

# GAM run 03-30

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Groundwater Availability Modeling Section  
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## REQUESTOR:

Region C Water Planning Group

## DESCRIPTION OF REQUEST:

The Region C Water Planning Group (RCWPG) requested that the Northern and Central Carrizo-Wilcox Groundwater Availability Models (Dutton and others, 2003; Fryar and others, 2003) be rerun using the county-basin pumpage totals shown in Table 1. These county-basin pumpage totals are total water availability based on 100 percent of recharge summed over county-basins. The recharge totals are from a previous GAM run using the Central Carrizo-Wilcox GAM (GAM Run 03-24). The RCWPG intersects the two model areas in Freestone, Henderson, and Navarro counties (Figure 1).

**Table 1. Groundwater availability numbers to use as pumpage in GAM runs.**

County	Basin	Climatic Condition	2000	2010	2020	2030	2040	2050
Freestone	Trinity	Average	31,096	31,096	31,096	31,096	31,096	31,096
Freestone	Brazos	Average	5,320	5,320	5,320	5,320	5,320	5,320
Henderson	Trinity	Average	10,008	10,008	10,008	10,008	10,008	10,008
Navarro	Trinity	Average	2,199	2,199	2,199	2,199	2,199	2,199

## PARAMETERS AND ASSUMPTIONS:

The models were run with the following assumptions:

- The pumpage in the models was increased by uniformly scaling all pumpage in a county-basin by a factor equal to:

$$\frac{(\text{county-basin total recharge from Central Model})}{(\text{original county-basin total pumpage})}$$

- Pumpage in surrounding county-basins was scaled upward based on total county-basin recharge amounts from the Central Carrizo-Wilcox GAM.
- For county-basins with no recharge or where the original pumpage was greater than recharge, the pumpage was maintained at the original amount.

- County-basins with no pumpage in the original GAMs will not have pumpage in the new runs.

All other parameters and assumptions remain the same as reported in the 2003 model reports (Dutton and others, 2003; Fryar and others, 2003).

## **METHODS:**

To address the request, we:

- Extracted the total county basin pumpage input for the predictive Northern and Central Carrizo-Wilcox GAMs from the MODFLOW well file.
- Ran the predictive Central Carrizo-Wilcox GAMs and extracted the total recharge for each county basin.
- Constructed a table of ratios (Central Carrizo-Wilcox GAM county-basin recharge total)/(county-basin pumpage total).
- Adjusted the MODFLOW well file for the predictive GAMs based on the ratios and the assumptions discussed above.
- Reran the predictive GAMs with the new pumpage volumes.
- Extracted flow budgets for Freestone, Henderson, and Navarro counties.
- Plotted head distributions for the original GAM runs and the revised GAM run and plotted the difference in heads between the runs.

## **RESULTS:**

Central Carrizo-Wilcox GAM head plots and head difference plots for layers 3 (Carrizo) and 5 (Simsboro) are shown in Figures 2 through 5. Northern Carrizo-Wilcox GAM head plots and head difference plots for layer 3 (Carrizo) are shown in Figures 6 and 7. Slight declines of 10 to 20 feet due to the additional pumpage are indicated in Layer 3 in Henderson and Freestone counties (Figures 2, 3, 6, and 7). More significant declines occur in Layer 5 especially in Freestone County (Figures 4 and 5). Plots of layer 5 are not shown for the Northern Carrizo-Wilcox model because two high pumpage cells in Freestone and Limestone counties converted to dry cells during the simulation. Consequently, pumping no longer occurred in those cells, and as a result heads in the surrounding cells rebounded; therefore, the comparison plot would indicate rebound which might be misleading.

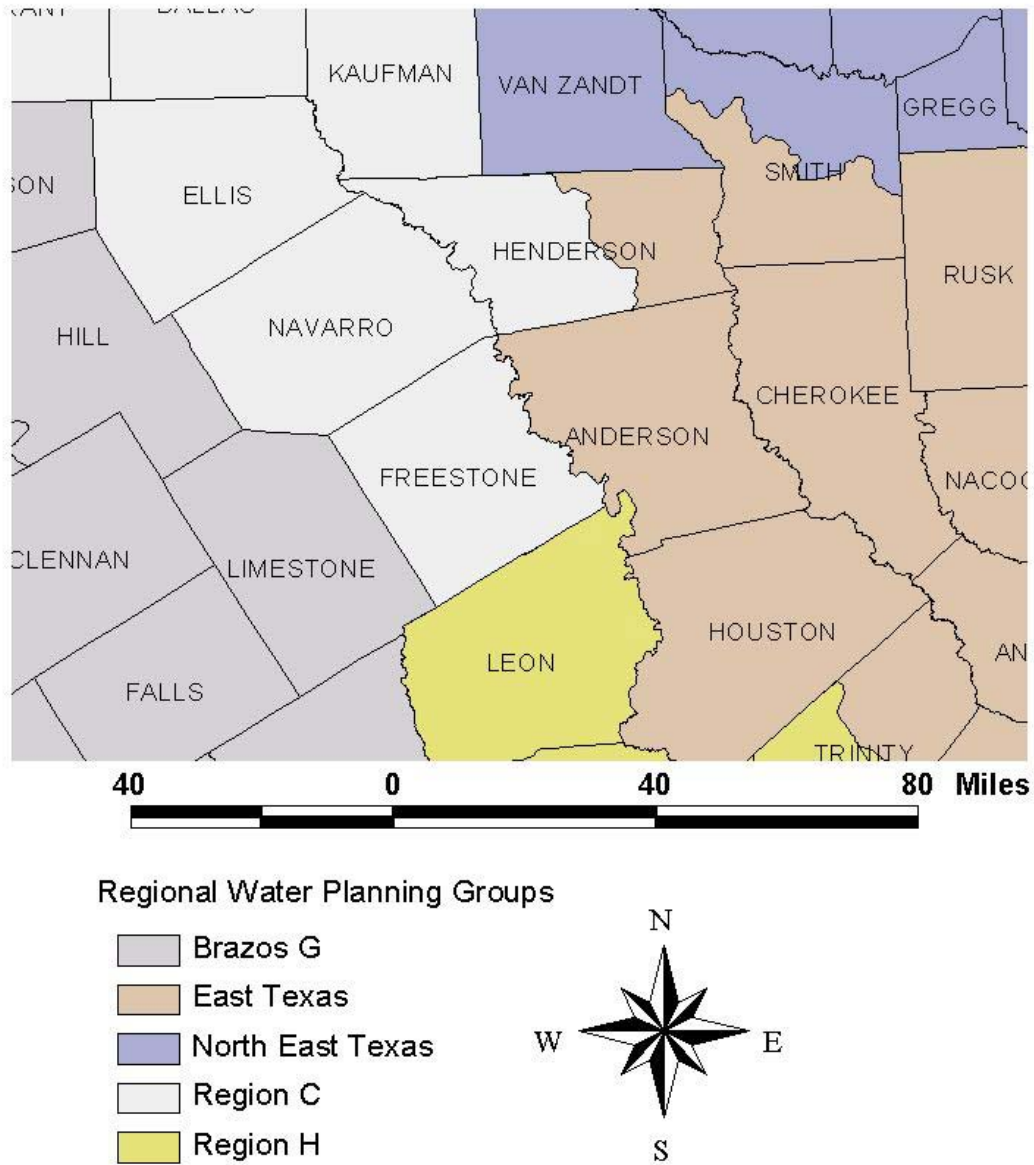
Charts comparing the flow budget for each of the four county basins are shown in Figures 8 – 12. Figure 8 is a comparison for a single layer (layer 5) in Freestone-Brazos. The charts indicate the source of the additional water for pumpage. For example, in Figure 9 (Navarro-Trinity All Layers), the additional pumpage is supplemented by water from storage, reduction in evapotranspiration, and reduction in discharge to streams. It should be noted that the recharge values for the original and revised scenarios are generally the same; however, the slight difference shown in Figure 9 results from recharge cells converting to dry cells.

The complete flow budget for the Central and Northern models are shown in Tables 2 and 3, respectively. The county-basin revised pumpage totals for all layers for the four county-basins listed in Tables 2 and 3 are generally equal to the values listed in Table 1. However, in some cases the pumpage values shown in Tables 2 and 3 are less than that shown in Table 1 because some of the outcrop pumping cells have gone dry during the simulation. This reduction especially occurs in Freestone-Brazos. In some cases, the total pumpage shown in Tables 2 and 3 may slightly exceed that shown in Table 1 because the scaling factors for adjusting pumpage were calculated on decade basis; whereas, the budget shown in Tables 2 and 3 is for one particular year. However, these differences are only slight.

It should also be noted that the total county-basin pumpage for Freestone-Brazos in the Northern Carrizo-Wilcox model is significantly greater than in the Central Carrizo-Wilcox model. This difference is likely to be a result of pumpage from Limestone County, directly west of Freestone, being attributed to grid cells centered in Freestone County. In the analysis performed for this report, a grid cell is attributed with the county where the center of the cell lies, even though part of that cell may lie in another county. In most cases this is a reasonable approach. However, if large volume point pumping is located close to a county line, large differences in county totals may occur. This discrepancy does not affect the model results. It is only reflected in the accounting process.

## **REFERENCES:**

- Dutton, A. R., Harden, R., Nicot, J. P., and O' Rourke, D., 2003, Groundwater availability model for the central part of the Carrizo-Wilcox aquifer in Texas: Final Report prepared for the Texas Water Development Board by the Bureau of Economic Geology, R.W. Harden and Associates, and HDR Engineering Services, Inc.
- Fryar, D., Senger, R., Deeds, N., Pickens, J., Jones, T., Whallon, A. J., and Dean, K. E., 2003, Groundwater availability model for the northern Carrizo-Wilcox aquifer: Final Report prepared for the Texas Water Development Board by INTERA Incorporated and Parsons Engineering.



**Figure 1. Area of interest for model runs. The Northern and Central Carrizo-Wilcox GAMs intersect Region C Water Planning Group in Navarro, Freestone, and Henderson counties.**

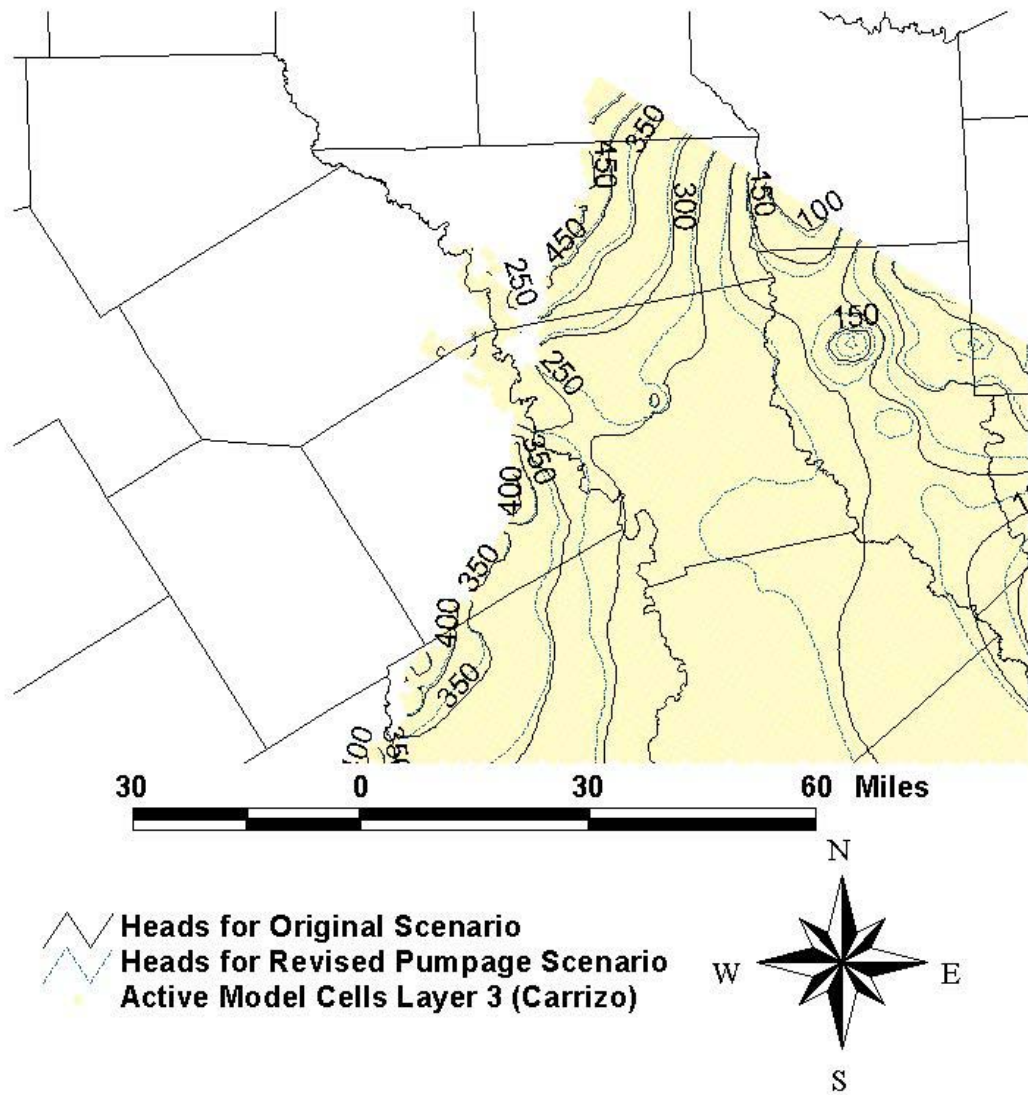


Figure 2. Distribution of Carrizo aquifer heads for original Central Carrizo-Wilcox GAM run and revised pumpage GAM run. Heads are in feet above sea level.

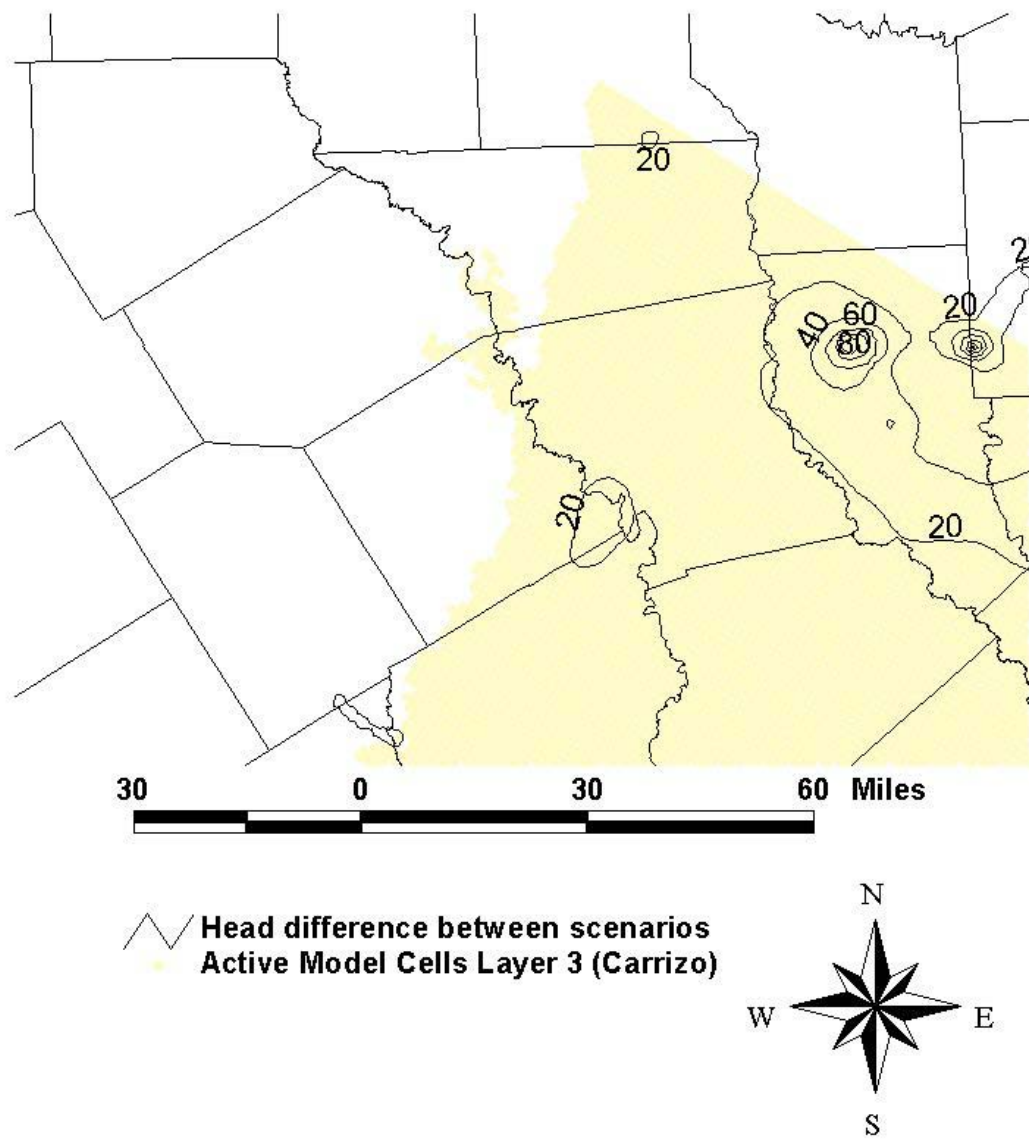


Figure 3. Amount of head decline in Carrizo aquifer due to additional pumpage in revised Central Carrizo-Wilcox GAM Run. Head differences are in feet.

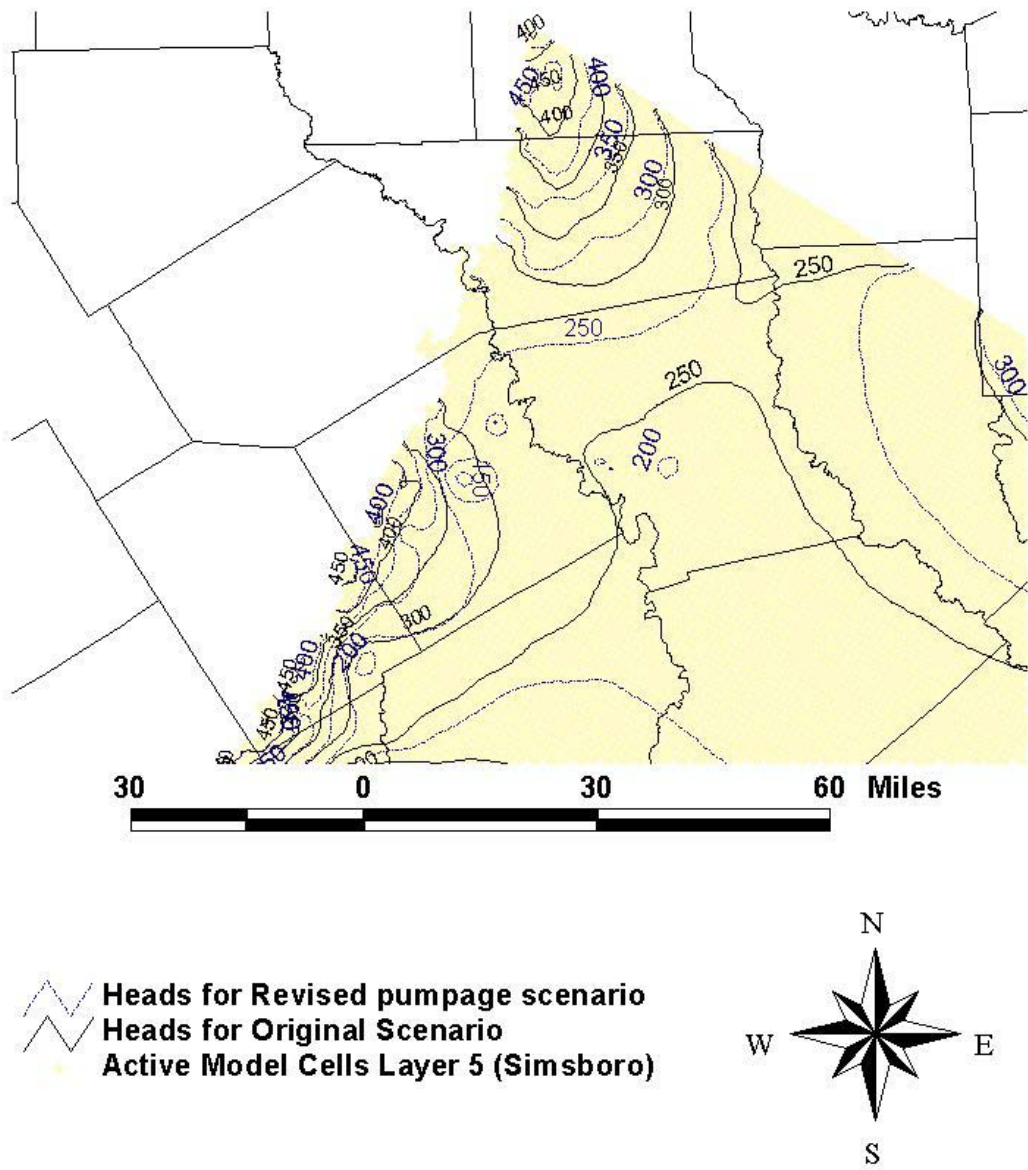


Figure 4. Distribution of Simsboro aquifer heads for original Central Carrizo-Wilcox GAM run and revised pumpage GAM run. Heads are in feet above sea level.

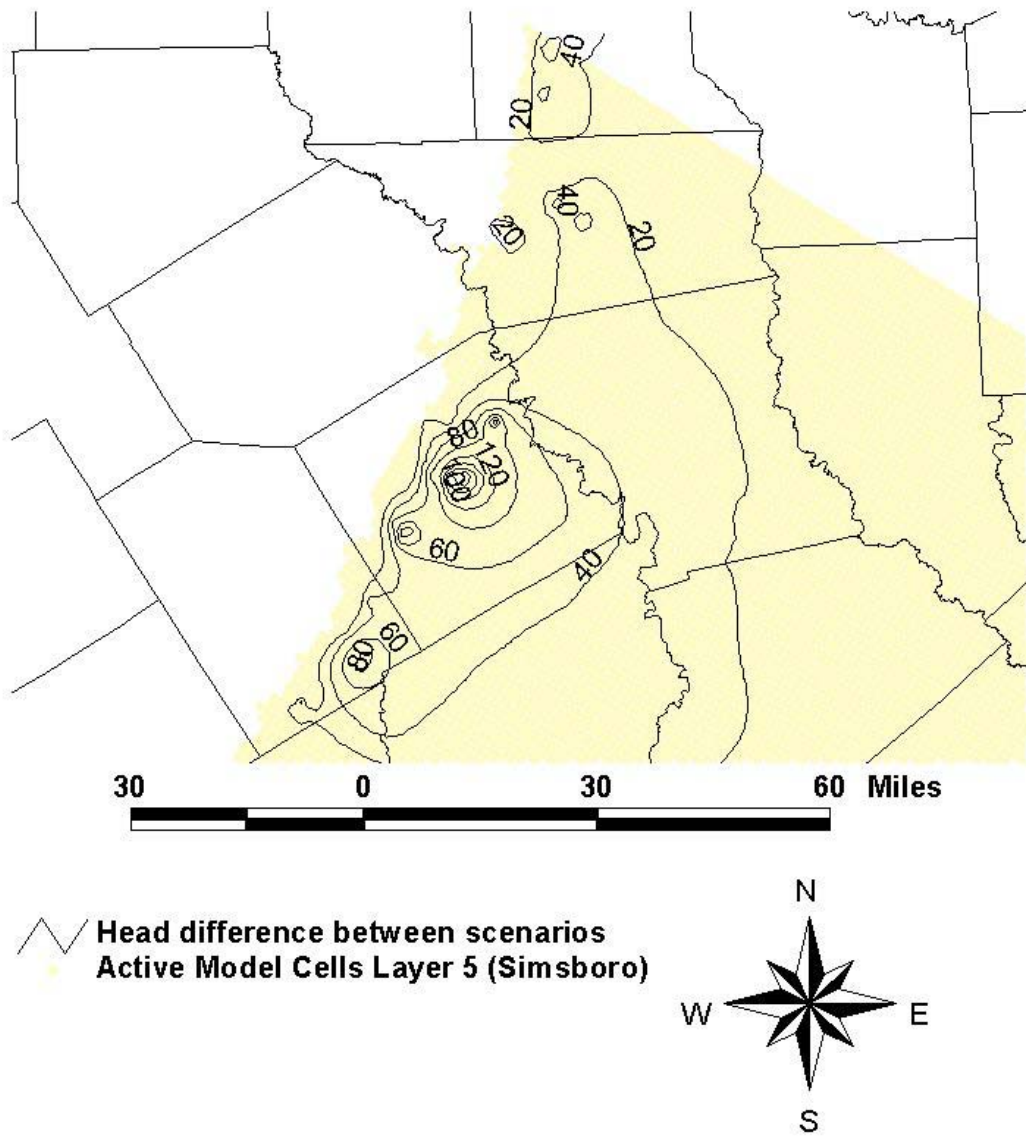
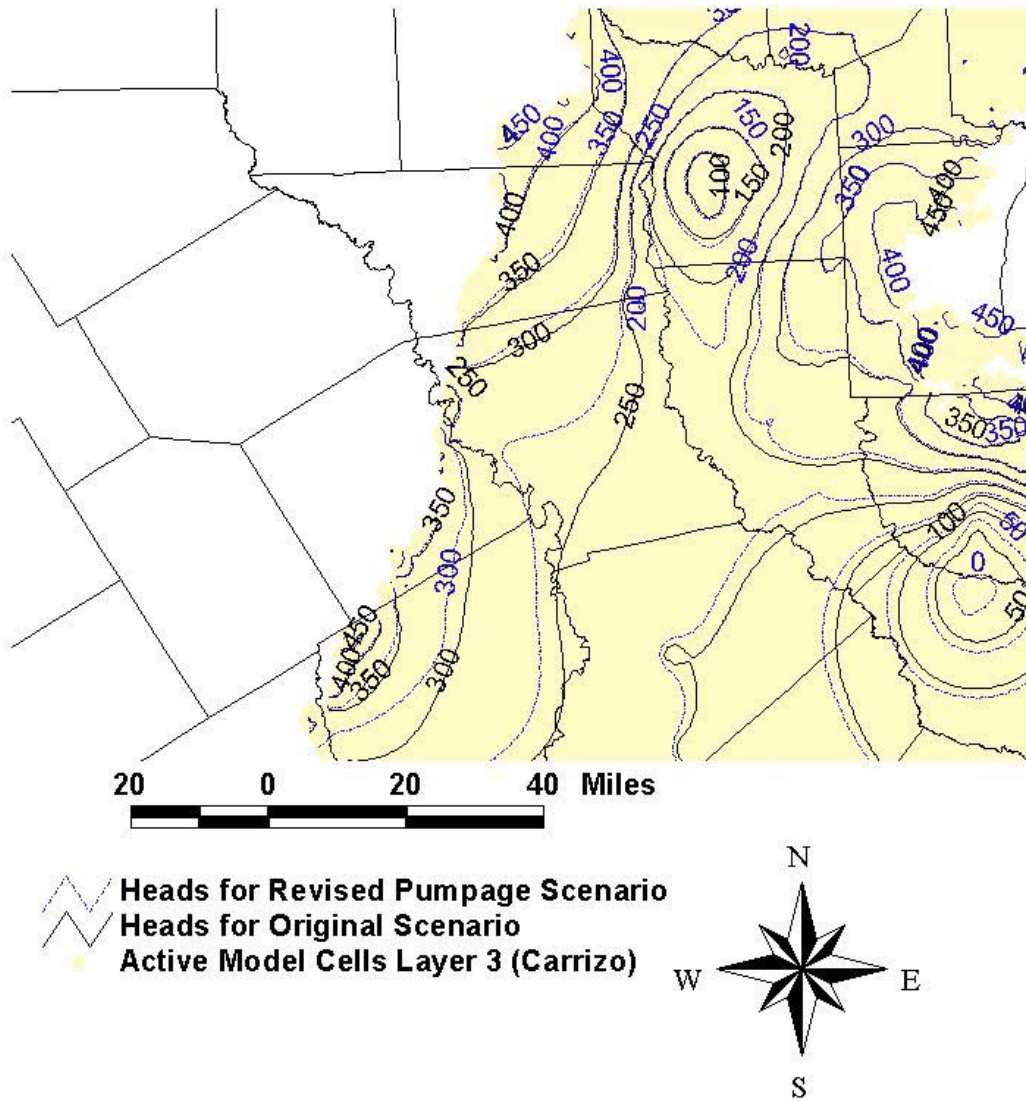
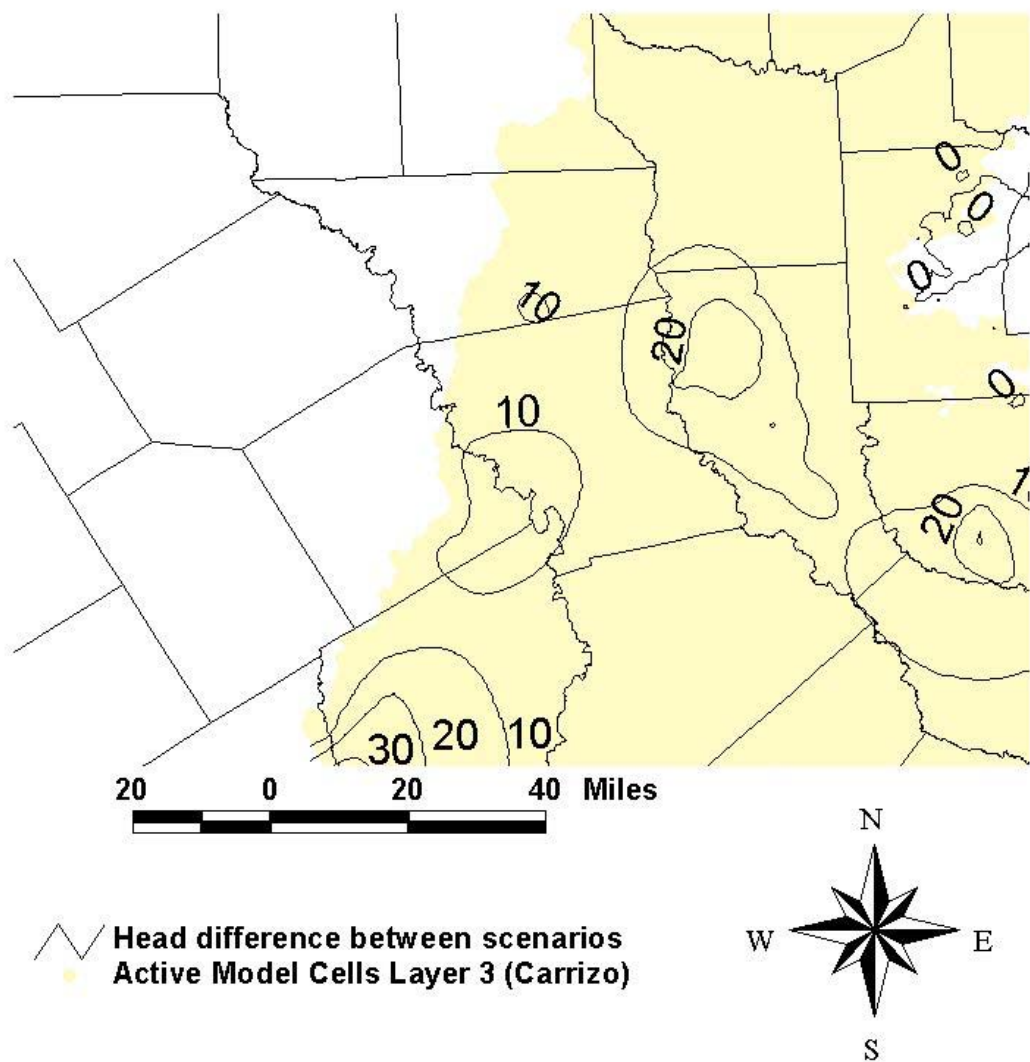


Figure 5. Amount of head decline in Simsboro aquifer due to additional pumpage in revised Central Carrizo-Wilcox GAM Run. Head differences are in feet.





**Figure 6. Distribution of Carrizo aquifer heads for original Northern Carrizo-Wilcox GAM run and revised pumpage GAM run. Heads are in feet above sea level.**



**Figure 7. Amount of head decline in Carrizo aquifer due to additional pumpage in revised Northern Carrizo-Wilcox GAM Run. Head differences are in feet.**

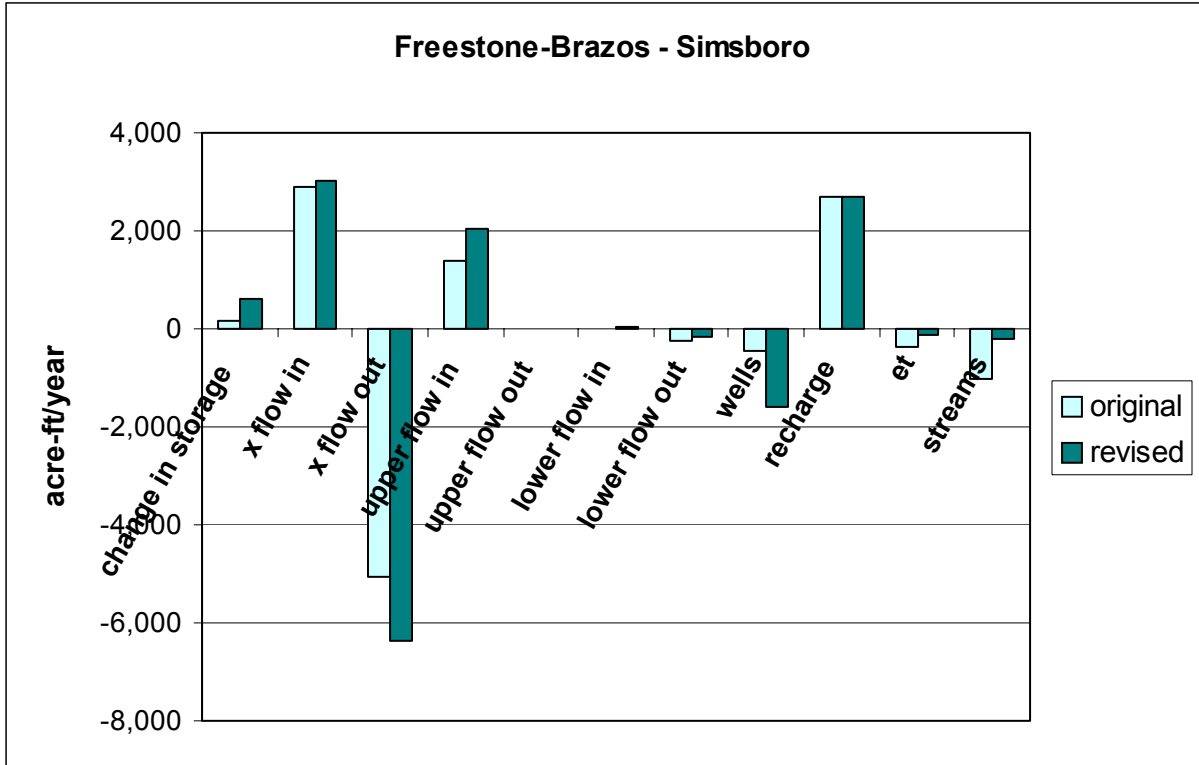


Figure 8. Comparison of Central Carrizo-Wilcox layer 5 (Simsboro) model flow budget in Freestone-Brazos for original and revised pumpage scenarios.

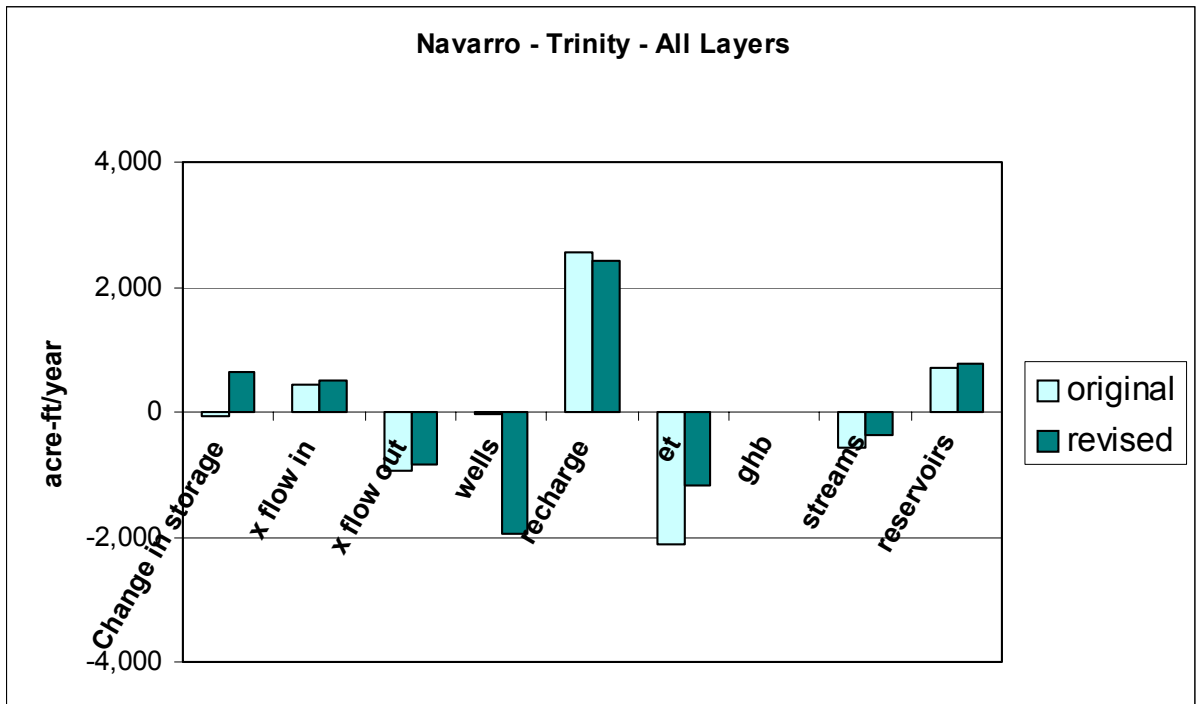


Figure 9. Comparison of Central Carrizo-Wilcox model flow budget in Navarro-Trinity for original and revised pumpage scenarios.

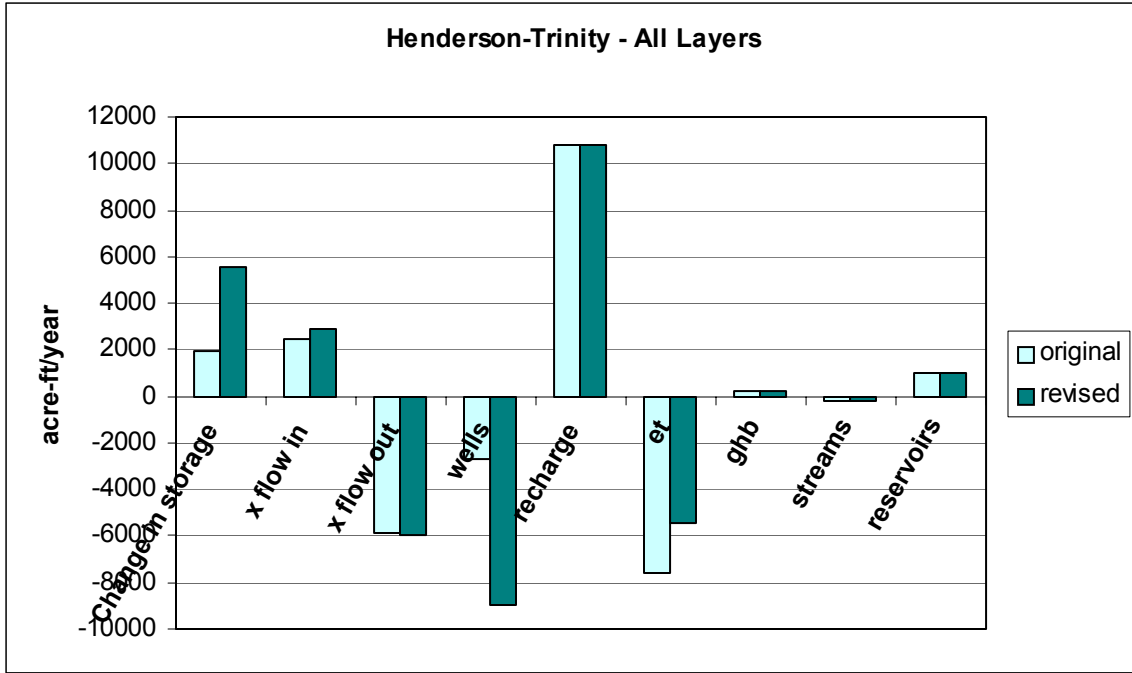


Figure 10. Comparison of Central Carrizo-Wilcox model flow budget in Henderson -Trinity for original and revised pumpage scenarios.

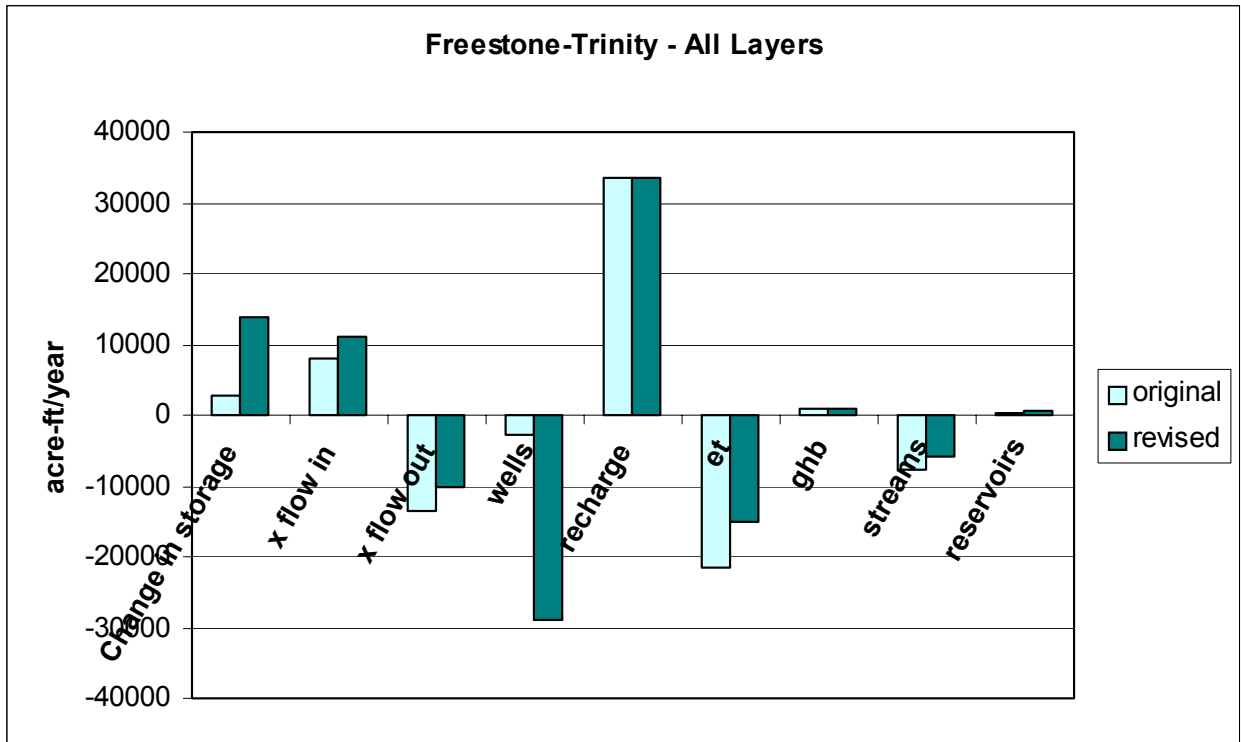


Figure 11. Comparison of Central Carrizo-Wilcox model flow budget in Freestone -Trinity for original and revised pumpage scenarios.

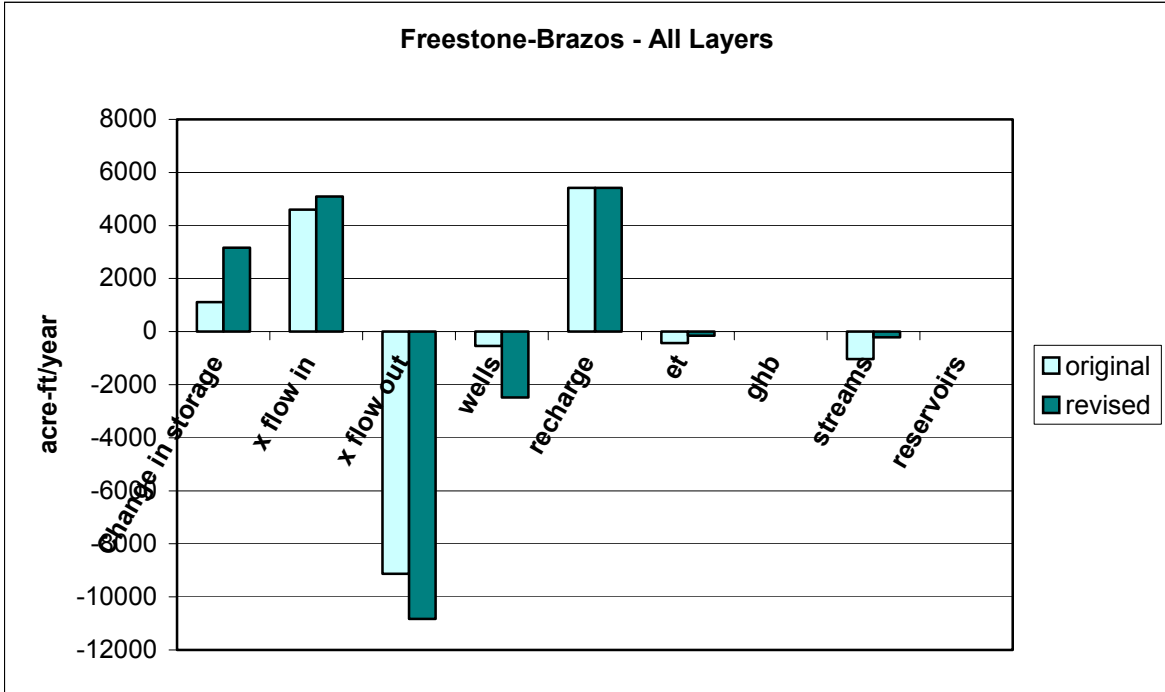


Figure 12. Comparison of Central Carrizo-Wilcox model flow budget in Freestone-Brazos for original and revised pumpage scenarios.



Table 2. Original and revised model flow budgets for the Central Carrizo-Wilcox aquifer in 2050.

county	basin	layer	change in storage	x flow in	x flow out	upper flow in	upper flow out	lower flow in	lower flow out	wells	re-charge	et	ghb	streams	Reser-voirs
<b>Original pumpage average conditions Central Model</b>															
Navarro	Trinity	1	-29	33	-120	0	0	1,068	-92	0	310	-1,051	0	-561	442
Navarro	Trinity	2	-29	0	0	92	-1,068	1,068	-63	0	0	0	0	0	0
Navarro	Trinity	3	-29	0	0	63	-1,068	1,068	-35	0	0	0	0	0	0
Navarro	Trinity	4	-20	11	-3	35	-1,068	1,130	-11	0	76	-150	0	0	0
Navarro	Trinity	5	-9	141	-432	11	-1,130	255	-1	-4	1,085	0	0	0	84
Navarro	Trinity	6	52	241	-373	1	-255	0	0	-15	1,075	-915	0	0	188
<b>Total</b>			<b>-64</b>	<b>427</b>	<b>-928</b>	<b>203</b>	<b>-4,588</b>	<b>4,588</b>	<b>-203</b>	<b>-19</b>	<b>2,547</b>	<b>-2,116</b>	<b>0</b>	<b>-561</b>	<b>714</b>
Henderson	Trinity	1	10	88	-24	0	0	663	0	0	292	-817	0	-213	0
Henderson	Trinity	2	26	155	-339	0	-663	653	-37	0	567	-593	230	0	0
Henderson	Trinity	3	675	355	-2,410	37	-653	643	-1,795	-181	4,501	-1,172	0	0	0
Henderson	Trinity	4	613	183	-963	1,795	-643	781	-2,400	-573	3,195	-2,009	0	0	21
Henderson	Trinity	5	530	428	-1,379	2,400	-781	263	-425	-1,188	1,040	-888	0	0	0
Henderson	Trinity	6	63	1,228	-760	425	-263	0	0	-742	1,191	-2,095	0	0	954
<b>Total</b>			<b>1,917</b>	<b>2,438</b>	<b>-5,875</b>	<b>4,657</b>	<b>-3,004</b>	<b>3,004</b>	<b>-4,657</b>	<b>-2,685</b>	<b>10,786</b>	<b>-7,573</b>	<b>230</b>	<b>-213</b>	<b>975</b>
Freestone	Trinity	1	11	146	-114	0	0	2,407	-7	0	645	-1,363	0	-1,921	196
Freestone	Trinity	2	133	76	-289	7	-2,407	2,649	-806	0	1,431	-1,532	775	-38	0
Freestone	Trinity	3	102	1,055	-3,425	806	-2,649	1,564	-256	-193	13,929	-8,949	0	-1,985	0
Freestone	Trinity	4	1,933	856	-1,928	256	-1,564	1,408	-3,565	-388	8,345	-3,845	0	-1,638	130
Freestone	Trinity	5	311	3,032	-4,228	3,565	-1,408	149	-867	-1,761	6,425	-4,709	0	-639	130
Freestone	Trinity	6	351	2,726	-3,609	867	-149	0	0	-447	2,833	-1,111	0	-1,462	0
<b>Total</b>			<b>2,841</b>	<b>7,891</b>	<b>-13,593</b>	<b>5,501</b>	<b>-8,177</b>	<b>8,177</b>	<b>-5,501</b>	<b>-2,789</b>	<b>33,609</b>	<b>-21,508</b>	<b>775</b>	<b>-7,683</b>	<b>456</b>
Freestone	Brazos	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	3	0	0	-194	0	0	0	-1	0	194	0	0	0	0
Freestone	Brazos	4	599	183	-1,109	1	0	9	-1,388	-40	1,824	-50	0	-29	0
Freestone	Brazos	5	153	2,896	-5,052	1,388	-9	3	-226	-448	2,686	-384	0	-1,006	0
Freestone	Brazos	6	365	1,514	-2,770	226	-3	0	0	-49	716	0	0	0	0
<b>Total</b>			<b>1,117</b>	<b>4,593</b>	<b>-9,124</b>	<b>1,615</b>	<b>-12</b>	<b>12</b>	<b>-1,615</b>	<b>-537</b>	<b>5,421</b>	<b>-434</b>	<b>0</b>	<b>-1,035</b>	<b>0</b>
<b>Revised pumpage average conditions Central Model</b>															
Navarro	Trinity	1	-14	32	-123	0	0	693	-131	0	310	-830	0	-379	442
Navarro	Trinity	2	-14	0	0	131	-693	681	-105	0	0	0	0	0	0
Navarro	Trinity	3	-14	0	0	105	-681	669	-79	0	0	0	0	0	0
Navarro	Trinity	4	15	10	-3	79	-669	672	-68	-4	76	-109	0	0	0
Navarro	Trinity	5	55	168	-424	68	-672	153	-19	-509	1,085	0	0	0	93
Navarro	Trinity	6	607	301	-297	19	-153	0	0	-1,451	961	-232	0	0	246
<b>Total</b>			<b>635</b>	<b>511</b>	<b>-847</b>	<b>403</b>	<b>-2,868</b>	<b>2,868</b>	<b>-403</b>	<b>-1,963</b>	<b>2,433</b>	<b>-1,171</b>	<b>0</b>	<b>-379</b>	<b>781</b>
Henderson	Trinity	1	30	95	-23	0	0	448	0	0	292	-674	0	-168	0

county	basin	layer	change in storage	x flow in	x flow out	upper flow in	upper flow out	lower flow in	lower flow out	wells	re-charge	et	ghb	streams	Reservoirs
Henderson	Trinity	2	47	155	-338	0	-448	418	-42	0	567	-592	233	0	0
Henderson	Trinity	3	1,218	470	-2,359	42	-418	394	-2,178	-670	4,501	-1,000	0	0	0
Henderson	Trinity	4	1,929	235	-934	2,178	-394	395	-3,286	-2,055	3,178	-1,292	0	0	46
Henderson	Trinity	5	1,693	462	-1,407	3,286	-395	142	-558	-3,554	989	-658	0	0	0
Henderson	Trinity	6	640	1,510	-912	558	-142	0	0	-2,654	1,250	-1,237	0	0	987
<b>Total</b>			<b>5,557</b>	<b>2,928</b>	<b>-5,974</b>	<b>6,064</b>	<b>-1,797</b>	<b>1,797</b>	<b>-6,064</b>	<b>-8,932</b>	<b>10,777</b>	<b>-5,454</b>	<b>233</b>	<b>-168</b>	<b>1,034</b>
Freestone	Trinity	1	45	141	-111	0	0	1,869	-39	0	645	-1,121	0	-1,626	196
Freestone	Trinity	2	269	72	-287	39	-1,869	1,967	-1,147	0	1,431	-1,289	850	-34	0
Freestone	Trinity	3	218	1,514	-3,186	1,147	-1,967	1,013	-410	-2,180	13,929	-8,216	0	-1,863	0
Freestone	Trinity	4	7,125	905	-1,823	410	-1,013	569	-7,665	-4,395	8,345	-1,691	0	-931	163
Freestone	Trinity	5	3,959	4,769	-2,544	7,665	-569	1,010	-564	-17,443	6,425	-2,403	0	-445	140
Freestone	Trinity	6	2,167	3,618	-2,110	564	-1,010	0	0	-5,003	2,815	-224	0	-818	0
<b>Total</b>			<b>13,784</b>	<b>11,019</b>	<b>-10,061</b>	<b>9,825</b>	<b>-6,428</b>	<b>6,428</b>	<b>-9,825</b>	<b>-29,021</b>	<b>33,591</b>	<b>-14,945</b>	<b>850</b>	<b>-5,717</b>	<b>500</b>
Freestone	Brazos	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	3	0	0	-189	0	0	0	-1	-5	194	0	0	0	0
Freestone	Brazos	4	1,543	183	-1,076	1	0	0	-2,035	-407	1,824	-11	0	-24	0
Freestone	Brazos	5	610	3,033	-6,352	2,035	0	48	-156	-1,572	2,686	-141	0	-191	0
Freestone	Brazos	6	1,008	1,873	-3,211	156	-48	0	0	-494	716	0	0	0	0
<b>Total</b>			<b>3,161</b>	<b>5,090</b>	<b>-10,828</b>	<b>2,191</b>	<b>-48</b>	<b>48</b>	<b>-2,191</b>	<b>-2,478</b>	<b>5,421</b>	<b>-152</b>	<b>0</b>	<b>-214</b>	<b>0</b>

**Notes:**

Positive numbers refer to water entering flow system. Negative numbers refer to water leaving flow system.

**Change in storage:** Water coming out of or going into storage

**X flow in:** Lateral flow from upgradient

**X flow out:** Lateral flow downgradient

**Upper flow in:** cross-formational flow downward

**Upper flow out:** cross-formational flow upward

**Lower flow in:** cross-formational flow upward

**Lower flow out:** cross-formation flow downward

**Wells:** well discharge

**Recharge:** groundwater recharge from ground-surface

**et:** Evapotranspiration discharge from the water table

**ghb:** General Head boundary condition

**Streams:** Loss or gain to aquifer from streams

**Reservoirs:** Leakage into or out of reservoirs or lakes.



Table 3. Original and revised model flow budgets for the Northern Carrizo-Wilcox aquifer in 2050.

county	basin	layer	change in storage	x flow in	x flow out	upper flow in	upper flow out	lower flow in	lower flow out	wells	re-charge	et	ghb	streams	reser-voirs
<b>Original pumpage average conditions Northern Model</b>															
Navarro	Trinity	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	5	1,899	154	-82	0	0	184	-241	0	1,538	-2,338	0	-1,113	0
Navarro	Trinity	6	-804	447	-588	241	-184	0	0	-12	5,646	-2,421	0	-2,933	606
<b>Total</b>			<b>1,095</b>	<b>601</b>	<b>-670</b>	<b>241</b>	<b>-184</b>	<b>184</b>	<b>-241</b>	<b>-12</b>	<b>7,184</b>	<b>-4,759</b>	<b>0</b>	<b>-4,046</b>	<b>606</b>
Henderson	Trinity	1	-249	615	-293	0	0	20	-101	-9	10,960	-9,031	0	-1,912	0
Henderson	Trinity	2	586	48	-260	101	-20	0	-335	-3	2,643	-2,565	0	-197	0
Henderson	Trinity	3	-82	280	-1,477	335	0	1	-620	-60	1,736	-17	0	-96	0
Henderson	Trinity	4	-52	270	-1,432	620	-1	55	-1,572	-389	13,330	-6,063	0	-1,908	-2,860
Henderson	Trinity	5	11,509	349	-1,212	1,572	-55	152	-2,658	-587	7,281	-10,833	0	-4,749	-768
Henderson	Trinity	6	-2,773	1,249	-950	2,658	-152	0	0	-1,766	4,334	-1,876	0	-2,381	1,657
<b>Total</b>			<b>8,939</b>	<b>2,812</b>	<b>-5,624</b>	<b>5,286</b>	<b>-227</b>	<b>227</b>	<b>-5,286</b>	<b>-2,815</b>	<b>40,284</b>	<b>-30,385</b>	<b>0</b>	<b>-11,244</b>	<b>-1,970</b>
Freestone	Trinity	1	-1,637	163	-1,800	0	0	90	-44	-19	10,728	-5,810	0	-1,671	0
Freestone	Trinity	2	-412	45	-233	44	-90	98	-831	-4	16,668	-12,333	0	-2,950	0
Freestone	Trinity	3	936	547	-1,851	831	-98	446	-79	-125	6,766	-3,880	0	-3,492	0
Freestone	Trinity	4	-8,922	1,386	-4,163	79	-446	441	-1,684	-442	41,144	-11,907	0	-14,940	-547
Freestone	Trinity	5	-3,366	2,051	-1,882	1,684	-441	1,167	-3,000	-412	26,099	-11,957	0	-10,171	226
Freestone	Trinity	6	-6,778	1,924	-2,703	3,000	-1,167	0	0	-1,897	20,050	-6,822	0	-6,431	825
<b>Total</b>			<b>-20,180</b>	<b>6,115</b>	<b>-12,631</b>	<b>5,638</b>	<b>-2,242</b>	<b>2,242</b>	<b>-5,638</b>	<b>-2,900</b>	<b>121,454</b>	<b>-52,708</b>	<b>0</b>	<b>-39,655</b>	<b>505</b>
Freestone	Brazos	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	4	-401	130	-1,388	0	0	0	-487	-26	4,129	-1,957	0	0	0
Freestone	Brazos	5	-1,146	2,887	-2,236	487	0	280	-527	-3,504	9,794	-4,764	0	-1,272	0
Freestone	Brazos	6	-2,326	956	-1,672	527	-280	0	0	-114	4,725	-1,815	0	0	0
<b>Total</b>			<b>-3,873</b>	<b>3,973</b>	<b>-5,297</b>	<b>1,014</b>	<b>-280</b>	<b>280</b>	<b>-1,014</b>	<b>-3,644</b>	<b>18,648</b>	<b>-8,536</b>	<b>0</b>	<b>-1,272</b>	<b>0</b>
<b>Revised pumpage average conditions Northern Model</b>															
Navarro	Trinity	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Navarro	Trinity	5	2,008	153	-92	0	0	141	-290	-46	1,538	-2,338	0	-1,074	0
Navarro	Trinity	6	-489	442	-453	290	-141	0	0	-2,339	5,646	-1,907	0	-2,294	1,245
<b>Total</b>			<b>1,520</b>	<b>595</b>	<b>-544</b>	<b>290</b>	<b>-141</b>	<b>141</b>	<b>-290</b>	<b>-2,385</b>	<b>7,184</b>	<b>-4,245</b>	<b>0</b>	<b>-3,369</b>	<b>1,245</b>
Henderson	Trinity	1	-244	621	-293	0	0	19	-103	-33	10,960	-9,023	0	-1,904	0
Henderson	Trinity	2	610	49	-259	103	-19	0	-360	-10	2,643	-2,562	0	-195	0

county	basin	layer	change in storage	x flow in	x flow out	upper flow in	upper flow out	lower flow in	lower flow out	wells	re-charge	et	ghb	streams	reservoirs
Henderson	Trinity	3	193	347	-1,452	360	0	0	-865	-211	1,736	-11	0	-97	0
Henderson	Trinity	4	550	312	-1,281	865	0	34	-1,865	-1,373	13,330	-5,901	0	-1,813	-2,859
Henderson	Trinity	5	12,575	448	-994	1,865	-34	104	-3,266	-2,073	7,281	-10,648	0	-4,576	-682
Henderson	Trinity	6	-1,516	1,416	-806	3,266	-104	0	0	-6,235	4,334	-1,646	0	-1,928	3,219
<b>Total</b>			<b>12,168</b>	<b>3,193</b>	<b>-5,085</b>	<b>6,459</b>	<b>-157</b>	<b>157</b>	<b>-6,459</b>	<b>-9,935</b>	<b>40,284</b>	<b>-29,791</b>	<b>0</b>	<b>-10,514</b>	<b>-321</b>
Freestone	Trinity	1	-1,572	163	-1,767	0	0	82	-47	-207	10,728	-5,719	0	-1,661	0
Freestone	Trinity	2	-277	42	-249	47	-82	69	-897	-44	16,668	-12,360	0	-2,914	0
Freestone	Trinity	3	1,590	539	-1,453	897	-69	367	-109	-1,359	6,586	-3,620	0	-3,369	0
Freestone	Trinity	4	-8,059	1,499	-3,988	109	-367	386	-1,759	-4,807	41,323	-10,577	0	-13,266	-496
Freestone	Trinity	5	-1,876	1,874	-1,144	1,759	-386	927	-4,402	-3,357	26,007	-10,383	0	-9,267	251
Freestone	Trinity	6	475	2,127	-2,517	4,402	-927	0	0	-14,611	20,107	-5,372	0	-5,123	1,438
<b>Total</b>			<b>-9,720</b>	<b>6,242</b>	<b>-11,117</b>	<b>7,214</b>	<b>-1,832</b>	<b>1,832</b>	<b>-7,214</b>	<b>-24,386</b>	<b>121,418</b>	<b>-48,032</b>	<b>0</b>	<b>-35,599</b>	<b>1,193</b>
Freestone	Brazos	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Freestone	Brazos	4	-349	142	-1,569	0	0	0	-168	-39	4,129	-2,147	0	0	0
Freestone	Brazos	5	1,424	124	-1,990	168	0	67	-671	-2,713	9,794	-4,935	0	-1,267	0
Freestone	Brazos	6	-2,112	721	-2,071	671	-67	0	0	-170	4,725	-1,697	0	0	0
<b>Total</b>			<b>-1,037</b>	<b>988</b>	<b>-5,630</b>	<b>839</b>	<b>-67</b>	<b>67</b>	<b>-839</b>	<b>-2,923</b>	<b>18,648</b>	<b>-8,780</b>	<b>0</b>	<b>-1,267</b>	<b>0</b>

**Notes:**

Positive numbers refer to water entering flow system. Negative numbers refer to water leaving flow system.

**Change in storage:** Water coming out of or going into storage

**X flow in:** Lateral flow from upgradient

**X flow out:** Lateral flow downgradient

**Upper flow in:** cross-formational flow downward

**Upper flow out:** cross-formational flow upward

**Lower flow in:** cross-formational flow upward

**Lower flow out:** cross-formation flow downward

**Wells:** well discharge

**Recharge:** groundwater recharge from ground-surface

**et:** Evapotranspiration discharge from the water table

**ghb:** General Head boundary condition

**Streams:** Loss or gain to aquifer from streams

**Reservoirs:** Leakage into or out of reservoirs or lakes.