5C.1.4 North Texas Municipal Water District

The North Texas Municipal Water District (NTMWD) serves much of the rapidly growing suburban area north and east of Dallas, supplying water to over 75 cities and water suppliers including the cities of Plano, Allen, McKinney, Garland, and Mesquite. The population served by NTWMD is expected to more than double over the next 50 years, growing from about 1.75 million people in 2020 to 3.7 million in 2070. While the population will grow more than 110%, demands on the NTMWD are only expected to increase by 85% from 2020 to 2070. It should be noted that the demands on NTWMD shown in this plan are about 20 to 25% less than the demands presented in 2011 Region C Water Plan. The demands in this plan reflect a large amount of conservation that has been achieved in the past 10 years. Even with these lower demands, NTMWD will still need almost 320,000 acre-feet per year of additional supplies by 2070, and will need supplies in addition to that in order to have a safety factor greater than 1.0. The potentially feasible strategies considered for NTMWD and their unit costs are shown on Figure 4E.7. The recommended water management strategies for NTMWD include:

- Conservation
- Removal of Silt Barrier to Chapman Lake Intake Pump Station
- Dredge Lake Lavon
- Additional Measure to Access Full Yield of Lake Lavon
- Chapman Booster Pump Station
- Main Stem Pump Station & Reuse
- Lower Bois d'Arc Creek Reservoir
- Additional Lake Texoma Supplies (blending with Lower Bois d'Arc water)
- Sulphur Basin Supplies
- Additional Lake Texoma Supplies (blending with Sulphur Basin Supplies)
- Toledo Bend Reservoir

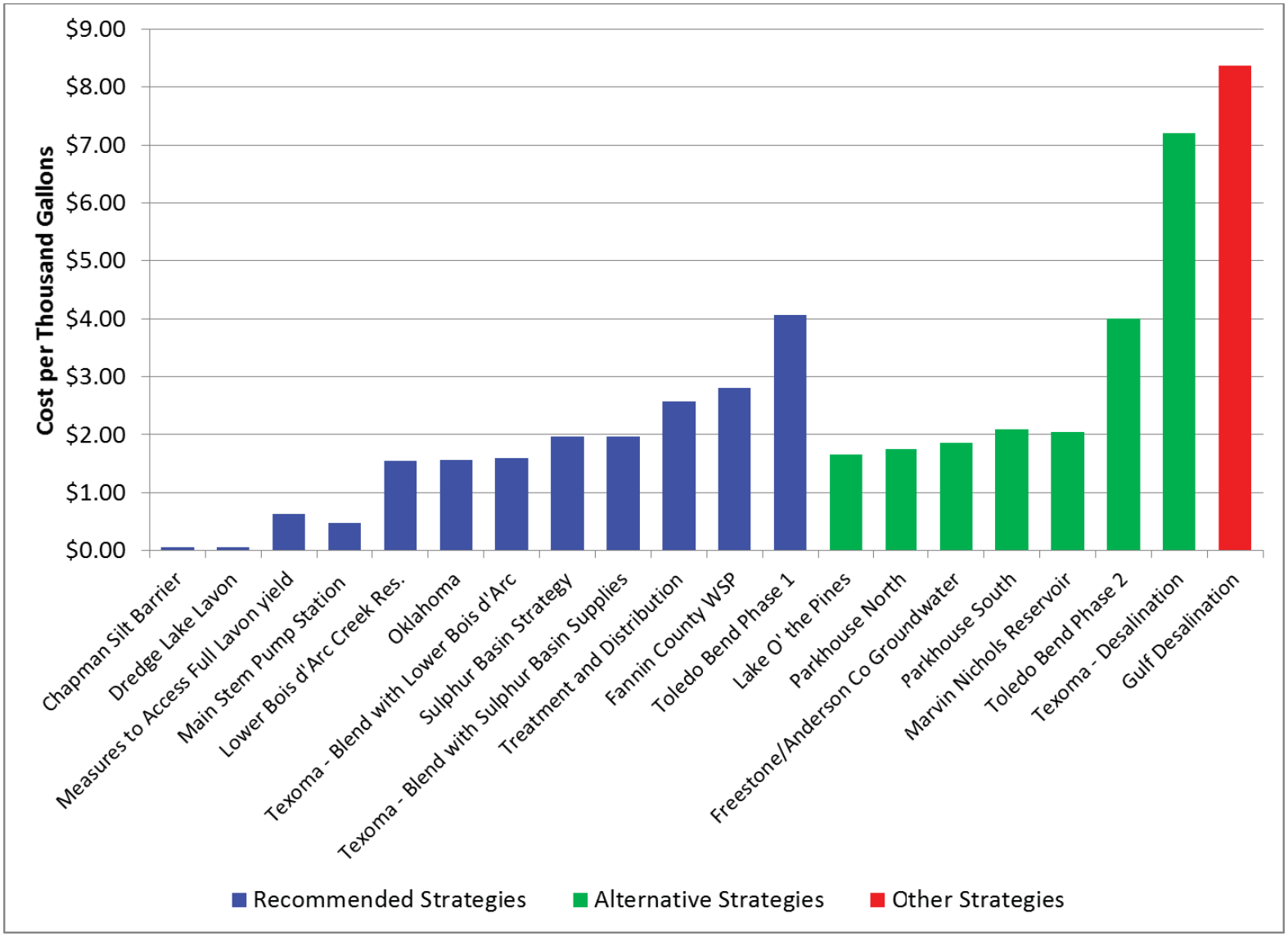
- Oklahoma Water
- Infrastructure to Treat and Deliver to Customers
- Fannin County Water Supply System
- Treatment and Distribution Improvements

The development of the Sulphur Basin Supplies strategy, connection to Toledo Bend Reservoir, and connection to Oklahoma water sources are multi-provider strategies and are discussed earlier in this chapter and in Chapter 5B. The other recommended strategies are discussed individually below.

NTMWD Conservation. Conservation is the projected conservation savings for NTMWD's existing and potential customers, based on the Region C recommended water conservation program. Not including savings from low-flow plumbing fixtures (which are built into the demand projections) and not including reuse, conservation by NTMWD customers is projected to reach 25,933 acre-feet per year by 2070.

Removal of Silt Barrier at Chapman Lake Intake Pump Station. NTMWD is in the design phase of a project that would remove a silt barrier in Chapman Lake. This silt barrier currently limits the amount of water reaching the intake structure at the lake. This project will allow for use of full yield of Chapman Lake. This project is estimated to be completed before 2020.

Figure 5C.7
Unit Costs of Potentially Feasible Strategies for NTMWD



Dredge Lake Lavon. NTMWD is in the design phase of a project that will remove sediment in Lake Lavon. This dredging project would allow NTWMD to divert water down to elevation 467 msl. This project is estimated to be completed before 2020.

Additional Measures to Access Full Yield of Lake Lavon. If necessary in drought conditions, NTWMD will take emergency measures to access water below elevation 467 msl. These measures may include, but are not limited to: extension and/or dredging of the pump station intake channel and utilizing floating barges equipped with pumps. The cost estimate for this strategy includes floating barges outfitted with pumps and associated piping, but any emergency measures deemed necessary at the time will be considered to be consistent with this plan.

Main Stem Pump Station and Reuse. NTMWD is currently designing a pump station to deliver water from the Main Stem of the Trinity River to the NTMWD East Fork Wetlands. The capacity of the wetlands is a little over 100,000 acre-feet per year, but current return flows available for reuse from the East Fork are less than half that amount, leaving capacity in the wetlands to treat additional return flows from other sources. NTWMD is developing an agreement with the Trinity River Authority to purchase up to 56,050 acre-feet per year of return flows from the main stem of the Trinity River. This Main Stem pump station will be used to deliver these return flows from the main stem of the Trinity River into the NTMWD East Fork wetlands system. Initially this Pump Station will deliver over 50,000 acre-feet per year, but use of this Pump Station will diminish over time as more return flow is available from the East Fork. In addition, as described under DWU's strategies on page 5C.7, the Main Stem Pump Station will make it possible for Dallas to make use of NTMWD's return flows to Lake Ray Hubbard in return for providing NTMWD with Dallas return flows via the Main Stem Pump Station.

Lower Bois d'Arc Creek Reservoir. Lower Bois d'Arc Creek Reservoir is a proposed reservoir on Bois d'Arc Creek in the Red River Basin. It was included in the 2001, 2006, and 2011 Region C Water Plans [1, 2, 3] as a supply for NTMWD. NTMWD is in the process of obtaining a Texas water right, a Section 404 permit, and other necessary permits for the project. Lower Bois d'Arc Creek Reservoir will provide up to 120,200 acre-feet per year for NTMWD and Fannin County. Lower Bois d'Arc Creek Reservoir will be developed by 2020. The supply shown for the lake in 2020 is limited to 15 MGD due to the anticipation that the lake will still be filling at that time. It is assumed that full filling will occur before 2030. The cost estimate for Lower Bois d'Arc Creek Reservoir includes not only the dam and reservoir, but also transmission facilities to deliver raw water to the proposed Leonard water treatment plant and to deliver treated water to District

customers. The cost estimate for the Leonard treatment plant itself is included under NTWMD's strategy of "Treatment and Distribution Improvements."

Additional Supply from Lake Texoma (blending with Lower Bois d'Arc Creek and Sulphur Basin Supplies). NTMWD holds a Texas water right in Lake Texoma to divert and use up to 197,000 acre-feet per year from the lake. Water from Lake Texoma is high in dissolved solids and the current supply from the lake is limited to 84,075 acre-feet per year (75 MGD) by the need to blend Texoma water with other supplies to maintain acceptable water quality. In 2009, the presence of invasive zebra mussels in Lake Texoma prohibited NTMWD from pumping Texoma water into the Trinity River basin via open channel flow or into Lake Lavon, causing NTWMD to lose access to 25% of their then-current supply. In response to this emergency condition, NTWMD completed a 48-mile pipeline from the end of the existing Texoma pipeline directly to NTMWD's four existing water treatment plants located at Lake Lavon.

Since the current maximum use from Texoma is only 84,075 acre-feet per year, this leaves almost 113,000 acre-feet per year that can be used if additional transmission capacity is developed. NTMWD will either blend the water with higher quality supplies from other sources or develop a desalination plant. At this time, blending appears to be the more economical approach. It is assumed that NTMWD will use one part of Lake Texoma supply to three parts of other imported water (specifically water from Lower Bois d'Arc Creek Reservoir and the Sulphur Basin Supplies as they are developed). NTMWD will deliver the water directly from Lake Texoma and/or from the Red River downstream of the lake. (Downstream diversions would require a longer pipeline but offer the advantage of reduced levels of dissolved solids.) It is anticipated that transmission capacity will be constructed in 2040 to deliver about 40,000 acre-feet per year of Lake Texoma supply to be blended with Lower Bois d'Arc water. It is anticipated that additional transmission capacity will be constructed in 2060 to deliver additional Lake Texoma supply to be blended with Sulphur Basin Supplies.

Infrastructure to Treat and Deliver to Customers:

Fannin County Water Supply System. NTMWD will cooperate with Fannin County entities to develop a treated water supply system for Fannin County water users after the Lower Bois d'Arc Creek Reservoir is developed by 2020.

Treatment and Distribution Improvements. In addition to securing raw water sources, NTWMD must also treat the water, and all infrastructure to deliver this treated water to its member cities is the responsibility of NTWMD. NTWMD has a schedule of projects necessary to do this. These projects are divided into decadal needs.

As shown on Table 5C.7 and Figure 5C.8, about 580,000 acre-feet per year of new supplies are recommended for NTMWD, leading to a total supply of about 960,000 acre-feet per year in 2070. Almost 200,000 acre-feet per year of NTMWD's 2070 total water supply will be from conservation and reuse, representing 21 percent of NTMWD's total supplies. Figure 5C.9 shows the new supplies for NTMWD in 2070 by the type of supply. A summary of costs for the recommended strategies is presented in Table 5C.8.

The following alternative water management strategies are recommended for NTMWD:

- Toledo Bend Reservoir Phase 2 (accelerated to occur before 2070)
- Lake O' the Pines
- Lake Texoma with desalination rather than blending
- Groundwater in Freestone/Anderson County Area (Forestar)
- George Parkhouse Reservoir (North)
- George Parkhouse Reservoir (South)
- Marvin Nichols Reservoir (328 msl)

Costs for the alternative strategies are shown in Table 5C.9.

Table 5C.7
Summary of Recommended Water Management Strategies for NTMWD

Planned Supplies (Ac-Ft/Yr)	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Projected Demands (including losses for Treatment & Delivery) (Table H.23)	**379,792**	**437,185**	**505,223**	**573,182**	**637,354**	**699,519**
Existing						
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 (with Ray Hubbard Pass through)	*47,802*	*62,977*	*75,524*	*87,291*	*97,655*	*100,890*
Upper Sabine Basin	50,707	10,629	10,550	10,472	10,394	10,315
Direct Reuse for Irrigation (Collin & Rockwall Co)	2,519	2,519	2,519	2,519	2,519	2,519
Total Available Supplies	***349,252***	***333,211***	***352,288***	***371,284***	***380,780***	***383,146***
Need (Demand-Supply)	***30,540***	***103,975***	***152,935***	***201,898***	***256,574***	***316,373***

Planned Supplies (Ac-Ft/Yr) **Water Management Strategies**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Conservation (Wholesale Customers)	8,044	12,805	15,816	18,955	22,305	25,933
Removal of Chapman Silt Barrier	3,620	3,523	3,426	3,329	3,232	3,135
Dredge Lake Lavon	7,959	7,735	7,399	7,062	6,726	6,390
Add'l measure to access full Lavon yield	14,461	13,505	12,661	11,818	10,974	10,130
Chapman Booster Pump Station						
Main Stem PS (additional East Fork wetlands) – TRA sources	53,088	37,913	25,366	13,599	3,235	0
Lower Bois d'Arc Creek Res.	16,815	120,200	120,200	118,000	115,800	113,600
Additional Lake Texoma - Blend with Lower Bois d'Arc water			39,571	39,333	38,600	37,867
Sulphur Basin Supplies					45,367	174,800
Additional Lake Texoma - Blend with Sulphur Basin Supplies					15,122	58,267
Toledo Bend Phase 1					100,000	100,000
Oklahoma						50,000
Infrastructure to Treat & Deliver to Customers:						
Fannin Co. Water Supply System	*56*	*912*	*2,436*	*4,666*	*8,466*	*12,760*
Treatment and Distribution (CIP)	*95,943*	*182,876*	*208,623*	*193,141*	*339,056*	*554,189*
Total Supplies from Strategies	**103,987**	**195,681**	**224,439**	**212,096**	**361,361**	**580,122**
Total Supplies	**453,239**	**528,892**	**576,728**	**583,380**	**742,141**	**963,268**
Reserve or (Shortage)	**73,447**	**91,706**	**71,505**	**10,198**	**104,787**	**263,749**
Management Supply Factor	**1.19**	**1.21**	**1.14**	**1.02**	**1.16**	**1.38**

Figure 5C.8
Recommended Water Management Strategies for North Texas Municipal Water District

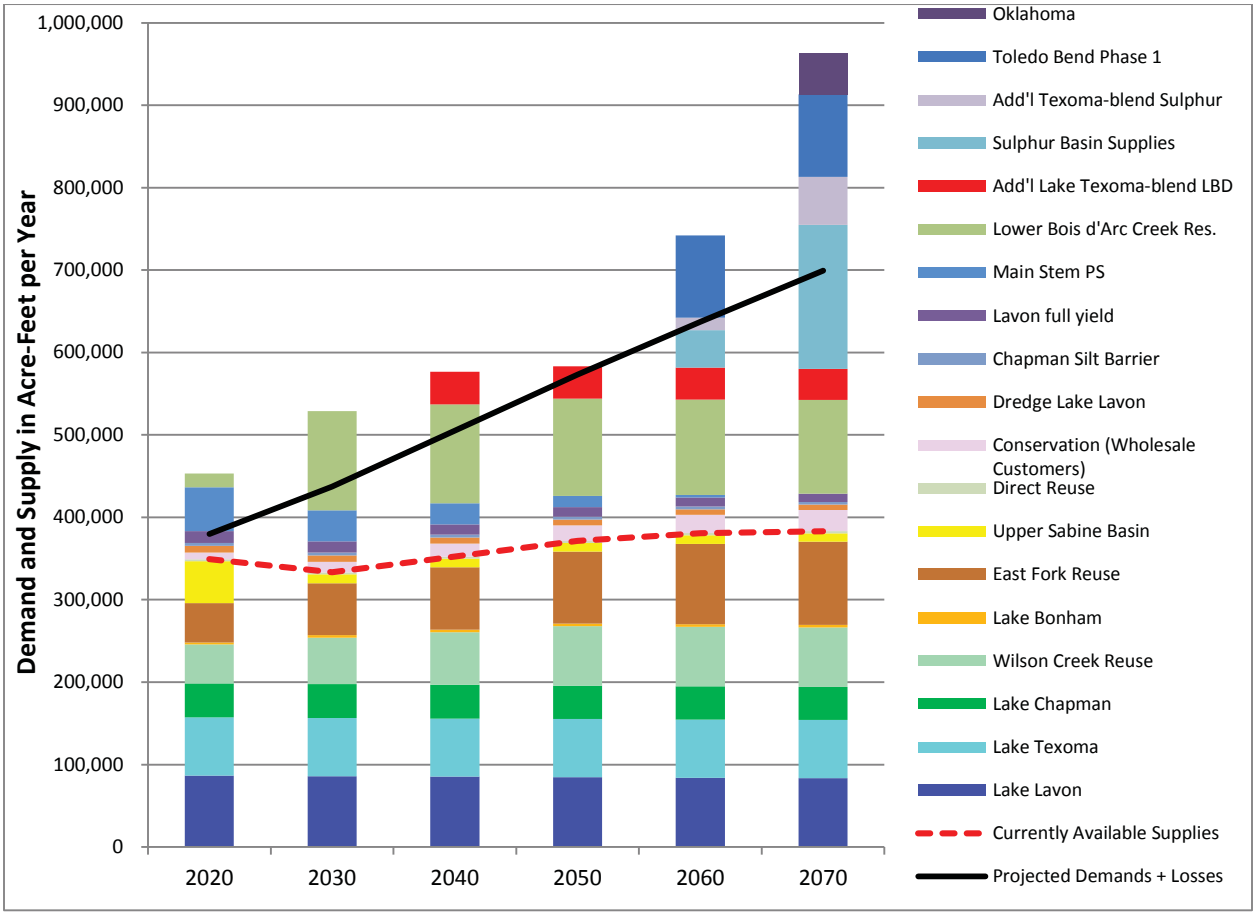


Figure 5C.9
North Texas Municipal's Water District's 2070 Additional Supply by Type (Acre-Feet per Year)

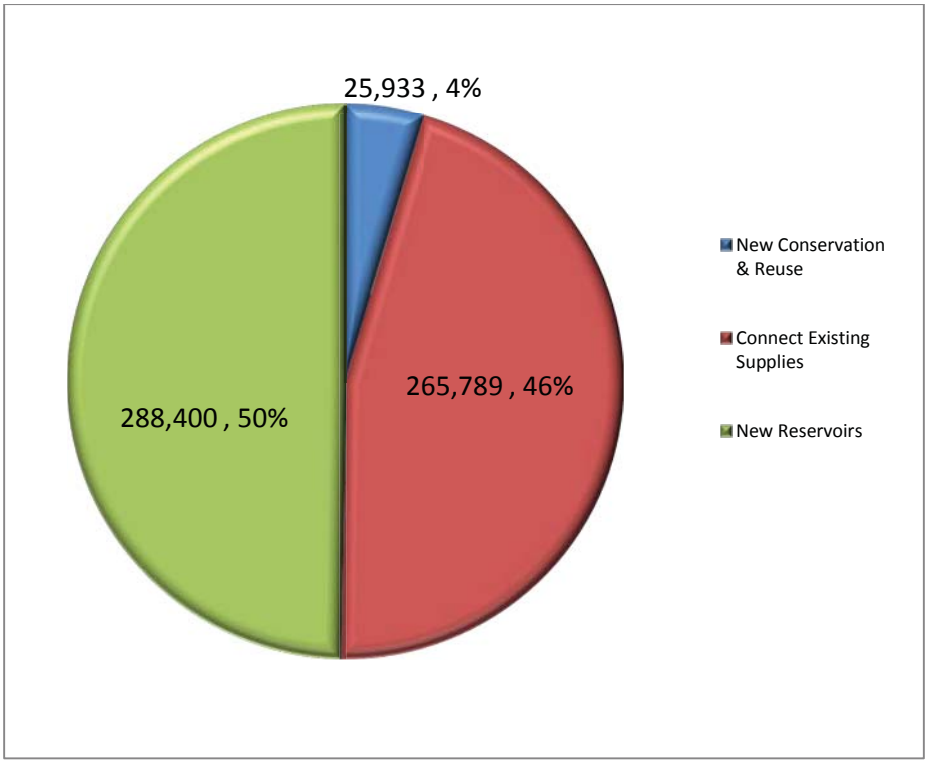


Table 5C.8
Summary of Costs for NTMWD Recommended Strategies

Strategy	Date to be Developed	Quantity for NTMWD (Ac-Ft/Yr)	NTMWD Share of Capital Costs	Unit Cost ($/1000 gal)		Table for Details
				With Debt Service	After Debt Service	
Conservation*	2020	25,933	Included under County Summaries in Section 5D.			
Removal of Chapman Silt Barrier	2020	3,620	$1,793,000	$0.06	NA	Q-19
Dredge Lake Lavon	2020	7,959	$1,967,000	$0.06	NA	Q-20
Add'l measure to access full Lavon yield	2020	14,461	$20,823,000	$0.63	$0.26	Q-21
Main Stem Trinity PS	2020	53,088	$71,743,000	$0.47	$0.14	Q-22
Lower Bois d'Arc Creek	2020	120,200	$625,610,000	$1.55	$0.22	Q-23
Lake Chapman Pump Station Expansion	2020		$25,638,000	NA	NA	Q-24
Add'l Lake Texoma-blending Lower Bois d'Arc	2040	39,571	$174,179,000	$1.59	$0.46	Q-25

Strategy	Date to be Developed	Quantity for NTMWD (Ac-Ft/Yr)	NTMWD Share of Capital Costs	Unit Cost ($/1000 gal)		Table for Details
				With Debt Service	After Debt Service	
Sulphur Basin Supplies	2060	174,800	$1,206,634,000	$2.18	$0.51	Q-18
Add'l Lake Texoma-blending Sulphur Basin water	2060	58,267	$347,596,000	$1.97	$0.44	Q-26
Toledo Bend Phase 1	2060	100,000	$1,248,461,000	$4.07	$0.95	Q-57
Oklahoma	2070	50,000	$167,541,000	$1.56	$0.70	Q-27
Fannin Co Water Supply System	2020	12,760	$45,753,900	$2.80	$1.88	Q-150
Treatment and Distribution Improvements	2020-2070	554,189	$4,270,988,000	$2.57	$0.59	Q-28
Total NTMWD Capital Costs			**$8,208,736,900**			

* NTMWD has no retail sales, so conservation savings are reflected in their customers' conservation savings. NTMWD has an extensive water conservation program, the costs for which are not reflected in this table.

Table 5C.9
Summary of Costs for NTMWD Alternative Strategies

Strategy	Quantity for NTMWD (Ac-Ft/Yr)	NTMWD Share of Capital Costs	Unit Cost ($/1000 gal)		Table for Details
			With Debt Service	After Debt Service	
Toledo Bend Reservoir Phase 2	100,000	$1,210,468,000	$4.01	$0.89	Q-15
Lake O' the Pines	87,900	$361,876,000	$1.66	$0.74	Q-29
Lake Texoma - Desalinate	39,235	$622,592,000	$7.20	$2.96	Q-30
Freestone/Anderson Co Groundwater (Forestar)	42,000	$230,043,000	$1.86	$0.45	Q-31
George Parkhouse Reservoir (North)	118,960	$729,557,000	$1.76	$0.35	Q-32
George Parkhouse Res. (South)	108,480	$857,396,000	$2.10	$0.34	Q-33
Marvin Nichols Reservoir	160,300	$1,042,498,000	$2.04	$0.52	Q-16