Texas Water Development Board

2016 Region M Water Plan

Chapter 11: Implementation and Comparison to the Previous Regional Water Plan

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List of Abbreviations

Acre-ft.	Acre-feet
DFC	Desired Future Condition
GAM	Groundwater Availability Model
GMA	Groundwater Management Area
MAG	Managed Available Groundwater
MGD	Million Gallons per Day
RWP	Regional Water Plan
RWPG	Regional Water Planning Group
SCADA	Supervisory Control and Data Acquisition
SWIFT	State Water Implementation Fund for Texas
SWP	State Water Plan
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
WAM	Water Availability Model
WMS	Water Management Strategy
WUG	Water User Group
WWTP	Wastewater Treatment Plant

Chapter 11. Implementation and Comparison to the Previous RWP

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 development and conservation goals, and to lay out a path toward meeting future water needs. Every five-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 (WMS) that can be used to meet projected needs. The revisions from the 2011 Rio Grande Regional Water Plan (Region M Plan) and the current, 2016 update to that plan are described below.

11.2 Demands

For each cycle of regional water planning the 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 over the 50-year planning horizon. Municipal demands are developed for each entity with a population greater than 500, and rural, industrial, and irrigation demands are aggregated within each county and river basin. Demand projections are developed initially by the TWDB technical staff, and are then evaluated by the regional water planning groups 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 municipal demand, manufacturing, livestock, and steam-electric power generation. The TWDB projections for irrigation and mining demands were revised based on local information. The total demand projections for all of Water User Groups (WUGs) over the planning horizon are shown aggregated for this Regional Water Plan (RWP) and the 2011 RWP in Figure 11-1.

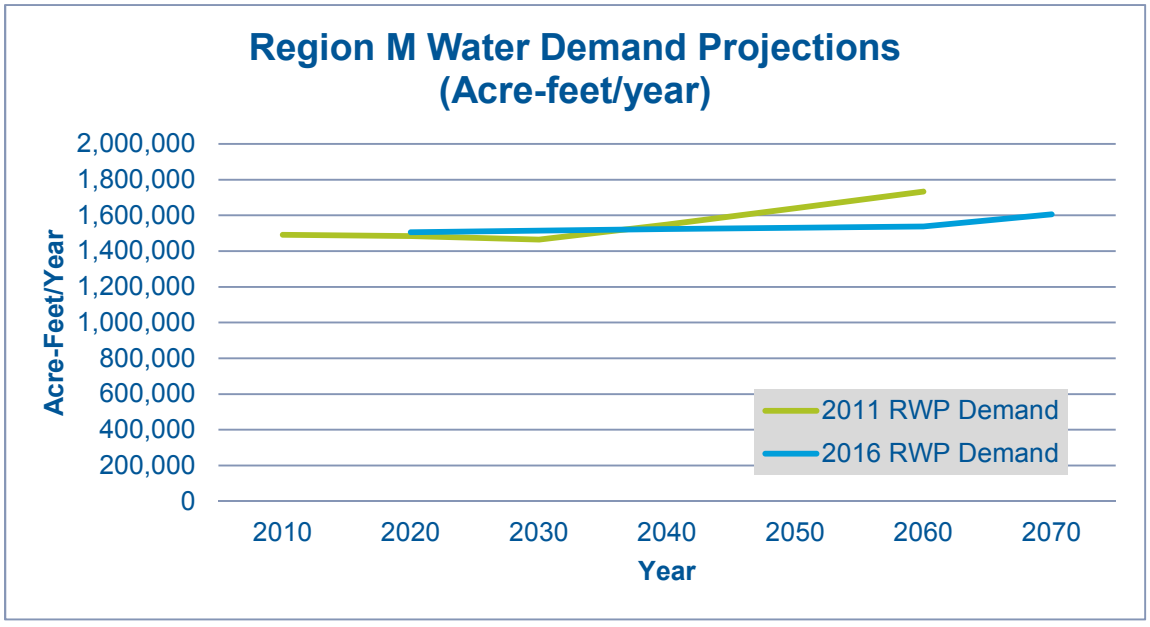

Figure 11-1 Comparison of Water Demand Projections, 2011 and 2016 RWPs

11.2.1 Population Projections

The population projections were developed with similar methodology in the third (2011) and fourth (2016) 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 Region M Planning Group determined that the demand projections developed by TWDB for this plan were appropriate.

In the 2011 RWP development process, the Region M Planning Group made some revisions to the distribution of population from the initial TWDB recommendation. TWDB had recommended a 3% population increase above the 2006 SWP for each decade, and the planning group referenced the State Data Center which identified 23 cities that were growing faster than their anticipated growth rate in the 2006 SWP, and adjusted the growth rates for those cities.

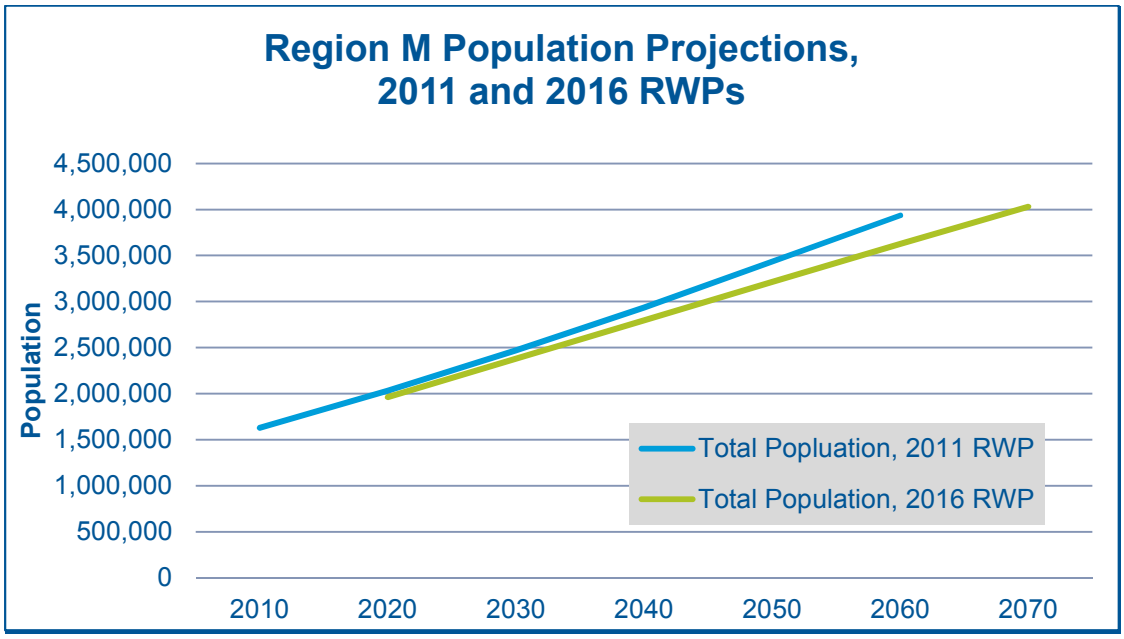

Figure 11-2 Comparison of Population Projections, 2011 and 2016 RWPs

The 2020 populations predicted in the two plans are very close, with a slightly less rapid rate of population growth anticipated in this plan (Figure 11-2). Only a small change is shown in the distribution of projected population on a county basis between the 2011 and 2016 plans, as shown in Figure 11-3 and Figure 11-4.

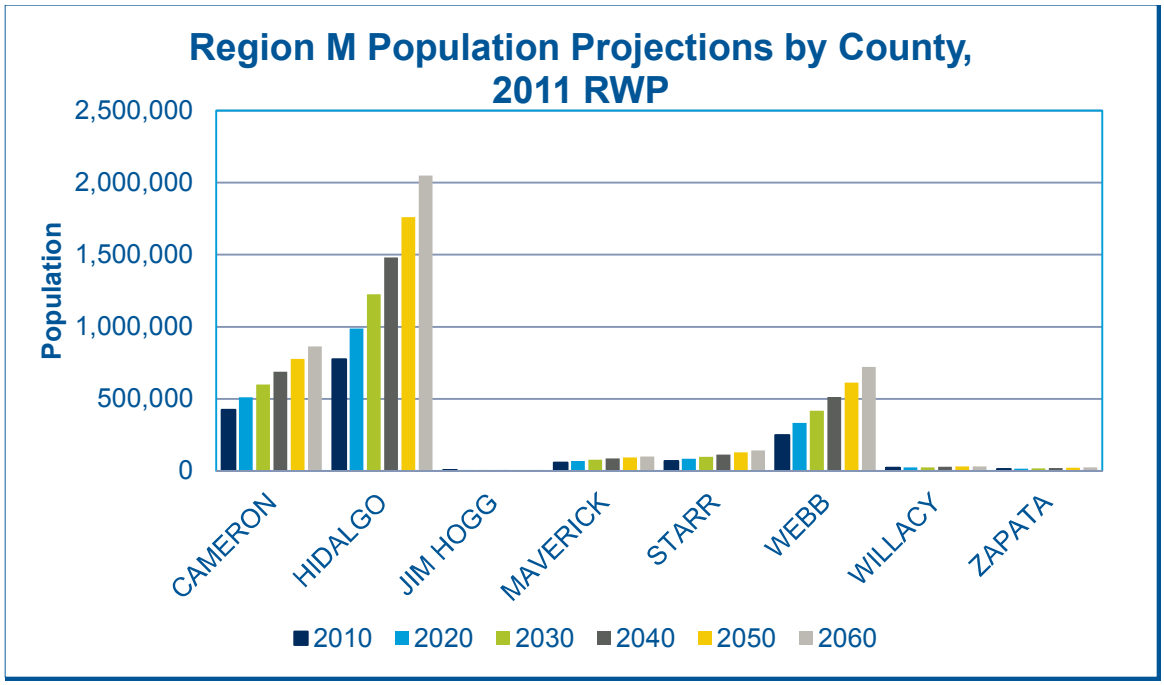

Figure 11-3 Population Projections by County, 2011 RWP

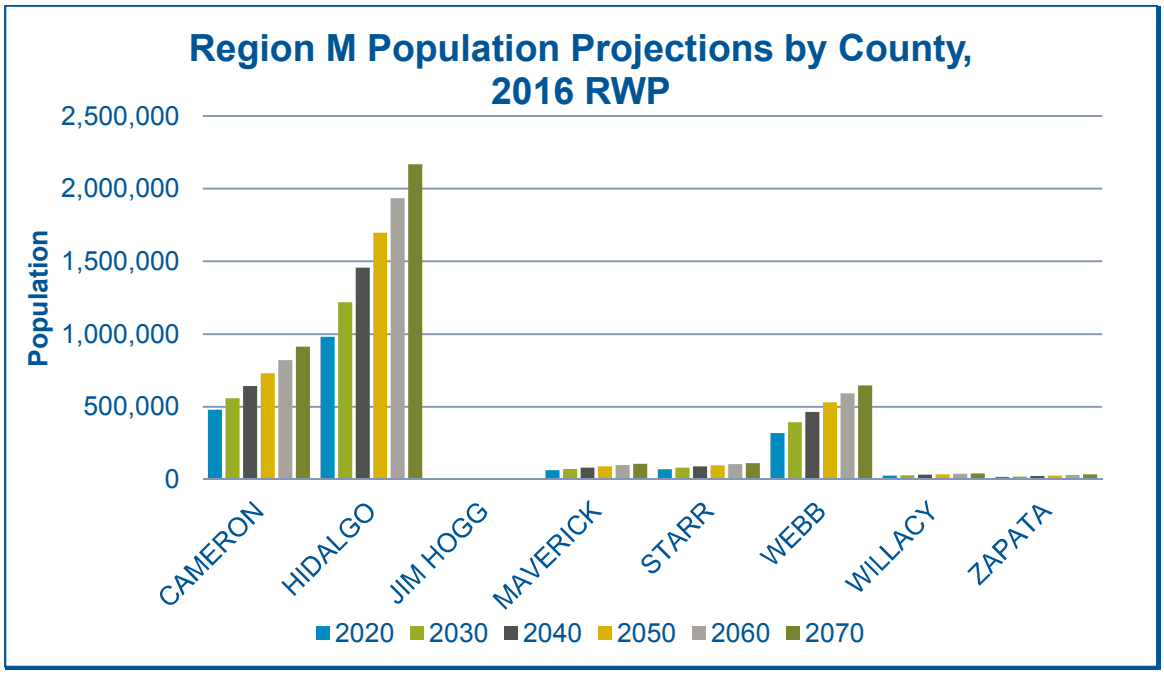

Figure 11-4 Population Projections by County, 2016 RWP

11.2.2 Municipal Water Demands

The municipal demand projections have been reduced in the 2016 RWP as compared to the 2011 RWP (Figure 11-5), based on a slightly lower projected population and lower measured and projected per-capita water use.

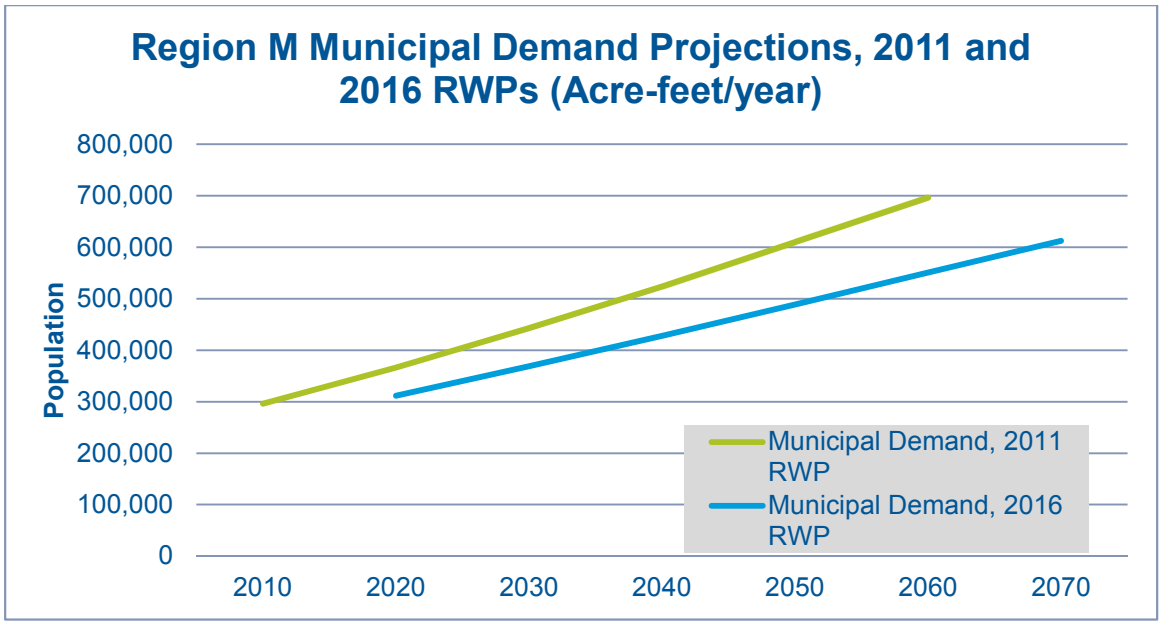

Figure 11-5 Comparison of Municipal Demand Projections, 2011 and 2016 RWPs

11.2.3 Irrigation Demands

Each cycle of planning in Region M has predicted decreasing demand for irrigation water, based on anticipated urbanization, particularly in Cameron and Hidalgo Counties (Figure 11-6). The Planning Group used recorded irrigation use from 2005-2009 and compiled the highest demand year for each county to predict a base year demand. The intent was to estimate demands in a year with less than average rainfall and full reservoirs, rather than show the use in a drought year when supplies are limited. This revised approach results in an increase of the updated base year estimate from 998,000 acre-ft. to 1,100,000 acre-ft., an increase of over 12%.

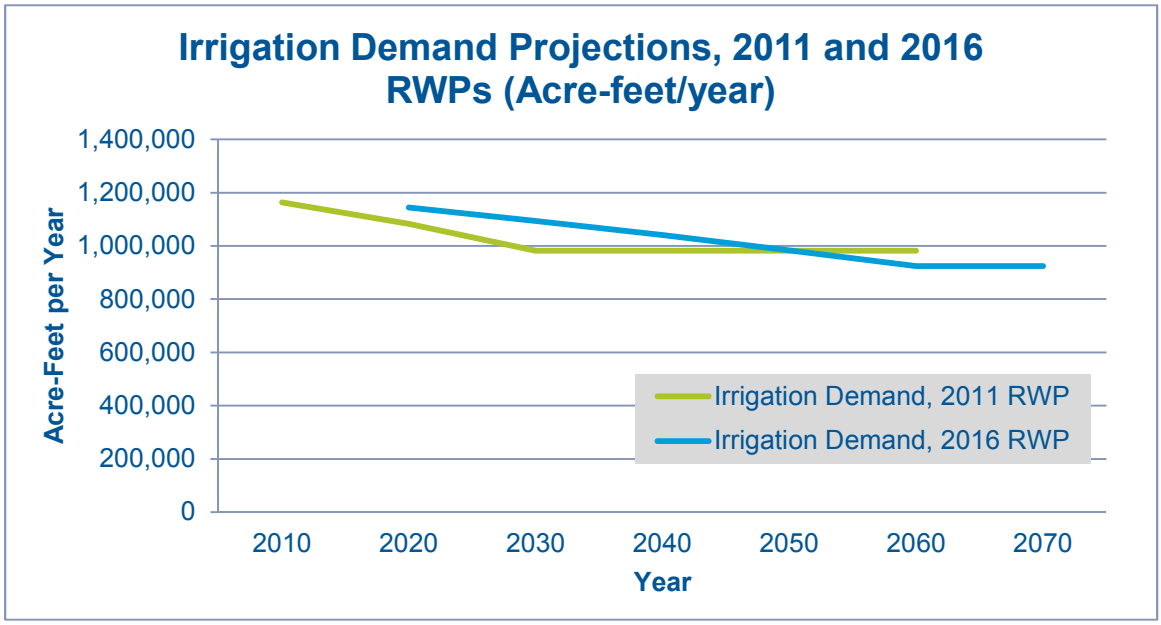

Figure 11-6 Comparison of Irrigation Demand Projections, 2011 and 2016 RWPs

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. It is assumed that water rights will be converted from irrigation use to municipal use. 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.

In the 2006 RWP, irrigation water demand projections were determined by the Planning Group with assistance from TCEQ. In order to estimate demand in a year with normal rainfall and normal reservoir levels, a representative year with low rainfall and high reservoir levels was selected. In 1994, rainfall totaled 20 inches, 2.5 inches below the average rainfall from 1989 to 2004, and the Amistad/Falcon reservoir system was filled to 86.5% of total capacity. Total irrigation usage in that year, as reported by TCEQ, was 1,180,278 acre-ft. The RWPG revised the base year to reflect this increased demand.

The 2011 RWP used the same base year as the 2006 RWP (1,180,278 ac-ft.). The total demand was divided into by-county use based on the percentage of Amistad/Falcon water rights associated with each county. The rate of change from the 2001 RWP was used to project these demands over the planning horizon.

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 11-7). The base year increased slightly due to reported water use, and the rate of change is tied to population growth in both planning cycles.

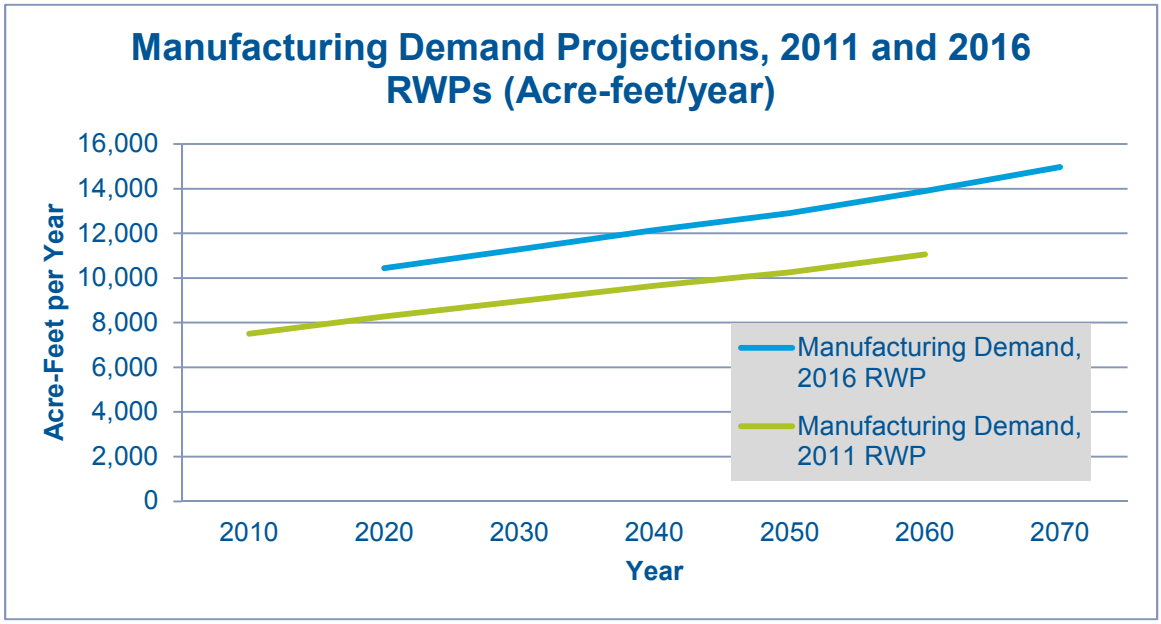

Figure 11-7 Comparison of Manufacturing Demand Projections, 2011 and 2016 RWPs

11.2.5 Mining Demands

The mining demand projections shifted radically from the 2011 RWP (Figure 11-8). 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 were expected to change over time.

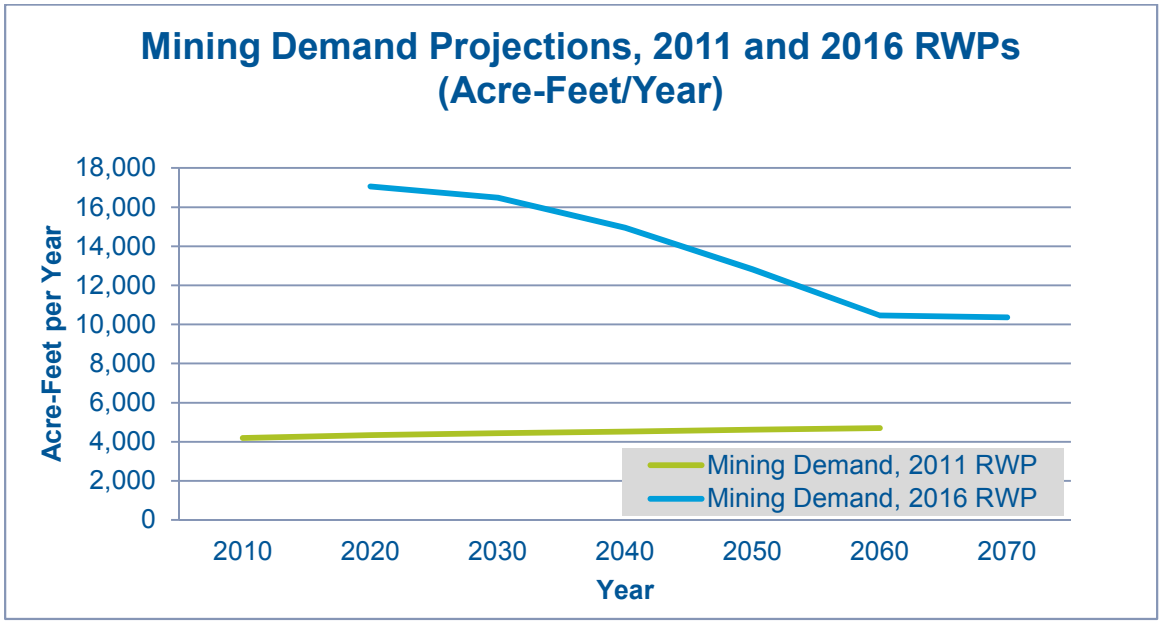

Figure 11-8 Comparison of Mining Demand Projections, 2011 and 2016 RWPs

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. Since the adoption of mining water demand projections used in this RWP, the price of oil has changed and the projections of mining water demands are likely to have changed in response. Mining demands are extremely difficult to estimate as a result of both the volatility of the mining industry as well as water use reporting exemptions in place for the industry.

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 in Figure 11-9. These projections link population growth with an increased demand for power.

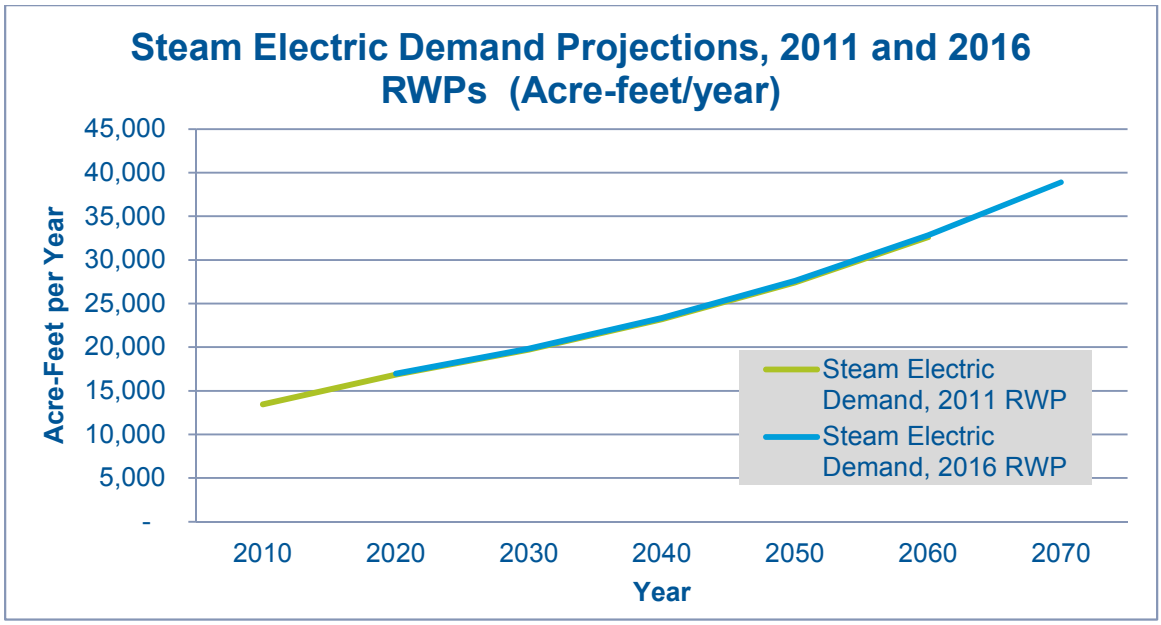

Figure 11-9 Comparison of Steam Electric Demand Projections, 2011 and 2016 RWPs

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 demand has been assumed to be constant in both this plan and the 2011 RWP. Base year livestock demands in this plan are shown to be slightly lower than the projections from the 2011 RWP, as shown in Figure 11-10.

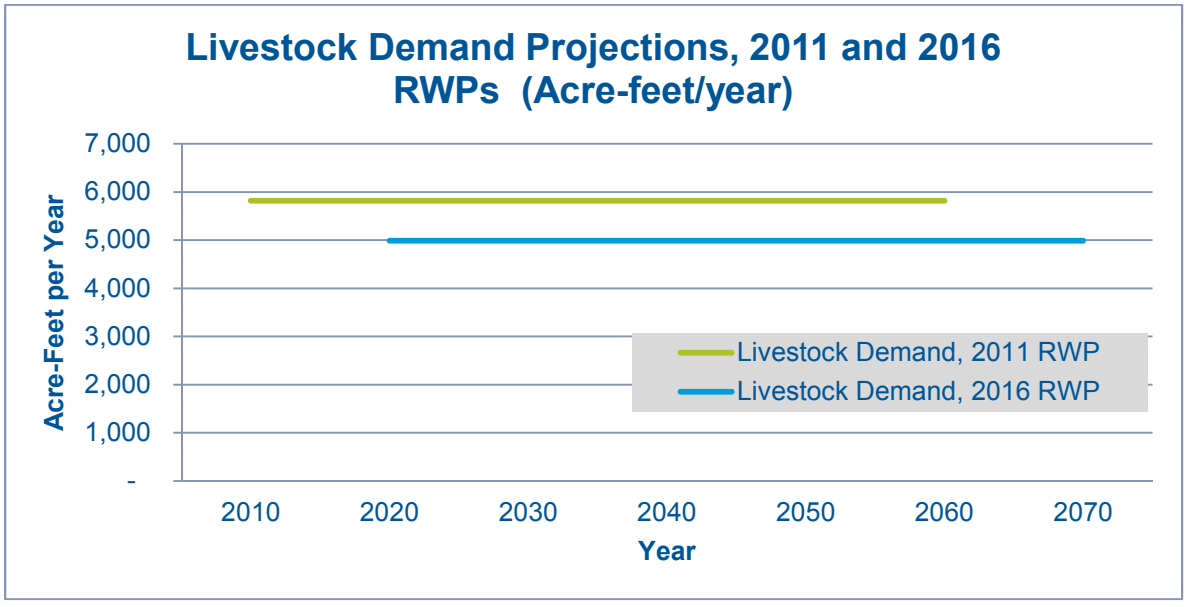

Figure 11-10 Comparison of Livestock Demand Projections, 2011 and 2016 RWPs

11.3 Availability and Supply

The Rio Grande Water Availability Model (WAM) was revised as a part of the 4th cycle of planning for Region M, which impacted the firm yield values that are used in the planning process. Also, this is the first RWP cycle which requires all current and proposed groundwater development to align with the conservation goals proposed in the relevant Groundwater Management Areas (GMAs).

11.3.1 Rio Grande WAM

Black and Veatch contracted with Kennedy Resource Company (KRC) to review and revise the Rio Grande water availability model (WAM). Through the course of this effort, several problems with the existing WAM were noted that expanded the initial scope of the project. A summary of these WAM issues and their resolution and the basic results from the WAM simulations are addressed in Chapter 3. Some of the major changes are described here, specifically those that impact the firm yield.

First, the WAM was simplified so that many of the water rights are aggregated into a few control points, and adjusted until the river losses approximated those predicted in the more complex model. Second, the sedimentation rates for Amistad Reservoir were adjusted and corrected based on surveys done in 1980 and 2005, disregarding an erroneous survey from 1992, on which previous sedimentation rates had been based. This second change resulted in an increase in firm yield. The previous and updated Firm Yield projections are shown in Figure 11-11.

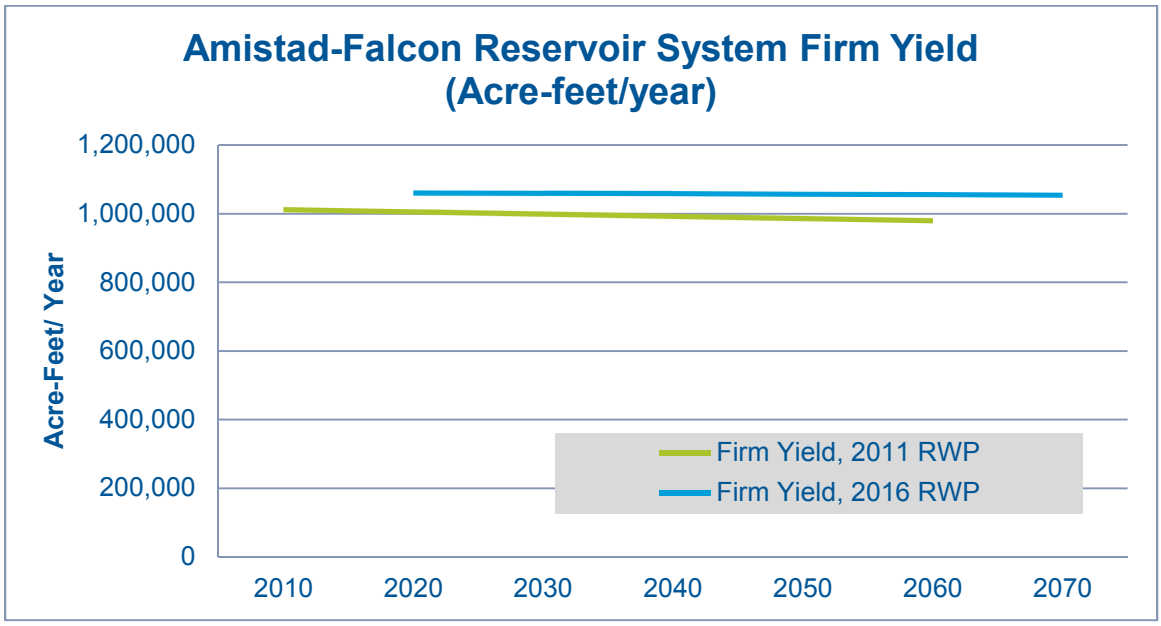

Figure 11-11 Firm Yield Projections for the Amistad-Falcon Reservoir System, 2011 and 2016 RWPs

The 2007 Rio Grande WAM, used to generate data for the 2011 RWP, references the same drought of record as the WAM update (1993-2000). The firm yield is considerably greater in the updated WAM due in part to the corrections of sedimentation rates. It is the recommendation of the Planning Group that the Rio Grande WAM naturalized flow data be updated regularly by TCEQ in order to provide the most accurate data as the basis for Regional Water Planning.

11.3.2 Role of Irrigation Districts

The 2011 RWP periodically refers to Irrigation Districts as Wholesale Water Providers, but does not consistently show the water that is delivered by each district to end users. This updated RWP attempts to quantify the water rights diverted by each irrigation district and delivered to end users. These districts play a critical infrastructure role in the region that is not limited to irrigation, but also the vast majority of municipal and industrial uses.

By showing the network of Irrigation Districts associated with their end users, it is possible to estimate how Irrigation District system losses impact supplies. Districts are all required to meter the water that is diverted from the Rio Grande, but there are limitations to the accuracy of metering water that is delivered to customers. Without significant improvements and costly metering, it is difficult to estimate the efficiency of any District.

The 2011 Plan and the current Region M Planning Group agree that improvements in the Districts are a high priority for increasing regional supplies. For these District improvements to be listed as conservation Water Management Strategies (WMS) there needs to be an identified system loss. The estimated system losses will guide an estimate of how much water can be conserved by implementing District improvements. Estimates of system losses for each district have been compiled by various sources, and current supplies estimated conservatively by selecting the lowest estimate for efficiency estimated within the last 10 years. Although the Districts operate much more efficiently in drought years, this conservative estimate allows the Region to plan for the worst case scenario.

11.3.3 Groundwater

The 2016 RWP is the first cycle of planning that requires that all current and future groundwater usage described in the plan to not exceed the Modeled Available Groundwater (MAG) values. Groundwater Management Areas (GMAs) have been 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 groundwater management area determine the Desired Future Conditions (DFCs) for the aquifers in that area. DFCs are conservation goals associated with a quantifiable measure of aquifer conditions, like 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.

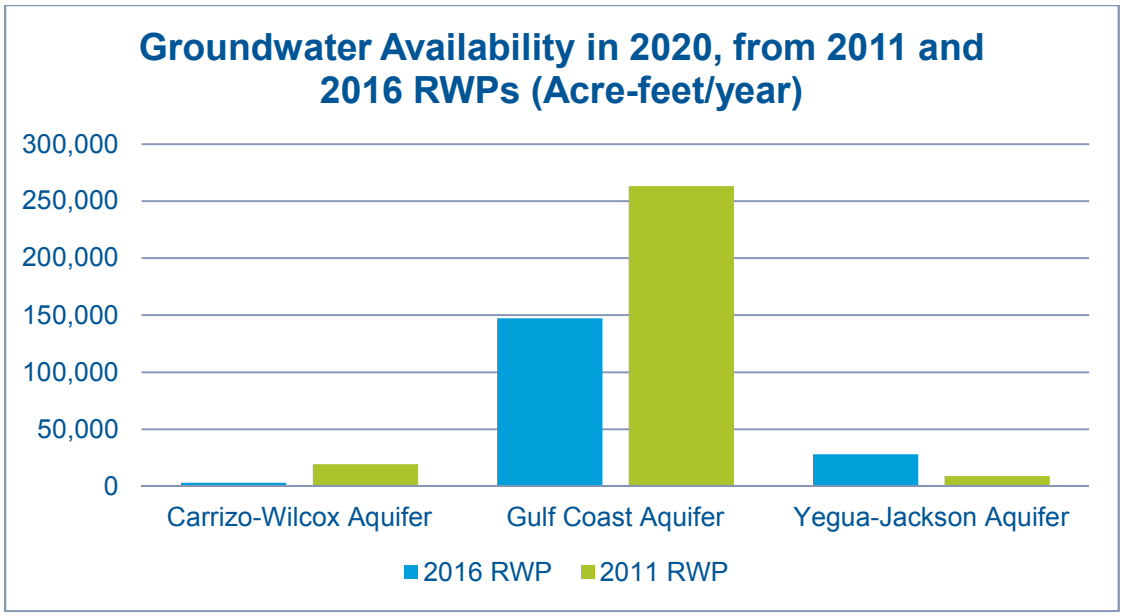

Figure 11-12 Modeled Available Groundwater Projections, 2011 and 2016 RWPs

A Groundwater Availability Model (GAM) allows the TWDB to evaluate what amount of groundwater production, on an average annual basis, that 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 based on 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 11-12 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. The MAG reports used in this plan, with the associated assumptions, are shown in Table 11-1. More detailed information about regional groundwater availability is available in Chapter 3.

Table 11-1 GAM Reports Used for Current MAG Volumes

Aquifer	GAM Run	Date
Carrizo-Wilcox Aquifer, 2016 RWP	10-012 MAG	August 2, 2012
Gulf Coast Aquifer, 2016 RWP	10-047 MAG	December 8, 2011
Yegua-Jackson Aquifer, 2016 RWP	10-041 MAG	December 8, 2011

In the 2011 RWP there were a number of groundwater sources listed as "Other Aquifer" all of which were researched and associated with a specific aquifer appropriate for that area.

11.3.4 WUG Supplies

Supplies between the 2011 and 2016 RWP differed for various reasons. One of the most impactful reasons is because the 2016 RWP reduced the WUG Amistad-Falcon Reservoir System surface water supply by the amount of water that is lost through conveyance before it reaches the entities. The 2011 RWP did not reduce surface water supplies for distribution system losses.

Additionally, changes in the availability models for surface and groundwater affect WUG supplies.

Figure 11-13 through Figure 11-18 shows the difference between the supplies between the two RWPs by WUG Type.

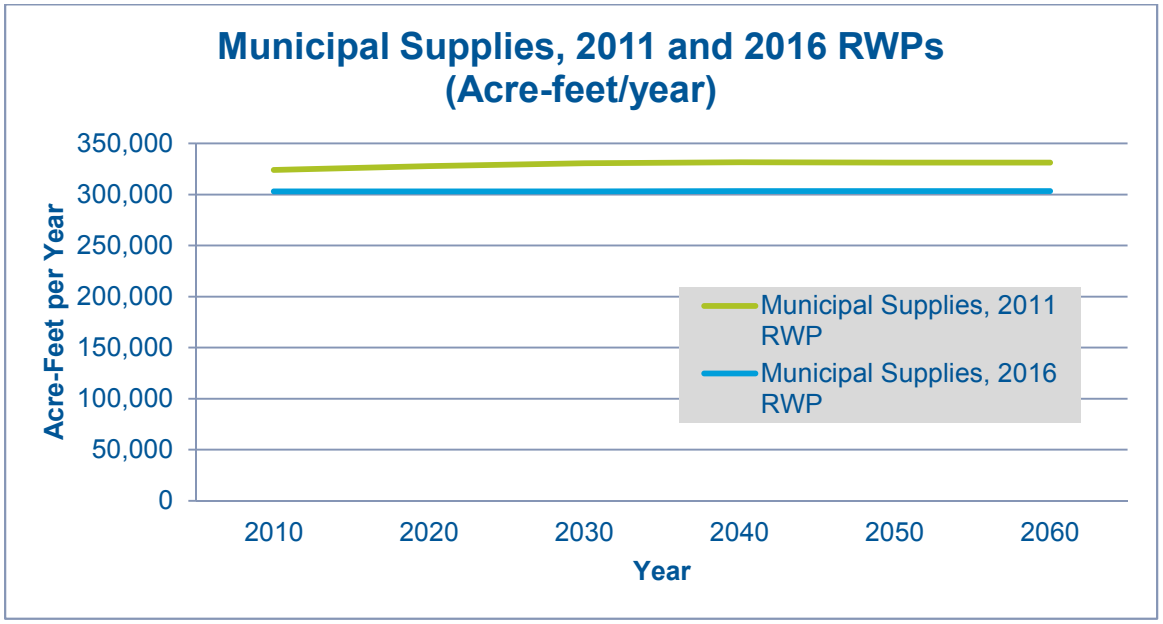

Figure 11-13 Comparison of Municipal Water Supplies, 2011 and 2016 RWPs

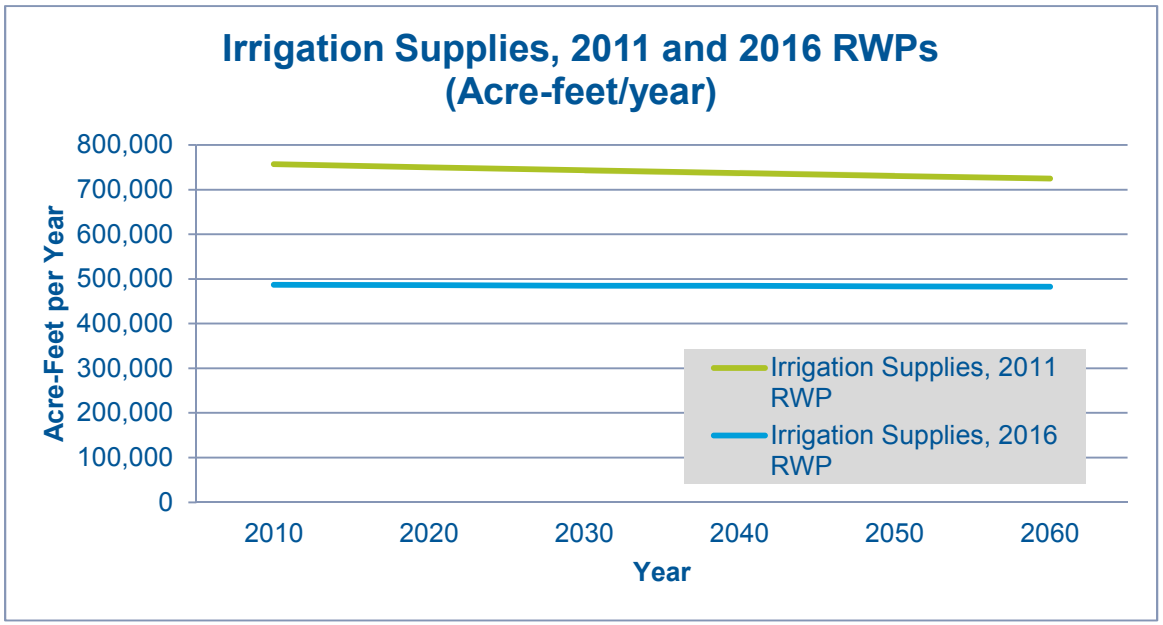

Figure 11-14 Comparison of Irrigation Water Supplies, 2011 and 2016 RWPs

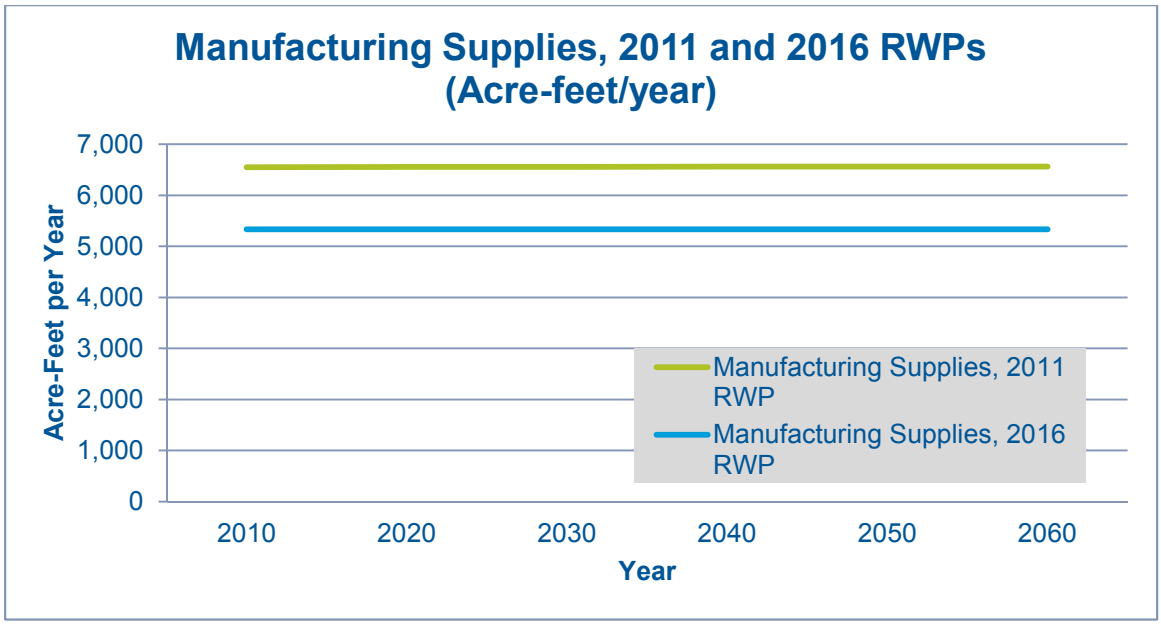

Figure 11-15 Comparison of Manufacturing Water Supplies, 2011 and 2016 RWPs

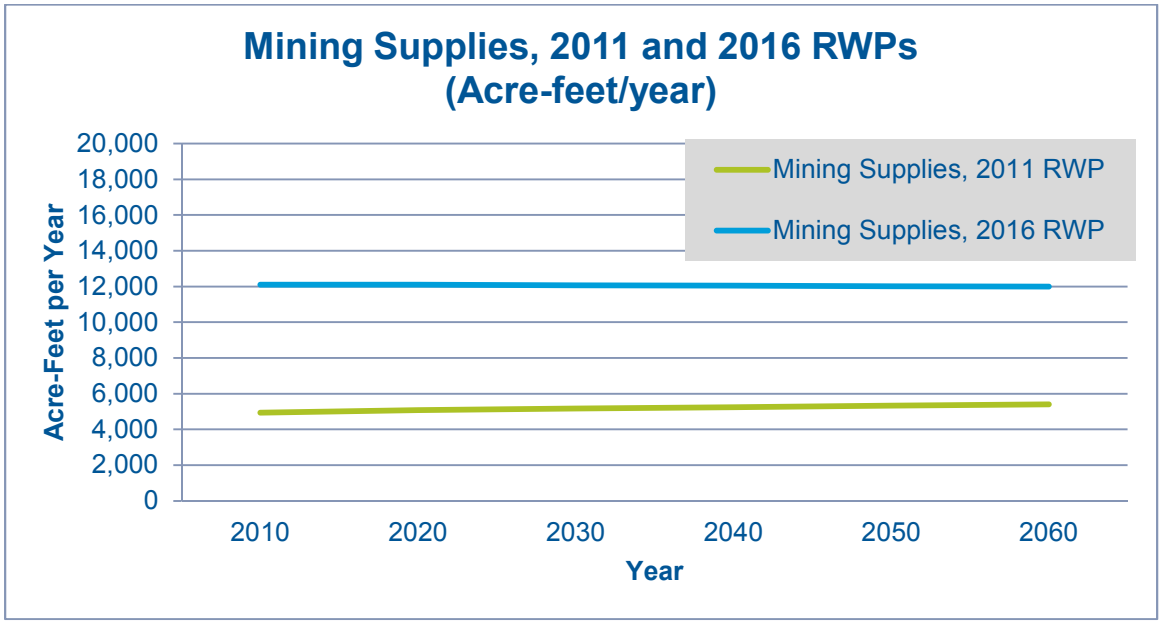

Figure 11-16 Comparison of Mining Water Supplies, 2011 and 2016 RWPs

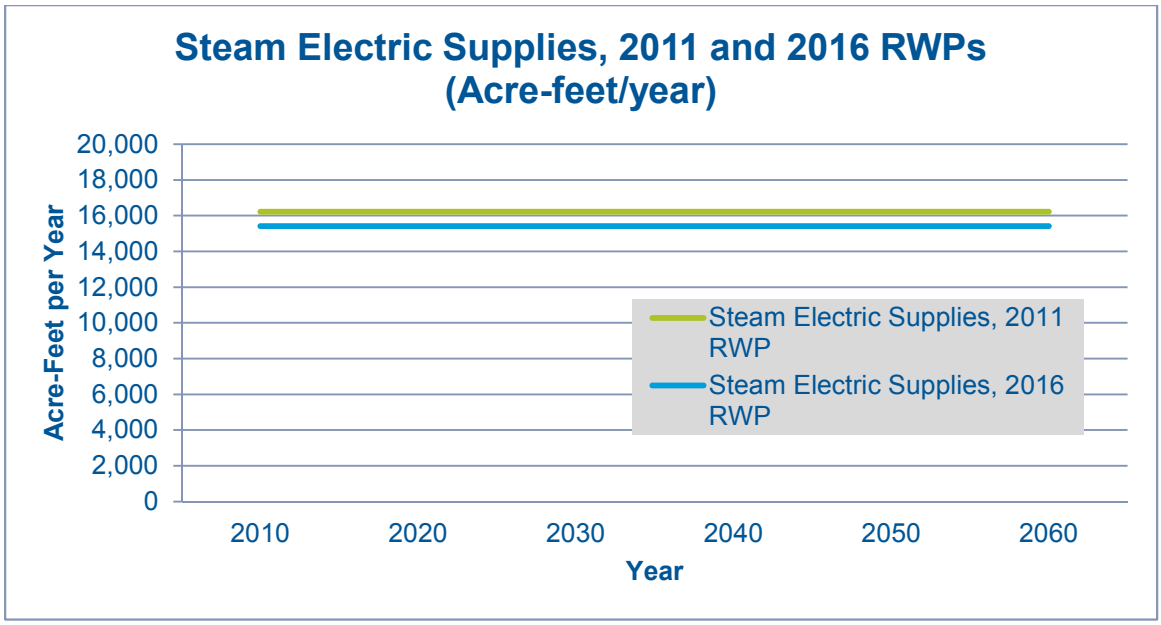

Figure 11-17 Comparison of Steam Electric Water Supplies, 2011 and 2016 RWPs

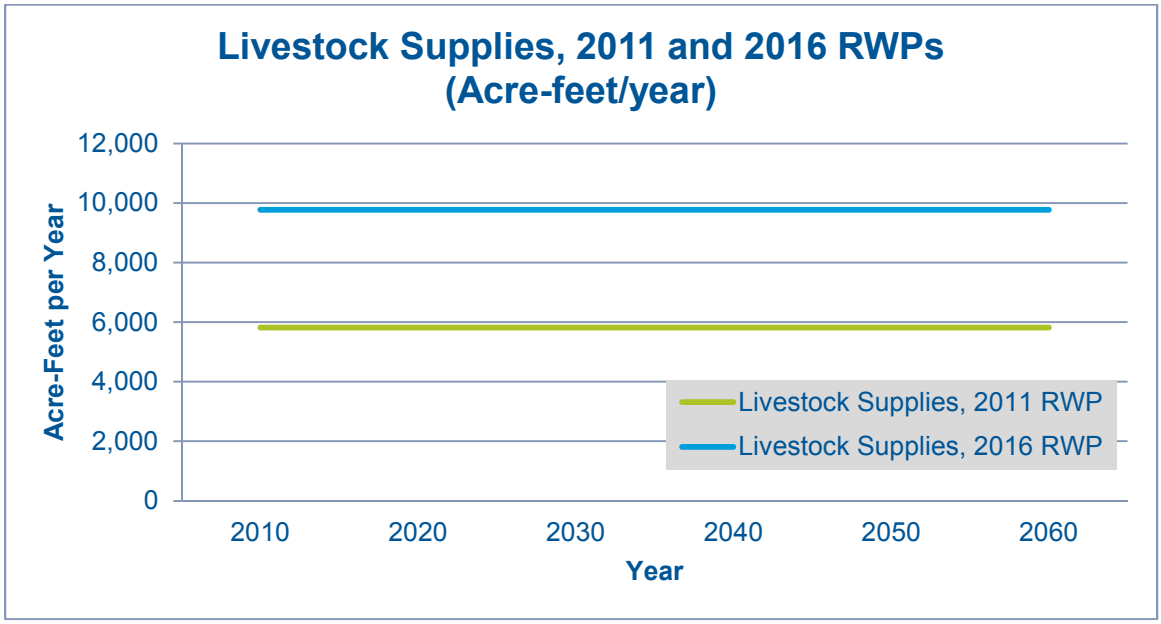

Figure 11-18 Comparison of Livestock Water Supplies, 2011 and 2016 RWPs

11.4 Needs

Because the demands and supplies differed between the 2011 and 2016 RWPs, there were variations in the needs. Figure 11-19 presents the difference between the total needs.

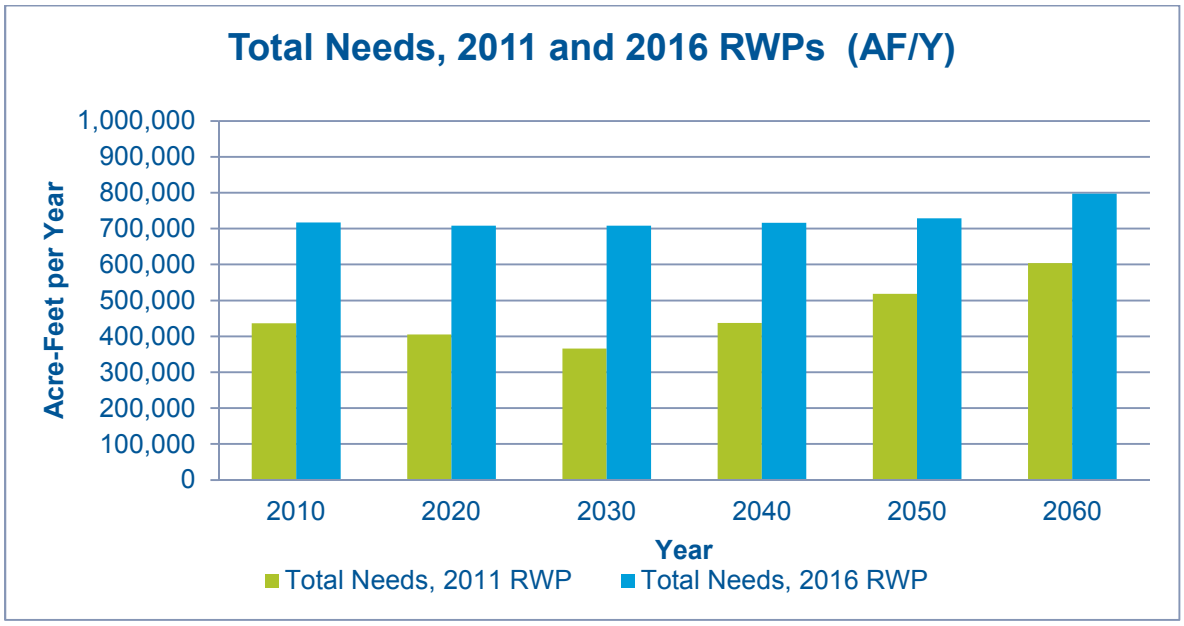

Figure 11-19 Comparison of Total Needs, 2011 and 2016 RWPs

Figure 11-20 through Figure 11-24 compare the needs per WUG Type between the two plans. Livestock was not projected to have any deficit needs in either the 2011 or 2016 RWP.

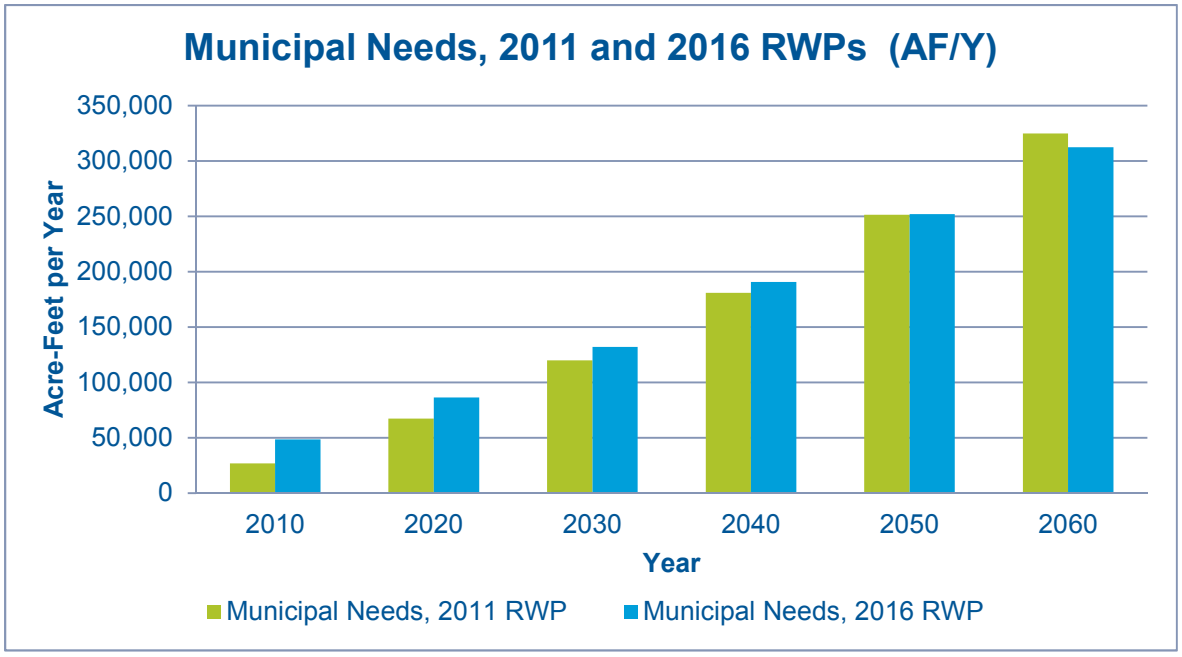

Figure 11-20 Comparison of Municipal Needs, 2011 and 2016 RWPs

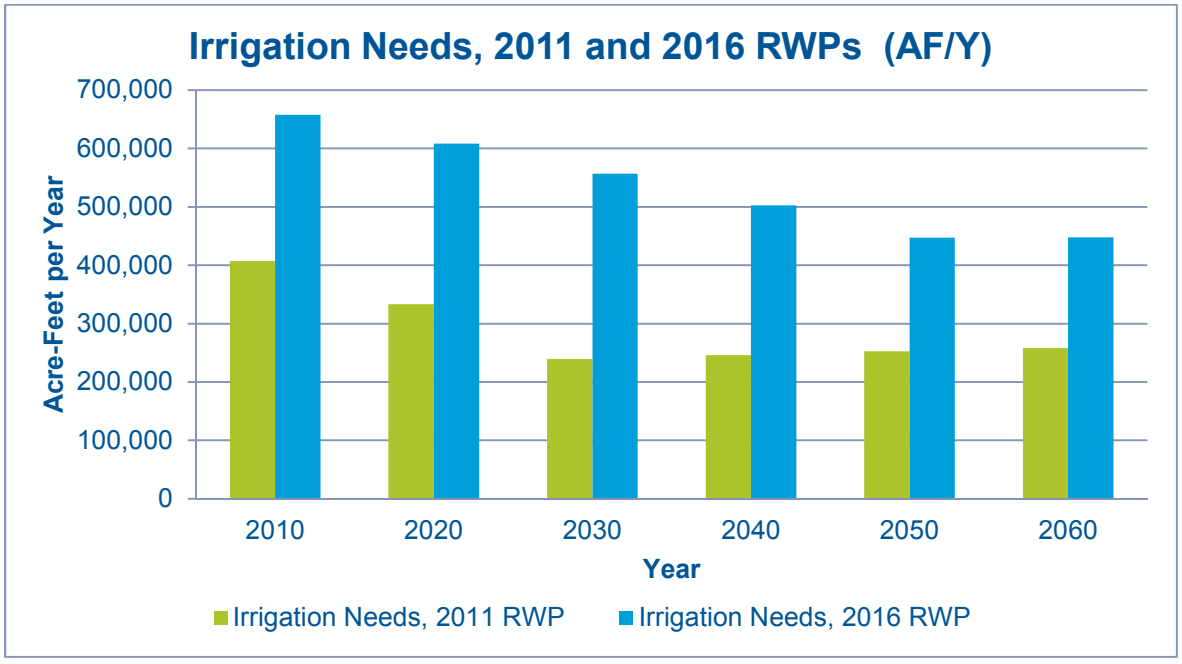

Figure 11-21 Comparison of Irrigation Needs, 2011 and 2016 RWPs

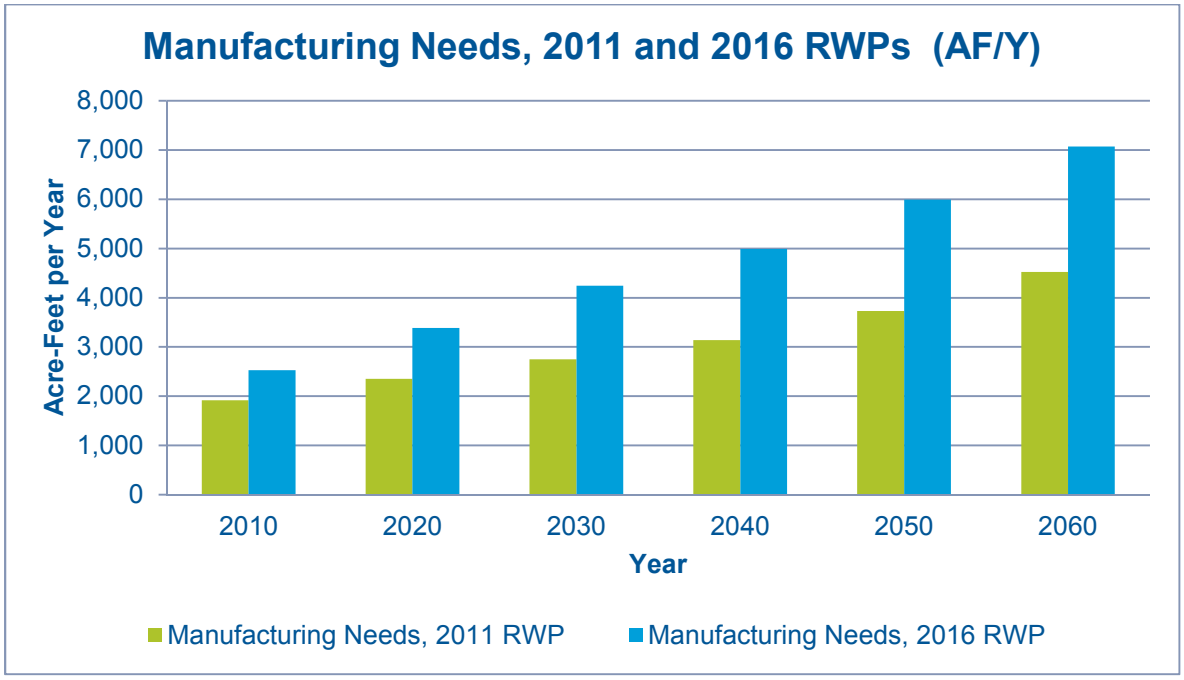

Figure 11-22 Comparison of Manufacturing Needs, 2011 and 2016 RWPs

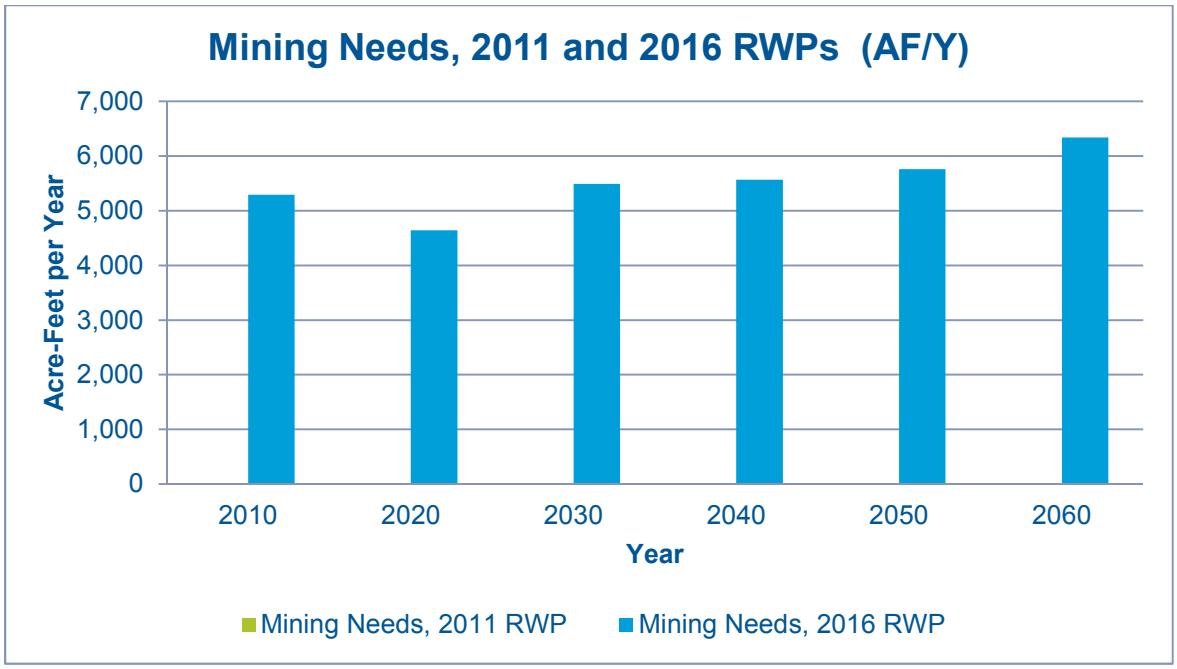

Figure 11-23 Comparison of Mining Needs, 2011 and 2016 RWPs

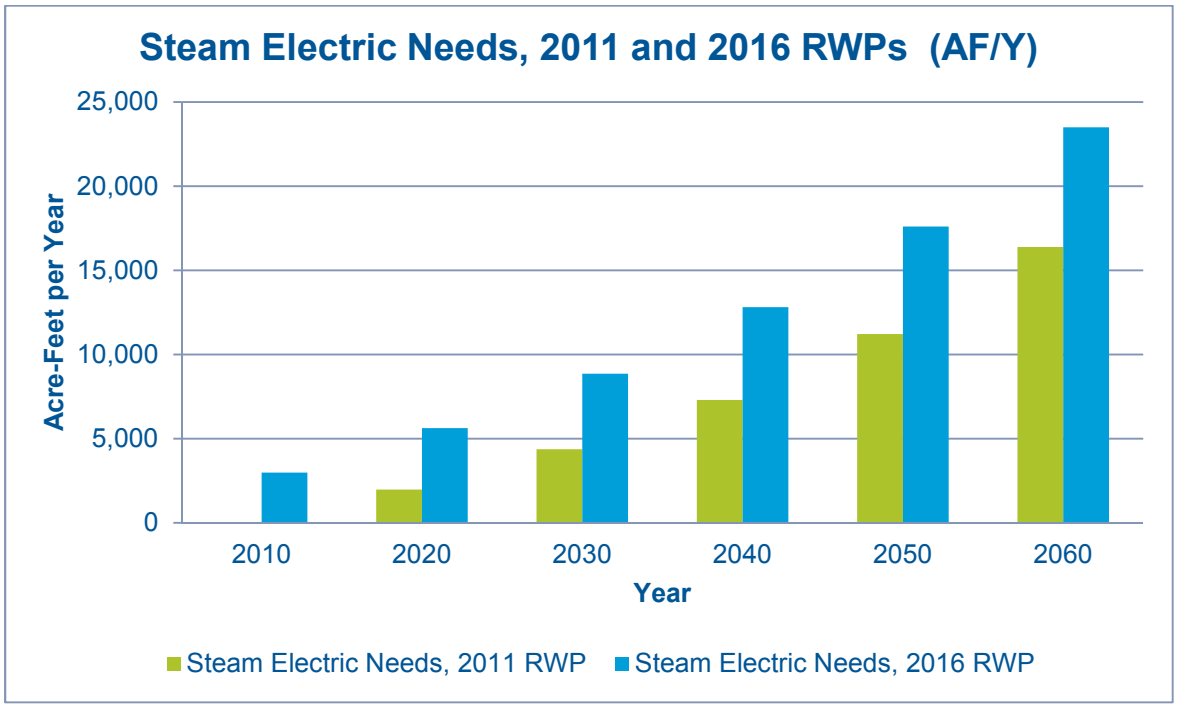

Figure 11-24 Comparison of Steam Electric Needs, 2011 and 2016 RWPs

11.5 Water Management Strategies

Concurrent with the development of this 2016 RWP, the Texas Legislature authorized, and Texas voters approved, transferring $2 billion from the state's "Rainy Day Fund" to create a new loan program to fund projects in the state water plan. The State Water Implementation Fund for Texas (SWIFT) is designed to fund water supply projects recommended in the state water plan over the next 50 years, which has increased awareness of regional water planning statewide.

Many of the WMS recommended in the 2011 Region M plan were generalized for multiple WUGs. This plan develops WMS in more detail, thereby presenting a clear plan with fundable water projects and programs. The process for gathering all Potentially Feasible WMS included WMS from three sources.

1. A data request was sent to all of the municipal WUGs, utilities, Irrigation Districts, and stakeholders representing farmers, environmental interests, and other water users. Over 120 WMS were submitted by 46 different entities. These submitted WMS were evaluated for compliance with TWDB rules, completeness and consistency.
2. WMS were developed where entities did not provide information to the Planning Group:
    a. Advanced conservation was evaluated for each municipal WUG,
    b. Reuse was evaluated for each WUG with a wastewater treatment plant that has an average annual effluent stream of 2 MGD or greater,
    c. An Irrigation District Improvements WMS was developed for each Irrigation District with aggregated costs and water savings based on the estimated efficiency, quantity of water, and existing components of each system (i.e. whether the district has storage capacity, whether the majority of the network is canal or pipeline, etc.)
    d. Acquisition of water rights will be considered for all WMS up to the firm yield of the Amistad-Falcon Reservoir system.
3. Recommended WMS from the 2011 RWP were considered when the WMS was still feasible and where there was sufficient information for the strategy to be evaluated. The advanced water conservation and water rights acquisition strategies were not carried over from the 2011 RWP, and were evaluated separately. All WMS from the 2011 RWP were updated to 2013 dollars or costs re-estimated.

Advanced municipal conservation, Irrigation District improvements, and industrial conservation WMS were applied to the WUGs and WWPs, and a secondary needs calculation was performed.

Potentially feasible WMS were considered to meet secondary needs. Staying within the bounds of water availability from each source, the WMS specific to each WUG were selected that could meet the projected need with the lowest cost and meet other evaluation criteria. 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 specific WMS that was recommended in the 2011 RWP and the current RWP.

Table 11-2 Comparison of Recommended WMS from 2011 and 2016 RWPs

Category	Number of Recommended WMS	
	2011 RWP	2016 RWP
Acquisition of Water Rights	89	25
Biological Control of Arundo Donax	0	10
Brackish Groundwater	30	19
Distribution & Transmission	1	3
Fresh Groundwater	24	13
Industrial Conservation	0	23
Irrigation District Conservation	15	27
Municipal Conservation	73	67
On Farm Conservation	0	12
Reuse	17	17
Seawater Desalination	3	1
Storage	4	4
Surface Water Treatment	0	5

The 2011 RWP did not include specific alternative WMS, but instead listed possible alternative WMS that each WUG or WWP could implement in the event that the recommended strategies become infeasible. The list of possible alternative WMS include:

- Municipal Water Conservation
- Non-potable Reuse
- Acquisition of Additional Rio Grande Water Rights
- Desalination of Brackish Groundwater
- Desalination of Seawater
- Damns, Weirs, And Storage
- Improving Water Infrastructure and Distribution

The number of each type of alternative WMS in the 2016 RWP is listed in Table 11-3.

Table 11-3 2016 RWP Alternative WMS by Category

Category	Number of Alternative WMS
Acquisition of Water Rights	1
Brackish Groundwater	14
Fresh Groundwater	3
Reuse	10
Seawater Desalination	2
Storage	1
Surface Water Treatment	3

A number of WMS recommended in the 2011 RWP applied for and received TWDB funding. An implementation survey was completed as part of the final Regional Water Plan, which describes which of the WMS recommended in the 2011 Region M Water Plan have been

implemented, and to what extent. The survey includes information regarding the WMS description, type of infrastructure, level of implementation achieved, initial (and final if phased) volume of water provided, funds to date, project cost, and year of implementation and completion. The survey is included in Appendix G.

11.6 Drought Response

In an effort to provide relevant information for drought preparations and response in one place, the scope of the RWPs has expanded to include a new chapter, Chapter 7, that is dedicated to a discussion of each region's preparations for and response to drought. The previous requirements for the RWPs have been retained, and aggregated into this chapter, and clarified, and new requirements have been added.

Previous requirements:

- Current preparations and responses to drought
- Evaluation of drought management WMS for needs
- Recommendation of other drought management measures

Modified requirements:

- More information on the Drought of Record
- Identification of existing and potential future interconnections
- Consolidation of this information into one chapter
- Detailed information on drought action triggers

New requirements:

- 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
- Region-specific model Drought Contingency Plans for each type of WUG
- Recommendations to the State Drought Preparedness Council