

4. Identification, Evaluation, and Selection of Water Management Strategies

This chapter of the report covers the heart of the *2011 Region C Water Plan* - the identification, evaluation, and selection of water management strategies. Since the required content of Chapter 4 covers a great deal of material, we have divided the chapter into sections as follows:

4A – Comparison of Current Water Supply and Projected Demand

4B – Water Conservation and Reuse

4C – Methodology for Evaluation and Selection of Water Management Strategies

4D – Evaluation of Major Water Management Strategies

4E – Recommended Water Management Strategies for Wholesale Water Providers

4F – Recommended Water Management Strategies for Water User Groups by County

4G – TWDB Required Tables

4H – Summary of Special Studies

4A. Comparison of Current Water Supply and Projected Demand

Texas Water Development Board (TWDB) guidelines require that reserves and needs for additional water supply be determined for each water user group in the region based on the comparison of current water supply and projected demand. The specific surpluses and needs shown should be treated with caution because their development requires certain assumptions:

- TWDB guidelines require that the comparison be based on currently connected supplies, without considering future connection of already developed supplies ⁽¹⁾.
- The division of existing supplies among users can be made in many ways. For example, the amount of groundwater available in a county on a sustainable basis was divided among users based on historical use and on well capacities. The actual future groundwater use may differ from these assumptions.

The resulting comparison shows the reserves and needs that will exist in Region C if no steps are taken to connect existing water supplies or develop to additional water supplies. This comparison is specifically required by Texas Water Development Board planning guidelines ⁽¹⁾. Development of infrastructure to make existing supplies available to users and development of new supplies are treated as water management strategies, and they will be discussed in Sections 4C, 4D, 4E, and 4F.

In the remainder of this section, projected water demands are compared to currently available water supplies, and projected water shortages and reserves are identified for Region C as a whole (Section 4A.1), for wholesale water providers (Section 4A.2), and for water user groups (Section 4A.3). Finally, the projected shortages are summarized (Section 4A.4), and the socio-economic impacts of not meeting the projected shortages are discussed (Section 4A.5).

4A.1 Regional Comparison of Supply and Demand

Table 4A.1 and Figure 4A.1 summarize the comparison of total currently connected water supply and total projected water demand in Region C, considering all water user groups. If only water user groups with projected shortages (and not reserves) are considered, there is a need for approximately 77,671 acre-feet per year of additional supply by 2010, growing to a need for 1.55 million acre-feet per year of additional supply by 2060,

Table 4A.1
Comparison of Connected Supply with Projected Demand by Decade in Region C
 -Values in Acre-Feet per Year-

Item	2010	2020	2030	2040	2050	2060
Connected Supply in Region C	1,799,744	1,774,665	1,775,510	1,786,914	1,787,981	1,779,896
Projected Demand	1,761,353	2,078,744	2,377,738	2,655,102	2,942,321	3,272,461
Total Regional Reserve or (Need)	38,391	(304,079)	(602,228)	(868,188)	(1,154,340)	(1,492,565)
Regional Reserve or (Need) Considering Only Water User Groups With Needs	(77,671)	(390,942)	(672,469)	(931,670)	(1,212,980)	(1,549,377)
Counties with Needs	3	11	13	13	14	14
User Groups with Needs	205	292	308	314	317	319

Figure 4A.1
Comparison of Connected Supply with Projected Demand by Decade for Region C

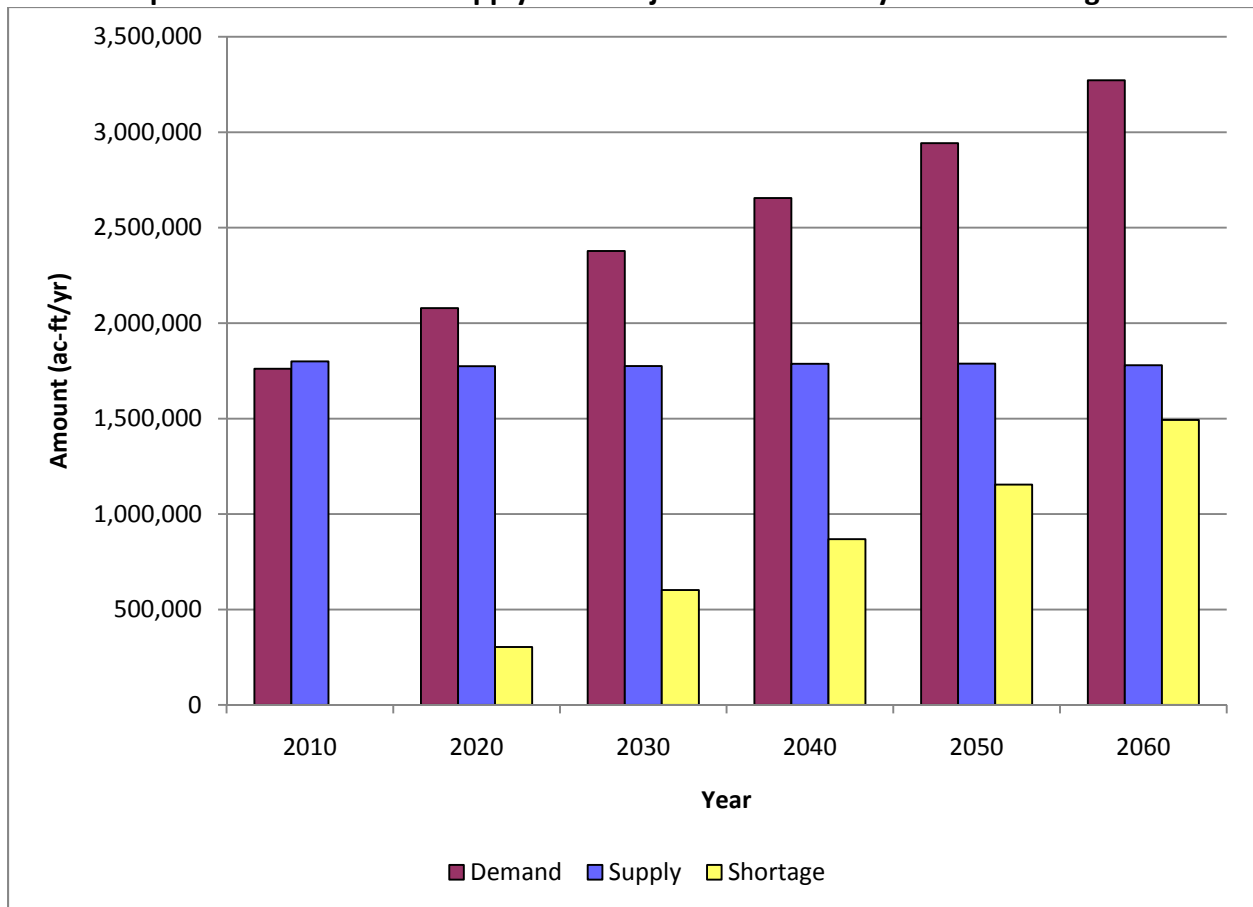
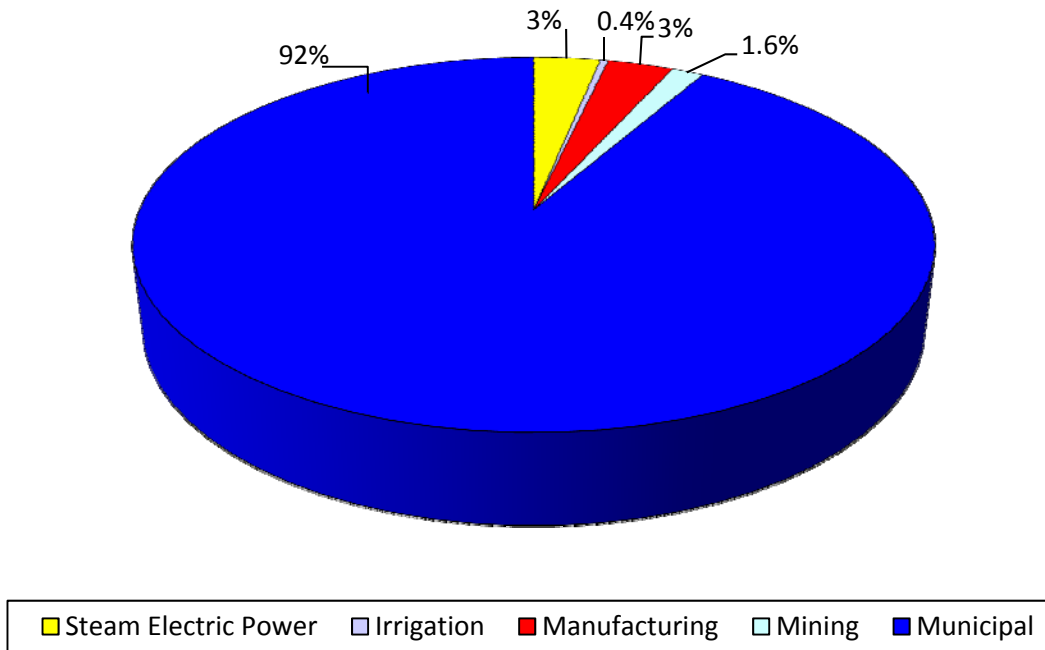


Figure 4A.2
Projected Shortage by Use Type for Region C in 2060



based on currently connected supplies. Figure 4A.2 shows the projected distribution of shortages. Ninety-two percent of the projected shortage in 2060 is for municipal users. It should be noted that most of the “shortages” shown for 2010 are fully met with expected conservation savings which is treated as a water management strategy rather than a currently available supply.

Table 4A.2 shows the comparison of supply and demands by county. In 2010, Dallas, Rockwall, and Tarrant Counties (3 out of 16 in the region) show a net need for more water. By 2060, only Fannin and Jack Counties show a net surplus. Most of the surplus in Fannin County is attributed to surplus supply for irrigation from run-of-the-river water rights in the Red River Basin. There are seven water user groups with projected 2060 shortages in Fannin County, totaling over 8,000 acre-feet per year. On a regional basis, 319 out of 357 water users in Region C are predicted to have a need for additional water by 2060. In general, the largest water needs are in Collin, Dallas, Denton and Tarrant Counties, with lesser but significant needs in other counties.

The comparison of supply and demand in Table 4A.1 and Figure 4A.1 focuses on currently connected supplies. Region C also has a significant amount of unconnected

supplies that could be made available to the region. An unconnected water supply is an existing and permitted supply that is not currently available due to infrastructure limitations. Table 4A.3 and Figure 4A.3 show the comparison of total supply with demand for Region C, including connected and unconnected supply. By 2030, the projected demand for Region C exceeds total connected and unconnected supply.

Table 4A.2
Reserve or (Need) by County for Region C
 -Values in Acre-Feet per Year-

County	2010	2020	2030	2040	2050	2060
Collin	983	(54,228)	(103,468)	(157,988)	(213,648)	(258,282)
Cooke	97	(1,062)	(1,919)	(2,643)	(3,810)	(4,801)
Dallas	(28,507)	(160,086)	(224,387)	(274,788)	(338,013)	(427,978)
Denton	7,337	(43,987)	(82,146)	(117,509)	(155,003)	(208,300)
Ellis	1,279	(7,553)	(13,884)	(22,656)	(34,033)	(47,583)
Fannin	29,019	22,837	16,719	14,965	12,478	9,419
Freestone	17,733	11,319	8,037	3,474	(1,707)	(7,736)
Grayson	4,085	(5,495)	(14,402)	(19,493)	(24,718)	(30,939)
Henderson	9,267	2,333	(5,783)	(8,303)	(11,149)	(14,447)
Jack	1,286	1,231	1,193	1,165	1,119	1,062
Kaufman	607	(7,387)	(13,499)	(19,741)	(26,208)	(33,317)
Navarro	651	(7,415)	(13,681)	(14,232)	(14,926)	(15,860)
Parker	2,807	4,124	(4,327)	(10,999)	(15,909)	(20,740)
Rockwall	(32)	(6,276)	(12,053)	(17,412)	(21,915)	(25,655)
Tarrant	(9,647)	(47,614)	(124,530)	(199,147)	(274,843)	(365,720)
Wise	1,425	(4,818)	(14,097)	(22,879)	(32,054)	(41,687)
Total	38,391	(304,079)	(602,228)	(868,188)	(1,154,340)	(1,492,565)

Table 4A.3
Comparison of Total Connected and Unconnected Supply with Region C Demand
 - Values in Acre-Feet per Year -

Item	2010	2020	2030	2040	2050	2060
Total Connected and Unconnected Supply	2,335,133	2,347,912	2,360,542	2,374,535	2,369,994	2,373,705
Demand	1,761,353	2,078,744	2,377,738	2,655,102	2,942,321	3,272,461
Reserve/(Need)	573,780	269,168	(17,196)	(280,567)	(572,327)	(898,756)

4A.2 Comparison of Connected Supply and Projected Demand by Wholesale Water Provider

Under the planning rules, a wholesale water provider (WWP) is defined as an entity that sold or had contracts to sell more than 1,000 acre-feet of water on a wholesale basis in recent years or that is projected to sell more than 1,000 acre-feet per year on a wholesale basis during the planning period ⁽¹⁾. The Region C Water Planning Group has designated 41 wholesale water providers for Region C. Table 4A.4 summarizes the comparison of supply and demand and shows the reserves or needs for additional supply for each wholesale water provider. As a group, the wholesale water providers are projected to have a need for additional supply in each decade of the planning period. Steps to meet these projected needs will be discussed in Section 4E.

Two wholesale water providers do not have a projected shortage in Region C within the planning period: Dallas County Park Cities Municipal Utility District and Sulphur River Water District. Five wholesale water providers (Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Trinity River Authority and Upper Trinity Regional Water District) provide water to meet approximately 90 percent of the total demand in Region C.

4A.3 Comparison of Connected Supply and Projected Demand by Water User Group

Projected supplies, demands, reserves, and shortages are summarized for each water user group in Appendix C. As shown on Table 4A.1, there are 319 water user groups with projected water shortages by 2060. These shortages range from 62 acre-feet per year for the City of Palmer to nearly 252,017 acre-feet per year for the City of Dallas.

Sections 4C through 4F of this report discusses the selection of water management strategies to address the requirements for additional supply. Many water user groups in Region C are served by wholesale water providers, and the needs of these water user groups will be addressed by obtaining additional supplies from the wholesale water providers. Other water user groups will require the development of individual water management strategies to address their needs.

Figure 4A.3
Comparison of Connected and Unconnected Supply and Demand for Region C

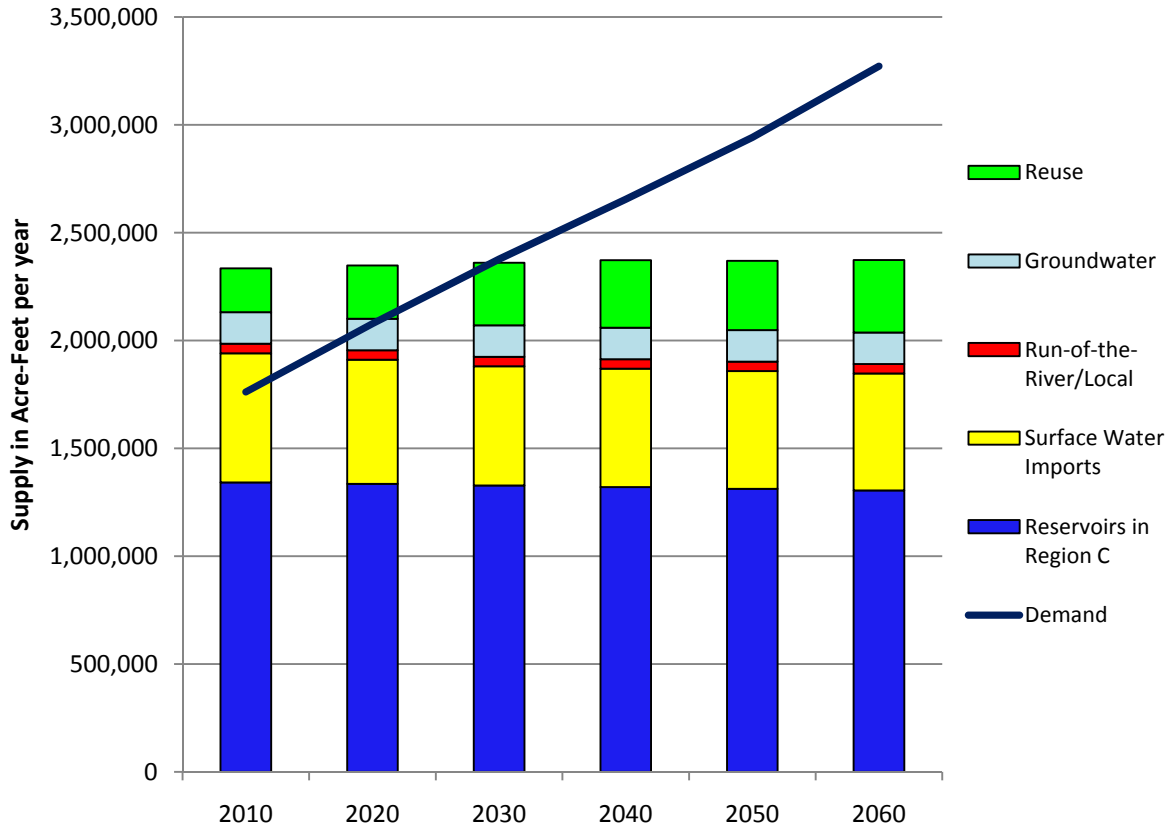


Table 4A.4
Reserve or (Need) by Wholesale Water Provider Using Only Connected Supplies
 - Values in Acre-Feet per Year -

Wholesale Water Provider	Projected Needs for Current and Future Customers					
	2010	2020	2030	2040	2050	2060
Dallas Water Utilities	(48,797)	(171,460)	(207,076)	(257,089)	(326,980)	(445,790)
Tarrant Regional Water District	0	(49,680)	(147,533)	(244,544)	(351,389)	(477,251)
North Texas Municipal Water District	0	(91,679)	(170,209)	(243,628)	(313,320)	(368,061)
City of Fort Worth	(7,856)	(36,230)	(98,727)	(166,043)	(244,828)	(340,031)
Trinity River Authority	0	0	(16,750)	(31,912)	(51,767)	(76,052)
Upper Trinity Regional Water District	(1,744)	(756)	(22,211)	(48,242)	(77,525)	(100,520)
Greater Texoma Utility Authority	0	(10,574)	(23,123)	(32,739)	(43,849)	(56,756)
Dallas County Park Cities Municipal Utility District	0	0	0	0	0	0

Table 4A.4, Continued

Wholesale Water Provider	Projected Needs for Current and Future Customers					
	2010	2020	2030	2040	2050	2060
City of Corsicana	0	(6,932)	(13,241)	(14,152)	(15,298)	(16,760)
Sabine River Authority	(94,103)	(97,032)	(99,960)	(102,888)	(105,817)	(108,745)
Sulphur River Water District	0	0	0	0	0	0
Upper Neches River Municipal Water Authority	(2,677)	(4,708)	(6,740)	(8,773)	(10,808)	(12,843)
Argyle Water Supply Corporation	0	(2,069)	(3,436)	(4,070)	(4,731)	(5,316)
City of Arlington	(2,330)	(7,541)	(20,225)	(30,982)	(39,035)	(46,678)
Athens Municipal Water Authority	0	(3,090)	(3,722)	(4,439)	(5,374)	(6,527)
Bartonville Water Supply Corporation	(43)	(1,271)	(1,639)	(1,834)	(2,004)	(2,136)
Bolivar Water Supply Corporation	0	(1,006)	(3,095)	(6,588)	(10,629)	(14,321)
Dallas County WCID #6	(211)	(680)	(793)	(932)	(1,111)	(1,374)
City of Denton	0	(2,396)	(12,834)	(25,014)	(38,030)	(64,009)
East Cedar Creek Freshwater Supply District	(72)	(235)	(732)	(1,179)	(1,633)	(2,138)
City of Ennis	0	(93)	(569)	(1,632)	(4,154)	(6,399)
City of Forney	(38)	(1,358)	(2,673)	(3,926)	(5,287)	(6,649)
City of Gainesville	(130)	(1,332)	(2,047)	(2,794)	(3,891)	(4,897)
City of Garland	(758)	(8,608)	(13,989)	(17,470)	(20,531)	(22,685)
City of Grand Prairie	(1,972)	(22,616)	(24,775)	(27,405)	(30,785)	(33,211)
Lake Cities Municipal Utility Authority	0	(1,625)	(2,224)	(2,579)	(2,690)	(2,750)
City of Mansfield	(531)	(12,498)	(21,354)	(26,291)	(29,979)	(33,663)
City of Midlothian	(234)	(12,270)	(15,003)	(17,422)	(20,069)	(22,735)
Mustang Special Utility District	(27)	(2,023)	(3,251)	(5,101)	(7,079)	(9,041)
City of North Richland Hills	(139)	(1,448)	(4,073)	(6,186)	(7,957)	(9,612)
City of Princeton	(30)	(746)	(1,611)	(3,041)	(5,507)	(8,688)
Rockett Special Utility District	0	(1,749)	(4,105)	(5,372)	(6,088)	(6,289)
City of Rockwall	(109)	(3,332)	(6,420)	(9,292)	(11,123)	(12,184)
City of Seagoville	(228)	(976)	(1,376)	(1,911)	(2,626)	(3,666)
City of Sherman	0	(2,526)	(5,523)	(8,696)	(12,334)	(17,358)
City of Terrell	(46)	(2,304)	(4,996)	(7,892)	(10,454)	(13,021)
Walnut Creek Special Utility District	(88)	(1,380)	(4,384)	(6,645)	(8,040)	(9,384)
City of Waxahachie	0	(220)	(1,065)	(4,739)	(11,022)	(16,694)
City of Weatherford	(226)	(410)	(1,451)	(2,767)	(4,075)	(5,559)
West Cedar Creek Municipal Utility District	(603)	(1,564)	(2,375)	(3,124)	(4,086)	(5,299)
Wise County Water Supply District	(25)	(390)	(1,143)	(1,947)	(3,003)	(3,824)

4A.4 Summary of Projected Water Shortages

- If no new supplies are developed, the total of projected shortages in Region C is 77,671 acre-feet per year by 2010, growing to 1,549,377 acre-feet per year by 2060.
- Many of the shortages in 2010 are fully addressed by water conservation measures.
- There are substantial unconnected supplies in Region C that could be made available by completing water transmission facilities.
- The number of Region C counties with net needs for more water changes from 3 out of 16 counties in 2010 to 14 out of 16 counties in 2060.
- There are 357 individual water user groups in Region C. Of these, 205 water user groups are projected to need more supply in 2010, growing to 319 water user groups by 2060.
- Many Region C water suppliers depend on the region's wholesale water providers for all or part of their supplies. All but two of the wholesale water providers will need to develop additional supplies by 2060.

4A.5 Socio-Economic Impacts of Not Meeting Projected Shortages

If no additional water supplies are developed, Region C will face substantial shortages in water supply over the next 50 years. The Texas Water Development Board (TWDB) provides technical assistance to regional water planning groups in the development of specific information on the socio-economic impacts of failing to meet projected water needs. This information is presented in Appendix N. A summary of the TWDB's socio-economic report ⁽²⁾ is presented in this section.

The TWDB analysis of socio-economic impacts is based on information on potential shortages in Region C provided to the TWDB by Region C. Table 4A.5 and Figures 4A.4 and 4A.5 summarize the TWDB's analysis of the impacts of a severe drought occurring in a single year at each decadal period in Region C. It was assumed that all of the projected shortage was attributed to drought. Under these assumptions, the TWDB's findings can be summarized as follows:

- With the projected shortages, the region's projected 2060 population would be reduced by approximately 2 percent.
- Without any additional supplies, the projected water needs would reduce the region's projected 2060 employment by nearly 547,000 jobs.

- Without any additional supplies, the projected water needs would reduce the region's projected annual income and taxes in 2060 by over \$64 billion.
- The monetary value of domestic water shortages in 2060 is \$11.7 billion.
- The lost water utility revenues (municipal sector only) in 2060 are \$3.5 billion.

The projected impact on population and jobs over the planning period is shown on Figure 4A.4. The impacts to income and local and state taxes are shown on Figure 4A.5.

It is important to note that this socio-economic impact analysis only considers a severe drought occurring in a single year. A drought several years long would have an even greater impact on the region.

Table 4A.5
Socio-Economic Impacts in Region C of Not Meeting Projected Demands

Year	Income (\$ Millions)	State and Local Taxes (\$ Millions)	Jobs Lost	Population Losses
2010	\$2,682.23	\$129.50	23,808	12,490
2020	\$6,668.39	\$340.74	52,165	28,278
2030	\$15,687.26	\$847.87	131,257	73,478
2040	\$24,553.45	\$1,287.96	206,836	111,021
2050	\$33,440.87	\$1,671.87	270,935	148,215
2060	\$61,457.79	\$3,059.54	546,676	244,179

Figure 4A.4
Socio-Economic Impacts of Not Meeting Projected Demands

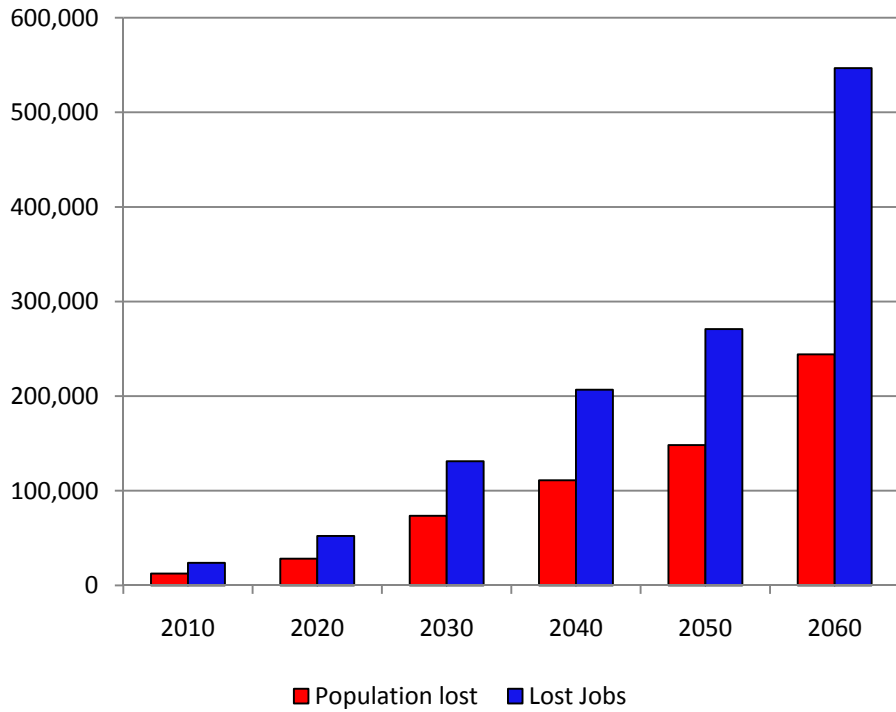
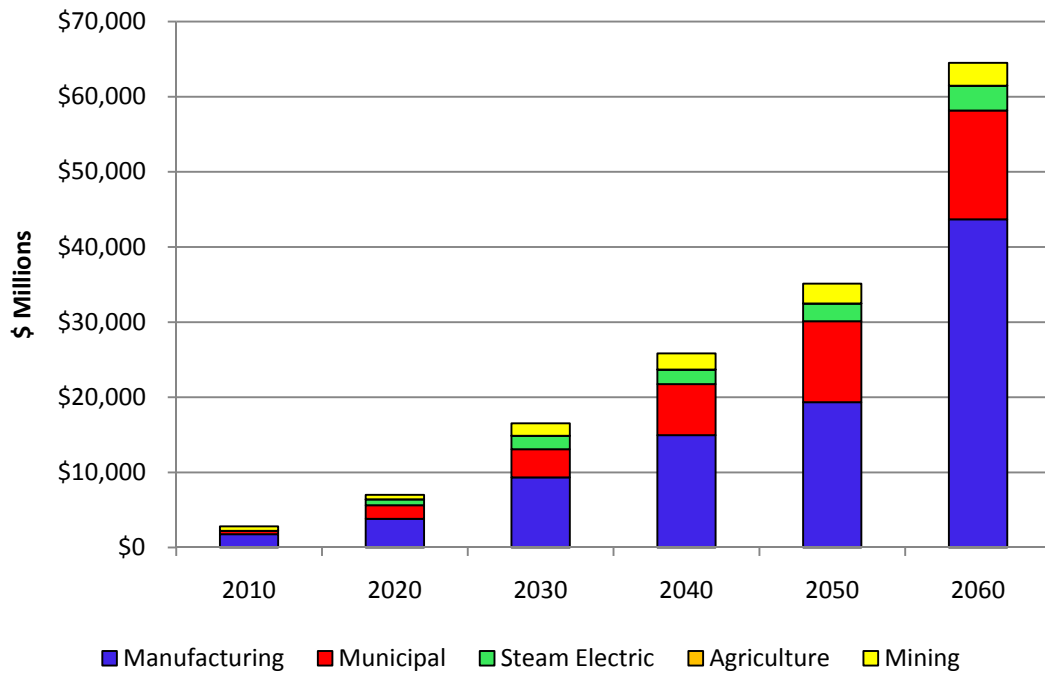


Figure 4A.5
Projected Loss of Income and Taxes with Not Meeting Projected Demands



SECTION 4A
LIST OF REFERENCES

- (1) Texas Water Development Board, *Exhibit C General Guidelines for Regional Water Plan Development (2007-2011)*, Austin, [Online] Available URL: <http://www.twdb.state.tx.us/wrpi/rwp/docu.htm>, September 8, 2008.
- (2) Texas Water Development Board, *Economic Impacts of Projected Water Shortages for the Region C Regional Water Planning Area*, Austin, July 2010 (Revised 1 September, 2010).