	309	309	309	309	309
Demand	163	183	205	222	240	255

FALCON RURAL WSC	2020	2030	2040	2050	2060	2070
Need(-)/Surplus(+)	**146**	**126**	**104**	**87**	**69**	**54**

Table 5.3-242 Falcon Rural WSC WMS Supplies (acft/yr)

FALCON RURAL WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	12	31	41	54	66
ID Improvements - HCID#2	1	2	3	4	5	7
Roma - Regional WTP (See section for Roma)	0	100	100	100	100	100
New Supplies from WMS	**1**	**114**	**134**	**145**	**159**	**173**
WUG Balance After WMS	**147**	**240**	**238**	**232**	**228**	**227**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Falcon Rural WSC's 2011 GPCD was estimated at 177, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reaches 140.

La Grulla

La Grulla has a need in all decades (Table 5.3-243); Advanced Municipal Water Conservation, Drought Management, and purchase of any water rights made available through Conversion of Water Rights are all recommended to meet the need (Table 5.3-244).

Table 5.3-243 La Grulla Existing Supply Balance (acft/yr)

LA GRULLA	2020	2030	2040	2050	2060	2070
Supplies	600	600	600	600	600	600
Demand	1,308	1,445	1,575	1,712	1,842	1,962
Need(-)/Surplus(+)	**(708)**	**(845)**	**(975)**	**(1,112)**	**(1,242)**	**(1,401)**

Table 5.3-244 La Grulla WMS Supplies (acft/yr)

LA GRULLA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	84	178	257	350	450
Conversion of Water Rights	697	745	777	831	864	880

LA GRULLA	2020	2030	2040	2050	2060	2070
Municipal Drought Management	36	41	45	50	54	57
New Supplies from WMS	**733**	**870**	**1,000**	**1,137**	**1,267**	**1,387**
WUG Balance After WMS	**25**	**25**	**25**	**25**	**25**	**25**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. La Grulla's 2011 GPCD was estimated at 169, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Mirando City Water Supply Corporation

Mirando City WSC has needs from 2030 onward (Table 5.3-245); Advanced Municipal Water Conservation, Drought Management, and purchase of any water rights made available through Conversion of Water Rights are all recommended to meet the need (
Table 5.3-246).

Table 5.3-245 Mirando City WSC Existing Supply Balance (acft/yr)

MIRANDO CITY WSC	2020	2030	2040	2050	2060	2070
Supplies	70	70	70	70	70	70
Demand	69	83	96	108	121	132
Need(-)/Surplus(+)	**1**	**(13)**	**(26)**	**(38)**	**(51)**	**(62)**

Table 5.3-246 Mirando City WSC WMS Supplies (acft/yr)

MIRANDO CITY WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	2	8	15
Conversion of Water Rights	25	34	47	56	62	66
Municipal Drought Management	0	4	4	5	6	6
New Supplies from WMS	**25**	**38**	**51**	**63**	**76**	**87**
WUG Balance After WMS	**26**	**25**	**25**	**25**	**25**	**25**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Mirando City WSC's 2011 GPCD was estimated at 109, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use beginning in 2050.

Rio Grande City

Rio Grande City exhibits needs beginning in the 2030 decade (Table 5.3-247) and provides water to El Sauz, El Tanque, and Rio WSC. Advanced Municipal Water Conservation, Drought Management, and purchase of any water rights made available through Conversion of Water Rights are all recommended to meet the need (Table 5.3-248).

Table 5.3-247 Rio Grande City Existing Supply Balance (acft/yr)

RIO GRANDE	2020	2030	2040	2050	2060	2070
WUG Demand	3,118	3,462	3,786	4,122	4,439	4,728
El Sauz - Contract Demand	105	105	105	105	105	105
El Tanque - Contract Demand	177	177	177	177	177	177
Rio WSC - Contract Demand	684	684	684	684	684	684
Demand	**4,084**	**4,428**	**4,752**	**5,088**	**5,435**	**5,694**
Supplies	**4,084**	**4,084**	**4,084**	**4,084**	**4,084**	**4,084**
Need/Surplus	**0**	**(345)**	**(668)**	**(1,005)**	**(1,321)**	**(1,610)**

Table 5.3-248 Rio Grande City WMS Supplies (acft/yr)

RIO GRANDE CITY	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	402	901	1,470	2,086	2,544
Conversion of Water Rights	1,362	1,486	1,482	1,428	1,297	1,282
Municipal Drought Management	70	80	88	97	104	111
Water Meter Replacement	300	300	300	300	300	300
New Supplies from WMS	**1,732**	**2,268**	**2,771**	**3,295**	**3,787**	**4,237**
WUG Balance After WMS	**1,732**	**1,923**	**2,103**	**2,290**	**2,466**	**3,077**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Rio Grande City's 2011 GPCD was estimated at 223, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Water Meter Replacement

Project Source

This strategy was submitted by Rio Grande City to the RWPG.

Description

This strategy is to replace existing broken and malfunctioning water meters with 100 percent lead-free meters equipped with automated meter reading equipment within the city's distribution system. The current water meters are not 100 percent lead-free and are experiencing significant water loss as evidenced by meter and billing records.

Available Supply

The City estimates 10 percent to 15 percent of their current water losses can be conserved. Therefore, 10 percent of the current WUG supply, or 370 acft/yr, was used as the WMS yield. The end users that benefit from this project are shown in Table 5.3-249.

Table 5.3-249 Supplies from Rio Grande City Water Meter Replacement WMS (acft/yr)

RIO GRANDE CITY WATER METER REPLACEMENT	2020	2030	2040	2050	2060	2070
Rio Grande City	300	300	300	300	300	300
Rio WSC	70	70	70	70	70	70
Total Supply	**370**	**370**	**370**	**370**	**370**	**370**

Engineering and Costing

Rio Grande City estimated the capital cost for this strategy at approximately $3,560,000 in the 2016 plan, which is converted to 2018 dollars at $3,839,104. Table 5.3-250 outlines the project requirements and other cost metrics developed in UCM, assuming 1 year of construction and standard financing parameters.

Implementation Issues

No implementation issues have been identified. Metering is recommended across the region to reduce system losses.

Table 5.3-250 Rio Grande City - Water Meter Replacement Project Requirements and Costs

COST ESTIMATE SUMMARY	
RIO GRANDE CITY – WATER METER REPLACEMENT	
Item	Estimated Costs for Facilities
Water Meter Replacement	$3,839,000
CAPITAL COST	**$3,839,000**
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$106,000
TOTAL COST OF PROJECT	**$3,945,000**

COST ESTIMATE SUMMARY	
RIO GRANDE CITY – WATER METER REPLACEMENT	
Item	**Estimated Costs for Facilities**
Water Meter Replacement	$3,839,000
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$278,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$38,000
Pumping Energy Costs (62,477 kWh at 0.08 $/kWh)	$5,000
TOTAL O&M	$43,000
TOTAL ANNUAL COST	**$321,000**
Available Project Yield (acft/yr)	**370**
Annual Cost of Water ($ per acft)	**$868**
Annual Cost of Water After Debt Service ($ per acft)	**$116**
Annual Cost of Water ($ per 1,000 gallons)	**$2.66**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.36**

Rio Water Supply Corporation

Rio WSC has a WUG need in every decade (Table 5.3-251); WMSs recommended to address the need are shown in Table 5.3-252.

Table 5.3-251 Rio WSC Existing Supply Balance (acft/yr)

RIO WSC	2020	2030	2040	2050	2060	2070
Irrigation, Cameron - Contract Demand	44	44	44	44	44	44
Demand	**643**	**706**	**767**	**832**	**894**	**952**
Supplies	**684**	**684**	**684**	**684**	**684**	**684**
Need/Surplus	**(3)**	**(66)**	**(127)**	**(192)**	**(254)**	**(312)**

Table 5.3-252 Rio WSC WMS Supplies (acft/yr)

RIO WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	26	67	114

RIO WSC	2020	2030	2040	2050	2060	2070
Conversion of Water Rights	0	0	0	0	55	71
Municipal Drought Management	26	29	32	35	38	40
Rio Grande City - Water Meter Replacement (See section for Rio Grande City	70	70	70	70	70	70
Roma - Regional WTP (See section for Roma)	0	300	300	300	300	300
New Supplies from WMS	**96**	**399**	**402**	**431**	**530**	**595**
WUG Balance After WMS	**45**	**285**	**227**	**191**	**228**	**235**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Rio WSC's 2011 GPCD was estimated at 100, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use beginning in 2050.

Roma

Rom has a need in the 2070 decade of the planning horizon (Table 5.3-253); WMSs recommended to address the need are shown in Table 5.3-254.

Table 5.3-253 Roma Existing Supply Balance (acft/yr)

ROMA	2020	2030	2040	2050	2060	2070
Supplies	3,377	3,377	3,377	3,377	3,377	3,377
Demand	2,466	2,681	2,890	3,124	3,359	3,577
Need(-)/Surplus(+)	**911**	**696**	**487**	**253**	**18**	**(200)**

Table 5.3-254 Roma WMS Supplies (acft/yr)

ROMA	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	155	330
Regional WTP	0	800	800	800	800	800
New Supplies from WMS	**0**	**800**	**800**	**800**	**955**	**1,130**
WUG Balance After WMS	**911**	**1,496**	**1,287**	**1,053**	**973**	**930**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Roma's 2011 GPCD was estimated at 117, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Regional WTP

Project Source

This strategy was submitted by the City of Roma to the RWPG.

Description

This strategy is to construct a Regional WTP to serve the City of Roma, Falcon Rural WSC, El Sauz WSC, El Tanque WSC, and Rio WSC. The consolidation of treatment facilities for this strategy may provide significant cost savings when compared to each entity operating independently.

Available Supply

This strategy, as submitted, would provide an initial drinking water supply of 10 mgd by 2030 and expand to 16.7 mgd in 2040, with a buildout capacity of 22.7 mgd in 2060. However, the regional water demands are significantly less than the proposed supplies, and the strategy has been modified to show a 5 mgd treatment plant built in 2030, which treats the City of Roma's existing water rights (1,989 AF in 2020). Purchase of 1,500 surface water rights in 2030 and another 500 AF in 2040 is included as a component of the WMS and allows for the system to meet regional demands. Proposed supplies to end users have been modified from initial project description to align somewhat with demands (Table 5.3-255).

Table 5.3-255 Roma Regional WTP WMS Supplies (acft/yr)

ROMA	2020	2030	2040	2050	2060	2070
El Sauz WSC	0	150	150	150	150	150
El Tanque WSC	0	150	150	150	150	150
Falcon Rural WSC	0	100	100	100	100	100
Rio WSC	0	300	300	300	300	300
Roma	0	800	800	800	800	800
Total WMS Supply	**0**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**

Engineering and Costing

This strategy consists of a conventional WTP, utilizing microfiltration instead of dual media filters because of increased salinity of surface water. The costs for this strategy were estimated in the UCM and consisted of a conventional WTP and a filtration process. It is assumed that the construction period for this strategy is 2 years. Table 5.3-256 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

There are two major implementation issues associated with this strategy: the risk of one or more of the five entities not agreeing to join the regional approach and not being able to secure the necessary water rights for each phase.

Table 5.3-256 Roma - Regional WTP Project Requirements and Costs

COST ESTIMATE SUMMARY	
ROMA – REGIONAL WTP	
Item	Estimated Costs for Facilities
CAPITAL COST	
Intake Pump Stations (0 mgd)	$2,831,000
Transmission Pipeline (36 in. diameter, 0 miles)	$614,000
Transmission Pump Station(s) and Storage Tank(s)	$220,000
WTP Upgrade	$301,000
TOTAL COST OF FACILITIES	**$3,966,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$1,358,000
Environmental and Archaeology Studies and Mitigation	$165,000
Land Acquisition and Surveying (73 acres)	$263,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$159,000
TOTAL COST OF PROJECT	**$5,911,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$416,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$6,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$76,000
WTP	$362,000
Pumping Energy Costs (27,818 kWh at 0.08 $/kWh)	$2,000
TOTAL O&M	$446,000
Purchase of Water (1,500 acft/yr at 3000 $/acft)	$4,500,000
TOTAL ANNUAL COST	**$5,362,000**
Available Project Yield (acft/yr)	**5,600**

COST ESTIMATE SUMMARY	
ROMA – REGIONAL WTP	
Item	Estimated Costs for Facilities
Annual Cost of Water ($ per acft).5	$958
Annual Cost of Water After Debt Service ($ per acft)	$883
Annual Cost of Water ($ per 1,000 gallons)	$7.02
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$4.90

Union Water Supply Corporation

Union WSC has a need in every decade (Table 5.3-257); WMSs recommended to meet that need are shown in Table 5.3-258.

Table 5.3-257 Union WSC Existing Supply Balance (acft/yr)

UNION WSC	2020	2030	2040	2050	2060	2070
Supplies	542	542	542	542	542	542
Demand	1,261	1,402	1,535	1,672	1,800	1,917
Need(-)/Surplus(+)	(719)	(860)	(993)	(1,130)	(1,258)	(1,375)

Table 5.3-258 Union WSC WMS Supplies (acft/yr)

UNION WSC	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	100	178	258	350	447
Conversion of Water Rights	715	752	804	857	890	907
Waterline Replacement and Automatic Meter Reading System	88	88	88	88	88	88
Municipal Drought Management	29	33	37	40	43	46
New Supplies from WMS	**832**	**973**	**1,106**	**1,243**	**1,371**	**1,488**
WUG Balance After WMS	113	113	113	113	113	113

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Union WSC's 2011 GPCD was estimated at 108, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Water Meter Replacement

Project Source

This strategy was submitted by Union WSC to the RWPG.

Description

This strategy is to replace all existing meters with 100 percent lead-free smart meters with built in leak detection and install an automatic meter reading system. This will eliminate significant water losses, increase the system's efficiency, and ensure compliance with anticipated future regulations.

Available Supply

Union WSC estimates that replacing the outdated meters and deteriorated pipes will save the corporation approximately 88 acft/yr.

Engineering and Costing

Union WSC submitted this project for consideration to the 2012 and 2013 Drinking Water State Revolving Fund Intended Use Plans administered by the TWDB. In December 2012, the TWDB approved the corporation's financial assistance request of $2,995,875 for design and construction. This project is currently being implemented and is in the design phase. Table 5.3-259 outlines the estimates costs using the UCM, updated to 2018 dollars.

Implementation Issues

No implementation issues are anticipated for this strategy.

Table 5.3-259 Union WSC - Water Meter Replacement Project Costs

COST ESTIMATE SUMMARY	
UNION WSC – WATER METER REPLACEMENT	
Item	Estimated Costs for Facilities
CAPITAL COST	**$3,231,000**
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$89,000
TOTAL COST OF PROJECT	**$3,320,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$234,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$32,000
Pumping Energy Costs (62,477 kWh at 0.08 $/kWh)	$5,000
TOTAL O&M	$37,000
TOTAL ANNUAL COST	$271,000

COST ESTIMATE SUMMARY	
UNION WSC – WATER METER REPLACEMENT	
Item	Estimated Costs for Facilities
Available Project Yield (acft/yr)	88
Annual Cost of Water ($ per acft)	$3,079.55
Annual Cost of Water After Debt Service ($ per acft)	$420.45
Annual Cost of Water ($ per 1,000 gallons)	$9.45
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$1.29

County-Other, Starr

Starr County-Other has needs in every decade (Table 5.3-260); development of fresh groundwater and expanded delivery of treated surface water by existing utilities are recommended to meet these needs (Table 5.3-261).

Table 5.3-260 County-Other, Starr Existing Supply Balance (acft/yr)

COUNTY-OTHER, STARR	2020	2030	2040	2050	2060	2070
Supplies	134	134	134	134	134	134
Demand	679	734	785	846	906	961
Need(-)/Surplus(+)	**(545)**	**(600)**	**(651)**	**(712)**	**(772)**	**(827)**

Table 5.3-261 County-Other, Starr WMS Supplies (acft/yr)

COUNTY-OTHER, STARR	2020	2030	2040	2050	2060	2070
Additional Groundwater Wells	400	400	400	400	400	400
Conversion of Water Rights	160	225	275	325	400	450
New Supplies from WMS	**560**	**625**	**675**	**725**	**800**	**850**
WUG Balance After WMS	**15**	**25**	**24**	**13**	**28**	**23**

Advanced Municipal Water Conservation

Methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. The 2011 GPCD for County-Other, Starr was estimated at 124, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Additional Groundwater Wells

Project Source

This strategy was identified by the RWPG.

Description

This strategy is to provide additional supply to County-Other, Starr with fresh groundwater wells.

Available Yield

The available supply is 400 acft/yr beginning in 2020.

Engineering and Costing

The UCM was utilized to develop estimated costs for this strategy based on assumptions about the individual wells. Six wells were costed with a capacity of 50 gpm, including well construction, studies, land acquisition, and O&M, assuming no well field piping. The estimated costs and project requirements for this strategy are presented in Table 5.3-262.

Table 5.3-262 County-Other, Starr - Additional Groundwater Wells Project Requirements and Costs

COST ESTIMATE SUMMARY	
COUNTY-OTHER, STARR – ADDITIONAL GROUNDWATER WELLS	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$994,000
TOTAL COST OF FACILITIES	**$994,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$348,000
Environmental and Archaeology Studies and Mitigation	$11,000
Land Acquisition and Surveying (8 acres)	$13,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$38,000
TOTAL COST OF PROJECT	**$1,404,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$99,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$10,000
Pumping Energy Costs (189,119 kWh at 0.08 $/kWh)	$15,000
TOTAL O&M	$25,000
TOTAL ANNUAL COST	**$124,000**

COST ESTIMATE SUMMARY	
COUNTY-OTHER, STARR – ADDITIONAL GROUNDWATER WELLS	
Item	Estimated Costs for Facilities
Available Project Yield (acft/yr)	400
Annual Cost of Water ($ per acft)	$310
Annual Cost of Water After Debt Service ($ per acft)	$63
Annual Cost of Water ($ per 1,000 gallons)	$0.95
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$0.19

Irrigation, Starr

Irrigation in Starr County shows a need in every decade (Table 5.3-263); on-farm conservation and biological control of *Arundo donax* are recommended (
Table 5.3-264).

Table 5.3-263 Irrigation, Starr Existing Supply Balance (acft/yr)

IRRIGATION, STARR	2020	2030	2040	2050	2060	2070
Supplies	4,294	4,293	4,292	4,291	4,290	4,289
Demand	23,875	23,109	22,342	21,576	20,809	20,043
Need(-)/Surplus(+)	(19,581)	(18,816)	(18,050)	(17,285)	(16,519)	(15,754)

Table 5.3-264 Irrigation, Starr WMS Supplies (acft/yr)

IRRIGATION, STARR	2020	2030	2040	2050	2060	2070
On-Farm Conservation	439	439	439	439	439	439
Bio Control Arundo Donax	43	43	43	43	43	43
WUG Balance After WMS	(19,099)	(18,334)	(17,568)	(16,803)	(16,037)	(15,272)

Irrigation needs reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Starr County decrease over the planning period. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Starr County irrigation is left with shortages in years of limited supply.

Livestock, Starr

Starr County livestock has sufficient supply in every decade (Table 5.3-265). There are no projected needs for livestock in Starr County over the planning period; therefore, no WMSs were identified for this WUG.

Table 5.3-265 Livestock, Starr Existing Supply Balance (acft/yr)

LIVESTOCK, STARR	2020	2030	2040	2050	2060	2070
Supplies	1,192	1,192	1,192	1,192	1,192	1,192
Demand	1,192	1,192	1,192	1,192	1,192	1,192
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Manufacturing, Starr

Manufacturing has a small need in Starr County in every decade (Table 5.3-266); BMPs are recommended to alleviate the needs (Table 5.3-267).

Table 5.3-266 Manufacturing, Starr Existing Supply Balance (acft/yr)

MANUFACTURING, STARR	2020	2030	2040	2050	2060	2070
Supplies	85	86	86	86	86	86
Demand	95	116	116	116	116	116
Need(-)/Surplus(+)	**(10)**	**(30)**	**(30)**	**(30)**	**(30)**	**(30)**

Table 5.3-267 Manufacturing, Starr WMS (acft/yr) Supplies (acft)

MANUFACTURING, STARR	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	10	12	12	12	12	12
WUG Balance After WMS	**0**	**(18)**	**(18)**	**(18)**	**(18)**	**(18)**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Mining, Starr

Mining in Starr County has a need in every decade (Table 5.3-268); BMPs are recommended (Table 5.3-269).

Table 5.3-268 Mining, Starr Existing Supply Balance (acft/yr)

MINING, STARR	2020	2030	2040	2050	2060	2070
Supplies	276	276	276	276	276	276
Demand	571	697	775	858	961	1,091
Need(-)/Surplus(+)	**(295)**	**(421)**	**(499)**	**(582)**	**(685)**	**(815)**

Table 5.3-269 Mining, Starr WMS Supplies (acft/yr)

MINING, STARR	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	57	70	78	86	96	109
WUG Balance After WMS	**(238)**	**(351)**	**(422)**	**(496)**	**(589)**	**(706)**

The mining needs are partially met by the implementation of BMPs; however, because of the decreased reliability of mining water rights in a drought year, Starr County mining is left with shortages in years of limited supply. Additionally, there may be further groundwater supplies for mining that exceed the MAG values for the Gulf Coast Aquifer. Because of limited reporting requirements and no active groundwater conservation district, it is not certain that these water sources are currently being used in excess of the MAG.

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.6 Webb County

Webb County WUGs and WUGs/WWPs that have recommended strategies with associated capital costs and locations are represented in Figure 5.3-24 and listed in Table 5.3-270.

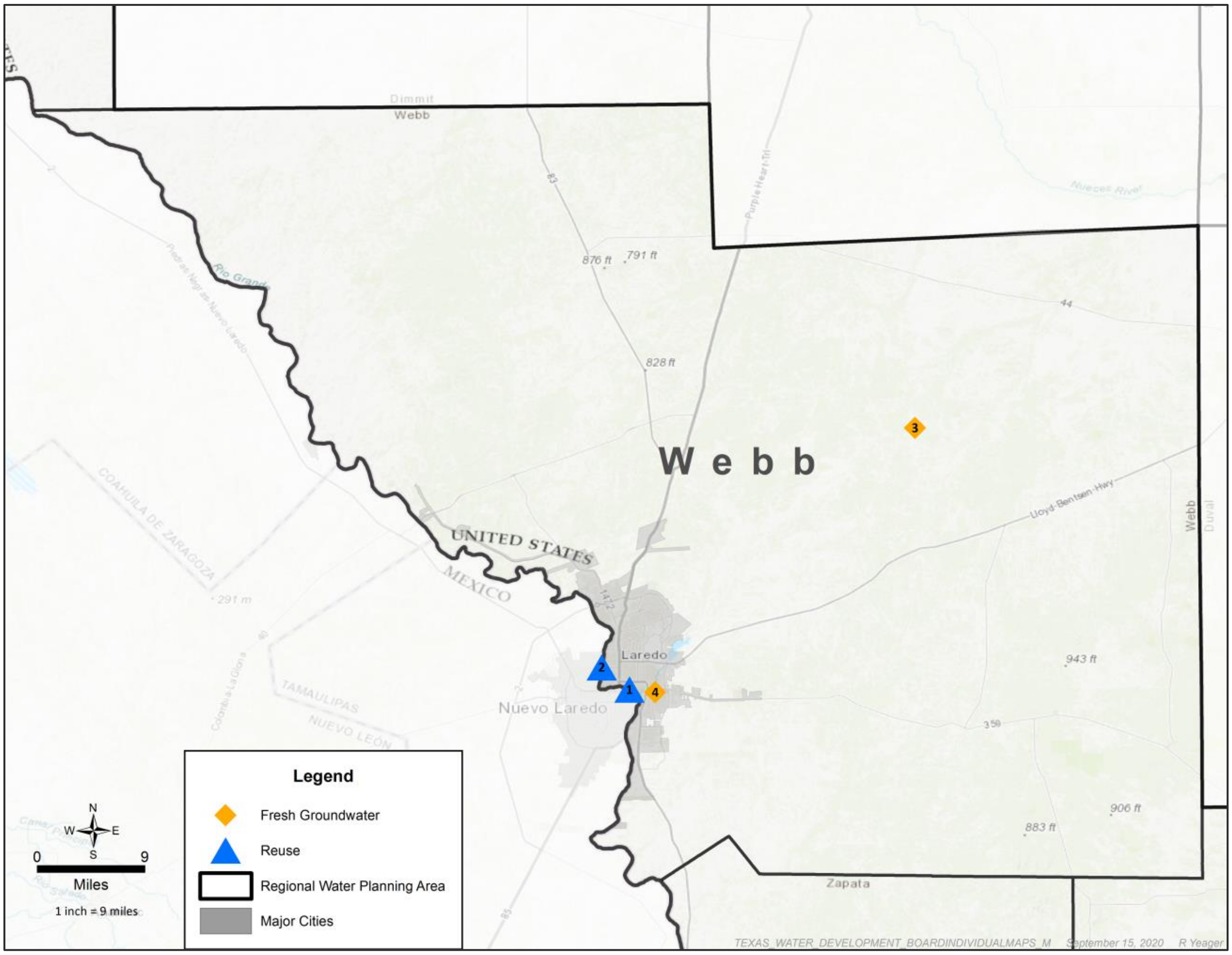

Figure 5.3-21 Webb County Recommended Water Management Strategies

Table 5.3-270 Map Legend: Webb County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Laredo	South Laredo WWTP Potable Reuse Phase I	Reuse
2	Laredo	South Laredo WWTP Potable Reuse Phase I	Reuse
3	County-Other, Webb	Additional Groundwater Wells	Fresh Groundwater
4	Webb County Water Utility	Expanded Groundwater Supply	Fresh Groundwater

5.3.6.1 Water User Groups and Water User Groups/Wholesale Water Providers

Laredo

Laredo is a WUG and a WWP, and exhibits needs beginning in 2050 (Table 5.3-271). Advanced Municipal Water Conservation, Drought Management, reuse, and purchase of water rights are recommended to meet these needs (Table 5.3-272).

Table 5.3-271 Laredo Existing Supply Balance (acft/yr)

LAREDO	2020	2030	2040	2050	2060	2070
WUG Demand	42,028	50,530	58,812	66,591	74,190	81,096
Irrigation, Webb – Contract Demand	1,657	1,656	1,656	1,655	1,655	1,655
Manufacturing, Manufacturing – Contract Demand	100	100	100	100	100	100
Mining, Webb – Contract Demand	66	66	66	66	66	66
Demand	**43,851**	**52,352**	**60,634**	**68,412**	**76,011**	**82,917**
Supplies	**61,827**	**61,826**	**61,826**	**61,825**	**61,825**	**61,825**
Need/Surplus	**17,976**	**9,474**	**1,192**	**(6,587)**	**(14,186)**	**(21,092)**

Table 5.3-272 Laredo WMS Supplies (acft/yr)

LAREDO	2020	2030	2040	2050	2060	2070
Recommended WMS						
Advanced Municipal Water Conservation	0	0	221	3,030	6,713	10,902
Conversion of Water Rights	0	0	0	0	0	980
Municipal Drought Management	0	0	0	2,406	2,686	2,938
South Laredo WWTP Potable Reuse	0	0	3,360	3,360	6,720	6,720
New Supplies from WMS	**0**	**0**	**3,581**	**8,796**	**16,119**	**21,540**
WUG Balance After WMS	**17,976**	**9,474**	**4,773**	**2,209**	**1,933**	**448**
Alternative WMS*						
El Pico WTP Expansion (Phases 1-4)	28,000	56,000	89,600	162,400	162,400	162,400
*Alternative WMS are evaluated in Section 5.4.						

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Laredo's 2011 GPCD was estimated at 134, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

South Laredo WWTP Potable Reuse

Project source

This strategy was submitted by Laredo to the RWPG during the 2021 regional water planning process.

Description

This direct potable reuse strategy is to pump treated effluent from the South Laredo WWTP to the Laredo Jefferson WTP. The approximate alignment of the South Laredo WWTP potable reuse pipeline is shown on Figure 5.3-22.

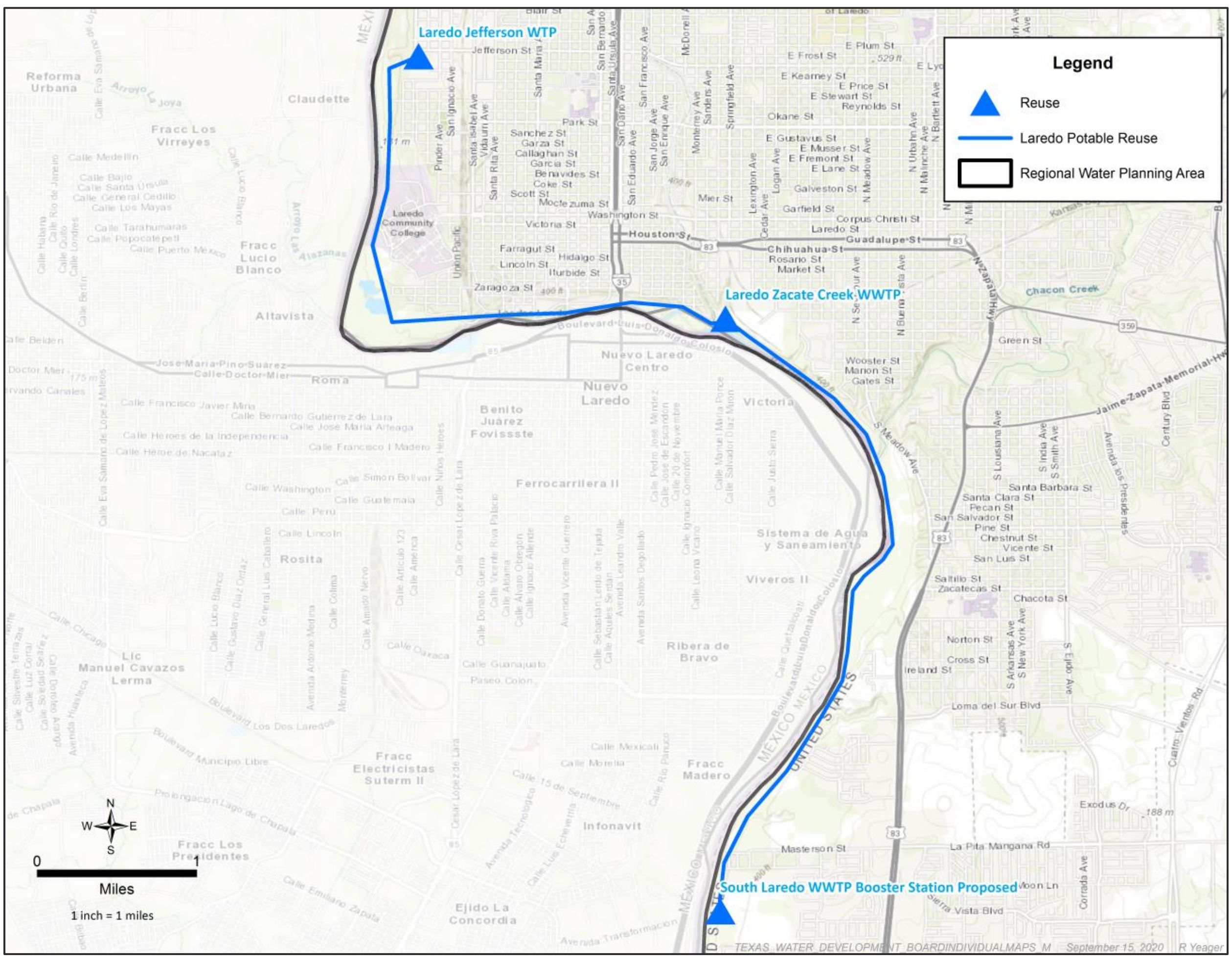

Figure 5.3-22 South Laredo WWTP Potable Reuse Pipeline Project Location

Available Supply

After the completion of WWTP expansion, the annual average flow for the South Laredo Creek WWTP will be an estimated 18 mgd. Approximately half of the flow is assumed to be available on a consistent basis. The WWTP currently provides 0.1 mgd of non-potable reuse; therefore, 6.9 mgd or 7,728 acft/yr, is available for indirect potable reuse. Phase 1 of this strategy will produce 3,360 acft/yr in 2040. Phase II of this strategy will produce 6,720 acft/yr of reuse water in 2060 to meet Laredo's future needs.

Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and ground storage tank at the South Laredo WWTP site and a pipeline, which will be size sufficiently for both phases, to convey the reuse water to Jefferson WTP, would be constructed. During Phase II construction, the pump station would be expanded to ultimate build out capacity. It is assumed that the construction period for each phase would be 2 years. Phase I would begin in the 2030 decade, and Phase II in the 2060 decade. Table 5.3-273 through Table 5.3-274 outline the estimated costs and project requirements used to develop the cost estimate.

Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

Table 5.3-273 Laredo - South Laredo WWTP Potable Reuse Phase I Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO – SOUTH LAREDO WWTP REUSE PROJECT PHASE I	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Stations	$8,500,000
Transmission Pipeline (24 in. diameter, 8.7 miles)	$9,201,000
TOTAL COST OF FACILITIES	**$17,701,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$5,735,000
Environmental and Archaeology Studies and Mitigation	$218,000
Land Acquisition and Surveying (43 acres)	$398,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$662,000
TOTAL COST OF PROJECT	**$24,714,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
LAREDO – SOUTH LAREDO WWTP REUSE PROJECT PHASE I	
Item	**Estimated Costs for Facilities**
Debt Service (3.5 percent, 20 years)	$1,739,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$92,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$213,000
Pumping Energy Costs (543,948 kWh at 0.08 $/kWh)	$44,000
TOTAL O&M	$349,000
TOTAL ANNUAL COST	**$2,088,000**
Available Project Yield (acft/yr)	**3,360**
Annual Cost of Water ($ per acft)	**$621**
Annual Cost of Water After Debt Service ($ per acft)	**$104**
Annual Cost of Water ($ per 1,000 gallons)	**$1.91**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.32**

Table 5.3-274 Laredo - South Laredo Potable Reuse Phase II Project Expansion Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO – SOUTH LAREDO WWTP POTABLE REUSE PROJECT PHASE II	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$4,092,000
Advanced Water Treatment Facility (3 mgd)	$22,651,000
TOTAL COST OF FACILITIES	**$26,743,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$9,360,000
Environmental and Archaeology Studies and Mitigation	$92,000
Land Acquisition and Surveying (43 acres)	$156,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$1,000,000
TOTAL COST OF PROJECT	**$37,351,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
LAREDO – SOUTH LAREDO WWTP POTABLE REUSE PROJECT PHASE II	
Item	**Estimated Costs for Facilities**
Debt Service (3.5 percent, 20 years)	$2,628,000
O&M	
Intakes and Pump Stations (2.5 percent of cost of facilities)	$102,000
Advanced Water Treatment Facility	$2,898,000
Pumping Energy Costs (529,632 kWh at 0.08 $/kWh)	$42,000
TOTAL O&M	$3,042,000
TOTAL ANNUAL COST	**$5,670,000**
Available Project Yield (acft/yr)	**3,360**
Annual Cost of Water ($ per acft)	**$1,688**
Annual Cost of Water After Debt Service ($ per acft)	**$905**
Annual Cost of Water ($ per 1,000 gallons)	**$5.18**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.78**

Webb County Water Utility

Webb County Water Utility operates the Rio Bravo WTP, which serves Rio Bravo and El Cenizo as well as a couple of small colonias (County-Other, Webb). Webb County has needs from 2050 onward (Table 5.3-275), and Advanced Municipal Water Conservation, Drought Management, and purchase of water rights made available through Conversion of Water Rights are recommended to meet those needs (Table 5.3-276).

Table 5.3-275 Webb County Water Utility Existing Supply Balance (acft/yr)

WEBB COUNTY WATER UTILITY	2020	2030	2040	2050	2060	2070
WUG SUPPLY BALANCE						
Supplies	2,311	2,311	2,311	2,311	2,311	2,311
Demand	1,614	1,929	2,239	2,532	2,819	3,082
Need(-)/Surplus(+)	**697**	**382**	**72**	**(221)**	**(508)**	**(771)**

Table 5.3-276 Webb County Water Utility WMS Supplies (acft/yr)

WEBB COUNTY WATER UTILITY	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	51	185	342

WEBB COUNTY WATER UTILITY	2020	2030	2040	2050	2060	2070
Conversion of Water Rights Water Rights	0	0	0	150	300	400
Municipal Drought Management	0	0	0	44	49	53
Expanded Groundwater Supply (MAG limited)	0	76	76	76	76	76
New Supplies from WMS	**0**	**76**	**76**	**320**	**609**	**871**
WUG Balance After WMS	**697**	**458**	**148**	**99**	**101**	**100**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. The 2011 GPCD for Webb County Water Utility was estimated at 115, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Expanded Groundwater Supply

Project Source

This strategy was submitted by Webb County Water Utility during the 2021 regional water planning process.

Description

This strategy is to provide additional supply to Webb County Water Utility with the rehabilitation of the utility's WTP and groundwater system.

Available Yield

Due to MAG limitations, this strategy would provide up to 76 acft/yr starting in the 2030 decade.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water disinfection. It is assumed the construction / rehabilitation period for this strategy is one year.

UCM was used to estimate costs on the basis of the project requirements shown below. Six wells were costed with a capacity of 200 gpm, including well construction, studies, land acquisition, and O&M, assuming no well field piping. The total estimated costs and project requirements for this strategy are presented in Table 5.3-280.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of new groundwater wells may also include a TCEQ well drilling permit, and wells for domestic use are encouraged to perform water quality testing.

Table 5.3-277 Webb County Water Utility - Expanded Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
WEBB COUNTY WATER UTILITY – EXPANDED GROUNDWATER SUPPLY	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$412,000
Water Treatment Plant (0.1 mgd)	$23,000
TOTAL COST OF FACILITIES	**$435,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$152,000
Environmental & Archaeology Studies and Mitigation	$15,000
Land Acquisition and Surveying (3 acres)	$12,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$17,000
TOTAL COST OF PROJECT	**$631,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$44,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$4,000
Water Treatment Plant	$14,000
TOTAL O&M	$18,000
TOTAL ANNUAL COST	**$62,000**
Available Project Yield (acft/yr)	**76**
Annual Cost of Water ($ per acft)	**$816**
Annual Cost of Water After Debt Service ($ per acft)	**$237**
Annual Cost of Water ($ per 1,000 gallons)	**$2.50**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.73**

County-Other, Webb

Rural Webb County has needs in every decade (Table 5.3-278); groundwater wells are recommended (Table 5.3-279).

Table 5.3-278 County-Other, Webb Existing Supply Balance (acft/yr)

COUNTY-OTHER, WEBB	2020	2030	2040	2050	2060	2070
Supplies	235	237	239	247	247	247
Demand	302	356	414	471	525	573
Need(-)/Surplus(+)	**(67)**	**(119)**	**(175)**	**(224)**	**(278)**	**(326)**

Table 5.3-279 County-Other, Webb WMS Supplies (acft/yr)

COUNTY-OTHER, WEBB	2020	2030	2040	2050	2060	2070
Additional Groundwater Wells	350	350	350	350	350	350
WUG Balance After WMS	**283**	**231**	**175**	**126**	**72**	**24**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. The 2011 GPCD for County-Other, Webb was estimated at 116, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Additional Groundwater Wells

Project Source

This strategy was identified by the RWPG.

Description

This strategy is to provide additional supply to County-Other, Webb with the installation of fresh groundwater wells.

Available Yield

Based on preliminary needs estimates for County-Other, Webb, an estimated seven proposed new 50 gpm groundwater wells would provide 350 acft/yr beginning in 2020.

Engineering and Costing

UCM was used to estimate costs on the basis of the project requirements shown below. Six wells were costed with a capacity of 200 gpm, including well construction, studies, land acquisition, and O&M, assuming no well field piping. The total estimated costs and project requirements for this strategy are presented in Table 5.3-280.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of new groundwater wells may also include a TCEQ well drilling permit, and wells for domestic use are encouraged to perform water quality testing.

Table 5.3-280 County-Other, Webb - Additional Groundwater Wells Project Requirements and Costs

COST ESTIMATE SUMMARY	
COUNTY-OTHER, WEBB – ADDITIONAL GROUNDWATER WELLS	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$2,483,000
TOTAL COST OF FACILITIES	**$2,483,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$869,000
Environmental & Archaeology Studies and Mitigation	$11,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$93,000
TOTAL COST OF PROJECT	**$3,469,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$244,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$25,000
Pumping Energy Costs (189,119 kWh at 0.08 $/kWh)	$5,000
TOTAL O&M	$30,000
TOTAL ANNUAL COST	**$274,000**
Available Project Yield (acft/yr)	**350**
Annual Cost of Water ($ per acft)	**$783**
Annual Cost of Water After Debt Service ($ per acft)	**$86**
Annual Cost of Water ($ per 1,000 gallons)	**$2.40**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.26**

Irrigation, Webb

There is a surplus of supply for irrigation in Webb County (Table 5.3-281), but on-farm conservation is recommended and irrigation supplies will be increased by biological control of *Arundo donax* (Table 5.3-282).

Table 5.3-281 Irrigation, Webb Existing Supply Balance (acft/yr)

IRRIGATION, WEBB	2020	2030	2040	2050	2060	2070
Supplies	10,610	10,607	10,605	10,601	10,599	10,597
Demand	10,425	10,090	9,756	9,421	9,086	8,752
Need(-)/Surplus(+)	**185**	**517**	**849**	**1,180**	**1,513**	**1,845**

Table 5.3-282 Irrigation, Webb WMS Supplies (acft/yr)

IRRIGATION, WEBB	2020	2030	2040	2050	2060	2070
On-Farm Conservation	192	192	192	192	192	192
Bio Control Arundo Donax	19	19	19	19	19	19
WUG Balance After WMS	**396**	**728**	**1,060**	**1,391**	**1,724**	**2,056**

Livestock, Webb

There are no projected needs for livestock in Webb County over the planning period; therefore, no WMSs were identified for this WUG (Table 5.3-283).

Table 5.3-283 Livestock, Webb Existing Supply Balance (acft/yr)

LIVESTOCK, WEBB	2020	2030	2040	2050	2060	2070
Supplies	1,079	1,079	1,079	1,079	1,079	1,079
Demand	963	963	963	963	963	963
Need(-)/Surplus(+)	**116**	**116**	**116**	**116**	**116**	**116**

Manufacturing, Webb

Manufacturing in Webb County does not have needs (Table 5.3-284), but implementation of BMPs are recommended (Table 5.3-285).

Table 5.3-284 Manufacturing, Webb Existing Supply Balance (acft/yr)

MANUFACTURING, WEBB	2020	2030	2040	2050	2060	2070
Supplies	346	391	391	391	391	391
Demand	251	296	296	296	296	296

MANUFACTURING, WEBB	2020	2030	2040	2050	2060	2070
Need(-)/Surplus(+)	95	95	95	95	95	95

Table 5.3-285 Manufacturing, Webb WMS (acft/yr) Supplies (acft)

MANUFACTURING, WEBB	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	25	30	30	30	30	30
WUG Balance After WMS	120	125	125	125	125	125

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Mining, Webb

Mining in Webb County has needs in 2020 through 2040 (Table 5.3-286); BMPs are recommended for all decades (Table 5.3-287).

Table 5.3-286 Mining, Webb Existing Supply Balance (acft/yr)

MINING, WEBB	2020	2030	2040	2050	2060	2070
Supplies	5,518	5,542	5,565	5,583	5,609	5,608
Demand	10,331	8,047	6,038	4,112	1,846	1,343
Need(-)/Surplus(+)	(4,813)	(2,505)	(473)	1,471	3,763	4,265

Table 5.3-287 Mining, Webb WMS Supplies (acft/yr)

MINING, WEBB	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	1,033	805	604	411	185	134
WUG Balance After WMS	(3,780)	(1,700)	131	1,882	3,948	4,399

The mining needs are partially met by the implementation of BMPs; however, because of the decreased reliability of mining water rights in a drought year, Webb County mining is left with shortages in years of limited supply. Because of limited reporting requirements and no active groundwater conservation district, it is not certain that these water sources are currently being used in excess of the MAG.

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

Steam-Electric, Webb

Steam-Electric in Webb County does not have any needs (Table 5.3-288); however, BMPs are recommended as a WMS (

Table 5.3-289).

Table 5.3-288 Steam-Electric, Webb Existing Supply Balance (acft/yr)

STEAM-ELECTRIC, WEBB	2020	2030	2040	2050	2060	2070
Supplies	695	695	695	695	695	695
Demand	152	152	152	152	152	152
Need(-)/Surplus(+)	543	543	543	543	543	543

Table 5.3-289 Steam-Electric, Webb WMS Supplies (acft/yr)

STEAM-ELECTRIC, WEBB	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	15	15	15	15	15	15
WUG Balance After WMS	558	558	558	558	558	558

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.7 Willacy County

5.3.7.1 Irrigation District/WWP

ID improvement WMS is recommended for the ID located in Willacy County (Figure 5.3-23).

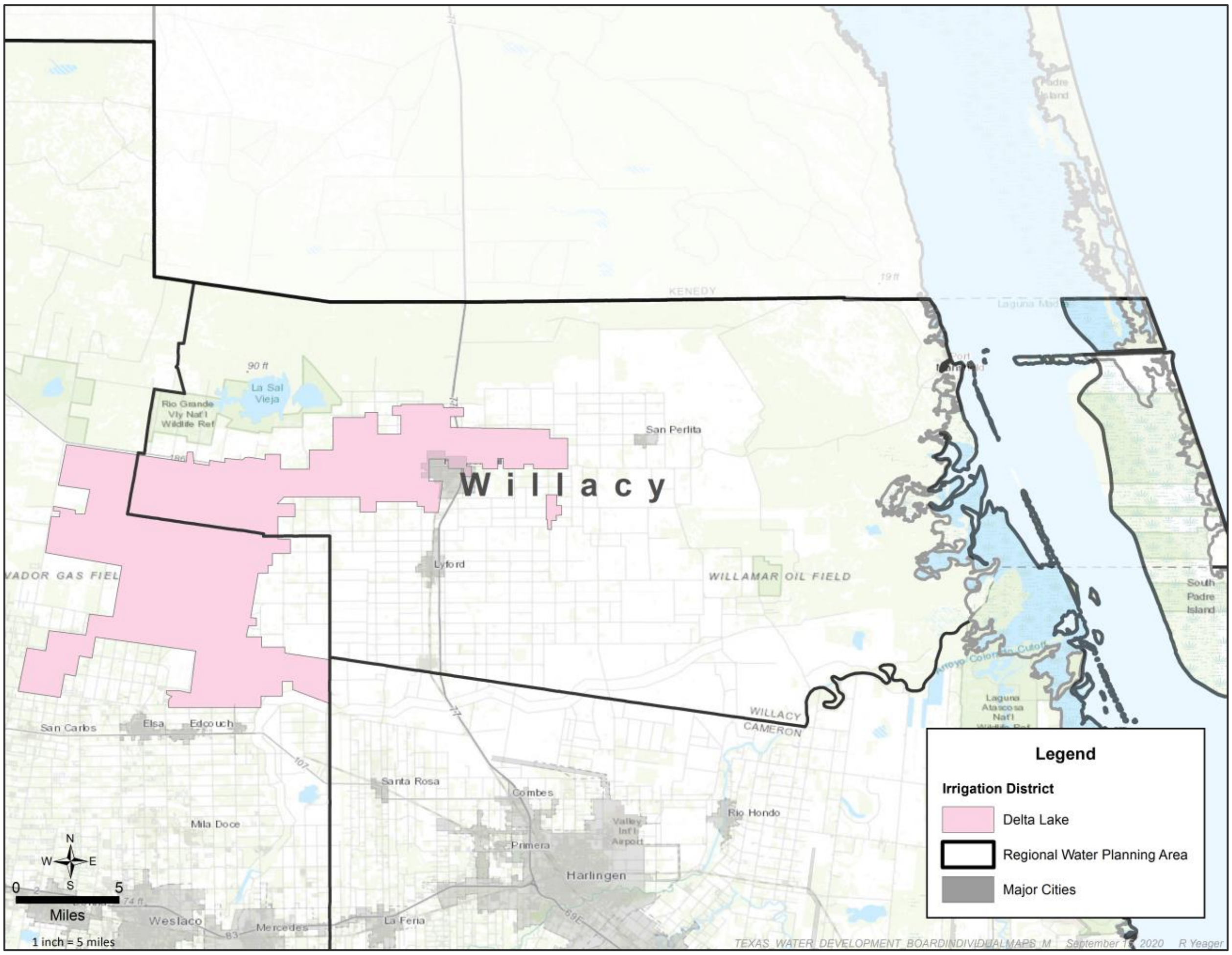

Figure 5.3-23 Map of Irrigation District in Willacy County

Delta Lake Irrigation District

Delta Lake ID delivers irrigation water within Hidalgo County and Willacy County (56.7 percent and 43.3 percent respectively), as well as the cities of Lyford, Raymondville, Port Mansfield, and other users in Willacy County. Delta Lake ID also passes water through their system for NAWSC, Engelman ID, and Valley Acres ID. Delta Lake ID has a current estimated efficiency of 65 percent. Projects submitted to the RWPG consist of a two canal lining projects and four concrete-lined canal replacements. These projects are estimated to conserve 5,583 acft/yr when implemented (Table 5.3-291).

Table 5.3-290 Delta Lake ID Water Supply Balance

DELTA LAKE ID	2020	2030	2040	2050	2060	2070
County-Other, Willacy - Contract Demand	65	65	65	65	65	65
Port Mansfield – Contract Demand	98	98	98	98	98	98
Irrigation, Willacy – Contract Demand	50,392	50,378	50,364	50,351	50,337	50,323
Livestock, Willacy – Contract Demand	235	235	140	140	140	140
Lyford - Contract Demand	637	637	637	637	637	637
NAWSC - Contract Demand	5,575	5,575	5,575	5,575	5,575	5,575
Raymondville - Contract Demand	3,750	3,750	3,750	3,750	3,750	3,750
Demand	**60,516**	**60,502**	**60,489**	**60,475**	**60,461**	**60,448**
Supplies	**110,373**	**110,348**	**110,323**	**110,298**	**110,272**	**110,247**
Need/Surplus	**20,194**	**20,191**	**20,188**	**20,184**	**20,181**	**20,178**

Table 5.3-291 Total Supplies from Delta Lake ID Improvements

ID IMPROVEMENTS - DELTA LAKE ID	2020	2030	2040	2050	2060	2070
County-Other, Willacy	3	6	8	11	14	16
Irrigation, Hidalgo	1,445	2,584	3,722	4,860	5,997	7,133
Irrigation, Willacy	1,104	1,973	2,843	3,711	4,580	5,447
Lyford	32	58	83	108	134	159
Port Mansfield	5	9	13	17	20	24
Raymondville	190	339	489	638	788	937
New Supplies from WMS	**2,779**	**4,969**	**7,158**	**9,346**	**11,533**	**13,718**
WUG Balance After WMS	**22,973**	**25,160**	**27,346**	**29,529**	**31,715**	**33,895**

Table 5.3-292 Delta Lake ID Improvement Cost Estimate Summary

ITEM	ESTIMATED COSTS FOR FACILITIES
TOTAL COST OF PROJECT	$55,808,978
TOTAL ANNUAL COST	$3,793,990
Available Project Yield (acft/yr)	5,583
Annual Cost of Water ($ per acft)	$680
Annual Cost of Water ($ per 1,000 gallons)	$2.09

5.3.7.2 Water User Groups and Water User Groups/Wholesale Water Providers

Willacy County WUGs and WUGs/WWPs that have recommended strategies with associated capital costs and locations are represented in Figure 5.3-24 and listed in Table 5.3-293.

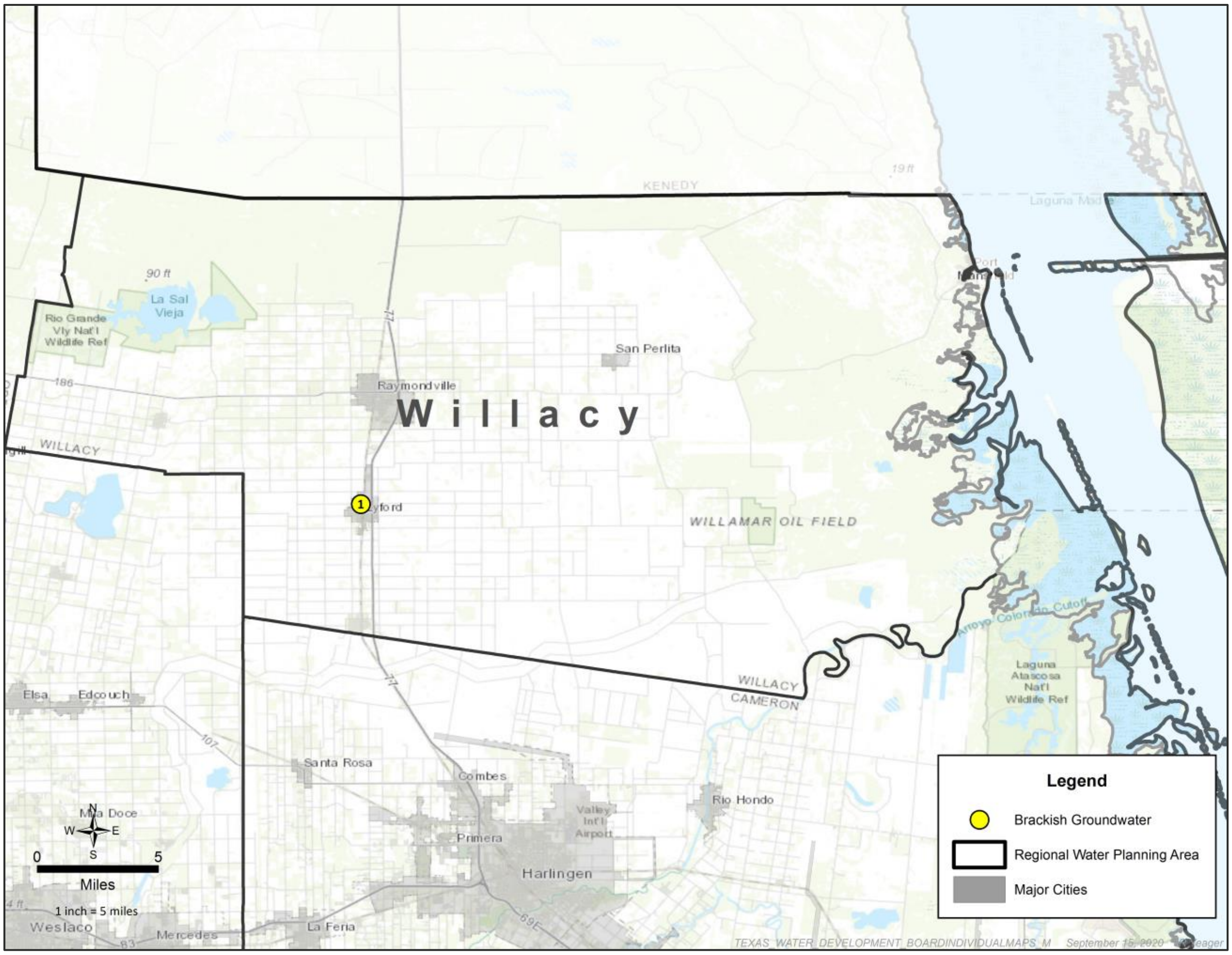

Figure 5.3-24 Willacy County Recommended Water Management Strategies

Table 5.3-293 Map Legend: Willacy County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Lyford	Brackish Groundwater Well and Desalination	Brackish Groundwater

ERHWSC

Refer to Subsection 5.3.1, Cameron County.

Lyford

Lyford does not have needs in any decade (Table 5.3-294), but is recommended to implement Advanced Municipal Water Conservation, a BGD facility, and benefits from ID improvements (Table 5.3-295).

Table 5.3-294 Lyford Existing Supply Balance (acft/yr)

LYFORD	2020	2030	2040	2050	2060	2070
Supplies	637	637	637	637	637	637
Demand	290	314	338	367	399	431
Need(-)/Surplus(+)	**347**	**323**	**299**	**270**	**238**	**206**

Table 5.3-295 Lyford WMS Supplies (acft/yr)

LYFORD	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	0	12	33
Brackish Groundwater Well and Desalination	0	1,120	1,120	1,120	1,120	1,120
ID Improvements - Delta Lake ID	32	58	83	108	134	159
New Supplies from WMS	**32**	**1,178**	**1,203**	**1,228**	**1,266**	**1,312**
WUG Balance After WMS	**379**	**1,501**	**1,502**	**1,498**	**1,504**	**1,518**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Lyford's 2011 GPCD was estimated at 96, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Brackish Groundwater Well and Desalination

Project Source

This strategy was submitted the City of Lyford to the RWPG.

Description

This strategy is to install a groundwater well and RO membrane water treatment facility to provide an alternate source of water for the City of Lyford. The proposed location would be adjacent to the city's WTP where the water would receive conventional treatment after the RO process.

Available Supply

This strategy would provide an additional 0.5 mgd of drinking water supply to the city in 2060. Assuming a RO efficiency of 80%, this strategy would require pumping 700 acft/yr of raw water, resulting in the 560 acft/yr yield (20% water loss).

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. Based on the BRACS study, well depth is estimated at 1,000 feet below ground surface. The well is sized to pump 125 percent of the produced water supply to account for treatment efficiency. It is assumed that the construction period for this strategy is 1 year. Table 5.3-296 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land if there is not adequate room at the WTP site.

Table 5.3-296 Lyford Water Brackish Groundwater Well Project Requirements and Costs

COST ESTIMATE SUMMARY	
LYFORD – BRACKISH GROUNDWATER WELL AND DESALINATION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$1,248,000
WTP (0.5 mgd)	$2,867,000
TOTAL COST OF FACILITIES	**$4,115,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$1,440,000
Environmental and Archaeology Studies and Mitigation	$26,000
Land Acquisition and Surveying (5 acres)	$18,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$154,000
TOTAL COST OF PROJECT	**$5,753,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$405,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$12,000
WTP	$558,000
Pumping Energy Costs (173,535 kWh at 0.08 $/kWh)	$28,000
TOTAL O&M	$598,000
TOTAL ANNUAL COST	**$1,003,000**

COST ESTIMATE SUMMARY	
LYFORD – BRACKISH GROUNDWATER WELL AND DESALINATION	
Item	Estimated Costs for Facilities
Available Project Yield (acft/yr)	1,120
Annual Cost of Water ($ per acft)	$896
Annual Cost of Water After Debt Service ($ per acft)	$534
Annual Cost of Water ($ per 1,000 gallons)	$2.75
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$1.64

North Alamo Water Supply Corporation

Refer to Subsection 5.3.1, Cameron County.

Port Mansfield Public Utility District

Port Mansfield PUD has needs in each decade (Table 5.3-297), and is recommended to implement Advanced Municipal Water Conservation, Drought Management, ID Improvements, and purchase of water rights (Table 5.3-298).

Table 5.3-297 Port Mansfield PUD Existing Supply Balance (acft/yr)

PORT MANSFIELD PUD	2020	2030	2040	2050	2060	2070
Supplies	98	98	98	98	98	98
Demand	231	259	285	313	342	369
Need(-)/Surplus(+)	(133)	(161)	(187)	(215)	(244)	(271)

Table 5.3-298 Port Mansfield PUD WMS Supplies (acft/yr)

PORT MANSFIELD PUD	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	3	26	52	80	112	144
Conversion of Water Rights	138	143	143	143	140	135
ID Improvements - Delta Lake ID	5	9	13	17	20	24
Municipal Drought Management	7	8	9	10	11	11
New Supplies from WMS	153	186	217	249	283	315
WUG Balance After WMS	20	25	30	35	40	43

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Port Mansfield PUD's 2011 GPCD was estimated at 358, and therefore the conservation WMS includes a 1.0 percent annual reduction in municipal use until a GPCD of 140 is reached.

Raymondville

Raymondville has a surplus in all decades (Table 5.3-299), but Advanced Municipal Water Conservation is still recommended, and their supplies will be increased as a result of ID improvements (

Table 5.3-300).

Table 5.3-299 Raymondville Existing Supply Balance (acft/yr)

RAYMONDVILLE	2020	2030	2040	2050	2060	2070
Supplies	3,691	3,691	3,691	3,691	3,691	3,691
Demand	1,490	1,618	1,747	1,904	2,072	2,239
Need(-)/Surplus(+)	**2,201**	**2,073**	**1,944**	**1,787**	**1,619**	**1,452**

Table 5.3-300 Raymondville WMS Supplies (acft/yr)

RAYMONDVILLE	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	14	110	221
ID Improvements - Delta Lake ID	190	339	489	638	788	937
New Supplies from WMS	**190**	**339**	**489**	**652**	**898**	**1,158**
WUG Balance After WMS	**2,391**	**2,412**	**2,433**	**2,439**	**2,517**	**2,610**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Raymondville's 2011 GPCD was estimated at 115, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use through the planning horizon.

Sebastian Municipal Utility District

Sebastian MUD has needs in 2050 through 2070 (Table 5.3-301), and Drought Management, and new surface water rights are recommended (Table 5.3-302).

Table 5.3-301 Sebastian MUD Existing Supply Balance (acft/yr)

SEBASTIAN MUD	2020	2030	2040	2050	2060	2070
Supplies	204	204	204	204	204	204
Demand	157	168	186	205	224	242
Need(-)/Surplus(+)	**47**	**36**	**18**	**(1)**	**(20)**	**(38)**

Table 5.3-302 Sebastian MUD WMS Supplies (acft/yr)

SEBASTIAN MUD	2020	2030	2040	2050	2060	2070
Conversion of Water Rights	0	0	0	1	20	38
Municipal Drought Management	0	0	0	11	12	13
New Supplies from WMS	**0**	**0**	**0**	**12**	**32**	**51**
WUG Balance After WMS	**47**	**36**	**18**	**11**	**12**	**13**

County-Other, Willacy

All of the municipal needs that are not served by municipal WUGs are included in County-Other, Willacy, which shows no needs (Table 5.3-303). However, users will benefit from ID improvements (Table 5.3-304).

Table 5.3-303 County-Other, Willacy Existing Supply Balance (acft/yr)

COUNTY-OTHER, WILLACY	2020	2030	2040	2050	2060	2070
Supplies	486	486	504	503	503	503
Demand	52	58	65	71	77	84
Need(-)/Surplus(+)	**434**	**428**	**439**	**432**	**426**	**419**

Table 5.3-304 County-Other, Willacy WMS Supplies (acft/yr)

COUNTY-OTHER, WILLACY	2020	2030	2040	2050	2060	2070
ID Improvements - Delta Lake ID	3	6	8	11	14	16
WUG Balance After WMS	**437**	**434**	**447**	**443**	**440**	**435**

Irrigation, Willacy

Irrigation in Willacy County has a need in every decade (Table 5.3-305); on-farm conservation is recommended to reduce the need (

Table 5.3-306).

Table 5.3-305 Irrigation, Willacy Existing Supply Balance (acft/yr)

IRRIGATION, WILLACY	2020	2030	2040	2050	2060	2070
Supplies	20,631	20,626	20,740	20,734	20,728	20,723
Demand	99,610	96,412	93,215	90,017	86,819	83,621
Need(-)/Surplus(+)	**(78,979)**	**(75,786)**	**(72,475)**	**(69,283)**	**(66,091)**	**(62,898)**

Table 5.3-306 Irrigation, Willacy WMS Supplies (acft/yr)

IRRIGATION, WILLACY	2020	2030	2040	2050	2060	2070
Bio Control of Arundo donax	178	178	178	178	178	178
ID Improvements - Delta Lake ID	1,104	1,973	2,843	3,711	4,580	5,448
On-Farm Conservation	1,830	1,830	1,830	1,830	1,830	1,830
WUG Balance After WMS	**(75,867)**	**(71,805)**	**(67,624)**	**(63,564)**	**(59,503)**	**(55,442)**

Irrigation needs reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Willacy County are partially met by ID conservation strategies and decrease over the planning period. Although increased on-farm conservation efforts are recommended, it is not likely that those strategies will reduce the demand for irrigation water. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Willacy County irrigation is left with shortages in years of limited supply.

Livestock, Willacy

There are no needs for livestock in Willacy County (Table 5.3-307).

Table 5.3-307 Livestock, Willacy Existing Supply Balance (acft/yr)

LIVESTOCK, WILLACY	2020	2030	2040	2050	2060	2070
Supplies	235	235	235	235	235	235
Demand	235	235	235	235	235	235
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Mining, Willacy

Mining in Willacy County has a need in from 2020 through 2050 (Table 5.3-308). BMPs are recommended to reduce needs (Table 5.3-309).

Table 5.3-308 Mining, Willacy Existing Supply Balance (acft/yr)

MINING, WILLACY	2020	2030	2040	2050	2060	2070
Supplies	0	0	20	20	20	20
Demand	49	51	38	28	18	12
Need(-)/Surplus(+)	**(49)**	**(51)**	**(18)**	**(8)**	**2**	**8**

Table 5.3-309 Mining, Willacy WMS Supplies (acft/yr)

MINING, WILLACY	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	5	5	4	3	2	1
WUG Balance After WMS	**(44)**	**(46)**	**(14)**	**(5)**	**4**	**9**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.8 Zapata County

5.3.8.1 Water User Groups and Water User Groups/Wholesale Water Providers

Zapata County WUGs and WUGs/WWPs that have recommended strategies with associated capital costs and locations are represented on Figure 5.3-25 and listed in Table 5.3-310.

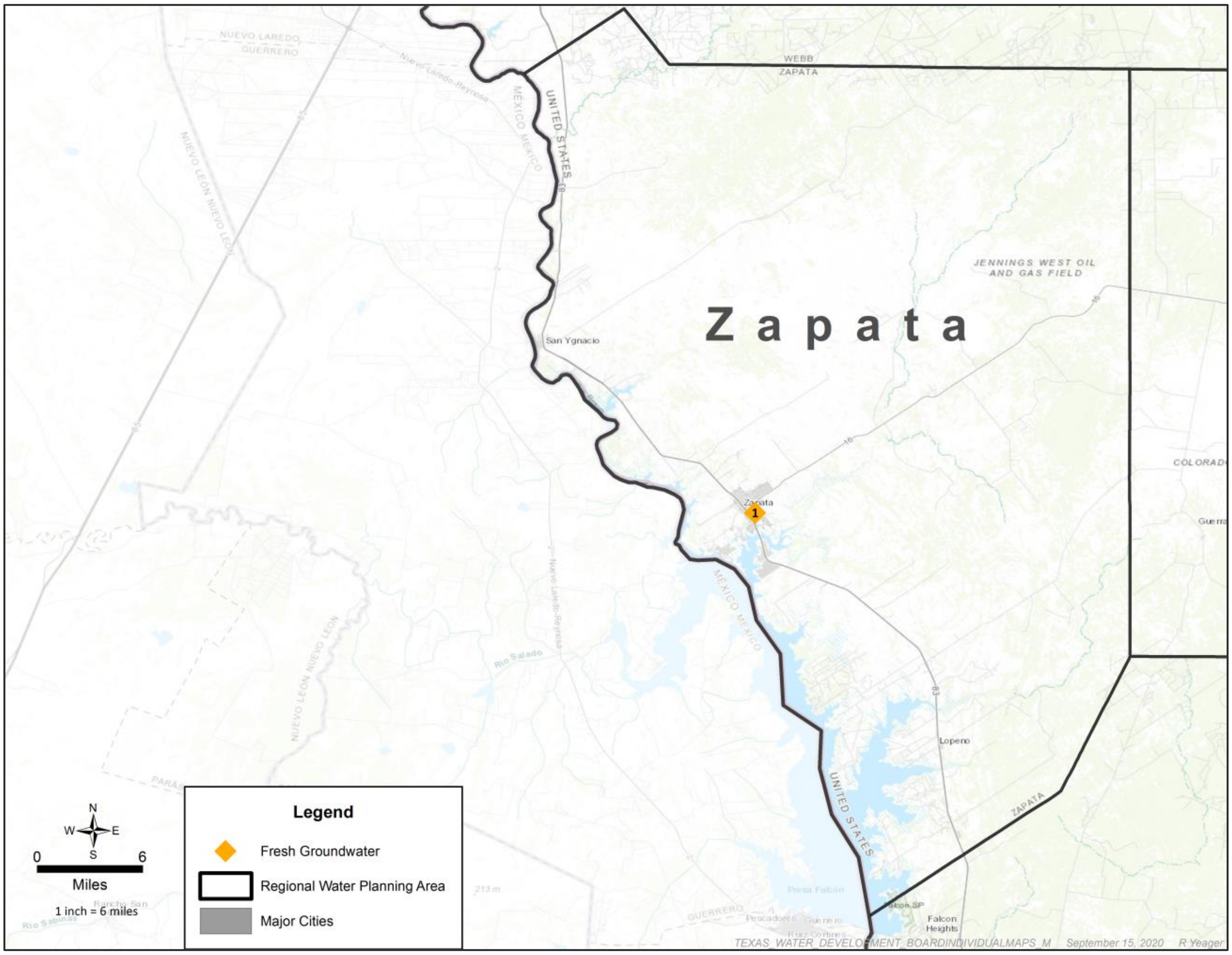

Figure 5.3-25 Zapata County Recommended Water Management Strategies

Table 5.3-310 Map Legend: Zapata County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Zapata County	New Groundwater Supply	Fresh Groundwater

San Ygnacio Municipal Utility District

San Ygnacio MUD has needs in 2060 and 2070 (Table 5.3-311), which is met by Advanced Municipal Water Conservation (Table 5.3-312).

Table 5.3-311 San Ygnacio MUD Existing Supply Balance (acft/yr)

SAN YGNACIO MUD	2020	2030	2040	2050	2060	2070
Supplies	284	284	284	284	284	284
Demand	189	216	247	283	321	361
Need(-)/Surplus(+)	**95**	**68**	**37**	**1**	**(37)**	**(77)**

Table 5.3-312 San Ygnacio MUD WMS Supplies (acft/yr)

SAN YGNACIO MUD	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	12	32	49	68	90
New Supplies from WMS	**0**	**12**	**32**	**49**	**68**	**90**
WUG Balance After WMS	**95**	**80**	**69**	**50**	**31**	**13**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. San Ygnacio MUD's 2011 GPCD was estimated at 132, and therefore the conservation WMS includes a 1.0 percent annual reduction in municipal use until a GPCD of 140 is reached.

Siesta Shores Water Control and Improvement District

Siesta Shores WCID has a need in 2060 and 2070 (Table 5.3-313) which is met by Advanced Municipal Water Conservation, Municipal Drought Management, benefits from ID Improvements, and purchase of water rights (Table 5.3-315).

Table 5.3-313 Siesta Shores WCID Existing Supply Balance (acft/yr)

SIESTA SHORES WCID	2020	2030	2040	2050	2060	2070
Supplies	369	369	369	369	369	369
Demand	222	254	291	333	377	424
Need(-)/Surplus(+)	**147**	**115**	**78**	**36**	**(8)**	**(55)**

Table 5.3-314 Siesta Shores WCID WMS Supplies (acft/yr)

SIESTA SHORES WCID	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	0	0	11	29	51
Conversion of Water Rights	2	34	71	102	128	153
ID Improvements - La Feria ID	38	38	38	38	38	38
Municipal Drought Management	7	8	9	11	12	14
New Supplies from WMS	**47**	**80**	**118**	**162**	**207**	**256**
WUG Balance After WMS	**194**	**195**	**196**	**198**	**199**	**201**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Siesta Shores WCID 2011 GPCD was estimated at 132, and therefore the conservation WMS includes a 0.5 percent annual reduction in municipal use.

Zapata County Water Control and Improvement District – Highway 16 East

Zapata County WCID Hwy 16 East does not have a need (Table 5.3-317), but Advanced Municipal Water Conservation is recommended (

Table 5.3-318).

Table 5.3-315 Zapata County WCID-HWY 16 East Existing Supply Balance (acft/yr)

ZAPATA COUNTY WCID-HWY 16 EAST	2020	2030	2040	2050	2060	2070
Supplies	502	502	502	502	502	502
Demand	102	118	136	156	177	199
Need(-)/Surplus(+)	**400**	**384**	**366**	**346**	**325**	**303**

Table 5.3-316 Zapata County WCID-HWY 16 East Existing Supply Balance (acft/yr)

ZAPATA COUNTY WCID-HWY 16 EAST	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	10	22	38	55	75
WUG Balance After WMS	**400**	**394**	**388**	**384**	**380**	**378**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Zapata County WCID-HWY 16 East 2011 GPCD was estimated at 275, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

Zapata County

Zapata County has needs in all decades (Table 5.3-317). Advanced Municipal Water Conservation, Drought Management, and a new groundwater supply are recommended to meet these needs (

Table 5.3-318).

Table 5.3-317 Zapata County Existing Supply Balance (acft/yr)

ZAPATA COUNTY	2020	2030	2040	2050	2060	2070
Supplies	2,084	2,084	2,084	2,084	2,084	2,084
Demand	2,247	2,582	2,956	3,396	3,857	4,359
Need(-)/Surplus(+)	**(163)**	**(498)**	**(872)**	**(1,312)**	**(1,773)**	**(2,275)**

Table 5.3-318 Zapata County WMS Supplies (acft/yr)

ZAPATA COUNTY	2020	2030	2040	2050	2060	2070
Advanced Municipal Water Conservation	0	155	395	578	807	1,079
New Groundwater Supply	1,120	1,120	1,120	1,120	1,120	1,120
Municipal Drought Management	62	73	85	98	112	126
New Supplies from WMS	**1,182**	**1,348**	**1,600**	**1,796**	**2,039**	**2,326**
WUG Balance After WMS	**1,019**	**850**	**728**	**484**	**266**	**51**

Advanced Municipal Water Conservation

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP identified in the BMP Guide discussed in Subsection 5.2.5, Advanced Municipal Water Conservation. Zapata County's 2011 GPCD was estimated at 175, and therefore the conservation WMS includes a 1 percent annual reduction in municipal use until the GPCD reached 140.

New Groundwater Supply

Project Source

This strategy was identified by the RWPG.

Description

This strategy is to drill a new fresh groundwater well and provide disinfection treatment for the groundwater beginning in 2050. There are a number of domestic wells around Zapata, which are drilled to depths between 650 and 400 feet below ground surface.

Available Supply

Based on preliminary needs estimates for Zapata County, the new fresh groundwater well is sized for 1,120 acft/yr.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and disinfection treatment. It is assumed that the construction period for this strategy is 1 year. Table 5.3-319 outlines the project requirements and cost estimate developed in UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a Texas DOT ROW permit.

Table 5.3-319 Zapata County - New Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
ZAPATA COUNTY – NEW GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station (1 mgd)	$3,679,000
Transmission Pipeline (10 in. diameter, 5 miles)	$1,311,000
Well Fields (wells, pumps, and piping)	$2,823,000
WTP (1 mgd)	$89,000
TOTAL COST OF FACILITIES	**$7,902,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30 percent for pipes and 35 percent for all other facilities)	$2,700,000
Environmental and Archaeology Studies and Mitigation	$149,000
Land Acquisition and Surveying (9 acres)	$13,000
Interest During Construction (3 percent for 1 year with a 0.5 percent ROI)	$297,000
TOTAL COST OF PROJECT	**$11,061,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
ZAPATA COUNTY – NEW GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
Debt Service (3.5 percent, 20 years)	$778,000
O&M	
Pipeline, Wells, and Storage Tanks (1 percent of cost of facilities)	$41,000
Intakes and Pump Stations (2.5 percent of cost of facilities)	$92,000
WTP	$53,000
Pumping Energy Costs (1,064,959 kWh at 0.08 $/kWh)	$85,000
TOTAL O&M	$271,000
TOTAL ANNUAL COST	**$1,049,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$937**
Annual Cost of Water After Debt Service ($ per acft)	**$242**
Annual Cost of Water ($ per 1,000 gallons)	**$2.87**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.74**

County-Other, Zapata

Areas of Zapata County that are not currently served by a WUG are shown to have a need in all decades (Table 5.3-320) recommended to be met by Conversion of Water Rights (Table 5.3-321), served through expanded service by utilities.

Table 5.3-320 County-Other, Zapata Existing Supply Balance (acft/yr)

COUNTY-OTHER, ZAPATA	2020	2030	2040	2050	2060	2070
Supplies	66	66	66	66	66	66
Demand	122	136	157	180	211	233
Need(-)/Surplus(+)	**(56)**	**(70)**	**(91)**	**(114)**	**(145)**	**(167)**

Table 5.3-321 County-Other, Zapata WMS Supplies (acft/yr)

COUNTY-OTHER, ZAPATA	2020	2030	2040	2050	2060	2070
Conversion of Water Rights	56	70	91	114	145	167
WUG Balance After WMS	**0**	**0**	**0**	**0**	**0**	**0**

Irrigation, Zapata

Irrigation in Zapata County has a need in every decade (Table 5.3-322); On-Farm Conservation and Biological Control of *Arundo donax* are recommended to reduce the need (Table 5.3-323).

Table 5.3-322 Irrigation, Zapata Existing Supply Balance (acft/yr)

IRRIGATION, ZAPATA	2020	2030	2040	2050	2060	2070
Supplies	2,074	2,074	2,073	2,073	2,072	2,072
Demand	5,100	4,936	4,773	4,609	4,445	4,281
Need(-)/Surplus(+)	**(3,026)**	**(2,862)**	**(2,700)**	**(2,536)**	**(2,373)**	**(2,209)**

Table 5.3-323 Irrigation, Zapata WMS Supplies (acft/yr)

IRRIGATION, ZAPATA	2020	2030	2040	2050	2060	2070
On-Farm Conservation	94	94	94	94	94	94
Bio Control Arundo Donax	9	9	9	9	9	9
WUG Balance After WMS	**(2,923)**	**(2,759)**	**(2,597)**	**(2,433)**	**(2,270)**	**(2,106)**

Irrigation needs reflect the shortages on the highest demand year and the lowest supply year, with the understanding that these needs will not be met entirely in this scenario. The irrigation needs in Zapata County decrease over the planning period. In a drought year irrigation surface water rights are only allocated after DMI water rights have been filled; therefore, Zapata County irrigation is left with shortages in years of limited supply.

Livestock, Zapata

Livestock in Zapata County has surplus across the planning horizon (Table 5.3-324), and no WMSs are recommended at this time.

Table 5.3-324 Livestock, Zapata Existing Supply Balance (acft/yr)

LIVESTOCK, ZAPATA	2020	2030	2040	2050	2060	2070
Supplies	479	479	479	479	479	479
Demand	398	398	398	398	398	398
Need(-)/Surplus(+)	**81**	**81**	**81**	**81**	**81**	**81**

Manufacturing, Zapata

There are projected needs for manufacturing in Zapata County over the planning period (Table 5.3-325); BMPs were recommended as a WMS (Table 5.3-328).

Table 5.3-325 Manufacturing, Zapata Existing Supply Balance (acft/yr)

MANUFACTURING, ZAPATA	2020	2030	2040	2050	2060	2070
Supplies	5	5	5	5	5	5
Demand	9	9	9	9	9	9
Need(-)/Surplus(+)	**(4)**	**(4)**	**(4)**	**(4)**	**(4)**	**(4)**

Table 5.3-326 Manufacturing, Zapata WMS Supplies (acft/yr)

MANUFACTURING, ZAPATA	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	1	1	1	1	1	1
WUG Balance After WMS	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**

Mining, Zapata

Mining in Zapata County does not have needs in any decade (Table 5.3-327); however, BMPs were recommended as a WMS (Table 5.3-328).

Table 5.3-327 Mining, Zapata Existing Supply Balance (acft/yr)

MINING, ZAPATA	2020	2030	2040	2050	2060	2070
Supplies	1,332	1,332	1,332	1,332	1,332	1,332
Demand	911	954	707	525	332	214
Need(-)/Surplus(+)	**421**	**378**	**625**	**807**	**1,000**	**1,118**

Table 5.3-328 Mining, Zapata WMS Supplies (acft/yr)

MINING, ZAPATA	2020	2030	2040	2050	2060	2070
Implementation of Industrial BMPs	91	95	71	53	33	21
WUG Balance After WMS	**512**	**473**	**696**	**860**	**1,033**	**1,139**

Implementation of Best Management Practices

This strategy includes methods and practices that either reduce demand for water supply or increase the efficiency of supply. These strategies include the BMP in Subsection 5.2.7, Implementation of Best Management Practices for Industrial Users.

5.3.9 Management Supply Factors

Assuming all recommended WMSs are implemented, Table 5.3-329 summarizes the calculated management supply factor for each MWP. The formula for management supply factors equates to: the total existing supplies, plus all water supplies from recommended WMSs; divided by the entity's total projected Water Demand, within each planning decade [31 TAC § 357.35(g)(2)].

Table 5.3-329 MWP Management Supply Factors

ENTITY	2020	2030	2040	2050	2060	2070
Agua SUD	1.3	1.2	1.5	1.4	1.4	1.4
Alamo	1.1	1.3	1.2	1.2	1.2	1.2
Bayview ID	0.8	0.8	0.8	0.8	0.8	0.8
BPUB	1.2	1.3	1.2	1.2	1.1	1.1
Brownsville ID	0.8	0.8	0.8	0.8	0.9	0.9
CCID #10	0.5	0.5	0.5	0.5	0.5	0.5
CCID #2	0.4	0.4	0.4	0.4	0.4	0.4
CCID #6	0.6	0.6	0.6	0.6	0.6	0.6
Delta Lake ID	0.7	0.7	0.8	0.8	0.8	0.8
Donna ID	0.7	0.7	0.8	0.8	0.8	0.8
Eagle Pass	1.2	1.2	1.1	1.1	1.1	1.1
ERHWSC	1.4	1.5	1.5	1.4	1.4	1.3
Edinburg	1.0	1.0	1.1	1.1	1.1	1.1
Harlingen Water Works System	1.4	1.3	1.3	1.2	1.2	1.2
Harlingen ID	0.9	0.9	0.9	1	1	1
HCID #1	0.9	0.9	0.9	0.9	0.9	0.9
HCID #16	0.8	0.8	0.8	0.8	0.8	0.8
HCID #2	0.8	0.8	0.8	0.8	0.8	0.9
HCID #6	0.8	0.8	0.8	0.8	0.8	0.8
HCWID #3	1.0	1.0	1.0	1.0	1.0	1.0
H&CCID #9	0.7	0.8	0.8	0.8	0.8	0.8
La Feria ID	0.8	0.8	0.8	0.8	0.8	0.9
Laguna Madre Water District	1.3	1.3	1.3	1.4	1.3	1.3
Laredo	1.4	1.2	1.1	1.0	1.0	1.0
McAllen	1.1	1.1	1.1	1.1	1.1	1.1
Military Highway WSC	1.2	1.1	1.1	1.1	1	1

ENTITY	2020	2030	2040	2050	2060	2070
Mission	1	1	1.1	1.1	1.1	1.1
NAWSC	1	1.1	1.3	1.4	1.4	1.3
Pharr	1.7	1.5	1.3	1.2	1.1	1.1
Rio Grande City	0.9	0.9	0.9	0.9	0.9	0.9
San Benito	1.2	1.4	1.5	1.4	1.3	1.3
San Juan	1	1.3	1.5	1.4	1.4	1.3
Sharyland WSC	1.1	1.2	1.1	1.1	1.1	1.1
SRWA	1	1	1	1	1	1
United ID	1	1	1	1	1	1
Weslaco	1.1	1.1	1.1	1	1	1

FINAL PLAN

CHAPTER 5.4: EVALUATION OF ALTERNATIVE WATER MANAGEMENT STRATEGIES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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5.4 Evaluation of Alternative Water Management Strategies

This chapter describes potentially feasible alternative WMSs. This chapter is organized first by county, then by sponsor/entity, then by the alternative WMS.

5.4.1 Cameron County

5.4.1.1 Brownsville

Brownsville-Matamoros Weir and Reservoir

Project Source

This strategy was submitted by the City of Brownsville to the RWPG during the 2016 regional water planning process.

Description

This strategy is for the construction of a weir and on-channel reservoir to capture and store excess river flow for an additional water supply in the lower Rio Grande Valley. The weir and reservoir would be located about four miles southeast of Brownsville. This project is on hold pending approval from Mexico.

Available Supply

BPUB currently has authorization to divert up to 40,000 acft/yr of "excess flows" from the Rio Grande under TCEQ Permit No. 1838. Excess flows are defined as all US waters passing the Brownsville gauging station above 25 cfs. Excess US river flows will be impounded in the Brownsville Reservoir under BPUB's TCEQ water rights Permit No. 5259. According to hydrologic studies performed for the project sponsors, the proposed project would allow the diversion of the full 40,000 acft/yr authorized under the existing permit approximately 70 percent of the time. The yield associated with the Brownsville Reservoir under water right number 5259 is simulated as part of water right number 1838 using the Rio Grande WAM Run 3.

Environmental Issues

Environmental issues include impacts on water quality (i.e., increased salinity) within and downstream of the reservoir, impacts to aquatic and riparian habitat as a result of changes in downstream flow and salinity patterns, potential impacts to habitat from reservoir construction and inundation, potential adverse impacts to the Audubon Society's Sabal Palm Sanctuary, and increased risk of flooding. The project sponsors have indicated their intent to operate the proposed project to mitigate these concerns; resource advocates remain concerned about these issues.

TCEQ issued a water right permit for the Brownsville Weir and Reservoir Project in 2000. This permit authorizes the construction of the Brownsville Weir on the Rio Grande and impoundment of 6,000 acft of Rio Grande water in the Brownsville Reservoir. Special conditions included in this permit require the BPUB to (1) pass a minimum flow of 25 cfs when water is being impounded, (2) pass sufficient water through the reservoir to satisfy demands of downstream water rights holders as directed by the Rio Grande Watermaster, (3) monitor salinity in the Rio Grande downstream of the weir near the riverine/estuarine interface (23.6 river miles upstream from the mouth of the river) and only impound water in the reservoir when the measured salinity is less than an established low salinity condition, and (4) consult with the TCEQ, TPWD, USFWS, and other appropriate agencies to develop and implement an acceptable mitigation plan for the overall Brownsville Weir and Reservoir Project.

The mitigation plan for the project will be developed and finalized through the Section 404/10 process under the authority of the Galveston District of the Corps of Engineers. Environmental issues that have been raised must be satisfactorily addressed through the Section 404/10 federal permitting process and through the IBWC project approval process in order for the project to be authorized. The IBWC will be the lead agency for all discussions and dealings with Mexico that depend on the Section 404/10 permit.

Engineering and Costing

Costs for this strategy from the UCM include an on-channel reservoir and land acquisition. It is assumed that the construction period for this strategy is one year. Per section 8.2.4 of the UCM User Guide, dated November 2018, for all project components except pipelines, the UCM assumes the Environmental/Mitigation Costs are 100 percent of land costs. The recommended value for environmental studies and mitigation costs for pipelines is $25,000/mile of pipeline. This cost estimate is representative of 300 acres for the Reservoir foot-print and conservation pool. Table 5.4-1 outlines the estimated project requirements and costs.

Table 5.4-1 BPUB - Brownsville-Matamoros Weir and Reservoir Project Requirements and Costs

COST ESTIMATE SUMMARY	
BPUB - BROWNSVILLE-MATAMOROS WEIR AND RESERVOIR	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Off-Channel Storage/Ring Dike (conservation pool 6,000 acft, 300 acres)	$15,589,000
TOTAL COST OF FACILITIES	**$15,589,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$5,456,000
Environmental and Archaeology Studies and Mitigation	$1,054,000
Land Acquisition and Surveying (300 acres)	$1,069,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$638,000
TOTAL COST OF PROJECT	**$23,806,000**
ANNUAL COST	
Reservoir Debt Service (3.5%, 40 years)	$1,115,000
O&M	
Dam and Reservoir (1.5% of cost of facilities)	$234,000
Pumping Energy Costs (1608390 kWh at 0.08 $/kWh)	$129,000

COST ESTIMATE SUMMARY	
BPUB - BROWNSVILLE-MATAMOROS WEIR AND RESERVOIR	
TOTAL O&M	$363,000
TOTAL ANNUAL COST	**$1,478,000**
Available Project Yield (acft/yr)	**19,176**
Annual Cost of Water ($ per acft)	**$77**
Annual Cost of Water After Debt Service ($ per acft)	**$19**
Annual Cost of Water ($ per 1,000 gallons)	**$0.24**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.06**

Seawater Desalination Demonstration and Implementation

Project Source

This strategy was submitted by the City of Brownsville to the RWPG during the 2016 regional water planning process.

Description

This strategy is for the construction of a 2.5 mgd seawater desalination facility on the south shore of the Brownsville Ship Channel. In anticipation of a future expansion to a 25 mgd facility, this strategy includes some full-scale components like the intake system, concentrate disposal system, and land acquisition.

Available Supply

This strategy would start with a desalination demonstration in 2020, supplying 2.5 mgd (~2,800 acft/yr) of drinking water. It is assumed that the full-scale, 25 mgd (~28,000 acft/yr) desalination facility will be constructed by 2060 when Brownsville's drinking water demand exceeds its current water treatment capacity. A breakdown of the supplies is summarized in Table 5.4-2.

Table 5.4-2 Seawater Desalination Demonstration and Implementation WMS Supplies (acft/yr)

BROWNSVILLE	2020	2030	2040	2050	2060	2070
Brownsville	0	2,603	2,603	2,603	26,022	26,022
El Jardin WSC	0	108	108	108	1,081	1,081
Manufacturing, Cameron	0	56	56	56	565	565
Steam-Electric Power, Cameron	0	33	33	33	332	332
Total WMS Supply	**0**	**2,800**	**2,800**	**2,800**	**28,000**	**28,000**

Engineering and Costing

This strategy includes two separate costs. One cost is for the initial 2.5 mgd demonstration, including an intake structure, piping, land acquisition, and treatment. The second cost includes the facility expansion to 25 mgd, including expanded intake structure and pipeline.

This strategy proposes construction and implementation of alternative energy generation facilities, including wind generation and landfill gas reclamation. These alternatives could not be incorporated into the UCM and are not included in the costs presented. Table 5.4-3 and Table 5.4-4 outline the estimated costs and project requirements for the seawater desalination demonstration and implementation, respectively.

Table 5.4-3 BPUB - Seawater Desalination Demonstration Project Requirements and Costs

COST ESTIMATE SUMMARY	
BPUB - SEAWATER DESALINATION DEMONSTRATION	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station (5.3 mgd)	$4,248,000
Transmission Pipeline (18 in dia., 0.06 mile)	$33,000
Two WTPs (2.5 mgd and 2.5 mgd)	$49,205,000
TOTAL COST OF FACILITIES	**$53,486,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$18,718,000
Environmental and Archaeology Studies and Mitigation	$26,000
Land Acquisition and Surveying (8 acres)	$30,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$1,988,000
TOTAL COST OF PROJECT	**$74,248,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$5,224,000
O&M	
Intakes and Pump Stations (2.5% of cost of facilities)	$106,000
WTP	$6,555,000
Pumping Energy Costs (576,024 kWh at 0.08 $/kWh)	$46,000
TOTAL O&M	$6,707,000
TOTAL ANNUAL COST	**$11,931,000**

COST ESTIMATE SUMMARY	
BPUB - SEAWATER DESALINATION DEMONSTRATION	
Available Project Yield (acft/yr)	**2,800**
Annual Cost of Water ($ per acft)	**$4,261**
Annual Cost of Water After Debt Service ($ per acft)	**$2,395**
Annual Cost of Water ($ per 1,000 gallons)	**$13.07**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$7.35**

Table 5.4-4 BPUB - Seawater Desalination Implementation Project Requirements and Costs

COST ESTIMATE SUMMARY	
BROWNSVILLE PUBLIC UTILITIES BOARD - SEAWATER DESALINATION IMPLEMENTATION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station (52.6 mgd)	$17,877,000
Transmission Pipeline (60 in dia., 0.07 mile)	$123,000
Two WTP (22.5 mgd and 22.5 mgd)	$320,569,000
TOTAL COST OF FACILITIES	**$338,569,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$118,493,000
Environmental and Archaeology Studies and Mitigation	$1,000
Land Acquisition and Surveying (28 acres)	$2,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$12,570,000
TOTAL COST OF PROJECT	**$469,635,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$33,044,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$1,000
Intakes and Pump Stations (2.5% of cost of facilities)	$447,000
WTP	$41,391,000
Pumping Energy Costs (5,691,079 kWh at 0.08 $/kWh)	$455,000
TOTAL O&M	$42,294,000

COST ESTIMATE SUMMARY	
BROWNSVILLE PUBLIC UTILITIES BOARD - SEAWATER DESALINATION IMPLEMENTATION	
TOTAL ANNUAL COST	$75,338,000
Available Project Yield (acft/yr)	28,000
Annual Cost of Water ($ per acft)	$2,690
Annual Cost of Water After Debt Service ($ per acft)	$1,510
Annual Cost of Water ($ per 1,000 gallons)	$8.26
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$4.63

Implementation Issues

Financing a full-scale seawater desalination facility is a major implementation issue. The BPUB is researching potential federal, state, and local funding sources to help finance this strategy.

5.4.1.2 East Rio Hondo Water Supply Corporation (ERHWSC)

Surface WTP Phase II with Inter-Basin Transfer of Surface Water

Project Source

This strategy was submitted by ERHWSC to the RWPG concurrently with the recommended Phase I portion of the project during the 2016 regional water planning process.

Description

Phase II includes a pump station and WTP expansion, with inter-basin transfer of surface water with a proposed implementation decade of 2050.

Available Supply

The pump station and treatment plant expansions would be designed for an additional 2.3 mgd capacity. Through Phase II, the surface WTP would treat approximately 4,000 acft/yr from the Phase I portion and an additional 2,500 acft/yr, that requires 1,700 acft of converted irrigation water rights.

Engineering and Costing

As detailed above, costs for this strategy from the UCM include expanding the pump station and WTP, with inter-basin transfer of surface water. It is assumed that the construction period for this strategy is 6 months. Because of the needs of ERHWSC, only Phase I is recommended, and Phase II has remained an alternative this planning cycle. Table 5.4-5 outlines the requirements and cost for this strategy.

Implementation Issues

The availability of surface water rights required to supply the treatment plant expansion is a potential implementation issue.

Table 5.4-5 ERHWSC - Surface Water Treatment Plant Phase II Expansion with Inter-Basin Transfer Project Requirements and Costs

COST ESTIMATE SUMMARY	
ERHWSC - SURFACE WATER TREATMENT PLANT PHASE II EXPANSION AND INTER-BASIN TRANSFER	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station (2.3 mgd)	$3,360,000
WTP Upgrade	$8,582,000
TOTAL COST OF FACILITIES	**$11,942,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$4,180,000
Environmental and Archaeology Studies and Mitigation	$129,000
Land Acquisition and Surveying (67 acres)	$4,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$448,000
TOTAL COST OF PROJECT	**$16,703,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$1,175,000
O&M	
Intakes and Pump Stations (2.5% of cost of facilities)	$84,000
WTP	$763,000
Pumping Energy Costs (241,279 kWh at 0.08 $/kWh)	$35,000
TOTAL O&M	$882,000
Purchase of Water (1,700 acft/yr at 2,040 $/acft)	$3,468,000
TOTAL ANNUAL COST	**$5,525,000**
Available Project Yield (acft/yr)	**2,500**
Annual Cost of Water ($ per acft)	**$2,210**
Annual Cost of Water After Debt Service ($ per acft)	**$1,740**
Annual Cost of Water ($ per 1,000 gallons)	**$6.78**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$5.34**

5.4.1.3 La Feria

Non-Potable Wastewater Effluent Reuse

Project Source

This strategy was submitted by the City of La Feria to the RWPG and has been adapted from the 2016 RWP.

Description

The City of La Feria currently uses wastewater effluent to fill three small lakes in the city's Nature Park. This direct non-potable reuse strategy involves adding tertiary treatment to the WWTP and using additional effluent to irrigate the native vegetation at the park.

Available Supply

The WWTP has a rated capacity of 1.25 mgd and a 2013 daily average of 0.38 mgd. A portion of the WWTP effluent is already conveyed to Nature Park, so according to current flows, an additional 0.155 mgd could be available. This WMS would have enabled a supply volume of 50 acft/yr in 2020, increasing to a full supply of 800 acft/yr by 2070.

Although a certain amount of water is available to use for irrigation, because the plants at Nature Park are native vegetation, no additional irrigation should be required for them. Therefore, this management strategy is not recommended and is listed as an alternative because it does not necessarily displace any the demand shown for La Feria.

Engineering and Costing

To establish this management strategy, tertiary treatment would be added to the WWTP and additional pumping and piping would be needed to convey the reclaimed water to the park. Stainless steel disk, cloth media filters would be installed to further treat the wastewater effluent. A ground storage tank would also be included to provide one days worth of storage. It is assumed that the construction period would be 1.5 years.

Table 5.4-6 outlines the project requirements and cost estimate developed using UCM. Treatment Level 2 was used on the UCM spreadsheet to estimate the costs for addition of the cloth media filters.

Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit. Environmental impacts typical of direct potable reuse are discussed in Section 5.2.

Table 5.4-6 La Feria - Non-Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
CITY OF LA FERIA - NON-POTABLE WASTEWATER EFFLUENT REUSE	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$1,636,000
Transmission Pipeline (6 in dia., 0.5 mile)	$92,000
Storage Tanks (other than at booster pump stations)	$945,000
WTP (0.2 mgd)	$1,694,000
TOTAL COST OF FACILITIES	**$4,367,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$1,524,000
Environmental and Archaeology Studies and Mitigation	$13,000
Land Acquisition and Surveying (13 acres)	$23,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$164,000
TOTAL COST OF PROJECT	**$6,091,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$429,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$10,000
Intakes and Pump Stations (2.5% of cost of facilities)	$41,000
WTP	$169,000
Pumping Energy Costs (17800 kWh at 0.08 $/kWh)	$1,000
TOTAL O&M	$221,000
TOTAL ANNUAL COST	**$650,000**
Available Project Yield (acft/yr)	**800**
Annual Cost of Water ($ per acft)	**$3,736**
Annual Cost of Water After Debt Service ($ per acft)	**$1,270**
Annual Cost of Water ($ per 1,000 gallons)	**$11.46**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.90**

5.4.1.4 Military Highway Water Supply Corporation

Expand Existing Groundwater Supply (Hidalgo County)

Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

Description

This strategy is to provide additional supply to Military Highway WSC in Hidalgo County with the installation of additional fresh groundwater wells.

Available Supply

The proposed groundwater wells would provide 250 acft/yr in 2020 during Phase I and a total of 625 acft/yr once Phase II is implemented in 2050.

Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water disinfection. It is assumed that the construction period for this strategy is 1 year per phase. Table 5.4-7 and

Table 5.4-8 outline the estimated costs and project requirements for each phase.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. Environmental impacts typical of groundwater expansion projects are discussed in Section 5.2.

Table 5.4-7 Military Highway WSC - Expand Existing Groundwater Supply (Phase I) Project Requirements and Costs

COST ESTIMATE SUMMARY	
MILITARY HIGHWAY WSC - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE I)	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$520,000
WTP (0.2 mgd)	$30,000
TOTAL COST OF FACILITIES	**$550,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$193,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$21,000

COST ESTIMATE SUMMARY	
MILITARY HIGHWAY WSC - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE I)	
Item	Estimated Costs for Facilities
TOTAL COST OF PROJECT	**$772,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$54,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$5,000
WTP	$18,000
TOTAL O&M	$23,000
TOTAL ANNUAL COST	**$77,000**
Available Project Yield (acft/yr)	**250**
Annual Cost of Water ($ per acft)	**$308**
Annual Cost of Water After Debt Service ($ per acft)	**$92**
Annual Cost of Water ($ per 1,000 gallons)	**$0.95**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.28**

Table 5.4-8 Military Highway WSC - Expand Existing Groundwater Supply (Phase II) Project Requirements and Costs

COST ESTIMATE SUMMARY	
MILITARY HIGHWAY WSC - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE II)	
Item	Estimated Costs for Facilities
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$520,000
WTP (0.3 mgd)	$38,000
TOTAL COST OF FACILITIES	**$558,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$195,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$21,000
TOTAL COST OF PROJECT	**$782,000**
ANNUAL COST	

COST ESTIMATE SUMMARY	
MILITARY HIGHWAY WSC - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE II)	
Item	Estimated Costs for Facilities
Debt Service (3.5%, 20 years)	$55,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$5,000
WTP	$23,000
TOTAL O&M	$28,000
TOTAL ANNUAL COST	**$83,000**
Available Project Yield (acft/yr)	**625**
Annual Cost of Water ($ per acft)	**$221**
Annual Cost of Water After Debt Service ($ per acft)	**$75**
Annual Cost of Water ($ per 1,000 gallons)	**$0.68**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.23**

5.4.1.5 North Alamo Water Supply Corporation

WTP No. 5 and 16-Inch Waterline Expansion

Project Source

This strategy was originally submitted as separated strategies by NAWSC to the RWPG during the 2016 regional water planning process: 1) WTP No. 5 Expansion; and 2) WTP No. 5, 16-Inch Waterline Expansion. Due to TWDB guidance that requires WMSs to supply new water, the 16-Inch Waterline Expansion was combined with the WTP No. 5 Expansion during this planning cycle.

Description

This strategy is for the expansion of WTP No. 5 and a 16-inch waterline. The expansion would serve residents within the Weslaco, Donna, Alamo, and surrounding areas. This strategy would also hydraulically interconnect the NAWSC distribution system, allowing for utilization of other water districts in time of drought for push water. It would also provide the NAWSC the ability to utilize other water districts as a source of push water for delivery of water in times of drought. Acquisition of water rights through urbanization is required for this strategy.

Available Supply

The expansion of WTP No. 5 would provide NAWSC with capacity to treat an additional 4 mgd of drinking water. In the first decade, only 1,120 acft/yr of converted water rights are assumed to be available, which limits the new supply in the first decade. In 2030, it is assumed the remaining water rights are available for the plant to supply the full treatment capacity of 4,480 acft/yr. However, because of supplies from other sources and strategies, this strategy is now an alternative for this planning cycle.

Engineering and Costing

Costs for this strategy from the UCM include WTP expansion; purchase of water rights, which are separated into the initial decade and following decades as water rights become available through urbanization; a pump station, and pipeline. It is assumed that the construction period for this strategy is 1 year.

A unit capital cost of $3,000 per acft has been estimated as the market value for water rights. However, under Subchapter O of Chapter 49 Texas Water Code, a municipal supplier can buy water rights to the net irrigable acres in a subdivision at 68 percent of the market value. It is assumed that water rights will be urbanized within NAWSC's jurisdiction, and this reduced rate would apply. Therefore, a unit capital cost of $2,040 per acft is used to estimate the capital costs. Table 5.4-9 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

The project would be constructed within existing easements and right-of-ways; however, as with any project, necessary state and federal permits must be obtained before construction can begin.

Table 5.4-9 NAWSC - WTP No. 5 Expansion and 16-Inch Waterline Project Requirements and Costs

COST ESTIMATE SUMMARY	
NAWSC - WTP NO. 5 EXPANSION AND 16-INCH WATERLINE PROJECT	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$5,938,000
Transmission Pipeline	$2,622,000
WTP (4 mgd)	$12,109,000
TOTAL COST OF FACILITIES	**$20,669,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$7,103,000
Environmental and Archaeology Studies and Mitigation	$111,000
Land Acquisition and Surveying (2 acres)	$7,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$767,000
TOTAL COST OF PROJECT	**$28,657,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$2,016,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$26,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$148,000
WTP	$972,000

COST ESTIMATE SUMMARY	
NAWSC - WTP NO. 5 EXPANSION AND 16-INCH WATERLINE PROJECT	
Item	Estimated Costs for Facilities
Pumping Energy Costs (1,146,254 kW-hr @ 0.08 $/kW-hr)	$92,000
Purchase of Water (4,480 acft/yr at 2,040 $/acft)	$9,139,000
TOTAL O&M	$1,146,000
TOTAL ANNUAL COST	**$12,393,000**
Available Project Yield (acft/yr)	**4,480**
Annual Cost of Water ($ per acft)	**$2,766**
Annual Cost of Water After Debt Service ($ per acft)	**$2,316**
Annual Cost of Water ($ per 1,000 gallons)	**$8.49**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$7.11**

5.4.1.6 San Benito

Potable Reuse of Treated Effluent from City's Wastewater Treatment Plant

Project Source

This strategy was submitted by the City of San Benito to the RWPG.

Description

A modular WTP would be built to provide additional treatment for the treated wastewater effluent to bring it to potable water standards. The direct potable reuse water would then serve potable water needs for the north portion of the City of San Benito.

Available Supply

The City of San Benito WWTP currently discharges 2.3 mgd of effluent into a minor stream. Initially, 1 mgd would be produced from the modular treatment plant. As the WWTP effluent increases, the modular plant would be expanded, and eventually, a total of 3 mgd would be produced, equating to an ultimate build-out capacity of 3,360 acft/yr.

Engineering and Costing

This project consists of a new modular WTP, pump station, pipeline, and storage tank to bring the reuse water into the city's distribution system. It is assumed that the construction period would be 2 years per phase. Because the first phases would be constructed in 2020 and the second phase would not be implemented until 2070, it was costed for the pump station and pipeline to be replaced during construction of Phase II. Table 5.4-10 and Table 5.4-11 outline the project requirements and cost estimate for both phases developed using the UCM spreadsheet.

Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipelines may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit. Environmental impacts typical of potable reuse are discussed in Section 5.2.

Table 5.4-10 San Benito - Potable Reuse (Phase I) Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN BENITO - REUSE OF TREATED EFFLUENT FROM CITY'S WWTP (PHASE I)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Primary Pump Station	$3,887,000
Transmission Pipeline (8 in dia., 3 miles)	$1,166,000
Storage Tanks (other than at booster pump stations)	$1,297,000
WTP (1 mgd)	$6,231,000
TOTAL COST OF FACILITIES	**$12,581,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$4,345,000
Environmental and Archaeology Studies and Mitigation	$75,000
Land Acquisition and Surveying (44 acres)	$137,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$472,000
TOTAL COST OF PROJECT	**$17,610,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$1,239,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$25,000
Intakes and Pump Stations (2.5% of cost of facilities)	$97,000
WTP	$623,000
Pumping Energy Costs (412,768 kWh at 0.08 $/kWh)	$33,000
TOTAL O&M	$778,000
TOTAL ANNUAL COST	**$2,017,000**
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$1,801**
Annual Cost of Water After Debt Service ($ per acft)	**$695**
Annual Cost of Water ($ per 1,000 gallons)	**$5.53**

COST ESTIMATE SUMMARY	
SAN BENITO - REUSE OF TREATED EFFLUENT FROM CITY'S WWTP (PHASE I)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.13**

Table 5.4-11 San Benito - Potable Reuse (Phase II) Project Requirements and Costs

COST ESTIMATE SUMMARY	
CITY OF SAN BENITO - REUSE OF TREATED EFFLUENT FROM CITY'S WWTP (PHASE II)	
Item	**Estimated Costs for Facilities**
Primary Pump Station	$3,887,000
Transmission Pipeline (10 in dia., 3 miles)	$1,166,000
Storage Tanks (other than at booster pump stations)	$1,297,000
WTP (2 mgd)	$10,253,000
TOTAL COST OF FACILITIES	**$16,603,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$5,753,000
Environmental and Archaeology Studies and Mitigation	$75,000
Land Acquisition and Surveying (44 acres)	$137,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$621,000
TOTAL COST OF PROJECT	**$23,189,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$1,632,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$25,000
Intakes and Pump Stations (2.5% of cost of facilities)	$97,000
WTP	$884,000
Pumping Energy Costs (412,768 kWh at 0.08 $/kWh)	$33,000
TOTAL O&M	$778,000
TOTAL ANNUAL COST	**$2,671,000**
Available Project Yield (acft/yr)	**3,360**
Annual Cost of Water ($ per acft)	**$795**
Annual Cost of Water After Debt Service ($ per acft)	**$309**

COST ESTIMATE SUMMARY	
CITY OF SAN BENITO - REUSE OF TREATED EFFLUENT FROM CITY'S WWTP (PHASE II)	
Item	**Estimated Costs for Facilities**
Annual Cost of Water ($ per 1,000 gallons)	**$2.44**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.95**

Non-Potable Reuse of Treated Effluent from City's Wastewater Treatment Plant

Project Source

This strategy was submitted by the City of San Benito to the RWPG.

Description

This direct non-potable reuse strategy involves diverting a portion of WWTP effluent to a canal for irrigation use.

Available Supply

The City of San Benito WWTP currently discharges 2.3 mgd of effluent into a minor stream that feeds the Arroyo Colorado. Of this, 1,120 acft/yr would be diverted and used to supplement the irrigation canal.

Engineering and Costing

This project would require modifications to the WWTP's effluent pump station and a new pipeline. It is assumed that the construction period would be 1 year. Table 5.4-12 outlines the project requirements and cost estimated with the UCM.

Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit.

Use of any ID canals to convey recycled water (specifically Cameron County ID No. 2 listed here), would require a permit from the ID. Environmental impacts typical of non-potable reuse are discussed in Section 5.2.

Map

A map depicting the approximate alignment of the reuse pipeline is shown on Figure 5.4-1.

Table 5.4-12 San Benito - Non-Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
SAN BENITO - REUSE OF TREATED EFFLUENT FROM CITY'S WWTP	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$930,000
Transmission Pipeline (8 in dia., 2 miles)	$657,000
TOTAL COST OF FACILITIES	**$1,587,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$523,000
Environmental and Archaeology Studies and Mitigation	$55,000
Land Acquisition and Surveying (32 acres)	$101,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$63,000
TOTAL COST OF PROJECT	**$2,329,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$164,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$7,000
Intakes and Pump Stations (2.5% of cost of facilities)	$23,000
Pumping Energy Costs (336558 kWh at 0.08 $/kWh)	$27,000
TOTAL O&M	$57,000
TOTAL ANNUAL COST	$221,000
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$197**
Annual Cost of Water After Debt Service ($ per acft)	**$51**
Annual Cost of Water ($ per 1,000 gallons)	**$0.61**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.16**

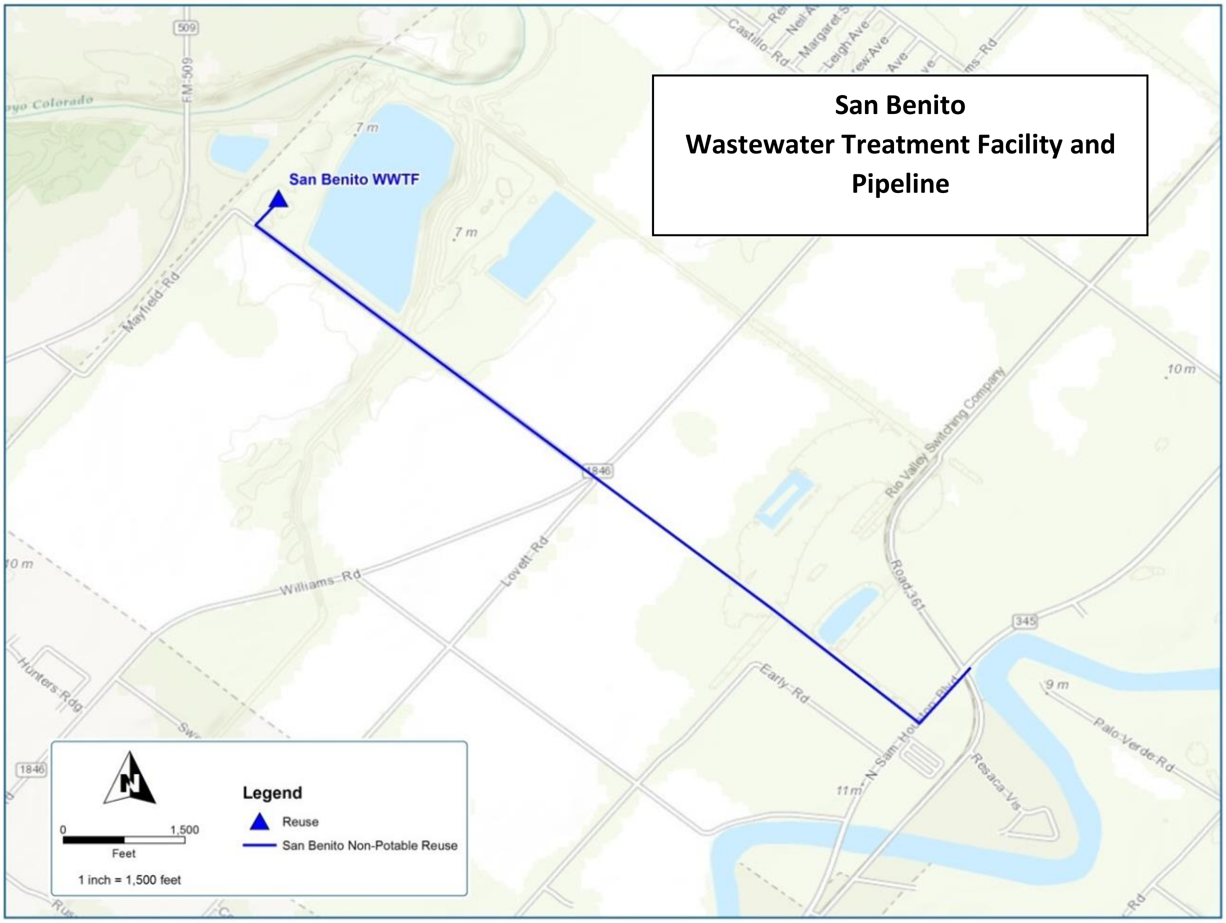

Figure 5.4-1 San Benito - Non-Potable Reuse Pipeline Location

5.4.2 Hidalgo County

5.4.2.1 Agua SUD

Non-Potable Reuse

Project Source

This strategy was submitted by the Agua SUD to the RWPG.

Description

The Agua SUD owns one WWTP (West Agua WWTP) and is planning to build a second plant (East Agua WWTP). The West Agua WWTP is located in Sullivan City, Texas, and the East Agua WWTP is located near Palmview, Texas. This direct non-potable reuse strategy is to provide Type II reclaimed water currently produced at the WWTP to individual customers with a need for reuse water.

Available Supply

Because there were no specific customers or uses identified for the non-potable reuse, it was assumed that only 5 percent of Agua SUD's 2020 WUG demand could be met by non-potable reuse. Therefore, this strategy was sized to produce 1,120 acft/yr.

Engineering and Costing

Costs for this strategy from the UCM include tertiary treatment at the WWTP and storage. The submitted strategy discussed having customers receive the reclaimed water at the WWTP; therefore, no pumping or piping costs were included. This strategy could be implemented at either of Agua SUD's WWTPs. Table 5.4-13 outlines the project requirements and cost estimate developed in the UCM.

Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit. Environmental impacts typical of non-potable reuse projects are discussed in Section 5.2.

Table 5.4-13 Agua SUD - Non-Potable Reuse Project Requirements and Costs

COST ESTIMATE SUMMARY	
AGUA SUD - NON-POTABLE REUSE	
Item	Estimated Costs for Facilities
CAPITAL COST	
Primary Pump Station	$3,878,000
Transmission Pipeline (10 in dia., 11 miles)	$3,988,000
Storage Tanks (other than at booster pump stations)	$772,000
Advanced Water Treatment Facility (1 mgd)	$9,918,000
TOTAL COST OF FACILITIES	**$18,556,000**

COST ESTIMATE SUMMARY	
AGUA SUD - NON-POTABLE REUSE	
Item	Estimated Costs for Facilities
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$6,295,000
Environmental and Archaeology Studies and Mitigation	$299,000
Land Acquisition and Surveying (141 acres)	$530,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$707,000
TOTAL COST OF PROJECT	**$26,387,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$1,857,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$48,000
Intakes and Pump Stations (2.5% of cost of facilities)	$97,000
Advanced Water Treatment Facility	$1,186,000
Pumping Energy Costs (402,620 kWh at 0.08 $/kWh)	$32,000
TOTAL O&M	$1,363,000
TOTAL ANNUAL COST	$3,220,000
Available Project Yield (acft/yr)	**1,120**
Annual Cost of Water ($ per acft)	**$2,875**
Annual Cost of Water After Debt Service ($ per acft)	**$1,217**
Annual Cost of Water ($ per 1,000 gallons)	**$8.82**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$3.73**

5.4.2.2 Elsa

WTP Expansion and Interconnect to Engelman ID

Project Source

This strategy was submitted by the City of Elsa to the RWPG during the 2016 regional water planning process.

Description

This strategy is for an interconnect between the City of Elsa and Engleman ID. Hidalgo County ID No. 9 is currently the sole source for Elsa raw water. This strategy would provide the City of Elsa with a reliable second source of raw water in case of drought or when a supply is down for an extended period of time for system repairs. It also includes an expansion of Elsa's WTP.

Available Supply

This strategy would supply the City of Elsa's WTP with 2,240 acft/yr in the 2020 decade.

Engineering and Costing

Costs for this strategy from the UCM include WTP expansion, pipeline, and pipeline right-of-way. It is assumed that the construction period for this strategy is 1 year. Table 5.4-14 outlines the project requirements and cost estimate developed using the UCM.

Implementation Issues

Typical environmental impacts are discussed in Section 5.2. No implementation issues have been identified at this time.

Table 5.4-14 Elsa - WTP Expansion and Interconnect to Engelman ID Project Requirements and Costs

COST ESTIMATE SUMMARY	
ELSA - WTP EXPANSION AND INTERCONNECT TO ENGLEMAN ID	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Transmission Pipeline (12 in dia., 2.4 miles)	$1,016,000
WTP (2 mgd)	$8,190,000
TOTAL COST OF FACILITIES	**$9,206,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$3,171,000
Environmental and Archaeology Studies and Mitigation	$63,000
Land Acquisition and Surveying (35 acres)	$109,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$346,000
TOTAL COST OF PROJECT	**$12,895,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$907,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$10,000
WTP	$739,000
Pumping Energy Costs (397,443 kWh at 0.08 $/kWh)	$32,000
TOTAL O&M	$781,000
TOTAL ANNUAL COST	**$1,688,000**

COST ESTIMATE SUMMARY	
ELSA - WTP EXPANSION AND INTERCONNECT TO ENGLEMAN ID	
Item	**Estimated Costs for Facilities**
Available Project Yield (acft/yr)	**2,240**
Annual Cost of Water ($ per acft)	**$754**
Annual Cost of Water After Debt Service ($ per acft)	**$347**
Annual Cost of Water ($ per 1,000 gallons)	**$2.31**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$1.07**

5.4.2.3 McAllen

Expand Existing Groundwater Supply

Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

Description

This strategy is to provide additional supply to McAllen with the installation of additional fresh groundwater wells.

Available Supply

The proposed groundwater wells would provide 500 acft/yr in Phase I and a total of 1,500 acft/yr once Phase II is implemented.

Engineering and Costing

It is assumed that the construction period for this strategy is 1.5 years. Table 5.4-15 and Table 5.4-16 outline the estimated project requirements and cost estimates for each phase developed in the UCM.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. Environmental impacts typical of groundwater supply projects are discussed in Section 5.2.

Table 5.4-15 Expand Existing Groundwater Supply (Phase I) Project Requirements and Costs

COST ESTIMATE SUMMARY	
McALLEN - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE I)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$737,000
WTP (0.5 mgd)	$52,000
TOTAL COST OF FACILITIES	**$789,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$276,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$30,000
TOTAL COST OF PROJECT	**$1,103,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$78,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$7,000
WTP	$31,000
TOTAL O&M	$38,000
TOTAL ANNUAL COST	**$116,000**
Available Project Yield (acft/yr)	**500**
Annual Cost of Water ($ per acft)	**$232**
Annual Cost of Water After Debt Service ($ per acft)	**$76**
Annual Cost of Water ($ per 1,000 gallons)	**$0.71**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.23**

Table 5.4-16 McAllen - Expand Existing Groundwater Supply (Phase II) Project Requirements and Costs

COST ESTIMATE SUMMARY	
MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY (PHASE II)	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$749,000
WTP (0.9 mgd)	$82,000
TOTAL COST OF FACILITIES	**$831,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$291,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$32,000
TOTAL COST OF PROJECT	**$1,162,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$82,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$7,000
WTP	$49,000
TOTAL O&M	$56,000
TOTAL ANNUAL COST	**$138,000**
Available Project Yield (acft/yr)	**1,500**
Annual Cost of Water ($ per acft)	**$92**
Annual Cost of Water After Debt Service ($ per acft)	**$37**
Annual Cost of Water ($ per 1,000 gallons)	**$0.28**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.11**

5.4.2.4 Mercedes

Expand Existing Groundwater Supply

Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

Description

This strategy is to provide additional supply to Mercedes with an additional groundwater well.

Available Supply

The proposed groundwater well would provide 560 acft/yr.

Engineering and Costing

Costs for this strategy from the UCM assumed that the construction period is 1 year. Table 5.4-17 outlines the estimated project requirements and costs.

Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. Environmental impacts typical of groundwater supply expansion projects are discussed in Section 5.2.

Table 5.4-17 Mercedes - Expand Existing Groundwater Supply Project Requirements and Costs

COST ESTIMATE SUMMARY	
MERCEDES - EXPAND EXISTING GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$783,000
WTP (0.5 mgd)	$52,000
TOTAL COST OF FACILITIES	**$835,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$292,000
Environmental & Archaeology Studies and Mitigation	$6,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$32,000
TOTAL COST OF PROJECT	**$1,167,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$82,000

COST ESTIMATE SUMMARY	
MERCEDES - EXPAND EXISTING GROUNDWATER SUPPLY	
Item	**Estimated Costs for Facilities**
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$8,000
WTP	$31,000
TOTAL O&M	$39,000
TOTAL ANNUAL COST	**$121,000**
Available Project Yield (acft/yr)	**560**
Annual Cost of Water ($ per acft)	**$216**
Annual Cost of Water After Debt Service ($ per acft)	**$70**
Annual Cost of Water ($ per 1,000 gallons)	**$0.62**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.21**

5.4.3 Jim Hogg County

No alternative WMSs have been identified for Jim Hogg County

5.4.4 Maverick County

5.4.4.1 Eagle Pass

Eagle Pass ASR Project

Project Source

This strategy was submitted by Eagle Pass to the RWPG.

Description

This strategy is for using ASR for Eagle Pass.

Available Supply

The supply for this WMS will come from Eagle Pass's current supplies. When the entity has a surplus of water supplies, the excess water will be injected into the aquifer for storage. When Eagle Pass is experiencing water shortage or drought conditions, water can be recovered from the aquifer and delivered throughout its system. For the purposes of this plan, it is assumed the ASR project will have a capacity of 3,360 acft/yr that would be implemented in the 2020 decade. The strategy water loss of ASR water is assumed to be zero for the purpose of this WMS modeling, but further study is recommended.

Engineering and Costing

Costs for this strategy from the UCM include a new WTP, land acquisition, and a new well field with dual purpose well pumps for both injecting surplus water and recovering the stored water, and well field piping. It is assumed that the construction period for this strategy is 1.5 years. Table 5.4-18 outlines the estimated project requirements and cost estimate.

Implementation Issues

Additional studies will need to be conducted for the feasibility of the project. Appropriate TCEQ permitting is required. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit. Environmental impacts typical of ASR plants are discussed in Section 5.2.

Table 5.4-18 Eagle Pass - ASR Project Requirements and Costs

COST ESTIMATE SUMMARY	
EAGLE PASS - ASR	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
Well Fields (wells, pumps, and piping)	$9,495,000
WTP (3 mgd)	$10,490,176,000
TOTAL COST OF FACILITIES	**$10,499,671,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$3,674,885,000
Environmental and Archaeology Studies and Mitigation	$5,844,000
Land Acquisition and Surveying (1,696 acres)	$6,403,000
Interest During Construction (3% for 1 year with a 0.5% return on investment)	$390,138,000
TOTAL COST OF PROJECT	**$14,576,941,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$1,025,649,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of cost of facilities)	$95,000
WTP	$734,312,000
Pumping Energy Costs (304,678 kWh at 0.08 $/kWh)	$24,000
TOTAL O&M	$734,431,000
TOTAL ANNUAL COST	**$1,760,080,000**
Available Project Yield (acft/yr)	**3,360**
Annual Cost of Water ($ per acft)	**$523,833**

COST ESTIMATE SUMMARY	
EAGLE PASS - ASR	
Item	Estimated Costs for Facilities
Annual Cost of Water After Debt Service ($ per acft)	$218,581
Annual Cost of Water ($ per 1,000 gallons)	$1,607
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	$671

5.4.5 Starr County

No alternative WMSs have been identified for Starr County.

5.4.6 Webb County

5.4.6.1 Laredo

Laredo - El Pico Water Treatment Plant – 1st Expansion

Project Source

This strategy was submitted by the City of Laredo to the RWPG during the 2016 regional water planning process.

Description

This strategy is for the expansion of the El Pico WTP from 20 mgd to 45 mgd. This expansion would occur in 2020.

Available Supply

Expanding the plant would supply an additional 25 mgd of drinking water.

Engineering and Costing

Costs for this strategy from the UCM include only water treatment and land acquisition. It is assumed that the construction period for this strategy is 1.5 years. Table 5.4-19 outlines the estimated costs and project requirements used to develop the cost estimate.

Implementation Issues

Necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Environmental impacts typical of WTP expansions are discussed in Section 5.2.

Table 5.4-19 Laredo - El Pico WTP 1st Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO - EL PICO WTP 1ST EXPANSION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
WTP (25 mgd)	$47,231,000
TOTAL COST OF FACILITIES	**$47,231,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$16,531,000
Interest During Construction (3% for 1.5 years with a 0.5% return on investment)	$2,631,000
TOTAL COST OF PROJECT	**$66,393,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$4,671,000
O&M	
WTP	$3,306,000
TOTAL O&M	$3,306,000
TOTAL ANNUAL COST	**$7,977,000**
Available Project Yield (acft/yr)	**28,000**
Annual Cost of Water ($ per acft)	**$285**
Annual Cost of Water After Debt Service ($ per acft)	**$118**
Annual Cost of Water ($ per 1,000 gallons)	**$0.87**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.36**

El Pico Water Treatment Plant - 2nd Expansion

Description

This strategy is to expand the El Pico WTP from 45 mgd to 70 mgd. This expansion would occur in 2030.

Available Supply

Expanding the plant would supply an additional 25 mgd of drinking water.

Engineering and Costing

Costs for this strategy from the UCM include only water treatment and land acquisition. It is assumed that the construction period for this strategy is 1.5 years Table 5.4-20 outlines the estimated costs.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Environmental impacts typical of WTP expansions are discussed in Section 5.2.

Table 5.4-20 Laredo - El Pico WTP 2nd Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO - EL PICO WTP 2ND EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
WTP (25 mgd)	$47,231,000
TOTAL COST OF FACILITIES	**$47,231,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$16,531,000
Interest During Construction (3% for 1.5 years with a 0.5% return on investment)	$2,631,000
TOTAL COST OF PROJECT	**$66,393,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$4,671,000
O&M	
WTP	$3,306,000
TOTAL O&M	$3,306,000
TOTAL ANNUAL COST	**$7,977,000**
Available Project Yield (acft/yr)	**28,000**
Annual Cost of Water ($ per acft)	**$285**
Annual Cost of Water After Debt Service ($ per acft)	**$118**
Annual Cost of Water ($ per 1,000 gallons)	**$0.87**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.36**

El Pico Water Treatment Plant – 3rd Expansion

Description

This strategy is to expand the El Pico WTP from 70 mgd to 100 mgd. This expansion would occur in 2040.

Available Supply

Expanding the plant would supply an additional 30 mgd of drinking water.

Engineering and Costing

Costs for this strategy from the UCM include only water treatment and land acquisition, assuming 1.5 years for construction. Table 5.4-21 outlines the estimated costs and project requirements.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Environmental impacts typical of WTP expansions are discussed in Section 5.2.

Table 5.4-21 Laredo - El Pico WTP 3rd Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO - EL PICO WTP 3RD EXPANSION	
Item	Estimated Costs for Facilities
CAPITAL COST	
WTP (30 mgd)	$55,020,000
TOTAL COST OF FACILITIES	**$55,020,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$19,257,000
Interest During Construction (3% for 1.5 years with a 0.5% return on investment)	$3,064,000
TOTAL COST OF PROJECT	**$77,341,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$5,442,000
O&M	
WTP	$3,851,000
TOTAL O&M	$3,851,000
TOTAL ANNUAL COST	**$9,293,000**
Available Project Yield (acft/yr)	**33,600**
Annual Cost of Water ($ per acft)	**$277**
Annual Cost of Water After Debt Service ($ per acft)	**$115**
Annual Cost of Water ($ per 1,000 gallons)	**$0.85**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.35**

El Pico Water Treatment Plant- 4th Expansion

Description

This strategy is to expand the El Pico WTP from 100 mgd to 165 mgd in 2050.

Available Supply

Expanding the plant would supply an additional 65 mgd of drinking water.

Engineering and Costing

Costs for this strategy from the UCM include only water treatment and land acquisition, and 1.5 years assumed for construction. Table 5.4-22 details the costs and requirements for this strategy.

Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Environmental impacts typical of WTP expansions are discussed in Section 5.2.

Table 5.4-22 Laredo - El Pico WTP 4th Expansion Project Requirements and Costs

COST ESTIMATE SUMMARY	
LAREDO - EL PICO WTP 4TH EXPANSION	
Item	**Estimated Costs for Facilities**
CAPITAL COST	
WTP (65 mgd)	$116,670,000
TOTAL COST OF FACILITIES	**$116,670,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes and 35% for all other facilities)	$40,835,000
Interest During Construction (3% for 1.5 years with a 0.5% return on investment)	$6,498,000
TOTAL COST OF PROJECT	**$164,003,000**
ANNUAL COST	
Debt Service (3.5%, 20 years)	$11,539,000
O&M	
WTP	$8,167,000
TOTAL O&M	$8,167,000
TOTAL ANNUAL COST	**$19,706,000**
Available Project Yield (acft/yr)	**72,800**
Annual Cost of Water ($ per acft)	**$271**
Annual Cost of Water After Debt Service ($ per acft)	**$112**
Annual Cost of Water ($ per 1,000 gallons)	**$0.83**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$0.34**

5.4.7 Willacy County

No alternative WMSs have been identified for Willacy County.

5.4.8 Zapata County

No alternative WMSs have been identified for Zapata County.

FINAL PLAN

CHAPTER 5.5: ADDITIONAL RECOMMENDATIONS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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5.5 ADDITIONAL RECOMMENDATIONS

As detailed through Chapters 5.1 through 5.4, WMSs were evaluated and updated in the Region M RWP as either recommended or alternative WMSs to meet needs for each WUG. In general, per TWDB rules and guidelines, WMSs must provide increased water supplies to their respective sponsors and/or customers from water supply sources, reuse, conservation, and drought management. This chapter describes projects of interest that do not quite meet the above criteria, but were submitted by sponsors with the potential to be part of suitable WMSs in the future. Example items/projects that cannot be fully evaluated as WMSs as described in TWDB Exhibit C include, but are not limited to:

- New facilities with internal distribution networks that do not convey additional water supply volumes to WUGs (including reuse);
- Water system improvements to address compliance issues related to water quality or water distribution pressure;
- New wells required to simply replace aging wells;
- Preventative measures to protect or maintain infrastructure against future water loss or degradation; or
- Water storage facilities (e.g., elevated storage tanks).

Table 5.5-1 summarizes Additional Recommendation projects and respective sponsors.

Table 5.5-1 Summary of Additional Recommendations

ENTITY	COUNTY	PROJECT	ONLINE DECADE	ESTIMATED COST
North Alamo WSC	Cameron	1 MG Water Tower – Edinburg/Pharr	2020	$3,935,000
North Alamo WSC	Cameron	1 MG Water Tower – Mid Valley	2020	$3,935,000
Weslaco	Hidalgo	Emergency Transfers of Surface Water or Interconnects Between Systems	2020	--

5.5.1 North Alamo WSC (NAWSC)

One Million Gallon (MG) Water Tower – Edinburg/Pharr

This project was originally submitted by NAWSC as a strategy to the RWPG during the 2016 regional water planning process. The 1 MG Water Tower is planned to provide additional water storage and increase water pressure in the Edinburg and Pharr areas. This project would also hydraulically interconnect the NAWSC distribution system, allowing for utilization of other water districts in time of drought for push water. Because this standalone project would not provide additional new water, it could not be evaluated as a WMS. The 1 MG Water Tower is estimated to cost $3,935,000 if constructed.

1 MG Water Tower – Mid Valley

This project was originally submitted by NAWSC as a strategy to the RWPG during the 2016 regional water planning process. The 1 MG Water Tower is planned to provide additional water storage and increase water pressure in the Mid Valley area. This project would also hydraulically interconnect the NAWSC distribution system, allowing for utilization of other water districts in time of drought for push water. Because this standalone project would not provide additional new water, it could not be evaluated as a WMS. The 1 MG Water Tower is estimated to cost $3,935,000 if constructed.

5.5.2 Weslaco

Emergency Transfers of Surface Water or Interconnects Between Systems

This project was originally submitted by the City of Weslaco to the RWPG during the 2016 regional water planning process. This strategy is to provide relief and possibly treatment assistance to water infrastructure by interconnecting with an adjacent system in the northwest portion of Weslaco. The City of Weslaco has an adjacent system with three entities: the City of Mercedes, NAWSC, and Military Highway WSC. This strategy would physically connect the City of Weslaco and NAWSC systems.

Because this strategy would only transfer water to Weslaco in emergencies, it cannot be considered as providing a reliable water supply and, therefore, could not be considered a WMS for the purposes of this RWP.

FINAL PLAN

CHAPTER 6: IMPACTS OF REGIONAL WATER PLAN AND CONSISTENCY WITH PROTECTION OF RESOURCES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
ID	Irrigation District
MAG	Modeled Available Groundwater
RWP	Regional Water Plan
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TWDB	Texas Water Development Board
WMS	Water Management Strategy
WUG	Water User Group
WWTP	Wastewater Treatment Plant

CHAPTER 6: IMPACTS OF REGIONAL WATER PLAN AND CONSISTENCY WITH PROTECTION OF RESOURCES

6.1 IMPACTS OF WATER MANAGEMENT STRATEGIES

Impacts of the five major water management strategies (WMSs) recommended in the Regional Water Plan (RWP) are discussed below.

6.1.1 Reuse

6.1.1.1 Potable

These strategies result in lower wastewater effluent flows, which cause a reduction in organic levels in the receiving streams. However, there is also less water discharged to the local watershed, which can reduce the quantity of water available for other users and environmental flows and can reduce assimilative capacity used by downstream wastewater treatment plant (WWTP) dischargers.

Many of the locations where potable reuse was recommended are in the Nueces-Rio Grande Basin, but the source waters are predominantly from the Rio Grande. Wastewater reuse projects will primarily impact the flows into the drainage network, including the Arroyo Colorado. Water rights holders along the Arroyo Colorado and other drainage canals in the Nueces Rio-Grande Basin could potentially be impacted, including irrigators, some shrimp farming, and other aquaculture.

If potable reuse projects involve storing the effluent in a raw water reservoir prior to treatment, water quality of the reservoir may be impacted. If membrane treatment, such as reverse osmosis, is used as a part of the advanced treatment process to meet potable water quality requirements, options for discharge of the waste stream will need to consider minimizing impacts to the receiving environment.

6.1.1.2 Non-Potable

For non-potable reuse used for irrigation, there is a potential to accumulate byproducts, such as salts and other minerals, in the soil that may be present in runoff water. Non-potable water use by other non-municipal users such as steam-electric power generation and manufacturing can greatly reduce the demands on freshwater sources and reduce the impacts, such as increased return water temperatures, of using freshwater.

6.1.2 Brackish Desalination

The disposal of concentrate from brackish desalination facilities will increase levels of total dissolved solids (TDS) in the receiving streams. Many of the facilities that are currently treating brackish groundwater dispose of concentrate in the drainage canal network in the Nueces-Rio Grande Basin. This network of canals is usually brackish, and discharges into the Laguna Madre, parts of which are naturally hypersaline. The greatest recent threat to wildlife in the Lower Laguna Madre has been increased inflows of low-salinity water.

As with any groundwater development project, there is potential to affect the quality of the aquifer as more water is drawn from it. Land subsidence may be a byproduct of increased groundwater pumping.

6.1.3 Fresh Groundwater

Water quality concerns from fresh groundwater projects are minimal; however, as with any groundwater development project, there is potential to affect the quality of the aquifer as more water is drawn from it. As with brackish groundwater development, land subsidence may be a byproduct of fresh groundwater pumping.

6.1.4 Advanced Water Conservation

Advanced Water Conservation focuses on decreasing water usage, which results in lowered flow to WWTPs. However, wastewater influent flow typically has the same amount of organic waste, which can require WWTP upgrades to maintain target organic levels in the receiving stream.

Advanced Water Conservation can reduce billing revenue received by water and wastewater utilities. Education and customer buy-in is required to implement successful conservation, and it can be difficult to follow these programs with a rate increase. Recommendations for how to manage these programs can include preliminary evaluation of potential rate impacts prior to initiating conservation programming and changes to the rate structures that incentivize conservation.[1]

In addition to utility revenue issues, wastewater utilities may also experience changes in the amount, location, and other characteristics of sewage which require adjusting treatment processes or collections infrastructure and operations.

6.1.5 Acquisition of Water Rights through Urbanization

This strategy comprises of converting irrigation water rights to municipal water rights as land is converted from agricultural and rural uses to urban uses. The intent of this strategy is to provide additional municipal and industrial water from the areas that are already being urbanized and not to take any additional irrigation water rights from land that would still require them.

The Texas Commission on Environmental Quality (TCEQ) rules establish conversion ratios of 2 acre-feet (acft) of Class A irrigation water rights and 2.5 acft Class B water rights to 1 acft of municipal water rights. Therefore, if the infrastructure that was previously used to convey an amount of water associated with irrigation water rights is later used to convey water for the converted municipal water rights, a lesser amount of water would be seen. This would result in less available push water. Because of the current structure and condition of irrigation district (ID) conveyance systems, more water may need to be diverted to convey municipal deliveries to the end user. However, if the recommended improvements to ID conveyance systems are implemented, this effect would be minimized.

Conversion of water rights from agricultural to municipal comes with urbanization and an overall reduction in the irrigated acreage shown in Table 6-1. An evaluation of the economic impacts of unmet needs in irrigation is included in Appendix D.

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[1] Examining conservation-oriented water pricing and programs through an energy lens (2017). Kate Zerrenner Jaclyn Rambarran. http://blogs.edf.org/energyexchange/files/2017/12/conservation-rates-white-paper-Final.pdf.

Table 6-1 Estimated Reduction in Irrigated Acreage as a Result of Urbanization

CUMULATIVE TOTAL REDUCTION IN IRRIGATED ACREAGE	2020	2030	2040	2050	2060	2070
Cameron	6,916	13,833	20,750	27,666	34,583	41,235
Hidalgo	10,250	20,500	30,750	40,999	51,250	61,108
Maverick	1,961	3,922	5,882	7,843	9,804	11,690
Starr	153	305	458	610	763	909
Webb	307	614	921	1,227	1,534	1,829
Willacy	2,350	4,699	7,049	9,399	11,748	14,008
Zapata	79	159	238	318	397	474

6.2 PROTECTION OF RESOURCES

All the recommendations in the RWP are consistent with the laws and requirements that protect the water within the region. The amount of water used for recommended strategies are within the limitations of the water availability model for surface water and the groundwater availability model for all aquifers.

The Rio Grande supports extensive wildlife habitat and migration corridors. Although there are no required minimum environmental flows for the river, it is important to refrain from negatively impacting the Rio Grande and harming the native wildlife. According to evaluations performed to date, the recommended strategies would not significantly alter the water quality of the Rio Grande or the Arroyo Colorado, which is the receiving stream for most runoff in the Lower Rio Grande Valley. The net amount of water diverted from the Rio Grande would not be increased by the implementation of the recommended strategies. It is not anticipated that any recommendations would result in major threats to agriculture, natural resources, or navigation.

6.2.1 Impacts to Agricultural Resources

Agricultural resources may be impacted by the 2021 RGRWP through the conversion of agricultural land uses to well fields, water treatment facilities, pipelines, or other appurtenant structures. Additionally, the redistribution of water from rural and agricultural areas would reduce the amount of water available for irrigation and livestock purposes.

To evaluate potential impacts on agricultural resources, construction impacts for each of the WMSs were estimated based on the acreage of agricultural land impacted according to TPWD mapping. Impacts are described for each WMS in Section 5.2. Overall, construction activities for the combined WMS have the potential to affect 75 acres of agricultural land (i.e. row crops, grass farms, and orchards).

6.3 UNMET NEEDS

There are no municipal unmet needs in Region M. However, there are unmet needs in non-municipal water user groups (WUGs) as detailed below.

6.3.1 Irrigation

As detailed in Table 6-2, if Region M experiences extensive drought years, irrigation would exhibit unmet needs. The water rights system in the Amistad-Falcon Reservoir system is structured such that municipal water rights are protected, and irrigation water rights have lower reliability in years of limited supply. Limited supplies in the reservoirs may occur because of drought or because of a deficit in deliveries from Mexico under the 1944 treaty governing the Rio Grande/Rio Bravo.

Irrigators implement conservation to increase their efficiency with available water, but increased efficiency does not decrease the overall demand for irrigation water. Increased shortages may appear in the balance after WMS as a result of the conversion of irrigation water rights to municipal use via the Urbanization WMS.

Table 6-2 Irrigation Supply Balance in Counties with Unmet Needs (acft/yr)

IRRIGATION	2020	2030	2040	2050	2060	2070
Cameron County						
Supplies	178,005	177,972	177,938	177,905	177,873	177,840
Demand	537,217	519,972	502,725	485,479	468,233	450,987
Need(-)/Surplus(+)	(359,212)	(342,000)	(324,787)	(307,574)	(290,360)	(273,147)
Balance After WMS	(342,829)	(329,057)	(315,099)	(300,041)	(285,988)	(272,661)
Hidalgo County						
Supplies	278,271	278,217	278,143	277,725	277,997	277,923
Demand	688,667	666,560	644,451	622,343	600,236	578,127
Need(-)/Surplus(+)	(410,396)	(388,343)	(366,308)	(344,618)	(322,239)	(300,204)
Balance After WMS	(382,983)	(358,081)	(340,754)	(321,333)	(301,468)	(283,177)
Maverick County						
Supplies	44,012	44,000	43,989	43,977	43,965	43,953
Demand	61,706	59,725	57,744	55,763	53,782	51,801
Need(-)/Surplus(+)	(17,694)	(15,725)	(13,755)	(11,786)	(9,817)	(7,848)
Balance After WMS	(12,274)	(10,168)	(10,312)	(9,187)	(7,099)	(4,052)
Starr County						
Supplies	4,294	4,293	4,292	4,291	4,290	4,289
Demand	23,875	23,109	22,342	21,576	20,809	20,043
Need(-)/Surplus(+)	(19,581)	(18,816)	(18,050)	(17,285)	(16,519)	(15,754)
Balance After WMS	(19,231)	(18,598)	(17,932)	(17,299)	(16,664)	(16,026)

IRRIGATION	2020	2030	2040	2050	2060	2070
Webb County						
Supplies	10,610	10,607	10,605	10,601	10,599	10,597
Demand	10,425	10,090	9,756	9,421	9,086	8,752
Need(-)/Surplus(+)	185	517	849	1,180	1,513	1,845
Balance After WMS	-1,155	-394	-667	-423	-177	143
Willacy County						
Supplies	20,631	20,626	20,740	20,734	20,728	20,723
Demand	99,610	96,412	93,215	90,017	86,819	83,621
Need(-)/Surplus(+)	(78,979)	(75,786)	(72,475)	(69,283)	(66,091)	(62,898)
Balance After WMS	(77,682)	(71,958)	(73,688)	(72,059)	(68,956)	(65,970)
Zapata County						
Supplies	2,074	2,074	2,073	2,073	2,072	2,072
Demand	5,100	4,936	4,773	4,609	4,445	4,281
Need(-)/Surplus(+)	(3,026)	(2,862)	(2,700)	(2,536)	(2,373)	(2,209)
Balance After WMS	(2,506)	(2,404)	(2,309)	(2,212)	(2,115)	(2,016)
Total Unmet Need*	**(838,660)**	**(790,660)**	**(760,761)**	**(722,554)**	**(682,467)**	**(643,902)**
* Summation of unmet needs only; does not include surplus						

6.3.2 Manufacturing

Cameron, Starr, and Zapata Counties are the only counties that exhibit manufacturing unmet needs (Table 6-3). Best management practices were recommended for every industrial WUG.

Table 6-3 Manufacturing Supply Balance in Counties with Unmet Needs (acft/yr)

MANUFACTURING	2020	2030	2040	2050	2060	2070
Cameron County						
Supplies	1,029	1,029	1,029	1,029	1,029	1,029
Demand	1,647	1,846	1,846	1,846	1,846	1,846
Need(-)/Surplus(+)	(618)	(817)	(817)	(817)	(817)	(817)
Balance After WMS	(436)	(614)	(614)	(614)	(613)	(614)
Starr County						
Supplies	85	86	86	86	86	86
Demand	95	116	116	116	116	116
Need(-)/Surplus(+)	(10)	(30)	(30)	(30)	(30)	(30)
Balance After WMS	0	(18)	(18)	(18)	(18)	(18)

MANUFACTURING	2020	2030	2040	2050	2060	2070
Zapata County						
Supplies	5	5	5	5	5	5
Demand	9	9	9	9	9	9
Need(-)/Surplus(+)	(4)	(4)	(4)	(4)	(4)	(4)
Balance After WMS	(3)	(3)	(3)	(3)	(3)	(3)
Total Unmet Need*	**(439)**	**(635)**	**(635)**	**(635)**	**(634)**	**(635)**
* Summation of unmet needs only; does not include surplus						

6.3.3 Mining

Mining exhibits unmet needs in drought years for all counties except Cameron and Zapata Counties (Table 6-4). The water rights system in the Amistad-Falcon Reservoir system is structured so that municipal water rights are protected, and irrigation and mining water rights have lower reliability in years of limited supply. Limited supplies in the reservoirs may occur because of drought or because of a deficit in deliveries from Mexico under the 1944 treaty governing the Rio Grande/Rio Bravo.

Table 6-4 Mining Supply Balance in Counties with Unmet Needs (acft/yr)

MINING	2020	2030	2040	2050	2060	2070
Hidalgo County						
Supplies	1,933	1,933	1,932	1,932	1,932	1,931
Demand	2,844	3,620	4,198	4,819	5,532	6,434
Need(-)/Surplus(+)	(911)	(1,687)	(2,266)	(2,887)	(3,600)	(4,503)
Balance After WMS	(627)	(1,325)	(1,846)	(2,405)	(3,047)	(3,860)
Jim Hogg County						
Supplies	93	97	34	53	34	22
Demand	93	97	72	53	34	22
Need(-)/Surplus(+)	0	0	(38)	0	0	0
Balance After WMS	9	10	(31)	5	3	2
Maverick County						
Supplies	1,394	1,394	1,393	1,393	1,393	1,392
Demand	1,988	2,737	2,933	2,302	1,674	1,217
Need(-)/Surplus(+)	(594)	(1,343)	(1,540)	(909)	(281)	175
Balance After WMS	(395)	(1,069)	(1,247)	(679)	(114)	297

MINING	2020	2030	2040	2050	2060	2070
Starr County						
Supplies	276	276	276	276	276	276
Demand	571	697	775	858	961	1,091
Need(-)/Surplus(+)	(295)	(421)	(499)	(582)	(685)	(815)
Balance After WMS	(238)	(351)	(421)	(496)	(589)	(706)
Webb County						
Supplies	5,518	5,542	5,565	5,583	5,609	5,608
Demand	10,331	8,047	6,038	4,112	1,846	1,343
Need(-)/Surplus(+)	(4,813)	(2,505)	(473)	1,471	3,763	4,265
Balance After WMS	(3,780)	(1,700)	131	1,882	3,948	4,399
Willacy County						
Supplies	0	0	20	20	20	20
Demand	49	51	38	28	18	12
Need(-)/Surplus(+)	(49)	(51)	(18)	(8)	2	8
Balance After WMS	(44)	(46)	(14)	(5)	4	9
Total Unmet Need*	**(5,084)**	**(4,491)**	**(3,528)**	**(3,585)**	**(3,750)**	**(4,566)**
* Summation of unmet needs only; does not include surplus						

6.3.4 Steam Electric Power Generation

Steam-electric power generation shows unmet needs in Cameron and Hidalgo Counties (Table 6-5). Steam-electric demand projections are based on projections regarding the location and timing of future facilities. While reuse may be recommended to meet these future needs, the source and suppliers of reuse water may not be identified at this time.

Table 6-5 Steam-Electric Supply Balance in Counties with Unmet Needs (acft/yr)

STEAM ELECTRIC	2020	2030	2040	2050	2060	2070
Cameron County						
Supplies	125	125	125	125	125	125
Demand	3,550	3,550	3,550	3,550	3,550	3,550
Need(-)/Surplus(+)	(3,425)	(3,425)	(3,425)	(3,425)	(3,425)	(3,425)
Balance After WMS	(3,070)	3,651	3,651	3,651	3,651	3,651
Hidalgo County						
Supplies	9,746	9,935	10,035	10,035	10,035	10,035
Demand	11,538	11,538	11,538	11,538	11,538	11,538
Need(-)/Surplus(+)	(1,792)	(1,603)	(1,503)	(1,503)	(1,503)	(1,503)
Balance After WMS	139	(349)	(249)	(249)	(249)	(249)
Total Unmet Need	**(3,095)**	**(449)**	**(349)**	**(349)**	**(349)**	**(349)**
* Summation of unmet needs only; does not include surplus						

6.4 SOCIOECONOMIC IMPACTS OF SHORTAGES

A socioeconomic impact analysis has been provided by the Texas Water Development Board (TWDB) and included as Appendix D.

FINAL PLAN

CHAPTER 7: DROUGHT RESPONSE INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
DCP	Drought Contingency Plan
DMI	Domestic, Municipal, and Industrial
DOR	Drought of Record
ERHWSC	East Rio Hondo Water Supply Corporation
IBWC	International Boundary Water Commission
NCRWP	North Cameron Regional Water Plant
No.	Number
PDSI	Palmer Drought Severity Index
psi	Pounds per square inch
PUB	Public Utilities Board
RWPG	Regional Water Planning Group
RWP	Regional Water Plans
SRWA	Southmost Regional Water Supply Corporation
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
US	United States
WAM	Water Availability Model
WCP	Water Conservation Plan
WMS	Water Management Strategy
WSOC	Water Supply Option Contracts
WTP	Water Treatment Plant
WUG	Water User Group
WWP	Wholesale Water Provider

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CHAPTER 7: DROUGHT RESPONSE INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

7.1 DROUGHTS OF RECORD IN THE REGIONAL WATER PLANNING AREA

Region M relies heavily on water from the Rio Grande, managed through Amistad and Falcon Reservoirs; although, brackish and fresh groundwater provide supplemental and locally critical supplies. Response to drought varies across the region depending on the primary source of water and type of water use.

Severe drought has affected Region M in the period of record of the Water Availability Model (WAM) (1940 through 2000) as well as in the years since 2000. The drought record helps to understand the firm yield from the Amistad-Falcon Reservoir system, and if droughts after 2000 have been more severe that those encompassed by the model's period of record, the firm yield is likely to be overestimated in the WAM.

Because of the unique mechanism for fulfillment of water rights of the Rio Grande system, and the heavy reliance on that source, drought impacts Region M somewhat differently than other regions. In addition, a significant portion of the water used in Region M comes from the Mexican side of the Rio Grande watershed.

Drought and other circumstances can contribute to a water shortage, which is any situation when there is less supply of water than there is demand for water. Shortages can be the result of low rainfall, operational decisions, higher than normal temperatures, or growing populations causing increased demand. Drought preparation and response can help to mitigate the impacts of these shortages by finding ways to reduce demands and supplement supplies in response to water shortages.

The Texas Division of Emergency Management submitted recommendations from the Drought Preparedness Council to all Regional Water Planning Groups (RWPGs) on August 1, 2019. The Council advised the RWPGs to follow the Texas Water Development Board (TWDB) template for this chapter and to develop region-specific model drought contingency plans for all water use categories in the region that account for more than 10 percent of water demands in any decade over the 50 year planning horizon. These recommendations have been considered in the development of this chapter.

This chapter consolidates the existing information on current drought preparation and response activities for Region M and makes recommendations where needed.

7.1.1 Current Drought of Record

The drought of record (DOR) is the basis of the firm yield projection for each surface water supply. The DOR identifies the worst drought during the period of record, and the firm yield is the supply that can be expected from that river or system in that most severe drought scenario. The Rio Grande WAM includes hydrologic information from 1940 through 2000.

The longest duration drought modeled for both the combined reservoir system and the US portion spans the 1960s: 12/1959 through 10/1971 for the combined storage belonging to the United States and Mexico (11 years, 10 months) and 6/1961 through 10/1971 for the US portion (10 years, 4 months).

The drought spanning from July of 1992 to the end of the modeled period includes the minimum storage events for both the United States and combined systems, and the extent of the model does not include the end of the drought. The duration shown (8 years, 5 months) is shorter than the 1960s drought but is not a complete record. Refer to Figure 7-1.

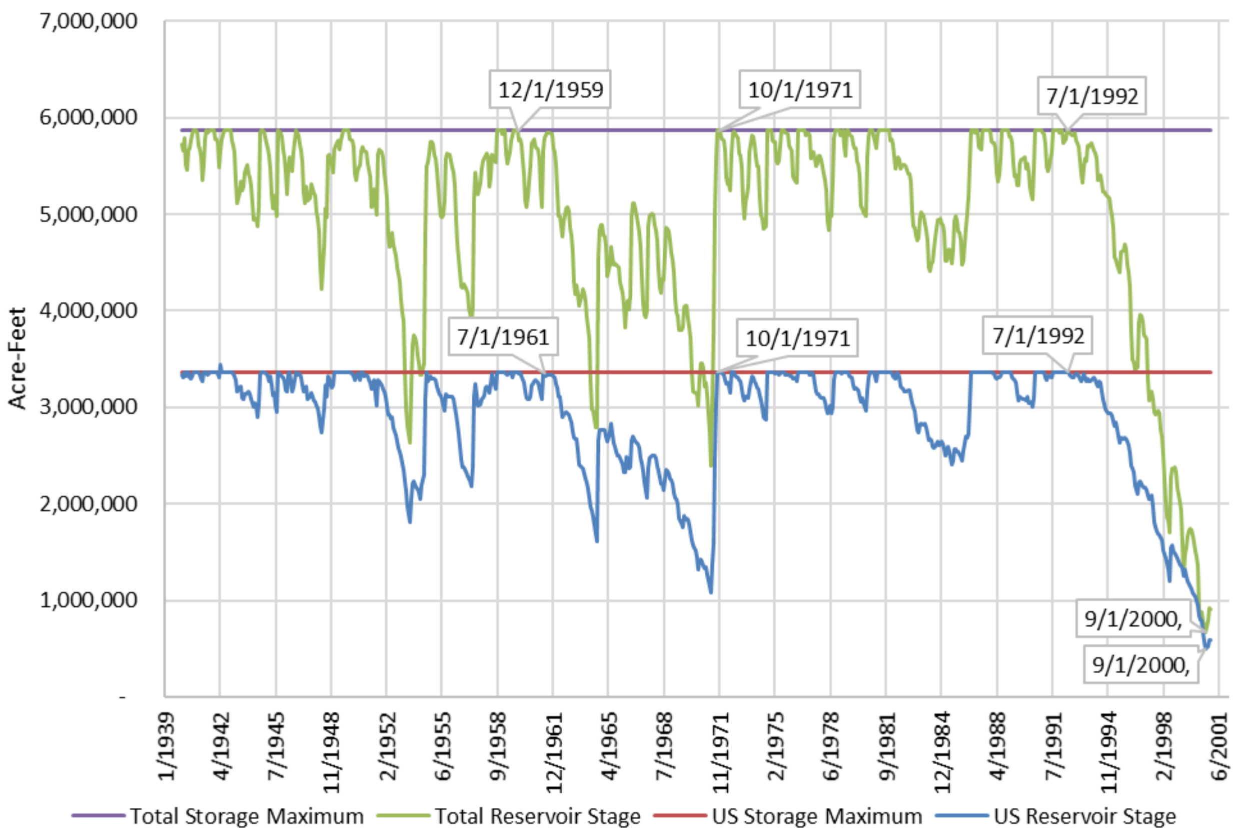

Figure 7-1 Modeled Reservoir Storage for the Amistad-Falcon System, US and Combined

The WAM takes into account inflows from both Mexican and US tributaries associated with the drought of record, volumes and locations of demands along the river, channel losses along the river, and other factors. The deliveries from Mexico are not modeled according to the 1944 treaty, which establishes 350,000 acre-feet/year to be delivered to the United States; the deliveries are modeled according to historical supplies and demands rather than assuming that the treaty obligation will be met in full each year. Firm yield decreases slightly each decade from reduced reservoir capacity due to sedimentation.

The hydrologic record in the Rio Grande WAM, including all of the drought periods discussed, is used to predict firm yield over the planning horizon, given in Table 7-1.

Table 7-1 Firm Yield Projections, Amistad-Falcon Reservoir System 2020-2070 (Acre-feet/year)

	2020	2030	2040	2050	2060	2070
Amistad-Falcon Reservoir System	1,079,381	1,079,175	1,078,968	1,078,762	1,078,555	1,078,349

Because the hydrologic data in the WAM extends only through the year 2000, more recent drought years are not considered in the determination of the DOR. The 2011 and 2016 Regional Water Plans (RWPs) recommended that the Rio Grande WAM should be regularly updated; this recommendation is the opinion of the current RWPG. Legislation passed in the 2019 session mandates and funds updating the naturalized flow records for the Rio Grande WAM through 2017, which will be available for use in development of the 2026 RWP update.

7.1.2 Potential Droughts of Record

The naturalized flow record that is used in the WAM is one way to evaluate the scale and duration of drought. That flow record extends only through 2000 in the Rio Grande WAM; severe droughts have occurred since then that are not currently evaluated in the WAM. Without a full naturalized flow record for comparison, it is difficult to know whether there has been a new DOR since 2000, but other measures and indicators of drought can be used to compare recent years with the historical record.

7.1.2.1 Drought Indices

Drought indices have been developed to assess the effects of drought through parameters, including severity, duration, and spatial extent. One of the first comprehensive efforts using precipitation and temperature for estimating a region's moisture was the Palmer Drought Severity Index (PDSI). Index values range from up to 6, indicating wetter-than-normal conditions, and as low as -6 for severe drought. The PDSI includes values across the country through 2019, which makes it a valuable addition to drought analysis. Graphs for yearly PDSI values for Texas Climate Divisions 9 and 10 (Figure 7-2) show more recent and severe droughts in the 21st century than the drought of the 1950s, but over a shorter duration for Region M (Figure 7-3 and Figure 7-4).

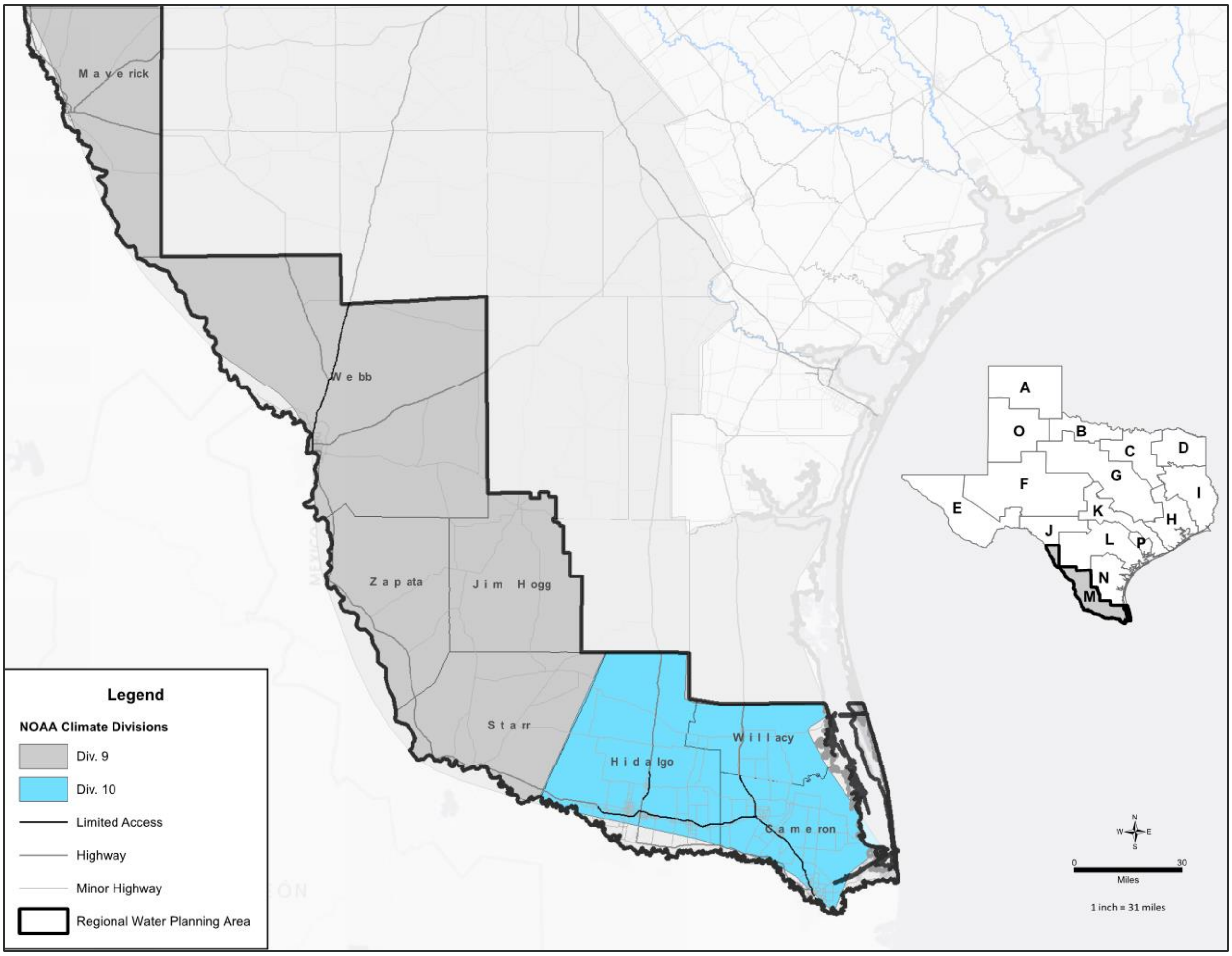

Figure 7-2 National Oceanic and Atmospheric Administration Climate Divisions 9 and 10

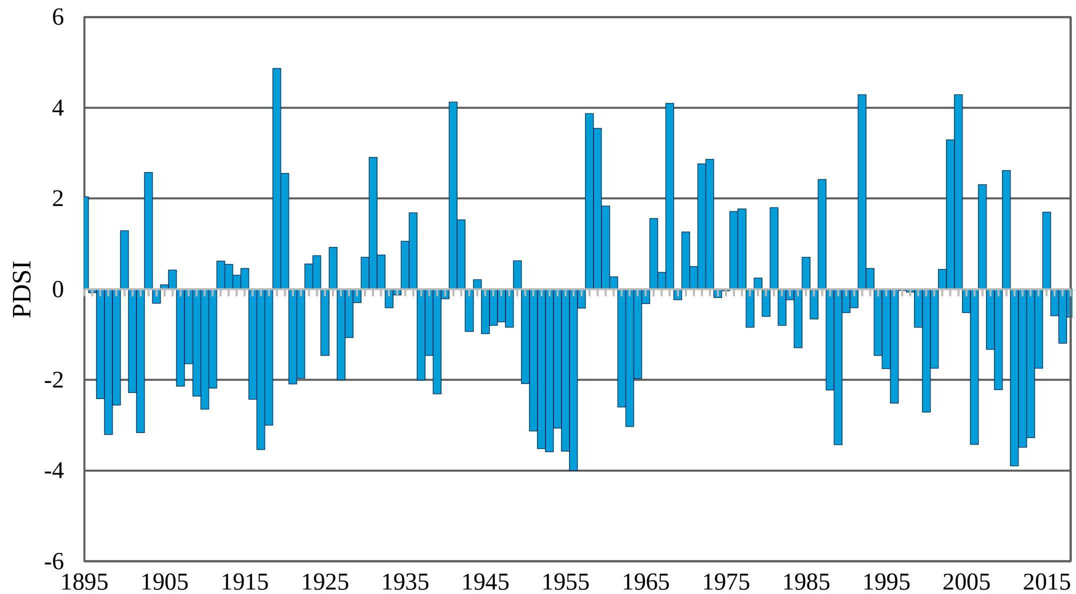

Figure 7-3 **Palmer Drought Severity Index for Division 9**

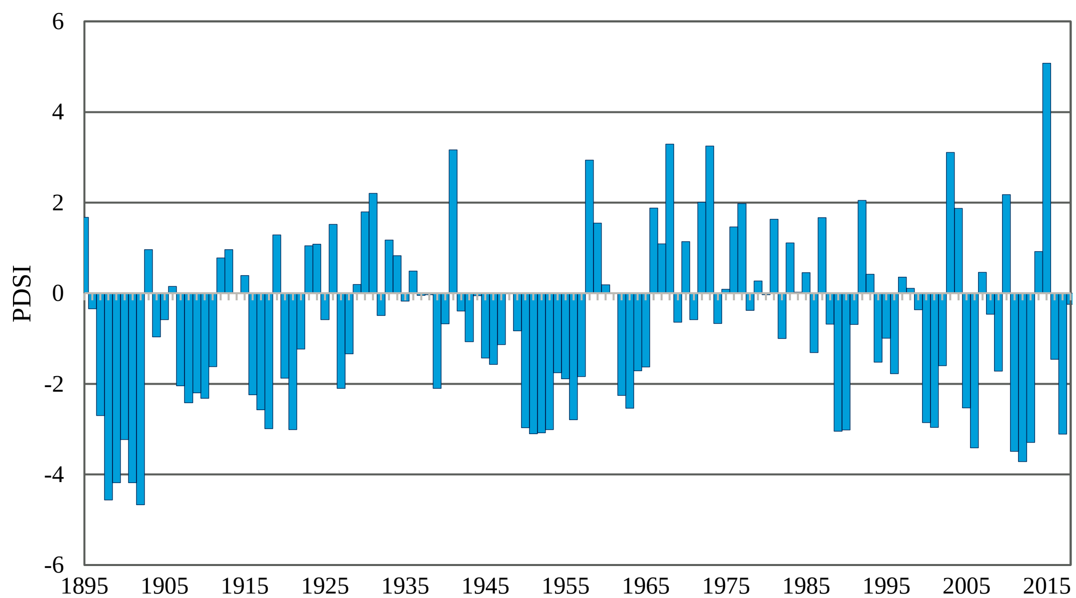

Figure 7-4 **Palmer Drought Severity Index for Division 10**

7.2 CURRENT DROUGHT PREPARATIONS AND RESPONSE

7.2.1 Overview

All water user groups (WUGs) in Region M can prepare for drought by participating in the regional planning process, which plans for long-term supplies that are reliable for the DOR. The regional planning process attempts to meet projected water demands during a drought of severity equivalent to the DOR. Statewide, there have been increased efforts in recent years to establish both long-term drought management strategies to avoid shortages and Drought Contingency Plans (DCPs) to plan for temporary water supply shortages and other water supply emergencies.

The Texas Commission on Environmental Quality (TCEQ) requires that anyone applying for a water right, irrigation districts, wholesale public water suppliers, and all retail public water suppliers serving 3,300 connections or more submit a DCP to the TCEQ. Public water suppliers serving fewer than 3,300 connections are required to have a DCP on file but are not required to submit it to TCEQ. May 1, 2019, was the most recent deadline for DCP submittals.

All the entities that are required to submit a DCP, as well as all users of 1,000 acre-feet or more domestic, municipal, or industrial (DMI) surface water rights and 10,000 acre-feet or more of irrigation surface water rights, are required to submit a Water Conservation Plan (WCP) to TCEQ and TWDB.

Because of these requirements and recent drought conditions, many communities in the Rio Grande Region have addressed drought preparedness and water conservation planning. A complete list of the DCP and WCP that have been submitted to TCEQ at this time is shown in Table 7-2.

DCPs for retail or wholesale water suppliers are required to include the following:

- Specific, quantified targets for water use reductions;
- Drought response stages;
- Triggers to begin and end each stage;
- Supply management measures;
- Demand management measures;
- Descriptions of drought indicators;
- Notification procedures;
- Enforcement procedures;
- Procedures for granting exceptions;
- Public input to the plan;
- Ongoing public education;
- Adoption of plan; and
- Coordination with the RWPG.

Utilities within Region M may have recently implemented drought contingency measures in response to drought conditions. At the time of writing this chapter, Stage 2 drought restrictions were implemented by the City of San Juan as recently as July 2020. North Alamo WSC, the City of Laredo, and Olmito WSC indicated that they have no records of activating drought contingency measures since adoption of the 2016 Regional Water Plan.

Table 7-2 Submitted Water Conservation and Drought Contingency Plans

ENTITY	WATER CONSERVATION PLAN DATE	DROUGHT CONTINGENCY PLAN DATE
Agua Special Utility District (SUD)	4/25/2019	4/25/2019
Alamo	-	3/28/2014
Bayview Irrigation District No. 11	5/6/2019	5/6/2019
Brownsville Irrigation District	5/15/2009	4/1/2014
Brownsville Public Utilities Board	4/24/2019	4/24/2019
Bruni Rural Water Supply Corporation (WSC)	1/24/2011	1/24/2011
Cameron County Irrigation District No. 2	4/24/2019	4/24/2019
Cameron County Irrigation District No. 6	-	3/14/2016
Delta Lake Irrigation District	9/19/2014	9/19/2014
Donna	-	9/1/2007
Donna Irrigation District	-	-
Eagle Pass Water Works System	9/15/2017	9/15/2017
East Rio Hondo WSC	6/25/2019	6/25/2019
Harlingen Irrigation District	5/19/2003	5/19/2003
Harlingen Waterworks System	6/15/2015	6/15/2015
Hidalgo	8/5/2019	-
Hidalgo Co. Drainage District No. 1	8/25/2014	8/25/2014
Hidalgo Co. Irrigation District No. 1	-	2/22/2007
Hidalgo Co. Irrigation District No. 2	4/18/2019	8/28/2014
Hidalgo Co. Irrigation District No. 5	4/30/2019	4/30/2019
Hidalgo Co. Irrigation District No. 6	4/30/2019	4/30/2019
Hidalgo Co. Irrigation District No. 9	-	-
Hidalgo Co. Irrigation District No. 13	-	4/22/2019
Hidalgo Water Improvement District No. 3	5/20/2019	5/20/2019
Jim Hogg County Irrigation District No. 2	3/31/2011	3/31/2011

ENTITY	WATER CONSERVATION PLAN DATE	DROUGHT CONTINGENCY PLAN DATE
La Feria Irrigation District	5/20/2019	5/20/2019
Laguna Madre Water District	3/13/2019	3/3/2019
Laredo	8/9/2019	8/9/2019
Los Fresnos	8/23/2019	8/23/2019
Lyford	-	7/24/2000
Maverick County Water Control and Improvement District No. 1	4/29/2019	4/29/2019
McAllen, McAllen Public Utility	5/29/2018	5/29/2018
Military Highway WSC	5/5/2014	5/5/2014
Mission Public Works Department	9/25/2019	9/25/2019
North Alamo WSC	9/17/2019	9/17/2019
North Cameron Regional WSC	-	9/11/2014
Olmito WSC	3/11/2019	3/11/2019
Pharr	4/22/2019	4/22/2019
Raymondville	8/28/2014	8/28/2014
Rio Grande City	5/28/2019	5/28/2019
Roma	6/17/2014	6/17/2014
San Benito	8/1/2014	8/1/2014
San Juan	8/17/2011	-
San Ygnacio Municipal Utility District	-	4/8/2014
Santa Cruz Irrigation District No. 15	5/31/2019	5/31/2019
Sharyland WSC	7/16/2019	7/16/2019
Southmost Regional Water Authority	4/24/2019	4/24/2019
Union WSC	-	11/29/2011
United Irrigation district	8/31/2015	8/31/2015
Valley Municipal Utility District No. 2	-	6/18/2013
Valley Acres Irrigation District	-	-
Weslaco	5/1/2009	5/1/2009
Zapata County Water Works	7/13/2014	5/28/2013

7.2.2 Drought Response Triggers

Drought response varies from entity to entity, primarily between groundwater and surface water sources, and those who serve customers with raw water, and those who deliver treated water. For irrigation districts, which deliver raw surface water, the response to drought is largely determined by the Rio Grande water right system. For treated water suppliers, triggers are specific to their users' demand in relation to treatment capacity, wellfield capacity, or the account balance on DMI water rights held.

7.2.2.1 Irrigation Districts

The TCEQ Rio Grande operating rules determine how the United States' share of surface water stored in Amistad and Falcon Reservoirs is apportioned among water right holders in the Region M planning area. A 225,000 acre-foot storage pool within the reservoir is replenished at the beginning of each month for DMI water right accounts. After the DMI storage pool and reservoir operating requirements are met, Class A and B water rights, used primarily for irrigation and mining, are allotted what remains on their account balances if there is sufficient water in the reservoir. In the history of the Watermaster Program, the DMI reserves have always been replenished in full, but the water available annually for Class A and B water rights is often significantly less than the annual maximum authorization of those water rights. Class A and B water rights absorb the impacts of drought on the reservoir system by having less than 100 percent reliability.

Irrigation districts deliver a significant portion of the water used in the Lower Rio Grande Valley (Cameron, Hidalgo, Willacy, and Starr Counties) and Maverick County. The majority of Rio Grande water rights are delivered by irrigation districts. Farmers pay an annual flat rate assessment that entitles them to receive irrigation water on the basis of acreage. When an irrigation district crosses its drought trigger, it goes on water allocation. This means that the district's available water is allocated to irrigation account balances as it becomes available.

Each water district has slightly different rules when on allocation; in some cases, water is allowed to be sold between farmers in their district, or farmers may consolidate their allocation on a portion of their land, leaving other areas for dry land farming. These measures allow farmers to adjust to anticipated water shortages.

A summary of the drought triggers and responses as listed by the irrigation districts that submitted DCPs at the time of writing is shown in Table 7-3.

Table 7-3 Summary of Irrigation District Drought Triggers and Responses

ENTITY	DATE		
Bayview Irrigation District	May 6, 2019	TRIGGERS:	Water assignments are initiated upon approval of the board.
		ACTIONS:	Each irrigation user shall be allocated one irrigation or 0.70 acre-feet of water each flat rate acre on which all taxes, fees, and charges have been paid. As additional water supplies become available to the district, water will be equally distributed, on a pro-rata basis, to those irrigation users whose storage balance in the district's irrigation water rights account reaches 9,000 acre-feet.
Brownsville Irrigation District	April 24, 2019	TRIGGERS:	Water assignments are initiated upon approval of the board.
		ACTIONS:	Each irrigation user shall be assigned three irrigations or 1 acre-foot of water for each acre planted in the previous year. As additional water supplies become available to the district, water will be equally distributed as described in Section 11.039 in the Texas Water Code.
Cameron County Irrigation District No. 2	April 24, 2019	TRIGGERS:	Water allocations for irrigators go into effect as determined by the board of the district.
		ACTIONS:	The total water allocated to the irrigation district by the Watermaster will be divided among flat-rate customers evenly so that no one user can irrigate more than their portion.
Delta Lake Irrigation District	Sept. 19 2014	TRIGGERS:	Upon approval of the board, water allocation will become effective when the storage balance in the district's irrigation water rights account reaches 60,000 acre-feet.
		ACTIONS:	Each irrigation user shall be allocated three irrigations or 2 acre-feet of water each flat rate acre. Additional water available to the district will be equally distributed, on a pro-rata basis, to users having an account balance of less than 1 acre-foot of water for each flat rate acre. Transfers of allotments within the district are allowed.
Harlingen Irrigation District	June 15, 2015	TRIGGERS:	Water allocations for irrigators go into effect when either (1) the storage balance in the district's irrigation water rights account has declined to one irrigation-per-acre level or (2) the board determines that there is not sufficient water to complete the traditional crop year.
		ACTIONS:	The total water allocated to the irrigation district by the Watermaster will be divided among flat-rate customers evenly so that no one user can irrigate more than their portion.

ENTITY	DATE		
Hidalgo Co. Irrigation District No. 1	Feb. 22, 2007	TRIGGERS:	When the Watermaster initiates diversions on the basis of allocations, the district's board of directors determines the total allocation available to the district and stored in the Falcon/Amistad Reservoir System is less than 2.5 acre-feet/year of the estimated active parcels of land.
		ACTIONS:	The district initiates allocation of water to active irrigation users, on a pro-rata basis, provided that no parcel receives an allocation that will result in an account balance exceeding 1.83 acre-feet per acre.
Hidalgo Co. Irrigation District No. 2	April 18, 2019	TRIGGERS:	Water allocation goes into effect when the district's total irrigation water account storage balance amounts to a maximum of irrigations for each flat rate acre in which all flat rate is paid and current, and for each net irrigable acre as shown by District records with respect to land in the International Boundary and Water Commission (IBWC) floodway.
		ACTIONS:	Additional water allocated to the district will be equally distributed to those irrigation accounts having a balance of less than three irrigations (or 2 acre-feet equivalent) based on flat rate or net floodway acreage.
Hidalgo Co. Irrigation District No. 5	April 30, 2019	TRIGGERS:	Upon approval of the board, water allocation will become effective when the water allocated to Irrigation District No. 5 for irrigation by the Rio Grande Watermaster amounts to 2-1/2 acre-feet per compliant acre or less.
		ACTIONS:	Water will be allocated on a pro-rata-per-acre basis to the compliant acreage.
Hidalgo Co. Irrigation District No. 6	April 30, 2019	TRIGGERS:	Upon approval of the board, water allocation will become effective when the water allocated to Irrigation District No. 6 for irrigation by the Rio Grande Watermaster amounts to 2-1/2 acre-feet per compliant acre or less.
		ACTIONS:	Water will be allocated on a pro-rata-per-acre basis to the compliant acreage. Transfers of allotments within (but not outside) the district, with the consent of the allotted, will be permitted.

ENTITY	DATE		
Hidalgo Co. Irrigation District No. 13	April 22, 2019	TRIGGERS:	Upon approval of the board, water allocation will go into effect when the storage balance in the district's irrigation water storage account reaches 1,600 acre-feet and/or Hidalgo County Irrigation District No. 1 notifies the district that water deliveries will be limited to less than 2,000 acre-feet/year.
		ACTIONS:	Upon initiation of water allocation, each irrigation user shall be allocated 1.33 acre-feet of water for each flat rate acre. Additional water allocated to the district will be equally distributed, on a pro rata basis, to those irrigation accounts having account balances less than one irrigation for each flat rate acre.
Hidalgo County Water Improvement District No. 3	May 20, 2019	TRIGGERS:	Upon approval of the board, water allocation will go into effect when the district's total water right from the Rio Grande Watermaster amounts to less than 1 year supply as determined by the board.
		ACTIONS:	Water is pro-rated to irrigable land on which all flat rate assessment is paid in accordance with the district's Water Allocation Program. Additional water will be equally distributed, on a pro-rata acreage basis. When the Water Allocation Program is in effect, the district will not supply out-of-district water except in accordance with policy adopted as a result of US Bureau of Reclamation WaterSMART Grant. Additionally, the district does not have issues with push water, as the majority of the water supplied is municipal and does not require irrigation push water.
La Feria Irrigation District	May 20, 2019	TRIGGERS:	Upon approval of the board, water allocation becomes effective when the storage balance in the water rights account reaches an amount less than or equal to two irrigations for each flat rate acre.
		ACTIONS:	Each user is allocated one irrigation or 1 acre-foot of water, if metered, for each flat rate acre. Transfer within the district is allowed. Transfer from outside of the district to a user in the district is allowed.
Santa Cruz Irrigation District	May 31, 2019	TRIGGERS:	Allocation will become effective, upon board approval, when the combined storage in the Amistad and Falcon Reservoirs is at or less than 80% of storage capacity for the district water balance.
		ACTIONS:	Each user is allocated three irrigations or 2 acre-feet of water for each flat rate acre for which taxes, fees, and charges have been paid. Transfer within the district is allowed. Transfer from outside of the district to a user in the district is allowed, but transfers out of the district are not allowed.

7.2.2.2 Retail Public Water Suppliers

Although some cities rely on groundwater exclusively or groundwater comprises a part of their supply, most cities in Region M rely on surface water from the Rio Grande. Because municipal water rights have priority in the Amistad-Falcon Reservoir system, these water rights have historically been considered "guaranteed" in their full authorized diversion volume.

Those entities who deliver treated water generally developed triggers that were either based on the remaining municipal water rights available to the city for that year or the capacities of their treatment plants, so that high demands on the plants trigger a conservation stage. The conditions of the reservoirs are occasionally listed among triggers in public water supply DCPs but have little bearing on the availability of municipal water. The conservation stages for cities included limitations on car washing and lawn watering, ranging from voluntary in early stages to some fines or other penalties in later stages.

A summary of the DCPs available for cities and water supply corporations at the time of writing is included as Appendix E.1, and summary tables for some of the larger systems are shown in Table 7-4 through Table 7-9.

Table 7-4 East Rio Hondo Water Supply Corporation Drought Response

EAST RIO HONDO WATER SUPPLY CORPORATION		6/25/2019
Basis of Drought	Reservoir level, irrigation district notice to disallow irrigation, water demand, system break/failure or contamination, distribution system pressure	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	Falcon and Amistad Reservoirs reach 40% of capacity as determined by the TCEQ	Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses.
Stage 2	(1) Cameron County Irrigation District No. 2 or other irrigation districts provide notice to East Rio Hondo WSC that they will disallow farm irrigation water use within 60-90 days. (2) Distribution system pressures fall below 35 pounds per square inch (psi) requirements for two consecutive days. (3) East Rio Hondo WSC consumer demand exceeds 85% of East Rio Hondo WSC plan capacity for 15 days out of any consecutive 30 day period. (4) Falcon and Amistad Reservoirs reach 15% of capacity as determined by TCEQ.	Customers shall be required to comply with the requirements and restrictions on certain nonessential water uses, such as irrigation, washing vehicles, and ornamental fountains and ponds.
Stage 3	(1) Major water line breaks, or pump or system failures occur, which cause loss of capability to provide water service. (2) Natural or man-made contamination of the water supply source(s). (3) Rapidly occurring low-pressure conditions (less than 20 psi) for any reason.	All requirements of Stage 2 shall remain in effect, except the following are prohibited: all irrigation of landscape, using water to wash any vehicle, and adding water to any type of pool.

Table 7-5 Brownsville Public Utilities Board Drought Response

BROWNSVILLE PUBLIC UTILITIES BOARD		4/24/2019
Basis of Drought	Time of year, reservoir level, system break/failure or contamination, water demand/water treatment plant (WTP) capacity, projected water demand	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	Automatically initiated on May 1 of each year and for any of the following: (1) Rio Grande Watermaster advises that a water shortage is possible because of low levels in Amistad and Falcon reservoirs. (2) Level of US' water in Amistad and Falcon reservoirs reaches 51%. (3) Line break, pump, or system failure may result in unprecedented loss of capability to provide service. (4) Peak demand on the distribution system and/or treatment plants is nearing capacity limits.	Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses.
Stage 2	(1) Level of US' water in Amistad and Falcon reservoirs reaches 25%. (2) Analyses of water supply and demand indicate that the annual water allotment may be exhausted. (3) Line break or pump, or system failure will result in unprecedented loss of capability to provide service. (4) Peak demands on the distribution system and/or treatment plants are nearing capacity levels. (5) Contamination of the water supply and/or transmission system may result in unprecedented loss of capability to provide service.	Customers shall only be allowed to irrigate and wash vehicles following a certain schedule, golf courses shall follow restrictions in their approved water management plans, restaurants may only serve water to customers upon request, and the following are prohibited unless necessary for public health and safety: washing hard-surfaced areas, washing buildings or structures, using water for dust control, flushing gutters, and failing to repair controllable leaks within a reasonable period of time.
Stage 3	(1) Level of US' water in Amistad and Falcon reservoirs reaches 15%. (2) Analyses of water supply and demand the annual water allotment will be exhausted. (3) Major line break, or pump or system failure may result in unprecedented loss of capability to provide service. (4) Peak demand on the distribution system and/or treatment plants has exceeded capacity levels for three days. (5) Contamination of the water supply and/or transmission system will result in unprecedented loss of capability to provide service. (6) The inability to maintain or replenish adequate volumes of water in storage to provide for public health and safety.	All requirements of Stage 2 shall remain in effect, and in addition, the schedule irrigation and vehicle washing will be further restricted, the use of water from hydrants is only allowed when necessary to maintain public health, safety, and/or welfare, and the following are prohibited: refilling outdoor pools (with some exceptions), operation of outdoor fountains or ponds without recirculation systems unless required to maintain aquatic life, hydrant and sewer flushing except for emergencies, and use of water from or pumping water into resacas.
Stage 4	(1) Major line breaks, or pump or system failures occur which cause unprecedented loss of capability to provide water service, or (2) contamination of water supply and/or transmission system	All requirements of Stage 3 shall remain in effect, and in addition, the following are prohibited: all landscaping watering, use of water for construction purposes under special permit, adding water to swimming pools, adding water to any outdoor or indoor fountain or pond, except to maintain aquatic life.

Table 7-6 City of Laredo Drought Response

CITY OF LAREDO		8/9/2019
Basis of Drought:	Water demand/WTP capacity, reservoir level	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	(1) WTP flow is less than 85% capacity for 5 consecutive days. (2) Amistad Reservoir level reaches 51% capacity.	Customers are asked to voluntarily reduce their water usage and the following are prohibited: allowing irrigation water to run off into a gutter, ditch, drain, or street and failure to repair a controllable leak.
Stage 2	(1) WTP flow is at 85% capacity for 3 consecutive days. (2) Amistad Reservoir level reaches 25% capacity.	All requirements for Stage 1 remain in effect, and the following are only allowed during certain scheduled times: irrigation with sprinkler systems, washing of vehicles, adding water to pools, irrigating parks/plazas/squares. The following are prohibited: operating any ornamental fountain or similar structure without a recycling system and washing paved areas, except to alleviate immediate fire hazards.
Stage 3	(1) WTP flow is at 90% capacity for 1 day. (2) Amistad Reservoir level reaches 20% capacity.	All requirements for Stage 2 remain in effect, except the schedules to use water for certain activities are even stricter, and irrigating athletic fields is also held to a certain schedule. No bulk water sales will be made by the city when the water will be transported outside of the city except for domestic/residential/livestock use. Fire hydrant water sales shall cease.
Stage 4	(1) WTP flow is at 95% capacity for 1 day. (2) Amistad Reservoir level is less than 20% capacity.	All requirements for Stage 3 remain in effect, and no applications for new or expanded water service connections will be approved without permission from the utilities director, water delivered to nonessential industrial and commercial customers will be reduced, and a maximum monthly water use allocation may be established for residential customers. The following are prohibited: irrigation, washing vehicles, adding water to pools.

Table 7-7 McAllen Public Utility Drought Response

MCALLEN PUBLIC UTILITY		12/12/2013
Basis of Drought:	WTP capacity being used, reservoir levels, system outages or failures	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	In effect at all times.	Customers asked to voluntarily limit water use to an amount absolutely necessary for health, business, and irrigation.
Stage 2	(1) Demand reaches or exceeds 85% of capacity for 3 consecutive days. (2) Amistad-Falcon reservoirs reach 40% capacity. (3) Including, but not limited to, system outage, equipment failure, or supply contamination.	The following are restricted: irrigation, but drip method or hand-held buckets permitted at any time; washing motor vehicles, except commercial carwashes or service stations; washing or sprinkling foundations; adding water to swimming pools; operation of fountains or ponds, except with a recycling system; irrigation for golf courses, except those using wastewater effluent; hydrants restricted to firefighting and necessary activities. The following are absolutely prohibited: allowing irrigation water to run off into gutter, ditch, or rain; failure to repair controllable leaks; washing paved surfaces.
Stage 3	(1) Demand reaches or exceeds 90% of capacity for 3 consecutive days. (2) Amistad-Falcon reservoirs reach 25% capacity. (3) Including, but not limited to, system outage, equipment failure, or supply contamination.	All Stage 2 restrictions except further restrictions on means and schedule for irrigation, except by drip or hand-held buckets; watering of golf fairways is prohibited unless with wastewater effluent, reused water, or well water; customers to pay a water surcharge.
Stage 4	(1) Demand reaches or exceeds 95% of capacity for 3 consecutive days. (2) Amistad-Falcon reservoirs reach 20% capacity. (3) Including, but not limited to, system outage, equipment failure, or supply contamination.	All Stage 2 and 3 restrictions except further restrictions on means and schedule for irrigation; washing of motor vehicles not occurring on commercial carwashes and not in the immediate interest of public health and safety is prohibited; carwashes in the interest of public health and safety limited to 50% of monthly average; commercial nurseries, sod farmers, etc., limited to means and schedule restrictions; adding water to pools, except to maintain structural integrity, is prohibited; operation of fountains prohibited; customers to pay a water surcharge.
Stage 5	(1) Demand reaches or exceeds 100% of capacity. (2) Amistad-Falcon reservoirs reach 15% capacity. (3) Including, but not limited to, system outage, equipment failure, or supply contamination.	All Stage 2, 3, and 4 restrictions except no applications for new, additional, or expanded water connections, lines, etc., are allowed except as approved by the public utility board; water allocations to nonessential customers reduced as established by the public utility board; maximum monthly water allocation for residential customers established with revised rate schedules and penalties by the public utility board; irrigation permitted only by handheld hoses, handheld faucet filled buckets; drip irrigation on set schedule; customers to pay a water surcharge.

Table 7-8 Southmost Regional Water Authority Drought Response

SOUTHMOST REGIONAL WATER AUTHORITY		4/24/2019
Basis of Drought	Time of year, reservoir levels, system malfunction or failure, contamination of water	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	Automatically initiated from May 1 to Sept. 30 of each year or if one or more of the following occur: (1) Watermaster advises the Brownsville public utility board that a water shortage is possible. (2) Level of Amistad and Falcon reservoirs reach 51% or 1.66 million acre-feet. (3) Line breaks or system failures cause loss of service. (4) WTP is nearing capacity levels.	Customers asked to voluntarily conserve water and adhere to the following restrictions: restrict means and/or schedule of irrigation of landscaped areas; minimize or discontinue use of nonessential purposes; and reduce fire hydrant and sewer line flushing.
Stage 2	(1) Levels of Amistad and Falcon reservoirs reach 25% or 834,600 acre-feet. (2) Line breaks or system failures cause loss of service. (3) Demands on Brownsville public utility board distribution and/or WTPs near capacity levels. (4) Contamination of water supply or distribution system causes loss of service.	All Stage 1 restrictions in effect and any or all of the following restrictions: means and schedule of landscape irrigation restricted further; means and schedule of washing motor vehicles, boasts, planes, etc., restricted; water use for golf courses based on water management plan; restaurants prohibited from serving water unless requested; all nonessential uses prohibited.
Stage 3	(1) Levels of Amistad and Falcon reservoirs reach 15% or 504,600 acre-feet. (2) Line breaks or system failures cause loss of service. (3) Demands on Southmost Regional Water Authority distribution and/or WTP exceed capacity for 3 days. (4) Contamination of water supply or distribution system causes loss of service. (5) Inability to maintain or replenish water in storage for public health and safety.	All Stage 1 and 2 restrictions and any or all of the following: means and schedule of landscape irrigation and residential car washing restricted further; water from hydrants limited to firefighting or other activities necessary to maintain public health and safety or for construction under special permit; filling swimming pools prohibited; operation of fountain or pond prohibited except for aquatic life; hydrant and sewer line flushing permitted only for emergency; use of water for scenic and recreational ponds and lakes prohibited.
Stage 4	(1) Line breaks or system failures cause loss of service. (2) Contamination of water supply and/or distribution system.	All Stage 1, 2, and 3 restrictions remain in effect and any or all of the following: all landscape watering is prohibited; use of water for construction under special permit prohibited; washing of motor vehicles, boats, planes, etc., prohibited; filling of pools to a maintenance level is prohibited; water for maintenance level of fountains or ponds except to support aquatic life is prohibited. Water rationing can be initiated with any or all of Stage 4 restrictions.

Table 7-9 City of Weslaco Drought Response

CITY OF WESLACO		5/1/2009
Basis of Drought:	Reservoir level, projected water demand, system break/failure	
Drought Stage	**TRIGGERS:**	**ACTIONS:**
Stage 1	(1) Levels of US waters in Amistad and Falcon reservoirs reach 51%. (2) Water demand projections for the year suggest available water rights may be used at 95%.	Request customers to voluntarily reduce water usage.
Stage 2	(1) Levels of US water in Amistad and Falcon reservoirs reach 25%. (2) A condition causes systemwide problems so the normal level of water service may be diminished for a period of time. (3) Water demand projections for the year suggest available water rights may be used at 98%.	The means and/or schedule for the following will be restricted: watering of grass and vegetation, washing of vehicles, adding water to pools, and irrigating golf courses. The following are prohibited: allowing water to run off into gutters or streets, washing of buildings, trailers, railroad cars, failure to maintain defective home plumbing, use of hydrants except for firefighting, ornamental fountain without recirculation, use of water to wash down hard surfaced area, and use of water for dust control.
Stage 3	(1) Levels of US water in Amistad and Flacon reservoirs reach 15%. (2) A condition related to extraordinary circumstances severely and immediately diminish the ability to deliver a normal level of water. (3) Water demand projections for the year suggest available water rights may be used at 100%.	The following are prohibited: new service connections to the water system if another water source is already used, serving restaurant customers water when they do not ask for it, use of water for scenic and recreational ponds or lakes, use of water for pools, use of water to put new agricultural land into production, use of water for new planting or landscaping, and acceptance of applications for new or extended water service connections without approval by the city. Industrial and commercial users must implement an individual curtailment plan, and residential customers will receive a maximum monthly usage amount.

7.3 EXISTING AND POTENTIAL EMERGENCY INTERCONNECTS

7.3.1 Information Collection Methodology

In accordance with Texas Administrative Code (31 TAC 357.42(d)), the RWPG has collected high-level information on existing interconnects. Most water users in Region M are located along the Rio Grande or along canals that convey Rio Grande water. In a sense, the region is highly interconnected.

The distribution system for raw Rio Grande water includes the reservoir system and the 27 Irrigation districts, many of which are either interconnected or have high potential to be connected. The RWPG has reached out through representatives of the Lower Rio Grande Valley Water District Managers Association to the district managers for information about interconnects between raw water systems.

Municipal utilities supplying treated water to retail customers are becoming more interconnected across the region. To evaluate current connections between systems, the Region M Planning Group appointed a member to evaluate information about existing interconnects.

7.3.2 Local Drought Contingency Plans with Emergency Interconnects

Although utilization of emergency interconnects was not included in the DCPs that were reviewed, Table 7-10 shows the known interconnections between public water supply systems and whether the connections are used for regular service or only in emergencies. Detailed information about these interconnections was submitted securely to the Executive Administrator of the TWDB.

Table 7-10 Emergency Interconnections Between Public Water Supply Systems

PUBLIC WATER SUPPLY SYSTEM	INTERCONNECTS	TYPE OF CONNECTION
Agua SUD	La Joya	One-way emergency interconnect
	Peñitas, Palmview, Sullivan City, Mission	All within Agua SUD service area
East Rio Hondo WSC	Harlingen WW	Connection for regular service with capacity to increase in emergencies
	City of Los Fresnos	Connection for regular service
	Olmito WSC	Connection for regular service with capacity to increase in emergencies
	North Cameron Regional	Connection for regular service
	Combes	Emergency Interconnect
Harlingen Water Works (WW)	City of La Feria	Emergency Interconnect
	City of Combes	5 Connections for regular service
	City of Primera	2 Connections for regular service
	City of San Benito	Emergency Interconnect
	City of Palm Valley	2 Connections for regular service
	East Rio Hondo WSC	Connection for regular service
	Military Highway WSC	Connection for regular service

PUBLIC WATER SUPPLY SYSTEM	INTERCONNECTS	TYPE OF CONNECTION
City of McAllen	Edinburg	Used only during times of high demand
	Pharr	Used only during times of high demand
	Mission	Used only during times of high demand
	Hidalgo	Used only during times of high demand
	Hidalgo Co. Irrigation District No. 2, Hidalgo Co. Irrigation District No. 3, United Irrigation District	McAllen receives raw water from these districts
Military Highway WSC	Harlingen WW (see above)	
	Los Indios, Progreso, San Juan	Military Highway serves these entities
North Alamo WSC	City of Mercedes	Emergency interconnect
	Sebastian Municipal Utility District (MUD)	Emergency interconnect
	City of Lyford	Emergency interconnect
	City of Raymondville	Emergency interconnect
	City of Edcouch	Emergency interconnect
	City of Elsa	Emergency interconnect
	City of La Villa	Emergency interconnect
	City of Donna	Connection for regular service
	City of Edinburg	2 Connections for regular service
	Military Highway WSC	Connection for regular service
	Quiet Village Utilities	Connection for regular service
	Port Mansfield PUB	Connection for regular service
	Delta Lake ID, Donna Irrigation District, Hidalgo Co. Irrigation District No. 2, Hidalgo Co. Irrigation District No. 1, East Rio Hondo WSC	North Alamo WSC receives raw water from these districts
Olmito WSC	Los Fresnos	Two-Way emergency interconnect
	Valley MUD No. 2	Two-Way emergency interconnect
Zapata County Waterworks	Zapata Co. Water Control & Improvement District No. 16	Connection for regular service
Brownsville PUB	El Jardin WSC	Connection for regular service
Laguna Madre Water District	Laguna Vista, Port Isabel, South Padre Island	Connection for regular service

PUBLIC WATER SUPPLY SYSTEM	INTERCONNECTS	TYPE OF CONNECTION
Valley MUD No. 2	Military Highway WSC	Emergency interconnect
	Olmito WSC	Emergency interconnect
	Southmost Regional Water Authority	Connection for regular service
	Rancho Viejo	Connection for regular service
Rio Grande City	Rio WSC	Connection for regular service
City of Roma	Escobares	Connection for regular service
Weslaco	Mercedes	Emergency interconnect

7.4 EMERGENCY RESPONSES TO LOCAL DROUGHT CONDITIONS OR LOSS OF MUNICIPAL SUPPLY

Municipal WUGs that are of concern for emergency drought response are identified as those that have a population of 7,500 or less and have a sole source of water, even if that water is provided by a wholesale water provider, or in the case of the Rio Grande region, if those entities receive waters from the Rio Grande from multiple irrigation districts. For purposes of this evaluation, entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply. Additionally, all “county-other” WUGs are considered.

WUGs that meet these criteria are shown in Table 7-11, with the 2010 census population and current suppliers. Most of these districts rely exclusively on water from the Rio Grande system and have no secondary source available to them (the districts that provide Rio Grande surface water are listed as the “Current Supply”). Those that indicate their sole supply is groundwater are generally geographically constrained and limited to local groundwater supplies.

Table 7-11 WUGs Identified for Emergency Drought Response Evaluation

COUNTY	ENTITY	CENSUS POPULATION 2010	CURRENT SUPPLY (1)	CURRENT SUPPLY (2)
Cameron	County-Other	44,311	Surface Water (various)	Groundwater (various)
Cameron	La Feria	7,302	La Feria Irrigation District 3	La Feria (emergency)
Cameron	Laguna Vista	3,117	Laguna Madre Water District	limited non-potable reuse available
Cameron	Olmito WSC	3,361	Cameron Co. Irrigation District No. 6	
Cameron	Palm Valley	1,304	Harlingen Irrigation District No. 1	
Cameron	Primera	4,036	Harlingen Irrigation District No. 1	North Alamo WSC

COUNTY	ENTITY	CENSUS POPULATION 2010	CURRENT SUPPLY (1)	CURRENT SUPPLY (2)
Cameron	Rio Hondo	2,356	Cameron Co. Irrigation District No. 2	
Cameron	Santa Rosa	2,873	La Feria Irrigation District	
Hidalgo	County-Other	32,223	Surface water (various)	Groundwater (various)
Hidalgo	Edcouch	3,161	Hidalgo Co. Irrigation District No. 9	North Alamo WSC emergency interconnect
Hidalgo	Elsa	5,660	Hidalgo Co. Irrigation District No. 9	North Alamo WSC emergency interconnect
Hidalgo	Hidalgo County MUD No. 1	5,412	Hidalgo Co. Irrigation District No. 1	
Hidalgo	La Joya	3,985	Hidalgo County Irrigation District No. 16	Agua SUD one-way emergency interconnect
Hidalgo	La Villa	1,957	Hidalgo Co. Irrigation District No. 9	North Alamo WSC emergency interconnect
Jim Hogg	County-Other	742	Local groundwater	
Jim Hogg	Jim Hogg County Water Control & Improvement District No. 2	4,155	Gulf Coast groundwater	
Maverick	County-Other	28,010	Surface water (various)	Groundwater (various)
Starr	County-Other	24,657	Surface water (various)	Groundwater (various)
Starr	El Sauz WSC	1,504	Rio Grande City	
Starr	El Tanque WSC	1,850	Rio Grande City	
Starr	La Grulla	1,622	Direct Rio Grande	
Starr	Rio WSC	3,298	Rio Grande City	
Webb	County-Other	6,146	Surface water (various)	Groundwater (various)
Webb	Mirando City WSC	541	Mirando City WSC	
Willacy	County-Other	468	Surface water (various)	Groundwater (various)

COUNTY	ENTITY	CENSUS POPULATION 2010	CURRENT SUPPLY (1)	CURRENT SUPPLY (2)
Willacy	Lyford	2,611	Delta Lake Irrigation District	North Alamo WSC emergency interconnect
Willacy	Port Mansfield Public Utility District	277	North Alamo WSC	North Alamo WSC emergency interconnect
Willacy	Sebastian MUD	1,834	La Feria	North Alamo WSC emergency interconnect
Zapata	County-Other	2,321	Surface water (various)	Groundwater (various)
Zapata	San Ygnacio MUD	835	Self-supplied surface water	
Zapata	Siesta Shores Water Control & Improvement District	1,373	Siesta Shores Water Control & Improvement District	

7.4.1.1 Sole Source: Surface Water

Entities that depend entirely on surface water in Region M are very common. If shortages occur as a result of having insufficient water rights to meet demand or to deliver water, there is a water market and provisions that allow for entities to purchase water. Special provisions enable purchase of emergency water. It is recommended that all WUGs procure sufficient water rights or long-term contracts to meet projected demands when feasible. Additionally, access to off-channel storage reservoirs or additional sources of water (groundwater, reuse, etc.) for sole-source utilities may provide increased resilience.

Interconnections

Interconnections between utilities build greater resilience by providing utilities an alternate source of treated water if either system is damaged or fails. Entities that experience push-water requirements when irrigation deliveries are curtailed may also benefit from both raw and treated water interconnects, which could allow districts and utilities to coordinate and consolidate deliveries in a limited number of canals.

Water Quality

Any emergency that impacts the quality of the water in the Rio Grande has the potential to cause significant harm to the region. Because contamination could be released from either the US or Mexican side of the river, there is an additional level of uncertainty regarding potential contaminants. In the past, there have been releases into Rio Grande tributaries that were identified only by a widespread fish kill. No emergency response plan is currently in place to handle the release of contaminants into the Rio Grande.

A release in April of 2014 on the Rio Salado (a Rio Grande tributary in Mexico) was identified by the Mexican counterpart to the International Boundary and Water Commission (IBWC), the Comisión Internacional de Límites y Aguas, which reported that a release had occurred, but the quantity and the material were unknown.[1] Later information showed that the release was on April 8, but the notification was not until April 30.

TCEQ conducted testing on the Rio Grande upstream and downstream of the inflows from the Rio Salado, which took 5 days to analyze. In this case, the results of broad-spectrum pollutant analysis showed that there were no contaminants that could endanger human health, and other contaminants of concern such as heavy metals were beneath federal and state limits for drinking water. However, this incident drew attention to the lack of emergency plan for the region.

Regular water quality testing and reporting is already in place in some locations to alert farmers of high total dissolved solids in the river. This type of system could be expanded upon to provide regular reports of water quality to utility managers and agencies such as IBWC and TCEQ. This kind of water quality analysis is complicated by the fact that the potential contaminants are not known in many cases. Understanding the timing of contaminant transport through the system could allow entities to pump enough water to fill reservoirs before the contaminant has reached that location. However, the success of this approach is contingent on timely information about releases. At a minimum, information must be communicated to utilities and to the public in an accurate and timely manner so that safe drinking water can be provided immediately.

Recommendations

Long-term recommendations for entities that rely solely on surface water include expansion of alternate water supplies, including fresh and brackish groundwater where available. Emergency recommendations are listed in Table 7-12.

Table 7-12 Recommended Emergency Water Shortage Responses: Surface Water Dependent WUGs

EMERGENCY SHORTAGE	RESPONSES
Insufficient Surface Water Rights	• Purchase surface water. • Highest stage drought restrictions. • Long term: purchase DMI water rights.
Water Treatment Plant Failure	• Interconnects with other systems. • Truck in water. • Highest stage drought restrictions. • Long term: facility improvements, system evaluation, and phased improvement plan.

[1] Taylor, Steve. "Darling: Fish Kill Highlights Need For Rio Grande Emergency Plan" Rio Grande Guardian, March 14, 2014. http://riograndeguardian.com/darling-fish-kill-highlights-need-for-rio-grande-emergency-plan/, accessed April 6, 2015.

EMERGENCY SHORTAGE	RESPONSES
Rio Grande Contamination	• Immediate testing. • Pumping and storage of safe water to any existing storage facilities. • Interconnects with systems that have alternate supplies. • Truck in water. • Emergency communication with boil water or other guidance to customers. • Highest stage drought restrictions. • Long term: emergency response plan including communications, provision of safe water to critical facilities, etc.

7.4.1.2 Sole Source: Groundwater

Utilities that depend exclusively on groundwater tend to be isolated from other sources and other cities. For instance, Hebbronville is over 30 miles from the nearest city, Falfurrias. For entities that are dependent on groundwater, the entities are encouraged to actively monitor water levels in wells, especially in high-demand periods. Water levels can be used to trigger drought responses, and to guide expansion of wellfields or deepening of wells. Additionally, groundwater quality may be an indicator of decreasing availability from a well or wellfield.

Emergency responses for entities that rely solely on groundwater are shown in Table 7-13.

Table 7-13 Recommended Emergency Water Shortage Responses: Groundwater Dependent WUGs

EMERGENCY SHORTAGE	RESPONSES
Insufficient Well Production	• Highest stage drought restrictions. • Deepen wells (if possible). • Interconnects with other systems (if possible). • Truck in water. • Long term: facility improvements, system evaluation, and phased improvement plan.
Water Treatment Plant Failure	• Highest stage drought restrictions. • Interconnects with other systems (if possible). • Truck in water. • Long term: facility improvements, system evaluation, and phased improvement plan.
Groundwater Quality	• Immediate testing. • Highest stage drought restrictions. • Additional emergency treatment (if possible). • Interconnects with other systems (if possible). • Truck in water. • Long term: supply or treatment facility improvements, system evaluation, and phased improvement plan.

7.5 REGION-SPECIFIC DROUGHT RESPONSE RECOMMENDATIONS AND MODEL DROUGHT CONTINGENCY PLANS

The drought response recommendations made for each water source in the following subsections should be considered in the development of drought response preparations. The TCEQ has prepared model DCPs for wholesale and retail water suppliers to provide guidance and suggestions to entities regarding the preparation of DCPs. Not all items in the model will apply to every system's situation, but the overall model can be used as a starting point for most entities. The LRGVRWP suggests that the TCEQ model DCPs be used for entities wishing to develop a new DCP. The TECQ model DCPs and WCPs are included for all WUG types in Appendix E.2. The TCEQ model DCPs can be found on TCEQ's website: (https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency.html)

7.5.1 Amistad-Falcon Reservoir System Drought Response Recommendations

Water supplies from the Amistad-Falcon reservoir system are managed with a unique operating and water rights system, which reserves a significant portion of the reservoir to effectively guarantee DMI water rights and fills irrigation and mining water right accounts as water is available to that storage pool.

This system ensures that, even in the worst recorded drought, a WUG may divert its full annual authorized diversion each year. If a WUG has sufficient water rights to meet its needs, and a reasonable means of delivering the water from the diversion point to the point of need, there should be no issues getting that water in a year similar to the DOR.

Water shortages among municipal WUGs can result from a range of scenarios (discussed in Subsection 7.2.2) including insufficient water rights, issues with water rights account budgeting, delivery issues, and water treatment or storage issues. The primary impact of drought on municipal utilities that rely on the Amistad-Falcon reservoir system is an increase in demands, and not a reduction of supplies.

7.5.1.1 DMI Water Rights Holders

Cities and industrial users in Region M experience drought under the following scenarios, described in Table 7-14 with recommendations specific to each.

Table 7-14 Municipal Shortage Scenarios and Recommendations

SHORTAGE SCENARIO AND TRIGGERS	RECOMMENDED RESPONSES
Insufficient water rights to meet demand. An entity may have sufficient treatment capacity to meet its demands but have insufficient water rights to meet drought year demands. Triggers should be based on useable balance calculations and monthly/weekly demand projections. When the balance of water available for the remainder of the year does not exceed the demand projections by a reasonable margin, severe drought response should be implemented. When the projected demands exceed the balance of water, critical drought response should be implemented.	**Best Practices:** Use of water rights should be managed carefully, and cities should track their useable balance over the year compared with seasonal/monthly demand projections. This will allow a city to implement conservation measures early in the year to stay within its water budget. It is recommended that any city that projects a shortage should purchase water rights when feasible. **Severe Conditions:** Request voluntary municipal and industrial conservation, limit unnecessary municipal usage, consider billing rate incentives for conservation in severe drought periods, and purchase water as it is available. **Critical Conditions:** Implement mandatory municipal and industrial water use restrictions, restrict nonessential municipal water use, consider billing rate incentives for conservation in critical drought periods, and purchase water as it is available.
Water treatment plant capacity. Municipal utilities with sufficient water rights may experience a shortage if, during their peak demand months, the capacity of the WTP is not sufficient to meet permit requirements. Triggers should be based on daily treatment volumes and TCEQ WTP capacity rules. When 85% capacity is reached for three consecutive days, severe drought response should be implemented. When 95% capacity is reached, critical drought response should be implemented.	**Best Practices:** Conservation programs can reduce demands on the WTP. The long-term solution is expansion of WTPs' capacity and interconnections with other facilities. **Severe Conditions:** Request voluntary municipal and industrial conservation, limit unnecessary municipal usage, consider billing rate incentives for conservation in severe drought periods, and utilize emergency interconnects. **Critical Conditions:** Implement mandatory municipal and industrial water use restrictions, restrict nonessential municipal water use, consider billing rate incentives for conservation in critical drought periods, and utilize emergency interconnects.
Push water. Even with sufficient water rights to meet demands and to cover normal delivery losses, some municipalities, especially those who receive surface water from irrigation districts that serve mostly irrigation water users, may need additional water to meet minimum operational requirements in the district conveyance system if irrigation water is curtailed. Triggers should be based on (1) the requirement of irrigation water to deliver DMI water in a given district, (2) the useable balance available to irrigators in the district, and whether those irrigators are on allocation, and (3) the storage capacity available to the utility. Severe drought restrictions should be implemented if stored water is at or within a small margin of the projected demands before the next feasible delivery from the district. Critical drought restrictions should be implemented if water in storage is less than the projected demands before the next feasible delivery from the district.	**Best Practices:** First, utilities should have a clear communication plan in place with the irrigation district that alerts the city when irrigation water users may be put on allocation. This may include a drought trigger associated with Amistad/Falcon reservoir storage levels and the useable balance of irrigation accounts in the district. Second, utilities should evaluate their current conveyance methods to see if there are alternate canals or districts that may be able to serve their systems in the case of a push water shortage. Third, where possible, entities should increase their raw water storage to allow for more time between deliveries that need to be timed to coincide with irrigation deliveries. Last, interconnections and emergency agreements with other utilities and other sources are recommended. **Severe Conditions:** Request voluntary municipal and industrial conservation, limit unnecessary municipal usage, consider billing rate incentives for conservation in severe drought periods, utilize emergency interconnects, and identify water that may be available for purchase as push water. **Critical Conditions:** Implement mandatory municipal and industrial water use restrictions, restrict nonessential municipal water use, consider billing rate incentives for conservation in critical drought periods, utilize emergency interconnects, and identify water that may be available for purchase as push water.

7.5.1.2 Irrigation and Mining Water Rights Holders

Farmers can respond to drought through planning, crop selection, highly efficient operations, and on-farm demand reduction strategies (such as narrow border citrus and drip irrigation). Farmers and irrigation districts should maintain useable balance calculations and monitor reservoir levels to facilitate planning. Selection of crops, in conjunction with available demand reduction strategies, can allow farmers to maximize their yield in years of drought. Crop selection tools that take current costs and market values into account have been made available to farmers in the High Plains and could be updated with information specific to the region.

Cooperation with the irrigation districts to increase the operational and conveyance efficiency could yield a significant amount of water to farmers. This is discussed as a water management strategy in Chapter 5.

Mining water use, including oil and gas drilling, can be decreased by close controls of leaks and spills, on-site reuse, and new technology or approaches that require less water. Because mining water rights are subject to the same decrease in reliability in drought years, mining water users are highly encouraged to identify and implement water conservation measures. Both irrigation and mining water demand can be scaled according to available water, and alternate sources, such as reuse or groundwater, may be used when surface water is scarce.

7.5.2 Groundwater Supply Drought Response Recommendations

Many users in Region M rely on groundwater as their main source of supply. The aquifers and subsections of aquifers within Region M exhibit a broad range of drought response characteristics, which require specific drought triggers and responses to be developed for each situation. In general, groundwater wells may be impacted by increased pumping in the area and by decreasing recharge resulting from drought. Insufficient groundwater or groundwater of acceptable quality may result in a shortage.

For general drought preparedness, wells should regularly be monitored for changing water levels and changes in quality. If required, additional temporary treatment may need to be implemented to meet drinking water standards. It is important to understand what temporary treatment options may be used in the case of a shortage. Additional wells and emergency rehabilitation or deepening of existing wells can help to increase supplies in a shortage.

Under severe conditions, established when supplies may be insufficient to meet demands within 60 days or decrease in well productivity or quality, it is recommended that city utility managers request voluntary municipal and industrial conservation, limit unnecessary municipal usage, consider billing rate incentives for conservation in severe drought periods, and utilize any available emergency interconnects.

Under critical conditions, established when demands are expected to exceed supplies within 30 days, it is recommended that city utility managers implement mandatory municipal and industrial water use restrictions, restrict nonessential municipal water use, consider billing rate incentives for conservation in critical drought periods, and utilize emergency interconnects. In the most extreme cases, trucking in water may be the best alternative to meet immediate needs.

7.6 DROUGHT MANAGEMENT WATER MANAGEMENT STRATEGIES

Drought water management strategies (WMS), such as voluntary or mandatory drought water restrictions, are those which are intended to be implemented only in times of drought. While conservation as a whole may be implemented as a long-term strategy, the ability of a WUG to reduce demands in times of severe water shortage can enable reliable delivery of water at levels that maintain near-term health and safety.

It has been demonstrated across the state that municipal WUGs that focus on reducing discretionary outdoor water use first in response to drought and avoid water use reductions in the commercial and manufacturing use sectors, may find drought management to be economically viable and cost-competitive with other WMS. Drought WMS may be economically viable as an interim strategy to meet near-term needs through demand reduction until such time as economically viable long-term water supplies can be developed. For planning purposes, it is important that a utility understand the amount of demand reduction that can be expected when drought restrictions are put in place.

All WMS are discussed in more detail in Chapter 5.

7.6.1 Drought Management WMS Considered

The drought management WMS that were considered for Region M included conservation strategies intended to reduce demand or reduce losses and the development of new supplies, which is intended to make the region more resilient to drought. Drought management WMS that were evaluated for all possible WUGs include the following:

- Municipal Drought Management. Water demand reductions, by voluntary or mandatory restrictions, were considered for all municipal WUGs with needs in drought years.
- On-Farm Irrigation Conservation. This strategy is categorized as water management practices, land management systems, and on-farm water delivery systems. However, farming practices considered as drought management WMS include water budgeting, fallowing and consolidating available water supplies, crop selection for low water use, and dry year option contracts.

7.6.2 Recommended Drought Management WMS and Triggers

7.6.2.1 Municipal Drought Management WMS

Water demand reductions, by voluntary or mandatory restrictions, were recommended for all municipal WUGs with needs. The RWP is representative of the worst historical drought conditions, and municipal water utilities in Region M and across the state have successfully integrated water demand reduction into their DCPs as a way to respond to drought. Subsection 7.2.2.2 includes examples of drought triggers and responses from municipal water utilities in Region M.

The RWPG has determined that 5 percent demand reduction is an attainable demand reduction for any utility with needs in a drought year. This reduction has been applied to all municipal WUGs with needs.

7.6.2.2 On-Farm Irrigation Conservation

The recommended WMS for on-farm conservation are divided into three categories: water management practices, land management systems, and on-farm water delivery systems. However, farming practices considered as drought management WMS could include water budgeting, fallowing and consolidating available water supplies, crop selection for low water use, and dry year option contracts, which are not specifically included in the on-farm conservation WMS.

Farmers and irrigation districts should maintain useable balance calculations and monitor reservoir levels to facilitate planning. Selection of crops, in conjunction with available demand reduction strategies, can allow farmers to maximize their yield in years of drought. Crop selection tools that take current costs and market values into account have been made available to farmers in the High Plains and could be updated with information specific to the region. Triggers may need to be specific to the irrigation district or the farmer, depending on specific water needs, but should be tied to reservoir levels and water right account balances.

These practices are common and represent the region’s response to unmet needs for irrigated agriculture in previous RWPs. An estimated 10 percent reduction in irrigation water demand is applied to all irrigation WUGs with needs.

7.6.3 Drought Management WMS Not Recommended

An approach to water marketing known as "dry year option contracts" or "water supply option contracts" (WSOC) may reduce the impact on agricultural production while providing drought supplies for other uses. This concept involves temporary transfers of irrigation water to provide secure water supplies to non-agricultural users during droughts. This option would transfer water to other users when needed while preserving the water for agriculture during normal water supply situations. In Texas, WSOC is a practice in the Edwards Aquifer area to provide water for endangered species and San Antonio water users during drought.

The Lower Rio Grande Valley and Region M have some unique institutional, hydrologic, and economic conditions that would need to be addressed to provide seller and buyer incentives to enter into a WSOC. Unlike many other areas of the Western United States, water rights are held by the irrigation districts rather than farmers. Given this and the generally low price of agricultural water, farmers have little incentive to conserve water except in drought and lack the ability to sell water conserved by more efficient irrigation methods or fallowing land such as for WSOC payments. While the potential exists for irrigation districts to enter into a WSOC with another user, irrigation districts would need to work with farmers and pass through exercise payments to make WSOCs feasible from the farmer’s point of view. In addition, with the generally low cost of irrigation district water, the purchase of this water may be the lowest cost to urban providers and other users compared to alternative sources such as desalination or reuse.

Urban demand has the highest priority in drought conditions, and therefore, urban communities may feel little need to have WSOCs unless there is concern about the agricultural community and/or irrigation district welfare. This strategy would require significant legislative changes and is not recommended at this time.

7.7 OTHER CONSIDERATIONS AND RECOMMENDATIONS

7.7.1 Relevant Recommendations from Drought Preparedness Council

In a letter addressed to all the RWPGs of Texas dated August 1, 2019, the Drought Preparedness Council recommended developing region-specific model DCPs for all water use categories that account for more than 10 percent of water demands in any decade over the 50 year planning horizon. As detailed in the TWDB (refer to Table 7-15), irrigation and municipal WUG water use categories for Region M accounted for more than 10 percent of water demands in all projected decades. Therefore, model DCPs have been developed for irrigation and municipal WUG water use categories and are discussed in Subsection 7.2.2.

Table 7-15 2021 WUG Water Demand Project Data and Drought Contingency Plan Selection Criteria by WUG Water User Category (TWDB 2019)

WUG WATER USE CATEGORY	MODEL DROUGHT CONTINGENCY PLAN	2020	2030	2040	2050	2060	2070
PROJECTED DEMANDS (ACRE-FEET./YEAR)							
IRRIGATION	YES	1,426,960	1,381,152	1,335,343	1,289,533	1,243,724	1,197,914
LIVESTOCK	NO	4,748	4,748	4,748	4,748	4,748	4,748
MANUFACTURING	NO	4,305	5,055	5,055	5,055	5,055	5,055
MINING	NO	17,051	16,480	14,952	12,823	10,458	10,361
MUNICIPAL	YES	315,689	373,896	433,312	494,887	558,022	620,040
STEAM ELECTRIC POWER	NO	15,240	15,240	15,240	15,240	15,240	15,240
PROJECTED DEMANDS (%)							
IRRIGATION	YES	80%	77%	74%	71%	68%	65%
LIVESTOCK	NO	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
MANUFACTURING	NO	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%
MINING	NO	1.0%	0.9%	0.8%	0.7%	0.6%	0.6%
MUNICIPAL	YES	18%	21%	24%	27%	30%	34%
STEAM ELECTRIC POWER	NO	0.9%	0.8%	0.8%	0.8%	0.8%	0.8%

7.7.2 Other Drought Management Measures

Livestock water supplies are from both groundwater and surface water in Region M. In a drought scenario, it is important that windmill pumps that fill stock ponds and tanks be used only when needed, rather than allowed to run at all times. Agricultural and livestock demands may be significantly increased in severe drought, which can impact groundwater supplies. In addition to careful management of water supplies, drought relief programs may be pursued to assist with livestock demands in a severe drought, including the emergency Haying and Grazing Program.

7.7.3 Recommendations Regarding the Drought Preparedness Council and State Drought Preparedness Plan

The 2019 Texas Legislature and Governor Abbott greatly expanded the TWDB's role in flood planning and financing. In addition to existing flood programs, the TWDB will be administering new state and regional flood planning process with flood planning regions based on river basins. The regional flood planning process will be developed and initial regional flood planning groups formed by mid-2020; the first regional flood plans will be due in 2023, and the first state flood plan will be due September 1, 2024.

The legislature has allocated funds to collect flood-related data, support river and coastal modeling capabilities, distribute critical flood information, and create a new flood funding program to be administered by the TWDB. The funding program will be designed to make the implementation of drainage and flood projects more affordable for Texas communities and to meet immediate needs for funding. The funding will become available in 2020.

7.7.4 Recommendations Regarding Counteractive Variations in Drought Response Strategies

Unnecessary or counterproductive variations in drought response strategies may impede drought response efforts. Counterproductive examples include entities having different stages, triggers, and responses that may have been counterproductive to the efforts of drought response and negatively impact local resources. Furthermore, municipalities have drought triggers that are set on varying reservoir levels, and if they have municipal water rights, these water rights are not affected by reservoir levels. Setting drought response stages or triggers with respect to the budgeting of water rights rather than reservoir levels could prove to be more beneficial for drought response strategies for entities in the region. In addition, if an entity enacts a drought response faster than other entities, the action complicated connections. Entity coordination of drought response triggers could mitigate some counteractive variations in drought response strategies. Lastly, a measure to assist in mitigating the counterproductive measures associated with push water would be for entities to coordinate the timing of the utilization of push water to decrease excess water used in distribution canals.

FINAL PLAN

CHAPTER 8: POLICY RECOMMENDATIONS AND UNIQUE SITES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
BPUB	Brownsville Public Utilities Board
BRACS	Brackish Resources Aquifer Characterization
IBWC	International Boundary Water Commission
ID	Irrigation District
RGV	Rio Grande Valley
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SB	Senate Bill
SWIFT	State Water Implementation Fund for Texas
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resource Conservation Commission
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
USFWS	US Fish and Wildlife Service
WAC	Watermaster Advisory Committee
WAM	Water Availability Model
WMS	Water Management Strategy

CHAPTER 8: POLICY RECOMMENDATIONS AND UNIQUE SITES

In addition to making recommendations regarding strategies for meeting current and future water needs, Texas Water Development Board (TWDB) rules for Senate Bill (SB) 1 regional planning allow the regional water planning groups (RWPGs) to include recommendations in the regional water plan (RWP) with regard to legislative designation of ecologically unique streams, sites for future reservoir development, and policy issues. The Region M WPG elected to consider recommendations in each of these areas, which are presented in this chapter.

8.1 DESIGNATION OF ECOLOGICALLY UNIQUE STREAM SEGMENTS

TWDB rules for SB 1 regional water planning describe the process by which RWPGs may prepare and submit recommendations for legislative designation of ecologically unique river and stream segments. This process involves the Region M RWPG, the Texas Parks and Wildlife Department (TPWD), the TWDB, and ultimately, the Texas Legislature. According to SB 1, the Rio Grande RWPG may recommend legislative designation of river or stream segments within the region as “ecologically unique.”

TWDB rules provide that the RWPGs forward any recommendations regarding legislative designation of ecologically unique streams to the TPWD and include TPWD’s written evaluation of such recommendations in the adopted RWP. The recommendation of the RWPG is then to be considered by the TWDB for inclusion in the state water plan. Finally, the Texas Legislature will consider any recommendations presented in the state water plan regarding designation of stream segments as ecologically unique.

8.1.1 Criteria for Designation of Ecologically Unique Stream Segments

TWDB rules also specify the following criteria that are to be applied in the evaluation of potential ecologically unique river or stream segments:

Biological Function: Stream segments that display significant overall habitat value, including both quantity and quality, considering the degree of biodiversity, age and uniqueness observed, and including terrestrial, wetland, aquatic, or estuarine habitats;

Hydrologic Function: Stream segments that are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization, or groundwater recharge and discharge;

Riparian Conservation Areas: Stream segments that are fringed by significant areas in public ownership, including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas or other areas held by governmental organizations for conservation purposes, or segments that are fringed by other areas managed for conservation purposes under a governmentally-approved conservation plan;

High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: stream segments and spring resources that are significant because of unique or critical habitats and exceptional aquatic life uses dependent upon or associated with high water quality; and/or

Threatened or Endangered Species/Unique Communities: Sites along streams where water development projects would have significant detrimental effects on state- or federally-listed threatened and endangered species, and sites along segments that are significant because of the presence of unique, exemplary, or unusually extensive natural communities.

8.1.2 Candidate Stream Segments

To assist each of the 16 RWPGs, the TPWD developed a list of candidate stream segments in each region that appear to meet the criteria for designation as ecologically unique. For the Rio Grande Region, TPWD prepared a report entitled Ecologically Significant River and Stream Segments of Region M, Regional Water Planning Area (May 2000), that presents information on four stream segments within the region that meet one or more of the following criteria for designation as ecologically unique:[1]

1. Arroyo Colorado

This tidal segment of the Arroyo Colorado (Texas Natural Resource Conservation Commission [TNRCC] classified segment 2201) runs just upstream of Port of Harlingen to its confluence with Laguna Madre in Willacy/Cameron Counties.

- Biological Function - Priority riparian and extensive freshwater wetland habitats displays significant overall habitat value.
- Riparian Conservation Area - Laguna Atascosa National Wildlife Refuge; Las Palomas Wildlife Management Area.

2. Las Moras Creek

From the confluence with the Rio Grande in Maverick County upstream to the Maverick/Kinney County line.

- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value - Ecoregion stream; high water quality, diverse benthic macroinvertebrate community[2].
- Threatened or Endangered Species/Unique Communities - Proserpine shiner (SOC/St.T)[3].

3. Rio Grande

From the confluence with the Gulf of Mexico in Cameron County upstream to Falcon Dam in Starr County (TNRCC classified stream segments 2301 and 2302).

- Biological Function: Priority bottomland habitat; extensive freshwater and estuarine wetland habitats[4].
- Riparian Conservation Area - Not just one, but nine unique locations in the Rio Grande Valley (RGV). Each site of the World Birding Center has its own attractions for both the first time visitor and expert birder.

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[1] https://tpwd.texas.gov/landwater/water/conservation/water_resources/water_quantity/sigsegs/regionm.phtml.
[2] Bayer, C.W., J.R. Davis, S.R. Twidwell, R. Kleinsasser, G. Linam, K. Mayes, and E. Hornig. 1992. Texas aquatic ecoregion project: an assessment of least disturbed streams (draft). Texas Water Commission, Austin, Texas.
[3] Hubbs, C., R.J. Edwards, and G.P. Garrett. 1991. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. Texas Journal of Science 43: 1-56.
[4] Bauer, J., R. Frye, B. Spain. 1991. A natural resource survey for proposed reservoir sites and selected stream segments in Texas. TPWD, Austin, Texas.

- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value - High water quality and exceptional aquatic life use[5]; diverse benthic macroinvertebrate community[6].
- Threatened or Endangered Species/Unique Communities - Blackfin goby (SOC/St.T)[7]; unique Black Mangrove Series community; unique Texas Palmetto Series habitat[8].

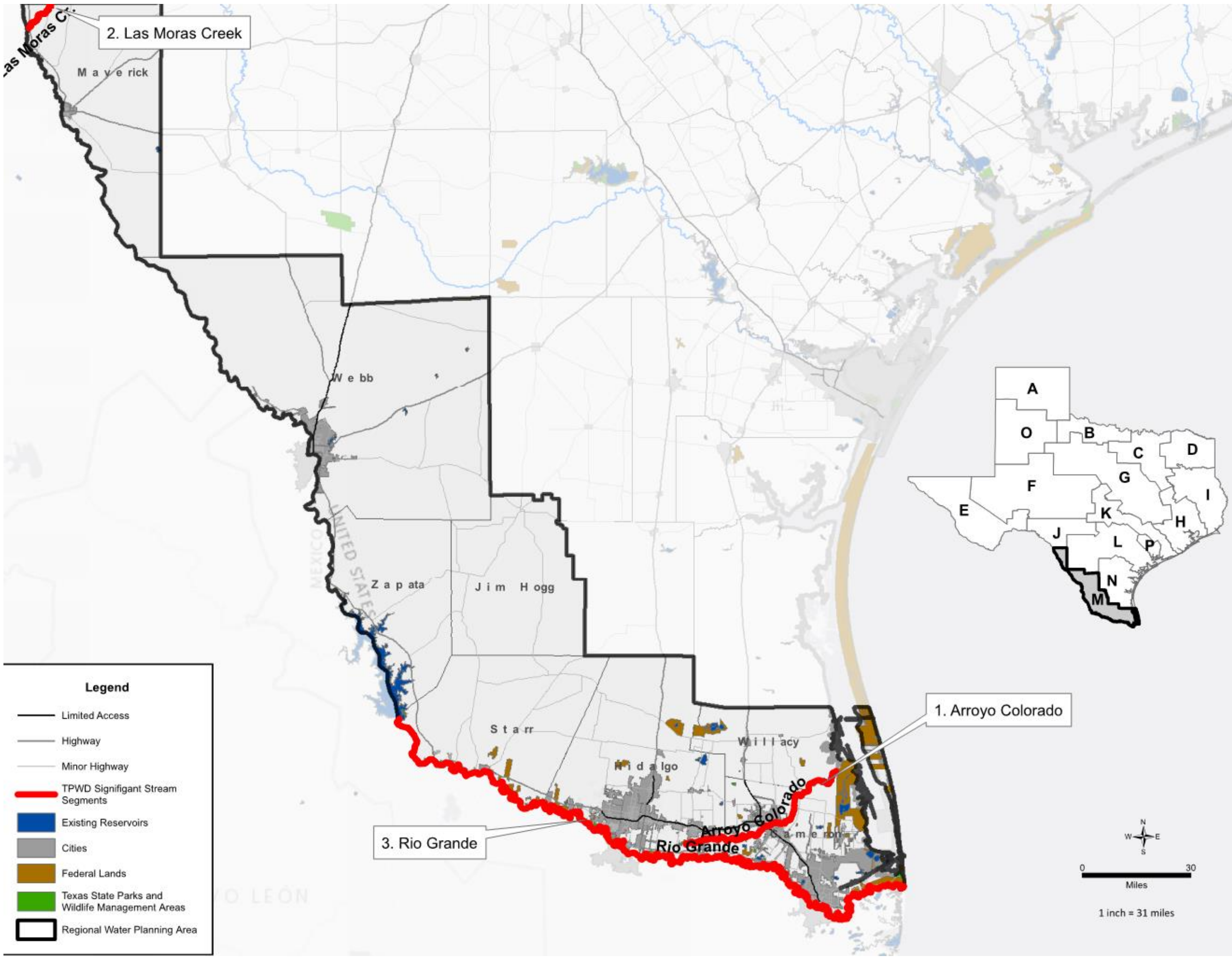

Figure 8-1 TPWD Proposed Ecologically Significant Stream Segments

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[5] TNRCC. 1996. Texas surface water quality standards. TNRCC, Austin, Texas.
[6] Davis, J.R. 1998. Personal communication. TNRCC, Austin, Texas.
[7] Hubbs, C., R.J. Edwards, and G.P. Garrett. 1991. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. Texas Journal of Science 43: 1-56.
[8] Texas Organization for Endangered Species. 1992. Endangered, threatened, and watch list of natural communities of Texas. Texas Organization for Endangered Species, Austin, Texas.

The Rio Grande RWPG also received suggestions from the US Fish & Wildlife Service (USFWS), Zapata County, and the Texas Shrimp Association through two stakeholder focus group meetings during previous planning cycles. The focus group meetings were held in December 1999 and January 2000, and more than 200 individuals representing local, state, and federal agencies, environmental groups, and other parties with a known interest in the subject received written invitations to attend and provide input.

Subsequent to the 2006 plan, a request for additional consideration of unique stream segments was made. An environmental subcommittee to the Region M WPG was formed to look in greater detail at various environmental issues related to WMSs, unique stream segments, and other items affecting environmental considerations. The subcommittee met on several occasions to discuss the unique stream segments on the Rio Grande. The USFWS and the TPWD made formal requests for designation of unique stream segments on the Rio Grande. A workshop was held by the Region M WPG for a presentation by the TPWD on January 25, 2005. No action was taken then. A meeting of the subcommittee was held February 16, 2005, to consider the proposals. A motion was made to accept the designation of the segment of the Rio Grande from the mouth of the Rio Grande upstream to the upstream boundary of the USFWS Tulosa tract. The motion died for a lack of a second. No further appeals for designation of unique stream segments were made in the fourth or fifth cycles of planning.

8.1.3 Recommendation

The Region M WPG reviewed the nominations submitted by TPWD and others with regard to legislative designation of river or stream segments as ecologically unique. The Environmental Subcommittee had no recommendation for the Region M RWPG for inclusion in the plan. Designation would have the advantage of allowing entities to receive federal and state financial assistance for the preservation of lands adjoining these segments. The perceived disadvantage to the Region M RWPG would be that a designation could cause that segment to be more susceptible to such issues as environmental flows and water quality issues upstream of the designation. Lack of action by the Region M RWPG indicates a non-designation of unique stream segments recommendation at this time. It was agreed that the issue could be brought up and considered in the future.

8.2 RESERVOIR SITES

TWDB rules (31 TAC, Section 357.9) for the preparation of regional water supply plans provide that the RWPGs "…may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation and the expected beneficiaries of the water supply to be developed at the site." TWDB rules further specify that the following criteria be applied to determine whether a site is unique for reservoir construction:

- Site-specific reservoir development is recommended as a specific WMS or in an alternative long-term scenario in an adopted RWP; and

- The location, hydrologic, geologic, topographic, water availability, water quality, environmental, cultural, and current development characteristics or other pertinent factors make the site uniquely suited for the following:
  - Reservoir development to provide water supply for the current planning period; or
  - Where it might reasonably be needed to meet needs beyond the 50 year planning period.

The 1944 Treaty states in Article 5, Section II, that three reservoirs should be constructed on the Rio Grande, but one may be omitted: one between Santa Elena Canyon and the mouth of the Pecos (the approximate location of Amistad Reservoir), one in the section between Eagle Pass and Laredo (no existing dam), and one between Laredo and Roma (Falcon Reservoir). Additional sites have been evaluated since the treaty but have not been found geographically or geologically acceptable.

Three reservoir sites have been considered by the Region M RWPG: (1) the proposed Brownsville Weir and Reservoir; (2) the proposed Banco Morales Reservoir; and (3) the proposed Laredo Low Water Weir. Each project is briefly discussed below.

8.2.1 Brownsville Weir and Reservoir

An overview of the proposed Brownsville Weir and Reservoir is provided in Chapter 5 of this plan. The City of Brownsville Public Utilities Board (BPUB) has acquired the required state water right permit and the federal Section 10/404 permit for this project and has obtained federal funding for engineering design and construction. Currently, the BPUB is working with the United States and Mexican sections of the International Boundary and Water Commission (IBWC) to develop an implementation plan for the project, including consideration of ownership, financing, and operational issues. Implementation of the project will require approvals from the IBWC and Mexico. The BPUB is also discussing a partnership with the City of Matamoros for the project whereby the two cities would share in the benefits of the project. There is currently no timetable set for this project.

The Brownsville Weir and Reservoir project is expected to provide approximately 20,000 acre-feet per year (acft/yr) of additional dependable surface water supply for the City of Brownsville. This additional supply will play an important role in meeting Brownsville's projected water supply needs through the planning period. The development of the project is included as a water supply strategy in the first (2001) Rio Grande RWP (Region M) and in the resulting (2002) State Water Plan. The project has continually been included in each ensuing Region M and State Water Plan, including this 2021 Region RWP. Recent discussions with BPUB have noted prioritization of other projects (e.g. Resaca Restoration), which has pushed implementation of the Brownsville Weir and Reservoir to the 2030 decade.

8.2.2 Banco Morales Reservoir

The Banco Morales Reservoir is being proposed by the BPUB as a surface water development project on the Lower Rio Grande in Cameron County. This project is proposed to provide additional dependable water supply for municipal and industrial use for the City of Brownsville by capturing and diverting "excess" flows of US waters in the Rio Grande, as well as storing the city's existing water rights. As it stands now, the excess water is currently allowed to flow through Brownsville and into the Gulf of Mexico. It will now have a chance to be captured and stored and pumped to future users. This project is proposed to meet the future municipal and industrial water needs of the BPUB and the region. Existing municipal and industrial water supply sources for BPUB cannot currently satisfy the anticipated future water needs for the region.

The Banco Morales Reservoir project is expected to provide approximately 1,700 acft/yr of additional dependable surface water supply for the City of Brownsville. The additional supply will play an important role in meeting Brownsville's projected supply needs through the planning period. Similar to the Brownsville Weir and Reservoir above, implementation of the Banco Morales Reservoir has pushed implementation to the 2030 decade.

8.2.3 Laredo Low Water Weir

Laredo has been investigating the feasibility of developing a low water weir on the Rio Grande approximately 200 feet downstream of the existing La Bota site. The project will not develop additional water supply. Rather, the project is proposed to improve water quality, provide a diversion location for a new regional water treatment plant, and provide hydroelectric power. Recreational amenities may also be developed. The proposed structure would be 56 feet high, which would provide a water surface elevation below the 100 year flood plain. The design and operation of the structure would not alter the normal flows of the Rio Grande. The weir would store approximately 66,007 acre-feet (acft) of water. Laredo intends to lease water rights for the initial filling of the reservoir.

At the request of Laredo, the Rio Grande RWPG has endorsed further investigation of the feasibility of the Laredo low water weir and any potential groundwater recharge associated with the weir. This would include more detailed evaluation of project costs, benefits, impacts, and permitting requirements.

8.2.4 Hidalgo County Drainage District Delta Watershed Project

The drainage district has proposed construction of two reservoirs in northeastern Hidalgo County to capture tailwaters and precipitation runoff for beneficial use, discussed in detail in Chapter 5. The Santa Cruz/Lake Edinburg reservoir (425 acres) and the proposed Delta Region Reservoir (350 acres) are both in the Delta Watershed, which is distinct from other portions of the Nueces Rio Grande Watershed, and impact no downstream water rights. Recently established environmental flow requirements for the Nueces Rio Grande basin do not place any limitations on the drainageways that will be impacted by this strategy. These reservoirs will allow for better control and management of flows in the drainage network, and will allow for the drainage district to treat and distribute a portion of the flows for irrigation and as a raw water source for municipal treatment and distribution. The Edinburg reservoir requires construction of a ring dike around a 10 foot depth reservoir. The existing Panchita control structure and associated weir would be raised for the Delta Reservoir, which is also proposed to be 10-feet deep.

8.2.5 United Irrigation District Off-Channel Reservoir

A storage reservoir is nearing completion (as of January 2020) between the pump station at the Rio Grande and the first pump station within the United Irrigation District (ID) canal network, which would have a 640 acft storage capacity, as opposed to the estimated 80 acft capacity that was previously available in the main canal. This allows for general operational improvements within the district but will also yield an estimated additional 2,000 acft of supply in a drought of record scenario without any additional water rights. This reservoir will allow United ID to better meet the needs of Region M over the planning horizon and beyond.

8.2.6 Recommendations

The Brownsville-Matamoros Weir and Reservoir has been considered a recommended alternative on the basis of cost, yield, and permitting concerns. The Laredo Low Water Weir may have considerable value as a flood control mechanism but does not meet the requirements to be recommended in the plan because it does not provide an increase in supply. The Banco Morales Reservoir and the United Off-Channel Reservoir have all been recommended by the RWPG. The Delta Watershed Project reservoirs are being reevaluated for next cycle.

None of these sites are recommended as unique reservoir sites.

8.3 LEGISLATIVE RECOMMENDATIONS

TWDB rules provide that RWPs may include "regulatory, administrative, or legislative recommendations that the regional WPG believes are needed and desirable to facilitate the orderly development, management, and conservation of water resources and preparation for and response to drought conditions…." [31 TAC 357.7(a)(10)]

8.3.1 Recommendations on State Issues

1. The RWPG recommends continued evaluation of the connection between the pumping of groundwater and its impact on surface water, specifically the impact of pumping groundwater in the Pecos and Devils River watersheds on the flows into the Rio Grande. For example, current studies indicate that up to one-third of the recharge flows into Amistad Reservoir depend on flow from the Pecos and Devils River valleys and Goodenough Springs, which are shown to be sensitive to groundwater pumping.[9] There is not a Groundwater Conservation District (GWCD) in the area, which could provide a mechanism for local management of these interconnected resources. The RWPG recommends enforcement of current laws and consideration of new laws establishing rules for permitting that acknowledge the impact of groundwater development on surface water.

2. The Lower RGV farmers, as a result of the uncertainty of surface water delivery and the fact that most farmers do not own their own Rio Grande water rights, are limited in their ability to provide collateral for loans for on-farm conservation and improvements. This makes many of the loan programs currently available to farmers in other regions of Texas difficult for farmers in the RGV to access. Additionally, in many cases the types of irrigation conservation measures used in the RGV are installed underground as opposed to aboveground equipment like center pivots used in the High Plains. The TWDB and the State of Texas should work with farmers in the region to develop loan programs that enable on farm water conservation specific to this region.

3. There is not a mechanism or entity in the RGV to accept on-farm irrigation conservation loans from the TWDB and to lend those funds to farmers for on-farm water conservation.

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[9] Green, R.T. & Fratesi, B. & Toll, N. & Bertetti, F. Paul & Nunu, R. (2019). Devils River watershed: Southern Edwards-Trinity Aquifer. 10.1130/2019.1215 (08).

4. Stakeholders who depend on the water of the Rio Grande should be involved and informed of state activities related to negotiations with Mexico regarding implementation of the 1944 Treaty.

5. Recent droughts make it imperative that the Rio Grande Water Availability Model (WAM) is continually updated. The naturalized flow record in the current Rio Grande WAM extends from 1940 through 2000. The period from 1999 to 2000 was among the most severe modeled droughts, and the drought that continued into 2003 is likely a new drought of record, which could significantly impact water availability, as the basis for planning. The state should fully fund the revision and update to the WAM to extend the naturalized flows using the most current data available.

6. The State should continue to consider the impacts of climate change in terms of Regional Water Planning and future water supplies. The US Bureau of Reclamation's Lower Rio Grande Basin Study evaluated climate impacts on the availability, which should be considered in future planning efforts.

7. The State should encourage IBWC to give Mexico delivery credit of the annual minimum 350,000 acft from only the named tributaries as stipulated in the 1944 Treaty during a five (5) year cycle or as provided in Minute No. 234 of the IBWC dated December 2, 1969.

8. The State should assist in finding new technical and financial resources to help the region combat Arundo Donax, aquatic weeds, and salt cedar and thus protect its water supplies. The Region M RWPG encourages funding for projects aimed at eradicating Arundo Donax, aquatic weeds, and salt cedar in the Rio Grande watershed and for ongoing long-term brush management activities. The USDA has studied and implemented a biological controls program with costs and quantified water savings, and continued work and monitoring is recommended WMS in this Plan.[10]

9. The State should continue providing technical and financial resources to fully develop the regional groundwater availability models. The Brackish Resources Aquifer Characterization (BRACS) 2014 report for the Lower RVG is an essential resource as brackish groundwater desalination continues to be one of the recommended strategies to meet future needs.[11]

10. The Texas Commission on Environmental Quality (TCEQ) should work with the Rio Grande RWPG to review rules on converting water rights from one use to another and considers appropriate rule amendments, if necessary. As water rights are converted from irrigation to municipal and the WAM is updated, it is recommended that the conversion factor rule and operational rules should be reevaluated. These conversions may have the effect of reducing the water volume demand on the Rio Grande making the reservoir system less efficient. In this regard it is noted that the conversion rule is an administrative rule in that it was not required in the court adjudication in the Valley Water Suit Judgement or in the adjudication case covering the Middle Rio Grande.

[10] Goolsby, John. Biological Control of Arundo Donax; and invasive weed of the Rio Grande Basin. USDA, 2007.
[11] Meyer, John E. Brackish Groundwater in the Gulf Coast Aquifer, Lower RGV, Texas, September 2014. TWDB.

11. The RWPG encourages entities within the region to cooperate to resolve water issues through such means as regional water and wastewater utilities. The Rio Grande Regional Water Authority, Southmost Regional Water Authority, and other entities have pursued and, in some cases, constructed regional projects that supply water to multiple cities.

12. The formation of GWCDs should be encouraged as a means to protect groundwater supplies, which are increasingly being tapped as a new water supply for municipal, industrial use, and mining use. As the aquifers in Region M are more extensively developed, the impact of pumping has started to be seen in spring flows and drawdown Region M supports new and expanded groundwater districts to protect the regional groundwater resources, and recommends that the state provide continued technical assistance regarding formation, structure, and technical basis for GCDs to operate meaningfully.

13. The State should appropriate sufficient funds to the Texas Railroad Commission to allow for capping abandoned oil and gas wells that threaten groundwater supplies.

14. The Texas Legislature should continue to provide technical and financial assistance to implement WMSs identified in the regional water plans. In 2013 the Texas legislature passed House Bill 4 and Senate Joint Resolution 1, which created the State Water Implementation Fund for Texas (SWIFT) and the State Water Implementation Revenue Fund for Texas. Companion legislation, House Bill 1025, provided $2 billion in initial funding for SWIFT from the state's Economic Stabilization Fund. In November of 2013, Texas voters approved the funding to support the implementation of projects recommended by the State Water Plan.

15. The Texas legislature should appropriate funds to continue the regional water planning process.

16. Educational programs for farmers, ID Boards of Directors, and ID employees are recommended and should be supported by the TWDB, TCEQ, and universities in Texas.

17. The Rio Grande Center for Ag Water Efficiency (Texas AWE) flowmeter demonstration and calibration facility is intended to be available as an educational, testing, and calibration resource for districts looking to implement or expand their metering programs. Continued funding and expanded use of these facilities is recommended by the Region M WPG.

18. Continued evaluation of ID infrastructure is recommended, including the work that has been done by Texas A&M University through the Texas Water Resource Institute and the ID Engineering and Assistance Program. This program has assisted districts in mapping and evaluating the current state of their conveyance systems and rates of urbanization. These measures can assist districts in prioritizing improvements so that the greatest gains are made with the least cost.

19. Since the Watermaster program collects funds through assessed fees, it is recommended that the fund balances be rolled over into the operating budget for the next fiscal year. It is also recommended that the Watermaster Advisory Committee (WAC) continue to oversee the Watermaster budget.

20. It is recommended that the United States be officially recognized as a water user by Mexico and allocate water to the United States as a part of its annual water allocation process.

8.3.2 Recommendations on Federal and International Issues

1. The State of Texas, the US Congress, and the IBWC should renew efforts to ensure that Mexico complies with Minute 309 and set in place means to achieve full compliance with the 1944 Treaty, including enforcement of Minute 234, which addresses the actions required of Mexico to completely eliminate water delivery deficits within specified treaty cycles. Water saved in irrigation conservation projects in Mexico should be dedicated to ensure deliveries to the Rio Grande pursuant to the 1944 Treaty under Article 4B(c) and Minute 309.

2. The United States and Mexico should reinforce the powers and duties of both sections of the IBWC pursuant to Article 24(c) which provides, among other things, for the enforcement of the Treaty and other agreement provisions that "… each Commissioner shall invoke when necessary the jurisdiction of the Courts or other appropriate agencies of his Country to aid in the execution and enforcement of these powers and duties."

3. Projects funded by national and international agencies to modernize and improve the facilities of IDs in the Rio Grande Basin should be supported and given priority. In particular, both countries should support continued grant funding for conservation projects and projects that protect water quality.

4. The conservation irrigation projects are authorized through the Bureau of Reclamation for improvement to the irrigation systems of IDs in the Rio Grande Basin in the United States should be supported, and the US Congress should be encouraged to appropriate money to pay for approved projects.

5. For purposes of clarity, the IBWC should approve a Minute setting out the definition of "extraordinary drought" as that term is implicitly defined in the second subparagraph of Article 4B(d) as an event that makes it difficult for Mexico " … to make available the run-off of 350,000 acre feet (431,721,000 cubic meters) annually." A drought condition occurs when there is less than 1,050,000 acft annually of runoff waters in the watersheds of the named Mexican tributaries in the 1944 Treaty, measured as water enters the Rio Grande from the named tributaries, of which the US 1/3 share is 350,000 acft. For better water management in the Lower Reach of the Rio Grande, downstream of Anzalduas Dam, both countries should reaffirm operational policies that Mexico continue to take its share of waters through the Anzalduas canal diversion at the Anzalduas Dam or account for its water at that point, including any diversions by Mexico from the proposed Brownsville Weir Project storage, to the extent of its participation in the project and at other points of diversion by Mexico users downstream of Anzalduas Dam.

6. IBWC should convene a binational meeting of water planners and water use stakeholders in both countries within six months following completion of the annual water accounting where an annual deficit in flows from the named Mexican tributaries in the 1944 Treaty occurs. This meeting would be designed to share data and information useful in planning for water needs and contingencies in the intermediate future.

7. IBWC should restore the Rio Grande below Fort Quitman, Texas.

8. The IBWC should assume all local and regional financial responsibility for upkeep and maintenance of El Morillo Drain.

9. IBWC should coordinate bilateral efforts to review and evaluate existing sources of data regarding groundwater development in both countries in the Rio Grande Basin below Fort Quitman to the Gulf of Mexico. This effort should be focused on the potential impact on surface water supply in the Rio Grande watershed, with the goal of pursing such actions as may be necessary to evaluate present conditions and promote programs protecting the historical surface water supply in affected regions.
10. Regional watershed planning should be encouraged on both sides of the Rio Grande throughout the basin, including efforts to promote binational coordination of long-range water plans and watershed-based plans designed to protect water quality in the river.
11. Interstate compacts between affected states in Mexico, similar to the Rio Grande compact and Pecos River compact between affected states in the United States, which deal with apportionment of available water supply from the Rio Grande and its tributaries to each state consistent with existing domestic and international law, should be encouraged.
12. The Rio Grande RWPG joins with the far West Texas and Plateau RWPGs to encourage funding for projects aimed at eradicating Arundo Donax, salt cedar, and aquatic weeds in the Rio Grande watershed and for ongoing long-term brush management activities. These activities are not constrained to state or national boundaries and would benefit from widespread support.
13. The Rio Grande RWPG supports US Congressional legislation that authorizes the US State Department to report to Congress periodically on the status of Mexico's deliveries of water to the Rio Grande for US use.
14. The IBWC should give Mexico delivery credit of the annual minimum 350,000 acft from only the named tributaries as stipulated in the 1944 Treaty during a five (5) year cycle or as provided in Minute No. 234 of the IBWC dated December 2, 1969.
15. The El Morillo drain system does not currently convey the design flow; the pump station is capable of operating at the design flow, but the channel is not currently capable of conveying the full design flow. The RWPG recommends that the IBWC and CILA make the necessary improvements to convey the design flow.
16. The Rio Grande RWPG supports binational efforts to improve and protect water quality in the Rio Grande. Efforts such as the Lower Rio Grande Water Quality Initiative should be continued and supported through grant funding or other discretionary state of federal funding.

8.3.3 Issues Identified in Previous Planning Cycles

In the second round of regional water planning, the TWDB emphasized "input from RWPGs for the policy portion of the 2011 State Water Plan" (Memo from William Mullican, then Deputy Executive Administrator, Office of Planning, July 2, 2003). The Board disseminated an "Initial List of Policy Topics" as a catalyst for discussion among the planning groups. In September 2003, Rio Grande RWPG members ranked each issue on the list as to level of importance in the region's water planning efforts ("not at all important," "somewhat important," "important," and "extremely important").

The policy issues receiving top rankings from Rio Grande RWPG members fell into the following four major categories:

A. International Compliance with the 1944 Treaty.

B. Competing Water Demands Between Agricultural and Municipal Interests:

   i. Sustainable growth, including impacts of growth.

   ii. Assessment of the current water resources regulatory system to meet water management needs of the 21st century.

   iii. Impacts on water supply and quality resulting from conversion of agricultural lands to urban lands.

   iv. Protecting agricultural and rural water supplies, considering economic constraints and competing purposes.

   v. Conservation of agricultural water for additional agricultural use, urban use, or for environmental purposes.

C. Alternative Water Supply/Water Quality:

   i. Integrating water quality and water supply considerations.

   ii. Watershed planning/source water protection.

   iii. Sustainability and groundwater management.

D. Technical and Financial Resources:

   i. State participation.

   ii. Potential funding sources for water supply.

   iii. Retail customer water pricing.

   iv. Incentives for planning implementation.

   v. Improving groundwater availability data.

   vi. Education.

The Rio Grande RWPG also approved a resolution encouraging the formation of GWCDs and greater oversight by sales of groundwater produced from State-owned lands. The group also approved motions supporting the following:

- Capping abandoned oil and gas wells;
- Improving the stretch of the Rio Grande known as the “Forgotten River,” which has a significant amount of salt cedar without defined bed and banks. The water flowing downstream in this area, which could be put to beneficial use downstream, is spread over a large area and experiences high loss rates;
- Identifying and eradicating growing stands of salt cedar;
- Continue efforts to control and manage Arundo; and
- Supporting ongoing Valley Water Summits.

The Rio Grande RWPG continues to believe that these issues are tightly interconnected and that they cannot be discussed, much less resolved, in a vacuum.

Many of the issues and needs of the region arise from the fact that the Rio Grande is an international river whose waters are shared by the United States and Mexico. No other regional water planning area faces this reality. Water right holders in Texas lack any ready recourse to compel Mexico to observe the 1944 Treaty that apportions inflows between the countries. In addition, international protocols impact efforts to address water quality and resolve problems created by aquatic weeds, such as hydrilla and water hyacinth, and other invasive species, including salt cedar.

Currently, Mexico is in a deficit in the current five (5) year cycle under the 1944 Treaty, and there are no enforcement mechanisms for preventing similar situations in the future.

Because of the unique way in which water rights are prioritized along the Rio Grande, the Mexican water debt has first and foremost directly impacted agricultural interests. However, repercussions from the debt also have affected municipal and industrial users. With the few exceptions of the BPUB, Laguna Madre Water District (serving Port Isabel, South Padre Island, and Laguna Vista) and the City of Laredo, municipal users of surface water depend on IDs to pump and convey water supplies to their treatment plants. When irrigation flows are curtailed, municipalities must either find new ways to push raw water or turn to alternative sources.

Brackish groundwater resources have become a viable alternative for municipal suppliers, especially those located at a distance from the Rio Grande. Improvements in desalination technology, coupled with the cost of surface water rights, are making groundwater desalination an economical and reliable option. However, there is limited information about the quality and quantity of groundwater supplies in the region (this has been partially addressed by the BRACS study in the LRGV). Furthermore, groundwater in certain parts of the region is threatened by abandoned uncapped oil and gas wells.

IDs are also looking to new technology and improved processes to minimize conveyance and evaporation losses attributable to an aging infrastructure. Districts do not have ready access to low-cost loans that are readily available to municipal suppliers. Several districts have secured funding from the North American Development Bank and the US Bureau of Reclamation, but others cannot meet the local match requirements. Funding from the North American Development Bank is no longer available, and mechanisms for funding are in need of development.

The water debt has created both challenges and opportunities for municipal and irrigation users to work together. The Rio Grande RWPG has supported initiatives such as the Valley Water Summits that bring different interests together to share problems and jointly create solutions.

The WAC also has proven to be an effective forum for addressing issues. Subsequent to the first planning cycle, the committee developed a rule change that freed up water in storage for irrigation use with no detriment to municipal supplies. Operations of the Rio Grande Watermaster are paid entirely by fees levied on water right holders. However, appropriations to the Watermaster are capped at a level that is significantly lower than revenues. This limits the ability of the office to provide services to meet changing needs.

Particular attention should be directed to rules pertaining to water rights. Currently, when the intended use of irrigation water rights is changed to municipal and industrial use, a conversion factor provided in 30 TAC § 303.43 is applied so that the municipal use after conversion will receive a "definite quantity of water in acre-feet per annum." This rule is consistent with the treatment of certain municipal, industrial, and domestic allocations approved in the Final Judgment of the Valley Water Suit, which provided for a reserve of 60,000 acft/yr to be held for domestic use and use by cities to support these allocations. This reserve was increased to 225,000 acft/yr, under a conversion rule adopted by the then Texas Water Rights Commission on July 2, 1986, following the conclusion of the Middle Rio Grande Adjudication. Information developed through the WAM and as part of the regional planning process would indicate that this practice should be reviewed with respect to long-term water management practices on the Lower and Middle Rio Grande downstream from Amistad Reservoir. Additional studies are required to analyze the long-term impact of reducing authorized municipal and industrial reserves on two fronts: (1) providing a defined entitlement and (2) promoting water conservation in both Amistad and Falcon Reservoirs.

Finally, international attention also could enhance water quality as well as safety. The funding from the United States is shared between the US section of IBWC and Cameron, Hidalgo, and Willacy Counties. Lower valley water interests were responsible for a significant portion of the construction and upkeep of El Morillo Drain, built in 1969 to divert salty water from the Rio Grande. The Rio Grande RWPG supports shared responsibility between the United States and Mexican sections of IBWC for the maintenance of El Morillo Drain.

FINAL PLAN

CHAPTER 9: INFRASTRUCTURE FINANCING ANALYSIS

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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List of Abbreviations

IFR	Infrastructure Financing Report
RWP	Regional Water Plans
RWPG	Regional Water Planning Group
TWDB	Texas Water Development Board
WMS	Water Management Strategies
WUG	Water User Group

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CHAPTER 9: INFRASTRUCTURE FINANCING ANALYSIS

9.1 INTRODUCTION

The infrastructure financing analysis is important to ensure that entities can receive funding to meet their water needs. Senate Bill 2 of the 77th Texas Legislature incorporated the Infrastructure Financing Report (IFR) requirement into the regional water planning process. For purposes of the IFR, each regional water planning group (RWPG) is required to determine proposed financing for all the water management strategies (WMSs) with capital costs that were proposed in this round of planning. For each of these strategies, the RWPG must determine the funding needed to implement the strategy and what types of funding are likely to be accessed.

According to Texas Water Development Board (TWDB) guidelines, the primary objectives of the IFR are to determine the following:

- The number of entities with identified needs for additional water supplies that will be unable to pay for their water infrastructure needs without outside financial assistance;
- How much of the infrastructure costs in the Regional Water Plans (RWPs) cannot be paid for solely through local utility revenue sources;
- The financing options proposed by entities to meet future water infrastructure needs (including the identification of any state funding sources considered); and
- What role(s) the RWPGs propose for the state in financing the recommended water supply projects.

The TWDB provided the RWPGs with an IFR survey used to obtain information about each water user group (WUG) entity's plan to finance the WMS recommended for them in the 2021 RWP.

The tabulated survey results are presented in Appendix F.

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CHAPTER 10: PUBLIC PARTICIPATION AND PLAN ADOPTION

Rio Grande Regional Water Plan

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List of Abbreviations

BMP	Best Management Practice
ID	Irrigation District
IPP	Initially Prepared Plan
LRGVDC	Lower Rio Grande Valley Development Council
RGRWA	Rio Grande Regional Water Authority
RWPG	Regional Water Planning Group
RGRWPG	Rio Grande Regional Water Planning Group
SWIFT	State Water Implementation Fund of Texas
TAC	Texas Administrative Code
TSSWCB	Texas State Soil and Water Conservation Board
TWDB	Texas Water Development Board
WQMPP	Water Quality Management Plan Program
WSC	Water Supply Corporation
WUG	Water User Group
WWP	Wholesale Water Provider

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CHAPTER 10: PUBLIC PARTICIPATION AND PLAN ADOPTION

10.1 PUBLIC PARTICIPATION

Public participation is the basis of the regional water planning process initiated by Senate Bill 2 in 1997. Under Texas Water Development Board (TWDB) rules laid out in 31 Texas Administrative Code (TAC) §357, regional water planning groups (RWPGs) must include a broad cross-section of stakeholder groups representing communities throughout the region. Voting members of the Rio Grande RWPG as of January 27, 2020, are listed in Table 10-1.

New to the Regional Water Planning process this cycle, beginning in 2019 were the adoptions of the Open Meetings Act[1] and Public Information Act[2], which require members of governmental bodies to participate in education training and open records training pursuant to Sections 551.005 and 552.012 of the Texas Government Code, respectively. These Acts in conjunction determine how open meetings are operated and public information is made available to the public. More information can be found on the Office of the Texas Attorney General website (https://www.texasattorneygeneral.gov/). As described above, the RGRWPG has routinely abided by such open forums and information prior to the adoption of these acts and has been able to appropriately incorporate the requirements. The RGRWPG met all requirements under the Texas Open Meetings Act and Public Information Act in accordance with Title 31 of the Texas Administrative Code (31 TAC) Sections 357.12, 357.21, and 357.50(f).

TWDB rules require RWPGs to have at least one meeting prior to preparation of the regional water plan, provide ongoing opportunities for public participation during the planning process, and hold at least one public hearing prior to adoption of the initially prepared regional water plan (IPP). The RWPGs are also required to comply with TWDB rules specifying how and to whom notice of public meetings and public hearings is to be provided.

The Rio Grande RWPG (RGRWPG) has gone well beyond minimum requirements set by the state for public participation, providing multiple opportunities for public input and for direct participation in the planning process and development of the draft plan. The group also identified key groups of stakeholders that represent utilities, irrigation districts (IDs), farmers, and environmental organizations, beyond the individual stakeholders on the planning group, that have participated in development of the plan. The RGRWPG held regular meetings throughout the planning process, generally on a monthly basis. Each meeting provided opportunity for public comment. Meeting schedules, agendas, and minutes were emailed to the planning group and posted on the Region M website, and the meeting dates were listed on the TWDB website. The Rio Grande RWPG's website: www.RioGrandeWaterPlan.org, is a resource for the public on issues of concern to regional water planning and information on the planning process.

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[1] Office of the Texas Attorney General. "Open Meetings Act". https://www.texasattorneygeneral.gov/open-government/open-meetings-act-training.

[2] Office of the Texas Attorney General. "Public Information Act". https://www.texasattorneygeneral.gov/open-government/governmental-bodies/pia-and-oma-training-resources/public-information-act-training.

Table 10-1 Voting Members of the Region M Planning Group

INTEREST	NAME	RESIDENT COUNTY
Public	Tomas Rodriguez, Chairman* Laredo	Webb
Counties	Joe Rathmell County Judge, Zapata	Zapata
	David L. Fuentes Precinct 1 Commissioner, Weslaco	Hidalgo
Municipalities	Jorge Flores Eagle Pass Water Works, Eagle Pass	Maverick
	John Bruciak Brownsville Public Utility Board, Brownsville	Cameron
	Riazul Mia City of Laredo	Webb
Industries	Donald K. McGhee, Secretary* Hydro Systems, Inc., Harlingen	Cameron
Agriculture	Neal Wilkins, Ph.D. East Wildlife Foundation	Jim Hogg
	Dale Murden Texas Citrus Mutual, Mission	Hidalgo
Environmental	Jaime Flores The Arroyo Colorado Watershed	Hidalgo
Small Business	Carlos Garza AEC Engineering, LLC, Edinburg	Hidalgo
	Nick Benavides* Nick Benavides Co.	Webb
River Authorities	Mayor Jim Darling Rio Grande Regional Water Authority (RGRWA)	Hidalgo
Water Districts	Sonny Hinojosa, Vice-Chairman* Hidalgo County ID No. 2, San Juan	Hidalgo

INTEREST	NAME	RESIDENT COUNTY
	Tom McLemore	Cameron
	Harlingen ID	
Water Utilities	Dennis Goldsberry	Hidalgo
	North Alamo Water Supply Corporation (WSC)	
Groundwater Management Area	Armando Vela	Hidalgo
	Red Sands Groundwater Conservation District	
Other	Glenn Jarvis	Hidalgo
	Attorney, McAllen	
	Frank Schuster*	Hidalgo
	Val Verde Vegetable Co.	
Electric Generating Utilities	Vacant	VACANT
*Executive Committee		

10.1.1 Public Hearings and Responses to Comments on Initially Prepared Plan

This IPP was approved and certified for submittal by the voting members of the RGRWPG at the regularly scheduled meeting on February 5, 2020. The approved IPP was submitted to the TWDB and made available for review and comment on March 3, 2020. Hardcopies and electronic versions of the IPP were made available to county clerks and public libraries throughout the region and on the internet. The RGRWPG provided extensive notice of and opportunity for public comment on the IPP. As required by TWDB rule, copies of the draft plan were placed in at least one public library in each county within the regional planning area as well as in the office of the county clerk in each county within the regional planning area (Table 10-2). Copies also were placed at the offices of councils of governments in the region, including the Lower Rio Grande Valley Development Council (LRGVDC) and the RGRWA.

Table 10-2 Locations of Public Posting for the Initially Prepared Plan

COUNTY	LOCATION
Cameron	Cameron County Clerk's Office, 964 E. Harrison, Brownsville, TX 78520
	Brownsville Public Library, 2600 Central Blvd., Brownsville, TX 78520
Hidalgo	Hidalgo County Clerk's Office, 100 N. Closner, Edinburg, TX 78539
	McAllen Public Library, 4001 N. 23rd St., McAllen, TX 78504
Jim Hogg	Jim Hogg County Clerk's Office, 102 E. Tilley, Hebbronville, TX 78361
	Jim Hogg County Library, 210 N. Smith, Hebbronville, TX 78361
Maverick	Maverick County Clerk's Office, 500 Quarry St., Suite 2, Eagle Pass, TX 78852

COUNTY	LOCATION
	Eagle Pass Public Library, 589 E. Main St., Eagle Pass, TX 78852
Starr	Starr County Clerk's Office, 401 N. Britton Ave., Room 201, Rio Grande City, TX 78582
	Rio Grande City Public Library, 591 E. Canales, Rio Grande City, TX 78582
Webb	Webb County Clerk's Office, 1110 Victoria St., Suite 201, Laredo, TX 78040
	Laredo Public Library, 1120 E. Calton St., Laredo, TX 78041
Willacy	Willacy County Clerk's Office, 576 W. Main St., Raymondville, TX 78580
	Reber Memorial Library, 193 N. 4th, Raymondville, TX 78580
Zapata	Zapata County Clerk's Office, 200 E. 7th Ave., Suite 138, Zapata, TX 78076
	Zapata County Library, 901 Kennedy St., Zapata, TX 78076

Beginning in mid-March 2020, the COVID-19 pandemic prompted local and state-wide stay-at-home orders in order to slow the spread of the novel coronavirus. On March 16, 2020, the Texas Governor granted the Office of the Attorney General's request for temporary suspension of certain open-meeting statutes to allow for telephonic or videoconference meetings of governmental bodies that are accessible to the public. The TWDB recommended that RWPGs hold virtual public hearings, as resources allow. In response to these developments, the RGRWPG held a virtual public hearing via GoToMeeting on the originally-scheduled date of May 6, 2020. A total of two oral comments were received during the public hearing.

During this transition, the RGRWPG and its consultant team actively solicited comments from local entities on the basic data used to develop the plan as follows via TWDB provided water infrastructure financing and supplemental information surveys. These surveys were e-mailed to each water user group (WUG) in June 2020, with follow-up phone calls with each entity. The infrastructure survey was intended to determine the capability to pay for WMSs listed in the plan. The supplemental information survey collected input from the WUGs related to water supply issues and their strategies to solve long-term water shortages. Additionally, members of the consultant team also made several presentations to a variety of groups with an interest in water planning, including water utility associations, citrus growers, the RGRWA, and the Lower Rio Grande Valley Water District Managers Association.

Written comments regarding the IPP were accepted from the public through July 5, 2020, and from other state and federal agencies through August 19, 2020. One comment letter was received by the Texas State Soil and Water Conservation Board (TSSWCB) on June 18, 2020. The TSSWCB signified the importance of implementing best management practices (BMPs) and the TSSWCB Water Quality Management Plan Program (WQMPP) to ensure adequate supplies, provide technical and financial assistance, and protection of natural resources in Region M. The TWDB provided comments on June 15, 2020 and were addressed and incorporated through the finalization of the RGRWP. TWDB, agency, and public comments and responses are included in Appendix G.

10.1.2 Final Regional Water Plan Adoption

The 2021 RGRWP was certified complete and adopted by a majority vote of the RGRWP on October 7, 2020, and submitted to the TWDB on November 4, 2020, for approval and integration into the 2022 State Water Plan.

10.2 FACILITATION OF THE REGIONAL WATER PLANNING PROCESS

Facilitation of the regional water planning process for the Rio Grande Region has been provided by the staff of the LRGVDC. In addition to performing administrative duties relating to the management of state funds, the LRGVDC made all arrangements for meetings of the Rio Grande RWPG, which included posting required meeting notices, preparing meeting agendas, and distributing agenda backup materials to members of the RWPG. The LRGVDC recorded all Rio Grande RWPG meetings and prepared the official meeting minutes.

10.3 PLAN IMPLEMENTATION ISSUES

A number of key issues will affect whether this plan is successful in achieving its primary purpose – to provide recommendations regarding strategies for meeting the near and long-term water needs of the Rio Grande Region. Many of these issues are identified and discussed in previous chapters, particularly in association with recommended WMSs and policy issues. Some of the key issues to implementation are discussed in the following subsections.

10.3.1 Additional Planning Studies

The recommendations presented in this regional water plan are based on planning-level evaluation of projected water demands, water supply, needs, and strategies for meeting future needs. It is important to note that additional, more detailed feasibility evaluations will be necessary before most recommended strategies are implemented. In many cases, feasibility evaluations will need to be followed by engineering design, permitting, environmental impacts assessment, and opportunities for public input. Additional planning and project development activities required for strategy implementation will be the responsibility of project sponsors, often with state and/or federal technical and financial assistance.

10.3.2 Local Water Supply Planning and Implementation

This regional water plan is best viewed as providing a framework for local action to implement strategies for meeting future water needs and assist the state in developing the State Water Plan. Implementation of strategies recommended for meeting future water needs is a primary responsibility of local water suppliers, which include cities, WSCs, other public water supply entities, and IDs. With or without outside assistance, more detailed feasibility-level planning studies and engineering design is largely the responsibility of local water suppliers. Similarly, the costs of implementing water conservation and water supply strategies will be borne largely by the ratepayers served by local water suppliers. It is therefore essential that there be a strong commitment on the part of the governing bodies and management of local water suppliers to implement the strategies recommended in this plan.

Locally, there has been a great deal of progress with stakeholders working together. The Region M planning group highly recommends that this continue to aid in the implementation of water strategies throughout the region. Of key importance is the re-creation of the RGRWA, which has statutory authority to investigate, plan, acquire, construct, maintain, or operate any property the authority considers necessary or proper for the accomplishment of the purposes of the authority, including water treatment, wastewater treatment, water conveyance, and desalination of water. The RGRWA encompasses many of the same counties in the Rio Grande RWPG. It includes on its board representatives of each county, as well as the IDs, WSCs, municipalities, and the general public.

10.3.3 Funding for Plan Implementation

The availability of funding and access to funding for the implementation of recommended WMSs is crucial. The State Water Implementation Fund of Texas (SWIFT) program is enabling further state investment in water projects. As the initial rules are developed and the first rounds of loans are distributed, the Region M planning group intends to stay involved in the refinement process to advocate for the types of projects that are recommended for Region M.

Most local water suppliers in the Rio Grande Region are governmental or quasi-governmental entities (e.g., WSCs) that have the authority to charge and collect taxes and/or fees for the services they provide. These entities also have the ability to borrow money for the acquisition of additional water supplies and for water-related infrastructure development and rehabilitation. For the most part, the direct costs for the services provided by these entities should be borne by the individual water users through taxes and/or fees for services.

State and federal loan and grant programs have played a critical role in the financing of water conservation, water supply development, and infrastructure projects. At present, a number of state and federal financial assistance programs for water-related infrastructure projects are available to municipal water suppliers. However, few programs provide financial assistance to IDs for infrastructure improvements, and farmers in the Lower Rio Grande Valley face some difficulty obtaining financing that is available to farmers elsewhere in the state because of the nature of water rights ownership. Because agricultural water conservation is a central element of this regional water plan – and is essential to maintaining the viability of this sector of the regional economy – the Region M planning group recommends that new public funding sources be developed to assist IDs and farmers with the implementation of conservation programs.

FINAL PLAN

CHAPTER 11: COMPARISON TO PREVIOUS REGIONAL WATER PLAN

Rio Grande Regional Water Plan

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acft/yr	Acre-Feet per Year
ASR	Aquifer Storage and Recovery
DFC	Desired Future Condition
GAM	Groundwater Availability Model
GMA	Groundwater Management Area
ID	Irrigation District
MAG	Modeled Available Groundwater
mgd	Million Gallons per Day
MUD	Municipal Utility District
MWP	Major Water Providers
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SCADA	Supervisory Control and Data Acquisition
SUD	Special Utility District
SWIFT	State Water Implementation Fund for Texas
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
WAM	Water Availability Model
WMS	Water Management Strategy
WSC	Water Supply Corporation
WTP	Water Treatment Plant
WUG	Water User Group
WWP	Wholesale Water Provider
WWTP	Wastewater Treatment Plant

CHAPTER 11: COMPARISON TO PREVIOUS REGIONAL WATER PLAN

11.1 INTRODUCTION

Each update to the Regional Water Plan (RWP) is an opportunity for the Regional Water Planning Group (RWPG) to evaluate the changes in the region's water use and conservation goals, and to lay out a path toward meeting future water needs. Every 5 year cycle of planning includes reevaluation of demands, current and future, an update of supplies currently being used, and development of a range of water management strategies (WMSs) that can be used to meet projected needs. A few of the changes to the planning process for this 2021 update are:

- Municipal water user groups (WUGs) were changed from being based on the municipal boundaries (2016 RWPs and earlier), to being defined by the extent of the water supply utility;
- Consideration of Aquifer Storage and Recovery (ASR) as a potential WMS is required; and
- Major Water Providers (MWPs) were introduced as a new designation, and each planning group defined the designation. The Rio Grande RWPG elected to define a MWP as any entity that provides 3,000 acft/yr or more of water for municipal use.

The revisions from the 2016 Rio Grande RWP (Region M Plan) and the current 2021 update to that plan are described below. A detailed quantitative comparison is included in Appendices A.10a and A.10b.

11.2 DEMANDS

For each cycle of regional water planning the Texas Water Development Board (TWDB) evaluates demographic data and information on agricultural and industrial water usage. This information is used to develop the current demands (base year demands) and to develop an anticipated rate of change to project those demands over the 50 year planning horizon. Municipal demands are developed for each water user group (WUG), which is defined as any utility or water systems that provide more than 100 acre-feet per year (acft/yr) for municipal use, as opposed to the 2016 RWP, which defined a WUG as serving a population of 500 or more. Rural, industrial, and irrigation demands are aggregated into WUGs for each county and river basin. Demand projections are developed initially by the TWDB technical staff and are then evaluated by the RWPGs for accuracy and revised if necessary. The demand projection methodology is discussed in detail in Chapter 2.

The Region M planning group approved the draft projections developed by the TWDB for manufacturing, livestock, mining, and steam-electric power generation demands. The TWDB projections for municipal and irrigation demands were revised based on local information. The total demand projections for all WUGs over the planning horizon are shown aggregated for this RWP and the 2011 RWP on Figure 11-1.

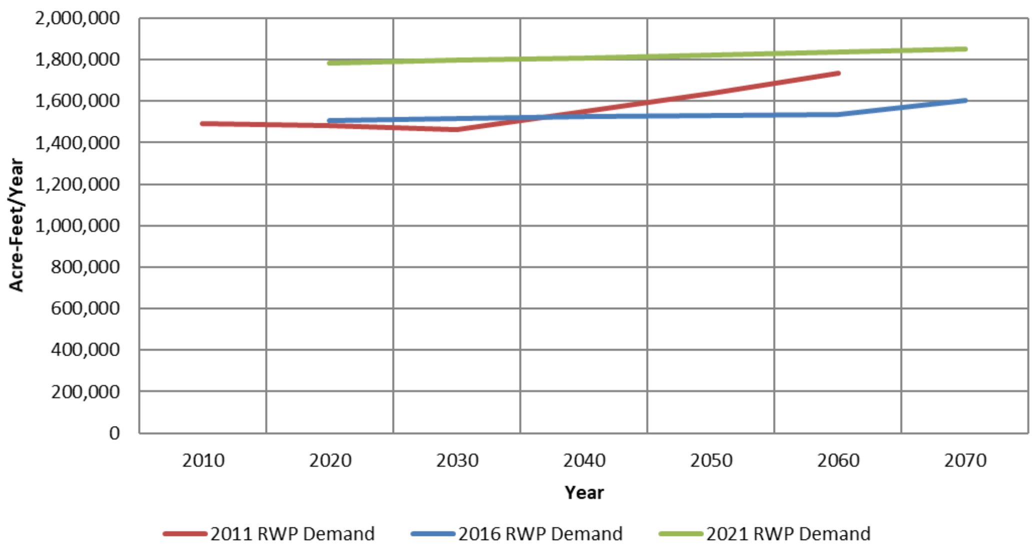

Figure 11-1 **Comparison of Regional Demand Projections, 2011, 2016, and 2021 RWPs**

11.2.1 Population Projections

The population projections were developed with similar methodology in the third (2011), fourth (2016), and fifth (2021) cycles of regional planning. The 2010 census is used as a basis, and population growth is estimated using demographics and projected birth, death, and migration rates. The countywide population data was not changed from the 2016 RWP to the 2021 RWP. The Region M Planning Group requested various changes to the population projections for municipal WUGs using survey responses and local information. None of the countywide population estimates that were developed by TWDB were changed, only the distribution of population within a county. Refer to Figure 11-2.

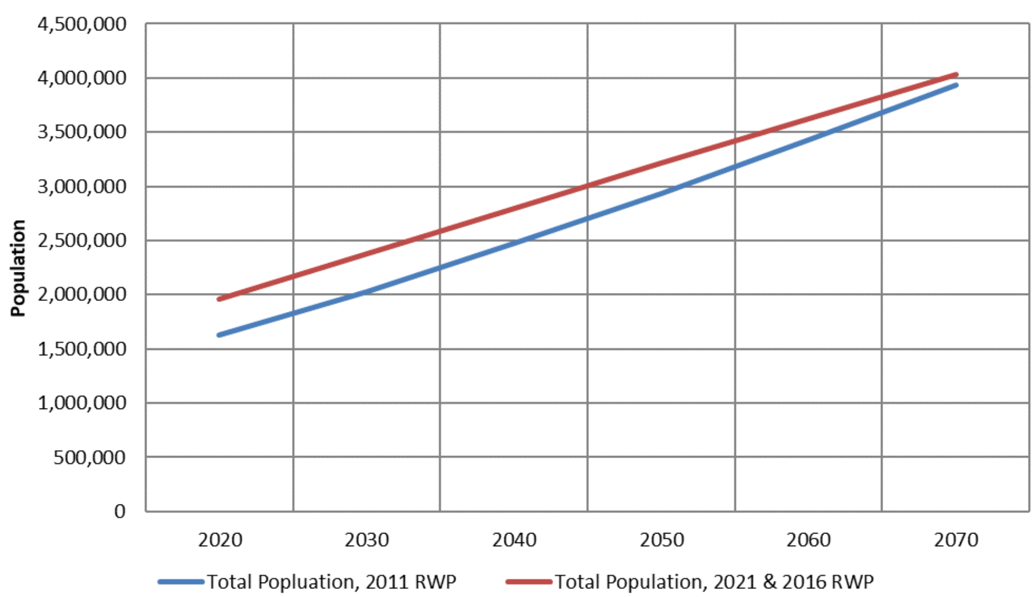

Figure 11-2 **Comparison of Population Projections, 2011, 2016, and 2021 RWPs**

In the updated plan, only a small change is noted in the distribution of projected population on a county basis, as shown on Figure 11-3.

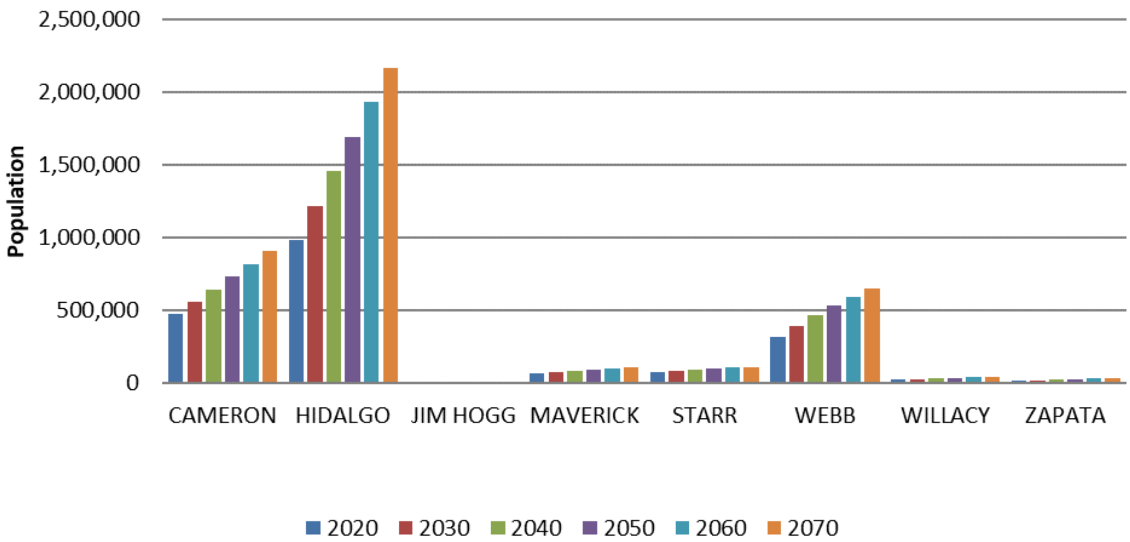

Figure 11-3 Population Projections by County, 2021 RWP

11.2.2 Municipal Water Demands

The municipal demand projections for 2021 are slightly higher than the 2016 RWP projections (Figure 11-4) because of a slightly lower projected population and lower measured and projected per-capita water use.

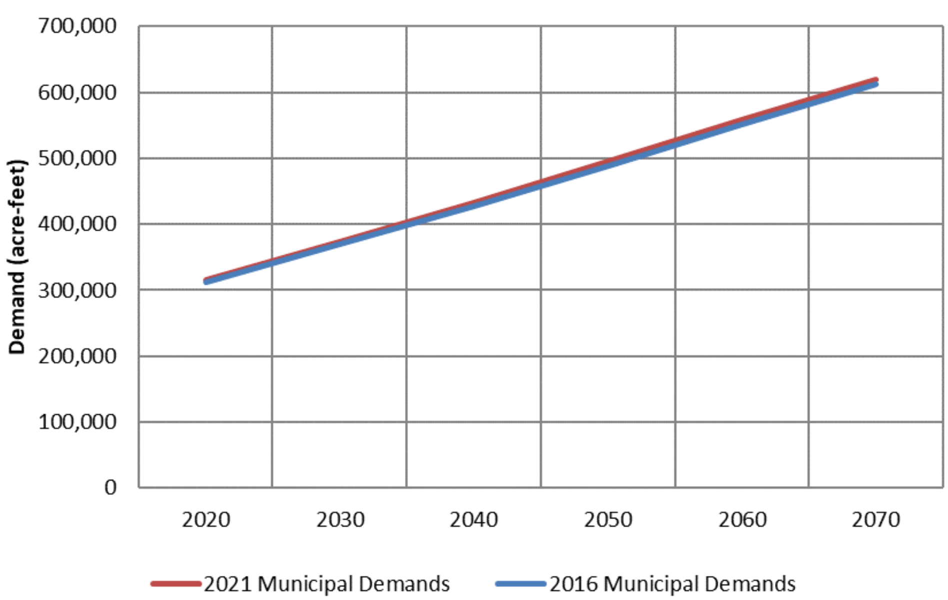

Figure 11-4 Comparison of Municipal Demand Projections, 2016 and 2021 RWPs

11.2.3 Irrigation Demands

Each cycle of planning in Region M has predicted decreasing demand for irrigation water over the planning horizon, based on anticipated urbanization, particularly in Cameron and Hidalgo counties (Figure 11-5).

The 2021 irrigation demand projections are based on the TWDB Historical Water Use Estimates[1] for 2011, data provided in May of 2017, which was considered representative of a year with high water storage (not supply-limited), and low rainfall (high demand). The rate of change was estimated by the rate of conversion of water rights from irrigation to municipal use across the planning region and was based on Texas Commission on Environmental Quality (TCEQ) records of active water rights.[2]

In 2016, the planning group used recorded irrigation use from 2005 to 2009 and compiled the highest demand year for each county to predict a base year demand. The rate of change that was initially recommended by the TWDB was based on the 2001 RWP, and was determined by the planning group to be outdated. The projected increases in municipal demand relate to increasing development and urbanization, which should correlate to decreased irrigated land and it is assumed that water rights will be converted from irrigation use to municipal use. The rate that irrigation water use is projected to decrease can be correlated with the increasing municipal demands, given that there are limited alternative sources for irrigation water. For the purposes of this study, the planning group estimated the rate of decreasing irrigation demand by the inverse of the rate at which municipal water demand increases.

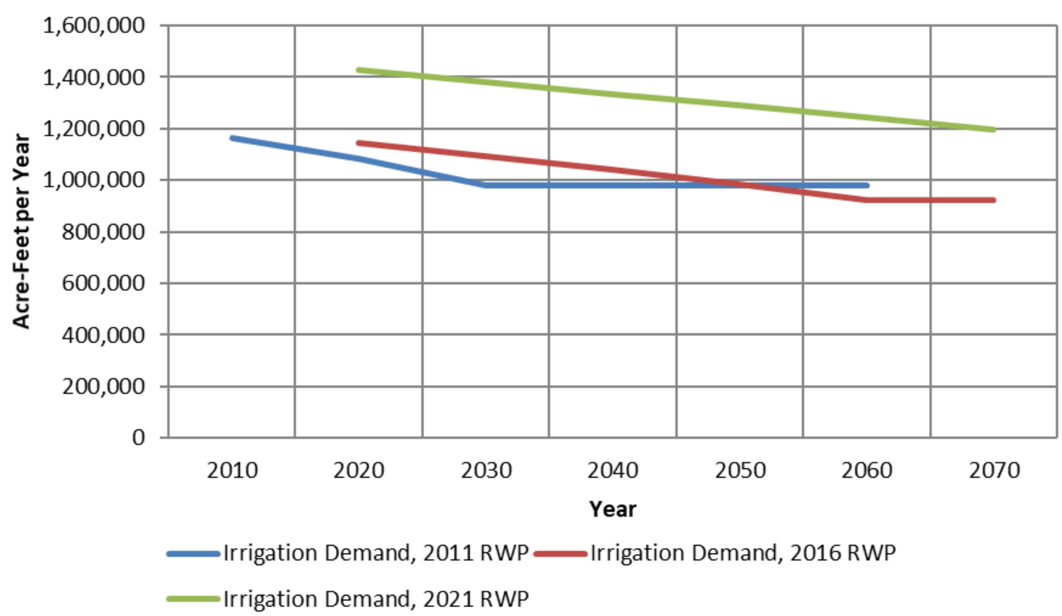

Figure 11-5 Comparison of Irrigation Demand Projections, 2011, 2016, and 2021 RWPs

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[1] http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/index.asp.

[2] "WRActive" file available https://www.tceq.texas.gov/permitting/water_rights/wr-permitting/wrwud. Previous downloads of the file were dated and a trend analysis performed for the classification of water rights.

11.2.4 Manufacturing Demands

Manufacturing demands represent a very small portion of the overall regional water demands and are revised upward slightly in this plan (Figure 11-6). The base year increased slightly because of reported water use, and the rate of change is tied to population growth in both planning cycles.

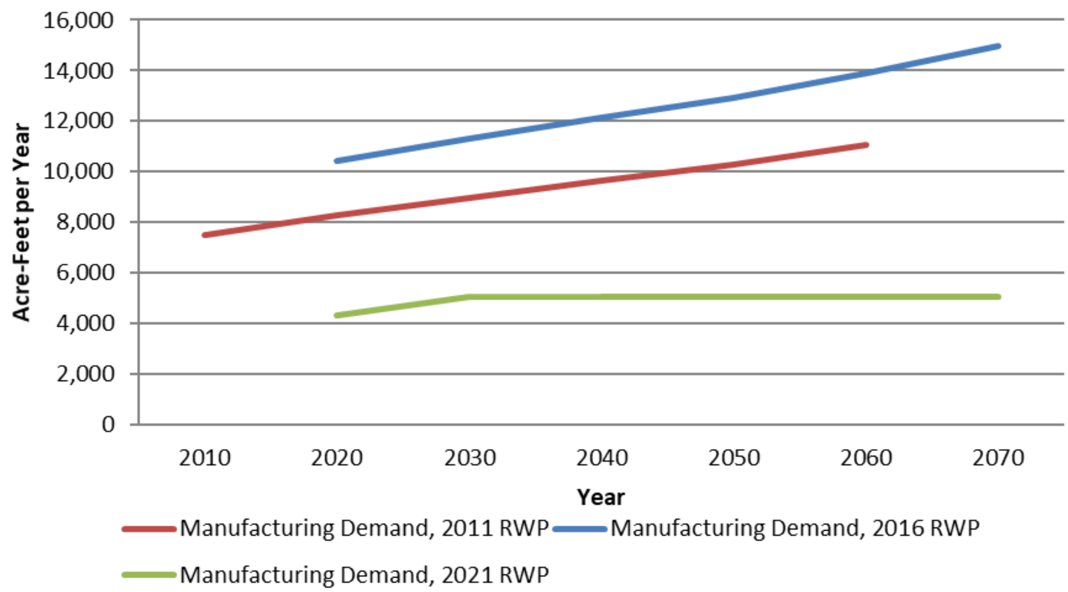

Figure 11-6 Comparison of Manufacturing Demand Projections, 2011, 2016, and 2021 RWPs

11.2.5 Mining Demands

The mining demand projections shifted radically from the 2011 RWP (Figure 11-7). The demands associated with aggregates and standard method oil and gas extraction were fairly consistent, but the introduction of hydraulic fracturing in Webb County increased the overall mining water demand projections and affected how these demands are expected to change over time. The planning group used the Bureau of Economic Geology's most recent reports in conjunction with the TCEQ Watermaster's office records to estimate water use. Mining demands are extremely difficult to estimate as a result of water use reporting exemptions in place for the industry.

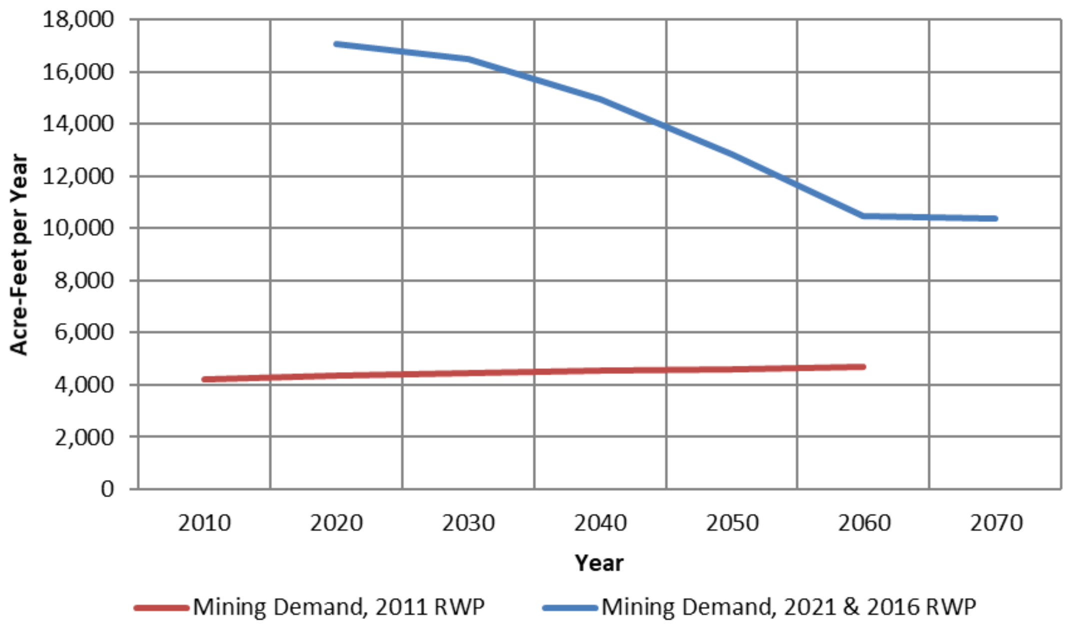

Figure 11-7 Comparison of Mining Demand Projections, 2011, 2016, and 2021 RWPs

11.2.6 Steam-Electric Power Generation Demand Projections

The steam-electric power generation demand projections from both 2011 and this current plan are based on the 2008 TWDB report water demand projections for power generation in Texas, as shown on Figure 11-8. These projections link population growth with an increased demand for power.

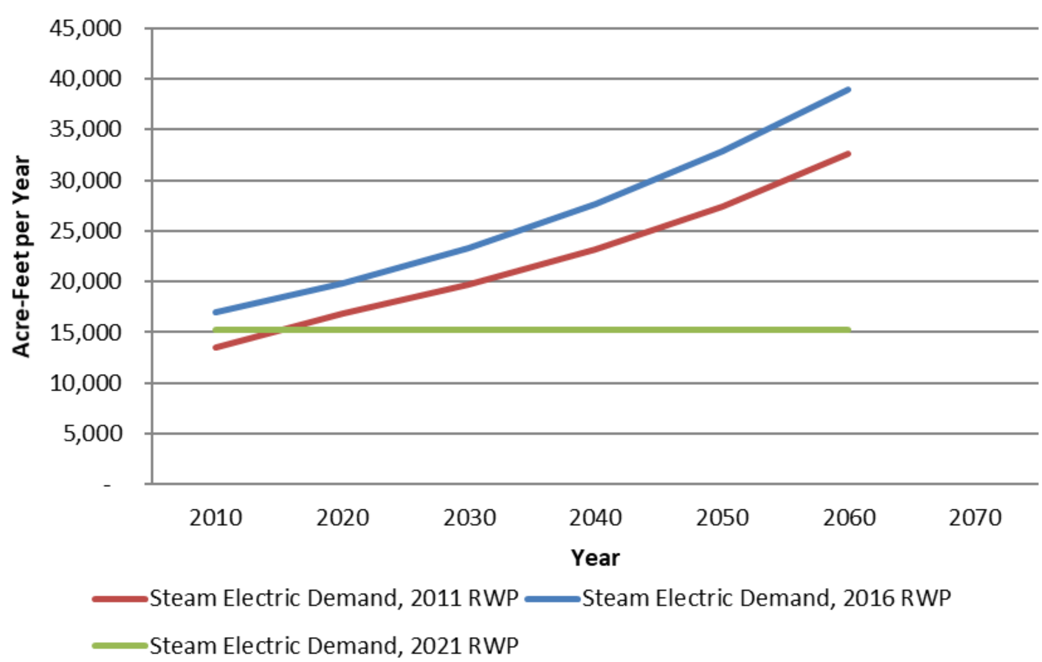

Figure 11-8 Comparison of Steam Electric Demand Projections, 2011, 2016, and 2021 RWPs

11.2.7 Livestock Demands

The RWPs since 2001 have estimated livestock demand using the numbers of each type of livestock and estimated water usage for each type. The rate of change has been assumed to be constant in both this plan, the 2016 RWP, and the 2011 RWP. Base year livestock demands in this plan are shown to be slightly lower than the projections from the 2016 RWP, as shown on Figure 11-9.

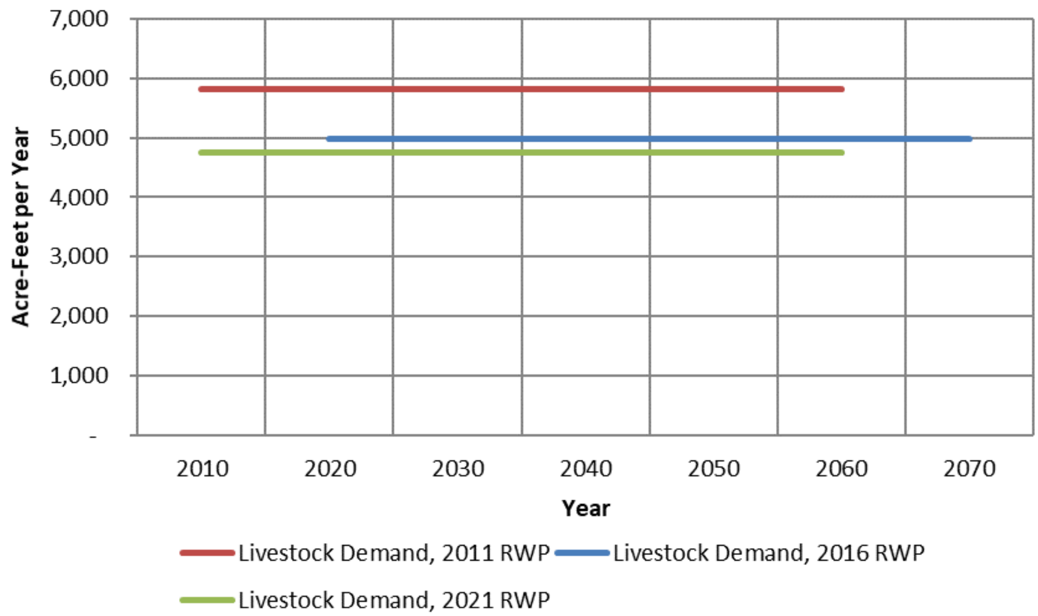

Figure 11-9 Comparison of Livestock Demand Projections, 2011, 2016, and 2021 RWPs

11.3 AVAILABILITY AND SUPPLY

The Rio Grande Water Availability Model (WAM) was revised as a part of the fourth cycle of planning for Region M, which impacted the firm yield values that are used in the planning process. The fourth and fifth planning cycles are required to fit all current and future groundwater supplies within the modeled available groundwater (MAG) as established by ground management area (GMA) 13 and GMA 16.

11.3.1 Rio Grande WAM

The Rio Grande WAM was updated as described in the Technical Memorandum, such that the current distribution of water rights is included, and the revisions made by Region E to the upper basin are included in the Region M modeling for consistency. A correction to the sedimentation estimates was implemented between the 2011 and 2016 RWPs, which accounts for a slower rate of reduction in capacity and yield. Figure 11-10 shows the variation in the firm yield from the Rio Grande WAM in the last three planning cycles.

The naturalized flow record only extends to 2000, but the 2019 Texas Legislature allocated funding to update the data for the Rio Grande and three other basins by 2023. This and a comprehensive evaluation of the accuracy and modeling logic in the Rio Grande WAM are highly recommended by the Region M planning group.

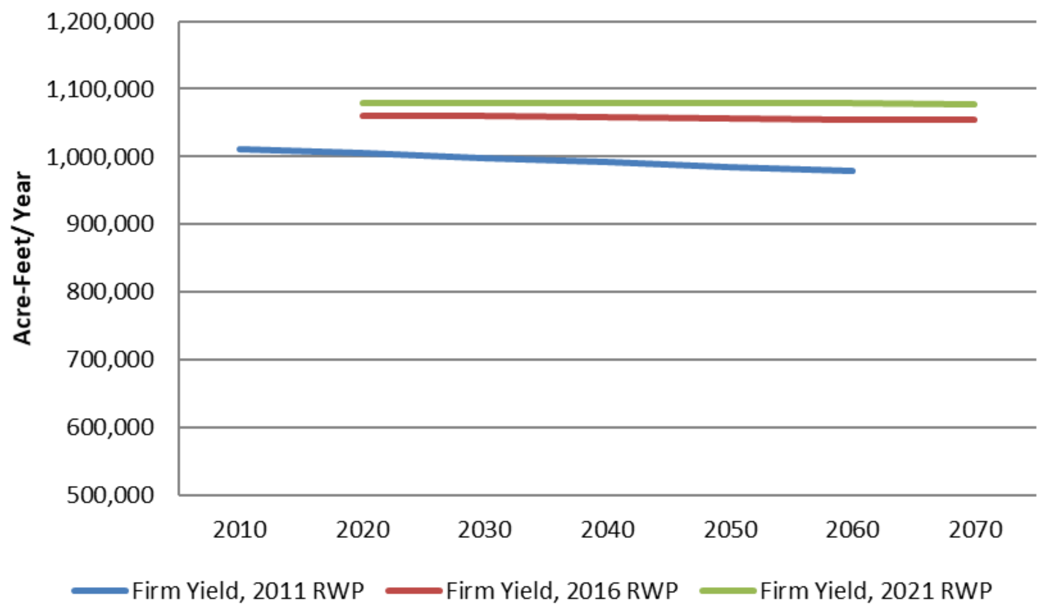

Figure 11-10 Firm Yield Projections for the Amistad-Falcon Reservoir System, 2011, 2016, and 2021 RWPs

11.3.2 Groundwater

The 2016 RWP was the first cycle of planning that required that all current and future groundwater usage described in the plan to not exceed the MAG values. GMAs were established across the state to help facilitate local regulation of groundwater. Groundwater can be regulated locally by groundwater conservation districts where they have been formed, but most of Region M is not within a district. The groundwater conservation districts within a single GMA determine the desired future conditions (DFCs) for the aquifers in that area. DFCs are conservation goals associated with a quantifiable measure of aquifer conditions, such as future water levels, water quality, or spring flows that are specified for certain times in the future, i.e., 12 feet of drawdown in 50 years. In the case of Region M, representatives from the existing GCDs in GMA 16 and GMA 13 established the DFCs.

A groundwater availability model (GAM) allows the TWDB to evaluate what amount of groundwater production, on an average annual basis, will achieve the stated DFCs for an aquifer. The current MAGs do not specify water quality, but the supplies are identified as fresh, fresh/brackish, or brackish according to the aquifer and the location within that aquifer (specified by county and river basin).

Region M has two major and one minor aquifer for which MAGs are available. Figure 11-11 shows the previous estimates of groundwater availability for each aquifer that were used in the 2011 RWP (in green/on the right), and the current MAGs in blue/on the left. More detailed information about regional groundwater availability is available in Chapter 3.

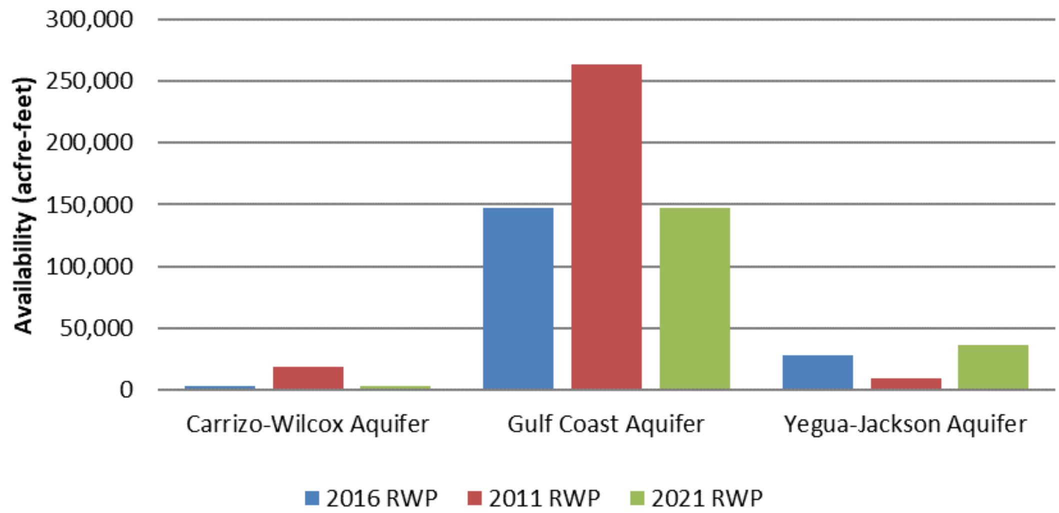

Figure 11-11 Modeled Available Groundwater Projections, 2011,2016, and 2021 RWPs

11.4 WATER MANAGEMENT STRATEGIES

Before a RWPG begins the process of identifying potentially feasible WMSs, RWPGs must document the process by which it will list all possible WMSs and identify the strategies that are potentially feasible for meeting a need in the region. The Region M RWPG adopted the process to identify potentially feasible WMSs on January 24, 2018.

The Region M potentially feasible WMSs were identified using the following documented process:

1. Current water planning information, including specific WMS of interest, will be solicited from Water User Groups (WUGs) and Wholesale Water Providers (WWPs) in Summer 2018.
    a. Solicitation of planning information will include a draft list of WMS deemed potentially feasible to meet projected needs.
    b. Draft list will generally include the recommended WMS in the 2016 Region M Plan, WMSs in local water plans, and/or other strategies perceived to be of interest to WUGs/WWPs.
    c. WUGs/WWPs will be encouraged to classify each water management strategy on their draft list as recommended, alternative, or rejected and provide comments.
2. A list of potentially feasible WMSs will be prepared based on an initial technical evaluation and the comments received, which will be available for consideration by the RWPG by early 2019.
3. Additional WMS may be brought forth to the RWPG for consideration until March of 2019.
4. Potentially Feasible WMS will then be evaluated by metrics developed and weighted by the RWPG.

Using the documented process identified above, the Region M RWPG identified Potentially Feasible WMSs for the 2021 RWP, which are listed in Table 11-1.

Table 11-1 2021 Potentially Feasible WMSs

POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES	FOR DETAILED EVALUATION, SEE SECTION:
Water Infrastructure and Distribution Systems • Irrigation District Improvements / Conservation • Municipal Infrastructure Improvements ▪ Distribution and Transmission ▪ Storage ▪ Surface Water Treatment	5.2.1 5.2.1.1 5.2.1.2
Wastewater Reuse • Non-Potable Reuse • Potable Reuse	5.2.2
Desalination • Local Brackish Groundwater Development and Treatment • Seawater Desalination	5.2.3
Fresh Groundwater	5.2.4
Advanced Municipal Water Conservation	5.2.5
Municipal Drought Management	5.2.6
Implementation of Best Management Practices for Industrial Users	5.2.7
Conversion/Purchase of Surface Water Rights	5.2.8
On-Farm Irrigation Conservation	5.2.9
Biological Control of *Arundo donax*	5.2.10
Aquifer Storage and Recovery	5.2.11

Once the list of potentially feasible WMSs was developed, it was used in conjunction with the “Needs Analysis” based on supplies and demands. Advanced municipal conservation, drought management, reuse, ID improvements, and industrial conservation WMSs were applied to the WUGs and WWPs, and a secondary needs calculation was performed.

These secondary needs were then compared to the submitted, developed, and carried over WMS available to each WUG or WWP. Staying within the bounds of water availability from each source, the WMSs specific to each WUG were selected that could meet the projected need with the lowest cost. A detailed description of the “Needs Analysis” is discussed in Chapter 4, and the WMS evaluation process is included in Chapter 5.

Table 11-2 compares the number of each type of WMS that was recommended in the 2016 RWP and the 2021 RWP. The 2016 LRGVRWP included 195 recommended WMSs and 54 alternative WMSs; whereas the 2021 LRGVRWP recommends 132 WMSs and 21 alternative WMSs. The total volume of recommended strategies in the 2021 Plan for the year 2070 is 508,462 acft/yr, with alternative strategies were projected to be 231,241 acft/yr. The 2016 LRGVRWP new supplies were projected to be 668,705 acft/yr and alternative strategies were projected to be 383,144 acft/yr.

Table 11-2 Comparison of Recommended WMS Projects from 2021 and 2016 RWPs

CATEGORY	NUMBER OF RECOMMENDED WMS PROJECTS		NUMBER OF ALTERNATIVE WMS PROJECTS	
	2021 RWP	2016 RWP	2021 RWP	2016 RWP
Acquisition of Water Rights	46	29	-	-
Aquifer Storage and Recovery	-	-	1	-
Brackish Groundwater	2	10	-	17
Fresh Groundwater	18	18	5	4
ID Improvements	24	28	-	-
Municipal Conservation	1	61	-	-
Municipal Infrastructure Improvements	13	15	7	11
Reuse	-	1	-	-
Seawater Desalination	20	24	5	16
Storage	6	2	2	5
Surface Water Treatment	1	4	1	1

11.4.1 Implementation of WMS Projects

Several sponsors of WMS Projects recommended in the 2016 RWP applied for and received TWDB State Water Implementation Fund for Texas (SWIFT) funding. Table 11-3 presents 2016 RWP Recommended WMS Projects that have received SWIFT funding from TWDB.

Table 11-3 2016 RWP Recommended WMS Projects That Received TWDB SWIFT Funding

SPONSOR	COUNTY	RECOMMENDED WMS PROJECT NAME	STATUS AS OF JULY 2020	PROJECT DESCRIPTION
McAllen	Hidalgo	Purchase of Water Rights	Completed	Purchase of 3,000 acft of water rights, completed in 2019.
United Irrigation District	Hidalgo	Off-Channel Storage Facility	Construction	Construction of off-channel storage to allow the District to divert during no-charge pumping, and better manage supplies.
Hidalgo County Irrigation District No. 1	Hidalgo	Irrigation District Improvements	Construction	Improvement of Irrigation District facilities.

An implementation survey was conducted for the 2021 Region M RWP, which describes the progress toward implementing projects listed in the 2016 RWP. Appendix H includes survey results and project information that were received by sponsors.

11.5 DROUGHT RESPONSE

Chapter 7 is dedicated to a discussion of each region's preparations for and response to drought. The previous requirements for the RWPs have been retained, aggregated into this chapter, clarified, and new requirements have been added.

<u>Previous requirements include the following</u>:

- Current preparations and responses to drought;
- Evaluation of drought management WMS for needs; and
- Recommendation of other drought management measures.

<u>Modified requirements include the following</u>:

- More information on the drought of record;
- Identification of existing and potential future interconnections;
- Consolidation of this information into one chapter; and
- Detailed information on drought action triggers.

<u>New requirements include the following</u>:

- Recommendations for each existing source (triggers and responses);
- Emergency responses to local conditions, especially for all County-Other and cities with a sole water source and population of less than 7,500;
- Two model drought contingency plans; and
- Recommendations to the State Drought Preparedness Council.

11.6 ASSESSMENT OF PROGRESS TOWARD REGIONALIZATION

In accordance with 31 TAC §357.45(b), planning groups must "assess the progress of the RWPA in encouraging cooperation between WUGs for the purpose of achieving economies of scale and otherwise incentivizing WMSs that benefit the entire RWPA." This rule is new for this cycle of planning, and because it became effective shortly before Plan adoption (on June 28, 2020), the TWDB provided guidance that RWPGs may provide a general assessment of the progress toward regionalization, as opposed to the more prescriptive requirements identified in the adopted rule.

Several WMSs since the 2016 RWP have focused on cooperative agreements among WUGs and WWPs. For example, the North Cameron Regional WTP Wellfield Expansion (both in the 2016 and the 2021 RWPs) has been a focus to increase supplies to both the NAWSC and ERHWSC systems. Another major example is the ID Conservation WMS, which focuses on improving ID distribution systems to reduce losses and remove infrastructure bottlenecks. Continued improvement to any ID increases efficiency and enables more water to convey through the complex systems in the Lower Rio Grande Valley. Outside of WMSs, SRWA has also conducted successful regional groundwater connection studies.

For many years, the Rio Grande RWPA has encouraged cooperation and collaboration among WUGs for the purposes of achieving economies of scales. For example, the Southmost Regional Water Authority utilizes economy of scale to service various independent systems. These WUGs include Brownsville PUB, Valley MUD, Brownsville Navigation District (i.e. Manufacturing, Cameron in the RWP), Los Fresnos, and Indian Lake (i.e. County-Other, Cameron in the RWP).

This assessment demonstrates that many entities within the Rio Grande RWPA coordinate and collaborate in order to achieve regionalization. Based on the array of collaborative projects and partnerships, the RGRWPA has been successful in encouraging cooperation among WUGs for the purpose of achieving economies of scale or otherwise incentivizing WMSs that benefit the entire RWPA. The Rio Grande RWPG is committed to encouraging continued cooperation among WUGs and is always looking for ways to achieve economies of scale for the benefit of the region and the state.

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FINAL PLAN

APPENDICIES

Rio Grande Regional Water Plan

B&V PROJECT NO. 192863

PREPARED FOR

Rio Grande Regional Water Planning Group

5 NOVEMBER 2020

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[1] DB22 Report appears blank because there is no relevant data for the report.

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Region M Water User Group (WUG) Population

	WUG POPULATION					
	2020	2030	2040	2050	2060	2070
BROWNSVILLE	206,346	245,513	285,245	328,173	372,056	417,176
COMBES	3,411	3,986	4,567	5,195	5,840	6,501
EAST RIO HONDO WSC	27,978	32,687	33,340	37,155	40,906	45,540
EL JARDIN WSC	13,117	15,325	17,565	19,977	22,458	25,002
HARLINGEN	89,171	104,179	118,211	131,729	145,037	161,462
LA FERIA	8,610	10,059	11,530	13,113	14,742	16,411
LAGUNA MADRE WATER DISTRICT	18,783	21,944	25,150	28,603	32,157	35,798
LOS FRESNOS	6,573	7,679	8,801	10,009	11,253	12,528
MILITARY HIGHWAY WSC	23,315	28,060	32,845	37,795	42,809	47,806
NORTH ALAMO WSC	4,578	5,661	6,747	7,837	8,926	9,986
OLMITO WSC	6,275	7,331	8,404	9,558	10,746	11,962
PALM VALLEY	1,350	1,364	1,377	1,391	1,405	1,419
PRIMERA	4,758	5,560	6,373	7,247	8,148	9,070
RIO HONDO	2,777	3,244	3,718	4,229	4,755	5,292
SAN BENITO	29,602	34,583	39,638	45,082	50,682	56,421
SANTA ROSA	3,407	3,981	4,563	5,189	5,833	6,493
VALLEY MUD 2	2,832	3,308	3,791	4,313	4,849	5,397
COUNTY-OTHER	23,312	22,015	25,893	28,748	32,801	33,557
NUECES-RIO GRANDE BASIN TOTAL	**476,195**	**556,479**	**637,758**	**725,343**	**815,403**	**907,821**
BROWNSVILLE	1,257	1,496	1,738	1,999	2,267	2,542
EL JARDIN WSC	404	472	541	616	692	771
MILITARY HIGHWAY WSC	144	173	203	233	264	295
VALLEY MUD 2	235	275	315	358	402	448
COUNTY-OTHER	739	698	821	912	1,040	1,064
RIO GRANDE BASIN TOTAL	**2,779**	**3,114**	**3,618**	**4,118**	**4,665**	**5,120**
CAMERON COUNTY TOTAL	**478,974**	**559,593**	**641,376**	**729,461**	**820,068**	**912,941**
AGUA SUD	57,800	71,745	85,741	99,765	113,788	127,418
ALAMO	23,259	28,881	34,525	40,181	45,837	51,335
DONNA	20,021	24,860	29,719	34,587	39,456	44,189
EDCOUCH	3,837	4,765	5,696	6,629	7,562	8,469
EDINBURG	96,678	120,046	143,507	167,015	190,523	213,378
ELSA	7,362	9,140	10,927	12,717	14,508	16,248
HIDALGO	14,063	17,462	20,875	24,295	27,715	31,039
HIDALGO COUNTY MUD 1	7,909	8,937	9,912	10,843	11,737	12,576
LA JOYA	3,995	4,961	5,930	6,901	7,873	8,817
LA VILLA	2,508	3,114	3,723	4,332	4,942	5,536
MCALLEN	169,099	209,972	251,008	292,126	333,245	373,221
MERCEDES	19,732	24,501	29,290	34,088	38,886	43,551
MILITARY HIGHWAY WSC	19,071	22,951	26,865	30,915	35,017	39,103
MISSION	96,925	120,352	143,872	167,440	191,010	213,922
NORTH ALAMO WSC	162,960	201,502	240,156	278,948	317,715	355,415
PHARR	89,197	110,756	132,402	154,091	175,780	196,866
SAN JUAN	34,508	42,849	51,223	59,614	68,005	76,163
SHARYLAND WSC	72,459	89,974	107,558	125,178	142,798	159,928
WESLACO	44,194	57,073	68,676	80,515	92,319	103,339
COUNTY-OTHER	22,513	28,252	35,350	42,122	48,936	55,924
NUECES-RIO GRANDE BASIN TOTAL	**968,090**	**1,202,093**	**1,436,955**	**1,672,302**	**1,907,652**	**2,136,437**
AGUA SUD	10,978	13,626	16,285	18,949	21,612	24,201

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region M Water User Group (WUG) Population

	WUG POPULATION					
	2020	2030	2040	2050	2060	2070
HIDALGO	128	159	190	221	252	283
LA JOYA	1,055	1,310	1,566	1,823	2,079	2,329
MILITARY HIGHWAY WSC	376	453	530	610	690	771
MISSION	53	66	79	92	104	117
PHARR	23	29	34	40	46	51
COUNTY-OTHER	1,187	1,489	1,863	2,220	2,580	2,948
RIO GRANDE BASIN TOTAL	**13,800**	**17,132**	**20,547**	**23,955**	**27,363**	**30,700**
HIDALGO COUNTY TOTAL	**981,890**	**1,219,225**	**1,457,502**	**1,696,257**	**1,935,015**	**2,167,137**
JIM HOGG COUNTY WCID 2	4,589	4,984	5,324	5,703	6,032	6,336
COUNTY-OTHER	1,226	1,331	1,422	1,524	1,612	1,694
NUECES-RIO GRANDE BASIN TOTAL	**5,815**	**6,315**	**6,746**	**7,227**	**7,644**	**8,030**
COUNTY-OTHER	38	41	44	47	50	52
RIO GRANDE BASIN TOTAL	**38**	**41**	**44**	**47**	**50**	**52**
JIM HOGG COUNTY TOTAL	**5,853**	**6,356**	**6,790**	**7,274**	**7,694**	**8,082**
COUNTY-OTHER	24	22	20	18	16	15
NUECES BASIN TOTAL	**24**	**22**	**20**	**18**	**16**	**15**
EAGLE PASS	57,119	66,607	75,457	84,618	93,399	101,833
MAVERICK COUNTY	1,671	1,920	2,152	2,392	2,622	2,843
COUNTY-OTHER	4,293	3,942	3,614	3,276	2,951	2,636
RIO GRANDE BASIN TOTAL	**63,083**	**72,469**	**81,223**	**90,286**	**98,972**	**107,312**
MAVERICK COUNTY TOTAL	**63,107**	**72,491**	**81,243**	**90,304**	**98,988**	**107,327**
COUNTY-OTHER	1,219	1,371	1,509	1,647	1,767	1,876
NUECES-RIO GRANDE BASIN TOTAL	**1,219**	**1,371**	**1,509**	**1,647**	**1,767**	**1,876**
AGUA SUD	317	393	470	547	623	698
EL SAUZ WSC	1,617	1,829	2,025	2,218	2,391	2,548
EL TANQUE WSC	1,858	2,102	2,326	2,548	2,747	2,928
LA GRULLA	7,314	8,273	9,158	10,031	10,815	11,522
RIO GRANDE CITY	20,304	22,966	25,418	27,848	30,022	31,991
RIO WSC	6,224	7,040	7,791	8,535	9,202	9,806
ROMA	20,613	23,314	25,803	28,271	30,476	32,476
UNION WSC	7,215	8,161	9,032	9,894	10,667	11,367
COUNTY-OTHER	4,122	4,636	5,101	5,568	5,977	6,343
RIO GRANDE BASIN TOTAL	**69,584**	**78,714**	**87,124**	**95,460**	**102,920**	**109,679**
STARR COUNTY TOTAL	**70,803**	**80,085**	**88,633**	**97,107**	**104,687**	**111,555**
WEBB COUNTY	1,572	1,944	2,298	2,621	2,926	3,200
COUNTY-OTHER	49	61	72	82	91	100
NUECES BASIN TOTAL	**1,621**	**2,005**	**2,370**	**2,703**	**3,017**	**3,300**
COUNTY-OTHER	1,033	1,278	1,511	1,723	1,923	2,104
NUECES-RIO GRANDE BASIN TOTAL	**1,033**	**1,278**	**1,511**	**1,723**	**1,923**	**2,104**
LAREDO	301,124	372,380	440,247	502,142	560,482	613,020
MIRANDO CITY WSC	620	766	906	1,033	1,153	1,261
WEBB COUNTY	12,127	14,995	17,728	20,222	22,571	24,687
COUNTY-OTHER	1,503	1,860	2,198	2,507	2,799	3,061
RIO GRANDE BASIN TOTAL	**315,374**	**390,001**	**461,079**	**525,904**	**587,005**	**642,029**
WEBB COUNTY TOTAL	**318,028**	**393,284**	**464,960**	**530,330**	**591,945**	**647,433**
EAST RIO HONDO WSC	37	41	46	50	55	59
LYFORD	2,981	3,360	3,723	4,110	4,485	4,851

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Region M Water User Group (WUG) Population

	WUG POPULATION					
	2020	2030	2040	2050	2060	2070
NORTH ALAMO WSC	6,406	7,220	8,000	8,832	9,637	10,424
PORT MANSFIELD PUD	592	668	740	817	891	964
RAYMONDVILLE	12,619	14,224	15,762	17,401	18,986	20,538
SEBASTIAN MUD	2,213	2,494	2,763	3,051	3,329	3,601
COUNTY-OTHER	416	472	525	579	629	684
NUECES-RIO GRANDE BASIN TOTAL	**25,264**	**28,479**	**31,559**	**34,840**	**38,012**	**41,121**
WILLACY COUNTY TOTAL	**25,264**	**28,479**	**31,559**	**34,840**	**38,012**	**41,121**
FALCON RURAL WSC	863	990	1,119	1,225	1,321	1,408
SAN YGNACIO MUD	1,002	1,174	1,363	1,571	1,786	2,010
SIESTA SHORES WCID	1,617	1,910	2,240	2,582	2,936	3,304
ZAPATA COUNTY	12,126	14,250	16,547	19,142	21,780	24,627
ZAPATA COUNTY WCID-HWY 16 EAST	345	404	469	541	615	692
COUNTY-OTHER	866	981	1,138	1,304	1,538	1,701
RIO GRANDE BASIN TOTAL	**16,819**	**19,709**	**22,876**	**26,365**	**29,976**	**33,742**
ZAPATA COUNTY TOTAL	**16,819**	**19,709**	**22,876**	**26,365**	**29,976**	**33,742**
REGION M POPULATION TOTAL	**1,960,738**	**2,379,222**	**2,794,939**	**3,211,938**	**3,626,385**	**4,029,338**

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Region M Water User Group (WUG) Demand

	WUG DEMAND (ACRE-FEET PER YEAR)					
	2020	**2030**	**2040**	**2050**	**2060**	**2070**
BROWNSVILLE	35,262	40,949	46,882	53,560	60,613	67,922
COMBES	321	357	396	444	497	553
EAST RIO HONDO WSC	3,895	4,452	4,483	4,963	5,452	6,065
EL JARDIN WSC	1,480	1,677	1,887	2,125	2,383	2,650
HARLINGEN	15,797	17,992	20,088	22,212	24,412	27,160
LA FERIA	1,125	1,274	1,432	1,612	1,808	2,011
LAGUNA MADRE WATER DISTRICT	7,930	9,179	10,461	11,865	13,330	14,835
LOS FRESNOS	442	516	592	673	756	842
MILITARY HIGHWAY WSC	3,534	4,151	4,791	5,475	6,189	6,907
NORTH ALAMO WSC	742	900	1,062	1,227	1,395	1,560
OLMITO WSC	1,159	1,321	1,490	1,682	1,888	2,100
PALM VALLEY	250	246	244	244	246	248
PRIMERA	418	467	521	585	655	728
RIO HONDO	203	224	250	284	320	356
SAN BENITO	3,733	4,195	4,688	5,267	5,906	6,570
SANTA ROSA	296	326	360	402	450	500
VALLEY MUD 2	903	1,042	1,186	1,344	1,509	1,680
COUNTY-OTHER	3,810	3,507	4,048	4,449	5,065	5,179
MANUFACTURING	714	800	800	800	800	800
MINING	264	277	191	126	61	28
STEAM ELECTRIC POWER	3,423	3,423	3,423	3,423	3,423	3,423
LIVESTOCK	411	411	411	411	411	411
IRRIGATION	505,075	488,862	472,647	456,433	440,218	424,004
NUECES-RIO GRANDE BASIN TOTAL	**591,187**	**586,548**	**582,333**	**579,606**	**577,787**	**576,532**
BROWNSVILLE	215	249	286	326	369	414
EL JARDIN WSC	46	52	58	66	73	82
MILITARY HIGHWAY WSC	22	26	30	34	38	43
VALLEY MUD 2	75	87	98	111	125	139
COUNTY-OTHER	121	111	128	141	161	164
MANUFACTURING	933	1,046	1,046	1,046	1,046	1,046
STEAM ELECTRIC POWER	127	127	127	127	127	127
LIVESTOCK	25	25	25	25	25	25
IRRIGATION	32,142	31,110	30,078	29,046	28,015	26,983
RIO GRANDE BASIN TOTAL	**33,706**	**32,833**	**31,876**	**30,922**	**29,979**	**29,023**
CAMERON COUNTY TOTAL	**624,893**	**619,381**	**614,209**	**610,528**	**607,766**	**605,555**
AGUA SUD	6,198	7,465	8,781	10,138	11,533	12,904
ALAMO	3,230	3,908	4,607	5,326	6,064	6,786
DONNA	2,610	3,126	3,659	4,218	4,802	5,374
EDCOUCH	343	401	463	531	603	675
EDINBURG	12,974	15,730	18,573	21,484	24,459	27,374
ELSA	832	987	1,150	1,322	1,504	1,683
HIDALGO	1,841	2,233	2,637	3,051	3,473	3,888
HIDALGO COUNTY MUD 1	816	896	979	1,063	1,147	1,228
LA JOYA	515	619	727	839	955	1,068
LA VILLA	277	332	388	448	509	570
MCALLEN	39,787	48,510	57,403	66,492	75,765	84,820
MERCEDES	2,222	2,648	3,090	3,558	4,048	4,530
MILITARY HIGHWAY WSC	2,891	3,395	3,919	4,479	5,062	5,650

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Region M Water User Group (WUG) Demand

	WUG DEMAND (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MISSION	20,059	24,519	29,070	33,699	38,393	42,978
NORTH ALAMO WSC	26,417	32,031	37,785	43,670	49,653	55,513
PHARR	9,920	11,930	14,016	16,178	18,410	20,601
SAN JUAN	4,947	5,990	7,063	8,166	9,298	10,407
SHARYLAND WSC	12,901	15,628	18,421	21,302	24,263	27,160
WESLACO	7,697	9,711	11,550	13,443	15,391	17,218
COUNTY-OTHER	2,729	3,384	4,217	5,010	5,808	6,632
MANUFACTURING	2,236	2,721	2,721	2,721	2,721	2,721
MINING	2,636	3,355	3,891	4,467	5,127	5,963
STEAM ELECTRIC POWER	7,569	7,569	7,569	7,569	7,569	7,569
LIVESTOCK	706	706	706	706	706	706
IRRIGATION	661,160	639,936	618,710	597,485	576,261	555,035
NUECES-RIO GRANDE BASIN TOTAL	**833,513**	**847,730**	**862,095**	**877,365**	**893,524**	**909,053**
AGUA SUD	1,177	1,418	1,668	1,926	2,191	2,451
HIDALGO	17	20	24	28	32	35
LA JOYA	136	164	192	221	252	282
MILITARY HIGHWAY WSC	57	67	77	88	100	111
MISSION	11	13	16	18	21	24
PHARR	3	3	4	4	5	5
COUNTY-OTHER	144	178	222	264	306	350
MINING	208	265	307	352	405	471
STEAM ELECTRIC POWER	3,969	3,969	3,969	3,969	3,969	3,969
LIVESTOCK	71	71	71	71	71	71
IRRIGATION	27,507	26,624	25,741	24,858	23,975	23,092
RIO GRANDE BASIN TOTAL	**33,300**	**32,792**	**32,291**	**31,799**	**31,327**	**30,861**
HIDALGO COUNTY TOTAL	**866,813**	**880,522**	**894,386**	**909,164**	**924,851**	**939,914**
JIM HOGG COUNTY WCID 2	643	675	702	743	783	822
COUNTY-OTHER	148	154	160	169	178	187
MANUFACTURING	2	2	2	2	2	2
MINING	84	88	65	48	31	20
LIVESTOCK	282	282	282	282	282	282
IRRIGATION	288	278	270	260	251	242
NUECES-RIO GRANDE BASIN TOTAL	**1,447**	**1,479**	**1,481**	**1,504**	**1,527**	**1,555**
COUNTY-OTHER	5	5	5	5	6	6
MINING	9	9	7	5	3	2
LIVESTOCK	94	94	94	94	94	94
IRRIGATION	72	70	67	65	63	60
RIO GRANDE BASIN TOTAL	**180**	**178**	**173**	**169**	**166**	**162**
JIM HOGG COUNTY TOTAL	**1,627**	**1,657**	**1,654**	**1,673**	**1,693**	**1,717**
COUNTY-OTHER	3	3	3	2	2	2
MINING	398	548	587	461	335	244
LIVESTOCK	93	93	93	93	93	93
NUECES BASIN TOTAL	**494**	**644**	**683**	**556**	**430**	**339**
EAGLE PASS	9,545	10,839	12,074	13,429	14,795	16,122
MAVERICK COUNTY	241	268	295	324	355	384
COUNTY-OTHER	573	511	460	414	372	332
MANUFACTURING	65	65	65	65	65	65
MINING	1,590	2,189	2,346	1,841	1,339	973

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Region M Water User Group (WUG) Demand

	WUG DEMAND (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
LIVESTOCK	278	278	278	278	278	278
IRRIGATION	61,706	59,725	57,744	55,763	53,782	51,801
RIO GRANDE BASIN TOTAL	**73,998**	**73,875**	**73,262**	**72,114**	**70,986**	**69,955**
MAVERICK COUNTY TOTAL	**74,492**	**74,519**	**73,945**	**72,670**	**71,416**	**70,294**
COUNTY-OTHER	155	168	179	193	207	219
MINING	131	160	178	197	220	250
LIVESTOCK	179	179	179	179	179	179
NUECES-RIO GRANDE BASIN TOTAL	**465**	**507**	**536**	**569**	**606**	**648**
AGUA SUD	34	41	48	56	63	71
EL SAUZ WSC	163	177	191	207	222	237
EL TANQUE WSC	276	305	332	360	388	413
LA GRULLA	1,308	1,445	1,575	1,712	1,842	1,962
RIO GRANDE CITY	4,850	5,386	5,889	6,413	6,905	7,355
RIO WSC	643	706	767	832	894	952
ROMA	2,466	2,681	2,890	3,124	3,359	3,577
UNION WSC	1,261	1,402	1,535	1,672	1,800	1,917
COUNTY-OTHER	524	566	606	653	699	742
MANUFACTURING	95	116	116	116	116	116
MINING	440	537	597	661	741	841
LIVESTOCK	1,013	1,013	1,013	1,013	1,013	1,013
IRRIGATION	23,875	23,109	22,342	21,576	20,809	20,043
RIO GRANDE BASIN TOTAL	**36,948**	**37,484**	**37,901**	**38,395**	**38,851**	**39,239**
STARR COUNTY TOTAL	**37,413**	**37,991**	**38,437**	**38,964**	**39,457**	**39,887**
WEBB COUNTY	185	221	257	291	323	354
COUNTY-OTHER	6	7	8	9	10	11
MANUFACTURING	47	56	56	56	56	56
MINING	3,099	2,414	1,811	1,233	554	403
LIVESTOCK	432	432	432	432	432	432
NUECES BASIN TOTAL	**3,769**	**3,130**	**2,564**	**2,021**	**1,375**	**1,256**
COUNTY-OTHER	121	142	165	188	210	229
MINING	517	403	302	206	92	67
LIVESTOCK	59	59	59	59	59	59
NUECES-RIO GRANDE BASIN TOTAL	**697**	**604**	**526**	**453**	**361**	**355**
LAREDO	42,028	50,530	58,812	66,591	74,190	81,096
MIRANDO CITY WSC	69	83	96	108	121	132
WEBB COUNTY	1,429	1,708	1,982	2,241	2,496	2,728
COUNTY-OTHER	175	207	241	274	305	333
MANUFACTURING	204	240	240	240	240	240
MINING	6,715	5,230	3,925	2,673	1,200	873
STEAM ELECTRIC POWER	152	152	152	152	152	152
LIVESTOCK	472	472	472	472	472	472
IRRIGATION	10,425	10,090	9,756	9,421	9,086	8,752
RIO GRANDE BASIN TOTAL	**61,669**	**68,712**	**75,676**	**82,172**	**88,262**	**94,778**
WEBB COUNTY TOTAL	**66,135**	**72,446**	**78,766**	**84,646**	**89,998**	**96,389**
EAST RIO HONDO WSC	5	6	6	7	7	8
LYFORD	290	314	338	367	399	431
NORTH ALAMO WSC	1,038	1,148	1,259	1,383	1,506	1,628

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Region M Water User Group (WUG) Demand

	WUG DEMAND (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
PORT MANSFIELD PUD	231	259	285	313	342	369
RAYMONDVILLE	1,490	1,618	1,747	1,904	2,072	2,239
SEBASTIAN MUD	157	168	186	205	224	242
COUNTY-OTHER	52	58	65	71	77	84
MINING	49	51	38	28	18	12
LIVESTOCK	235	235	235	235	235	235
IRRIGATION	99,610	96,412	93,215	90,017	86,819	83,621
NUECES-RIO GRANDE BASIN TOTAL	**103,157**	**100,269**	**97,374**	**94,530**	**91,699**	**88,869**
WILLACY COUNTY TOTAL	**103,157**	**100,269**	**97,374**	**94,530**	**91,699**	**88,869**
FALCON RURAL WSC	163	183	205	222	240	255
SAN YGNACIO MUD	189	216	247	283	321	361
SIESTA SHORES WCID	222	254	291	333	377	424
ZAPATA COUNTY	2,247	2,582	2,956	3,396	3,857	4,359
ZAPATA COUNTY WCID-HWY 16 EAST	102	118	136	156	177	199
COUNTY-OTHER	122	136	157	180	211	233
MANUFACTURING	9	9	9	9	9	9
MINING	911	954	707	525	332	214
LIVESTOCK	398	398	398	398	398	398
IRRIGATION	5,100	4,936	4,773	4,609	4,445	4,281
RIO GRANDE BASIN TOTAL	**9,463**	**9,786**	**9,879**	**10,111**	**10,367**	**10,733**
ZAPATA COUNTY TOTAL	**9,463**	**9,786**	**9,879**	**10,111**	**10,367**	**10,733**
REGION M DEMAND TOTAL	**1,783,993**	**1,796,571**	**1,808,650**	**1,822,286**	**1,837,247**	**1,853,358**

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Region M Water User Group (WUG) Category Summary

MUNICIPAL	2020	2030	2040	2050	2060	2070
POPULATION	1,898,198	2,310,773	2,713,858	3,119,661	3,521,675	3,915,579
DEMAND (acre-feet per year)	307,001	364,759	422,648	482,865	544,405	605,337
EXISTING SUPPLIES (acre-feet per year)	321,072	322,505	320,207	320,816	321,662	322,152
NEEDS (acre-feet per year)*	31,634	64,813	111,354	167,037	226,842	286,729

COUNTY-OTHER	2020	2030	2040	2050	2060	2070
POPULATION	62,540	68,449	81,081	92,277	104,710	113,759
DEMAND (acre-feet per year)	8,688	9,137	10,664	12,022	13,617	14,703
EXISTING SUPPLIES (acre-feet per year)	5,447	5,449	5,469	5,476	5,476	5,476
NEEDS (acre-feet per year)*	3,853	4,267	5,759	7,094	8,673	9,743

MANUFACTURING	2020	2030	2040	2050	2060	2070
DEMAND (acre-feet per year)	4,305	5,055	5,055	5,055	5,055	5,055
EXISTING SUPPLIES (acre-feet per year)	4,447	4,493	4,493	4,493	4,493	4,493
NEEDS (acre-feet per year)*	632	851	851	851	851	851

MINING	2020	2030	2040	2050	2060	2070
DEMAND (acre-feet per year)	17,051	16,480	14,952	12,823	10,458	10,361
EXISTING SUPPLIES (acre-feet per year)	11,207	11,235	11,213	11,250	11,257	11,242
NEEDS (acre-feet per year)*	6,662	6,007	4,834	4,386	4,566	5,318

STEAM ELECTRIC POWER	2020	2030	2040	2050	2060	2070
DEMAND (acre-feet per year)	15,240	15,240	15,240	15,240	15,240	15,240
EXISTING SUPPLIES (acre-feet per year)	10,566	10,755	10,855	10,855	10,855	10,855
NEEDS (acre-feet per year)*	5,217	5,028	4,928	4,928	4,928	4,928

LIVESTOCK	2020	2030	2040	2050	2060	2070
DEMAND (acre-feet per year)	4,748	4,748	4,748	4,748	4,748	4,748
EXISTING SUPPLIES (acre-feet per year)	5,022	5,022	5,022	5,022	5,022	5,022
NEEDS (acre-feet per year)*	0	0	0	0	0	0

IRRIGATION	2020	2030	2040	2050	2060	2070
DEMAND (acre-feet per year)	1,426,960	1,381,152	1,335,343	1,289,533	1,243,724	1,197,914
EXISTING SUPPLIES (acre-feet per year)	538,257	538,149	538,140	537,666	537,884	537,757
NEEDS (acre-feet per year)*	888,896	843,532	798,075	753,082	707,399	662,060

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Category Summary report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG category level, calculated surpluses are updated to zero so that only the WUGs with needs in the decade are included with the Needs totals.

Region M Source Availability

GROUNDWATER SOURCE TYPE				SOURCE AVAILABILITY (ACRE-FEET PER YEAR)					
SOURCE NAME	COUNTY	BASIN	SALINITY *	2020	2030	2040	2050	2060	2070
CARRIZO-WILCOX AQUIFER	MAVERICK	NUECES	FRESH	777	777	777	777	472	472
CARRIZO-WILCOX AQUIFER	MAVERICK	RIO GRANDE	FRESH/ BRACKISH	1,265	1,265	1,224	1,137	1,097	1,059
CARRIZO-WILCOX AQUIFER	WEBB	NUECES	FRESH	92	92	92	92	92	92
CARRIZO-WILCOX AQUIFER	WEBB	RIO GRANDE	FRESH/ BRACKISH	824	824	824	824	824	824
GULF COAST AQUIFER SYSTEM	CAMERON	NUECES-RIO GRANDE	FRESH/ BRACKISH	45,270	49,931	54,592	59,252	63,914	63,914
GULF COAST AQUIFER SYSTEM	CAMERON	RIO GRANDE	FRESH/ BRACKISH	1,033	1,235	1,439	1,641	1,842	1,842
GULF COAST AQUIFER SYSTEM	HIDALGO	NUECES-RIO GRANDE	FRESH/ BRACKISH	86,405	91,810	97,216	102,620	107,784	107,784
GULF COAST AQUIFER SYSTEM	HIDALGO	RIO GRANDE	FRESH/ BRACKISH	1,634	2,041	2,447	2,854	3,260	3,260
GULF COAST AQUIFER SYSTEM	JIM HOGG	NUECES-RIO GRANDE	FRESH/ BRACKISH	5,236	5,236	5,236	5,236	5,236	5,236
GULF COAST AQUIFER SYSTEM	JIM HOGG	RIO GRANDE	FRESH/ BRACKISH	938	938	938	938	938	938
GULF COAST AQUIFER SYSTEM	STARR	NUECES-RIO GRANDE	FRESH/ BRACKISH	1,497	1,891	2,285	2,678	3,072	3,072
GULF COAST AQUIFER SYSTEM	STARR	RIO GRANDE	FRESH/ BRACKISH	2,225	2,810	3,396	3,981	4,567	4,567
GULF COAST AQUIFER SYSTEM	WEBB	NUECES	FRESH/ BRACKISH	18	22	27	32	37	37
GULF COAST AQUIFER SYSTEM	WEBB	NUECES-RIO GRANDE	FRESH/ BRACKISH	504	642	780	918	1,056	1,056
GULF COAST AQUIFER SYSTEM	WEBB	RIO GRANDE	FRESH/ BRACKISH	98	125	152	179	206	206
GULF COAST AQUIFER SYSTEM	WILLACY	NUECES-RIO GRANDE	FRESH/ BRACKISH	2,337	2,866	3,394	3,922	4,258	4,258
YEGUA-JACKSON AQUIFER	STARR	RIO GRANDE	FRESH	8,013	8,013	8,013	8,013	8,013	8,013
YEGUA-JACKSON AQUIFER	WEBB	NUECES	FRESH	11,969	11,969	11,969	11,969	11,969	11,969
YEGUA-JACKSON AQUIFER	WEBB	RIO GRANDE	FRESH	8,031	8,031	8,031	8,031	8,031	8,031
YEGUA-JACKSON AQUIFER	ZAPATA	RIO GRANDE	FRESH	7,987	7,987	7,987	7,987	7,987	7,987
			GROUNDWATER SOURCE AVAILABILITY TOTAL	**186,153**	**198,505**	**210,819**	**223,081**	**234,655**	**234,617**

REUSE SOURCE TYPE				SOURCE AVAILABILITY (ACRE-FEET PER YEAR)					
SOURCE NAME	COUNTY	BASIN	SALINITY *	2020	2030	2040	2050	2060	2070
DIRECT REUSE	CAMERON	NUECES-RIO GRANDE	FRESH	9,064	13,737	15,782	15,782	16,782	16,782
DIRECT REUSE	CAMERON	RIO GRANDE	FRESH	112	112	112	112	112	112
DIRECT REUSE	HIDALGO	NUECES-RIO GRANDE	FRESH	31,856	33,526	34,646	39,446	41,686	41,686
DIRECT REUSE	HIDALGO	RIO GRANDE	FRESH	2,887	4,887	6,283	7,493	7,493	7,493
DIRECT REUSE	MAVERICK	RIO GRANDE	FRESH	650	650	650	650	650	650
DIRECT REUSE	WEBB	RIO GRANDE	FRESH	773	6,498	6,498	6,498	9,733	12,533
			REUSE SOURCE AVAILABILITY TOTAL	**45,342**	**59,410**	**63,971**	**69,981**	**76,456**	**79,256**

* Salinity field indicates whether the source availability is considered 'fresh' (less than 1,000 mg/L), 'brackish' (1,000 to 10,000 mg/L), 'saline' (10,001 mg/L to 34,999 mg/L), or 'seawater' (35,000 mg/L or greater). Sources can also be labeled as 'fresh/brackish' or 'brackish/saline', if a combination of the salinity types is appropriate.

** Since reservoir sources can exist across multiple counties, the county field value, 'reservoir' is applied to all reservoir sources.

Region M Source Availability

SURFACE WATER SOURCE TYPE				SOURCE AVAILABILITY (ACRE-FEET PER YEAR)					
SOURCE NAME	**COUNTY**	**BASIN**	**SALINITY ***	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	RESERVOIR**	RIO GRANDE	FRESH	1,079,381	1,079,175	1,078,968	1,078,762	1,078,555	1,078,349
LIVESTOCK LOCAL SUPPLY	JIM HOGG	NUECES-RIO GRANDE	FRESH	222	222	222	222	222	222
LIVESTOCK LOCAL SUPPLY	JIM HOGG	RIO GRANDE	FRESH	49	49	49	49	49	49
LIVESTOCK LOCAL SUPPLY	MAVERICK	NUECES	FRESH	49	49	49	49	49	49
LIVESTOCK LOCAL SUPPLY	MAVERICK	RIO GRANDE	FRESH	147	147	147	147	147	147
LIVESTOCK LOCAL SUPPLY	STARR	RIO GRANDE	FRESH	65	65	65	65	65	65
LIVESTOCK LOCAL SUPPLY	WEBB	NUECES	FRESH	413	413	413	413	413	413
LIVESTOCK LOCAL SUPPLY	WEBB	NUECES-RIO GRANDE	FRESH	55	55	55	55	55	55
LIVESTOCK LOCAL SUPPLY	WEBB	RIO GRANDE	FRESH	451	451	451	451	451	451
LIVESTOCK LOCAL SUPPLY	ZAPATA	RIO GRANDE	FRESH	249	249	249	249	249	249
NUECES-RIO GRANDE RUN-OF-RIVER	CAMERON	NUECES-RIO GRANDE	FRESH	350	350	350	350	350	350
NUECES-RIO GRANDE RUN-OF-RIVER	HIDALGO	NUECES-RIO GRANDE	FRESH	7,522	7,522	7,522	7,522	7,522	7,522
NUECES-RIO GRANDE RUN-OF-RIVER	WILLACY	NUECES-RIO GRANDE	FRESH	350	350	350	350	350	350
RIO GRANDE RUN-OF-RIVER	MAVERICK	RIO GRANDE	FRESH	243	243	243	243	243	243
			SURFACE WATER SOURCE AVAILABILITY TOTAL	**1,089,546**	**1,089,340**	**1,089,133**	**1,088,927**	**1,088,720**	**1,088,514**

REGION M SOURCE AVAILABILITY TOTAL	**1,321,041**	**1,347,255**	**1,363,923**	**1,381,989**	**1,399,831**	**1,402,387**

* Salinity field indicates whether the source availability is considered ‘fresh’ (less than 1,000 mg/L), ‘brackish’ (1,000 to 10,000 mg/L), ‘saline’ (10,001 mg/L to 34,999 mg/L), or ‘seawater’ (35,000 mg/L or greater). Sources can also be labeled as ‘fresh/brackish’ or ‘brackish/saline’, if a combination of the salinity types is appropriate.
** Since reservoir sources can exist across multiple counties, the county field value, ‘reservoir’ is applied to all reservoir sources.

Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
BROWNSVILLE	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	33,241	33,241	33,240	33,241	33,240	33,240
BROWNSVILLE	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	9,930	9,931	9,930	9,931	9,931	9,930
COMBES	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	677	677	677	677	677	677
EAST RIO HONDO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	4,364	4,364	4,364	4,364	4,364	4,364
EAST RIO HONDO WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	536	566	598	629	662	662
EL JARDIN WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,457	1,457	1,457	1,456	1,457	1,457
HARLINGEN	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	19,838	19,837	19,837	19,840	19,840	19,839
HARLINGEN	M	DIRECT REUSE	1,120	1,120	1,120	1,120	1,120	1,120
LA FERIA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,300	1,400	1,500	1,700	2,000	2,200
LAGUNA MADRE WATER DISTRICT	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	7,513	7,513	7,513	7,513	7,513	7,513
LOS FRESNOS	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	715	715	715	715	715	715
LOS FRESNOS	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	267	267	267	267	267	267
MILITARY HIGHWAY WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	399	399	399	399	399	399
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	1,265	1,265	1,265	1,265	1,265	1,265
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	2,435	2,435	2,435	2,435	2,435	2,435
NORTH ALAMO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	329	330	331	332	332	332
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	2	2	2	2	2	2
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	228	229	230	230	230	231
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	30	35	36	36	36	36
OLMITO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,251	1,251	1,251	1,251	1,251	1,251
PALM VALLEY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	266	266	266	266	266	266
PRIMERA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	340	340	340	380	450	523
PRIMERA	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	205	205	205	205	205	205
RIO HONDO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	712	712	712	712	712	712
SAN BENITO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,846	4,346	5,326	5,426	5,626	5,626
SANTA ROSA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	612	612	612	612	612	612
VALLEY MUD 2	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	737	737	737	737	737	737
VALLEY MUD 2	M	DIRECT REUSE	90	103	103	103	103	103
VALLEY MUD 2	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	342	361	378	397	415	415
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,753	1,753	1,753	1,753	1,753	1,753
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	261	261	261	261	261	261
MANUFACTURING	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	185	185	185	185	185	185
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	661	661	661	661	661	661
STEAM ELECTRIC POWER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	121	121	121	121	121	121
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	411	411	411	411	411	411
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	166,864	166,833	166,802	166,769	166,740	166,708
IRRIGATION	M	NUECES-RIO GRANDE RUN-OF-RIVER	340	340	340	340	340	340
		NUECES-RIO GRANDE BASIN TOTAL	**264,643**	**265,281**	**266,380**	**266,742**	**267,334**	**267,574**
BROWNSVILLE	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	202	202	203	202	203	202
BROWNSVILLE	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	61	60	61	60	60	61
EL JARDIN WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	43	43	43	44	43	43
MILITARY HIGHWAY WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3	3	3	3	3	3
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	8	8	8	8	8	8
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	15	15	15	15	15	15
VALLEY MUD 2	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	61	61	61	61	61	61
VALLEY MUD 2	M	DIRECT REUSE	8	9	9	9	9	9
VALLEY MUD 2	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	29	30	32	33	35	35

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR) 2020	2030	2040	2050	2060	2070
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	37	37	37	37	37	37
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	342	342	342	342	342	342
MANUFACTURING	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	241	241	241	241	241	241
STEAM ELECTRIC POWER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	4	4	4	4	4	4
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	25	25	25	25	25	25
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	10,621	10,619	10,616	10,616	10,613	10,612
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	177	177	177	177	177	177
IRRIGATION	M	NUECES-RIO GRANDE RUN-OF-RIVER	3	3	3	3	3	3
		RIO GRANDE BASIN TOTAL	**11,880**	**11,879**	**11,880**	**11,880**	**11,879**	**11,878**
		CAMERON COUNTY TOTAL	**276,523**	**277,160**	**278,260**	**278,622**	**279,213**	**279,452**
AGUA SUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	7,148	7,148	7,149	7,147	7,148	7,148
ALAMO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,694	1,694	1,694	1,694	1,694	1,694
ALAMO	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	522	522	522	522	522	522
DONNA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,126	3,125	3,125	3,125	3,125	3,125
EDCOUCH	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	262	262	262	262	262	262
EDINBURG	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	6,139	6,139	4,222	4,222	4,222	4,222
ELSA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	568	568	568	567	567	567
HIDALGO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	136	136	136	136	136	136
HIDALGO	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,602	1,766	1,766	1,766	1,766	1,766
HIDALGO COUNTY MUD 1	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	604	604	604	604	604	604
LA JOYA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	288	288	288	288	288	288
LA VILLA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	236	236	236	236	236	236
MCALLEN	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	33,544	33,544	31,744	31,744	31,744	31,744
MCALLEN	M	DIRECT REUSE	2,251	2,251	2,251	2,251	2,251	2,251
MCALLEN	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,120	1,120	1,120	1,120	1,120	1,120
MERCEDES	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	2,267	2,267	2,267	2,267	2,267	2,267
MERCEDES	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	626	626	626	626	626	626
MILITARY HIGHWAY WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	327	327	327	327	327	327
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	1,034	1,034	1,034	1,034	1,034	1,034
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,991	1,991	1,991	1,991	1,991	1,991
MISSION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	11,550	11,550	11,550	11,550	11,550	11,550
NORTH ALAMO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	11,707	11,744	11,772	11,789	11,805	11,817
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	65	66	66	66	66	66
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	8,132	8,159	8,178	8,191	8,201	8,208
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	1,070	1,264	1,266	1,268	1,269	1,271
PHARR	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	7,978	7,978	7,978	7,978	7,978	7,978
PHARR	M	DIRECT REUSE	991	1,192	1,401	1,617	1,841	2,060
PHARR	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,399	1,399	1,399	1,399	1,399	1,399
SAN JUAN	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,166	3,166	3,166	3,166	3,166	3,166
SAN JUAN	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	662	662	662	662	662	662
SAN JUAN	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,120	1,120	1,120	1,120	1,120	1,120
SHARYLAND WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	13,195	13,195	13,195	13,195	13,195	13,195
WESLACO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	5,408	5,408	5,408	5,408	5,408	5,408
WESLACO	M	DIRECT REUSE	770	971	1,052	1,052	1,052	1,052
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,922	1,923	1,922	1,922	1,922	1,922
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	243	238	238	238	238	238
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	415	415	415	415	415	415
MANUFACTURING	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	2,500	2,500	2,500	2,500	2,500	2,500

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Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,203	1,203	1,202	1,202	1,202	1,201
MINING	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	635	635	635	635	635	635
STEAM ELECTRIC POWER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	344	343	343	343	343	343
STEAM ELECTRIC POWER	M	DIRECT REUSE	4,769	4,769	4,769	4,769	4,769	4,769
STEAM ELECTRIC POWER	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1,319	1,443	1,509	1,509	1,509	1,509
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	4	20	20	20	20	20
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	702	686	686	686	686	686
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	261,605	261,537	261,465	261,065	261,325	261,253
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	5,550	5,567	5,567	5,567	5,567	5,567
		NUECES-RIO GRANDE BASIN TOTAL	**413,909**	**414,801**	**411,416**	**411,261**	**411,773**	**411,940**
AGUA SUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,357	1,357	1,357	1,358	1,358	1,357
HIDALGO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1	1	1	1	1	1
HIDALGO	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	15	16	16	16	16	16
LA JOYA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	76	76	76	76	76	76
MILITARY HIGHWAY WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	6	6	6	6	6	6
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	20	20	20	20	20	20
MILITARY HIGHWAY WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	39	39	39	39	39	39
MISSION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	6	6	6	6	6	6
PHARR	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	2	2	2	2	2	2
PHARR	M	DIRECT REUSE	1	1	1	1	1	1
PHARR	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	1	1	1	1	1	1
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	102	101	102	102	102	102
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	2	7	7	7	7	7
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	95	95	95	95	95	95
STEAM ELECTRIC POWER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	122	122	122	122	122	122
STEAM ELECTRIC POWER	M	DIRECT REUSE	2,501	2,501	2,501	2,501	2,501	2,501
STEAM ELECTRIC POWER	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	691	757	791	791	791	791
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	67	51	51	51	51	51
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	4	20	20	20	20	20
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	10,885	10,881	10,879	10,861	10,873	10,871
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	231	232	232	232	232	232
		RIO GRANDE BASIN TOTAL	**16,224**	**16,292**	**16,325**	**16,308**	**16,320**	**16,317**
		HIDALGO COUNTY TOTAL	**430,133**	**431,093**	**427,741**	**427,569**	**428,093**	**428,257**
JIM HOGG COUNTY WCID 2	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	1,412	1,412	1,412	1,412	1,412	1,412
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	272	273	273	272	272	273
MANUFACTURING	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	2	2	2	2	2	2
MINING	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	84	88	31	48	31	20
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	105	105	105	105	105	105
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	222	222	222	222	222	222
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	280	280	280	280	280	280
		NUECES-RIO GRANDE BASIN TOTAL	**2,377**	**2,382**	**2,325**	**2,341**	**2,324**	**2,314**
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	14	13	13	14	14	13
MINING	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	9	9	3	5	3	2
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	60	60	60	60	60	60
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	49	49	49	49	49	49
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | JIM HOGG COUNTY	80	80	80	80	80	80
		RIO GRANDE BASIN TOTAL	**212**	**211**	**205**	**208**	**206**	**204**
		JIM HOGG COUNTY TOTAL	**2,589**	**2,593**	**2,530**	**2,549**	**2,530**	**2,518**

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Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1	1	1	1	1	1
COUNTY-OTHER	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	5	5	5	5	5	5
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	277	277	277	277	277	277
MINING	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	2	2	2	2	2	2
LIVESTOCK	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	15	15	15	15	15	15
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	49	49	49	49	49	49
LIVESTOCK	M	RIO GRANDE RUN-OF-RIVER	33	33	33	33	33	33
		NUECES BASIN TOTAL	**382**	**382**	**382**	**382**	**382**	**382**
EAGLE PASS	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	10,613	10,613	10,613	10,613	10,613	10,613
MAVERICK COUNTY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	607	607	606	606	606	606
MAVERICK COUNTY	M	RIO GRANDE RUN-OF-RIVER	111	111	111	111	111	111
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	175	175	175	175	175	175
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	50	50	50	50	50	50
MANUFACTURING	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	15	15	15	15	15	15
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,107	1,107	1,106	1,106	1,106	1,105
MINING	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	8	8	8	8	8	8
LIVESTOCK	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	45	45	45	45	45	45
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	147	147	147	147	147	147
LIVESTOCK	M	RIO GRANDE RUN-OF-RIVER	99	99	99	99	99	99
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	43,592	43,580	43,569	43,557	43,545	43,533
IRRIGATION	M	CARRIZO-WILCOX AQUIFER | MAVERICK COUNTY	420	420	420	420	420	420
		RIO GRANDE BASIN TOTAL	**56,989**	**56,977**	**56,964**	**56,952**	**56,940**	**56,927**
		MAVERICK COUNTY TOTAL	**57,371**	**57,359**	**57,346**	**57,334**	**57,322**	**57,309**
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	6	6	6	6	6	6
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | STARR COUNTY	1	1	1	1	1	1
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	46	46	46	46	46	46
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	179	179	179	179	179	179
		NUECES-RIO GRANDE BASIN TOTAL	**232**	**232**	**232**	**232**	**232**	**232**
AGUA SUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	40	40	39	40	39	40
EL SAUZ WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	105	105	105	105	105	105
EL TANQUE WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	177	177	177	177	177	177
LA GRULLA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	600	600	600	600	600	600
RIO GRANDE CITY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,118	3,118	3,118	3,118	3,118	3,118
RIO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	616	616	616	616	616	616
ROMA	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,377	3,377	3,377	3,377	3,377	3,377
UNION WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	542	542	542	542	542	542
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	113	113	113	113	113	113
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | STARR COUNTY	14	14	14	14	14	14
MANUFACTURING	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	74	74	74	74	74	74
MANUFACTURING	M	YEGUA-JACKSON AQUIFER | STARR COUNTY	11	12	12	12	12	12
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	156	156	156	156	156	156
MINING	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	74	74	74	74	74	74
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	748	748	748	748	748	748
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	65	65	65	65	65	65
LIVESTOCK	M	YEGUA-JACKSON AQUIFER | STARR COUNTY	200	200	200	200	200	200
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,974	3,973	3,972	3,971	3,970	3,969
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | STARR COUNTY	280	280	280	280	280	280
IRRIGATION	M	YEGUA-JACKSON AQUIFER | STARR COUNTY	40	40	40	40	40	40

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Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
		RIO GRANDE BASIN TOTAL	**14,324**	**14,324**	**14,322**	**14,322**	**14,320**	**14,320**
		STARR COUNTY TOTAL	**14,556**	**14,556**	**14,554**	**14,554**	**14,552**	**14,552**
WEBB COUNTY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	265	265	265	266	265	265
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	6	6	6	6	6	6
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | WEBB COUNTY	3	3	3	3	3	3
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	30	30	30	30	30	30
MANUFACTURING	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	35	44	44	44	44	44
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,420	1,420	1,419	1,419	1,419	1,419
MINING	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	149	149	149	149	149	149
MINING	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	67	75	82	88	96	96
LIVESTOCK	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	34	34	34	34	34	34
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	15	15	15	15	15	15
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	413	413	413	413	413	413
		NUECES BASIN TOTAL	**2,437**	**2,454**	**2,460**	**2,467**	**2,474**	**2,474**
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	118	119	120	123	123	123
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | WEBB COUNTY	42	42	42	42	42	42
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	242	242	242	242	241	241
MINING	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	20	20	20	20	20	20
MINING	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	12	13	14	15	16	16
LIVESTOCK	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	5	5	5	5	5	5
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	3	3	3	3	3	3
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	55	55	55	55	55	55
		NUECES-RIO GRANDE BASIN TOTAL	**497**	**499**	**501**	**505**	**505**	**505**
LAREDO	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	59,226	59,226	59,226	59,226	59,226	59,226
LAREDO	M	DIRECT REUSE	773	773	773	773	773	773
MIRANDO CITY WSC	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	70	70	70	70	70	70
WEBB COUNTY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	2,046	2,046	2,046	2,045	2,046	2,046
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	5	6	7	12	12	12
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | WEBB COUNTY	61	61	61	61	61	61
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	128	128	128	128	128	128
MANUFACTURING	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	153	189	189	189	189	189
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,139	3,138	3,137	3,136	3,136	3,135
MINING	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	323	323	323	323	323	323
MINING	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	146	162	179	191	209	209
STEAM ELECTRIC POWER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	695	695	695	695	695	695
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	50	50	50	50	50	50
LIVESTOCK	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	36	36	36	36	36	36
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | WEBB COUNTY	17	17	17	17	17	17
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	451	451	451	451	451	451
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	10,570	10,567	10,565	10,561	10,559	10,557
IRRIGATION	M	CARRIZO-WILCOX AQUIFER | WEBB COUNTY	40	40	40	40	40	40
		RIO GRANDE BASIN TOTAL	**77,929**	**77,978**	**77,993**	**78,004**	**78,021**	**78,018**
		WEBB COUNTY TOTAL	**80,863**	**80,931**	**80,954**	**80,976**	**81,000**	**80,997**
EAST RIO HONDO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	5	5	5	5	5	5
EAST RIO HONDO WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	1	2	2	2	1	1
LYFORD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	588	588	588	588	588	588
NORTH ALAMO WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	460	422	392	374	358	346
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | CAMERON COUNTY	3	2	2	2	2	2

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Region M Water User Group (WUG) Existing Water Supply

WUG NAME	SOURCE REGION	SOURCE DESCRIPTION	EXISTING SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | HIDALGO COUNTY	320	292	272	259	249	241
NORTH ALAMO WSC	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	42	45	42	40	39	37
PORT MANSFIELD PUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	98	98	98	98	98	98
RAYMONDVILLE	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	3,402	3,402	3,402	3,402	3,402	3,402
RAYMONDVILLE	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	4	5	5	5	5	5
SEBASTIAN MUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	204	204	204	204	204	204
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	486	486	486	485	485	485
COUNTY-OTHER	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	0	0	18	18	18	18
MINING	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	0	0	20	20	20	20
LIVESTOCK	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	235	235	140	140	140	140
LIVESTOCK	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	0	0	95	95	95	95
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	20,631	20,626	20,620	20,614	20,608	20,603
IRRIGATION	M	GULF COAST AQUIFER SYSTEM | WILLACY COUNTY	0	0	120	120	120	120
		NUECES-RIO GRANDE BASIN TOTAL	**26,479**	**26,412**	**26,511**	**26,471**	**26,437**	**26,410**
		WILLACY COUNTY TOTAL	**26,479**	**26,412**	**26,511**	**26,471**	**26,437**	**26,410**
FALCON RURAL WSC	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	309	309	309	309	309	309
SAN YGNACIO MUD	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	284	284	284	284	284	284
SIESTA SHORES WCID	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	369	369	369	369	369	369
ZAPATA COUNTY	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	2,084	2,084	2,084	2,084	2,084	2,084
ZAPATA COUNTY WCID-HWY 16 EAST	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	502	502	502	502	502	502
COUNTY-OTHER	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	63	63	63	63	63	63
COUNTY-OTHER	M	YEGUA-JACKSON AQUIFER | ZAPATA COUNTY	3	3	3	3	3	3
MANUFACTURING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	5	5	5	5	5	5
MINING	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	448	448	448	448	448	448
MINING	M	YEGUA-JACKSON AQUIFER | ZAPATA COUNTY	884	884	884	884	884	884
LIVESTOCK	M	LOCAL SURFACE WATER SUPPLY	249	249	249	249	249	249
LIVESTOCK	M	YEGUA-JACKSON AQUIFER | ZAPATA COUNTY	230	230	230	230	230	230
IRRIGATION	M	AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	1,994	1,994	1,993	1,993	1,992	1,992
IRRIGATION	M	YEGUA-JACKSON AQUIFER | ZAPATA COUNTY	80	80	80	80	80	80
		RIO GRANDE BASIN TOTAL	**7,504**	**7,504**	**7,503**	**7,503**	**7,502**	**7,502**
		ZAPATA COUNTY TOTAL	**7,504**	**7,504**	**7,503**	**7,503**	**7,502**	**7,502**
		REGION M EXISTING WATER SUPPLY TOTAL	**896,018**	**897,608**	**895,399**	**895,578**	**896,649**	**896,997**

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Region M Water User Group (WUG) Needs/Surplus

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Needs/Surplus report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Surplus volumes are shown as positive values, and needs are shown as negative values in parentheses.

	(NEEDS)/SURPLUS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
CAMERON COUNTY - NUECES-RIO GRANDE BASIN						
BROWNSVILLE	7,909	2,223	(3,712)	(10,388)	(17,442)	(24,752)
COMBES	356	320	281	233	180	124
EAST RIO HONDO WSC	1,005	478	479	30	(426)	(1,039)
EL JARDIN WSC	(23)	(220)	(430)	(669)	(926)	(1,193)
HARLINGEN	5,161	2,965	869	(1,252)	(3,452)	(6,201)
LA FERIA	175	126	68	88	192	189
LAGUNA MADRE WATER DISTRICT	(417)	(1,666)	(2,948)	(4,352)	(5,817)	(7,322)
LOS FRESNOS	540	466	390	309	226	140
MILITARY HIGHWAY WSC	565	(52)	(692)	(1,376)	(2,090)	(2,808)
NORTH ALAMO WSC	(153)	(304)	(463)	(627)	(795)	(959)
OLMITO WSC	92	(70)	(239)	(431)	(637)	(849)
PALM VALLEY	16	20	22	22	20	18
PRIMERA	127	78	24	0	0	0
RIO HONDO	509	488	462	428	392	356
SAN BENITO	113	151	638	159	(280)	(944)
SANTA ROSA	316	286	252	210	162	112
VALLEY MUD 2	266	159	32	(107)	(254)	(425)
COUNTY-OTHER	(2,057)	(1,754)	(2,295)	(2,696)	(3,312)	(3,426)
MANUFACTURING	(268)	(354)	(354)	(354)	(354)	(354)
MINING	397	384	470	535	600	633
STEAM ELECTRIC POWER	(3,302)	(3,302)	(3,302)	(3,302)	(3,302)	(3,302)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(337,871)	(321,689)	(305,505)	(289,324)	(273,138)	(256,956)
CAMERON COUNTY - RIO GRANDE BASIN						
BROWNSVILLE	48	13	(22)	(64)	(106)	(151)
EL JARDIN WSC	(3)	(9)	(15)	(22)	(30)	(39)
MILITARY HIGHWAY WSC	4	0	(4)	(8)	(12)	(17)
VALLEY MUD 2	23	13	4	(8)	(20)	(34)
COUNTY-OTHER	(84)	(74)	(91)	(104)	(124)	(127)
MANUFACTURING	(350)	(463)	(463)	(463)	(463)	(463)
STEAM ELECTRIC POWER	(123)	(123)	(123)	(123)	(123)	(123)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(21,341)	(20,311)	(19,282)	(18,250)	(17,222)	(16,191)
HIDALGO COUNTY - NUECES-RIO GRANDE BASIN						
AGUA SUD	950	(317)	(1,632)	(2,991)	(4,385)	(5,756)
ALAMO	(1,014)	(1,692)	(2,391)	(3,110)	(3,848)	(4,570)
DONNA	516	(1)	(534)	(1,093)	(1,677)	(2,249)
EDCOUCH	(81)	(139)	(201)	(269)	(341)	(413)
EDINBURG	(6,835)	(9,591)	(14,351)	(17,262)	(20,237)	(23,152)
ELSA	(264)	(419)	(582)	(755)	(937)	(1,116)
HIDALGO	(103)	(331)	(735)	(1,149)	(1,571)	(1,986)
HIDALGO COUNTY MUD 1	(212)	(292)	(375)	(459)	(543)	(624)
LA JOYA	(227)	(331)	(439)	(551)	(667)	(780)

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Region M Water User Group (WUG) Needs/Surplus

LA VILLA	(41)	(96)	(152)	(212)	(273)	(334)
MCALLEN	(2,872)	(11,595)	(22,288)	(31,377)	(40,650)	(49,705)
MERCEDES	671	245	(197)	(665)	(1,155)	(1,637)
MILITARY HIGHWAY WSC	461	(43)	(567)	(1,127)	(1,710)	(2,298)
MISSION	(8,509)	(12,969)	(17,520)	(22,149)	(26,843)	(31,428)
NORTH ALAMO WSC	(5,443)	(10,798)	(16,503)	(22,356)	(28,312)	(34,151)
PHARR	448	(1,361)	(3,238)	(5,184)	(7,192)	(9,164)
SAN JUAN	1	(1,042)	(2,115)	(3,218)	(4,350)	(5,459)
SHARYLAND WSC	294	(2,433)	(5,226)	(8,107)	(11,068)	(13,965)
WESLACO	(1,519)	(3,332)	(5,090)	(6,983)	(8,931)	(10,758)
COUNTY-OTHER	(564)	(1,223)	(2,057)	(2,850)	(3,648)	(4,472)
MANUFACTURING	679	194	194	194	194	194
MINING	(798)	(1,517)	(2,054)	(2,630)	(3,290)	(4,127)
STEAM ELECTRIC POWER	(1,137)	(1,014)	(948)	(948)	(948)	(948)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(394,005)	(372,832)	(351,678)	(330,853)	(309,369)	(288,215)
HIDALGO COUNTY - RIO GRANDE BASIN						
AGUA SUD	180	(61)	(311)	(568)	(833)	(1,094)
HIDALGO	(1)	(3)	(7)	(11)	(15)	(18)
LA JOYA	(60)	(88)	(116)	(145)	(176)	(206)
MILITARY HIGHWAY WSC	8	(2)	(12)	(23)	(35)	(46)
MISSION	(5)	(7)	(10)	(12)	(15)	(18)
PHARR	1	1	0	0	(1)	(1)
COUNTY-OTHER	(40)	(70)	(113)	(155)	(197)	(241)
MINING	(113)	(170)	(212)	(257)	(310)	(376)
STEAM ELECTRIC POWER	(655)	(589)	(555)	(555)	(555)	(555)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(16,391)	(15,511)	(14,630)	(13,765)	(12,870)	(11,989)
JIM HOGG COUNTY - NUECES-RIO GRANDE BASIN						
JIM HOGG COUNTY WCID 2	769	737	710	669	629	590
COUNTY-OTHER	124	119	113	103	94	86
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	(34)	0	0	0
LIVESTOCK	45	45	45	45	45	45
IRRIGATION	(8)	2	10	20	29	38
JIM HOGG COUNTY - RIO GRANDE BASIN						
COUNTY-OTHER	9	8	8	9	8	7
MINING	0	0	(4)	0	0	0
LIVESTOCK	15	15	15	15	15	15
IRRIGATION	8	10	13	15	17	20
MAVERICK COUNTY - NUECES BASIN						
COUNTY-OTHER	3	3	3	4	4	4
MINING	(119)	(269)	(308)	(182)	(56)	35
LIVESTOCK	4	4	4	4	4	4
MAVERICK COUNTY - RIO GRANDE BASIN						
EAGLE PASS	1,068	(226)	(1,461)	(2,816)	(4,182)	(5,509)
MAVERICK COUNTY	477	450	422	393	362	333
COUNTY-OTHER	(398)	(336)	(285)	(239)	(197)	(157)
MANUFACTURING	0	0	0	0	0	0
MINING	(475)	(1,074)	(1,232)	(727)	(225)	140

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Region M Water User Group (WUG) Needs/Surplus

LIVESTOCK	13	13	13	13	13	13
IRRIGATION	(17,694)	(15,725)	(13,755)	(11,786)	(9,817)	(7,848)
STARR COUNTY - NUECES-RIO GRANDE BASIN						
COUNTY-OTHER	(148)	(161)	(172)	(186)	(200)	(212)
MINING	(85)	(114)	(132)	(151)	(174)	(204)
LIVESTOCK	0	0	0	0	0	0
STARR COUNTY - RIO GRANDE BASIN						
AGUA SUD	6	(1)	(9)	(16)	(24)	(31)
EL SAUZ WSC	(58)	(72)	(86)	(102)	(117)	(132)
EL TANQUE WSC	(99)	(128)	(155)	(183)	(211)	(236)
LA GRULLA	(708)	(845)	(975)	(1,112)	(1,242)	(1,362)
RIO GRANDE CITY	(1,732)	(2,268)	(2,771)	(3,295)	(3,787)	(4,237)
RIO WSC	(27)	(90)	(151)	(216)	(278)	(336)
ROMA	911	696	487	253	18	(200)
UNION WSC	(719)	(860)	(993)	(1,130)	(1,258)	(1,375)
COUNTY-OTHER	(397)	(439)	(479)	(526)	(572)	(615)
MANUFACTURING	(10)	(30)	(30)	(30)	(30)	(30)
MINING	(210)	(307)	(367)	(431)	(511)	(611)
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	(19,581)	(18,816)	(18,050)	(17,285)	(16,519)	(15,754)
WEBB COUNTY - NUECES BASIN						
WEBB COUNTY	80	44	8	(25)	(58)	(89)
COUNTY-OTHER	3	2	1	0	(1)	(2)
MANUFACTURING	18	18	18	18	18	18
MINING	(1,463)	(770)	(161)	423	1,110	1,261
LIVESTOCK	30	30	30	30	30	30
WEBB COUNTY - NUECES-RIO GRANDE BASIN						
COUNTY-OTHER	39	19	(3)	(23)	(45)	(64)
MINING	(243)	(128)	(26)	71	185	210
LIVESTOCK	4	4	4	4	4	4
WEBB COUNTY - RIO GRANDE BASIN						
LAREDO	17,971	9,469	1,187	(6,592)	(14,191)	(21,097)
MIRANDO CITY WSC	1	(13)	(26)	(38)	(51)	(62)
WEBB COUNTY	617	338	64	(196)	(450)	(682)
COUNTY-OTHER	(109)	(140)	(173)	(201)	(232)	(260)
MANUFACTURING	77	77	77	77	77	77
MINING	(3,107)	(1,607)	(286)	977	2,468	2,794
STEAM ELECTRIC POWER	543	543	543	543	543	543
LIVESTOCK	82	82	82	82	82	82
IRRIGATION	185	517	849	1,180	1,513	1,845
WILLACY COUNTY - NUECES-RIO GRANDE BASIN						
EAST RIO HONDO WSC	1	1	1	0	(1)	(2)
LYFORD	298	274	250	221	189	157
NORTH ALAMO WSC	(213)	(387)	(551)	(708)	(858)	(1,002)
PORT MANSFIELD PUD	(133)	(161)	(187)	(215)	(244)	(271)
RAYMONDVILLE	1,916	1,789	1,660	1,503	1,335	1,168
SEBASTIAN MUD	47	36	18	(1)	(20)	(38)
COUNTY-OTHER	434	428	439	432	426	419
MINING	(49)	(51)	(18)	(8)	2	8
LIVESTOCK	0	0	0	0	0	0

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Region M Water User Group (WUG) Needs/Surplus

IRRIGATION	(78,979)	(75,786)	(72,475)	(69,283)	(66,091)	(62,898)
ZAPATA COUNTY - RIO GRANDE BASIN						
FALCON RURAL WSC	146	126	104	87	69	54
SAN YGNACIO MUD	95	68	37	1	(37)	(77)
SIESTA SHORES WCID	147	115	78	36	(8)	(55)
ZAPATA COUNTY	(163)	(498)	(872)	(1,312)	(1,773)	(2,275)
ZAPATA COUNTY WCID-HWY 16 EAST	400	384	366	346	325	303
COUNTY-OTHER	(56)	(70)	(91)	(114)	(145)	(167)
MANUFACTURING	(4)	(4)	(4)	(4)	(4)	(4)
MINING	421	378	625	807	1,000	1,118
LIVESTOCK	81	81	81	81	81	81
IRRIGATION	(3,026)	(2,862)	(2,700)	(2,536)	(2,373)	(2,209)

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Region M Water User Group (WUG) Second-Tier Identified Water Needs

Second-tier needs are WUG split needs adjusted to include the implementation of recommended demand reduction and direct reuse water management strategies.

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
CAMERON COUNTY - NUECES-RIO GRANDE BASIN						
BROWNSVILLE	0	0	0	0	1,597	3,116
COMBES	0	0	0	0	0	0
EAST RIO HONDO WSC	0	0	0	0	0	0
EL JARDIN WSC	0	154	356	517	651	771
HARLINGEN	0	0	0	0	0	104
LA FERIA	0	0	0	0	0	0
LAGUNA MADRE WATER DISTRICT	158	0	0	185	307	342
LOS FRESNOS	0	0	0	0	0	0
MILITARY HIGHWAY WSC	0	0	403	821	1,194	1,512
NORTH ALAMO WSC	133	243	352	449	534	603
OLMITO WSC	0	0	0	0	0	0
PALM VALLEY	0	0	0	0	0	0
PRIMERA	0	0	0	0	0	0
RIO HONDO	0	0	0	0	0	0
SAN BENITO	0	0	0	0	0	130
SANTA ROSA	0	0	0	0	0	0
VALLEY MUD 2	0	0	0	0	0	0
COUNTY-OTHER	2,057	1,754	2,295	2,696	3,312	3,426
MANUFACTURING	196	274	274	274	274	274
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	2,960	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	328,590	312,408	296,224	280,043	263,857	247,675
CAMERON COUNTY - RIO GRANDE BASIN						
BROWNSVILLE	0	0	0	0	11	19
EL JARDIN WSC	0	6	12	17	20	25
MILITARY HIGHWAY WSC	0	0	2	4	6	9
VALLEY MUD 2	0	0	0	0	0	0
COUNTY-OTHER	84	74	91	104	124	127
MANUFACTURING	257	358	358	358	358	358
STEAM ELECTRIC POWER	110	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	20,750	19,720	18,691	17,659	16,631	15,600
HIDALGO COUNTY - NUECES-RIO GRANDE BASIN						
AGUA SUD	0	0	0	0	0	0
ALAMO	896	1,546	2,170	2,629	3,029	3,358
DONNA	0	1	387	853	1,182	1,453
EDCOUCH	68	123	182	246	315	368
EDINBURG	3,104	5,065	9,378	11,209	12,807	14,121
ELSA	234	381	537	703	833	921
HIDALGO	60	277	626	894	1,126	1,320
HIDALGO COUNTY MUD 1	152	224	300	338	361	375
LA JOYA	214	314	419	504	571	626
LA VILLA	33	86	140	192	228	257

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Region M Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
HIDALGO COUNTY - NUECES-RIO GRANDE BASIN						
MCALLEN	661	1,687	6,875	6,987	8,348	11,253
MERCEDES	0	0	69	515	814	1,047
MILITARY HIGHWAY WSC	0	0	330	672	976	1,239
MISSION	3,648	5,959	7,563	5,238	7,215	8,828
NORTH ALAMO WSC	4,732	8,654	12,545	15,997	19,010	21,495
PHARR	0	0	0	0	0	0
SAN JUAN	0	914	0	348	978	1,500
SHARYLAND WSC	0	1,246	2,785	4,469	5,943	7,160
WESLACO	141	1,332	2,350	3,469	4,443	5,191
COUNTY-OTHER	564	1,223	2,057	2,850	3,648	4,472
MANUFACTURING	0	0	0	0	0	0
MINING	535	1,181	1,665	2,183	2,777	3,531
STEAM ELECTRIC POWER	0	257	191	191	191	191
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	381,856	360,683	339,529	318,704	297,220	276,066
HIDALGO COUNTY - RIO GRANDE BASIN						
AGUA SUD	0	0	0	0	0	0
HIDALGO	1	3	6	8	11	12
LA JOYA	56	84	111	133	150	165
MILITARY HIGHWAY WSC	0	0	7	14	20	25
MISSION	0	3	4	3	4	6
PHARR	0	0	0	0	0	0
COUNTY-OTHER	40	70	113	155	197	241
MINING	92	144	181	222	270	329
STEAM ELECTRIC POWER	25	192	158	158	158	158
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	15,886	15,006	14,125	13,260	12,365	11,484
JIM HOGG COUNTY - NUECES-RIO GRANDE BASIN						
JIM HOGG COUNTY WCID 2	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	28	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	2	0	0	0	0	0
JIM HOGG COUNTY - RIO GRANDE BASIN						
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	3	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
MAVERICK COUNTY - NUECES BASIN						
COUNTY-OTHER	0	0	0	0	0	0
MINING	79	214	249	136	23	0
LIVESTOCK	0	0	0	0	0	0
MAVERICK COUNTY - RIO GRANDE BASIN						
EAGLE PASS	0	0	209	912	1,464	1,890
MAVERICK COUNTY	0	0	0	0	0	0
COUNTY-OTHER	398	336	285	239	197	157

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Region M Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MAVERICK COUNTY - RIO GRANDE BASIN						
MANUFACTURING	0	0	0	0	0	0
MINING	316	855	998	543	91	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	16,560	14,591	12,621	10,652	8,683	6,714
STARR COUNTY - NUECES-RIO GRANDE BASIN						
COUNTY-OTHER	148	161	172	186	200	212
MINING	72	98	114	131	152	179
LIVESTOCK	0	0	0	0	0	0
STARR COUNTY - RIO GRANDE BASIN						
AGUA SUD	0	0	0	0	0	0
EL SAUZ WSC	51	64	77	92	98	100
EL TANQUE WSC	93	121	141	153	161	166
LA GRULLA	672	720	752	805	838	855
RIO GRANDE CITY	1,362	1,486	1,482	1,428	1,297	1,282
RIO WSC	0	0	49	85	103	112
ROMA	0	0	0	0	0	0
UNION WSC	602	639	690	744	777	794
COUNTY-OTHER	397	439	479	526	572	615
MANUFACTURING	0	18	18	18	18	18
MINING	166	253	307	365	437	527
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	19,142	18,377	17,611	16,846	16,080	15,315
WEBB COUNTY - NUECES BASIN						
WEBB COUNTY	0	0	0	14	31	44
COUNTY-OTHER	0	0	0	0	1	2
MANUFACTURING	0	0	0	0	0	0
MINING	1,153	529	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
WEBB COUNTY - NUECES-RIO GRANDE BASIN						
COUNTY-OTHER	0	0	3	23	45	64
MINING	191	88	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
WEBB COUNTY - RIO GRANDE BASIN						
LAREDO	0	0	0	0	0	537
MIRANDO CITY WSC	0	9	22	31	37	41
WEBB COUNTY	0	0	0	112	243	332
COUNTY-OTHER	109	140	173	201	232	260
MANUFACTURING	0	0	0	0	0	0
MINING	2,436	1,083	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
WILLACY COUNTY - NUECES-RIO GRANDE BASIN						
EAST RIO HONDO WSC	0	0	0	0	0	0
LYFORD	0	0	0	0	0	0
NORTH ALAMO WSC	185	311	419	506	576	631
PORT MANSFIELD PUD	123	127	126	125	121	116

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Region M Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
WILLACY COUNTY - NUECES-RIO GRANDE BASIN						
RAYMONDVILLE	0	0	0	0	0	0
SEBASTIAN MUD	0	0	0	0	8	25
COUNTY-OTHER	0	0	0	0	0	0
MINING	44	46	14	5	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	77,149	73,956	70,645	67,453	64,261	61,068
ZAPATA COUNTY - RIO GRANDE BASIN						
FALCON RURAL WSC	0	0	0	0	0	0
SAN YGNACIO MUD	0	0	0	0	0	0
SIESTA SHORES WCID	0	0	0	0	0	0
ZAPATA COUNTY	101	270	392	636	854	1,070
ZAPATA COUNTY WCID-HWY 16 EAST	0	0	0	0	0	0
COUNTY-OTHER	56	70	91	114	145	167
MANUFACTURING	3	3	3	3	3	3
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	2,448	2,284	2,122	1,958	1,795	1,631

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Region M Water User Group (WUG) Second-Tier Identified Water Needs Summary

Second-tier needs are WUG split needs adjusted to include the implementation of recommended demand reduction and direct reuse water management strategies.

WUG CATEGORY	NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MUNICIPAL	17,480	32,049	52,268	63,057	79,292	95,346
COUNTY-OTHER	3,853	4,267	5,759	7,094	8,673	9,743
MANUFACTURING	456	653	653	653	653	653
MINING	5,084	4,491	3,559	3,585	3,750	4,566
STEAM ELECTRIC POWER	3,095	449	349	349	349	349
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	862,383	817,025	771,568	726,575	680,892	635,553

Region M Source Water Balance (Availability - WUG Supply)

GROUNDWATER SOURCE TYPE				SOURCE WATER BALANCE (ACRE-FEET PER YEAR)					
SOURCE NAME	**COUNTY**	**BASIN**	**SALINITY***	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
CARRIZO-WILCOX AQUIFER	MAVERICK	NUECES	FRESH	312	312	312	312	7	7
CARRIZO-WILCOX AQUIFER	MAVERICK	RIO GRANDE	FRESH/ BRACKISH	1,220	1,220	1,179	1,092	1,052	1,014
CARRIZO-WILCOX AQUIFER	WEBB	NUECES	FRESH	0	0	0	0	0	0
CARRIZO-WILCOX AQUIFER	WEBB	RIO GRANDE	FRESH/ BRACKISH	121	76	76	76	76	76
GULF COAST AQUIFER SYSTEM	CAMERON	NUECES-RIO GRANDE	FRESH/ BRACKISH	29,020	33,630	38,240	42,849	47,459	47,459
GULF COAST AQUIFER SYSTEM	CAMERON	RIO GRANDE	FRESH/ BRACKISH	11	213	417	619	820	820
GULF COAST AQUIFER SYSTEM	HIDALGO	NUECES-RIO GRANDE	FRESH/ BRACKISH	56,597	62,018	67,424	72,828	77,992	77,992
GULF COAST AQUIFER SYSTEM	HIDALGO	RIO GRANDE	FRESH/ BRACKISH	0	18	324	731	1,137	1,137
GULF COAST AQUIFER SYSTEM	JIM HOGG	NUECES-RIO GRANDE	FRESH/ BRACKISH	3,332	3,328	3,391	3,372	3,391	3,403
GULF COAST AQUIFER SYSTEM	JIM HOGG	RIO GRANDE	FRESH/ BRACKISH	524	524	524	524	524	524
GULF COAST AQUIFER SYSTEM	STARR	NUECES-RIO GRANDE	FRESH/ BRACKISH	1,038	1,432	1,826	2,219	2,613	2,613
GULF COAST AQUIFER SYSTEM	STARR	RIO GRANDE	FRESH/ BRACKISH	1,210	1,795	2,381	2,966	3,552	3,552
GULF COAST AQUIFER SYSTEM	WEBB	NUECES	FRESH/ BRACKISH	8	12	17	22	27	27
GULF COAST AQUIFER SYSTEM	WEBB	NUECES-RIO GRANDE	FRESH/ BRACKISH	153	291	429	567	705	705
GULF COAST AQUIFER SYSTEM	WEBB	RIO GRANDE	FRESH/ BRACKISH	0	0	0	0	0	0
GULF COAST AQUIFER SYSTEM	WILLACY	NUECES-RIO GRANDE	FRESH/ BRACKISH	1,141	1,467	1,742	2,270	2,606	2,606
YEGUA-JACKSON AQUIFER	STARR	RIO GRANDE	FRESH	7,747	7,746	7,746	7,746	7,746	7,746
YEGUA-JACKSON AQUIFER	WEBB	NUECES	FRESH	11,963	11,963	11,963	11,963	11,963	11,963
YEGUA-JACKSON AQUIFER	WEBB	RIO GRANDE	FRESH	7,931	7,931	7,931	7,931	7,931	7,931
YEGUA-JACKSON AQUIFER	ZAPATA	RIO GRANDE	FRESH	6,790	6,790	6,790	6,790	6,790	6,790
			GROUNDWATER SOURCE WATER BALANCE TOTAL	**129,118**	**140,766**	**152,712**	**164,877**	**176,391**	**176,365**

REUSE SOURCE TYPE				SOURCE WATER BALANCE (ACRE-FEET PER YEAR)					
SOURCE NAME	**COUNTY**	**BASIN**	**SALINITY***	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
DIRECT REUSE	CAMERON	NUECES-RIO GRANDE	FRESH	7,944	12,617	14,662	14,662	15,662	15,662
DIRECT REUSE	CAMERON	RIO GRANDE	FRESH	14	0	0	0	0	0
DIRECT REUSE	HIDALGO	NUECES-RIO GRANDE	FRESH	20,573	21,841	22,671	27,255	29,271	29,052
DIRECT REUSE	HIDALGO	RIO GRANDE	FRESH	2,887	4,887	6,283	7,493	7,493	7,493
DIRECT REUSE	MAVERICK	RIO GRANDE	FRESH	650	650	650	650	650	650
DIRECT REUSE	WEBB	RIO GRANDE	FRESH	0	5,725	5,725	5,725	8,960	11,760
			REUSE SOURCE WATER BALANCE TOTAL	**32,068**	**45,720**	**49,991**	**55,785**	**62,036**	**64,617**

* Salinity field indicates whether the source availability is considered 'fresh' (less than 1,000 mg/L), 'brackish' (1,000 to 10,000 mg/L), 'saline' (10,001 mg/L to 34,999 mg/L), or 'seawater' (35,000 mg/L or greater). Sources can also be labeled as 'fresh/brackish' or 'brackish/saline', if a combination of the salinity types is appropriate.

** Since reservoir sources can exist across multiple counties, the county field value, 'reservoir' is applied to all reservoir sources.

Region M Source Water Balance (Availability - WUG Supply)

SURFACE WATER SOURCE TYPE				SOURCE WATER BALANCE (ACRE-FEET PER YEAR)					
SOURCE NAME	**COUNTY**	**BASIN**	**SALINITY***	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	RESERVOIR**	RIO GRANDE	FRESH	214	192	197	190	178	169
LIVESTOCK LOCAL SUPPLY	JIM HOGG	NUECES-RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	JIM HOGG	RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	MAVERICK	NUECES	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	MAVERICK	RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	STARR	RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	WEBB	NUECES	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	WEBB	NUECES-RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	WEBB	RIO GRANDE	FRESH	0	0	0	0	0	0
LIVESTOCK LOCAL SUPPLY	ZAPATA	RIO GRANDE	FRESH	0	0	0	0	0	0
NUECES-RIO GRANDE RUN-OF-RIVER	CAMERON	NUECES-RIO GRANDE	FRESH	0	0	0	0	0	0
NUECES-RIO GRANDE RUN-OF-RIVER	HIDALGO	NUECES-RIO GRANDE	FRESH	7,522	7,522	7,522	7,522	7,522	7,522
NUECES-RIO GRANDE RUN-OF-RIVER	WILLACY	NUECES-RIO GRANDE	FRESH	350	350	350	350	350	350
RIO GRANDE RUN-OF-RIVER	MAVERICK	RIO GRANDE	FRESH	0	0	0	0	0	0
SURFACE WATER SOURCE WATER BALANCE TOTAL				**8,086**	**8,064**	**8,069**	**8,062**	**8,050**	**8,041**

REGION M SOURCE WATER BALANCE TOTAL	**169,272**	**194,550**	**210,772**	**228,724**	**246,477**	**249,023**

* Salinity field indicates whether the source availability is considered 'fresh' (less than 1,000 mg/L), 'brackish' (1,000 to 10,000 mg/L), 'saline' (10,001 mg/L to 34,999 mg/L), or 'seawater' (35,000 mg/L or greater). Sources can also be labeled as 'fresh/brackish' or 'brackish/saline', if a combination of the salinity types is appropriate.

** Since reservoir sources can exist across multiple counties, the county field value, 'reservoir' is applied to all reservoir sources.

Region M Water User Group (WUG) Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
CAMERON COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,632	1,790	-32.0%	2,632	1,790	-32.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	7,749	3,931	-49.3%	10,176	5,343	-47.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	5,117	2,141	-58.2%	7,544	3,553	-52.9%
CAMERON COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	161,027	178,005	10.5%	159,630	177,840	11.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	355,962	537,217	50.9%	288,601	450,987	56.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	194,935	359,212	84.3%	128,971	273,147	111.8%
CAMERON COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,814	436	-88.6%	3,814	436	-88.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	334	436	30.5%	334	436	30.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CAMERON COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	4,021	1,029	-74.4%	4,021	1,029	-74.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,708	1,647	-65.0%	6,829	1,846	-73.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	687	618	-10.0%	2,808	817	-70.9%
CAMERON COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	492	661	34.3%	488	661	35.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	264	264	0.0%	28	28	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
CAMERON COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	81,741	94,477	15.6%	81,601	97,571	19.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	73,644	77,848	5.7%	137,756	143,365	4.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	4,251	596	-86.0%	56,404	46,733	-17.1%
CAMERON COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	487	125	-74.3%	487	125	-74.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,523	3,550	133.1%	3,428	3,550	3.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,036	3,425	230.6%	2,941	3,425	16.5%
HIDALGO COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,587	2,269	-36.7%	3,587	2,269	-36.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,952	2,873	-42.0%	10,691	6,982	-34.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,365	604	-55.8%	7,104	4,713	-33.7%
HIDALGO COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	247,454	278,271	12.5%	245,007	277,923	13.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	639,676	688,667	7.7%	502,563	578,127	15.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	392,222	410,396	4.6%	257,556	300,204	16.6%
HIDALGO COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,725	777	-55.0%	1,725	777	-55.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	830	777	-6.4%	830	777	-6.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
HIDALGO COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,714	2,915	-21.5%	3,714	2,915	-21.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	5,461	2,236	-59.1%	7,836	2,721	-65.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,747	0	-100.0%	4,122	0	-100.0%

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	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
HIDALGO COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,462	1,933	32.2%	1,449	1,931	33.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,844	2,844	0.0%	6,434	6,434	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,382	911	-34.1%	4,985	4,503	-9.7%
HIDALGO COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	121,406	134,222	10.6%	121,793	132,407	8.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	153,677	157,878	2.7%	325,125	333,335	2.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	33,234	27,186	-18.2%	203,332	200,928	-1.2%
HIDALGO COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	12,203	9,746	-20.1%	12,203	10,035	-17.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	14,151	11,538	-18.5%	32,507	11,538	-64.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,948	1,792	-8.0%	20,304	1,503	-92.6%
JIM HOGG COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	286	286	0.0%	286	286	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	100	153	53.0%	126	193	53.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
JIM HOGG COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	200	360	80.0%	200	360	80.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	439	360	-18.0%	451	302	-33.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	239	8	-96.7%	251	0	-100.0%
JIM HOGG COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	436	436	0.0%	436	436	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	436	376	-13.8%	436	376	-13.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
JIM HOGG COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	2	100.0%	0	2	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	0	2	100.0%	0	2	100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
JIM HOGG COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	93	93	0.0%	22	22	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	93	93	0.0%	22	22	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
JIM HOGG COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	592	1,412	138.5%	592	1,412	138.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	592	643	8.6%	745	822	10.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	153	0	-100.0%
MAVERICK COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	6,950	181	-97.4%	6,950	181	-97.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,269	576	-86.5%	6,523	334	-94.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	398	100.0%	0	157	100.0%
MAVERICK COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	39,285	44,012	12.0%	38,968	43,953	12.8%
PROJECTED DEMAND TOTAL (acre-feet per year)	52,993	61,706	16.4%	49,076	51,801	5.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	14,112	17,694	25.4%	10,516	7,848	-25.4%

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MAVERICK COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	499	388	-22.2%	499	388	-22.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	499	371	-25.7%	499	371	-25.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
MAVERICK COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	14	65	364.3%	14	65	364.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	93	65	-30.1%	121	65	-46.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	79	0	-100.0%	107	0	-100.0%
MAVERICK COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	404	1,394	245.0%	399	1,392	248.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,988	1,988	0.0%	1,217	1,217	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,584	594	-62.5%	818	0	-100.0%
MAVERICK COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,947	11,331	42.6%	7,947	11,330	42.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	6,004	9,786	63.0%	10,215	16,506	61.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	2,268	5,509	142.9%
STARR COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	938	134	-85.7%	938	134	-85.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	3,640	679	-81.3%	5,276	961	-81.8%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	2,702	545	-79.8%	4,338	827	-80.9%
STARR COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	8,829	4,294	-51.4%	8,689	4,289	-50.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	13,483	23,875	77.1%	3,714	20,043	439.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	4,654	19,581	320.7%	0	15,754	100.0%
STARR COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,105	1,192	7.9%	1,105	1,192	7.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,018	1,192	17.1%	1,018	1,192	17.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
STARR COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	14	85	507.1%	14	86	514.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	14	95	578.6%	19	116	510.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	10	100.0%	5	30	500.0%
STARR COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	560	276	-50.7%	557	276	-50.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	571	571	0.0%	1,091	1,091	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	49	295	502.0%	534	815	52.6%
STARR COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,217	8,575	18.8%	7,209	8,575	18.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	6,957	11,001	58.1%	10,413	16,484	58.3%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	587	3,343	469.5%	3,250	7,909	143.4%
WEBB COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	191	235	23.0%	191	247	29.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	912	302	-66.9%	1,732	573	-66.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	721	109	-84.9%	1,541	326	-78.8%

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	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
WEBB COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	6,314	10,610	68.0%	6,255	10,597	69.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	7,612	10,425	37.0%	7,612	8,752	15.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,298	0	-100.0%	1,357	0	-100.0%
WEBB COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	1,129	1,079	-4.4%	1,129	1,079	-4.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,129	963	-14.7%	1,129	963	-14.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
WEBB COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	21	346	1547.6%	21	391	1761.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	21	251	1095.2%	30	296	886.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	9	0	-100.0%
WEBB COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	8,056	5,518	-31.5%	8,056	5,608	-30.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	10,331	10,331	0.0%	1,343	1,343	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	2,275	4,813	111.6%	0	0	0.0%
WEBB COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	60,075	62,380	3.8%	60,324	62,380	3.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	42,842	43,711	2.0%	82,611	84,310	2.1%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	22,287	21,930	-1.6%
WEBB COUNTY | STEAM ELECTRIC POWER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,725	695	-74.5%	2,725	695	-74.5%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,298	152	-88.3%	2,981	152	-94.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	256	0	-100.0%
WILLACY COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	168	486	189.3%	168	503	199.4%
PROJECTED DEMAND TOTAL (acre-feet per year)	67	52	-22.4%	107	84	-21.5%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
WILLACY COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	19,949	20,631	3.4%	19,785	20,723	4.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	69,253	99,610	43.8%	68,741	83,621	21.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	49,304	78,979	60.2%	48,956	62,898	28.5%
WILLACY COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	438	235	-46.3%	438	235	-46.3%
PROJECTED DEMAND TOTAL (acre-feet per year)	261	235	-10.0%	261	235	-10.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
WILLACY COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	120	0	-100.0%	120	0	-100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	136	0	-100.0%	136	0	-100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	16	0	-100.0%	16	0	-100.0%
WILLACY COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	49	0	-100.0%	49	20	-59.2%
PROJECTED DEMAND TOTAL (acre-feet per year)	49	49	0.0%	12	12	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	49	100.0%	0	0	0.0%

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WILLACY COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	7,606	5,127	-32.6%	7,365	4,929	-33.1%
PROJECTED DEMAND TOTAL (acre-feet per year)	3,190	3,211	0.7%	4,875	4,917	0.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	56	346	517.9%	1,022	1,313	28.5%
ZAPATA COUNTY | COUNTY-OTHER WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	187	66	-64.7%	187	66	-64.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	391	122	-68.8%	767	233	-69.6%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	204	56	-72.5%	580	167	-71.2%
ZAPATA COUNTY | IRRIGATION WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	3,432	2,074	-39.6%	3,378	2,072	-38.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	4,717	5,100	8.1%	3,800	4,281	12.7%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	1,285	3,026	135.5%	422	2,209	423.5%
ZAPATA COUNTY | LIVESTOCK WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	479	479	0.0%	479	479	0.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	479	398	-16.9%	479	398	-16.9%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
ZAPATA COUNTY | MANUFACTURING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	0	5	100.0%	0	5	100.0%
PROJECTED DEMAND TOTAL (acre-feet per year)	0	9	100.0%	0	9	100.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	4	100.0%	0	4	100.0%
ZAPATA COUNTY | MINING WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	983	1,332	35.5%	982	1,332	35.6%
PROJECTED DEMAND TOTAL (acre-feet per year)	911	911	0.0%	214	214	0.0%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	0	0	0.0%	0	0	0.0%
ZAPATA COUNTY | MUNICIPAL WUG TYPE						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	2,402	3,548	47.7%	2,402	3,548	47.7%
PROJECTED DEMAND TOTAL (acre-feet per year)	2,605	2,923	12.2%	4,989	5,598	12.2%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	297	163	-45.1%	2,587	2,407	-7.0%
REGION M						
EXISTING WUG SUPPLY TOTAL (acre-feet per year)	835,458	896,018	7.2%	831,030	896,997	7.9%
PROJECTED DEMAND TOTAL (acre-feet per year)	1,505,168	1,783,993	18.5%	1,605,919	1,853,358	15.4%
WATER SUPPLY NEEDS TOTAL (acre-feet per year)*	717,386	936,894	30.6%	797,344	969,629	21.6%

*WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The needs shown in the WUG Data Comparison to 2016 RWP report are calculated by first deducting the WUG split's projected demand from its total existing water supply volume. If the WUG split has a greater existing supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG county and category level, calculated surpluses are updated to zero so that only the WUGs with needs in the decade are included with the Needs totals.

Region M Source Data Comparison to 2016 Regional Water Plan (RWP)

	2020 PLANNING DECADE			2070 PLANNING DECADE		
	2016 RWP	2021 RWP	DIFFERENCE (%)	2016 RWP	2021 RWP	DIFFERENCE (%)
CAMERON COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	50,560	46,303	-8.4%	50,560	65,756	30.1%
REUSE AVAILABILITY TOTAL (acre-feet per year)	9,176	9,176	0.0%	16,002	16,894	5.6%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	50	350	600.0%	50	350	600.0%
HIDALGO COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	41,926	88,039	110.0%	41,926	111,044	164.9%
REUSE AVAILABILITY TOTAL (acre-feet per year)	34,743	34,743	0.0%	49,179	49,179	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	7,522	7,522	0.0%	7,522	7,522	0.0%
JIM HOGG COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	24,414	6,174	-74.7%	24,414	6,174	-74.7%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	271	271	0.0%	271	271	0.0%
MAVERICK COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	2,043	2,042	0.0%	1,532	1,531	-0.1%
REUSE AVAILABILITY TOTAL (acre-feet per year)	650	650	0.0%	650	650	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	439	439	0.0%	439	439	0.0%
RESERVOIR* COUNTY						
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,060,616	1,079,381	1.8%	1,053,834	1,078,349	2.3%
STARR COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	9,526	11,735	23.2%	9,526	15,652	64.3%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	65	65	0.0%	65	65	0.0%
WEBB COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	23,917	21,536	-10.0%	23,917	22,215	-7.1%
REUSE AVAILABILITY TOTAL (acre-feet per year)	773	773	0.0%	12,533	12,533	0.0%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	919	919	0.0%	919	919	0.0%
WILLACY COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	20,013	2,337	-88.3%	20,013	4,258	-78.7%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	0	350	100.0%	0	350	100.0%
ZAPATA COUNTY						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	7,999	7,987	-0.2%	7,999	7,987	-0.2%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	249	249	0.0%	249	249	0.0%
REGION M						
GROUNDWATER AVAILABILITY TOTAL (acre-feet per year)	180,398	186,153	3.2%	179,887	234,617	30.4%
REUSE AVAILABILITY TOTAL (acre-feet per year)	45,342	45,342	0.0%	78,364	79,256	1.1%
SURFACE WATER AVAILABILITY TOTAL (acre-feet per year)	1,070,131	1,089,546	1.8%	1,063,349	1,088,514	2.4%

* Since reservoir sources can exist across multiple counties, the county field value, 'reservoir' is applied to all reservoir sources.

Region M Water User Group (WUG) Unmet Needs

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. In order to display only unmet needs associated with the WUG split, these surplus volumes are updated to a zero and the unmet needs water volumes are shown as absolute values.

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region M Water User Group (WUG) Unmet Needs

	WUG UNMET NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
CAMERON COUNTY - NUECES-RIO GRANDE BASIN						
MANUFACTURING	189	266	266	266	266	266
STEAM ELECTRIC POWER	2,960	0	0	0	0	0
IRRIGATION	322,468	309,523	296,399	282,241	269,030	256,499
CAMERON COUNTY - RIO GRANDE BASIN						
MANUFACTURING	247	348	348	348	347	348
STEAM ELECTRIC POWER	110	0	0	0	0	0
IRRIGATION	20,361	19,534	18,700	17,800	16,958	16,162
HIDALGO COUNTY - NUECES-RIO GRANDE BASIN						
MINING	535	1,181	1,665	2,183	2,777	3,531
STEAM ELECTRIC POWER	0	257	191	191	191	191
IRRIGATION	367,686	343,777	327,145	308,497	289,429	271,868
HIDALGO COUNTY - RIO GRANDE BASIN						
MINING	92	144	181	222	270	329
STEAM ELECTRIC POWER	25	192	158	158	158	158
IRRIGATION	15,297	14,304	13,609	12,836	12,039	11,309
JIM HOGG COUNTY - NUECES-RIO GRANDE BASIN						
MINING	0	0	28	0	0	0
JIM HOGG COUNTY - RIO GRANDE BASIN						
MINING	0	0	3	0	0	0
MAVERICK COUNTY - NUECES BASIN						
MINING	79	214	249	136	23	0
MAVERICK COUNTY - RIO GRANDE BASIN						
MINING	316	855	998	543	91	0
IRRIGATION	12,274	10,168	10,312	9,187	7,099	4,052
STARR COUNTY - NUECES-RIO GRANDE BASIN						
MINING	72	98	114	131	152	179
STARR COUNTY - RIO GRANDE BASIN						
MANUFACTURING	0	18	18	18	18	18
MINING	166	253	307	365	437	527
IRRIGATION	19,231	18,598	17,932	17,299	16,664	16,026
WEBB COUNTY - NUECES BASIN						
MINING	1,153	529	0	0	0	0
WEBB COUNTY - NUECES-RIO GRANDE BASIN						
MINING	191	88	0	0	0	0
WEBB COUNTY - RIO GRANDE BASIN						
MINING	2,436	1,083	0	0	0	0
IRRIGATION	1,155	394	667	423	177	0
WILLACY COUNTY - NUECES-RIO GRANDE BASIN						
MINING	44	46	14	5	0	0
IRRIGATION	77,682	71,958	73,688	72,059	68,956	65,970
ZAPATA COUNTY - RIO GRANDE BASIN						
MANUFACTURING	3	3	3	3	3	3
IRRIGATION	2,506	2,404	2,309	2,212	2,115	2,016

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Region M Water User Group (WUG) Unmet Needs Summary

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs Summary report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG category level, calculated surpluses are updated to zero so that only the WUGs with unmet needs in the decade are included with the Needs totals. Unmet needs water volumes are shown as absolute values.

WUG CATEGORY	NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MUNICIPAL	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	439	635	635	635	634	635
MINING	5,084	4,491	3,559	3,585	3,750	4,566
STEAM ELECTRIC POWER	3,095	449	349	349	349	349
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	838,660	790,660	760,761	722,554	682,467	643,902

Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
AGUA SUD	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	404	1,077	1,890
AGUA SUD	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	348	415	483	551	617
AGUA SUD	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$336	$0	282	326	369	413	456	500
AGUA SUD	M	HIDALGO COUNTY ID NO. 6 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$394	$0	720	800	881	961	1,041	1,122
AGUA SUD	M	REUSE	M | DIRECT POTABLE REUSE	$4443	$1692	560	560	4,480	4,480	4,480	4,480
AGUA SUD	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	1,421	2,500	3,353	4,042
ALAMO	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	46	278	587	952
ALAMO	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$1790	0	896	896	896	896	896
ALAMO	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$78	$78	118	146	175	203	232	260
ALAMO	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$117	$28	1,120	1,120	1,120	1,120	1,120	1,120
ALAMO	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	8	57	107	156	205	254
ALAMO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	245	606	1,185	1,591	1,948	2,230
BROWNSVILLE	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	2,258	4,355	7,038	10,466	14,463
BROWNSVILLE	M	CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$399	$0	41	49	57	65	73	81
BROWNSVILLE	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$74	0	817	949	1,091	1,237	1,388
BROWNSVILLE	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	DEMAND REDUCTION	$1155	$0	877	877	877	877	877	877
BROWNSVILLE	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | NUECES-RIO GRANDE RUN-OF-RIVER STORAGE (BANCO MORALES)	N/A	$153	0	1,700	1,700	1,700	1,700	1,700
BROWNSVILLE	M	REUSE	M | DIRECT POTABLE REUSE	N/A	$2908	0	0	0	3,360	3,360	5,040
BROWNSVILLE	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	0	338	1,841
COMBES	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	4	31
COMBES	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	42	63	85	106	106	106
COUNTY-OTHER, CAMERON	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	63	62	62	61	61	60
COUNTY-OTHER, CAMERON	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	$251	$40	1,000	1,000	2,000	2,000	3,000	3,000
COUNTY-OTHER, CAMERON	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$425	$0	170	173	175	178	181	183
COUNTY-OTHER, CAMERON	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	952	602	948	1,365	2,004	2,119
COUNTY-OTHER, HIDALGO	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$513	$0	39	104	168	233	298	363

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR) 2020	2030	2040	2050	2060	2070
COUNTY-OTHER, HIDALGO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	575	1,199	2,012	2,782	3,557	4,360
COUNTY-OTHER, MAVERICK	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	425	350	300	250	225	175
COUNTY-OTHER, STARR	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | STARR COUNTY	$310	$63	400	400	400	400	400	400
COUNTY-OTHER, STARR	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	160	225	275	325	400	450
COUNTY-OTHER, WEBB	M	FRESH GROUNDWATER	M | YEGUA-JACKSON AQUIFER | WEBB COUNTY	$783	$86	350	350	350	350	350	350
COUNTY-OTHER, WILLACY	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$680	$0	3	6	8	11	14	16
COUNTY-OTHER, ZAPATA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	56	70	91	114	145	167
DONNA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	69	300	578
DONNA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	0	147	171	195	218
DONNA	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$513	$0	64	170	276	382	488	594
DONNA	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1222	$486	950	950	2,240	2,240	2,240	2,240
DONNA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$2040	$2308	1,415	2,240	2,361	2,721	2,943	3,107
EAGLE PASS	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	481	914	1,525	2,299	3,163
EAGLE PASS	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	256	298	338	379	419	456
EAGLE PASS	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	370	1,140	1,903	2,605	3,160	3,585
EAST RIO HONDO WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	112	331	601	930
EAST RIO HONDO WSC	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	427	424	420	416	412	409
EAST RIO HONDO WSC	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	N/A	$984	0	400	400	400	400	400
EAST RIO HONDO WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	148	152	170	187	208
EAST RIO HONDO WSC	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	18	27	37	46	46	46
EAST RIO HONDO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	DEMAND REDUCTION	N/A	$6833	0	30	30	30	30	30
EAST RIO HONDO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$874	0	800	800	800	800	800
EDCOUCH	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	0	16
EDCOUCH	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	13	16	19	23	26	29
EDCOUCH	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$888	$215	725	725	725	725	725	725
EDCOUCH	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	14	24	35	45	56	66

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
EDINBURG	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	329	1,290	2,549	4,035
EDINBURG	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$52	$52	488	606	724	843	961	1,076
EDINBURG	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	259	350	216	261	305	350
EDINBURG	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	11	79	146	214	281	349
EDINBURG	M	REUSE	M | DIRECT NON-POTABLE REUSE	$562	$254	3,243	3,920	3,920	3,920	3,920	3,920
EDINBURG	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	3,236	5,072	10,758	12,411	13,824	14,969
EL JARDIN WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	0	71	189	331
EL JARDIN WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	50	58	66	75	85	94
EL JARDIN WSC	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$346	$0	119	162	204	246	288	330
EL JARDIN WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	DEMAND REDUCTION	$150727	$24091	11	11	11	11	11	11
EL JARDIN WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	23	114	219	329	458	553
EL SAUZ WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	0	0	9	21
EL SAUZ WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	7	8	9	10	10	11
EL SAUZ WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$883	0	150	150	150	150	150
EL SAUZ WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	60	10	10	10	10	10
EL TANQUE WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	7	22	41	61
EL TANQUE WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	6	7	7	8	9	9
EL TANQUE WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$883	0	150	150	150	150	150
EL TANQUE WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	100	20	20	20	20	20
ELSA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	44	128
ELSA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$44	$44	30	38	45	52	60	67
ELSA	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	33	58	82	107	132	157
ELSA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	225	355	499	655	799	934
FALCON RURAL WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	12	31	41	54	66
FALCON RURAL WSC	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	1	2	3	4	5	7
FALCON RURAL WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$883	0	100	100	100	100	100
HARLINGEN	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	960	2,164	3,215	4,519	6,097
HARLINGEN	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	1,250	1,889	2,528	3,168	3,168	3,168

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
HARLINGEN	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	275	675	1,325
HIDALGO	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	46	184	364	577
HIDALGO	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$49	$49	43	54	64	74	85	95
HIDALGO	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$127	0	0	300	300	300	300
HIDALGO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	78	298	662	924	1,594	1,352
HIDALGO COUNTY MUD 1	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	39	93	153
HIDALGO COUNTY MUD 1	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	60	68	75	82	89	96
HIDALGO COUNTY MUD 1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	42	56	71	85	100	115
HIDALGO COUNTY MUD 1	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	148	218	254	293	284	292
IRRIGATION, CAMERON	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$10	$10	955	955	955	955	955	955
IRRIGATION, CAMERON	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	5,637	5,586	5,534	5,483	5,432	5,381
IRRIGATION, CAMERON	M	CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$399	$0	1,668	1,989	2,310	2,631	2,952	3,273
IRRIGATION, CAMERON	M	CAMERON COUNTY WATER IMPROVEMENTS DISTRICT NO. 10 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$406	$0	50	145	240	335	430	525
IRRIGATION, CAMERON	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	166	290	415	539	663	787
IRRIGATION, CAMERON	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$163	$0	4,149	5,938	7,727	9,515	9,923	10,332
IRRIGATION, CAMERON	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	9,872	9,872	9,872	9,872	9,872	9,872
IRRIGATION, HIDALGO	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$10	$10	1,226	1,226	1,226	1,226	1,226	1,226
IRRIGATION, HIDALGO	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	2,079	3,635	5,191	6,746	8,300	9,853
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	1,601	2,164	2,726	3,288	3,850	4,411
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 13 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$515	$0	72	85	98	111	124	136
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$336	$0	1,088	1,255	1,423	1,590	1,757	1,924
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	212	1,467	2,721	3,975	5,228	6,480
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 5 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$341	$0	863	863	863	864	864	865
IRRIGATION, HIDALGO	M	HIDALGO COUNTY ID NO. 6 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$394	$0	1,259	1,399	1,540	1,680	1,820	1,960
IRRIGATION, HIDALGO	M	HIDALGO COUNTY WCID NO. 18 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$380	$0	84	90	95	100	105	110
IRRIGATION, HIDALGO	M	HIDALGO COUNTY WID NO. 19 (SHARYLAND) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$465	$0	393	410	427	444	460	477

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
IRRIGATION, HIDALGO	M	HIDALGO COUNTY WID NO. 3 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$2094	$0	391	391	391	391	391	391
IRRIGATION, HIDALGO	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$432	$0	14,000	17,103	20,204	23,304	26,402	29,498
IRRIGATION, HIDALGO	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	12,654	12,654	12,654	12,654	12,654	12,654
IRRIGATION, JIM HOGG	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | JIM HOGG COUNTY	$687	$75	350	350	350	350	350	350
IRRIGATION, JIM HOGG	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	7	7	7	7	7	7
IRRIGATION, MAVERICK	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | RIO GRANDE RUN-OF-RIVER	$10	$10	110	110	110	110	110	110
IRRIGATION, MAVERICK	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$394	$0	5,802	6,505	7,208	7,911	8,613	9,315
IRRIGATION, MAVERICK	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	1,134	1,134	1,134	1,134	1,134	1,134
IRRIGATION, STARR	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$10	$10	43	43	43	43	43	43
IRRIGATION, STARR	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	439	439	439	439	439	439
IRRIGATION, WEBB	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | RIO GRANDE RUN-OF-RIVER	$10	$10	19	19	19	19	19	19
IRRIGATION, WEBB	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	192	192	192	192	192	192
IRRIGATION, WILLACY	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$10	$10	178	178	178	178	178	178
IRRIGATION, WILLACY	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$680	$0	1,104	1,973	2,843	3,711	4,580	5,448
IRRIGATION, WILLACY	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	1,830	1,830	1,830	1,830	1,830	1,830
IRRIGATION, ZAPATA	M	ARUNDO DONAX BIOLOGICAL CONTROL	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$10	$10	9	9	9	9	9	9
IRRIGATION, ZAPATA	M	ON-FARM IRRIGATION CONSERVATION	DEMAND REDUCTION	$1392	$1392	578	578	578	578	578	578
JIM HOGG COUNTY WCID 2	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	16	51	91
LA FERIA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	51	139	244
LA FERIA	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	N/A	$882	0	1,120	1,120	1,120	1,120	1,120
LA FERIA	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$428	$0	383	383	383	383	383	383
LA GRULLA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	84	178	257	350	450
LA GRULLA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	36	41	45	50	54	57
LA GRULLA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	697	745	777	831	864	880
LA JOYA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	30	89	159
LA JOYA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	17	21	25	29	33	36
LA JOYA	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$336	$0	39	45	51	57	63	69
LA JOYA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	377	391	503	611	675	737

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

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WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
LA VILLA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	6	29	59
LA VILLA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	8	10	12	14	16	18
LA VILLA	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	11	19	27	35	43	51
LA VILLA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	37	97	141	188	202	218
LAGUNA MADRE WATER DISTRICT	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	$681	$681	129	936	1,917	3,077	4,395	5,840
LAGUNA MADRE WATER DISTRICT	M	DESALINATION	M | GULF OF MEXICO SALINE	N/A	$3188	0	0	0	1,120	1,120	1,120
LAGUNA MADRE WATER DISTRICT	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	130	152	174	198	223	248
LAGUNA MADRE WATER DISTRICT	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$4001	$3374	2,352	2,352	2,352	2,352	2,352	2,352
LAGUNA MADRE WATER DISTRICT	M	REUSE	M | DIRECT POTABLE REUSE	N/A	$34	0	627	892	892	892	892
LAGUNA MADRE WATER DISTRICT	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	373	682	869	980	976	886
LAREDO	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	221	3,030	6,713	10,902
LAREDO	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$45	0	0	0	2,406	2,686	2,938
LAREDO	M	REUSE	M | DIRECT POTABLE REUSE	N/A	$2601	0	0	3,360	3,360	6,720	6,720
LAREDO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	0	0	980
LOS FRESNOS	M	CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$399	$0	80	95	111	126	142	157
LOS FRESNOS	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$4382	$3900	560	560	560	560	560	560
LYFORD	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	12	33
LYFORD	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | WILLACY COUNTY	N/A	$534	0	1,120	1,120	1,120	1,120	1,120
LYFORD	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$680	$0	32	58	83	108	134	159
MANUFACTURING, CAMERON	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	16	16	16	16	16	15
MANUFACTURING, CAMERON	M	CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$399	$0	1	2	2	2	3	3
MANUFACTURING, CAMERON	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	165	185	185	185	185	185
MANUFACTURING, HIDALGO	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	224	272	272	272	272	272
MANUFACTURING, MAVERICK	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	7	7	7	7	7	7
MANUFACTURING, STARR	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	10	12	12	12	12	12

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

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WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
MANUFACTURING, WEBB	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	25	30	30	30	30	30
MANUFACTURING, ZAPATA	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	1	1	1	1	1	1
MAVERICK COUNTY	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	12	30	49
MCALLEN	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	3,558	8,804	15,340	22,992	28,889
MCALLEN	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$1283	0	2,688	2,688	2,688	2,688	2,688
MCALLEN	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$39	$39	1,071	1,330	1,589	1,850	2,110	2,363
MCALLEN	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	196	264	333	402	471	540
MCALLEN	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	29	204	378	552	727	901
MCALLEN	M	HIDALGO COUNTY WID NO. 3 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$2094	$0	1,672	1,672	1,672	1,672	1,672	1,672
MCALLEN	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$575	$0	1,227	1,227	1,227	1,227	1,227	1,227
MCALLEN	M	MCALLEN - AMI PROJECT	DEMAND REDUCTION	$1747	$212	1,140	1,140	1,140	1,140	1,140	1,140
MCALLEN	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | NUECES-RIO GRANDE RUN-OF-RIVER	$340	$201	800	800	800	800	800	800
MCALLEN	M	REUSE	M | DIRECT POTABLE REUSE	N/A	$1900	0	3,880	3,880	6,060	6,060	6,060
MCALLEN	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	2,968	3,622	5,223	8,370
MERCEDES	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	170	399
MERCEDES	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$39	0	0	128	150	171	191
MERCEDES	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	95	167	239	310	382	453
MERCEDES	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	220	448	609
MILITARY HIGHWAY WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	302	757	1,350	2,048
MILITARY HIGHWAY WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	198	231	266	301	336
MILITARY HIGHWAY WSC	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	38	57	77	96	96	96
MILITARY HIGHWAY WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	100	844	1,457	1,998	2,455	3,079
MINING, CAMERON	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	26	28	19	13	6	3
MINING, HIDALGO	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	284	362	420	482	553	643
MINING, JIM HOGG	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	9	10	7	5	3	2
MINING, MAVERICK	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	199	274	293	230	167	122

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WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
MINING, STARR	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	57	70	78	86	96	109
MINING, WEBB	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	1,033	805	604	411	185	134
MINING, WILLACY	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	5	5	4	3	2	1
MINING, ZAPATA	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	91	95	71	53	33	21
MIRANDO CITY WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	0	2	8	15
MIRANDO CITY WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$79	0	4	4	5	6	6
MIRANDO CITY WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	25	34	47	56	62	66
MISSION	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	1,916	4,635	7,721	10,209	12,958
MISSION	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$1283	0	2,688	2,688	2,688	2,688	2,688
MISSION	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$43	$43	949	1,178	1,408	1,639	1,870	2,094
MISSION	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$575	$0	1,483	1,483	1,483	1,483	1,483	1,483
MISSION	M	REUSE	M | DIRECT POTABLE REUSE	$1661	$1784	3,920	3,920	3,920	7,560	7,560	7,560
MISSION	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$2116	2,200	2,587	5,272	4,128	6,287	8,083
NORTH ALAMO WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	1,346	3,089	5,449	8,378	11,743
NORTH ALAMO WSC	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	N/A	$1073	0	3,040	3,040	3,040	3,040	3,040
NORTH ALAMO WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$48	$48	759	935	1,112	1,290	1,467	1,640
NORTH ALAMO WSC	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	165	290	414	538	662	786
NORTH ALAMO WSC	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	69	92	117	141	165	189
NORTH ALAMO WSC	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	13	88	163	239	314	390
NORTH ALAMO WSC	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$101	$0	48	65	83	100	117	135
NORTH ALAMO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$6328	0	0	4,480	6,160	6,160	6,160
NORTH ALAMO WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$2686	5,363	10,068	17,761	27,254	30,118	32,486
OLMITO WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	73	189	275	383	507
OLMITO WSC	M	CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$399	$0	118	140	163	186	209	231
OLMITO WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	31	35	40	45	50

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OLMITO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$4214	$3671	1,120	1,120	1,120	1,120	1,120	1,120
OLMITO WSC	M	REUSE	M | DIRECT NON-POTABLE REUSE	$1672	$156	290	330	373	421	472	525
OLMITO WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	13	66	172	270	358
PALM VALLEY	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	12	30	38	48	58
PALM VALLEY	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	16	25	33	42	42	42
PHARR	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	458	1,354	2,433
PHARR	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$63	0	556	665	774	883	989
PHARR	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	39	271	502	734	965	1,197
PHARR	M	REUSE	M | DIRECT POTABLE REUSE	$878	$338	6,721	6,721	6,721	6,721	6,721	6,721
PHARR	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	20	20	20	20	20
PORT MANSFIELD PUD	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	$681	$681	3	26	52	80	112	144
PORT MANSFIELD PUD	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	7	8	9	10	11	11
PORT MANSFIELD PUD	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$680	$0	5	9	13	17	21	24
PORT MANSFIELD PUD	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	138	143	143	143	140	135
PRIMERA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	18	54
PRIMERA	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	N/A	$900	0	1,120	1,120	1,120	1,120	1,120
PRIMERA	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$67	0	0	0	27	30	34
PRIMERA	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$54	$0	21	32	43	53	53	53
PRIMERA	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	40	92	129
RAYMONDVILLE	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	14	110	221
RAYMONDVILLE	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$680	$0	190	339	489	638	788	937
RIO GRANDE CITY	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	402	901	1,470	2,086	2,544
RIO GRANDE CITY	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$87	$87	70	80	88	97	104	111
RIO GRANDE CITY	M	RIO GRANDE CITY - WATER METER REPLACEMENT	DEMAND REDUCTION	$868	$116	300	300	300	300	300	300
RIO GRANDE CITY	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	1,362	1,486	1,482	1,428	1,297	1,282
RIO HONDO	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	75	74	73	73	72	71
RIO HONDO	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	$86	$38	1,120	1,120	1,120	1,120	1,120	1,120
RIO HONDO	M	REUSE	M | DIRECT NON-POTABLE REUSE	$2947	$1251	51	56	63	71	80	89

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR) 2020	2030	2040	2050	2060	2070
RIO WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	0	0	26	67	114
RIO WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	26	29	32	35	38	40
RIO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$883	0	300	300	300	300	300
RIO WSC	M	RIO GRANDE CITY - WATER METER REPLACEMENT	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$868	$116	70	70	70	70	70	70
RIO WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	0	55	71
ROMA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	155	330
ROMA	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$883	0	800	800	800	800	800
SAN BENITO	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	29	305	640
SAN BENITO	M	CAMERON COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$669	$0	588	583	578	573	568	563
SAN BENITO	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | CAMERON COUNTY	N/A	$25	0	1,120	1,120	1,120	1,120	1,120
SAN BENITO	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$96	0	0	0	0	0	174
SAN BENITO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	0	0	304
SAN JUAN	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	93	451	928	1,491
SAN JUAN	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$832	0	2,912	2,912	2,912	2,912	2,912
SAN JUAN	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$66	0	128	153	179	204	228
SAN JUAN	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1912	$0	10	71	133	194	255	316
SAN JUAN	M	REUSE	M | DIRECT POTABLE REUSE	N/A	$948	0	0	2,240	2,240	2,240	2,240
SAN JUAN	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	612	1,181	1,643
SAN YGNACIO MUD	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	12	32	49	68	90
SANTA ROSA	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	0	12
SANTA ROSA	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$428	$0	156	156	156	156	156	156
SEBASTIAN MUD	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$79	0	0	0	11	12	13
SEBASTIAN MUD	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	1	20	38
SHARYLAND WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	831	2,016	3,143	4,560	6,172
SHARYLAND WSC	M	DESALINATION	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$1831	0	1,800	1,800	1,800	1,800	1,800
SHARYLAND WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	287	356	425	495	565	633
SHARYLAND WSC	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$291	$0	483	653	823	993	1,163	1,333

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
SHARYLAND WSC	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$496	$0	766	813	859	906	952	999
SHARYLAND WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	343	1,836	3,475	4,904	6,076
SIESTA SHORES WCID	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	11	29	51
SIESTA SHORES WCID	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	7	8	9	11	12	14
SIESTA SHORES WCID	M	ID CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$428	$0	38	38	38	38	38	38
SIESTA SHORES WCID	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	2	34	71	102	128	153
STEAM ELECTRIC POWER, CAMERON	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	355	355	355	355	355	355
STEAM ELECTRIC POWER, CAMERON	M	REUSE	M | DIRECT NON-POTABLE REUSE	N/A	$416	0	6,721	6,721	6,721	6,721	6,721
STEAM ELECTRIC POWER, HIDALGO	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	1,154	1,154	1,154	1,154	1,154	1,154
STEAM ELECTRIC POWER, HIDALGO	M	REUSE	M | DIRECT NON-POTABLE REUSE	$97	N/A	677	0	0	0	0	0
STEAM ELECTRIC POWER, WEBB	M	IMPLEMENTATION OF INDUSTRIAL BEST MANAGEMENT PRACTICES	DEMAND REDUCTION	$3000	$3000	15	15	15	15	15	15
UNION WSC	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$770	0	100	178	258	350	447
UNION WSC	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	29	33	37	40	43	46
UNION WSC	M	UNION WSC - WATER METER AND WATER LINE REPLACEMENT	DEMAND REDUCTION	$3080	$420	88	88	88	88	88	88
UNION WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$3000	$3000	715	752	804	857	890	907
VALLEY MUD 2	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	$681	$681	8	104	222	362	523	700
WEBB COUNTY	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	51	185	342
WEBB COUNTY	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	N/A	$69	0	0	0	44	49	53
WEBB COUNTY	M	FRESH GROUNDWATER	M | CARRIZO-WILCOX AQUIFER FRESH/BRACKISH | WEBB COUNTY	N/A	$237	0	76	76	76	76	76
WEBB COUNTY	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	0	0	150	300	400
WESLACO	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	547	1,219	1,924	2,829	3,844
WESLACO	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$79	$79	258	333	401	470	539	603
WESLACO	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$186	$30	560	560	560	560	560	560
WESLACO	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$1073	$0	235	411	588	764	940	1,117
WESLACO	M	REUSE	M | DIRECT POTABLE REUSE	$1227	$568	1,120	1,120	1,120	1,120	1,120	1,120
WESLACO	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$3000	0	1,000	1,792	2,735	3,533	4,105

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Region M Recommended Water User Group (WUG) Water Management Strategies (WMS)

WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR) 2020	2030	2040	2050	2060	2070
ZAPATA COUNTY	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	155	395	578	807	1,079
ZAPATA COUNTY	M	DROUGHT MANAGEMENT	DEMAND REDUCTION	$69	$69	62	73	85	98	112	126
ZAPATA COUNTY	M	FRESH GROUNDWATER	M | YEGUA-JACKSON AQUIFER | ZAPATA COUNTY	$937	$242	1,120	1,120	1,120	1,120	1,120	1,120
ZAPATA COUNTY WCID-HWY 16 EAST	M	ADVANCED MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$681	0	10	22	38	55	75
					REGION M RECOMMENDED WMS SUPPLY TOTAL	141,446	218,512	296,070	372,204	440,183	508,462

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Region M Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
AGUA SUD	YES	2020	AGUA SUD - EAST WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$28,261,000
AGUA SUD	YES	2020	AGUA SUD - WEST WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$24,515,000
AGUA SUD	YES	2040	AGUA SUD - WEST WWTP POTABLE REUSE PHASE II	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$24,367,000
AGUA SUD	YES	2040	URBANIZATION - AGUA SUD	WATER RIGHT/PERMIT LEASE OR PURCHASE	$4,263,000
ALAMO	YES	2030	ALAMO - BRACKISH GROUNDWATER DESALINATION PLANT	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$16,845,000
ALAMO	YES	2020	ALAMO - FRESH GROUNDWATER WELL	SINGLE WELL	$1,416,000
ALAMO	YES	2020	URBANIZATION - ALAMO	WATER RIGHT/PERMIT LEASE OR PURCHASE	$735,000
BAYVIEW IRRIGATION DISTRICT #11	YES	2020	BAYVIEW ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL; CONSERVATION - AGRICULTURAL	$10,125,384
BROWNSVILLE	YES	2030	BROWNSVILLE - BANCO MORALES RESERVOIR	RESERVOIR CONSTRUCTION	$12,516,000
BROWNSVILLE	YES	2030	BROWNSVILLE - NON-POTABLE WATER REUSE PIPELINE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$99,249,000
BROWNSVILLE	YES	2020	BROWNSVILLE - RESACA RESTORATION	DREDGE TO RECOVER CAPACITY	$14,398,000
BROWNSVILLE	YES	2050	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$43,787,000
BROWNSVILLE	YES	2070	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE II	WATER TREATMENT PLANT EXPANSION; PUMP STATION	$22,759,000
BROWNSVILLE	YES	2060	URBANIZATION - BROWNSVILLE	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,014,000
BROWNSVILLE IRRIGATION DISTRICT	YES	2020	BROWNSVILLE ID CONSERVATION	CONVEYANCE/TRANSMISSION PIPELINE; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY	$7,637,457
CAMERON COUNTY IRRIGATION DISTRICT #10	YES	2020	CAMERON COUNTY WATER IMPROVEMENT DISTRICT NO. 10 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DREDGE TO RECOVER CAPACITY; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL	$2,361,772
CAMERON COUNTY IRRIGATION DISTRICT #2	YES	2020	CAMERON COUNTY ID #2 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$79,856,194
CAMERON COUNTY IRRIGATION DISTRICT #6	YES	2020	CAMERON COUNTY ID NO. 6 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$28,752,120
COUNTY-OTHER, CAMERON	YES	2020	COUNTY-OTHER, CAMERON - EXPANDED GROUNDWATER SUPPLY	MULTIPLE WELLS/WELL FIELD	$9,783,000
COUNTY-OTHER, CAMERON	YES	2020	URBANIZATION - CAMERON COUNTY-OTHER	WATER RIGHT/PERMIT LEASE OR PURCHASE	$2,661,000
COUNTY-OTHER, HIDALGO	YES	2020	URBANIZATION - HIDALGO COUNTY-OTHER	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,725,000
COUNTY-OTHER, MAVERICK	YES	2020	URBANIZATION - MAVERICK COUNTY-OTHER	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,275,000
COUNTY-OTHER, STARR	YES	2020	COUNTY-OTHER, STARR - ADDITIONAL GROUNDWATER WELLS	MULTIPLE WELLS/WELL FIELD	$1,404,000
COUNTY-OTHER, STARR	YES	2020	URBANIZATION - STARR COUNTY-OTHER	WATER RIGHT/PERMIT LEASE OR PURCHASE	$480,000
COUNTY-OTHER, WEBB	YES	2020	COUNTY-OTHER, WEBB - ADDITIONAL GROUNDWATER WELLS	MULTIPLE WELLS/WELL FIELD	$3,469,000

Region M Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
COUNTY-OTHER, ZAPATA	YES	2020	URBANIZATION - ZAPATA COUNTY-OTHER	WATER RIGHT/PERMIT LEASE OR PURCHASE	$168,000
DELTA LAKE IRRIGATION DISTRICT	YES	2020	DELTA LAKE ID - ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$55,808,978
DONNA	YES	2020	DONNA - WTP EXPANSION, NEW RAW WATER RESERVOIR, AND RAW WATER PUMP STATION	NEW WATER TREATMENT PLANT; PUMP STATION; RESERVOIR CONSTRUCTION; CONVEYANCE/TRANSMISSION PIPELINE	$27,155,000
DONNA	YES	2020	URBANIZATION - DONNA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$6,720,000
DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1	YES	2020	DONNA ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$7,459,530
EAGLE PASS	YES	2020	URBANIZATION - EAGLE PASS	WATER RIGHT/PERMIT LEASE OR PURCHASE	$672,000
EAST RIO HONDO WSC	YES	2030	ERHWSC - FM 2925 TRANSMISSION LINE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION	$8,039,000
EAST RIO HONDO WSC	YES	2020	ERHWSC - SURFACE WTP PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$45,625,000
EAST RIO HONDO WSC	YES	2030	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	MULTIPLE WELLS/WELL FIELD; CONVEYANCE/TRANSMISSION PIPELINE	$3,566,333
EAST RIO HONDO WSC	YES	2020	URBANIZATION - EAST RIO HONDO WSC (ERHWSC)	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,632,000
EDCOUCH	YES	2020	EDCOUCH - NEW GROUNDWATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; PUMP STATION	$6,931,000
EDINBURG	YES	2020	EDINBURG - NON-POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$17,177,000
EDINBURG	YES	2020	URBANIZATION - EDINBURG	WATER RIGHT/PERMIT LEASE OR PURCHASE	$9,708,000
EL JARDIN WSC	YES	2020	EL JARDIN WSC - DISTRIBUTION PIPELINE REPLACEMENT	CONVEYANCE/TRANSMISSION PIPELINE	$19,802,000
EL JARDIN WSC	YES	2020	URBANIZATION - EL JARDIN WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$69,000
EL SAUZ WSC	YES	2020	URBANIZATION - EL SAUZ WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$150,000
EL TANQUE WSC	YES	2020	URBANIZATION - EL TANQUE WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$75,000
ELSA	YES	2020	URBANIZATION - ELSA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$675,000
ENGELMAN IRRIGATION DISTRICT	YES	2020	ENGLEMAN ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$5,262,249
HARLINGEN	YES	2050	URBANIZATION - HARLINGEN	WATER RIGHT/PERMIT LEASE OR PURCHASE	$825,000
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	YES	2020	HARLINGEN ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$3,814,870
HIDALGO	YES	2040	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	NEW WATER TREATMENT PLANT; SINGLE WELL	$831,000
HIDALGO	YES	2020	URBANIZATION - HIDALGO	WATER RIGHT/PERMIT LEASE OR PURCHASE	$234,000
HIDALGO COUNTY IRRIGATION DISTRICT #1	YES	2020	HIDALGO COUNTY ID NO. 1 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$26,418,956
HIDALGO COUNTY IRRIGATION DISTRICT #13	YES	2020	HIDALGO COUNTY ID NO. 13 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$772,193
HIDALGO COUNTY IRRIGATION DISTRICT #16	YES	2020	HIDALGO COUNTY ID NO. 16 CONSERVATION	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$9,801,872

Region M Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
HIDALGO COUNTY IRRIGATION DISTRICT #19	YES	2020	HIDALGO COUNTY WID NO. 19 (SHARYLAND) CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$3,789,099
HIDALGO COUNTY IRRIGATION DISTRICT #2	YES	2020	HIDALGO COUNTY ID NO. 2 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$12,825,016
HIDALGO COUNTY IRRIGATION DISTRICT #5	YES	2020	HIDALGO COUNTY ID NO. 5 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$6,092,515
HIDALGO COUNTY IRRIGATION DISTRICT #6	YES	2040	HCID#6 SERVICE AREA EXPANSION	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; RESERVOIR CONSTRUCTION; WATER RIGHT/PERMIT LEASE OR PURCHASE	$19,281,000
HIDALGO COUNTY IRRIGATION DISTRICT #6	YES	2020	HIDALGO COUNTY ID NO. 6 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$16,160,527
HIDALGO COUNTY MUD 1	YES	2020	URBANIZATION - HIDALGO COUNTY MUD 1	WATER RIGHT/PERMIT LEASE OR PURCHASE	$444,000
HIDALGO COUNTY WCID #18	YES	2020	HIDALGO COUNTY WCID NO. 18 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$665,437
HIDALGO COUNTY WID #3	YES	2020	HIDALGO COUNTY WID NO. 3 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$70,572,603
HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9	YES	2020	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$63,146,985
IRRIGATION, JIM HOGG	YES	2020	IRRIGATION, JIM HOGG - ADDITIONAL GROUNDWATER WELLS	MULTIPLE WELLS/WELL FIELD	$2,631,000
LA FERIA	YES	2030	LA FERIA - WATER WELL WITH RO UNIT	NEW WATER TREATMENT PLANT; SINGLE WELL	$7,413,000
LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3	YES	2020	LA FERIA ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DREDGE TO RECOVER CAPACITY; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL	$59,989,636
LA GRULLA	YES	2020	URBANIZATION - LA GRULLA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$2,091,000
LA JOYA	YES	2020	URBANIZATION - LA JOYA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,131,000
LA VILLA	YES	2020	URBANIZATION - LA VILLA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$111,000
LAGUNA MADRE WATER DISTRICT	YES	2030	LAGUNA MADRE WATER DISTRICT - POTABLE REUSE	NEW WATER TREATMENT PLANT	$4,197,000
LAGUNA MADRE WATER DISTRICT	YES	2050	LAGUNA MADRE WATER DISTRICT - SEAWATER DESALINATION PLANT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$40,290,000
LAGUNA MADRE WATER DISTRICT	YES	2020	LAGUNA MADRE WATER DISTRICT - WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	PUMP STATION; WATER TREATMENT PLANT EXPANSION; NEW WATER RIGHT/PERMIT NO IBT; STORAGE TANK	$20,953,000
LAGUNA MADRE WATER DISTRICT	YES	2020	URBANIZATION - LAGUNA MADRE WATER DISTRICT	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,119,000
LAREDO	YES	2040	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$24,714,000

Region M Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
LAREDO	YES	2060	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE II	PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION; CONVEYANCE/TRANSMISSION PIPELINE	$37,351,000
LAREDO	YES	2070	URBANIZATION - LAREDO	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,800,000
LOS FRESNOS	YES	2020	LOS FRESNOS - WTP EXPANSION	WATER TREATMENT PLANT EXPANSION	$3,845,000
LOS FRESNOS	YES	2020	URBANIZATION - LOS FRESNOS	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,680,000
LYFORD	YES	2030	LYFORD - BRACKISH GROUNDWATER WELL AND DESALINATION	NEW WATER TREATMENT PLANT; SINGLE WELL	$5,753,000
MAVERICK COUNTY WCID #1	YES	2020	MAVERICK COUNTY WCID - ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$50,136,923
MCALLEN	YES	2020	MCALLEN - AMI PROJECT	DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$500
MCALLEN	YES	2030	MCALLEN - BRACKISH GROUNDWATER DESALINATION PLANT	NEW WATER TREATMENT PLANT; MULTIPLE WELLS/WELL FIELD	$41,344,000
MCALLEN	YES	2030	MCALLEN - NORTH WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$49,777,000
MCALLEN	YES	2050	MCALLEN - NORTH WWTP POTABLE REUSE PHASE II	STORAGE TANK; WATER TREATMENT PLANT EXPANSION; PUMP STATION	$27,604,000
MCALLEN	YES	2020	MCALLEN - RAW WATER LINE PROJECT	CONVEYANCE/TRANSMISSION PIPELINE	$1,576,000
MCALLEN	YES	2040	URBANIZATION - MCALLEN	WATER RIGHT/PERMIT LEASE OR PURCHASE	$8,904,000
MERCEDES	YES	2050	URBANIZATION - MERCEDES	WATER RIGHT/PERMIT LEASE OR PURCHASE	$660,000
MILITARY HIGHWAY WSC	YES	2020	URBANIZATION - MILITARY HIGHWAY WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$300,000
MIRANDO CITY WSC	YES	2020	URBANIZATION - MIRANDO CITY WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$75,000
MISSION	YES	2030	MISSION - BRACKISH GROUNDWATER DESALINATION PLANT	NEW WATER TREATMENT PLANT; MULTIPLE WELLS/WELL FIELD	$41,344,000
MISSION	YES	2020	MISSION - WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$43,296
MISSION	YES	2050	MISSION - WWTP POTABLE REUSE PHASE II	STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$39,139
MISSION	YES	2020	URBANIZATION - MISSION	WATER RIGHT/PERMIT LEASE OR PURCHASE	$5,961,000
NORTH ALAMO WSC	YES	2030	NAWSC - DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$28,374,000
NORTH ALAMO WSC	YES	2040	NAWSC - DELTA WTP EXPANSION PHASE I	WATER RIGHT/PERMIT LEASE OR PURCHASE; WATER TREATMENT PLANT EXPANSION	$16,797,000
NORTH ALAMO WSC	YES	2050	NAWSC - DELTA WTP EXPANSION PHASE II	WATER RIGHT/PERMIT LEASE OR PURCHASE; WATER TREATMENT PLANT EXPANSION	$10,008,000
NORTH ALAMO WSC	YES	2030	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	MULTIPLE WELLS/WELL FIELD; CONVEYANCE/TRANSMISSION PIPELINE	$7,132,667
NORTH ALAMO WSC	YES	2020	URBANIZATION - NORTH ALAMO WSC (NAWSC)	WATER RIGHT/PERMIT LEASE OR PURCHASE	$16,049,929
OLMITO WSC	YES	2020	OLMITO WSC - NEW BIOLAC WWTP	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; STORAGE TANK; PUMP STATION	$11,311,000
OLMITO WSC	YES	2020	OLMITO WSC - WTP EXPANSION	WATER TREATMENT PLANT EXPANSION	$11,311,000
OLMITO WSC	YES	2030	URBANIZATION - OLMITO WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$39,000
PHARR	YES	2020	PHARR - RAW WATER RESERVOIR AUGMENTATION	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$53,015,000
PHARR	YES	2030	URBANIZATION - PHARR	WATER RIGHT/PERMIT LEASE OR PURCHASE	$60,000
PORT MANSFIELD PUD	YES	2020	URBANIZATION - PORT MANSFIELD PUD	WATER RIGHT/PERMIT LEASE OR PURCHASE	$414,000
PRIMERA	YES	2030	PRIMERA - RO WTP WITH GROUNDWATER WELL	NEW WATER TREATMENT PLANT; SINGLE WELL	$10,804,000
PRIMERA	YES	2050	URBANIZATION - PRIMERA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$120,000
RIO GRANDE CITY	YES	2020	RIO GRANDE CITY - WATER METER REPLACEMENT	DATA GATHERING/MONITORING TECHNOLOGY	$3,945,000
RIO GRANDE CITY	YES	2020	URBANIZATION - RIO GRANDE CITY	WATER RIGHT/PERMIT LEASE OR PURCHASE	$4,086,000

Region M Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
RIO HONDO	YES	2020	RIO HONDO - NEW GROUNDWATER SUPPLY	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$765,000
RIO HONDO	YES	2020	RIO HONDO - NON-POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$10,848,000
RIO WSC	YES	2060	URBANIZATION - RIO WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$165,000
ROMA	YES	2030	ROMA - REGIONAL WTP	NEW WATER TREATMENT PLANT; WATER RIGHT/PERMIT LEASE OR PURCHASE	$45,625,000
ROMA	YES	2020	URBANIZATION - ROMA	WATER RIGHT/PERMIT LEASE OR PURCHASE	$3,060,000
SAN BENITO	YES	2030	SAN BENITO - NEW GROUNDWATER SUPPLY	MULTIPLE WELLS/WELL FIELD	$2,214,000
SAN BENITO	YES	2070	URBANIZATION - SAN BENITO	WATER RIGHT/PERMIT LEASE OR PURCHASE	$912,000
SAN JUAN	YES	2030	SAN JUAN - BRACKISH GROUNDWATER WELL	SINGLE WELL; NEW WATER TREATMENT PLANT	$8,594,000
SAN JUAN	YES	2040	SAN JUAN - POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$24,354,000
SAN JUAN	YES	2030	SAN JUAN - WTP NO. 1 UPGRADE, EXPANSION, AND BGD	MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION	$11,784,000
SAN JUAN	YES	2050	URBANIZATION - SAN JUAN	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,836,000
SANTA CRUZ IRRIGATION DISTRICT #15	YES	2020	SANTA CRUZ ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$5,356,629
SEBASTIAN MUD	YES	2050	URBANIZATION - SEBASTIAN MUD	WATER RIGHT/PERMIT LEASE OR PURCHASE	$3,000
SHARYLAND WSC	YES	2030	SHARYLAND WSC - WELL AND RO UNIT AT WTP #2	NEW WATER TREATMENT PLANT; SINGLE WELL	$19,805,000
SHARYLAND WSC	YES	2030	SHARYLAND WSC - WELL AND RO UNIT AT WTP #3	NEW WATER TREATMENT PLANT; SINGLE WELL	$19,805,000
SHARYLAND WSC	YES	2030	URBANIZATION - SHARYLAND WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$1,029,000
SIESTA SHORES WCID	YES	2020	URBANIZATION - SIESTA SHORES WCID	WATER RIGHT/PERMIT LEASE OR PURCHASE	$6,000
UNION WSC	YES	2020	UNION WSC METER AND LINE REPLACEMENT	CONVEYANCE/TRANSMISSION PIPELINE; DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$3,320,000
UNION WSC	YES	2020	URBANIZATION - UNION WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE	$2,145,000
UNITED IRRIGATION DISTRICT	YES	2020	UNITED ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL	$23,387,772
VALLEY ACRES IRRIGATION DISTRICT	YES	2020	VALLEY ACRES ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DREDGE TO RECOVER CAPACITY; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL	$2,846,479
WEBB COUNTY	YES	2050	URBANIZATION - WEBB COUNTY	WATER RIGHT/PERMIT LEASE OR PURCHASE	$450,000
WEBB COUNTY	YES	2030	WEBB COUNTY WATER UTILITY - EXPANDED GROUNDWATER SUPPLY	SINGLE WELL; WATER TREATMENT PLANT EXPANSION	$631,000
WESLACO	YES	2030	URBANIZATION - WESLACO	WATER RIGHT/PERMIT LEASE OR PURCHASE	$3,000,000
WESLACO	YES	2020	WESLACO - GROUNDWATER DEVELOPMENT AND BLENDING	SINGLE WELL	$1,240,000
WESLACO	YES	2020	WESLACO - NORTH WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$10,489,000
ZAPATA COUNTY	YES	2020	ZAPATA COUNTY - NEW GROUNDWATER SUPPLY	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$11,061,000

REGION M RECOMMENDED CAPITAL COST TOTAL	**$1,727,057,060**

Region M Alternative Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
AGUA SUD	M	REUSE	M | DIRECT NON-POTABLE REUSE	$2875	$1217	1,120	1,120	1,120	1,120	1,120	1,120
BROWNSVILLE	M	BROWNSVILLE - MATAMOROS WEIR AND RESERVOIR	M | RIO GRANDE RUN-OF-RIVER STORAGE (MATAMOROS WEIR)	N/A	$19	0	19,176	19,176	19,176	19,176	19,176
BROWNSVILLE	M	DESALINATION	M | GULF OF MEXICO SALINE	N/A	$3708	0	2,603	2,603	2,603	26,022	26,022
COUNTY-OTHER, HIDALGO	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$308	$167	1	1	1	3	3	3
EAGLE PASS	M	EAGLE PASS - ASR	M | CARRIZO-WILCOX AQUIFER ASR FRESH/BRACKISH | MAVERICK COUNTY	$523833	$218580	3,360	3,360	3,360	3,360	3,360	3,360
EAST RIO HONDO WSC	M	URBANIZATION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	N/A	$1740	0	0	0	2,500	2,500	2,500
EL JARDIN WSC	M	DESALINATION	M | GULF OF MEXICO SALINE	N/A	$3708	0	108	108	108	1,081	1,081
ELSA	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$754	$347	2,240	2,240	2,240	2,240	2,240	2,240
LA FERIA	M	REUSE	M | DIRECT NON-POTABLE REUSE	N/A	$1270	0	50	200	400	600	800
LAREDO	M	LAREDO - EL PICO WTP EXPANSION	M | AMISTAD-FALCON LAKE/RESERVOIR SYSTEM	$285	$463	28,000	56,000	89,600	162,400	162,400	162,400
MANUFACTURING, CAMERON	M	DESALINATION	M | GULF OF MEXICO SALINE	N/A	$3708	0	56	56	56	565	565
MCALLEN	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	N/A	$168	0	500	500	500	1,500	1,500
MERCEDES	M	MERCEDES - EXPAND EXISTING GROUNDWATER SUPPLY	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$216	$70	560	560	560	560	560	560
MILITARY HIGHWAY WSC	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$308	$167	247	247	247	617	617	617
NORTH ALAMO WSC	M	MUNICIPAL INFRASTRUCTURE IMPROVEMENTS	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$2766	$2316	1,120	4,480	4,480	4,480	4,480	4,480
SAN BENITO	M	REUSE	M | DIRECT NON-POTABLE REUSE	$197	$51	1,120	1,120	1,120	1,120	1,120	1,120
SAN BENITO	M	REUSE	M | DIRECT POTABLE REUSE	$1801	$1490	1,120	1,120	1,120	1,120	1,120	3,360
SAN JUAN	M	FRESH GROUNDWATER	M | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | HIDALGO COUNTY	$308	$167	2	2	2	5	5	5
STEAM ELECTRIC POWER, CAMERON	M	DESALINATION	M | GULF OF MEXICO SALINE	N/A	$3708	0	33	33	33	332	332
REGION M ALTERNATIVE WMS SUPPLY TOTAL						38,890	92,776	126,526	202,401	228,801	231,241

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region M Alternative Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
AGUA SUD	YES	2020	AGUA SUD - NON-POTABLE REUSE	NEW WATER TREATMENT PLANT; STORAGE TANK	$26,387,000
BROWNSVILLE	YES	2030	BROWNSVILLE - SEAWATER DESALINATION DEMONSTRATION	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT	$74,248,000
BROWNSVILLE	YES	2060	BROWNSVILLE - SEAWATER DESALINATION IMPLEMENTATION	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; WATER TREATMENT PLANT EXPANSION	$469,635,000
BROWNSVILLE	YES	2030	BROWNSVILLE-MATAMOROS WEIR AND RESERVOIR	DIVERSION AND CONTROL STRUCTURE; RESERVOIR CONSTRUCTION	$23,806,000
EAGLE PASS	YES	2020	EAGLE PASS - ASR PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$14,576,941,000
EAST RIO HONDO WSC	YES	2050	ERHWSC - SURFACE WTP PHASE II WITH INTER-BASIN TRANSFER OF SURFACE WATER	PUMP STATION; WATER TREATMENT PLANT EXPANSION; NEW WATER RIGHT/PERMIT NON-EXEMPT IBT	$16,703,000
ELSA	YES	2020	ELSA - WTP EXPANSION AND INTERCONNECT TO ENGLEMAN ID	CONVEYANCE/TRANSMISSION PIPELINE; WATER TREATMENT PLANT EXPANSION	$12,895,000
LA FERIA	YES	2030	LA FERIA - NON-POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$6,091,000
LAREDO	YES	2020	LAREDO - EL PICO WTP EXPANSION #1	NEW WATER RIGHT/PERMIT NO IBT; WATER TREATMENT PLANT EXPANSION	$66,393,000
LAREDO	YES	2030	LAREDO - EL PICO WTP EXPANSION #2	NEW WATER RIGHT/PERMIT NO IBT; WATER TREATMENT PLANT EXPANSION	$66,393,000
LAREDO	YES	2040	LAREDO - EL PICO WTP EXPANSION #3	NEW WATER RIGHT/PERMIT NO IBT; WATER TREATMENT PLANT EXPANSION	$77,341,000
LAREDO	YES	2050	LAREDO - EL PICO WTP EXPANSION #4	NEW WATER RIGHT/PERMIT NO IBT; WATER TREATMENT PLANT EXPANSION	$164,003,000
MCALLEN	YES	2030	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE I	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$1,103,000
MCALLEN	YES	2060	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE II	MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION	$1,162,000
MERCEDES	YES	2020	MERCEDES - EXPAND EXISTING GROUNDWATER SUPPLY	MULTIPLE WELLS/WELL FIELD	$1,167,000
MILITARY HIGHWAY WSC	YES	2020	MHWSC - EXPAND EXISTING GROUNDWATER WELLS (HIDALGO COUNTY) PHASE I	SINGLE WELL; WATER TREATMENT PLANT EXPANSION	$772,000
MILITARY HIGHWAY WSC	YES	2050	MHWSC - EXPAND EXISTING GROUNDWATER WELLS (HIDALGO COUNTY) PHASE II	SINGLE WELL; WATER TREATMENT PLANT EXPANSION	$782,000
NORTH ALAMO WSC	YES	2020	NAWSC - EXPANSION OF WTP NO. 5 AND WATERLINE	WATER TREATMENT PLANT EXPANSION; CONVEYANCE/TRANSMISSION PIPELINE	$22,657,000
SAN BENITO	YES	2020	SAN BENITO - NON-POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$2,329,000
SAN BENITO	YES	2020	SAN BENITO - POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$17,610,000
SAN BENITO	YES	2070	SAN BENITO - POTABLE REUSE PHASE II	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$23,189,000

REGION M ALTERNATIVE CAPITAL COST TOTAL	**$15,651,607,000**

Region M Water User Group (WUG) Management Supply Factor

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. To calculate the Management Supply Factor for each WUG as a whole, not split by region-county-basin, the combined total of existing and future supply is divided by the total projected demand. If a WUG is split by more than one planning region, the whole WUG's management supply factor will show up in each of its planning region's management supply factor reports.

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
AGUA SUD	1.4	1.2	1.5	1.5	1.4	1.4
ALAMO	1.1	1.3	1.2	1.2	1.2	1.2
BROWNSVILLE	1.3	1.2	1.1	1.1	1.0	1.0
COMBES	2.2	2.1	1.9	1.8	1.6	1.5
COUNTY-OTHER, CAMERON	1.0	1.0	1.2	1.2	1.3	1.3
COUNTY-OTHER, HIDALGO	1.0	1.0	1.0	1.0	1.0	1.0
COUNTY-OTHER, JIM HOGG	1.9	1.8	1.7	1.6	1.6	1.5
COUNTY-OTHER, MAVERICK	1.1	1.0	1.0	1.0	1.1	1.1
COUNTY-OTHER, STARR	1.0	1.0	1.0	1.0	1.0	1.0
COUNTY-OTHER, WEBB	1.9	1.6	1.4	1.3	1.1	1.0
COUNTY-OTHER, WILLACY	9.4	8.5	7.9	7.2	6.7	6.2
COUNTY-OTHER, ZAPATA	1.0	1.0	1.0	1.0	1.0	1.0
DONNA	2.1	2.1	2.2	2.1	1.9	1.8
EAGLE PASS	1.2	1.2	1.1	1.1	1.1	1.1
EAST RIO HONDO WSC	1.4	1.5	1.5	1.4	1.4	1.3
EDCOUCH	3.0	2.6	2.2	2.0	1.8	1.6
EDINBURG	1.0	1.0	1.1	1.1	1.1	1.1
EL JARDIN WSC	1.1	1.1	1.0	1.0	1.0	1.0
EL SAUZ WSC	1.1	1.5	1.4	1.3	1.3	1.3
EL TANQUE WSC	1.0	1.2	1.1	1.0	1.0	1.0
ELSA	1.0	1.0	1.0	1.0	1.1	1.1
FALCON RURAL WSC	1.9	2.3	2.2	2.0	2.0	1.9
HARLINGEN	1.4	1.3	1.3	1.2	1.2	1.2
HIDALGO	1.0	1.0	1.1	1.1	1.2	1.1
HIDALGO COUNTY MUD 1	1.0	1.1	1.0	1.0	1.0	1.0
IRRIGATION, CAMERON	0.4	0.4	0.4	0.4	0.4	0.4
IRRIGATION, HIDALGO	0.4	0.5	0.5	0.5	0.5	0.5
IRRIGATION, JIM HOGG	2.0	2.1	2.1	2.2	2.3	2.4
IRRIGATION, MAVERICK	0.8	0.8	0.8	0.8	0.9	0.9
IRRIGATION, STARR	0.2	0.2	0.2	0.2	0.2	0.2
IRRIGATION, WEBB	0.9	1.0	0.9	1.0	1.0	1.0
IRRIGATION, WILLACY	0.2	0.3	0.2	0.2	0.2	0.2
IRRIGATION, ZAPATA	0.5	0.5	0.5	0.5	0.5	0.5
JIM HOGG COUNTY WCID 2	2.2	2.1	2.0	1.9	1.9	1.8
LA FERIA	1.5	2.3	2.1	2.0	2.0	2.0
LA GRULLA	1.0	1.0	1.0	1.0	1.0	1.0
LA JOYA	1.2	1.0	1.0	1.0	1.0	1.0
LA VILLA	1.1	1.1	1.1	1.1	1.0	1.0
LAGUNA MADRE WATER DISTRICT	1.3	1.3	1.3	1.4	1.3	1.3
LAREDO	1.4	1.2	1.1	1.0	1.0	1.0
LIVESTOCK, CAMERON	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, HIDALGO	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, JIM HOGG	1.2	1.2	1.2	1.2	1.2	1.2
LIVESTOCK, MAVERICK	1.0	1.0	1.0	1.0	1.0	1.0

*A single asterisk next to a WUG's name denotes that the WUG is split by more than one planning region.

Region M Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
LIVESTOCK, STARR	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, WEBB	1.1	1.1	1.1	1.1	1.1	1.1
LIVESTOCK, WILLACY	1.0	1.0	1.0	1.0	1.0	1.0
LIVESTOCK, ZAPATA	1.2	1.2	1.2	1.2	1.2	1.2
LOS FRESNOS	3.7	3.2	2.8	2.5	2.2	2.0
LYFORD	2.1	5.6	5.3	4.9	4.6	4.4
MANUFACTURING, CAMERON	0.7	0.7	0.7	0.7	0.7	0.7
MANUFACTURING, HIDALGO	1.4	1.2	1.2	1.2	1.2	1.2
MANUFACTURING, JIM HOGG	1.0	1.0	1.0	1.0	1.0	1.0
MANUFACTURING, MAVERICK	1.1	1.1	1.1	1.1	1.1	1.1
MANUFACTURING, STARR	1.0	0.8	0.8	0.8	0.8	0.8
MANUFACTURING, WEBB	1.5	1.4	1.4	1.4	1.4	1.4
MANUFACTURING, ZAPATA	0.7	0.7	0.7	0.7	0.7	0.7
MAVERICK COUNTY	3.0	2.7	2.4	2.3	2.1	2.0
MCALLEN	1.1	1.1	1.1	1.1	1.1	1.1
MERCEDES	1.3	1.2	1.1	1.0	1.0	1.0
MILITARY HIGHWAY WSC	1.2	1.1	1.1	1.1	1.0	1.0
MINING, CAMERON	2.6	2.5	3.6	5.3	10.9	23.7
MINING, HIDALGO	0.8	0.6	0.6	0.5	0.4	0.4
MINING, JIM HOGG	1.1	1.1	0.6	1.1	1.1	1.1
MINING, MAVERICK	0.8	0.6	0.6	0.7	0.9	1.2
MINING, STARR	0.6	0.5	0.5	0.4	0.4	0.4
MINING, WEBB	0.6	0.8	1.0	1.5	3.1	4.3
MINING, WILLACY	0.1	0.1	0.6	0.8	1.2	1.8
MINING, ZAPATA	1.6	1.5	2.0	2.6	4.1	6.3
MIRANDO CITY WSC	1.4	1.3	1.3	1.2	1.2	1.2
MISSION	1.0	1.0	1.1	1.1	1.1	1.1
NORTH ALAMO WSC	1.0	1.1	1.3	1.4	1.4	1.3
OLMITO WSC	2.4	2.2	2.1	2.1	2.0	1.9
PALM VALLEY	1.1	1.2	1.3	1.4	1.4	1.5
PHARR	1.7	1.5	1.3	1.2	1.1	1.1
PORT MANSFIELD PUD	1.1	1.1	1.1	1.1	1.1	1.1
PRIMERA	1.4	3.6	3.3	3.1	3.0	2.9
RAYMONDVILLE	2.4	2.3	2.2	2.1	2.1	2.0
RIO GRANDE CITY	1.0	1.0	1.0	1.0	1.0	1.0
RIO HONDO	9.6	8.8	7.9	7.0	6.2	5.6
RIO WSC	1.1	1.4	1.3	1.3	1.3	1.3
ROMA	1.4	1.6	1.4	1.3	1.3	1.3
SAN BENITO	1.2	1.4	1.5	1.4	1.3	1.3
SAN JUAN	1.0	1.3	1.5	1.4	1.4	1.3
SAN YGNACIO MUD	1.5	1.4	1.3	1.2	1.1	1.0
SANTA ROSA	2.6	2.4	2.1	1.9	1.7	1.6
SEBASTIAN MUD	1.3	1.2	1.1	1.1	1.1	1.1
SHARYLAND WSC	1.1	1.2	1.1	1.1	1.1	1.1
SIESTA SHORES WCID	1.9	1.8	1.7	1.6	1.5	1.5
STEAM ELECTRIC POWER, CAMERON	0.1	2.0	2.0	2.0	2.0	2.0
STEAM ELECTRIC POWER, HIDALGO	1.0	1.0	1.0	1.0	1.0	1.0
STEAM ELECTRIC POWER, WEBB	4.7	4.7	4.7	4.7	4.7	4.7

*A single asterisk next to a WUG's name denotes that the WUG is split by more than one planning region.

Region M Water User Group (WUG) Management Supply Factor

	WUG MANAGEMENT SUPPLY FACTOR					
WUG NAME	2020	2030	2040	2050	2060	2070
UNION WSC	1.1	1.1	1.1	1.1	1.1	1.1
VALLEY MUD 2	1.3	1.2	1.2	1.2	1.2	1.1
WEBB COUNTY	1.4	1.2	1.1	1.0	1.0	1.0
WESLACO	1.1	1.1	1.1	1.0	1.0	1.0
ZAPATA COUNTY	1.5	1.3	1.2	1.1	1.1	1.0
ZAPATA COUNTY WCID-HWY 16 EAST	4.9	4.3	3.9	3.5	3.1	2.9

*A single asterisk next to a WUG's name denotes that the WUG is split by more than one planning region.

Region M Recommended Water Management Strategy (WMS) Supply Associated with a New or Amended Inter-Basin Transfer (IBT) Permit

IBT WMS supply is the portion of the total WMS benefitting WUGs that will require a new or amended IBT permit that is not considered exempt under the Texas Water Code § 11.085.

			IBT WMS SUPPLY (ACRE-FEET PER YEAR)					
WMS NAME	SOURCE BASIN	RECIPIENT WUG BASIN	2020	2030	2040	2050	2060	2070

Region M Water User Groups (WUGs)
Recommended Water Management Strategy (WMS) Supply Associated with a
New or Amended Inter-Basin Transfer (IBT) Permit and Total Recommended Conservation WMS Supply

IBT WMS supply is the portion of the total WMS benefitting the WUG basin split listed that will require a new or amended IBT permit that is not considered exempt under the Texas Water Code § 11.085. Total conservation supply represents all conservation WMS volumes recommended within the WUG's region-basin geographic split.

BENEFITTING WUG NAME | BASIN	WMS SOURCE ORIGIN BASIN | WMS NAME	WMS SUPPLY (ACRE-FEET PER YEAR)					
		2020	2030	2040	2050	2060	2070

Region M Sponsored Recommended Water Management Strategy (WMS) Supplies Unallocated* to Water User Groups (WUG)

WMS NAME	WMS SPONSOR	SOURCE NAME	UNALLOCATED STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
			2020	2030	2040	2050	2060	2070
BROWNSVILLE - BANCO MORALES RESERVOIR	BROWNSVILLE	M | NUECES-RIO GRANDE RUN-OF-RIVER STORAGE (BANCO MORALES)	0	190	190	190	190	190
RIO HONDO - NON-POTABLE REUSE	RIO HONDO	M | DIRECT NON-POTABLE REUSE	399	394	387	379	370	361
TOTAL UNALLOCATED STRATEGY SUPPLIES			**399**	**584**	**577**	**569**	**560**	**551**

* Strategy supplies created through the WMS that have not been assigned to a WUG will be allocated to the entity responsible for the water through an ‘unassigned water volumes’ entity. Only strategy supplies associated with an 'unassigned water volume' entity are shown in this report, and may not represent all strategy supplies associated with the listed WMS.

Region M Water User Group (WUG) Strategy Supplies by Water Management Strategy (WMS) Type

WMS TYPE *	STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
DIRECT POTABLE REUSE	12,321	16,828	26,613	35,793	39,153	40,833
DROUGHT MANAGEMENT	4,787	8,116	9,852	13,892	15,730	17,676
GROUNDWATER DESALINATION	0	18,904	18,904	18,904	18,904	18,904
GROUNDWATER WELLS & OTHER	6,745	6,821	8,121	8,121	9,121	9,121
IRRIGATION CONSERVATION	67,324	77,994	88,662	99,324	108,600	117,872
MUNICIPAL CONSERVATION	14,552	31,044	52,277	82,020	117,618	155,279
OTHER CONSERVATION	3,677	3,698	3,545	3,332	3,095	3,084
OTHER DIRECT REUSE	4,261	11,027	11,077	11,133	11,193	11,255
OTHER STRATEGIES	2,540	2,540	2,540	2,540	2,540	2,540
OTHER SURFACE WATER	25,239	41,540	74,479	96,025	113,109	130,778
SEAWATER DESALINATION	0	0	0	1,120	1,120	1,120
CONJUNCTIVE USE	0	0	0	0	0	0
INDIRECT REUSE	0	0	0	0	0	0
AQUIFER STORAGE & RECOVERY	0	0	0	0	0	0
NEW MAJOR RESERVOIR	0	0	0	0	0	0
TOTAL STRATEGY SUPPLIES	**141,446**	**218,512**	**296,070**	**372,204**	**440,183**	**508,462**

* WMS type descriptions can be found on the interactive state water plan website at http://texasstatewaterplan.org/ using the 'View data for' drop-down menus to navigate to a specific WMS Type page. The data used to create each WMS type value is available in Appendix 3 of the Guidelines for Regional Water Planning Data Deliverable (Exhibit D) document at http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/doc/current_docs/contract_docs/ExhibitD.pdf.

Region M Water User Group (WUG)
Recommended Water Management Strategy (WMS) Supplies by Source Type

SOURCE SUBTYPE*	STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
AQUIFER STORAGE & RECOVERY	0	0	0	0	0	0
GROUNDWATER	6,745	25,725	27,025	27,025	28,025	28,025
GROUNDWATER TOTAL STRATEGY SUPPLIES	**6,745**	**25,725**	**27,025**	**27,025**	**28,025**	**28,025**
DIRECT NON-POTABLE REUSE	4,261	11,027	11,077	11,133	11,193	11,255
DIRECT POTABLE REUSE	12,321	16,828	26,613	35,793	39,153	40,833
INDIRECT NON-POTABLE REUSE	0	0	0	0	0	0
INDIRECT POTABLE REUSE	0	0	0	0	0	0
REUSE TOTAL STRATEGY SUPPLIES	**16,582**	**27,855**	**37,690**	**46,926**	**50,346**	**52,088**
ATMOSPHERE	0	0	0	0	0	0
GULF OF MEXICO	0	0	0	1,120	1,120	1,120
LIVESTOCK LOCAL SUPPLY	0	0	0	0	0	0
OTHER LOCAL SUPPLY	0	0	0	0	0	0
RAINWATER HARVESTING	0	0	0	0	0	0
RESERVOIR	0	1,700	1,700	1,700	1,700	1,700
RESERVOIR SYSTEM	79,481	107,532	153,696	188,636	217,022	245,987
RUN-OF-RIVER	929	929	929	929	929	929
SURFACE WATER TOTAL STRATEGY SUPPLIES	**80,410**	**110,161**	**156,325**	**192,385**	**220,771**	**249,736**
REGION M TOTAL STRATEGY SUPPLIES	**103,737**	**163,741**	**221,040**	**266,336**	**299,142**	**329,849**

* A full list of source subtype definitions can be found in section 3 of the Guidelines for Regional Water Planning Data Deliverable (Exhibit D) document at http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2021/doc/current_docs/contract_docs/ExhibitD.pdf.

Region M Major Water Provider (MWP) Existing Sales and Transfers

Major Water Providers are entities of particular significance to a region's water supply as defined by the Regional Water Planning Group (RWPG), and may be a Water User Group (WUG) entity, Wholesale Water Provider (WWP) entity , or both (WUG/WWP).

Retail denotes WUG projected demands and existing water supplies used by the WUG. Wholesale denotes a WWP or WUG/WWP selling water to another entity.

AGUA SUD - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	7,409	8,924	10,497	12,120	13,787	15,426
PROJECTED WHOLESALE CONTRACT DEMANDS	500	500	500	500	500	500
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**7,909**	**9,424**	**10,997**	**12,620**	**14,287**	**15,926**
SURFACE WATER SALES TO RETAIL CUSTOMERS	8,545	8,545	8,545	8,545	8,545	8,545
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	355	355	355	355	355	355
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**8,900**	**8,900**	**8,900**	**8,900**	**8,900**	**8,900**

ALAMO - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	3,230	3,908	4,607	5,326	6,064	6,786
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**3,230**	**3,908**	**4,607**	**5,326**	**6,064**	**6,786**
GROUNDWATER SALES TO RETAIL CUSTOMERS	522	522	522	522	522	522
SURFACE WATER SALES TO RETAIL CUSTOMERS	1,694	1,694	1,694	1,694	1,694	1,694
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**2,216**	**2,216**	**2,216**	**2,216**	**2,216**	**2,216**

BAYVIEW IRRIGATION DISTRICT #11 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	7,687	7,685	7,683	7,681	7,679	7,677
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**7,687**	**7,685**	**7,683**	**7,681**	**7,679**	**7,677**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	5,227	5,226	5,224	5,223	5,221	5,220
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**5,227**	**5,226**	**5,224**	**5,223**	**5,221**	**5,220**

BROWNSVILLE - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	35,477	41,198	47,168	53,886	60,982	68,336
PROJECTED WHOLESALE CONTRACT DEMANDS	2,670	2,670	2,670	2,670	2,670	2,670
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**38,147**	**43,868**	**49,838**	**56,556**	**63,652**	**71,006**
GROUNDWATER SALES TO RETAIL CUSTOMERS	9,991	9,991	9,991	9,991	9,991	9,991
SURFACE WATER SALES TO RETAIL CUSTOMERS	33,443	33,443	33,443	33,443	33,443	33,442
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	2,670	2,670	2,670	2,670	2,670	2,670
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**46,104**	**46,104**	**46,104**	**46,104**	**46,104**	**46,103**

BROWNSVILLE IRRIGATION DISTRICT - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	18,839	18,835	18,831	18,827	18,823	18,819
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**18,839**	**18,835**	**18,831**	**18,827**	**18,823**	**18,819**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	13,931	13,928	13,925	13,922	13,920	13,917
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**13,931**	**13,928**	**13,925**	**13,922**	**13,920**	**13,917**

CAMERON COUNTY IRRIGATION DISTRICT #10 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	20,691	20,690	20,689	20,688	20,687	20,686
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**20,691**	**20,690**	**20,689**	**20,688**	**20,687**	**20,686**

Region M Major Water Provider (MWP) Existing Sales and Transfers

SURFACE WATER SALES TO WHOLESALE CUSTOMERS	10,088	10,088	10,087	10,086	10,086	10,085
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**10,088**	**10,088**	**10,087**	**10,086**	**10,086**	**10,085**

CAMERON COUNTY IRRIGATION DISTRICT #2 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	165,822	165,822	165,822	165,822	165,822	165,822
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**165,822**	**165,822**	**165,822**	**165,822**	**165,822**	**165,822**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	65,065	65,065	65,065	65,065	65,065	65,065
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**65,065**	**65,065**	**65,065**	**65,065**	**65,065**	**65,065**

CAMERON COUNTY IRRIGATION DISTRICT #6 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	50,183	50,177	50,171	50,165	50,159	50,153
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**50,183**	**50,177**	**50,171**	**50,165**	**50,159**	**50,153**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	28,250	28,246	28,242	28,238	28,234	28,230
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**28,250**	**28,246**	**28,242**	**28,238**	**28,234**	**28,230**

DELTA LAKE IRRIGATION DISTRICT - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	108,168	108,142	108,022	107,997	107,972	107,947
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**108,168**	**108,142**	**108,022**	**107,997**	**107,972**	**107,947**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	75,583	75,565	75,453	75,435	75,417	75,399
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**75,583**	**75,565**	**75,453**	**75,435**	**75,417**	**75,399**

DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	48,668	48,657	48,646	48,634	48,623	48,612
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**48,668**	**48,657**	**48,646**	**48,634**	**48,623**	**48,612**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	34,555	34,546	34,538	34,530	34,522	34,514
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**34,555**	**34,546**	**34,538**	**34,530**	**34,522**	**34,514**

EAGLE PASS - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	9,545	10,839	12,074	13,429	14,795	16,122
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**9,545**	**10,839**	**12,074**	**13,429**	**14,795**	**16,122**
SURFACE WATER SALES TO RETAIL CUSTOMERS	10,613	10,613	10,613	10,613	10,613	10,613
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**10,613**	**10,613**	**10,613**	**10,613**	**10,613**	**10,613**

EAST RIO HONDO WSC - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	3,900	4,458	4,489	4,970	5,459	6,073
PROJECTED WHOLESALE CONTRACT DEMANDS	215	215	215	215	215	215
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**4,115**	**4,673**	**4,704**	**5,185**	**5,674**	**6,288**
GROUNDWATER SALES TO RETAIL CUSTOMERS	537	568	600	631	663	663
SURFACE WATER SALES TO RETAIL CUSTOMERS	4,369	4,369	4,369	4,369	4,369	4,369
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	215	215	215	215	215	215
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**5,121**	**5,152**	**5,184**	**5,215**	**5,247**	**5,247**

EDINBURG - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)

Region M Major Water Provider (MWP) Existing Sales and Transfers

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	12,974	15,730	18,573	21,484	24,459	27,374
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**12,974**	**15,730**	**18,573**	**21,484**	**24,459**	**27,374**
SURFACE WATER SALES TO RETAIL CUSTOMERS	6,139	6,139	4,222	4,222	4,222	4,222
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**6,139**	**6,139**	**4,222**	**4,222**	**4,222**	**4,222**

HARLINGEN - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED RETAIL WUG DEMANDS	15,797	17,992	20,088	22,212	24,412	27,160
PROJECTED WHOLESALE CONTRACT DEMANDS	486	486	486	371	371	371
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**16,283**	**18,478**	**20,574**	**22,583**	**24,783**	**27,531**
REUSE SALES TO RETAIL CUSTOMERS	1,120	1,120	1,120	1,120	1,120	1,120
SURFACE WATER SALES TO RETAIL CUSTOMERS	19,838	19,837	19,837	19,840	19,840	19,839
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	486	486	486	371	371	371
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**21,444**	**21,443**	**21,443**	**21,331**	**21,331**	**21,330**

HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	79,438	79,424	79,410	79,324	79,380	79,439
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**79,438**	**79,424**	**79,410**	**79,324**	**79,380**	**79,439**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	66,101	66,088	66,076	65,992	66,051	66,111
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**66,101**	**66,088**	**66,076**	**65,992**	**66,051**	**66,111**

HIDALGO COUNTY IRRIGATION DISTRICT #1 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	90,058	90,039	87,321	87,301	87,283	87,264
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**90,058**	**90,039**	**87,321**	**87,301**	**87,283**	**87,264**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	74,349	74,333	72,401	72,385	72,369	72,353
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**74,349**	**74,333**	**72,401**	**72,385**	**72,369**	**72,353**

HIDALGO COUNTY IRRIGATION DISTRICT #16 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	18,497	18,493	18,490	18,486	18,482	18,479
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**18,497**	**18,493**	**18,490**	**18,486**	**18,482**	**18,479**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	13,134	13,131	13,128	13,126	13,123	13,121
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**13,134**	**13,131**	**13,128**	**13,126**	**13,123**	**13,121**

HIDALGO COUNTY IRRIGATION DISTRICT #2 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	88,206	88,190	88,175	88,159	88,143	88,128
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**88,206**	**88,190**	**88,175**	**88,159**	**88,143**	**88,128**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	66,156	66,144	66,131	66,120	66,108	66,096
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**66,156**	**66,144**	**66,131**	**66,120**	**66,108**	**66,096**

HIDALGO COUNTY IRRIGATION DISTRICT #6 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
PROJECTED WHOLESALE CONTRACT DEMANDS	22,877	22,873	22,869	22,865	22,861	22,857
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**22,877**	**22,873**	**22,869**	**22,865**	**22,861**	**22,857**

Region M Major Water Provider (MWP) Existing Sales and Transfers

SURFACE WATER SALES TO WHOLESALE CUSTOMERS	16,243	16,240	16,237	16,234	16,232	16,229
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**16,243**	**16,240**	**16,237**	**16,234**	**16,232**	**16,229**

HIDALGO COUNTY WID #3 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	21,277	21,276	21,275	21,274	21,273	21,272
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**21,277**	**21,276**	**21,275**	**21,274**	**21,273**	**21,272**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	19,113	19,112	19,112	19,111	19,110	19,109
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**19,113**	**19,112**	**19,112**	**19,111**	**19,110**	**19,109**

HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	94,933	94,911	94,890	94,870	94,849	94,828
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**94,933**	**94,911**	**94,890**	**94,870**	**94,849**	**94,828**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	66,427	66,413	66,398	66,383	66,369	66,354
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**66,427**	**66,413**	**66,398**	**66,383**	**66,369**	**66,354**

LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3 - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	43,247	43,237	43,227	43,216	43,206	43,196
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**43,247**	**43,237**	**43,227**	**43,216**	**43,206**	**43,196**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	28,667	28,760	28,853	29,046	29,339	29,532
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**28,667**	**28,760**	**28,853**	**29,046**	**29,339**	**29,532**

LAGUNA MADRE WATER DISTRICT - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	7,930	9,179	10,461	11,865	13,330	14,835
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**7,930**	**9,179**	**10,461**	**11,865**	**13,330**	**14,835**
SURFACE WATER SALES TO RETAIL CUSTOMERS	7,513	7,513	7,513	7,513	7,513	7,513
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**7,513**	**7,513**	**7,513**	**7,513**	**7,513**	**7,513**

LAREDO - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	42,028	50,530	58,812	66,591	74,190	81,096
PROJECTED WHOLESALE CONTRACT DEMANDS	1,823	1,822	1,822	1,821	1,821	1,821
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**43,851**	**52,352**	**60,634**	**68,412**	**76,011**	**82,917**
REUSE SALES TO RETAIL CUSTOMERS	773	773	773	773	773	773
SURFACE WATER SALES TO RETAIL CUSTOMERS	59,226	59,226	59,226	59,226	59,226	59,226
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	1,823	1,822	1,822	1,821	1,821	1,821
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**61,822**	**61,821**	**61,821**	**61,820**	**61,820**	**61,820**

MCALLEN - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	39,787	48,510	57,403	66,492	75,765	84,820
PROJECTED WHOLESALE CONTRACT DEMANDS	355	355	355	355	355	355
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**40,142**	**48,865**	**57,758**	**66,847**	**76,120**	**85,175**
GROUNDWATER SALES TO RETAIL CUSTOMERS	1,120	1,120	1,120	1,120	1,120	1,120
REUSE SALES TO RETAIL CUSTOMERS	2,251	2,251	2,251	2,251	2,251	2,251
SURFACE WATER SALES TO RETAIL CUSTOMERS	33,544	33,544	31,744	31,744	31,744	31,744

Region M Major Water Provider (MWP) Existing Sales and Transfers

SURFACE WATER SALES TO WHOLESALE CUSTOMERS	355	355	355	355	355	355
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**37,270**	**37,270**	**35,470**	**35,470**	**35,470**	**35,470**

MILITARY HIGHWAY WSC - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	6,504	7,639	8,817	10,076	11,389	12,711
PROJECTED WHOLESALE CONTRACT DEMANDS	35	35	35	35	35	35
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**6,539**	**7,674**	**8,852**	**10,111**	**11,424**	**12,746**
GROUNDWATER SALES TO RETAIL CUSTOMERS	6,807	6,807	6,807	6,807	6,807	6,807
SURFACE WATER SALES TO RETAIL CUSTOMERS	735	735	735	735	735	735
GROUNDWATER SALES TO WHOLESALE CUSTOMERS	25	25	25	25	25	25
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	10	10	10	10	10	10
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**7,577**	**7,577**	**7,577**	**7,577**	**7,577**	**7,577**

MISSION - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	20,070	24,532	29,086	33,717	38,414	43,002
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**20,070**	**24,532**	**29,086**	**33,717**	**38,414**	**43,002**
SURFACE WATER SALES TO RETAIL CUSTOMERS	11,556	11,556	11,556	11,556	11,556	11,556
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**11,556**	**11,556**	**11,556**	**11,556**	**11,556**	**11,556**

NORTH ALAMO WSC - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	28,197	34,079	40,106	46,280	52,554	58,701
PROJECTED WHOLESALE CONTRACT DEMANDS	2,042	2,042	2,042	2,042	2,042	2,042
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**30,239**	**36,121**	**42,148**	**48,322**	**54,596**	**60,743**
GROUNDWATER SALES TO RETAIL CUSTOMERS	9,892	10,094	10,094	10,094	10,094	10,094
SURFACE WATER SALES TO RETAIL CUSTOMERS	12,496	12,496	12,495	12,495	12,495	12,495
GROUNDWATER SALES TO WHOLESALE CUSTOMERS	842	842	842	842	842	842
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	1,148	1,148	1,148	1,148	1,148	1,148
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**24,378**	**24,580**	**24,579**	**24,579**	**24,579**	**24,579**

PHARR - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	9,923	11,933	14,020	16,182	18,415	20,606
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**9,923**	**11,933**	**14,020**	**16,182**	**18,415**	**20,606**
GROUNDWATER SALES TO RETAIL CUSTOMERS	1,400	1,400	1,400	1,400	1,400	1,400
REUSE SALES TO RETAIL CUSTOMERS	992	1,193	1,402	1,618	1,842	2,061
SURFACE WATER SALES TO RETAIL CUSTOMERS	7,980	7,980	7,980	7,980	7,980	7,980
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**10,372**	**10,573**	**10,782**	**10,998**	**11,222**	**11,441**

RIO GRANDE CITY - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	4,850	5,386	5,889	6,413	6,905	7,355
PROJECTED WHOLESALE CONTRACT DEMANDS	1,653	1,653	1,653	1,653	1,653	1,653
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**6,503**	**7,039**	**7,542**	**8,066**	**8,558**	**9,008**
SURFACE WATER SALES TO RETAIL CUSTOMERS	3,118	3,118	3,118	3,118	3,118	3,118
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	966	966	966	966	966	966
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**4,084**	**4,084**	**4,084**	**4,084**	**4,084**	**4,084**

Region M Major Water Provider (MWP) Existing Sales and Transfers

SAN BENITO - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	3,733	4,195	4,688	5,267	5,906	6,570
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**3,733**	**4,195**	**4,688**	**5,267**	**5,906**	**6,570**
SURFACE WATER SALES TO RETAIL CUSTOMERS	3,846	4,346	5,326	5,426	5,626	5,626
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**3,846**	**4,346**	**5,326**	**5,426**	**5,626**	**5,626**

SAN JUAN - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	4,947	5,990	7,063	8,166	9,298	10,407
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**4,947**	**5,990**	**7,063**	**8,166**	**9,298**	**10,407**
GROUNDWATER SALES TO RETAIL CUSTOMERS	1,782	1,782	1,782	1,782	1,782	1,782
SURFACE WATER SALES TO RETAIL CUSTOMERS	3,166	3,166	3,166	3,166	3,166	3,166
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**4,948**	**4,948**	**4,948**	**4,948**	**4,948**	**4,948**

SHARYLAND WSC - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	12,901	15,628	18,421	21,302	24,263	27,160
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**12,901**	**15,628**	**18,421**	**21,302**	**24,263**	**27,160**
SURFACE WATER SALES TO RETAIL CUSTOMERS	13,195	13,195	13,195	13,195	13,195	13,195
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**13,195**	**13,195**	**13,195**	**13,195**	**13,195**	**13,195**

SOUTHMOST REGIONAL WATER AUTHORITY - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	10,754	10,754	10,754	10,754	10,754	10,754
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**
GROUNDWATER SALES TO WHOLESALE CUSTOMERS	10,754	10,754	10,754	10,754	10,754	10,754
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**

UNITED IRRIGATION DISTRICT - WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED WHOLESALE CONTRACT DEMANDS	52,527	52,521	52,515	52,509	52,503	52,497
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**52,527**	**52,521**	**52,515**	**52,509**	**52,503**	**52,497**
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	44,648	44,643	44,638	44,633	44,628	44,623
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**44,648**	**44,643**	**44,638**	**44,633**	**44,628**	**44,623**

WESLACO - WUG/WWP	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
PROJECTED RETAIL WUG DEMANDS	7,697	9,711	11,550	13,443	15,391	17,218
PROJECTED WHOLESALE CONTRACT DEMANDS	175	175	175	175	175	175
TOTAL PROJECTED WHOLESALE CONTRACT AND RETAIL DEMANDS	**7,872**	**9,886**	**11,725**	**13,618**	**15,566**	**17,393**
REUSE SALES TO RETAIL CUSTOMERS	770	971	1,052	1,052	1,052	1,052
SURFACE WATER SALES TO RETAIL CUSTOMERS	5,408	5,408	5,408	5,408	5,408	5,408
SURFACE WATER SALES TO WHOLESALE CUSTOMERS	175	175	175	175	175	175
TOTAL WHOLESALE AND RETAIL SALES TO CUSTOMERS	**6,353**	**6,554**	**6,635**	**6,635**	**6,635**	**6,635**

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

MWPs are entities of significance to a region's water supply as defined by the Regional Water Planning Group (RWPG) and may be a Water User Group (WUG) entity, Wholesale Water Provider (WWP) entity, or both (WUG/WWP).'MWP Retail Customers' denotes recommended WMS supply used by the WUG. 'Transfers Related to Wholesale Customers' denotes a WWP or WUG/WWP selling or transferring recommended WMS supply to another entity. Supply associated with the MWP's wholesale transfers will only display if it is listed as the main seller in the State Water Planning database, even if multiple sellers are involved with the sale o water to WUGs. Unallocated water volumes represent MWP recommended WMS supply not currently allocated to a customer of the MWP.'Total MWP Related WMS Supply' will display if the MWP's WMS is related to more than one WMS supply type (retail, wholesale, and/or unallocated). Associated WMS Projects are listed when the MWP is one of the project's sponsors. Report contains draft data and is subject to change.

AGUA SUD | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	404	1,077	1,890

AGUA SUD | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	348	415	483	551	617

AGUA SUD | HIDALGO COUNTY ID NO. 16 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	282	326	369	413	456	500

AGUA SUD | HIDALGO COUNTY ID NO. 6 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	720	800	881	961	1,041	1,122

AGUA SUD | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	560	560	4,480	4,480	4,480	4,480
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AGUA SUD - WEST WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
AGUA SUD - WEST WWTP POTABLE REUSE PHASE II	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
AGUA SUD - EAST WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					

AGUA SUD | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	1,421	2,500	3,353	4,042
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - AGUA SUD	WATER RIGHT/PERMIT LEASE OR PURCHASE					

ALAMO | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	46	278	587	952

ALAMO | DESALINATION

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	896	896	896	896	896
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
ALAMO - BRACKISH GROUNDWATER DESALINATION PLANT	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT					

ALAMO | DROUGHT MANAGEMENT

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	118	146	175	203	232	260

ALAMO | FRESH GROUNDWATER

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,120	1,120	1,120	1,120	1,120	1,120
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
ALAMO - FRESH GROUNDWATER WELL	SINGLE WELL					

ALAMO | HIDALGO COUNTY ID NO. 2 CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	8	57	107	156	205	254

ALAMO | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	245	606	1,185	1,591	1,948	2,230
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
URBANIZATION - ALAMO	WATER RIGHT/PERMIT LEASE OR PURCHASE					

BAYVIEW IRRIGATION DISTRICT #11 | ID CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	602	711	820	930	1,039	1,148
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
BAYVIEW ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL; CONSERVATION - AGRICULTURAL					

BROWNSVILLE | ADVANCED MUNICIPAL CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	2,258	4,355	7,038	10,466	14,463

BROWNSVILLE | CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	41	49	57	65	73	81

BROWNSVILLE | DROUGHT MANAGEMENT

	WATER VOLUMES (ACRE-FEET PER YEAR)

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	817	949	1,091	1,237	1,388

BROWNSVILLE | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,700	1,700	1,700	1,700	1,700
RELATED UNALLOCATED WMS WATER VOLUMES	0	190	190	190	190	190
TOTAL MWP RELATED WMS SUPPLY	877	2,767	2,767	2,767	2,767	2,767
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
BROWNSVILLE - BANCO MORALES RESERVOIR	RESERVOIR CONSTRUCTION					
BROWNSVILLE - RESACA RESTORATION	DREDGE TO RECOVER CAPACITY					

BROWNSVILLE | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	3,360	3,360	5,040
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	6,721	6,721	6,721	6,721	6,721
TOTAL MWP RELATED WMS SUPPLY	0	6,721	6,721	10,081	10,081	11,761
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
BROWNSVILLE - NON-POTABLE WATER REUSE PIPELINE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE II	WATER TREATMENT PLANT EXPANSION; PUMP STATION					

BROWNSVILLE | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	338	1,841
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - BROWNSVILLE	WATER RIGHT/PERMIT LEASE OR PURCHASE					

BROWNSVILLE IRRIGATION DISTRICT | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	931	1,261	1,589	1,917	2,244	2,572
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
BROWNSVILLE ID CONSERVATION	CONVEYANCE/TRANSMISSION PIPELINE; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY					

CAMERON COUNTY IRRIGATION DISTRICT #10 | CAMERON COUNTY WATER IMPROVEMENTS DISTRICT NO. 10 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	50	145	240	335	430	525
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
CAMERON COUNTY WATER IMPROVEMENT DISTRICT NO. 10 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DREDGE TO RECOVER CAPACITY; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL					

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

CAMERON COUNTY IRRIGATION DISTRICT #2 | CAMERON COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	6,806	6,745	6,683	6,622	6,561	6,499
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
CAMERON COUNTY ID #2 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL					

CAMERON COUNTY IRRIGATION DISTRICT #6 | CAMERON COUNTY ID NO. 6 (LOS FRESNOS) CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	1,908	2,275	2,643	3,010	3,379	3,745
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
CAMERON COUNTY ID NO. 6 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL					

DELTA LAKE IRRIGATION DISTRICT | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	2,779	4,969	7,158	9,345	11,534	13,717
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
DELTA LAKE ID - ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL					

DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1 | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	703	1,875	3,046	4,217	5,388	6,558
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
DONNA ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL					

EAGLE PASS | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	481	914	1,525	2,299	3,163

EAGLE PASS | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	256	298	338	379	419	456

EAGLE PASS | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	370	1,140	1,903	2,605	3,160	3,585
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - EAGLE PASS	WATER RIGHT/PERMIT LEASE OR PURCHASE					

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

EAST RIO HONDO WSC | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	112	331	601	930

EAST RIO HONDO WSC | CAMERON COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	427	424	420	416	412	409

EAST RIO HONDO WSC | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	400	400	400	400	400
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	MULTIPLE WELLS/WELL FIELD; CONVEYANCE/TRANSMISSION PIPELINE					

EAST RIO HONDO WSC | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	148	152	170	187	208

EAST RIO HONDO WSC | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	18	27	37	46	46	46

EAST RIO HONDO WSC | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	30	30	30	30	30
TOTAL MWP RELATED WMS SUPPLY	0	830	830	830	830	830
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
ERHWSC - FM 2925 TRANSMISSION LINE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION					
ERHWSC - SURFACE WTP PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
URBANIZATION - EAST RIO HONDO WSC (ERHWSC)	WATER RIGHT/PERMIT LEASE OR PURCHASE					

EDINBURG | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	329	1,290	2,549	4,035

EDINBURG | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	488	606	724	843	961	1,076

EDINBURG | HIDALGO COUNTY ID NO. 1 CONSERVATION	
	WATER VOLUMES (ACRE-FEET PER YEAR)

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	259	350	216	261	305	350

EDINBURG | HIDALGO COUNTY ID NO. 2 CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	11	79	146	214	281	349

EDINBURG | REUSE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	3,243	3,920	3,920	3,920	3,920	3,920

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
EDINBURG - NON-POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK

EDINBURG | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	3,236	5,072	10,758	12,411	13,824	14,969

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
URBANIZATION - EDINBURG	WATER RIGHT/PERMIT LEASE OR PURCHASE

HARLINGEN | ADVANCED MUNICIPAL CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	960	2,164	3,215	4,519	6,097

HARLINGEN | ID CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,250	1,889	2,528	3,168	3,168	3,168

HARLINGEN | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	275	675	1,325

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
URBANIZATION - HARLINGEN	WATER RIGHT/PERMIT LEASE OR PURCHASE

HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1 | ID CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	4,085	6,173	8,262	10,349	10,349	10,349

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HARLINGEN ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO COUNTY IRRIGATION DISTRICT #1 | HIDALGO COUNTY ID NO. 1 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	2,650	3,579	4,286	5,170	6,054	6,938

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO COUNTY ID NO. 1 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO COUNTY IRRIGATION DISTRICT #1 | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	800	800	800	800	800	800

HIDALGO COUNTY IRRIGATION DISTRICT #16 | HIDALGO COUNTY ID NO. 16 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	1,409	1,626	1,843	2,060	2,276	2,493

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO COUNTY ID NO. 16 CONSERVATION	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO COUNTY IRRIGATION DISTRICT #2 | HIDALGO COUNTY ID NO. 2 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	323	2,239	4,153	6,068	7,980	9,894

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO COUNTY ID NO. 2 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO COUNTY IRRIGATION DISTRICT #6 | HIDALGO COUNTY ID NO. 6 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	1,979	2,199	2,421	2,641	2,861	3,082

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO COUNTY ID NO. 6 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO COUNTY WID #3 | HIDALGO COUNTY WID NO. 3 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	2,063	2,063	2,063	2,063	2,063	2,063

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO COUNTY WID NO. 3 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9 | HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION

	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	2,798	4,894	6,991	9,084	11,178	13,270

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL

LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3 | ID CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	7,300	7,300	7,300	7,300	7,300	7,300

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
LA FERIA ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DREDGE TO RECOVER CAPACITY; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL

LAGUNA MADRE WATER DISTRICT | ADVANCED MUNICIPAL CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	129	936	1,917	3,077	4,395	5,840

LAGUNA MADRE WATER DISTRICT | DESALINATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	1,120	1,120	1,120

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
LAGUNA MADRE WATER DISTRICT - SEAWATER DESALINATION PLANT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT

LAGUNA MADRE WATER DISTRICT | DROUGHT MANAGEMENT

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	130	152	174	198	223	248

LAGUNA MADRE WATER DISTRICT | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	2,352	2,352	2,352	2,352	2,352	2,352

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
URBANIZATION - LAGUNA MADRE WATER DISTRICT	WATER RIGHT/PERMIT LEASE OR PURCHASE
LAGUNA MADRE WATER DISTRICT - WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	PUMP STATION; WATER TREATMENT PLANT EXPANSION; NEW WATER RIGHT/PERMIT NO IBT STORAGE TANK

LAGUNA MADRE WATER DISTRICT | REUSE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	627	892	892	892	892

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
LAGUNA MADRE WATER DISTRICT - POTABLE REUSE	NEW WATER TREATMENT PLANT

LAGUNA MADRE WATER DISTRICT | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	373	682	869	980	976	886

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
URBANIZATION - LAGUNA MADRE WATER DISTRICT	WATER RIGHT/PERMIT LEASE OR PURCHASE

LAREDO | ADVANCED MUNICIPAL CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	221	3,030	6,713	10,902

LAREDO | DROUGHT MANAGEMENT

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	2,406	2,686	2,938

LAREDO | REUSE

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	3,360	3,360	6,720	6,720

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK
LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE II	PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION; CONVEYANCE/TRANSMISSION PIPELINE

LAREDO | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	980

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
URBANIZATION - LAREDO	WATER RIGHT/PERMIT LEASE OR PURCHASE

MCALLEN | ADVANCED MUNICIPAL CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	3,558	8,804	15,340	22,992	28,889

MCALLEN | DESALINATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	2,688	2,688	2,688	2,688	2,688

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
MCALLEN - BRACKISH GROUNDWATER DESALINATION PLANT	NEW WATER TREATMENT PLANT; MULTIPLE WELLS/WELL FIELD

MCALLEN | DROUGHT MANAGEMENT

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,071	1,330	1,589	1,850	2,110	2,363

MCALLEN | HIDALGO COUNTY ID NO. 1 CONSERVATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	196	264	333	402	471	540

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

MCALLEN | HIDALGO COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	29	204	378	552	727	901

MCALLEN | HIDALGO COUNTY WID NO. 3 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,672	1,672	1,672	1,672	1,672	1,672

MCALLEN | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,227	1,227	1,227	1,227	1,227	1,227

MCALLEN | MCALLEN - AMI PROJECT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,140	1,140	1,140	1,140	1,140	1,140
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
MCALLEN - AMI PROJECT	DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL					

MCALLEN | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	800	800	800	800	800	800
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
MCALLEN - RAW WATER LINE PROJECT	CONVEYANCE/TRANSMISSION PIPELINE					

MCALLEN | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	3,880	3,880	6,060	6,060	6,060
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
MCALLEN - NORTH WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
MCALLEN - NORTH WWTP POTABLE REUSE PHASE II	STORAGE TANK; WATER TREATMENT PLANT EXPANSION; PUMP STATION					

MCALLEN | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	2,968	3,622	5,223	8,370
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - MCALLEN	WATER RIGHT/PERMIT LEASE OR PURCHASE					

MILITARY HIGHWAY WSC | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	302	757	1,350	2,048

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

MILITARY HIGHWAY WSC | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	198	231	266	301	336

MILITARY HIGHWAY WSC | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	38	57	77	96	96	96

MILITARY HIGHWAY WSC | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	100	844	1,457	1,998	2,455	3,079
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - MILITARY HIGHWAY WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE					

MISSION | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,916	4,635	7,721	10,209	12,958

MISSION | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	2,688	2,688	2,688	2,688	2,688
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
MISSION - BRACKISH GROUNDWATER DESALINATION PLANT	NEW WATER TREATMENT PLANT; MULTIPLE WELLS/WELL FIELD					

MISSION | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	949	1,178	1,408	1,639	1,870	2,094

MISSION | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,483	1,483	1,483	1,483	1,483	1,483

MISSION | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	3,920	3,920	3,920	7,560	7,560	7,560
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
MISSION - WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					
MISSION - WWTP POTABLE REUSE PHASE II	STORAGE TANK; WATER TREATMENT PLANT EXPANSION					

MISSION | URBANIZATION	
	WATER VOLUMES (ACRE-FEET PER YEAR)

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	2,200	2,587	5,272	4,128	6,287	8,083
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
URBANIZATION - MISSION	WATER RIGHT/PERMIT LEASE OR PURCHASE					

NORTH ALAMO WSC | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,346	3,089	5,449	8,378	11,743

NORTH ALAMO WSC | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	3,040	3,040	3,040	3,040	3,040
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	MULTIPLE WELLS/WELL FIELD; CONVEYANCE/TRANSMISSION PIPELINE					
NAWSC - DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT					

NORTH ALAMO WSC | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	759	935	1,112	1,290	1,467	1,640

NORTH ALAMO WSC | HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	165	290	414	538	662	786

NORTH ALAMO WSC | HIDALGO COUNTY ID NO. 1 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	69	92	117	141	165	189

NORTH ALAMO WSC | HIDALGO COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	13	88	163	239	314	390

NORTH ALAMO WSC | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	48	65	83	100	117	135

NORTH ALAMO WSC | MUNICIPAL INFRASTRUCTURE IMPROVEMENTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	4,480	6,160	6,160	6,160
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
NAWSC - DELTA WTP EXPANSION PHASE I	WATER RIGHT/PERMIT LEASE OR PURCHASE; WATER TREATMENT PLANT EXPANSION					

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

NAWSC - DELTA WTP EXPANSION PHASE II	WATER RIGHT/PERMIT LEASE OR PURCHASE; WATER TREATMENT PLANT EXPANSION
URBANIZATION - NORTH ALAMO WSC (NAWSC)	WATER RIGHT/PERMIT LEASE OR PURCHASE

NORTH ALAMO WSC | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	5,363	10,068	17,761	27,254	30,118	32,486
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
NAWSC - DELTA WTP EXPANSION PHASE II	WATER RIGHT/PERMIT LEASE OR PURCHASE; WATER TREATMENT PLANT EXPANSION					
URBANIZATION - NORTH ALAMO WSC (NAWSC)	WATER RIGHT/PERMIT LEASE OR PURCHASE					

PHARR | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	458	1,354	2,433

PHARR | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	556	665	774	883	989

PHARR | HIDALGO COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	39	271	502	734	965	1,197

PHARR | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	6,721	6,721	6,721	6,721	6,721	6,721
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
PHARR - RAW WATER RESERVOIR AUGMENTATION	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					

PHARR | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	20	20	20	20	20
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - PHARR	WATER RIGHT/PERMIT LEASE OR PURCHASE					

RIO GRANDE CITY | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	402	901	1,470	2,086	2,544

RIO GRANDE CITY | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	70	80	88	97	104	111

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

RIO GRANDE CITY | RIO GRANDE CITY - WATER METER REPLACEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	300	300	300	300	300	300
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	70	70	70	70	70	70
TOTAL MWP RELATED WMS SUPPLY	370	370	370	370	370	370
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
RIO GRANDE CITY - WATER METER REPLACEMENT	DATA GATHERING/MONITORING TECHNOLOGY					

RIO GRANDE CITY | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,362	1,486	1,482	1,428	1,297	1,282
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - RIO GRANDE CITY	WATER RIGHT/PERMIT LEASE OR PURCHASE					

SAN BENITO | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	29	305	640

SAN BENITO | CAMERON COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	588	583	578	573	568	563

SAN BENITO | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,120	1,120	1,120	1,120	1,120
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
SAN BENITO - NEW GROUNDWATER SUPPLY	MULTIPLE WELLS/WELL FIELD					

SAN BENITO | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	174

SAN BENITO | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	304
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - SAN BENITO	WATER RIGHT/PERMIT LEASE OR PURCHASE					

SAN JUAN | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	93	451	928	1,491

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

SAN JUAN | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	2,912	2,912	2,912	2,912	2,912
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
SAN JUAN - WTP NO. 1 UPGRADE, EXPANSION, AND BGD	MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION					
SAN JUAN - BRACKISH GROUNDWATER WELL	SINGLE WELL; NEW WATER TREATMENT PLANT					

SAN JUAN | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	128	153	179	204	228

SAN JUAN | HIDALGO COUNTY ID NO. 2 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	10	71	133	194	255	316

SAN JUAN | REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	2,240	2,240	2,240	2,240
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
SAN JUAN - POTABLE REUSE	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					

SAN JUAN | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	612	1,181	1,643
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - SAN JUAN	WATER RIGHT/PERMIT LEASE OR PURCHASE					

SHARYLAND WSC | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	831	2,016	3,143	4,560	6,172

SHARYLAND WSC | DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,800	1,800	1,800	1,800	1,800
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
SHARYLAND WSC - WELL AND RO UNIT AT WTP #2	NEW WATER TREATMENT PLANT; SINGLE WELL					
SHARYLAND WSC - WELL AND RO UNIT AT WTP #3	NEW WATER TREATMENT PLANT; SINGLE WELL					

SHARYLAND WSC | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	287	356	425	495	565	633

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

SHARYLAND WSC | HIDALGO COUNTY ID NO. 1 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	483	653	823	993	1,163	1,333

SHARYLAND WSC | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	766	813	859	906	952	999

SHARYLAND WSC | URBANIZATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	343	1,836	3,475	4,904	6,076
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
URBANIZATION - SHARYLAND WSC	WATER RIGHT/PERMIT LEASE OR PURCHASE					

SOUTHMOST REGIONAL WATER AUTHORITY | NO RECOMMENDED WMS SUPPLY RELATED TO MWP

UNITED IRRIGATION DISTRICT | ID CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	5,730	5,730	5,730	5,730	5,730	5,730
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
UNITED ID CONSERVATION	CANAL LINING; CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - AGRICULTURAL; WATER LOSS CONTROL					

WESLACO | ADVANCED MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	547	1,219	1,924	2,829	3,844

WESLACO | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	258	333	401	470	539	603

WESLACO | FRESH GROUNDWATER						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	560	560	560	560	560	560
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
WESLACO - GROUNDWATER DEVELOPMENT AND BLENDING	SINGLE WELL					

WESLACO | HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	235	411	588	764	940	1,117

WESLACO | REUSE

Region M Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	1,120	1,120	1,120	1,120	1,120	1,120
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
WESLACO - NORTH WWTP POTABLE REUSE PHASE I	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK					

WESLACO | URBANIZATION

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,000	1,792	2,735	3,533	4,105
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
URBANIZATION - WESLACO	WATER RIGHT/PERMIT LEASE OR PURCHASE					

Appendix B: MWP/WWP Population, Demands, and Contractual Demands for WUG-Sellers

1 MWP Population

2 MWP Demands

3 MWP Supplies

4 MWP Needs

5 MWP Second Tier Needs

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	Population Projections					
Entity	2020	2030	2040	2050	2060	2070
Agua SUD	69,095	85,764	102,496	119,261	136,023	152,317
Alamo	23,259	28,881	34,525	40,181	45,837	51,335
Bayview Irrigation District #11	-	-	-	-	-	-
Brownsville	207,603	247,009	286,983	330,172	374,323	419,718
Brownsville Irrigation District	-	-	-	-	-	-
Cameron County Irrigation District #2	-	-	-	-	-	-
Cameron County Irrigation District #6	-	-	-	-	-	-
Cameron County Irrigation District #10	-	-	-	-	-	-
Delta Lake Irrigation District	-	-	-	-	-	-
Donna Irrigation District-Hidalgo County #1	-	-	-	-	-	-
Eagle Pass	57,119	66,607	75,457	84,618	93,399	101,833
East Rio Hondo WSC	28,015	32,728	33,386	37,205	40,961	45,599
Edinburg	96,678	120,046	143,507	167,015	190,523	213,378
Harlingen	89,171	104,179	118,211	131,729	145,037	161,462
Harlingen Irrigation District-Cameron County #1	-	-	-	-	-	-
Hidalgo County Irrigation District #1	-	-	-	-	-	-
Hidalgo County Irrigation District #2	-	-	-	-	-	-
Hidalgo County Irrigation District #6	-	-	-	-	-	-
Hidalgo County Irrigation District #16	-	-	-	-	-	-
Hidalgo County WID #3	-	-	-	-	-	-
Hidalgo-Cameron County Irrigation District #9	-	-	-	-	-	-
La Feria Irrigation District-Cameron County #3	-	-	-	-	-	-
Laguna Madre Water District	18,783	21,944	25,150	28,603	32,157	35,798
Laredo	301,124	372,380	440,247	502,142	560,482	613,020
Mcallen	169,099	209,972	251,008	292,126	333,245	373,221
Military Highway WSC	42,906	51,637	60,443	69,553	78,780	87,975
Mission	96,978	120,418	143,951	167,532	191,114	214,039
North Alamo WSC	173,944	214,383	254,903	295,617	336,278	375,825
Pharr	89,220	110,785	132,436	154,131	175,826	196,917
Rio Grande City	20,304	22,966	25,418	27,848	30,022	31,991
San Benito	29,602	34,583	39,638	45,082	50,682	56,421
San Juan	34,508	42,849	51,223	59,614	68,005	76,163
Sharyland WSC	72,459	89,974	107,558	125,178	142,798	159,928
Southmost Regional Water Authority	-	-	-	-	-	-
United Irrigation District	-	-	-	-	-	-
Weslaco	44,194	57,073	68,676	80,515	92,319	103,339

Entity	MWP Type	Use Type	Water Demand Projections (acft/yr) 2020	2030	2040	2050	2060	2070
Agua SUD	WUG Demand	Utility	7,409	8,924	10,497	12,120	13,787	15,426
Agua SUD	Contract Demand	Steam Electric Power	500	500	500	500	500	500
Agua SUD Total			**7,909**	**9,424**	**10,997**	**12,620**	**14,287**	**15,926**
Alamo	WUG Demand	Utility	3,230	3,908	4,607	5,326	6,064	6,786
Alamo Total			**3,230**	**3,908**	**4,607**	**5,326**	**6,064**	**6,786**
Bayview Irrigation District #11	Contract Demand	Irrigation	7,504	7,502	7,500	7,498	7,496	7,494
Bayview Irrigation District #11	Contract Demand	Municipal	183	183	183	183	183	183
Bayview Irrigation District #11 Total			**7,687**	**7,685**	**7,683**	**7,681**	**7,679**	**7,677**
Brownsville	WUG Demand	Utility	35,477	41,198	47,168	53,886	60,982	68,336
Brownsville	Contract Demand	Irrigation	825	825	825	825	825	825
Brownsville	Contract Demand	Manufacturing	220	220	220	220	220	220
Brownsville	Contract Demand	Municipal	1,500	1,500	1,500	1,500	1,500	1,500
Brownsville	Contract Demand	Steam Electric Power	125	125	125	125	125	125
Brownsville Total			**38,147**	**43,868**	**49,838**	**56,556**	**63,652**	**71,006**
Brownsville Irrigation District	Contract Demand	Irrigation	15,005	15,001	14,997	14,993	14,989	14,985
Brownsville Irrigation District	Contract Demand	Municipal	1,834	1,834	1,834	1,834	1,834	1,834
Brownsville Irrigation District	Contract Demand	WWP	2,000	2,000	2,000	2,000	2,000	2,000
Brownsville Irrigation District Total			**18,839**	**18,835**	**18,831**	**18,827**	**18,823**	**18,819**
Cameron County Irrigation District #10	Contract Demand	Irrigation	3,515	3,514	3,513	3,512	3,511	3,510
Cameron County Irrigation District #10	Contract Demand	Mining	15	15	15	15	15	15
Cameron County Irrigation District #10	Contract Demand	WWP	17,161	17,161	17,161	17,161	17,161	17,161
Cameron County Irrigation District #10 Total			**20,691**	**20,690**	**20,689**	**20,688**	**20,687**	**20,686**
Cameron County Irrigation District #2	Contract Demand	Irrigation	151,851	151,851	151,851	151,851	151,851	151,851
Cameron County Irrigation District #2	Contract Demand	Manufacturing	192	192	192	192	192	192
Cameron County Irrigation District #2	Contract Demand	Municipal	13,779	13,779	13,779	13,779	13,779	13,779
Cameron County Irrigation District #2 Total			**165,822**	**165,822**	**165,822**	**165,822**	**165,822**	**165,822**
Cameron County Irrigation District #6	Contract Demand	Irrigation	21,908	21,902	21,896	21,890	21,884	21,878
Cameron County Irrigation District #6	Contract Demand	Manufacturing	20	20	20	20	20	20
Cameron County Irrigation District #6	Contract Demand	Municipal	3,141	3,141	3,141	3,141	3,141	3,141
Cameron County Irrigation District #6	Contract Demand	WWP	25,114	25,114	25,114	25,114	25,114	25,114
Cameron County Irrigation District #6 Total			**50,183**	**50,177**	**50,171**	**50,165**	**50,159**	**50,153**
Delta Lake Irrigation District	Contract Demand	Irrigation	77,526	77,504	77,483	77,462	77,441	77,420
Delta Lake Irrigation District	Contract Demand	Livestock	235	235	140	140	140	140
Delta Lake Irrigation District	Contract Demand	Municipal	15,576	15,576	15,576	15,576	15,576	15,576
Delta Lake Irrigation District	Contract Demand	WWP	14,831	14,827	14,823	14,819	14,815	14,811
Delta Lake Irrigation District Total			**108,168**	**108,142**	**108,022**	**107,997**	**107,972**	**107,947**
Donna Irrigation District-Hidalgo County #1	Contract Demand	Irrigation	41,576	41,565	41,554	41,542	41,531	41,520
Donna Irrigation District-Hidalgo County #1	Contract Demand	Municipal	7,092	7,092	7,092	7,092	7,092	7,092
Donna Irrigation District-Hidalgo County #1 Total			**48,668**	**48,657**	**48,646**	**48,634**	**48,623**	**48,612**
Eagle Pass	WUG Demand	Utility	9,545	10,839	12,074	13,429	14,795	16,122
Eagle Pass Total			**9,545**	**10,839**	**12,074**	**13,429**	**14,795**	**16,122**
East Rio Hondo WSC	WUG Demand	Utility	3,900	4,458	4,489	4,970	5,459	6,073
East Rio Hondo WSC	Contract Demand	Municipal	215	215	215	215	215	215
East Rio Hondo WSC Total			**4,115**	**4,673**	**4,704**	**5,185**	**5,674**	**6,288**
Edinburg	WUG Demand	Utility	12,974	15,730	18,573	21,484	24,459	27,374
Edinburg Total			**12,974**	**15,730**	**18,573**	**21,484**	**24,459**	**27,374**
Harlingen	WUG Demand	Utility	15,797	17,992	20,088	22,212	24,412	27,160
Harlingen	Contract Demand	Manufacturing	150	150	150	150	150	150
Harlingen	Contract Demand	Municipal	336	336	336	221	221	221
Harlingen Total			**16,283**	**18,478**	**20,574**	**22,583**	**24,783**	**27,531**
Harlingen Irrigation District-Cameron County #1	Contract Demand	Irrigation	51,369	51,355	51,341	51,327	51,313	51,299
Harlingen Irrigation District-Cameron County #1	Contract Demand	Municipal	28,069	28,069	28,069	27,997	28,067	28,140
Harlingen Irrigation District-Cameron County #1 Total			**79,438**	**79,424**	**79,410**	**79,324**	**79,380**	**79,439**

Entity	MWP Type	Use Type	2020	2030	2040	2050	2060	2070
			Water Demand Projections (acft/yr)					
Hidalgo County Irrigation District #1	Contract Demand	Irrigation	32,743	32,734	32,725	32,716	32,707	32,698
Hidalgo County Irrigation District #1	Contract Demand	Municipal	21,426	21,426	18,726	18,725	18,725	18,725
Hidalgo County Irrigation District #1	Contract Demand	WWP	35,889	35,879	35,870	35,860	35,851	35,841
Hidalgo County Irrigation District #1 Total			**90,058**	**90,039**	**87,321**	**87,301**	**87,283**	**87,264**
Hidalgo County Irrigation District #16	Contract Demand	Irrigation	13,591	13,587	13,584	13,580	13,576	13,573
Hidalgo County Irrigation District #16	Contract Demand	Livestock	100	100	100	100	100	100
Hidalgo County Irrigation District #16	Contract Demand	Mining	88	88	88	88	88	88
Hidalgo County Irrigation District #16	Contract Demand	Municipal	4,718	4,718	4,718	4,718	4,718	4,718
Hidalgo County Irrigation District #16 Total			**18,497**	**18,493**	**18,490**	**18,486**	**18,482**	**18,479**
Hidalgo County Irrigation District #2	Contract Demand	Irrigation	57,681	57,665	57,650	57,634	57,618	57,603
Hidalgo County Irrigation District #2	Contract Demand	Municipal	30,281	30,281	30,281	30,281	30,281	30,281
Hidalgo County Irrigation District #2	Contract Demand	WWP	244	244	244	244	244	244
Hidalgo County Irrigation District #2 Total			**88,206**	**88,190**	**88,175**	**88,159**	**88,143**	**88,128**
Hidalgo County Irrigation District #6	Contract Demand	Irrigation	14,548	14,544	14,540	14,536	14,532	14,528
Hidalgo County Irrigation District #6	Contract Demand	Municipal	8,329	8,329	8,329	8,329	8,329	8,329
Hidalgo County Irrigation District #6 Total			**22,877**	**22,873**	**22,869**	**22,865**	**22,861**	**22,857**
Hidalgo County WID #3	Contract Demand	Irrigation	4,024	4,023	4,022	4,021	4,020	4,019
Hidalgo County WID #3	Contract Demand	Mining	44	44	44	44	44	44
Hidalgo County WID #3	Contract Demand	Municipal	17,209	17,209	17,209	17,209	17,209	17,209
Hidalgo County WID #3 Total			**21,277**	**21,276**	**21,275**	**21,274**	**21,273**	**21,272**
Hidalgo-Cameron County Irrigation District #9	Contract Demand	Irrigation	76,110	76,089	76,068	76,048	76,027	76,006
Hidalgo-Cameron County Irrigation District #9	Contract Demand	Municipal	18,823	18,822	18,822	18,822	18,822	18,822
Hidalgo-Cameron County Irrigation District #9 Total			**94,933**	**94,911**	**94,890**	**94,870**	**94,849**	**94,828**
La Feria Irrigation District-Cameron County #3	Contract Demand	Irrigation	37,927	37,917	37,907	37,896	37,886	37,876
La Feria Irrigation District-Cameron County #3	Contract Demand	Municipal	5,320	5,320	5,320	5,320	5,320	5,320
La Feria Irrigation District-Cameron County #3 Total			**43,247**	**43,237**	**43,227**	**43,216**	**43,206**	**43,196**
Laguna Madre Water District	WUG Demand	Utility	7,930	9,179	10,461	11,865	13,330	14,835
Laguna Madre Water District Total			**7,930**	**9,179**	**10,461**	**11,865**	**13,330**	**14,835**
Laredo	WUG Demand	Utility	42,028	50,530	58,812	66,591	74,190	81,096
Laredo	Contract Demand	Irrigation	1,657	1,656	1,656	1,655	1,655	1,655
Laredo	Contract Demand	Manufacturing	100	100	100	100	100	100
Laredo	Contract Demand	Mining	66	66	66	66	66	66
Laredo Total			**43,851**	**52,352**	**60,634**	**68,412**	**76,011**	**82,917**
Mcallen	WUG Demand	Utility	39,787	48,510	57,403	66,492	75,765	84,820
Mcallen	Contract Demand	Manufacturing	300	300	300	300	300	300
Mcallen	Contract Demand	Municipal	55	55	55	55	55	55
Mcallen Total			**40,142**	**48,865**	**57,758**	**66,847**	**76,120**	**85,175**
Military Highway WSC	WUG Demand	Utility	6,504	7,639	8,817	10,076	11,389	12,711
Military Highway WSC	Contract Demand	Municipal	35	35	35	35	35	35
Military Highway WSC Total			**6,539**	**7,674**	**8,852**	**10,111**	**11,424**	**12,746**
Mission	WUG Demand	Utility	20,070	24,532	29,086	33,717	38,414	43,002
Mission Total			**20,070**	**24,532**	**29,086**	**33,717**	**38,414**	**43,002**
North Alamo WSC	WUG Demand	Utility	28,197	34,079	40,106	46,280	52,554	58,701
North Alamo WSC	Contract Demand	Municipal	2,042	2,042	2,042	2,042	2,042	2,042
North Alamo WSC Total			**30,239**	**36,121**	**42,148**	**48,322**	**54,596**	**60,743**
Pharr	WUG Demand	Utility	9,923	11,933	14,020	16,182	18,415	20,606
Pharr Total			**9,923**	**11,933**	**14,020**	**16,182**	**18,415**	**20,606**
Rio Grande City	WUG Demand	Utility	4,850	5,386	5,889	6,413	6,905	7,355
Rio Grande City	Contract Demand	Municipal	1,653	1,653	1,653	1,653	1,653	1,653
Rio Grande City Total			**6,503**	**7,039**	**7,542**	**8,066**	**8,558**	**9,008**
San Benito	WUG Demand	Utility	3,733	4,195	4,688	5,267	5,906	6,570
San Benito Total			**3,733**	**4,195**	**4,688**	**5,267**	**5,906**	**6,570**
San Juan	WUG Demand	Utility	4,947	5,990	7,063	8,166	9,298	10,407

Entity	MWP Type	Use Type	Water Demand Projections (acft/yr) 2020	2030	2040	2050	2060	2070
San Juan Total			**4,947**	**5,990**	**7,063**	**8,166**	**9,298**	**10,407**
Sharyland WSC	WUG Demand	Utility	12,901	15,628	18,421	21,302	24,263	27,160
Sharyland WSC Total			**12,901**	**15,628**	**18,421**	**21,302**	**24,263**	**27,160**
Southmost Regional Water Authority	Contract Demand	Manufacturing	226	226	226	226	226	226
Southmost Regional Water Authority	Contract Demand	Municipal	10,528	10,528	10,528	10,528	10,528	10,528
Southmost Regional Water Authority Total			**10,754**	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**
United Irrigation District	Contract Demand	Irrigation	21,823	21,817	21,811	21,806	21,800	21,794
United Irrigation District	Contract Demand	Municipal	30,704	30,704	30,704	30,703	30,703	30,703
United Irrigation District Total			**52,527**	**52,521**	**52,515**	**52,509**	**52,503**	**52,497**
Weslaco	WUG Demand	Utility	7,697	9,711	11,550	13,443	15,391	17,218
Weslaco	Contract Demand	Municipal	175	175	175	175	175	175
Weslaco Total			**7,872**	**9,886**	**11,725**	**13,618**	**15,566**	**17,393**

			Existing Water Supplies (acft/yr)					
Entity	MWP Type	Use Type	2020	2030	2040	2050	2060	2070
Agua SUD	WUG Supplies	Utility	8,545	8,545	8,545	8,545	8,545	8,545
Agua SUD	Contract Supplies	Steam Electric Power	355	355	355	355	355	355
Agua SUD Total			**8,900**	**8,900**	**8,900**	**8,900**	**8,900**	**8,900**
Alamo	WUG Supplies	Utility	2,216	2,216	2,216	2,216	2,216	2,216
Alamo Total			**2,216**	**2,216**	**2,216**	**2,216**	**2,216**	**2,216**
Bayview Irrigation District #11	Contract Supplies	Irrigation	5,103	5,102	5,100	5,099	5,097	5,096
Bayview Irrigation District #11	Contract Supplies	Municipal	124	124	124	124	124	124
Bayview Irrigation District #11 Total			**5,227**	**5,226**	**5,224**	**5,223**	**5,221**	**5,220**
Brownsville	WUG Supplies	Utility	43,434	43,434	43,434	43,434	43,434	43,433
Brownsville	Contract Supplies	Irrigation	825	825	825	825	825	825
Brownsville	Contract Supplies	Manufacturing	220	220	220	220	220	220
Brownsville	Contract Supplies	Municipal	1,500	1,500	1,500	1,500	1,500	1,500
Brownsville	Contract Supplies	Steam Electric Power	125	125	125	125	125	125
Brownsville Total			**46,104**	**46,104**	**46,104**	**46,104**	**46,104**	**46,103**
Brownsville Irrigation District	Contract Supplies	Irrigation	10,204	10,201	10,198	10,195	10,193	10,190
Brownsville Irrigation District	Contract Supplies	Municipal	1,727	1,727	1,727	1,727	1,727	1,727
Brownsville Irrigation District	Contract Supplies	WWP	2,000	2,000	2,000	2,000	2,000	2,000
Brownsville Irrigation District Total			**13,931**	**13,928**	**13,925**	**13,922**	**13,920**	**13,917**
Cameron County Irrigation District #10	Contract Supplies	Irrigation	2,390	2,390	2,389	2,388	2,388	2,387
Cameron County Irrigation District #10	Contract Supplies	Mining	11	11	11	11	11	11
Cameron County Irrigation District #10	Contract Supplies	WWP	7,687	7,687	7,687	7,687	7,687	7,687
Cameron County Irrigation District #10 Total			**10,088**	**10,088**	**10,087**	**10,086**	**10,086**	**10,085**
Cameron County Irrigation District #2	Contract Supplies	Irrigation	53,887	53,887	53,887	53,887	53,887	53,887
Cameron County Irrigation District #2	Contract Supplies	Manufacturing	154	154	154	154	154	154
Cameron County Irrigation District #2	Contract Supplies	Municipal	11,024	11,024	11,024	11,024	11,024	11,024
Cameron County Irrigation District #2 Total			**65,065**	**65,065**	**65,065**	**65,065**	**65,065**	**65,065**
Cameron County Irrigation District #6	Contract Supplies	Irrigation	14,897	14,893	14,889	14,885	14,881	14,877
Cameron County Irrigation District #6	Contract Supplies	Manufacturing	14	14	14	14	14	14
Cameron County Irrigation District #6	Contract Supplies	Municipal	2,136	2,136	2,136	2,136	2,136	2,136
Cameron County Irrigation District #6	Contract Supplies	WWP	11,203	11,203	11,203	11,203	11,203	11,203
Cameron County Irrigation District #6 Total			**28,250**	**28,246**	**28,242**	**28,238**	**28,234**	**28,230**
Delta Lake Irrigation District	Contract Supplies	Irrigation	50,392	50,378	50,365	50,351	50,337	50,323
Delta Lake Irrigation District	Contract Supplies	Livestock	235	235	140	140	140	140
Delta Lake Irrigation District	Contract Supplies	Municipal	10,125	10,125	10,125	10,125	10,125	10,125
Delta Lake Irrigation District	Contract Supplies	WWP	14,831	14,827	14,823	14,819	14,815	14,811
Delta Lake Irrigation District Total			**75,583**	**75,565**	**75,453**	**75,435**	**75,417**	**75,399**
Donna Irrigation District-Hidalgo County #1	Contract Supplies	Irrigation	29,519	29,511	29,503	29,495	29,487	29,479
Donna Irrigation District-Hidalgo County #1	Contract Supplies	Municipal	5,036	5,035	5,035	5,035	5,035	5,035
Donna Irrigation District-Hidalgo County #1 Total			**34,555**	**34,546**	**34,538**	**34,530**	**34,522**	**34,514**
Eagle Pass	WUG Supplies	Utility	10,613	10,613	10,613	10,613	10,613	10,613
Eagle Pass Total			**10,613**	**10,613**	**10,613**	**10,613**	**10,613**	**10,613**
East Rio Hondo WSC	WUG Supplies	Utility	4,906	4,937	4,969	5,000	5,032	5,032
East Rio Hondo WSC	Contract Supplies	Municipal	215	215	215	215	215	215
East Rio Hondo WSC Total			**5,121**	**5,152**	**5,184**	**5,215**	**5,247**	**5,247**
Edinburg	WUG Supplies	Utility	6,139	6,139	4,222	4,222	4,222	4,222
Edinburg Total			**6,139**	**6,139**	**4,222**	**4,222**	**4,222**	**4,222**
Harlingen	WUG Supplies	Utility	20,958	20,957	20,957	20,960	20,960	20,959
Harlingen	Contract Supplies	Manufacturing	150	150	150	150	150	150
Harlingen	Contract Supplies	Municipal	336	336	336	221	221	221
Harlingen Total			**21,444**	**21,443**	**21,443**	**21,331**	**21,331**	**21,330**
Harlingen Irrigation District-Cameron County #1	Contract Supplies	Irrigation	43,664	43,652	43,640	43,628	43,617	43,605
Harlingen Irrigation District-Cameron County #1	Contract Supplies	Municipal	22,437	22,436	22,436	22,364	22,434	22,506
Harlingen Irrigation District-Cameron County #1 Total			**66,101**	**66,088**	**66,076**	**65,992**	**66,051**	**66,111**

Entity	MWP Type	Use Type	Existing Water Supplies (acft/yr) 2020	2030	2040	2050	2060	2070
Hidalgo County Irrigation District #1	Contract Supplies	Irrigation	23,247	23,241	23,235	23,229	23,222	23,216
Hidalgo County Irrigation District #1	Contract Supplies	Municipal	15,213	15,213	13,296	13,296	13,296	13,296
Hidalgo County Irrigation District #1	Contract Supplies	WWP	35,889	35,879	35,870	35,860	35,851	35,841
Hidalgo County Irrigation District #1 Total			**74,349**	**74,333**	**72,401**	**72,385**	**72,369**	**72,353**
Hidalgo County Irrigation District #16	Contract Supplies	Irrigation	9,650	9,647	9,644	9,642	9,639	9,637
Hidalgo County Irrigation District #16	Contract Supplies	Livestock	71	71	71	71	71	71
Hidalgo County Irrigation District #16	Contract Supplies	Mining	63	63	63	63	63	63
Hidalgo County Irrigation District #16	Contract Supplies	Municipal	3,350	3,350	3,350	3,350	3,350	3,350
Hidalgo County Irrigation District #16 Total			**13,134**	**13,131**	**13,128**	**13,126**	**13,123**	**13,121**
Hidalgo County Irrigation District #2	Contract Supplies	Irrigation	43,261	43,249	43,237	43,226	43,214	43,202
Hidalgo County Irrigation District #2	Contract Supplies	Municipal	22,712	22,712	22,711	22,711	22,711	22,711
Hidalgo County Irrigation District #2	Contract Supplies	WWP	183	183	183	183	183	183
Hidalgo County Irrigation District #2 Total			**66,156**	**66,144**	**66,131**	**66,120**	**66,108**	**66,096**
Hidalgo County Irrigation District #6	Contract Supplies	Irrigation	10,329	10,326	10,323	10,320	10,318	10,315
Hidalgo County Irrigation District #6	Contract Supplies	Municipal	5,914	5,914	5,914	5,914	5,914	5,914
Hidalgo County Irrigation District #6 Total			**16,243**	**16,240**	**16,237**	**16,234**	**16,232**	**16,229**
Hidalgo County WID #3	Contract Supplies	Irrigation	3,585	3,584	3,584	3,583	3,582	3,581
Hidalgo County WID #3	Contract Supplies	Mining	40	40	40	40	40	40
Hidalgo County WID #3	Contract Supplies	Municipal	15,488	15,488	15,488	15,488	15,488	15,488
Hidalgo County WID #3 Total			**19,113**	**19,112**	**19,112**	**19,111**	**19,110**	**19,109**
Hidalgo-Cameron County Irrigation District #9	Contract Supplies	Irrigation	53,276	53,262	53,247	53,233	53,219	53,204
Hidalgo-Cameron County Irrigation District #9	Contract Supplies	Municipal	13,151	13,151	13,151	13,150	13,150	13,150
Hidalgo-Cameron County Irrigation District #9 Total			**66,427**	**66,413**	**66,398**	**66,383**	**66,369**	**66,354**
La Feria Irrigation District-Cameron County #3	Contract Supplies	Irrigation	25,790	25,783	25,776	25,769	25,762	25,755
La Feria Irrigation District-Cameron County #3	Contract Supplies	Municipal	2,877	2,977	3,077	3,277	3,577	3,777
La Feria Irrigation District-Cameron County #3 Total			**28,667**	**28,760**	**28,853**	**29,046**	**29,339**	**29,532**
Laguna Madre Water District	WUG Supplies	Utility	7,513	7,513	7,513	7,513	7,513	7,513
Laguna Madre Water District Total			**7,513**	**7,513**	**7,513**	**7,513**	**7,513**	**7,513**
Laredo	WUG Supplies	Utility	59,999	59,999	59,999	59,999	59,999	59,999
Laredo	Contract Supplies	Irrigation	1,657	1,656	1,656	1,655	1,655	1,655
Laredo	Contract Supplies	Manufacturing	100	100	100	100	100	100
Laredo	Contract Supplies	Mining	66	66	66	66	66	66
Laredo Total			**61,822**	**61,821**	**61,821**	**61,820**	**61,820**	**61,820**
Mcallen	WUG Supplies	Utility	36,915	36,915	35,115	35,115	35,115	35,115
Mcallen	Contract Supplies	Manufacturing	300	300	300	300	300	300
Mcallen	Contract Supplies	Municipal	55	55	55	55	55	55
Mcallen Total			**37,270**	**37,270**	**35,470**	**35,470**	**35,470**	**35,470**
Military Highway WSC	WUG Supplies	Utility	7,542	7,542	7,542	7,542	7,542	7,542
Military Highway WSC	Contract Supplies	Municipal	35	35	35	35	35	35
Military Highway WSC Total			**7,577**	**7,577**	**7,577**	**7,577**	**7,577**	**7,577**
Mission	WUG Supplies	Utility	11,556	11,556	11,556	11,556	11,556	11,556
Mission Total			**11,556**	**11,556**	**11,556**	**11,556**	**11,556**	**11,556**
North Alamo WSC	WUG Supplies	Utility	22,388	22,590	22,589	22,589	22,589	22,589
North Alamo WSC	Contract Supplies	Municipal	1,990	1,990	1,990	1,990	1,990	1,990
North Alamo WSC Total			**24,378**	**24,580**	**24,579**	**24,579**	**24,579**	**24,579**
Pharr	WUG Supplies	Utility	10,372	10,573	10,782	10,998	11,222	11,441
Pharr Total			**10,372**	**10,573**	**10,782**	**10,998**	**11,222**	**11,441**
Rio Grande City	WUG Supplies	Utility	3,118	3,118	3,118	3,118	3,118	3,118
Rio Grande City	Contract Supplies	Municipal	966	966	966	966	966	966
Rio Grande City Total			**4,084**	**4,084**	**4,084**	**4,084**	**4,084**	**4,084**
San Benito	WUG Supplies	Utility	3,846	4,346	5,326	5,426	5,626	5,626
San Benito Total			**3,846**	**4,346**	**5,326**	**5,426**	**5,626**	**5,626**
San Juan	WUG Supplies	Utility	4,948	4,948	4,948	4,948	4,948	4,948

			Existing Water Supplies (acft/yr)					
Entity	MWP Type	Use Type	2020	2030	2040	2050	2060	2070
San Juan Total			**4,948**	**4,948**	**4,948**	**4,948**	**4,948**	**4,948**
Sharyland WSC	WUG Supplies	Utility	13,195	13,195	13,195	13,195	13,195	13,195
Sharyland WSC Total			**13,195**	**13,195**	**13,195**	**13,195**	**13,195**	**13,195**
Southmost Regional Water Authority	Contract Supplies	Manufacturing	226	226	226	226	226	226
Southmost Regional Water Authority	Contract Supplies	Municipal	10,528	10,528	10,528	10,528	10,528	10,528
Southmost Regional Water Authority Total			**10,754**	**10,754**	**10,754**	**10,754**	**10,754**	**10,754**
United Irrigation District	Contract Supplies	Irrigation	18,550	18,545	18,540	18,535	18,530	18,525
United Irrigation District	Contract Supplies	Municipal	26,098	26,098	26,098	26,098	26,098	26,098
United Irrigation District Total			**44,648**	**44,643**	**44,638**	**44,633**	**44,628**	**44,623**
Weslaco	WUG Supplies	Utility	6,178	6,379	6,460	6,460	6,460	6,460
Weslaco	Contract Supplies	Municipal	175	175	175	175	175	175
Weslaco Total			**6,353**	**6,554**	**6,635**	**6,635**	**6,635**	**6,635**

			Water Need Projections (acft/yr) [1]					
Entity	**MWP Type**	**Use Type**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Agua SUD	WUG Needs	Utility	-	(379)	(1,952)	(3,575)	(5,242)	(6,881)
Agua SUD	Contract Needs	Steam Electric Power	(145)	(145)	(145)	(145)	(145)	(145)
Agua SUD Total			**(145)**	**(524)**	**(2,097)**	**(3,720)**	**(5,387)**	**(7,026)**
Alamo	WUG Needs	Utility	(1,014)	(1,692)	(2,391)	(3,110)	(3,848)	(4,570)
Alamo Total			**(1,014)**	**(1,692)**	**(2,391)**	**(3,110)**	**(3,848)**	**(4,570)**
Bayview Irrigation District #11	Contract Needs	Irrigation	(2,401)	(2,400)	(2,400)	(2,399)	(2,399)	(2,398)
Bayview Irrigation District #11	Contract Needs	Municipal	(59)	(59)	(59)	(59)	(59)	(59)
Bayview Irrigation District #11 Total			**(2,460)**	**(2,459)**	**(2,459)**	**(2,458)**	**(2,458)**	**(2,457)**
Brownsville	WUG Needs	Utility	-	-	(3,734)	(10,452)	(17,548)	(24,903)
Brownsville	Contract Needs	Irrigation	-	-	-	-	-	-
Brownsville	Contract Needs	Manufacturing	-	-	-	-	-	-
Brownsville	Contract Needs	Municipal	-	-	-	-	-	-
Brownsville	Contract Needs	Steam Electric Power	-	-	-	-	-	-
Brownsville Total			**-**	**-**	**(3,734)**	**(10,452)**	**(17,548)**	**(24,903)**
Brownsville Irrigation District	Contract Needs	Irrigation	(4,801)	(4,800)	(4,799)	(4,798)	(4,796)	(4,795)
Brownsville Irrigation District	Contract Needs	Municipal	(107)	(107)	(107)	(107)	(107)	(107)
Brownsville Irrigation District	Contract Needs	WWP	-	-	-	-	-	-
Brownsville Irrigation District Total			**(4,908)**	**(4,907)**	**(4,906)**	**(4,905)**	**(4,903)**	**(4,902)**
Cameron County Irrigation District #10	Contract Needs	Irrigation	(1,125)	(1,124)	(1,124)	(1,124)	(1,123)	(1,123)
Cameron County Irrigation District #10	Contract Needs	Mining	(4)	(4)	(4)	(4)	(4)	(4)
Cameron County Irrigation District #10	Contract Needs	WWP	(9,474)	(9,474)	(9,474)	(9,474)	(9,474)	(9,474)
Cameron County Irrigation District #10 Total			**(10,603)**	**(10,602)**	**(10,602)**	**(10,602)**	**(10,601)**	**(10,601)**
Cameron County Irrigation District #2	Contract Needs	Irrigation	(97,964)	(97,964)	(97,964)	(97,964)	(97,964)	(97,964)
Cameron County Irrigation District #2	Contract Needs	Manufacturing	(38)	(38)	(38)	(38)	(38)	(38)
Cameron County Irrigation District #2	Contract Needs	Municipal	(2,755)	(2,755)	(2,755)	(2,755)	(2,755)	(2,755)
Cameron County Irrigation District #2 Total			**(100,757)**	**(100,757)**	**(100,757)**	**(100,757)**	**(100,757)**	**(100,757)**
Cameron County Irrigation District #6	Contract Needs	Irrigation	(7,011)	(7,009)	(7,007)	(7,005)	(7,003)	(7,001)
Cameron County Irrigation District #6	Contract Needs	Manufacturing	(6)	(6)	(6)	(6)	(6)	(6)
Cameron County Irrigation District #6	Contract Needs	Municipal	(1,005)	(1,005)	(1,005)	(1,005)	(1,005)	(1,005)
Cameron County Irrigation District #6	Contract Needs	WWP	(13,911)	(13,911)	(13,911)	(13,911)	(13,911)	(13,911)
Cameron County Irrigation District #6 Total			**(21,933)**	**(21,931)**	**(21,929)**	**(21,927)**	**(21,925)**	**(21,923)**
Delta Lake Irrigation District	Contract Needs	Irrigation	(27,134)	(27,126)	(27,118)	(27,111)	(27,104)	(27,097)
Delta Lake Irrigation District	Contract Needs	Livestock	-	-	-	-	-	-
Delta Lake Irrigation District	Contract Needs	Municipal	(5,451)	(5,451)	(5,451)	(5,451)	(5,451)	(5,451)
Delta Lake Irrigation District	Contract Needs	WWP	-	-	-	-	-	-
Delta Lake Irrigation District Total			**(32,585)**	**(32,577)**	**(32,569)**	**(32,562)**	**(32,555)**	**(32,548)**
Donna Irrigation District-Hidalgo County #1	Contract Needs	Irrigation	(12,057)	(12,054)	(12,051)	(12,047)	(12,044)	(12,041)
Donna Irrigation District-Hidalgo County #1	Contract Needs	Municipal	(2,056)	(2,057)	(2,057)	(2,057)	(2,057)	(2,057)
Donna Irrigation District-Hidalgo County #1 Total			**(14,113)**	**(14,111)**	**(14,108)**	**(14,104)**	**(14,101)**	**(14,098)**
Eagle Pass	WUG Needs	Utility	-	(226)	(1,461)	(2,816)	(4,182)	(5,509)
Eagle Pass Total			**-**	**(226)**	**(1,461)**	**(2,816)**	**(4,182)**	**(5,509)**
East Rio Hondo WSC	WUG Needs	Utility	-	-	-	-	(427)	(1,041)
East Rio Hondo WSC	Contract Needs	Municipal	-	-	-	-	-	-
East Rio Hondo WSC Total			**-**	**-**	**-**	**-**	**(427)**	**(1,041)**
Edinburg	WUG Needs	Utility	(6,835)	(9,591)	(14,351)	(17,262)	(20,237)	(23,152)
Edinburg Total			**(6,835)**	**(9,591)**	**(14,351)**	**(17,262)**	**(20,237)**	**(23,152)**
Harlingen	WUG Needs	Utility	-	-	-	(1,252)	(3,452)	(6,201)
Harlingen	Contract Needs	Manufacturing	-	-	-	-	-	-

Entity	MWP Type	Use Type	Water Need Projections (acft/yr) [1] 2020	2030	2040	2050	2060	2070
Harlingen	Contract Needs	Municipal	-	-	-	-	-	-
Harlingen Total			-	-	-	(1,252)	(3,452)	(6,201)
Harlingen Irrigation District-Cameron County #1	Contract Needs	Irrigation	(7,705)	(7,703)	(7,701)	(7,699)	(7,696)	(7,694)
Harlingen Irrigation District-Cameron County #1	Contract Needs	Municipal	(5,632)	(5,633)	(5,633)	(5,633)	(5,633)	(5,634)
Harlingen Irrigation District-Cameron County #1 Total			(13,337)	(13,336)	(13,334)	(13,332)	(13,329)	(13,328)
Hidalgo County Irrigation District #1	Contract Needs	Irrigation	(9,496)	(9,493)	(9,490)	(9,487)	(9,485)	(9,482)
Hidalgo County Irrigation District #1	Contract Needs	Municipal	(6,213)	(6,213)	(5,430)	(5,429)	(5,429)	(5,429)
Hidalgo County Irrigation District #1	Contract Needs	WWP	-	-	-	-	-	-
Hidalgo County Irrigation District #1 Total			(15,709)	(15,706)	(14,920)	(14,916)	(14,914)	(14,911)
Hidalgo County Irrigation District #16	Contract Needs	Irrigation	(3,941)	(3,940)	(3,940)	(3,938)	(3,937)	(3,936)
Hidalgo County Irrigation District #16	Contract Needs	Livestock	(29)	(29)	(29)	(29)	(29)	(29)
Hidalgo County Irrigation District #16	Contract Needs	Mining	(25)	(25)	(25)	(25)	(25)	(25)
Hidalgo County Irrigation District #16	Contract Needs	Municipal	(1,368)	(1,368)	(1,368)	(1,368)	(1,368)	(1,368)
Hidalgo County Irrigation District #16 Total			(5,363)	(5,362)	(5,362)	(5,360)	(5,359)	(5,358)
Hidalgo County Irrigation District #2	Contract Needs	Irrigation	(14,420)	(14,416)	(14,413)	(14,408)	(14,404)	(14,401)
Hidalgo County Irrigation District #2	Contract Needs	Municipal	(7,569)	(7,569)	(7,570)	(7,570)	(7,570)	(7,570)
Hidalgo County Irrigation District #2	Contract Needs	WWP	(61)	(61)	(61)	(61)	(61)	(61)
Hidalgo County Irrigation District #2 Total			(22,050)	(22,046)	(22,044)	(22,039)	(22,035)	(22,032)
Hidalgo County Irrigation District #6	Contract Needs	Irrigation	(4,219)	(4,218)	(4,217)	(4,216)	(4,214)	(4,213)
Hidalgo County Irrigation District #6	Contract Needs	Municipal	(2,415)	(2,415)	(2,415)	(2,415)	(2,415)	(2,415)
Hidalgo County Irrigation District #6 Total			(6,634)	(6,633)	(6,632)	(6,631)	(6,629)	(6,628)
Hidalgo County WID #3	Contract Needs	Irrigation	(439)	(439)	(438)	(438)	(438)	(438)
Hidalgo County WID #3	Contract Needs	Mining	(4)	(4)	(4)	(4)	(4)	(4)
Hidalgo County WID #3	Contract Needs	Municipal	(1,721)	(1,721)	(1,721)	(1,721)	(1,721)	(1,721)
Hidalgo County WID #3 Total			(2,164)	(2,164)	(2,163)	(2,163)	(2,163)	(2,163)
Hidalgo-Cameron County Irrigation District #9	Contract Needs	Irrigation	(22,834)	(22,827)	(22,821)	(22,815)	(22,808)	(22,802)
Hidalgo-Cameron County Irrigation District #9	Contract Needs	Municipal	(5,672)	(5,671)	(5,671)	(5,672)	(5,672)	(5,672)
Hidalgo-Cameron County Irrigation District #9 Total			(28,506)	(28,498)	(28,492)	(28,487)	(28,480)	(28,474)
La Feria Irrigation District-Cameron County #3	Contract Needs	Irrigation	(12,137)	(12,134)	(12,131)	(12,127)	(12,124)	(12,121)
La Feria Irrigation District-Cameron County #3	Contract Needs	Municipal	(2,443)	(2,343)	(2,243)	(2,043)	(1,743)	(1,543)
La Feria Irrigation District-Cameron County #3 Total			(14,580)	(14,477)	(14,374)	(14,170)	(13,867)	(13,664)
Laguna Madre Water District	WUG Needs	Utility	(417)	(1,666)	(2,948)	(4,352)	(5,817)	(7,322)
Laguna Madre Water District Total			(417)	(1,666)	(2,948)	(4,352)	(5,817)	(7,322)
Laredo	WUG Needs	Utility	-	-	-	(6,592)	(14,191)	(21,097)
Laredo	Contract Needs	Irrigation	-	-	-	-	-	-
Laredo	Contract Needs	Manufacturing	-	-	-	-	-	-
Laredo	Contract Needs	Mining	-	-	-	-	-	-
Laredo Total			-	-	-	(6,592)	(14,191)	(21,097)
Mcallen	WUG Needs	Utility	(2,872)	(11,595)	(22,288)	(31,377)	(40,650)	(49,705)
Mcallen	Contract Needs	Manufacturing	-	-	-	-	-	-
Mcallen	Contract Needs	Municipal	-	-	-	-	-	-
Mcallen Total			(2,872)	(11,595)	(22,288)	(31,377)	(40,650)	(49,705)
Military Highway WSC	WUG Needs	Utility	-	(97)	(1,275)	(2,534)	(3,847)	(5,169)
Military Highway WSC	Contract Needs	Municipal	-	-	-	-	-	-
Military Highway WSC Total			-	(97)	(1,275)	(2,534)	(3,847)	(5,169)
Mission	WUG Needs	Utility	(8,514)	(12,976)	(17,530)	(22,161)	(26,858)	(31,446)
Mission Total			(8,514)	(12,976)	(17,530)	(22,161)	(26,858)	(31,446)
North Alamo WSC	WUG Needs	Utility	(5,809)	(11,489)	(17,517)	(23,691)	(29,965)	(36,112)

			Water Need Projections (acft/yr) [1]					
Entity	**MWP Type**	**Use Type**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
North Alamo WSC	Contract Needs	Municipal	(52)	(52)	(52)	(52)	(52)	(52)
North Alamo WSC Total			**(5,861)**	**(11,541)**	**(17,569)**	**(23,743)**	**(30,017)**	**(36,164)**
Pharr	WUG Needs	Utility	-	(1,360)	(3,238)	(5,184)	(7,193)	(9,165)
Pharr Total			**-**	**(1,360)**	**(3,238)**	**(5,184)**	**(7,193)**	**(9,165)**
Rio Grande City	WUG Needs	Utility	(1,732)	(2,268)	(2,771)	(3,295)	(3,787)	(4,237)
Rio Grande City	Contract Needs	Municipal	(687)	(687)	(687)	(687)	(687)	(687)
Rio Grande City Total			**(2,419)**	**(2,955)**	**(3,458)**	**(3,982)**	**(4,474)**	**(4,924)**
San Benito	WUG Needs	Utility	-	-	-	-	(280)	(944)
San Benito Total			**-**	**-**	**-**	**-**	**(280)**	**(944)**
San Juan	WUG Needs	Utility	-	(1,042)	(2,115)	(3,218)	(4,350)	(5,459)
San Juan Total			**-**	**(1,042)**	**(2,115)**	**(3,218)**	**(4,350)**	**(5,459)**
Sharyland WSC	WUG Needs	Utility	-	(2,433)	(5,226)	(8,107)	(11,068)	(13,965)
Sharyland WSC Total			**-**	**(2,433)**	**(5,226)**	**(8,107)**	**(11,068)**	**(13,965)**
Southmost Regional Water Authority	Contract Needs	Manufacturing	-	-	-	-	-	-
Southmost Regional Water Authority	Contract Needs	Municipal	-	-	-	-	-	-
Southmost Regional Water Authority Total			**-**	**-**	**-**	**-**	**-**	**-**
United Irrigation District	Contract Needs	Irrigation	(3,273)	(3,272)	(3,271)	(3,271)	(3,270)	(3,269)
United Irrigation District	Contract Needs	Municipal	(4,606)	(4,606)	(4,606)	(4,605)	(4,605)	(4,605)
United Irrigation District Total			**(7,879)**	**(7,878)**	**(7,877)**	**(7,876)**	**(7,875)**	**(7,874)**
Weslaco	WUG Needs	Utility	(1,519)	(3,332)	(5,090)	(6,983)	(8,931)	(10,758)
Weslaco	Contract Needs	Municipal	-	-	-	-	-	-
Weslaco Total			**(1,519)**	**(3,332)**	**(5,090)**	**(6,983)**	**(8,931)**	**(10,758)**

[1] The following table only shows needs. Any surplus will result in a zero value representing that the entity has no needs.

			Second Tier Water Need Projections (acft/yr)[1]					
Entity	MWP Type	Use Type	2020	2030	2040	2050	2060	2070
Agua SUD	WUG 2nd Tier Needs	Utility	-	-	-	-	-	-
Agua SUD	Contract 2nd Tier Needs	Steam Electric Power	(145)	(145)	(145)	(145)	(145)	(145)
Agua SUD Total			**(145)**	**(145)**	**(145)**	**(145)**	**(145)**	**(145)**
Alamo	WUG 2nd Tier Needs	Utility	(896)	(1,546)	(2,170)	(2,629)	(3,029)	(3,358)
Alamo Total			**(1,014)**	**(1,692)**	**(2,391)**	**(3,110)**	**(3,848)**	**(4,570)**
Bayview Irrigation District #11	Contract 2nd Tier Needs	Irrigation	(1,813)	(1,706)	(1,599)	(1,491)	(1,385)	(1,277)
Bayview Irrigation District #11	Contract 2nd Tier Needs	Municipal	(45)	(42)	(40)	(37)	(34)	(32)
Bayview Irrigation District #11 Total			**(1,858)**	**(1,748)**	**(1,639)**	**(1,528)**	**(1,419)**	**(1,309)**
Brownsville	WUG 2nd Tier Needs	Utility	-	-	-	-	(1,597)	(3,116)
Brownsville	Contract 2nd Tier Needs	Irrigation	-	-	-	-	-	-
Brownsville	Contract 2nd Tier Needs	Manufacturing	-	-	-	-	-	-
Brownsville	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Brownsville	Contract 2nd Tier Needs	Steam Electric Power	-	-	-	-	-	-
Brownsville Total			**-**	**-**	**-**	**-**	**(1,597)**	**(3,116)**
Brownsville Irrigation District	Contract 2nd Tier Needs	Irrigation	(3,989)	(3,701)	(3,414)	(3,127)	(2,840)	(2,553)
Brownsville Irrigation District	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Brownsville Irrigation District	Contract 2nd Tier Needs	WWP	-	-	-	-	-	-
Brownsville Irrigation District Total			**(3,989)**	**(3,701)**	**(3,414)**	**(3,127)**	**(2,840)**	**(2,553)**
Cameron County Irrigation District #10	Contract 2nd Tier Needs	Irrigation	(1,075)	(979)	(884)	(789)	(693)	(598)
Cameron County Irrigation District #10	Contract 2nd Tier Needs	Mining	(4)	(4)	(4)	(4)	(4)	(4)
Cameron County Irrigation District #10	Contract 2nd Tier Needs	WWP	(9,474)	(9,474)	(9,474)	(9,474)	(9,474)	(9,474)
Cameron County Irrigation District #10 Total			**(10,553)**	**(10,457)**	**(10,362)**	**(10,267)**	**(10,171)**	**(10,076)**
Cameron County Irrigation District #2	Contract 2nd Tier Needs	Irrigation	(92,327)	(92,378)	(92,430)	(92,481)	(92,532)	(92,583)
Cameron County Irrigation District #2	Contract 2nd Tier Needs	Manufacturing	(22)	(22)	(22)	(22)	(22)	(23)
Cameron County Irrigation District #2	Contract 2nd Tier Needs	Municipal	(1,602)	(1,612)	(1,622)	(1,632)	(1,642)	(1,652)
Cameron County Irrigation District #2 Total			**(93,951)**	**(94,012)**	**(94,074)**	**(94,135)**	**(94,196)**	**(94,258)**
Cameron County Irrigation District #6	Contract 2nd Tier Needs	Irrigation	(5,343)	(5,020)	(4,697)	(4,374)	(4,051)	(3,728)
Cameron County Irrigation District #6	Contract 2nd Tier Needs	Manufacturing	(5)	(4)	(4)	(4)	(3)	(3)
Cameron County Irrigation District #6	Contract 2nd Tier Needs	Municipal	(766)	(721)	(674)	(628)	(581)	(536)
Cameron County Irrigation District #6	Contract 2nd Tier Needs	WWP	(13,911)	(13,911)	(13,911)	(13,911)	(13,911)	(13,911)
Cameron County Irrigation District #6 Total			**(20,025)**	**(19,656)**	**(19,286)**	**(18,917)**	**(18,546)**	**(18,178)**
Delta Lake Irrigation District	Contract 2nd Tier Needs	Irrigation	(24,585)	(22,569)	(20,553)	(18,540)	(16,527)	(14,516)
Delta Lake Irrigation District	Contract 2nd Tier Needs	Livestock	-	-	-	-	-	-
Delta Lake Irrigation District	Contract 2nd Tier Needs	Municipal	(5,221)	(5,039)	(4,858)	(4,677)	(4,494)	(4,315)
Delta Lake Irrigation District	Contract 2nd Tier Needs	WWP	-	-	-	-	-	-
Delta Lake Irrigation District Total			**(29,806)**	**(27,608)**	**(25,411)**	**(23,217)**	**(21,021)**	**(18,831)**
Donna Irrigation District-Hidalgo County #1	Contract 2nd Tier Needs	Irrigation	(11,457)	(10,453)	(9,449)	(8,445)	(7,442)	(6,440)
Donna Irrigation District-Hidalgo County #1	Contract 2nd Tier Needs	Municipal	(1,953)	(1,783)	(1,613)	(1,442)	(1,271)	(1,100)
Donna Irrigation District-Hidalgo County #1 Total			**(13,410)**	**(12,236)**	**(11,062)**	**(9,887)**	**(8,713)**	**(7,540)**
Eagle Pass	WUG 2nd Tier Needs	Utility	-	-	(209)	(912)	(1,464)	(1,890)
Eagle Pass Total			**-**	**(226)**	**(1,461)**	**(2,816)**	**(4,182)**	**(5,509)**
East Rio Hondo WSC	WUG 2nd Tier Needs	Utility	-	-	-	-	-	-
East Rio Hondo WSC	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
East Rio Hondo WSC Total			**-**	**-**	**-**	**-**	**-**	**-**
Edinburg	WUG 2nd Tier Needs	Utility	(3,104)	(5,065)	(9,378)	(11,209)	(12,807)	(14,121)
Edinburg Total			**(6,835)**	**(9,591)**	**(14,351)**	**(17,262)**	**(20,237)**	**(23,152)**
Harlingen	WUG 2nd Tier Needs	Utility	-	-	-	-	-	(104)
Harlingen	Contract 2nd Tier Needs	Manufacturing	-	-	-	-	-	-
Harlingen	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Harlingen Total			**-**	**-**	**-**	**-**	**-**	**(104)**
Harlingen Irrigation District-Cameron County #1	Contract 2nd Tier Needs	Irrigation	(5,005)	(3,623)	(2,242)	(861)	(858)	(856)

			Second Tier Water Need Projections (acft/yr)[1]					
Entity	**MWP Type**	**Use Type**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Harlingen Irrigation District-Cameron County #1	Contract 2nd Tier Needs	Municipal	(4,247)	(3,540)	(2,830)	(2,122)	(2,122)	(2,123)
Harlingen Irrigation District-Cameron County #1 Total			**(9,252)**	**(7,163)**	**(5,072)**	**(2,983)**	**(2,980)**	**(2,979)**
Hidalgo County Irrigation District #1	Contract 2nd Tier Needs	Irrigation	(7,895)	(7,329)	(6,764)	(6,199)	(5,635)	(5,071)
Hidalgo County Irrigation District #1	Contract 2nd Tier Needs	Municipal	(5,164)	(4,798)	(3,870)	(3,547)	(3,225)	(2,902)
Hidalgo County Irrigation District #1	Contract 2nd Tier Needs	WWP	-	-	-	-	-	-
Hidalgo County Irrigation District #1 Total			**(13,059)**	**(12,127)**	**(10,634)**	**(9,746)**	**(8,860)**	**(7,973)**
Hidalgo County Irrigation District #16	Contract 2nd Tier Needs	Irrigation	(2,853)	(2,685)	(2,517)	(2,348)	(2,180)	(2,012)
Hidalgo County Irrigation District #16	Contract 2nd Tier Needs	Livestock	(29)	(29)	(29)	(29)	(29)	(29)
Hidalgo County Irrigation District #16	Contract 2nd Tier Needs	Mining	(25)	(25)	(25)	(25)	(25)	(25)
Hidalgo County Irrigation District #16	Contract 2nd Tier Needs	Municipal	(1,047)	(997)	(948)	(898)	(849)	(799)
Hidalgo County Irrigation District #16 Total			**(3,954)**	**(3,736)**	**(3,519)**	**(3,300)**	**(3,083)**	**(2,865)**
Hidalgo County Irrigation District #2	Contract 2nd Tier Needs	Irrigation	(14,208)	(12,949)	(11,692)	(10,433)	(9,176)	(7,921)
Hidalgo County Irrigation District #2	Contract 2nd Tier Needs	Municipal	(7,458)	(6,797)	(6,138)	(5,477)	(4,818)	(4,156)
Hidalgo County Irrigation District #2	Contract 2nd Tier Needs	WWP	(61)	(61)	(61)	(61)	(61)	(61)
Hidalgo County Irrigation District #2 Total			**(21,727)**	**(19,807)**	**(17,891)**	**(15,971)**	**(14,055)**	**(12,138)**
Hidalgo County Irrigation District #6	Contract 2nd Tier Needs	Irrigation	(2,960)	(2,819)	(2,677)	(2,536)	(2,394)	(2,253)
Hidalgo County Irrigation District #6	Contract 2nd Tier Needs	Municipal	(1,695)	(1,615)	(1,534)	(1,454)	(1,374)	(1,293)
Hidalgo County Irrigation District #6 Total			**(4,655)**	**(4,434)**	**(4,211)**	**(3,990)**	**(3,768)**	**(3,546)**
Hidalgo County WID #3	Contract 2nd Tier Needs	Irrigation	(48)	(48)	(47)	(47)	(47)	(47)
Hidalgo County WID #3	Contract 2nd Tier Needs	Mining	(4)	(4)	(4)	(4)	(4)	(4)
Hidalgo County WID #3	Contract 2nd Tier Needs	Municipal	(49)	(49)	(49)	(49)	(49)	(49)
Hidalgo County WID #3 Total			**(101)**	**(101)**	**(100)**	**(100)**	**(100)**	**(100)**
Hidalgo-Cameron County Irrigation District #9	Contract 2nd Tier Needs	Irrigation	(20,589)	(18,902)	(17,215)	(15,530)	(13,845)	(12,162)
Hidalgo-Cameron County Irrigation District #9	Contract 2nd Tier Needs	Municipal	(5,119)	(4,702)	(4,286)	(3,873)	(3,457)	(3,042)
Hidalgo-Cameron County Irrigation District #9 Total			**(25,708)**	**(23,604)**	**(21,501)**	**(19,403)**	**(17,302)**	**(15,204)**
La Feria Irrigation District-Cameron County #3	Contract 2nd Tier Needs	Irrigation	(5,570)	(5,567)	(5,564)	(5,560)	(5,557)	(5,554)
La Feria Irrigation District-Cameron County #3	Contract 2nd Tier Needs	Municipal	(1,710)	(1,610)	(1,510)	(1,310)	(1,010)	(810)
La Feria Irrigation District-Cameron County #3 Total			**(7,280)**	**(7,177)**	**(7,074)**	**(6,870)**	**(6,567)**	**(6,364)**
Laguna Madre Water District	WUG 2nd Tier Needs	Utility	(158)	-	-	(185)	(307)	(342)
Laguna Madre Water District Total			**(417)**	**(1,666)**	**(2,948)**	**(4,352)**	**(5,817)**	**(7,322)**
Laredo	WUG 2nd Tier Needs	Utility	-	-	-	-	-	(537)
Laredo	Contract 2nd Tier Needs	Irrigation	-	-	-	-	-	-
Laredo	Contract 2nd Tier Needs	Manufacturing	-	-	-	-	-	-
Laredo	Contract 2nd Tier Needs	Mining	-	-	-	-	-	-
Laredo Total			**-**	**-**	**-**	**-**	**-**	**(537)**
Mcallen	WUG 2nd Tier Needs	Utility	(661)	(1,687)	(6,875)	(6,987)	(8,348)	(11,253)
Mcallen	Contract 2nd Tier Needs	Manufacturing	-	-	-	-	-	-
Mcallen	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Mcallen Total			**(661)**	**(1,687)**	**(6,875)**	**(6,987)**	**(8,348)**	**(11,253)**
Military Highway WSC	WUG 2nd Tier Needs	Utility	-	-	(403)	(821)	(1,194)	(1,512)
Military Highway WSC	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Military Highway WSC Total			**-**	**-**	**(403)**	**(821)**	**(1,194)**	**(1,512)**
Mission	WUG 2nd Tier Needs	Utility	(3,648)	(5,959)	(7,563)	(5,238)	(7,215)	(8,828)
Mission Total			**(8,514)**	**(12,976)**	**(17,530)**	**(22,161)**	**(26,858)**	**(31,446)**
North Alamo WSC	WUG 2nd Tier Needs	Utility	(133)	(243)	(352)	(449)	(534)	(603)
North Alamo WSC	Contract 2nd Tier Needs	Municipal	(52)	(52)	(52)	(52)	(52)	(52)
North Alamo WSC Total			**(185)**	**(295)**	**(404)**	**(501)**	**(586)**	**(655)**
Pharr	WUG 2nd Tier Needs	Utility	-	-	-	-	-	-
Pharr Total			**-**	**(1,360)**	**(3,238)**	**(5,184)**	**(7,193)**	**(9,165)**
Rio Grande City	WUG 2nd Tier Needs	Utility	(1,362)	(1,486)	(1,482)	(1,428)	(1,297)	(1,282)
Rio Grande City	Contract 2nd Tier Needs	Municipal	(687)	(687)	(687)	(687)	(687)	(687)

Entity	MWP Type	Use Type	Second Tier Water Need Projections (acft/yr)[1] 2020	2030	2040	2050	2060	2070
Rio Grande City Total			**(2,049)**	**(2,173)**	**(2,169)**	**(2,115)**	**(1,984)**	**(1,969)**
San Benito	WUG 2nd Tier Needs	Utility	-	-	-	-	-	(130)
San Benito Total			**-**	**-**	**-**	**-**	**(280)**	**(944)**
San Juan	WUG 2nd Tier Needs	Utility	-	(914)	-	(348)	(978)	(1,500)
San Juan Total			**-**	**(1,042)**	**(2,115)**	**(3,218)**	**(4,350)**	**(5,459)**
Sharyland WSC	WUG 2nd Tier Needs	Utility	-	(1,246)	(2,785)	(4,469)	(5,943)	(7,160)
Sharyland WSC Total			**-**	**(2,433)**	**(5,226)**	**(8,107)**	**(11,068)**	**(13,965)**
Southmost Regional Water Authority	Contract 2nd Tier Needs	Manufacturing	-	-	-	-	-	-
Southmost Regional Water Authority	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Southmost Regional Water Authority Total			**-**	**-**	**-**	**-**	**-**	**-**
United Irrigation District	Contract 2nd Tier Needs	Irrigation	(892)	(891)	(890)	(890)	(889)	(888)
United Irrigation District	Contract 2nd Tier Needs	Municipal	(1,257)	(1,257)	(1,257)	(1,256)	(1,256)	(1,256)
United Irrigation District Total			**(2,149)**	**(2,148)**	**(2,147)**	**(2,146)**	**(2,145)**	**(2,144)**
Weslaco	WUG 2nd Tier Needs	Utility	(141)	(1,332)	(2,350)	(3,469)	(4,443)	(5,191)
Weslaco	Contract 2nd Tier Needs	Municipal	-	-	-	-	-	-
Weslaco Total			**(141)**	**(1,332)**	**(2,350)**	**(3,469)**	**(4,443)**	**(5,191)**

[1] The following table only shows needs. Any surplus will result in a zero value representing that the entity has no needs.

Appendix C: Water Availability

1 Hydrologic Variance

2 Water Rights

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Texas Water
Development Board

P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.texas.gov
Phone (512) 463-7847, Fax (512) 475-2053

September 18, 2018

Mr. Tomas Rodriguez
Chairman
Rio Grande Regional Water Planning Group
310 Chetumal Drive
Laredo, TX 78045

RE: Region M Regional Water Planning Group (RWPG) request for approval to modify surface water availability hydrologic assumptions for development of the 2021 Region M Regional Water Plan (RWP)

Dear Chairman Rodriguez:

The Texas Water Development Board (TWDB) has reviewed the request dated August 17, 2018 for approval of alternative water supply assumptions to be used in determining existing and future surface water availability. This letter confirms that the TWDB approves the following variances:

1. Use adjusted demand patterns for irrigation water rights above Fort Quitman for existing supplies, as approved for the Region E RWPG.
2. Determination of the upper limit of source water available for reuse water management strategies (WMSs) based on the amount of water returned to a utility's wastewater treatment plant, estimated at 50% of the utility's projected water demands, adjusted for water conservation and drought management strategies, unless site-specific information is available. Indirect reuse WMSs may be evaluated with Texas Commission on Environmental Quality (TCEQ)Water Availability Model (WAM) RUN3. If such strategy is the indirect reuse of calculated return flows, modification to the WAM is allowed.

For the purpose of evaluating potentially feasible water management strategies not included in the above list, the TCEQ WAM RUN3 is to be used.

While the TWDB authorizes these modifications to evaluate water supplies for development of the 2021 Region M RWP, it is the responsibility of the RWPG to ensure that the resulting estimates of water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of actual drought conditions; and in all other regards will be evaluated in accordance with the contract Exhibit C, *Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development.*

If you have any questions, please do not hesitate to contact William Alfaro, project manager for Region M at 512-463-4741 or via email at william.alfaro@twdb.texas.gov.

Sincerely,

Jeff Walker
Executive Administrator

JW/WA/ms

c: Mr. Ron Garza, Lower Rio Grande Valley Development Council
Ms. Sara Eatman, Black & Veatch
Ms. Jennifer Herrera, WSP
Mr. William Alfaro, TWDB

BLACK & VEATCH
Building a world of difference.

August 17, 2018

Jeff Walker,
Executive Administrator
Texas Water Development Board
1700 North Congress
Austin, TX 78711-3234

Re: Hydrologic Variance Request for the 2021 Rio Grande Regional Water Plan (Region M)

Mr. Walker,
The Rio Grande Planning Region intends to rely on current Water Availability Model (WAM) Run 3 estimates of Firm Yield and Modeled Available Groundwater to establish availabilities in the 2021 Rio Grande Regional Water Plan. The following assumptions **have been approved by the Rio Grande Regional Water Planning Group at the August 1, 2018 scheduled Board Meeting** and are submitted here for your review.

Surface Water

1. The most current WAM Run 3 will be used for all Surface Water Rights Modeling for existing supplies and future WMS, which includes:
    a. Full exercise of existing surface water rights;
    b. Zero effluent discharges unless specifically required by a surface water right (hydropower, industrial rights, etc.); and
    c. Best available water rights information as of June 2018.
    d. In the evaluation of the cumulative effects of water management strategies, the Rio Grande WAM Run 3 may be used to estimate the impacts of future urbanization (and the resulting reclassification of water rights) on the firm yield of the system. The results of these analyses will be limited to the discussion of cumulative effects.
2. Reservoir capacities for Amistad and Falcon will be based on the current estimates for sedimentation in 2020 and 2070, and a linear interpolation will be used to determine capacity for the decades between.
    a. Existing supplies will be based on the 2020 Firm Yield; and
    b. Projected supplies and WMS will rely on estimated decadal averages of Firm Yield.

3. Period of record for simulations:
    a. Rio Grande WAM: 1940 – 2000
    b. Nueces-Rio Grande WAM: 1948 – 1998
4. The Rio Grande WAM will be run to be consistent with the variance submitted by Region E and approved April 18, 2018 with respect to the following:
    a. Irrigation demand patterns above Fort Quitman will be modified so that diversions only occur March through October, which is consistent with the operations of the Rio Grande Project. This demand pattern change does not have a discernible impact on the firm yield of the Amistad-Falcon system in Region M.

Reuse/Recycle Water

1. Source water available for a reuse water management strategy will be determined based on the estimated amount of water returned to a utility's WWTPs for each decade, less the amount of reuse water already being utilized as existing supply.
    a. The amount of water returned to a utility's WWTP will be estimated at 50% of the utility's projected water demands, adjusted for water conservation and drought management strategies, unless site-specific information is available

       Example: [50% * (projected water demands for a utility - conservation WMS volumes - drought management WMS volumes)] – existing reuse supply

        i. For Direct Reuse, this calculation will set an upper limit to the volume of reuse water available, and will not require any WAM modeling, since Run 3 assumes no return flows.
        ii. For Indirect reuse, treated effluent discharge volumes returned to the Rio Grande would be limited by this calculation, and the effluent could be entered as a return flow in the WAM to assess downstream availability. There are no current or proposed future indirect reuse project in Region M.
2. Existing and future non-potable reuse supplies will be shown to meet no more than **10%** of municipal demands. Manufacturing and steam-electric use of non-potable water will be considered on a case-by-case basis.

Hydrologic Models

- Rio Grande WAM (downloaded from TCEQ 8/15/18, may be updated as TCEQ posts additional updates)
- Nueces – Rio Grande WAM (downloaded from TCEQ 6/21/18)
- Southern Carrizo-Wilcox-Queen City-Sparta GAM
- Gulf Coast Aquifer System (southern portion) GAM
- Yegua-Jackson Aquifer GAM
- Any additional currently-approved WAM or GAM necessary

Please contact me if you have any questions.

Sincerely,

Sara Eatman
Technical Consultant, Rio Grande Regional Water Planning Group

Cc: Tomas Rodriguez, Chairman, Rio Grande Regional Water Planning Group
Ron Garza, Lower Rio Grande Development Council
William Alfaro, TWDB Project Manager

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	840	Adams Garden ID #19	Irrigation	Cameron	18,738	A	Adams Garden ID #19		
Rio Grande	27	Agua SUD	Frontera/JL Bates Power Gen	Webb	125	M	HCID#16		
Rio Grande	81	Agua SUD	Agua SUD	Starr	2,416	M	HCID#16		
Rio Grande	294	Agua SUD	Frontera/JL Bates Power Gen	Webb	375	M	HCID#16		
Rio Grande	319	Agua SUD	Agua SUD	Hidalgo	1	A	HCID#16		
Rio Grande	521	Agua SUD	Agua SUD	Hidalgo	250	M	HCID#16		
Rio Grande	835	Bayview ID #11	Bayview ID #11 Muni Customers	Cameron	183.1	M	Bayview ID #11		
Rio Grande	835	Bayview ID #11	Irrigation	Cameron	16,978	A	Bayview ID #11		
Rio Grande	843	Brownsville ID	Irrigation	Cameron	33,950	A	Brownsville ID		
Rio Grande	843	Brownsville ID	HCID#2 Muni Customers	Hidalgo	3,834	M	HCID#2		
Rio Grande	66	Brownsville PUB	Brownsville PUB	Cameron	72	B	Brownsville PUB		
Rio Grande	170	Brownsville PUB	Brownsville PUB	Cameron	25	B	Brownsville PUB		
Rio Grande	208	Brownsville PUB	Brownsville PUB	Cameron	24	B	Brownsville PUB		
Rio Grande	829	Brownsville PUB	Brownsville PUB	Cameron	63	A	Brownsville PUB		
Rio Grande	865	Brownsville PUB	Brownsville PUB	Cameron	1,783	A	Brownsville PUB		
Rio Grande	865	Brownsville PUB	Brownsville PUB	Cameron	29,565	M	Brownsville PUB		
Rio Grande	865	Brownsville PUB	Brownsville PUB	Cameron	1,897	M	Brownsville PUB		
Rio Grande	51	CCID#2	Irrigation	Cameron	14	B	CCID#2		
Rio Grande	841	CCID#2	Industrial	Cameron	192	M	CCID#2		
Rio Grande	841	CCID#2	Irrigation	Cameron	147,824	A	CCID#2		
Rio Grande	841	CCID#2	Rio Hondo & San Benito	Cameron	8,914	M	CCID#2		
Rio Grande	829	CCID#6	Irrigation	Cameron	49,565	A	CCID#6		
Rio Grande	829	CCID#6	CCID#6 Muni Customers	Cameron	20	M	CCID#6		
Rio Grande	834	CCWID#10	Irrigation	Cameron	7,953	A	CCWID#10		
Rio Grande	834	CCWID#10	Irrigation	Cameron	35	A	CCWID#10		
Rio Grande	843	City of Alamo	City of Alamo	Hidalgo	83	M	HCID#2		
Rio Grande	875	City of Donna	City of Donna	Hidalgo	480	A	Donna ID		
Rio Grande	3998	City of Eagle Pass	City of Eagle Pass	Maverick	7,707	M	City of Eagle Pass		
Rio Grande	806	City of Eagle Pass	City of Eagle Pass	Maverick	250	A	City of Eagle Pass		
Rio Grande	3998	City of Eagle Pass	City of Eagle Pass	Maverick	53	A	City of Eagle Pass		
Rio Grande	3998	City of Eagle Pass	City of Eagle Pass	Maverick	50	M	City of Eagle Pass		
Rio Grande	124	City of Eagle Pass	City of Eagle Pass	Maverick	23	B	City of Eagle Pass		
Rio Grande	825	City of Edcouch	City of Edcouch	Hidalgo	226	M	H&CCID#9		
Rio Grande	421	City of Edinburg	City of Edinburg	Hidalgo	10	B	HCID#1		
Rio Grande	801	City of Edinburg	City of Edinburg	Hidalgo	2,591	M	HCID#1		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	302	City of Hidalgo	City of Hidalgo	Hidalgo	311	A	City of Hidalgo		
Rio Grande	36	City of La Grulla	City of La Grulla	Starr	54	B	City of La Grulla		
Rio Grande	190	City of La Grulla	City of La Grulla	Starr	35	B	City of La Grulla		
Rio Grande	236	City of La Grulla	City of La Grulla	Starr	7	M	City of La Grulla		
Rio Grande	264	City of La Grulla	City of La Grulla	Starr	3	M	City of La Grulla		
Rio Grande	767	City of La Grulla	City of La Grulla	Starr	1	B	City of La Grulla		
Rio Grande	787	City of La Grulla	City of La Grulla	Starr	31	B	City of La Grulla		
Rio Grande	863	City of La Grulla	City of La Grulla	Starr	552	M	City of La Grulla		
Rio Grande	864	City of La Joya	City of La Joya	Hidalgo	13	M	HCID#16		
Rio Grande	37	City of Laredo	City of Laredo	Webb	231	B	City of Laredo		
Rio Grande	601	City of Laredo	City of Laredo	Webb	1,287	A	City of Laredo		
Rio Grande	601	City of Laredo	City of Laredo	Webb	1,030	B	City of Laredo		
Rio Grande	2698	City of Laredo	City of Laredo	Webb	500	A	City of Laredo		
Rio Grande	2761	City of Laredo	City of Laredo	Webb	167	A	City of Laredo		
Rio Grande	2761	City of Laredo	City of Laredo	Webb	58	B	City of Laredo		
Rio Grande	2774	City of Laredo	City of Laredo	Webb	157	B	City of Laredo		
Rio Grande	2774	City of Laredo	City of Laredo	Webb	50	B	City of Laredo		
Rio Grande	2777	City of Laredo	City of Laredo	Webb	1,279	B	City of Laredo		
Rio Grande	3997	City of Laredo	City of Laredo	Webb	47,844	M	City of Laredo		
Rio Grande	3997	City of Laredo	City of Laredo	Webb	10,915	M	City of Laredo		
Rio Grande	853	City of Los Fresnos	City of Los Fresnos	Cameron	1,051	M	CCID#6		
Rio Grande	821	City of Lyford	City of Lyford	Cameron	370	M	Delta Lake		
Rio Grande	353	City of McAllen	City of McAllen	Hidalgo	679	M	HCWID#3		
Rio Grande	848	City of McAllen	City of McAllen	Hidalgo	550	M	HCWID#3		
Rio Grande	823	City of Mercedes	City of Mercedes	Hidalgo	1,015	M	H&CCID#9		
Rio Grande	580	City of Mission	City of Mission	Hidalgo	65	B	United Irigation District		
Rio Grande	581	City of Mission	City of Mission	Hidalgo	10	B	United Irigation District		
Rio Grande	806	City of Mission	City of Mission	Hidalgo	141	M			
Rio Grande	806	City of Mission	City of Mission	Hidalgo	1,365	M	United Irigation District		
Rio Grande	828	City of Mission	City of Mission	Hidalgo	1,250	M	United Irigation District		
Rio Grande	845	City of Mission	City of Mission	Hidalgo	215	A	United Irigation District		
Rio Grande	808	City of Pharr	City of Pharr	Hidalgo	1,764	M	HCID#2		
Rio Grande	874	City of Pharr	City of Pharr	Hidalgo	1,186	M	HCID#2		
Rio Grande	2727	City of Pharr	City of Pharr	Hidalgo	1,500	M	HCID#2		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	855	City of Primera	City of Primera	Cameron	400	M	Harlingen ID		
Rio Grande	841	City of San Benito	City of San Benito	Cameron	1,532	M	CCID#2		
Rio Grande	386	City of San Juan	City of San Juan	Hidalgo	75	B	HCID#2		
Rio Grande	573	City of San Juan	City of San Juan	Hidalgo	73	B	HCID#2		
Rio Grande	873	City of San Juan	City of San Juan	Hidalgo	316	M	HCID#2		
Rio Grande	824	City of Weslaco	City of Weslaco	Hidalgo	736	M	H&CCID#9		
Rio Grande	809	Delta Lake ID	Irrigation	Hidalgo	50	A	Delta Lake		
Rio Grande	811	Delta Lake ID	Irrigation	Hidalgo	175,026	A	Delta Lake		
Rio Grande	811	Delta Lake ID	Irrigation	Hidalgo	452	B	Delta Lake		
Rio Grande	811	Delta Lake ID	Delta Lake ID Muni Customers	Hidalgo	5,670	M	Delta Lake		
Rio Grande	811	Delta Lake ID	Delta Lake ID Muni Customers	Hidalgo	1,230	M	Delta Lake		
Rio Grande	811	Delta Lake ID	City of Lyford	Hidalgo	610	M	Delta Lake		
Rio Grande	811	Delta Lake ID	Delta Lake ID Muni Customers	Hidalgo	600	M	Delta Lake		
Rio Grande	805	Donna ID	Donna ID	Hidalgo	94,064	A	Donna ID		
Rio Grande	805	Donna ID	Donna ID	Hidalgo	4,190	M	Donna ID		
Rio Grande	805	Donna ID	Donna ID	Hidalgo	2,690	M	Donna ID		
Rio Grande	838	East Rio Hondo WSC	East Rio Hondo WSC	Cameron	3,303	M	CCID#2		
Rio Grande	72	Falcon Rural WSC	Falcon Rural WSC	Starr	85	M	Falcon Rural WSC		
Rio Grande	582	Falcon Rural WSC	Falcon Rural WSC	Starr	85	M	Falcon Rural WSC		
Rio Grande	603	Falcon Rural WSC	Falcon Rural WSC	Starr	10	M	Falcon Rural WSC		
Rio Grande	646	Falcon Rural WSC	Falcon Rural WSC	Starr	10	M	Falcon Rural WSC		
Rio Grande	673	Falcon Rural WSC	Falcon Rural WSC	Starr	20	M	Falcon Rural WSC		
Rio Grande	675	Falcon Rural WSC	Falcon Rural WSC	Starr	14	M	Falcon Rural WSC		
Rio Grande	699	Falcon Rural WSC	Falcon Rural WSC	Starr	25	M	Falcon Rural WSC		
Rio Grande	812	H&CCID#9	Irrigation	Hidalgo	172,152	A	H&CCID#9		
Rio Grande	827	H&CCID#9	La Villa	Hidalgo	63	A	H&CCID#9		
Rio Grande	452	H&CCID#9	Irrigation	Hidalgo	59	B	H&CCID#9		
Rio Grande	812	H&CCID#9	NAWSC (2400)	Hidalgo	2,580	M	H&CCID#9		
Rio Grande	812	H&CCID#9	NAWSC (3200)	Hidalgo	3,174	M	H&CCID#9		
Rio Grande	812	H&CCID#9	Edcouch (375) & La Villa (275)	Hidalgo	500	M	H&CCID#9		
Rio Grande	812	H&CCID#9	Elsa (811)	Hidalgo	1,340	M	H&CCID#9		
Rio Grande	812	H&CCID#9	Mercedes (2223)	Hidalgo	1,840	M	H&CCID#9		
Rio Grande	812	H&CCID#9	Weslaco (7240)	Hidalgo	7,194	M	H&CCID#9		
Rio Grande	831	Harlingen ID	Harlingen ID Muni Customers	Cameron	93,858	A	Harlingen ID		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	831	Harlingen ID	Harlingen ID Muni Customers	Cameron	4,375	A	Harlingen ID		
Rio Grande	831	Harlingen ID	Harlingen ID Muni Customers	Cameron	692	M	Harlingen ID		
Rio Grande	19	Harlingen WW	Irrigation	Cameron	99	B	Harlingen ID		
Rio Grande	831	Harlingen WW	Harlingen WW	Cameron	18,020	M	Harlingen ID		
Rio Grande	831	Harlingen WW	Harlingen WW	Cameron	2,175	M	Harlingen ID		
Rio Grande	831	Harlingen WW	Harlingen WW	Cameron	2,000	M	Harlingen ID		
Rio Grande	831	Harlingen WW	Harlingen WW	Cameron	293	M	Harlingen ID		
Rio Grande	834	Harlingen WW	Irrigation	Cameron	1,625	A	Adams Garden ID #19		
Rio Grande	816	HCID#1	Edinburg (6940), Sharyland (5200)	Hidalgo	9,766	M	HCID#1		
Rio Grande	816	HCID#1	Irrigation	Hidalgo	74,079	A	HCID#1		
Rio Grande	816	HCID#1	NAWSC (1740) McAllen (4000)	Hidalgo	2,423	M	HCID#1		
Rio Grande	816	HCID#1	HCID#1 Muni Customers	Hidalgo	814	M	HCID#1		
Rio Grande	802	HCID#16	Domestic & Livestock	Hidalgo	100	M	HCID#16		
Rio Grande	802	HCID#16	Irrigation	Hidalgo	30,749	A	HCID#16		
Rio Grande	802	HCID#16	Mining	Hidalgo	200	A	HCID#16		
Rio Grande	802	HCID#16	Agua SUD, La Joya	Hidalgo	1,500	M	HCID#6		
Rio Grande	302	HCID#2	Irrigation	Hidalgo	9	A	HCID#2		
Rio Grande	808	HCID#2	Irrigation	Hidalgo	137,775	A	HCID#2		
Rio Grande	808	HCID#2	HCID#2 Muni Customers	Hidalgo	13,273	M	HCID#2		
Rio Grande	808	HCID#2	HCID#2 Muni Customers	Hidalgo	10,943	M	HCID#2		
Rio Grande	432	HCID#5	Irrigation	Hidalgo	403	B	HCID#5		
Rio Grande	813	HCID#5	Irrigation	Hidalgo	14,235	A	HCID#5		
Rio Grande	828	HCID#6	Agua SUD	Hidalgo	6,816	M	HCID#6		
Rio Grande	828	HCID#6	Irrigation	Hidalgo	32,913	A	HCID#6		
Rio Grande	828	HCID#6	Irrigation	Hidalgo	32,913	A	HCID#6		
Rio Grande	832	HCWID#18	Irrigation	Hidalgo	3,228	B	HCWID#18		
Rio Grande	806	HCWID#19	Irrigation	Hidalgo	8,266	A	HCWID#19		
Rio Grande	848	HCWID#3	City of McAllen	Hidalgo	8,980	M	HCWID#3		
Rio Grande	848	HCWID#3	City of McAllen	Hidalgo	5,000	M	HCWID#3		
Rio Grande	848	HCWID#3	Irrigation & Mining	Hidalgo	8,553	A	HCWID#3	HCID#2	
Rio Grande	848	HCWID#3	Irrigation & Mining	Hidalgo	100	A	HCWID#3		
Rio Grande	833	Hidalgo MUD	Hidalgo MUD	Hidalgo	700	B	HCID#1		
Rio Grande	833	Hidalgo MUD	Hidalgo MUD	Hidalgo	631	M	HCID#1		
Rio Grande	803	La Feria ID CC#3	Irrigation	Cameron	75,626	A	La Feria ID CC#3		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	803	La Feria ID CC#3	La Feria ID Muni Customers	Cameron	2,152	M	La Feria ID CC#3		
Rio Grande	803	La Feria ID CC#3	La Feria ID Muni Customers	Cameron	1,800	M	La Feria ID CC#3		
Rio Grande	803	La Feria ID CC#3	La Feria ID Muni Customers	Cameron	900	M	La Feria ID CC#3		
Rio Grande	803	La Feria ID CC#3	La Feria ID Muni Customers	Cameron	300	M	La Feria ID CC#3		
Rio Grande	817	La Feria ID CC#3	Irrigation	Cameron	10,183	A	La Feria ID CC#3		
Rio Grande	817	La Feria ID CC#3	La Feria ID Muni Customers	Cameron	60	M	La Feria ID CC#3		
Rio Grande	850	Laguna Madre Water District	Laguna Madre Water District	Cameron	3,750	M	Bayview ID #11	CCID#6	CCID#10
Rio Grande	850	Laguna Madre Water District	Laguna Madre Water District	Cameron	3,529	M	Bayview ID #11	CCID#6	CCID#10
Rio Grande	850	Laguna Madre Water District	Laguna Madre Water District (Dom & Livestock)	Cameron	100	M	Bayview ID #11	CCID#6	CCID#10
Rio Grande	858	Los Ebanos	Agua SUD	Hidalgo	13	M	HCID#16		
Rio Grande	831	Military Highway WSC	Military Highway WSC	Cameron	632	M	Harlingen ID		
Rio Grande	240	NAWSC	NAWSC	Hidalgo	8,577	M	Delta Lake		
Rio Grande	461	NAWSC	NAWSC	Hidalgo	3,750	B	HCID#2		
Rio Grande	240	NAWSC	NAWSC	Hidalgo	250	M	HCID#2		
Rio Grande	240	NAWSC	NAWSC	Hidalgo	80	M	HCID#2		
Rio Grande	804	NAWSC	NAWSC	Hidalgo	104	M	HCID#2		
Rio Grande	812	NAWSC	NAWSC	Hidalgo	535	M	HCID#2		
Rio Grande	808	NAWSC	NAWSC	Hidalgo	749	M	Santa Cruz ID		
Rio Grande	841	Olmito WSC	Olmito WSC	Cameron	550	M	CCID#6		
Rio Grande	854	Olmito WSC	Olmito WSC	Cameron	996	M	CCID#6		
Rio Grande	809	Palm Valley Estate	Palm Valley	Cameron	313	M	Harlingen ID		
Rio Grande	860	Penitas	Agua SUD	Hidalgo	13	M	HCID#16		
Rio Grande	7	Port Mansfield, in NAWSC	Port Mansfield	Willacy	50	M	Delta Lake		
Rio Grande	201	Port Mansfield, in NAWSC	Port Mansfield	Willacy	100	M	Delta Lake		
Rio Grande	822	Raymondville	Raymondville	Willacy	224	A	Delta Lake		
Rio Grande	464	Rio Grande City	Rio Grande City	Starr	51	B	Rio Grande City		
Rio Grande	711	Rio Grande City	Rio Grande City	Starr	34	B	Rio Grande City		
Rio Grande	851	Rio Grande City	Rio Grande City	Starr	3,152	M	Rio Grande City		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	285	Rio WSC	Rio WSC	Starr	43	M	Rio Grande City		
Rio Grande	292	Rio WSC	Rio WSC	Starr	23	A	Rio Grande City		
Rio Grande	530	Rio WSC	Rio WSC	Starr	19	M	Rio Grande City		
Rio Grande	582	Rio WSC	Rio WSC	Starr	763	M	Rio Grande City		
Rio Grande	624	Rio WSC	Rio WSC	Starr	5	B	Rio Grande City		
Rio Grande	767	Rio WSC	Rio WSC	Starr	115	B	Rio Grande City		
Rio Grande	804	Santa Cruz ID	Irrigation	Hidalgo	74,873	A	Santa Cruz ID		
Rio Grande	804	Santa Cruz ID	Sharyland?	Hidalgo	120	M	Santa Cruz ID		
Rio Grande	809	Sharyland WSC	Sharyland WSC	Hidalgo	8,666	M	HCID#1		
Rio Grande	809	Sharyland WSC	Sharyland WSC	Hidalgo	250	M	United Irigation District		
Rio Grande	346	Siesta Shores WCID	Siesta Shores WCID	Zapata	200	M	Siesta Shores WCID		
Rio Grande	859	Sullivan City	Agua SUD	Hidalgo	13	M	HCID#16		
Rio Grande	862	Town of Fronton	City of Roma	Starr	13	M	City of Roma		
Rio Grande	862	Town of Garceno	City of Roma	Starr	13	M	City of Roma		
Rio Grande	857	Town of Hidalgo	Town of Hidalgo	Hidalgo	13	M	Town of Hidalgo (?)		
Rio Grande	852	Town of La Blanca	NAWSC	Hidalgo	13	M	NAWSC		
Rio Grande	815	Town of Progresso	Irrigation	Hidalgo	174	A	MHWSC		
Rio Grande	126	U.S. Fish & Wildlife Service	U.S. Fish & Wildlife Service	Cameron	19,937	B	HCID#2		
Rio Grande	126	U.S. Fish & Wildlife Service	U.S. Fish & Wildlife Service	Cameron	1,848	A	HCID#2		
Rio Grande	232	Union WSC	Union WSC	Starr	454	M	Union WSC		
Rio Grande	846	United Irigation District	City of McAllen (11250)	Hidalgo	11,000	M	United Irigation District		
Rio Grande	846	United Irigation District	City of Mission (10,722)	Hidalgo	8,625	M	United Irigation District		
Rio Grande	846	United Irigation District	Sharyland WSC (1400)	Hidalgo	1,190	M	United Irigation District		
Rio Grande	847	United Irigation District	Irrigation	Hidalgo	44,374	A	United Irigation District		
Rio Grande	849	United Irigation District	Uncommitted (2743)	Hidalgo	5,300	M	United Irigation District		
Rio Grande	807	Valley Acres ID	Industrial	Hidalgo	200	A	Valley Acres ID		
Rio Grande	807	Valley Acres ID	Irrigation	Hidalgo	16,124	A	Valley Acres ID		
Rio Grande	72	Valley MUD #2	Irrigation	Cameron	5,716	B	Valley MUD #2		
Rio Grande	202	Valley MUD #2	Valley MUD #2	Cameron	798	M	Valley MUD #2		
Rio Grande	2720	Webb County	Webb County	Webb	2,004	M	Webb County		
Rio Grande	2720	Webb County	Webb County	Webb	307	M	Webb County		

Basin	WR#	Owner Name	User	County	Diversion	Class	Diverter (1)	Diverter (2)	Diverter (3)
Rio Grande	201	Willacy County Nav District	Willacy County Nav District/ Industrial?	Wilalcy	100	M	Delta Lake		
Rio Grande	803	Zapata County WCID	Zapata County WCID	Zapata	502	M	Zapata County WCID		
Rio Grande	2804	Zapata County WW	Zapata County WW	Zapata	2,084	M	Zapata County WW		

Appendix D: Evaluation of the Economic Impacts of Unmet Needs

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Socioeconomic Impacts of Projected Water Shortages for the Rio Grande (Region M) Regional Water Planning Area

Prepared in Support of the 2021 Region M Regional Water Plan

Dr. John R. Ellis
Water Use, Projections, & Planning Division
Texas Water Development Board

November 2019

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Executive Summary

Evaluating the social and economic impacts of not meeting identified water needs is a required analysis in the regional water planning process. The Texas Water Development Board (TWDB) estimates these impacts for regional water planning groups (RWPGs) and summarizes the impacts in the state water plan. The analysis presented is for the Rio Grande Regional Water Planning Group (Region M).

Based on projected water demands and existing water supplies, Region M identified water needs (potential shortages) that could occur within its region under a repeat of the drought of record for six water use categories (irrigation, livestock, manufacturing, mining, municipal and steam-electric power). The TWDB then estimated the annual socioeconomic impacts of those needs—if they are not met—for each water use category and as an aggregate for the region.

This analysis was performed using an economic impact modeling software package, IMPLAN (Impact for Planning Analysis), as well as other economic analysis techniques, and represents a snapshot of socioeconomic impacts that may occur during a single year repeat of the drought of record with the further caveat that no mitigation strategies are implemented. Decade specific impact estimates assume that growth occurs, and future shocks are imposed on an economy at 10-year intervals. The estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

For regional economic impacts, income losses and job losses are estimated within each planning decade (2020 through 2070). The income losses represent an approximation of gross domestic product (GDP) that would be foregone if water needs are not met.

The analysis also provides estimates of financial transfer impacts, which include tax losses (state, local, and utility tax collections); water trucking costs; and utility revenue losses. In addition, social impacts are estimated, encompassing lost consumer surplus (a welfare economics measure of consumer wellbeing); as well as population and school enrollment losses.

IMPLAN data reported that Region M generated more than $45 billion in gross domestic product (GDP) (2018 dollars) and supported roughly 735,000 jobs in 2016. The Region M estimated total population was approximately 1.7 million in 2016.

It is estimated that not meeting the identified water needs in Region M would result in an annually combined lost income impact of approximately $8 billion in 2020 and $7.3 billion in 2070 (Table ES-1). In 2020, the region would lose approximately 56,000 jobs, and by 2070 job losses would increase to approximately 104,000 if anticipated needs are not mitigated.

All impact estimates are in year 2018 dollars and were calculated using a variety of data sources and tools including the use of a region-specific IMPLAN model, data from TWDB annual water use estimates, the U.S. Census Bureau, Texas Agricultural Statistics Service, and the Texas Municipal League.

Table ES-1 Region M socioeconomic impact summary

Regional Economic Impacts	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$8,004	$7,273	$6,468	$6,523	$6,581	$7,355
Job losses	56,165	61,242	66,154	76,308	87,917	104,162
Financial Transfer Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Tax losses on production and imports ($ millions)*	$771	$650	$538	$531	$522	$600
Water trucking costs ($ millions)*	$0	$0	$1	$1	$2	$2
Utility revenue losses ($ millions)*	$75	$151	$251	$366	$488	$613
Utility tax revenue losses ($ millions)*	$1	$3	$5	$7	$10	$12
Social Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Consumer surplus losses ($ millions)*	$39	$82	$192	$341	$559	$844
Population losses	10,312	11,244	12,146	14,010	16,142	19,124
School enrollment losses	1,972	2,151	2,323	2,680	3,088	3,658

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

1 Introduction

Water shortages during a repeat of the drought of record would likely curtail or eliminate certain economic activity in businesses and industries that rely heavily on water. Insufficient water supplies could not only have an immediate and real impact on the regional economy in the short term, but they could also adversely and chronically affect economic development in Texas. From a social perspective, water supply reliability is critical as well. Shortages could disrupt activity in homes, schools and government, and could adversely affect public health and safety. For these reasons, it is important to evaluate and understand how water supply shortages during drought could impact communities throughout the state.

As part of the regional water planning process, RWPGs must evaluate the social and economic impacts of not meeting water needs (31 Texas Administrative Code §357.33 (c)). Due to the complexity of the analysis and limited resources of the planning groups, the TWDB has historically performed this analysis for the RWPGs upon their request. Staff of the TWDB's Water Use, Projections, & Planning Division designed and conducted this analysis in support of Region M, and those efforts for this region as well as the other 15 regions allow consistency and a degree of comparability in the approach.

This document summarizes the results of the analysis and discusses the methodology used to generate the results. Section 1 provides a snapshot of the region's economy and summarizes the identified water needs in each water use category, which were calculated based on the RWPG's water supply and demand established during the regional water planning process. Section 2 defines each of ten impact assessment measures used in this analysis. Section 3 describes the methodology for the impact assessment and the approaches and assumptions specific to each water use category (i.e., irrigation, livestock, manufacturing, mining, municipal, and steam-electric power). Section 4 presents the impact estimates for each water use category with results summarized for the region as a whole. Appendix A presents a further breakdown of the socioeconomic impacts by county.

1.1 Regional Economic Summary

The Region M Regional Water Planning Area generated more than $45 billion in gross domestic product (2018 dollars) and supported roughly 735,000 jobs in 2016, according to the IMPLAN dataset utilized in this socioeconomic analysis. This activity accounted for 2.6 percent of the state's total gross domestic product of 1.73 trillion dollars for the year based on IMPLAN. Table 1-1 lists all economic sectors ranked by the total value-added to the economy in Region M. The health care, retail trade, and real estate sectors generated more than 30 percent of the region's total value-added and were also significant sources of tax revenue. The top employers in the region were in the health care, public administration, and retail trade sectors. Region M's estimated total population was roughly 1.7 million in 2016, approximately 6 percent of the state's total.

This represents a snapshot of the regional economy as a whole, and it is important to note that not all economic sectors were included in the TWDB socioeconomic impact analysis. Data considerations prompted use of only the more water-intensive sectors within the economy because damage estimates could only be calculated for those economic sectors which had both reliable income and water use estimates.

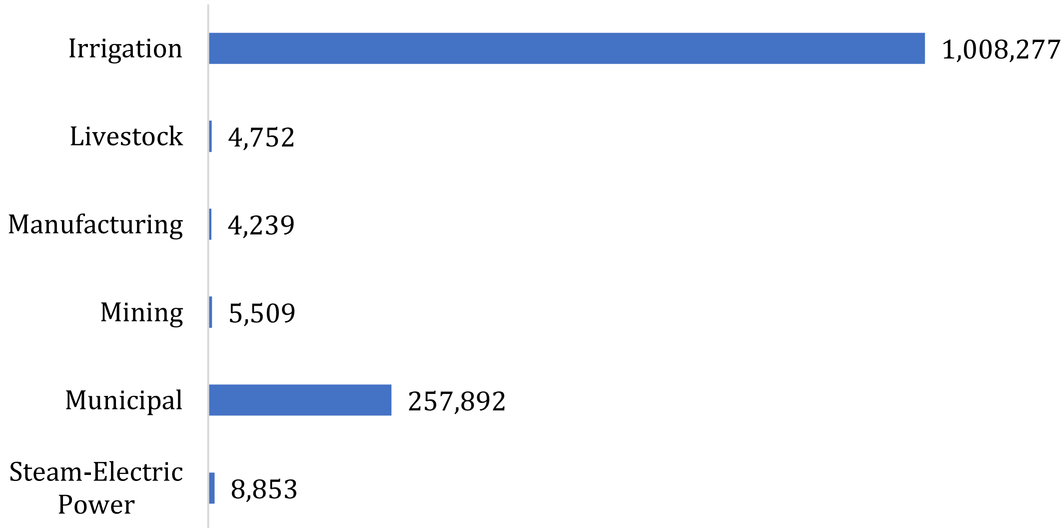
Table 1-1 Region M regional economy by economic sector*

Economic sector	Value-added ($ millions)	Tax ($ millions)	Jobs
Public Administration	$10,375.3	$(45.7)	127,182
Health Care and Social Assistance	$4,984.3	$70.4	133,872
Retail Trade	$4,442.5	$1,183.3	86,562
Real Estate and Rental and Leasing	$4,318.4	$745.7	22,799
Transportation and Warehousing	$3,023.9	$82.4	44,318
Wholesale Trade	$2,665.5	$658.1	22,328
Accommodation and Food Services	$2,132.4	$338.1	55,212
Administrative and Support and Waste Management and Remediation Services	$1,611.9	$58.0	50,071
Construction	$1,592.6	$40.8	36,849
Manufacturing	$1,570.1	$64.2	17,474
Finance and Insurance	$1,493.3	$113.3	27,596
Professional, Scientific, and Technical Services	$1,435.7	$48.7	25,050
Other Services (except Public Administration)	$1,426.0	$175.8	32,241
Mining, Quarrying, and Oil and Gas Extraction	$1,206.1	$259.6	7,204
Information	$900.4	$340.5	5,755
Agriculture, Forestry, Fishing and Hunting	$783.6	$21.9	18,398
Utilities	$730.6	$147.0	2,151
Educational Services	$307.7	$15.3	9,649
Arts, Entertainment, and Recreation	$217.4	$55.0	7,621
Management of Companies and Enterprises	$98.5	$6.7	2,379
Grand Total	$45,316.4	$4,379.1	734,713

*Source: 2016 IMPLAN for 536 sectors aggregated by 2-digit NAICS (North American Industry Classification System)

While municipal sectors led the region in economic output, the majority (78 percent) of water use in 2016 occurred in irrigated agriculture. Notably, close to 13 percent of the state's irrigation water use occurred within Region M. Figure 1-1 illustrates Region M's breakdown of the 2016 water use estimates by TWDB water use category.

Figure 1-1 Region M 2016 water use estimates by water use category (in acre-feet)



Source: TWDB Annual Water Use Estimates (all values in acre-feet)

1.2 Identified Regional Water Needs (Potential Shortages)

As part of the regional water planning process, the TWDB adopted water demand projections for water user groups (WUG) in Region M with input from the planning group. WUG-level demand projections were established for utilities that provide more than 100 acre-feet of annual water supply, combined rural areas (designated as county-other), and county-wide water demand projections for five non-municipal categories (irrigation, livestock, manufacturing, mining and steam-electric power). The RWPG then compared demands to the existing water supplies of each WUG to determine potential shortages, or needs, by decade.

Table 1-2 summarizes the region's identified water needs in the event of a repeat of the drought of record. Demand management, such as conservation, or the development of new infrastructure to increase supplies, are water management strategies that may be recommended by the planning group to address those needs. This analysis assumes that no strategies are implemented, and that the identified needs correspond to future water shortages. Note that projected water needs generally increase over time, primarily due to anticipated population growth, economic growth, or declining supplies. To provide a general sense of proportion, total projected needs as an overall percentage of total demand by water use category are also presented in aggregate in Table 1-2. Projected needs for individual water user groups within the aggregate can vary greatly and may reach 100% for a given WUG and water use category. A detailed summary of water needs by WUG and county appears in Chapter 4 of the 2021 Region M Regional Water Plan.

Table 1-2 Regional water needs summary by water use category

Water Use Category		2020	2030	2040	2050	2060	2070
Irrigation	water needs (acre-feet per year)	885,781	840,437	794,983	749,994	704,314	658,981
	% of the category's total water demand	62%	61%	60%	58%	57%	55%
Livestock	water needs (acre-feet per year)	561	545	450	450	450	450
	% of the category's total water demand	12%	11%	9%	9%	9%	9%
Manufacturing	water needs (acre-feet per year)	1,220	1,477	1,477	1,477	1,477	1,477
	% of the category's total water demand	28%	29%	29%	29%	29%	29%
Mining	water needs (acre-feet per year)	6,718	6,067	4,831	4,402	4,566	5,318
	% of the category's total water demand	39%	37%	32%	34%	44%	51%
Municipal*	water needs (acre-feet per year)	38,764	77,988	127,571	184,769	245,248	306,403
	% of the category's total water demand	12%	21%	29%	37%	44%	49%
Steam-electric power	water needs (acre-feet per year)	5,217	5,028	4,928	4,928	4,928	4,928
	% of the category's total water demand	34%	33%	32%	32%	32%	32%
Total water needs (acre-feet per year)		**938,261**	**931,542**	**934,240**	**946,020**	**960,983**	**977,557**

* Municipal category consists of residential and non-residential (commercial and institutional) subcategories.

2 Impact Assessment Measures

A required component of the regional and state water plans is to estimate the potential economic and social impacts of potential water shortages during a repeat of the drought of record. Consistent with previous water plans, ten impact measures were estimated and are described in Table 2-1.

Table 2-1 Socioeconomic impact analysis measures

Regional economic impacts	Description
Income losses - value-added	The value of output less the value of intermediate consumption; it is a measure of the contribution to gross domestic product (GDP) made by an individual producer, industry, sector, or group of sectors within a year. Value-added measures used in this report have been adjusted to include the direct, indirect, and induced monetary impacts on the region.
Income losses - electrical power purchase costs	Proxy for income loss in the form of additional costs of power as a result of impacts of water shortages.
Job losses	Number of part-time and full-time jobs lost due to the shortage. These values have been adjusted to include the direct, indirect, and induced employment impacts on the region.
Financial transfer impacts	**Description**
Tax losses on production and imports	Sales and excise taxes not collected due to the shortage, in addition to customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments less subsidies. These values have been adjusted to include the direct, indirect and induced tax impacts on the region.
Water trucking costs	Estimated cost of shipping potable water.
Utility revenue losses	Foregone utility income due to not selling as much water.
Utility tax revenue losses	Foregone miscellaneous gross receipts tax collections.
Social impacts	**Description**
Consumer surplus losses	A welfare measure of the lost value to consumers accompanying restricted water use.
Population losses	Population losses accompanying job losses.
School enrollment losses	School enrollment losses (K-12) accompanying job losses.

2.1 Regional Economic Impacts

The two key measures used to assess regional economic impacts are income losses and job losses. The income losses presented consist of the sum of value-added losses and the additional purchase costs of electrical power.

Income Losses - Value-added Losses

Value-added is the value of total output less the value of the intermediate inputs also used in the production of the final product. Value-added is similar to GDP, a familiar measure of the productivity of an economy. The loss of value-added due to water shortages is estimated by input-output analysis using the IMPLAN software package, and includes the direct, indirect, and induced monetary impacts on the region. The indirect and induced effects are measures of reduced income as well as reduced employee spending for those input sectors which provide resources to the water shortage impacted production sectors.

Income Losses - Electric Power Purchase Costs

The electrical power grid and market within the state is a complex interconnected system. The industry response to water shortages, and the resulting impact on the region, are not easily modeled using traditional input/output impact analysis and the IMPLAN model. Adverse impacts on the region will occur and are represented in this analysis by estimated additional costs associated with power purchases from other generating plants within the region or state. Consequently, the analysis employs additional power purchase costs as a proxy for the value-added impacts for the steam-electric power water use category, and these are included as a portion of the overall income impact for completeness.

For the purpose of this analysis, it is assumed that power companies with insufficient water will be forced to purchase power on the electrical market at a projected higher rate of 5.60 cents per kilowatt hour. This rate is based upon the average day-ahead market purchase price of electricity in Texas that occurred during the recent drought period in 2011. This price is assumed to be comparable to those prices which would prevail in the event of another drought of record.

Job Losses

The number of jobs lost due to the economic impact is estimated using IMPLAN output associated with each TWDB water use category. Because of the difficulty in predicting outcomes and a lack of relevant data, job loss estimates are not calculated for the steam-electric power category.

2.2 Financial Transfer Impacts

Several impact measures evaluated in this analysis are presented to provide additional detail concerning potential impacts on a portion of the economy or government. These financial transfer impact measures include lost tax collections (on production and imports), trucking costs for imported water, declines in utility revenues, and declines in utility tax revenue collected by the state. These measures are not solely adverse, with some having both positive and negative impacts. For example, cities and residents would suffer if forced to pay large costs for trucking in potable water. Trucking firms, conversely, would benefit from the transaction. Additional detail for each of these measures follows.

Tax Losses on Production and Imports

Reduced production of goods and services accompanying water shortages adversely impacts the collection of taxes by state and local government. The regional IMPLAN model is used to estimate reduced tax collections associated with the reduced output in the economy. Impact estimates for this measure include the direct, indirect, and induced impacts for the affected sectors.

Water Trucking Costs

In instances where water shortages for a municipal water user group are estimated by RWPGs to exceed 80 percent of water demands, it is assumed that water would need to be trucked in to support basic consumption and sanitation needs. For water shortages of 80 percent or greater, a fixed, maximum of $35,000[1] per acre-foot of water applied as an economic cost. This water trucking cost was utilized for both the residential and non-residential portions of municipal water needs.

Utility Revenue Losses

Lost utility income is calculated as the price of water service multiplied by the quantity of water not sold during a drought shortage. Such estimates are obtained from utility-specific pricing data provided by the Texas Municipal League, where available, for both water and wastewater. These water rates are applied to the potential water shortage to estimate forgone utility revenue as water providers sold less water during the drought due to restricted supplies.

Utility Tax Losses

Foregone utility tax losses include estimates of forgone miscellaneous gross receipts taxes. Reduced water sales reduce the amount of utility tax that would be collected by the State of Texas for water and wastewater service sales.

[1] Based on staff survey of water hauling firms and historical data concerning transport costs for potable water in the recent drought in California for this estimate. There are many factors and variables that would determine actual water trucking costs including distance to, cost of water, and length of that drought.

2.3 Social Impacts

Consumer Surplus Losses for Municipal Water Users

Consumer surplus loss is a measure of impact to the wellbeing of municipal water users when their water use is restricted. Consumer surplus is the difference between how much a consumer is willing and able to pay for a commodity (i.e., water) and how much they actually have to pay. The difference is a benefit to the consumer's wellbeing since they do not have to pay as much for the commodity as they would be willing to pay. Consumer surplus may also be viewed as an estimate of how much consumers would be willing to pay to keep the original quantity of water which they used prior to the drought. Lost consumer surplus estimates within this analysis only apply to the residential portion of municipal demand, with estimates being made for reduced outdoor and indoor residential use. Lost consumer surplus estimates varied widely by location and degree of water shortage.

Population and School Enrollment Losses

Population loss due to water shortages, as well as the associated decline in school enrollment, are based upon the job loss estimates discussed in Section 2.1. A simplified ratio of job and net population losses are calculated for the state as a whole based on a recent study of how job layoffs impact the labor market population.[2] For every 100 jobs lost, 18 people were assumed to move out of the area. School enrollment losses are estimated as a proportion of the population lost based upon public school enrollment data from the Texas Education Agency concerning the age K-12 population within the state (approximately 19%).

[2] Foote, Andrew, Grosz, Michel, Stevens, Ann. "Locate Your Nearest Exit: Mass Layoffs and Local Labor Market Response." University of California, Davis. April 2015, http://paa2015.princeton.edu/papers/150194. The study utilized Bureau of Labor Statistics data regarding layoffs between 1996 and 2013, as well as Internal Revenue Service data regarding migration, to model the change in the population as the result of a job layoff event. The study found that layoffs impact both out-migration and in-migration into a region, and that a majority of those who did move following a layoff moved to another labor market rather than an adjacent county.

3 Socioeconomic Impact Assessment Methodology

This portion of the report provides a summary of the methodology used to estimate the potential economic impacts of future water shortages. The general approach employed in the analysis was to obtain estimates for income and job losses on the smallest geographic level that the available data would support, tie those values to their accompanying historic water use estimate, and thereby determine a maximum impact per acre-foot of shortage for each of the socioeconomic measures. The calculations of economic impacts are based on the overall composition of the economy divided into many underlying economic sectors. Sectors in this analysis refer to one or more of the 536 specific production sectors of the economy designated within IMPLAN, the economic impact modeling software used for this assessment. Economic impacts within this report are estimated for approximately 330 of these sectors, with the focus on the more water-intensive production sectors. The economic impacts for a single water use category consist of an aggregation of impacts to multiple, related IMPLAN economic sectors.

3.1 Analysis Context

The context of this socioeconomic impact analysis involves situations where there are physical shortages of groundwater or surface water due to a recurrence of drought of record conditions. Anticipated shortages for specific water users may be nonexistent in earlier decades of the planning horizon, yet population growth or greater industrial, agricultural or other sector demands in later decades may result in greater overall demand, exceeding the existing supplies. Estimated socioeconomic impacts measure what would happen if water user groups experience water shortages for a period of one year. Actual socioeconomic impacts would likely become larger as drought of record conditions persist for periods greater than a single year.

3.2 IMPLAN Model and Data

Input-Output analysis using the IMPLAN software package was the primary means of estimating the value-added, jobs, and tax related impact measures. This analysis employed regional level models to determine key economic impacts. IMPLAN is an economic impact model, originally developed by the U.S. Forestry Service in the 1970's to model economic activity at varying geographic levels. The model is currently maintained by the Minnesota IMPLAN Group (MIG Inc.) which collects and sells county and state specific data and software. The year 2016 version of IMPLAN, employing data for all 254 Texas counties, was used to provide estimates of value-added, jobs, and taxes on production for the economic sectors associated with the water user groups examined in the study. IMPLAN uses 536 sector-specific Industry Codes, and those that rely on water as a primary input were assigned to their appropriate planning water user categories (irrigation, livestock, manufacturing, mining, and municipal). Estimates of value-added for a water use category were obtained by summing value-added estimates across the relevant IMPLAN sectors associated with that water use category. These calculations were also performed for job losses as well as tax losses on production and imports.

The adjusted value-added estimates used as an income measure in this analysis, as well as the job and tax estimates from IMPLAN, include three components:

- ***Direct effects*** representing the initial change in the industry analyzed;
- ***Indirect effects*** that are changes in inter-industry transactions as supplying industries respond to reduced demands from the directly affected industries; and,
- ***Induced effects*** that reflect changes in local spending that result from reduced household income among employees in the directly and indirectly affected industry sectors.

Input-output models such as IMPLAN only capture backward linkages and do not include forward linkages in the economy.

3.3 Elasticity of Economic Impacts

The economic impact of a water need is based on the size of the water need relative to the total water demand for each water user group. Smaller water shortages, for example, less than 5 percent, are generally anticipated to result in no initial negative economic impact because water users are assumed to have a certain amount of flexibility in dealing with small shortages. As a water shortage intensifies, however, such flexibility lessens and results in actual and increasing economic losses, eventually reaching a representative maximum impact estimate per unit volume of water. To account for these characteristics, an elasticity adjustment function is used to estimate impacts for the income, tax and job loss measures. Figure 3-1 illustrates this general relationship for the adjustment functions. Negative impacts are assumed to begin accruing when the shortage reaches the lower bound 'b1' (5 percent in Figure 3-1), with impacts then increasing linearly up to the 100 percent impact level (per unit volume) once the upper bound reaches the 'b2' level shortage (40 percent in Figure 3-1).

To illustrate this, if the total annual value-added for manufacturing in the region was $2 million and the reported annual volume of water used in that industry is 10,000 acre-feet, the estimated economic measure of the water shortage would be $200 per acre-foot. The economic impact of the shortage would then be estimated using this value-added amount as the maximum impact estimate ($200 per acre-foot) applied to the anticipated shortage volume and then adjusted by the elasticity function. Using the sample elasticity function shown in Figure 3-1, an approximately 22 percent shortage in the livestock category would indicate an economic impact estimate of 50% of the original $200 per acre-foot impact value (i.e., $100 per acre-foot).

Such adjustments are not required in estimating consumer surplus, utility revenue losses, or utility tax losses. Estimates of lost consumer surplus rely on utility-specific demand curves with the lost consumer surplus estimate calculated based on the relative percentage of the utility's water shortage. Estimated changes in population and school enrollment are indirectly related to the elasticity of job losses.

Assumed values for the lower and upper bounds 'b1' and 'b2' vary by water use category and are presented in Table 3-1.

Figure 3-1 Example economic impact elasticity function (as applied to a single water user's shortage)

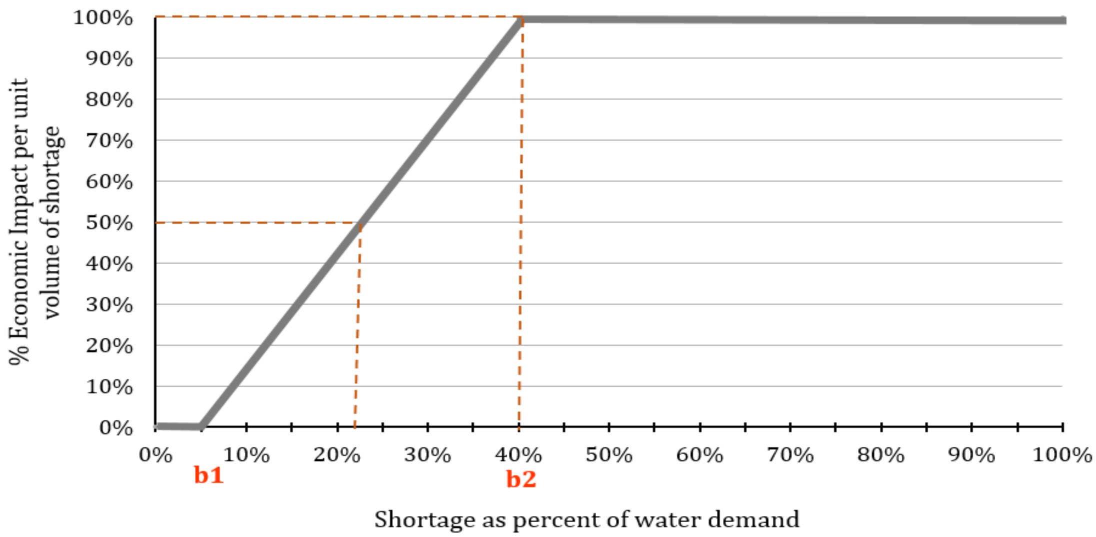


Table 3-1 Economic impact elasticity function lower and upper bounds

Water use category	Lower bound (b1)	Upper bound (b2)
Irrigation	**5%**	**40%**
Livestock	**5%**	**10%**
Manufacturing	**5%**	**40%**
Mining	**5%**	**40%**
Municipal (non-residential water intensive subcategory)	**5%**	**40%**
Steam-electric power	**N/A**	**N/A**

3.4 Analysis Assumptions and Limitations

The modeling of complex systems requires making many assumptions and acknowledging the model's uncertainty and limitations. This is particularly true when attempting to estimate a wide range of socioeconomic impacts over a large geographic area and into future decades. Some of the key assumptions and limitations of this methodology include:

1. The foundation for estimating the socioeconomic impacts of water shortages resulting from a drought are the water needs (potential shortages) that were identified by RWPGs as part of the

regional water planning process. These needs have some uncertainty associated with them but serve as a reasonable basis for evaluating the potential impacts of a drought of record event.

2. All estimated socioeconomic impacts are snapshots for years in which water needs were identified (i.e., 2020, 2030, 2040, 2050, 2060, and 2070). The estimates are independent and distinct "what if" scenarios for each particular year, and water shortages are assumed to be temporary events resulting from a single year recurrence of drought of record conditions. The evaluation assumed that no recommended water management strategies are implemented. In other words, growth occurs and future shocks are imposed on an economy at 10-year intervals, and the resulting impacts are estimated. Note that the estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

3. Input-output models such as IMPLAN rely on a static profile of the structure of the economy as it appears today. This presumes that the relative contributions of all sectors of the economy would remain the same, regardless of changes in technology, availability of limited resources, and other structural changes to the economy that may occur in the future. Changes in water use efficiency will undoubtedly take place in the future as supplies become more stressed. Use of the static IMPLAN structure was a significant assumption and simplification considering the 50-year time period examined in this analysis. To presume an alternative future economic makeup, however, would entail positing many other major assumptions that would very likely generate as much or more error.

4. This is not a form of cost-benefit analysis. That approach to evaluating the economic feasibility of a specific policy or project employs discounting future benefits and costs to their present value dollars using some assumed discount rate. The methodology employed in this effort to estimate the economic impacts of future water shortages did not use any discounting methods to weigh future costs differently through time.

5. All monetary values originally based upon year 2016 IMPLAN and other sources are reported in constant year 2018 dollars to be consistent with the water management strategy requirements in the State Water Plan.

6. IMPLAN based loss estimates (income-value-added, jobs, and taxes on production and imports) are calculated only for those IMPLAN sectors for which the TWDB's Water Use Survey (WUS) data was available and deemed reliable. Every effort is made in the annual WUS effort to capture all relevant firms who are significant water users. Lack of response to the WUS, or omission of relevant firms, impacts the loss estimates.

7. Impacts are annual estimates. The socioeconomic analysis does not reflect the full extent of impacts that might occur as a result of persistent water shortages occurring over an extended duration. The drought of record in most regions of Texas lasted several years.

8. Value-added estimates are the primary estimate of the economic impacts within this report. One may be tempted to add consumer surplus impacts to obtain an estimate of total adverse economic impacts to the region, but the consumer surplus measure represents the change to the wellbeing of households (and other water users), not an actual change in the flow of dollars through the economy. The two measures (value-added and consumer surplus) are both valid impacts but ideally should not be summed.

9. The value-added, jobs, and taxes on production and import impacts include the direct, indirect and induced effects to capture backward linkages in the economy described in Section 2.1. Population and school enrollment losses also indirectly include such effects as they are based on the associated losses in employment. The remaining measures (consumer surplus, utility revenue, utility taxes, additional electrical power purchase costs, and potable water trucking costs), however, do not include any induced or indirect effects.

10. The majority of impacts estimated in this analysis may be more conservative (i.e., smaller) than those that might actually occur under drought of record conditions due to not including impacts in the forward linkages in the economy. Input-output models such as IMPLAN only capture backward linkages on suppliers (including households that supply labor to directly affected industries). While this is a common limitation in this type of economic modeling effort, it is important to note that forward linkages on the industries that use the outputs of the directly affected industries can also be very important. A good example is impacts on livestock operators. Livestock producers tend to suffer substantially during droughts, not because there is not enough water for their stock, but because reductions in available pasture and higher prices for purchased hay have significant economic effects on their operations. Food processors could be in a similar situation if they cannot get the grains or other inputs that they need. These effects are not captured in IMPLAN, resulting in conservative impact estimates.

11. The model does not reflect dynamic economic responses to water shortages as they might occur, nor does the model reflect economic impacts associated with a recovery from a drought of record including:
    a. The likely significant economic rebound to some industries immediately following a drought, such as landscaping;
    b. The cost and time to rebuild liquidated livestock herds (a major capital investment in that industry);
    c. Direct impacts on recreational sectors (i.e., stranded docks and reduced tourism); or,
    d. Impacts of negative publicity on Texas' ability to attract population and business in the event that it was not able to provide adequate water supplies for the existing economy.

12. Estimates for job losses and the associated population and school enrollment changes may exceed what would actually occur. In practice, firms may be hesitant to lay off employees, even in difficult economic times. Estimates of population and school enrollment changes are based on regional evaluations and therefore do not necessarily reflect what might occur on a statewide basis.

13. **The results must be interpreted carefully. It is the general and relative magnitudes of impacts as well as the changes of these impacts over time that should be the focus rather than the absolute numbers.** Analyses of this type are much better at predicting relative percent differences brought about by a shock to a complex system (i.e., a water shortage) than the precise size of an impact. To illustrate, assuming that the estimated economic impacts of a drought of record on the manufacturing and mining water user categories are $2 and $1 million, respectively, one should be more confident that the economic impacts on manufacturing are twice as large as those on mining and that these impacts will likely be in the millions of dollars. But one should have less confidence that the actual total economic impact experienced would be $3 million.

14. The methodology does not capture "spillover" effects between regions – or the secondary impacts that occur outside of the region where the water shortage is projected to occur.

15. The methodology that the TWDB has developed for estimating the economic impacts of unmet water needs, and the assumptions and models used in the analysis, are specifically designed to estimate potential economic effects at the regional and county levels. Although it may be tempting to add the regional impacts together in an effort to produce a statewide result, the TWDB cautions against that approach for a number of reasons. The IMPLAN modeling (and corresponding economic multipliers) are all derived from regional models – a statewide model of Texas would produce somewhat different multipliers. As noted in point 14 within this section, the regional modeling used by TWDB does not capture spillover losses that could result in other regions from unmet needs in the region analyzed, or potential spillover gains if decreased production in one region leads to increases in production elsewhere. The assumed drought of record may also not occur in every region of Texas at the same time, or to the same degree.

4 Analysis Results

This section presents estimates of potential economic impacts that could reasonably be expected in the event of water shortages associated with a drought of record and if no recommended water management strategies were implemented. Projected economic impacts for the six water use categories (irrigation, livestock, manufacturing, mining, municipal, and steam-electric power) are reported by decade.

4.1 Impacts for Irrigation Water Shortages

Seven of the eight counties in the region are projected to experience water shortages in the irrigated agriculture water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-1. Note that tax collection impacts were not estimated for this water use category. IMPLAN data indicates a negative tax impact (i.e., increased tax collections) for the associated production sectors, primarily due to past subsidies from the federal government. However, it was not considered realistic to report increasing tax revenues during a drought of record.

Table 4-1 Impacts of water shortages on irrigation in Region M

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$387	$366	$345	$324	$303	$283
Job losses	5,738	5,424	5,113	4,808	4,502	4,203

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.2 Impacts for Livestock Water Shortages

Four of the eight counties in the region are projected to experience water shortages in the livestock water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-2.

Table 4-2 Impacts of water shortages on livestock in Region M

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$20	$20	$17	$17	$17	$17
Jobs losses	711	691	574	574	574	574
Tax losses on production and imports ($ millions)*	$1	$1	$1	$1	$1	$1

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.3 Impacts of Manufacturing Water Shortages

Manufacturing water shortages in the region are projected to occur in six of the eight counties in the region for at least one decade of the planning horizon. Estimated impacts to this water use category appear in Table 4-3.

Table 4-3 Impacts of water shortages on manufacturing in Region M

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$2,306	$2,780	$2,780	$2,780	$2,780	$2,780
Job losses	21,770	26,905	26,905	26,905	26,905	26,905
Tax losses on production and Imports ($ millions)*	$154	$193	$193	$193	$193	$193

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.4 Impacts of Mining Water Shortages

Mining water shortages in the region are projected to occur in six of the eight counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use type appear in Table 4-4.

Table 4-4 Impacts of water shortages on mining in Region M

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$4,699	$3,226	$1,967	$1,494	$946	$1,046
Job losses	22,042	15,438	9,697	7,647	5,280	5,967
Tax losses on production and Imports ($ millions)*	$589	$398	$237	$174	$101	$109

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.5 Impacts for Municipal Water Shortages

Seven of the eight counties in the region are projected to experience water shortages in the municipal water use category for one or more decades within the planning horizon.

Impact estimates were made for two sub-categories within municipal water use: residential and non-residential. Non-residential municipal water use includes commercial and institutional users, which are further divided into non-water-intensive and water-intensive subsectors including car wash, laundry, hospitality, health care, recreation, and education. Lost consumer surplus estimates were made only for needs in the residential portion of municipal water use. Available IMPLAN and TWDB Water Use Survey data for the non-residential, water-intensive portion of municipal demand allowed these sectors to be included in income, jobs, and tax loss impact estimate.

Trucking cost estimates, calculated for shortages exceeding 80 percent, assumed a fixed, maximum cost of $35,000 per acre-foot to transport water for municipal use. The estimated impacts to this water use category appear in Table 4-5.

Table 4-5 Impacts of water shortages on municipal water users in Region M

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses[1] ($ millions)*	$259	$560	$1,046	$1,594	$2,219	$2,914
Job losses[1]	5,905	12,785	23,865	36,374	50,656	66,513
Tax losses on production and imports[1] ($ millions)*	$26	$57	$107	$163	$226	$297
Trucking costs ($ millions)*	$0	$0	$1	$1	$2	$2
Utility revenue losses ($ millions)*	$75	$151	$251	$366	$488	$613
Utility tax revenue losses ($ millions)*	$1	$3	$5	$7	$10	$12

[1] Estimates apply to the water-intensive portion of non-residential municipal water use.
* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.6 Impacts of Steam-Electric Water Shortages

Steam-electric water shortages in the region are projected to occur in two of the eight counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-6.

Note that estimated economic impacts to steam-electric water users:

- Are reflected as an income loss proxy in the form of estimated additional purchasing costs for power from the electrical grid to replace power that could not be generated due to a shortage;
- Do not include estimates of impacts on jobs. Because of the unique conditions of power generators during drought conditions and lack of relevant data, it was assumed that the industry would retain, perhaps relocating or repurposing, their existing staff in order to manage their ongoing operations through a severe drought.
- Do not presume a decline in tax collections. Associated tax collections, in fact, would likely increase under drought conditions since, historically, the demand for electricity increases during times of drought, thereby increasing taxes collected on the additional sales of power.

Table 4-6 Impacts of water shortages on steam-electric power in Region M

Impacts measure	2020	2030	2040	2050	2060	2070
Income Losses ($ millions)*	$334	$321	$315	$315	$315	$315

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.7 Regional Social Impacts

Projected changes in population, based upon several factors (household size, population, and job loss estimates), as well as the accompanying change in school enrollment, were also estimated and are summarized in Table 4-7.

Table 4-7 Region-wide social impacts of water shortages in Region M

Impacts measure	2020	2030	2040	2050	2060	2070
Consumer surplus losses ($ millions)*	$39	$82	$192	$341	$559	$844
Population losses	10,312	11,244	12,146	14,010	16,142	19,124
School enrollment losses	1,972	2,151	2,323	2,680	3,088	3,658

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

Appendix A - County Level Summary of Estimated Economic Impacts for Region M

County level summary of estimated economic impacts of not meeting identified water needs by water use category and decade (in 2018 dollars, rounded). Values are presented only for counties with projected economic impacts for at least one decade.
(* Entries denoted by a dash (-) indicate no estimated economic impact)

		Income losses (Million $)*						Job losses					
County	Water Use Category	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
CAMERON	IRRIGATION	$103.92	$98.91	$93.90	$88.88	$83.87	$78.86	1,692	1,611	1,529	1,447	1,366	1,284
CAMERON	LIVESTOCK	$2.15	$2.15	$2.15	$2.15	$2.15	$2.15	71	71	71	71	71	71
CAMERON	MANUFACTURING	$2,181.94	$2,617.45	$2,617.45	$2,617.45	$2,617.45	$2,617.45	19,243	23,083	23,083	23,083	23,083	23,083
CAMERON	MUNICIPAL	$39.90	$60.96	$122.19	$225.04	$374.31	$578.29	911	1,391	2,789	5,136	8,543	13,199
CAMERON	STEAM ELECTRIC POWER	$218.99	$218.99	$218.99	$218.99	$218.99	$218.99	-	-	-	-	-	-
CAMERON Total		**$2,546.89**	**$2,998.46**	**$3,054.67**	**$3,152.51**	**$3,296.77**	**$3,495.73**	**21,916**	**26,156**	**27,472**	**29,738**	**33,063**	**37,637**
HIDALGO	IRRIGATION	$207.74	$196.56	$185.39	$174.40	$163.06	$151.89	2,977	2,817	2,657	2,500	2,337	2,177
HIDALGO	LIVESTOCK	$4.49	$3.90	$3.90	$3.90	$3.90	$3.90	152	132	132	132	132	132
HIDALGO	MINING	$54.02	$129.53	$173.99	$221.67	$276.41	$345.75	425	1,019	1,369	1,745	2,175	2,721
HIDALGO	MUNICIPAL	$187.35	$448.46	$851.03	$1,253.55	$1,629.31	$1,997.16	4,276	10,236	19,424	28,611	37,187	45,583
HIDALGO	STEAM ELECTRIC POWER	$114.58	$102.49	$96.10	$96.10	$96.10	$96.10	-	-	-	-	-	-
HIDALGO Total		**$568.18**	**$880.95**	**$1,310.41**	**$1,749.62**	**$2,168.78**	**$2,594.80**	**7,831**	**14,205**	**23,583**	**32,988**	**41,832**	**50,614**
JIM HOGG	IRRIGATION	$0.04	$0.04	$0.04	$0.03	$0.03	$0.02	1	1	1	1	1	1
JIM HOGG	MANUFACTURING	$0.57	$0.57	$0.57	$0.57	$0.57	$0.57	33	33	33	33	33	33
JIM HOGG Total		**$0.61**	**$0.61**	**$0.61**	**$0.60**	**$0.60**	**$0.59**	**34**	**34**	**34**	**34**	**34**	**34**
MAVERICK	IRRIGATION	$12.02	$9.62	$7.43	$5.46	$3.73	$2.29	176	141	109	80	55	33
MAVERICK	MANUFACTURING	$0.23	$0.23	$0.23	$0.23	$0.23	$0.23	2	2	2	2	2	2
MAVERICK	MINING	$362.84	$1,154.08	$1,323.37	$769.69	$81.32	-	1,682	5,349	6,133	3,567	377	-
MAVERICK	MUNICIPAL	$2.57	$7.99	$18.23	$33.51	$52.05	$64.03	59	182	416	765	1,188	1,461
MAVERICK Total		**$377.66**	**$1,171.93**	**$1,349.26**	**$808.90**	**$137.33**	**$66.55**	**1,918**	**5,674**	**6,660**	**4,414**	**1,621**	**1,497**

County	Water Use Category	Income losses (Million $)* 2020	2030	2040	2050	2060	2070	Job losses 2020	2030	2040	2050	2060	2070
STARR	IRRIGATION	$27.60	$26.52	$25.44	$24.36	$23.28	$22.20	370	356	341	327	312	298
STARR	LIVESTOCK	$5.86	$5.86	$5.86	$5.86	$5.86	$5.86	200	200	200	200	200	200
STARR	MANUFACTURING	$5.88	$21.46	$21.46	$21.46	$21.46	$21.46	342	1,247	1,247	1,247	1,247	1,247
STARR	MINING	$253.50	$361.78	$428.81	$500.13	$588.64	$700.36	1,175	1,677	1,987	2,318	2,728	3,246
STARR	MUNICIPAL	$25.90	$35.70	$42.88	$50.38	$57.51	$64.09	591	815	979	1,150	1,313	1,463
STARR Total		**$318.74**	**$451.31**	**$524.44**	**$602.18**	**$696.74**	**$813.96**	**2,678**	**4,294**	**4,754**	**5,241**	**5,799**	**6,453**
WEBB	MANUFACTURING	$115.50	$137.76	$137.76	$137.76	$137.76	$137.76	2,017	2,406	2,406	2,406	2,406	2,406
WEBB	MINING	$4,004.31	$1,555.91	$31.86	-	-	-	18,601	7,227	148	-	-	-
WEBB	MUNICIPAL	$0.27	$0.42	$0.62	$16.45	$87.80	$188.59	6	10	14	375	2,004	4,304
WEBB Total		**$4,120.08**	**$1,694.09**	**$170.24**	**$154.21**	**$225.56**	**$326.35**	**20,624**	**9,643**	**2,568**	**2,782**	**4,410**	**6,711**
WILLACY	IRRIGATION	$30.00	$28.79	$27.53	$26.32	$25.11	$23.89	449	431	412	394	375	357
WILLACY	LIVESTOCK	$7.91	$7.91	$4.71	$4.71	$4.71	$4.71	288	288	172	172	172	172
WILLACY	MINING	$23.92	$24.90	$8.79	$2.63	-	-	159	166	58	18	-	-
WILLACY	MUNICIPAL	$2.39	$5.66	$8.53	$10.71	$12.83	$14.85	55	129	195	244	293	339
WILLACY Total		**$64.22**	**$67.26**	**$49.56**	**$44.37**	**$42.65**	**$43.46**	**951**	**1,014**	**837**	**827**	**840**	**868**
ZAPATA	IRRIGATION	$5.43	$5.14	$4.85	$4.55	$4.26	$3.97	72	68	64	60	56	52
ZAPATA	MANUFACTURING	$2.29	$2.29	$2.29	$2.29	$2.29	$2.29	133	133	133	133	133	133
ZAPATA	MUNICIPAL	$0.36	$0.95	$2.14	$4.00	$5.58	$7.16	8	22	49	91	127	163
ZAPATA Total		**$8.08**	**$8.38**	**$9.28**	**$10.85**	**$12.13**	**$13.42**	**213**	**223**	**246**	**285**	**317**	**349**
REGION M Total		**$8,004.47**	**$7,272.98**	**$6,468.47**	**$6,523.25**	**$6,580.56**	**$7,354.85**	**56,165**	**61,242**	**66,154**	**76,308**	**87,917**	**104,162**

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Appendix E: Drought Response Plans and Recommendations

1 A Summary of the Drought Contingency Plans (DCPs)

2 Model DCPs and Water Conservation Plans (WCPs)

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	Agua Special Utility District, 4/25/2019	
BASIS OF DROUGHT	Reservoir level, water demand/WTP and pump capacity, emergency situation	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) US waters of the Amistad and Falcon reservoirs is equal to or less than 40% storage capacity, b) any of the WTP are operating at or above 65% total daily capacity for 3 consecutive days, c) water system pumps are operating at or above 65% total daily capacity for 3 consecutive days	Customers are required to follow a certain schedule in order to: irrigate landscapes, wash vehicles, add water to pools, and irrigate golf courses/parks/greenbelt. The following are prohibited: operating ornamental fountains unless required to support aquatic life or if recirculation is used, use of water from hydrants or flush valves unless required to maintain public health, safety, and welfare, washing down hard-surfaced areas or structures, use of water for dust control, permitting water to run into any gutter or street, failure to repair controllable leaks within a reasonable period of time, any waste of water.
Stage 2	a) US waters of the Amistad and Falcon reservoirs is equal to or less than 30% storage capacity, b) any of the WTPs are operating at or above 75% total daily capacity for 3 consecutive days, c) water system pumps are operating at or above 75% total daily capacity for 3 consecutive days	Customers are required to follow a certain schedule in order to: irrigate landscapes in a hand-help watering manner, wash vehicles, and add water to pools. The following are prohibited: irrigating landscapes with a sprinkler, irrigating gold courses/parks/greenbelt, operating ornamental fountains unless required to support aquatic life or if recirculation is used, use of water from hydrants or flush valves unless required to maintain public health, safety, and welfare, washing down hard-surfaced areas or structures, use of water for dust control, permitting water to run into any gutter or street, failure to repair controllable leaks within a reasonable period of time, any waste of water.
Stage 3	a) US waters of the Amistad and Falcon reservoirs is equal to or less than 25% storage capacity, b) any of the WTPs are operating at or above 85% total daily capacity for 3 consecutive days, c) water system pumps are operating at or above 75% total daily capacity for 3 consecutive days	Customers are required to follow a stricter schedule in order to irrigate landscapes in a hand-help watering manner. The following are prohibited: washing vehicles, adding water to pools, irrigating landscapes with a sprinkler, irrigating gold courses/parks/greenbelt, operating ornamental fountains unless required to support aquatic life or if recirculation is used, use of water from hydrants or flush valves unless required to maintain public health, safety, and welfare, washing down hard-surfaced areas or structures, use of water for dust control, permitting water to run into any gutter or street, failure to repair controllable leaks within a reasonable period of time, any waste of water. No applications for any new or expanded water service connections will be approved.

Stage 4	a) US waters of the Amistad and Falcon reservoirs is equal to or less than 20% storage capacity, b) any of the WTPs are operating at or above 90% total daily capacity for 24 consecutive hours, c) water system pumps are operating at or above 90% total daily capacity for 24 consecutive hours, d) an immediate reduction in water use is required to protect the public health and safety and/or integrity of the water system	The following are prohibited: irrigation of landscaped area, all outdoor use of water, washing vehicles, adding water to pools, irrigating gold courses/parks/greenbelt, operating ornamental fountains unless required to support aquatic life or if recirculation is used, use of water from hydrants or flush valves unless required to maintain public health, safety, and welfare, washing down hard-surfaced areas or structures, use of water for dust control, permitting water to run into any gutter or street, failure to repair controllable leaks within a reasonable period of time, any waste of water. No applications for any new or expanded water service connections will be approved.
	City of Alamo, 3/28/2014	
BASIS OF DROUGHT	Time of year, water demand/WTP capacity, system break/failure or contamination	
	TRIGGERS:	**ACTIONS:**
Stage 1	Initiated automatically May 1 through Sept. 30 each year	a) customers requested to voluntarily limit landscape irrigation to certain days and times. b) all operations of the city of Alamo will adhere to restrictions in Stage 2. c) customers requested to practice water conservation and minimize or discontinue water use for non-essential purposes.
Stage 2	Daily water use equals or exceeds 85% of treatment capacity for 7 consecutive days	a)City to reduce flushing of water mains. b) required schedule and/or means restricted for the following: landscape irrigation, washing motor vehicles, filling pools, irrigation of golf courses unless using alternate water source. c) the following are prohibited: operation of fountains or ponds except to support aquatic life or with recirculation system; use of hydrants except for fire fighting, construction with special permit, and other necessary activities; serving water in restaurants except when requested; all non-essential uses and failure to repair controllable leak(s)
Stage 3	Daily water use equals or exceeds 95% of treatment capacity for 7 consecutive days and/or reservoir levels continually recede on a daily basis and remain below 74% of capacity for 48 consecutive hours, and/or water pressure below 20 psi occurs in distribution system.	City to reduce or discontinue flushing of water mains and irrigation of public landscaped areas, as well as use alternative supply sources. All requirements from Stage 2 except: schedule and means further restricted for landscape irrigation, watering of golf courses prohibited unless using alternate water source, use of hydrants for construction with special permit to be discontinued.

Stage 4	Daily water use equals or exceeds 120% of treatment capacity for 3 consecutive days and/or the reservoir levels continually recede on a daily basis and remain below 50% capacity for 24 consecutive hours, and/or water pressure bellow 20 psi occurs in distribution system and the City Manager determines such conditions are a hazard to public health and safety.	City to reduce or discontinue flushing of water mains and irrigation of public landscaped areas, as well as use alternative supply sources. All requirements from Stage 2 and 3 except: schedule and means further restricted for landscape irrigation and washing of motor vehicles; use of water for swimming pools prohibited; no applications for new, additional, or expanded water connections, meters, lines, etc. shall be approved.
Stage 5	1. Major water lines break, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	City to discontinue flushing of water mains, fire hydrants, and irrigation of public landscaped areas. All requirements from Stages 2, 3, and 4 except: irrigation of landscaped areas and use of water to wash motor vehicles is absolutely prohibited. Stage 6 - Water allocation according to water allocation plan.

Brownsville Public Utilities Board, 4/24/2019

BASIS OF DROUGHT	Time of year, reservoir level, system break/failure or contamination, water demand/WTP capacity, projected water demand	
	TRIGGERS:	**ACTIONS:**
Stage 1	Automatically initiated on May 1 of each year and for any of the following: a) TCEQ Rio Grande Watermaster advises that a water shortage is possible due to low levels in Amistad and Falcon reservoirs, b) level of US' water in Amistad and Falcon reservoirs reaches 51%, c) line break, pump, or system failure may result in unprecedented loss of capability to provide service, or d) peak demand on the distribution system and/or treatment plants is nearing capacity limits	Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses.

Stage 2	a) Level of US' water in Amistad and Falcon reservoirs reaches 25%, b) analyses of water supply and demand indicate that the annual water allotment may be exhausted, c) line break or pump, or system failure will result in unprecedented loss of capability to provide service, d) peak demands on the distribution system and/or treatment plants are nearing capacity levels, or e) contamination of the water supply and/or transmission system may result in unprecedented loss of capability to provide service	Customers shall only be allowed to irrigate and wash vehicles following a certain schedule, golf courses shall follow restrictions in their approved water management plans, restaurants may only serve water to customers upon request, and the following are prohibited unless necessary for public health and safety: washing hard-surfaced areas, washing buildings or structures, using water for dust control, flushing gutters, and failing to repair controllable leaks within a reasonable period of time
Stage 3	a) Level of US' water in Amistad and Falcon reservoirs reaches 15%, b) analyses of water supply and demand the annual water allotment will be exhausted, c) major line break, or pump or system failure may result in unprecedented loss of capability to provide service, d) peak demand on the distribution system and/or treatment plants has exceeded capacity levels for three days, e) contamination of the water supply and/or transmission system will result in unprecedented loss of capability to provide service, or f) the inability to maintain or replenish adequate volumes of water in storage to provide for public health and safety	All requirements of Stage 2 shall remain in effect and in addition the schedule irrigation and vehicle washing will be further restricted, the use of water from hydrants is only allowed when necessary to maintain public health, safety, and/or welfare, and the following are prohibited: refilling outdoor pools (with some exceptions), operation of outdoor fountains or ponds without recirculation systems unless required to maintain aquatic life, hydrant and sewer flushing except for emergencies, and use of water from or pumping water into resacas.
Stage 4	a) Major line breaks, or pump or system failures occur which cause unprecedented loss of capability to provide water service, or b) contamination of water supply and/or transmission system	All requirements of Stage 3 shall remain in effect and in addition the following are prohibited: all landscaping watering, use of water for construction purposes under special permit, adding water to swimming pools, adding water to any outdoor or indoor fountain or pond, except to maintain aquatic life
	City of Donna 9/1/2007	
BASIS OF DROUGHT	Water treatment plant operations, line breaks or system failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	Total daily water demand equals or exceeds 82.2 percent of the system's safe operating capacity for 3 consecutive days.	a) customers requested to voluntarily limit landscape irrigation to certain days and times. b) all operations of the city of Alamo will adhere to restrictions in Stage 2. c) customers requested to practice water conservation and minimize or discontinue non-essential water use.

Stage 2	Total daily water demand equals or exceeds 86.6 percent of the system's safe operating capacity for 3 consecutive days.	City shall reduce flushing of water mains. a) schedule and/or means of the following are restricted: landscape irrigation, washing of motor vehicles, use of water for pools, golf course irrigation. b) The following are prohibited: use of water for fountains or ponds, except to support aquatic life; use of hydrants, except for fire fighting, construction with special permit, and necessary activities; serving water in restaurants unless requested; all non-essential uses.
Stage 3	Total daily water demand equals or exceeds 91.1 percent of the system's safe operating capacity for 3 consecutive days.	City shall discontinue flushing of water mains and inspect water distribution system, tanks, and treatment plants to locate leaks and make repairs. All requirements of Stage 2 in effect except: Further restrictions on schedule and means of landscape irrigation, watering of golf courses prohibited unless using alternate water source, use of hydrants for construction with special permit discontinued.
Stage 4	Total daily water demand equals or exceeds 95.5 percent of the system's safe operating capacity for 3 consecutive days.	City shall actively pursue the detection, repair, and correction of leaks by means of watering, analysis of water system and billing data, use of leak detection equipment, or use of control devices. All requirements of Stage 3 in effect except: further restrictions on schedule and means of landscape irrigation and washing motor vehicles; water for pools prohibited; water for fountains prohibited except for aquatic life; and no applications for new, additional, or expanded water service connections, lines, etc. shall be allowed.
Stage 5	a) Major water line breaks or pump or system failures occur, causing unprecedented loss of capability to provide water service, or b) Natural of man-made contamination of water supply source(s), or c) unavailability of water supply, unavailability of alternate sources of water, or drought of record conditions which cause unprecedented loss of capability to provide water service	All requirements of stage 4 remain in effect except: landscape irrigation and use of water to wash motor vehicles is absolutely prohibited.
	Eagle Pass Water Works System, 9/15/2017	
BASIS OF DROUGHT	Water demand, distribution system pressure, system break/failure or contamination	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) Daily Water demand exceeds 85% of the rated plant capacity for three consecutive days, or b) distribution pressure remains below 45 psi for more than six consecutive days	Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses.

Stage 2	a) Daily water demand exceeds 90% of the rated plant capacity for three consecutive days, or b) distribution pressure remains below 43 psi for more than six consecutive days	Customers are required to follow an irrigation schedule and the following are prohibited unless necessary for public health and safety: waste of water, car, window, or pavement washing without the use of a bucket, street washing, fire hydrant flushing, filling swimming pools, athletic field watering
Stage 3	a) Daily water demand exceeds 95% of the rated plant capacity for three consecutive days, b) distribution system pressure remains below 40 psi for more than six consecutive days, c) contamination of the supply sources, or d) system outage due to the failure or damage of major water system components	All requirements of Stage 2 shall remain in effect and in addition all outdoor water use is banned and limits will be set on water use by both commercial and resident users
	East Rio Hondo Water Supply Corporation 6/25/2019	
BASIS OF DROUGHT	Reservoir level, irrigation district notice to disallow irrigation, water demand, system break/failure or contamination, distribution system pressure	
	TRIGGERS:	**ACTIONS:**
Stage 1	Falcon and Amistad Reservoirs reach 40% of capacity as determined by the TCEQ	Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses.
Stage 2	a) Cameron County Irrigation District No. 2 or other IDs provide notice to ERHWSC that they will disallow farm irrigation water use within 60-90 days, b) distribution system pressures fall below 35 psi requirements for two consecutive days, c) ERHWSC consumer demand exceeds 85% of ERHWSC plan capacity for 15 days out of any consecutive 30 day period, or d) Falcon and Amistad Reservoirs reach 15% of capacity as determined by TCEQ.	Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses, such as irrigation, washing vehicles, and ornamental fountains and ponds.
Stage 3	a) Major water line breaks, or pump or system failures occur, which cause loss of capability to provide water service, b) natural or man-made contamination of the water supply source(s), c) rapidly occurring low- pressure conditions (less than 20 psi) due to any reason.	All requirements of Stage 2 shall remain in effect, except the following are prohibited: all irrigation of landscape, using water to wash any vehicle, and adding water to any type of pool.
	Harlingen Waterworks System 6/15/2015	
BASIS OF DROUGHT	City reservoir levels, flowrate in the Rio Grande, Palmer Drought Severity Index, WTP demands, and system breaks or failures	
	TRIGGERS:	**ACTIONS:**

Stage 1	When three or more of the following criteria are met: 1) City reservoir levels = 43' MFR & 40' DTW and falling, 2) Rio Grande River flows = 13.0 cm/s, 3) PDSI = moderate drought (-2.0 to -2.9), 4) Water demand = 70% of WTP Capacity (26.2 MGD)	Customers are requested to voluntarily conserve water by limiting the irrigation od landscaped areas and minimize waster use for non-essential purposes. All operations of Harlingen Waterworks System shall adhere to water restrictions prescribed for Stage 2.
Stage 2	When three or more of the following criteria are met: 1) City reservoir levels = 42' MFR & 39' DTW and falling, 2) Rio Grande River flows = 12.0 cm/s, 3) PDSI = severe drought (-3.0 to -3.9), 4) Water demand = 80% of WTP Capacity (26.2 MGD)	Irrigation of landscape not by use of a hand-held hose, bucket, or drip irrigation shall be on a schedule based on location. Automobile washing not at a commercial facility will be limited to the irrigation schedule and will only be permitted with a hand-held bucket or hose with shut off nozzle. Use of water from fire hydrants will only be allowed for fire fighting or activities to maintain public health, safety, and welfare without a special permit. Golf course irrigation will only be allowed between 11pm and 6am.
Stage 3	When three or more of the following criteria are met: 1) City reservoir levels = 41' MFR & 38' DTW and falling, 2) Rio Grande River flows = 11.0 cm/s, 3) PDSI = extreme drought (-4.0 or less), 4) Water demand = 90% of WTP Capacity (26.2 MGD)	The schedule for landscape irrigation is limited further. Use of water to fill pools is only allowed on watering days. Operation of ornamental fountains will only be allowed if they are necessary to sustain aquatic life or equipped with recirculation system. Only greens and tees on golf courses may be watered. Restaurants may only serve water to their customers when it is requested. The following are prohibited: wash down of sidewalks, walkways, driveways, parking lots, tennis courts, or other hard surfaces; wash down of buildings or structures; use of water for dust control; flushing gutters or permitting water to accumulate in a gutter or street; failure to repair a controllable leak within a reasonable period of time
Stage 4	All four of the criteria of Stage 3 are met; a major pipeline breaks or pump system failure occurs which causes unprecedented loss of capacity to provide water service; or contamination of the water supply	The following are prohibited: all outdoor use of water (including irrigation) except for the direct need to protect the health, safety, and welfare of the public; washing automobiles; filling pools; operation of ornamental fountains unless necessary to sustain aquatic life. The General Manager is authorized to deny any new or expanded water connections, pipeline extensions, etc.
	Laguna Madre Water District, 3/3/2019	
BASIS OF DROUGHT	Storage in Amistad-Falcon Reservoir system, water use compared with system capacity, utility's amount of water in storage, treatment or delivery failures, high demand periods like holidays.	
	TRIGGERS:	**ACTIONS:**
Stage 1	Voluntary conservation is the first stage. It is always in effect unless a higher stage is required and enacted.	Voluntary Water Use Restrictions: 1. Recommend that all landscape areas be irrigated on a twice per week or less schedule and that such irrigation occur from midnight through 7 am or other schedules as determined from the General manager; 2. Recommend water customers to discontinue water use for non- essential purposes such as washing any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard surface areas

Stage 2	1. When the level of U.S. water stored in Amistad and Falcon Reservoirs reaches 51% or 1,660,000 AF (or below). When the level of water is above this amount, this phase is terminated. 2. Average daily water use is approaching 90% of system capacity, 3.Net storage in District's raw water reservoirs are at 75% and is continually decreasing on a daily basis such that a more serious problem may develop, 4.The availability of raw water is low. 5. The availability of water rights based on quarterly capacity: 1st - 20%, 2nd-40%, 3rd-70%. 6. The capacity to transport and/or treat raw water has been affected. 7. The distribution capacity to customers is approaching a maximum. 8. The reservoir III level at WTP #2 is at 7 feet and dropping.	1. Landscape irrigation will be permitted from 7 pm through 7 am and on designated water days. 2. Use of water to wash any motor vehicle, trucks, trailers, boats, airplanes, and other mobile equipment will be prohibited except of the landscape water days described above. 3. Water use for non-essential purposes is prohibited.
Stage 3	1. During peak demand days such as Texas Week, Easter, Memorial Day, and Labor Day. 2. When the level of US water stored in Amistad and Falcon Reservoirs reaches 25% or 834,600 AF (or below). When the level of water is above this amount, this phase may be terminated. 3. Net storage in District's raw water reservoirs is at 50% and is continually decreasing on a daily basis such that a more serious problem may develop. 4. The availability of raw water is low. 5. The availability of water rights based on quarterly capacity: 1st-22%, 2nd-46%, 3rd-81%	1. During Spring Break (Texas Week) landscape irrigation will be restricted from 9am the Friday before the actual date of Spring Break through Monday at 9am. Peak demands on other Holidays falling on a Tuesday, Wednesday, or Thursday will have restrictions beginning at 9am a day before the holiday and ending a day after at 9am. Holidays falling on Friday thru Monday will have restrictions beginning on Friday 9am and end on Monday at 9am. 2. Landscape irrigation will be permitted on designated water days. Landscape irrigation with a hand-held garden hose, soaker hose, hand-held bucket or water can, no more than 5 gallons capacity or drip irrigation. Landscape irrigation time will be 7pm to 7am. 3. Commercial nurseries and other similar establishments will have these water restrictions: hand-held buckets or water cans from 7pm - 7am, drip or sprinkler irrigation systems from 7pm-7am. 4. Water use for non-essential purposes is prohibited. 5. Permitting or maintaining defective plumbing in a home or business is prohibited. 6. Operation of any outdoor ornamental fountain or pond for aesthetic or scenic purposes is prohibited, except where necessary to support aquatic life or where such fountain or ponds are equipped with a water recirculation system. 7. Landscape irrigation variances are available but customers need to apply by mail. Facsimile, or email their name, address where the new landscape is to be installed, and the date of installation

Stage 4	1. When the level of US water stored in Amistad and Falcon Reservoirs reaches 15% or 504,600 AF (or below). 2. When a condition related to unexpected circumstances, such as a major problem on the water system due to natural disaster or unanticipated restriction on the raw water delivery system that immediately diminishes the LMWD's ability to deliver a normal water level. 3. Net storage in district's raw water reservoirs is at 25% and is continually decreasing on a daily basis such that a more serious problem may develop. 4. water demand is exceeding the system's capacity on a regular basis. 5. Rio Grande River level is so low that the River Pumps cannot pump the daily raw water demand. 6. All raw water is being pumped from District's Storage Reservoirs and all replenishment of raw Water Reservoirs has stopped. 7. The availability of water rights based on quarterly capacity: 1st-24%, 2nd-50%, 3rd-89%. 8. Contamination of the water supply and/or transmission and distribution system due to hurricanes, freezes and/or other natural disasters or man- made cause may result in extraordinary loss of capability to provide service. 9. The alternative water source for the LMWD is to purchase "water" from another system or from a retail entity.	1. Water use for non-essential purposes is prohibited, including landscape water irrigation, washing of mobile vehicles, watering of golf courses, use of fountains. 2. The use of fire hydrants for any purpose other than fire fighting is prohibited. The water District's General Manager may permit the use of metered fire hydrant water to clear or clean sanitary or storm sewers. 3. The use of water by golf courses for landscape irrigation is prohibited except: areas designated as tees and greens, between 7pm and 7am on designated days. 4. Industrial customers are required to implement an individual water conservation plans. The plans are subject to approval by the Water District's General manager and/or his designee. 5. If the customer already has a water connection, a new water service connection is prohibited. 6. Restaurants will be prohibited from serving water to customers except when requested by customers. 7. The use of water for the expansion of commercial nursery facilities is prohibited. 8. No applications for new, additional, expanded, or increased-in-size water service connections, meters, service lines, or other water service facilities shall be allowed, approved, or installed except as directed by the water District's General Manager. 9. Maximum amounts of monthly water usage and surcharges may be implemented during the emergency as directed by the LMWD's General Manager with approval of the water district's Board of Directors. 10. The water Districts General Manager is authorized to take any actions deemed necessary to meet conditions resulting from the emergency. 11. Violation of this policy is subject to any or all of the following: $200 fine, disconnection of service. 12. Imposing of surcharges fee would be initiated.
	City of Laredo, 8/7/2019	
BASIS OF DROUGHT	Water demand/WTP capacity, reservoir level	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) WTP flow is less than 85% capacity for 5 consecutive days, b) Amistad reservoir level reaches 51% capacity	Customer are asked to voluntarily reduce their water usage and the following are prohibited: allowing irrigation water to run off into a gutter, ditch, drain, street and failure to repair a controllable leak

Stage 2	a) WTP flow is at 85% capacity for 3 consecutive days, b) Amistad reservoir level reaches 25% capacity	All requirements for stage 1 remain in effect and the following are only allowed during certain scheduled times: irrigation with sprinkler systems, washing of vehicles, adding water to pools, irrigating parks/plazas/squares. The following are prohibited: operating any ornamental fountain or similar structure without a recycling system and washing paved areas, except to alleviate immediate fire hazards.
Stage 3	a) WTP flow is at 90% capacity for 1 day, b) Amistad reservoir level reaches 20% capacity	All requirements for stage 2 remain in effect, except the schedules to use water for certain activities are even stricter and irrigating athletic fields is also held to a certain schedule. No bulk water sales will be made by the City when the water will be transported outside of the City except for domestic/residential/livestock use. Fire hydrant water sales shall cease.
Stage 4	a) WTP flow is at 95% capacity for 1 day, b) Amistad reservoir level is less than 20% capacity	All requirements for stage 3 remain in effect and no applications for new or expanded water service connections will be approved with permission from the Utilities Director, water delivered to non-essential industrial and commercial customers will be reduced, and a maximum monthly water use allocation may be established for residential customers. The following are prohibited: irrigation, washing vehicles, adding water to pools.
	City of Lyford, 7/24/2000	
BASIS OF DROUGHT	Reservoir Levels, WTP Capacity	
	TRIGGERS:	**ACTIONS:**
Stage 1	Falcon and Amistad conservation level between 51% and 26% or flow capacity at 90% for 5 consecutive days. Cumulative reduction goal is 5%.	Customers are requested to voluntarily limit the amount of water used to that amount absolutely necessary for health, business, and irrigation. The following uses are prohibited: Allowing irrigation water to run off into a gutter, ditch, or drain; and failure to repair a controllable leak.

Stage 2	Falcon and Amistad conservation level between 25% and 20% or flow capacity at 95% for 5 consecutive days. Cumulative reduction goal is 10%.	All elements of Stage 1 remain in effect except that: 1. Irrigation utilizing hose-end sprinkler systems for lawns, gardens, landscaped areas, trees, shrubs, and other plants is prohibited except during designated hours of 6am to 8am and 8pm to 11pm. Customers with an address east of Hwy 77 are only allowed to water between designated hours on M, W, F. Customers with an address west of Hwy 77 are only allowed to water between designated hours on T, Thr, Sat. Exception: commercial nurseries, sod farmers, and similar establishments are exempt but requested to curtail all nonessential water use. 2. The washing of mobile vehicles and equipment is prohibited except on designated hours between 6am and 8 am and 8pm to 11pm on same days designated above. Exception: washing can be done on premises of a commercial carwash or service station and for cleaning of garbage trucks and vehicles to transport food and perishables. 3. The refilling or adding to residential swimming and/or wading pools is prohibited except on designated hours between 8pm to 8am on designated days above. 4. The operation of any ornamental fountain or other structure making similar use of water is prohibited except for those with a recycling system. 5. The use of water for irrigation of parks, plazas, and squares is prohibited except between 8pm to 8am. the irrigation of golf course fairway areas is absolutely prohibited. 6. Essential and utility Use: Fire fighting-no restrictions; medical use by care facilities -no restrictions; Utility-reduction of average system pressure to 60 psi recommended, leak detection and system repairs recommended, stabilizing and equalizing system pressure recommended
Stage 3	Falcon and Amistad conservation level between 20% and 15% or flow capacity at 95% for 5 consecutive days. Cumulative reduction goal is 15%.	All elements of Stage 2 shall remain in effect except that: 1. irrigation utilizing hose-end sprinklers or automatic sprinkler systems for lawns, gardens, landscaped areas, trees, shrubs, and other plants is prohibited except during designated hours of 6am to 8am and 8pm to 11pm. Customers east of Whey 77 on M and F, and west of HWY 77 T and Sat. Irrigation by hand-held hoses or drip irrigation systems are exempt. 2. Irrigation using hose-end sprinklers or automatic sprinkler systems for athletic fields is prohibited except during designated house between 8pm to 8am. 3. The watering of golf fairway areas is prohibited unless done with treated wastewater, reused water, or well water. 4. A water use surcharge of $10 shall be levied against all customers that use over 8,000 gallons per month.

Stage 4	Falcon and Amistad conservation level between 15% and 10% or flow capacity at 100% for 3 consecutive days. Cumulative reduction goal is 25%.	All elements of Stage 3 remain in effect except that: 1. irrigation utilizing hose-end sprinklers or automatic sprinkler systems for lawns, gardens, landscaped areas, trees, shrubs, and other plants is prohibited except during designated hours of 6am to 8am and 8pm to 11pm. Customers east of Whey 77 on Wednesdays, and west of HWY 77 only on Saturdays. Irrigation by hand-held hoses or drip irrigation systems are exempt. 2. Washing of mobile vehicles not occurring on the premises of commercial carwashes and service stations, and not in the immediate interest of public health shall be prohibited except between the hours of 6am-8am and 8pm to 11pm and only on the owner's premises. Customers East of HWY 77 are allowed to on Wednesdays, customers west of HWY 77 are allowed to on Saturdays. 3. Commercial car washes and service stations in the immediate interest of public health, safety and welfare shall be limited to five (5%) percent of their monthly average usage based on the last twelve billing periods for each of such customer. After such usage, the Mayor or his designee shall enforce this subsection by terminating water service. 4. Commercial nurseries, sod farmers, and similar establishments shall water only on designated days between 10pm and 5am and shall use only hand-held hoses, drip irrigation systems or hand- held buckets. 5. The filling, refilling or adding of water, except to maintain the structural integrity of a pool, to swimming and/or wading pools is prohibited. 6. The operation of any ornamental fountain with or without recirculating features is prohibited. 7. Irrigation for athletic fields is prohibited except between the hour of 8pm to 8am with same designated days as other customers. 8. A water surcharge of $15 shall be levied against all customers that use over 8,000 gallons per month.

Stage 5	Falcon and Amistad conservation level at 10% or less or flow capacity at 100% for 3 consecutive days. Cumulative reduction goal is 35%.	All elements of Stage 4 shall remain in effect in Stage 5 except that: 1. No applications for new, additional, further expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or other water service facilities of any kind shall be allowed, approved or installed except as approved by the City Council. 2. All allocations of water use to non-essential Industrial and Commercial customers shall be reduced to amounts as established by the Mayor, his designee or the Water Advisory Council. 3. The maximum monthly water use allocation for residential customers my be established with revised rate schedules and penalties by the City Council upon recommendation by the Mayor, his designee or the Water Advisory Council. 4. Irrigation by hose-end sprinklers or automatic sprinkler systems is prohibited.. Irrigation by hand-held hoses or drip irrigation systems is allowed between 6am to 8am and 8pm to 11pm for customers east of HWY 77 on Wednesdays and customers west of HWY 77 on Saturdays. 5. The washing of mobile vehicles not occurring on the premises of commercial car washes and service stations and not in the immediate interest of the public health, safety, and welfare is prohibited. 6. Irrigation for athletic fields is prohibited. 6. A water use surcharge of $20 shall be levied against all customers that use over 8,000 gallons per month.
	City of McAllen McAllen Public Utility, 5/29/2018	
BASIS OF DROUGHT	**TRIGGERS:**	**ACTIONS:**
Stage 1	In effect at all times	Customers asked to voluntarily limit water use to an amount absolutely necessary for health, business, and irrigation.
Stage 2	1. Demand reaches or exceeds 85% of capacity for 3 consecutive days 2. Amistad-Falcon reservoirs reach 40% capacity 3. Including but not limited to: system outage, equipment failure, or supply contamination	The means and/or schedule of the following is restricted: Irrigation, but drip method or hand-held buckets permitted at any time; washing motor vehicles, except commercial carwashes or service stations; washing or sprinkling foundations; adding water to swimming pools; operation of fountains or ponds, except with a recycling system; irrigation for golf courses, except those using wastewater effluent; hydrants restricted to fire fighting and necessary activities. The following are absolutely prohibited: allowing irrigation water to run off into gutter, ditch, or rain; failure to repair controllable leaks; washing paved surfaces.
Stage 3	1. Demand reaches or exceeds 90% of capacity for 3 consecutive days 2. Amistad-Falcon reservoirs reach 25% capacity 3. Including but not limited to: system outage, equipment failure, or supply contamination	All stage 2 restrictions except: further restrictions on means and schedule for irrigation, except by drip or hand-held buckets; watering of golf fairways is prohibited unless with wastewater effluent, reused water, or well water; customers to pay a water surcharge.

Stage 4	1. Demand reaches or exceeds 95% of capacity for 3 consecutive days 2. Amistad-Falcon reservoirs reach 20% capacity 3. Including but not limited to: system outage, equipment failure, or supply contamination	All stage 2 and 3 restrictions except: further restrictions on means and schedule for irrigation; washing of motor vehicles not occurring on commercial carwashes and not in the immediate interest of public health and safety is prohibited; carwashes in the interest of public health and safety limited to 50% of monthly average; commercial nurseries, sod farmers, etc. limited to means and schedule restrictions; adding water to pools, except to maintain structural integrity, is prohibited; operation of fountains prohibited; customers to pay a water surcharge.
Stage 5	1. Demand reaches or exceeds 100% of capacity 2. Amistad-Falcon reservoirs reach 15% capacity 3. Including but not limited to: system outage, equipment failure, or supply contamination	All stage 2, 3, and 4 restrictions except: no applications for new, additional, or expanded water connections, lines, etc. are allowed except as approved by PUB; water allocations to non-essential customers reduced as established by the PUB; max monthly water allocation for residential customers established with revised rate schedules and penalties by the PUB; irrigation permitted only by handheld hoses, handheld faucet filled buckets; drip irrigation on set schedule; customers to pay a water surcharge.
	Military Highway Water Supply Corporation 5/5/2014	
BASIS OF DROUGHT	Seasonal, water demands, low rainfall, system failure or water line breaks	
	TRIGGERS:	**ACTIONS:**
Stage 1	Automatically initiated annually from May 1 through October 31 of each year.	Military Highway WSC will reduce or discontinue flushing of water mains and activate use of alternative supply source(s). Customers are asked to voluntarily limit irrigation of landscaped areas to certain days and times. All operations of Military Highway WSC shall voluntarily adhere to Stage 2 water restrictions. Customers are asked to voluntarily practice water conservation and to minimize or discontinue water use for non-essential purposes.
Stage 2	a) Consumption of 80% of daily max supply for 3 consecutive days. b) Supply is reduced to only 20% greater than the average consumption for the previous month. c) Extended period (at least 8 weeks) of low rainfall and daily use is 20% above the use for the same period during the previous year.	Military Highway WSC will discontinue flushing of water mains and irrigation of landscaped areas. The means and/or schedule for the following is restricted: irrigation of landscaped areas; washing of motor vehicles, boats, cars, etc.; use of water to fill swimming pool; irrigation of golf courses; operation of fountains or ponds except when necessary to support aquatic life; use of water for hydrants limited to fire fighting or activities to maintain public health, safety and welfare, and construction with special permit; and restaurants are prohibited from serving water except when requested. The following are non-essential and prohibited: wash down sidewalks, driveways, parking lots; use of water to wash down buildings or structures; use of water for dust control; flushing gutters; and failure to repair a controllable leak(s).
Stage 3	a) Consumption of 90% of supply for 3 consecutive days. b) Water level in any water storage tanks cannot be replenished for 3 consecutive days.	Military Highway WSC will discontinue flushing of water mains and irrigation of landscaped areas. All requirements for Stage 2 restrictions remain in effect except: the means and schedule for irrigation of landscaped areas is further restricted, watering of golf courses is prohibited, and the use of water for construction purposes from fire hydrants under special permit is to be discontinued

Stage 4	a) Failure of major system component or an event which reduces the minimum residual pressure in the system below 20 psi for 24 hours or longer. b) Consumption of 95% or more of max supply for 3 consecutive days. c) Consumption of 100% of max supply at water storage levels in system drop during one 24-hour period. d) Natural or man-made contamination of water supply source(s) e) Declaration of a state of disaster due to drought conditions in a county or counties served by the Corporation. f) Reduction of wholesale water supply due to drought conditions. g) Other unforeseen events which could cause imminent health or safety risks to public.	Military Highway WSC will discontinue flushing of water mains and irrigation of landscaped areas. All requirements for Stage 2 and 3 remain in effect except: the means and schedule for irrigation of landscaped areas is further restricted; use of water to wash motor vehicles, boats, airplanes, etc. is prohibited and schedules for commercial car washes are restricted; adding water to swimming pools is prohibited; operation of fountains or ponds is prohibited except where necessary to support aquatic life; and no applications for new, additional, or expanded water service connections, meters, mains, etc. of any kind shall be allowed or approved.
Stage 5	a)Major water line breaks, or pump or system failures occur, which case unprecedented loss of capability to provide water service. b) Natural or man-made contamination of the water supply source(s).	Military Highway WSC will use an alternative supply source(s). All requirements of State 2, 3, and 4 restrictions remain in effect except: irrigation of landscaped areas is prohibited, of water to wash any motor vehicle, boat, plane, etc. is prohibited. In the event water shortage conditions threaten public health, safety , and welfare, the GM is authorized to ration water according to a set water allocation plan.
	City of Mission, 9/25/2019	
BASIS OF DROUGHT	Water demand and reservoir level	
	TRIGGERS:	**ACTIONS:**
Stage 1	Always in effect unless a more stringent plan is required	Requests customers to voluntarily conserve water using beset management practices to meet 10 percent reduction in daily water demand. Requested voluntary restrictions include irrigation planning and City operations to operate with water use restrictions from Stage 2.
Stage 2	a) Total daily water demand meets or exceeds 21.0 MG for five consecutive days or 22.0 MG on a single day, and b) reservoir levels do not refill above 65% in a 24-hour period	Customers are required to limit irrigation of landscaped areas with hose-end springlers or automatic systems to 3 days; the washing of any vehicle is designated for morning or evenings on irrigation days or may be performed at any time at a commercial car wash. Filling or refilling pools of any type is prohibited outside of designated watering days; operation of ornamental fountains or ponds is prohibited when not necessary to support aquatic life. Restaurants are prohibited from serving water to patrons except upon request. Non-essential uses of water are prohibited
Stage 3	a) Total daily water demand meets or exceeds 22.0 MG for five consecutive days or 23.0 MG on a signle day, and b) reservoir levels do not refill above 55% in a 24-hour period	Irrigation schedules further restricted to two days per week.

Stage 4	a) Total daily water demand equals or exceeds 23.0 MG for five consecutive days or 24.0 MG on a single day, and b) reservoir levels do not refills above 45% in a 24-hour period	Irrigation schedules further restricted to one day per week and to non-hose-end or automatic sprinkler systems. Vehicle washing on private properties is prohibited. Refilling or filling of pools is prohibited. Finally, the approval for any new, additional, or larger water service connections shall be postponed.
Stage 5	Major water line breaks or pump system failures, contamination of water supply sources, or as determined by the City Manager or their designee	Irrigation of landscaped areas prohibited. All vehicle washing prohibited.
	North Alamo Water Supply Corporation, 9/17/2019	
BASIS OF DROUGHT	Reservoir level, system failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	Level in Amistad and Falcon Reservoirs reaches 49% of capacity	All customers are asked to check their plumbing fixtures and facilities to ensure that they are working properly and no water is being wasted. Industrial, wholesale, and certain other customers are asked required to develop and submit a Water Rationing Plan within 60 days.
Stage 2	Level in Amistad and Falcon Reservoirs reaches 40% of capacity	All WSC owned facilities will be placed on mandatory conservation practices. All customers will be asked to comply with a voluntary watering schedule based on their location.
Stage 3	Level in Amistad and Falcon Reservoirs reaches 23% of capacity	The voluntary lawn watering provisions from Stage 2 will become mandatory. Allowing water to run off yards, plants, or vegetation into gutters or streets will be prohibited. Non commercial washing of vehicles must be done with a hand0held hose or bucket between 6am and 9am or 7pm and 9pm. Commercial washing of any vehicle will only be allowed on commercial washing facilities. Industrial and wholesale customers are required to implement their Water Rationing Plans. The following are prohibited: exterior washing of structures; use of water to wash down sidewalks, driveways, or hard surfaces; continued use of defective plumbing; use of fire hydrants for purposes other than fire fighting; use of water for dust control.
Stage 4	Level in Amistad and Falcon Reservoirs reaches 13% of capacity or in response to 1. supply source contamination, 2. water production or distribution system limitation, 3. system outage due to failure or damage of major water system components	All nonessential water use not necessary to maintain public health, safety and welfare is prohibited. A pro rata curtailment of deliveries of wholesale water will occur. No application for new or expanded water connections, pipeline extensions, etc. will be allowed except as approved by the Review Committee. The maximum amount of water usage for customers and surcharges may be revised.
	North Cameron Regional Water Supply Corporation 9/11/2014	
BASIS OF DROUGHT	Ground storage tank levels	
	TRIGGERS:	**ACTIONS:**
Stage 1	North Cameron Regional Water Plant (NCRWP) ground storage tank falls below 50% capacity.	Request wholesale water customers initiate voluntary measure to reduce water use.

Stage 2	NCRWP ground storage tank capacity falls to 25% capacity.	a) Discuss water supply/demand conditions with customers and request they initiate measures to reduce water use b) Implement pro rata curtailment of water diversions and/or deliveries to add 50,000 gallons per day to storage tank
Stage 3	NCRWP ground storage tank capacity fall to 10% capacity.	a) Increase water blend ratios if possible, not exceeding 1000 ppm TDS b) Discuss water supply/demand conditions with customers and request they initiate measures to reduce water use and utilize alternative water supplies c) Implement pro rata curtailment of water diversions and/or deliveries to add 75,000 gallons per day to storage tank
Stage 4	NCRWP has no production capacity.	a) Notify customers of the need to switch to alternate water supplies b) If appropriate, notify member, county, and/or state emergency response officials c) Undertake necessary actions, including repairs and/or clean-up as needed. d) Prepare post-event assessment report on incident and critique of emergency response procedures
	Olmito WSC, 3/7/2019	
BASIS OF DROUGHT	Reservoir level	
	TRIGGERS:	**ACTIONS:**
Stage 1	Level of US waters in Amistad and Falcon Reservoirs reaches 51% of capacity	Request customers to voluntarily reduce water usage
Stage 2	Level of Amistad and Falcon Reservoirs reaches 25% of capacity	Customers are required to limit irrigation of landscaped areas with hose-end sprinklers or automatic systems to twice per week at certain times, and the washing of any vehicle is prohibited outside of certain times on watering days, and must be performed at commercial car washing locations or be performed by hand-held bucket or hand-held hose. Additionally, filling or refilling pools is prohibited outside of certain times on watering days; operation of ornamental fountains or ponds is prohibited when not necessary to support aquatic life; irrigation of golf courses limited; and non-essential uses of water are prohibited.
Stage 3	Level in Amistad and Falcon Reservoirs reaches 15% of capacity	Irrigation schedules further restricted; watering of golf course tees prohibited unless watered by source other than Olmito WSC.
Stage 4	Level in Amistad and Falcon Reservoirs reaches 15% of capacity	Irrigation schedules further restricted; washing of motor vehicles or other vehicles limited to commercial locations with more restricted hours than previous stages; new connections will not be made, and the approval for new additions is postponed.

Stage 5	Major water line breaks or pump system failures occur, which cause unprecedented loss of capability to provide water service, or as determined by the following: a) Olmito WSC Board of Directors b) County Emergency Management Coordinator(s) c) County Judge & Commissioners d) Texas Commission on Environmental Quality	Irrigation of landscaped areas prohibited. All vehicle washing prohibited.
	City of Pharr, 4/22/2019	
BASIS OF DROUGHT	Demand, treated water reservoir levels, raw water supplies, line break or system failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	Total daily water demand equals or exceeds 15.0 MGD for 5 consecutive days	The public is asked to voluntarily follow certain schedules for landscape irrigation and vehicle washing and to stop using ornamental water features.
Stage 2	Total daily water demand equals or exceeds 18.0 MGD for 3 consecutive days	The public is required to follow a certain schedule for landscape irrigation and vehicle washing. The following is prohibited: use of ornamental water features without recirculation, washing down paved areas, failure to repair a leak in a timely manner
Stage 3	Treated water reservoir levels do not refill above 75% overnight	The requirements for stage 2 are still in effect, except that the schedule to irrigate landscape and wash vehicles is stricter.
Stage 4	a) Water supply available from Hidalgo Irrigation District No. 2 is equal to or less than 5,000 acre-feet b) Notification is received from Hidalgo Irrigation District No. 2 pursuant to requirements in water purchase contract with distract requesting initiation of Stage 4 Drought Contingency Plan	Further restrictions on irrigation scheduling; irrigation on golf courses more strictly regulated. Vehicle washing limited to certain times and only at commercial locations; filling of pools or other water bodies prohibited.
Stage 5	a) Major water line breaks or pump or system failures occur, causing unprecedented loss of capability to provide water service b) Natural of man-made contamination of water supply source(s)	Irrigation of landscaped areas prohibited. All vehicle washing prohibited.
	Raymondville, 8/28/2014	
BASIS OF DROUGHT	Demand levels, service disruption or failure	
	TRIGGERS:	**ACTIONS:**

Stage 1	1.Water demand reaches 90% of firm production capacity; or 2. A disruption due to equipment or distribution system failure that would limit the capacity of the water system below 85% of capacity during high demand periods.	Goal: Achieve a voluntary 35% reduction in daily water use per capita. Voluntary water use restrictions include: a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 pm to midnight on designated watering days. (b) All operations of the City shall adhere to water use restrictions prescribed for Stage 2 of the Plan. (c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.
Stage 2	1. Water demand reaches 95% of firm production capacity; or 2. A disruption due to equipment or distribution system failure that would limit the capacity of the water system below 75% of capacity during high demand periods.	Goal: achieve 40% reduction in daily water use per capita. Restrictions include: (a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number, and Saturdays and Wednesdays for water customers with a street address ending in an odd number, and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system. (b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand- held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables. (c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

Stage 3	1. Water demand reaches 100% of firm production capacity; or 2. A disruption due to equipment or distribution system failure that would limit the capacity of the water system below 70% of capacity during high demand periods.	Goal: achieve 50% reduction in daily water use per capita. Restrictions include all requirements from Stage 2 except: (a) Irrigation of landscaped areas shall be limited to designate watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times. (b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the City. (c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.
Stage 4	In the event of an extended period of the severe condition or any natural catastrophic situations that interrupt or have the potential to interrupt the City's potable water supply, the City is authorized to take all reasonable measures as deemed necessary to provide for the public's safety.	Goal: achieve a 60% reduction in daily water use per capita. Restrictions include all requirements of Stage 2 and 3 except: (a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times. (b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m. (c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited. (d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system. (e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5	Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when Board President, or his/her designee, determines that a water supply emergency exists based on: 1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or, 2. Natural or man-made contamination of the water supply source(s).	Goal: achieve a 60% reduction in daily use per capita. Restrictions include all requirements from Stages 2, 3, and 4 except: (a) Irrigation of landscaped areas is absolutely prohibited. (b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.
	Rio Grande City, 5/1/2014	
BASIS OF DROUGHT	**TRIGGERS:**	**ACTIONS:**
Stage 1	Amistad-Falcon Reservoirs reach 50% conservation levels or City's system demand is at 7.48 MGD.	Customers requested to voluntarily limited water use to the amount absolutely necessary for health, business, and irrigation.
Stage 2	Amistad-Falcon Reservoirs reach 40% conservation levels or City's system demand is at 7.7 MGD.	schedule restrictions apply to the following: irrigation of outdoors vegetation; washing motor vehicles; washing or sprinkling foundations; water for swimming pools; water for fountains or structures prohibited except with recycling system; water for hydrants limited to firefighting and necessary activities. The following are prohibited: allowing irrigation water to run off; failure to repair controllable leaks; washing paved surfaces. No bulk water sales if transported by truck.
Stage 3	Amistad-Falcon Reservoirs reach 25% conservation levels or City's system demand is at 7.92 MGD.	Restrictions from Stage 2 except: it shall be unlawful to irrigate outdoor vegetation other than on schedule, except drip or hand-held bucket permitted; water surcharge for residential, irrigation-metered, and commercial and industrial metered customers.
Stage 4	Amistad-Falcon Reservoirs reach 20% conservation levels or City's system demand is at 8.14 MGD.	Restrictions from Stage 3 except: commercial carwashes and service station limited to 50% of monthly average; schedule restrictions for irrigation, nurseries, washing of vehicles, sod farms and only with hand- held hoses, buckets, or drip irrigation; filling pools prohibited except to maintain structural integrity; operation of fountains prohibited; increased surcharge for customers.
Stage 5	Amistad-Falcon Reservoirs reach 15% conservation levels, City's system demand is at 8.36 MGD, or in response to emergency conditions.	Restrictions from Stage 4 except: no applications for new, additional, or expanded water connections, meters, lines, etc. are allowed except as approved by the PUB; All non-essential customer amounts reduced as established by the PUB; Max monthly allocation for residential customers established with revised rate schedules and penalties on recommendation by the PUB; Washing of vehicles not necessary for public safety and health prohibited; increased surcharge for customers.
	City of Roma, 6/1/2014	

BASIS OF DROUGHT	Water demand/WTP capacity, reservoir level, system break/failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) Average daily water use reaches 90% of WTP capacity for 5 consecutive days, b) Falcon and Amistad conservation level is between 26% and 51%	Users are requested to voluntarily limit water usage and the following are prohibited: allowing irrigation water to run off into a gutter/ditch/drain and failure to repair a controllable leak
Stage 2	a) Average daily water use reaches 95% WTP capacity for 5 consecutive days, b) Falcon and Amistad conservation level is between 20% and 25%	All requirements for stage 1 remain in effect and users are required to follow a certain schedule irrigation of landscapes/parks/plazas/squares/athletic fields, and vehicle washing. The following is prohibited: use of ornamental water features without recirculation, washing down paved areas unless it's a fire hazard, irrigating golf course fairway. No bulk water sales will be allowed when water will be transported by a truck or vehicle outside of City limits.
Stage 3	a) Average daily water use reaches 100% WTP capacity for 5 consecutive days, b) Falcon and Amistad conservation level is between 15% and 20%	All requirements of stage 2 remain in effect except the schedule for irrigation is stricter.
Stage 4	a) Average daily water use reaches 100% WTP capacity for 5 consecutive days, b) Falcon and Amistad conservation level is between 10% and 15%	All requirements of stage 3 remain in effect except the schedules for irrigation and vehicle washing are even stricter. The following are prohibited: adding water to a pool unless required to maintain structural integrity and operation of any ornamental fountain or similar structure.
Stage 5	a) Average daily water use reaches 100% WTP capacity for 5 consecutive days, b) Falcon and Amistad conservation level is less than 10%, c) the imminent or immediate failure of a major component of the system causes an immediate health or safety hazard, water levels in the distribution system storage tanks drop to levels such that service pumps cannot pump daily water demand	All requirements of stage 4 remain in effect and any application for new or expanded water service connection will not be allowed unless approved by City Council, allocations of water to non-essential industrial and commercial customers will be reduced, and maximum monthly water use allocations for residential customers may be established. The following are prohibited: irrigation by sprinkler systems, irrigation of athletic fields, and vehicle washing not at commercial locations except as required for public health, safety, or welfare.

City of San Benito, 8/1/2014

BASIS OF DROUGHT	Reservoir level and water treatment capacity.	
	TRIGGERS:	**ACTIONS:**
Stage 1	Falcon and Amistad US storage level is 51% of capacity, or upon request from Cameron County Irrigation District #2 as applied to customers within the city with lawn watering contracts.	Users are requested to voluntarily limit water usage and the following are prohibited: allowing irrigation water to run off into a gutter/ditch/drain and failure to repair a controllable leak

Stage 2	Falcon and Amistad US storage level is 25% of capacity, or upon request from Cameron County Irrigation District #2 as applied to customers within the city with lawn watering contracts. Or the City Manager may implement Stage 2 at his discretion if the water treatment plant reaches 95% of capacity.	City Manager notifies, by public announcement and publication, customers of the water system of mandatory conservation and limitation of use. All municipal operations are placed on mandatory conservation. Lawn watering is not allowed between 10:00 am and 6:00 pm. Grass, trees, shrubbery, annual, biennial or perennial vines, gardens, and other similar vegetation may be watered with a hand-held hose equipped with a positive shut-off nozzle or a hand-held bucket or water can no larger than 5 gallons in capacity. Drip irrigation and sprinkler systems are allowed. Car, trailer, and boat washing are limited to 5-gallon buckets or hand-held hose between 6:00 pm and 9:00 pm. Wasting of water as a result of defective plumbing is prohibited. Hydrants may only be used for fire-fighting. Ornamental fountains or artificial waterfalls where water is not reused or recirculated are prohibited. Washing sidewalks, driveways, parking lots, tennis courts, and buildings is prohibited. Water may only be used for dust control for health hazards. Swimming pools and jacuzzis are not permitted to use water except where required to maintain structural integrity. The city may not use water to place new agricultural land into service. Rate surcharges are put into place.
Stage 3	Falcon and Amistad US storage level is 10% of capacity, or upon request from Cameron County Irrigation District #2 as applied to customers within the city with lawn watering contracts. Or the City Manager may implement Stage 2 at his discretion if the water treatment plant reaches 95% of capacity.	All requirements of stage 2 remain in effect, plus water allowed to run off of yards, plants or vegetation into gutters is prohibited. Rates are increased for high-volume users.
Stage 4	Falcon and Amistad US storage level is 15% of capacity, or upon request from Cameron County Irrigation District #2 as applied to customers within the city with lawn watering contracts. Or the City Manager may implement Stage 2 at his discretion if the water treatment plant reaches 95% of capacity.	All nonessential water use not necessary to maintain public health, safety and welfare is prohibited. Plant watering, car washing, and fountains as described above are prohibited. No new or expanded water service connections, services or facilities may be approved. Residential use may be capped and surcharges associated by the City Commission. The City Manager may take any other actions necessary.
	San Juan 8/19/2011	
BASIS OF DROUGHT	Irrigation allocations by Watermaster halted, water demands,	
	TRIGGERS:	**ACTIONS:**
Stage 1	Always in effect unless a more stringent plan is required	Users are requested to voluntarily limit the amount of water used to that amount absolutely necessary for health, business, and irrigation.

Stage 2	Agricultural use of irrigation water is discontinued and/or when the demand on the City's system is at 3.7 MGD for a three consecutive day period	Public is required to limit landscape irrigation with hose-end sprinklers automatic irrigation systems to certain days based on location and only between 8am and 8pm (excludes hand-held hose or drip irrigation). Car washing is limited to the same days as irrigation. Public must discontinue use of ornamental water features unless provisions are made for recirculation of water.
Stage 3	Service or deliver water storage in Falcon and Amistad Reservoirs is reduced by 50% by the Watermaster and/or demand on the City's system is at 4.1 MGD for a three consecutive day period	Public is required to limit landscape irrigation with hand-held hose or drip irrigation systems to certain days of the week based on location and only between 8am and 8pm. Car washing is only allowed at residences on irrigations days and with hoses with flow control devices. Public must discontinue use of ornamental water features unless provisions are made for recirculation of water.
Stage 4	Municipal allocations are reduced to 75% of full amounts by the Watermaster and/or demand on the City's system is at 4.5 MGD for three consecutive days	All elements of Stage 3 remain in effect except that: 1. irrigation of vegetation is only allowed between 12am to 10 am and 8pm to 12 am, 2. automobiles may only be washed at non-commercial facilities on irrigation days and on the owner of the vehicle's property, 3. commercial nurseries, sod farmers, and similar shall only water between 10pm and 5am and shall use only hand-held hoses, drip irrigation, or buckets, 4. residential/domestic meter customers shall pay an additional 75% surcharge for any water used over 10,000 gallons per month
Stage 5	Municipal allocations are reduced to 80% of full amounts by the Watermaster and/or demand on the City's system is at 4.8 MGD for three consecutive days	All elements of Stage 4 remain in effect except that: 1. no applications for new or increased water connections, pipeline extensions, etc. shall be allowed, except as approved by the City Commission on recommendation by the Public Utilities Director, 2. maximum monthly water use allocation for residential customers may be established with revised rate schedules and penalties, 3. irrigation is only permitted by hand-held hose, bucket, or drip irrigation between 6am to 8am once every 10 days
	San Ygnacio Municipal Utility District, 4/1/2014	
BASIS OF DROUGHT	Reservoir level, water demand, system break/failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) Falcon lake level drops below 270 ft., b) daily demand exceeds 60% of supply capacity for 3 consecutive days	Wholesale water users will be requested to voluntarily reduce water use
Stage 2	a) Falcon lake level drops below 265 ft., b) daily demand exceeds 65% of supply capacity for 3 consecutive days	Wholesale water customers will be requested to initiate mandatory measures to reduce non-essential water use and preparations for implementing pro rata curtailment of water deliveries will be made.
Stage 3	a) Falcon lake level drops below 360 ft., b) daily demand exceeds 70% of supply capacity for 3 consecutive days	Wholesale water customers will be requested to initiate additional mandatory measures to reduce non-essential water use and pro rata curtailment of water deliveries will be implemented.
Stage 4	Major water line breaks or pump system failure occurs, which cause unprecedented loss of capability to provide water service	Inform wholesale water customers of the problem and take necessary actions to resolve it.
	Union Water Supply Corporation 7/26/2011	

BASIS OF DROUGHT	Falcon reservoir level and/or demand	
	TRIGGERS:	**ACTIONS:**
Stage 1	Always in effect between April 1st and September 30th of every year.	Customers are asked to voluntarily limit water use by the following measures: 1. only irrigate between 6pm and 10am, 2. irrigate on certain days, based on address, 3. prevent significant run off from lawn irrigation, 4. wash vehicles only on same days as lawn watering, 5. minimize use of potable water for washing sidewalks, drives, and dust control
Stage 2	Implemented when: 1. drought conditions are officially declared for the County, 2. water levels in Falcon Reservoir drop below 80% of conservation levels, 3. daily water consumption exceeds 90% of daily supply capacity for ten consecutive days	Customers will be required to implement the following measures: 1. only irrigate between 6pm and 10am, 2. irrigate on certain days, based on address, 3. prevent significant run off from lawn irrigation, 4. wash vehicles only on same days as lawn watering, 5. do not use of potable water for washing sidewalks, drives, and dust control
Stage 3	Implemented when: 1. extreme drought conditions are officially declared for the County, 2. water levels in Falcon Reservoir drop below 70% of conservation levels, 3. raw water supply drop to 10% below projected needs, 4. daily water consumption exceeds 100% of daily supply capacity for ten consecutive days	Customers will be required to implement the following measures: 1. irrigation of landscaped areas only allowed on certain days based on location and between 8pm and 10am, except for irrigation with a hand- held hose, bucket, or drip system, 2. vehicle washing not at a commercial facility is only allowed on watering days between 8pm and 10am and with a bucket or hand-held hose with shut off nozzle, 3. filling pools is only allowed on water days between 8pm and 10am, 4. operation of ornamental fountains is prohibited unless they are required to support aquatic life or are equipped with recirculation system, 5. use of water from hydrants or flush valves are only permitted to maintain public health, safety, or welfare, 6. water golf course and parks is only allowed on water days between 8pm and 10am and with a hand-held hose, 7. the following are prohibited: wash down of sidewalks, walkways, driveways, etc.; wash down of building and structures; use of water for dust control; flushing gutters or permitting water to accumulate in gutters or streets; failure to repair a controllable leak within a reasonable amount of time; any waste of water.

Stage 4	Implemented when: 1. emergency drought conditions are officially declared for the County, 2. water levels in Falcon Reservoir drop below 60% of conservation levels, 3. raw water supply drop to 30% below projected needs, 4. daily water consumption exceeds 105% of daily supply capacity for ten consecutive days	Customers will be required to implement the following measures: 1. irrigation of lawns and landscaped areas is prohibited, 2. vehicle washing is only permitted at a commercial facility, 3. filling pools is prohibited, 4. operation of ornamental fountains is prohibited unless required to sustain aquatic life or if it is equipped with a recirculation system, 5. use of water from hydrants or flush valves is only permitted to maintain public health, safety, and welfare, 6. use of water to irrigate golf course and parks is prohibited, 6. the following are prohibited: wash down of sidewalks, walkways, driveways, etc.; wash down of building and structures; use of water for dust control; flushing gutters or permitting water to accumulate in gutters or streets; failure to repair a controllable leak within a reasonable amount of time; any waste of
	Valley MUD No. 2, 6/18/2013	
BASIS OF DROUGHT	Storage in Amistad-Falcon Reservoir system, water use compared with system capacity, irrigation allocations, treatment or delivery failures	
	TRIGGERS:	**ACTIONS:**
Stage 1	1) When the level of United States water stored in Rio-Grande River Basin Reservoirs reaches 60 % of capacity, or Valley MUD #2 allocation of irrigation water has reached 5400 acre-ft. 2) When equipment failure or treatment problems causes the capacity of Valley MUD #2’s treatment and pumping facilities to fall to within 90% of the daily consumption of potable water.	1) Water customers are requested to voluntarily limit the irrigation of landscaped areas to no more than 3 days a week. Do not water between the hours of 10:00 a.m. and 7:00 p.m. 2) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2	1) When the level of United States water stored in Rio-Grande River Basin Reservoirs reaches 50 % of capacity, or Valley MUD #2 allocation of water has reached 3350 acre-ft. 2) When equipment failure or treatment problems causes the capacity of Valley MUD #2's treatment and pumping facilities to fall to within 70% of the daily consumption of potable water.	1) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number, and Saturdays and Wednesdays for water customers with a street address ending in an odd number. Irrigation of landscaped areas is further restricted and prohibited between the hours of 10:00 a.m. and 7:00 p.m. on designated watering days. However, irrigation of landscaped areas is permitted at any time if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system. 2) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days. Such washing shall be done with a bucket and a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables. 3) Operation of any ponds or ornamental fountain for aesthetic or scenic purposes is prohibited. 4) Use of water from hydrants shall be limited to firefighting, related activities, or other activities necessary to maintain public health, safety, and welfare. Use of water from designated fire hydrants for construction purposes may be allowed under special permit from the Valley MUD #2. 5) Irrigation of golf course greens, tees, and fairways is permitted between the hours 7:00 p.m. and 10:00 a.m.

Stage 3	1) When the level of United States water stored in Rio-Grande River Basin Reservoirs reaches 30%, or Valley MUD #2 allocation of water has reached 1900 acre-ft. 2) When equipment failure or treatment problems causes the capacity of Valley MUD #2's treatment and pumping facilities to fall to within 50% of the daily consumption of potable water.	1) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Thursdays for customers with a street address ending in an even number, and Wednesdays for water customers with a street address ending in an odd number. Irrigation of landscaped areas is further restricted and prohibited between the hours of 10:00 a.m. and 7:00 p.m. on designated watering days. Irrigation of landscaped areas is permitted at any time if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system. 2) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days. Such washing shall be done with a bucket and a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables. 3) Operation of any ponds or ornamental fountain for aesthetic or scenic purposes is prohibited. Fountains that are equipped with a recirculation system are not exempt at this stage. 4) Use of water from hydrants shall be limited to firefighting, related activities, or other activities necessary to maintain public health, safety, and welfare. The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued. 5) Irrigation of golf course greens, tees, is permitted between the hours 7:00 p.m. and 10:00 a.m.

Stage 4	1) when the level of United States water stored in Rio-Grande River Basin Reservoirs reaches 20%, or Valley MUD #2 allocation of water has reached 800 acre-ft. 2) When equipment failure or treatment problems causes the capacity of Valley MUD #2's treatment and pumping facilities to fall to within 25% of the daily consumption of potable water. 3) When water levels in the Rio Grande are low enough to restrict pumping.	1) All irrigation of landscapes is prohibited except for minimal hand watering of drought stressed trees and shrubs. 2) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited. Washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables. 3) Operation of any ponds or ornamental fountain for aesthetic or scenic purposes is prohibited. Fountains that are equipped with a recirculation system are not exempt at this stage. 4) Use of water from hydrants shall be limited to firefighting, related activities, or other activities necessary to maintain public health, safety, and welfare. The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued. 5) Hand watering of golf course greens and tees is permitted between the hours 7:00 p.m. and 10:00 a.m. Treated effluent must be used for this hand watering. The watering of golf course fairways is prohibited. 6) The following uses of water are defined as non-essential and are prohibited: a) Wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas; b) use of water to wash down buildings or structures for purposes other than immediate fire protection; c) use of water for dust control; d) flushing gutters or permitting water to run or accumulate in any gutter or street; and e) failure to repair a controllable leak(s) within 3 working days after having been given notice directing the repair of such leak(s).
	City of Weslaco, 5/1/2009	
BASIS OF DROUGHT	Reservoir level, projected water demand, system break/failure	
	TRIGGERS:	**ACTIONS:**
Stage 1	a) Level of US waters in Amistad and Falcon reservoirs reaches 51%, b) water demand projections for the year suggest available water rights may be used at 95%	Request customers to voluntarily reduce water usage
Stage 2	a) Level of US water in Amistad and Falcon reservoirs reaches 25%, b) a condition causes system-wide problems so the normal level of water service may be diminished for a period of time, c) water demand projections for the year suggest available water rights may be used at 98%	The means and/or schedule for the following will be restricted: watering of grass and vegetation, washing of vehicles, adding water to pools, and irrigating golf courses. The following are prohibited: allowing water to run off into gutters or streets, washing of buildings, trailers, railroad cars, maintaining defective home plumbing, use of hydrants except for fire fighting, ornamental fountain without recirculation, use of water to wash down hard surfaced area, and use of water for dust control.

Stage 3	a) Level of US water in Amistad and Flacon reservoirs reaches 15%, b) a condition related to extraordinary circumstances severely and immediately diminish the ability to deliver a normal level of water, c) water demand projections for the year suggest available water rights may be used at 100%	The following are prohibited: new service connections to the water system if another water source is already used, serving restaurant customers water when they do not ask for it, use of water for scenic and recreational ponds or lakes, use of water for pools, use of water to put new agricultural land into production, use of water for new planting or landscaping, and acceptance of applications for new or extended water service connections without approval by City. Industrial and commercial users must implement an individual curtailment plan and residential customers will receive a maximum monthly usage amount.
	Zapata County Waterworks, 7/1/2014	
BASIS OF DROUGHT	Time of year, reservoir level, system break/failure or contamination, water demand/WTP capacity	
	TRIGGERS:	**ACTIONS:**
Stage 1	Automatically initiated on April 1 of each year	Customers are requested to voluntarily limit the use of water for nonessential purposes
Stage 2	a) Level of Falcon reservoir drops below 270 feet, or b) recorded drinking water treatment as a percentage of total drinking water capacity exceeds 70%	Customers are requested to voluntarily reduce their water use and to follow an irrigation schedule and county and nonessential governmental water use will be reduced.
Stage 3	a) Level of Falcon reservoir drops below 260 feet, or b) recorded drinking water treatment as percentage of total treatment capacity exceeds 80%	Customers will be limited to certain schedules and methods for irrigation, vehicle washing, and adding water to pools and the following are prohibited: operation of fountains or ponds without recirculation except when necessary to maintain aquatic life, using water from hydrants or flush valves except when maintaining public health, safety, and welfare, washing down hard-surfaced areas, use of water to wash down buildings or structures, use of water for dust control, flushing gutters, failure to repair controllable leaks within a reasonable period of time, any waste of water
Stage 4	a) Level of Falcon reservoir drops below 250 feet, or b) recorded drinking water treatment as percentage of total treatment capacity exceeds 90%	In addition to Stage 3 restrictions, emergency interconnects or alternative supply arrangements shall be investigated, and implemented, if available.
Stage 5	System outage or supply contamination	The TCEQ Regional Office will be immediately notified

Texas Commission on Environmental Quality
Water Availability Division
MC-160, P.O. Box 13087 Austin, Texas 78711-3087
Telephone (512) 239-4691, FAX (512) 239-2214

Drought Contingency Plan for a Retail Public Water Supplier

This form is provided as a model of a drought contingency plan for a retail public water supplier. If you need assistance in completing this form or in developing your plan, please contact the Conservation Staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Drought Contingency Plans must be formally adopted by the governing body of the water provider and documentation of adoption must be submitted with the plan. For municipal water systems, adoption would be by the city council as an ordinance. For other types of publicly-owned water systems (example: utility districts), plan adoption would be by resolution of the entity's board of directors adopting the plan as administrative rules. For private investor-owned utilities, the drought contingency plan is to be incorporated into the utility's rate tariff. Each water supplier shall provide documentation of the formal adoption of their drought contingency plan.

Name:	______________________
Address:	______________________
Telephone Number:	( ) Fax: ( )
Water Right No.(s):	______________________
Regional Water Planning Group:	______________________
Form Completed by:	______________________
Title:	______________________
Person responsible for implementation:	Phone: ( )
Signature:	Date: / /

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the ________________________ (*name of your water supplier*) hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section X of this Plan.

Section II: Public Involvement
Opportunity for the public to provide input into the preparation of the Plan was provided by the _________________________ (*name of your water supplier*) by means of ___________________ _____________________________ (*describe methods used to inform the public about the preparation of the plan and provide opportunities for input; for example, scheduling and providing public notice of a public meeting to accept input on the Plan*).

Section III: Public Education
The _________________________ (*name of your water supplier*) will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of ____ (*describe methods to be used to provide information to the public about the Plan; for example, public events, press releases or utility bill inserts*).

Section IV: Coordination with Regional Water Planning Groups
The service area of the _________________________ (*name of your water supplier*) is located within the _________________________ (*name of regional water planning area or areas*) and _________________________ (*name of your water supplier*) has provided a copy of this Plan to the _________________________ (*name of your regional water planning group or groups*).

Section V: Authorization
The _________________________ (*designated official; for example, the mayor, city manager, utility director, general manager, etc.*), or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _________________________ (*designated official*) or his/her designee shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application
The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the _________________________ (*name of your water supplier*). The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions
For the purposes of this Plan**,** the following definitions shall apply:

<u>Aesthetic water use</u>: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

<u>Commercial and institutional water use</u>: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

<u>Conservation</u>: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

<u>Customer</u>: any person, company, or organization using water supplied by _________________________ (*name of your water supplier*).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The _________________________ (*designated official*) or his/her designee shall monitor water supply and/or demand conditions on a _________________________ (*example: daily, weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on:
____.
(*Provide a brief description of the rationale for the triggering criteria; for example, triggering criteria / trigger levels based on a statistical analysis of the vulnerability of the water source under drought of record conditions, or based on known system capacity limits*).

Utilization of alternative water sources and/or alternative delivery mechanisms:

Alternative water source(s) for _________________________ (*name of utility*) is/are:
____.

(Examples: Other well(s), Inter-connection with other system, Temporary use of a non-municipal water supply, Purchased water, Use of reclaimed water for non-potable purposes, etc.).

Stage 1 Triggers -- MILD Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII Definitions, when ____.
(*Describe triggering criteria / trigger levels; see examples below*).

Following are examples of the types of triggering criteria that might be used <u>in one or more successive stages</u> of a drought contingency plan. The public water supplier may devise other triggering criteria and an appropriate number of stages tailored to its system. One or a combination of the criteria selected by the public water supplier must be defined for each drought response stage, but usually <u>not all will apply</u>.

Example 1: *Annually, beginning on May 1 through September 30.*

Example 2: *When the water supply available to the _________________________ (name of your water supplier) is equal to or less than ____________ (acre-feet, percentage of storage, etc.).*

Example 3: *When, pursuant to requirements specified in the _________________________ (name of **your** water supplier) wholesale water purchase contract with _________________________ (name of your wholesale water supplier), notification is received requesting initiation of Stage 1 of the Drought Contingency Plan.*

Example 4: *When flows in the _________________________ (name of stream or river) are equal to or less than _____________ cubic feet per second.*

Example 5: *When the static water level in the _________________________ (name of your water supplier) well(s) is equal to or less than ___________ feet above/below mean sea level.*

Example 6: *When the specific capacity of the _________________________ (name of your water supplier) well(s) is equal to or less than ________ percent of the well's original specific capacity.*

Example 7: *When total daily water demand equals or exceeds ___________ million gallons for _____________ consecutive days of ________________ million gallons on a single day (example: based on the safe operating capacity of water supply facilities).*

Example 8: *Continually falling treated water reservoir levels which do not refill above _________ percent overnight (example: based on an evaluation of minimum treated water storage required to avoid system outage).*

<u>Requirements for termination</u>
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____________ (*example: 3*) consecutive days.

Stage 2 Triggers – MODERATE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when ____ (*describe triggering criteria; see examples in Stage 1*).

<u>Requirements for termination</u>
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of __________ (*example: 3*) consecutive days. Upon termination of Stage 2, Stage 1, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 3 Triggers – SEVERE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when ______________________________________ (*describe triggering criteria; see examples in Stage 1*).

<u>Requirements for termination</u>
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of __________ (*example: 3*) consecutive days. Upon termination of Stage 3, Stage 2, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 4 Triggers – CRITICAL Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when ____ (*describe triggering criteria; see examples in Stage 1*).

<u>Requirements for termination</u>
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of __________ (*example: 3*) consecutive days. Upon termination of Stage 4, Stage 3, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 5 Triggers – EMERGENCY Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when _________________________ (*designated official*), or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; **or**

2. Natural or man-made contamination of the water supply source(s).

<u>Requirements for termination</u>
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of __________ (*example: 3*) consecutive days.

Stage 6 Triggers – WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when ____ (*describe triggering criteria, see examples in Stage 1*).

Requirements for termination - Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _________ (*example: 3*) consecutive days.

Note: The inclusion of WATER ALLOCATION as part of a drought contingency plan may not be required in all cases. For example, for a given water supplier, an analysis of water supply availability under drought of record conditions may indicate that there is essentially no risk of water supply shortage. Hence, a drought contingency plan for such a water supplier might only address facility capacity limitations and emergency conditions (example: supply source contamination and system capacity limitations).

Section IX: Drought Response Stages
The ________________________ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification
Notification of the Public:
The ________________________ (*designated official*) or his/ her designee shall notify the public by means of:

Examples:
publication in a newspaper of general circulation,
direct mail to each customer,
public service announcements,
signs posted in public places
take-home fliers at schools.

Additional Notification:
The ________________________ (*designated official*) or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TCEQ *(required when* mandatory *restrictions are imposed)*
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers

Note: The plan should specify direct notice only as appropriate to respective drought stages.

Stage 1 Response – MILD Water Shortage Conditions

<u>Target</u>: Achieve a voluntary _________ percent reduction in ________________________ (*example: total water use, daily water demand, etc.*).

<u>Best Management Practices for Supply Management</u>:

D*escribe additional measures, if any, to be implemented directly by (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes.*

<u>Voluntary Water Use Restrictions for Reducing Demand</u>:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the ________________________ (*name of your water supplier*) shall adhere to water use restrictions prescribed for Stage 1 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response – MODERATE Water Shortage Conditions

<u>Target</u>: Achieve a _________ percent reduction in ________________________ (*example: total water use, daily water demand, etc.*).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by ________________________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Demand Reduction</u>:
Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the __________________________ (*name of your water supplier*).

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the __________________________ (*name of your water supplier*), the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response – SEVERE Water Shortage Conditions

<u>Target</u>: Achieve a __________ percent reduction in __________________________ (*example: total water use, daily water demand, etc.*).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by __________________________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, *reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.*

Water Use Restrictions for Demand Reduction:
All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the __________________________ (*name of your water supplier*).

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response – CRITICAL Water Shortage Conditions

Target: Achieve a __________ percent reduction in __________________________ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by __________________________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:
All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response – EMERGENCY Water Shortage Conditions

<u>Target</u>: Achieve a __________ percent reduction in _________________________ (*example: total water use, daily water demand, etc.*).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by _________________________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Reducing Demand:</u>
All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Stage 6 Response – WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare, the _________________________ (*designated official*) is hereby authorized to allocate water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" include only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the _________________________ (*name of your water supplier*) of a greater number of persons per household on a form prescribed by the _________________________ (*designated official*). The _________________________ (*designated official*) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the _________________________ (*name of your water supplier*) offices to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the _________________________ (*designated official*). When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the _________________________ (*name of water supplier*) on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the _________________________ (*name of your water supplier*) in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the _________________________ (*designated official*) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the _________________________ (*name of your water supplier*) of a reduction in the number of person in a household shall be fined not less than $__________.

Residential water customers shall pay the following surcharges:

$__________ for the first 1,000 gallons over allocation.
$__________ for the second 1,000 gallons over allocation.
$__________ for the third 1,000 gallons over allocation.
$__________ for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (example: apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the _________________________ (*name of your water supplier*) of a greater number on a form prescribed by the _________________________ (*designated official*). The _________________________ (*designated official*) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the _________________________ (*name of your water supplier*) offices to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the _________________________ (*designated official*). If the number of dwelling units served by a master meter is reduced, the customer shall notify the _________________________ (*name of your water supplier*) in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the _________________________ (*designated official*) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the _________________________ (*name of your water supplier*) of a reduction in the number of person in a household shall be fined not less than $__________. Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$__________ for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$__________, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$__________, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$__________, thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water allocation shall be established by the _________________________ (*designated official*), or his/her designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately __________ (*example: 75%*) percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, __________percent of whose monthly usage is less than __________ gallons, shall be allocated __________ gallons. The _________________________ (*designated official*) shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the _________________________ (*name of your water supplier*) to determine the allocation. Upon request of the customer or at the initiative of the _________________________ (*designated official*), the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the _________________________ (*designated official or alternatively, a special water allocation review committee*). Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is __________ gallons through __________ gallons per month:

$__________ per thousand gallons for the first 1,000 gallons over allocation.
$__________ per thousand gallons for the second 1,000 gallons over allocation.
$__________ per thousand gallons for the third 1,000 gallons over allocation.
$__________ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is __________ gallons per month or more:

__________times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
__________times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
__________times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
__________times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water allocation shall be established by the _________________________ (*designated official*), or his/her designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately __________ (*example: 90%*) percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's allocation shall be further reduced to __________ (*example: 85%*) percent of the customer's water usage baseline. The industrial customer's water use baseline will be computed on the average water use for the __________ month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than __________ months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The _________________________ (*designated official*) shall give his/her best effort to see that notice of each industrial customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the _________________________ (*name of your water supplier*) to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the _________________________ (*designated official*), the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the customer's normal water use because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the _________________________ (*designated official or alternatively, a special water allocation review committee*). Industrial customers shall pay the following surcharges:

Customers whose allocation is __________ gallons through __________ gallons per month:

$__________ per thousand gallons for the first 1,000 gallons over allocation.
$__________ per thousand gallons for the second 1,000 gallons over allocation.
$__________ per thousand gallons for the third 1,000 gallons over allocation.
$__________ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is __________ gallons per month or more:

__________times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
__________times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
__________times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
__________times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the _________________________ (*name of your water supplier*) for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by _________________________ (*designated official*), or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than __________ dollars ($__________) and not more than __________ dollars ($__________). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the _________________________ (*designated official*) shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $__________, and any other costs incurred by the _________________________ (*name of your water supplier*) in discontinuing service. In addition, suitable assurance must be given to the _________________________ (*designated official*) that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the _________________________ (*name of your water supplier*), in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the _________________________ (*name of your water supplier*), police officer, or other _________________________ employee designated by the _________________________ (*designated official*), may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the _________________________ (*example: municipal court*) on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in _________________________ (*example: municipal court*) to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in _________________________ (*example: municipal court*), a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in _________________________ (*example: municipal court*) before all other cases.

Section XI: Variances

The _________________________ (*designated official*), or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the _________________________ (*name of your water supplier*) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the _________________________ (*designated official*), or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Texas Commission on Environmental Quality
Water Availability Division
MC-160, P.O. Box 13087 Austin, Texas 78711-3087
Telephone (512) 239-4691, FAX (512) 239-2214

Model Drought Contingency Plan for an Irrigation District

This form is provided as a model of a drought contingency plan for an irrigation district. If you need assistance in completing this form or in developing your plan, please contact the Conservation Staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Drought Contingency Plans must be formally adopted by the governing body of the irrigation district and documentation of adoption must be submitted with the plan. An example resolution can be found at the end of this form.

Irrigation District:		
Address:		
Telephone Number:	( )	Fax: ( )
Water Right No.(s):		
Regional Water Planning Group:		
Form Completed by:		
Title:		
Person responsible for implementation:		Phone: ( )
Signature:		Date: / /

Section I: Declaration of Policy, Purpose, and Intent

The Board of Directors of the _______________________ (*name of irrigation district*) deems it to be in the interest of the District to adopt Rules and Regulations governing the equitable and efficient allocation of limited water supplies during times of shortage. These Rules and Regulations constitute the District's drought contingency plan required under Section 11.1272, Texas Water Code, *Vernon's Texas Codes Annotated*, and associated administrative rules of the Texas Commission on Environmental Quality (Title 30, Texas Administrative Code, Chapter 288).

Section II: User Involvement

Opportunity for users of water from the _______________________ (*name of irrigation district*) was provided by means of ____ (*describe methods used to inform water users about the preparation of the plan and opportunities for input; for example, scheduling and providing notice of a public meeting to accept user input on the plan*).

Section III: User Education

The _________________________ (*name of irrigation district*) will periodically provide water users with information about the Plan, including information about the conditions under which water allocation is to be initiated or terminated and the district's policies and procedures for water allocation. This information will be provided by means of _____________________________________ (*example: describe methods to be used to provide water users with information about the Plan; for example, by providing copies of the Plan and by posting water allocation rules and regulations on the district's public bulletin board*).

Section IV: Authorization

The _________________________ (*example: general manager*) is hereby authorized and directed to implement the applicable provision of the Plan upon determination by the Board that such implementation is necessary to ensure the equitable and efficient allocation of limited water supplies during times of shortage.

Section V: Application

The provisions of the Plan shall apply to all persons utilizing water provided by the _________________________ (*name of irrigation district*). The term "person" as used in the Plan includes individuals, corporations, partnerships, associations, and all other legal entities.

Section VI: Initiation of Water Allocation

The _________________________ (*designated official*) shall monitor water supply conditions on a _________________________ (*example: weekly, monthly*) basis and shall make recommendations to the Board regarding irrigation of water allocation. Upon approval of the Board, water allocation will become effective when _____________________________________ (*describe the criteria and the basis for the criteria*):

Below are examples of the types of triggering criteria that might be used; singly or in combination, in an irrigation district's drought contingency plan:

Example 1: Water in storage in the _________________________ (*name of reservoir*) is equal to or less than _______________ (*acre-feet and/or percentage of storage capacity*).

Example 2: Combined storage in the _________________________ (*name or reservoirs*) reservoir system is equal to or less than _______________ (*acre-feet and/or percentage of storage capacity*).

Example 3: Flows as measured by the U.S. Geological Survey gage on the _________________________ (*name of reservoir*) near _________________________, Texas reaches _______________ cubic feet per second (cfs).

Example 4: The storage balance in the district's irrigation water rights account reaches ______________ acre-feet.

Example 5: The storage balance in the district's irrigation water rights account reaches an amount equivalent to _______________ (*number*) irrigations for each flat rate acre in which all flat rate assessments are paid and current.

Example 6: The _________________________ (*name of entity supplying water to the irrigation district*) notifies the district that water deliveries will be limited to _______________ acre-feet per year (*i.e. a level below that required for unrestricted irrigation*).

Section VII: Termination of Water Allocation

The district's water allocation policies will remain in effect until the conditions defined in Section IV of the Plan no longer exist and the Board deems that the need to allocate water no longer exists.

Section VIII: Notice

Notice of the initiation of water allocation will be given by notice posted on the District's public bulletin board and by mail to each ________________________ (*example: landowner, holders of active irrigation accounts, etc.*).

Section IX: Water Allocation

(a) In identifying **specific, quantified targets** for water allocation to be achieved during periods of water shortages and drought, each irrigation user shall be allocated ______________ irrigations or ______________ acre-feet of water each flat rate acre on which all taxes, fees, and charges have been paid. The water allotment in each irrigation account will be expressed in acre-feet of water.

Include explanation of water allocation procedure. For example, in the Lower Rio Grande Valley, an "irrigation" is typically considered to be equivalent to eight (8) inches of water per irrigation acre; consisting of six (6) inches of water per acre applied plus two (2) inches of water lost in transporting the water from the river to the land. Thus, three irrigations would be equal to 24 inches of water per acre or an allocation of 2.0 acre-feet of water measured at the diversion from the river.

(b) As additional water supplies become available to the District in an amount reasonably sufficient for allocation to the District's irrigation users, the additional water made available to the District will be equally distributed, on a pro rata basis, to those irrigation users having ____.

Example 1: An account balance of less than ______________ irrigations for each flat rate acre (*i.e.* ______________ *acre-feet*).

Example 2: An account balance of less than ______________ acre-feet of water for each flat rate acre.

Example 3: An account balance of less than ______________ acre-feet of water.

(c) The amount of water charged against a user's water allocation will be ______________ (*example: eight inches*) per irrigation, or one allocation unit, unless water deliveries to the land are metered. Metered water deliveries will be charges based on actual measured use. In order to maintain parity in charging use against a water allocation between non-metered and metered deliveries, a loss factor of ______________ percent of the water delivered in a metered situation will be added to the measured use and will be charged against the user's water allocation. Any metered use, with the loss factor applied, that is less than eight (8) inches per acre shall be credited back to the allocation unit and will be available to the user. It shall be a violation of the Rules and Regulations for a water user to use water in excess of the amount of water contained in the user's irrigation account.

(d) Acreage in an irrigation account that has not been irrigated for any reason within the last two (2) consecutive years will be considered inactive and will not be allocated water. Any landowner whose land has not been irrigated within the last two (2) consecutive years, may, upon application to the District expressing intent to irrigate the land, receive future allocations. However, irrigation water allocated shall be applied only upon the acreage to which it was allocated and such water allotment cannot be transferred until there have been two consecutive years of use.

Section X: Transfers of Allotments

(a) A water allocation in an active irrigation account may be transferred within the boundaries of the District from one irrigation account to another. The transfer of water can only be made by the landowner's agent who is authorized in writing to act on behalf of the landowner in the transfer of all or part of the water allocation from the described land of the landowner covered by the irrigation account.

(b) A water allocation may not be transferred to land owned by a landowner outside the District boundaries.

or

A water allocation may be transferred to land outside the District's boundaries by paying the current water charge as if the water was actually delivered by the District to the land covered by an irrigation account. The amount of water allowed to be transferred shall be stated in terms of acre-feet and deducted from the landowner's current allocation balance in the irrigation account. Transfers of water outside the District shall not affect the allocation of water under Section VII of these Rules and Regulations.

(c) Water from outside the District may not be transferred by a landowner for use within the District.

or

Water from outside the District may be transferred by a landowner for use within the District. The District will divert and deliver the water on the same basis as District water is delivered, except that a _______________ percent conveyance loss will be charged against the amount of water transferred for use in the District as the water is delivered.

Section XI: Penalties

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations, shall be considered in violation of Section 11.0083, Texas Water Code, *Vernon's Texas Codes Annotated*, which provides for punishment by fine of not less than $10.00 nor more than $200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties provided by the laws of the State and may by enforced by complaints filed in the appropriate court jurisdiction in __________________________ County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.

Section XII: Severability

It is hereby declared to be the intention of the Board of Directors of the __________________________ (*name of irrigation district*) that the sections, paragraphs, sentences, clauses, and phrases of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Board without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Section XIII: Authority

The foregoing rules and regulations are adopted pursuant to and in accordance with Sections 11.039, 11.083, 11.1272; Section 49.004; and Section 58.127-130 of the Texas Water Code, *Vernon's Texas Codes Annotated.*

Section XIV: Effective Date of Plan

The effective date of this Rule shall be five (5) days following the date of Publication hereof and ignorance of the Rules and Regulations is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

RESOLUTION NO. __________

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE ___________________ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the ___________ (*name of water supplier*) and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the ________________ (*name of water supply system*), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE ________________ (*name of water supplier*):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit A and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the ________________ (*name of water supplier*).

SECTION 2. That the _______________ (*example: general manager*) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE ______________, ON THIS __ day of _____________, 20__.

____
President, Board of Directors

ATTESTED TO:

____
Secretary, Board of Directors

Texas Commission on Environmental Quality

Water Availability Division
MC-160, P.O. Box 13087 Austin, Texas 78711-3087
Telephone (512) 239-4691, FAX (512) 239-2214

Drought Contingency Plan for a Wholesale Public Water Supplier

This form is provided as a model of a drought contingency plan for a wholesale public water supplier. If you need assistance in completing this form or in developing your plan, please contact the Conservation Staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Drought Contingency Plans must be formally adopted by the governing body of the water provider and documentation of adoption must be submitted with the plan. For example, adoption by a city council as an ordinance or by resolution of the entity's board of directors adopting the plan as administrative rules.

Name:	______________________________	
Address:	______________________________	
Telephone Number:	( )	Fax: ( )
Water Right No.(s):	______________________________	
Regional Water Planning Group:	______________________________	
Form Completed by:	______________________________	
Title:	______________________________	
Person responsible for implementation:		Phone: ( )
Signature:		Date: / /

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and/or to protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the ________________________ (*name of your water supplier*) adopts the following Drought Contingency Plan (the Plan).

Section II: Public Involvement

Opportunity for the public and wholesale water customers to provide input into the preparation of the Plan was provided by ________________________ (*name of your water supplier*) by means of ____ (*describe methods used to inform the public and wholesale customers about the preparation of the plan and opportunities for input; for example, scheduling and proving public notice of a public meeting to accept input on the Plan*).

Section III: Wholesale Water Customer Education

The _________________________ (*name of your water supplier*) will periodically provide wholesale water customers with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of ____ (*example: describe methods to be used to provide customers with information about the Plan; for example, providing a copy of the Plan or periodically including information about the Plan with invoices for water sales*).

Section IV: Coordination with Regional Water Planning Groups

The water service area of the _________________________ (name of your water supplier) is located within the _________________________ (*name of regional water planning area or areas*) and the _________________________ (*name of your water supplier*) has provided a copy of the Plan to the _________________________ (*name of your regional water planning group or groups*).

Section V: Authorization

The _________________________ (*designated official; for example, the general manager or executive director*), or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _________________________ or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all customers utilizing water provided by the _________________________ (*name of your water supplier*). The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Criteria for Initiation and Termination of Drought Response Stages

The _________________________ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions on a (*example: weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Customer notification of the initiation or termination of drought response stages will be made by mail or telephone. The news media will also be informed.

The triggering criteria described below are based on: ____.
(*provide a brief description of the rationale for the triggering criteria; for example, triggering criteria are based on a statistical analysis of the vulnerability of the water source under drought of record conditions).*

Utilization of alternative water sources and/or alternative delivery mechanisms:

Alternative water source(s) for _________________________ (*name of utility*) is/are: ____.
(Examples: Other well(s), Inter-connection with other system, Temporary use of a non-municipal water supply, Purchased water, Use of reclaimed water for non-potable purposes, etc.).

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation – The ________________________ (*name of your water supplier*) will recognize that a mild water shortage condition exists when ____ (*describe triggering criteria, see examples below).*

> ***Below are examples of the types of triggering criteria that might be used in a wholesale water supplier's drought contingency plan.*** *The wholesale water supplier may devise other triggering criteria and an appropriate number of stages tailored to its system; however, the plan must contain a minimum of three drought stages.* ***One or a combination of such criteria may be defined for each drought response stage:***
>
> ***Example 1: Water in storage in the ________________________ (name of reservoir) is equal to or less than ______________ (acre-feet and/or percentage of storage capacity).***
>
> ***Example 2: When the combined storage in the ________________________ (name of reservoirs) is equal to or less than ______________ (acre-feet and/or percentage of storage capacity).***
>
> ***Example 3: Flows as measured by the U.S. Geological Survey gage on the ________________________ (name of river) near ________________________, Texas reaches ______________ cubic feet per second (cfs).***
>
> ***Example 4: When total daily water demand equals or exceeds ______________ million gallons for ______________ consecutive days or ______________ million gallons on a single day.***
>
> ***Example 5: When total daily water demand equals or exceeds ______________ percent of the safe operating capacity of ______________ million gallons per day for ______________ consecutive days or ______________ percent on a single day.***

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ______________ (*example: 30*) consecutive days. The ________________________ (*name of water supplier*) will notify its wholesale customers and the media of the termination of Stage 1.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

<u>Requirements</u> <u>for</u> <u>initiation</u> – The ________________________ (*name of your water supplier*) will recognize that a moderate water shortage condition exists when ____ (*describe triggering criteria*).

<u>Requirements</u> <u>for</u> <u>termination</u> - Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ______________ (*example: 30*) consecutive days. Upon termination of Stage 2, Stage 1, or the applicable drought response stage based on the triggering criteria, becomes operative. The ________________________ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 2.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

<u>Requirements</u> <u>for</u> <u>initiation</u> – The ________________________ (*name of your water supplier*) will recognize that a severe water shortage condition exists when ____ (*describe triggering criteria; see examples in Stage 1*).

<u>Requirements</u> <u>for</u> <u>termination</u> - Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _________ (*example: 30*) consecutive days. Upon termination of Stage 3, Stage 2, or the applicable drought response stage based on the triggering criteria,

becomes operative. The _________________________ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 3.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation - The _________________________ (*name of your water supplier*) will recognize that an emergency water shortage condition exists when ____ (*describe triggering criteria*; *see examples below*).

Example 1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

Example 2. Natural or man-made contamination of the water supply source(s).

Requirements for termination - Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _______________ (*example: 30*) consecutive days. The _________________________ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 4.

Section VIII: Drought Response Stages

The _________________________ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions and, in accordance with the triggering criteria set forth in Section VII, shall determine that mild, moderate, severe, or critical water shortage conditions exist or that an emergency condition exists and shall implement the following actions:

Stage 1 Response -- MILD Water Shortage Conditions

Target: Achieve a voluntary _______________ percent reduction in _________________________ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _________________________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for nonpotable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _________________________ (*designated official*), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate voluntary measures to reduce water use (*example: implement Stage 1 or appropriate stage of the customer's drought contingency plan*).

(b) The _________________________ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 2 Response -- MODERATE Water Shortage Conditions

Target: Achieve a _______________ percent reduction in _________________________ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ________________________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The ________________________ (*designated official*), or his/her designee(s), will request wholesale water customers to initiate mandatory measures to reduce non-essential water use (*example: implement Stage 2 or appropriate stage of the customer's drought contingency plan*).

(b) The ________________________ (*designated official*), or his/her designee(s), will initiate weekly contact with wholesale water customers to discuss water supply and/or demand conditions and the possibility of pro rata curtailment of water diversions and/or deliveries.

(c) The ________________________ (*designated official*), or his/her designee(s), will further prepare for the implementation of pro rata curtailment of water diversions and/or deliveries by preparing a monthly water usage allocation baseline for each wholesale customer.

(d) The ________________________ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 3 Response -- SEVERE Water Shortage Conditions

Target: Achieve a ______________ percent reduction in ________________________ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ________________________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The ________________________ (*designated official*), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate additional mandatory measures to reduce non-essential water use (example: implement Stage 3 or appropriate stage of the customer's drought contingency plan).

(b) The ________________________ (*designated official*), or his/her designee(s), will initiate pro rata curtailment of water diversions and/or deliveries for each wholesale customer.

(c) The ________________________ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 4 Response -- EMERGENCY Water Shortage Conditions

Whenever emergency water shortage conditions exist as defined in Section VII of the Plan, the _________________________ (*designated official*) shall:

1. Assess the severity of the problem and identify the actions needed and time required to solve the problem.
2. Inform the utility director or other responsible official of each wholesale water customer by telephone or in person and suggest actions, as appropriate, to alleviate problems (*example: notification of the public to reduce water use until service is restored*).
3. If appropriate, notify city, county, and/or state emergency response officials for assistance.
4. Undertake necessary actions, including repairs and/or clean-up as needed.
5. Prepare a post-event assessment report on the incident and critique of emergency response procedures and actions.

Section IX: Pro Rata Curtailment

In the event that the triggering criteria specified in Section VII of the Plan for Stage 3 – Severe Water Shortage Conditions have been met, the _________________________ (*designated official*) is hereby authorized to initiate allocation of water supplies on a pro rata basis in accordance with Texas Water Code, §11.039.

Section X: Contract Provisions

The _________________________ (*name of your water supplier*) will include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039.

Section XI: Enforcement

Example of surcharge:
During any period when either mandatory water use restrictions or pro rata allocation of available water supplies are in effect, wholesale customers shall pay the following surcharges on excess water diversions and/or deliveries:

_______ times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from _______________ percent through _______________ percent above the monthly allocation.

Examples of fines and/or discontinuation of service:
Mandatory water use restrictions or pro rata allocation of available water supplies may be imposed during drought stages and emergency water management actions. These water use restrictions will be enforced by warnings and penalties as follows:

- On the first violation, customers will be notified by written notice that they have violated the mandatory water use restriction.
- If the first violation has not been corrected after ten (10) days from the written notice, _________________________ (*name of your water supplier*) may assess a fine up to $_______________ per violation.
- _________________________ (*name of your water supplier*) may install a flow restricting device in

the line to limit the amount of water which will pass through the meter in a 24-hour period. The utility may charge the customer for the actual cost of installing and removing the flow restricting device, not to exceed fifty dollars ($50.00);

- _________________________ (*name of your water supplier*) maintains the right, at any violation or action level, to disconnect irrigation systems and/or suspend water services to a customer for public safety issues with reconnection fees and possible citations.
- Subsequent violations of the plan shall result in increased fines or upon the occurrence of ______________ violations, after notice, the discontinuation of services. Services discontinued under this provision shall be restored only upon payment of a reconnection fee and any other costs incurred by the utility in discontinuing service.

Section XII: Variances

The _________________________ (*designated official*), or his/her designee, may, in writing, grant a temporary variance to the pro rata water allocation policies provided by this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the public health, welfare, or safety and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the _________________________ (*designated official*) within 5 days after pro rata allocation has been invoked. All petitions for variances shall be reviewed by the _________________________ (*governing body*), and shall include the following:

(a) Name and address of the petitioner(s).
(b) Detailed statement with supporting data and information as to how the pro rata allocation of water under the policies and procedures established in the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(c) Description of the relief requested.
(d) Period of time for which the variance is sought.
(e) Alternative measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(f) Other pertinent information.

Variances granted by the _________________________ (*governing body*) shall be subject to the following conditions, unless waived or modified by the _________________________ (*governing body*) or its designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XIII: Severability

It is hereby declared to be the intention of the _________________________ (*governing body of your water supplier*) that the sections, paragraphs, sentences, clauses, and phrases of this Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the ________________________ (*governing body of your water supplier*) without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Texas Commission on Environmental Quality
Water Availability Division
MC-160, P.O. Box 13087 Austin, Texas 78711-3087
Telephone (512) 239-4691, FAX (512) 239-2214

Utility Profile and Water Conservation Plan Requirements for Municipal Water Use by Retail Public Water Suppliers

This form is provided to assist retail public water suppliers in water conservation plan assistance in completing this form or in developing your plan, please contact the Conservation staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Water users can find best management practices (BMPs) at the Texas Water Development Board's website http://www.twdb.texas.gov/conservation/BMPs/index.asp. The practices are broken out into sectors such as Agriculture, Commercial and Institutional, Industrial, Municipal and Wholesale. BMPs are voluntary measures that water users use to develop the required components of Title 30, Texas Administrative Code, Chapter 288. BMPs can also be implemented in addition to the rule requirements to achieve water conservation goals.

Contact Information

Name of Water Supplier:	Click to add text
Address:	
Telephone Number:	( ) Fax: ( )
Water Right No.(s):	
Regional Water Planning Group:	
Water Conservation Coordinator (or person responsible for implementing conservation program):	Phone: ( )
Form Completed by:	
Title:	
Signature:	Date: / /

A water conservation plan for municipal use by retail public water suppliers must include the following requirements (as detailed in 30 TAC Section 288.2). If the plan does not provide information for each requirement, you must include in the plan an explanation of why the requirement is not applicable.

Utility Profile

I. POPULATION AND CUSTOMER DATA

A. Population and Service Area Data

1. Attach a copy of your service-area map and, if applicable, a copy of your Certificate of Convenience and Necessity (CCN).
2. Service area size (in square miles):

   (Please attach a copy of service-area map)
3. Current population of service area:
4. Current population served for:
   a. Water
   b. Wastewater

5. Population served for previous five years:

Year	*Population*

6. Projected population for service area in the following decades:

Year	*Population*
2020	
2030	
2040	
2050	
2060	

7. List source or method for the calculation of current and projected population size.

B. Customer Data

Senate Bill 181 requires that uniform consistent methodologies for calculating water use and conservation be developed and available to retail water providers and certain other water use sectors as a guide for preparation of water use reports, water conservation plans, and reports on water conservation efforts. A water system must provide the most detailed level of customer and water use data available to it, however, any new billing system purchased must be capable of reporting data for each of the sectors listed below. More guidance can be found at: http://www.twdb.texas.gov/conservation/doc/SB181Guidance.pdf

1. Quantified 5-year and 10-year goals for water savings:

	Historic 5-year Average	*Baseline*	*5-year goal for year*	*10-year goal for year*
Total GPCD				
Residential GPCD				
Water Loss GPCD				
Water Loss Percentage				

Notes:
Total GPCD = (Total Gallons in System ÷ Permanent Population) ÷ 365
Residential GPCD = (Gallons Used for Residential Use ÷ Residential Population) ÷ 365
Water Loss GPCD = (Total Water Loss ÷ Permanent Population) ÷ 365
Water Loss Percentage = (Total Water Loss ÷ Total Gallons in System) x 100; or (Water Loss GPCD ÷ Total GPCD) x 100

2. Current number of active connections. Check whether multi-family service is counted as ☐ Residential or ☐ Commercial?

Treated Water Users	*Metered*	*Non-Metered*	*Totals*
Residential			
Single-Family			
Multi-Family			
Commercial			
Industrial/Mining			
Institutional			
Agriculture			
Other/Wholesale			

3. List the number of new connections per year for most recent three years.

Year			
Treated Water Users			
Residential			
Single-Family			
Multi-Family			
Commercial			
Industrial/Mining			
Institutional			
Agriculture			
Other/Wholesale			

4. List of annual water use for the five highest volume customers.

Customer	*Use (1,000 gal/year)*	*Treated or Raw Water*

II. WATER USE DATA FOR SERVICE AREA

A. Water Accounting Data

1. List the amount of water use for the previous five years (in 1,000 gallons).

   Indicate whether this is ☐ diverted or ☐ treated water.

Year					
Month					
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
Totals					

2. Describe how the above figures were determined (e.g, from a master meter located at the point of a diversion from the source or located at a point where raw water enters the treatment plant, or from water sales).

3. Amount of water (in 1,000 gallons) delivered/sold as recorded by the following account types for the past five years.

Year					
Account Types					
Residential	___	___	___	___	___
Single-Family	___	___	___	___	___
Multi-Family	___	___	___	___	___
Commercial	___	___	___	___	___
Industrial/Mining	___	___	___	___	___
Institutional	___	___	___	___	___
Agriculture	___	___	___	___	___
Other/Wholesale	___	___	___	___	___

4. List the previous records for water loss for the past five years (the difference between water diverted or treated and water delivered or sold).

Year	*Amount (gallons)*	*Percent %*
___	___	___
___	___	___
___	___	___
___	___	___
___	___	___

B. *Projected Water Demands*

1. If applicable, attach or cite projected water supply demands from the applicable Regional Water Planning Group for the next ten years using information such as population trends, historical water use, and economic growth in the service area over the next ten years and any additional water supply requirements from such growth.

III. WATER SUPPLY SYSTEM DATA

A. *Water Supply Sources*

1. List all current water supply sources and the amounts authorized (in acre feet) with each.

Water Type	*Source*	*Amount Authorized*
Surface Water	___	___

Groundwater		
Other		

B. Treatment and Distribution System (if providing treated water)

1. Design daily capacity of system (MGD):
2. Storage capacity (MGD):
   a. Elevated
   b. Ground
3. If surface water, do you recycle filter backwash to the head of the plant?

   ☐ Yes ☐ No If yes, approximate amount (MGD):

IV. WASTEWATER SYSTEM DATA

A. Wastewater System Data (if applicable)

1. Design capacity of wastewater treatment plant(s) (MGD):
2. Treated effluent is used for ☐ on-site irrigation, ☐ off-site irrigation, for ☐ plant wash-down, and/or for ☐ chlorination/dechlorination.

   If yes, approximate amount (in gallons per month):
3. Briefly describe the wastewater system(s) of the area serviced by the water utility. Describe how treated wastewater is disposed. Where applicable, identify treatment plant(s) with the TCEQ name and number, the operator, owner, and the receiving stream if wastewater is discharged.

B. Wastewater Data for Service Area (if applicable)

1. Percent of water service area served by wastewater system: %
2. Monthly volume treated for previous five years (in 1,000 gallons):

Year					
Month					
January					
February					
March					
April					

May					
June					
July					
August					
September					
October					
November					
December					
Totals					

Water Conservation Plan

In addition to the utility profile, please attach the following as required by Title 30, Texas Administrative Code, §288.2. Note: If the water conservation plan does not provide information for each requirement, an explanation must be included as to why the requirement is not applicable.

A. *Record Management System*

The water conservation plan must include a record management system which allows for the classification of water sales and uses in to the most detailed level of water use data currently available to it, including if possible, the following sectors: residential (single and multi-family), commercial.

B. *Specific, Quantified 5 & 10-Year Targets*

The water conservation plan must include specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for municipal use in gallons per capita per day. Note that the goals established by a public water supplier under this subparagraph are not enforceable. These goals must be updated during the five-year review and submittal.

C. *Measuring and Accounting for Diversions*

The water conservation plan must include a statement about the water suppliers metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply.

D. *Universal Metering*

The water conservation plan must include and a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement.

E. *Measures to Determine and Control Water Loss*

The water conservation plan must include measures to determine and control water loss (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections; abandoned services; etc.).

F. *Continuing Public Education & Information*

The water conservation plan must include a description of the program of continuing public education and information regarding water conservation by the water supplier.

G. *Non-Promotional Water Rate Structure*

The water supplier must have a water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water. This rate structure must be listed in the water conservation plan.

H. *Reservoir Systems Operations Plan*

The water conservation plan must include a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies.

I. Enforcement Procedure and Plan Adoption

The water conservation plan must include a means for implementation and enforcement, which shall be evidenced by a copy of the ordinance, rule, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan.

J. Coordination with the Regional Water Planning Group(s)

The water conservation plan must include documentation of coordination with the regional water planning groups for the service area of the public water supplier in order to ensure consistency with the appropriate approved regional water plans.

K. Plan Review and Update

A public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. The revised plan must also include an implementation report.

VI. ADDITIONAL REQUIREMENTS FOR LARGE SUPPLIERS

Required of suppliers serving population of 5,000 or more or a projected population of 5,000 or more within the next ten years:

A. Leak Detection and Repair

The plan must include a description of the program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted for uses of water.

B. Contract Requirements

A requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

VII. ADDITIONAL CONSERVATION STRATEGIES

Any combination of the following strategies shall be selected by the water supplier, in addition to the minimum requirements of 30 TAC §288.2(1), if they are necessary in order to achieve the stated water conservation goals of the plan. The commission may require by commission order that any of the following strategies be implemented by the water supplier if the commission determines that the strategies are necessary in order for the conservation plan to be achieved:

1. Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;

2. Adoption of ordinances, plumbing codes, and/or rules requiring water conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition;

3. A program for the replacement or retrofit of water-conserving plumbing fixtures in existing structures;

4. A program for reuse and/or recycling of wastewater and/or graywater;

5. A program for pressure control and/or reduction in the distribution system and/or for customer connections;

6. A program and/or ordinance(s) for landscape water management;

7. A method for monitoring the effectiveness and efficiency of the water conservation plan; and

8. Any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

VIII. WATER CONSERVATION PLANS SUBMITTED WITH A WATER RIGHT APPLICATION FOR NEW OR ADDITIONAL STATE WATER

Water Conservation Plans submitted with a water right application for New or Additional State Water must include data and information which:

1. support the applicant's proposed use of water with consideration of the water conservation goals of the water conservation plan;

2. evaluates conservation as an alternative to the proposed appropriation; and

3. evaluates any other feasible alternative to new water development including, but not limited to, waste prevention, recycling and reuse, water transfer and marketing, regionalization, and optimum water management practices and procedures.

Additionally, it shall be the burden of proof of the applicant to demonstrate that no feasible alternative to the proposed appropriation exists and that the requested amount of appropriation is necessary and reasonable for the proposed use.

Texas Commission on Environmental Quality
Water Availability Division
MC-160, P.O. Box 13087 Austin, Texas 78711-3087
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System Inventory and Water Conservation Plan for Agricultural Water Suppliers Providing Water to More Than One User

This form is provided to assist entities in developing a water conservation plan for agricultural water suppliers providing water to more than one user. If you need assistance in completing this form or in developing your plan, please contact the Conservation staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Additional resources such as best management practices (BMPs) are available on the Texas Water Development Board's website http://www.twdb.texas.gov/conservation/BMPs/index.asp. The practices are broken out into sectors such as Agriculture, Commercial and Institutional, Industrial, Municipal and Wholesale. BMPs are voluntary measures that water users use to develop the required components of Title 30, Texas Administrative Code, Chapter 288. BMPs can also be implemented in addition to the rule requirements to achieve water conservation goals.

Contact Information

Name: Click to add text

Address: ____________________

Telephone Number: (   ) ____________ Fax: (   ) ____________

Form Completed By: ____________________

Title: ____________________

Signature: ____________ Date: / /

A water conservation plan for agriculture use (for a system providing agricultural water to more than one user) must include the following requirements (as detailed in 30 TAC Section 288.4). If the plan does not provide information for each requirement, you must include in the plan an explanation of why the requirement is not applicable.

I. BACKGROUND DATA

A. Structural Facilities (Supplier's water storage, conveyance, and delivery structures)

1. Description of service area:

2. Total miles of main canals and pipelines:

3. Total miles of lateral canals and pipelines:

4. Description of canal construction:
    a. Miles of unlined canals
    b. Miles of lined canals
    c. Miles of enclosed pipelines
    d. Other
5. Description of canal conditions and recent or planned improvements:

6. Reservoir capacity, if applicable:

7. Description of pumps and pumping stations:

8. Description of meters and/or measuring devices:

9. Description of customer gates and measuring devices:

10. Description of any other structural facilities not covered above:

B. Management Practices

1. Total water available to district (in acre-feet/year):
    a. Maximum water rights allocation to district:
    b. Water right number(s):
    c. Other water contracted to be delivered by district:

2. Average annual water diverted by district (in acre-feet/year):
3. Average annual water delivered to customers (in acre-feet/year):
4. Delivery efficiency (percentage):

5. Historical diversion and deliveries for the previous three years (in acre-feet/year):

Year	*Total Water Diverted Annually*	*Irrigation Water Delivered Annually*	*Municipal Water Delivered Annually*	*Total Water Delivered Annually*	*Estimated Delivery Efficiency (%)*
Average					

6. Description of practices and/or devices used to account for water deliveries:

7. Water pricing policy:

8. Operating rules and policies which encourage water conservation (if a separate document, include it as an attachment to the Water Conservation Plan):

9. Provide specific, quantified 5-year and 10-year targets for water savings or system efficiency below, including maximum allowable losses for the storage and distribution system. Water savings may be represented in acre-feet or in water use efficiency.

   Quantified 5-year and 10-year targets for water savings and water loss:

   5-year goal:
   Water savings in acre-feet or water use efficiency %
   Water loss

   10-year goal:
   Water savings in acre-feet or water use efficiency %
   Water loss

10. Describe the practice(s) and/or device(s) which will be utilized to measure and account for the amount of water diverted from the source(s) of supply:

11. Describe the monitoring and record management program for water deliveries, sales, and losses:

12. Describe any programs that will be used for water loss control, leak detection, and repair:

13. Describe any program for customer assistance in the development of on-farm water conservation and pollution prevention plans and/or measures:

14. Describe any other water conservation practice, method, or technique which the supplier shows to be appropriate for achieving conservation (if applicable):

C. User profile

1. Total number of acres or square miles in service area:
2. Average number of acres irrigated annually:
3. Projected number of acres to be irrigated in 10 years:
4. Number of active customers taking delivery of water by the system:
5. Total irrigation water delivered annually (in acre-feet):
6. Types of crops grown by customers:

7. Types of irrigation systems used by customers:

8. Types of drainage systems used by customers:

9. Any additional relevant information on irrigation customers:

10. List of municipal customers and number of acre-feet allocated annually:

11. List of industrial and other large customers and number of acre-feet allocated annually:

D. Additional Requirements

In addition to the above information, please attach the following as required by Title 30, Texas Administrative Code, §288.4(3).

1. A requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in 30 TAC Chapter 288. If the customer intends to resell the water, then the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of 30 TAC Chapter 288.

2. Evidence of official adoption of the water conservation plan and goals, by ordinance, rule, resolution, or tariff, indicating that the plan reflects official policy of the supplier.

3. Documentation of coordination with the Regional Water Planning Group(s) in order to ensure consistency with the appropriate approved regional water plan(s).

II. Water Conservation Plans submitted with a Water Right Application for New or Additional State Water

Water Conservation Plans submitted with a water right application for New or Additional State Water must include data and information which:

1. support the applicant's proposed use of water with consideration of the water conservation goals of the water conservation plan;

2. evaluates conservation as an alternative to the proposed appropriation; and

3. evaluates any other feasible alternative to new water development including, but not limited to, waste prevention, recycling and reuse, water transfer and marketing, regionalization, and optimum water management practices and procedures.

Additionally, it shall be the burden of proof of the applicant to demonstrate that no feasible alternative to the proposed appropriation exists and that the requested amount of appropriation is necessary and reasonable for the proposed use.

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Utility Profile and Water Conservation Plan Requirements for Wholesale Public Water Suppliers

This form is provided to assist wholesale public water suppliers in water conservation plan development. If you need assistance in completing this form or in developing your plan, please contact the Conservation staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Water users can find best management practices (BMPs) at the Texas Water Development Board's website http://www.twdb.texas.gov/conservation/BMPs/index.asp. The practices are broken out into sectors such as Agriculture, Commercial and Institutional, Industrial, Municipal and Wholesale. BMPs are voluntary measures that water users use to develop the required components of Title 30, Texas Administrative Code, Chapter 288. BMPs can also be implemented in addition to the rule requirements to achieve water conservation goals.

Contact Information

Name: Click to add text ______________________

Address: ______________________

Telephone Number: ( ) ______________ Fax: ( ) ______________

Water Right No.(s): ______________________

Regional Water Planning Group: ______________________

Person responsible for implementing conservation program: ______________ Phone: ( ) ______________

Form Completed By: ______________________

Title: ______________________

Signature: ______________ Date: / /

A water conservation plan for wholesale public water suppliers must include the following requirements (as detailed in 30 TAC Section 288.5). If the plan does not provide information for each requirement, you must include in the plan an explanation of why the requirement is not applicable.

Utility Profile

I. WHOLESALE SERVICE AREA POPULATION AND CUSTOMER DATA

A. Population and Service Area Data:

1. Service area size (in square miles):

   (Please attach a copy of service-area map)

2. Current population of service area:

3. Current population served for:

   a. Water

   b. Wastewater

4. Population served for previous five years:

Year	Population

5. Projected population for service area in the following decades:

Year	Population
2020	
2030	
2040	
2050	
2060	

6. List source or method for the calculation of current and projected population size.

B. Customer Data

List (or attach) the names of all wholesale customers, amount of annual contract, and amount of annual use for each customer for the previous year:

Wholesale Customer	*Contracted Amount (Acre-feet)*	*Previous Year Amount of Water Delivered (acre-feet)*

II. WATER USE DATA FOR SERVICE AREA

A. Water Delivery

Indicate if the water provided under wholesale contracts is treated or raw water and the annual amounts for the previous five years (in acre feet):

Year	*Treated Water*	*Raw Water*
Totals		

B. *Water Accounting Data*

1. Total amount of water diverted at the point of diversion(s) for the previous five years (in acre-feet) for all water uses:

Year					
Month					
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

Totals __________ __________ __________ __________ __________

2. Wholesale population served and total amount of water diverted for **municipal use** for the previous five years (in acre-feet):

Year	*Total Population Served*	*Total Annual Water Diverted for Municipal Use*

C. *Projected Water Demands*

If applicable, project and attach water supply demands for the next ten years using information such as population trends, historical water use, and economic growth in the service area over the next ten years and any additional water supply requirements from such growth.

III. WATER SUPPLY SYSTEM DATA

A. *Projected Water Demands*

List all current water supply sources and the amounts authorized (in acre feet) with each.

Water Type	*Source*	*Amount Authorized*
Surface Water		
Groundwater		
Other		

B. *Treatment and Distribution System (if providing treated water)*

1. Design daily capacity of system (MGD):

2. Storage capacity (MGD):

   a. Elevated

   b. Ground

3. Please attach a description of the water system. Include the number of treatment plants, wells, and storage tanks

IV. WASTEWATER SYSTEM DATA

A. Wastewater System Data (if applicable)

1. Design capacity of wastewater treatment plant(s) (MGD):

2. Briefly describe the wastewater system(s) of the area serviced by the wholesale public water supplier. Describe how treated wastewater is disposed. Where applicable, identify treatment plant(s) with the TCEQ name and number, the operator, owner, and the receiving stream if wastewater is discharged.

B. Wastewater Data for Service Area (if applicable)

1. Percent of water service area served by wastewater system: %

2. Monthly volume treated for previous five years (in 1,000 gallons):

Year					
Month					
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
Totals					

Water Conservation Plan

In addition to the description of the wholesaler's service area (profile from above), a water conservation plan for a wholesale public water supplier must include, at a minimum, additional information as required by Title 30, Texas Administrative Code, Chapter 288.5. Note: If the water conservation plan does not provide information for each requirement an explanation must be included as to why the requirement is not applicable.

A. *Specific, Quantified 5 & 10-Year Targets*

The water conservation plan must include specific, quantified 5-year and 10-year targets for water savings including, where appropriate, target goals for municipal use in gallons per capita per day for the wholesaler's service area, maximum acceptable water loss, and the basis for the development of these goals. Note that the goals established by a wholesale water supplier under this subparagraph are not enforceable. These goals must be updated during the 5-year review and submittal.

B. *Measuring and Accounting for Diversions*

The water conservation plan must include a description as to which practice(s) and/or device(s) will be utilized to measure and account for the amount of water diverted from the source(s) of supply.

C. *Record Management Program*

The water conservation plan must include a monitoring and record management program for determining water deliveries, sales, and losses.

D. *Metering/Leak-Detection and Repair Program*

The water conservation plan must include a program of metering and leak detection and repair for the wholesaler's water storage, delivery, and distribution system.

E. *Contract Requirements for Successive Customer Conservation*

The water conservation plan must include a requirement in every water supply contract entered into or renewed after official adoption of the water conservation plan, and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements of Title 30 TAC Chapter 288. If the customer intends to resell the water, then the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

F. *Reservoir Systems Operations Plan*

The water conservation plan must include a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin. The reservoir systems operations plan shall include optimization of water supplies as one of the significant goals of the plan.

G. *Enforcement Procedure and Official Adoption*

The water conservation plan must include a means for implementation and enforcement, which shall be evidenced by a copy of the ordinance, rule, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan.

H. *Coordination with the Regional Water Planning Group(s)*

The water conservation plan must include documentation of coordination with the regional water planning groups for the service area of the wholesale water supplier in order to ensure consistency with the appropriate approved regional water plans.

Example statement to be included within the water conservation plan:

The service area of the _____________ (name of water supplier) is located within the ___________ (name of regional water planning area or areas) and ___________ (name of water supplier) has provided a copy of this water conservation plan to the ____________ (name of regional water planning group or groups).

I. *Plan Review and Update*

A wholesale water supplier shall review and update its water conservation plan, as appropriate based on an assessment of previous 5-year and 10-year targets and any other new or updated information. A wholesale water supplier shall review and update the next revision of its water conservation plan no later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. The revised plan must also include an implementation report.

V. ADDITIONAL CONSERVATION STRATEGIES

Any combination of the following strategies shall be selected by the water wholesaler, in addition to the minimum requirements of 30 TAC §288.5(1), if they are necessary in order to achieve the stated water conservation goals of the plan. The commission may require by commission order that any of the following strategies be implemented by the water supplier if the commission determines that the strategies are necessary in order for the conservation plan to be achieved:

1. Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;
2. A program to assist agricultural customers in the development of conservation, pollution prevention and abatement plans;
3. A program for reuse and/or recycling of wastewater and/or graywater;
4. Any other water conservation practice, method, or technique which the wholesaler shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

VI. WATER CONSERVATION PLANS SUBMITTED WITH A WATER RIGHT APPLICATION FOR NEW OR ADDITIONAL STATE WATER

Water Conservation Plans submitted with a water right application for New or Additional State Water must include data and information which:

1. support the applicant’s proposed use of water with consideration of the water conservation goals of the water conservation plan;

2. evaluates conservation as an alternative to the proposed appropriation; and

3. evaluates any other feasible alternative to new water development including, but not limited to, waste prevention, recycling and reuse, water transfer and marketing, regionalization, and optimum water management practices and procedures.

Additionally, it shall be the burden of proof of the applicant to demonstrate that no feasible alternative to the proposed appropriation exists and that the requested amount of appropriation is necessary and reasonable for the proposed use.

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Telephone (512) 239-4691, FAX (512) 239-2214

Industrial / Mining Water Conservation Plan

This form is provided to assist entities in developing a water conservation plan for industrial water use. If you need assistance in completing this form or in developing your plan, please contact the Conservation staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Additional resources such as best management practices (BMPs) are available on the Texas Water Development Board's website http://www.twdb.texas.gov/conservation/BMPs/index.asp. The practices are broken out into sectors such as Agriculture, Commercial and Institutional, Industrial, Municipal and Wholesale. BMPs are voluntary measures that water users use to develop the required components of Title 30, Texas Administrative Code, Chapter 288. BMPs can also be implemented in addition to the rule requirements to achieve water conservation goals.

Contact Information

Name: Click to add text ______________________

Address: ______________________

Telephone Number: (   ) ______________ Fax: (   ) ______________

Form Completed By: ______________________

Title: ______________________

Signature: ______________ Date: / /

A water conservation plan for industrial use must include the following requirements (as detailed in 30 TAC Section 288.3). If the plan does not provide information for each requirement, you must include in the plan an explanation of why the requirement is not applicable.

I. BACKGROUND DATA

A. Water Use

1. Annual diversion appropriated or requested (in acre-feet):

2. Maximum diversion rate (cfs):

B. Water Sources

1. Please indicate the maximum or average annual amounts of water currently used and anticipated to be used (in acre-feet) for industrial purposes:

Source	*Water Right No.(s)*	*Current Use*	*Anticipated Use*
Surface Water			
Groundwater			
Purchased			
Total			

2. How was the surface water data and/or groundwater data provided in B(1) obtained?

   Master meter ; Customer meter ; Estimated ; Other

3. Was purchased water raw or treated?

   If both, % raw ; % treated ; and Supplier(s)

C. Industrial Information

1. Major product(s) or service(s) produced by applicant:

2. North American Industry Classification System (NAICS):

II. WATER USE AND CONSERVATION PRACTICES

A. Water Use in Industrial Processes

Production Use	*% Groundwater*	*% Surface Water*	*% Saline Water*	*% Treated Water*	*Water Use (in acre-ft)*
Cooling, condensing, & refrigeration					
Processing, washing, transport					
Boiler feed					
Incorporated into product					
Other					

Facility Use	*% Groundwater*	*% Surface Water*	*% Saline Water*	*% Treated Water*	*Water Use (in acre-ft)*
Cooling tower(s)					
Pond(s)					
Once through					
Sanitary & drinking water					
Irrigation & dust control					

1. Was fresh water recirculated at this facility? ☐ Yes ☐ No
2. Provide a detailed description of how the water will be utilized in the industrial process.
3. Estimate the quantity of water consumed in production processes and is therefore unavailable for reuse, discharge, or other means of disposal.
4. Monthly water consumption for previous year (in acre-feet).

Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
January			
February			
March			
April			
May			
June			
July			
August			

September			
October			
November			
December			
Totals			

5. Projected monthly water consumption for next year (in acre-feet).

Month	*Diversion Amount*	*% of Water Returned (If Any)*	*Monthly Consumption*
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Totals			

B. *Specific and Quantified Conservation Goal*

Water conservation goals for the industrial sector are generally established either for (1) the amount of water recycled, (2) the amount of water reused, or (3) the amount of water not lost or consumed, and therefore is available for return flow.

1. Water conservation goal (water use efficiency measure)

Type of goal(s):

% reused water

% of water not consumed and therefore returned

Other (specify)

2. Provide specific, quantified 5-year and 10-year targets for water savings and the basis for development of such goals for this water use/facility.

   Quantified 5-year and 10-year targets for water savings:

   a. 5-year goal:

   b. 10-year goal:

3. Describe the device(s) and/or method(s) used to measure and account for the amount of water diverted from the supply source, and verify the accuracy is within plus or minus 5%.

4. Provide a description of the leak-detection and repair, and water-loss accounting measures used.

5. Describe the application of state-of-the-art equipment and/or process modifications used to improve water use efficiency.

6. Describe any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan:

III. Water Conservation Plans submitted with a Water Right Application for New or Additional State Water

Water Conservation Plans submitted with a water right application for New or Additional State Water must include data and information which:

1. support the applicant's proposed use of water with consideration of the water conservation goals of the water conservation plan;

2. evaluates conservation as an alternative to the proposed appropriation; and

3. evaluates any other feasible alternative to new water development including, but not limited to, waste prevention, recycling and reuse, water transfer and marketing, regionalization, and optimum water management practices and procedures.

Additionally, it shall be the burden of proof of the applicant to demonstrate that no feasible alternative to the proposed appropriation exists and that the requested amount of appropriation is necessary and reasonable for the proposed use.

Appendix F: Infrastructure Financing Report Survey

Entity Name	Entity Planning Region	Respondent Contact Name	Area Code	Phone	Extension	Email	Comment	Entity Rwp Id
AGUA SUD	M							2806
ALAMO	M							159
BAYVIEW IRRIGATION DISTRICT #11	M							6864
BROWNSVILLE	M							278
BROWNSVILLE IRRIGATION DISTRICT	M	Arturo Cabello Jr	956	831-8462		acbid06@sbcglobal.net		16
CAMERON COUNTY IRRIGATION DISTRICT #10	M							6876
CAMERON COUNTY IRRIGATION DISTRICT #2	M							18
CAMERON COUNTY IRRIGATION DISTRICT #6	M							6865
COUNTY-OTHER, CAMERON	M							397
COUNTY-OTHER, HIDALGO	M							474
COUNTY-OTHER, MAVERICK	M							528
COUNTY-OTHER, STARR	M							580
COUNTY-OTHER, WEBB	M							606
COUNTY-OTHER, ZAPATA	M							619
DELTA LAKE IRRIGATION DISTRICT	M	Troy Allen	956	262-2101		troy@deltalakeid.org		37
DONNA	M							666
DONNA IRRIGATION DISTRICT-HIDALGO	M							39
EAGLE PASS	M	Jorge L. Flores	830	773-2351		jflores@epwaterworks.org	At this time, EPWWS does not have any plans for the projects below	42
EAST RIO HONDO WSC	M							679
EDCOUCH	M							685
EDINBURG	M							688
EL JARDIN WSC	M							2975
EL SAUZ WSC	M							12991
EL TANQUE WSC	M							12992
ELSA	M							702
ENGELMAN IRRIGATION DISTRICT	M							6872
HARLINGEN	M	Timothy E. Skoglund	956	430-6157		tskoglund@hwws.com; administration@hwws.com	Project for purchase of water rights. No construction or state funding involved	66
HARLINGEN IRRIGATION DISTRICT-CAMERON	M							65
HIDALGO	M							843
HIDALGO COUNTY IRRIGATION DISTRICT #1	M							68
HIDALGO COUNTY IRRIGATION DISTRICT #13	M							6874
HIDALGO COUNTY IRRIGATION DISTRICT #16	M							69
HIDALGO COUNTY IRRIGATION DISTRICT #19	M							6880
HIDALGO COUNTY IRRIGATION DISTRICT #2	M							70
HIDALGO COUNTY IRRIGATION DISTRICT #5	M							6873
HIDALGO COUNTY IRRIGATION DISTRICT #6	M							67
HIDALGO COUNTY MUD 1	M							844
HIDALGO COUNTY WCID #18	M							6875
HIDALGO COUNTY WID #3	M							71
HIDALGO-CAMERON COUNTY IRRIGATION	M							72
IRRIGATION, JIM HOGG	M							996
LA FERIA	M							1172
LA FERIA IRRIGATION DISTRICT-CAMERON	M							78
LA GRULLA	M							1174
LA JOYA	M							1175
LA VILLA	M							1179
LAGUNA MADRE WATER DISTRICT	M	Charles Ortiz	956	943-2626	130	cortiz@lmwd.org		80
LAREDO	M	Riazul Mia	956	721-2000		rmia@ci.laredo.tx.us		1199
LOS FRESNOS	M							1488
LYFORD	M	Lydia Moreno	956	347-3512		cityoflyford@lyfordtx.us		1498
MANUFACTURING, MAVERICK	M							1616
MAVERICK COUNTY WCID #1	M							6867
MCALLEN	M							93
MERCEDES	M							1711
MILITARY HIGHWAY WSC	M							1722
MIRANDO CITY WSC	M							13136
MISSION	M							1952
NORTH ALAMO WSC	M							98
OLMITO WSC	M	Robert Tamayo	956	350-4099		rtamayo@olmitowsc.com		2026
PHARR	M							2067
PORT MANSFIELD PUD	M							13202
PRIMERA	M							2102
RIO GRANDE CITY	M							2136
RIO HONDO	M	Ben Medina Jr.	956	748-2102		bmedina@riohondo.us	Extra contact: 956-204-0499	2137
RIO WSC	M							2139
ROMA	M							2589
SAN BENITO	M							2175
SAN JUAN	M							2178
SANTA CRUZ IRRIGATION DISTRICT #15	M							2979
SEBASTIAN MUD	M	Tommie Martin	956	347-3036		sebmud@aol.com	At this time I do not have any information to give for any infrastructure	2197
SHARYLAND WSC	M							122
SIESTA SHORES WCID	M							13234
STEAM ELECTRIC POWER, HIDALGO	M							2284
UNION WSC	M							2856
UNITED IRRIGATION DISTRICT	M							136
VALLEY ACRES IRRIGATION DISTRICT	M							6866
WEBB COUNTY	M	Tomas Sanchez Jr.	956	523-5590		tomsanchez@webbcountytx.gov	From call: no projects in pursuit at this time	2422
WESLACO	M							2429
ZAPATA COUNTY	M							2864

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
AGUA SUD	M	AGUA SUD - EAST WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2806	2610	1
AGUA SUD	M	AGUA SUD - EAST WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				2806	2610	2
AGUA SUD	M	AGUA SUD - EAST WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2806	2610	3
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2806	2365	1
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				2806	2365	2
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2806	2365	3
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2806	2609	1
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE II	M	CONSTRUCTION FUNDING				2806	2609	2
AGUA SUD	M	AGUA SUD - WEST WWTP POTABLE REUSE PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2806	2609	3
AGUA SUD	M	URBANIZATION - AGUA SUD	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2806	2734	1
AGUA SUD	M	URBANIZATION - AGUA SUD	M	CONSTRUCTION FUNDING				2806	2734	2
AGUA SUD	M	URBANIZATION - AGUA SUD	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2806	2734	3
ALAMO	M	ALAMO - BRACKISH GROUNDWATER DESALINATION PLANT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				159	1120	1
ALAMO	M	ALAMO - BRACKISH GROUNDWATER DESALINATION PLANT	M	CONSTRUCTION FUNDING				159	1120	2
ALAMO	M	ALAMO - BRACKISH GROUNDWATER DESALINATION PLANT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				159	1120	3
ALAMO	M	ALAMO - FRESH GROUNDWATER WELL	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				159	1601	1
ALAMO	M	ALAMO - FRESH GROUNDWATER WELL	M	CONSTRUCTION FUNDING				159	1601	2
ALAMO	M	ALAMO - FRESH GROUNDWATER WELL	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				159	1601	3
ALAMO	M	URBANIZATION - ALAMO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				159	2738	1
ALAMO	M	URBANIZATION - ALAMO	M	CONSTRUCTION FUNDING				159	2738	2
ALAMO	M	URBANIZATION - ALAMO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				159	2738	3
BAYVIEW IRRIGATION DISTRICT #11	M	BAYVIEW ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6864	2216	1

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
BAYVIEW IRRIGATION DISTRICT #11	M	BAYVIEW ID CONSERVATION	M	CONSTRUCTION FUNDING				6864	2216	2
BAYVIEW IRRIGATION DISTRICT #11	M	BAYVIEW ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6864	2216	3
BROWNSVILLE	M	BROWNSVILLE - BANCO MORALES RESERVOIR	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	2343	1
BROWNSVILLE	M	BROWNSVILLE - BANCO MORALES RESERVOIR	M	CONSTRUCTION FUNDING				278	2343	2
BROWNSVILLE	M	BROWNSVILLE - BANCO MORALES RESERVOIR	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	2343	3
BROWNSVILLE	M	BROWNSVILLE - NON-POTABLE WATER REUSE PIPELINE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	2355	1
BROWNSVILLE	M	BROWNSVILLE - NON-POTABLE WATER REUSE PIPELINE	M	CONSTRUCTION FUNDING				278	2355	2
BROWNSVILLE	M	BROWNSVILLE - NON-POTABLE WATER REUSE PIPELINE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	2355	3
BROWNSVILLE	M	BROWNSVILLE - RESACA RESTORATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	2524	1
BROWNSVILLE	M	BROWNSVILLE - RESACA RESTORATION	M	CONSTRUCTION FUNDING				278	2524	2
BROWNSVILLE	M	BROWNSVILLE - RESACA RESTORATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	2524	3
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	2356	1
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				278	2356	2
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	2356	3
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	2607	1
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE II	M	CONSTRUCTION FUNDING				278	2607	2
BROWNSVILLE	M	BROWNSVILLE - SOUTHSIDE WWTP POTABLE REUSE PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	2607	3
BROWNSVILLE	M	URBANIZATION - BROWNSVILLE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				278	4248	1
BROWNSVILLE	M	URBANIZATION - BROWNSVILLE	M	CONSTRUCTION FUNDING				278	4248	2
BROWNSVILLE	M	URBANIZATION - BROWNSVILLE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				278	4248	3
BROWNSVILLE IRRIGATION DISTRICT	M	BROWNSVILLE ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	N/A	N/A		16	2215	1
BROWNSVILLE IRRIGATION DISTRICT	M	BROWNSVILLE ID CONSERVATION	M	CONSTRUCTION FUNDING	N/A	N/A		16	2215	2
BROWNSVILLE IRRIGATION DISTRICT	M	BROWNSVILLE ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	N/A			16	2215	3

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
CAMERON COUNTY IRRIGATION DISTRICT #10	M	CAMERON COUNTY WATER IMPROVEMENT DISTRICT NO. 10 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6876	2229	1
CAMERON COUNTY IRRIGATION DISTRICT #10	M	CAMERON COUNTY WATER IMPROVEMENT DISTRICT NO. 10 CONSERVATION	M	CONSTRUCTION FUNDING				6876	2229	2
CAMERON COUNTY IRRIGATION DISTRICT #10	M	CAMERON COUNTY WATER IMPROVEMENT DISTRICT NO. 10 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6876	2229	3
CAMERON COUNTY IRRIGATION DISTRICT #2	M	CAMERON COUNTY ID #2 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				18	2218	1
CAMERON COUNTY IRRIGATION DISTRICT #2	M	CAMERON COUNTY ID #2 CONSERVATION	M	CONSTRUCTION FUNDING				18	2218	2
CAMERON COUNTY IRRIGATION DISTRICT #2	M	CAMERON COUNTY ID #2 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				18	2218	3
CAMERON COUNTY IRRIGATION DISTRICT #6	M	CAMERON COUNTY ID NO. 6 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6865	2222	1
CAMERON COUNTY IRRIGATION DISTRICT #6	M	CAMERON COUNTY ID NO. 6 CONSERVATION	M	CONSTRUCTION FUNDING				6865	2222	2
CAMERON COUNTY IRRIGATION DISTRICT #6	M	CAMERON COUNTY ID NO. 6 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6865	2222	3
COUNTY-OTHER, CAMERON	M	COUNTY-OTHER, CAMERON - EXPANDED GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				397	2680	1
COUNTY-OTHER, CAMERON	M	COUNTY-OTHER, CAMERON - EXPANDED GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				397	2680	2
COUNTY-OTHER, CAMERON	M	COUNTY-OTHER, CAMERON - EXPANDED GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				397	2680	3
COUNTY-OTHER, CAMERON	M	URBANIZATION - CAMERON COUNTY-OTHER	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				397	2729	1
COUNTY-OTHER, CAMERON	M	URBANIZATION - CAMERON COUNTY-OTHER	M	CONSTRUCTION FUNDING				397	2729	2
COUNTY-OTHER, CAMERON	M	URBANIZATION - CAMERON COUNTY-OTHER	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				397	2729	3
COUNTY-OTHER, HIDALGO	M	URBANIZATION - HIDALGO COUNTY-OTHER	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				474	2735	1
COUNTY-OTHER, HIDALGO	M	URBANIZATION - HIDALGO COUNTY-OTHER	M	CONSTRUCTION FUNDING				474	2735	2
COUNTY-OTHER, HIDALGO	M	URBANIZATION - HIDALGO COUNTY-OTHER	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				474	2735	3
COUNTY-OTHER, MAVERICK	M	URBANIZATION - MAVERICK COUNTY-OTHER	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				528	4127	1
COUNTY-OTHER, MAVERICK	M	URBANIZATION - MAVERICK COUNTY-OTHER	M	CONSTRUCTION FUNDING				528	4127	2

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
COUNTY-OTHER, MAVERICK	M	URBANIZATION - MAVERICK COUNTY-OTHER	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				528	4127	3
COUNTY-OTHER, STARR	M	COUNTY-OTHER, STARR - ADDITIONAL GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				580	2616	1
COUNTY-OTHER, STARR	M	COUNTY-OTHER, STARR - ADDITIONAL GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				580	2616	2
COUNTY-OTHER, STARR	M	COUNTY-OTHER, STARR - ADDITIONAL GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				580	2616	3
COUNTY-OTHER, STARR	M	URBANIZATION - STARR COUNTY-OTHER	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				580	4128	1
COUNTY-OTHER, STARR	M	URBANIZATION - STARR COUNTY-OTHER	M	CONSTRUCTION FUNDING				580	4128	2
COUNTY-OTHER, STARR	M	URBANIZATION - STARR COUNTY-OTHER	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				580	4128	3
COUNTY-OTHER, WEBB	M	COUNTY-OTHER, WEBB - ADDITIONAL GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				606	1709	1
COUNTY-OTHER, WEBB	M	COUNTY-OTHER, WEBB - ADDITIONAL GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				606	1709	2
COUNTY-OTHER, WEBB	M	COUNTY-OTHER, WEBB - ADDITIONAL GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				606	1709	3
COUNTY-OTHER, ZAPATA	M	URBANIZATION - ZAPATA COUNTY-OTHER	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				619	2754	1
COUNTY-OTHER, ZAPATA	M	URBANIZATION - ZAPATA COUNTY-OTHER	M	CONSTRUCTION FUNDING				619	2754	2
COUNTY-OTHER, ZAPATA	M	URBANIZATION - ZAPATA COUNTY-OTHER	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				619	2754	3
DELTA LAKE IRRIGATION DISTRICT	M	DELTA LAKE ID - ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$20,000.00	2023		37	2312	1
DELTA LAKE IRRIGATION DISTRICT	M	DELTA LAKE ID - ID CONSERVATION	M	CONSTRUCTION FUNDING	$500,000.00	2024		37	2312	2
DELTA LAKE IRRIGATION DISTRICT	M	DELTA LAKE ID - ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	5%			37	2312	3
DONNA	M	DONNA - WTP EXPANSION, NEW RAW WATER RESERVOIR, AND RAW WATER PUMP STATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				666	2596	1
DONNA	M	DONNA - WTP EXPANSION, NEW RAW WATER RESERVOIR, AND RAW WATER PUMP STATION	M	CONSTRUCTION FUNDING				666	2596	2

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
DONNA	M	DONNA - WTP EXPANSION, NEW RAW WATER RESERVOIR, AND RAW WATER PUMP STATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				666	2596	3
DONNA	M	URBANIZATION - DONNA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				666	2597	1
DONNA	M	URBANIZATION - DONNA	M	CONSTRUCTION FUNDING				666	2597	2
DONNA	M	URBANIZATION - DONNA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				666	2597	3
DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1	M	DONNA ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				39	2327	1
DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1	M	DONNA ID CONSERVATION	M	CONSTRUCTION FUNDING				39	2327	2
DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1	M	DONNA ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				39	2327	3
EAGLE PASS	M	URBANIZATION - EAGLE PASS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				42	4141	1
EAGLE PASS	M	URBANIZATION - EAGLE PASS	M	CONSTRUCTION FUNDING				42	4141	2
EAGLE PASS	M	URBANIZATION - EAGLE PASS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				42	4141	3
EAST RIO HONDO WSC	M	ERHWSC - FM 2925 TRANSMISSION LINE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				679	2340	1
EAST RIO HONDO WSC	M	ERHWSC - FM 2925 TRANSMISSION LINE	M	CONSTRUCTION FUNDING				679	2340	2
EAST RIO HONDO WSC	M	ERHWSC - FM 2925 TRANSMISSION LINE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				679	2340	3
EAST RIO HONDO WSC	M	ERHWSC - SURFACE WTP PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				679	2380	1
EAST RIO HONDO WSC	M	ERHWSC - SURFACE WTP PHASE I	M	CONSTRUCTION FUNDING				679	2380	2
EAST RIO HONDO WSC	M	ERHWSC - SURFACE WTP PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				679	2380	3
EAST RIO HONDO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				679	1604	1
EAST RIO HONDO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	CONSTRUCTION FUNDING				679	1604	2
EAST RIO HONDO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				679	1604	3
EAST RIO HONDO WSC	M	URBANIZATION - EAST RIO HONDO WSC (ERHWSC)	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				679	2615	1
EAST RIO HONDO WSC	M	URBANIZATION - EAST RIO HONDO WSC (ERHWSC)	M	CONSTRUCTION FUNDING				679	2615	2
EAST RIO HONDO WSC	M	URBANIZATION - EAST RIO HONDO WSC (ERHWSC)	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				679	2615	3
EDCOUCH	M	EDCOUCH - NEW GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				685	1712	1
EDCOUCH	M	EDCOUCH - NEW GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				685	1712	2

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
EDCOUCH	M	EDCOUCH - NEW GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				685	1712	3
EDINBURG	M	EDINBURG - NON-POTABLE REUSE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				688	2366	1
EDINBURG	M	EDINBURG - NON-POTABLE REUSE	M	CONSTRUCTION FUNDING				688	2366	2
EDINBURG	M	EDINBURG - NON-POTABLE REUSE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				688	2366	3
EDINBURG	M	URBANIZATION - EDINBURG	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				688	2740	1
EDINBURG	M	URBANIZATION - EDINBURG	M	CONSTRUCTION FUNDING				688	2740	2
EDINBURG	M	URBANIZATION - EDINBURG	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				688	2740	3
EL JARDIN WSC	M	EL JARDIN WSC - DISTRIBUTION PIPELINE REPLACEMENT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2975	2428	1
EL JARDIN WSC	M	EL JARDIN WSC - DISTRIBUTION PIPELINE REPLACEMENT	M	CONSTRUCTION FUNDING				2975	2428	2
EL JARDIN WSC	M	EL JARDIN WSC - DISTRIBUTION PIPELINE REPLACEMENT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2975	2428	3
EL JARDIN WSC	M	URBANIZATION - EL JARDIN WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2975	4147	1
EL JARDIN WSC	M	URBANIZATION - EL JARDIN WSC	M	CONSTRUCTION FUNDING				2975	4147	2
EL JARDIN WSC	M	URBANIZATION - EL JARDIN WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2975	4147	3
EL SAUZ WSC	M	URBANIZATION - EL SAUZ WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				12991	4148	1
EL SAUZ WSC	M	URBANIZATION - EL SAUZ WSC	M	CONSTRUCTION FUNDING				12991	4148	2
EL SAUZ WSC	M	URBANIZATION - EL SAUZ WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				12991	4148	3
EL TANQUE WSC	M	URBANIZATION - EL TANQUE WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				12992	4149	1
EL TANQUE WSC	M	URBANIZATION - EL TANQUE WSC	M	CONSTRUCTION FUNDING				12992	4149	2
EL TANQUE WSC	M	URBANIZATION - EL TANQUE WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				12992	4149	3
ELSA	M	URBANIZATION - ELSA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				702	2741	1
ELSA	M	URBANIZATION - ELSA	M	CONSTRUCTION FUNDING				702	2741	2
ELSA	M	URBANIZATION - ELSA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				702	2741	3
ENGELMAN IRRIGATION DISTRICT	M	ENGLEMAN ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6872	2234	1
ENGELMAN IRRIGATION DISTRICT	M	ENGLEMAN ID CONSERVATION	M	CONSTRUCTION FUNDING				6872	2234	2
ENGELMAN IRRIGATION DISTRICT	M	ENGLEMAN ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6872	2234	3
HARLINGEN	M	URBANIZATION - HARLINGEN	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$100,000/yr	2040		66	4150	1
HARLINGEN	M	URBANIZATION - HARLINGEN	M	CONSTRUCTION FUNDING	N/A	N/A		66	4150	2

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HARLINGEN	M	URBANIZATION - HARLINGEN	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			66	4150	3
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				65	2294	1
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	CONSTRUCTION FUNDING				65	2294	2
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				65	2294	3
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				843	1715	1
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				843	1715	2
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				843	1715	3
HIDALGO	M	URBANIZATION - HIDALGO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				843	2742	1
HIDALGO	M	URBANIZATION - HIDALGO	M	CONSTRUCTION FUNDING				843	2742	2
HIDALGO	M	URBANIZATION - HIDALGO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				843	2742	3
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				68	2325	1
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	CONSTRUCTION FUNDING				68	2325	2
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				68	2325	3
HIDALGO COUNTY IRRIGATION DISTRICT #13	M	HIDALGO COUNTY ID NO. 13 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6874	2353	1
HIDALGO COUNTY IRRIGATION DISTRICT #13	M	HIDALGO COUNTY ID NO. 13 CONSERVATION	M	CONSTRUCTION FUNDING				6874	2353	2
HIDALGO COUNTY IRRIGATION DISTRICT #13	M	HIDALGO COUNTY ID NO. 13 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6874	2353	3
HIDALGO COUNTY IRRIGATION DISTRICT #16	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				69	2306	1
HIDALGO COUNTY IRRIGATION DISTRICT #16	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M	CONSTRUCTION FUNDING				69	2306	2
HIDALGO COUNTY IRRIGATION DISTRICT #16	M	HIDALGO COUNTY ID NO. 16 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				69	2306	3
HIDALGO COUNTY IRRIGATION DISTRICT #19	M	HIDALGO COUNTY WID NO. 19 (SHARYLAND) CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6880	2315	1
HIDALGO COUNTY IRRIGATION DISTRICT #19	M	HIDALGO COUNTY WID NO. 19 (SHARYLAND) CONSERVATION	M	CONSTRUCTION FUNDING				6880	2315	2
HIDALGO COUNTY IRRIGATION DISTRICT #19	M	HIDALGO COUNTY WID NO. 19 (SHARYLAND) CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6880	2315	3
HIDALGO COUNTY IRRIGATION DISTRICT #2	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				70	2613	1

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HIDALGO COUNTY IRRIGATION DISTRICT #2	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M	CONSTRUCTION FUNDING				70	2613	2
HIDALGO COUNTY IRRIGATION DISTRICT #2	M	HIDALGO COUNTY ID NO. 2 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				70	2613	3
HIDALGO COUNTY IRRIGATION DISTRICT #5	M	HIDALGO COUNTY ID NO. 5 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6873	2303	1
HIDALGO COUNTY IRRIGATION DISTRICT #5	M	HIDALGO COUNTY ID NO. 5 CONSERVATION	M	CONSTRUCTION FUNDING				6873	2303	2
HIDALGO COUNTY IRRIGATION DISTRICT #5	M	HIDALGO COUNTY ID NO. 5 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6873	2303	3
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HCID#6 SERVICE AREA EXPANSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				67	4390	1
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HCID#6 SERVICE AREA EXPANSION	M	CONSTRUCTION FUNDING				67	4390	2
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HCID#6 SERVICE AREA EXPANSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				67	4390	3
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HIDALGO COUNTY ID NO. 6 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				67	2304	1
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HIDALGO COUNTY ID NO. 6 CONSERVATION	M	CONSTRUCTION FUNDING				67	2304	2
HIDALGO COUNTY IRRIGATION DISTRICT #6	M	HIDALGO COUNTY ID NO. 6 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				67	2304	3
HIDALGO COUNTY MUD 1	M	URBANIZATION - HIDALGO COUNTY MUD 1	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				844	4151	1
HIDALGO COUNTY MUD 1	M	URBANIZATION - HIDALGO COUNTY MUD 1	M	CONSTRUCTION FUNDING				844	4151	2
HIDALGO COUNTY MUD 1	M	URBANIZATION - HIDALGO COUNTY MUD 1	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				844	4151	3
HIDALGO COUNTY WCID #18	M	HIDALGO COUNTY WCID NO. 18 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6875	2310	1
HIDALGO COUNTY WCID #18	M	HIDALGO COUNTY WCID NO. 18 CONSERVATION	M	CONSTRUCTION FUNDING				6875	2310	2
HIDALGO COUNTY WCID #18	M	HIDALGO COUNTY WCID NO. 18 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6875	2310	3
HIDALGO COUNTY WID #3	M	HIDALGO COUNTY WID NO. 3 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				71	2308	1
HIDALGO COUNTY WID #3	M	HIDALGO COUNTY WID NO. 3 CONSERVATION	M	CONSTRUCTION FUNDING				71	2308	2
HIDALGO COUNTY WID #3	M	HIDALGO COUNTY WID NO. 3 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				71	2308	3
HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				72	2354	1
HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M	CONSTRUCTION FUNDING				72	2354	2
HIDALGO-CAMERON COUNTY IRRIGATION DISTRICT #9	M	HIDALGO AND CAMERON COUNTY ID NO. 9 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				72	2354	3

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
IRRIGATION, JIM HOGG	M	IRRIGATION, JIM HOGG - ADDITIONAL GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				996	1718	1
IRRIGATION, JIM HOGG	M	IRRIGATION, JIM HOGG - ADDITIONAL GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				996	1718	2
IRRIGATION, JIM HOGG	M	IRRIGATION, JIM HOGG - ADDITIONAL GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				996	1718	3
LA FERIA	M	LA FERIA - WATER WELL WITH RO UNIT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1172	1619	1
LA FERIA	M	LA FERIA - WATER WELL WITH RO UNIT	M	CONSTRUCTION FUNDING				1172	1619	2
LA FERIA	M	LA FERIA - WATER WELL WITH RO UNIT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1172	1619	3
LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3	M	LA FERIA ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				78	2326	1
LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3	M	LA FERIA ID CONSERVATION	M	CONSTRUCTION FUNDING				78	2326	2
LA FERIA IRRIGATION DISTRICT-CAMERON COUNTY #3	M	LA FERIA ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				78	2326	3
LA GRULLA	M	URBANIZATION - LA GRULLA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1174	4152	1
LA GRULLA	M	URBANIZATION - LA GRULLA	M	CONSTRUCTION FUNDING				1174	4152	2
LA GRULLA	M	URBANIZATION - LA GRULLA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1174	4152	3
LA JOYA	M	URBANIZATION - LA JOYA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1175	4153	1
LA JOYA	M	URBANIZATION - LA JOYA	M	CONSTRUCTION FUNDING				1175	4153	2
LA JOYA	M	URBANIZATION - LA JOYA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1175	4153	3
LA VILLA	M	URBANIZATION - LA VILLA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1179	2743	1
LA VILLA	M	URBANIZATION - LA VILLA	M	CONSTRUCTION FUNDING				1179	2743	2
LA VILLA	M	URBANIZATION - LA VILLA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1179	2743	3
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - POTABLE REUSE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$1,570,000.00	2025		80	2368	1
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - POTABLE REUSE	M	CONSTRUCTION FUNDING	$12,043,000.00	2028		80	2368	2
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - POTABLE REUSE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			80	2368	3
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - SEAWATER DESALINATION PLANT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$6,043,500.00	2048		80	2474	1
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - SEAWATER DESALINATION PLANT	M	CONSTRUCTION FUNDING	$34,246,500.00	2050		80	2474	2

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LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - SEAWATER DESALINATION PLANT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			80	2474	3
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				80	4382	1
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	M	CONSTRUCTION FUNDING				80	4382	2
LAGUNA MADRE WATER DISTRICT	M	LAGUNA MADRE WATER DISTRICT - WTP NO. 1 EXPANSION AND PROCESS IMPROVEMENTS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				80	4382	3
LAGUNA MADRE WATER DISTRICT	M	URBANIZATION - LAGUNA MADRE WATER DISTRICT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$0.00	N/A		80	4154	1
LAGUNA MADRE WATER DISTRICT	M	URBANIZATION - LAGUNA MADRE WATER DISTRICT	M	CONSTRUCTION FUNDING	$0.00	N/A		80	4154	2
LAGUNA MADRE WATER DISTRICT	M	URBANIZATION - LAGUNA MADRE WATER DISTRICT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			80	4154	3
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$6,286,120.00	2035		1199	2369	1
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING	$17,620,400.00	2038		1199	2369	2
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			1199	2369	3
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$ 5,000,000.00	2055		1199	2608	1
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE II	M	CONSTRUCTION FUNDING	$ 20,000,000.00	2058		1199	2608	2
LAREDO	M	LAREDO - SOUTH LAREDO WWTP POTABLE REUSE PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			1199	2608	3
LAREDO	M	URBANIZATION - LAREDO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$500,000.00	2030		1199	4155	1
LAREDO	M	URBANIZATION - LAREDO	M	CONSTRUCTION FUNDING	$1,300,000.00	2030		1199	4155	2
LAREDO	M	URBANIZATION - LAREDO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			1199	4155	3
LOS FRESNOS	M	LOS FRESNOS - WTP EXPANSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1488	4385	1
LOS FRESNOS	M	LOS FRESNOS - WTP EXPANSION	M	CONSTRUCTION FUNDING				1488	4385	2
LOS FRESNOS	M	LOS FRESNOS - WTP EXPANSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1488	4385	3
LOS FRESNOS	M	URBANIZATION - LOS FRESNOS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1488	4400	1
LOS FRESNOS	M	URBANIZATION - LOS FRESNOS	M	CONSTRUCTION FUNDING				1488	4400	2
LOS FRESNOS	M	URBANIZATION - LOS FRESNOS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1488	4400	3

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LYFORD	M	LYFORD - BRACKISH GROUNDWATER WELL AND DESALINATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$1,638,000.00	2022		1498	1674	1
LYFORD	M	LYFORD - BRACKISH GROUNDWATER WELL AND DESALINATION	M	CONSTRUCTION FUNDING	$4,115,000.00	2023		1498	1674	2
LYFORD	M	LYFORD - BRACKISH GROUNDWATER WELL AND DESALINATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			1498	1674	3
MANUFACTURING, MAVERICK	M	MAVERICK MANUFACTURING NEW GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1616	2727	1
MANUFACTURING, MAVERICK	M	MAVERICK MANUFACTURING NEW GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				1616	2727	2
MANUFACTURING, MAVERICK	M	MAVERICK MANUFACTURING NEW GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1616	2727	3
MAVERICK COUNTY WCID #1	M	MAVERICK COUNTY WCID - IDCONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6867	2314	1
MAVERICK COUNTY WCID #1	M	MAVERICK COUNTY WCID - IDCONSERVATION	M	CONSTRUCTION FUNDING				6867	2314	2
MAVERICK COUNTY WCID #1	M	MAVERICK COUNTY WCID - IDCONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6867	2314	3
MCALLEN	M	MCALLEN - AMI PROJECT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	4386	1
MCALLEN	M	MCALLEN - AMI PROJECT	M	CONSTRUCTION FUNDING				93	4386	2
MCALLEN	M	MCALLEN - AMI PROJECT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	4386	3
MCALLEN	M	MCALLEN - BRACKISH GROUNDWATER DESALINATION PLANT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	1679	1
MCALLEN	M	MCALLEN - BRACKISH GROUNDWATER DESALINATION PLANT	M	CONSTRUCTION FUNDING				93	1679	2
MCALLEN	M	MCALLEN - BRACKISH GROUNDWATER DESALINATION PLANT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	1679	3
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	2209	1
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE I	M	CONSTRUCTION FUNDING				93	2209	2
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	2209	3
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	4387	1
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE II	M	CONSTRUCTION FUNDING				93	4387	2

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
MCALLEN	M	MCALLEN - EXPAND EXISTING GROUNDWATER SUPPLY PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	4387	3
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	2370	1
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				93	2370	2
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	2370	3
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	2684	1
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE II	M	CONSTRUCTION FUNDING				93	2684	2
MCALLEN	M	MCALLEN - NORTH WWTP POTABLE REUSE PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	2684	3
MCALLEN	M	MCALLEN - RAW WATER LINE PROJECT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	2336	1
MCALLEN	M	MCALLEN - RAW WATER LINE PROJECT	M	CONSTRUCTION FUNDING				93	2336	2
MCALLEN	M	MCALLEN - RAW WATER LINE PROJECT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	2336	3
MCALLEN	M	URBANIZATION - MCALLEN	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				93	2745	1
MCALLEN	M	URBANIZATION - MCALLEN	M	CONSTRUCTION FUNDING				93	2745	2
MCALLEN	M	URBANIZATION - MCALLEN	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				93	2745	3
MERCEDES	M	URBANIZATION - MERCEDES	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1711	4156	1
MERCEDES	M	URBANIZATION - MERCEDES	M	CONSTRUCTION FUNDING				1711	4156	2
MERCEDES	M	URBANIZATION - MERCEDES	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1711	4156	3
MILITARY HIGHWAY WSC	M	URBANIZATION - MILITARY HIGHWAY WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1722	2730	1
MILITARY HIGHWAY WSC	M	URBANIZATION - MILITARY HIGHWAY WSC	M	CONSTRUCTION FUNDING				1722	2730	2
MILITARY HIGHWAY WSC	M	URBANIZATION - MILITARY HIGHWAY WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1722	2730	3
MIRANDO CITY WSC	M	URBANIZATION - MIRANDO CITY WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				13136	4157	1
MIRANDO CITY WSC	M	URBANIZATION - MIRANDO CITY WSC	M	CONSTRUCTION FUNDING				13136	4157	2
MIRANDO CITY WSC	M	URBANIZATION - MIRANDO CITY WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				13136	4157	3
MISSION	M	MISSION - BRACKISH GROUNDWATER DESALINATION PLANT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1952	1680	1

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
MISSION	M	MISSION - BRACKISH GROUNDWATER DESALINATION PLANT	M	CONSTRUCTION FUNDING				1952	1680	2
MISSION	M	MISSION - BRACKISH GROUNDWATER DESALINATION PLANT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1952	1680	3
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1952	2373	1
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				1952	2373	2
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1952	2373	3
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1952	2689	1
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE II	M	CONSTRUCTION FUNDING				1952	2689	2
MISSION	M	MISSION - WWTP POTABLE REUSE PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1952	2689	3
MISSION	M	URBANIZATION - MISSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				1952	2746	1
MISSION	M	URBANIZATION - MISSION	M	CONSTRUCTION FUNDING				1952	2746	2
MISSION	M	URBANIZATION - MISSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				1952	2746	3
NORTH ALAMO WSC	M	NAWSC - DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				98	4375	1
NORTH ALAMO WSC	M	NAWSC - DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	M	CONSTRUCTION FUNDING				98	4375	2
NORTH ALAMO WSC	M	NAWSC - DELTA AREA BRACKISH GROUNDWATER DESALINATION PLANT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				98	4375	3
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				98	2381	1
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE I	M	CONSTRUCTION FUNDING				98	2381	2
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				98	2381	3
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE II	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				98	2606	1
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE II	M	CONSTRUCTION FUNDING				98	2606	2
NORTH ALAMO WSC	M	NAWSC - DELTA WTP EXPANSION PHASE II	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				98	2606	3
NORTH ALAMO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				98	1604	1

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
NORTH ALAMO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	CONSTRUCTION FUNDING				98	1604	2
NORTH ALAMO WSC	M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				98	1604	3
NORTH ALAMO WSC	M	URBANIZATION - NORTH ALAMO WSC (NAWSC)	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				98	4158	1
NORTH ALAMO WSC	M	URBANIZATION - NORTH ALAMO WSC (NAWSC)	M	CONSTRUCTION FUNDING				98	4158	2
NORTH ALAMO WSC	M	URBANIZATION - NORTH ALAMO WSC (NAWSC)	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				98	4158	3
OLMITO WSC	M	OLMITO WSC - NEW BIOLAC WWTP	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2026	4377	1
OLMITO WSC	M	OLMITO WSC - NEW BIOLAC WWTP	M	CONSTRUCTION FUNDING				2026	4377	2
OLMITO WSC	M	OLMITO WSC - NEW BIOLAC WWTP	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2026	4377	3
OLMITO WSC	M	OLMITO WSC - WTP EXPANSION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2026	4378	1
OLMITO WSC	M	OLMITO WSC - WTP EXPANSION	M	CONSTRUCTION FUNDING				2026	4378	2
OLMITO WSC	M	OLMITO WSC - WTP EXPANSION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2026	4378	3
OLMITO WSC	M	URBANIZATION - OLMITO WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$0.00	N/A		2026	2731	1
OLMITO WSC	M	URBANIZATION - OLMITO WSC	M	CONSTRUCTION FUNDING	$0.00	N/A		2026	2731	2
OLMITO WSC	M	URBANIZATION - OLMITO WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			2026	2731	3
PHARR	M	PHARR - RAW WATER RESERVOIR AUGMENTATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2067	2374	1
PHARR	M	PHARR - RAW WATER RESERVOIR AUGMENTATION	M	CONSTRUCTION FUNDING				2067	2374	2
PHARR	M	PHARR - RAW WATER RESERVOIR AUGMENTATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2067	2374	3
PHARR	M	URBANIZATION - PHARR	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2067	4159	1
PHARR	M	URBANIZATION - PHARR	M	CONSTRUCTION FUNDING				2067	4159	2
PHARR	M	URBANIZATION - PHARR	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2067	4159	3
PORT MANSFIELD PUD	M	URBANIZATION - PORT MANSFIELD PUD	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				13202	4160	1
PORT MANSFIELD PUD	M	URBANIZATION - PORT MANSFIELD PUD	M	CONSTRUCTION FUNDING				13202	4160	2
PORT MANSFIELD PUD	M	URBANIZATION - PORT MANSFIELD PUD	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				13202	4160	3
PRIMERA	M	PRIMERA - RO WTP WITH GROUNDWATER WELL	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2102	2359	1

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PRIMERA	M	PRIMERA - RO WTP WITH GROUNDWATER WELL	M	CONSTRUCTION FUNDING				2102	2359	2
PRIMERA	M	PRIMERA - RO WTP WITH GROUNDWATER WELL	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2102	2359	3
PRIMERA	M	URBANIZATION - PRIMERA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2102	4161	1
PRIMERA	M	URBANIZATION - PRIMERA	M	CONSTRUCTION FUNDING				2102	4161	2
PRIMERA	M	URBANIZATION - PRIMERA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2102	4161	3
RIO GRANDE CITY	M	RIO GRANDE CITY - WATER METER REPLACEMENT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2136	2589	1
RIO GRANDE CITY	M	RIO GRANDE CITY - WATER METER REPLACEMENT	M	CONSTRUCTION FUNDING				2136	2589	2
RIO GRANDE CITY	M	RIO GRANDE CITY - WATER METER REPLACEMENT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2136	2589	3
RIO GRANDE CITY	M	URBANIZATION - RIO GRANDE CITY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2136	4163	1
RIO GRANDE CITY	M	URBANIZATION - RIO GRANDE CITY	M	CONSTRUCTION FUNDING				2136	4163	2
RIO GRANDE CITY	M	URBANIZATION - RIO GRANDE CITY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2136	4163	3
RIO HONDO	M	RIO HONDO - NEW GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2137	4374	1
RIO HONDO	M	RIO HONDO - NEW GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				2137	4374	2
RIO HONDO	M	RIO HONDO - NEW GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2137	4374	3
RIO HONDO	M	RIO HONDO - NON-POTABLE REUSE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$380,000.00	2023		2137	4115	1
RIO HONDO	M	RIO HONDO - NON-POTABLE REUSE	M	CONSTRUCTION FUNDING	$8,000,000.00	2025		2137	4115	2
RIO HONDO	M	RIO HONDO - NON-POTABLE REUSE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			2137	4115	3
RIO WSC	M	URBANIZATION - RIO WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2139	4184	1
RIO WSC	M	URBANIZATION - RIO WSC	M	CONSTRUCTION FUNDING				2139	4184	2
RIO WSC	M	URBANIZATION - RIO WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2139	4184	3
ROMA	M	ROMA - REGIONAL WTP	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2589	2595	1
ROMA	M	ROMA - REGIONAL WTP	M	CONSTRUCTION FUNDING				2589	2595	2
ROMA	M	ROMA - REGIONAL WTP	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2589	2595	3
ROMA	M	URBANIZATION - ROMA	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2589	4162	1
ROMA	M	URBANIZATION - ROMA	M	CONSTRUCTION FUNDING				2589	4162	2

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ROMA	M	URBANIZATION - ROMA	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2589	4162	3
SAN BENITO	M	SAN BENITO - NEW GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2175	2083	1
SAN BENITO	M	SAN BENITO - NEW GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				2175	2083	2
SAN BENITO	M	SAN BENITO - NEW GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2175	2083	3
SAN BENITO	M	URBANIZATION - SAN BENITO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2175	4189	1
SAN BENITO	M	URBANIZATION - SAN BENITO	M	CONSTRUCTION FUNDING				2175	4189	2
SAN BENITO	M	URBANIZATION - SAN BENITO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2175	4189	3
SAN JUAN	M	SAN JUAN - BRACKISH GROUNDWATER WELL	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2178	4380	1
SAN JUAN	M	SAN JUAN - BRACKISH GROUNDWATER WELL	M	CONSTRUCTION FUNDING				2178	4380	2
SAN JUAN	M	SAN JUAN - BRACKISH GROUNDWATER WELL	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2178	4380	3
SAN JUAN	M	SAN JUAN - POTABLE REUSE	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2178	4379	1
SAN JUAN	M	SAN JUAN - POTABLE REUSE	M	CONSTRUCTION FUNDING				2178	4379	2
SAN JUAN	M	SAN JUAN - POTABLE REUSE	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2178	4379	3
SAN JUAN	M	SAN JUAN - WTP NO. 1 UPGRADE, EXPANSION, AND BGD	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2178	2383	1
SAN JUAN	M	SAN JUAN - WTP NO. 1 UPGRADE, EXPANSION, AND BGD	M	CONSTRUCTION FUNDING				2178	2383	2
SAN JUAN	M	SAN JUAN - WTP NO. 1 UPGRADE, EXPANSION, AND BGD	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2178	2383	3
SAN JUAN	M	URBANIZATION - SAN JUAN	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2178	2750	1
SAN JUAN	M	URBANIZATION - SAN JUAN	M	CONSTRUCTION FUNDING				2178	2750	2
SAN JUAN	M	URBANIZATION - SAN JUAN	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2178	2750	3
SANTA CRUZ IRRIGATION DISTRICT #15	M	SANTA CRUZ ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2979	2328	1
SANTA CRUZ IRRIGATION DISTRICT #15	M	SANTA CRUZ ID CONSERVATION	M	CONSTRUCTION FUNDING				2979	2328	2
SANTA CRUZ IRRIGATION DISTRICT #15	M	SANTA CRUZ ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2979	2328	3
SEBASTIAN MUD	M	URBANIZATION - SEBASTIAN MUD	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	N/A	N/A		2197	4190	1
SEBASTIAN MUD	M	URBANIZATION - SEBASTIAN MUD	M	CONSTRUCTION FUNDING	N/A	N/A		2197	4190	2
SEBASTIAN MUD	M	URBANIZATION - SEBASTIAN MUD	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	N/A			2197	4190	3

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SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #2	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				122	2360	1
SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #2	M	CONSTRUCTION FUNDING				122	2360	2
SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #2	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				122	2360	3
SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #3	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				122	2361	1
SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #3	M	CONSTRUCTION FUNDING				122	2361	2
SHARYLAND WSC	M	SHARYLAND WSC - WELL AND RO UNIT AT WTP #3	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				122	2361	3
SHARYLAND WSC	M	URBANIZATION - SHARYLAND WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				122	4192	1
SHARYLAND WSC	M	URBANIZATION - SHARYLAND WSC	M	CONSTRUCTION FUNDING				122	4192	2
SHARYLAND WSC	M	URBANIZATION - SHARYLAND WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				122	4192	3
SIESTA SHORES WCID	M	URBANIZATION - SIESTA SHORES WCID	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				13234	4191	1
SIESTA SHORES WCID	M	URBANIZATION - SIESTA SHORES WCID	M	CONSTRUCTION FUNDING				13234	4191	2
SIESTA SHORES WCID	M	URBANIZATION - SIESTA SHORES WCID	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				13234	4191	3
STEAM ELECTRIC POWER, HIDALGO	M	HIDALGO STEAM-ELEC. ADDITIONAL GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2284	2726	1
STEAM ELECTRIC POWER, HIDALGO	M	HIDALGO STEAM-ELEC. ADDITIONAL GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				2284	2726	2
STEAM ELECTRIC POWER, HIDALGO	M	HIDALGO STEAM-ELEC. ADDITIONAL GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2284	2726	3
UNION WSC	M	UNION WSC METER AND LINE REPLACEMENT	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2856	2435	1
UNION WSC	M	UNION WSC METER AND LINE REPLACEMENT	M	CONSTRUCTION FUNDING				2856	2435	2
UNION WSC	M	UNION WSC METER AND LINE REPLACEMENT	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2856	2435	3
UNION WSC	M	URBANIZATION - UNION WSC	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2856	4193	1
UNION WSC	M	URBANIZATION - UNION WSC	M	CONSTRUCTION FUNDING				2856	4193	2
UNION WSC	M	URBANIZATION - UNION WSC	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2856	4193	3
UNITED IRRIGATION DISTRICT	M	UNITED ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				136	2318	1

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UNITED IRRIGATION DISTRICT	M	UNITED ID CONSERVATION	M	CONSTRUCTION FUNDING				136	2318	2
UNITED IRRIGATION DISTRICT	M	UNITED ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				136	2318	3
VALLEY ACRES IRRIGATION DISTRICT	M	VALLEY ACRES ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6866	2257	1
VALLEY ACRES IRRIGATION DISTRICT	M	VALLEY ACRES ID CONSERVATION	M	CONSTRUCTION FUNDING				6866	2257	2
VALLEY ACRES IRRIGATION DISTRICT	M	VALLEY ACRES ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				6866	2257	3
WEBB COUNTY	M	URBANIZATION - WEBB COUNTY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	N/A	N/A		2422	4194	1
WEBB COUNTY	M	URBANIZATION - WEBB COUNTY	M	CONSTRUCTION FUNDING	N/A	N/A		2422	4194	2
WEBB COUNTY	M	URBANIZATION - WEBB COUNTY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	N/A			2422	4194	3
WEBB COUNTY	M	WEBB COUNTY WATER UTILITY - EXPANDED GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	N/A	N/A		2422	2643	1
WEBB COUNTY	M	WEBB COUNTY WATER UTILITY - EXPANDED GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING	N/A	N/A		2422	2643	2
WEBB COUNTY	M	WEBB COUNTY WATER UTILITY - EXPANDED GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	N/A			2422	2643	3
WESLACO	M	URBANIZATION - WESLACO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2429	2749	1
WESLACO	M	URBANIZATION - WESLACO	M	CONSTRUCTION FUNDING				2429	2749	2
WESLACO	M	URBANIZATION - WESLACO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2429	2749	3
WESLACO	M	WESLACO - GROUNDWATER DEVELOPMENT AND BLENDING	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2429	1702	1
WESLACO	M	WESLACO - GROUNDWATER DEVELOPMENT AND BLENDING	M	CONSTRUCTION FUNDING				2429	1702	2
WESLACO	M	WESLACO - GROUNDWATER DEVELOPMENT AND BLENDING	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2429	1702	3
WESLACO	M	WESLACO - NORTH WWTP POTABLE REUSE PHASE I	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2429	2376	1
WESLACO	M	WESLACO - NORTH WWTP POTABLE REUSE PHASE I	M	CONSTRUCTION FUNDING				2429	2376	2
WESLACO	M	WESLACO - NORTH WWTP POTABLE REUSE PHASE I	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2429	2376	3
ZAPATA COUNTY	M	ZAPATA COUNTY - NEW GROUNDWATER SUPPLY	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				2864	1727	1
ZAPATA COUNTY	M	ZAPATA COUNTY - NEW GROUNDWATER SUPPLY	M	CONSTRUCTION FUNDING				2864	1727	2
ZAPATA COUNTY	M	ZAPATA COUNTY - NEW GROUNDWATER SUPPLY	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				2864	1727	3

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Appendix G: Texas Water Development Board, Agency, and Public Comments and Responses

1 TWDB Comments

2 Response to TWDB Comments

3 Agency Comments

4 Response to Agency and Public Comments

5 Supporting Communication for TWDB Comments

Texas Water Development Board

P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.texas.gov
Phone (512) 463-7847, Fax (512) 475-2053

Mr. Tomas Rodriguez, Jr., Chair
310 Chetumal Dr
Laredo, Texas 78045

Mr. Manuel Cruz
Lower Rio Grande Valley Development Council
301 W Railroad
Weslaco, Texas 78596

Re: Texas Water Development Board Comments for the Rio Grande (Region M) Regional Water Planning Group Initially Prepared Plan, Contract No. 1548301841

Dear Mr. Rodriguez and Mr. Cruz:

Texas Water Development Board (TWDB) staff have completed their review of the Initially Prepared Plan (IPP) submitted by March 3, 2020 on behalf of the Rio Grande Regional Water Planning Group (RWPG). The attached comments follow this format:

- **Level 1:** Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements; and,

- **Level 2:** Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

Please note that rule references are based on recent revisions to 31 Texas Administrative Code (TAC) Chapter 357, adopted by the TWDB Board on June 4, 2020. 31 TAC § 357.50(f) requires the RWPG to consider timely agency and public comment. Section 357.50(g) requires the final adopted plan include summaries of all timely written and oral comments received, along with a response explaining any resulting revisions or why changes are not warranted. Copies of TWDB's Level 1 and 2 written comments and the region's responses must be included in the final, adopted regional water plan (*Contract Exhibit C, Section 13.1.2)*.

Standard to all planning groups is the need to include certain content in the final regional water plans that was not yet available at the time that IPPs were prepared and submitted. In your final regional water plan, please be sure to also incorporate the following:

a) Completed results from the RWPG's infrastructure financing survey for sponsors of recommended projects with capital costs, including an electronic version of the survey spreadsheet *[31 TAC § 357.44]*;

b) Completed results from the implementation survey, including an electronic version of the survey spreadsheet *[31 TAC § 357.45(a)]*;
c) Documentation that comments received on the IPP were considered in the development of the final plan *[31 TAC § 357.50(f)]*; and
d) Evidence, such as a certification in the form of a cover letter, that the final, adopted regional water plan is complete and adopted by the RWPG *[31 TAC § 357.50(h)(1)]*.

Please ensure that the final plan includes updated State Water Planning Database (DB22) reports, and that the numerical values presented in the tables throughout the final, adopted regional water plan are consistent with the data provided in DB22. For the purpose of development of the 2022 State Water Plan, water management strategy and other data entered by the RWPG in DB22 shall take precedence over any conflicting data presented in the final regional water plan *[Contract Exhibit C, Sections 13.1.3 and 13.2.2]*.

Additionally, subsequent review of DB22 data is being performed. If issues arise during our ongoing data review, they will be communicated promptly to the planning group to resolve. Please anticipate the need to respond to additional comments regarding data integrity, including any source overallocations, prior to the adoption of the final regional water plans.

The provision of certain content in an electronic-only form is permissible as follows: Internet links are permissible as a method for including model conservation and drought contingency plans within the final regional water plan; hydrologic modeling files may be submitted as electronic appendices, however all other regional water plan appendices should also be incorporated in hard copy format within each plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2 and 13.2.1]*.

The following items must accompany, the submission of the final, adopted regional water plan:

1. The prioritized list of all recommended projects in the regional water plan, including an electronic version of the prioritization spreadsheet *[31 TAC § 357.46];* and,
2. All hydrologic modeling files and GIS files, including any remaining files that may not have been provided at the time of the submission of the IPP but that were used in developing the final plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2, and 13.2.1].*

The following general requirements that apply to recommended water management strategies must be adhered to in all final regional water plans including:

1. Regional water plans must not include any recommended strategies or project costs that are associated with simply maintaining existing water supplies or replacing existing infrastructure. Plans may include only infrastructure costs that are associated with volumetric increases of treated water supplies delivered to water user groups or that result in more efficient use of existing supplies *[31 TAC § 357.10(39), § 357.34(e)(3)(A), Contract Exhibit C, Sections 5.5.2 and 5.5.3]*; and,

2. Regional water plans must not include the costs of any retail distribution lines or other infrastructure costs that are not directly associated with the development of additional supply volumes (e.g., via treatment) other than those line replacement costs related to projects that are for the primary purpose of achieving conservation savings via water loss reduction *[§ 357.34(e)(3)(A), Contract Exhibit C, Section 5.5.3]*.

Please be advised that, within the attached document, your region has received a comment specifically requesting that the RWPG provide the basis for how the RWPG considers it feasible that certain water management strategies will actually be implemented by January 5, 2023 (see Level 1, Comment 1), especially for projects with long lead times. This comment is aimed at making sure RWPGs do not present projects in their plans to provide water during the 2020 decade that cannot reasonably be expected to be online, *and provide water supply*, by January 5, 2023. For project types whose drought yields rely on *previously stored water*, the 2020 supply volume should take into consideration reasonably expected accumulated storage that would already be available in the event of drought. The RWPG must adequately address this Level 1 comment in the final, adopted regional water plan, which might require making changes to your regional plan.

It is preferable that RWPGs adopt a realistic plan that acknowledges the likelihood of unmet needs in a near-term drought, rather than to present a plan that overlooks reasonably foreseeable, near-term shortages due to the inclusion of unrealistic project timelines. If a '2020' decade project cannot reasonably be expected to come online by January 2023, for example if a reservoir has not started the permitting process, it should be moved to the 2030 decade. Any potential supply gaps (unmet needs) created by moving out projects to the 2030 decade may be shown as simply 'unmet' in the 2020 decade or be shown as met by a 'demand management' strategy. Doing so will appropriately reflect the fact that some entities would likely face an actual shortage if a drought of record were to occur in the very near future despite projects (that may be included in the plan but associated with a later decade) that will eventually address those same potential shortages in future years.

It is imperative that you provide the TWDB with information on how you intend to address this comment and all other comments well in advance of your adoption the regional water plan to ensure that the response is adequate for the Executive Administrator to recommend the plan to the TWDB Board for consideration in a timely and efficient manner. Your TWDB project manager will review and provide feedback to ensure all IPP comments and associated plan revisions have been addressed adequately. Failure to adequately address this comment (or any Level 1 comment) may result in the delay of the TWDB Board approval of your final regional water plan.

As a reminder, the deadline to submit the final, adopted regional water plan and associated material to the TWDB is **October 14, 2020**. Any remaining data revisions to DB22 must be communicated to Sabrina Anderson at Sabrina.Anderson@twdb.texas.gov by **September 14, 2020.**

If you have any questions regarding these comments or would like to discuss your approach to addressing any of these comments, please do not hesitate to contact William Alfaro at (512) 463-4741 or William.Alfaro@twdb.texas.gov. TWDB staff will be available to assist you in any way possible to ensure successful completion of your final regional water plan.

Sincerely,

Jessica Pena Zuba Digitally signed by Jessica Pena Zuba
Date: 2020.06.15 19:30:38 -05'00'

Jessica Zuba Date: 6/15/2020
Deputy Executive Administrator
Water Supply and Infrastructure

Attachment

c w/att.: Ms. Debby Morales, Lower Rio Grande Valley Development Council
Ms. Sara Eatman, Black & Veatch

TWDB comments on the Initially Prepared 2021 Rio Grande (Region M) Regional Water Plan.

Level 1: Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

1. Chapter 5 and the State Water Planning Database (DB22). The plan includes the following recommended water management strategies (WMS) by WMS type, providing supply in 2020 (not including demand management): 10 *groundwater wells & other*, seven *groundwater desalination,* five *direct potable reuse,* three *other direct reuse*, one *seawater desalination*, five *other surface water,* and one *other strategies.* **Strategy supply with an online decade of 2020 must be constructed and delivering water by January 5, 2023**.
    a) Please confirm that all strategies shown as providing supply in 2020 are expected to be providing water supply by January 5, 2023. *[31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]*
    b) Please provide the specific basis on which the planning group anticipates that it is feasible that the seven *groundwater desalination,* one *seawater desalination*, and five *other surface water* WMSs will all actually be online and providing water supply by January 5, 2023. For example, provide information on actions taken by sponsors and anticipated future project milestones that demonstrate sufficient progress toward implementation. *[31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]*
    c) In the event that the resulting adjustment of the timing of WMSs in the plan results in an increase in near-term unmet water needs, please update the related portions of the plan and DB22 accordingly, and also indicate whether 'demand management' will be the WMS used in the event of drought to address such water supply shortfalls or if the plan will show these as simply 'unmet'. If municipal shortages are left 'unmet' and without a 'demand management' strategy to meet the shortage, please also ensure that adequate justification is included in accordance with 31 TAC § 357.50(j). *[TWC § 16.051(a); 31 § TAC 357.50(j); [31 TAC § 357.34(i)(2); Contract Exhibit C, Section 5.2]*
    d) **Please be advised that, in accordance with Senate Bill 1511, 85th Texas Legislature, the planning group will be expected to rely on its next planning cycle budget to amend its 2021 Regional Water Plan during development of the 2026 Regional Water Plan, if recommended WMSs or projects become infeasible, for example, do to timing of projects coming online.** Infeasible WMSs include those WMSs where proposed sponsors have not taken an affirmative vote or other action to make expenditures necessary to construct or file applications for permits required in connection with implementation of the WMS on a schedule in order for the WMS to be completed by the time the WMS is needed to address drought in the plan. *[Texas Water Code § 16.053(h)(10); 31 TAC § 357.12(b)]*

2. Page 1-30, Table 1-7. Please clarify if 2010 water loss audit data was used for the data presented Table 1-7. If not, please update the table name. If so, please summarize water loss audit data provided during the current planning cycle in the final, adopted regional water plan. *[31 TAC § 357.30(11)]*

3. Section 3.1.4, page 3-20. Please confirm whether the local surface water supplies listed in Table 3-5 are firm supplies that will be available under drought conditions in the final, adopted regional water plan. *[31 TAC § 357.32(a); Contract Exhibit C, Section 3.7]*

4. Section 3.2.4, page 3-30. The plan references the GAM Run 17-027 MAG report as the citation for the non-MAG availability presented in Table 3-10. GAM Run 17-027 MAG does not report availability projections for the Yegua-Jackson aquifer. Please clarify the data source for these values as appropriate and document the information in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.5.2]*

5. Chapter 3. The plan does not appear to include the evaluation results of existing supplies for major water providers (MWP). Please report existing supplies for MWPs by decade and category of use in the final, adopted regional water plan. *[31 TAC § 357.32(g)]*

6. Section 4.3.1, page 4-7. The plan does not appear to include identified water needs for MWPs reported by category of use including municipal, mining, manufacturing, irrigation, steam electric, mining, and livestock. Please report the results of the needs analysis for MWPs by categories of use as applicable in the region in the final, adopted regional water plan. *[31 TAC § 357.33(b)]*

7. Chapter 4. The plan does not appear to include a secondary needs analysis for MWPs. Please present the results of the secondary needs analysis by decade for MWPs in the final, adopted regional water plan. *[31 TAC § 357.33(e)]*

8. Section 5.2.11, page 5-83. The plan does not appear to define a threshold for significant water needs related to the potential for aquifer storage and recovery (ASR) projects to meet those needs. Please include information on how the planning group defines significant water need for the potential for ASR projects to meet those needs in the final, adopted regional water plan. *[TWC § 16.053(e)(10); 31 TAC § 357.34(h)]*

9. Section 5.2.5 and DB22. The plan includes rainwater harvesting as a recommended demand reduction WMS for La Feria. For regional water planning purposes *rainwater harvesting* is considered a separate source and should not be classified as *conservation* in accordance with contract guidance. Please include a specific WMS evaluation for rainwater harvesting, including assumed rainfall under drought of record conditions, and revise the WMS classification in DB22 in the final, adopted regional water plan. [*Contract Exhibit C, Section 5.10]*

10. Section 5.2.10. Please confirm that the quantified supply estimates for the Arundo Donax Biological Control WMS is available during drought of record conditions in the final, adopted regional water plan. *[31 TAC § 357.34(b); 31 TAC §357.34(e)(3)(A)]*

11. Section 5.3. Please clarify whether the Resaca Restoration WMS is subject to TCEQ's adopted environmental flow standards and document this information in in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B); 31 TAC § 358.3(22); 31 TAC § 358.3(23)]*

12. Section 5.3, page 15. The firm yield for the proposed Banco Morales Reservoir when running the Water Availability Model (WAM) files provided is 1,561 acre-feet/year, which differs from the 3,835-3,906 acre-feet/year listed for water right number 1838. Please reconcile the difference in firm yield for Banco Morales Reservoir in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.2.1]*

13. Section 5.4. The plan does not appear to provide complete strategy evaluations for alternative WMSs. For example, the alternative Delta Watershed WMS is briefly mentioned in Section 5.2.9 but does not appear to be evaluated in Section 5.4 (Alternative WMSs). Additionally, some alterative WMSs reported in DB22, for example, the Eagle Pass New BGD Plant alternative WMS do not appear to be included in the text of the plan. Please include complete evaluations for all alternative WMS and projects in the final, adopted regional water plan or remove them from the alternative WMS list. *[31 TAC 357.35 (g)(3)]*

14. Chapter 5. The alternative strategy evaluation for the 1 Million Gallon Water Tower WMS (page 5.4-19) states that the strategy provides storage but does not provide any additional supply. Please ensure that all recommended WMSs and projects increase the volume of water supply that is delivered to a WUG (e.g., via transmission). The final adopted regional water plan may include a separate section for additional recommendations that do not increase the volume of water supply, but these may not be considered recommended WMS. *[31 TAC 357.43(d); Contract Exhibit C, Section 5.5.3]*

15. Units costs reported in DB22 appear notably high for the Eagle Pass – ASR and MII - El Jardin WSC Distribution Pipeline Replacement WMSs. For example, unit costs range from $523,833 in 2020 to $218,580 in 2070 for the Eagle Pass – ASR WMS, and unit costs are reported as $150,727 in 2020 and 2030 for the El Jardin WSC Distribution Pipeline Replacement WMS. Please confirm that the calculated unit costs are correct in DB22 and that costs were considered in WMS recommendations in the final, adopted regional water plan. *[31 TAC § 357.34(e)(2)]*

16. Chapter 5. The plan does not appear to include the documented process used by the planning group to identify potentially feasible WMSs, as presented to the planning group in accordance with 31 TAC § 357.21(b). Please include this information in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.1]*

17. Chapter 5. The plan does not appear to include the list of potentially feasible WMSs identified for the region. Please include this information in the final, adopted regional water plan. *[31 TAC § 357.34(b)]*

18. Chapter 5. Please clarify whether potentially feasible WMSs were evaluated under drought of record conditions and document this information in the final, adopted regional water plan. *[31 TAC § 357.35(a)]*

19. Chapter 5. WMS and associated project evaluations presented in the plan do not appear to include quantitative reporting of reliability or anticipated strategy water losses. Please provide this information for all strategy evaluations in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(A)]*

20. Chapter 5. The WMS evaluations do not appear to include a quantitative reporting of all environmental factors, even when there may not be impacts. For example, the environmental evaluations do not appear to include a quantitative reporting of effects to environmental water needs and upstream development on bays, estuaries, and arms of the Gulf of Mexico. Please include a quantitative reporting of impacts to environmental water needs and upstream development on bays, estuaries, and arms of the Gulf of Mexico in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B)]*

21. Chapter 5. The plan does not appear to include a quantitative analysis for impacts to agricultural resources for the strategies evaluated. Please include a quantitative impacts analysis for agricultural resources for each WMS in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(C)]*

22. Chapter 5. The plan does not appear to include consideration of third-party social and economic impacts resulting from voluntary redistributions of water, including analysis of third-party impacts of moving water from rural and agricultural areas in the evaluation of potentially feasible WMSs. Please include this information in the final, adopted regional water plan. *[31 TAC § 357.34(e)(7)]*

23. Chapter 5. The plan does not appear to present the reservoir-associated land costs separately. Please include separated reservoir-associated land costs as applicable to reservoir WMSs in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.5]*

24. Chapter 5. The plan does not appear to present management supply factors for MWPs. Please report management supply factors for all MWPs by decade in the final, adopted regional water plan. *[31 TAC § 357.35(g)(2)]*

25. Section 6.3 and Table 4-14. The plan states that there are no unmet Municipal/County-Other needs. However, the summary of unmet needs presented in Table 4-14 includes Municipal and County-Other unmet needs. Additionally, the unmet needs data presented in Table 4-14 appears to be inconsistent with data reported in DB22. For example, in DB22, there are no unmet Municipal needs, however County-Other unmet needs in DB22 range from 13 ac-ft/yr in 2020 to 18

ac-ft/yr in 2070. Table 4-14 presents these County-Other unmet needs as 162 ac-ft/yr in 2020 and 597 ac-ft/yr in 2070. Please reconcile this data as necessary and provide an adequate justification of unmet needs for Municipal and/or County-Other WUGs as outlined in rule and contract guidance in the final, adopted regional water plan *[31 TAC § 357.50(j); Contract Exhibit C, Section 6.3]*

26. Section 7.4. Please confirm whether the entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply. *[Contract Exhibit C, Section 7.4]*

27. Section 7.5, page 7-27. The plan does not appear to include copies of the model drought contingency plans as referenced in Attachment 7.B. Please include the model plans (two plans minimum) in the final, adopted regional water plan. *[31 TAC § 357.42(j)]*

28. Chapter 7. Model drought contingency plans were not provided for review. Please ensure that model drought contingency plans submitted with the final, adopted regional water plan at a minimum have triggers and responses to 'severe' and 'critical/emergency' drought conditions. *[Contract Exhibit C, Section 7.6]*

29. Chapter 7. The plan does not appear to include a discussion of whether drought contingency measures have been recently implemented (for example, since adoption of the last regional water plan) in response to drought conditions. Please describe this in the final, adopted regional water plan. *[Contract Scope of Work, Task 7, subtask 3]*

30. Chapter 7. The plan does not appear to include discussion of unnecessary or counterproductive variations in drought response strategies that may impede drought response efforts. Please include discussion of any unnecessary or counterproductive variations in drought response strategies that were identified by the planning group in the final, adopted regional water plan. *[TWC § 16.053(e)(3)(E); 31 TAC § 357.42(b)(2)]*

31. Chapter 10. Please address how the planning group complied with the Texas Open Meetings Act and Texas Public Information Act in the final, adopted regional water plan. *[31 TAC §357.21; 31 TAC §357.50(f)]*

32. Chapter 11, Section 11.4. The plan did not include implementation survey data collected to date in Appendix E. Please ensure that the template and data used for the implementation survey in the final, adopted regional water plan are based on the survey template and data that the TWDB provided in June 2019. *[31 TAC § 357.45(a)]*

33. Chapter 11. Please provide a brief summary of how the 2016 Plan differs from the 2021 Plan with regards to recommended and alternative WMS *projects* in the final, adopted regional water plan. *[31 TAC § 357.45(c)(4)]*

34. Chapter 11. The plan does not appear to assess the progress of the regional water planning area in encouraging cooperation between water user groups for the purpose of achieving economies of scale and otherwise incentivizing strategies that benefit the entire region. Please provide a general assessment of these items in the final, adopted regional water plan. *[TWC § 16.053(e)(12); 31 TAC § 357.45(b)]*

35. Please clarify whether the plan development was guided by the principal that designated water quality and related uses as shown in the state water quality management plan shall be improved or maintained. *[31 TAC § 358.3(19)]*

36. Appendix A. The plan includes some DB22 reports that appear blank due to the region not having relevant data for these reports. Please provide a cover page to the DB22 report appendix indicating the reason for these report contents being blank.

37. Electronic Appendices. The WAM file used to simulate the yield from the proposed Brownsville-Matamoros Weir and Reservoir (water right number 5259) does not appear to have been provided. Please provide the WAM file with the final, adopted regional water plan. *[Contract Exhibit C, Section 5.2.1]*

38. The GIS files submitted did not appear to include the locations of every recommended and alternative WMS project. Please include the locations of every recommended and alternative WMS project listed in the final, adopted regional water plan with the final GIS data submitted. *[Contract Exhibit C, Section 13.1.2]*

Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

1. Page ES-12, Table ES-5. Please consider updating the outdated term ‘Managed Available Groundwater’ to ‘Modeled Available Groundwater’.

2. Chapter 3, page 3-8, footnote No. 4. The WRAP version date of 2004 is not consistent with the WRAP version date of July 2018 in the WAM files submitted. Please reconcile this inconsistency and revise the footnote in the final plan.

3. Page 3-26, Table 3-9. Please correct the legend to correctly identify the "Carrizo-Wilcox (outcrop)" aquifer.

4. Page 3-31. Please consider revising the title of Section 3.2.6 to Allocation of Groundwater Supplies.

5. Please consider including section number references (e.g. Banco Morales Reservoir - Section 5.3.1.2) for WMSs on page 5-7 to clearly identify where additional information about the WMS can be found in the plan.

6. Page 5-9, Table 5.2-3. The Adams Garden ID row is the same as the Bayview ID row below it. Please verify the data in these rows and revise as appropriate.

7. Section 5.2.5 includes rainwater harvesting and reuse in the list of advance water conservation measures. While the TWDB acknowledges that the municipal conservation best practices guide includes rainwater harvesting and reuse, for regional water planning purposes these practices are considered separate sources and should not be classified as conservation. Please consider clarifying this information within Section 5.2.5 in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.6]*

8. Page 5-27, Table 5.2-11. Column A for County-Other, Cameron is zero and Column B, which should be 110 percent of column A, is 10. Also, in Table 5.2-11, Irrigation, Jim Hogg, Column A is 3 and column B, which should be 110 percent of column A, is 6. Please correct these values as appropriate.

9. Page 5.4-39. Please consider removing the duplicate section of "Implementation Issues".

10. Page 7-30. Please consider revising the section title of 7.6.2 to Recommended Drought Management WMS and Triggers, since no alternative Drought Management WMSs appear to be included in the plan.

11. Page 8-5. Please consider updating the state of the Brownsville Weir and Reservoir to reflect past Legislative designation, and updated information regarding planning cycles, for example, the last sentence in Section 8.2.1 states the 2010 plan is the current plan.

12. Section 11.5. The plan states that there are new requirements related to drought response that were required in the previous planning cycle. Additionally, the plan states that region specific model drought contingency plans are required for each type of WUG, however the TWDB requires two model plans. Please correct this information in the final plan.

13. The GIS files submitted for WMS projects do not adhere to the contractually required naming convention. Please rename the GIS files following the naming convention outlined in Exhibit D, Section 2.4.5 in the final GIS files submitted. *[Contract Exhibit D, Section 2.4.5]*

14. The GIS files submitted for WMS projects do not include all of the required attribute fields listed in Table 1 of Exhibit D, Section 2.4.5. Please include the following attribute fields in all submitted WMS project GIS data: Description, Project Components, and Datum, with the final GIS files submitted. *[Contract Exhibit D, Section 2.4.5]*

15. The GIS files submitted for WMS projects do not include minimum metadata requirements. Please include at a minimum, metadata about the data's projection, with the final GIS data submitted. *[Contract Exhibit D, Section 2.4.1]*

Appendix G.2: Texas Water Development Board Comments and Responses

This appendix provides the comments received from the Texas Water Development Board (TWDB) and the Rio Grande Regional Water Planning Group's (RGRWPG's) responses. Comments from other federal/state agencies regarding the 2021 Region M IPP are compiled in Appendix G.3. An overview and summary of comments is included in Chapter 10 of the RGRWP. The following provides each comment from the TWDB and the RGRWPG's corresponding response, including revisions made to the final plan to address the comment.

Level 1: Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
1.a	Chapter 5 and DB22	1. Chapter 5 and the State Water Planning Database (DB22). The plan includes the following recommended water management strategies (WMS) by WMS type, providing supply in 2020 (not including demand management): 10 groundwater wells & other, seven groundwater desalination, five direct potable reuse, three other direct reuse, one seawater desalination, five other surface water, and one other strategies. Strategy supply with an online decade of 2020 must be constructed and delivering water by January 5, 2023. 1.a) Please confirm that all strategies shown as providing supply in 2020 are expected to be providing water supply by January 5, 2023. [31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]	The Region M technical consultant, Black & Veatch, reached out to sponsors with projects beginning in 2020 to verify whether projects providing a supply in 2020 will be online by January 5, 2023. Based on responses received from sponsors, eight (8) projects have a revised implementation decade from 2020 to 2030, including the following WMSs/WMS projects: Alamo – Brackish Groundwater Desalination Plant; Brownsville – Banco Morales Reservoir; McAllen – Brackish Groundwater Desalination Plant; Mission – Brackish Groundwater Desalination Plant; Roma – Regional Water Treatment Plant; San Juan – WTP No. 1 Upgrade, Expansion, and Brackish Groundwater Desalination; Sharyland WSC – Water Well and RO Unit at WTP No. 2; and Sharyland WSC – Water Well and RO Unit at WTP No. 3. The RWP and DB22 have been updated to reflect revised decades for these WMS Projects.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
1.b	Chapter 5 and DB22	1.b) Please provide the specific basis on which the planning group anticipates that it is feasible that the seven groundwater desalination, one seawater desalination, and five other surface water WMSs will all actually be online and providing water supply by January 5, 2023. For example, provide information on actions taken by sponsors and anticipated future project milestones that demonstrate sufficient progress toward implementation. [31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]	The Region M technical consultant requested status updates from project sponsors regarding actions taken and anticipated future project milestones that demonstrate sufficient progress toward implementation by the January 5, 2023 deadline. If sufficient responses were not received, the RGRWPG approved to move the implementation decade of the project of interest to the 2030 decade. Of the 12 listed projects provided by the TWDB, nine (9) projects were revised to later implementation decade: • Alamo – Brackish Groundwater Desalination; • Brownsville – Banco Morales Reservoir; • Laguna Madre Water District – Seawater Desalination Plant; • McAllen – Brackish Groundwater Desalination Plant; • North Alamo WSC – Delta Area Brackish Groundwater Desalination Plant; • Roma – Regional Water Treatment Plant; • San Juan - WTP No. 1 Upgrade and Expansion to Include Brackish Groundwater Desalination; • Sharyland WSC – Water Well and RO Unit at WTP No. 2; and • Sharyland WSC – Water Well and RO Unit at WTP No. 3. One project was a carry over from the 2016 RWP and has been since removed in DB22: • Jim Hogg County WCID (originally Hebbronville in 2016 RWP) – New Brackish Groundwater Desalination Plant One project was confirmed to be constructed and delivering water by January 5, 2023: • McAllen – Raw Water Line: Construction of this project, as described in the RWP, should commence fall 2020, with an anticipated completion by the end of 2021. -- See attachment in Appendix G.5 for communications to confirm completion of

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
1.c	Chapter 5 and DB22	1.c) In the event that the resulting adjustment of the timing of WMSs in the plan results in an increase in near-term unmet water needs, please update the related portions of the plan and DB22 accordingly, and also indicate whether 'demand management' will be the WMS used in the event of drought to address such water supply shortfalls or if the plan will show these as simply 'unmet'. If municipal shortages are left 'unmet' and without a 'demand management' strategy to meet the shortage, please also ensure that adequate justification is included in accordance with 31 TAC § 357.50(j). [TWC § 16.051(a); 31 § TAC 357.50(j); [31 TAC § 357.34(i)(2); Contract Exhibit C, Section 5.2]	With revisions to timing of the WMSs, there are no near-term unmet needs for municipal WUGs. However, there is one additional non-municipal WUG with unmet needs in the 2020 decade, including Cameron County Steam-Electric. Therefore, the plan and DB22 have been updated accordingly to show the additional WUG with unmet needs. Since there are no municipal unmet needs, a justification for municipal shortages is not necessary for inclusion in the RWP.
1.d	Senate Bill 1511	1.d) Please be advised that, in accordance with Senate Bill 1511, 85th Texas Legislature, the planning group will be expected to rely on its next planning cycle budget to amend its 2021 Regional Water Plan during development of the 2026 Regional Water Plan, if recommended WMSs or projects become infeasible, for example, do to timing of projects coming online. Infeasible WMSs include those WMSs where proposed sponsors have not taken an affirmative vote or other action to make expenditures necessary to construct or file applications for permits required in connection with implementation of the WMS on a schedule in order for the WMS to be completed by the time the WMS is needed to address drought in the plan. [Texas Water Code § 16.053(h)(10); 31 TAC § 357.12(b)]	The RGRWPG acknowledges this comment.
2.	Chapter 1, Page 1-30, Table 1-7	2. Page 1-30, Table 1-7. Please clarify if 2010 water loss audit data was used for the data presented Table 1-7. If not, please update the table name. If so, please summarize water loss audit data provided during the current planning cycle in the final, adopted regional water plan. [31 TAC § 357.30(11)]	The noted year "2010" in title was incorrect, it is corrected to "2017".
3.	Chapter 3, Section, 3.1.4, Page 3-20	3. Section 3.1.4, page 3-20. Please confirm whether the local surface water supplies listed in Table 3-5 are firm supplies that will be available under drought conditions in the final, adopted regional water plan. [31 TAC § 357.32(a); Contract Exhibit C, Section 3.7]	Surface water availabilities presented are firm supplies available under the drought of record conditions. Language was added into Section 3.1.4: "Livestock is managed in such a way that populations will be maintained at a level that can be supported by a combination of known groundwater supplies and livestock local supplies; available during drought conditions."

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
4.	Chapter 3, Section 3.2.4, Page 3-30	4. Section 3.2.4, page 3-30. The plan references the GAM Run 17-027 MAG report as the citation for the non-MAG availability presented in Table 3-10. GAM Run 17-027 MAG does not report availability projections for the Yegua-Jackson aquifer. Please clarify the data source for these values as appropriate and document the information in the final, adopted regional water plan. [Contract Exhibit C, Section 3.5.2]	Language was revised in Section 3.2.4 to indicate that the Yegua-Jackson aquifer availabilities are DFC compatible non-relevant availability estimates, generated in the GR17-027_MAG model run, as reported in the "NonRelevantGroundwaterDFCCompatibleWaterVolumes" workbook provided by TWDB dated 5/2/2018. (GR17-030_MAG is also listed in the non-relevant workbook for the Region M counties with Yegua-Jackson, but that model, from GMA12, does not cover any counties in Region M.)
5.	Chapter 3	5. Chapter 3. The plan does not appear to include the evaluation results of existing supplies for major water providers (MWP). Please report existing supplies for MWPs by decade and category of use in the final, adopted regional water plan. [31 TAC § 357.32(g)]	MWP existing supplies have been consolidated in Appendix B. Mention of MWP existing supplies and Appendix B is located in Section 3.4.
6.	Chapter 4, Section 4.3.1, Page 4-7	6. Section 4.3.1, page 4-7. The plan does not appear to include identified water needs for MWPs reported by category of use including municipal, mining, manufacturing, irrigation, steam electric, mining, and livestock. Please report the results of the needs analysis for MWPs by categories of use as applicable in the region in the final, adopted regional water plan. [31 TAC § 357.33(b)]	MWP identified water needs reported by category have been consolidated in Appendix B. Mention of MWP identified needs and Appendix B is located in Section 4.3.1.
7.	Chapter 4	7. Chapter 4. The plan does not appear to include a secondary needs analysis for MWPs. Please present the results of the secondary needs analysis by decade for MWPs in the final, adopted regional water plan. [31 TAC § 357.33(e)]	MWP secondary needs analysis for MWPs have been consolidated in Appendix B. Mention of MWP secondary needs analysis and Appendix B is located in Section 4.10.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
8.	Chapter 5, Section 5.2.11, Page 5-83	8. Section 5.2.11, page 5-83. The plan does not appear to define a threshold for significant water needs related to the potential for aquifer storage and recovery (ASR) projects to meet those needs. Please include information on how the planning group defines significant water need for the potential for ASR projects to meet those needs in the final, adopted regional water plan. [TWC § 16.053(e)(10); 31 TAC § 357.34(h)]	Language was added to Section 5.1.2 Potential for ASR Projects to Meet Significant Needs. "In accordance with Title 31 of the Texas Administrative Code (TAC) Section 357.34(h), if a Regional Water Planning Area (RWPA) has significant identified water needs, the Regional Water Planning Group (RWPG) shall provide a specific assessment of the potential for ASR projects to meet those needs. At the July 1, 2020, RWPG meeting, the LRGRWPG defined the threshold of significant water needs to be a municipal WUG with an identified need of 10,000 ac-ft/yr or greater. WUGs meeting this definition in the 2021 LRGRWP in 2070 include Brownsville, Edinburg, Laredo, McAllen, Mission, North Alamo WSC, Sharyland WSC, and Weslaco. At this point in time, the respective WUGs above and RWPG have found that ASR is an infeasible and expensive methodology to increase supply. During this planning cycle, only Eagle Pass submitted an ASR Project to meet their needs. However, due to the reasons noted above, it is an alternative WMS – described in Section 5.2.11 and evaluated in Section 5.4."
9.	Chapter 5, Section 5.2.5, DB22	9. Section 5.2.5 and DB22. The plan includes rainwater harvesting as a recommended demand reduction WMS for La Feria. For regional water planning purposes rainwater harvesting is considered a separate source and should not be classified as conservation in accordance with contract guidance. Please include a specific WMS evaluation for rainwater harvesting, including assumed rainfall under drought of record conditions, and revise the WMS classification in DB22 in the final, adopted regional water plan. [Contract Exhibit C, Section 5.10]	The La Feria Rainwater Harvesting WMS in DB22 and in the IPP was a carry over from the 2016 RWP and has since been removed.
10.	Chapter 5, Section 5.2.10	10. Section 5.2.10. Please confirm that the quantified supply estimates for the Arundo Donax Biological Control WMS is available during drought of record conditions in the final, adopted regional water plan. [31 TAC § 357.34(b); 31 TAC §357.34(e)(3)(A)]	Language was added to Section 5.2.10 as indicated below: "This suggests a water savings of 6,593 acft because of reduced consumptive use by A. donax, accounting for water used by regrowth of native riparian plants. Since the United States receives about 2/9 of this water, availability to the United States would be 2,183 acft. This water, available annually, will increase over time, as will the effectiveness and expansion of the biological control agents. It is assumed that 80 percent of the total water saved through biological control will be above the Amistad or Falcon Reservoirs in the Rio Grande Watershed, thus making that water available as a supply for irrigators; estimated for drought of record conditions (Table 5.2 38)."

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
11.	Chapter 5, Section 5.3	11. Section 5.3. Please clarify whether the Resaca Restoration WMS is subject to TCEQ's adopted environmental flow standards and document this information in in the final, adopted regional water plan. [31 TAC § 357.34(e)(3)(B); 31 TAC § 358.3(22); 31 TAC § 358.3(23)]	Clarifying language was added to the Resaca Restoration WMS evaluation in Section 5.3 in the Environmental Issues subsection. "The resacas that are considered in the Resaca Restoration WMS are oxbow lakes in the former channel of the Rio Grande, which have been cut off from the river for decades and are outside of the Rio Grande basin as a result of the levees that have since been constructed to control flood waters along the Rio Grande. They do not have flowing inlets or outlets to either the Rio Grande or the Arroyo Colorado, and are therefore not subject to TCEQ environmental flow standards."
12.	Chapter 5, Section 5.3, Page 5.3-15	12. Section 5.3, page 15. The firm yield for the proposed Banco Morales Reservoir when running the Water Availability Model (WAM) files provided is 1,561 acre-feet/year, which differs from the 3,835-3,906 acre-feet/year listed for water right number 1838. Please reconcile the difference in firm yield for Banco Morales Reservoir in the final, adopted regional water plan. [Contract Exhibit C, Section 5.2.1]	The Region M technical consultant, with the help of the TWDB Surface Water Team, determined that the firm yield of the Banco Morales Reservoir was 1,700 acft when modeled using the Rio Grande WAM. The firm yield and cost estimate for the Banco Morales Reservoir has been updated to reflect the modeled firm yield of 1,700acft/yr.
13.	Chapter 5, Section 5.4	13. Section 5.4. The plan does not appear to provide complete strategy evaluations for alternative WMSs. For example, the alternative Delta Watershed WMS is briefly mentioned in Section 5.2.9 but does not appear to be evaluated in Section 5.4 (Alternative WMSs). Additionally, some alterative WMSs reported in DB22, for example, the Eagle Pass New BGD Plant alternative WMS do not appear to be included in the text of the plan. Please include complete evaluations for all alternative WMS and projects in the final, adopted regional water plan or remove them from the alternative WMS list. [31 TAC 357.35 (g)(3)]	Alternative WMSs for the 2021 cycle were identified and fully evaluated. Alternative WMSs that were carried over from the 2016 cycle or not submitted by sponsors have been removed. See Section 5.2 for WMS evaluations and Section 5.4 for project write-ups.
14.	Chapter 5, Section 5.4, Page 5.4-19	14. Chapter 5. The alternative strategy evaluation for the 1 Million Gallon Water Tower WMS (page 5.4-19) states that the strategy provides storage but does not provide any additional supply. Please ensure that all recommended WMSs and projects increase the volume of water supply that is delivered to a WUG (e.g., via transmission). The final adopted regional water plan may include a separate section for additional recommendations that do not increase the volume of water supply, but these may not be considered recommended WMS. [31 TAC 357.43(d); Contract Exhibit C, Section 5.5.3]	All recommended WMSs and projects were confirmed to increase the volume of supply. WMSs that were initially recommended or alternative, but not increasing volume of supply have been moved to Section 5.5 - Additional Recommendations.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
15.	Chapter 5, Section 5.3	15. Units costs reported in DB22 appear notably high for the Eagle Pass – ASR and MII - El Jardin WSC Distribution Pipeline Replacement WMSs. For example, unit costs range from $523,833 in 2020 to $218,580 in 2070 for the Eagle Pass – ASR WMS, and unit costs are reported as $150,727 in 2020 and 2030 for the El Jardin WSC Distribution Pipeline Replacement WMS. Please confirm that the calculated unit costs are correct in DB22 and that costs were considered in WMS recommendations in the final, adopted regional water plan. [31 TAC § 357.34(e)(2)]	Unit costs were confirmed for both the Eagle Pass - ASR and El Jardin WSC - Distribution Pipeline Replacement WMSs. Due to costs, Eagle Pass - ASR was an alternative WMS. As submitted, the El Jardin WSC - Distribution Pipeline Replacement was anticipated to save approximately 3.6 MG/year, which equates to 11 acft/yr. This low yield resulted in high unit costs.
16.	Chapter 5	16. Chapter 5. The plan does not appear to include the documented process used by the planning group to identify potentially feasible WMSs, as presented to the planning group in accordance with 31 TAC § 357.21(b). Please include this information in the final, adopted regional water plan. [Contract Exhibit C, Section 5.1]	The documented process for identifying Potentially Feasible WMSs, as described in the September 6, 2018, Technical Memorandum to the TWDB, has been added to Section 5.1.1. This information has also been revised in Section 11.4 of Chapter 11.
17.	Chapter 5	17. Chapter 5. The plan does not appear to include the list of potentially feasible WMSs identified for the region. Please include this information in the final, adopted regional water plan. [31 TAC § 357.34(b)]	The complete list of potentially feasible WMS was included in a new table, Table 5.2-1.
18.	Chapter 5	18. Chapter 5. Please clarify whether potentially feasible WMSs were evaluated under drought of record conditions and document this information in the final, adopted regional water plan. [31 TAC § 357.35(a)]	Potentially feasible WMS were evaluated under drought of record conditions. Language was added to Section 5.2, as follows: "Analyses of WMSs yields were performed under drought of record conditions."
19.	Chapter 5	19. Chapter 5. WMS and associated project evaluations presented in the plan do not appear to include quantitative reporting of reliability or anticipated strategy water losses. Please provide this information for all strategy evaluations in the final, adopted regional water plan. [31 TAC § 357.34(e)(3)(A)]	Reliability and Strategy Water losses were described in subsection of Section 5.2. Quantitative reporting for reliability has been added as additional Environmental Impacts for each WMS in Section 5.2. Quantitative reporting for strategy water losses have been added in Section 5.2, and are also detailed for each applicable WMSP.
20.	Chapter 5	20. Chapter 5. The WMS evaluations do not appear to include a quantitative reporting of all environmental factors, even when there may not be impacts. For example, the environmental evaluations do not appear to include a quantitative reporting of effects to environmental water needs and upstream development on bays, estuaries, and arms of the Gulf of Mexico. Please include a quantitative reporting of impacts to environmental water needs and upstream development on bays, estuaries, and arms of the Gulf of Mexico in the final, adopted regional water plan. [31 TAC § 357.34(e)(3)(B)]	Chapter 5.2 has been revised to include a quantitative reporting of all environmental factors, including effects on environmental water needs and upstream development on bays, estuaries, and arms of the Gulf of Mexico. The revised language and associated tables satisfy requirements for evaluating potentially feasible WMSs, as established in 31 TAC §357.34(e)(3)(B).

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
21.	Chapter 5	21. Chapter 5. The plan does not appear to include a quantitative analysis for impacts to agricultural resources for the strategies evaluated. Please include a quantitative impacts analysis for agricultural resources for each WMS in the final, adopted regional water plan. [31 TAC § 357.34(e)(3)(C)]	Quantitative analysis for impacts to agricultural resources was described as a subsection of 5.2. Quantitative reporting was completed for each WMS in the Environmental Impacts subsections in Section 5.2. Chapter 6 has been revised to include a summary of the total amount of agricultural acres impacted by WMSs.
22.	Chapter 5	22. Chapter 5. The plan does not appear to include consideration of third-party social and economic impacts resulting from voluntary redistributions of water, including analysis of third-party impacts of moving water from rural and agricultural areas in the evaluation of potentially feasible WMSs. Please include this information in the final, adopted regional water plan. [31 TAC § 357.34(e)(7)]	Consideration of third-party social and economic impacts resulting from voluntary redistributions of water has been added as a subsection Chapter 5.2.
23.	Chapter 5	23. Chapter 5. The plan does not appear to present the reservoir-associated land costs separately. Please include separated reservoir-associated land costs as applicable to reservoir WMSs in the final, adopted regional water plan. [Contract Exhibit C, Section 5.5]	Reservoir-associated land costs have been separated in text for the Brownsville Banco Morales Reservoir and Pharr Raw Water Reservoir Augmentation recommended WMSs. And the Brownsville Matamoros Weir and Reservoir alternative WMS.
24.	Chapter 5	24. Chapter 5. The plan does not appear to present management supply factors for MWPs. Please report management supply factors for all MWPs by decade in the final, adopted regional water plan. [31 TAC § 357.35(g)(2)]	Management supply factors for MWPs have been inserted into Section 5.3.9 Management Supply Factors. Table 5.3-327 was developed based on a DB22 query of "The formula for management supply factors equates to: the total existing supplies, plus all water supplies from recommended WMSs; divided by the entity's total projected Water Demand, within each planning decade".
25.	Chapter 6.3, Table 4-14	25. Section 6.3 and Table 4-14. The plan states that there are no unmet Municipal/County-Other needs. However, the summary of unmet needs presented in Table 4-14 includes Municipal and County-Other unmet needs. Additionally, the unmet needs data presented in Table 4-14 appears to be inconsistent with data reported in DB22. For example, in DB22, there are no unmet Municipal needs, however County-Other unmet needs in DB22 range from 13 ac-ft/yr in 2020 to 18 ac-ft/yr in 2070. Table 4-14 presents these County-Other unmet needs as 162 ac-ft/yr in 2020 and 597 ac-ft/yr in 2070. Please reconcile this data as necessary and provide an adequate justification of unmet needs for Municipal and/or County- Other WUGs as outlined in rule and contract guidance in the final, adopted regional water plan [31 TAC § 357.50(j); Contract Exhibit C, Section 6.3]	Data in the RWP and DB22 have been consolidated based on revised supply balances, WMSs for all entities, and incorporation of the non-MAG for Cameron and Willacy Counties. Based on these revisions, there were no Municipal and County-Other unmet needs as reflected in Section 6.3. Table 4-14 has since been removed due to presenting unmet needs prior to presenting Chapter 5. Thus all discussion of unmet needs was incorporated only in Section 6.3.
26.	Chapter 7, Section 7.4	26. Section 7.4. Please confirm whether the entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply. [Contract Exhibit C, Section 7.4]	The following language was added to Section 7.4: "For purposes of this evaluation, entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply."

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
27.	Chapter 7, Section 7.5, Page 7-27	27. Section 7.5, page 7-27. The plan does not appear to include copies of the model drought contingency plans as referenced in Attachment 7.B. Please include the model plans (two plans minimum) in the final, adopted regional water plan. [31 TAC § 357.42(j)]	The following language was added to Section 7.5: "The TCEQ has prepared model DCPs for wholesale and retail water suppliers to provide guidance and suggestions to entities regarding the preparation of DCPs. Not all items in the model will apply to every system's situation, but the overall model can be used as a starting point for most entities. The LRGVRWP suggests that the TCEQ model DCPs be used for entities wishing to develop a new DCP. The TCEQ model DCPs and WCPs are included for all WUG types in Appendix 7.B.The TCEQ model DCPs can be found on TCEQ's website: (https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency.html)"
28.	Chapter 7	28. Chapter 7. Model drought contingency plans were not provided for review. Please ensure that model drought contingency plans submitted with the final, adopted regional water plan at a minimum have triggers and responses to 'severe' and 'critical/emergency' drought conditions. [Contract Exhibit C, Section 7.6]	Model Drought Contingency Plans were provided in Appendix E.
29.	Chapter 7	29. Chapter 7. The plan does not appear to include a discussion of whether drought contingency measures have been recently implemented (for example, since adoption of the last regional water plan) in response to drought conditions. Please describe this in the final, adopted regional water plan. [Contract Scope of Work, Task 7, subtask 3]	Black and Veatch reached out to several sponsors to see if drought contingency measures had been recently implemented. The following text has been added to chapter 7: "Utilities within Region M may have recently implemented drought contingency measures in response to drought conditions. At the time of writing this chapter, Stage 2 drought restrictions were implemented by the City of San Juan as recently as July 2020. North Alamo WSC, the City of Laredo, and Olmito WSC indicated that they have no records of activating drought contingency measures since adoption of the 2016 Regional Water Plan."

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
30.	Chapter 7	30. Chapter 7. The plan does not appear to include discussion of unnecessary or counterproductive variations in drought response strategies that may impede drought response efforts. Please include discussion of any unnecessary or counterproductive variations in drought response strategies that were identified by the planning group in the final, adopted regional water plan. [TWC § 16.053(e)(3)(E); 31 TAC § 357.42(b)(2)]	Based on a discussion was held during the July 1, 2020 LRGVRWPG meeting, the following language was added to Section 7.7.4: "Unnecessary or counterproductive variations in drought response strategies may impede drought response efforts. Counterproductive examples include entities having different stages, triggers, and responses that may have been counterproductive to the efforts of drought response and negatively impact local resources. Furthermore, municipalities have drought triggers that are set on varying reservoir levels, and if they have municipal water rights, these water rights are not affected by reservoir levels. Setting drought response stages or triggers with respect to the budgeting of water rights rather than reservoir levels could prove to be more beneficial for drought response strategies for entities in the region. In addition, if an entity enacts a drought response faster than other entities, the action complicated connections. Entity coordination of drought response triggers could mitigate some counteractive variations in drought response strategies. Lastly, a measure to assist in mitigating the counterproductive measures associated with push water would be for entities to coordinate the timing of the utilization of push water to decrease excess water used in distribution canals."

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
31.	Chapter 10	31. Chapter 10. Please address how the planning group complied with the Texas Open Meetings Act and Texas Public Information Act in the final, adopted regional water plan. [31 TAC §357.21; 31 TAC §357.50(f)]	Section 10.1 was revised to include a more detailed discussion of how the RWPG complied with Texas Open Meetings Act and Texas Public Information Act: "New to the Regional Water Planning process this cycle, beginning in 2019 were the adoptions of the Open Meetings Act[1] and Public Information Act[2], which require members of governmental bodies to participate in education training and open records training pursuant to Sections 551.005 and 552.012 of the Texas Government Code, respectively. These Acts in conjunction determine how open meetings are operated and public information is made available to the public. More information can be found on the Office of the Texas Attorney General website (https://www.texasattorneygeneral.gov/). As described above, the RGVRWPG has routinely abided by such open forums and information prior to the adoption of these acts and has been able to appropriately incorporate the requirements. The RGVRWPG met all requirements under the Texas Open Meetings Act and Public Information Act in accordance with Title 31 of the Texas Administrative Code (31 TAC) Sections 357.12, 357.21, and 357.50(f)." [1] Office of the Texas Attorney General. “Open Meetings Act”. https://www.texasattorneygeneral.gov/open-government/open-meetings-act-training. [2] Office of the Texas Attorney General. “Public Information Act”. https://www.texasattorneygeneral.gov/open-government/governmental-bodies/pia-
32.	Chapter 11, Section 11.4	32. Chapter 11, Section 11.4. The plan did not include implementation survey data collected to date in Appendix E. Please ensure that the template and data used for the implementation survey in the final, adopted regional water plan are based on the survey template and data that the TWDB provided in June 2019. [31 TAC § 357.45(a)]	Implementation survey data using the required template has been included in the final plan.
33.	Chapter 11, Section 11.4	33. Chapter 11. Please provide a brief summary of how the 2016 Plan differs from the 2021 Plan with regards to recommended and alternative WMS projects in the final, adopted regional water plan. [31 TAC § 357.45(c)(4)]	Section 11.4 describes how WMS were evaluated in each plan, and a comparison of recommended WMS in the 2016 and 2021 plans is included as Table 11-2.
34.	Chapter 11	34. Chapter 11. The plan does not appear to assess the progress of the regional water planning area in encouraging cooperation between water user groups for the purpose of achieving economies of scale and otherwise incentivizing strategies that benefit the entire region. Please provide a general assessment of these items in the final, adopted regional water plan. [TWC § 16.053(e)(12); 31 TAC § 357.45(b)]	Progress of the regional water planning area in encouraging cooperation was inserted as Section 11.6 Assessment of Progress Toward Regionalization. This section summarized WMSs and groups that encourage cooperation between WUGs and WWPs and regionalization in the Rio Grande Valley.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
35.	[31 TAC § 358.3(19)]	35. Please clarify whether the plan development was guided by the principal that designated water quality and related uses as shown in the state water quality management plan shall be improved or maintained. [31 TAC § 358.3(19)]	The following language was added to Section 5.1.1 to clarify plan development: "In accordance with Chapter 31 of the Texas Administrative Code, Chapter 358.3 (19), the plan development was guided by the principal that designated water quality and related uses as shown in the state water quality management plan shall be improved or maintained. The state water quality management plan is developed and maintained by the Texas Commission on Environmental Quality (TCEQ) and can be found at the following weblink: https://www.tceq.texas.gov/permitting/wqmp. "
36.	Appendix A	36. Appendix A. The plan includes some DB22 reports that appear blank due to the region not having relevant data for these reports. Please provide a cover page to the DB22 report appendix indicating the reason for these report contents being blank.	The cover page has been revised to indicate why the following DB22 reports are blank: WMS supply associated with interbasin transfers, and WUG WMS supply associated with IBT.
37.	Electronic Appendices	37. Electronic Appendices. The WAM file used to simulate the yield from the proposed Brownsville-Matamoros Weir and Reservoir (water right number 5259) does not appear to have been provided. Please provide the WAM file with the final, adopted regional water plan. [Contract Exhibit C, Section 5.2.1]	The WAM code provided by Region M did not include the simulation for water right number 5259 (Brownsville weir), however, closer examination of the code shows that the yield for Brownsville weir is simulated under water right number 1838. In conclusion, even though the yield associated with the Brownsville Reservoir under water right number 5259 is not simulated, it is simulated as part of water right number 1838. Language to clarify was included in Section 5.4.1.1.
38.	GIS Files	38. The GIS files submitted did not appear to include the locations of every recommended and alternative WMS project. Please include the locations of every recommended and alternative WMS project listed in the final, adopted regional water plan with the final GIS data submitted. [Contract Exhibit C, Section 13.1.2]	GIS records have be reconciled with final WMS projects so that all alternative and recommended projects are shown.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.			
1.	Page ES-12, Table ES-5.	Please consider updating the outdated term 'Managed Available Groundwater' to 'Modeled Available Groundwater'.	The term was revised to 'Modeled Available Groundwater' in Table ES-5.
2.	Chapter 3, page 3-8, footnote No. 4.	The WRAP version date of 2004 is not consistent with the WRAP version date of July 2018 in the WAM files submitted. Please reconcile this inconsistency and revise the footnote in the final plan.	The footnote has been revised to reflect the proper WRAP version date of July 2018.
3.	Page 3-26, Table 3-9.	3. Please correct the legend to correctly identify the "Carrizo- Wilcox (outcrop)" aquifer.	Language above Table 3-9 was revised to identify the Carrizo Sand as synonymous to the Carrizo-Wilcox Aquifer. Additionally, the reference to Figure 3-9 explicitly notes to "see 'Carrizo-Wilcox (outcrop)' in Figure 3-9".
4.	Page 3-31.	Please consider revising the title of Section 3.2.6 to Allocation of Groundwater Supplies.	Section 3.2.6 has been revised to "Allocation to Groundwater Supplies".
5.	page 5-7	Please consider including section number references (e.g. Banco Morales Reservoir - Section 5.3.1.2) for WMSs on page 5-7 to clearly identify where additional information about the WMS can be found in the plan.	The team considered adding section number references to Chapter 5.1, but ultimately did not because WMSs included in Chapter 5.3 and 5.4 do not have section numbers for each WMS but rather, just have section number for each Entity.
6.	Page 5-9, Table 5.2-3.	The Adams Garden ID row is the same as the Bayview ID row below it. Please verify the data in these rows and revise as appropriate.	Adams Garden ID has been dissolved and incorporated into other districts. The data listed was initially copied over and has since been removed.
7.	Section 5.2.5	Section 5.2.5 includes rainwater harvesting and reuse in the list of advance water conservation measures. While the TWDB acknowledges that the municipal conservation best practices guide includes rainwater harvesting and reuse, for regional water planning purposes these practices are considered separate sources and should not be classified as conservation. Please consider clarifying this information within Section 5.2.5 in the final, adopted regional water plan. [Contract Exhibit C, Section 5.6]	A clarifying footnote was added to the mention of rainwater harvesting in Section 5.2.5: "While Rainwater Harvesting, Condensate Reuse, and Reuse of Reclaimed Water are included in the WCAC Municipal BMP Guide as water conservation measures, they are not classified as water conservation measures by the TWDB for regional water planning purposes or in DB22."
8.	Page 5-27, Table 5.2-11.	Column A for County-Other, Cameron is zero and Column B, which should be 110 percent of column A, is 10. Also, in Table 5.2-11, Irrigation, Jim Hogg, Column A is 3 and column B, which should be 110 percent of column A, is 6. Please correct these values as appropriate.	The Environmental Impacts of Fresh Groundwater Strategies has been corrected for County-Other, Cameron as: (A) 4; (B) 4. For Irrigation, Jim Hogg: (A) 3; (B) 3. These values were revised based on revisions to the WMS and estimated acreage.
9.	Page 5.4-39.	Please consider removing the duplicate section of "Implementation Issues".	The duplicate "Implementation Issues" section has been removed.

No.	IPP Reference	TWDB Comment	RGRWPG Proposed Response/Approach
10.	Page 7-30.	Please consider revising the section title of 7.6.2 to Recommended Drought Management WMS and Triggers, since no alternative Drought Management WMSs appear to be included in the plan.	Section 7.6.2 has been revised to Recommended Drought Management WMS and Triggers.
11.	Page 8-5.	Please consider updating the state of the Brownsville Weir and Reservoir to reflect past Legislative designation, and updated information regarding planning cycles, for example, the last sentence in Section 8.2.1 states the 2010 plan is the current plan.	Language has been revised based on recent discussion (Sept. 2020) with the BPUB as: "The Brownsville Weir and Reservoir project is expected to provide approximately 20,000 acre-feet per year (acft/yr) of additional dependable surface water supply for the City of Brownsville. This additional supply will play an important role in meeting Brownsville's projected water supply needs through the planning period. The development of the project is included as a recommended water supply strategy in the first (2001) Rio Grande RWP (Region M) and in the resulting (2002) State Water Plan. The project has continually been included in each ensuing Region M and State Water Plan, including this 2021 Region RWP. Recent discussions with BPUB have noted prioritization of other projects (e.g. Resaca Restoration), which has pushed implementation of the Brownsville Weir and Reservoir to the 2030 decade."
12.	Section 11.5.	The plan states that there are new requirements related to drought response that were required in the previous planning cycle. Additionally, the plan states that region specific model drought contingency plans are required for each type of WUG, however the TWDB requires two model plans. Please correct this information in the final plan.	Language was revised to reflect the TWDB's requirements for two model drought contingency plans.
13.	GIS Files	The GIS files submitted for WMS projects do not adhere to the contractually required naming convention. Please rename the GIS files following the naming convention outlined in Exhibit D, Section 2.4.5 in the final GIS files submitted. [Contract Exhibit D, Section 2.4.5]	The GIS files have been revised.
14.	GIS Files	The GIS files submitted for WMS projects do not include all of the required attribute fields listed in Table 1 of Exhibit D, Section 2.4.5. Please include the following attribute fields in all submitted WMS project GIS data: Description, Project Components, and Datum, with the final GIS files submitted. [Contract Exhibit D, Section 2.4.5]	The GIS files have been revised.
15.	GIS Files	The GIS files submitted for WMS projects do not include minimum metadata requirements. Please include at a minimum, metadata about the data's projection, with the final GIS data submitted. [Contract Exhibit D, Section 2.4.1]	The GIS files have been revised.

TEXAS STATE SOIL AND WATER CONSERVATION BOARD

Protecting and Enhancing Natural Resources for Tomorrow

June 18, 2020

Mr. Tomas Rodriguez
Region M Chair

Dear Mr. Rodriguez;

For the past 2 years the Texas State Soil and Water Conservation Board (TSSWCB) has been participating in the Texas Water Development Board's (TWDB) Regional Water Planning meetings as directed by Senate Bill 1511, passed in the 2017 legislative session. We appreciate being included in the process and offer these constructive comments to the regional water plans and ultimately the State water plan.

As you may know 82% of Texas' land area is privately-owned and are working lands, involved in agricultural, timber, and wildlife operations. These lands are important as they provide substantial economic, environmental, and recreational resources that benefit both the landowners and public. They also provide ecosystem services that we all rely on for everyday necessities, such as air and water quality, carbon sequestration, and wildlife habitat.

With that said, these working lands are where the vast majority of our rain falls and ultimately supply the water for all of our needs, such as municipal, industrial, wildlife, and agricultural to name a few. Texas' private working lands are a valuable resource for all Texans.

Over the years, the private landowners of these working lands have been good stewards of their property. In an indirect way they have been assisting the 16 TWDB's Regional Water Planning Groups in achieving their goals through voluntary incentive-based land conservation practices.

It has been proven over time if a raindrop is controlled where it hits the ground there can be a benefit to both water quality and water quantity. Private landowners have been providing benefits to our water resources by implementing Best Management Practices (BMP) that slow water runoff and provide for soil stabilization, which also slows the sedimentation of our reservoirs and allows for more water infiltration into our aquifers.

1497 Country View Lane • Temple, TX 76504-8806
Phone: 254-773-2250 • Fax: 254-773-3311
http://www.tsswcb.texas.gov

Some common BMPs include brush management, prescribed grazing, fencing, grade stabilization, irrigation land leveling, terrace, contour farming, cover crop, residue and tillage management, and riparian herbaceous cover.

The TSSWCB has been active with agricultural producers since 1939 as the lead agency for planning, implementing, and managing coordinated natural resource conservation programs for preventing and abating agricultural and sivicultural nonpoint sources of water pollution.

The TSSWCB also works to ensure that the State's network of over 2,000 flood control dams are protecting lives and property by providing operation, maintenance, and structural repair grants to local government sponsors.

The TSSWCB successfully delivers technical and financial assistance to private landowners of Texas through Texas' 216 local Soil and Water Conservation Districts (SWCD) which are led by 1,080 locally elected district directors who are active in agriculture. Through the TSSWCB Water Quality Management Plan Program (WQMP), farmers, ranchers, and silviculturalists receive technical and financial assistance to voluntarily conserve and protect our natural resources. Participants receive assistance with conservation practices, BMPs, that address water quality, water quantity, and soil erosion while promoting the productivity of agricultural lands. This efficient locally led conservation delivery system ensures that those most affected by conservation programs can make decisions on how and what programs will be implemented voluntarily on their private lands.

Over time, lands change ownership and many larger tracts are broken up into smaller parcels. Most new landowners did not grow up on working lands and therefore may not have a knowledge of land management techniques. The TSSWCB is writing new WQMPs for these new landowners who are implementing BMPs on their land. Education and implementation of proper land management and BMPs continues to be essential. Voluntary incentive-based programs are essential to continue to address soil and water conservation in Texas.

These BMPs implemented for soil and water conservation provide benefits not only to the landowner but ultimately to all Texans and our water supply.

Respectfully,

Barry Mahler
Chairman

Rex Isom
Executive Director

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Appendix G.4: Agency and Public Comments and Responses

This appendix provides the comments received from federal/state agencies and the public regarding the 2021 Region M IPP. An overview and summary of comments is included in Chapter 10 of the RGRWP. The following provides a list of each comment and includes the RGRWPG's response. If applicable, the RGRWP's response describes revisions made to the final plan to address the comment. Comments are numbered sequentially based on when they were received.

No.	Commenter	Comment	RGRWPG Proposed Response/Approach
1	Texas State Soil and Water Conservation Board (TSSWCB)	Summary: The TSSWCB signified the importance of implementing best management practices (BMPs) and the TSSWCB Water Quality Management Plan Program (WQMPP) to ensure adequate supplies, provide technical and financial assistance, and protection of natural resources in Region M. The full TSSWCB letter can be found in Appendix G.3.	The RGRWPG appreciates the letter provided by TSSWCB and acknowledges the comments.
2	Louis Peña, Brush Country GCD	Falling oil prices may change demands for oil drilling	The RGRWPG acknowledges this comment and notes that if falling oil prices may change demands for oil drilling, the projected demands will be consolidated and adjusted in the 2026 RWP.
3	Mayor Jim Darling, McAllen	COVID may cause some of the projections to change, could require mid-cycle update or similar	The RGRWPG acknowledges this comment and will work with the TWDB to accurately detail Region M projection changes due to COVID and other significant events if they occur.

Communications to Support Comment 1.b

From: Mark A. Vega, City of McAllen
Sent: Friday, August 28, 2020 2:11 PM
To: Mantilla-Pena, Carlos
Cc: Gonzalez, Lauren; Snyder, Katherine; Lagade, Junior
Subject: RE: Region M – Confirmation of McAllen Raw Waterline Project Online Date

Mantilla, see responses in red font below. Thank you.

1) Will the McAllen – Raw Waterline Project be constructed and delivering water by January 5, 2023? Yes, we should commence construction of the Raw Waterline that will allow us to convey water from HCID # 1 Canal to our North Water Treatment Plant Reservoir in the Fall of 2020 and anticipate completing project by the end of 2021.
2) What milestones have been accomplished thus far? This can include feasibility studies, conceptual designs, engineering reports, or final design completion. Engineering Design is 95% Complete; Funding is in place
3) What supporting data is available to show that the quantity of water needed is available? This can include models performed, field tests / measurements implemented, or project specific studies. McAllen typically conducts a Master Plan Update about every 10 years. The Master Plan Scope addresses historical usage patterns as well future growth projections. These studies are used as a planning tool to help plan for current and future needs.
4) Does McAllen have the necessary legal rights, water rights, and/or contracts to use the water that this project requires? This includes partial water rights, application submitted, or application administratively complete. McAllen recently completed a water transaction for 4,000 ac-ft/ac yr of raw water from HCID # 1.

Project Financing for McAllen – Raw Waterline Project
If you are seeking assistance for your project, we would like to know:

1) Point of contact (if someone else):
    a. Name
    b. Phone Number
    c. Email
2) Planning, Design, Permitting, & Acquisition Funding:
    a. Amount ($)
    b. Year Needed
3) Construction Funding:
    a. Amount ($)
    b. Year Needed
4) Percent State Participation in Owning Excess Capacity
    a. State Ownership (%)

If not seeking assistance, please provide a point of contact if it is someone other than yourself. We do not anticipate seeking additional funding source for this project. We have an existing SDSRF Loan that we will be using to fund this project.

From: Mantilla-Pena, Carlos
Sent: Friday, August 28, 2020 9:42 AM
To: Mark A. Vega
Cc: Gonzalez, Lauren; Snyder, Katherine; Lagade, Junior
Subject: Region M - Confirmation of McAllen Raw Waterline Project Online Date

Greetings Mark,

Earlier in March, the Region M Regional Water Planning Group published the Initially Prepared Plan (IPP) for the 2021 Region M Water Plan for public review and comment prior to the publication of the final plan in Spring of 2021. The full plan is available at http://www.riograndewaterplan.org/waterplan.

A recent legislative rule has required that the Regional Water Planning Group confirm that projects recommended in the Regional Water Plan with an **online decade of 2020** would be **constructed and delivering water by January 5, 2023**. As such, we are contacting your utility to confirm the following information necessary for the McAllen – Raw Waterline Project. Confirming such information is imperative to maintain a high standing in state funding for the McAllen – Raw Waterline Project.

Project Milestones

1) Will the McAllen – Raw Waterline Project be constructed and delivering water by January 5, 2023?
2) What milestones have been accomplished thus far? This can include feasibility studies, conceptual designs, engineering reports, or final design completion.
3) What supporting data is available to show that the quantity of water needed is available? This can include models performed, field tests / measurements implemented, or project specific studies.
4) Does McAllen have the necessary legal rights, water rights, and/or contracts to use the water that this project requires? This includes partial water rights, application submitted, or application administratively complete.

Project Financing for McAllen – Raw Waterline Project

If you are seeking assistance for your project, we would like to know:

1) Point of contact (if someone else):
    a. Name
    b. Phone Number
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2) Planning, Design, Permitting, & Acquisition Funding:
    a. Amount ($)
    b. Year Needed
3) Construction Funding:
    a. Amount ($)
    b. Year Needed
4) Percent State Participation in Owning Excess Capacity
    a. State Ownership (%)

If not seeking assistance, please provide a point of contact if it is someone other than yourself.

As we are also in the process of finalizing the report with various changes since the IPP, please note that we may contact your utility again to assure that we are depicting McAllen as accurately as possible.

Please let me know that I contacted the right individual or whom I should I contact otherwise. If you have any questions or concerns please don't hesitate to contact me via phone or email.

Thank you for your time - stay safe and happy!

Carlos

Carlos F. Mantilla-Peña, Ph.D., EIT
Engineering, Water
Black & Veatch
Building a World of Difference.®

Appendix H: Implementation Survey

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)
M	DELTA LAKE ID CONSERVATION	2020	PROJECT SPONSOR(S): DELTA LAKE IRRIGATION	RECOMMENDED WMS PROJECT	2312						
M	EAGLE PASS ADVANCED MUNICIPAL CONSERVATION	2020	PROJECT SPONSOR(S): EAGLE PASS	RECOMMENDED WMS PROJECT	2507	No					
M	EAGLE PASS NEW GROUNDWATER SUPPLY	2050	PROJECT SPONSOR(S): EAGLE PASS	RECOMMENDED WMS PROJECT	1710	No					
M	EAST RIO HONDO WSC ADVANCED MUNICIPAL CONSERVATION	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2477	No					
M	ERHWSC CONVERSION OF WATER RIGHTS	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2615	Yes	Occurs every year	Occurs every year	Currently operating		
M	ERHWSC FM 2925 TRANSMISSION LINE	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2340	No			Not implemented	Financing	Access to funding
M	ERHWSC HARLINGEN WW INTERCONNECT	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2341	Yes			All phases fully implemented		
M	ERHWSC MUNICIPAL (UV DISINFECTION FM 510 WTP)	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2418	Yes			All phases fully implemented		
M	ERHWSC SURFACE WATER TREATMENT PLANT	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC	RECOMMENDED WMS PROJECT	2380	No			Not implemented	Financing	Access to funding
M	HARLINGEN ADVANCED MUNICIPAL CONSERVATION	2020	PROJECT SPONSOR(S): HARLINGEN	RECOMMENDED WMS PROJECT	2460	Yes	2017	Ongoing	Under construction		
M	HARLINGEN WWTP 2 POTABLE REUSE	2040	PROJECT SPONSOR(S): HARLINGEN	RECOMMENDED WMS PROJECT	2367	No				If other, please describe.	
M	HIDALGO COUNTY ID NO. 1 CONSERVATION	2020	PROJECT SPONSOR(S): HIDALGO COUNTY IRRIGATION DISTRICT #1	RECOMMENDED WMS PROJECT	2325	Yes	2015	3/31/2020	Under construction		
M	LAGUNA MADRE NEW BGD PLANT	2020	PROJECT SPONSOR(S): LAGUNA MADRE WD	RECOMMENDED WMS PROJECT	2357	No			Not implemented	If other, please describe.	
M	LAGUNA MADRE POTABLE REUSE	2020	PROJECT SPONSOR(S): LAGUNA MADRE WD	RECOMMENDED WMS PROJECT	2368	Yes	2017	2019	Under construction	If other, please describe.	
M	LAREDO ADVANCED MUNICIPAL CONSERVATION	2050	PROJECT SPONSOR(S): LAREDO	RECOMMENDED WMS PROJECT	2517	No			Not implemented		
M	LYFORD BGD	2020	PROJECT SPONSOR(S): LYFORD	RECOMMENDED WMS PROJECT	1674	No			Not implemented	Financing	
M	MCALLEN ACQUISITION OF WR FROM IDS	2040	PROJECT SPONSOR(S): MCALLEN	RECOMMENDED WMS PROJECT	2745	Yes	2018	9/1/2019	All phases fully implemented		
M	MCALLEN BGD PLANT	2020	PROJECT SPONSOR(S): MCALLEN	RECOMMENDED WMS PROJECT	1679	No			Not implemented		
M	MCALLEN HCID NO. 1 RAW WATER LINE	2020	PROJECT SPONSOR(S): MCALLEN	RECOMMENDED WMS PROJECT	2336	Yes		2020	Acquisition and design phase		
M	NORTH CAMERON REGIONAL WTP WELLFIELD EXPANSION	2020	PROJECT SPONSOR(S): EAST RIO HONDO WSC; NORTH ALAMO WSC	RECOMMENDED WMS PROJECT	1604	No			Permit application submitted/pending	Permit constraints	Permitting process
M	RIO HONDO EMERGENCY INTERCONNECTS	2020	PROJECT SPONSOR(S): RIO HONDO	RECOMMENDED WMS PROJECT	2725	Yes	2014	2022	Acquisition and design phase		
M	ROMA WTP AND PURCHASE OF WATER RIGHTS	2020	PROJECT SPONSOR(S): ROMA	RECOMMENDED WMS PROJECT	2595	No					
M	SOUTH LAREDO WWTP POTABLE REUSE - PHASE I	2030	PROJECT SPONSOR(S): LAREDO	RECOMMENDED WMS PROJECT	2369	No			Not implemented		
M	SOUTH LAREDO WWTP POTABLE REUSE - PHASE II	2060	PROJECT SPONSOR(S): LAREDO	RECOMMENDED WMS PROJECT	2608	No			Not implemented		
M	SOUTH LAREDO WWTP POTABLE REUSE - PHASE III	2070	PROJECT SPONSOR(S): LAREDO	RECOMMENDED WMS PROJECT	2614	No			Not implemented		
M	UNITED ID OFF-CHANNEL STORAGE	2020	PROJECT SPONSOR(S): UNITED IRRIGATION DISTRICT	RECOMMENDED WMS PROJECT	2547	Yes	2016	5/30/2020	Under construction		
M	WEBB COUNTY WATER UTILITY EXPAND EXISTING GROUNDWATER SUPPLY	2060	PROJECT SPONSOR(S): WEBB COUNTY WATER UTILITY	RECOMMENDED WMS PROJECT	2643	No			Not implemented		

Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
								Other	Grants	Yes			The District does not plan on borrowing any money from TWDB, they will
										No			At this time, EPWWS does not have any plans for these projects.
										No			At this time, EPWWS does not have any plans for these projects.
										No			No action taken
										Yes	No	No	Continually implemented via Subchapter O
				No						Yes	No	No	Have not started; Probably late 2020's, early 2030's
112				No						No	No	No	
11				No						No	No	No	
				No						Yes	No	No	Have not started; Probably late 2020's, early 2030's
								Other	Self-funded	Yes	No	No	
										No			Long-range project that won't be implemented for 20+ years
941			2020	No				TWDB - SWIFT		No	No		
Undetermined	$ -	Unknown		No	Unknown	Unknown			Unknown	No	No	No	District has focused on higher priority projects; Brackish Groundwater
627	$ 10,685,000.00	$ 10,685,000.00		Yes	892	$ 17,545,000.00	2040	Other	Tax Bonds, Revenute Notes (SRF); Reclamation Title XVI Eligible	No	No	No	Advanced Water Treatment is unfunded; Online in 2030; Port Isabel WWTP Phase II Improvements under design are Lift Station Upgrades to accommodate Peak Flow; cost not included in estimate
										No			Call: this project has not been implemented at this time
					1480	$ 5,753,000.00	2030	Other	Grant Funds	Yes	No	No	
3000				No				TWDB - SWIFT		No	No	No	
										Yes			Not likely to be constructed and delivering water by January 5, 2023. A Master Plan Update is currently being conducted and will likely identify
								Other	SDSRF Loan	Yes			Yes, we should commence construction of the Raw Waterline that will allow us to convey water from HCID # 1 Canal to our North Water Treatment Plant Reservoir in the Fall of 2020 and anticipate completing project by the end of 2021. Engineering Design is 95% Complete; Funding is in place. McAllen typically conducts a Master Plan Update about every 10 years. The Master Plan Scope addresses historical usage patterns as well future growth projections. These studies are used as a planning tool to help plan for current and future needs. McAllen recently completed a water transaction for 4,000 ac-ft/ac yr of raw water from HCID # 1.We do not anticipate seeking additional funding source for this project. We have an existing SDSRF Loan that we will be using to fund this project.
				No	1200					Yes	No	No	Have not started; Probably 2025; Currently resolving water quality discussion with TCEQ
	$ 200,000.00									Yes	No	No	
										Yes			A planning study funded by TWDB was completed in 2012. The plan detailed an option for Roma to be the regional provider for several entities within the region. Since the report, none of the entities have expressed interest in supporting the regionalization effort. No additional studies have been performed. The plan detailed the necessary additional water rights that would be needed to support the growth of the City and regional customers. Without regional customers, the projected water rights needed will be less. Funding for this project is not currently being pursued by the City. Project will not be constructed and delivering water by January 5, 2023.
										Yes			Call: this project has not been implemented at this time
										Yes			Call: this project has not been implemented at this time
										Yes			Call: this project has not been implemented at this time
2000				No				TWDB - SWIFT		No		Potentially, but no technical flood analysis performed	
										Yes			This project has not been implemented or executed at this time