5.0 Evaluation and Selection of Water Management Strategies

The primary emphasis of the regional water supply planning process established by S.B. 1 is the identification of current and future water needs and the development of strategies for meeting those needs. This chapter presents the results of the evaluation of various water management strategies, a conceptual framework and overview of the water management strategies recommended for implementation within the North East Texas Region, and specific recommendations to meet specific water supply shortages.

5.1 TWDB Guidelines for Preparation of Regional Water Plans

By rule, the Texas Water Development Board (TWDB) has set forth specific requirements for the preparation of a regional water plan (31 Texas Administrative Code, Chapter 357). With regard to recommendations for meeting identified water supply needs, the regional water plans are to include:

- Specific recommendations for meeting near-term needs (2000-2030) in sufficient detail to allow the TWDB and the Texas Natural Resource Conservation Commission (TNRCC) to make financial assistance or regulatory decisions with regard to the consistency of the proposed action with an approved regional water plan.

- Recommendations or alternative scenarios for meeting long term needs (2030-2050).

It should be noted that TWDB rules provide that a regional water plan may also identify water needs for which no water management strategy is feasible, provided applicable strategies are evaluated and reasons are given as to why no strategies are determined to be feasible.

TWDB rules also specify that the regional water plans are to include the evaluation of all water management strategies the Regional Water Planning Group determined to be potentially feasible. Strategies to be considered may include:

- Municipal water conservation and drought response planning, including demand management
- Reuse of waste water;
- Expanded use or acquisition of existing supplies including systems optimization and conjunctive use of resources;
- Reallocation of reservoir storage to new uses;
- Voluntary redistribution of water resources including water marketing, regional water banks, sales, leases, options, subordination agreements, and financing arrangements;
- Enhancements of yields of existing sources;
- Control of naturally occurring chlorides;
- Interbasin transfers;
- New supply development including construction and improvement of surface water resources;
- Brush control, precipitation enhancement, and desalinization;
- Water supply that could be made available by cancellation of water rights based on data; provided by the Texas Natural Resource Conservation Commission;
- Aquifer storage and recovery.

According to TWDB rules, each of the potentially feasible water management strategies are to be evaluated by considering:

- The quantity, reliability, and cost of water delivered and treated for the end user's requirements;
- Environmental factors including effects on environmental water needs, wildlife habitat, and cultural resources;
- Impacts on other water resources of the state including other water management strategies and groundwater / surface water interrelationships;
- Impacts of water management strategies on threats to agricultural and natural resources;
- Any other factors deemed relevant by the regional water planning group including recreational impacts;
- Equitable comparison and consistent application of all water management strategies the regional water planning group determines to be potentially feasible for each water supply need;
- Consideration of the provisions in Texas Water Code, Section 11.085(k)(1) for interbasin transfers; and
- Consideration of third party social and economic impacts resulting from voluntary redistributions of water.

TWDB rules also require the RWPGs to "…provide water management strategies to be used during a drought-of-record" and, for each source of supply within a region, identify:

- Factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and
- Actions to be taken as part of the response.

The North East Texas Regional Water Planning Group approach to the evaluation of water management strategies focused on the estimated water supply yield, cost, and the anticipated environmental impact of each water management strategy. In accordance with TWDB guidelines, yield is the quantity of water that is available from a particular strategy under drought-of-record hydrologic conditions. The cost of implementing a strategy includes the estimated capital cost (including construction, engineering, legal, and other costs), the total annualized cost, and the unit cost expressed as dollars per acre-foot of yield. As indicated, cost estimates include the cost of water delivered and treated for end user requirements. Cost estimates were prepared in consideration of TWDB guidelines regarding interest rates, debt service, and other project costs (e.g., environmental studies, permitting, and mitigation). In addition to environmental considerations included in estimates of cost for each strategy, environmental impacts were considered and assessed at a reconnaissance level. A description of the cost estimating procedure is included in Appendix A.

In general, most of the projected water supply needs within the North East Texas Region are associated with relatively small municipal water users and water supply systems in the rural "county-other" water user groups. Overall, the recommended strategies for meeting these needs involve the development of additional groundwater supplies in areas where supply availability is not a constraint or the contractual acquisition of surface water supplies from existing sources. With the exception of proposed new reservoir projects (see Chapter 6), no major water supply development projects are recommended to meet needs within the region. As such, the mostly local solutions proposed for localized water supply problems will not adversely impact other water resources of the state, will not aggravate or increase threats to agricultural and natural resources (see Chapter 1), and will not result in adverse socio-economic impacts to third parties from voluntary redistribution of water (e.g., contractual water sales). Also, to the extent

that future interbasin transfers from the North East Texas Region to adjacent regions are contemplated in another region's water plan, it is primarily the responsibility of that region to fully consider the provisions of current state law relating to state authorization of interbasin transfers (Texas Water Code, Section 11.085(k)(1)).

5.2 Regional Summary

5.2 (a) Current and Projected Water Demands

Current and projected water demands within the North East Texas Region are presented in Chapter 2 of this plan. As indicated, moderate population growth is expected to continue through the 50 year planning period, with population increasing from approximately 687,000 at present to over 1 million in 2050. With population growth and continued urbanization, increases in municipal water demands are projected through the planning period. Table 5.1 below summarizes current and projected regional water demands for each of the six major water use categories.

Table 5.1 - Population and Water Demand Projections Summary for the North East Texas Regional Water Planning Area

Regional Total Projection	2000	2010	2020	2030	2040	2050
Population	687,105	757,522	821,294	887,167	952,818	1,017,477
Municipal Water Demand (ac-ft/yr)	118,802	124,561	128,928	135,498	141,548	149,108
Manufacturing Water Demand (ac-ft/yr)	355,258	385,363	390,601	392,864	409,173	427,613
Irrigation Water Demand (ac-ft/yr)	12,566	12,734	12,684	12,637	12,471	12,127
Steam Electric Water Demand (ac-ft/yr)	52,432	72,033	74,033	82,033	82,033	89,533
Mining Water Demand (ac-ft/yr)	10,365	24,191	23,470	22,964	21,923	10,220
Livestock Water Demand (ac-ft/yr)	29,671	29,899	29,951	30,006	29,714	29,273
TOTAL WATER DEMAND (ac-ft/yr)	**579,094**	**648,781**	**659,667**	**676,002**	**696,862**	**717,874**

It is important to note that while urban water demands are projected to increase significantly as a percentage of total regional water demand, manufacturing will remain the dominant water use in the region, accounting for roughly 61 percent of water demand at present and 60 percent of water demand in 2050. Clearly, the manufacturing sector will continue to be a vital component of the region's economy for the foreseeable future.

5.2 (b) Currently Available Water Supply

As discussed in Chapter 3 of this plan, surface water is the primary water source for the North East Texas Region, now and in the future. At present, the water supply from surface water supplies available to the region during drought-of-record hydrologic conditions is approximately 1.47 million ac-ft/yr. This represents more than 60 percent of the total amount of water presently available to the region from all sources (i.e., groundwater and other local sources).

In addition to the supply available from surface water, nearly 877,000 ac-ft./yr. of water supply, or 40 percent of the total water supply is estimated to be available from groundwater sources at present.

5.2 (c) Water Supply Needs

The comparison of projected water demands to estimates of available water supply (Chapter 4) reveals that the North East Texas Region has adequate water supplies for the foreseeable future with existing water resources. However, a user-by-user comparison of supply and demand reveals that 131 entities within the designated water user groups (WUGs) within the North East Texas Region are projected to experience shortages during the 50 year planning period.

Two of the 19 manufacturing "water user groups" in the North East Texas Region (Camp County and Gregg County) show shortages during the 50 year planning period. No shortages are projected for the irrigation, mining, and livestock categories of water use for any of the counties in the region.

Total shortages in all sectors are expected to reach 78,000 acre-ft/yr by the year 2050. Projected shortages within the municipal sector are widespread, with 12 designated municipal water user groups in the region showing shortages at some point during the 50 year planning period. Regionwide, there are two water shortages projected for the manufacturing sector, as discussed above, and the steam electric water user group in Upshur County is projected to need additional supply during the planning period.

5.2 (d) Recommended Water Management Strategies

The Regional Water Planning Group is required by TWDB rules to evaluate all water management strategies that are determined to be "potentially feasible." Strategies that are not applicable to the conditions or needs of the region can be considered infeasible and excluded from evaluation.

Most of the water supply shortages in the region are projected to occur in rural communities within the municipal "county other" water use category. There are also a few shortages projected to occur in the manufacturing and steam electric power generation categories, as discussed in the previous section. Within the municipal water use category, there are two types of shortages: 1) those that are due to expiration of an existing water supply contract and / or an insufficient contract amount; and 2) actual physical shortages of water where the demand for water is projected to exceed currently available water supplies. With few exceptions, the recommended strategy for addressing the "contractual" water shortages is for the individual water user to renew their contract and / or increase the amount of water that can be supplied under an existing contract. Each water user with a contractual water shortage was contacted and their concurrence with the recommended strategy was requested.

As indicated, most of the municipal water users identified with water supply shortages are small rural communities and rural water supply corporations within the "county other" water user group. Generally speaking, there are only four categories of options for meeting the needs of these water users as follows:

- Advanced Water Conservation
- Water Reuse
- Groundwater
- Surface Water

Presented below is the discussion of the potentially feasible water management strategies selected by the North East Texas RWPG within each option category. Each of the potentially feasible water management strategies listed below correspond with one more of those listed in the TWDB rules.

5.2 (e) Advanced Water Conservation

The adopted water demand projections for municipal water users includes a significant degree of reduction in future per capita water demand. Described as the "expected case" by the TWDB, the water conservation measures imbedded in the approved municipal water demand projections for the North East Texas Region include:

- Compliance with current state and federal plumbing fixture efficiency standards for new construction and fixture replacement;
- Continued implementation of water conservation educational programs;
- Continued implementation of state requirements to develop water conservation programs; and
- Current and expected future levels of effort in the areas of water distribution system leak detection and repair, commercial water conservation, and trends in home appliance water use efficiency.

An "advanced" water conservation scenario has also been evaluated for municipal water users in the North East Texas Region. This scenario, which was developed by the TWDB for the 1997 State Water Plan, includes implementation of all of the measures included in the expected case plus implementation of additional measures by local entities including:

- Accelerated replacement of older, less efficient plumbing fixtures through consumer incentive programs (e.g., rebates for toilet replacement, free low flow shower heads);
- Implementation of landscape irrigation ordinances to require use of low-water use landscaping and efficient irrigation technology;
- Intensified programs to promote water conservation in institutional and commercial establishments;
- Intensified programs to control distribution system water losses; and
- Implementation of conservation oriented water rate structures (e.g., increasing block rates, seasonal rates, excess use rates).

In addition, the advanced water conservation scenario would also involve additional action by the state of Texas, including mandatory implementation of water conservation programs by all municipal water users; a statewide water conservation education program with funding similar to that provided for the "Don't Mess with Texas" highway litter educational program; and requirements for labeling of clothes washers and dishwashers with consumer oriented water use and conservation information.

The North East Texas Regional Water Planning Group established a floor of 115 gallons/person/day in the approved water demand projections. As such, the advanced water conservation scenario was not considered as a strategy for any municipal water user with per capital use ratio below 115 gallons per capita per day.

5.2 (f) Water Reuse

This strategy includes the direct use of reclaimed water for nonpotable purposes (e.g., irrigation, industrial and steam electric cooling water). This strategy was considered applicable only to entities with a central waste water collection and treatment system.

5.2 (g) Groundwater

This strategy includes development of new supply (e.g., drilling additional wells), receipt of a contract supply from another provider, and consideration of advanced treatment scenarios (e.g., demineralization, removal of iron, manganese, or fluoride).

Due to the increasing costs to comply with more stringent regulations and decreasing reliability of groundwater as a future supply source due to quality issues within the region, this strategy was considered applicable only to entities with demands considered small with respect to the entire region. For example, a small, isolated water supply corporation with available groundwater wells and a relatively low demand is a likely candidate for this option.

It is recommended that groundwater supplied systems in the region combine resources and / or solicit future water supply from neighboring systems and / or major water providers in the region where possible. If feasible alternatives become available, such as system grouping or creation of a large surface water supply network, groundwater supply recommendations should be re-evaluated.

5.2 (h) Surface Water

This strategy includes receipt of contract supply from another provider (e.g., water purchase contracts), the development of new supply (e.g., new run-of-the-river diversions, new reservoirs, enhanced yields of existing sources), and consideration of interbasin transfers.

Other strategies listed in the TWDB rules and listed in Section 5.1 are not considered applicable in the North East Texas Region and were therefore not evaluated. For example, brush control and precipitation enhancement are approaches to increasing water supply that do not provide the degree of reliability during drought conditions that is required for municipal, manufacturing, and steam electric uses. Similarly, sea water desalinization, aquifer storage and recovery, water rights cancellations, control of naturally occurring chlorides, and reservoir storage reallocation are not considered to be applicable to the needs of water users in the North East Texas Region.

5.3 Recommended Water Management Strategies

In order to more accurately estimate the water needs in the North East Texas Region, the county other water user group in each of the 19 counties was divided into individual entities. The entities included water supply corporations, special utility districts, freshwater supply districts, unincorporated cities, cities not designated as water user groups by the TWDB, and self-supplied persons.

Senate Bill 1 requires future projects to be consistent with the regional water plans to be eligible for Texas Water Development Board (TWDB) funding and Texas Natural Resource Conservation Commission (TNRCC) permitting. The provision related to TNRCC is found in Texas Water Code §11.134. It provides that the Commission shall grant an application to appropriate surface water, including amendments, only if the proposed appropriation address a water supply need in a manner that is consistent with an approved regional water plan. TNRCC may waive this requirement if conditions warrant. For TWDB funding, Texas Water Code § 16.053(j) states that after January 5, 2002, TWDB may provide financial assistance to a water supply project only after the Board determines that the needs to be addressed by the project will be addressed in a manner that is consistent with that appropriate regional water plan. The TWDB may waive this provision if conditions warrant.

Regional Water Planning Groups (RWPG) recognizes that a wide variety of proposals could be brought before TNRCC and TWDB. For example, TNRCC considers water right applications for irrigation, hydroelectric power, and industrial purposes, in addition to water right applications for municipal purposes. It also considers other miscellaneous types of applications, such as navigation or recreation uses. Many of these applications are for small amounts of water, often less than 1,000 acre-feet per year. Some are temporary.

Small applications to the TNRCC of this nature are consistent with the North East Texas Regional Water Plan, when the surface water uses will not have a significant impact on the region's water even though not specifically recommended in the regional water plan.

TWDB receives applications for financial assistance for many types of water supply projects. Some involve repairing plants and pipelines and constructing new water towers. Water supply projects that do not involve the development of or connection to a new water supply is consistent with the regional water plan even though not specifically recommended in the regional water plan.

A total of 128 entities are projected to have a water shortage in either 2030 or 2050. Of these entities, 78 are contractual related shortages. The remaining 50 entities were actual projected shortages which require consideration of alternative water management strategies.

It should be noted that the cities of Lakeport and Liberty City in Gregg County are water user groups, in accordance with TWDB rules. However, the City of Lakeport is served by Elderville Water Supply Corporation, and the City of Liberty City is served by Liberty City Water Supply Corporation. Liberty City WSC and Elderville WSC are entities included in the county other WUG for Gregg County. In this report, these cities and their respective water supply corporation are considered as one distinct entity.

5.3 (a) Recommended Strategies for Entities with Contractual Shortages

Within the North East Texas Region, there are 78 municipal entities with contractual shortages. Fifty-seven of these shortages are due to expiration of a water supply contract or permit. As discussed in Chapter 4, there are three possible strategies to resolve these shortages. The first, and most common strategy is to renew the contract on or before its expiration date. This strategy is designated with an “E”, for “expiration.” There are some entities that require a renewal of their contract along with an increase in the contracted amount. This strategy is designated with an “EI”, for “expiration and inadequate contract amount.” The Liberty-Danville Freshwater Supply District No. 1 in Gregg County has a contract that is valid for perpetuity, but is inadequate in 2050. For this particular entity, the recommended strategy is to increase their contracted amount. This strategy is designated with an “EI*”. Each of the entities with a contractual shortage is shown in Table 5.2.

It should be noted a Water Supply Contract has been entered into between the City of Texarkana, Texas, and each of the “Member Cities”, being the Cities of Annona, Avery, DeKalb, Hooks, Maud, New Boston and Wake Village, Texas. These cities are members of the Lake Texarkana Water Supply Corporation. The Corporation is organized for the purpose of furnishing a water supply to towns, cities, private corporations, individuals and military camps and bases, and is authorized to obtain money for the purpose of financing the acquisition, construction and maintenance of its projects and improvements and to evidence the transaction by the issuance of bonds to secure the funds so obtained.

In the event that equitable contract renewal terms could not be reached between the parties, an alternative strategy would be for Lake Texarkana Water Supply Corporation to develop its own treatment facilities to supply the member cities. Raw water supply for this entity could be available from Lake Wright Patman and ultimately from the proposed Marvin Nichols Reservoir.

Table 5.2 – Recommended Strategies for Entities with Contractual Shortages

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Bowie County						
DeKalb	366	416			366	416
Hooks	484	528			484	528
Maud	149	157			149	157
Nash	324	341			324	341
New Boston	1,280	1,425			1,280	1,425
Redwater	461	628			461	628
Wake Village	743	781			743	781
Burns Redbank WSC	318	364			318	364
Central Bowie WSC	1,121	1,765			1,121	1,765
Macedonia-Eylau MUD #1	1,151	1,412			1,151	1,412
Oak Grove WSC	146	182			146	182
Camp County						
Cass County						
Atlanta	1,416	1,422			1,416	1,422
Queen City	58	92			58	92
Domino	65	85			65	85
Holly Springs WSC	250	322			250	322
Delta County						
Charleston WSC	131	123			131	123
Enloe-Lake Creek WSC	58	54			58	54
West Delta WSC	140	128			140	128
Franklin County						
Mount Vernon	707	780			707	780
Cypress Springs WSC		1,825				1,825
Pelican Bay (CSWSC)		75				75
Gregg County						
Clarksville City	150	161			150	161
Lakeport	119	127			119	127
White Oak	946	1,047			946	1,047
Warren City	49	61			49	61
Elderville WSC	593	767			593	767
Liberty-Danville FWSC 2		10				10
Tryon Road WSC	660	922			660	922
Harrison County						
Hallsville	288	310			288	310
Gum Springs WSC	906	1,161			906	1,161
Leigh WSC	110	131			110	131
Big Oaks Mobil Home Park	12	8			12	8
Cypress Valley WSC	30	76			30	76
Talley WSC	75	98			75	98
Hopkins County						
Brashear WSC	120	121			120	121
Brinker WSC	2	21			2	21

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Hopkins County (cont.)						
Gafford Chapel WSC	150	196			150	196
Martin Springs WSC	49	78			49	78
Miller Grove WSC	40	75			40	75
North Hopkins WSC	893	1,030			893	1,030
Pleasant Hill WSC 2	33	37			33	37
Shady Grove #2 WSC	84	94			84	94
Hunt County						
Caddo Mills	183	197			183	197
Commerce	2,132	2,504			2,132	2,504
Greenville	4,875	6,256			4,875	6,256
Lone Oak	97	113			97	113
Quinlan	256	276			256	276
West Tawakoni	244	275			244	275
Steam Electric	516	516			516	516
BHP WSC	301	317			301	317
Caddo Basin SUD		938				938
Cash WSC	1,419	1,558			1,419	1,558
Combined Consumers WSC	925	988			925	988
Community Water	88	81			88	81
Jacobia WSC	92	87			92	87
Maloy WSC	18	32			18	32
North Hunt WSC	298	375			298	375
Lamar County						
Blossom	241	248			241	248
Deport	124	127			124	127
Reno	656	707			656	707
Roxton	101	103			101	103
Lamar County WSD	2,122	2,289			2,122	2,289
M J C WSC	68	65			68	65
Pattonville WSC	43	43			43	43
Marion County						
Morris County						
Rains County						
East Tawakoni	138	160			138	160
Emory	278	329			278	329
Point	141	164			141	164
South Rains WSC	441	531			441	531
Red River County						
410 WSC	274	253			274	253
Annona	41	37			41	37
Avery	75	69			75	69
Red River County WSC	84	46			84	46
Smith County						
Titus County						
Winfield	116	134			116	134

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Titus County (cont.)						
Tri Water Supply Corp	1,730	1,935			1,730	1,935
Upshur County						
Van Zandt County						
Edgwood	156	199			156	199
Wills Point	740	867			740	867
Mac Bee WSC	929	1,053			929	1,053
South Tawakoni WSC	736	929			736	929
Wood County						
Winnsboro		699				699

5.3 (b) Recommended Strategies for Entities with Actual Shortages

There are 50 entities in the North East Texas Region with actual projected water supply shortages. Additional groundwater supply is recommended for 34 of these entities. Surface water supplies are recommended for the other 15 entities. Diana WSC in Upshur is recommended for both surface and groundwater. Although there are more individual entities with a recommendation for groundwater, surface water is the predominate recommended supply, accounting for approximately 80 percent of the total supply required. Table 5.3 summarizes these entities.

Table 5.3 – Recommended Strategies for Entities with Actual Shortages

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Bowie County						
Camp County						
Manufacturing	2,232	2,232	2,232	2,232		
Cass County						
Linden	106	126			136	176
Bloomburg WSC		20		62		
Delta County						
Ben Franklin WSC	29	27			29	29
Pecan Gap	9	6			38	38
Franklin County						
Gregg County						
Gladewater	281	429			1,679	1,679
Liberty City	311	461	376	470		
Manufacturing	12,671	17,746			12,671	17,746
West Gregg WSC	225	386	242	403		
Harrison County						
Waskom	13	47	44	88		
Blocker-Crossroads WSC	26	60	64	64		
Caddo Lake WSC	16	40	36	72		
Elysian Fields WSC		6		50		
Harleton WSC	178	303			239	309

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Harrison County (cont.)						
North Harrison WSC	26	62	67	67		
Waskom Rural WSC No.1	31	74	59	118		
West Harrison WSC	27	60	108	108		
Hopkins County						
Como	12	26	46	46		
Pickton WSC		12		41		
Shirley WSC	20	66	46	92		
Hunt County						
Wolfe City	43	74	80	80		
Tri-County Corp. WSC	22	9			38	38
Lamar County						
Petty WSC	18	17			18	17
Marion County						
Kellyville-Berea WSC	67	108			67	108
Pine Harbor Water System	6	43	108	108		
Shady Shores Water System	14	24	46	46		
Morris County						
Rains County						
Bright Star-Salem WSC	68	214			560	560
Red River County						
Detroit	44	46			106	106
Town of English	3				7	7
Smith County						
Enchanted Lakes Water Co.	64	102	62	62		
Lindale Rural WSC	366	819	591	1,182		
Star Mountain WSC	237	344	323	323		
Titus County						
Upshur County						
East Mountain	140	174	187	187		
Steam Electric	5,601	5,601			5,601	5,601
Diana WSC	162	299	71	71	248	248
Harmony ISD	44	66	48	73		
Pritchett WSC	382	529			532	532
Union Grove WSC	58	106	84	167		
Van Zandt County						
Canton	73	221	108	216		
Grand Saline	163	294	323	323		
Van	99	220	269	269		
Ben Wheeler WSC	23	50	134	134		
Corinth WSC	36	82	108	108		
Crooked Creek WSC	33	70	108	108		
Edom WSC	86	140	46	92		
Fruitvale WSC	242	400	269	430		

	Shortage (ac-ft/yr)		Groundwater Strategy (ac-ft/yr)		Surface Water Strategy (ac-ft/yr)	
Year	**2030**	**2050**	**2030**	**2050**	**2030**	**2050**
Van Zandt County (cont.)						
Little Hope-Moore WSC	179	265			145	145
Wood County						
Mineola	125	276	323	323		
Fouke WSC		27		108		
Lake Fork WSC	253	410	430	430		
TOTALS (all counties)	**24,864**	**33,219**	**7,038**	**8,753**	**22,114**	**27,339**

The development of water wells generally has minimal environmental impact, because of the limited disturbance, and the limited disturbance tends to be temporary. Generally environmental issues can be easily avoided in the siting of new wells. Similarly, the water management strategies that utilize surface water that require the transmission of treated water as opposed to new facilities or the discharge of any material, typically have minimal environmental impact because the disturbances with water mains are also temporary or can be avoided in the routing of the water transmission pipelines. The development of treatment facilities may have greater environmental impact. All of these strategies should avoid, minimize, or mitigate the environmental impacts during project development.

Back-up information on the evaluation of water management strategies for each entity with projected shortages can be found in Appendix A.

5.3 (c) Bowie County

There are no entities with actual shortages in Bowie County.

5.3 (d) Camp County

- **Manufacturing**

Description / Discussion of Needs

Manufacturing in Camp County is projected to have a water supply shortage within the planning period. This projected shortage is related to a proposed poultry processing facility being constructed on Walker Creek east of U.S. Highway 271 between Pittsburg and Mount Pleasant. The facility is being developed by Pilgrim's Pride Corporation and is projected to need 2,232 ac-ft/yr of supply by 2010.

Recommendations

The Pilgrim's Pride facility is not in production at this time and it will be the responsibility of the company to locate an acceptable water source or sources. Sources that are being considered by the company include groundwater from the Carrizo-Wilcox formation, purchase of treated water from area municipal and rural water systems, and surface water purchased from existing water rights holders. Additionally, the plant design will emphasize water reuse and conservation techniques to minimize the need for new water sources.

5.3 (e) Cass County

- **Bloomburg WSC**

Description / Discussion of Needs

Bloomburg WSC, which is included in the County Other for Cass County, provides water service in the northeastern portion of Cass County. The system is not bounded by any immediate water supply corporations or other entities, but is bounded on the east by the State of Arkansas. In 1998 the WSC served approximately 225 connections. The WSC currently serves a population of approximately 543 persons, and is projected to grow to 1,343 persons by the year 2050. The system relies on two wells with a total rated capacity of 230 GPM, or 123 ac-ft/yr. The system currently has a leak detection program in place for water conservation. BWSC does not have either a water conservation plan or a drought management plan. The BWSC is projected to have a water supply surplus of 5 ac-ft/yr in 2030 and a deficit of 20 ac-ft/yr by 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for Bloomburg WSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the Bloomburg service area does not have a centralized waste water collection system. Surface water alternatives were not considered as there is no surface water supply source within close proximity to the area and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

Additional groundwater is the recommended strategy that is cost effective and reliable for Bloomburg WSC to meet their projected deficit in the year 2040. One additional well with a rated capacity of 115 GPM would provide approximately 62 ac-ft/yr. The strategy would require drilling an additional water well similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Cass County. The Carrizo-Wilcox Aquifer in Cass County is projected to have an ample supply availability for Bloomburg WSC.

- **City of Linden**

Description / Discussion of Needs

The City of Linden is located in central Cass County. The system is bounded on all sides by the Western Cass WSC certificate of convenience and necessity area. The Western Cass WSC is currently under construction. In 1998, the city served 992 connections. The city is projected to grow from a current population of 2,465 persons in 2000 to 3,317 persons by the year 2050. The city relies on groundwater from four water wells, which produce a cumulative total of approximately 430 GPM, or 231 ac-ft/yr. The city does not have either a water conservation plan or a drought management plan. The City of Linden is projected to have a water supply deficit of 95 ac-ft/yr beginning in 2000 and increasing to a deficit of 176 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita ratio do not exceed the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Although the City of Linden has a centralized waste water collection system, water reuse was not considered because Linden does not have a suitable user of non-potable water. Groundwater was not considered, as the City of Linden has been experiencing steady decrease in the quantity of water from their existing wells. Surface water was considered, as the Northeast Texas Municipal Water District has recently entered into an agreement with the city to provide treated water.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Linden to meet their projected deficits would be to continue their efforts to acquire treated water from the Northeast Texas Municipal Water District. The City of Linden has recently entered into contract with the Northeast Texas Municipal Water District to purchase treated water at a maximum of 800,000 GPD, or 896 ac-ft/yr on an annualized basis. The Northeast Texas Municipal Water District has a water supply line approximately 14 miles from the City of Linden. The City intends to construct a pipe line to connect the source to the City. The City of Linden plans to augment their existing well production with the purchased surface water, gradually increasing the water purchased as their existing wells continue to deteriorate in production. The recommended water supply source, Lake O' The Pines, has an ample supply to meet the needs of the City of Linden.

5.3 (f) Delta County

- **Ben Franklin WSC**

Description / Discussion of Needs

Ben Franklin WSC, which is within the County Other area in Delta County, is a small public water supply located in northern Delta County. In 1998, Ben Franklin served 91 connections. The system currently serves 241 people and is not projected to grow over the planning period. The current source of supply is a single well into the Trinity Aquifer. Ben Franklin WSC provides water to its own customers and also has a supply contract with the Enloe-Lake Creek WSC. Enloe-Lake Creek is projected to have growth over the planning period. Once contract demands are met, Ben Franklin will not have adequate supply to meet its own needs. In addition, the WSC's well does not meet TNRCC secondary water quality standards and is expected to fail sometime after 2020. The system does not have either a water conservation plan or a drought management plan. BFWSC is projected to have a water supply deficit of 9 ac-ft/yr beginning in 2000 and increasing to a deficit of 27 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. There are no current water needs in Ben Franklin that could be met by water reuse. Finally, groundwater is not sufficient or of appropriate quality, as noted above. Conversion to surface water by contracting or merging with Delta County MUD was the alternative selected for evaluation for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for Ben Franklin WSC is to enter into a contract for treated surface water from Delta County MUD. The MUD has adequate supply available and has an expansion project underway which could deliver water to the Ben Franklin area by 2005. Since Delta County MUD already has water available, and since there would be no significant construction, environmental impact would be negligible.

An alternate strategy would be to treat the existing groundwater to meet TNRCC standards. This presumes that the Enloe/Lake Creek need will be met by connection to Delta County MUD, leaving Ben Franklin's well adequate to supply its own needs. Treatment will be required to reduce iron, fluoride, and dissolved solids. Disposal of the waste stream plus technological complexity render this alternative problematic.

- **City of Pecan Gap**

Description / Discussion of Needs

The City of Pecan Gap is located in northwestern Delta County, and is situated in the Sulphur River Basin. In 1998, Pecan Gap served 109 connections. The system currently serves 286 people, and is expected to remain at that population until the year 2050. Pecan Gap is supplied from a city lake and surface water treatment plant. Pecan Gap also supplies water to the Lone Star WSC. Lone Star is not projected to grow during the planning period. The supply is deficient because the firm yield of Lyndsay Lake, the city's reservoir, is insufficient. The system does not have a water conservation plan or a drought management plan. The City of Pecan Gap is projected to have a water supply deficit of 15 ac-ft/yr in 2000.

Evaluated Strategies

Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. There are no current water needs which could be met by water reuse. Groundwater quality in the area around Pecan Gap does not meet TNRCC secondary quality standards. Therefore, a water purchase contract with the Delta County MUD was the alternative selected for this entity. There are no other systems in the immediate area with sufficient capacity to supply Pecan Gap.

Recommendations

The recommended strategy that is cost effective and reliable for Pecan Gap is to contract with Delta County MUD for purchase of water from Big Creek Lake. These entities are already in negotiation, and are both agreeable to this strategy. Funding has been offered through the USDA – Rural Development, and that agency has issued a finding of "no significant impact" on the environment. The MUD has adequate supply in the Big Creek Reservoir. Because the entities involved have agreed to this proposed solution, no further alternatives were analyzed.

5.3 (g) Franklin County

There are no entities with actual shortages in Franklin County.

5.3 (h) Gregg County

- **City of Gladewater**

Description / Discussion of Needs

The City of Gladewater is located along the Gregg / Upshur county line, near the eastern border of Smith County. The city provides water service to city residents in both Upshur and Gregg Counties. In 1998, the city served 2,720 connections. The population is projected to increase from 6,896 persons in 2000 to 9,987 persons in 2050. The city is currently contractually obligated to serve three other entities; Clarksville City, Warren City, and Starrville-Friendship WSC. Of these entities, only Starrville-Friendship has a secondary water supply source to complement Gladewater's supply. The city relies on surface water from Lake Gladewater, which is owned and operated by the City. The city is currently permitted by the TNRCC to withdraw 1,679 ac-ft/yr. The city has a water conservation plan in place, which includes universal metering and education and information. The city does not have a drought contingency plan. The system is bounded on the east by the City of Warren City and the City of White Oak; the south by the Sabine River; the west by Starrville-Friendship WSC, and on the north by Pritchett and Union Grove Water Supply Corporations. The City of Gladewater is projected to have a water supply deficit of 157 ac-ft/yr beginning in 2000 and increasing to a deficit of 429 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was considered as a strategy because the per capita use per day exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because there are no non-potable water users large within reasonable proximity to wastewater treatment facilities. Surface water was considered, as the city's primary source is surface water from Lake Gladewater.

Recommendations

The City of Gladewater is requesting a water permit amendment to expand to 3,358 ac-ft/yr. The recommended strategy that is cost effective and reliable for the city to meet their projected needs is to continue the permit amendment process and upgrade their water treatment facilities as necessary to expand their treatment capabilities to meet demands. The recommended supply source, Lake Gladewater, with an estimated firm yield of 6,900 ac-ft/yr, has ample supply to provide for the further needs of the City of Gladewater.

- **Manufacturing in Gregg County**

Description / Discussion of Needs

Manufacturing water demand in Gregg County is projected to increase from a current demand of 16,538 ac-ft/yr in 2000 to 29,716 ac-ft/yr in 2050. The projected demand is largely a result of expected industrial growth in and near the City of Longview. Manufacturing in Gregg County relies on four primary supply sources: the Carrizo-Wilcox Aquifer, direct reuse, local supply sources, and the City of Longview water system. The manufacturing WUG in Gregg County is projected to have a water supply deficit of 10,717 ac-ft/yr beginning in 2000 and increasing to a deficit of 17,746 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because it is not applicable to manufacturing. Water reuse was not considered because there would be no net change in demand required by an entity if reuse were implemented, and the entities are projected entities only, and cannot be construed to benefit from reuse. Groundwater was not considered due to questionable reliability and the large quantity required for manufacturing. Surface water was considered, as the City of Longview has available supply from surface water sources in its water system.

Recommendations

The recommended strategy that is cost effective and reliable for the Gregg County manufacturing WUG to meet projected demands during the planning period is to purchase raw or treated water from the City of Longview. The City of Longview has an ample supply of water to meet the needs of manufacturing in Gregg County.

- **Liberty City WSC (including the City of Liberty City)**

Description / Discussion of Needs

Liberty City WSC provides water service in the rural southern portion of Gregg County. In 1998, the WSC served 1,495 connections. The population is projected to increase from 3,600 persons in 2000 to 6,639 persons in 2050. The City of Liberty City is served by the WSC, and in 1998, approximately 2,778 persons of the total population lived within the city limits of Liberty City. The system is bounded on the north by Prairie Creek and the Sabine River; the east by SH 31; the south by Liberty-Danville FWSD #1 and West Gregg WSC; and on the west by the Smith County line. The system currently relies on five wells with a total rated capacity of 860 GPM, or 462 ac-ft/yr. The system currently has a leak detection program for water conservation. LCWSC does not have either a water conservation plan or a drought management plan. Liberty City WSC is projected to have a water supply deficit of 134.2 ac-ft/yr beginning in 2000 and increasing to a deficit of 461.2 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was not considered for the County Other portion of LCWSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. However, advanced water conservation was considered for the city portion. Water reuse was not considered because the Liberty City area does not have a centralized waste water collection system. Surface water alternatives were also not considered since no supply source is within close proximity to the area, and surface water treatment is generally not economically feasible for a system of this size. LCWSC has purchased water from the City of Kilgore in the recent past, so a purchase agreement alternative was considered.

Recommendations

Liberty City WSC is currently completing plans to construct an additional water well (June, 2000). The recommended strategy that is cost effective and reliable for LCWSC to meet their projected deficits would be to complete construction of this water well, and construct four additional water wells similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Gregg County which is projected to have an ample supply available for Liberty City WSC. A total of five additional wells with a rated capacity of 175 GPM each would provide approximately 470 additional ac-ft/yr. The wells should be constructed in the decades when the deficits are projected to occur. Due to

the high unit cost of purchasing water from the City of Kilgore, the purchase agreement option is not recommended. Due to the high unit cost of implementing water conservation, advanced water conservation is not recommended.

- **West Gregg WSC**

Description / Discussion of Needs

West Gregg WSC provides water service in the rural southwestern corner of Gregg County, a portion of eastern Smith County, and a small portion of Rusk County. The system is bounded on the north by Liberty City WSC; the east by Liberty-Danville FWSD #1; the south by the City of Kilgore, and the west by the Browning community in Smith County. Approximately 3 percent of the system is outside of the North East Texas Region. In 1997, the system served approximately 1,223 connections. The population is projected to increase from 2,291 persons in 2000 to 5,764 persons in 2050. The WSC is included in the County Other WUG for Gregg and Smith County. The system relies on five wells with a total rated capacity of 640 GPM, or 344.1 ac-ft/yr. Approximately 10.3 ac-ft of this capacity is allocated to users outside of Region D. The system currently has a water conservation plan and a leak detection program. WGWSC has a water conservation plan but does not have a drought management plan. West Gregg WSC is projected to have a water supply deficit of 0.2 ac-ft/yr beginning in 2000 and increasing to a deficit of 385 ac-ft/yr in 2050.

Evaluated Strategies

Advanced water conservation was considered because the per capita use rate exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the West Gregg WSC service area does not have a centralized waste water collection system. Surface water alternatives were also not considered since no supply source is within close proximity to the area and surface water treatment is not economically feasible for a system of this size. A 10 year master plan was recently completed for this system and the supply improvements specified in that plan were considered.

Recommendations

The recommended strategy that is cost effective and reliable for West Gregg WSC to meet their projected deficits would be to construct five additional water wells similar to their existing wells. The recommended supply source for the wells would be the Carrizo-Wilcox Aquifer in Gregg County, which is projected to have an ample supply availability for WGWSC. A total of five additional wells at 150 GPM each would provide approximately 403 additional ac-ft/yr. The wells should be constructed in the decades when the deficits are projected to occur. Advanced water conservation is not recommended for WGWSC due to the higher unit cost, as compared to the groundwater strategy. Given the increasing costs to comply with more stringent regulations and decreasing reliability of groundwater as a future supply source due to quality issues in this region, it is recommended that groundwater supply systems consider combining resources and/or soliciting future water supply from neighboring systems and/or major water providers in the region. If a feasible alternative becomes available, then the recommendations previously discussed should be re-evaluated.

5.3 (i) Harrison County

- **Blocker-Crossroads WSC**

Description / Discussion of Needs

Blocker-Crossroads WSC is located in southeastern Harrison County and serves an area east of US Hwy 59 and South of Interstate Highway 20. The system is bound on the west by Gill WSC, on the north by the City of Scottsville, on the east by Waskom Rural WSC No. 1, and on the south by Elysian Fields WSC. In 1999 the system had 330 members. The population is projected to increase from 677 persons in 2000 to 1677 persons in 2050. The BCWSC is included in the County Other water user group for Harrison County. The system's current water supply consists of two water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 240 GPM which equates to 128 ac-ft/yr on an annual average basis. BCWSC does not have either a water conservation plan or a drought management plan. Blocker-Crossroads WSC is projected to have a water supply deficit of 7 ac-ft/yr in 2020 increasing to a deficit of 60 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was omitted from consideration because the per capita use rate was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted from consideration because the BCWSC does not have a centralized sewerage collection system. Surface water alternatives were also not considered since there is not a supply source within close proximity to the BCWSC and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Blocker-Crossroads WSC to meet their projected water needs is to construct one additional water well similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. A well with rated capacity of 120 gpm would provide approximately 64 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of BCWSC for the planning period.

- **Caddo Lake WSC**

Description / Discussion of Needs

Caddo Lake WSC is located in northeastern Harrison County and serves the community of Uncertain east of Karnack and west of Caddo Lake. The system is bound on the west by Karnack WSC, on the north by the Big Cypress Bayou, on the east by Caddo Lake, and on the south by the Longhorn Army Ammunition Plant. In 1999 the system had 397 members. The population is projected to increase from 838 persons in 2000 to 1638 persons in 2050. The CLWSC is included in the County Other water user group for Harrison County. The system's current water supply consist of four water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these four wells is 267 GPM, which equates to 144 ac-ft/year on an annual average basis. The CLWSC does not have either a water conservation plan or a drought management plan. Caddo Lake WSC is projected to have a water supply deficit of 2.0 ac-ft/yr in 2020 and increasing to a deficit of 40 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted from consideration because the CLWSC does not have a centralized sewerage collection system. Surface water alternatives were also not considered since there is not a supply source within close proximity to the CLWSC and surface water treatment is not generally economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Caddo Lake WSC to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source is the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 67 gpm each would provide approximately 36 ac-ft each or 72 ac-ft total on an annualized basis. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of CLWSC for the planning period.

- **City of Waskom**

Description / Discussion of Needs

The City of Waskom is located in southeastern Harrison County and serves the incorporated city limits and an area immediately north, east, and south of the City of Waskom. The system is bound on the east, south, and west by the Waskom Rural WSC No.1 In 1999 the system had 876 connections. The population is projected to increase from 2,301 persons in 2000 to 3,292 persons in 2050. The city is included in the County Other WUG for Harrison County. The system's current water supply consists of eight water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 654 GPM, or 352 ac-ft/yr. The City does not have a water conservation plan. The City of Waskom is projected to have a water supply deficit of 2 ac-ft/yr in 2020 and increasing to a deficit of 47 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the City does not have a large user of nonpotable water. Surface water alternatives were not considered since there is not a supply source within close proximity to the City and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Waskom to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 82 gpm each would provide approximately 44 ac-ft each or 88 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of the City of Waskom for the planning period.

- **Elysian Fields WSC**

Description / Discussion of Needs

Elysian Fields WSC is located in southeastern Harrison County (90 percent Region D) and northeastern Panola County (10 percent Region I). The service area is located along State Highway 31 and in the Elysian Fields Community. The system is bounded on the west by Gill WSC, on the north by Blocker-Crossroads WSC, on the east by Waskom Rural WSC No.1, and on the south by Rock Hill WSC. In 1999 the system had 214 members. The population is projected to increase from 452 persons in 2000 to 852 persons in 2050. The EFWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of two water wells, which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 185 GPM, which equates to 100 ac-ft/yr. The supply is distributed proportionately between the two counties for this evaluation. EFWSC does not have a water conservation plan or a drought contingency plan. Elysian Fields WSC is projected to have a water supply surplus of 5 ac-ft/yr in 2030 and a deficit of 6 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the EFWSC does not have a centralized sewerage collection system. Surface water alternatives also were not considered since there is not a supply source within close proximity to the EFWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Elysian Fields WSC to meet their projected water needs would be to construct one additional water well similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. A well with rated capacity of 90 gpm would provide approximately 50 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of EFWSC for the planning period.

- **Harleton WSC**

Description / Discussion of Needs

Harleton WSC is located in northwestern Harrison County and southwestern Marion County and serves an area around the communities of Harleton, Smyrna, Lake Deerwood, and Jackson. The system is bounded on the west by Diana WSC, on the north by Lake O' the Pines, and on the south by Little Cypress Creek. In 1999 the system had 867 members with 87 percent in Harrison County and 13 percent in Marion County. The population is projected to increase from 1,808 persons in 2000 to 5,408 persons in 2050. The HWSC is included in the County Other WUG for Harrison and Marion Counties. The system's current water supply consists of five water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 557 GPM, or 299 ac-ft/yr. HWSC does not have either a water conservation plan or a drought contingency plan. Harleton WSC is projected to have a water supply deficit of 27.7 ac-ft/yr in 2010 and increasing to a deficit of 302.7 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the HWSC does not have a centralized sewerage collection system. One surface water alternative was evaluated, which involves purchasing treated water from the Northeast Texas Municipal Water District near Jefferson. A groundwater strategy was evaluated that assumes HWSC can construct water wells of adequate quantity and quality for domestic use. HWSC has had difficulty in the past developing acceptable wells due to poor quality groundwater. The HWSC recently received funding assistance from USDA Rural Utility Services to expand their service area and connect to the NETMWD near Jefferson.

Recommendations

The recommended strategy that is cost effective and reliable for the Harleton WSC to meet their water needs is to construct a treated water main and related facilities to purchase surface water from the Northeast Texas Municipal Water District. The recommended supply source will be Lake O' The Pines in Marion County. NETMWD would initially provide approximately 168 ac-ft/yr and ultimately could provide 309 ac-ft/yr to the HWSC. Lake O' The Pines in Marion County is projected to have a supply available to meet the short term needs of HWSC for the planning period.

- **North Harrison WSC**

Description / Discussion of Needs

North Harrison WSC is located in north central Harrison County and serves an area along US Highway 59 around the community of Woodlawn. The system is bound on the west by the Cypress Valley WSC, on the north and east by a proposed expansion project by Harleton WSC, and on the south by Leigh WSC. In 1999 the system had 330 members. The population is projected to increase from 696 persons in 2000 to 1,746 persons in 2050. The NHWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of two water wells, which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 250 GPM, which equates to 134 ac-ft/yr. NHWSC does not have either a water conservation plan or a drought contingency plan. North Harrison WSC is projected to have a water supply deficit of 6 ac-ft/yr in 2020 and increasing to a deficit of 62 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the NHWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since no supply source is within close proximity to the NHWSC and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the North Harrison WSC to meet their water needs is to construct one additional water well similar to their existing wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. One well with rated capacity of 125 gpm would provide approximately 67 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is

projected to have a more than ample supply availability to meet the needs of NHWSC for the planning period.

- **Waskom Rural WSC No.1**

Description / Discussion of Needs

Waskom Rural WSC No.1 is located in southeastern Harrison County and serves an area east, south, and west of the City of Waskom. The system is bound on the west by the City of Scottsville, on the east by the State of Louisiana, and on the south by De Berry WSC. In 1999 the system had 240 members. The population is projected to increase from 506 persons in 2000 to 1,706 persons in 2050. The WRWSC No.1 is included in the County Other WUG for Harrison County. The system's current water supply consist of two water wells which provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these two wells is 220 GPM, which equates to 118 ac-ft/yr. WRWSC No.1 does not have either a water conservation plan or a drought contingency plan. The Waskom Rural WSC No.1 is projected to have a water supply deficit of 7 ac-ft/yr in 2020 and increasing to a deficit of 74 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the planning group. Water reuse was not considered because the WRWSC No.1 does not have a centralized sewerage collection system. Surface water alternatives were omitted since no supply source is within close proximity to the WRWSC No.1 and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Waskom Rural WSC No.1 to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to the decade in which the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. Two wells with rated capacity of 110 gpm each would provide approximately 59 ac-ft each or 118 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of WRWSC No.1 for the planning period.

- **West Harrison WSC**

Description / Discussion of Needs

West Harrison WSC is located in western Harrison County and serves an area on the north, east, and south side of the City of Hallsville. The system is bound on the west by the City of Hallsville and Gum Springs WSC, on the north and east by Talley WSC, and on the south by the Sabine River. In 1999 the system had 397 members. The population is projected to increase from 922 persons in 2000 to 1,972 persons in 2050. The WHWSC is included in the County Other WUG for Harrison County. The system's current water supply consists of three water wells from the Queen City and Carrizo-Wilcox Aquifers. The total rated capacity of these three wells is 300 GPM, or 161 ac-ft/yr. WHWSC does not have either a water conservation plan or a drought contingency plan. West Harrison WSC is projected to have a water supply deficit of 7 ac-ft/yr in 2020 and increasing to a deficit of 60 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered because the per capita use rate is below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the WHWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since no supply source is within close proximity to the WHWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the West Harrison WSC to meet their water needs is to construct one additional water well similar to their largest existing well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Harrison County. One well with rated capacity of 200 gpm would provide approximately 108 ac-ft/yr. The Carrizo-Wilcox Aquifer in Harrison County is projected to have a more than ample supply availability to meet the needs of WHWSC for the planning period.

5.3 (j) Hopkins County

- **City of Como**

Description / Discussion of Needs

The City of Como is located in southeast Hopkins County, and is situated in both the Sabine and Sulphur river basins. It is surrounded by multiple WSCs. Como served 261 connections in 1998. The City's estimated population is 643 people, which is projected to increase to 992 by the year 2050. Como's current source of supply comes from two wells in the Carrizo-Wilcox formation. Water quality meets current TNRCC standards, however the quantity is not sufficient to meet demands. The system does not have either a water conservation plan or a drought contingency plan. The City of Como is projected to have a water supply deficit of 2 ac-ft/yr beginning in 2010 and increasing to a deficit of 26 ac-ft-/yr in 2050.

Evaluated Strategies

There are no current water needs which could be met by water reuse. Advanced municipal conservation is not applicable since per capita use would be less than 115 gallons per capita per day. Finally, connection with a surface water supply source was evaluated (City of Sulphur Springs) and would prove significantly more costly than continued reliance on groundwater. Drilling an additional well was the alternative selected for this entity. The average production capacity of Como's current wells is 95 GPM, which can be projected to yield 46 ac-ft/yr under drought-of-record conditions. One additional well would be sufficient to meet projected demands.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Como is to drill an additional well by the year 2010 into the Carrizo-Wilcox Aquifer. An additional well with a yield of 46 ac-ft/yr would be sufficient to supply the 26 ac-ft/yr deficit. Currently, groundwater quality meets TNRCC standards and the groundwater supply is adequate in this area. Environmental impact would be minimal, and primarily related to any pipeline required to connect the new well to the system.

Como is located approximately eight miles from the City of Sulphur Springs, a major water provider in the North East Texas Region. In the event that groundwater is not available, or should other factors dictate, it is recommended that Como consider soliciting future supply from Sulphur Springs. Sulphur Springs has adequate supply to meet the system's needs.

- **Pickton WSC**

Description / Discussion of Needs

The Pickton WSC is located in Hopkins County, along S.H. 11. It is surrounded by several WSCs serving Hopkins and Wood Counties. In 1998, Pickton served 208 connections. The estimated population served in the year 2000 is 503 and it is projected to increase to 776 persons by the year 2050. Pickton's current source of supply consists of two wells in the Carrizo-Wilcox formation. The rated capacity of these wells is 93 GPM under drought of record conditions, which equates to 98 ac-ft/yr on an annual average basis. Water quality from these wells is in compliance with TNRCC standards, however quantity will not prove sufficient to meet projected demands. The WSC does not have either a water conservation plan or a drought contingency plan. The PWSC is projected to have a water supply surplus of 5 ac-ft/yr in 2020 and a deficit of 12 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal conservation was not considered applicable since per capita use is less than the 115 gallons per capita per day set by the Regional Water Planning Group. Water reuse was not considered applicable since the WSC does not have a wastewater collection or treatment system in place. A surface supply option of connection to the City of Sulphur Springs was considered. Continued use of groundwater is the preferred option.

Recommendations

The recommended strategy that is cost effective and reliable for the Pickton WSC would be to drill one additional well into the Carrizo-Wilcox formation, at a depth of about 500 feet. Environmental impacts are considered minimal, and this aquifer can adequately supply the increase in demand. Purchase of treated surface water from the City of Sulphur Springs would also be feasible, but does not appear cost-effective as long as an adequate quality and quantity of groundwater is available.

- **Shirley WSC**

Description / Discussion of Needs

The Shirley WSC is located in the southwest corner of Hopkins County and the northeast corner of Rains County. It is situated in the Sabine River Basin. Shirley is bound on the west by Miller Grove WSC, and on the east by various small WSCs. In 1998, Shirley served 609 connections. The estimated population in the year 2000 is 1,394, and is projected to grow to 2,290 by the year 2050. Shirley's current water supply comes from seven wells in the Carrizo-Wilcox Aquifer. Water quality meets current TNRCC standards; however, the quantity will not be sufficient to meet projected demands. The system does not have either a water conservation plan or a drought contingency plan. The SWSC is projected to have a water supply deficit of 20 ac-ft/yr in 2030 and increasing to a deficit of 66 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse is not applicable since Shirley has no wastewater collection or treatment system. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. Connection with a surface water supply source was considered (City of Sulphur Springs) and would prove more costly than a groundwater supply. Shirley's existing wells produce an average of 96 GPM, which can be equated to 46 ac-ft/yr in a drought of record situation. Drilling two additional wells will meet the need for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for the Shirley WSC is to drill one additional well into the Carrizo-Wilcox by the year 2030 and a second well between 2030 and 2050. Currently, groundwater quality meets TNRCC standards. Environmental impact would be negligible.

An alternative strategy would be to purchase water from the City of Sulphur Springs. Sulphur Springs is a major water provider, located about five miles from the Shirley service area, and has sufficient water to meet Shirley's need. Connection to Sulphur Springs would initially be more costly than additional well development. However, Shirley's service area is on the outcrop of the Carrizo-Wilcox, and in this area both water quality and quantity problems are common. Difficulties in obtaining additional wells or the increasing complexity of operating a groundwater system could make surface water supply an attractive alternative.

5.3 (k) Hunt County

- **Tri County WSC**

Description / Discussion of Needs

The Tri County Water Corporation is made up of five subdivisions located in Hunt County, which are managed by the Aqua Source Corporation. These subdivisions are Barrow, Country Wood Estates, Quinlan North, Quinlan South, and Crazy Horse Rancheros. These combined systems served 406 connections in 1998. The estimated population in the Tri-County service area in 2000 is 1,357 people, and the population is expected to increase to 1,458 by the year 2050. Tri County's current source of supply comes from several wells in the Woodbine formation. The system does not have a water conservation plan or a drought contingency plan. The Tri-County WSC is projected to have a water supply deficit of 32 ac-ft/yr in 2000.

Evaluated Strategies

Water reuse is not applicable because the system does not have a centralized wastewater collection or treatment facility. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. Groundwater does not meet TNRCC secondary standards in most of the system's wells; therefore, conversion to surface water is recommended if possible.

Recommendations

The recommended strategy that is cost effective and reliable for the Tri-County WSC is to convert from poor quality groundwater to surface water. The five subdivisions comprising this user group are too scattered to be interconnected with one another. Ten out of 11 wells exceed one or more secondary drinking water standards, but the only identified shortage is in the Barrow area. This shortage can be

resolved by purchasing treated surface water from Lake Tawakoni through the Ables Springs WSC. Environmental impact would be minimal because an available connection to the Ables Springs system is less than 100 feet from the Barrow service area. Water quality issues in the remaining service areas should be addressed by purchasing treated surface water, either to replace the wells or for blending from Cash WSC.

- **Wolfe City**

Description / Discussion of Needs

The City of Wolfe City is located in northern Hunt County and is situated in the Sulphur River Basin. Wolfe City is bound on the west side by the Hickory Creek SUD, and the City of Commerce is located southeast of the city. In 1998, Wolfe City served 744 connections. The system currently serves 1,633 people, and the population is expected to increase to 2,568 by the year 2050. Wolfe City's current source of supply comes from two city lakes located on Turkey Creek in the South Sulphur River Basin, as well as one well in the Woodbine formation about seven miles west of the city. Water quality meets current TNRCC standards; however, the quantity will not be sufficient to meet projected demands. The system does not have a water conservation plan nor a drought contingency plan. The City of Wolfe City is projected to have a water supply deficit of two ac-ft/yr beginning in 2010 and increasing to a deficit of 74 ac-ft/yr in 2050.

Evaluated Strategies

There are no current water needs which could be met by water reuse. Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day. The system has a number of surface water options, including connection to the City of Commerce, City of Greenville, or the proposed Ralph Hall Reservoir in Region C. Additional groundwater was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Wolfe City is to drill an additional 150 gpm well into the Woodbine Aquifer west of the city, in Fannin County. The time frame for this alternative would be around 2010. The well would discharge into the existing transmission main from the city's current well to town. An intermediate pumping and storage facility would be added to enhance the capacity of the transmission main. This recommendation is made based on limited knowledge of firm yield of the city lakes. No in-depth studies were available indicating either the current firm yield of the reservoirs, or whether dredging or similar enhancements to the storage capacity could improve the firm yield. It is recommended that the city pursue such a study.

Surface water from the proposed Ralph Hall Reservoir in Fannin County near Ladonia could be a long range future supply. The lake is proposed in the Region C plan, but the permit process has not begun and the date of impoundment, if any, is unknown. The city currently operates its own surface water treatment plant; should the future regulatory or economic environment significantly affect this operation, purchase of treated surface water from Commerce or Greenville could be an option.

5.3 (l) Lamar County

- **Petty WSC**

Description / Discussion of Needs

Petty WSC is a small public water supply located in western Lamar County along State Highway 82. It is surrounded on all sides by the Lamar County WSD. In 1998, Petty served 53 connections. The estimated population is 114 in the year 2000 and is projected to be 137 by the year 2050. Petty WSC is included in the County Other water user group for Lamar County. Current source of supply is a single well into the Woodbine formation. Water quality does not meet current TNRCC standards. Backup for the single well is provided through a 6 inch connection to Lamar County WSD. The system does not have either a water conservation plan or a drought contingency plan. PWSC is projected to have a water supply deficit of 18 ac-ft/yr in 2020.

Evaluated Strategies

Advanced municipal conservation is not applicable since per capita use is less than 115 gallons per capita per day, the threshold set by the planning group. There are no current water needs which could be met by water reuse. Groundwater is not of suitable quality. The WSC's existing well is projected to fail by 2020 and a replacement well will not be a viable option, since water quality is below TNRCC minimum standards. Conversion to surface water by contracting with LCWSD was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable is for Petty WSC to enter into a contract for treated surface water with Lamar County Water Supply District when necessary. LCWSD has adequate supply available and already has facilities in place to provide this service. There are no other suppliers in the Petty area with adequate facilities to meet Petty's needs. Given that facilities are in place, capital costs would be negligible. Since LCWSD already has water available, and no significant construction would be required, environmental impact would be negligible.

An alternative scenario would be to treat the existing groundwater to remove fluoride and dissolved solids. The capital cost of this technology, coupled with the problems of disposal of the waste stream, results in surface water being the proposed alternative.

5.3 (m) Marion County

- **Kellyville-Berea WSC**

Description / Discussion of Needs

The Kellyville-Berea WSC is located in central Marion County, west of the City of Jefferson. In 1998, the WSC provided water service to 320 connections. The system is bounded on the east by the City of Jefferson; the south by the Big Cypress River; the west by Mims WSC; and on the north by East Marion County WSC. The population is projected to increase from 581 persons in 2000 to 1,831 persons in 2050. The system is included in the County Other WUG for Marion County. The system relies on groundwater from two water wells. The two wells provide a cumulative total of 165 GPM, or 87 ac-ft/yr. The system does not have either a water conservation plan or a drought contingency plan, but does have a leak

detection system in place. KBWSC is projected to have a water supply deficit of 16 ac-ft/yr in 2010 and increasing to a deficit of 108 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was considered because the per capita use per day exceeded the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse not considered because the Kellyville-Berea WSC service area does not have a centralized waste water collection system, and a reuse system is not economically feasible for an entity of this size. Surface water was considered, as the Northeast Texas Municipal Water District (NETMWD) is currently completing construction of a water main to serve the City of Jefferson, which will be located near the Kellyville-Berea system.

Recommendations

The Kellyville-Berea WSC has met with the NETMWD regarding the purchase of treated water from the NETMWD's Jefferson supply line. The NETMWD has an ample supply in their Jefferson Water line to meet the projected needs of Kellyville-Berea WSC. The WSC intends to enter into negotiations with the NETMWD before their supply deficit occurs. The WSC may choose to augment their existing well production with the purchased surface water, gradually increasing the water purchased. The recommended strategy that is cost effective and reliable for the Kellyville-Berea WSC to meet their projected deficits would be to continue their efforts to enter into a water purchase contract with the NETMWD for treated water. The recommended supply source, Lake O' The Pines, has an adequate supply to meets the needs of the Kellyville-Berea WSC.

- **Pine Harbor WSC**

Description / Discussion of Needs

Pine Harbor WSC provides water service on the north side of Lake O' The Pines, in Marion County. The system currently serves approximately 379 customers. The system is bounded on the north by Mims WSC, on the east by Indian Hills Harbor Subdivision, and on the south and west by Lake O' The Pines. The population is projected to increase from 692 persons in 2000 to 1,842 persons in 2050. The system is included in the County Other water user group for Marion County. Pine Harbor WSC relies on two water wells with a combined rated capacity of 285 GPM, or 153 ac-ft/yr. The WSC has a leak detection program in place. PHWSC does not have either a water conservation plan or a drought contingency plan. Pine Harbor WSC is projected to have a water supply deficit of 6 ac-ft/yr in 2030 and increasing to a deficit of 43 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for PHWSC because the per capita use rate is below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the Pine Harbor area does not have a centralized waste water collection system. Surface water alternatives were not considered since no supply source is within close proximity to the area and surface water treatment is generally not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for Pine Harbor WSC to meet their projected water needs is to construct an additional water well similar to their existing well No. 2. The well should

be constructed before the year 2030. The recommended supply source for the well is the Carrizo-Wilcox Aquifer in Marion County. One well with a rated capacity of 200 GPM would provide approximately 108 ac-ft/yr. The Carrizo-Wilcox Aquifer in Marion County is projected to have an adequate supply availability for the Pine Harbor WSC.

- **Shady Shores WSC**

Description / Discussion of Needs

Shady Shores WSC provides water service on the south side of Lake O' The Pines, in Marion County. The system currently serves approximately 170 customers. The system is bounded on the north by the lake, and there are no organized water supply systems bounding the system on the west, south, or east. The population is projected to increase from 308 persons in 2000 to 658 persons in 2050. The system is included in the County Other WUG for Marion County. Shady Shores WSC relies on one water well with a rated capacity of 85 GPM, or 45 ac-ft/yr. The WSC does not have a conservation plan or a drought contingency plan. Shady Shores WSC is projected to have a water supply deficit of 1 ac-ft/yr in 2010 and increasing to a deficit of 24 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered for Shady Shores WSC because the per capita use per day was below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered because the Shady Shores area does not have a centralized wastewater collection system. Surface water alternatives were omitted since no supply source is within close proximity to the area, and surface water treatment is not economically feasible for a system of this size

Recommendations

The recommended strategy that is cost effective and reliable for Shady Shores WSC to meet their projected water needs is to construct an additional water well similar to their existing well. The well should be constructed before the year 2010. The recommended supply source for the well is the Carrizo-Wilcox Aquifer in Marion County. One well with a rated capacity of 85 GPM would provide approximately 46 ac-ft/yr. The Carrizo-Wilcox Aquifer in Marion County is projected to have an ample supply availability for the Shady Shores WSC.

5.3 (n) Morris County

There are no entities with actual shortages in Morris County.

5.3 (o) Rains County

- **Bright Star-Salem WSC**

Description / Discussion of Needs

The Bright Star-Salem WSC is located in Wood and Rains Counties, near Lake Fork Reservoir. The system lies on the outcrop of the Carrizo-Wilcox, where the aquifer is poorly developed and both quality and quantity are spotty. In 1998, the system served 1460 connections. The estimated population in the year 2000 is 2692 people, and it is expected to increase to 4713 persons by the year 2050. Bright Star's current source of supply consists of 10 wells in the Carrizo-Wilcox Aquifer. Water quality from these wells is generally in compliance with TNRCC standards, except that iron and manganese are a problem in

some wells. A filtration plant is used for iron/manganese removal at one well, and chemical sequestration is employed at another. Quantity will not prove sufficient to meet projected demands. The WSC does not have a water conservation plan, but is in the process of creating a drought contingency plan. BSSWSC is projected to have a water supply deficit of 68 ac-ft/yr in 2030 and increasing to a deficit of 214 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered since per capita use is less than 115 gallons per capita per day set by the Regional Water Planning Group. Water reuse was not considered applicable since the WSC does not have a wastewater collection or treatment system in place. Continued use of groundwater is not the preferred long term option because Bright Star's existing well water quantity and quality is unreliable. Conversion to surface water by contracting with the Sabine River Authority would be the preferred alternative for this entity, although there is presently no water available in Lake Fork Reservoir. Should water not be available at the time required, additional wells may be the only available option.

Recommendations

The recommended strategy that is cost effective and reliable for the Bright Star-Salem WSC is to connect with the Sabine River Authority for water from Lake Fork Reservoir. At present, all Lake Fork water is under contract, and the implementation of this strategy will depend on water becoming available in an appropriate time frame. The system has requested a 750,000-gpd allotment from SRA. It is anticipated, however, that Bright Star would convert partially to this surface water supply, while retaining several of its more productive wells. While the current supply shows to be adequate, most of the well supply is in the southeastern part of the system, while a substantial part of the growth is in the far north. Consequently, shortages are being experienced in the northern portions of the system, and another well in that area will be required near term. Should surface water not become available in time, additional wells would be required. These would likely be located in the southern part of the system, and would require associated pumping and transmission facilities to service the northern areas.

5.3 (p) Red River County

- **City of Detroit**

Description / Discussion of Needs

The City of Detroit is located in western Red River County along U.S. Highway 82, and is situated in both the Red and Sulphur Basins. It is surrounded on three sides by the 410 WSC, and on the west by the Lamar County WSD. In 1998, Detroit served 279 connections. The system currently serves 822 people, and is anticipated to grow to 998 by the year 2050. Detroit's current source of supply is a single well into the Trinity formation. The rated capacity of this well is 120 GPM, which equates to 60 ac-ft/yr on an annual average basis. The city does not have either a water conservation plan or a drought contingency plan. The City of Detroit is projected to have a water supply deficit of 46 ac-ft/yr in 2000.

Evaluated Strategies

Advanced municipal water conservation was not considered since per capita use is less than 115 gallons per capita per day. There are no current needs that could be met by water reuse. Continued use of groundwater is not the preferred option because Detroit's existing well water quantity is unreliable, and water quality is below TNRCC secondary standards because of fluoride and total solids. Conversion to

surface water by contracting with Lamar County Water Supply District was the alternative selected for this entity.

Recommendations

The recommended strategy that is cost effective and reliable is for the City of Detroit to enter into a contract for treated surface water with Lamar County Water Supply District as soon as possible. LCWSD has adequate supply available, and there are no other systems in the Detroit area with sufficient supply to serve the city. Detroit already has plans and funding in place to tie on to the LCWSD system. A finding of "no significant impact" on the environment has been issued by the USDA for construction of the necessary tie-in facilities.

An alternative strategy would be to treat the existing groundwater. This is considered less desirable than the selected alternative, because (1) an additional well would still be required; (2) technology for this treatment is expensive; and (3) disposal of the waste stream is problematic in the Detroit area.

- **Town of English**

Description / Discussion of Needs

The town of English is located in northeastern Red River County, and is situated in the Red River Basin. It is surrounded on all sides by the Red River County WSC. In 1998, English served 65 connections. The system's year 2000 projected population is 163 people, which is expected to decline to 130 by the year 2050. English's current source of supply comes from two wells in an alluvial formation. The system does not have a water conservation plan or a drought contingency plan. The town of English is projected to have a water supply deficit of 7 ac-ft/yr in 2000.

Evaluated Strategies

English does not have a centralized wastewater collection or treatment system; therefore, water reuse is not an option. Advanced conservation is not applicable since per capita use is less than 115 gallons per capita per day. The alluvial formation in which current wells are located is not considered adequate for increased production. Therefore, surface water was the alternative selected for this entity. Red River WSC has lines very close to English, and is willing to supply the small quantity required to meet the projected deficit.

Recommendations

The recommended strategy that is cost effective and reliable for the town of English is to contract with the Red River WSC for a supplemental supply. The water would be surface water from Lake Wright Patman, purchased by Red River WSC from Texarkana Water Utilities. Red River WSC has three potential points of connection, all within ½ mile of the English system.

English could also purchase its water directly from Texarkana, but the capital cost would be substantially greater, particularly in light of the small amount of water required. A pump station and storage tank would be required, as well as a significant amount of water main.

5.3 (q) Smith County

- **Enchanted Lakes Water Company**

Description / Discussion of Needs

Enchanted Lakes Water Company provides water service in Smith County. Enchanted Lakes Water Company has been sold to and is operated by Aqua Source based in Houston, Texas. In 2000, the WSC served 130 connections, representing a population of approximately 434 persons. The population is projected to be 868 in the year 2050. The system doesn't expect to have more than 260 connections since they only serve one older subdivision. Enchanted Lakes Water Company is included in the County Other water user group for Smith County. The Golden WSC is located northwest of Enchanted Lakes Water Company. The system's current water supply consists of one well which provide water from the Carrizo-Wilcox Aquifer. The total pumping capacity of this one well is 117 GPM, which equates to 62 ac-ft/yr on an annual average basis. ELWC is projected to have a water supply deficit of 4 ac-ft/yr in 2000 and increasing to a deficit of 48 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was omitted from consideration because the system does not have a centralized sewerage collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the system.

Recommendations

The recommended strategy that is cost effective and reliable for Enchanted Lakes Water Company to meet their projected water needs is to construct another groundwater well similar to the one existing. The recommended supply source will be the Carrizo-Wilcox Aquifer in Smith County. A well with a rated capacity of 116 Gallon Per Minute would provide approximately 62 ac-ft/yr. This is enough to meet their projected shortages.

- **Lindale Rural WSC**

Description / Discussion of Needs

Lindale Rural WSC provides water service in Smith County. The service area extends to about 6 miles north of downtown Tyler on US Hwy 69, bounded on east by Saline and Hills Creeks, south by County Road 46, west by County RD 411, and north by the old Sabine River channel. In 1998, the WSC served 1,914 connections. The estimated population is 5,164 in the year 2000 and is projected to be 15,079 in the year 2050. Lindale Rural WSC is included in the County Other water user group for Smith County. The system relies on four wells with a total pumping capacity of 1,020 GPM, or 548 ac-ft/yr on an annual average basis. The WSC is currently drilling a well in the same location as the abandoned well #4. When this well is completed, the projected total pumping capacity will be 2,020 GPM, or 1,086 ac-ft/yr. They have a drought contingency plan. LRWSC is projected to have a water supply deficit of 147 ac-ft/yr in 2020 and increasing to a deficit of 819 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was not considered because the WSC does not have a centralized sewerage collection system. Lindale Rural WSC currently has an emergency water connection with the City of Lindale and is negotiating for surface water with the City of Tyler, therefore surface water alternatives were considered.

Recommendations

The recommended strategy that is cost effective and reliable for Lindale Rural WSC to meet their projected water needs is to construct groundwater wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Smith County. A well with a rated capacity of 1,100 GPM would provide approximately 591 ac-ft per year. This is enough to meet their projected shortages through the year 2040 but falls short of meeting their projected shortages for the decade of 2050 by 228 ac-ft/yr. The most viable strategy (in terms of unit cost) is to drill another well by the year 2050.

- **Star Mountain WSC**

Description / Discussion of Needs

Star Mountain WSC provides water service in Smith and Gregg Counties. Its service area extends along Texas Highway 271, approximately seven miles along several rural and county roads. In 1998, the WSC served 430 connections. The estimated population is 1,220 in the year 2000 and is projected to be 3,562 in the year 2050. Star Mountain WSC is included in the County Other water user group for Smith County. The system is served by two wells from the Carrizo-Wilcox Aquifer with a total pumping capacity of 200 GPM, or 108 ac-ft/yr on an average annual basis. SMWSC is projected to have a water supply deficit of 78 ac-ft/yr in 2000 and increasing to a deficit of 342 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was omitted from consideration because the WSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since surface water treatment is not available.

Recommendations

The recommended strategy that is cost effective and reliable for Star Mountain WSC to meet their projected water needs is to construct three additional water wells in the Carrizo-Wilcox aquifer. Three wells with a total rated capacity of 600 GPM would provide approximately 323 ac-ft on an average per year. The first well has to be constructed in the year 2000, the second well has to be constructed by the year 2010, and the third well has to be constructed by the year 2030 for the WSC to meet their water demands.

5.3 (r) Titus County

There are no entities with actual shortages in Titus County.

5.3 (s) Upshur County

- **City of East Mountain**

Description / Discussion of Needs:

The City of East Mountain provides water service in the southern portion of Upshur County and the northern portion of Gregg County. The system is bounded on the west by Union Grove and Pritchett WSC; on the north and east by Glenwood WSC; and on the south by the City of Longview, Clarksville City, and the City of White Oak. The population is projected to increase from 1,237 persons in 2000 to

2,195 persons by 2050. Approximately 78 percent of the population is in Upshur County. The City of East Mountain is included in the County Other WUG for Upshur and Gregg. The city relies on one well with a capacity of 150 GPM, or 81 ac-ft/yr. The City does not have either a water conservation plan or a drought contingency plan. The City of East Mountain is projected to have a water supply deficit of 87 ac-ft/yr beginning in 2000 and increasing to a deficit of 174 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the East Mountain area does not have a centralized wastewater collection system. Surface water alternatives were not considered since there is not a supply source within close proximity to the area, and surface water treatment is not economically feasible for a system of this size.

Recommendations

East Mountain has contracted with Glenwood WSC for 50 GPM through an interconnect. The recommended strategy that is cost effective and reliable for East Mountain to meet their projected water needs is to complete their planned interconnect with Glenwood WSC, and construct two water wells similar to their existing well. The first well should be constructed immediately and the second well before the year 2010. The recommended supply source is the Carrizo-Wilcox Aquifer in Upshur County. The interconnect will provide approximately 26 ac-ft/yr. Two wells at 150 GPM each would provide approximately 161 ac-ft/yr, for a total of 187 ac-ft/yr. The Carrizo-Wilcox in Upshur County is projected to have an adequate supply availability for the City of East Mountain.

- **Diana WSC**

Description / Discussion of Needs

Diana WSC is located in eastern Upshur County, northwestern Harrison County, and southwestern Marion County and serves an area around the communities of Diana, Graceton, Stamps, and Ashland. The system is bounded on the west by Bi-County WSC, on the north by Ore City, on the south by Glenwood WSC, and on the east by Harleton WSC. In 1999 the system had 1,380 members with 88 percent in Upshur County, 7 percent in Harrison County, and 5 percent in Marion County. The population is projected to increase from 3,061 persons in 2000 to 7,461 persons in 2050. The DWSC is included in the County Other WUG for Upshur, Harrison, and Marion Counties. The system's current water supply consists of seven water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 922 GPM, or 498 ac-ft/yr. DWSC has a water conservation plan and a drought contingency plan. Diana WSC is projected to have a water supply deficit of 81 ac-ft/yr in 2020 and increasing to a deficit of 299 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the DWSC does not have an identified demand for non-potable water. One surface water alternative was completed which included participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from a proposed water plant on the south side of Lake O' The Pines. The regional system sponsored by NETMWD is proposed to be constructed in approximately 10 years.

Recommendations

The recommended strategy that is cost effective and reliable for the Diana WSC to meet their projected short term deficit of 81 ac-ft/yr in 2020 would be to construct one additional water well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. One well with rated capacity of 132 gpm would provide approximately 71 ac-ft/yr. The Carrizo-Wilcox Aquifer in Upshur County is projected to have a more than ample supply availability to meet the short term needs of DWSC for the planning period.

The recommended strategy that is cost effective and reliable for the Diana WSC to meet their projected long term deficit of 299 ac-ft/yr in 2050 would be to continue to participate in the planned NETMWD southside regional system. The recommended supply source will be Lake O' The Pines in Marion County. The proposed system will have a rated capacity of 460 gpm and would provide approximately 248 ac-ft/yr. Lake O' The Pines in Marion County, through NETMWD, is projected to have supply available to meet the long term needs of DWSC for the planning period.

- **Harmony ISD**

Description / Discussion of Needs

Harmony ISD is located in western Upshur County on State Highway 154 and serves the Harmony School Campus. The system is bounded on the south by Pritchett WSC, on the north by Sharon WSC, and on the east and west by Texas Water Systems Rosewood and Rhonesboro Systems. In 1999 the system had an enrollment of 936 students. The population equivalent is projected to increase from 200 persons in 2000 to 850 persons in 2050. The HISD is included in the County Other WUG for Upshur County. The system's current water supply consists of one water well which provides water from the Carrizo-Wilcox Aquifer. The total rated capacity of the well is 30 GPM which equates to 24 ac-ft/yr on an annual average basis for a school district. HISD does not have either a water conservation plan or a drought contingency plan. Harmony ISD is projected to have a water supply deficit of 2 ac-ft/yr in 2000 and increasing to a deficit of 66 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the HISD indicated the downstream landowner was already utilizing their discharge for irrigation on pastures. Surface water alternatives were not considered since there is generally not a supply source within close proximity to the HISD and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for the Harmony ISD to meet their projected deficit of 1.9 ac-ft in the year 2000 and 65.9 ac-ft in the year 2050 would be to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. Three wells at 30 GPM each would provide approximately 24 ac-ft each or 73 ac-ft/yr total. The Carrizo-Wilcox Aquifer in Upshur County is projected to have a more than ample supply availability to meet the needs of HISD for the planning period.

- **Pritchett WSC**

Description / Discussion of Needs

Pritchett WSC is located in southwestern Upshur County and eastern Wood County and serves an area around the communities of Pritchett, Center Point, Latch, Shady Grove, and Wilkins. The system is bounded on the west by Fouke WSC, on the north by Sharon WSC and the City of Gilmer, on the south by the cities of Gladewater and Big Sandy, and on the east by Union Grove WSC and Glenwood WSC. In 1999 the system had 2,124 members with 99 percent in Upshur County and 1 percent in Wood County. The population is projected to increase from 4,660 persons in 2000 to 9,702 persons in 2050. The PWSC is included in the County Other WUG for Upshur and Wood Counties. The system's current water supply consists of 14 water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 934 GPM, or 504 ac-ft/yr. PWSC does not have either a water contingency plan or a drought management plan. Pritchett WSC is projected to have a water supply deficit of 95 ac-ft/yr in 2000 and increasing to a deficit of 529 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was omitted because the PWSC does not have centralized sewerage collection system. One surface water alternative was completed which included participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from a proposed water plant on the south side of Lake O' The Pines. The regional system sponsored by NETMWD is proposed to be constructed in approximately 10 years. There are alternative sources of surface water available to PWSC such as the City of White Oak, the City of Gilmer and the City of Gladewater, all of which have been discussing potential contract arrangements with PWSC. All of these alternatives or combination of alternatives have merit and should be evaluated in more detail with council by the WSC engineer, financial advisor, and attorney.

Recommendations

The recommended strategy that is cost effective and reliable for the Pritchett WSC to meet their projected water needs is to construct an emergency connection to either the City of Gilmer, White Oak, or Gladewater to meet the immediate deficits until the NETMWD Lake O' The Pines south side project can be developed. The long term recommended strategy would be to purchase treated water from the NETMWD. The recommended supply source will be the Lake O' The Pines Reservoir in Marion County. The system should provide the projected demand of approximately 532 ac-ft/yr. The NETMWD through Lake O' The Pines in Marion County is projected to have supply to meet the long term needs of PWSC for the planning period.

- **Steam Electric in Upshur County**

Description / Discussion of Needs

The Steam Electric WUG in Upshur County has a demand that is projected to grow from a current demand of 0 ac-ft/yr in 2000 to 5,601 ac-ft/yr in 2050. The projected demand is the result of an expected steam electric generating facility near the City of Gilmer. There are not any existing steam electric facilities in Upshur County. A steam electric utility is currently in negotiations. The Steam Electric WUG in Upshur County is projected to have a water supply deficit of 5,601 ac-ft/yr in 2010 and remaining at a deficit of 5,601 ac-ft/yr to 2050.

Evaluated Strategies

Advanced conservation was not considered because it is not applicable for steam electric utilities. Water reuse was not considered because there would be no net change in demand required by an entity if reuse were implemented, and the entities are projected entities only, and cannot be construed to benefit from reuse. Groundwater was not considered due to questionable reliability and the large quantity required for a steam electric facility. Surface water was considered because the City of Gilmer recently completed construction of Lake Gilmer and has the available supply.

Recommendations

The recommended strategy that is cost effective and reliable for the Upshur County steam electric WUG to meet projected demands during the planning period is to purchase raw water from the City of Gilmer. The City of Gilmer will have an ample supply of water to meet the needs of steam electric in Upshur County once Lake Gilmer is fully operational.

- **Union Grove WSC**

Description / Discussion of Needs

Union Grove WSC is located in southern Upshur County and serves an area around the communities of Union Grove and West Mountain along US Highway 271. The system is bound on the north and west by Pritchett WSC, on the south by the City of Gladewater, and on the east by the City of East Mountain. In 1999 the system had 735 members. The population is projected to increase from 1,637 persons in 2000 to 3,337 persons in 2050. The UGWSC is included in the County Other WUG for Upshur County. The system's current water supply consists of three water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these three wells is 464 GPM, or 249 ac-ft/yr. UGWSC does not have either a water conservation plan nor a drought contingency plan. Union Grove WSC is projected to have a water supply deficit of 29 ac-ft/yr in 2020 and increasing to a deficit of 106 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the water Regional Water Planning Group. Water reuse was not considered because the UGWSC does not have a centralized sewerage collection system. Two surface water alternatives were considered including participation in a regional system sponsored by the Northeast Texas Municipal Water District and purchasing treated water from the City of Gladewater. The regional system sponsored by NETMWD was determined to be too costly at this time and was not evaluated further

Recommendations

The recommended strategy that is cost effective and reliable for the Union Grove WSC to meet their projected water needs is to construct one additional water well similar to their existing wells just prior to each decade as the deficits occur. The recommended supply source will be the Carrizo-Wilcox Aquifer in Upshur County. Two wells with rated capacity of 155 gpm each would provide approximately 83 ac-ft each or 167 ac-ft/yr. The Carrizo-Wilcox Aquifer in Upshur County is projected to have supply available to meet the needs of UGWSC for the planning period.

5.3 (t) Van Zandt County

- **Ben Wheeler WSC**

Description / Discussion of Needs:

Ben Wheeler WSC provides water service in Van Zandt and Smith Counties. The system is bordered by the City of Van to the North and Edom WSC to the South. The service area extends to FM 1995 in the north, SH 64 in the south, FM 773 in the west, county line in the east and along FM 1995 and local roads in Smith County. In 1998, the WSC served 617 connections. The estimated population is 1,417 in the year 2000 and is projected to be 2,479 in the year 2050. Ben Wheeler WSC is included in the County Other water user group for Van Zandt (99 percent) and Smith (1 percent) counties. The system relies on three wells, which provide water from the Carrizo-Wilcox Aquifer with a total pumping capacity of 400 GPM or 215 ac-ft/yr on an annual average basis. The WSC is planning to drill one more well about 700 feet deep, which is expected to yield 250 GPM. Ben Wheeler WSC has a drought contingency plan. BWWSC is projected to have a water supply deficit of 7 ac/ft/yr in 2020 and increasing to a deficit of 50 ac-ft/yr in 2050.

Evaluated Strategies

Advanced conservation was not considered as the per capita use per day was below 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives were not considered since there is not a supply source within close proximity to the WSC.

Recommendations

The recommended strategy that is cost effective and reliable for Ben Wheeler WSC to meet their projected water needs is to construct one additional well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 250 GPM would provide approximately 134 ac-ft/yr. This supply is enough to meet the needs of Ben Wheeler WSC.

- **City of Canton**

Description / Discussion of Needs

City of Canton provides water service in Van Zandt County. The system is bordered by Myrtle Springs WSC to the Northwest and Mac Bee WSC to the Southwest. In 1998, the city served 1,175 connections. The estimated population is 3,559 in the year 2000 and is projected to be 6,232 in the year 2050. The city relies on its groundwater wells from the Carrizo-Wilcox with a total pumping capacity of 205 GPM, or 112 ac-ft/yr and 706 ac-ft/yr from Mill Creek Lake. Lake Canton, is not used due to inadequate treatment capacity. The City of Canton is projected to have a water supply deficit of 73 ac-ft/yr in 2030 and increasing to a deficit of 221 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not evaluated as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city does not have a demand for non-potable water at this time. Surface water alternatives were not considered since the city lake is no longer being used because it has no treatment capacity. The city has indicated a preference to use groundwater wells.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Canton to meet their projected water needs is to construct an additional well. The first additional well (which is in progress) will take care of the water shortage in the year 2030. The city will still have water shortages of 45 ac-ft in the year 2040 and 113 ac-ft in the year 2050. These shortages can be met by constructing an additional well similar to the other well. The recommended wells will be in the Carrizo-Wilcox Aquifer in Van Zandt County.

- **City of Van**

Description / Discussion of Needs

City of Van provides water service to Van and surrounding area located in Van Zandt (98 percent) and Smith (2 percent) Counties. The city is bordered on the south by Ben Wheeler WSC and Corinth WSC in the northwest. In 1998, they served 1,161 connections. The estimated population is 2,255 in the year 2000 and is projected to be 3,949 in the year 2050. The city relies on three wells with a total pumping capacity of 1,070 GPM, or 575 ac-ft/yr on an average annual basis. Surface water is available from an abandoned supply lake, but the city has not used the treatment plant since 1970 and the plant would require reconstruction and two miles of supply pipeline. The City of Van is projected to have a water supply deficit of 30 ac-ft/yr in 2020 and increasing to a deficit of 207 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city has no identified use for reuse water. Surface water alternative was not considered as it was cost prohibitive to utilize existing lake and there were no other supply sources in close proximity

Recommendations

The recommended strategy that is cost effective and reliable for the City of Van to meet their projected water needs is to construct one additional well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 500 GPM would provide approximately 269 ac-ft on an annualized basis.

- **City of Grand Saline**

Description / Discussion of Needs

City of Grand Saline provides water service in Van Zandt County. The City is bounded by Golden WSC to the East, Pruitt Sandflat and Corinth WSC to the South, and Fruitvale WSC to the West. In 1998, the city served 1,332 connections. The estimated population is 3,010 in the year 2000 and is projected to be 5,270 in the year 2050. The City relies on four wells in the Carrizo-Wilcox Aquifer with a total pumping capacity of 1,090 GPM, or 586 ac-ft/yr. The City of Grand Saline is projected to have a water supply deficit of 50 ac-ft/yr in 2010 and increasing to a deficit of 294 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was omitted from consideration because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the city does not have a centralized sewer collection system. Surface water alternatives were not considered because there was no viable supply source within close proximity to the city.

Recommendations

The recommended strategy that is cost effective and reliable for the City of Grand Saline to meet their projected water needs is to construct two wells. These two wells, 500 feet deep and with a total pumping capacity of 323 ac-ft will take care of the water shortage in the City of Grand Saline. The recommended wells will be in the Carrizo-Wilcox Aquifer in Van Zandt County.

- **Corinth WSC**

Description / Discussion of Needs

Corinth WSC provides water service in Van Zandt County. In 1997, the WSC served 274 connections. The system is bordered by Pruitt-Sandflat WSC to the East, Fruitvale WSC to the West, City of Grand Saline to the North, and City of Van and Ben Wheeler WSC to the South. The estimated population is 678 in the year 2000 and is projected to be 2,074 in year 2050. The system relies on one groundwater well, which provide water from the Carrizo-Wilcox Aquifer with a total pumping capacity of 258 GPM or 139 ac-ft/yr. Corinth WSC is included in the County Other water user group for Van Zandt County. CWSC is projected to have a water supply deficit of 9 ac-ft/yr in 2020 and increasing to a deficit of 82 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives not considered since there is not a supply source within close proximity to the WSC.

Recommendations

The recommended strategy that is cost effective and reliable for Corinth WSC to meet their projected water need is to construct one additional well in the Carrizo-Wilcox aquifer about 200 feet deep. A well with a total pumping capacity of 108 ac-ft will suffice to meet their shortages through the year 2050.

- **Crooked Creek WSC**

Description / Discussion of Needs

Crooked Creek WSC provides water service in Van Zandt County. In 1998, the WSC served 231 connection. The WSC is adjacent to rural roads between FM 859 and State Highway 9. The estimated population is 541 in the year 2000 and is projected to be 1,653 in the year 2050. Crooked Creek WSC is included in the County Other water user group for Van Zandt County. The system relies on one well in the Carrizo-Wilcox Aquifer with a total pumping capacity of 200 GPM, or 106 ac-ft/yr. CCWSC is

projected to have a water supply deficit of 12 ac-ft/yr in 2020 and increasing to a deficit of 70 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the water planning group. Water reuse was not considered as the WSC does not have a demand for nonpotable water at this time. The WSC is considering connections with the City of Canton for surface water.

Recommendations

The recommended strategy that is cost effective and reliable for the Crooked Creek WSC would be to construct a groundwater well. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a rated capacity of 200 GPM would provide approximately 108 ac-ft on an annualized basis.

- **Edom WSC**

Description / Discussion of Needs

Edom WSC provides water service in Van Zandt and Henderson Counties. In 1998, the WSC served 435 connections. The system is bordered by Ben Wheeler WSC to the northwest and RPM WSC to the northeast. The estimated population is 795 in the year 2000 and is projected to be 2,433 in the year 2050. Edom WSC is included in the County Other water user group for Van Zandt County. The system relies on four wells with a total pumping capacity of 340 GPM, or 183 ac-ft/yr. Edom WSC is planning a future well with a total pumping capacity of 85 GPM, or 46 ac-ft/yr. EWSC is projected to have a water supply deficit of 22 ac-ft/yr in 2030 and increasing to a deficit of 76 ac-ft/yr in 2050.

Evaluated Strategies:

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse not considered as the WSC does not have a centralized sewerage collection system. Surface water alternatives were considered since Edom WSC is negotiating with City of Tyler, which is 16 miles away. The cost of this connection would be shared by five other WSC's. The approximate cost of hooking up Edom WSC with the City of Tyler is $ 253,440.

Recommendations

The recommended strategy that is cost effective and reliable for Edom WSC to meet their projected water needs is to construct one additional well similar to their existing wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Van Zandt County. A well with a total rated capacity of 85 GPM would provide approximately 46 ac-ft/yr. This is enough to meet their projected shortages for the year 2030 but falls short of meeting their projected shortages for the year 2040 and 2050 by 4 ac-ft and 30 ac-ft respectively. To meet these additional shortages, it is recommended that they construct another well similar to the other wells.

- **Fruitvale WSC**

Description / Discussion of Needs

Fruitvale WSC provides water service in Van Zandt County. The system is bordered on the west by MacBee WSC, on the south by Corinth WSC and Crooked Creek WSC, and in the north by South Tawakoni WSC and Grand Saline WSC. In 1998, the WSC served 994 connections. The estimated population is 2,324 in the year 2000 and is projected to be 7,111 in the year 2050. Fruitvale WSC is included in the County Other water user group for Van Zandt County. The system relies on 11 wells with a total pumping capacity of 666 GPM, or 358 ac-ft/yr. FWSC is projected to have a water supply deficit of 51 ac-ft/yr in 2010 and increasing to a deficit of 400 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the WSC does not have a centralized sewer collection system. Surface water alternatives were not considered since there is no viable supply source within close proximity to the City. The system plans to continue adding water wells, which are 500 feet deep and have an average capacity of 100 GPM to meet their requirements.

Recommendations

The recommended strategy that is cost effective and reliable for Fruitvale WSC to meet their projected water needs is to construct eight additional wells. Five additional wells will take care of the water shortage till the year 2030. The other additional wells have to be drilled prior to the year 2040 to take care of the water shortages for year 2040 onwards. The five wells with a total rated capacity of 500 GPM would provide 269 ac-ft on an annualized basis. The recommended wells will be in the Carrizo-Wilcox aquifer in Van Zandt County.

- **Little Hope-Moore WSC**

Description / Discussion of Needs

Little Hope-Moore WSC provides water service in Van Zandt County. The WSC is bounded by City of Canton to the southwest, MacBee WSC to the south, and Corinth WSC to the east. In 2000, the WSC served about 500 connections representing a population of approximately 1,282. The population is projected to increase to 3,922 in the year 2050. Little Hope-Moore WSC is included in the County Other water user group for Van Zandt County. The system relies on four groundwater wells, which provide water from the Carrizo-Wilcox Aquifer. The four wells have a total pumping capacity of 345 GPM, or 186 ac-ft/yr. LHMWSC is projected to have a water supply deficit of 39 ac-ft/yr in 2010 and increasing to a deficit of 231 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the WSC does not have a centralized sewer collection system. Groundwater alternative was not considered because of high iron content in the water.

Recommendations

The recommended strategy that is cost effective and reliable for Little Hope-Moore WSC to meet their projected water needs is to buy surface water from the City of Tyler. A contract amounting to 145 ac-ft will take care of the water shortage in Little Hope-Moore WSC. The shortages in the year 2040 and the year 2050 can be avoided by buying more water from the City of Tyler at a cost of $ 73,316 and $140,116 respectively.

5.3 (u) Wood County

- **City of Mineola**

Description / Discussion of Needs

The City of Mineola is located in southwestern Wood County and serves the incorporated city limits and approximately 175 connections adjacent to the city. The system is bounded on the north and west by Ramey WSC, on the east by New Hope WSC and on the south by the Sabine River. In 1999 the system had 2,109 connections. The population is projected to increase from 5,128 persons in 2000 to 8,223 persons in 2050. The City of Mineola is included in the City and County Other water user groups for Wood County. The system's current water supply consists of three water wells in the Carrizo-Wilcox Aquifer. The total rated capacity of these three wells is 1800 GPM which equates to 967 ac-ft/yr on an annual average basis. The City of Mineola does have a water conservation plan and a drought contingency plan. The City of Mineola is projected to have a water supply deficit of 49 ac-ft/yr in 2020 and increasing to a deficit of 276 ac-ft/yr in 2050.

Evaluated Strategies

Water reuse was not considered as the city does not have a demand for nonpotable water at this time. Surface water alternatives were not considered surface water treatment is not economically feasible for a system when groundwater is readily available .

Recommendations

The recommended strategy that is cost effective and reliable for the City of Mineola to meet their projected water needs to construct one additional water well similar to their existing three wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Wood County. A well with rated capacity of 600 gpm would provide approximately 323 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the City of Mineola for the planning period. The City of Mineola is under construction of a new well at this time and it is expected to be complete in the year 2000.

- **Fouke WSC**

Description / Discussion of Needs

Fouke WSC is located in south eastern Wood County and serves an area north of the Sabine River, east of Lake Fork Creek, and south of State Highway 154. The system is bound on the east by Pritchett WSC, on the south by the Sabine River, on the west by New Hope WSC, and on the north by Jones WSC and Sharon WSC. In 1999 the system had 1,704 members. The population is projected to increase from 2,837 persons in 2000 to 5,487 persons in 2050. The FWSC is included in the County Other WUG for Wood and Upshur Counties. The system's current water supply consists of five water wells, which

provide water from the Carrizo-Wilcox Aquifer. The total rated capacity of these five wells is 1146 GPM, or 616 ac-ft/yr. FWSC does not have either a water conservation plan but does have a drought contingency plan. Fouke WSC has a projected water supply surplus of 81 ac-ft/yr in 2030 and a deficit of 27 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered as the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered as the FWSC does not generally have a centralized sewerage collection system. Surface water alternatives were omitted since there is not a supply source within close proximity to the FWSC and surface water treatment is not economically feasible for a system of this size.

Recommendations

The recommended strategy that is cost effective and reliable for Fouke WSC to meet their projected water needs is to construct one additional water well similar to their existing five wells. The recommended supply source will be the Carrizo-Wilcox aquifer in Wood County. A well with rated capacity of 200 gpm would provide approximately 108 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the Fouke WSC for the planning period. Fouke WSC is nearing construction of a new well at this time, and it is expected to be complete in the year 2000.

- **Lake Fork WSC**

Description / Discussion of Needs

Lake Fork WSC is located in northwestern Wood County and serves an area north of Lake Fork and south of Hopkins County. The system is bounded on the east, south, and west by Lake Fork, and on the north by Martin Springs WSC. The City of Yantis is completely surrounded by LFWSC. In 1999 the system had 855 members. The population is projected to increase from 1,396 persons in 2000 to 4,996 persons in 2050. The LFWSC is included in the County Other WUG for Wood and Hopkins Counties. The system's current water supply consists of two water wells from the Carrizo-Wilcox Aquifer. The total rated capacity of these wells is 340 GPM, or 182 ac-ft/yr. LFWSC does not have a water conservation plan, but does have a drought contingency plan. Lake Fork WSC has a projected water supply deficit of 16 ac-ft/yr in 2000 and increasing to a deficit of 405 ac-ft/yr in 2050.

Evaluated Strategies

Advanced municipal water conservation was not considered because the per capita use per day was below the 115 gallons per capita per day threshold set by the Regional Water Planning Group. Water reuse was not considered because the LFWSC does not have a centralized sewerage collection system. Surface water alternatives were not considered for the near term deficits since no supply source with the available capacity is within close proximity and surface water treatment is not economically feasible for a system of this size. In addition, LFWSC is constructing three new water wells with expected completion in 2000. The groundwater component was broken into two strategies to accommodate the groundwater development project in construction. Surface water alternatives should be considered for the long term deficits since LFWSC is located on Lake Fork, a surface water supply, and as the system grows it will become more feasible to operate a surface water treatment facility. If surface water becomes available from the Lake Fork Reservoir this study should be re-evaluated.

Recommendations

The recommended strategy that is cost effective and reliable for the Lake Fork WSC to meet their projected water needs is to construct eight additional water wells similar to their existing two wells. The recommended supply source will be the Carrizo-Wilcox Aquifer in Wood County. Eight wells with rated capacity of 800 gpm would provide approximately 430 ac-ft on an annualized basis. The Carrizo-Wilcox Aquifer in Wood County is projected to have a more than ample supply availability to meet the needs of the LFWSC for the planning period. The LFWSC is under construction of three new wells with a rated capacity of 300 GPM at this time and it is expected to be complete in the year 2000.

5.3 (v) TNRCC Minimum Installed Capacity Requirements

Specific strategies have been evaluated herein for entities that show a projected supply deficiency based upon evaluation of the overall system and consideration of its projected annual demand. It should be noted however, that some systems may require additional installed capacity for specific pressure planes within their system in order to comply with the TNRCC minimum supply requirement for public water supply systems of 0.6 gpm per meter installed capacity in each pressure plane. Two specific examples of this situation are the Campbell WSC in Hunt County and the Sharon WSC in Wood County. These and other projects that are identified in response to this minimum installed capacity requirement should be considered consistent with this regional plan.

5.4 Regional Drought Preparedness

As noted at the outset of this chapter, TWDB rules for S.B. 1 regional planning require the North East Texas Regional Water Planning Group to "…provide water management strategies to be used during a drought-of-record." Individually and in the aggregate, implementation of the recommended water management strategies will, by definition, meet all of the identified water needs in the region under drought-of-record hydrologic conditions. TWDB guidelines for S.B. 1 regional planning require that the water supply yield of recommended water management strategies be based on the estimated firm or dependable yield of the water source under drought-of-record conditions.

TWDB rules also require the North East Texas Regional Water Planning Group to identify, for each source of supply within a region, "…factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and actions to be taken as part of the response." For surface water supplies within the region, water availability is based on the estimated firm yield of the source during a repeat of the drought-of-record. As such, the primary factor to consider in determining whether to initiate a drought response would be whether and at what point a drought exceeds or becomes worse than the historical drought-of-record. When cumulative inflows are below historical levels by some amount and/or for some defined period (i.e., six months, one-year), it could be determined that a drought worse than the drought-of-record is in progress and some drought response is warranted (i.e., pro rata reduction of contractual water deliveries). A second factor is the actual amount of demand placed on the water source during drought. For example, a drought response indicator for a reservoir might be a comparison of cumulative inflows over a defined time period in comparison to historical cumulative inflows for a similar time period from the drought-of-record. If actual annual demand on the reservoir is well below it's firm yield, drought response measures may not be warranted even if hydrologic conditions are worse than the historical drought-of-record. In any event, these considerations are source and water supplier specific and are best addressed in the individual drought contingency plans of wholesale and retail water suppliers in the region. Such plans are required for all wholesale water suppliers and public water supply systems in the region (Texas Water Code, Section 11.1272).

For water users within the region with needs that are to be met through the development of additional groundwater supplies, water availability estimates for those groundwater sources indicated that there are ample supplies to meet needs under drought-of-record conditions. However, location specific factors could become a constraint on groundwater production during extreme drought. For example, while a groundwater supply may be adequate, production infrastructure (i.e., well capacity and depth of pumps) may limit the amount of water that could be withdrawn if an aquifer were drawn-down significantly during drought. These types of considerations can only be assessed and addressed effectively in local drought contingency plans.

Communities should also encourage their customers to use good water conservation practices and water efficient plumbing fixtures. However, the RWPG does not believe that advanced conservation programs should be prescribed across-the-board for all the public water supply systems in the region. Per capita water use rates in the region are generally low to begin with, and advanced measures, such as incentive-based plumbing fixture retrofits are not considered cost-effective. The RWPG believes such decisions should be made by the local water providers based on their own circumstances but does encourage all public water systems to educate their customers about the long-range importance of conservation. This issue is also addressed in the responses to public comments in Section 7.2 of this plan.

Drought Trigger Conditions by Source

Drought contingency plans the 12 designated major water providers have been filed with the TNRCC. These plans include source-specific "triggering" criteria for most of the major surface water supply sources within the North East Texas Region and define the actions to be taken by each water supplier when triggering criteria are met. This information is summarized in Table 5.4.

Table 5.4 Drought Trigger Conditions by Source and Drought Response Actions for Designated Major Water Providers

Major Water Provider	Source(s)	Drought Response Triggers	Drought Response Actions
City of Greenville	City-owned lakes and contract with the Sabine River Authority for supply from Lake Tawokoni.	Triggers based on City reservoir levels, Lake Tawakoni level, Palmer Drought Severity Index, recharge frequency of the city reservoirs and water demand.	Stage I - voluntary conservation, begin pumping from Tawakoni. Stage II - mandatory water use schedules, limits on fire hydrant water use, pump from Tawakoni. Stage III - Further mandatory water use schedules and restrictions, pump from Tawakoni. Stage IV - Even further mandatory water use schedules and increased restrictions, pump from Tawakoni. If deemed necessary, water rationing is an option. Wholesale customers will be rationed at stages 2-4.

City of Longview	Sabine River Lake Cherokee	Water demand and pumping volume. No source specific triggers.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, rationing and ban on non-essential uses.
City of Marshall	Big Cypress Bayou	Water demand and source-specific triggers. Stage 1 when water level is 3 feet above city's raw water intake; Stage 2 when water level is 2 feet above intake; Stage 3 when water level is 1 foot above intake.	Staged implementation of voluntary water conservation, terminate water main flushing, unspecified mandatory lawn watering schedule.
City of Mt. Pleasant	Lake Bob Sandlin Lake Cypress Springs Lake Tankersley	Water demand and non-specific source triggers (i.e., declining water levels in Lake Bob Sandlin).	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, and ban on non-essential uses.
City of Paris	Pat Mayse Lake Lake Crook	Water demand and source-specific triggers. State 1 when combined reservoir storage is at or below 80%; Stage 2 when reservoirs at or below 70%; Stage 3 when reservoirs at or below 60%; Stage 4 when reservoirs are at or below 50%.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, ban on non-essential uses.
City of Sulphur Springs	Cooper Reservoir Lake Sulphur Springs	Water demand and non-specific source triggers (i.e., declining water levels in reservoirs).	Staged implementation of voluntary water conservation, mandatory lawn watering schedule, and ban on non-essential uses.
City of Texarkana	Wright Patman Reservoir	Water demand and source specific triggers. Reservoir elevation at 220.6 feet msl and falling or raw water supply.	Staged implementation of voluntary water conservation, mandatory lawn watering schedule (unspecified), and ban on non-essential uses.

Cherokee Water Company	Lake Cherokee	None specified.	None specified.
Franklin County Water District	Lake Cypress Springs	Stage 1 when lake level is 2 feet below top of inlet structure (90% of conservation storage). Stage 2 when lake level 5 feet below top of inlet structure (75% of storage). Stage 3 when lake level is 8 feet below top of inlet structure (65% of storage).	Regular notification of wholesale customers and media. Request for customer implementation of mandatory lawn water schedule and ban on non-essential use, pro rata allocation of supply.
Northeast Texas Municipal Water District	Lake O' the Pines	Water demand triggers for treated water and source-specific triggers. Stage 1 when reservoir is at or below 50% of capacity. Stage 2 when reservoir is at or below 40% of capacity. Stage 3 when reservoir is at or below 25% of capacity.	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.
Sabine River Authority	Sabine River Lake Fork Lake Tawakoni	Stage 1 when combined capacity of Lake Fork and Tawakoni is at or below 75%. Stage 2 when combined capacity is at or below 66% of capacity. Stage 3 when combined storage is at or below 50% of capacity.	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.
Titus County Freshwater Supply District No. 1	Lake Bob Sandlin	Stage 1 when reservoir storage is less than 139,000 ac-ft (68%). Stage 2 when reservoir storage is less than 105,800 ac-ft (52%). Stage 3 when reservoir storage is less than 77,750 ac-ft (38%).	Regular notification of wholesale customers and media. Request for customer implementation of voluntary and mandatory lawn water schedule, pro rata allocation of supply.

5.5 Navigation

This regional plan is considered to have negligible effects upon use of the Region's waters for navigation. Only Cypress Creek and the Red River are considered feasible for navigation projects and the plan does not propose additional reservoirs in either basin. As noted in Chapter 1, navigation in the Cypress Basin, Shreveport to Daingerfield, is presently considered infeasible by the U.S. Army Corps of Engineers, both economically and because of significant environmental impacts. Studies continue regarding making the Red River navigable from Shreveport to Texarkana. Current planning, however, envisions the necessary water for this purpose will be taken from existing Corps projects and does not rely on the development of new supply sources.

5.6 Effects of Water Reuse on Future Water Availability

In some areas of Texas, beneficial reuse of reclaimed water (i.e., appropriately treated wastewater) offers significant potential as a strategy to extend available water supplies. However, reuse of reclaimed water also has potential impacts on future water availability in that return flows to a stream may be diminished, thereby potentially effecting water availability for downstream users and instream uses. Current state law and policy allows direct beneficial reuse of reclaimed water under some circumstances without regard for these potential impacts. However, within the North East Texas Region, the effects of reuse on water availability does not appear to be a concern, either now or in the foreseeable future. There are no documented examples of water reuse occurring within the region at present and this regional water plan does not recommend that reuse be implemented as a strategy for meeting any identified water supply needs. Should local water supply entities elect to consider beneficial reuse of reclaimed water as a strategy in the future, the potential adverse effects on return flows and water availability should be evaluated and considered. Also, the completion of new surface water availability models for the river basins within the North East Texas Region will allow for future assessment of the potential effects of reuse on return flows and surface water availability.

5.7 Effects of Instream Flow Requirements on Future Water Availability

Provisions added to the Texas Water Code in 1985 require that instream flow requirements be considered by the TNRCC in its review of applications for new surface water rights permits. Since that time, it has become increasingly common for new water rights permits to include conditions relating to maintenance of instream flows. In some cases, this has been expressed as reservoir release or pass-through requirements or limitations on the amount of water that can be diverted directly from a stream. The intent of such requirements is to provide sufficient instream flows to maintain aquatic and riparian habitat. Reservoir pass-through requirements or limitations on new run-of-the river diversions to maintain instream flows reduce the amount of water available for other beneficial uses.

Under the so-called “four corners” doctrine, conditions placed on existing water rights must be explicitly stated within the permit. Accordingly, surface water supplies currently available for use within the North East Texas Region are determined by existing water rights permits and the conditions attached to each permit. Any instream flow requirements included in existing permits should therefore be reflected in the water supply yield estimates presented in Chapter 3.

Texas Water Development Board rules for regional water planning require that evaluations of water management strategies include consideration of any “…effects on environmental water needs” (31 TAC 357.7(a)(7)). Furthermore, TWDB guidelines require that the State’s Consensus Environmental Guidelines are to be used in the evaluation of new surface water supplies. As part of the *Reservoir Site Assessment Study* performed for the North East Texas Region, the State’s Consensus Environmental Guidelines were applied in the yield analyses for three previously proposed new reservoir projects, the Marvin Nichols I and George Parkhouse II reservoirs in the Sulphur River Basin and the Prairie Creek reservoir in the Sabine River Basin. Specifically, firm yield estimates were determined for each potential project using the State’s guidelines for pass-through of flows from new reservoir projects. These potential reservoir sites are described in Chapter 6.

Relatively minor reductions in the estimated firm yield of the three previously proposed reservoirs result from the application of the State’s Consensus Environmental Guidelines. For the Marvin Nichols I reservoir, the estimated firm yield of the project without pass-through of environmental flows is 557,239 ac-ft/yr. This estimate is reduced to 550,842 ac-ft/yr with the application of the pass-through criteria.

This represents a reduction in future potential firm water supply of 6,397 ac-ft/yr (1.1 percent). The estimated firm yield of the Parkhouse I reservoir is 133,478 ac-ft/yr without environmental pass-through and 131,850 with environmental pass-through criteria applied. This is a reduction of 1,628 ac-ft/yr of future potential firm water supply (1.2 percent). For the proposed Prairie Creek reservoir, the estimated firm yield of the project without pass-through of environmental flows is 20,675 ac-ft/yr, which is reduced to 17,215 ac-ft/yr with pass-through. This represents a 3,460 ac-ft/yr decrease (1.7 percent) in potential future firm water supply.