3 Analysis of Water Supply Currently Available to Region C

This section gives an overall summary of the water supplies available to Region C. Appendix I includes further details on the development of this information. Under the Texas Water Development Board (TWDB) regional water planning guidelines [(1)], each region is to identify currently available water supplies to the region by source and user. The supplies available by source are based on the supply available during drought of record conditions. For surface water reservoirs, this is generally the equivalent of firm yield supply or permitted amount (whichever is lower). (Several providers in Region C have chosen to use safe yields as the available supply. The safe yield is less than the firm yield and is discussed in more detail in Section 3.1.) For run-of-the-river supplies, this is the minimum supply available in a year over the historical record. Available groundwater supplies are defined by county and aquifer. Generally, groundwater supply is the supply available with acceptable long-term impacts to water levels. Modeled Available Groundwater (MAG) numbers have been developed by the TWDB to define the long-term available groundwater supply. MAG numbers were not available for "other aquifer." These supply amounts are based on historical pumping data obtained from the TWDB [(3).]

Currently available water supplies are those water supplies that have been permitted or contracted and that have infrastructure in place to transport and treat the water. Some water supplies that are permitted or contracted for use do not yet have the infrastructure in place. Connecting such supplies is considered a water management strategy for use of this water in the future, and water management strategies are discussed in Chapter 5 of this report.

3.1 Overall Water Supply Availability

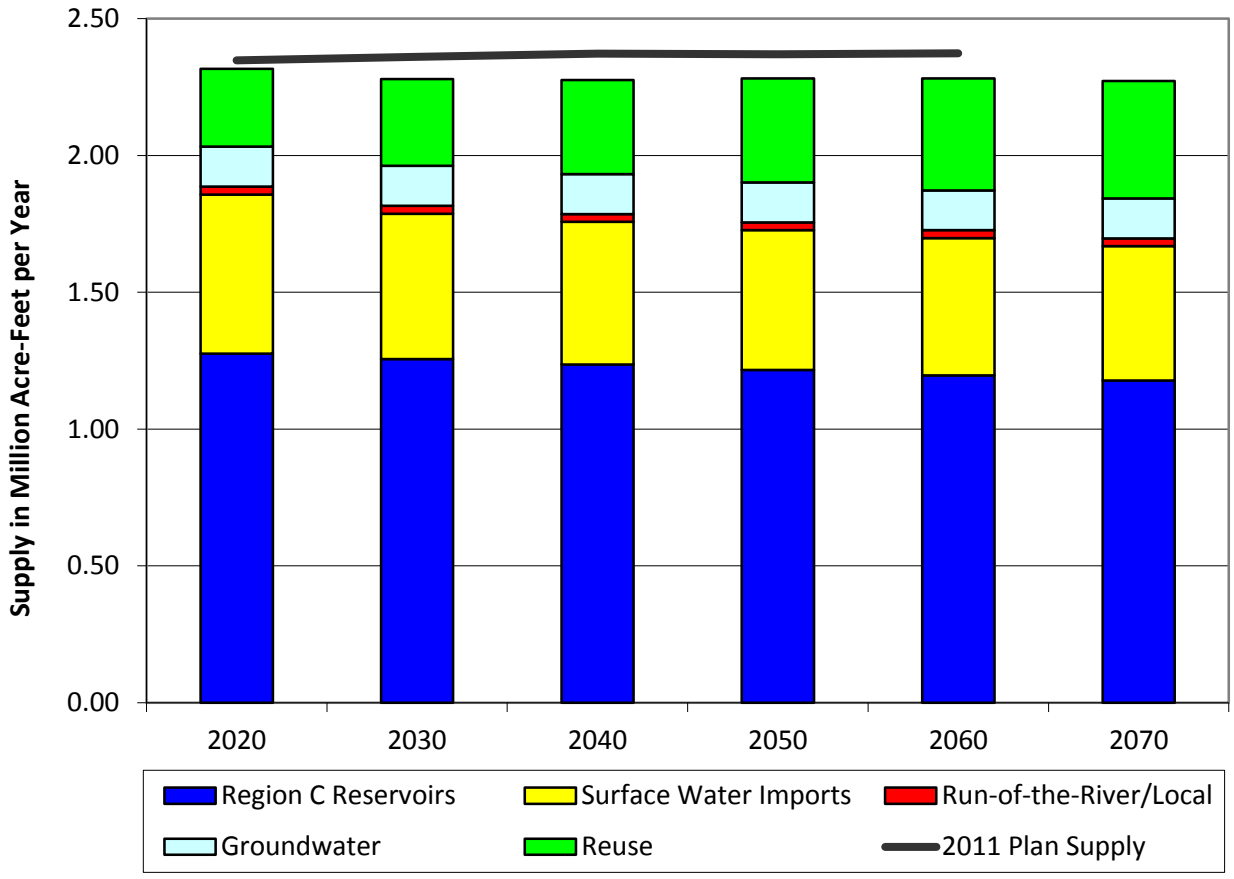
Table 3.1 and Figure 3.1 summarize the overall water supply availability in Region C, including both connected and unconnected water sources. Table 3.1 and Figure 3.1 show that in 2020:

- About 55 percent of the water supply available to Region C is from in-region reservoirs.
- Groundwater is approximately 6 percent of the overall supply available to Region C.
- Local supplies are less than 2 percent of the overall supply available to Region C.

Table 3.1
Overall Water Supply Availability in Region C (Acre-Feet per Year)

Summary	2020	2030	2040	2050	2060	2070
Reservoirs in Region C	1,275,970	1,256,257	1,236,417	1,216,578	1,196,738	1,177,262
Local Irrigation	8,734	8,734	8,734	8,734	8,734	8,734
Other Local Supply	19,931	19,931	19,931	19,931	19,931	19,931
Surface Water Imports	581,567	531,265	520,931	510,717	501,415	491,109
Groundwater	146,178	146,190	146,188	146,135	146,132	146,096
Reuse	283,893	316,972	343,226	380,051	408,880	429,018
REGION C TOTAL	**2,316,273**	**2,279,349**	**2,275,427**	**2,282,147**	**2,281,830**	**2,272,150**

Figure 3.1
Overall Water Supply Availability in Region C



- Currently authorized reuse is about 12 percent of the overall supply available to Region C. (It is worth noting that the development of reuse strategies has increased the 2060 overall reuse available from 336,082 acre-feet per year in the *2011 Region C Water Plan*[2] to 408,880 acre-feet per year in this plan in 2060.)
- Importation of water from other regions is approximately 25 percent of the water available to Region C.
- If all of the available supplies could be utilized, Region C would have 2,272,150 acre-feet per year available in 2070. The total water availability is less than in the *2011 Region C Water Plan* [2] primarily because of lower availability from surface water due to the use of safe yields by some of the larger WWPs. However, this is partially offset some by greater availability from reuse due to the development of new reuse projects.
- Currently connected and available supplies are less than overall water supplies and are discussed in Section 3.4. The sources of the information in Table 3.1 are discussed in greater detail below.

3.2 Surface Water Availability

Reservoirs. In its guidelines for Regional Water Planning [1], the TWDB requires that water availability for reservoirs be based on results of the TCEQ-approved Water Availability Models (WAMs). In Region C, most of the in-region reservoirs are located in the Trinity River Basin. Region C also uses water supplies originating in the Neches, Red, Sabine, Brazos, and Sulphur River Basins.

The WAM models were developed for the purpose of reviewing and granting new surface water right permits. The assumptions in the WAM models are based on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. For planning purposes, adjustments were made to the WAMs to better reflect current and future surface water conditions in the region. Generally, changes made to the WAM included:

- Assessment of reservoir sedimentation rates and calculation of area-capacity conditions for current (2000) and future (2060) conditions.
- Inclusion of subordination agreements.
- Inclusion of system operations where appropriate.
- Other specific corrections by river basin, as appropriate.

These adjustments were approved by the Executive Administrator (EA) of the Texas Water Development Board in a letter to the Chairman of the Region C Water Planning Group, dated December 11, 2012. According to the modified WAM results, the total available supply from Region C reservoirs is calculated at 1,275,970 acre-feet per year in 2020 and 1,177,262 acre-feet per year in 2070. The lower surface water availability compared to the *2011 Region C Water Plan* [2] is due to the use of safe yields by some of the

larger WWPs. The total available supply from imports from reservoirs in other regions is 581,567 acre-feet per year in 2020 and 491,109 acre-feet per year in 2070. Table 3.2 lists the reservoir water supplies available for use in Region C. More detail on the determination of available supplies from reservoirs is included in Appendix I.

Table 3.2
Surface Water Supplies Currently Available to Region C (Acre-Feet per Year)

Reservoir	Permitted Diversion	2020	2030	2040	2050	2060	2070
Systems in Region C							
Lost Creek/Jacksboro System	1,597	1,597	1,597	1,597	1,597	1,597	1,597
West Fork (includes Bridgeport Local) [(a)]	123,459	96,458	95,625	94,792	93,958	93,125	92,292
Elm Fork/Lewisville/Ray Roberts (Dallas) [(a)]	184,166	172,975	165,580	158,185	150,791	143,396	136,001
Grapevine - Dallas	7,367	7,367	7,150	6,933	6,717	6,500	6,283
Subtotal of Systems in Region C	**316,589**	**278,397**	**269,952**	**261,507**	**253,063**	**244,618**	**236,173**
Reservoirs in Region C							
Cedar Creek [(a)]	175,000	159,367	157,850	156,333	154,817	153,300	151,783
Richland-Chambers (TRWD) [(a)]	210,000	186,600	182,700	178,800	174,900	171,000	167,100
Richland-Chambers (Corsicana)	13,863	13,863	13,855	13,847	13,838	13,830	13,822
Moss	7,410	7,410	7,410	7,410	7,410	7,410	7,410
Lake Texoma (Texas' Share - NTMWD)	190,300	197,000	197,000	197,000	197,000	197,000	197,000
Lake Texoma (Texas' Share - GTUA)	83,200	83,200	83,200	83,200	83,200	83,200	83,200
Lake Texoma (Texas' Share - Denison)	24,400	24,400	24,400	24,400	24,400	24,400	24,400
Lake Texoma (Texas' Share - TXU)	16,400	16,400	16,400	16,400	16,400	16,400	16,400
Lake Texoma (Texas' Share - RRA)	2,250	2,250	2,250	2,250	2,250	2,250	2,250
Randell	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Valley	-	0	0	0	0	0	0
Bonham	5,340	5,340	5,340	5,340	5,340	5,340	5,340
Ray Roberts (Denton)	18,902	18,902	18,733	18,564	18,395	18,226	18,057
Lewisville (Denton)	7,817	7,817	7,715	7,613	7,512	7,410	7,308
Benbrook [(a)]	6,833	5,417	5,400	5,383	5,367	5,350	5,333
Weatherford	2,923	2,923	2,880	2,837	2,793	2,750	2,707
Grapevine (PCMUD)	16,900	16,900	16,750	16,600	16,450	16,300	16,150
Grapevine (Grapevine)	1,983	1,983	1,950	1,917	1,883	1,850	1,817
Arlington [(a)]	9,700	7,667	7,550	7,433	7,317	7,200	7,083

Table 3.2, Continued

Reservoir	Permitted Diversion	2020	2030	2040	2050	2060	2070
Joe Pool	14,883	14,883	14,575	14,267	13,958	13,650	13,342
Mountain Creek	6,400	6,400	6,400	6,400	6,400	6,400	6,400
North	-	0	0	0	0	0	0
Lake Ray Hubbard (Dallas)	56,113	56,113	54,800	53,487	52,173	50,860	49,547
White Rock	3,200	3,200	2,900	2,600	2,300	2,000	1,700
Terrell	2,267	2,267	2,250	2,233	2,217	2,200	2,183
Clark	210	210	210	210	210	210	210
Bardwell	9,600	9,600	9,295	8,863	8,432	8,000	7,931
Waxahachie	2,800	2,800	2,695	2,590	2,485	2,380	2,275
Forest Grove	8,653	8,653	8,590	8,527	8,463	8,400	8,337
Trinidad City Lake	450	450	450	450	450	450	450
Trinidad	3,050	3,050	3,050	3,050	3,050	3,050	3,050
Navarro Mills	18,333	18,333	17,325	16,317	15,308	14,300	13,292
Halbert	-	0	0	0	0	0	0
Fairfield	870	870	870	870	870	870	870
Bryson	-	0	0	0	0	0	0
Mineral Wells	2,495	2,495	2,483	2,470	2,458	2,445	2,433
Teague City Lake	189	189	189	189	189	189	189
Lake Lavon	108,920	108,920	107,140	105,360	103,580	101,800	100,020
Muenster	300	300	300	300	300	300	300
Subtotal of Reservoirs in Region C	**1,033,354**	**997,573**	**986,305**	**974,910**	**963,515**	**952,120**	**941,088**
Imports							
Chapman (NTMWD)	44,792	44,792	44,505	44,218	43,931	43,644	43,357
Chapman (Irving)	42,280	42,280	42,009	41,739	41,468	41,197	40,926
Chapman (Upper Trinity MWD)	12,606	12,606	12,525	12,445	12,364	12,283	12,202
Tawakoni (Dallas)	183,768	174,080	169,120	164,160	159,200	154,240	149,280
Fork (Dallas)	119,699	120,028	116,180	112,332	108,484	104,636	100,788
Upper Sabine (NTMWD)	50,707	50,707	10,629	10,550	10,472	10,394	10,315
Palestine (Dallas)	111,776	111,776	110,670	109,563	108,455	107,347	106,239
Lake Livingston	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Lake Aquilla	276	262	298	340	391	452	523
Lake Granbury	231	276	304	334	368	405	444
Lake Athens (Athens)	5,983	2,432	2,711	2,949	3,293	4,534	4,759
Vulcan Materials (from BRA-Possum Kingdom)	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Parker County (from Lake Palo Pinto)	1,257	1,328	1,314	1,302	1,292	1,284	1,276
Subtotal of Imports	**594,375**	**581,567**	**531,265**	**520,931**	**510,717**	**501,415**	**491,109**
TOTAL	**1,944,318**	**1,857,537**	**1,787,522**	**1,757,348**	**1,727,295**	**1,698,153**	**1,668,372**

(a) Amounts reported are safe yields.

Local Irrigation Supply. The local irrigation surface water supply is based on existing run-of-the-river water rights for irrigation not associated with major reservoirs. The total irrigation local supply in Region

C is estimated at 8,734 acre-feet per year throughout the planning period. More detail on the determination of available supplies for run-of-the-river supply is shown in Table 3.3 and in Appendix I.

Other Local Supplies. Other local supplies include run-of-the-river supplies associated with water rights and used for municipal, manufacturing, mining, and power generation. They also include local surface water supplies used for mining and livestock. For livestock and mining local supplies, some of the available supplies were revised considering the historical use over the past ten years [(4)], 2011 use [(4)], and projected demands. The total other local supply available in Region C is 17,974 acre-feet per year. More detail on the determination of available other local supplies is included in Table 3.3 and Appendix I.

Table 3.3
Run-of-the-River and Other Local Water Supplies

County	Run-of-the-River Supply (Acre-Feet per Year)				Other Local Supply (Acre-Feet per Year)	
	Irrigation	Manufacturing	Mining	Municipal	Livestock	Mining
Collin	408	0	0	0	1,002	0
Cooke	0	0	0	0	1,187	0
Dallas	791	368	0	0	198	1,525
Denton	0	0	0	0	622	0
Ellis	3	0	0	0	1,112	0
Fannin	4,613	0	72	69	1,306	0
Freestone	87	0	0	41	1,043	120
Grayson	1,091	30	0	0	1,075	0
Henderson	415	0	0	0	341	0
Jack	110	0	0	0	802	370
Kaufman	64	0	0	0	1,622	86
Navarro	226	0	0	252	1,603	0
Parker	239	0	0	33	1,922	20
Rockwall	0	0	0	0	117	0
Tarrant	549	959	0	0	442	342
Wise	139	0	133	0	1,117	0
TOTAL	**8,734**	**1,357**	**205**	**395**	**15,511**	**2,463**

Reuse. The reuse supply considered as available to the region is from existing projects based on current permits, authorizations, and facilities. Categories of reuse include (1) currently permitted and operating indirect reuse projects, in which water is reused after being returned to the stream; (2) existing reuse projects for industrial purposes (including recycled water for mining use); and (3) authorized direct reuse

projects for which facilities are already developed. The specific reuse projects included are discussed in Appendix I.

Indirect reuse project sponsors in Region C include the North Texas Municipal Water District (NTMWD), Trinity River Authority (TRA), Tarrant Regional Water District (TRWD), the Upper Trinity Regional Water District (UTRWD), Dallas Water Utilities (DWU), Denton, and Grapevine. In addition, there are a number of existing direct reuse projects for landscape irrigation, golf course irrigation, cooling water, park irrigation, and natural gas industry use in Region C. Many of these projects were included in the *2011 Region C Water Plan* [2]. Significant new reuse projects since the 2011 plan include:

- The expansion of the City of Fort Worth's Village Creek Reclaimed Water Delivery System to serve the Cities of Arlington and Euless, Dallas-Fort Worth International Airport, and other potential retail customers within the City of Fort Worth.
- The TRWD Richland-Chambers Reservoir reuse project began operation in 2009 and diverts return flows into off-channel, wetland impoundments for water quality treatment purposes before delivery into the Richland-Chambers Reservoir for storage and diversion. The project was expanded in 2013, and water right permits were amended in December 2014 to increase the supply available from this WMS.
- Dallas Water Utilities and NTMWD have entered into an agreement which would allow NTMWD to exchange return flows from its WWTPs discharging into Lake Ray Hubbard for Dallas return flows discharged to the main stem of the Trinity River. Under this agreement, Dallas will obtain the right to divert the NTMWD return flows from Lake Ray Hubbard and will pump an equal amount of flow from the main stem of the Trinity River to the NTMWD East Fork Water Supply Project wetland for use by NTMWD. In addition, once water rights for Elm Fork return flows (from NTMWD WWTPs discharging to Lake Lewisville) have been secured by NTMWD, NTMWD will support Dallas efforts to secure bed and banks transport, storage and diversion rights for the Elm Fork return flows. In exchange, Dallas will pump a quantity equal to NTMWD's discharge of its future Elm Fork return flows to the East Fork Water Supply Project wetland for use by NTMWD.

It is anticipated that reuse will increase significantly in Region C over the next 50 years, but proposed and potential reuse projects are not included as currently available supplies. There are a number of reuse projects being considered as potentially feasible management strategies as part of this planning process. Recommended water management strategies for reuse are discussed in Chapter 5 of this report.

Table 3.4 summarizes the currently permitted reuse supplies by county in Region C. The total available supply from reuse in Region C by 2020 is 283,893 acre-feet per year, increasing to 429,018 acre-feet per year in 2070.

Table 3.4
Currently Permitted Reuse Supplies by County (Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Collin	49,722	58,690	66,089	74,186	74,186	74,186
Cooke	9	9	9	9	9	9
Dallas	9,246	9,246	9,246	9,246	9,246	9,246
Denton	47,669	55,677	61,106	77,568	96,221	111,118
Ellis	4,388	4,791	5,523	6,038	6,038	6,038
Fannin	0	0	0	0	0	0
Freestone	0	0	0	0	0	0
Grayson	0	0	0	0	0	0
Henderson	32	32	32	32	32	32
Jack	27	26	26	25	25	24
Kaufman	57,328	72,606	85,261	97,028	107,392	112,634
Navarro	100,465	100,465	100,465	100,465	100,465	100,465
Parker	97	97	97	97	97	97
Rockwall	672	672	672	672	672	672
Tarrant	7,977	8,400	8,439	8,424	8,421	8,421
Wise	6,261	6,261	6,261	6,261	6,076	6,076
TOTAL	**283,893**	**316,972**	**343,226**	**380,051**	**408,880**	**429,018**

3.3 Groundwater Availability

Groundwater supplies in Region C are obtained from two major aquifers (Carrizo-Wilcox and Trinity), three minor aquifers (Woodbine, Nacatoch, and Queen City), and locally undifferentiated formations, referred to as "other aquifer".

The TWDB guidelines [(1)] state that Modeled Available Groundwater (MAG) estimates provided by the TWDB are to be used to determine available groundwater supplies. MAG estimates are developed by the TWDB using Desired Future Conditions (DFCs) submitted by Groundwater Management Areas (GMAs). The TWDB created sixteen GMAs in Texas. GMA 8 covers all of Region C except for Jack County, Henderson County, and a small portion of Navarro County. The GMAs are responsible for developing DFCs for aquifers within their respective areas. The TWDB quantifies MAG estimates based on the DFCs provided by the GMAs.

Trinity and Woodbine Aquifers. The Woodbine aquifer overlies the Trinity aquifer. The Woodbine aquifer is in Collin, Cooke, Dallas, Denton, Ellis, Fannin, Grayson, Kaufman, Navarro, Rockwall, and Tarrant counties in Region C. The Trinity aquifer is in Collin, Cooke, Dallas, Denton, Ellis, Fannin, Grayson, Jack, Kaufman, Navarro, Parker, Rockwall, Tarrant, and Wise counties in Region C. Most of the pumping from

the Trinity aquifer in Region C is from three layers: Paluxy, Hensel, and Hosston. MAG estimates provided by the TWDB were used to determine groundwater availability from the Trinity and Woodbine aquifers. These availability numbers are shown in Table 3.5.

Carrizo-Wilcox, Queen City, and Nacatoch Aquifers. Supplies from the Carrizo-Wilcox aquifer are available in Freestone, Henderson, and Navarro counties in Region C. Supplies from the Queen City aquifer are available in Henderson County in Region C. The Nacatoch aquifer underlies Kaufman, Henderson, and Navarro counties in Region C. MAG estimates provided by the TWDB were used to determine groundwater availability from the Carrizo-Wilcox, Queen City, and Nacatoch aquifers. Table 3.5 shows the groundwater availability by county to Region C from these aquifers. As with reservoirs, this number represents the amount of water available from the aquifer, without considering limitations imposed by, or current availability due to, the capacity of wells and other facilities. The amount of groundwater currently available in Region C is discussed in Section 3.4.

Other Aquifers. There are several locally undifferentiated formations in Region C, referred to as "other aquifer." Other aquifer supplies are used in Fannin, Jack, and Parker counties in Region C. Available supplies from these undifferentiated formations are not included in the MAG numbers. The Other aquifer available supply amounts are based on historical use. In the historical pumping data obtained from the TWDB, there are significant amounts of groundwater classified as "other aquifer" or "unknown aquifer". In many cases, it is believed the "other aquifer" use should be classified as part of a differentiated formation but was not. In these cases, other aquifer supplies were not shown to be available despite the "availability" shown in the historical data.

Groundwater Conservation Districts. There are currently seven Groundwater Conservation Districts (GCDs) that include one or more Region C counties:

- Upper Trinity GCD (Wise and Parker Counties)
- Northern Trinity GCD (Tarrant County)
- Neches and Trinity Valleys GCD (includes Henderson County
- Mid-East Texas GCD (includes Freestone County)
- Prairielands GCD (includes Ellis County)
- North Texas GCD (Collin, Cooke, and Denton Counties)
- Red River GCD (Grayson and Fannin Counties).

Summary. In Region C, MAG estimates for the Trinity, Woodbine, Carrizo-Wilcox, Nacatoch, and Queen City aquifers were available for this cycle of regional water planning. MAG estimates were not available

for other aquifers, and groundwater supplies were based on historical pumping information from the TWDB [3]. The total available supply from groundwater in Region C is 146,178 acre-feet per year in 2020, decreasing to 146,096 acre-feet per year in 2070. More detail on the determination of available supplies from groundwater is included in Appendix I.

3.4 Currently Available Water Supplies

Table 3.6 and Figure 3.2 show the currently available water supplies in Region C by different source types. Table 3.7 shows the currently available supplies for water user groups by county. Currently available supplies are supplies that can be used with currently existing water rights, contracts, and facilities. They are less than the overall supplies available to the region because the facilities needed to use some supplies have not yet been developed. (Common constraints limiting currently available supplies include the availability and capacity of transmission systems, treatment plants, and wells.) The comparison of overall water supply availability and currently available water supplies for Region C shows the following:

The total currently available supply in Region C for 2070 is 1,631,784 acre-feet per year, of which 1,616,245 acre-feet per year is available to users in Region C. (A portion is used to supply customers in adjacent regions.) This is 640,366 acre-feet per year less than the overall supply. The difference is due primarily to transmission and treatment plant capacity limitations. The currently available supply presented in this plan is less than what was in the 2011 Region C Plan. This is mainly due to the decreased yield of Chapman Lake using the new critical period of the reservoir and decreased supplies available to TRWD and DWU because of the use of safe yields.

The currently available supplies from in-region reservoirs, local sources, groundwater and current reuse are nearly fully allocated by 2070. Some of the differences can be attributed to sources that are not currently used for water supply (White Rock Lake, Lake Mineral Wells and Forest Grove Reservoir).

Groundwater supplies, which represent approximately 6 percent of the total available supply to the region, are over 86 percent utilized by current water users. The total amount of groundwater supply that is available for future allocation is around 20,000 acre-feet per year.

Table 3.5
Groundwater Supplies in Region C (Acre-Feet per Year)

Aquifer	County	2020	2030	2040	2050	2060	2070
Carrizo-Wilcox	Freestone	5,305	5,317	5,315	5,262	5,259	5,223
Carrizo-Wilcox	Henderson	5,187	5,187	5,187	5,187	5,187	5,187
Carrizo-Wilcox	Navarro	15	15	15	15	15	15
Carrizo-Wilcox Subtotal		**10,507**	**10,519**	**10,517**	**10,464**	**10,461**	**10,425**
Trinity	Collin	2,104	2,104	2,104	2,104	2,104	2,104
Trinity	Cooke	6,850	6,850	6,850	6,850	6,850	6,850
Trinity	Dallas	5,458	5,458	5,458	5,458	5,458	5,458
Trinity	Denton	19,333	19,333	19,333	19,333	19,333	19,333
Trinity	Ellis	3,959	3,959	3,959	3,959	3,959	3,959
Trinity	Fannin	700	700	700	700	700	700
Trinity	Grayson	9,400	9,400	9,400	9,400	9,400	9,400
Trinity	Kaufman	1,181	1,181	1,181	1,181	1,181	1,181
Trinity	Navarro	1,873	1,873	1,873	1,873	1,873	1,873
Trinity	Parker	15,248	15,248	15,248	15,248	15,248	15,248
Trinity	Rockwall	958	958	958	958	958	958
Trinity	Tarrant	18,747	18,747	18,747	18,747	18,747	18,747
Trinity	Wise	9,282	9,282	9,282	9,282	9,282	9,282
Trinity Subtotal		**95,093**	**95,093**	**95,093**	**95,093**	**95,093**	**95,093**
Woodbine	Collin	2,509	2,509	2,509	2,509	2,509	2,509
Woodbine	Cooke	154	154	154	154	154	154
Woodbine	Dallas	2,313	2,313	2,313	2,313	2,313	2,313
Woodbine	Denton	4,126	4,126	4,126	4,126	4,126	4,126
Woodbine	Ellis	5,441	5,441	5,441	5,441	5,441	5,441
Woodbine	Fannin	3,297	3,297	3,297	3,297	3,297	3,297
Woodbine	Grayson	12,087	12,087	12,087	12,087	12,087	12,087
Woodbine	Kaufman	200	200	200	200	200	200
Woodbine	Navarro	300	300	300	300	300	300
Woodbine	Rockwall	144	144	144	144	144	144
Woodbine	Tarrant	632	632	632	632	632	632
Woodbine Subtotal		**31,203**	**31,203**	**31,203**	**31,203**	**31,203**	**31,203**
Nacatoch	Ellis, Kaufman,	1,939	1,939	1,939	1,939	1,939	1,939
Queen City	Henderson	3,533	3,533	3,533	3,533	3,533	3,533
Other	Fannin, Jack &	3,903	3,903	3,903	3,903	3,903	3,903
Minor Aquifers		**9,375**	**9,375**	**9,375**	**9,375**	**9,375**	**9,375**
TOTAL		**146,178**	**146,190**	**146,188**	**146,135**	**146,132**	**146,096**

Permitted surface water imports to Region C are shown to be more than 490,000 acre-feet per year in 2070 in Table 3.1. Approximately 30% of these supplies are not currently connected to water supply systems. The connection of these supplies will be considered as water management strategies in Chapter 5.

Table 3.6
Currently Available Water Supplies to Water Users by Source Type (Acre-Feet per Year)

Category	2020	2030	2040	2050	2060	2070
Reservoirs in Region C	862,892	847,935	830,008	807,022	779,451	756,396
Local Irrigation	8,734	8,734	8,734	8,734	8,734	8,734
Other Local Supply	19,931	19,931	19,931	19,931	19,931	19,931
Surface Water Imports	393,293	358,588	349,702	338,786	326,578	315,540
Groundwater	125,736	125,197	125,261	125,255	125,194	125,090
Reuse	273,019	303,503	325,358	359,411	387,897	406,094
REGION C TOTAL	**1,683,605**	**1,663,889**	**1,658,993**	**1,659,140**	**1,647,786**	**1,631,784**

Figure 3.2
Currently Available Supplies to Region C Water Users

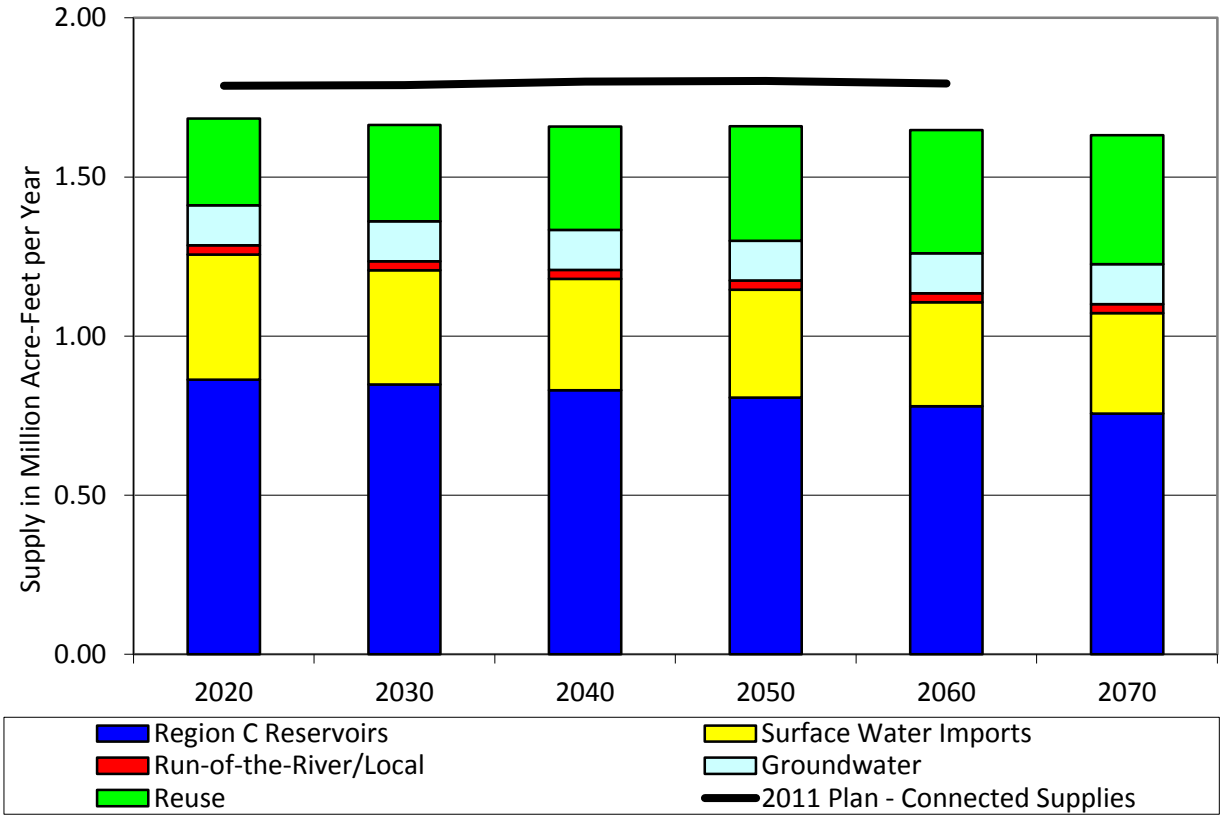


Table 3.7
Currently Available Supplies by County (Acre-Feet per Year)

County	2020	2030	2040	2050	2060	2070
Collin	208,371	194,592	205,058	214,835	212,779	211,390
Cooke	10,863	10,857	10,737	10,883	11,150	11,543
Dallas	540,511	521,951	513,314	512,811	508,124	499,804
Denton	177,361	182,417	180,786	177,677	177,798	176,907
Ellis	44,478	44,832	45,128	49,264	51,055	54,229
Fannin	21,878	22,562	22,562	22,562	22,562	22,561
Freestone	34,387	33,737	33,019	32,397	31,863	31,384
Grayson	47,102	47,243	47,381	47,528	48,586	48,869
Henderson	13,519	13,566	13,501	13,501	14,253	14,699
Jack	6,089	6,169	5,933	5,766	5,624	5,524
Kaufman	30,990	32,585	34,110	36,550	40,993	44,124
Navarro	14,650	11,613	11,563	11,651	11,859	11,940
Parker	37,299	43,158	44,216	46,127	45,747	44,910
Rockwall	19,360	21,753	22,853	25,205	28,400	31,211
Tarrant	432,186	431,778	422,707	405,933	389,856	375,127
Wise	28,485	29,302	30,296	31,223	31,880	32,023
Subtotal	**1,667,529**	**1,648,115**	**1,643,164**	**1,643,913**	**1,632,529**	**1,616,245**
Other Regions	16,076	15,774	15,829	15,227	15,257	15,539
TOTAL	**1,683,605**	**1,663,889**	**1,658,993**	**1,659,140**	**1,647,786**	**1,631,784**

3.5 Water Availability by Wholesale Water Provider (WWP)

As part of the Senate Bill One planning process, the Texas Water Development Board requires development of water availability for each designated wholesale water provider. A wholesale water provider is defined as "any person or entity, including river authorities and irrigation districts that has contracts to sell more than 1,000 acre-feet of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan." [(1)] The planning groups are also required to designate any person or entity expected to contract to sell at least 1,000 acre-feet per year of wholesale water during the planning period as a WWP. There are 40 entities in Region C that qualify as wholesale water providers (21 cities, 2 river authorities, and 17 water districts). Twelve of the wholesale water providers provide a large amount of wholesale water supplies to a number of customers and are considered "regional" wholesale water providers. Table 3.8 gives a summary of the supplies currently available to regional wholesale water providers. The remaining 28 WWPs supply less water to fewer customers and are considered local wholesale water providers. Table 3.9 gives a summary of the supplies currently available to local wholesale water providers serving Region C. As discussed in Section 3.4, currently available supplies are limited by existing physical facilities.

Table 3.8
Currently Available Supplies to Regional Wholesale Water Providers in Region C

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Dallas Water Utilities	Ray Roberts/Lewisville System[(a)]	172,975	165,580	158,185	150,791	143,396	136,001
	Lake Grapevine	7,367	7,150	6,933	6,717	6,500	6,283
	Lake Ray Hubbard	56,113	54,800	53,487	52,173	50,860	49,547
	Lake Tawakoni[(a)]	174,080	169,120	164,160	159,200	154,240	149,280
	Lake Fork[(a)]	50,120	55,080	60,040	65,000	69,960	74,920
	Direct Reuse (Cedar Crest GC)	1,121	1,121	1,121	1,121	1,121	1,121
	Indirect Reuse	32,550	38,223	41,048	55,000	73,091	87,511
	White Rock Lake (Irrigation Only)	3,200	2,900	2,600	2,300	2,000	1,700
	DWU Total	**497,526**	**493,974**	**487,574**	**492,302**	**501,168**	**506,363**
Tarrant Regional Water District[(a)]	West Fork System	96,458	95,625	94,792	93,958	93,125	92,292
	Lake Benbrook	5,417	5,400	5,383	5,367	5,350	5,333
	Lake Arlington	7,667	7,550	7,433	7,317	7,200	7,083
	Cedar Creek Lake	126,731	127,267	128,018	129,208	131,932	135,885
	Richland-Chambers Reservoir	186,600	182,700	178,800	174,900	171,000	167,100
	Richland-Chambers Reuse	61,831	65,731	69,631	73,531	77,431	81,331
	TRWD Total	**484,704**	**484,273**	**484,057**	**484,281**	**486,038**	**489,024**
North Texas Municipal Water District	Lake Lavon	86,500	85,900	85,300	84,700	84,100	83,500
	Lake Texoma	70,623	70,623	70,623	70,623	70,623	70,623
	Chapman Lake	41,172	40,982	40,792	40,602	40,412	40,222
	Wilson Creek Reuse	47,418	56,386	63,785	71,882	71,882	71,882
	Lake Bonham	2,511	3,195	3,195	3,195	3,195	3,195
	East Fork Reuse	47,802	62,977	75,524	87,291	97,655	102,897
	Upper Sabine Basin	50,707	10,629	10,550	10,472	10,394	10,315
	Direct Reuse	2,519	2,519	2,519	2,519	2,519	2,519
	NTMWD Total	**349,252**	**333,211**	**352,288**	**371,284**	**380,780**	**385,153**
City of Fort Worth	TRWD Supplies	275,830	278,569	278,569	278,569	278,569	278,569
	Direct Reuse	4,366	4,423	4,423	4,423	4,423	4,423
	Fort Worth Total	**280,196**	**282,992**	**282,992**	**282,992**	**282,992**	**282,992**

Table 3.8, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Sabine River Authority	Lake Tawakoni (Dallas)	174,080	169,120	164,160	159,200	154,240	149,280
	Lake Tawakoni (NTMWD)	30,707	10,629	10,550	10,472	10,394	10,315
	Lake Tawakoni (Others)	35,235	34,977	34,720	34,462	34,204	33,947
	Lake Fork (Dallas)	120,028	116,180	112,332	108,484	104,636	100,788
	Lake Fork (Others)	14,895	37,632	40,369	43,106	45,844	48,581
	Subtotal Upper Basin	**374,945**	**368,538**	**362,131**	**355,724**	**349,318**	**342,911**
	Toledo Bend Lake	750,000	750,000	750,000	750,000	750,000	750,000
	Sabine Run-of-River	147,100	147,100	147,100	147,100	147,100	147,100
	SRA Total	**1,272,045**	**1,265,638**	**1,259,231**	**1,252,824**	**1,246,418**	**1,240,011**
Trinity River Authority	Joe Pool Lake (Midlothian)	5,833	5,712	5,591	5,470	5,349	5,229
	Joe Pool Lake (Grand Prairie)	1,272	1,239	1,207	1,174	1,141	1,109
	Joe Pool Lake (Grand Prairie Raw)	300	300	300	300	300	300
	Navarro Mills Lake	18,333	17,325	16,317	15,308	14,300	13,292
	Bardwell Lake	9,600	9,295	8,863	8,432	8,000	7,931
	Lake Livingston (Region C)	20,000	20,000	20,000	20,000	20,000	20,000
	Reuse (Region C)	11,604	12,007	12,739	13,254	13,254	13,254
	Subtotal	**66,942**	**65,878**	**65,017**	**63,938**	**62,344**	**61,115**
	TRWD	61,449	61,182	57,735	57,970	57,033	53,881
	TRA Total in Region C	**128,391**	**127,060**	**122,752**	**121,908**	**119,377**	**114,996**
Upper Neches River Municipal Water Authority	Lake Palestine (Dallas)	111,694	110,589	109,484	108,378	107,270	106,164
	Lake Palestine (Other Committed)	93,723	92,786	91,849	90,914	89,980	89,065
	UNRMWA Total	**205,417**	**203,375**	**201,333**	**199,292**	**197,250**	**195,229**
Upper Trinity Regional Water District	Chapman Lake	11,356	11,303	8,438	8,399	8,360	5,547
	DWU Contract	37,307	40,513	37,930	35,231	33,087	31,490
	Chapman Reuse	5,435	5,575	4,287	4,392	4,497	3,068
	Direct Reuse	897	897	897	897	897	897
	UTRWD Total	**54,995**	**58,288**	**51,552**	**48,919**	**46,841**	**41,002**

Table 3.8, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Sulphur River Water District	Chapman Lake (UTRWD)	11,588	11,534	11,481	11,427	11,374	11,320
	Chapman Lake (NTMWD through Cooper)	2,309	2,299	2,288	2,277	2,267	2,256
	Chapman Lake (Other)	13,811	13,747	13,684	13,620	13,556	13,492
	SRWD Total	**27,708**	**27,580**	**27,452**	**27,324**	**27,196**	**27,068**
	SRWD to Region C	**13,897**	**13,833**	**13,769**	**13,704**	**13,640**	**13,576**
Dallas County Park Cities MUD	Lake Grapevine	16,900	16,750	16,600	16,450	16,300	16,150
	Grapevine Reuse	3,311	3,677	3,716	3,701	3,698	3,698
	DCPCMUD Total	**20,211**	**20,427**	**20,316**	**20,151**	**19,998**	**19,848**
Greater Texoma Utility Authority	Lake Texoma Raw Water	83,200	83,200	83,200	83,200	83,200	83,200
	Delivery Limited by WTP Capacity	11,210	11,210	11,210	11,210	11,210	11,210
	Usable Lake Texoma Raw Water	71,990	71,990	71,990	71,990	71,990	71,990
	Denison (for Pottsboro)	362	492	560	560	560	560
	NTMWD (Collin-Grayson MA)	1,661	2,160	3,375	5,400	5,400	5,400
	GTUA Total	**85,223**	**85,852**	**87,135**	**89,160**	**89,160**	**89,160**
City of Corsicana	Navarro Mills Lake (from TRA)	17,828	17,325	16,317	15,308	14,300	13,292
	Richland Chambers and Halbert	13,863	13,855	13,847	13,838	13,830	13,822
	Total (Limited by WTP Capacity)	**13,452**	**13,452**	**13,452**	**13,452**	**13,452**	**13,452**

[(a)] The available supply reported is the safe yield because of the operations by the WWP.

Table 3.9
Currently Available Supplies to Local Wholesale Water Providers in Region C

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Argyle WSC	Groundwater	950	950	950	950	950	950
	UTRWD	1,441	1,711	1,946	1,594	1,460	1,282
	Total	**2,391**	**2,661**	**2,896**	**2,544**	**2,410**	**2,232**
Arlington	Fort Worth (Reuse)	178	178	178	178	178	178
	TRWD	72,028	68,467	61,699	55,011	49,884	44,891
	Total	**72,206**	**68,645**	**61,877**	**55,189**	**50,062**	**45,069**
Athens Municipal Water Authority	Lake Athens (firm yield)	5,983	5,903	5,822	5,741	5,660	5,580
	Lake Athens (operational yield)	2,900	2,900	2,900	2,900	2,900	2,900
	Groundwater	966	966	966	966	966	966
	Total	**6,949**	**6,869**	**6,788**	**6,707**	**6,626**	**6,546**
Cross Timbers WSC	UTRWD	1,019	935	799	693	673	611
	Trinity Aquifer	800	800	800	800	800	800
	Total	**1,819**	**1,735**	**1,599**	**1,493**	**1,473**	**1,411**
Dallas County Park Cities MUD	Lake Grapevine	16,900	16,750	16,600	16,450	16,300	16,150
	Reuse	3,311	3,677	3,716	3,701	3,698	3,698
	Total	**20,211**	**20,427**	**20,316**	**20,151**	**19,998**	**19,848**
Denison	Lake Randall	1,400	1,400	1,400	1,400	1,400	1,400
	Lake Texoma (water right)	24,400	24,400	24,400	24,400	24,400	24,400
	Lake Texoma (contracted with GTUA)	12,204	12,204	12,204	12,204	12,204	12,204
	Groundwater	121	121	121	121	121	121
	Total (limited by WTP capacity)	**8,144**	**8,207**	**8,267**	**8,318**	**8,396**	**8,480**

Table 3.9, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Denton	Lake Lewisville	7,817	7,715	7,613	7,512	7,410	7,308
	Lake Ray Roberts	18,902	18,733	18,564	18,395	18,226	18,057
	Indirect Reuse	6,775	7,979	8,081	8,182	8,284	8,386
	DWU	0	2,300	7,735	14,433	27,838	37,545
	Subtotal (limited by WTP capacity)	**26,904**	**26,904**	**26,904**	**26,904**	**26,904**	**26,904**
	Reuse (Steam Electric Power and Irrigation)	1,052	1,139	1,225	1,312	1,399	1,494
	Total	**27,956**	**28,043**	**28,129**	**28,216**	**28,303**	**28,398**
East Cedar Creek FWSD	**TRWD (limited by contract)**	**1,758**	**1,712**	**1,702**	**1,687**	**1,961**	**2,434**
Ennis	Bardwell Lake (TRA)	5,200	5,035	4,801	4,567	4,333	4,296
	TRA (TRWD Sources)	379	946	1,173	2,309	3,934	3,991
	Rockett SUD	12	9	8	6	5	3
	Direct Reuse	909	909	909	909	909	909
	Total (limited by WTP capacity)	**6,500**	**6,899**	**6,891**	**7,641**	**7,640**	**7,638**
Forney	NTMWD	6,593	6,168	6,834	7,896	9,973	10,978
	Reuse from Garland (Steam Electric only)	6,879	6,879	6,879	6,879	6,879	6,879
	Total	**13,472**	**13,047**	**13,713**	**14,775**	**16,852**	**17,857**
Gainesville	Trinity Aquifer	2,104	2,104	2,104	2,104	2,104	2,104
	Moss Lake (limited by WTP)	2,242	2,242	2,242	2,242	2,242	2,242
	Direct Reuse	9	9	9	9	9	9
	Total	**4,355**	**4,355**	**4,355**	**4,355**	**4,355**	**4,355**

Table 3.9, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Garland	NTMWD	38,683	32,422	29,823	27,893	26,233	24,277
	Reuse sold to Forney (Steam Electric only)	8,979	8,979	8,979	8,979	8,979	8,979
	Total	**47,662**	**41,401**	**38,802**	**36,872**	**35,212**	**33,256**
Grand Prairie	Groundwater	4,200	4,200	4,200	4,200	4,200	4,200
	Joe Pool Raw Water	300	300	300	300	300	300
	Fort Worth (TRWD)	2,667	2,260	1,916	1,725	1,579	1,451
	Midlothian (Joe Pool)	3,363	3,363	3,363	3,363	3,363	3,363
	Mansfield (TRWD)	3,363	3,363	3,363	3,146	2,841	2,573
	DWU	23,966	26,712	26,052	23,869	21,938	20,918
	Total	**37,859**	**40,198**	**39,194**	**36,603**	**34,221**	**32,805**
Lake Cities MUA	UTRWD	1,785	1,622	1,481	1,293	1,165	1,021
	Groundwater	355	355	355	355	355	355
	Total	**2,140**	**1,977**	**1,836**	**1,648**	**1,520**	**1,376**
Mansfield	**TRWD**	**25,223**	**25,223**	**25,223**	**25,223**	**25,223**	**25,223**
Midlothian	TRA (TRWD)	4,870	5,045	5,045	5,045	5,045	5,045
	Joe Pool Lake (TRA)	5,833	5,712	5,591	5,470	5,349	5,229
	Total (limited by WTP capacity)	**10,703**	**10,757**	**10,636**	**10,515**	**10,394**	**10,274**
Mustang SUD	Trinity Aquifer	1,104	1,104	1,104	1,104	1,104	1,104
	Woodbine Aquifer	71	71	71	71	71	71
	UTRWD Sources	6,007	8,626	8,290	7,760	7,928	7,587
	Total	**7,182**	**9,801**	**9,465**	**8,935**	**9,103**	**8,762**
North Richland Hills	TRWD (through Ft Worth)	6,053	6,053	6,053	6,053	6,053	5,872
	TRWD (through TRA)	4,244	4,058	3,532	3,094	2,755	2,459
	Total	**10,298**	**10,111**	**9,585**	**9,147**	**8,808**	**8,331**

Table 3.9, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Princeton	**NTMWD**	**1,200**	**1,231**	**1,533**	**2,942**	**4,121**	**5,156**
Rockett SUD	Midlothian	2,118	1,738	1,382	1,141	969	848
	TRA (TRWD Sources)	6,781	6,781	6,781	6,781	6,781	6,781
	Sokoll WTP Capacity (TRWD Sources)	5,605	5,605	5,605	5,605	5,605	5,605
	Total	**7,723**	**7,343**	**6,987**	**6,746**	**6,574**	**6,453**
Rockwall	**NTMWD**	**13,537**	**16,003**	**16,627**	**17,488**	**18,995**	**20,027**
Seagoville	DWU Sources	2,404	2,396	2,453	2,595	3,230	4,247
	DWU Sources Limited by Contract	1,682	1,682	1,682	1,682	1,682	1,682
	Total	**1,682**	**1,682**	**1,682**	**1,682**	**1,682**	**1,682**
Sherman	Trinity Aquifer	4,083	4,083	4,083	4,083	4,083	4,083
	Woodbine Aquifer	1,289	1,289	1,289	1,289	1,289	1,289
	GTUA treated (limited by WTP)	11,210	11,210	11,210	11,210	11,210	11,210
	GTUA raw water (for SEP demand)	6,163	6,163	6,163	6,163	6,163	6,163
	Total	**22,745**	**22,745**	**22,745**	**22,745**	**22,745**	**22,745**
Terrell	**NTMWD**	**4,915**	**6,682**	**6,726**	**6,726**	**6,726**	**6,726**
Walnut Creek SUD	TRWD	2,627	2,922	3,203	3,897	4,480	4,480
	Total (limited by WTP capacity)	**2,627**	**2,922**	**3,203**	**3,897**	**4,480**	**4,480**
Waxahachie	Lake Waxahachie	2,800	2,695	2,590	2,485	2,380	2,275
	TRA (Bardwell)	4,320	4,183	3,989	3,794	3,600	3,569
	Rockett SUD (for retail connections)	427	343	275	234	187	137
	Reuse	3,479	3,882	4,614	5,129	5,129	5,129
	TRA (TRWD Sources for Sokoll WTP)	2,500	2,275	2,011	4,419	5,212	5,212
	Total	13,526	13,378	13,479	16,061	16,508	16,322
	Total (limited by WTP capacity)	**13,016**	**12,707**	**12,375**	**14,742**	**15,488**	**15,438**

Table 3.9, Continued

Provider	Source	Water Supply Currently Available (Acre-Feet per Year)					
		2020	2030	2040	2050	2060	2070
Weatherford	Lake Weatherford	2,923	2,880	2,837	2,793	2,750	2,707
	Lake Benbrook (TRWD)	1,162	2,077	2,862	5,826	8,824	8,770
	Total	**4,085**	**4,957**	**5,699**	**7,860**	**7,860**	**7,860**
West Cedar Creek	**TRWD (limited by contract)**	**2,220**	**2,220**	**2,220**	**2,220**	**2,220**	**2,220**
Wise County WSD	**TRWD (limited by WTP Capacity)**	**1,850**	**1,850**	**1,850**	**1,850**	**1,850**	**1,850**

3.6 Water Availability by Water User Group (WUG)

As part of the regional water planning process, the TWDB requires development of information on currently available water supplies for each water user group (WUG) by river basin and county. (Water user groups are cities with populations greater than 500, water suppliers other than cities that supply an annual average of at least 0.25 million gallons per day (mgd), "county-other" municipal uses that cover municipal use outside of designated WUGs (by small suppliers and individuals), and countywide manufacturing, irrigation, mining, livestock, and steam electric uses.) The availability figures by water user group are limited by contracts and existing physical facilities, including transmission facilities, groundwater wells, and water treatment. The supplies available to each WUG are shown in Appendix J.

As the information on currently available water supply for WUGs was developed, several important points became apparent:

- Most water user groups in Region C will need additional water supplies over the next 50 years to meet growing demands.
- There are some significant water supplies that can be made available by the development of additional water transmission facilities. An example is the full development of Dallas Water Utilities' share of Lake Palestine in the Neches Basin.

3.7 Summary of Current Water Supplies in Region C

- Region C water suppliers are currently using nearly 70 percent of the reliable supply available from in-region reservoirs.
- The projected overall water supply available to Region C in 2070 from current sources is 2,272,150 acre-feet per year. (This figure does not consider supply limitations due to the capacities of current raw water transmission facilities and wells.) The sources of supply for Region C in 2070 include:
    - 1,177,262 acre-feet per year (53%) from in-region reservoirs
    - 146,096 acre-feet per year (7%) from groundwater
    - 28,665 acre-feet per year (less than 2%) from local supplies
    - 429,018 acre-feet per year (19%; up four percent from the 2011 Region C Plan) from reuse
    - 491,109 acre-feet per year (22%) from imports from other regions
- Considering supply limitations due to the capacities of current raw water transmission facilities and wells, the currently available supply for Region C water users in 2070 is 1,631,784 acre- feet per year, with 15,539 acre-feet per year for water users in other regions. The total available supply is 2,272,150 acre-feet per year, which is 640,365 acre-feet per year more than the currently available supply. Most water user groups and wholesale water providers in Region C will have to make improvements to their facilities to meet projected needs.

- The supply currently available to Region C from existing sources in 2070 (1.63 million acre-feet per year) is significantly less than the projected 2070 water use, which is over 2.59 million acre-feet per year.
- The currently available supply for 2060 presented in this plan (1,647,786 acre-feet per year) is less than what was in the 2011 Region C Plan (1,793,842 acre-feet per year) mainly due to the use of safe yields by TRWD and DWU and the lower Chapman yield using the new critical period for the reservoir.
- Several major water suppliers will require additional raw water transmission facilities to make full use of their existing sources.
- Some sources of supply will probably not be utilized fully during the period covered by this plan, but these will generally be the smaller local supplies.

CHAPTER 3
LIST OF REFERENCES

(1) Texas Water Development Board, *Exhibit C First Amended General Guidelines for Regional Water Plan Development* (October 2012), Austin, [Online] Available URL: http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2016/doc/current_docs/contract_docs/2012_exhC_1st_amended_gen_guidelines.pdf, January 28, 2013.

(2) Freese and Nichols, Inc., Alan Plummer Associates, Inc., CP&Y, Inc., and Cooksey Communications, Inc.: *2011 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, October 2010.

(3) Texas Water Development Board: *Groundwater Pumpage Estimates, Pumpage Detail, 2000 and Later*, Austin, [Online] Available URL: http://www.twdb.texas.gov/waterplanning/waterusesurvey/historical-pumpage.asp, September 2013.

(4) Texas Water Development Board: *Water Use Summary Estimates, County, Summary, 2000 and Later*, Austin, [Online] Available URL: http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/, February 2, 2015.