

INITIALLY PREPARED 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

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## Table of Contents

<b>Chapter 2: Population and Water Demand Projections.....</b>	<b>2-1</b>
2.1 Introduction .....	2-1
2.2 Municipal Demands .....	2-2
2.2.1 Population Projections .....	2-2
2.2.2 Municipal Water Demand Projections .....	2-8
2.2.3 Major Water Provider Demands .....	2-12
2.3 Manufacturing Water Demand Projections.....	2-14
2.4 Steam-Electric Power Generation Water Demand Projections.....	2-15
2.5 Mining Water Demand Projections .....	2-16
2.6 Irrigation Water Demand Projections.....	2-18
2.7 Livestock Water Demand Projections.....	2-20

### LIST OF TABLES

Table 2-1	Regional Demand Projects by Water User Group (Acre-feet/year) .....	2-2
Table 2-2	Population Growth Projections for Region M.....	2-3
Table 2-3	Historical and Projected Population, by Decade .....	2-5
Table 2-4	GPCD and Projected Municipal WUG Demands by County (Acre-Feet/year) .....	2-9
Table 2-5	Region M Major Water Providers .....	2-12
Table 2-6	Manufacturing Demand Projections by County (acft/yr) .....	2-14
Table 2-7	Steam-Electric Power Generation Demands by County (acft/yr).....	2-15
Table 2-8	Mining Water Demand Projections (acft/yr) .....	2-16
Table 2-9	Irrigation Demand Projections by County (acft/yr) .....	2-18
Table 2-10	Projected Distribution of Water Rights and Supplies .....	2-20
Table 2-11	Livestock Category and Estimated Per Head Daily Water Use .....	2-20
Table 2-12	Livestock Demand Projections (acft/yr).....	2-21

### LIST OF FIGURES

Figure 2-1	Aggregated Demands for Each Water User Group in Region M (acft/yr) .....	2-1
Figure 2-2	Population Projections for Region M by County .....	2-3
Figure 2-3	2020 Municipal Demand Distribution Among the Eight Counties of Region M (acft/yr) .....	2-4
Figure 2-4	Lower Rio Grande Valley Irrigation Districts .....	2-13
Figure 2-5	Distribution of Water Right Types (Maximum Diversion) .....	2-19



## 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
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
WMS	Water Management Strategy
WMS	Water Management Strategy
WSC	Water Supply Corporation
WUG	Water User Group
WWP	Wholesale Water Providers



## 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.

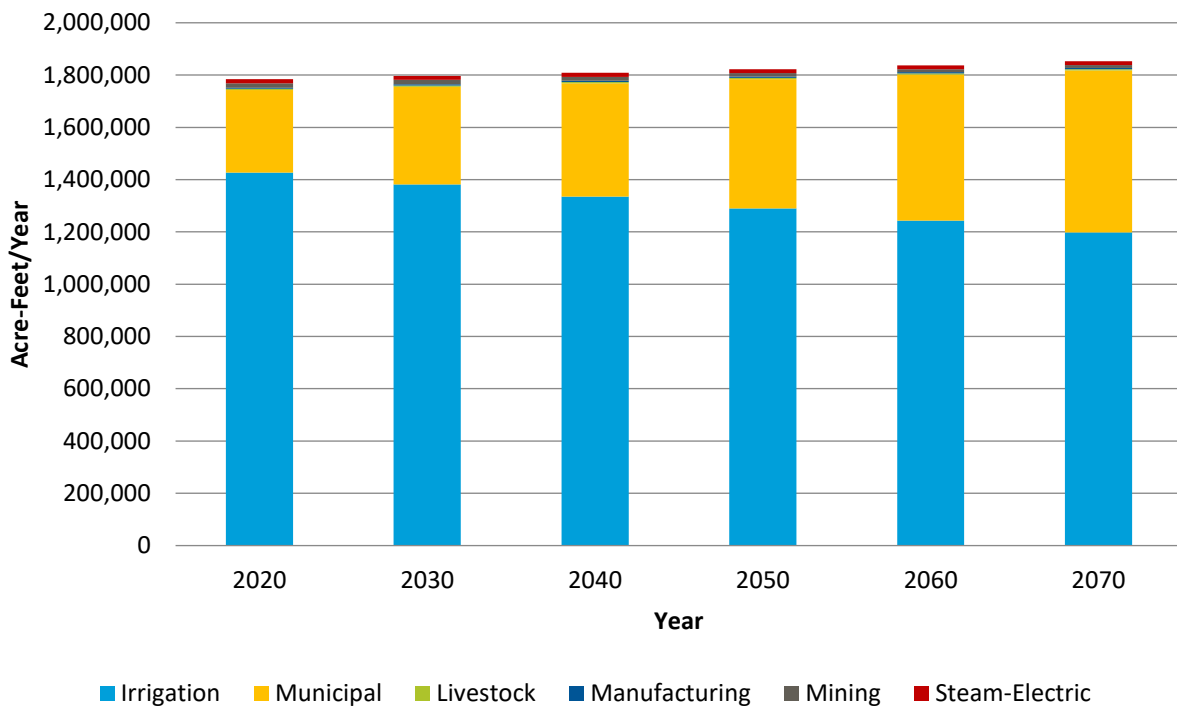


Figure 2-1 Aggregated Demands for Each Water User Group in Region M (acft/yr)

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 Projects by Water User Group (Acre-feet/year)**

WATER USER GROUP	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
<b>TOTAL</b>	<b>1,783,993</b>	<b>1,796,571</b>	<b>1,808,650</b>	<b>1,822,286</b>	<b>1,837,247</b>	<b>1,853,358</b>

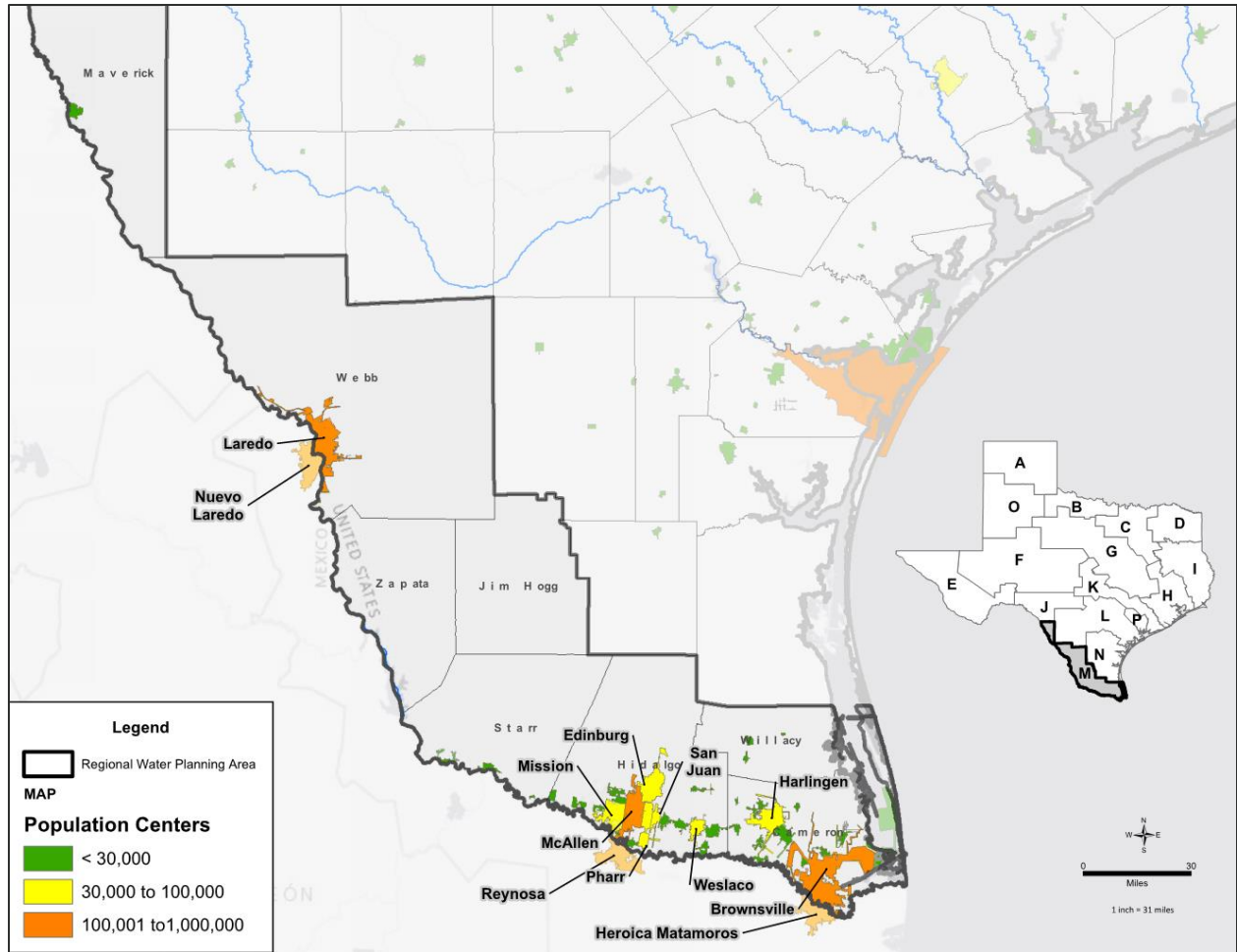
## 2.2 MUNICIPAL DEMANDS

### 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.



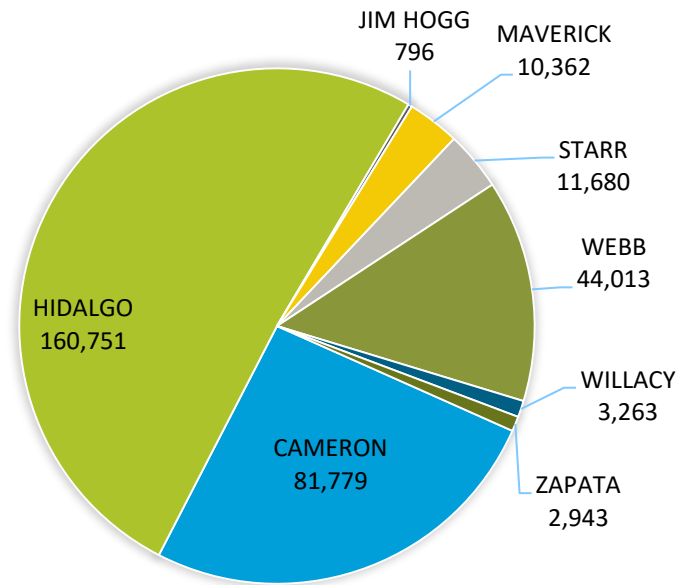


**Figure 2-2 Population Projections for Region M by County**

**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
<b>Total</b>	<b>1,960,738</b>	<b>2,379,222</b>	<b>2,794,939</b>	<b>3,211,938</b>	<b>3,626,385</b>	<b>4,029,338</b>

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 changed the definition of a WUG to being utility-based. 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)- (D) of this subsection.

The list of WUGs for the 2021 RWP 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 influence the allocation of growth, including that WUG’s share of historical growth 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. A table with 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
<b>CAMERON COUNTY</b>							
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	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

COUNTY/CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
Valley Municipal Utility District (MUD) 2	2,600	3,067	3,583	4,106	4,671	5,251	5,845
<i>Cameron County Total</i>	<i>406,220</i>	<i>478,974</i>	<i>559,593</i>	<i>641,376</i>	<i>729,461</i>	<i>820,068</i>	<i>912,941</i>
<b>HIDALGO COUNTY</b>							
Agua Special Utility District (SUD)*	54,292	68,778	85,371	102,026	118,714	135,400	151,619
Alamo	18,353	23,259	28,881	34,525	40,181	45,837	51,335
County-Other	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
<i>Hidalgo County Total</i>	<i>774,769</i>	<i>981,890</i>	<i>1,219,225</i>	<i>1,457,502</i>	<i>1,696,257</i>	<i>1,935,015</i>	<i>2,167,137</i>
<b>JIM HOGG COUNTY</b>							
County-Other	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

COUNTY/CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
<i>Jim Hogg County Total</i>	5,300	5,853	6,356	6,790	7,274	7,694	8,082
<b>MAVERICK COUNTY</b>							
County-Other	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
<i>Maverick County Total</i>	<i>54,258</i>	<i>63,107</i>	<i>72,491</i>	<i>81,243</i>	<i>90,304</i>	<i>98,988</i>	<i>107,327</i>
<b>STARR COUNTY</b>							
Agua SUD*	250	317	393	470	547	623	698
County-Other	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
<i>Starr County Total</i>	<i>60,968</i>	<i>70,803</i>	<i>80,085</i>	<i>88,633</i>	<i>97,107</i>	<i>104,687</i>	<i>111,555</i>
<b>WEBB COUNTY</b>							
County-Other	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
<i>Webb County Total</i>	<i>250,304</i>	<i>318,028</i>	<i>393,284</i>	<i>464,960</i>	<i>530,330</i>	<i>591,945</i>	<i>647,433</i>
<b>WILLACY COUNTY</b>							
County-Other	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

COUNTY/CITY	2010 WATER USE SURVEY	2020	2030	2040	2050	2060	2070
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
<i>Willacy County Total</i>	<i>22,134</i>	<i>25,264</i>	<i>28,479</i>	<i>31,559</i>	<i>34,840</i>	<i>38,012</i>	<i>41,121</i>
ZAPATA COUNTY							
County-Other	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
<i>Zapata County Total</i>	<i>14,018</i>	<i>16,819</i>	<i>19,709</i>	<i>22,876</i>	<i>26,365</i>	<i>29,976</i>	<i>33,742</i>

\*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 on the basis of 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.<sup>1</sup>

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.<sup>2</sup> 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.

<sup>1</sup> 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.

<sup>2</sup> 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.

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
<b>CAMERON COUNTY</b>							
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
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
<i>Cameron County Total</i>		<i>81,779</i>	<i>93,300</i>	<i>105,461</i>	<i>119,091</i>	<i>133,640</i>	<i>148,708</i>
<b>HIDALGO COUNTY</b>							
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

COUNTY/CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
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
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
<i>Hidalgo County Total</i>		<i>160,751</i>	<i>195,306</i>	<i>230,701</i>	<i>266,966</i>	<i>304,047</i>	<i>340,317</i>
<b>JIM HOGG COUNTY</b>							
County-Other, Jim Hogg	118	153	159	165	174	184	193
Jim Hogg County WCID 2	135	643	675	702	743	783	822
<i>Jim Hogg County Total</i>		<i>796</i>	<i>834</i>	<i>867</i>	<i>917</i>	<i>967</i>	<i>1,015</i>
<b>MAVERICK COUNTY</b>							
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
<i>Maverick County Total</i>		<i>10,362</i>	<i>11,621</i>	<i>12,832</i>	<i>14,169</i>	<i>15,524</i>	<i>16,840</i>
<b>STARR COUNTY</b>							
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



COUNTY/CITY	BASE DRY-YEAR GPCD	2020	2030	2040	2050	2060	2070
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
<i>Starr County Total</i>		<i>11,680</i>	<i>12,877</i>	<i>14,012</i>	<i>15,222</i>	<i>16,379</i>	<i>17,445</i>
<b>WEBB COUNTY</b>							
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
<i>Webb County Total</i>		<i>44,013</i>	<i>52,898</i>	<i>61,561</i>	<i>69,702</i>	<i>77,655</i>	<i>84,883</i>
<b>WILLACY COUNTY</b>							
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
<i>Willacy County Total</i>		<i>3,263</i>	<i>3,571</i>	<i>3,886</i>	<i>4,250</i>	<i>4,627</i>	<i>5,001</i>
<b>ZAPATA COUNTY</b>							
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
<i>Zapata County Total</i>		<i>3,045</i>	<i>3,489</i>	<i>3,992</i>	<i>4,570</i>	<i>5,183</i>	<i>5,831</i>

### 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 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 2-5 have been designated as MWP in the 2021 RWP. Appendix B includes the population and demand projections for the

**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 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

Irrigation districts<sup>3</sup> 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.

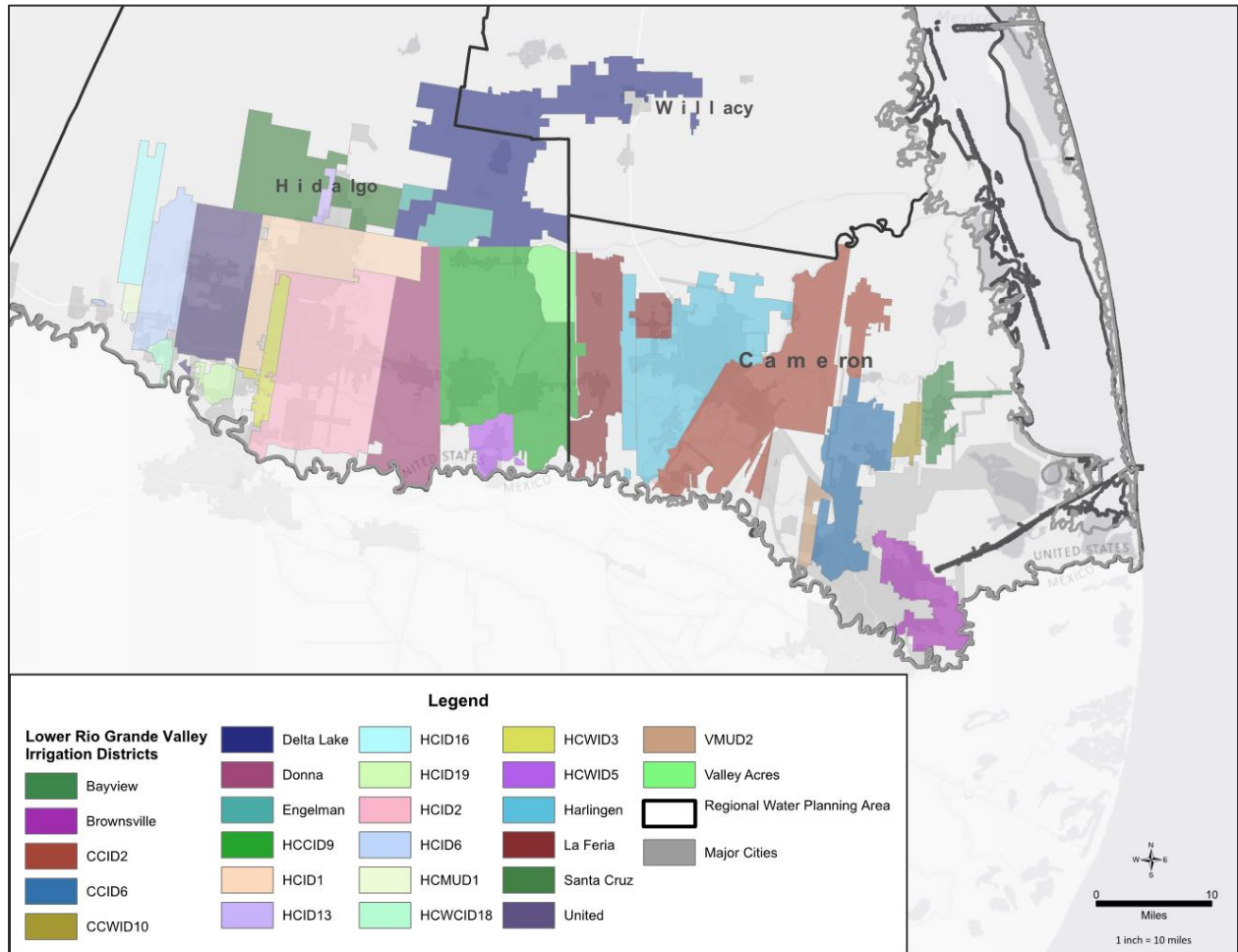


Figure 2-4 Lower Rio Grande Valley Irrigation Districts

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 as MWPs, including Alamo, Brownsville PUB, Eagle Pass, Edinburg, Harlingen, Laredo, McAllen, Pharr, Rio Grande City, San Benito, San Juan, and Weslaco.

<sup>3</sup> 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.

## 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
<b>TOTAL</b>	<b>4,305</b>	<b>5,055</b>	<b>5,055</b>	<b>5,055</b>	<b>5,055</b>	<b>5,055</b>

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
<b>TOTAL</b>	<b>15,240</b>	<b>15,240</b>	<b>15,240</b>	<b>15,240</b>	<b>15,240</b>	<b>15,240</b>

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,<sup>4</sup> 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
<b>TOTAL</b>	<b>17,051</b>	<b>16,480</b>	<b>14,952</b>	<b>12,823</b>	<b>10,458</b>	<b>10,361</b>

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

<sup>4</sup> 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](http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/0904830939_2012Update_MiningWaterUse.pdf).

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 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



COUNTY	HISTORICAL USE ESTIMATE 2011	IRRIGATION PROJECTIONS					
		2020	2030	2040	2050	2060	2070
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
<b>Total</b>	<b>1,426,960</b>	<b>1,426,960</b>	<b>1,381,153</b>	<b>1,335,342</b>	<b>1,289,532</b>	<b>1,243,725</b>	<b>1,197,914</b>

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).

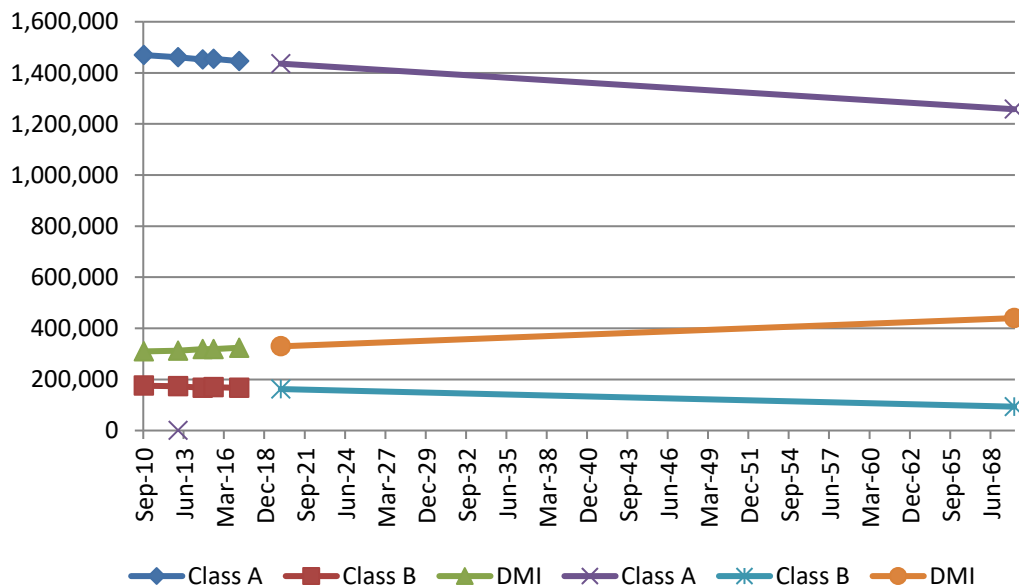


Figure 2-5 Distribution of Water Right Types (Maximum Diversion)

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
<b>TOTAL</b>	<b>4,748</b>	<b>4,748</b>	<b>4,748</b>	<b>4,748</b>	<b>4,748</b>	<b>4,748</b>

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.