

#### **4C.12 Local Groundwater Supplies**

Municipal water systems in the upper Coastal Plains area of the South Central Texas Water Planning Region commonly use the Carrizo-Wilcox, Gulf Coast, or Trinity Aquifers for their supply. These sources may be a strong preference because the water is usually readily available, inexpensive, and often suitable for public water supplies with minimal treatment.

The purposes of this analysis are to:

- Evaluate aquifers and existing well field(s) of each municipality for their ability to meet projected water supply requirements through 2060 based on groundwater supply estimates that are based on reported well capacity for municipalities or WSC's TECQ water system data sheets.
- If additional supplies are needed, identify whether or not additional wells are the most likely water management strategy or whether an alternative strategy, such as purchase from a wholesale water provider, is recommended.
- If additional wells are needed, identify a reconnaissance-level location for new well(s).
- If the water needs to be treated, estimate the cost of the facilities.

The evaluation of individual municipal water systems is at a reconnaissance level and includes the following:

1. Compiled information prepared for the South Central Texas Regional Water Planning Group on current and TWDB's projected populations and water demands for each of the municipalities.
2. Estimated the TCEQ system capacity through 2060 for each water system.
3. Compiled and summarized publicly available information for each municipal water system from TCEQ and TWDB.
4. If the estimated groundwater supply after adjustments was greater than the estimated required capacity in 2060, the evaluation concludes that the existing water supply is adequate.
5. If the estimated supply after adjustments was less than the estimated required capacity in the year 2060, the evaluation concluded that an additional water supply would be needed.
6. If new wells are the most feasible water management strategy, estimated at what decade it is needed and the capital cost of adding the new wells to the water system.

The methodology presented in the following text deals specifically with those entities that show a projected unmet need that is likely to be met through development of local aquifer

supplies; in other words, only those entities whose needs exceed the current estimation of local groundwater supply. This does not imply that other entities that currently utilize the Carrizo Aquifer for supply will no longer do so. For example, the City of Stockdale in Wilson County utilizes a local well field in the Carrizo Aquifer to supply its needs. However, needs analysis, according to the methods employed in this study, indicate that currently-allocated groundwater supplies are sufficient to meet Stockdale's needs through 2060. Therefore, there are no projected needs and Stockdale is not specifically considered in this section. However, it is acknowledged that they will continue to use the Carrizo Aquifer as their supply, and groundwater modeling to determine the effects of proposed water management strategies will simulate all projected demands for Stockdale and other cities with similar circumstances.

For municipal entities with needs to be met from local Carrizo, TCEQ water utility data sheets were reviewed. These data sheets provide the number, depth, and reported capacity of existing wells for the city or WSC. A depth and well capacity (gpm) estimate characteristic of existing wells in the vicinity was developed for costing purposes. For actual long term average well yield, identical assumptions were made as the groundwater supply calculations. It was assumed that the well capacity (gpm) reported in the TCEQ data sheets represents a peak flow rate, and assumed a municipal peaking factor of 2. Therefore, the average yield per municipal well, expressed in acft/year, was assumed to be one-half of the reported peak value. (This assumption was not made for steam electric demands, which were based on reported historic well use, not reported peak well capacity.) No pipelines or pump stations were assumed for costing purposes. It was assumed that these proposed wells would connect directly to the local distribution system, and that the cost of any associated piping would be covered in the 35% project cost contingency factor. For the purposes of estimating well pumping power costs, a total dynamic head estimate of 300 feet was assumed: 160 feet to bring water from pumping levels to the ground surface, and 140 feet to pump into a pressurized distribution system maintained at 60 psi. This conservative estimate is intended to account for local drawdown and declining water levels with time. An assessment of likely treatment requirements based on existing water quality and treatment data was made for water from each aquifer, and costs for the appropriate level of treatment were incorporated into the cost estimate.

All cost estimates were performed according to established SB1 methodology. In other words, all costs were amortized over a 30-year loan period, with debt service and annualized O&M often being a significant proportion of costs. In addition, all wells are costed in present

value, even if they are not scheduled to be needed until later decades. This is to maintain consistency in cost estimates with other projects. However, it should be noted that individual wells are not usually financed in this manner, and managers of affected municipalities and WSCs may be more interested simply in the estimated capital cost for the wells.

#### **4C.12.1 Carrizo-Wilcox Aquifer**

The following entities are expected to need new local supply wells in the Carrizo Aquifer added to their system by 2060: Benton City WSC, McCoy WSC, Atascosa County Steam Electric, City of Floresville, Oak Hills WSC, SS WSC, Sunko WSC, Gonzales WSC, Crystal Clear WSC, City of Lockhart, City of Luling, Aqua WSC, Polonia WSC. In addition, Bexar Met is planning to add water treatment facilities necessary to provide municipal water supply from its existing wells in south Bexar County. Figure 4C.12-1 presents the location of the entities with projected needs to be met from Local Carrizo Aquifer supply. Cost estimates for new wells were prepared according to the assumptions presented in the previous section. Table 4C.12-1 displays the projected needs, by decade, for each of these entities, and the decades in which additional wells are estimated to be needed. In addition the capital cost, project cost, annual cost, yield, and unit cost (in \$/acft and \$/1000 gallons) for water obtained under this strategy are presented in this table. However, regional water level declines in some areas may cause the system operators to lower pumps in some of their wells, and as growth in water demands occurs, it may be necessary to add wells to meet peak day demands. Water from the Carrizo-Wilcox Aquifer often has iron concentrations greater than 0.3 milligrams per liter, which exceeds guidelines for aesthetic effects. The costs of adding a water treatment plant to treat iron and manganese removal, as well as chlorination, were included in the cost estimates for these cities. Some of the well fields are located where the Carrizo Aquifer is very deep and produces relatively hot water, which may need to be cooled prior to distribution.

#### **4C.12.2 Gulf Coast Aquifer**

The City of Kenedy, in Karnes County (Figure 4C.12-2), was the only municipal system identified with projected needs that are likely to be met through local development of the Gulf Coast Aquifer. This entity is expected to need two new supply wells in the Gulf Coast Aquifer added to their system by the year 2060. Cost estimates for new wells were prepared according to the previously described methodology and are summarized in Table 4C.12-1.

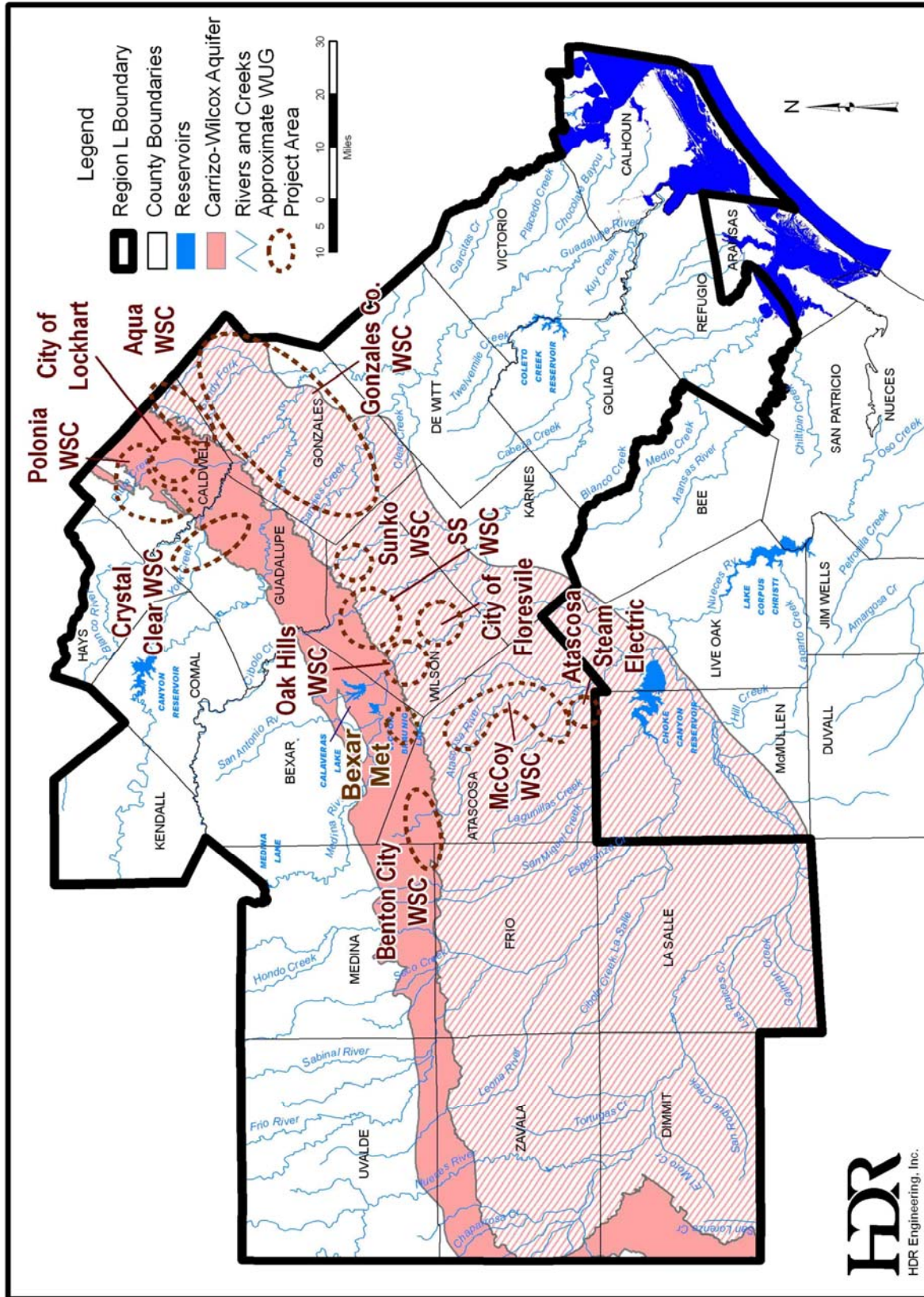


Figure 4C.12-1. Local Carrizo-Wilcox Supply



**Table 4C.12-1.  
Local Groundwater Water Management Strategy  
Cost and Schedule Summary**

User	County	Aquifer	Projected Needs New Wells	Needs <sup>1</sup>							Total Wells	Total Capital Cost	Total Project Cost	Total Annual Cost	Available Project Yield	Annual Cost (\$/acft)	Annual Cost (\$/1,000 gal)
				2010	2020	2030	2040	2050	2060	2060							
Benton City WSC	Atascosa	Carrizo	Projected Needs New Wells	0	144	385	627	869	1058	2	\$1,962,000	\$2,755,000	\$481,000	1,613	\$298	\$0.92	
McCoy WSC	Atascosa	Carrizo	Projected Needs New Wells	515	838	1107	1321	1520	1675	3	\$3,844,000	\$5,397,000	\$794,000	2,421	\$328	\$1.01	
Atascosa Steam Electric	Atascosa	Carrizo	Projected Needs New Wells	0	0	0	874	2212	3952	4	\$4,096,000	\$5,752,000	\$511,000	4,480	\$114	\$0.35	
City of Floresville	Wilson	Carrizo	Projected Needs New Wells	0	0	0	0	137	411	1	\$1,440,000	\$2,022,000	\$318,000	806	\$393	\$1.21	
Oak Hills WSC	Wilson	Carrizo	Projected Needs New Wells	0	0	81	366	673	990	2	\$1,848,000	\$2,595,000	\$448,000	1,452	\$309	\$0.95	
SS WSC	Wilson	Carrizo	Projected Needs New Wells	223	864	1546	2214	2939	3690	5	\$4,468,000	\$6,274,000	\$1,048,000	3,830	\$274	\$0.84	
Sunko WSC	Wilson	Carrizo	Projected Needs New Wells	0	0	0	95	237	392	1	\$1,440,000	\$2,022,000	\$317,000	807	\$392	\$1.20	
Gonzales Co WSC	Gonzales	Carrizo	Projected Needs New Wells	0	14	75	208	254	255	1	\$1,228,000	\$1,725,000	\$278,000	645	\$431	\$1.32	
Crystal Clear WSC <sup>2</sup>	Guadalupe	Wilcox	Projected Needs New Wells	0	2	494	1123	1911	2701	5	\$1,983,000	\$2,785,000	\$355,000	1,000	\$355	\$1.09	
City of Lockhart	Caldwell	Wilcox	Projected Needs New Wells	341	984	1519	1519	1519	1519	4	\$3,315,000	\$4,806,000	\$620,581	1,612	\$385	\$1.18	
City of Luling	Caldwell	Wilcox	Projected Needs New Wells	168	311	400	485	587	695	2	\$1,340,000	\$1,893,000	\$292,000	807	\$362	\$1.11	
Aqua WSC	Caldwell	Carrizo-	Projected Needs New Wells	49	121	178	240	300	362	1	\$1,031,000	\$1,448,000	\$236,000	536	\$443	\$1.36	
Polonia WSC	Caldwell	Wilcox	Projected Needs New Wells	0	0	137	331	520	719	3	\$1,561,000	\$2,193,000	\$312,000	720	\$433	\$1.33	
City of Kennedy	Karnes	Gulf Coast	Projected Needs New Wells	187	250	298	336	385	417	2	\$3,434,000	\$4,822,000	\$705,000	780	\$904	\$2.77	
County Line WSC <sup>3</sup>	Caldwell	Trinity	Projected Needs New Wells	44	1096	1416	1582	1900	2365	2	\$1,907,000	\$2,693,000	\$271,254	808	\$336	\$1.03	
Goforth WSC	Caldwell	Trinity	Projected Needs New Wells	400	400	400	400	400	400	1	\$971,000	\$1,373,000	\$146,000	400	\$365	\$1.12	
Bexar Met <sup>4</sup>	Bexar	Trinity	Projected Needs New Wells	20,243	27,744	31,263	33,753	36,346	39,016	38	\$14,455,000	\$20,382,000	\$4,934,000	15,000	\$329	\$1.01	
Bexar Met <sup>5</sup>	Bexar	Carrizo	Projected Needs New Wells	20,243	27,744	31,263	33,753	36,346	39,016	0	\$1,892,000	\$2,675,000	\$700,000	4,000	\$175	\$0.54	
SAWS <sup>6</sup>	Bexar	Trinity	Projected Needs New Wells	54,406	80,254	104,433	121,980	138,954	155,967	14	\$5,361,000	\$7,562,000	\$1,724,000	5,000	\$345	\$1.06	

Notes:  
 1) Indicates needs exceeding current estimate of local aquifer supply. See text for details.  
 2) Local Wilcox development to meet approximately 600 ac-ft/yr of needs.  
 3) Local Trinity development to supply approximately 808 ac-ft/yr of needs.  
 4) Local Trinity development to supply approximately 15,000 ac-ft/yr of needs by 2020.  
 5) Local Carrizo development to supply approximately 4,000 ac-ft/yr of needs by 2010. Wells already exist. Capital costs reflect treatment costs.  
 6) Local Trinity development to supply approximately 5,000 Ac-ft/year of needs.



The groundwater from the Catahoula Formation has TDS concentrations greater than 1,000 ppm. Current treatment is through a reverse osmosis membrane system. Costs for this treatment were included in cost estimates.

Two other WUGs identified with major needs through 2060 were the steam-electric users in Goliad County (no needs until 2060) and the manufacturing users in Victoria County (no needs until 2040). However, it was indicated that these needs were likely to be met through a purchase from a wholesale water provider or other strategies, and not from development of local Gulf Coast supplies.

#### **4C.12.3 Trinity Aquifer**

The following entities have indicated their intent to utilize local Trinity Aquifer supplies to meet projected needs through 2060: County Line WSC, Goforth WSC, Bexar Met, and SAWS (Figure 4C.12-3). County Line WSC has plans to develop Trinity wells to supply approximately 800 acft/year from Caldwell County. Cost estimates were based on data provided by the WSC's hydrogeologist (Table 4C.12-1). SAWS and Bexar Metropolitan Water District have also indicated plans to utilize the Trinity Aquifer within Bexar County to meet projected needs. In addition to these municipal users, there are projected needs to meet livestock demands in Comal and Kendall Counties. However, wells developed to meet these needs will be private wells located at the point of demand; cost estimates for wells in the Trinity Aquifer to meet livestock needs were not developed for this plan.

Water quality in the Trinity Aquifer is generally favorable for incorporation into a water supply system with only chlorination as treatment; cost estimates for the local Trinity Aquifer projects reflect this.

#### **4C.12.4 Barton Springs Edwards Aquifer**

The Local Barton Springs Edwards water management strategy involves the phased development of new groundwater supplies from the Barton Springs Edwards Aquifer through construction of new wells and/or acquisition of rights to pump from existing wells. Planned new supplies total 150 acft/yr by 2010 and 200 acft/yr by 2050 at an estimated cost of \$135/acft/yr.

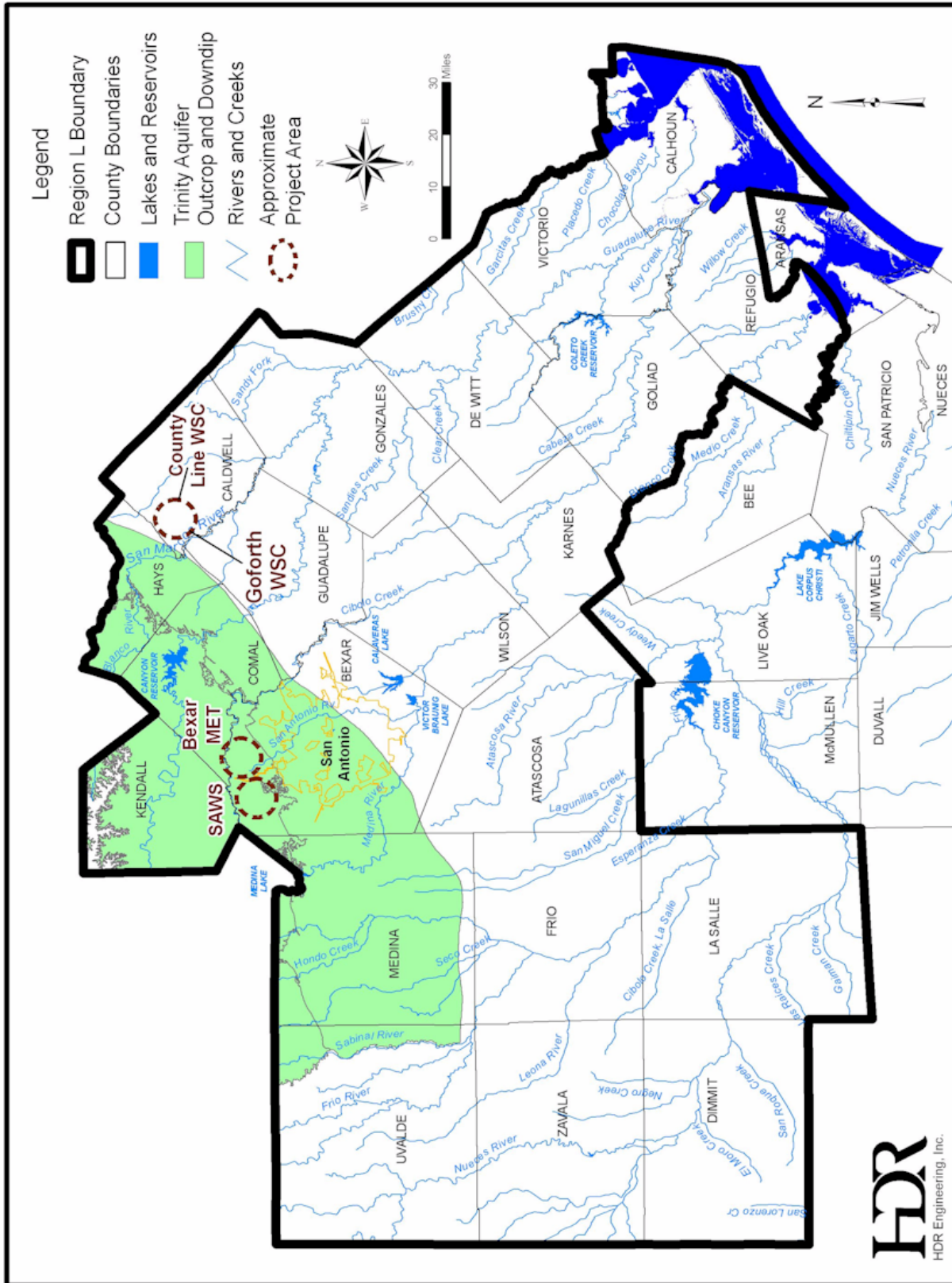


Figure 4C.12-3. Local Trinity Supply

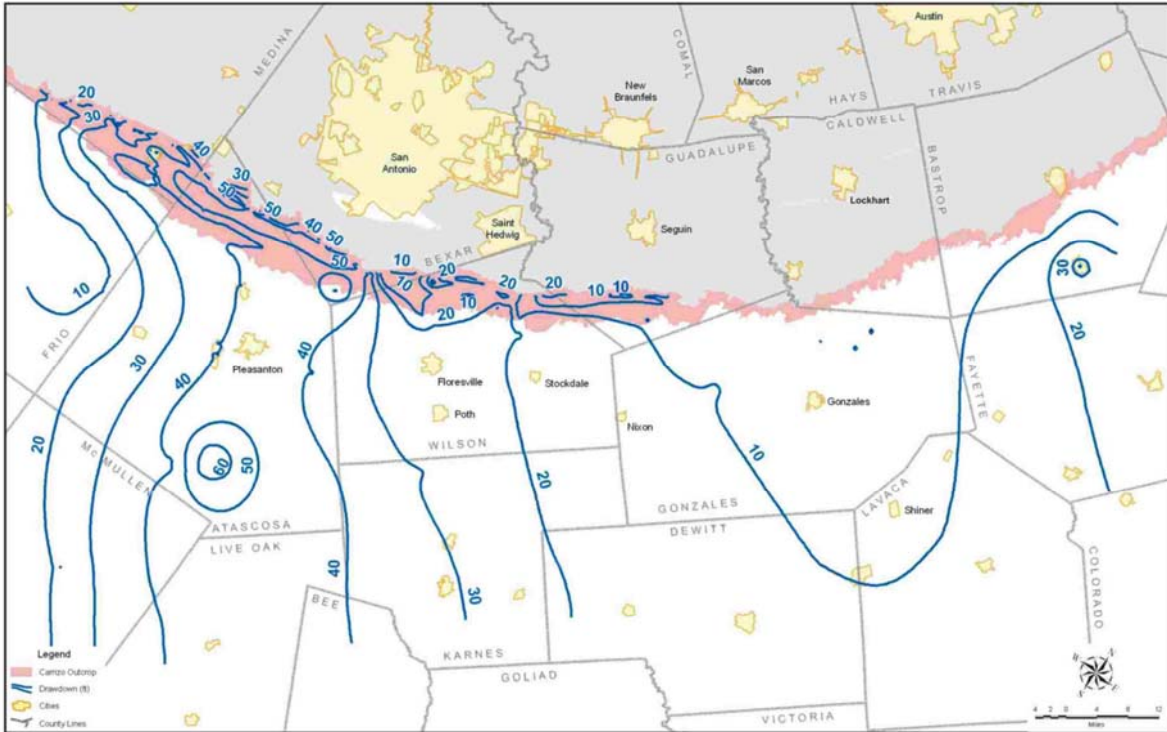


#### 4C.12.5 Drawdown

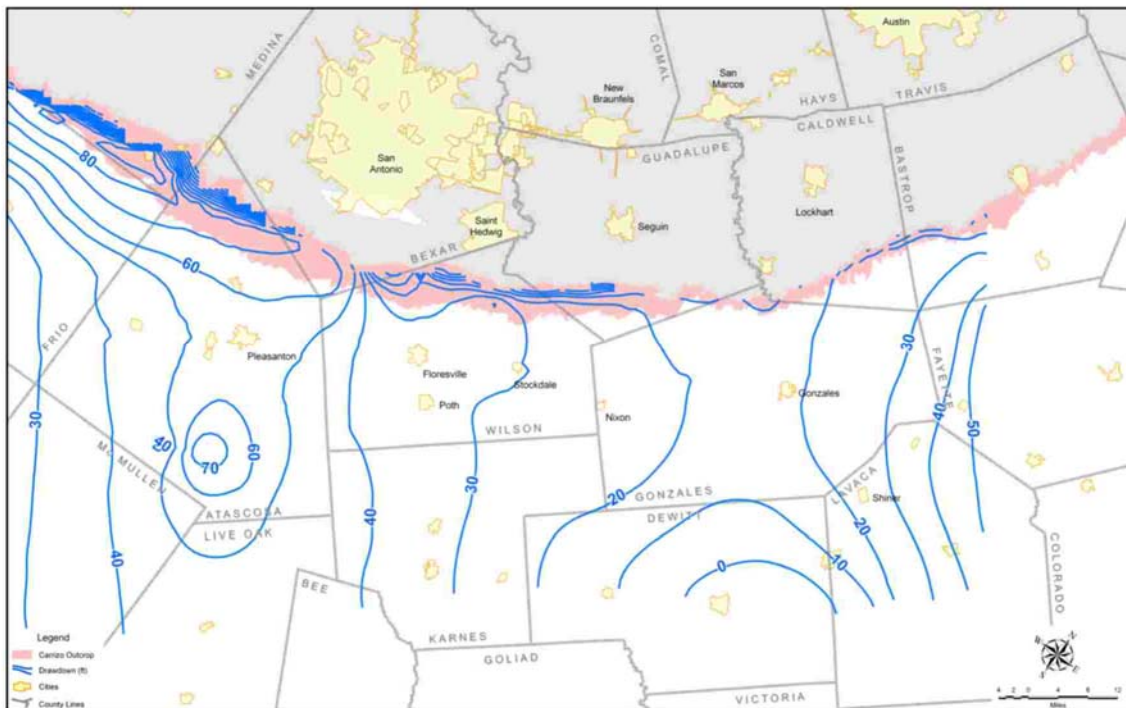
Predictive groundwater model simulations were performed representing projected pumpage for local supply using both the South Central Carrizo System (SCCS) groundwater model and the southern Carrizo-Wilcox/Queen City-Sparta Aquifers (SCWQSGAM). (Note: The projected local supply pumpage used for these model simulations does not include the 4,000 ac-ft/yr for the Bexar Metropolitan Water District (Bexar Met) Stagg Ranch wells in southern Bexar County, which were added to the plan in December 2005. For an indication of the drawdown effects of the BMWD Stagg Ranch wells, refer to the report section describing cumulative effects of recommended strategies (Volume I, Section 7, Figure 7.1-9). The SCWQSGAM has a larger modeled area than the SCCS model, extending all the way to the Rio Grande in the southwest. In the common area shared by both models, pumpage was identical for each county. For the area only represented in the SCWQSGAM, pumpage was consistent with groundwater usage projections developed from RWPG demand data.

Drawdown calculated by the SCCS model is displayed in Figure 4C.12-4. Drawdown calculated by the SCWQSGAM is displayed in Figure 4C.12-5. As can be seen in these figures, the SCWQSGAM calculates a greater amount of drawdown due to pumpage for local supply than does the SCCS model in the counties which are represented in both models.

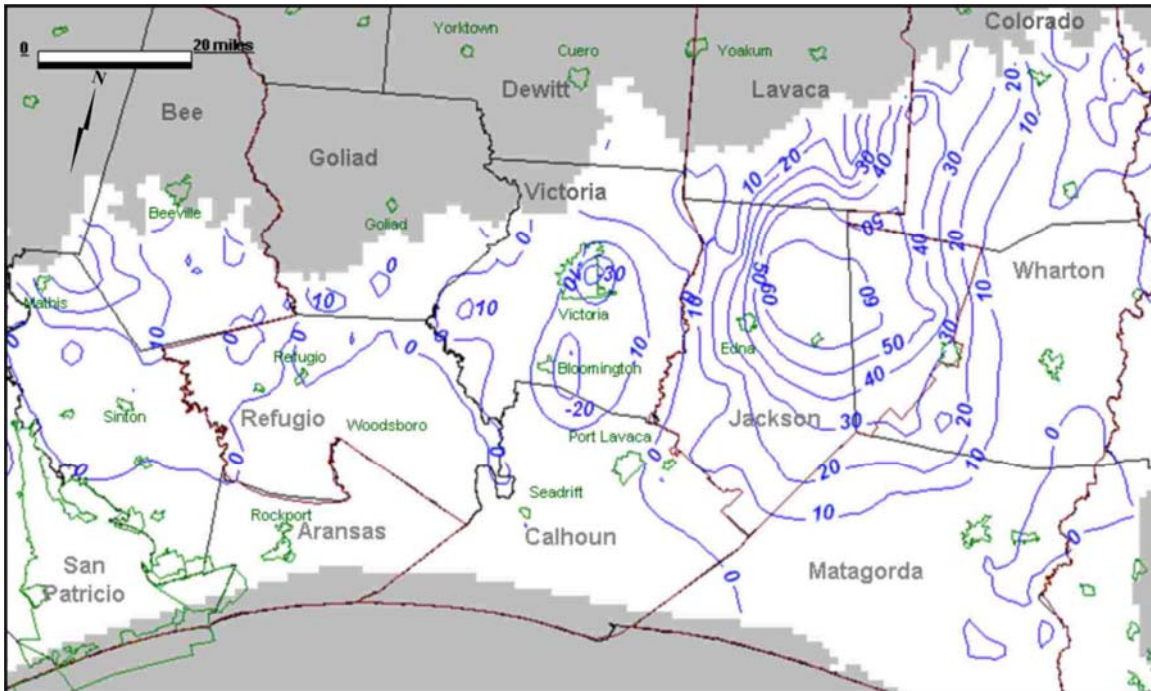
Estimated projected drawdown in the Gulf Coast Aquifer due to groundwater pumpage for local supply was calculated using the publicly-released partially penetrating version of the Central Gulf Coast Groundwater Availability Model. Calculated drawdown for the Chicot and Evangeline Aquifers due to local supply pumpage is presented in Figures 4C.12-6 and 4C.12-7, respectively. Projected drawdowns in Region L counties on the Gulf Coast Aquifer are not significant over the simulated time period. It is noteworthy that the area around the City of Victoria shows *negative* drawdown of over 90 feet, indicating rising groundwater levels from 2000 conditions. This results from simulating Victoria's proposed strategy of reducing dependence on groundwater and relying more on surface water sources. Thus a decrease in pumpage when compared to historical pumping levels results in rising groundwater elevations. This phenomenon is discussed in greater detail in Section 4C.19.



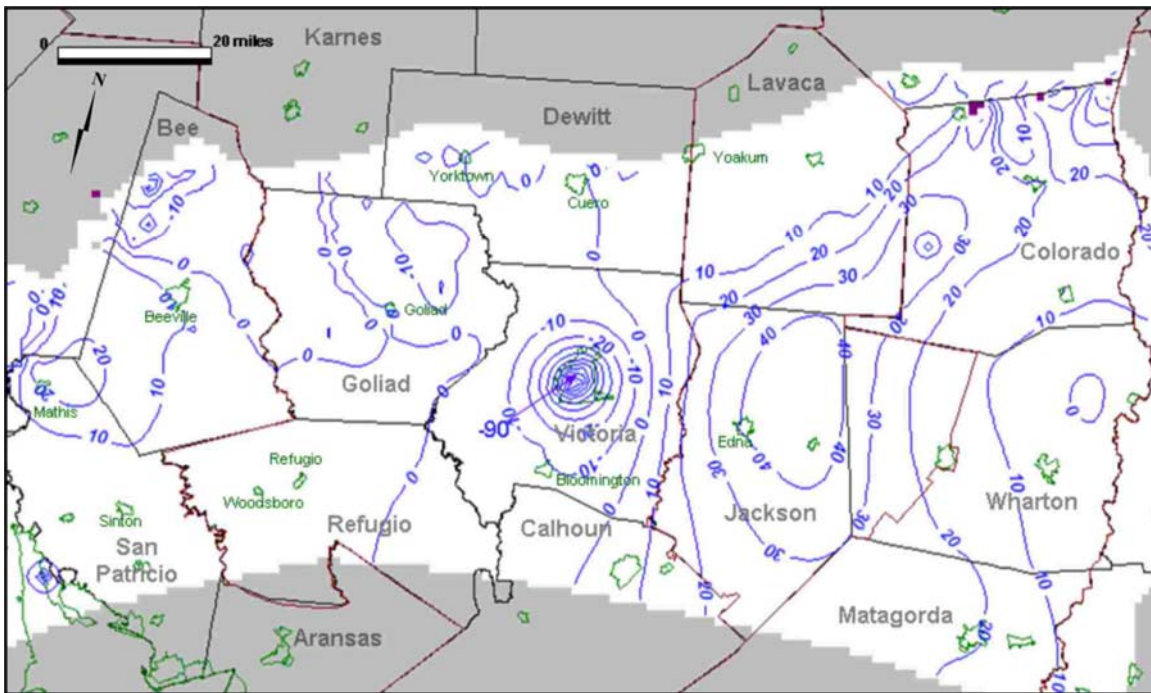
**Figure 4C.12-4. SCCS Predictive Simulation Results: 2002-2060 Carrizo Drawdown due to Local Supply Pumpage**



**Figure 4C.12-5. SCWQSGAM Predictive Simulation Results: 2002-2060 Carrizo Drawdown due to Local Supply Pumpage**



**Figure 4C.12-6. Central Gulf Coast GAM Predictive Simulation Results: 2000-2060 Chicot Aquifer Drawdown due to Local Supply Pumpage**



**Figure 4C.12-7. Central Gulf Coast GAM Predictive Simulation Results: 2000-2060 Evangeline Aquifer Drawdown due to Local Supply Pumpage**

#### **4C.12.6 Environmental Issues**

In the local groundwater water management strategy, existing municipal well fields in area that use the aforementioned aquifers for their water supply are evaluated. Some municipalities will need additional wells to meet projected water supply requirements to 2060.

Data from well fields in this area show declining trends in groundwater levels during the past 30 years. Pumping for water supply, amount of rainfall, and other factors affect aquifer levels.

The pumping of groundwater from the Carrizo-Wilcox Aquifer could have a negative impact on springflow and temporary pools in these areas. Some species inhabit or use temporary pools as well as aquifers and springs. Possible negative effects on these species should be considered when evaluating this option.

Habitat studies and surveys for protected species would need to be conducted at the proposed well field sites and along any pipeline routes. When potential protected species habitat or other significant resources cannot be avoided, additional studies would have to be conducted to evaluate habitat use or eligibility for inclusion in the National Register for Historic Places, respectively. Potential wetland impacts due to primary pipeline stream crossings can be minimized by right-of-way selection and appropriate construction methods, including erosion controls and revegetation procedures. Compensation for net losses of wetlands would be required where impacts are unavoidable.

#### **4C.12.7 Engineering and Costing**

A summary of projected needs and cost estimates for development of local groundwater supply in the three subject aquifers, subject to the assumptions previously discussed, is presented in Table 4C.12-1.

#### **4C.12.8 Implementation Issues**

The development of additional wells and well fields in the Carrizo-Wilcox Aquifer in the South Central Texas Water Planning Region may encounter the following issues:

- Detailed feasibility evaluation including test drilling and aquifer water quality testing.
- Impact on:
  - Endangered and threatened species,
  - Water levels in the aquifer,

- Baseflow in streams, and
- Wetlands.
- Competition with others for groundwater in the area.
- Regulations by Groundwater Conservation Districts, including the renewal of pumping permits at periodic intervals in counties where districts have been organized.

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