APPENDICES

APPENDIX 1A
REFERENCES

1A
References

Document	Description/Importance
The Dallas Morning News. 1998-1999. *Texas Almanac: 2004-2005* and *1998-1999*.	Provides background information and statistics on Texas and each county.
Golden Crescent Regional Planning Commission website, December 2004 www.gcrpc.org	Describes GCRPC, and gives an overview of its programs in areas such as aging, employment and training, economic development, E9-1-1, solid waste management, and rural transportation.
LNRA webpage. December 2004. *History and Functions of the Lavaca Navidad River Authority* www.lnra.org/history.htm	Describes the LNRA, when it was founded, its historical contracts and current long-term contracts, the construction of Lake Texana, and the activities of LNRA.
TWDB. January 2002. *Water For Texas*	The official water plan for Texas. Describes current use and supply, identifies water management measures and environmental concerns, and offers recommendations.
Texas Clean Rivers Program and TCEQ. 2002. *Texas Water Quality Inventory*	Summarizes the water quality issues for each segment of the Texas river basins.
Texas Natural Resources Information System (TNRIS). September 1999. *Irrigated Farm Lands* www.tnris.state.tx.us/pub/GIS/land_use/irrigfarms	Provides geologic survey maps and numerous other map collections on water resources, geology, Census, and other natural resources (Irrigated Farm Lands).
U.S. Department of Commerce, Bureau of Economic Analysis webpages, *Personal Income by Major Source and Earnings by Industry for 1998, 1999, and 2000* www.bea.doc.gov/bea/regional/reis/action.cfm	Outlines how much was earned in every county from each industry type in thousands of dollars per year.
U.S. Census Bureau. *Total Population Estimates for Texas Counties and Places.* Census 2000. http://www.factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=04000US48&-_box_head_nbr=GCT-PH1&-ds_name=DEC_2000_SF1_U&-_lang=en&-format=ST-2&-_sse=on	Resource for population estimates for Texas counties and places in various years.
U.S. Department of Agriculture. *2003 Agriculture Profiles, Texas State and County Profiles* www.nass.usda.gov/:81/ipedbcnty/report2.htm	Outlines the overall agricultural commodities for each county for 2003. Provides information on planted acres, harvested acres, and crop yield.
U.S. Department of Agriculture and the National Agricultural Statistics Service. *2002 Census of Agriculture for Texas-County Data*	The section on Market Value of Agricultural Products Sold and Farms by North American Industry Classification System: 2002 and 1997 gives the total sales and size of farms, etc. for specific crops in 2002 and 1997.
U.S. Census Bureau. *Small Area Income & Poverty Estimates for Texas in 2002* www.census.gov/cgi-bin/saipe/saipe.cgi	Contains statistical estimates for every county in the USA including information on median household incomes and poverty estimates.
Texas Parks and Wildlife Department, Wildlife Division, Non-game and Rare Species and Habitat Assessment programs. County Lists of Texas' Special Species. [Lavaca County, Jackson County, and Wharton County: September 2004].	Lists endangered, threatened, and rare species for each county.
National Center for Education Statistics, US Department of Education and Bureau of the Census, US Department of Commerce http://maps.nces.ed.gov/sddsgis/	Contains statistical information regarding school districts from 1999-2000.

APPENDIX 3A
TWDB GROUNDWATER QUALITY SAMPLES IN WHARTON COUNTY

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
65 41 401	112CHCT	90	6/16/1981	8.3	37	102	8	50		0	295	13	107	0.2	0.6	463	870	287	27	1.3	0
65 41 402	112CHCT	338	8/22/1974	7.5	29	94	26	50	4	0	462	26	31	0.2	0	487	932	340	23	1.2	0.7
65 41 505	112BMNT	83	11/15/1988	7.4	10	67	20	112	<1	0	421	7	119	0.5	0.1	543	949	249	49	3.1	1.9
	112BMNT	83	6/20/1989	7.7	11	63	20	122	<1	0	417	8	118	0.5	<.0	549		241	52	3.4	2
65 41 506	112BMNT	143	11/15/1988	7.0	14	124	25	59	3	0	458	23	95	0.1	<.0	568	982	413	23	1.3	0
	112BMNT	143	6/20/1989	7.3	14	115	24	62	1	0	458	22	94	0.2	<.0	558		386	25	1.4	0
65 41 704	112CHCT	322	8/22/1974	7.4		71	20	69		0	304	18	100			427	836	259	36	1.9	0
65 41 802	112CHCT	722	4/10/1953	8.2	15	36	15	99		0	256	73	57	0.4	<.4	421		151	58	3.5	1.2
	112CHCT	722	2/8/1966	7.7		38	15	81		0	250	20	71	0.4	<.4	348	680	156	52	2.8	1
	112CHCT	722	4/22/1974	7.8		32	18	128		12	275	37	105	0.3	0	467		154	64	4.5	1.8
	112CHCT	722	8/19/1983	8.4		33	13	80	2	4	245	21	67	0.3	<.0	340	685	135	56	3	1.4
65 41 803	112CEVG	874	3/11/1953	7.6	4	36	16	81		0	256	20	71	0.4	<.4	354		155	53	2.8	1.1
	112CEVG	874	4/22/1974	7.7		39	15	67		6	262	32	32	0.3		320	435	159	47	2.3	1.3
	112CEVG	874	8/22/1974	7.5	19	32	16	92	3	0	256	19	94	0.3	0.1	401	750	145	57	3.3	1.3
	112CEVG	874	8/8/1984	8.2	19	35	15	103	2	0	259	21	96	0.3	0	418	790	149	60	3.7	1.3
	112CEVG	874	5/1/1992	7.8	18	32	16	93	3	0	254	18	87	0.3	0.1	393	628	146	58	3.4	1.3
	112CEVG	874	6/24/1997	7.6	21	30	13	67	2	0	262	22	44	0.6	<.2	329		128	53	2.6	1.8
65 41 804	112CHCT	718	3/11/1953	7.5	22	84	19	44		0	256	18	110	0.3	<.4	423		287	24	1.1	0
	112CHCT	718	3/27/1973	7.3		57	4	115		0	275	11	122	0.5	0.1	444	765	158	61	4	1.3
	112CHCT	718	8/8/1984	8.3	20	32	13	81	2	0	260	21	49	0.3	<.1	346	625	133	56	3.1	1.6
	112CHCT	718	8/6/1985	8.1		92	9	25		0	296	28	38	<.1	0	337		265	16	0.7	0
65 41 925	112CHCT	450	8/23/1983	7.9	18	79	19	222	2	0	294	29	350	0.5	<.1	864	1792	275	63	5.8	0
65 41 933	112CHCT	590	11/11/1992	7.2	17	52	11	136	1	0	305	17	143	0.7	3.5	531	1001	174	62	4.5	1.5
	112CHCT	590	6/30/1994	8.0		36	10	156		0	268	19	170	1.1	0.1	524	1104	131	72	5.9	1.8
65 49 102	112CHCT	270	8/22/1974	7.5		83	26	132		0	482	21	130			629	1180	314	47	3.2	1.6
65 49 103	112CHCT	98	8/22/1974	7.5	18	80	20	98	3	0	462	7	88	0.3	0.2	541	986	281	43	2.5	1.9
65 49 107	112CHCT	106	11/16/1988	7.2	13	73	17	45	3	0	305	15	55	0.3	0	370	651	249	28	1.3	0
65 49 109	112CHCT	233	11/11/1992	7.2	25	65	17	49	2	0	247	23	80	0.3	4	386	608	232	31	1.4	0
65 49 401	112CHCT	207	3/7/1972	7.4	21	82	24	91		0	458	18	77	0.4	<.4	538	1015	303	39	2.3	1.4
65 49 404	112CEVG	1082	11/23/1966	7.4	24	62	13	44		0	288	10	40			334	591	208	31	1.3	0.6
66 31 301	112CEVG	702	8/14/1974	7.2	31	50	3	18	1	0	163	5	28	0.1	0.9	216	373	136	22	0.7	0
66 31 303	112CHCT	125	8/21/1974	7.2		33	1	33		0	125	5	37			170	355	87	45	1.5	0.3
66 31 404	112CHCT	325	6/23/1997	7.5	31	58	4	19	1	0	144	13	52	0.5	1.1	250		160	20	0.6	0
66 31 504	112CHCT	178	6/16/1981	7.8	25	22	5	19		0	101	8	18	0.2	0.4	147	239	75	35	1	0.2
	112CHCT	178	6/10/1992	7.3	31	150	10	70	1	0	323	22	207	0.2	3.5	654	1033	415	26	1.5	0
	112CHCT	178	6/26/2001	6.8	29.7	60.4	3.85	20.9	3.54	0	144	6.51	62	0.1	1.13	258	446	118	21		0
66 31 507	112CEVG	758	8/28/1974	7.5		46	6	42		0	183	9	50			242	480	139	39	1.5	0.2
66 31 606	112CHCT	50	5/5/1971	7.1	34	182	13	137	<1	0	343	51	333	0.1	1.5	921	1804	507	36	2.7	0
66 31 607	112CHCT	157	12/9/1966	7.4	29	77	8	30		0	237	8	64	0.2	<.4	333	600	226	22	0.9	0
	112CHCT	157	5/4/1971	7.5	30	89	9	31	<1	0	231	8	89	0.2	<.4	371	685	260	20	0.8	0
66 31 701	112CHCT	300	8/14/1974	7.2	35	92	9	45	2	0	247	13	100	0.2	0.8	417	759	264	26	1.2	0
66 31 903	112CHCT	337	6/24/1969	7.2	37	144	10	114		0	355	32	232	0.2	3	746	1458	400	38	2.5	0
	112CHCT	337	6/18/1979	7.9		113	13	141		0	154	43	338	0.1	1.2	724	1490	335	47	3.4	0
66 31 904	112CHCT	401	5/4/1971	7.7	28	58	7	24		0	165	9	50	0.2	<.4	257	459	173	23	0.8	0
	112CHCT	401	8/22/1983	8.0	27	52	5	25	2	0	150	5	58	0.2	0.8	249	440	151	26	0.9	0
66 31 905	112CHCT	397	12/9/1966	7.6	28	56	6	25		0	166	8	54	0.1	<.4	259	480	164	24	0.9	0
	112CHCT	397	5/4/1971	7.7	29	61	6	25	<1	0	165	9	57	0.2	<.4	269	480	175	23	0.8	0
66 31 906	121EVGL	1000	12/9/1966	7.9	17	24	8	90		0	244	17	43	0.2	<.4	319	564	92	67	4.1	2.2
	121EVGL	1000	5/4/1971	8.0	20	28	7	82	<1	0	247	18	42	0.3	<.4	320	560	99	64	3.6	2
	121EVGL	1000	9/12/1983	8.5	19	24	6	87	3	4	242	15	43	0.3	<.1	319	576	83	69	4.2	2.4
66 31 913	112CHCT	122	7/1/1966	7.1	30	229	19	539		0	321	31	1085	0.2	1.3	2092	4420	649	64	9.2	0
	112CHCT	122	12/9/1966	7.1	31	218	15	502		0	328	34	984	0.1	1.5	1947	4053	605	64	8.8	0
66 31 914	112CHCT	130	7/1/1966	7.6	30	262	29	476		0	322	26	1087	0.2	<.4	2069	4472	773	57	7.5	0
	112CHCT	130	12/9/1966	7.1	30	225	32	509		0	336	25	1064	0.2	1	2051	4368	693	61	8.4	0
	112CHCT	130	5/4/1971	7.2	31	144	14	244	<1	0	342	34	459	0.2	2.1	1097	2192	416	56	5.2	0
66 31 915	112CHCT	40	12/9/1966	7.0	31	201	16	159		0	308	27	453	0.1	3.5	1041	2167	567	37	2.9	0
	112CHCT	40	5/4/1971	7.2	32	152	11	211	<1	0	333	34	418	0.1	2.5	1025	2052	424	51	4.5	0
66 31 916	112CHCT	196	5/4/1971	7.5	32	87	9	34	<1	0	228	8	88	0.2	<.4	371	680	252	22	0.9	0
66 31 917	112CHCT	37	5/5/1971	7.9	31	316	24	127	<1	0	265	10	650	0.1	2	1291	2730	887	23	1.9	0
66 32 405	112CHCT	110	8/21/1974	7.5		73	6	59		0	312	7	51			349	652	208	37	1.8	1
	112CHCT	110	8/22/1983	8.3	30	78	8	42	1	0	277	23	46	0.2	8.3	373	672	229	28	1.2	0
66 32 502	112CHCT	247	8/21/1974	7.4	30	80	9	55	2	0	314	7	58	0.2	0.4	395	687	234	33	1.6	0.5

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
66 32 503	112CHCT	120	9/23/1983	8.2		67	9	60		0	301	10	53	0.3	0.1	347	700	204	38	1.8	0.9
66 32 709	112CHCT	190	7/14/1982	7.8		55	9	23		0	212	6	34	0.3	0.4	232	474	174	22	0.8	0
	112CHCT	190	6/26/1985	8.3		63	5	22		0	215	6	33	0.2	<.0	234	474	177	21	0.7	0
66 32 802	112CHCT	381	1/19/1956	7.7	26	64	8	38		0	232	14	50	0.4	<.4	314		192	30	1.2	0
	112CHCT	381	1/14/1958	6.8		64	8	34		0	242	6	45	0.3	<.4	276	600	192	27	1.1	0.1
	112CHCT	381	2/16/1959	7.1		62	9	22		0	229	9	43	0.1	0.4	258	499	191	19	0.7	0
	112CHCT	381	3/26/1984																		
	112CHCT	381	4/30/1992	7.4	32	72	9	33	2	0	254	9	46	0.3	1	329	505	216	24	1	0
	112CHCT	381	5/22/1997	7.3	35	62	7	31	<1	0	240	6	44	0.2	1	306	183		27	1	0.3
66 32 803	112CHCT	283	3/29/1961	6.7		70	14	31		0	250	4	45	0.1	<.4	287	560	232	22	0.9	0
	112CHCT	283	8/21/1974	7.6	30	68	6	33	2	0	252	6	41	0.2	0	309	543	194	26	1	0.2
	112CHCT	283	3/26/1984	U																	
66 32 806	112CHCT	117	8/27/1986	7.2	30	100	16	31	1	0	369	9	44	0.3		412	692	315	17	0.8	0
66 32 807	112CHCT	110	3/5/1974	7.5	26	84	13	49		0	336	10	62	0.4	<.4	409	770	263	28	1.3	0.2
66 32 808	112CHCT	160	6/18/1979	8.2	28	55	12	64		0	225	23	84	0.3	<.1	376	680	186	42	2	0
	112CHCT	160	8/23/1983	8.0	26	47	15	50	1	0	247	16	53	0.5	<.1	329	610	178	37	1.6	0.5
66 32 809	112CHCT	320	10/5/1976	7.2	23	84	10	48		0	332	10	49	0.4	2	389	657	250	29	1.3	0.4
	112CHCT	320	10/5/1976	7.9		88	8	51		0	332	<4	51	0.4	2.1	367	725	252	30	1.4	0.4
	112CHCT	320	8/23/1983	8.2	31	64	9	28	1	0	228	8	45	0.3	0.6	298	532	195	23	0.9	0
	112CHCT	320	3/26/1984																		
	112CHCT	320	6/26/2001	6.7	32	69	7.43	28.5	3.25	0	233.09	7.26	46	0.3	0.78	309	521	202	23		0
66 32 810	112CHCT	160	2/17/1987	7.5		81	8	83		0	332	16	89	0.3	0.5	441	894	234	43	2.4	0.7
66 37 901	112CHCT	131	6/27/1969	7.3	35	114	24	186		0	473	88	224	0.4	<.4	904	1727	383	51	4.1	0.1
66 38 201	112CHCT	408	6/24/1969	7.6	24	31	23	37		0	221	15	40	0.3	<.4	279	520	171	31	1.2	0.2
66 38 202	112CHCT	65	6/24/1969	7.1	34	193	28	35		0	685	33	42	0.3	26.5	728	1350	596	11	0.6	0
	112CHCT	65	12/16/1980	8.1	31	152	30	28		0	516	40	53	0.2	29.2	617	1155	502	10	0.5	0
	112CHCT	65	5/24/1984	7.8	28	128	13	24	2	0	404	27	47	0.2	11	478	900	372	12	0.5	0
66 38 301	112CHCT	288	6/17/1981	8.1	37	102	8	50		0	294	13	107	0.2	1.1	462	876	287	27	1.3	0
66 38 302	112CHCT	694	8/21/1974	7.4		56	7	24		0	170	8	50			228	464	166	23	0.8	0
66 38 304	112CHCT	113	6/21/1979	8.1	27	70	5	14		0	194	17	34	0.1	8	270	466	195	13	0.4	0
66 38 603	112CEVG	861	8/14/1974	7.4	26	59	10	40	3	0	210	13	61	0.2	1.1	316	579	188	31	1.3	0
66 38 702	112CHCT	116	8/14/1974	7.4		55	8	69		0	283	29	41			341	642	170	46	2.3	1.2
66 38 704	112CHCT	116	9/12/1978	8.0		109	6	29		0	332	26	35	0.2	<.1	368	700	296	17	0.7	0
	112CHCT	116	6/3/1982	7.8		96	5	26		0	289	29	41	0.1	<.0	339	679	260	17	0.7	0
	112CHCT	116	8/6/1985	8.1		92	9	25		0	297	28	38	<.1	0	337	679	266	16	0.7	0
	112CHCT	116	6/24/1997	7.1	19	102	7	24	2	0	278	34	33	0.5	1.2	360		285	15	0.6	0
66 38 801	112CHCT	116	6/24/1969	7.2	25	191	30	53		0	556	80	130	0.3	<.4	783	1503	599	16	0.9	0
66 38 905	112CHCT	155	11/16/1988	6.9	13	116	15	20	3	0	445	15	21	0.1	1.1	424	705	353	10	0.5	0.2
66 38 906	112CHCT	328	6/23/1997	7.3	26	58	10	38	2	0	257	18	35	0.6	1.5	317		186	30	1.2	0.5
66 39 101	112CHCT	479	8/21/1974	7.3	27	52	5	24	2	0	174	10	33	0.2	1.4	239	410	148	26	0.9	0
66 39 202	112CHCT	481	8/21/1974	7.2	30	69	9	31	2	0	200	11	72	0.2	1.6	324	586	209	24	0.9	0
66 39 204	112CHCT	559	8/14/1974	7.5	31	72	9	34	7	0	198	11	76	0.2	0.9	338	596	215	25	1	0
	112CHCT	559	5/24/1984	8.0	28	62	6	29	2	0	188	10	58	0.2	1.4	289	536	179	26	0.9	0
66 39 401	112CHCT	32	8/14/1974	7.3	40	200	36	310	2	0	424	72	620	0.3	8.9	1497	2660	647	51	5.3	0
66 39 701	112CHCT	214	6/24/1969	7.4	30	124	17	45		0	394	19	94	0.3	3	526	990	379	20	1	0
66 39 908	112CHCT	170	8/21/1974	7.2	31	130	23	52	3	0	257	18	230	0.3	1	614	1210	418	21	1.1	0
66 39 909	112CHCT	206	6/10/1992	7.3	30	133	23	42	4	0	247	16	218	0.3	1.5	589	960	427	17	0.9	0
66 40 105	112CHCT	560	8/28/1974	7.3	32	73	9	37	2	0	218	13	74	0.2	1	348	646	217	27	1.1	0
66 40 202	112CHCT	265	6/24/1969	7.4	27	86	12	48		0	288	15	86	0.4	<.4	416	785	263	28	1.3	0
66 40 401	112CHCT	488	6/18/1979	8.2	29	75	12	45		0	238	15	93	0.3	<.1	386	720	236	29	1.3	0
66 40 607	112CHCT	456	7/11/1980	7.5	25	75	12	28		0	220	0	81	0.3	1.1	330	623	236	20	0.8	0
	112CHCT	456	8/20/1981	8.4		4	1	143		1	215	14	92	0.3	1.2	362	695	14	95	16	3.3
66 40 701	112CHCT	60	8/21/1974	7.4		76	21	155		0	496	35	120			650	1210	276	54	4.1	2.6
66 40 803	112CHCT	312	4/30/1992	7.5	28	82	13	37	3	0	228	13	96	0.3	1.2	385	608	258	23	1	0
	112CHCT	312	5/22/1997	7.3	31	74	12	37	1	0	210	11	95	0.3	1.1	367		236	25	1.1	0
	112CHCT	312	6/123/2001	6.7	31	74.9	13.4	36.3	2.18	0	222.1	13	93	0.2	1.13	374	684	242	24		0
66 40 904	112CHCT	212	8/22/1974	7.5	26	88	14	52	3	0	289	13	110	0.3	0.3	448	826	277	28	1.4	0
66 44 808	112CEVG	1224	8/12/1974	7.7		35	6	88		0	253	8	61			321	636	110	63	3.6	1.9
66 45 303	112CHCT	147	8/19/1974	7.4		80	7	83		0	311	24	90			436	835	226	44	2.4	0.6
66 45 315	112CEVG	220	4/28/1995	6.9													670				
66 45 402	112CHCT	100	6/23/1969	7.3	36	130	9	78		0	332	20	173	<.1	<.4	609	1184	362	31	1.8	0
66 45 502	112CHCT	574	8/17/1974	7.3		150	12	104		0	284	34	270			709	1410	423	34	2.2	0

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
66 45 506	112CHCT	470	8/13/1974	7.3		97	9	50		0	244	17	120			412	816	277	28	1.3	0
66 45 601	112CHCT	429	6/23/1969	7.2	33	130	10	75		0	293	24	188	0.3	<.4	604	1200	364	30	1.7	0
	112CHCT	429	8/23/1983	7.6	36	108	12	96	1	0	239	31	206	0.2	2.4	610	1168	318	39	2.3	0
66 45 603	112CHCT	275	5/20/1997	6.8	38	128	12	113	<1	0	316	50	206	0.2	4.2	707		367	40	2.6	0
66 45 609	112CEVG	835	8/19/1974	7.3		160	16	113		0	291	34	310			776	1560	465	34	2.3	0
	112CEVG	835	5/20/1997	6.8	38	160	11	110	<1	0	309	41	271	0.1	2.8	786		444	35	2.3	0
	112CEVG	835	6/25/2001	6.3	37.3	181	13	113	2.89	0	285.56	54.9	338	0.2	4.06	885	1601	505	32		0
66 45 704	112CHCT	315	8/20/1974	7.2	40	120	9	74	2	0	323	20	150	0.1	0.4	574	1050	337	32	1.8	0
66 45 705	112CHCT	30	8/20/1974	7.4	29	84	7	67	2	0	256	8	130	0.5	0.4	453	835	237	38	1.9	0
66 45 706	112CHCT	88	6/11/1992	6.9	40	158	9	59	2	0	398	25	152	0.1	2.9	643	994	431	22	1.2	0
	112CHCT	88	5/21/1997	6.9	44	135	7	59	<1	0	397	24	118	0.1	2.6	585		365	25	1.3	0
	112CHCT	88	6/27/2001	6.4	41.7	181	9.39	56.8	1.48	0	378.31	32.2	185	0.1	2.97	696	1232	490	20		0
66 45 802	112CHCT	188	8/19/1974	7.4		110	8	69		0	295	16	140			487	972	306	32	1.7	0
66 46 402	112CHCT	366	6/23/1969	7.4	26	67	6	32		0	250	7	34	0.3	4.5	299	528	191	26	1	0.3
	112CHCT	366	6/21/1979	8.1	27	59	5	39		0	210	7	40	0.2	20	300	501	168	33	1.3	0.1
	112CHCT	366	5/25/1984	7.9	26	64	5	29	1	0	221	7	38	0.2	7.9	287	516	180	25	0.9	0
66 46 511	112CHCT	138	8/21/1974	7.5	37	53	10	68	2	0	350	17	27	0.1	1.2	387	658	173	46	2.3	2.3
	112CHCT	138	8/23/1983	8.2	22	51	11	62	2	0	312	16	30	0.3	<.1	348	630	172	43	2.1	1.7
66 46 601	112CHCT	186	6/25/1969	7.4	25	77	7	24		0	260	8	36	0.3	3	307	549	219	19	0.7	0
66 46 703	112CHCT	278	8/28/1974	7.4		75	8	109		0	324	23	120			494	949	221	51	3.2	0.9
66 46 802	112CHCT	203	6/25/1969	7.5	24	81	13	60		0	369	19	48	0.3	4	430	785	255	33	1.6	0.9
	112CHCT	203	6/21/1979	8.0	25	81	18	98		0	267	18	179	0.2	2.7	553	1106	276	43	2.6	0
66 46 814	112CHCT	335	8/20/1974	7.5	26	84	10	55	2	0	329	9	64	0.4	0.7	413	743	249	32	1.5	0.4
66 46 815	112CHCT	145	6/10/1992	7.3	29	88	8	49	3	0	310	15	63	0.2	2.9	410	678	251	29	1.3	0.1
	112CHCT	145	5/20/1997	7.2	31	68	6	48	1	0	304	11	36	0.2	2.6	353		193	35	1.5	1.1
	112CHCT	145	6/28/2001	6.6	29.9	71.5	6.27	47	1.81	0	286.78	13.6	34	0.2	2.61	347	584	204	33		0.62
66 46 903	112CHCT	244	8/21/1974	7.4		68	8	31		0	254	10	38			280	551	203	25	1	0.1
66 47 101	112CHCT	319	6/25/1969	7.4	26	90	12	32		0	344	13	37	0.3	<.4	379	700	273	20	0.8	0.2
66 47 103	112CHCT	160	6/10/1992	7.3	31	117	15	30	4	0	419	14	45	0.2	0.2	462	720	354	15	0.7	0
66 47 413	112CHCT	178	10/28/1974	7.3	23	100	16	54	3	0	409	14	57	0.3	0.4	468	825	315	27	1.3	0.4
66 47 414	112CHCT	350	6/26/1997	7.1	29	92	9	29	2	0	333	13	27	0.5	1	367		268	19	0.8	0.1
66 47 504	112CHCT	357	6/25/1969	7.4	26	75	20	32		0	327	11	42	0.3	<.4	367	680	269	20	0.9	0
66 47 904	112CHCT	350	1/4/1979	7.5		81	10	27		0	293	10	34	0.2	1.2	307	612	243	19	0.8	0
	112CHCT	350	11/11/1992	7.1	29	90	12	19	3	0	310	2	28	0.2	4.4	339	581	273	12	0.5	0
	112CHCT	350	5/19/1997	7.1	29	75	12	28	2	0	312	8	35	0.2	1.1	343	514	237	20	0.8	0.4
66 48 101	112CHCT	250	6/21/1983	7.8		140	14	44		0	232	15	211	0.2	0.1	538	1152	407	19	1	0
66 48 102	112CHCT	300	8/8/1978	8.0		115	23	46		0	262	16	169	0.3	0.7	498	1057	381	20	1	0
	112CHCT	300	4/28/1983	7.7		107	20	48		0	276	14	155	0.3	0.6	480	1024	349	23	1.1	0
	112CHCT	300	3/29/1984	7.9		114	19	47		0	270	16	162	0.3	<.0	490	1056	362	21	1.1	0
66 48 302	112CHCT	43	8/22/1974	7.4		100	24	109		0	532	23	89			606	1070	348	40	2.5	1.8
66 48 402	112CHCT	537	3/6/1956	8.1	16	60	13	34		0	220	14	58	0.2		303		202	26	0.3	0
	112CHCT	537	4/2/1957	8.5	19	49	12	35		0	221	15	37	0.2		275		171	30	1.2	0.2
	112CHCT	537	1/27/1958	7.9	19	58	19	34		0	227	25	61	0.2		327		222	24	1	0
	112CHCT	537	1/21/1959	7.9	22	54	19	37		0	232	13	63	0.3		322		212	27	1.1	0
	112CHCT	537	1/28/1960	7.8	25	32	29	39		0	250	15	44	0.3		307		199	29	1.2	0.1
	112CHCT	537	1/10/1961	7.6	27	51	25	32		0	238	14	63	0.1		329		229	23	0.9	0
66 48 402	112CHCT	537	1/15/1962	7.4	23	58	19	36		0	244	14	60	0.2		330		222	25	1.1	0
	112CHCT	537	1/10/1963	7.7	32	57	7	53		0	262	16	39	0.3		333		170	40	1.8	0.9
	112CHCT	537	1/17/1964	7.8	24	58	20	36		0	250	12	63	0.4		336		226	25	1	0
	112CHCT	537	2/24/1966	8.3	21	58	11	46		0	268	15	40			323		189	34	1.5	0.6
	112CHCT	537	1/10/1967	7.5	24	55	13	46		0	262	15	43	0.2		325		190	34	1.5	0.5
	112CHCT	537	1/11/1968	7.6		51	15	75		0	262	19	23	0.1		312		188	46	2.4	0.5
	112CHCT	537	1/13/1969	7.2		44	15	28		0	189	18	43	0.4		241	495	171	26	0.9	0
	112CHCT	537	8/20/1969	7.6	22	50	15	50		0	244	19	48	0.5	<.4	324	600	186	36	1.6	0.3
	112CHCT	537	1/12/1971	7.7		43	16	64		0	262	14	55	0.8		321		173	44	2.1	0.8
	112CHCT	537	1/4/1972	7.7		55	14	70		12	275	12	57	1.2	0.3	356		194	43	2.2	1
	112CHCT	537	1/2/1973	8.0		42	11	82		6	268	17	57	0.3	0.2	347	491	150	54	2.9	1.6
	112CHCT	537	1/7/1974	7.4		51	1	97		6	256	28	67	1	0.5	377	570	131	61	3.7	1.8
	112CHCT	537	4/28/1992	7.5	26	78	13	38	3	0	240	15	78	0.3	2	371	571	248	24	1.1	0
	112CHCT	537	5/19/1997	7.5	28	68	12	39	2	0	233	12	76	0.3	2	353	439	218	27	1.1	0
66 48 403	112CHCT	940	12/19/1939	7.8	26	65	14	43		0	262	17	55	0.4	0.9	350		219	29	1.3	0
	112CHCT	940	4/12/1940			37	13	70		0	253	23	47	0.4		314		145	51	2.5	1.2

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
66 48 404	112CHCT	760	3/6/1956	8.1	13	47	12	42		0	226	17	39	0.2		281		166	35	1.4	0.4
	112CHCT	760	2/11/1957	8.7	17	49	13	35		0	215	17	38	0.2		274		175	30	1.2	0
	112CHCT	760	1/27/1958	8.0	18	47	16	49		0	239	38	38	0.3		323		183	36	1.6	0.3
	112CHCT	760	1/21/1959	8.3	22	51	15	40		0	244	17	41	0.4		306		188	31	1.3	0.2
	112CHCT	760	1/28/1960	7.8	25	34	24	40		0	250	14	38	0.1		298		183	32	1.3	0.4
	112CHCT	760	1/10/1961	8.0	23	64	14	37		0	250	14	56	<.1		331		217	27	1.1	0
	112CHCT	760	1/15/1962	7.5	24	55	12	41		0	250	18	37	0.2		310		186	32	1.3	0.4
	112CHCT	760	1/10/1963	7.7	31	58	11	39		0	250	16	39	0.3		317		189	30	1.2	0.3
	112CHCT	760	1/7/1964	7.7	24	57	15	41		0	268	14	45	0.3		328		203	30	1.3	0.3
	112CHCT	760	1/25/1965	7.7	25	58	10	42		0	250	16	40	0.2		314		185	32	1.3	0.4
	112CHCT	760	2/24/1966	8.3	21	58	11	46		0	268	15	40	0.1		323		189	34	1.5	0.6
	112CHCT	760	1/10/1967	7.5	24	56	13	43		0	262	16	40	0.5		321		192	32	1.4	0.4
	112CHCT	760	1/11/1968	7.5		55	12	52		0	268	20	43	0.1		314		186	37	1.7	0.7
	112CHCT	760	1/13/1969	7.3		57	14	73		0	231	13	43	0.4		313	482	199	44	0.4	0
	112CHCT	760	6/25/1969	7.6	26	59	10	39		0	248	17	37	0.4	<.4	310	549	186	31	1.2	0.3
	112CHCT	760	1/12/1971	7.5		59	7	61		0	262	13	50	0.8		319		175	42	2	0.8
	112CHCT	760	1/4/1972	7.7		55	12	2		3	127	20	45	1.2	0.4	201		186	2	0.1	0
	112CHCT	760	1/2/1973	8.0		51	10	64		30	214	19	45	0.3	0.4	324	446	168	45	2.2	1.1
	112CHCT	760	1/7/1974			44	5	89		6	268	30	45	0.6	0.5	352	460	130	59	3.4	2
	112CHCT	760	6/21/1979	8.2	27	59	11	40		0	247	18	43	0.3	0.5	320	552	192	31	1.3	0.2
	112CHCT	760	8/23/1983	8.3	28	55	11	41		0	247	17	42	0.3	1.4	318	576	182	32	1.3	0.4
66 48 405	112CHCT	393	8/3/1934			67	14	32		0	256	16	47	0.8		302		224	23	0.9	0
	112CHCT	393	12/19/1939	7.9	30	39	14	72		0	266	22	50	0.5	<.4	358		155	50	2.5	1.3
	112CHCT	393	4/12/1940					37		0	250	14	44		1.2						
	112CHCT	393	6/5/1945	8.0	28	38	13	70		0	248	22	53	<.4	<.4	346		148	50	2.5	1.1
66 48 406	112CEVG	892	2/24/1966	8.4	14	26	9	96		0	275	17	45	0.3		342		101	67	4.1	2.5
	112CEVG	892	1/10/1967	7.6	20	32	14	70		0	268	20	35	0.7		323		137	52	2.6	1.7
	112CEVG	892	1/11/1968	7.8		33	11	75		0	262	23	38	0.1		309		127	56	2.9	1.8
	112CEVG	892	1/13/1969	8.0		29	11	53		0	189	17	43	0.5		246	506	117	49	2.1	0.8
	112CEVG	892	1/12/1971	8.1		34	12	74		0	262	16	45	0.7		310		134	54	2.8	1.6
	112CEVG	892	1/4/1972	8.0		37	16	67		24	214	19	35	1.1	0.2	304		158	47	2.3	1.1
	112CEVG	892	1/2/1973	7.7		20	15	85		12	244	20	40	0.3	0.2	312	440	111	62	4.7	2.2
	112CEVG	892	1/7/1974	7.3		47	5	90		6	256	28	60	0.6	0.5	363	485	137	58	3.3	1.6
66 48 407	112CEVG	1196	1/14/1986	8.1		32	11	106		0	254	58	53		17.3	402		127	64	4.1	1.6
	112CEVG	1196	1/14/1986	8.2		28	12	125		0	259	25	121	0.4	3.3	442		120	69	5	1.8
	112CEVG	1196	1/14/1986	8.3		31	15	159		0	336	82	81	3.5		536		140	71	5.8	2.7
	112CEVG	1196	1/14/1986	8.2		14	4	189		0	347	13	117	0.5	5	512		51	88	11	4.7
	112CEVG	1196	11/10/1992	7.5	18	33	13	136	3	0	264	22	135	0.3	4	493	569	135	68	5.1	1.6
66 48 503	112CHCT	167	3/22/1974	7.4		97	26	45		0	322	21	117	0.4	<.4	465	959	349	21	1.1	0
	112CHCT	167	8/15/1975	7.8		96	26	47		0	314	22	119	0.3	<.4	464	960	346	22	1.1	0
	112CHCT	167	4/10/1976	7.6		101	21	47		0	310	22	121	0.4	<.4	465	959	338	23	1.1	0
66 48 504	112CHCT	327	9/4/1985	7.8		79	13	36		0	247	15	86	0.3	2	352	745	250	23	1	0
66 48 604	112CHCT	350	9/25/1986	8.1		81	11	38		0	249	16	81	0.3	0.9	350	715	247	25	1.1	0
66 48 705	112CHCT	240	8/22/1974	7.4		110	28	60		0	472	21	79			530	995	389	25	1.3	0
66 48 706	112CHCT	340	8/22/1974	7.4	30	83	20	45	3	0	332	21	61	0.3	0.1	426	750	289	25	1.2	0
66 48 802	112CHCT	564	8/22/1974	7.4		29	23	132		0	386	22	81			476	887	166	63	4.4	3
66 48 904	112CHCT	370	6/24/1969	7.5	27	73	14	38		0	283	16	55	0.4	<.4	363	664	239	25	1.1	0
66 48 908	112CHCT	55	6/24/1997	6.8	27	142	33	119	3	0	349	28	253	0.6	0.9	779		490	34	2.3	0
66 51 307	112CEVG	996	8/12/1974	7.6	24	49	8	88	3	0	227	33	90	0.5	0	406	717	153	55	3.1	0.7
66 52 207	112CHCT	242	6/18/1969	7.1	38	45	4	35		0	150	8	53	0.3	<.4	257	447	127	37	1.4	0
	112CHCT	242	6/21/1979	8.2	40	47	4	37		0	155	8	61	0.1	<.1	274	486	135	37	1.4	0
66 52 208	112CEVG	1196	8/12/1974	7.5	15	36	7	120	3	0	258	41	87	0.1	0.7	436	773	120	68	4.8	1.8
66 52 304	112CHCT	650	6/18/1969	7.5	31	52	5	27		0	201	10	26	0.3	<.4	250	426	151	27	1	0.3
	112CHCT	650	6/21/1979	8.2	36	48	5	26		0	177	10	29	0.2	<.1	240	415	138	29	1	1
66 52 501	112CHCT	165	8/23/1983	8.1	42	158	19	124	1	0	336	40	309	0.2	1.9	860	1727	472	36	2.5	0
66 52 502	112CHCT	181	8/19/1974	7.6		49	8	68		0	211	15	80			323	632	153	49	2.4	0.4
66 52 504	112CHCT	98	6/25/1997	6.8	38	143	14	119	1	0	312	31	205	0.5	1.4	707		416	38	2.5	0
	112CHCT	98	6/27/2001	6.3	40.1	121	12.1	102	4.09	0	307.53	27.7	214	0.1	1.35	673	1199	351	38		0
66 52 602	112CHCT	275	8/12/1974	7.5		79	4	52		0	274	18	58			345	648	212	34	1.6	0.2
66 52 603	112CHCT	515	6/17/1981	8.1	37	101	7	49		0	286	14	101	0.2	0.7	450	845	280	27	1.3	0
66 52 902	112CHCT	230	8/19/1974	7.4	28	85	5	42	1	0	275	13	61	0.2	5.3	376	656	232	28	1.2	0
66 53 202	112CHCT	216	5/21/1997	7.0	40	143	9	73	<1	0	301	21	191	0.2	3	629		392	28	1.6	0

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
	112CHCT	216	5/21/1997	7.0	39.9	143	8.55	73	<1	0	301.43	21.1	191	0.2	2.97	629		392	28	1.6	0
66 53 209	112CHCT	240	8/27/1974	7.2	39	120	9	60	2	0	314	15	150	0.1	0.6	549	1000	335	27	1.4	0
66 53 302	112CHCT	617	6/23/1969	7.3	36	116	14	88		0	327	27	168	0.3	<.4	610	1184	347	35	2.1	0
66 53 307	112CHCT	282	6/18/1969	7.4	33	114	15	88		0	338	28	168	0.4	<.4	613	1200	346	35	2.1	0
66 53 503	112CHCT	338	6/25/1969	7.1	34	193	44	233		0	409	211	451	0.6	<.4	1368	2736	662	43	3.9	0
66 53 505	112CHCT	376	8/19/1974	7.4		120	19	129		0	378	63	200			716	1360	377	42	2.9	0
66 53 506	112CHCT	294	6/27/1966	7.4	30	118	9	67		0	294	21	153	0.2	<.4	543	1050	331	30	1.6	0
66 53 603	112CHCT	143	6/25/1969	7.3	33	135	23	141		0	389	37	267	0.4	2.5	830	1661	431	41	3	0
66 53 701	112CEVG	790	8/19/1974	7.4		75	11	39		0	233	11	81			331	665	232	26	1.1	0
66 53 804	112CHCT	495	6/25/1969	7.3	34	93	13	45		0	284	14	91	0.3	<.4	430	790	285	25	1.2	0
	112CHCT	495	6/21/1979	7.8	37	80	10	46		0	222	16	105	0.2	<.1	403	742	240	29	1.3	0
	112CHCT	495	6/16/1981	8.0	37	102	7	50		0	282	14	106	0.2	0.8	455	858	283	27	1.3	0
66 53 807	112CHCT	305	6/27/1966	7.2	32	140	22	96		0	380	34	224	0.4	<.4	735	1410	439	32	2	0
66 53 808	112CHCT	325	6/29/1966	7.9	22	124	26	108		0	311	48	257	0.3	<.4	738	1464	416	36	2.3	0
66 53 809	112CHCT	234	6/28/1966	7.2	36	114	14	76		0	331	21	152	0.2	<.4	576	1090	342	32	1.8	0
66 53 903	112CHCT	304	6/25/1969	7.1	30	220	44	273		0	481	69	606	0.7	<.4	1479	3104	729	44	4.4	0
66 54 108	112CHCT	360	5/10/1970	7.8	21	68	39	108		0	353	53	161	0.2	<.4	624	1224	330	41	2.6	0
66 54 205	112CHCT	320	8/14/1974	7.4		80	11	55		0	321	12	63			378	734	244	32	1.5	0.4
66 54 210	112CHCT	95	11/12/1992	6.9	28	105	16	21	2	0	354	4	52	0.3	9.8	411	814	327	12	0.5	0
66 54 219	112BMNT	93	3/4/1975	7.4	26	369	53	88		0	317	7	760	0.4	5.1	1464	3120	1138	14	1.1	0
	112BMNT	93	3/4/1975	7.2	24	404	61	92		0	311	7	856	0.3	2.1	1599	3458	1258	13	1.1	0
	112BMNT	93	3/4/1975	7.3	24	357	54	84		0	321	7	737	0.3	3.8	1425	3108	1112	14	1.1	0
	112BMNT	93	3/4/1975	7.3	23	424	63	94		0	314	7	900	0.4	5.2	1670	3640	1317	13	1.1	0
	112BMNT	93	3/4/1975	7.7	23	345	50	82		0	315	7	696	0.3	6	1364	2940	1066	14	1.1	0
66 54 220	112BMNT	75	3/4/1975	8.0	23	107	17	45		0	391	9	71	0.5	12	476	870	336	22	1.1	0
	112BMNT	75	6/21/1979	8.3	27	113	17	46		0	397	12	80	0.3	14.2	504	972	351	22	1.1	0
	112BMNT	75	8/24/1983	8.0	26	117	22	49	2	0	380	7	115	0.4	14.5	539	1040	382	21	1.1	0
66 54 221	112BMNT	90	3/4/1975	7.3	23	144	22	52		0	364	8	179	0.4	12	619	1200	449	20	1.1	0
66 54 222	112BMNT	100	3/4/1975	7.5	23	104	15	53		0	381	9	83	0.4	4.6	479	894	321	26	1.3	0
66 54 223	112BMNT	65	3/5/1975	7.5	23	105	14	39		0	400	9	44	0.5	16	447	804	319	20	1	0.2
66 54 224	112BMNT	90	3/5/1975	7.3	24	259	34	76		0	293	5	510	0.3	5.2	1057	2240	786	17	1.2	0
66 54 225	112BMNT	75	3/5/1975	7.3	24	259	36	96		0	325	4	520	0.3	7	1105	2384	794	20	1.5	0
66 54 226	112BMNT	54	3/4/1975	7.6	14	106	19	45		0	391	12	75	0.5	1.6	465	876	342	22	1.1	0
66 54 227	112BMNT	85	3/4/1975	7.5	23	92	14	49		0	399	9	41	0.4	3.2	427	775	287	27	1.3	0.8
66 54 228	112BMNT	100	3/4/1975	8.1	23	94	14	51		0	392	10	52	0.4	2.3	439	798	292	27	1.3	0.6
66 54 229	112BMNT	93	3/5/1975	7.5	23	692	94	198		0	248	<4	1680	0.3	5.9	2819	6355	2113	16	1.9	0
66 54 308	112CHCT	235	8/20/1974	7.4		160	11	160		0	152	5	470			880	1790	444	43	3.3	0
66 54 405	112CHCT	329	8/13/1974	7.5		90	13	64		0	323	16	96			437	846	278	33	1.7	0
66 54 503	112CHCT	370	8/20/1974	7.4		85	12	69		0	364	13	70			427	813	261	36	1.9	0.7
66 54 507	112CHCT	482	8/13/1974	7.6	31	82	11	48	3	0	324	11	59	0.2	1.1	405	713	249	29	1.3	0.3
66 54 508	112CHCT	233	08/0/1974	7.4	27	75	14	62	3	0	380	7	48	0.6	1.9	424	753	244	35	1.7	1.3
66 54 510	112CHCT	213	6/25/1986	8.3		74	8	42		0	292	9	48	0.3	2.3	326	640	217	29	1.2	0.4
66 54 511	112CEVG	970	4/20/1978	7.7	24	48	11	70		0	253	4	75	0.3	1.9	358	649	165	47	2.4	0.8
	112CEVG	970	11/9/1992	7.1	24	53	15	45	2	0	256	8	50	0.3	5.8	329	583	193	33	1.4	0.3
	112CEVG	970	5/20/1997	7.3	26	38	9	68	2	0	250	14	74	0.3	2.4	356		132	52	2.6	1.5
	112CEVG	970	6/12/2001	6.7	27.8	45	11.3	70.1	2.54	0	240.41	16.7	75	0.3	2.24	369	649	159	48		0.76
66 54 601	112CEVG	1088	10/18/1952	7.5	16	18	6	135		0	275	16	85	0.5	<.4	411		69	80	7	3.1
	112CEVG	1088	5/17/1957	7.6		24	8	108		0	248	9	75	0.5	<.4	346	670	92	71	4.9	2.2
	112CEVG	1088	3/5/1959	7.5		26	8	96		0	257	14	76	0.4	<.4	347	694	97	68	4.2	2.3
	112CEVG	1088	11/29/1961	7.8		25	9	100		0	255	10	75	0.4	<.4	345	644	99	68	4.4	2.2
	112CEVG	1088	5/5/1965	7.6		30	11	98		0	256	10	74	0.5	1.5	351	690	120	63	3.9	1.8
	112CEVG	1088	10/30/1968	7.9		31	9	99		0	260	12	76	0.5	0.5	355	700	114	65	4	2
66 54 603	112CEVG	1400	7/5/1946	8.0	48	62	31	36		0	256	58	64	0.2	2	427		282	21	0.9	0
	112CEVG	1400	2/25/1947	8.2	14	13	4	153		0	275	6	107	0.7	<.4	433		48	87	9.5	3.5
	112CEVG	1400	1/16/1948	8.2	16	14	4	143		0	278	14	85	0.3	<.4	413		51	85	8.7	3.5
	112CEVG	1400	11/1/1949	7.9	17	18	8	128		0	275	11	85	0.5	2.2	404		77	78	6.3	2.9
	112CEVG	1400	10/20/1950	7.9	19	16	10	128		0	275	14	85	0.5	<.4	407		81	77	6.2	2.9
	112CEVG	1400	12/7/1951		14	20	6	131		0	275	17	82	0.6	<.4	406		74	79	6.6	3
	112CEVG	1400	8/25/1952	8.1	13	18	13	132		0	275	33	89	0.5	<.4	433		98	74	5.8	2.5
	112CEVG	1400	9/7/1955	8.3	15	13	4	144		6	256	17	89	0.4	<.4	414		48	86	9	3.4
	112CEVG	1400	2/8/1956	7.9	14	14	5	143		0	262	24	89	0.6	<.4	419		55	84	8.4	3.2
	112CEVG	1400	5/16/1957	7.5		14	4	128		0	254	11	80	0.6	<.4	362	688	51	84	7.8	3.1

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
	112CEVG	1400	3/5/1959	7.7		14	4	121		0	268	12	79	0.4	<.4	362	712	51	83	7.3	3.4
	112CEVG	1400	11/29/1961	7.8		12	4	134		0	260	12	81	0.6	<.4	371	672	46	86	8.6	3.3
	112CEVG	1400	8/23/1963	8.1		13	4	133		0	262	8	80	0.8	<.4	368	705	48	85	8.3	3.3
66 54 603	112CEVG	1400	2/2/1967	8.0		12	5	133		0	265	7	82	0.6	<.4	370	704	50	85	8.1	3.3
	112CEVG	1400	7/8/1975	7.8		40	5	130		0	342	10	85	0.8	0.1	438	715	120	70	5.2	3.2
	112CEVG	1400	8/24/1983	8.3	16	11	4	138	2	0	265	9	85	0.6	<.1	395	725	43	87	9.1	3.5
66 54 604	121EVGL	1098	9/25/1937	8.5		5	5			0	272	11	82	0.5		371		33			3.8
	121EVGL	1098	12/6/1939	8.1	14	14	8	135		0	281	13	82	<.4	<.4	404		67	81	7.1	3.2
	121EVGL	1098	1/27/1942	7.7	13	14	6	127		0	268	11	75	<.4	<.4	378		59	82	7.2	3.2
	121EVGL	1098	1/15/1948	8.0	13	16	6	125		0	266	12	75	0.2	<.4	378		64	80	6.8	3.1
	121EVGL	1098	11/14/1950	8.2	16	16	7	126		0	268	7	82	0.4	<.4	386		68	79	6.6	3
	121EVGL	1098	5/16/1957	7.4		19	4	118		0	254	5	76	0.4	<.4	347	665	63	80	6.4	2.9
	121EVGL	1098	3/5/1959	7.7		20	1	115		0	257	8	79	0.4	<.4	350	694	54	82	6.8	3.1
	121EVGL	1098	11/29/1961	8.0		12	5	126		0	256	9	72	0.4	<.4	350	656	50	84	7.7	3.2
	121EVGL	1098	6/25/1969	8.0	17	14	5	125		0	266	9	79	0.6	<.4	380	658	55	83	7.3	3.3
66 54 609	121EVGL	1188	12/6/1939	8.4	17	13	8	140		0	281	8	92	0.7	<.4	417		65	82	7.5	3.3
	121EVGL	1188	2/1/1942	7.7	17	18	7	118		0	268	14	67	<.4	<.4	373		73	77	6	2.9
	121EVGL	1188	7/10/1948	8.0	18	30	6	115		0	268	19	78	0.3	<.4	398		99	71	5	2.4
	121EVGL	1188	11/4/1949	7.7	15	21	8	117		0	268	9	78	0.3	<.4	380		85	74	5.5	2.7
	121EVGL	1188	11/18/1950	8.3	15	17	9	122		12	244	8	82	0.4	<.4	385		79	76	6	2.8
	121EVGL	1188	12/7/1951	7.9	12	21	7	121		0	268	8	82	0.5	<.4	383		81	76	5.8	2.8
	121EVGL	1188	6/25/1969	8.1	17	14	5	125		0	266	9	79	0.6	<.4	381	705	55	82	7.3	3.2
66 54 612	112CHCT	91	8/20/1974	7.4	30	100	14	62	3	0	397	13	78	0.2	11.5	507	895	307	30	1.5	0.4
66 54 621	112CEVG	1032	4/28/1970	7.4	18	34	12	82		0	272	13	50			342	598	134	57	3.1	1.8
66 54 622	121EVGL	1200	6/8/1992	7.6	23	35	14	79	3	0	265	18	64	0.4	1.5	368	596	145	54	2.9	1.4
	121EVGL	1200	5/20/1997	7.5	25	29	13	84	2	0	267	14	63	0.3	1.6	363	126		59	3.3	1.9
	121EVGL	1200	6/12/2001	6.9	25.1	29.6	13	85.2	2.25	0	262.37	15.8	66	0.4	1.36	635	367	215	128		1.75
66 54 701	112CHCT	193	6/25/1969	7.3	26	88	14	126		0	391	43	138	0.6	<.4	628	1200	277	49	3.3	0.9
66 54 703	112CHCT	163	11/15/1988	7.4	15	80	13	52	2	0	317	14	64	0.2	1.2	396	680	251	31	1.4	0.2
66 54 707	112CHCT	97	8/21/1986	8.4		91	20	160		7	439	78	132	0.5	5.9	710	1413	309	52	4	1.3
66 54 812	112CHCT	688	8/13/1974	7.6		73	14	53		0	313	14	59			366	708	239	32	1.5	0.3
66 54 903	112CHCT	220	8/27/1974	7.4		90	13	70		0	360	14	86			450	864	278	35	1.8	0.3
66 54 912	112CHCT	220	4/27/1995	7.1													723				
66 55 103	112CHCT	500	7/12/1963	7.4	26	66	11	34		0	243	12	50	0.3	<.4	319	570	209	26	1	0
66 55 105	112CHCT	221	7/12/1963	7.5	25	85	11	61		0	358	8	56	0.2	<.4	422	762	257	34	1.7	0.7
	112CHCT	221	6/17/1981	8.0	37	98	8	50		0	276	14	107	0.2	0.7	450	828	277	28	1.3	0
66 55 112	112CHCT	107	7/10/1963	7.6	20	88	19	80		0	387	7	102	0.2	<.4	506	972	297	36	2	0.4
66 55 113	112CHCT	346	8/20/1974	7.4	27	140	13	81	3	0	296	7	230	0.1	1.7	648	1270	402	30	1.8	0
66 55 121	112CHCT	67	4/11/1973	7.5	24	71	17	95		0	384	13	77	0.5	4.1	490	906	247	45	2.6	1.4
66 55 122	112CHCT	175	11/15/1988	7.3	11	117	10	42	3	0	354	7	83	0.3	2.9	449	787	331	21	1	0
66 55 301	112CHCT	29	9/16/1974	7.8		68	23	71		0	380	15	65			428	803	264	36	1.9	0.9
66 55 302	112CHCT	550	8/22/1974	7.4	29	71	12	28	3	0	282	12	33	0.2	1.1	328	573	226	21	0.8	0.1
66 55 306	112CHCT	90	6/22/1992	7.2	27	82	21	90	3	0	437	21	77	0.4	0.8	537	713	291	40	2.3	1.3
66 55 307	112CHCT		6/13/2001	6.5	30.4	71.8	21.9	97	2.18	0	440.54	18.4	76	0.4	0.7	535	954	269	43		1.84
66 55 410	112CHCT	55	4/11/1973	7.4	25	68	23	157		0	422	47	147	0.8	0.8	676	1256	264	56	4.2	1.6
66 55 411	112CHCT	202	5/20/1982	7.9		59	8	34	3	0	254	10	28	0.3	<.0	267	521	180	29	1.1	0.6
66 55 501	112CHCT	352	4/11/1973	7.3	28	102	25	115		0	412	39	158	0.3	<.4	670	1280	357	41	2.7	0
66 55 503	112CHCT	324	8/13/1974	7.5		69	14	73		0	334	15	71			406	770	229	40	2.1	0.9
66 55 506	112CHCT	92	4/11/1973	7.4	24	96	31	170		0	452	49	222	0.5	<.4	814	1570	367	50	3.9	0.1
66 55 507	112CHCT	85	4/10/1973	7.3	24	141	59	265		0	441	155	474	0.6	0.4	1335	2709	594	49	4.7	0
	112CHCT	85	4/10/1973	7.3	25	97	35	196		0	470	75	245	0.6	<.4	905	1749	386	52	4.3	0
	112CHCT	85	4/10/1973	7.4	24	105	42	210		0	466	92	293	0.6	<.4	996	1958	434	51	4.4	0
	112CHCT	85	4/11/1973	7.4	25	95	35	201		0	473	72	240	0.5	<.4	901	1460	381	53	4.5	0.1
66 55 508	112CHCT	85	4/10/1973	7.4	23	101	40	214		0	481	90	274	0.5	21	999	1944	416	52	4.6	0
	112CHCT	85	4/11/1973	7.5	24	93	35	199		0	473	73	231	0.6	22	910	1749	376	53	4.5	0.2
66 55 509	112BMNT	85	4/10/1973	7.2	21	222	134	495		0	389	187	1117	1	125	2493	5148	1105	49	6.5	0
	112BMNT	85	4/10/1973	7.1	21	292	174	627		0	359	243	1489	1	190	3213	6601	1444	48	7.2	0
	112BMNT	85	4/10/1973	7.3	19	338	196	690		0	359	271	1730	1	240	3661	7544	1649	47	7.4	0
	112BMNT	85	4/11/1973	7.4	22	115	58	258		0	439	71	445	0.8	41	1226	2480	525	51	4.9	0
66 55 510	112CHCT	110	4/11/1973	7.2	28	122	41	199		0	347	29	418	0.6	<.4	1008	2079	473	47	4	0
66 55 511	112CHCT	110	4/11/1973	7.3	27	80	22	145		0	449	27	145	0.5	<.4	667	1256	290	52	3.7	1.6
66 55 601	112CHCT	30	9/23/1974	7.7	26	78	22	130	3	0	478	37	100	0.6	0.4	631	1110	285	49	3.4	2.1

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
66 55 703	112CHCT	524	6/26/1969	7.5	25	97	13	87		0	377	11	117	0.4	3	538	1036	295	39	2.2	0.3
66 56 101	112CEVG	1001	8/22/1974	7.5	29	60	15	43	3	0	280	16	46	0.3	0.2	350	615	211	30	1.3	0.4
66 56 103	112CHCT	107	9/16/1974	7.6		65	17	98		0	389	77	18			466	864	232	47	2.8	1.7
66 56 301	112CHCT	619	8/22/1974	7.5	30	69	15	37	3	0	291	15	46	0.3	0	358	625	233	25	1.1	0.1
66 56 302	112CHCT	490	6/24/1969	7.6	27	71	14	32		0	293	16	36	0.3	<.4	340	620	234	22	0.9	0.1
	112CHCT	490	6/18/1979	8.2	28	52	14	33		0	233	15	42	0.2	<.1	298	524	187	27	1.1	0.1
	112CHCT	490	5/24/1984	8.0	28	68	15	36	2	0	292	16	42	0.3	<.1	350	645	231	25	1	0.2
66 56 304	112CHCT	368	8/22/1974	7.5		67	19	46		0	302	16	58			354	687	245	28	1.3	0
66 56 307	112CHCT	100	3/13/1985	7.6		108	34	108		0	430	13	204	0.5	0.7	679	1408	409	36	2.3	0
66 56 401	112CHCT	229	6/22/1992	7.3	29	75	19	48	3	0	284	15	65	0.3	0.1	394	634	265	28	1.3	0
	112CHCT	229	6/26/1997	7.3	30	70	17	44	2	0	273	19	61	0.6	<.2	379		246	28	1.2	0
66 56 703	112CHCT	280	6/26/1969	7.2	27	181	43	221		0	425	32	526	0.5	<.4	1239	2565	628	43	3.8	0
66 56 705	112CHCT	160	1/18/1983	8.0		104	24	136		0	437	38	186	0.4	<.0	703	1430	358	45	3.1	0
66 61 212	112CHCT	373	8/20/1974	7.4		120	22	97		0	331	33	210			644	1240	389	35	2.1	0
66 61 301	112CHCT	688	5/21/1997	7.4	32	44	23	60	2	0	283	16	74	0.3	2	393		206	38	1.8	0.5
	112CHCT	688	6/14/2001	6.9	32.2	47.5	26.1	60.5	2.45	0	279.46	20.2	83	0.4	1.99	412	741	227	36		0.06
66 61 302	112CHCT	528	9/8/1958	7.5		54	24	50		0	268	17	75	0.4	1.5	353	656	233	31	1.4	0
66 61 305	112CHCT	600	6/25/1969	7.4	35	118	23	64		0	303	27	170	0.3	<.4	586	1141	389	26	1.4	0
	112CHCT	600	6/21/1979	7.8	36	96	21	82		0	215	30	212	0.3	1.5	584	1100	325	35	2	0
	112CHCT	600	8/24/1983	7.8	37	108	25	90	2	0	299	36	213	0.3	2.6	660	1320	372	34	2	0
66 61 309	112CHCT	410	11/29/1971	8.0		47	27	57		6	275	19	70	1.2	0.6	362	630	228	35	1.6	0.1
	112CHCT	410	4/12/1975	8.0		46	21	56		0	276	20	57	0.4	2	338	665	201	37	1.7	0.5
	112CHCT	410	2/16/1977	7.6		51	22	54		0	273	17	69	0.4	2.5	350	700	217	35	1.6	0.1
	112CHCT	410	6/9/1992	7.5	27	46	22	57	3	0	277	20	64	0.4	1.8	378	635	206	37	1.7	0.4
66 61 601	112CHCT	402	6/26/1969	7.5	24	96	16	73		0	373	19	102	0.4	<.4	514	990	305	34	1.8	0
66 61 607	112CHCT	391	2/9/1971	6.9	35	813	178	1017		0	272	16	3395	0.3	<.4	5588	12264	2760	44	8.4	0
	112CHCT	391	2/9/1971	6.8	34	918	203	1161		0	272	14	3884	0.3	<.4	6348	13860	3125	44	9	0
	112CHCT	391	2/10/1971	7.2	35	265	52	258		0	300	20	810	0.3	<.4	1588	3328	875	39	3.8	0
66 61 905	112CHCT	508	2/8/1971	7.1	12	186	103	554		0	262	8	1321	0.5	<.4	2314	4896	887	57	8.1	0
66 61 905	112CHCT	508	2/8/1971	6.9	8	147	104	554		0	156	<4	1327	0.3	<.4	2221	4752	794	60	8.6	0
66 61 912	112CHCT	500	2/8/1971	7.2	34	90	25	70		0	419	13	86	0.5	<.4	524	960	327	31	1.7	0.3
66 62 104	112CHCT	359	6/26/1969	7.4	31	85	16	47		0	350	13	56	0.4	<.4	421	785	277	26	1.2	0.2
66 62 110	112CHCT	90	6/11/1992	7.2	29	91	16	40	3	0	348	8	48	0.4	18.8	425	662	293	22	1	0
66 62 307	112CHCT	180	6/19/1969	7.4	27	100	17	51		0	384	8	79	0.4	1.5	472	906	319	25	1.2	0
	112CHCT	180	6/21/1979	8.2	29	85	19	53		0	340	10	90	0.3	2.1	455	888	290	28	1.4	0
66 62 310	112CHCT	580	8/27/1974	7.5		76	15	54		0	313	14	69			381	734	251	31	1.5	0.1
	112CHCT	580	8/24/1983	7.9	33	77	17	46	3	0	295	15	76	0.3	0.4	412	774	262	27	1.2	0
66 62 415	112CHCT	458	6/26/1969	7.3	33	94	21	54		0	353	15	89	0.4	<.4	480	906	320	26	1.3	0
66 62 508	112CHCT	285	8/20/1974	7.5		85	20	67		0	396	15	70			451	854	294	32	1.7	0.6
66 62 512	112CHCT	109	2/9/1971	7.2	30	90	17	85		0	401	16	91	0.3	1.5	528	960	294	38	2.2	0.7
66 62 602	112CHCT	150	8/13/1974	7.5		86	18	64		0	384	15	69			440	840	288	32	1.6	0.5
66 62 610	112CEVG	1080	8/22/1974	7.5	31	61	18	58	3	0	304	17	67	0.3	0.6	405	718	226	35	1.7	0.5
66 62 616	112CHCT		6/26/2001	6.7	31.3	72.5	12.2	35.4	3.61	0	258.71	12.8	57	0.2	1.99	354	609	231	24		0
66 62 711	112CHCT	792	8/20/1974	7.5	34	75	24	84	4	0	404	22	96	0.4	0	537	958	290	38	2.2	0.9
66 62 713	112CHCT	690	2/9/1971	7.1	24	97	46	94		0	506	12	136	0.8	5.5	664	1264	431	32	2	0
66 62 714	112CEVG	1011	8/27/1974	7.6	25	40	13	93	3	0	302	18	68	0.4	0.6	409	723	153	56	3.3	1.9
66 62 805	112CHCT	398	6/26/1969	7.2	33	129	24	71		0	358	19	188	0.4	<.4	640	1272	420	26	1.5	0
66 62 807	112CHCT	95	8/6/1966	7.4	14	2110	820	5200		0	68	11	14300	0.8	<.4	22489	50064	8638	56	24.3	0
66 62 808	112CHCT		2/8/1971	7.4	30	99	21	70		0	382	12	115	0.2	<.4	535	1008	333	31	1.7	0
66 62 809	112CHCT	111	2/9/1971	7.2	34	107	28	83		0	427	22	133	0.4	<.4	617	1176	382	32	1.9	0
66 62 810	112CHCT	180	6/25/1997	7.0	34	149	37	92	4	0	383	21	213	1	<.2	740		524	27	1.8	0
66 62 904	112CHCT	574	6/26/1969	7.3	26	91	19	49		0	322	17	96	0.3	<.4	457	894	305	25	1.2	0
	112CHCT	574	8/24/1983	8.1	32	89	20	54	3	0	336	17	101	0.3	<.1	481	918	304	27	1.4	0
66 62 908	112CHCT	631	8/20/1974	7.4		91	20	56		0	340	16	96			446	868	309	28	1.4	0
66 63 105	112CHCT	342	6/27/1969	7.3	24	110	23	99		0	397	19	172	0.5	<.4	642	1304	369	36	2.2	0
66 63 201	112CHCT	595	6/26/1969	7.4	33	81	18	40		0	304	14	72	0.3	<.4	408	765	276	23	1.1	0
	112CHCT	595	8/24/1983	8.1	32	69	17	42	3	0	282	15	67	0.3	1.2	385	710	242	27	1.2	0
66 63 405	112CHCT	51	11/15/1988	7.0	13	88	21	95	1	0	403	26	118	0.3	0.6	560	978	304	40	2.4	0.5
66 63 406	112GLFC	240	11/15/1988	7.2	15	86	24	57	2	0	329	17	110	0.4	<.0	473	843	312	28	1.4	0
66 63 503	112CHCT	407	6/26/1969	7.4	26	85	32	94		0	398	19	145	0.7	<.4	597	1184	343	37	2.2	0
66 63 504	112CHCT	687	5/31/1966	7.5	28	73	19	50	3	0	287	17	77	0.4	<.4	408	760	260	29	1.4	0
	112CHCT	687	6/26/1969	7.5	24	94	11	64		0	364	12	75	0.4	<.4	459	882	279	33	1.7	0.4

Table 3A - Groundwater Quality Samples - Wharton County

TWDB Groundwater Data System

Well	Aquifer	Well Depth (Feet)	Date of Collection	pH	Silica (SiO2) MG/L	Calcium (Ca) MG/L	Magnesium (Mg) MG\L	Sodium (Na) MG\L	Potassium (K) MG\L	Carbonate (CO3) MG\L	Bicarbonate (HCO3) MG\L	Sulfate (SO4) MG\L	Chloride (Cl) MG\L	Flouride (F) MG\L	Nitrate (NO3) MG\L	Dissolved Solids MG\L	Specific Conductance (micromhos)	Hardness (CaCO3) MG\L	% Sodium	SAR	RSC
	112CHCT	687	6/21/1979	8.2	31	57	18	46	3	0	234	16	82	0.3	<.4	368	705	216	31	1.4	0
66 63 506	112CHCT	651	8/20/1974	7.5		78	21	53		0	304	17	91			408	800	281	28	1.4	0
	112CHCT	651	8/24/1983	7.9	33	72	22	55	3	0	276	18	106	0.3		444	840	270	30	1.5	0
66 63 507	112CHCT	48	11/18/1993	6.7	24	88	42	185	3	0	486	37	253	1	21.2	893	1380	393	50	4.1	0.1
	112CHCT	48	6/25/1997	7.0	24	86	43	172	1	0	476	33	242	1.5	24.8	862		391	48	3.8	0
66 63 605	112CHCT	209	6/26/1969	7.5	26	96	16	76		0	393	16	97	0.3	<.4	520	984	305	35	1.9	0.3
66 64 102	112CHCT	314	8/20/1974	7.5	28	93	22	130	3	0	364	41	190	0.3	0	686	1290	320	46	3.2	0
66 64 402	112CHCT	897	8/20/1974	7.5	30	71	21	56	3	0	290	20	97	0.3	0	440	802	260	31	1.5	0
80 06 202	112CHCT	620	7/13/1966	7.5	28	84	23	49	3	0	303	17	104	0.3	<.4	457	880	304	25	1.2	0
80 06 305	112CHCT	704	8/13/1974	7.5		79	20	57		0	308	18	94			419	819	279	30	1.5	0

APPENDIX 3B
LRWPA
WATER SUPPLIES AND WATER SUPPLIES BY CITY AND CATEGORY

Table 3B.1 - Current Water Supply Sources Available to the Lavaca Region

Groundwater Source	Type	RWPG	County	Basin	Source Id.	Water Supply, (acre-feet/year) 2000	2010	2020	2030	2040	2050	2060
GULF COAST AQUIFER	01	P	JACKSON	COLORADO-LAVACA	12015	17,618	17,618	17,618	17,618	17,618	17,618	17,618
GULF COAST AQUIFER	01	P	JACKSON	LAVACA	12015	51,395	51,395	51,395	51,395	51,395	51,395	51,395
GULF COAST AQUIFER	01	P	JACKSON	LAVACA-GUADALUPE	12015	18,863	18,863	18,863	18,863	18,863	18,863	18,863
Jackson County Total						87,876	87,876	87,876	87,876	87,876	87,876	87,876
GULF COAST AQUIFER	01	P	LAVACA	LAVACA	14315	38,025	38,025	38,025	38,025	38,025	38,025	38,025
GULF COAST AQUIFER	01	P	LAVACA	LAVACA-GUADALUPE	14315	52	52	52	52	52	52	52
GULF COAST AQUIFER	01	P	LAVACA	GUADALUPE	14315	46	46	46	46	46	46	46
Lavaca County Total						38,123	38,123	38,123	38,123	38,123	38,123	38,123
GULF COAST AQUIFER	01	P	WHARTON	COLORADO-LAVACA	24115	21,949	21,949	21,949	21,949	21,949	21,949	21,949
GULF COAST AQUIFER	01	P	WHARTON	LAVACA	24115	67,992	67,904	67,904	67,904	67,904	67,904	67,904
Wharton County Total						89,941	89,853	89,853	89,853	89,853	89,853	89,853
GULF COAST AQUIFER	01	K	WHARTON	COLORADO	24115	290	290	290	290	290	290	290
Regional Total						216,230	216,142	216,142	216,142	216,142	216,142	216,142

Surface Water Source	Type	RWPG	County	Basin	Source Id.	Water Supply, (acre-feet/year) 2000	2010	2020	2030	2040	2050	2060	
Lake Texana	00	P	RESERVOIR	LAVACA	16010	74,500	74,500	74,500	74,500	74,500	74,500	74,500	*
Regional Total						74,500	74,500	74,500	74,500	74,500	74,500	74,500	

* Note: The total yield of Lake Texana is 79,000 ac-ft, and 4,500 ac-ft is designated for environmental flows.

Table 3B.2 - Current Water Supplies Available to the Lavaca Regional Water Planning Area by City and Category

WUG Name	WUG No.	RWPG User	City No.	County	Basin	Type of Source	Alpha Provider	RWPG Source	County Source	Basin Source	Source Id. No.	Source Name	Water Supply, (acre-feet/year) 2000	2010	2020	2030	2040	2050	2060
EDNA	2951	P	0183	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	861	861	861	861	861	861	861
GANADO	2954	P	0228	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	277	277	277	277	277	277	277
COUNTY-OTHER	2959	P	0757	JACKSON	COLORADO-LAVACA	01		P	JACKSON	COLORADO-LAVACA	12015	GULF COAST AQUIFER	277	277	277	277	277	277	277
COUNTY-OTHER	2960	P	0757	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	498	498	498	498	498	498	498
COUNTY-OTHER	2961	P	0757	JACKSON	LAVACA-GUADALUPE	01		P	JACKSON	LAVACA-GUADALUPE	12015	GULF COAST AQUIFER	61	61	61	61	61	61	61
MANUFACTURING	2966	P	1001	JACKSON	COLORADO-LAVACA	01	570	P	RESERVOIR	LAVACA	16010	TEXANA LAKE/RESERVOIR	1,832	1,832	1,832	1,832	1,832	1,832	1,832
MANUFACTURING	2967	P	1001	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	3	3	3	3	3	3	3
MINING	2970	P	1003	JACKSON	COLORADO-LAVACA	01		P	JACKSON	COLORADO-LAVACA	12015	GULF COAST AQUIFER	30	30	30	30	30	30	30
MINING	2971	P	1003	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	45	45	45	45	45	45	45
MINING	2972	P	1003	JACKSON	LAVACA-GUADALUPE	01		P	JACKSON	LAVACA-GUADALUPE	12015	GULF COAST AQUIFER	76	76	76	76	76	76	76
IRRIGATION	2976	P	1004	JACKSON	COLORADO-LAVACA	01		P	JACKSON	COLORADO-LAVACA	12015	GULF COAST AQUIFER	17,013	17,013	17,013	17,013	17,013	17,013	17,013
IRRIGATION	2977	P	1004	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	49,293	49,293	49,293	49,293	49,293	49,293	49,293
IRRIGATION	2978	P	1004	JACKSON	LAVACA-GUADALUPE	01		P	JACKSON	LAVACA-GUADALUPE	12015	GULF COAST AQUIFER	18,590	18,590	18,590	18,590	18,590	18,590	18,590
LIVESTOCK	2982	P	1005	JACKSON	COLORADO-LAVACA	01		P	JACKSON	COLORADO-LAVACA	12015	GULF COAST AQUIFER	298	298	298	298	298	298	298
LIVESTOCK	2983	P	1005	JACKSON	LAVACA	01		P	JACKSON	LAVACA	12015	GULF COAST AQUIFER	418	418	418	418	418	418	418
LIVESTOCK	2984	P	1005	JACKSON	LAVACA-GUADALUPE	01		P	JACKSON	LAVACA-GUADALUPE	12015	GULF COAST AQUIFER	136	136	136	136	136	136	136
Jackson County Total													89,708	89,708	89,708	89,708	89,708	89,708	89,708
HALLETTSVILLE	2955	P	0259	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	575	575	575	575	575	575	575
MOULTON	2956	P	0723	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	165	165	165	165	165	165	165
SHINER	2957	P	0557	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	501	501	501	501	501	501	501
YOAKUM	2958	P	0670	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	592	592	592	592	592	592	592
COUNTY-OTHER	2962	P	0757	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	1,235	1,235	1,235	1,235	1,235	1,235	1,235
COUNTY-OTHER	2964	P	0757	LAVACA	GUADALUPE	01		P	LAVACA	GUADALUPE	14315	GULF COAST AQUIFER	5	5	5	5	5	5	5
MANUFACTURING	2968	P	1001	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	570	570	570	570	570	570	570
MINING	2973	P	1003	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	10	10	10	10	10	10	10
MINING	2974	P	1003	LAVACA	LAVACA-GUADALUPE	01		P	LAVACA	LAVACA-GUADALUPE	14315	GULF COAST AQUIFER	31	31	31	31	31	31	31
IRRIGATION	2979	P	1004	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	32,380	32,380	32,380	32,380	32,380	32,380	32,380
LIVESTOCK	2985	P	1005	LAVACA	LAVACA	01		P	LAVACA	LAVACA	14315	GULF COAST AQUIFER	1,997	1,997	1,997	1,997	1,997	1,997	1,997
LIVESTOCK	2986	P	1005	LAVACA	LAVACA-GUADALUPE	01		P	LAVACA	LAVACA-GUADALUPE	14315	GULF COAST AQUIFER	21	21	21	21	21	21	21
LIVESTOCK	2987	P	1005	LAVACA	GUADALUPE	01		P	LAVACA	GUADALUPE	14315	GULF COAST AQUIFER	41	41	41	41	41	41	41
Lavaca County Total													38,123	38,123	38,123	38,123	38,123	38,123	38,123
EL CAMPO	2952	P	0184	WHARTON	COLORADO	01		K	WHARTON	COLORADO	24115	GULF COAST AQUIFER	290	290	290	290	290	290	290
EL CAMPO	2953	P	0184	WHARTON	COLORADO-LAVACA	01		P	WHARTON	COLORADO-LAVACA	24115	GULF COAST AQUIFER	1,713	1,713	1,713	1,713	1,713	1,713	1,713
COUNTY-OTHER	2965	P	0757	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	438	438	438	438	438	438	438
MANUFACTURING	2969	P	1001	WHARTON	COLORADO-LAVACA	01		P	WHARTON	COLORADO-LAVACA	24115	GULF COAST AQUIFER	84	84	84	84	84	84	84
MINING	2975	P	1003	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	4	4	4	4	4	4	4
IRRIGATION	2980	P	1004	WHARTON	COLORADO-LAVACA	01		P	WHARTON	COLORADO-LAVACA	24115	GULF COAST AQUIFER	11,609	11,609	11,609	11,609	11,609	11,609	11,609
IRRIGATION	2981	P	1004	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	66,849	66,849	66,849	66,849	66,849	66,849	66,849
LIVESTOCK	2988	P	1005	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	588	588	588	588	588	588	588
EL CAMPO	3795	P	0184	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	25	25	25	25	25	25	25
Wharton County Total													81,600	81,600	81,600	81,600	81,600	81,600	81,600
Regional Total													209,431	209,431	209,431	209,431	209,431	209,431	209,431

Table 3B.3 - Current Water Supply Sources Available to the Lavaca Region by Wholesale Water Provider

Wholesale Water Provider	Major Provider α No.	Type of Source	Seller Major Provider α No.	RWPG	County No.	Basin No.	Source Identifier	Name of Source	2000	2010	2020	2030	2040	2050
									(acre-feet/year)					
Lavaca-Navidad River Authority	570	03		P		16	16010	Lake Texana	12,232	12,232	12,232	12,232	12,232	12,232

Note: The current reliable supply from LNRA to the Lavaca Region includes the Inteplast contract of 1,832 acre-feet/year and the amount of water recallable to the Lavaca Region from the City of Corpus Christi.

APPENDIX 3C
LAVACA OBSERVATION WELLS
WELL, PUMP, MOTOR, AND TESTING DATA

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 1	Texas-West Indies,	1959	Katy Drilling	Ch/Ev	620	182-620	20	Vertical Turbine	--	--	290	--	126.38	--	9/5/2002
RY-66-43-902	Eddie Sacco						12			--	--	--	121.75	--	9/26/2002
N 29° 16'51	Well 11						[12]			--	--	--	116.46	--	10/7/2002
W 96° 39'45										--	--	--	125.67	--	10/31/2002
										--	--	--	112.00	--	11/14/2002
										--	--	--	110.67	--	12/2/2002
										--	--	--	98.00	--	12/13/2002
										--	--	--	92.33	--	1/17/2003
										--	--	--	90.67	--	1/31/2003
										--	--	--	84.25	--	4/2/2003
										--	--	--	93.33	--	4/24/2003
										--	--	--	95.67	--	5/2/2003
										--	--	--	95.67	--	5/8/2003
										--	--	--	145.50	--	5/30/2003
										--	--	--	155.58	--	6/12/2003
										--	--	--	161.50	--	6/26/2003
										--	--	--	148.25	--	7/10/2003
										--	--	--	143.67	--	7/28/2003
										--	--	--	132.17	--	8/7/2003
										--	--	--	132.75	--	8/22/2003
										--	--	--	130.58	--	9/5/2003
										--	--	--	123.33	--	9/24/2003
										--	--	--	112.33	--	10/17/2003
										--	--	--	109.33	--	10/31/2003
										--	--	--	105.92	--	12/18/2003
										--	--	--	88.33	--	2/3/2004
										--	--	--	82.92	--	3/17/2004
										--	--	--	86.50	--	4/27/2004
Well 2	Hancock,	1978	Crowell Drilling	Ev	1,120	--	--	Vertical Turbine	--	--	--	--	94.08	--	1/17/2003
RY-66-43-7xx	Eddie Sacco,		Company							--	--	--	92.50	--	1/31/2003
N 29° 16.548'	New Well Con't									--	--	--	86.08	--	4/2/2003
W 96° 39.014'										--	--	--	94.25	--	4/24/2003
										--	--	--	97.12	--	5/8/2003
										--	--	--	148.16	--	5/30/2003
										--	--	--	162.30	--	6/12/2003

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 2	Hancock,									--	--	--	166.42	--	6/26/2003
RY-66-43-7xx	Eddie Sacco,									--	--	--	154.58	--	7/10/2003
	New Well Con't									--	--	--	149.25	--	7/28/2003
										--	--	--	145.33	--	8/7/2003
										--	--	--	144.17	--	8/22/2003
										--	--	--	142.67	--	9/5/2003
										--	--	--	126.08	--	9/24/2003
										--	--	--	118.58	--	10/17/2003
										--	--	--	111.50	--	10/31/2003
										--	--	--	103.50	--	12/18/2003
										--	--	--	92.50	--	2/3/2004
										--	--	--	87.17	--	3/17/2004
										--	--	--	85.92	--	4/27/2004
										--	--	--	84.00	--	5/20/2004
										--	--	--	111.17	--	7/22/2004
										--	--	--	123.42	--	8/12/2004
										--	--	--	120.67	--	8/30/2004
										--	--	--	118.83	--	9/13/2004
										--	--	--	106.58	--	11/4/2004
										--	--	--	83.42	--	3/30/2005
										--	--	--	82.92	--	4/10/2005
										--	--	--	85.42	--	5/12/2005
Well 3	Gerald Clark	---	---	Ch	---	---	---	Vertical Turbine	Natural	--	--	--	113.04	--	8/14/01
PP-66-51-6xx	Well 1								Gas	--	--	--	113.54	--	9/11/01
N 29^{o} 11’34.64										--	--	--	112.12	--	10/11/01
W 96^{o} 39’58.14										--	--	--	109	--	10/25/01
										--	--	--	103.54	--	11/29/2001
										--	--	--	101.62	--	12/13/2001
										--	--	--	99.16'	--	01/03/02
										--	--	--	95.41'	--	02/04/02
										--	--	--	92.71	--	03/08/02
										--	--	--	93.54	--	03/28/02
										--	--	--	90.58	--	04/29/02
										--	--	--	116.75	--	05/17/02
										--	--	--	113.12	--	05/31/02

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 3	Gerald Clark									--	--	--	113.71	--	06/14/02
PP-66-51-9xx	Well 1, con't									--	--	--	109	--	06/28/02
										--	--	--	91.42	--	01/17/03
										--	--	--	90.92	--	01/31/03
										--	--	--	86.58	--	04/02/03
										--	--	--	88.33	--	04/24/03
										--	--	--	93.5	--	05/08/03
										--	--	--	108.67	--	05/30/03
										--	--	--	126.58	--	06/12/03
										--	--	--	131.83	--	06/26/03
										--	--	--	131.25	--	07/10/03
										--	--	--	128.33	--	07/28/03
										--	--	--	124.67	--	08/07/03
										--	--	--	124	--	8/22/03
										--	--	--	121.75	--	9/05/03
										--	--	--	113.33	--	9/24/03
										--	--	--	109.5	--	10/17/03
										--	--	--	106.25	--	10/31/03
										--	--	--	102.08	--	11/20/03
										--	--	--	99.58	--	12/18/03
										--	--	--	96.25	--	02/03/04
										--	--	--	93.58	--	03/17/04
										--	--	--	115.58	--	9/13/04
										--	--	--	100.75	--	11/04/04
										--	--	--	88.08	--	3/30/05
										--	--	--	91.58	--	4/10/05
										--	--	--	95.83	--	05/12/05
Well 4	Town of Edna	1952	Layne-Texas	Ev	1,210	970-1,195	14	--	--	--	--	--	97.00	--	1/17/2003
PP-80-03-301	Kleas Well						8		1:1	--	--	--	97.00	--	3/28/2003
N 28° 58’58.58							[8]			--	--	--	98.00	--	4/24/2003
W 96° 38’44.57										--	--	--	81.00	--	5/8/2003
										--	--	--	77.00	--	5/29/2003
										--	--	--	91.00	--	6/12/2003
										--	--	--	93.00	--	6/27/2003
										--	--	--	93.00	--	7/10/2003

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 4	Town of Edna									--	--	--	91.00	--	7/25/2003
PP-80-03-3xx	Kleas Well Con't									--	--	--	95.00	--	8/8/2003
										--	--	--	88.00	--	8/21/2003
										--	--	--	89.00	--	9/4/2003
										--	--	--	92.00	--	9/25/2003
										--	--	--	93.00	--	10/16/2003
										--	--	--	102.00	--	10/31/2003
										--	--	--	91.00	--	11/20/2003
										--	--	--	125.00	--	12/18/2003
										--	--	--	89.00	--	2/3/2004
										--	--	--	87.00	--	3/17/2004
										--	--	--	91.00	--	4/27/2004
										--	--	--	88.00	--	5/20/2004
										--	--	--	98.00	--	7/22/2004
										--	--	--	111.00	--	8/19/2004
										--	--	--	105.00	--	9/2/2004
										--	--	--	103.00	--	9/30/2004
										--	--	--	95.00	--	12/29/2004
										--	--	--	89.00	--	1/20/2005
										--	--	--	88.00	--	2/9/2005
										--	--	--	89.00	--	3/28/2005
										--	--	--	87.00	--	4/21/2005
										--	--	--	91.00	--	5/12/2005
Well 5	City of Ganado	1984	Crowell Drilling	Ev	1,090	752-1,068	18, 11	--	--	--	--	--	76.00	--	5/21/2002
PP-66-60-907	Well 4		Company			[166]	[11]			--	--	--	78.00	--	7/22/2002
N 29° 2’31.10										--	--	--	98.00	--	8/2/2002
W 96° 30’47.39										--	--	--	92.00	--	8/30/2002
										--	--	--	72.00	--	9/13/2002
										--	--	--	76.00	--	9/26/2002
										--	--	--	85.00	--	10/18/2002
										--	--	--	83.00	--	11/1/2002
										--	--	--	81.00	--	11/14/2002
										--	--	--	86.00	--	12/2/2002
										--	--	--	77.00	--	12/13/2002
										--	--	--	88.00	--	12/26/2002

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 5	City of Ganado									--	--	--	89.00	--	1/17/2003
PP-66-60-907	Well 4 Con't									--	--	--	85.00	--	1/29/2003
										--	--	--	77.00	--	3/28/2003
										--	--	--	81.00	--	4/24/2003
										--	--	--	84.00	--	5/8/2003
										--	--	--	85.00	--	5/29/2003
										--	--	--	91.00	--	6/12/2003
										--	--	--	88.00	--	6/27/2003
										--	--	--	85.00	--	7/10/2003
										--	--	--	111.00	--	7/25/2003
										--	--	--	94.00	--	8/8/2003
										--	--	--	83.00	--	8/21/2003
										--	--	--	91.00	--	9/4/2003
										--	--	--	94.00	--	9/25/2003
										--	--	--	89.00	--	10/16/2003
										--	--	--	89.00	--	10/31/2003
										--	--	--	91.00	--	12/18/2003
										--	--	--	86.00	--	2/3/2004
										--	--	--	87.00	--	3/17/2004
										--	--	--	94.00	--	4/27/2004
										--	--	--	91.00	--	5/20/2004
										--	--	--	94.00	--	7/22/2004
										--	--	--	84.00	--	8/19/2004
										--	--	--	89.00	--	9/2/2004
										--	--	--	85.00	--	9/30/2004
										--	--	--	88.00	--	11/4/2004
										--	--	--	87.00	--	12/29/2004
										--	--	--	89.00	--	1/20/2005
										--	--	--	88.00	--	2/9/2005
										--	--	--	91.00	--	3/28/2005
										--	--	--	95.00	--	4/21/2005
										--	--	--	92.00	--	5/12/2005

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 6	Lee Hafernick,	---	---	Ch/Ev	---	207-680	---	Vertical Turbine	Natural	--	--	--	81	--	7/11/01
PP-80-04-1xx	Robert Shoemate								Gas	--	--	--	84	--	7/27/01
N 28° 58’48.19	Well 1								2:3	--	--	--	86.66	--	8/09/01
W 96° 35’45.08										--	--	--	76.74	--	8/27/01
										--	--	--	75.52	--	9/06/01
										--	--	--	72.79	--	9/28/01
										--	--	--	66.66	--	10/11/01
										--	--	--	65.33	--	10/25/01
										0	--	0	61.37'	--	11/29/2001
										0	--	0	61.54'	--	12/13/2001
										0	--	0	59.87'	--	01/03/02
										0	--	0	57.83'	--	02/04/02
										0	--	0	56.50	--	03/08/02
										0	--	0	64.83	--	04/29/02
										950	--	2,200	--	--	05/17/02
										0	--	0	80.21	--	05/30/02
										950	--	2,200	--	--	06/14/02
										0	--	0	81.46	--	06/28/02
										0	--	0	59.67	--	01/17/03
										0	--	0	60.08	--	01/29/03
										1,000	--	1,500	--	--	05/08/03
										0	--	0	68.92	--	07/10/03
										0	--	0	71.75	--	08/08/03
										0	--	0	69.67	--	8/21/03
										0	--	0	68.33	--	9/04/03
										0	--	0	66.58	--	09/25/03
										0	--	0	58	--	10/16/03
										0	--	0	58.16	--	10/31/03
										0	--	0	57.83	--	11/20/03
										0	--	0	57.58	--	12/18/03
										0	--	0	57.92	--	02/03/04
										0	--	0	57.5	--	03/23/04
Well 7	Gordon Roads	--	--	--	--	--	--	--	--	--	--	--	49.46	--	5/3/2002
PP-80-04-5xx	Well 1									--	--	--	61.96	--	5/17/2002
										--	--	--	59.50	--	5/31/2002

TABLE 1. Lavaca Observation Wells
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Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 7	Gordon Roads									--	--	--	56.81	--	7/22/2002
PP-80-04-5xx	Well 1 Con't									--	--	--	57.08	--	8/2/2002
N 28° 56’33.05										--	--	--	58.83	--	8/30/2002
W 96° 33’51.19										--	--	--	57.58	--	9/13/2002
										--	--	--	45.50	--	10/31/2002
										--	--	--	45.83	--	11/14/2002
										--	--	--	43.42	--	12/2/2002
										--	--	--	41.17	--	12/26/2002
										--	--	--	40.67	--	1/17/2003
										--	--	--	41.42	--	1/29/2003
										--	--	--	39.25	--	3/28/2003
										--	--	--	41.67	--	4/24/2003
										--	--	--	43.67	--	5/8/2003
										--	--	--	49.50	--	5/29/2003
										--	--	--	55.42	--	6/12/2003
										--	--	--	58.92	--	6/27/2003
										--	--	--	56.54	--	7/10/2003
										--	--	--	52.58	--	7/25/2003
										--	--	--	47.33	--	8/8/2003
										--	--	--	46.08	--	8/21/2003
										--	--	--	41.83	--	9/4/2003
										--	--	--	46.50	--	9/25/2003
										--	--	--	47.25	--	10/16/2003
										--	--	--	45.83	--	11/20/2003
										--	--	--	43.33	--	12/18/2003
										--	--	--	40.08	--	2/3/2004
										--	--	--	40.83	--	3/17/2004
										--	--	--	41.17	--	4/27/2004
										--	--	--	41.50	--	5/20/2004
										--	--	--	45.60	--	7/22/2004
										--	--	--	47.92	--	8/19/2004
										--	--	--	44.25	--	9/2/2004
										--	--	--	42.67	--	9/30/2004
										--	--	--	43.50	--	11/4/2004
										--	--	--	43.17	--	12/29/2004
										--	--	--	42.92	--	1/20/2005

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 7	Gordon Roads									--	--	--	42.67	--	2/9/2005
PP-80-04-5xx	Well 1 Con't									--	--	--	42.08	--	3/28/2005
										--	--	--	43.17	--	4/21/2005
										--	--	--	42.92	--	5/12/2005
										--	--	--	103.54	--	11/29/2001
										--	--	--	101.62	--	12/13/2001
										--	--	--	99.16	--	1/3/2002
										--	--	--	95.41	--	2/4/2002
										--	--	--	92.71	--	3/8/2002
										--	--	--	93.54	--	3/28/2002
										--	--	--	90.58	--	4/29/2002
										--	--	--	116.75	--	5/17/2002
										--	--	--	113.12	--	5/31/2002
										--	--	--	113.71	--	6/14/2002
										--	--	--	109.00	--	6/28/2002
										--	--	--	122.87	--	7/22/2002
										--	--	--	108.08	--	8/2/2002
										--	--	--	106.25	--	8/30/2002
										--	--	--	113.16	--	9/13/2002
										--	--	--	104.08	--	10/31/2002
										--	--	--	101.33	--	11/14/2002
										--	--	--	97.50	--	12/2/2002
										--	--	--	92.75	--	12/26/2002
										--	--	--	91.42	--	1/17/2003
										--	--	--	90.92	--	1/31/2003
										--	--	--	86.58	--	4/2/2003
										--	--	--	88.33	--	4/24/2003
										--	--	--	93.50	--	5/8/2003
										--	--	--	108.67	--	5/30/2003
										--	--	--	126.58	--	6/12/2003
										--	--	--	131.83	--	6/26/2003
										--	--	--	131.25	--	7/10/2003
										--	--	--	128.33	--	7/28/2003
										--	--	--	124.67	--	8/7/2003
										--	--	--	124.00	--	8/22/2003
										--	--	--	121.75	--	9/5/2003

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 7	Gordon Roads									--	--	--	113.33	--	9/24/2003
PP-80-04-5xx	Well 1 Con't									--	--	--	109.50	--	10/17/2003
										--	--	--	106.25	--	10/31/2003
										--	--	--	102.08	--	11/20/2003
										--	--	--	99.58	--	12/18/2003
										--	--	--	96.25	--	2/3/2004
										--	--	--	93.58	--	3/17/2004
										--	--	--	115.58	--	9/13/2004
										--	--	--	100.75	--	11/4/2004
										--	--	--	88.08	--	3/30/2005
										--	--	--	91.58	--	4/10/2005
										--	--	--	95.83	--	5/12/2005
Well 8	Russell/Layton	198x	---	Ch/Ev	718	---	20	Vertical Turbine	Natural	1,100	--	3,000	--	104.57	7/13/01
ZA-66-45-5xx	Raun Well 8						[18]		Gas	1,050	--	2,700	--	106.12	7/26/01
N 29° 19’50.49							[12]		3:4	1,050	--	2,700	--	99.58	8/09/01
W 96° 25’6.83										1,000	--	2,250	--	95.58	8/27/01
										0	--	0	66.16	--	9/07/01
										1,100	--	3,000	--	94.5	9/28/01
										0	--	0	64.83	--	10/11/01
										0	--	0	64.37	--	10/31/01
										0	--	0	58.66	--	12/18/2001
										0	--	0	57.16	--	01/25/02
										0	--	0	56.83	--	02/13/02
										0	--	0	56.83	--	03/12/02
										1,120	--	3,100	--	84.41	04/17/02
										1,160	--	3,000	--	95.83	05/03/02
										1,160	--	3,000	--	101.04	05/21/02
										1,120	--	2,900	--	101.62	05/30/02
										1,120	--	2,850	--	106.66	06/14/02
										0	--	0	77.58	--	07/05/02
										0	--	0	55.17	--	01/17/03
										0	--	0	54.92	--	01/30/03
										950	--	3,100	--	86.17	04/02/03
										950	--	3,000	--	88.42	04/28/03
										900	--	2,700	--	90.13	05/13/03

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 8	Russell/Layton									1,000	--	3,400	--	106.08	05/29/03
ZA-66-45-5xx	Raun Well 8 Con't									1,100	--	3,200	--	101.16	6/12/03
										1,000	--	3,200	--	108.42	6/27/03
										1,000	--	3,500	--	102.33	07/11/03
										0	--	0	67.42		07/28/03
										1,000	--	3,300	--	100.67	08/08/03
										1,000	--	3,250	--	104.67	8/22/03
										0	--	0	71.67	--	9/05/03
										0	--	0	62.25	--	9/24/03
										0	--	0	58.25	--	10/17/03
										0	--	0	57.83	--	11/03/03
										0	--	0	56.08	--	11/21/03
										0	--	0	55.75	--	12/18/03
										0	--	0	55.17	--	02/03/04
										0	--	0	54.58	--	03/24/04
										0	--	0	56.08	--	04/26/04
										--	--	--	57.75	--	5/21/04
										0	--	0	63.58	--	7/22/04
										850	--	2,500	--	95.33	8/05/04
										850	--	2,500	--	97.67	8/19/04
										850	--	2,500	--	100.25	9/02/04
										0	--	0	65.5	--	9/30/04
										0	--	0	60.33	--	10/18/04
										0	--	0	58.83	--	11/21/04
										0	--	0	57.67	--	12/29/04
										0	--	0	52.92	--	2/10/05
										0	--	0	51.58	--	3/31/05
										850	--	2,500	--	81.25	4/20/05
										850	--	2,500	--	91.83	05/11/05
Well 9	Russell/Layton	198x	---	Ch/Ev	---	150-820	20	Vertical Turbine	Natural	1,100	--	2,500	---	102.11	7/13/01
ZA-66-45-6xx	Raun Well 7						[18]		Gas	1,100	--	2,700	---	101.83	7/26/01
N 29° 19'48.44							[12]		2:3	1,100	--	2,700	---	101.12	8/09/01
W 96° 24'9.59										1,000	--	2,450	---	95.91	8/27/01
										0	--	0	66.5	---	9/07/01
										1,100	--	3,000	---	97.58	9/28/01

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 9	Russell/Layton									0	--	0	63.87	---	10/11/01
ZA-66-45-6xx	Raun Well 7									0	--	0	66.83	---	10/31/01
										0	--	0	58.25	--	12/18/2001
										0	--	0	56.75	--	01/25/02
										0	--	0	56.33	--	02/13/02
										0	--	0	56.5	--	03/12/02
										0	--	0	57.41	--	04/17/02
										1,000	--	2,750	--	93.71	05/03/02
										1,000	--	2,900	--	101.29	05/21/02
										1,000	--	3,000	--	103.46	05/30/02
										1,000	--	2,850	--	105.5	06/14/02
										970	--	2,700	--	97.58	07/05/02
										0	--	0	--	--	01/17/03
										0	--	0	--	--	01/30/03
										850	--	2,500	--	81.42	04/02/03
										1,000	--	3,000	--	85.58	04/28/03
										850	--	2,300	--	89.5	05/13/03
										0	--	0	--	--	05/29/03
										900	--	2,300	--	89.5	6/12/03
										900	--	2,500	--	98.7	6/27/03
										0	--	0	--	--	07/11/03
										0	--	0	--	--	07/28/03
										850	--	2,400	--	90.17	08/08/03
										850	--	2,500	--	93.17	8/22/03
										0	--	0	--	--	9/05/03
										0	--	0	--	--	9/24/03
										0	--	0	--	--	10/17/03
										0	--	0	--	--	11/03/03
										0	--	0	--	--	11/21/03
										0	--	0	--	--	12/18/03
										0	--	0	54.67	--	02/03/04
										0	--	0	53.17	--	03/24/04
										0	--	0	55.75	--	04/26/04
										0	--	0	58.17	--	5/21/04
										850	--	2,500	--	88.67	7/22/04
										850	--	2,500	--	91.58	8/05/04

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

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Well 9	Russell/Layton									850	--	2,650	--	92.25	8/19/04
ZA-66-45-6xx	Raun Well 7 Con't									850	--	2,650	--	94.42	9/02/04
										0	--	0	62.17	--	9/30/04
										0	--	0	57.92	--	10/18/04
										0	--	--	56.08	--	11/21/04
										0	--	--	55.67	--	12/29/04
										0	--	--	51.25	--	2/10/05
										0	--	--	50.42	--	3/31/05
										850	--	--	--	80.42	4/20/05
										850	--	--	--	92.67	05/11/05
										850	--	--	--	100.08	06/16/05
										0	--	--	67.08	--	06/30/05
Well 10	L. G. Raun, Jr.	1997	Crowell Drilling	Ch/Ev	960	300-910	20, 16	Vertical Turbine	Natural	1,050	280	2,500	--	140	7/13/01
ZA-66-53-1xx	K-3 Well		Company				12, 10		Gas	0	--	0	119.33	--	7/26/01
N 29° 13'41.76							[16]		2:3	950	--	2,100	--	138	8/09/01
W 96° 28'56.23							[12]			0	--	0	117.58	--	8/27/01
							[10]			0	--	0	104.83	--	9/07/01
										0	--	0	95.8	--	9/28/01
										0	--	0	101.04	--	10/11/01
										0	--	0	78.66	--	10/31/01
										0	--	0	79.5	--	12/19/01
										0	--	0	77.58	--	01/25/02
										0	--	0	76.16	--	02/13/02
										0	--	0	74.54	--	03/12/02
										1,000	--	3,200	--	--	04/17/02
										970	--	3,230	--	155.26	05/03/02
										0	--	0	109.04	--	05/21/02
										0	--	0	116.5	--	05/30/02
										900	--	2,816	--	160.73	06/14/02
										0	--	0	114.16	--	07/05/02
										0	--	0	75.17	--	1/17/03
										0	--	0	74.5	--	1/30/03
										1,100	--	3,590	--	137.08	4/02/03
										0	--	0	80.33	--	4/28/03

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Well, Pump, Motor and Testing Data

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Well 10	L. G. Raun, Jr.									1,050	--	3,450	--	154.13	5/13/03
ZA-66-53-1xx	K-3 Well Con't									1,100	--	3,500	--	179.67	5/29/03
										0	--	0	120.08	--	6/12/03
										1,050	--	3,400	--	168.5	6/27/03
										0	--	0	107.5	--	7/11/03
										0	--	0	95	--	7/28/03
										1,000	--	--	--	164.67	8/08/03
										0	--	0	103.75	--	8/22/03
										0	--	0	100	--	9/05/03
										0	--	0	97.5	--	9/24/03
										0	--	0	83.42	--	10/17/03
										0	--	0	81.16	--	11/03/03
										0	--	0	80.17	--	11/21/03
										0	--	0	77.25	--	12/18/03
										0	--	0	73.5	--	02/03/04
										0	--	0	69.08	--	03/24/04
										0	--	0	71.42	--	04/26/04
										0	--	0	75.58	--	5/21/04
										0	--	0	87.92	--	7/22/04
										0	--	0	87	--	8/05/04
										0	--	0	89.58	--	8/19/04
										0	--	0	103.5	--	9/02/04
										1,100	--	3,300	--	--	9/30/04
										0	--	--	85.67	--	10/18/04
										0	--	0	78.42	--	11/21/04
										0	--	0	73.5	--	12/29/04
										0	--	0	68.67	--	2/10/05
										0	--	0	66	--	3/31/05
										1,100	--	3,450	--	135.67	4/20/05
										1,100	--	3,450	--	143.5	05/11/05
Well 11	L. G. Raun, Jr.	1944	Otto Mickelson	Ch	146	71-146	24	---	---	--	--	--	70.12	--	9/07/01
ZA-66-52-601	Old Well					[75]	[24]			--	--	--	65.58	--	10/03/01
N 29° 11'36										--	--	--	64.83	--	10/11/01
W 96° 31'10										--	--	--	63.29	--	10/31/01
										--	--	--	66.58	--	12/19/01

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

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Well 11	L. G. Raun, Jr.									--	--	--	68.08	--	01/25/02
ZA-66-52-601	Old Well Con't									--	--	--	64.58	--	02/13/02
										--	--	--	64.75	--	03/12/02
										--	--	--	65.33	--	04/17/02
										--	--	--	66.31	--	05/03/02
										--	--	--	68.08	--	05/21/02
										--	--	--	64.75	--	05/30/02
										--	--	--	64.83	--	06/14/02
										--	--	--	68.5	--	07/05/02
										--	--	--	61.92	--	01/17/03
										--	--	--	61.67	--	01/30/03
										--	--	--	62.83	--	04/02/03
										--	--	--	62.33	--	04/28/03
										--	--	--	70	--	05/13/03
										--	--	--	69.22	--	05/29/03
										--	--	--	63.83	--	6/12/03
										--	--	--	65.5	--	6/27/03
										--	--	--	60.92	--	07/11/03
										--	--	--	59.83	--	07/28/03
										--	--	--	59.5	--	08/08/03
										--	--	--	57.58	--	8/22/03
										--	--	--	55	--	9/05/03
										--	--	--	54.83	--	9/24/03
										--	--	--	57.67	--	10/17/03
										--	--	--	56.5	--	11/03/03
										--	--	--	56.67	--	11/21/03
										--	--	--	54.83	--	12/18/03
										--	--	--	55.42	--	02/03/04
										--	--	--	55.33	--	03/24/04
										--	--	--	54.67	--	04/26/04
										--	--	--	52.83	--	5/21/04
										--	--	--	49.75	--	7/22/04
										--	--	--	49.58	--	8/05/04
										--	--	--	49.75	--	8/19/04
										--	--	--	51.33	--	9/02/04
										--	--	--	49.75	--	9/30/04

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Well 11	L. G. Raun, Jr.									--	--	--	43.58	--	10/18/04
ZA-66-52-601	Old Well Con't									--	--	--	49.5	--	11/21/04
										--	--	--	49.33	--	12/29/04
										--	--	--	48.75	--	2/10/05
										--	--	--	53.08	--	3/31/05
										--	--	--	54.25	--	4/20/05
										--	--	--	51.5	--	05/11/05
Well 12	L. G. Raun, Jr.	1970	Crowell Drilling	Ch/Ev	890	141-890	20	Vertical Turbine	Natural	1,050	270	2,500	--	--	7/13/01
ZA-66-52-6xx	#3 Well		Company			[749]	16, 12		Gas	0	--	0	--	--	7/26/01
N 29° 12’7.59							[20]		3:4	1,150	--	3,200	--	136.78	8/09/01
W 96° 30’34.94							[16]			0	--	0	119.85	---	8/27/01
							[12]			0	--	0	---	---	9/28/01
										0	--	0	---	---	10/11/01
										1,120	--	3,500	--	--	04/17/02
										1,050	--	3,100	--	--	05/03/02
										0	--	0	118.75	--	05/21/02
										0	--	0	115.16	--	05/30/02
										700	--	2,100	--	--	06/14/02
										0	--	0	106.83	--	07/05/02
										0	--	0	77.67	--	01/17/03
										0	--	0	75	--	01/30/03
										1,150	--	3,450	--	--	04/02/03
										1,100	--	3,500	--	--	04/28/03
										1,100	--	3,250	--	--	05/13/03
										1,100	--	3,300	--	--	05/29/03
										1,050	--	3,000	--	--	6/12/03
										1,050	--	3,000	--	--	6/27/03
										0	--	0	107.5	--	07/11/03
										0	--	0	91.75	--	07/28/03
										1,100	--	3,450	--	--	08/08/03
										1,100	--	3,500	--	--	8/22/03
										0	--	0	96.75	--	9/05/03
										0	--	0	90.16	--	9/24/03
										0	--	0	82.5	--	10/17/03
										0	--	0	80.33	--	11/03/03

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Well 12	L. G. Raun, Jr.									0	--	0	79.58	--	11/21/03
ZA-66-52-6xx	#3 Well Con't									0	--	0	77.5	--	12/18/03
										0	--	0	73.5	--	02/03/04
										0	--	0	72.17	--	03/24/04
										0	--	0	74.33	--	04/26/04
										0	--	0	78.5	--	5/21/04
										0	--	0	91.75	--	7/22/04
										1,050	--	3,350	--	--	8/05/04
										--	--	--	91.5	--	8/19/04
										1,100	--	3,500	--	--	9/02/04
										0	--	0	88.83	--	9/30/04
										0	--	0	83.5	--	10/18/04
										0	--	0	--	--	11/21/04
										0	--	0	--	--	12/29/04
										0	--	0	--	--	2/10/05
										0	--	0	--	--	3/31/05
										1,100	--	3,400	--	--	4/20/05
										1,050	--	3,300	--	--	05/11/05
Well 13	Norris Raun	1913	William Thomas	Ch	275	---	24, 12	Vertical Turbine	Natural	1,000	--	1,750	--	--	8/27/01
ZA-66-52-604	Well 2						[12]		Gas	0	--	0	96.33	--	9/07/01
N 29° 11'16.26									2:3	0	--	0	87.66	--	9/28/01
W 96° 30'16.8										0	--	0	84.83	--	10/11/01
										0	--	0	80.54	--	10/31/01
										0	--	0	74.75	--	12/19/01
										0	--	0	73.71	--	01/25/02
										0	--	0	72.54	--	02/13/02
										0	--	0	72.29	--	03/12/02
										0	--	0	75.16	--	04/17/02
										1,100	--	3,775	--	--	05/03/02
										0	--	0	100.96	--	05/21/02
										0	--	0	106.58	--	05/30/02
										1,000	--	2,900	--	--	06/14/02
										0	--	0	100.96	--	07/05/02
										0	--	0	70.5	--	01/17/03

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 13	Norris Raun									0	--	0	70.08	--	01/30/03
ZA-66-52-604	Well 2 Con't									0	--	0	69.42	--	04/02/03
										900	--	--	--	--	04/28/03
										1,000	--	--	--	--	05/13/03
										1,000	--	--	--	171.92	05/29/03
										1,050	--	--	--	--	6/12/03
										1,000	--	--	--	--	6/27/03
										--	--	--	95.5	--	07/11/03
										--	--	--	88.17	--	07/28/03
										950	--	--	--	--	08/08/03
										1,000	--	--	--	--	8/22/03
										0	--	0	93.25	--	9/05/03
										0	--	0	88.83	--	9/24/03
										0	--	0	76.42	--	10/17/03
										0	--	0	75.25	--	11/03/03
										0	--	0	73.33	--	11/21/03
										0	--	0	71.17	--	12/18/03
										0	--	0	66.83	--	02/03/04
										0	--	0	66.67	--	03/24/04
										0	--	0	67.67	--	04/26/04
										0	--	0	69.25	--	05/21/04
										0	--	0	93.75	--	7/22/04
										0	--	0	71	--	8/05/04
										1,000	--	2,850	--	--	8/19/04
										0	--	0	93.58	--	9/02/04
										0	--	0	81.17	--	9/30/04
										0	--	0	77.25	--	10/18/04
										0	--	--	74.25	--	11/21/04
										0	--	--	71.08	--	12/29/04
										0	--	--	65.5	--	2/10/05
										0	--	--	64.83	--	3/31/05
										0	--	--	70.5	--	4/20/05
										1,050	--	--	--	--	05/11/05

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 14	Norris Raun	1990	Crowell Drilling	Ch/Ev	750	160-740	20	Vertical Turbine	Natural	0	--	0	78.69	--	8/10/01
ZA-66-53-7xx	Well 10		Company			[580]	16, 12		Gas	1,000	--	2,100	---	--	8/27/01
N 29° 9'44.16							[20]		3:4	0	--	0	75.25	--	9/07/01
W 96° 29'12.42							[16]			0	--	0	71.29	--	9/28/01
							[12]			0	--	0	70.46	--	10/11/01
										0	--	0	67.66	--	10/31/01
										0	--	0	64.46	--	12/19/01
										0	--	0	64.01	--	01/25/02
										0	--	0	62.79	--	02/13/02
										0	--	0	61.79	--	03/12/02
										0	--	0	62.96	--	04/17/02
										0	--	0	68.91	--	05/03/02
										0	--	0	74.75	--	05/21/02
										0	--	0	76.41	--	05/30/02
										950	--	1,960	--	--	06/14/02
										0	--	0	76.16	--	07/05/02
										0	--	0	60.17	--	01/17/03
										0	--	0	59.83	--	01/30/03
										0	--	0	58.08	--	04/02/03
										0	--	0	62.33	--	04/28/03
										1,150	--	--	--	--	05/13/03
										0	--	0	76.5	--	05/29/03
										900	--	2,100	--	--	6/12/03
										0	--	0	74.33	--	6/27/03
										0	--	0	71.5	--	07/11/03
										0	--	0	71.08	--	07/28/03
										0	--	0	73	--	08/08/03
										850	--	1,834	--	--	8/22/03
										0	--	0	68.58	--	9/05/03
										0	--	0	61.5	--	9/24/03
										0	--	0	59.92	--	10/17/03
										0	--	0	59.5	--	11/03/03
										0	--	0	60.92	--	11/21/03
										0	--	0	59.42	--	12/18/03
										0	--	0	57.92	--	02/03/04
										0	--	0	66.67	--	03/24/04

TABLE 1. Lavaca Observation Wells
Well, Pump, Motor and Testing Data

Report Well Number or State Grid Location	Well Owner or Tenant and Well Name/Number	Year Com-pleted	Drilling Firm or Driller	Aquifer/s	Total Depth of Well (feet)	Slotted or Screened Interval & [Total Length] (feet)	Casing & [Slot] or [Screen] Diameter/s (inches)	Type of Pump	Type of Fuel & Gear Ratio	Engine Rpm	Pump Bowl Setting (feet)	Estimated Pumping Rate (gpm) 1/	Static Water Level (feet)	Pumping Water Level (feet)	Date
Well 14	Norris Raun									0	--	0	56.5	--	03/24/04
ZA-66-53-7xx	Well 10 Con't									0	--	0	56.83	--	04/25/04
										0	--	0	59.17	--	5/21/04
										0	--	0	69.25	--	7/22/04
										0	--	0	67	--	8/05/04
										850	--	2,075	--	--	8/19/04
										850	--	1,910	--	--	9/02/04
										0	--	0	68.42	--	9/30/04
										0	--	0	62.17	--	10/18/04
										0	--	--	60.58	--	11/21/04
										0	--	--	58.75	--	12/29/04
										0	--	--	55.08	--	2/10/05
										0	--	--	53.75	--	3/31/05
										850	--	--	--	77.67	4/20/05
										850	--	--	--	--	05/11/05

EXPLANATION & NOTES:

Ch = Chicot aquifer; Ev = Evangeline aquifer.

Well data from: Ground-Water Resources of Colorado, Lavaca, and Wharton Counties, Texas Department of Water Resources Report 270, 1982;
Ground-Water Resources of Jackson County, Texas, Texas Water Development Board Report 1, 1965;
and from well owners and water well drilling and pump companies.

1/ Pumping rate estimated using a propeller-type flowmeter inserted into the end of the open discharge pipe, accuracy not known.

APPENDIX 4A
WUGS WITH ANTICIPATED SHORTAGES IN LRWPA

Table 4A - WUGs With Anticipated Shortages in the Lavaca Regional Water Planning Area

WUG Name	WUG No.	RWPG User	City No.	County	Basin	Type of Source	Alpha Provider	RWPG Source	County Source	Basin Source	Source Id. No.	Source Name	Shortage, (acre-feet/year) 2000	2010	2020	2030	2040	2050	2060
IRRIGATION	2976	P	1004	JACKSON	COLORADO-LAVACA	01		P	JACKSON	COLORADO-LAVACA	12015	GULF COAST AQUIFER	-115,719	-15,735	-15,751	-15,769	-15,791	-15,812	-15,834
Jackson County Total													-115,719	-15,735	-15,751	-15,769	-15,791	-15,812	-15,834
IRRIGATION	2980	P	1004	WHARTON	COLORADO-LAVACA	01		P	WHARTON	COLORADO-LAVACA	24115	GULF COAST AQUIFER	-5,523	-4,783	-4,197	-3,631	-3,086	-2,561	-2,068
IRRIGATION	2981	P	1004	WHARTON	LAVACA	01		P	WHARTON	LAVACA	24115	GULF COAST AQUIFER	-34,513	-30,137	-26,669	-23,324	-20,098	-16,988	-14,077
Wharton County Total													-40,036	-34,920	-30,866	-26,955	-23,184	-19,549	-16,145
Regional Total													-155,755	-50,655	-46,617	-42,724	-38,975	-35,361	-31,979

APPENDIX 4B
POTENTIAL MANAGEMENT STRATEGIES AND IMPACTS

Lavaca Regional Water Planning Area
Potential Management Strategies for Meeting Shortages

Strategy P-JW-IL-1 Construction of Palmetto Bend Phase II on the Lavaca River

Identified Shortage Jackson County Irrigation
Wharton County Irrigation

Shortage Amount Jackson County Irrigation – 15,769 acre-feet in 2030
Wharton County Irrigation – 26,955 acre-feet in 2030

Supply Quantity 35,000 acre-feet per year

Water Source Lavaca River

Quality No Change in treated water quality to end user

Reliability 100 percent

Cost ($/acre-foot) $508. Calculated based on a reservoir cost of $400/acre-ft, an intake location on Palmetto Bend Phase II, and a 35 mile pipeline to the agricultural areas in western Wharton and north and eastern Jackson Counties. Assumes no other distribution costs and no treatment of any kind. This strategy does not completely meet the expected shortage. It is assumed that this approach would be used in conjunction with another water management plan. Due to the extreme cost of implementation, no further investigation was done for this strategy beyond an initial cost estimate and comparison.

Environmental Impacts

Water that is currently leaving the basin would be used and then discharged to streams in the basin. Agricultural demand would continue to be met, with associated discharges to the watercourses of agricultural return flows. The Phase II portion of the lake is currently permitted, and the construction of the lake would provide additional habitat, although some existing habitats would be destroyed.

Impacts on other Water Resources of the State

Stress on the groundwater in the area would be reduced. Since the minimum streamflow requirements for the Palmetto Bend Phase II have not been established, the impacts on other water resources are unknown.

Impacts on Threats to Agriculture and other Natural Resources of the State

Availability of water for irrigation purposes reduces the threats to agriculture, and as noted previously, provides for wildlife habitat as well.

Socioeconomic Impacts of not meeting Needs

To be determined by TWDB

Lavaca Regional Water Planning Area
Potential Management Strategies for Meeting Shortages

Strategy P-J-IL-2 Conversion of Ganado and Edna to surface water

Identified Shortage Jackson County Irrigation

Shortage Amount Jackson County Irrigation – 15,769 acre-feet in 2030

Supply Quantity 1,740 acre-feet per year

Water Source Lake Texana water recalled from Corpus Christi Contract

Quality No Change in treated water quality to end user

Reliability 100 percent

Cost ($/acre-foot) $738. Calculated based on a plant located south of Hwy 59 between the cities, with the supply from the plant being pumped into existing distribution storage. Includes all treatment, transmission and pumping costs, as well as a raw water cost of $108.94 per acre-foot (based on current Corpus Christi contract). Does not include costs of wells to use groundwater conserved in irrigation. Assumes wells already in place.

Environmental Impacts

Water that is currently leaving the basin would be used, treated, and then discharged to streams in the basin. At least a portion of agricultural demand would continue to be met, with associated discharges to the watercourses of agricultural return flows

Impacts on other Water Resources of the State

Water to Corpus Christi would be reduced under this scenario. While Corpus Christi has additional rights in the Colorado River at Garwood, the infrastructure to move that water to Corpus Christi currently does not exist.

Impacts on Threats to Agriculture and other Natural Resources of the State

Availability of water for irrigation purposes reduces the threats to agriculture, and as noted previously, provides for wildlife habitat as well.

Socioeconomic Impacts of not meeting Needs

To be determined by TWDB

Lavaca Regional Water Planning Area
Potential Management Strategies for Meeting Shortages

Strategy P-W-I-1 Conjunctive Use of Groundwater and Surface Water

Identified Shortage Wharton County Irrigation

Shortage Amount Wharton County Irrigation – 26,955 acre-feet in 2030

Supply Quantity 26,955 acre-feet/year

Water Source Wharton County Groundwater

Quality No Change

Reliability 100 percent

Cost ($/acre-foot) $33 Calculated as the additional pumping cost for estimated additional drawdown of 35 feet, including 10 feet for seasonal variation due to the close proximity of well locations.[1] This cost would only be incurred when maximum rice production occurs during the drought of record. It is further assumed that surface water would be used when available and the aquifer would recover between droughts.

Environmental Impacts

The continued use of current levels of irrigation water would have the environmental benefit that current or near-current volumes of agricultural return flows will continue to be discharged to the streams in the region. As noted in Task 3, there are no springs so diminished springflow from reduced aquifer levels is not a concern. If overdrafting continues over a long period of time, there is a potential for land subsidence with attendant environmental effects. As proposed, there will be no long-term dewatering of the aquifer and minimal subsidence effects.

Impacts on other Water Resources of the State

The Gulf Coast Aquifer underlying Jackson County has a sufficient amount of water in storage to meet short term demands in drought-of-record conditions, so the localized impacts of conjunctive use would be unlikely to impact other water resources of the state. However, in a widespread drought, the adjacent regions are likely to be overdrafting as well, with some potential for additional drawdown.

[1] As an additional cost for pumping water would be experienced by all groundwater users in LRWPA, the unit cost was multiplied over the demand for the entire region and then divided over the total amount of irrigation shortages to determine this value. Only a portion of its cost would be paid by the irrigators experiencing the shortage.

Impacts on Threats to Agriculture and other Natural Resources of the State

Availability of water for irrigation purposes reduces the threats to agriculture. Additionally, wildlife habitat will benefit from sustained return flows in drought.

Socioeconomic Impacts of not meeting Needs

To be determined by TWDB

Lavaca Regional Water Planning Area
Potential Management Strategies for Meeting Shortages

Strategy P-JLW-IL-1 Reuse of municipal effluent

Identified Shortage Jackson County Irrigation
Wharton County Irrigation

Shortage Amount Jackson County Irrigation – 15,769 acre-feet in 2030
Wharton County Irrigation – 26,867 acre-feet in 2030

Supply Quantity 1,350 acre-feet per year (75 percent of combined effluents from El Campo, Edna, and Ganado)

Water Source Groundwater based municipal wastewater effluents

Quality Increased dissolved solids and bacterial content, plus some beneficial nutrients

Reliability 100 percent

Cost ($/acre-foot) Range: $104 to $324; Calculated based on irrigation of lands currently being irrigated with groundwater or unreliable surface water supplies until all effluent used. No costs for additional treatment of effluent to meet Type 2 requirements included.

Environmental Impacts

Water that is currently discharged into streams in the basin would be consumed instead. In addition, effluent reused for agricultural use would start with higher dissolved solids levels than either groundwater or surface water in the area. Agricultural use would further increase dissolved solids levels. Agricultural demand would continue to be met, with associated discharges to the watercourses of agricultural return flows.

Impacts on other Water Resources of the State

Stress on the groundwater in the area would be reduced. However, return flows to the streams in the area would also be reduced and dissolved solids concentrations would increase slightly. The overall effect would be minimal because of the limited amount of effluent available.

Impacts on Threats to Agriculture and other Natural Resources of the State

Availability of water for irrigation purposes reduces the threats to agriculture, and as noted previously, provides for wildlife habitat as well.

Socioeconomic Impacts of not meeting Needs

To be determined by TWDB

Lavaca Regional Water Planning Area
Potential Management Strategies for Meeting Shortages

Strategy P-J-IL-1 Conjunctive Use of Groundwater and Surface Water

Identified Shortage Jackson County Irrigation

Shortage Amount Jackson County Irrigation - 15,769 acre-feet in 2030

Supply Quantity 15,769 acre-feet

Water Source Jackson County Groundwater

Quality No Change

Reliability 100 percent

Cost ($/acre-foot) $33 Calculated as the additional pumping cost for an estimated additional drawdown of 35 feet.[2] This cost would only be incurred when a maximum rice production occurs during the drought of record. It is further assumed that surface water would be used when available and the aquifer would recover between droughts.

Environmental Impacts

The continued use of current levels of irrigation water would have the environmental benefit that current or near-current volumes of agricultural return flows will continue to be discharged to the streams in the region. As noted in Task 3, there are no springs so diminished springflow from reduced aquifer levels is not a concern. If overdrafting continues over a long period of time, there is a potential for land subsidence with attendant environmental effects. As proposed, there will be no long-term dewatering of the aquifer and minimal subsidence effects.

Impacts on other Water Resources of the State

The Gulf Coast Aquifer underlying Jackson County has a sufficient amount of water in storage to meet short term demands in drought-of-record conditions, so the localized impacts of conjunctive use would be unlikely to impact other water resources of the state. However, in a widespread drought, the adjacent regions are likely to be overdrafting as well, with some potential for additional drawdown.

[2] As an additional cost for pumping water would be experienced by all groundwater users in LRWPA, the unit cost was multiplied over the demand for the entire region and then divided over the total amount of irrigation shortages to determine this value. Only a portion of its cost would be paid by the irrigators experiencing the shortage.

Table 4B.2 - Evaluation Criteria Matrix

Management Strategy	Environmental Flows Impacts	Wildlife Habitat Impacts	Cultural Resources Impacts	Impacts on other Water Resources	Ground/Surface Water Interrelation	Social/Economic Impacts of Voluntary Redistribution
Jackson County Irrigation Conjunctive Overdraft	No reduction in stream flow, No impact on springs, irrigation return flows maintained	Wildlife habitat maintained in rice production areas	No construction of facilities which could impact cultural resources	Localized increased drawdown not anticipated to effect other areas. Return flows would still occur to the streams during dry weather so there would be no negative impact on navigation and potentially a slight positive impact.	No known springs to effect. Irrigation return flows will still go back to streams and contribute to upper groundwater	No Voluntary Redistribution Negative impact on agriculture through increased pumping costs
Jackson County Irrigation Ganado and Edna surface water Conversion	No reduction in stream flow. No impact on springs, irrigation return flows maintained	Wildlife habitat maintained in rice production areas	Construction of water treatment plant and pipelines could impact cultural resources in previously undisturbed areas	Decreases stress on Gulf Coast Aquifer in regional planning area. Reduces water to Corpus Christi. Return flows would still occur to the streams during dry weather so there would be no negative impact on navigation and potentially a slight positive impact.	Slight potential increase in aquifer water levels. Little or no net effect overall	Increased water rates for Ganado and Edna. Increase cost for alternate supply for Corpus Christi
Jackson County Irrigation Wharton County Irrigation Reuse of Municipal Effluent	Irrigation return flows maintained, but dry weather stream flows decreased through diversion of municipal effluent	Wildlife habitat maintained in rice production areas but minimum streamflows decreased downstream of Edna, Ganado, and El Campo	Construction of pumping plant and pipelines could impact cultural resources in previously undisturbed areas.	Decreases stress on Gulf Coast aquifer by a small amount. There would be a reduction in return flows to the streams by a very small amount, with potentially slight negative impacts on navigation	Reduction in streamflow could reduce near surface groundwater percolating through stream beds down- stream of Edna, Ganado and El Campo	Negative impact on agriculture as costs are above what agriculture can afford to pay.
Jackson County Irrigation and Wharton County Irrigation - Palmetto Bend Phase II	Irrigation return flows maintained. Downstream flows maintained from Lake Texana from confluence of Lavaca and Navidad Rivers. May need additional study	Wildlife habitat maintained in rice production areas Some habitat destroyed by construction of lake, other habitat created	Construction of lake and related pumping facilities and pipelines could impact cultural resources in previously undisturbed areas	Decreases stress on Gulf Coast aquifer by a significant amount. Reduces demand to sustainable yield during drought times Potentially reduced streamflows could have a slight negative impact on navigation	Potential increase in near surface groundwater around new lake area	Negative impact on agriculture as costs are above what agriculture can afford to pay.
Wharton County Irrigation Irrigation Conjunctive Use of Groundwater and Surface Water	No reduction in stream flow, No impact on springs, irrigation return flows maintained	Wildlife habitat maintained in rice production areas	No construction of facilities which could impact cultural resources	Localized increased drawdown not anticipated to affect other areas Return flows would still occur to the streams during dry weather so there would be no negative impact on navigation and potentially a slight positive impact.	No known springs to effect. Irrigation return flows will still go back to streams and contribute to upper groundwater	No Voluntary Redistribution Negative impact on agriculture through increased pumping costs

APPENDIX 4C
MANAGEMENT STRATEGY EVALUATION AND SELECTION

Table 4C.1 - Potentailly Feasible Water Management Strategies

ProviderName	WUGName	MWP Alpha#	WUG Num	RWPG	Seq#	City#	County#	Basin#	Strategy Type	RPG Source	County Source	Basin Source	Source ID	Source Name	Capital Cost	AnnCost 2000	AnnCost 2010	AnnCost 2020	AnnCost 2030 ($/acre-foot)	AnnCost 2040	AnnCost 2050	Ann Cost 2060	Supply 2000	Supply 2010	Supply 2020	Supply 2030 acre-feet/year	Supply 2040	Supply 2050	Supply 2060	Comments
	IRRIGATION		161004120	P	1004	1004	120	15	4b1	P	120	16	36331	Direct Reuse	$264,269	$325	$325	$325	$325	$325	$325	$325		123	123	123	123	123	123	Reuse of Ganado municipal effluent
	IRRIGATION		161004120	P	1004	1004	120	15	4b2	P	120	16	36331	Direct Reuse	$410,621	$104	$104	$104	$104	$104	$104	$104		630	630	630	630	630	630	Reuse of Edna municipal effluent
	IRRIGATION		161004120	P	1004	1004	120	15	4e1	P	120	16	12015	Gulf Coast Aquifer	$6,700,000	$738	$738	$738	$738	$738	$738	$738		1,730	1,730	1,730	1,692	1,683	1,683	Conversion of Edna and Ganado to SW*
	IRRIGATION		161004120	P	1004	1004	120	15	4i1	P	120	16	16020	Palmetto Bend II	$30,032,579	$508	$400	$400	$400	$400	$400	$400		26,440	26,440	26,440	26,440	26,440	26,440	Palmetto Bend Stage II
	IRRIGATION		161004120	P	1004	1004	120	15	4o	P	120	15	12015	Gulf Coast Aquifer	$0	$96	$96	$96	$96	$96	$96	$96	15,719	15,735	15,751	15,769	15,791	15,812	15,834	Overdrafting the Aquifer
	IRRIGATION		161004241	P	1004	1004	241	15	4b3	P	120	16	36331	Direct Reuse	$845,755			$216	$216	$216	$216	$216		89	89	89	83	83	83	Reuse of El Campo municipal effluent
	IRRIGATION		161004241	P	1004	1004	241	16	4b3	P	120	16	36331	Direct Reuse				$216	$216	$216	$216	$216		506	506	506	512	512	512	Reuse of El Campo municipal effluent
	IRRIGATION		161004241	P	1004	1004	241	15	4i1	P	120	16	16020	Palmetto Bend II				$508	$400	$400	$400	$400		1,260	1,260	1,260	1,176	1,176	1,176	Palmetto Bend Stage II
	IRRIGATION		161004241	P	1004	1004	241	16	4i1	P	120	16	16020	Palmetto Bend II				$508	$400	$400	$400	$400		7,140	7,140	7,140	7,224	7,224	7,224	Palmetto Bend Stage II
	IRRIGATION		161004241	P	1004	1004	241	15	4o	P	241	15	24115	Gulf Coast Aquifer	$0	$88	$88	$88	$88	$88	$88	$88	5,523	4,783	4,197	3,631	3,086	2,561	2,068	Overdrafting the Aquifer
	IRRIGATION		161004241	P	1004	1004	241	16	4o	P	241	16	24115	Gulf Coast Aquifer	$0	$88	$88	$88	$88	$88	$88	$88	34,513	30,137	26,669	23,324	20,098	16,988	14,077	Overdrafting the Aquifer

Note: * Edna and Ganado would convert from groundwater to Lake Texana supply. They would enact their right to recall up to 10,400 ac-ft/yr from the Corpus Christi contract with LNRA.

Table 4C.2 - Recommended Management Strategies by City and Category

WUG Name	WUG Number	RWPG	Seq #	City #	County #	Basin #	Management Strategy	Strategy Type	MWP #	RPG Source	County Source	Basin Source	Source ID	Source Name	Capital Cost	Supply 2000	Supply 2010	Supply 2020	Supply 2030	Supply 2040	Supply 2050	Supply 2060	Exception	Scenario #
																acre-feet/year								
IRRIGATION	161004120	P	1004	1004	120	15	Overdrafting the Aquifer	4o		P	120	15	12015	Gulf Coast Aquifer	$0.00	15,719	15,735	15,751	15,769	15,791	15,812	15,834		
IRRIGATION	161004241	P	1004	1004	241	15	Overdrafting the Aquifer	4o		P	241	15	24115	Gulf Coast Aquifer	$0.00	5,523	4,783	4,197	3,631	3,086	2,561	2,068		
IRRIGATION	161004241	P	1004	1004	241	16	Overdrafting the Aquifer	4o		P	241	16	24115	Gulf Coast Aquifer	$0.00	34,513	30,137	26,669	23,324	20,098	16,988	14,077		

APPENDIX 4D
IRRIGATION RETURN FLOW ANALYSIS

Figure 4D.1

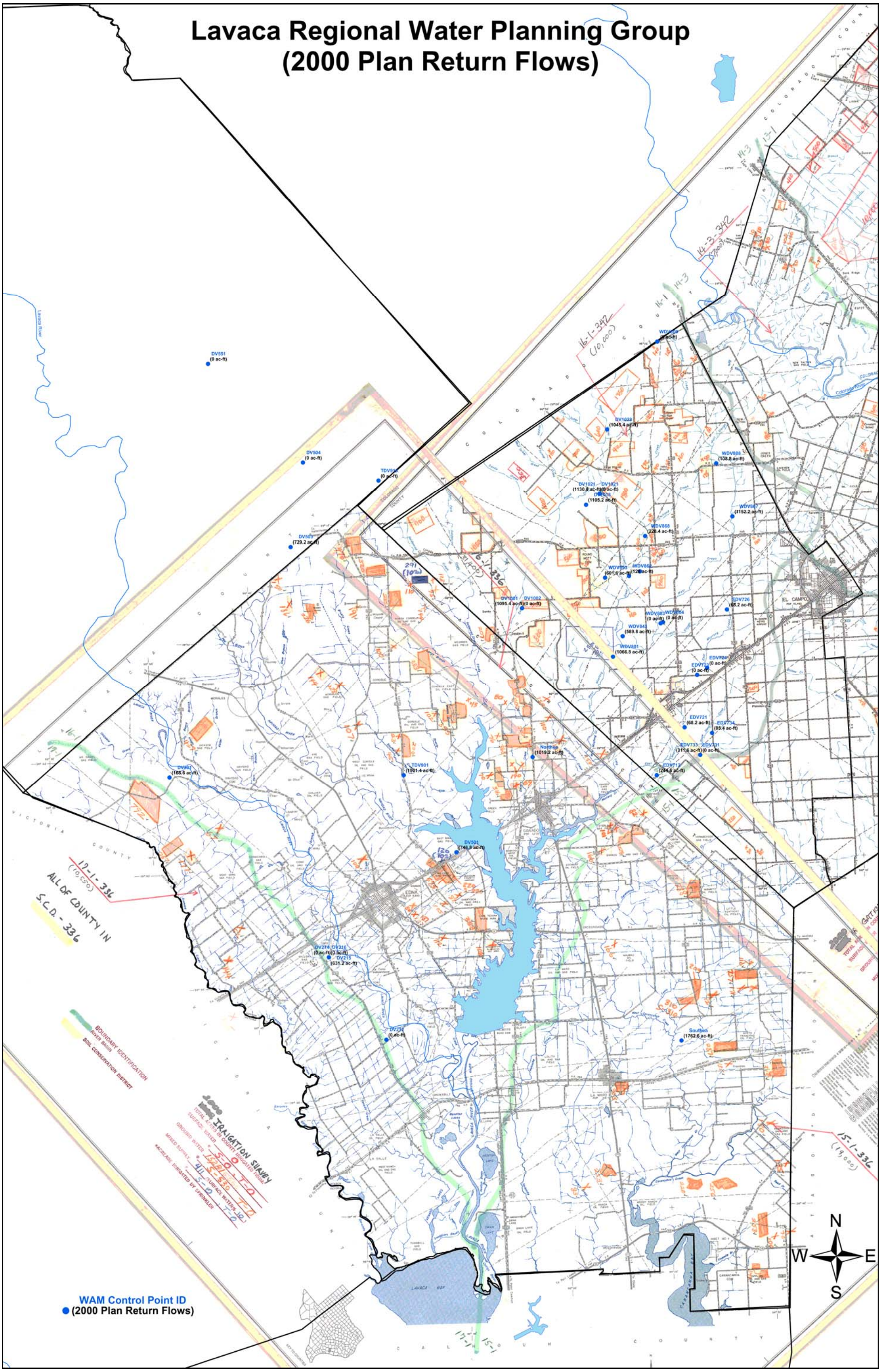
Lavaca Regional Water Planning Group
(2000 Plan Return Flows)
DV551 (0 ac-ft)
DV504 (0 ac-ft)
TDV902 (0 ac-ft)
DV503 (729.2 ac-ft)
DV502 (168.6 ac-ft)
TDV901 (1901.4 ac-ft)
DV501 (746.8 ac-ft)
DV214 DV216 (0 ac-ft)(0 ac-ft)
DV215 (631.2 ac-ft)
DV216 (0 ac-ft)
DV1023 (1045.4 ac-ft)
WDV808 (108.8 ac-ft)
DV1021 DV1021 (1130.8 ac-ft)(0 ac-ft)
DV1016 (1105.2 ac-ft)
WDV867 (1152.2 ac-ft)
WDV868 (228.4 ac-ft)
WDV869 (601.6 ac-ft)
WDV866 (126 ac-ft)
DV1001 DV1002 (1095.4 ac-ft)(0 ac-ft)
EDV726 (68.2 ac-ft)
WDV803 WDV804 (0 ac-ft) (0 ac-ft)
WDV843 (589.8 ac-ft)
WDV801 (1066.8 ac-ft)
EDV704 (0 ac-ft)
EDV723 (0 ac-ft)
EDV721 (68.2 ac-ft)
EDV734 (85.4 ac-ft)
EDV733 EDV731 (311.6 ac-ft)(0 ac-ft)
EDV712 (244.6 ac-ft)
Northbend (1019.2 ac-ft)
Southbend (1762.6 ac-ft)
EL CAMPO
COLORADO COUNTY
VICTORIA COUNTY
CALHOUN COUNTY
LAVACA BAY
Colorado River
Lavaca River
17-1-336 (10,650) ALL OF COUNTY IN S.C.D. - 336
14-3-342 (7,000)
16-1-342 (10,000)
16-1-336 (DEPLETED)
15-1-336 (14,000)
291 (10%)
126 (12%)
IRRIGATION SURVEY
BOUNDARY IDENTIFICATION
RIVER BASIN
SOIL CONSERVATION DISTRICT
WAM Control Point ID
(2000 Plan Return Flows)
N
W
E
S

Table 4D.1 -
Estimated Irrigation Return Flows for Lavaca Regional Water Planning Area

Control Point (WAM ID)	Stream	County	2000 Survey of Irrigated Land (ac)	Return Flow[2] (ac-ft)				2000 Survey Increased to 2000 Plan (ac)[1]	Return Flow[2] (ac-ft)				Naturalized Streamflow (ac-ft)[3]						Return Flow Greater Than Naturalized Streamflow[4]			
				No Conservation		Conservation			No Conservation		Conservation		June			July			No Conservation		Conservation	
				June	July	June	July		June	July	June	July	Average	Max	Min	Average	Max	Min	June	July	June	July
DV212	Lavaca River	Jackson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37522.8	302815.4	0.0	12615.5	250138.3	0.0				
DV214	Lavaca River	Jackson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36950.8	298199.3	0.0	12423.2	246325.2	0.0				
DV215	Lavaca River	Jackson	1599.0	40.0	359.8	20.0	179.9	2524.7	63.1	568.1	31.6	284.0	36950.9	298199.6	0.0	12423.2	246325.5	0.0	63.1	568.1	31.6	284.0
DV216	Lavaca River	Jackson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36950.9	298200.0	0.0	12423.2	246325.8	0.0				
DV301	Lavaca River	Jackson	427.0	10.7	96.1	5.3	48.0	674.2	16.9	151.7	8.4	75.8	35287.5	275307.8	0.0	11413.7	225337.3	0.0	16.9	151.7	8.4	75.8
DV501	Navidad River	Jackson	1892.0	47.3	425.7	23.7	212.9	2987.4	74.7	672.2	37.3	336.1	29891.3	265988.8	54.2	9054.0	92427.0	0.0	20.5	672.2		336.1
TDV901	Sandy Creek Tributary	Jackson	4817.0	120.4	1083.8	60.2	541.9	7605.8	190.1	1711.3	95.1	855.7	1751.5	15641.0	0.0	705.0	8560.9	0.0	190.1	1711.3	95.1	855.7
Southeast	Southeast	Jackson	4465.0	111.6	1004.6	55.8	502.3	7050.0	176.3	1586.3	88.1	793.1							NA	NA	NA	NA
Northeast	Northeast	Jackson	2582.0	64.6	581.0	32.3	290.5	4076.9	101.9	917.3	51.0	458.6							NA	NA	NA	NA
DV503	Navidad River	Lavaca	1694.0	42.4	381.2	21.2	190.6	2917.0	72.9	656.3	36.5	328.2	21401.9	190177.1	54.2	5637.0	50932.4	0.0	18.7	656.3		328.2
DV504	Navidad River	Lavaca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18366.1	163067.0	54.2	4415.1	46864.2	0.0				
DV551	Navidad River	Lavaca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14485.3	128706.2	49.7	3077.7	40293.6	0.0				
TDV333	Lavaca River Tributary	Lavaca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103.2	847.6	0.0	37.4	779.1	0.0				
TDV916	SCT - Goldenrod Crk	Lavaca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1803.9	16109.4	0.0	726.1	8817.3	0.0				
DV1001	Sandy Creek	Wharton	2567.0	64.2	577.6	32.1	288.8	4381.7	109.5	985.9	54.8	492.9	14465.1	144158.0	0.0	4793.4	48433.0	0.0	109.5	985.9	54.8	492.9
DV1002	Sandy Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14465.0	144157.5	0.0	4793.4	48432.8	0.0				
DV1018	SCT - Pinoak Creek	Wharton	2590.0	64.8	582.8	32.4	291.4	4421.0	110.5	994.7	55.3	497.4	5169.1	51515.0	0.0	1712.9	17307.6	0.0	110.5	994.7	55.3	497.4
DV1021	SCT - Pinoak Creek	Wharton	2650.0	66.3	596.3	33.1	298.1	4523.4	113.1	1017.8	56.5	508.9	5050.9	50336.8	0.0	1673.8	16911.7	0.0	113.1	1017.8	56.5	508.9
DV1023	SCT - Pinoak Creek	Wharton	2450.0	61.3	551.3	30.6	275.6	4182.0	104.5	940.9	52.3	470.5	3689.8	36772.0	0.0	1222.7	12354.3	0.0	104.5	940.9	52.3	470.5
EDV712	East Mustang Creek	Wharton	573.0	14.3	128.9	7.2	64.5	978.1	24.5	220.1	12.2	110.0	2852.6	19538.1	0.0	2334.6	35871.5	227.7	24.5		12.2	
EDV721	East Mustang Creek	Wharton	160.0	4.0	36.0	2.0	18.0	273.1	6.8	61.4	3.4	30.7	1489.8	10203.9	0.0	1219.3	18734.1	118.9	6.8		3.4	
EDV723	East Mustang Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1273.6	8723.2	0.0	1042.3	16015.5	101.7				
EDV724	East Mustang Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1218.7	8347.1	0.0	997.4	15325.1	97.3				
EDV726	East Mustang Creek	Wharton	160.0	4.0	36.0	2.0	18.0	273.1	6.8	61.4	3.4	30.7	849.1	5815.4	0.0	694.9	10677.0	67.8	6.8		3.4	
EDV731	East Mustang Creek Trib.	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1052.1	7205.8	0.0	861.0	13229.8	84.0				
EDV733	East Mustang Creek Trib.	Wharton	730.0	18.3	164.3	9.1	82.1	1246.1	31.2	280.4	15.6	140.2	1052.0	7205.5	0.0	861.0	13229.1	84.0	31.2	196.4	15.6	56.2
EDV734	East Mustang Creek Trib.	Wharton	200.0	5.0	45.0	2.5	22.5	341.4	8.5	76.8	4.3	38.4	655.4	4489.2	0.0	536.4	8242.0	52.3	8.5	24.5	4.3	
WDV801	West Mustang Creek	Wharton	2500.0	62.5	562.5	31.3	281.3	4267.3	106.7	960.2	53.3	480.1	6449.4	44173.2	0.0	5278.3	81100.9	514.8	106.7	445.4	53.3	
WDV803	West Mustang Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3690.9	25279.7	0.0	3020.7	46412.9	294.6				
WDV804	West Mustang Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3688.9	25266.3	0.0	3019.1	46388.3	294.4				
WDV807	West Mustang Creek	Wharton	2700.0	67.5	607.5	33.8	303.8	4608.7	115.2	1037.0	57.6	518.5	3011.9	20629.4	0.0	2465.0	37875.0	240.4	115.2	796.6	57.6	278.1
WDV808	West Mustang Creek	Wharton	255.0	6.4	57.4	3.2	28.7	435.3	10.9	97.9	5.4	49.0	2776.6	19017.7	0.0	2272.4	34916.0	221.6	10.9		5.4	
WDV809	West Mustang Creek	Wharton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1301.1	8911.2	0.0	1064.8	16360.7	103.8				
WDV843	WMCT - Porters Creek	Wharton	1382.0	34.6	311.0	17.3	155.5	2359.0	59.0	530.8	29.5	265.4	2230.0	15273.9	0.0	1825.1	28042.6	178.0	59.0	352.8	29.5	87.4
WDV853	West Mustang Creek Trib.	Wharton	1410.0	35.3	317.3	17.6	158.6	2406.8	60.2	541.5	30.1	270.8	154.4	1057.7	0.0	126.4	1941.8	12.3	60.2	529.2	30.1	258.5
WDV862	WMCT - Porters Creek	Wharton	300.0	7.5	67.5	3.8	33.8	512.1	12.8	115.2	6.4	57.6	1294.7	8867.5	0.0	1059.6	16280.6	103.3	12.8	11.9	6.4	
WDV865	WMCT - Porters Creek	Wharton	400.0	10.0	90.0	5.0	45.0	682.8	17.1	153.6	8.5	76.8	1261.8	8642.6	0.0	1032.7	15867.6	100.7	17.1	52.9	8.5	
WDV868	WMCT - Porters Creek	Wharton	535.0	13.4	120.4	6.7	60.2	913.2	22.8	205.5	11.4	102.7	510.3	3495.3	0.0	417.7	6417.3	40.7	22.8	164.8	11.4	62.0

1) 2000 Irrigated Land Survey increased by approximately 58% for Jackson County, 72% for Lavaca County, and 71% for West Wharton County to meet the current plan for 2000. This increase was calculated using the Base Y2000 NASS Acreages for the 1st crop land planted in each county.

2) Return flow is based on 10% of the fields drained in June and 90% in July and assumes a return rate of 0.25 acre feet per acre.

3) Naturalized streamflows were obtained from the Lavaca WAM model and include data from years 1940 to 1996.

4) Comparison of irrigation return flows to naturalized flows was conducted using 2000 Plan acreage.

APPENDIX 6A
WATER CONSERVATION
AND DROUGHT CONTINGENCY PLANS
FOR LRWPA

LAVACA-NAVIDAD RIVER AUTHORITY

DROUGHT CONTINGENCY PLAN

MAY 2005

DROUGHT CONTINGENCY PLAN

1.0 INTRODUCTION

Droughts and other uncontrollable circumstances can disrupt the normal availability of water supplies from either ground or surface sources. During drought periods, consumer demand is typically 15 to 25 percent higher than under normal conditions. Limitations on the supply of either ground or surface water, or on facilities to pump, treat, store, or distribute water can also present a public water supply utility with an emergency demand management situation.

The Drought Contingency Plan (DCP) establishes temporary methods designed to be used as long as the emergency exists. The purpose of the DCP is to specify how LNRA will contract and supply stored water supplies during a repetition of the critical drought of record. Consistent with Texas Commission on Environmental Quality (TCEQ) regulations, the LNRA has recommended that, as appropriate, its wholesale water customers consider adoption of drought contingency measures to be implemented in response to LNRA trigger conditions. As a provision of their respective water supply contracts, all LNRA customers have drought contingency plans on file with the TCEQ.

LNRA's DCP includes the following measures:

a. Trigger conditions signaling the start of an emergency period;
b. Designation of drought contingency measures;
c. Public information and education; and
d. Notification actions for drought termination

2.0 TRIGGERING CONDITIONS

As a wholesale water supply utility and a water resource manager, the LNRA will initiate drought contingency measures upon occurrence of the following conditions:

Condition One:	Compromised Reservoir Condition One Reservoir elevation is at or below elevation 43.00 msl
Condition Two:	Compromised Reservoir Condition Two Reservoir elevation is at or below elevation 40.15 msl
Condition Three:	Severe Local Drought Condition -- Compromised Groundwater Supply Reduction of local groundwater supplies to critical levels.

3.0 DROUGHT CONTINGENCY MEASURES

The following actions should be taken when trigger conditions are met. As a wholesale water supplier, the LNRA continuously monitors Lake Texana water levels and communicates with local communities as to the condition of water supplies in the Lavaca River Basin.

Condition One: Compromised Reservoir Condition One

A trigger condition has been established by an agreement between the LNRA and specified water rights permit holders upstream of Lake Texana using surface water for irrigation purposes. Trigger condition one impacts permit holders upstream of Lake Texana who divert water for irrigation purposes. Diversions for irrigation purposes are limited to times that Lake Texana is at or above elevation 43.00 msl. Prior to any initiating diversions, permittees must confirm the level of Lake Texana with either the LNRA or the TCEQ Watermaster. Diversions must cease within 24 hours following the time when the reservoir level drops below elevation 43.00 msl. The goal for water use reduction under Condition One is a 3% percent reduction of the use that would have occurred in the absence of drought contingency measures.

Upon reaching Condition One, LNRA will implement the following relevant actions:

a. Notify the TCEQ Watermaster of reservoir condition.
b. Inform public, giving notice of reservoir condition to the customers served by the LNRA system and upstream water rights permit holders.
c. Through the news media, the public should be advised of the trigger condition situation. Include in the information to the public a recommendation that water users look for ways to conserve water.

Resumption of normal operation and termination of Condition One should occur when reservoir levels are equal to or greater than elevation 43.00 msl.

Condition Two: Compromised Reservoir Condition Two

A trigger condition has been established by an agreement between LNRA, Texas Parks and Wildlife Department and Texas Water Development Board, whereby upon Lake Texana reaches elevation 40.15 or roughly 78% of the reservoir capacity, LNRA may reduce the volume of freshwater releases to bays and estuaries to 5 cubic feet per second. The goal for water use reduction under Condition Two is a 5% percent reduction of the use that would have occurred in the absence of drought contingency measures.

Upon reaching Condition Two, the LNRA will implement the following relevant actions:

a. Notify the TCEQ Watermaster of reservoir condition.
b. Inform public, giving notice of reservoir condition to the customers served by the LNRA system and include in the information recommendations for water conservation.

Resumption of normal operation and termination of Condition Two should occur when reservoir levels are equal to or greater than elevation 40.15 msl.

Condition Three: Severe Local Drought Condition- Compromised Groundwater Supply

All communities in the Lavaca River Basin use groundwater as their primary water supply source. Lowering of groundwater supplies to critical levels in these communities will impact the

health and safety of the public. The water sales contract between the LNRA and the City of Corpus Christi allows for the return of 10,400 acre-feet for meeting the needs of Jackson County. The goal for water use reduction under Condition Three is a 7% percent reduction of the use that would have occurred in the absence of drought contingency measures.

Upon reaching Condition Three, the LNRA will implement the following relevant actions:

a. Notify the TCEQ Watermaster of the compromised condition.
b. The affected community(s) should continue implementation of relevant DCP and water conservation actions
c. Upon authorization by the TCEQ Watermaster, the LNRA will enact contractual provisions and assist the affected community as appropriate
d. Certain industrial and commercial water uses which are not essential to the health and safety of the community should be prohibited; and
e. Through the news media, the public should be advised daily of the trigger conditions.

4.0 INFORMATION AND EDUCATION

Once trigger conditions have been reached for the LNRA system, LNRA will notify the TCEQ Watermaster and its customers, whereby customers should notify the public within their jurisdictions of conditions and measures to be taken. The process for notifying the public should include:

a. Posting the Notice of Drought conditions at City Hall, County Courthouse, Post Office, Public Library, Senior Citizens Center, and Major Supermarkets;
b. Copy of notice to newspapers and hold press conferences; and
c. Copy of notice to local radio and television stations.

5.0 TERMINATION NOTIFICATION

Termination of the drought contingency measures should take place when the trigger conditions that initiated the drought contingency measures have subsided, and an emergency situation no longer exists. LNRA will notify the TCEQ Watermaster and its customers. Customers should notify the public within their jurisdiction of termination of the drought contingency measures in the same manner they were informed of initiation of the drought contingency measures through the city officials in charge.

6.0 LNRA ENVIRONMENTAL ASSURANCE PROGRAM

LNRA participates in the TCEQ sponsored Texas Clean Rivers Program, conducting water quality assessments of the Lavaca River Basin. The purpose of the water quality assessment is to identify issues affecting water quality in the Lavaca River Basin, and to develop solution techniques for improving water quality. The assessment program is divided into two phases. LNRA's Clean Rivers Program involves collecting, reviewing, and analyzing past and present water quality data, addressing public opinion, and identifying areas of potential pollution. The program has required the implementation of a comprehensive data management system, the

establishment of a water quality monitoring network, and the identification of specific water quality concerns throughout the Lavaca River Basin. LNRA is providing water quality and water conservation information to citizens throughout the Lavaca River Basin as a means of public education. The LNRA Clean Rivers Program will assist in the protection of the water resources in the Lavaca River Basin.

APPENDIX A

Texas Administrative Code, Section 288.22

APPENDIX A

Texas Commission on Environmental Quality Rules on Drought Contingency Plans for Wholesale Water Suppliers

TITLE 30	ENVIRONMENTAL QUALITY
PART 1	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 288	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
SUBCHAPTER B	DROUGHT CONTINGENCY PLANS
RULE § 288.22	**Drought Contingency Plans for Wholesale Water Suppliers**

(a) A drought contingency plan for a wholesale water supplier must include the following minimum elements.

(1) Preparation of the plan shall include provisions to actively inform the public and to affirmatively provide opportunity for user input in the preparation of the plan and for informing wholesale customers about the plan. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

(2) The drought contingency plan must document coordination with the regional water planning groups for the service area of the wholesale public water supplier to ensure consistency with the appropriate approved regional water plans.

(3) The drought contingency plan must include a description of the information to be monitored by the water supplier and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

(4) The drought contingency plan must include a minimum of three drought or emergency response stages providing for the implementation of measures in response to water supply conditions during a repeat of the drought-of-record.

(5) The drought contingency plan must include the procedures to be followed for the initiation or termination of drought response stages, including procedures for notification of wholesale customers regarding the initiation or termination of drought response stages.

(6) The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this paragraph are not enforceable.

(7) The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

(A) A pro rata curtailment of water deliveries to or diversions by wholesale water customers as provided in Texas Water Code, § 11.039; and

(B) utilization of alternative water sources with the prior approval of the executive director as appropriate (e.g., interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.).

(8) The drought contingency plan must include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, § 11.039.

(9) The drought contingency plan must include procedures for granting variances to the plan.

(10) The drought contingency plan must include procedures for the enforcement of any mandatory water use restrictions including specification of penalties (e.g., liquidated damages, water rate surcharges, discontinuation of service) for violations of such restrictions.

(b) The wholesale public water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan.

(c) The wholesale public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as adoption or revision of the regional water plan.

Source Note: The provisions of this § 288.22 adopted to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384.

APPENDIX B

Letter to Customers

APPENDIX B
Example Letter to Wholesale Water Customers

Date

[Customer]
[Address]

Dear [Customer]:

The Lavaca-Navidad River Authority has prepared a draft Drought Contingency Plan which, when adopted by the Board of Directors of the Lavaca-Navidad River Authority, will be used by the Authority as a component of its Water Management Plan. As a wholesale water customer of the Authority, we are seeking your input and comments on the draft Drought Contingency Plan. I have enclosed a copy of the Plan for your review.

Public comments regarding the draft Drought Contingency Plan may be made at the Public Meeting to be held by the Lavaca-Navidad River Authority Board of Directors on April 20, 2005. Written comments on the draft Drought Contingency Plan will be accepted through close of business on Tuesday, April 19, 2005.

We appreciate your input and interest in the water resources in the Lavaca River Basin.

Sincerely,

Patrick Brzozowski
General Manager
Lavaca-Navidad River Authority

APPENDIX C

Letter to Regional Water Planning Groups

APPENDIX C
Example Letter to Regional Water Planning Groups
[Planning Groups P and N]

Date

[Chairman]
Chair, Region__ Water Planning Group
[Address]

Dear [Chairman]:

Enclosed please find a copy of the draft Drought Contingency Plan for the Lavaca-Navidad River Authority. I am submitting a copy of this plan to the Region __ Water Planning Group in accordance with the Texas Water Development Board and Texas Commission on Environmental Quality rules.

Please review the draft plan for consistency with the approved Regional Water Plan. Public comments regarding the draft Drought Contingency Plan may be made at the Public Meeting to be held by the Lavaca-Navidad River Authority Board of Directors on April 20, 2005. Written comments on the draft Drought Contingency Plan will be accepted through close of business on Tuesday, April 19, 2005.

Sincerely,

Patrick Brzozowski
General Manager
Lavaca-Navidad River Authority

APPENDIX D

Texas Water Code, Section 11.039

APPENDIX D

Texas Water Code Section 11.039

§ 11.039. Distribution of Water During Shortage

(a) If a shortage of water in a water supply not covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the water to be distributed shall be divided among all customers pro rata, according to the amount each may be entitled to, so that preference is given to no one and everyone suffers alike.

(b) If a shortage of water in a water supply covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the person, association of persons, or corporation owning or controlling the water shall divide the water to be distributed among all customers pro rata, according to:

(1) the amount of water to which each customer may be entitled; or

(2) the amount of water to which each customer may be entitled, less the amount of water the customer would have saved if the customer had operated its water system in compliance with the water conservation plan.

(c) Nothing in Subsection (a) or (b) precludes the person, association of persons, or corporation owning or controlling the water from supplying water to a person who has a prior vested right to the water under the laws of this state.

Amended by Acts 1977, 65th Leg., p. 2207, ch. 870, § 1, eff. Sept. 1, 1977.

Amended by Acts 2001, 77th Leg., ch. 1126, § 1, eff. June 15, 2001.

APPENDIX E

Board Resolution to Adopt the Drought Contingency Plan

Lavaca-Navidad River Authority
Resolution No. 2005-002
Board Resolution Adopting the Drought Contingency Plan

Resolution Adopting a Drought Contingency Plan for the Lavaca-Navidad River Authority, Authorizing Submittal of the Drought Contingency Plan to the Texas Commission on Environmental Quality and the Texas Water Development Board for Approval, and Authorizing Incorporation of Provisions into All Water Sales Contracts used by the Lavaca-Navidad River Authority

BE IT RESOLVED by the Board of Directors of the Lavaca-Navidad River Authority that a Drought Contingency Plan attached hereto as Exhibit A, prepared in conformance with the requirements of the Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB) is hereby adopted;

BE IT FURTHER RESOLVED by the Board of Directors of the Lavaca-Navidad River Authority that the General Manager is directed to submit the adopted Lavaca-Navidad River Authority Drought Contingency Plan to TCEQ and TWDB and for their approval; and

BE IT FURTHER RESOLVED by the Board of Directors of the Lavaca-Navidad River Authority that the General Manager, in accordance with state law, is directed to incorporate provisions into all water sales contracts used by the Lavaca-Navidad River Authority to require purchasers of water from the Lavaca-Navidad River Authority to implement water conservation and demand reduction measures in accordance with the adopted Lavaca-Navidad River Authority Drought Contingency Plan.

Passed and approved this 20th day of April, 2005.

Vee Strauss, President
Board of Directors
Lavaca-Navidad River Authority

ATTEST:

Willard Ulbricht, Secretary-Treasurer
Board of Directors
Lavaca-Navidad River Authority

CITY OF EDNA
DROUGHT CONTINGENCY PLAN

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions the City of Edna hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Edna by means of scheduling and providing public notice of a public meeting to accept input on the Plan.

Section III: Public Education

The City of Edna will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of public events, press releases or utility bill inserts.

Section IV: Coordination with Regional Water Planning Groups

The service area of the City of Edna is located within the LNRA Planning Group and the City has provided a copy of this Plan to the Lavaca Regional Water Planning Group.

Section V: Authorization

The City Manager or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The City Manager, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Edna. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entitles.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by the City of Edna.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street address, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;

(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable lake(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street address, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The City Manager or his/her designee shall monitor water supply and/or demand conditions on a daily basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on the amount of water the City is able to pump in a day.

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII – Definitions, when total daily water demand equals or exceeds 1.25 million gallons for three (3) consecutive days or 1.50 million gallons on a single day (e.g., based on the "safe" operating capacity of water supply facilities.)

Requirements for termination
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when total daily for three (3) consecutive days 1.50 MGD or 1.75 MGD on a single day.

Requirements for termination
Stage 2 of the Plan may be restricted when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when total daily for three (3) consecutive days 1.75 MGD or 2.00 MGD on a single day.

Requirements for termination
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when total daily for three (3) consecutive days 2.00 MGD for 2.25 MGD on a single day.

Requirements for termination
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers -- EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the City Manager or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

2. Nature or man-made contamination of the water supply source(s).

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days.

Stage 6 Triggers -- WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when total daily water demand equals or exceeds 90% of water system production capability for three (3) consecutive days.

Requirements for termination
Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days.

Section IX: Drought Response Stages

The City Manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

Notification of the Public
The City Manager or his/her designee shall notify the public by means of publication in a newspaper of general circulation, and cable TV

Additional Notification
The City Manager or his/her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / and members of the City Council
Fire Chief
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TNRCC (required when mandatory restrictions are imposed)
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers
Emergency Medical Director

Stage 1 Response – MILD Water Shortage Conditions

Goal: Achieve a voluntary five- (5) percent reduction in daily water demand (e.g., total water use, daily water demand, etc.).

Supply Management Measures:

(a) Reduced or disconnected flushing of water mains.
(b) No Bulk Water Sales

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6, or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7, or 9), and to irrigate landscapes between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the City of Edna shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response --MODERATE Water Shortage Conditions

Goal: Achieve a ten (10%) percent reduction in daily water demand (e.g., total water use, daily water demand, etc.).

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.
(c) No Bulk Water Sales.

Water Use Restrictions. Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6, or 8), and Saturdays and Wednesdays for water customers with a street address sending in an odd number (1, 3, 5, 7, or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under a special permit for the City of Edna.

(f) Use of water for the irrigation of golf courses greens, tees, and fairways is prohibited except on designated watering days between the hour's 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the City of Edna, the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and

5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response -- SEVERE Water Shortage Conditions

Goal: Achieve a fifteen (15%) percent reduction in daily water demand.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.
(c) No Bulk Water Sales.

Water Use Restrictions. All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the City of Edna.

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response -- CRITICAL Water Shortage Conditions

Goal: Achieve a twenty (20%) percent reduction in daily water demand.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.
(c) No Bulk Water Sales.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or

permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response -- EMERGENCY Water Shortage Conditions

Goal: Achieve a twenty-five (25%) percent reduction in daily water demand.

Supply Management Measures:

(a) Reduced or disconnected flushing of water mains.
(b) Reduced or disconnected irrigation of public landscaped areas.
(c) No Bulk Water Sales.

Water Use Restrictions. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.
(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle is absolutely prohibited.

Stage 6 Response -- WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare, the City Manager is hereby authorized to allocate water according to the following allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the City of Edna if a greater number of persons per household on a form prescribed by the City Manager shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of Edna offices to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the City Manager. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of Edna on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the City of Edna in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the City Manager shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the City of Edna of a reduction in the number of persons in a household shall be fined not less than five hundred dollars $500.00.

Residential water customers shall pay the following surcharges:

$10.00 for the first 1,000 gallons over allocation.
$20.00 for the second 1,000 gallons over allocation.
$30.00 for the third 1,000 gallons over allocation.
$40.00 for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the City of Edna of a greater number on a form prescribed by the City Manager. The City Manager shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of Edna offices to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the City Manager. If the number of dwelling units served by a master meter is reduced, the customer shall notify the City of Edna in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, served by a master meter or fails to timely notify the City of Edna of a reduction in the number of person in a household shall be fined not less than five hundred dollars ($500.00). Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$10.00, for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$20.00, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$30.00, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$40.00 , thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water allocation shall be established by the City of Edna or his/her designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately seventy-five (75%) percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, seventy-five (75%) percent of whose monthly usage is less than 6,000 gallons, shall be allocated 5,000 gallons. The City Manager shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of Edna to determine the allocation. Upon request of the customer or at the initiative of the City Manager, the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal

water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the City Council. Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is 6,000 gallons through 10,000 gallons per month:

$10.00 per thousand gallons for the first 1,000 gallons over allocation.
$20.00 per thousand gallons for the second 1,000 gallons over allocation.
$30.00 per thousand gallons for the third 1,000 gallons over allocation.
$40.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 10,000 gallons per month or more:

Two (2) times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
Three (3) times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
Four (4) times the block rate for each 1,000 gallons from 10 percent through 15 percent above all allocation.
Five (5) times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water allocation shall be established by the City Manager, or his/her designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately ninety (90%) percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's water usage baseline. The industrial customer's water use baseline will be computed on the average water use for the twelve (12) month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than twelve (12) months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The City Manager shall give his/her best effort to see that the notice of each industrial customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of Edna to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the City Manager the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the

customer's normal water use because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer had added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the City Council. Industrial customers shall pay the following surcharges:

Customers whose allocation is 10,000 gallons through 10,000 gallons per month:

$10.00 per thousand gallons for the first 1,000 gallons over allocation.
$20.00 per thousand gallons for the second 1,000 gallons over allocation.
$30.00 per thousand gallons for the third 1,000 gallons over allocation.
$40.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 100,000 gallons per month or more:

Two (2)	times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
Three (3)	times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
Four (4)	times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
Five (5)	times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Edna for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the City Manager, or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of no less than one hundred dollars (***$100.00***) and not more than one thousand dollars ($1000.00). Each day

that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the City Manager shall, upon due notice to the customer, be authorized to discontinue under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at twenty dollars $20.00, and any other costs incurred by the City of Edna in discontinuing service. In addition, suitable assurance must be given to the City Manager that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the City of Edna in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttal presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the City of Edna, police officer, or other City employee designated by the City Manager, may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the Municipal Court on the date shown on the citation for which the date shall not be less than three (3) days nor more than five (5) days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over fourteen (14) years of age who is member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in Municipal Court to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in Municipal Court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in Municipal Court before all other cases.

Section XI: Variances

The City Manager, or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the City of Edna within five (5) days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the City Manager, or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of Edna shall be subject to the following conditions, unless waived of modified by the City Manager or his/her designee:

(a) Variances granted shall include for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

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ORDINANCE NO. 2000 - 18

DROUGHT CONTINGENCY PLAN

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF EL CAMPO, TEXAS AMENDING CHAPTER 11 UTILITIES AND SOLID WASTE, SECTION 10 WATER RATIONING BY DELETING SAID CURRENT SECTION 10 AND ESTABLISHING A NEW SECTION 10 ENTITLED DROUGHT CONTINGENCY PLAN, ADOPTING VARIOUS PROVISION OF THE DROUGHT CONTINGENCY PLAN ITSELF, ESTABLISHING CRITERIA FOR INITIATION AND TERMINATION OF DROUGHT RESPONSE STAGES, ESTABLISHING ENFORCEMENT PROVISIONS, ALLOWING FOR VARIANCES, AND DECLARING AN EFFECTIVE DATE.

WHEREAS, the City of El Campo, Texas is interested in protecting its water supply in times of drought and emergency conditions; and,

WHEREAS, the Texas Natural Resources Conservation Commission requires the development of a comprehensive drought contingency plan; and

WHEREAS, the City of El Campo has conducted a public hearing to receive citizen input into the provisions of the proposed drought contingency plan;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF EL CAMPO

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of El Campo hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply conditions are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section IX of this plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of El Campo by means of public meetings at which time input from citizens was received. Notice of public meetings were announced on the radio, printed in the newspaper and presented on the local schedule of events on cable TV.

The City of El Campo will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of public events, press releases or utility bill inserts.

Section III: Coordination with Regional Water Planning Groups

The service area of the city of El Campo is located within the Lavaca Regional Planning Group. The City has provided a copy of this plan to the Lavaca Regional Planning Group and TNRCC.

Section IV: Authorization

The City Manager, or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The City Manager, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section V: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of El Campo. The term "customer" as used in the Plan includes individuals, corporations, partnerships, associations, private utility districts and all other legal entities.

Section VI: Definitions

For the purpose of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels, motels, restaurants, office buildings and other similar uses.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by the City of El Campo.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even-numbered address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalk, walkway, driveway, parking lot, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill or add to any indoor or outdoor swimming pool or jacuzzi-type pool;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd-numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VII: Criteria for Initiation and Termination of Drought Response Stages

The City Manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on the amount of water the City is able to pump in a day.

Stage 1 Triggers – MILD Water Shortage Conditions

Requirements for initiation
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VI – Definitions, when total daily water demand equals or exceeds 3.75 million gallons for three (3) consecutive days or 4 million gallons on a single day.

Requirements for termination
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days.

Stage 2 Triggers – MODERATE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section VIII of this Plan when total daily water demand equals or exceeds 4 MGD for three (3) consecutive days or 4.5 million gallons on a single day.

Requirements for termination
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers – SEVERE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section VIII of this Plan when total daily water demand equals or exceeds 4.5 MGD for three (3) consecutive days or 5.0 million gallons on a single day.

Requirements for termination
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers – CRITICAL Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section VIII of this Plan when total daily water demand equals or exceeds 5.0 MGD for three (3) consecutive days or 5.5 million gallons on a single day.

Requirements for termination
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers – EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions provided in Section VIII of this Plan when the City Manager, or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or
2. Natural or man-made contamination of the water supply source(s).

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days. Upon termination of Stage 5, Stage 4 becomes operative.

Stage 6 Triggers – WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section VIII of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when total daily water demand equals or exceeds 90% of water system production capability, or 7 MGD for three (3) consecutive days.

Requirements for termination
Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three (3) consecutive days.

Section VIII: Drought Response Stages

The City Manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

Notification of the Public:
The City Manager, or his/her designee, shall notify the public by means of publication in a newspaper of general circulation, radio announcements and cable T.V.

Additional Notification:
The City Manager, or his/her designee, shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / and members of the City Council
Fire Chief
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TNRCC (required when mandatory restrictions are imposed)
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers
Emergency Medical Director

Stage 1 Response – MILD Water Shortage Conditions

Goal: Achieve a voluntary five (5) percent reduction in daily water pumpage.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the City of El Campo shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response – MODERATE Water Shortage Conditions

Goal: Achieve a ten (10%) percent reduction in daily water pumpage.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.

Water Use Restrictions: Under threat of penalty for violation, the following water use restrictions shall apply to all persons.

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customer with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or hand-held hose equipped with a positive shutoff nozzle for quick

rinses. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and Welfare of the public is contingent upon frequent cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that the use of water from designated fire hydrants for construction purposes may be allowed under special permit from the City of El Campo.

(f) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalk, walkway, driveway, parking lot, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response – SEVERE Water Shortage Conditions

Goal: Achieve a fifteen (15%) percent reduction in daily water pumpage.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.

Water Use Restrictions: All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response – CRITICAL Water Shortage Conditions

Goal: Achieve a twenty (20%) percent reduction in daily water pumpage.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.

Water Use Restrictions: All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems is prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle not occurring on the premises of a commercial car wash or commercial service station and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes or commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10:00 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.
(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains or water service facilities of any kind shall be approved. Time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response – EMERGENCY Water Shortage Conditions

Goal: Achieve a twenty-five (25%) percent reduction in daily water pumpage.

Supply Management Measures:

(a) Reduced or discontinued flushing of water mains.
(b) Reduced or discontinued irrigation of public landscaped areas.

Water Use Restrictions: All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Stage 6 Response – Water Allocation

In the event that water shortage conditions threaten public health, safety, and welfare, the City Manager is hereby authorized to allocate water according to the following water allocation plan.

Single – Family residential customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a

particular customer's household is comprised of two (2) persons unless the customer notifies the City of El Campo of a greater number of persons per household on a form prescribed by the City Manager. The City Manager shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of El Campo offices, 315 E. Jackson Street, to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the City Manager. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of El Campo on such form and the change will be implemented in the next practical billing period. If the number of persons in a household is reduced, the customer shall notify the City of El Campo in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the City Manager shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household, or, fails to timely notify the City of El Campo of a reduction in the number of persons in a household, shall be fined not less than five hundred dollars $500.00.

Residential water customers shall pay the following surcharges:

$10.00 for the first 1,000 gallons over allocation.
$20.00 for the second 1,000 gallons over allocation.
$30.00 for the third 1,000 gallons over allocation.
$40.00 for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter, which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be 6,000 gallons per month for each dwelling unit. It shall be the customer's responsibility to provide the City of El Campo with the total number of residential units per water meter. It shall be assumed that each individual residential dwelling unit is comprised of two (2) persons per household unless the customer notifies the City of El Campo of a greater number on a form prescribed by the City Manager. The City Manager shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of El Campo offices, 315 E. Jackson Street, to complete and sign the form claiming more than two (2) persons per household per unit. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the City Manager. If the number of dwelling units served by a master meter is reduced, the customer shall notify the City of El Campo in writing within (2) days. In prescribing the method for claiming more than two (2)

persons per household per unit, the City Manager shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units and persons per household per unit served by a master meter or fails to timely notify the City of El Campo of a reduction in the number of persons in a household shall be fined not less than five hundred dollars $500.00. Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$10.00 - for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$20.00 - thereafter for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$30.00 - thereafter for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$40.00 - thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial customers

A monthly water allocation shall be established by the City Manager or his/her designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately seventy-five (75%) percent of the customer's usage for the previous corresponding 12 month billing period. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided that if the (75%) of the monthly usage is less than 6,000 gallons, the customer shall be allocated 5,000 gallons. The City Manager shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however a customer does not receive such notice, it shall be the customer's responsibility to contact the City of El Campo to determine the allocation. Upon request of the customer or the initiative of the City Manager, the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customers normal water usage. (2) One nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the City Council. Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is 6,000 gallons through 10,000 gallons per month:

$10.00 per thousand gallons for the first 1,000 gallons over allocation.
$20.00 per thousand gallons for the second 1,000 gallons over allocation.
$30.00 per thousand gallons for the third 1,000 gallons over allocations.
$40.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 10,000 gallons per month or more:

Two (2) times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.

Three (3) times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation

Four (4) times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.

Five (5) times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharge shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water allocation shall be established by the City Manager, or his/her designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately ninety (90%) percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's allocation shall be further reduced to eighty-five (85%) percent of the customer's water usage baseline. The industrial customer's water use baseline will be computed on the average water use for the (12) month period ending prior to the date of implementation of Stage 2 of the plan. If the industrial water customer's billing history is shorter than twelve (12) months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The City Manager shall give his/her best effort to see that notice of each industrial customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of El Campo to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the City Manager the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the customer's normal water use because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may

appeal an allocation established hereunder to the City Council. Industrial customers shall pay the following surcharges:

Customers whose allocation is 10,000 gallons through 100,000 per month:

$10.00 per thousand gallons for the first 1,000 gallons over allocation.
$20.00 per thousand gallons for the second 1,000 gallons over allocation.
$30.00 per thousand gallons for the third 1,000 gallons over allocation.
$40.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 100,000 gallons or more per month:

Two (2) times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.

Three (3) times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.

Four (4) times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.

Five (5) times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharge shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section IX: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of El Campo for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by City Manager, or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than one hundred dollars ($100.00) and not more than one thousand dollars ($1000.00). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the City Manager shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby

established at twenty dollars ($20.00), and any other costs incurred by the City of El Campo in discontinuing service. In addition, suitable assurance must be given to the City Manager that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the City of El Campo in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the City of El Campo, may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the Municipal Court on the date shown on the citation for which the date shall not be less than three (3) days nor more than five (5) days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over fourteen (14) years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in Municipal court to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in Municipal Court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in Municipal Court before all other cases.

Section X: Variances

The City Manager, or his/her designee, may, in writing, grant a temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance, and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the City of El Campo within five (5) days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the City Manager, or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if the petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of El Campo shall be subject to the following conditions, unless waived or modified by the City Manager or his/her designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

PASSED, APPROVED AND ADOPTED this 12th day of December, 2000

CITY OF EL CAMPO, TEXAS

KENNETH G. MARTIN, Mayor

ATTEST:

DIANE KALUZA, City Secretary

ORDINANCE NO. 2001- 09

WHOLESALE WATER SUPPLIER DROUGHT CONTINGENCY PLAN

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF EL CAMPO, TEXAS, BEING AN ADDENDUM TO ORDINANCE NO. 2000-18, DROUGHT CONTINGENCY PLAN, ADOPTED DECEMBER 12, 2000, ESTABLISHING PROVISIONS AND ENFORCEMENT ACTION RELATED TO THE CITY OF EL CAMPO BEING A WHOLESALE WATER SUPPLIER AND THE ISAACSON MUNICIPAL UTILITY DISTRICT BEING A WHOLESALE WATER CUSTOMER, ADOPTING THE VARIOUS PROVISIONS OF THE WHOLESALE WATER PLAN, PROVIDING FOR A REPEALING CLAUSE AND DECLARING AN EFFECTIVE DATE.

WHEREAS, the City of El Campo, Texas, did by City Council action adopt Ordinance No. 2000-18, Drought Contingency Plan, on the 12th day of December, 2000; and

WHEREAS, the City of El Campo, Texas, by definition is a Wholesale Water Supplier; and

WHEREAS, the City of El Campo, Texas, is the sole provider of water to the Isaacson Municipal Utility District, being the wholesale water customer; and

WHEREAS, it is necessary to pass an accompanying ordinance in conjunction with Ordinance No. 2000-18, to provide specific provisions and language for the Isaacson Municipal Utility District;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF EL CAMPO.

SECTION I. Provisions Exclusively For the Isaacson Municipal Utility District

To assure the Isaacson Municipal Utility District customers that equal treatment will be afforded them in the event of a drought situation the following steps have been taken:

a. Notification in the form of 10 hand delivered copies of the Drought Contingency Plan have been delivered to the General Manager's office.

b. In the event of a drought situation or condition the Isaacson Municipal Utility District customers would be handled in the same manner as any other individual utility customer on the City of El Campo's system as outlined in the Drought Contingency Plan.

c. In the event of a drought situation or condition, or a supply shortage, the provisions of the Texas Water Code, §11.039 shall be implemented.

d. The provisions of the Drought Contingency Plan and the Wholesale Water Supplier Drought Contingency Plan shall be inclusive in all future contracts between the City of El Campo and the Isaacson Municipal Utility District and shall include the provisions of the Texas Water Code, §11.039.

e. All variances related to the Isaacson Municipal Utility District customers shall be afforded the same opportunity as all other individual customers within the City of El Campo's water system.

f. Enforcement of the plan shall be done in accordance with the existing water contract plan between the City of El Campo and the Isaacson Municipal Utility District and the previously adopted provisions of the Drought Contingency Plan.

SECTION II. That all ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

SECTION III. This ordinance shall be effective from and after the date of passage.

PASSED, APPROVED AND ADOPTED this 8th day of May, 2001.

CITY OF EL CAMPO, TEXAS

KENNETH G. MARTIN, Mayor

ATTEST:

DIANE KALUZA, City Secretary

WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN FOR THE CITY OF GANADO

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of Ganado hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency and Water Conservation Plan are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Ganado by means of City Council meetings.

Section III: Public Education

The City of Ganado will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of newsletters and/or fliers.

Section IV: Coordination with Regional Water Planning Groups

The service area of the City of Ganado is located within the Lavaca water planning area and the City of Ganado has provided a copy of this Plan to the Lavaca Water Planning Group.

Section V: Authorization

The Director of Public Works or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The Director of Public Works or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Ganado. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by the City of Ganado.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The Director of Public Works or his/her designee shall monitor water supply and/or demand conditions on a bi-weekly basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on weather conditions, water levels, and system storage capacity.

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation

Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII – Definitions, when any one (1) or more triggering criteria's exist:

Criteria 1: ***Annually, beginning on May 1 through September 30.***

Criteria 2: ***When the water supply available to the City of Ganado is equal to or less than ninety (90)***

Criteria 3: ***When, the pumping level in the City of Ganado's wells is equal to or less than three hundred and seventy (370) feet in well # 4 or one hundred and eighty (180) feet in well #5.***

Criteria 4: ***When total water demand equals or exceeds two hundred and fifty thousand (250,000) gallons for three (3) consecutive days or five hundred thousand (500,000) gallons on a single day.***

Requirements for termination

Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for stage 2 of this Plan when any one (1) or more of the following exist:

Criteria 1: **Annually, beginning on May 1 through September 30.**

Criteria 2: When the water supply available to the City of Ganado is equal to or less than eighty (80) percent of storage.

Criteria 3: When the pumping level in the City of Ganado's wells is equal to or less than three hundred and seventy (370) feet in well #4 or one hundred and eighty (180) feet in well #5.

Criteria 4: When total water demand equals or exceeds two hundred and fifty thousand (250,000) gallons for three (3) consecutive days or five hundred thousand (500,000) gallons on a single day.

Requirements for termination

Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when one (1) or more of the following exist:

Criteria 1: When the water supply available to the City of Ganado is equal to or less than seventy (70) percent of storage.

Criteria 2: When the pumping level in the City of Ganado's wells is equal to or less less than three hundred and seventy (370) feet in well #4 or one hundred eighty (180) feet in well #5.

Criteria 3: When total daily water demand equals or exceeds two hundred and fifty thousand (250,000) gallons for three (3) consecutive days or five hundred thousand (5000,000) gallons on a single day.

Requirements for termination

Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when any one (1) or more of the following exist:

Criteria 1: When the water supply available to the City of Ganado is equal to or less than sixty (60) percent of storage.

Criteria 2: When the pumping level in the City of Ganado's wells is equal to or less than three hundred and seventy (370) feet in well #4 or one hundred and eighty (180) feet in well #5.

Criteria 3: When total water demand equals or exceeds two hundred and fifty thousand (250,000) gallons for three (3) consecutive days or five hundred thousand (5000,000) gallons on a single day.

Requirements for termination

Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers -- EMERGENCY Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the Director of Public Works or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination

Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days.

Stage 6 Triggers -- WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when any one (1) or more of the following exist:

Requirements for termination – Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of five (5) consecutive days.

Section IX: Drought Response Stages

The Director of Public Works or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

Notification of the Public:
The Director of Public Works or his/ here designee shall notify the public by means of any *one (1) or more of the following:*

publication in a newspaper of general circulation,
direct mail to each customer,
signs posted in public places.

Additional Notification:
The Director of Public Works or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TNRCC (required when* mandatory *restrictions are imposed)
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers

Stage 1 Response -- MILD Water Shortage Conditions

Goal: Achieve a voluntary ten (10) percent reduction in total water use.

Supply Management Measures:

***The City of Ganado will closely monitor the distribution system for leaks, reduce or* discontinue flushing of water mains, and discontinue the sale of bulk water.**

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m to midnight on designated watering days.

(b) All operations of the City of Ganado shall adhere to water use restrictions prescribed for Stage 1 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response -- MODERATE Water Shortage Conditions

Goal: Achieve a fifteen (15) percent reduction in total water use.

Supply Management Measures:

The City of Ganado will closely monitor the distribution system for leaks, reduce or discontinue flushing of water mains, and discontinue the sale of bulk water.

Water Use Restrictions. **Under threat of penalty for violation, the following water use restrictions shall apply to all persons:**

(a) **Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.**

(b) **Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.**

(c) **Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.**

(d) **Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.**

(e) **Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the City of Ganado.**

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the City of Ganado, the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response -- SEVERE Water Shortage Conditions

Goal: Achieve a twenty (20) percent reduction in total water use.

Supply Management Measures:

The City of Ganado will closely monitor the distribution system for leaks, reduce or discontinue flushing water mains and discontinue the sale of bulk water.

Water Use Restrictions. All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the City of Ganado.

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response -- CRITICAL Water Shortage Conditions

Goal: Achieve a twenty-five (25) percent reduction in total water use.

Supply Management Measures:

The City of Ganado will closely monitor the distribution system for leaks, reduce or discontinue flushing water mains and discontinue the sale of bulk water.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response -- EMERGENCY Water Shortage Conditions

Goal: Achieve a thirty (30) percent reduction in total water use.

Supply Management Measures:

The City of Ganado will closely monitor the distribution system for leaks, reduce or discontinue flushing water mains and discontinue the sale of bulk water.

Water Use Restrictions. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Stage 6 Response -- WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare, the Director of Public Works is hereby authorized to allocate water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the City of Ganado of a greater number of persons per household on a form prescribed by the Director of Public Works. The Director of Public Works shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the Ganado City Hall to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the Director of Public Works. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of Ganado on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the City of Ganado in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the Director of Public Works shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the City of Ganado of a reduction in the number of person in a household shall be fined not less than two hundred dollars (200.00).

Residential water customers shall pay the following surcharges:

$10.00 for the first 1,000 gallons over allocation.
$15.00 for the second 1,000 gallons over allocation.
$20.00 for the third 1,000 gallons over allocation.
$25.00 for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the City of Ganado of a greater number on a form prescribed by the Director of Public Works. The Director of Public Works shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of Ganado to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the Director of Public Works. If the number of dwelling units served by a master meter is reduced, the customer shall notify the City of Ganado in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the Director of Public Works shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the City of Ganado of a reduction in the number of person in a household shall be fined not less than two hundred dollars (200.00). Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$10.00, for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$15.00, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$20.00, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$25.00, thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water allocation shall be established by the Director of Public Works or his/her designee, for each nonresidential commercial customer other than an industrial customer

who uses water for processing purposes. The non-residential customer's allocation shall be approximately seventy-five (75) percent of the
billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the City of Ganado will determine a fair and reasonable allocation. The Director of Public Works shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of Ganado to determine the allocation. Upon request of the customer or at the initiative of the Director of Public Works, the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the Director of Public Works or the Ganado City Council. Nonresidential commercial customers shall pay the following surcharges:

$10.00 per thousand gallons for the first 1,000 gallons over allocation.
$15.00 per thousand gallons for the second 1,000 gallons over allocation.
$20.00 per thousand gallons for the third 1,000 gallons over allocation.
$25.00 per thousand gallons for each additional 1,000 gallons over allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Ganado for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by Director of Public Works or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than twenty-five dollars ($25.00) and not more than five hundred dollars ($500.00). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the Director of Public Works shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at two hundred and forty-five dollars ($245.00) and any other costs incurred by the City of Ganado in discontinuing service. In addition, suitable assurance must be given to the Director of Public Works that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the City of Ganado, in apparent con
to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the City of Ganado, police officer, or other city employee designated by the Director of Public Works or Ganado City Council, may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the municipal court on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in the municipal court to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in the municipal court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in the municipal court before all other cases.

Section XI: Variances

The Director of Public Works or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the City of Ganado within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the Director of Public Works and/or the Ganado City Council, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of Ganado shall be subject to the following conditions, unless waived or modified by the Director of Public Works and/or the Ganado City Council:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

EDUCATION AND INFORMATION

The most readily available and lowest cost method of promoting water conservation is to inform water users about ways to save water inside homes and other buildings, in landscaping and lawn uses, and recreational uses. Average residential in-home water use data indicate that about 40 percent is used for toilet flushing, 35 percent for bathing, 11 percent for kitchen uses, and 14 percent for clothes washing. Water saving methods that can be practiced by the individual water user are listed below.

IN THE BATHROOM

- Take a shower instead of filling the tub and taking a bath. Showers usually use less water than tub baths.
- Install a low-flow shower head which restricts the quantity of flow to no more than 3.0 gallons per minute.
- Reduce the level of water being used in a bath tub by one or two inches if a shower is not available.
- Turn water off when brushing teeth until it is time to rinse.
- Hold hot water in the basin when shaving instead of letting the faucet continue to run.
- Test toilets for leaks. To test for a leak, a few drops of food coloring can be added to the water in the tank. The toilet should not be flushed. The customer can then watch to see if the coloring appears in the bowl within a few minutes. If it does, the fixture needs adjustment or repair.
- Use a toilet displacement device. A one-gallon plastic milk bottle can be filled with stones or with water, recapped, and placed in the toilet tank. This will reduce the amount of water in the tank, but still provide enough for flushing.

IN THE KITCHEN

- Use a pan of water (or place a stopper in the sink) for rinsing pots and pans and cooking implements when cooking rather than turning on the water faucet each time a rinse is needed.
- Never run the dishwasher without a full load. In addition to saving water, expensive detergent will last longer and a significant energy saving will appear on the utility bill.

- Keep a container of drinking water in the refrigerator. Running water from the tap until it is cool is wasteful.

- Use a pan of water for rinsing when hand washing dishes rather than running the faucet.

- Always keep water conservation in mind, and think of other ways to save in the kitchen.

IN THE LAUNDRY ROOM

- Wash only a full load when using an automatic washing machine (32 to 59 gallons are required per load).

- Use the lowest water level setting on the washing machine for light loads whenever possible.

- Use cold water as often as possible to save energy and to conserve the hot water for uses which cold water cannot serve. This is also better for clothing made of today's synthetic fabrics.

FOR APPLIANCES AND PLUMBING

- Check water requirements of various models and brands when considering purchasing any new appliances that use water. Some use less water than others.

- Check all water line connections and faucets for leaks. If the cost of water is $1.00 per 1,000 gallons, one could be paying a large bill for water that simply goes down the drain because of leakage. A slow drip can waste as much as 170 gallons of water EACH DAY, or 5,000 gallons per month, and add as much as $5.00 to the water bill.

- Learn to replace faucet washers so that drips can be corrected promptly. It is easy to do, cost very little, and can represent a substantial amount saved in plumbing and water bills.

- Insulate all hot water pipes to avoid delays (and wasted water) experienced while waiting for the water to "run hot".

- Check for water leakage that the customer may be unaware of, such as a leak between the water meter and the house. To check, all indoor and outdoor faucets should be turned off, and the water meter should be checked. If it continues to run or turn, a leak probably exist and needs to be located.

- Be sure the hot water heater thermostat is not set too high. Extremely hot settings waste water and energy because the water often has to be cooled with cold water before it can be used.

- Use a moisture meter to determine when house plants need water. More plants die from over-watering than from being on the dry side.

OUTDOOR USE

- Water lawns early in the morning during the hotter summer months. Much of the water used on the lawn can simply evaporate between the sprinkler and the grass.

- Turn soaker hoses so the holes are on the bottom to avoid evaporation.

- Water slowly for better absorption, and never water on a windy day.

- Learn to know when grass needs watering. If it has turned a dull grey-green, or if footprints remain visible, it is time to water.

- Use a sprinkler that produces large drops of water, rather than a fine mist, to avoid evaporation.

- Operate automatic sprinkler system only when the demand on the town's water supply is lowest. Set the system to operate between four and six a.m..

- Use a bucket of soapy water and use the hose only for rinsing when washing the car.

- Use a watering can or hand water with the hose in small areas of the lawn that need more frequent watering (those near walks or driveways or in especially hot, sunny spots.

The water conservation plan will need to contain ways to communicate water saving practices, such as those listed above, to the public. Among the methods for public education about water conservation are television, radio, and newspaper announcements and advertisements; posters and public displays; contest and schoól programs; bill stuffers, flyers and news letters.

WATER CONSERVATION

INDOOR CONSERVATION

Install low-flow showerheads and low-volume toilets.
Turn the water off when brushing your and washing your hands.
Only run the dishwasher and washing machine with full loads.
Use a pan of water for washing and rinsing dishes.
Check all water-line connections and faucets for leaks.

OUTDOOR CONSERVATION

Water your lawn thoroughly, but only as needed - monthly for trees, and ground cover, every five days or so for lawns.
Water early in the morning and use drip irrigation where possible.
Set sprinkler heads to spray large droplets, not a fine mist.
Avoid wasting water on paved areas and from running off your yard.
When you wash your car, use a bucket of soapy water and a cutoff nozzle on your hose.
Don't mow grasses before they reach their proper length : St. Augustine at 3 inches, Bermuda at 1 inch, Zoysia and Centiped at 2 inches.
Add mulch to all beds and around trees to prevent erosion, suppress weeds, and retain soil moisture.
Wed your beds and yard so plants get all the water.
Use native plants that need less water and fertilizer.
Plant new landscaping in the fall so it's better established before the summer heat.

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ORDINANCE NO. 497-00

AN ORDINANCE OF THE CITY OF HALLETTSVILLE, TEXAS, ADOPTING A DROUGHT CONTINGENCY PLAN; ESTABLISHING CRITERIA FOR THE INITIATION AND TERMINIATION OF DROUGHT RESPONSE STAGES; ESTABLISHING RESTRICTIONS ON CERTAIN WATER USES; ESTABLISHING PENALTIES FOR THE VIOLATION OF AND PROVISIONS FOR ENFORCEMENT OF THESE RESTRICTIONS; ESTABLISHING PROCEDURES FOR GRANTING VARIANCES; AND PROVIDING SEVERABILITY AND AN EFFECTIVE DATE.

WHEREAS, the City of Hallettsville, Texas recognizes that the amount of water available to the City and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the City recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Natural Resource Conservation Commission require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the citizens of Hallettsville, Texas, the City Council deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT ORDAINED BY THE CITY OF HALLETTSVILLE, TEXAS:

SECTION 1.

That the City of Hallettsville, Texas Drought Contingency Plan attached hereto as Exhibit A and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the City.

SECTION 2.

That all ordinances that are in conflict with the provisions of this ordinance be, and the same are hereby, repealed and all other ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3.

Should any paragraph, sentence, subdivision, clause, phrase, or section of this ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this ordinance as a whole or any part or provision thereof, other than the part so declared to be invalid, illegal or unconstitutional.

SECTION 4.

This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law in such cases provides.

DULY PASSED BY THE CITY OF HALLETTSVILLE, TEXAS, on the 7th day of August, 2000

APPROVED:

Warren Grindeland, Mayor

ATTESTED TO:

Tom Donnelly, City Secretary

APPROVED AS TO FORM:

James Evans, City Attorney

Exhibit A

DROUGHT CONTINGENCY PLAN FOR THE CITY OF HALLETTSVILLE AUGUST 7, 2000

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of Hallettsville hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Hallettsville by means of scheduling and providing public notice of a public meeting to accept input on the Plan.

Section III: Public Education

The City of Hallettsville will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by one or more of the following: newspaper and radio or utility bill inserts.

Section IV: Coordination with Regional Water Planning Groups

The service area of the City of Hallettsville is located within Region P water planning area and the City of Hallettsville has provided a copy of this Plan to the Region P water planning area.

Section V: Authorization

The Mayor, or designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The Mayor, or designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided

by the City of Hallettsville. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by City of Hallettsville.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Garbage Days: Days residential solid waste is picked up in immediate area. (East of Hwy 77 and North of Hwy 90A on Tuesday and Friday; all other parts of City on Monday and Thursday)

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to

support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Section VIII: Triggering Criteria for Initiation and Termination of Drought Response Stages

The Mayor, or designee, shall monitor water supply and/or demand conditions on a weekly basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Public notification of the initiation or termination of drought response stages shall be by means of publication in a newspaper of general circulation, or direct mail to each customer, or signs posted in public places.

The triggering criteria described below are based on lowered water level tables.

(a) Stage 1 - Mild Water Shortage Conditions

Requirements for initiation - Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII when the pumpage of the City of Hallettsville wells is equal to or greater than 1.1 mgal per day for 3 consecutive days.

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 2 consecutive days.

(b) Stage 2 - Moderate Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section VII of this Plan when the pumpage of the City of Hallettsville wells is equal to or greater than 1.25 mgal per day for 3 consecutive days.

Requirements for termination - Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 2 consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

(c) Stage 3 - Severe Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when the pumpage of the City of Hallettsville wells is equal to or greater than 1.5 mgal per day for 3 consecutive days.

Requirements for termination - Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 2 consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

(d) Stage 4 - Critical Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and

restrictions on certain non-essential water uses for Stage 4 of this Plan when the pumpage of the City of Hallettsville wells is equal to or greater than 1.75 mgal per day for 3 consecutive days.

Requirements for termination - Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

(e) Stage 5 - Emergency Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the Mayor, or designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination – Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 1 day and normal storage levels are restored.

(f) Water Allocating

Requirements for initiation - Customers shall be required to comply with the water allocation plan prescribed in Section X of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when a prolonged electricity outage, source contamination, or system capacity limitations.

Requirements for termination - Water allocating may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 1 day and normal storage levels are restored.

Section IX: Drought Response Stages

The Mayor, or designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of the Plan, shall determine that a mild, moderate, severe, critical, or emergency condition exists and shall implement the following actions upon publication of notice in a newspaper of general circulation:

Stage 1 - Mild Water Shortage Condition

Goal: Achieve a voluntary 10% percent reduction in total water use.

Supply Management Measures:

The City of Hallettsville will reduce water demand by reducing flushing of water mains.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to garbage days and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the City of Hallettsville shall adhere to water use restrictions prescribed for Stage 1 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 - Moderate Water Shortage Conditions

Goal: Achieve a 20% percent reduction in total water use.

Supply Management Measures:

The City of Hallettsville will reduce water demand by reducing flushing of water mains.

Water Use Restrictions. Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to garbage days, and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other

activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the City of Hallettsville.

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the City of Hallettsville, the facility shall not be subject to these regulations.

(g) The following uses of water are defined as non-essential and are prohibited:
1.) wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2.) use of water to wash down buildings or structures for purposes other than immediate fire protection.
3.) use of water for dust control, except for street construction and compaction;
4.) flushing gutters or permitting water to run or accumulate in any gutter or street; and
5.) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 - Severe Water Shortage Conditions

Goal: Achieve a 30% percent reduction in total water use.

Supply Management Measures:

The City of Hallettsville will reduce water demand by discontinuing flushing of water mains and use non-potable well for non-potable purposes.

3.) Water Use Restrictions. All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the City of Hallettsville Municipal water system.

(c) The use of water for direct resale will be discontinued.

(d) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

(e) All restaurants are prohibited from serving water to its patrons except when requested.

Stage 4 - Critical Water Shortage Conditions

Goal: Achieve a 40% percent reduction in total water use.

Supply Management Measures:

The City of Hallettsville will reduce water demand by discontinuing flushing of water mains and use non-potable well for non-potable purposes.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The uses of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No applications for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be allowed or approved.

Stage 5 - Emergency Water Shortage Conditions

Goal: Achieve a 50% percent reduction in total water use.

Supply Management Measures:

The City of Hallettsville will reduce water demand by discontinuing flushing of water mains and use non-potable well for non-potable purposes.

Water Use Restrictions. All requirements of Stage 2, 3, and 4 shall remain in effect during

Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Section X: Water Allocation

In the event that water shortage conditions threaten public health, safety, and welfare, the Mayor is hereby authorized to distribute water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the City of Hallettsville of a greater number of persons per household on a form prescribed by the Mayor.

The Mayor shall make every effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of Hallettsville offices to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the Mayor. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of Hallettsville on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the City of Hallettsville in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the Mayor shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the City of Hallettsville of a reduction in the number of person in a household shall be fined not less than $100.00. Residential water customers shall pay the following surcharges:

$ 5.00 for the first 1,000 gallons over allocation.
$10.00 for the second 1,000 gallons over allocation.
$15.00 for the third 1,000 gallons over allocation.
$20.00 for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the City of Hallettsville of a greater number on a form prescribed by the Mayor. The Mayor shall make every effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City of Hallettsville offices to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the Mayor. If the number of dwelling units served by a master meter is reduced, the customer shall notify the City of Hallettsville in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the Mayor shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the City of Hallettsville of a reduction in the number of person in a household shall be fined not less than $200.00. Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$ 5.00 for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$10.00, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$15.00, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$20.00, thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water usage allocation shall be established by the Mayor, or designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately 75% percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, 75% percent of whose monthly usage is less than 6,000

gallons, shall be allocated 6,000 gallons. The Mayor shall make every effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of Hallettsville to determine the allocation. Upon request of the customer or at the initiative of the Mayor, the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the Mayor or alternatively, a special water allocation review committee. Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is 1,000 gallons through 20,000 gallons per month:

$2.00 per thousand gallons for the first 1,000 gallons over allocation.
$4.00 per thousand gallons for the second 1,000 gallons over allocation.
$6.00 per thousand gallons for the third 1,000 gallons over allocation.
$8.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 20,000 gallons per month or more:

2 times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
4 times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
6 times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
8 times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water usage allocation shall be established by the Mayor, or designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately 90% percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's allocation shall be further reduced to 85% percent of the customer's water usage baseline. The industrial customer's water usage baseline will be computed on the average water usage for the 12-month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The Mayor shall make every effort to see that notice of each industrial customers allocation is mailed to such customer. If, however, a customer does not receive such

notice, it shall be the customer's responsibility to contact the City of Hallettsville to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the Mayor, the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the customer's normal water usage because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce usage is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the Mayor or alternatively, a special water allocation review committee). Industrial customers shall pay the following surcharges:

Customers whose allocation is 1,000 gallons through 100,000 gallons per month:

$2.00 per thousand gallons for the first 1,000 gallons over allocation.
$4.00 per thousand gallons for the second 1,000 gallons over allocation.
$6.00 per thousand gallons for the third 1,000 gallons over allocation.
$8.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 100,000 gallons per month or more:

2 times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
4 times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
6 times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
8 times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section XI: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Hallettsville for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by Mayor, or designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan shall be issued a warning for the first violation.

(c) Any person who violates this Plan two or more times is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than one hundred dollars ($100.00) and not more than five hundred dollars ($500.00). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the Mayor shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $40.00, and any other costs incurred by the City of Hallettsville in discontinuing service. In addition, suitable assurance must be given to the Mayor that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(d) Any person, including a person classified as a water customer of the City of Hallettsville, in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(e) Any employee of the City of Hallettsville designated by the Mayor or police officer may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the municipal court on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in municipal court to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in municipal court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in municipal court before all other cases.

Section XII: Variances

The Mayor, or designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if City Council determines that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the City of Hallettsville within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the Mayor, or designee, before being considered by City Council and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of Hallettsville shall be subject to the following conditions, unless waived or modified by the City Council:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XIII: Severability

It is hereby declared to be the intention of the Hallettsville City Council that the sections, paragraphs, sentences, clauses, and phrases of this Ordinance are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Hallettsville City Council without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

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Exhibit A
Ordinance 9-99

DROUGHT CONTINGENCY PLAN
City of Moulton

Section I. Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of Moulton hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II. Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Moulton by means of a Public Hearing held on September 9th, 1999.

Section III. Public Education

The City of Moulton will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of newspaper articles or posted notices.

Section IV. Coordination with Regional Water Planning Groups

The service area of the City of Moulton's Water Department is located within Regional Water Planning Area P and the City of Moulton has provided a copy of this Plan to the Planning Area.

Section V. Authorization

The City Administrator, or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination by the City Council that such implementation is necessary to protect public health, safety, and welfare. The City Administrator, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan upon direction of the City Council.

Section VI. Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Moulton. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII. Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments such as retail establishments, hotels and motels, restaurants, office buildings, schools, nursing homes, medical clinics, etc.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by the City of Moulton.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;

(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;

(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas; use of water to wash down buildings or structures for purposes other than immediate fire protection; flushing gutters or permitting water to run or accumulate in any gutter or street; use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools; use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life; failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII. Triggering Criteria for Initiation and Termination of Drought Response Stages

The City administrator, or his/her designee, shall monitor water supply and/or demand conditions on a periodic basis and shall request the City Council for determination when conditions warrant initiation or termination of each stage of the Plan. Public notification of the initiation or termination of drought response stages shall be by means of notices published in the Moulton Eagle, signs posted in public places, and public service announcements on KCTI Radio Station and KHLT Radio Station.

The triggering criteria described on the following pages are based on the pumpage capability of the City's water wells. The City of Moulton has four wells capable of pumping 26,400 gallons per hour during periods of normal rainfall and can provide up to 600,000 gallons per day if required.

(a) Stage 1 - Mild Water Shortage Conditions

Requirements for initiation - Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII – Definitions, when;

A. The static water level in wells No. 1 and 2 drop to 225 feet below ground level, the static water level in well No. 3 drops to 175 feet below ground level and well No. 4 drops to 135 feet below ground level and/or;

B. When the specific capacity of the wells pumpage output is equal to or less than 90 percent of the wells original pumpage capacity and/or;.

C. Loss of use of two or more wells due to mechanical failure which can not be repaired within three days.

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 consecutive days.

(b) Stage 2 - Moderate Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section VII of this Plan when;

A. The static water level in wells No. 1 and 2 drop to 240 feet below ground level, the static water level in well No. 3 drops to 195 feet below ground level and well No. 4 drops to 155 feet below ground level and/or;

B. When the specific capacity of the wells pumpage output is equal to or less than 80 percent of the wells original pumpage capacity and/or;.

C. Loss of use of two or more wells due to mechanical failure which can not be repaired within three days.

Requirements for termination - Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

(c). Stage 3 - Severe Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when;

A. The static water level in wells No. 1 and 2 drop to 250 feet below ground level, the static water level in well No. 3 drops to 205 feet below ground level and well No. 4 drops to 165 feet below ground level and/or;

B. When the specific capacity of the wells pumpage output is equal to or less than 70 percent of the wells original pumpage capacity and/or;.

C. Loss of use of two or more wells due to mechanical failure which can not be repaired within three days.

Requirements for termination - Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

(d) Stage 4 - Critical Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when;

A. The static water level in wells No. 1 and 2 drop to 260 feet below ground level, the static water level in well No. 3 drops to 215 feet below ground level and well No. 4 drops to 175 feet below ground level and/or;

B. When the specific capacity of the wells pumpage output is equal to or less than 60 percent of the wells original pumpage capacity and/or;.

C. Loss of use of two or more wells due to mechanical failure which can not be repaired within three days.

Requirements for termination - Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of three consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

(e) Stage 5 - Emergency Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the City Council determines that a water supply emergency exists based on:

A. Major water line breaks, two or more well or well pump failures, two or more failures of main manifold pumps or a combination of failures occur, which cause unprecedented loss of capability to provide water service; or

B. Natural or man-made contamination of the water supply source.

Requirements for termination – Stage 5 of the Plan may be rescinded when the capability to resume the ability to supply an adequate amount of water for the distribution system has occurred, or the contamination of the water system has been eliminated.

(f) Water Rationing

Requirements for initiation - Customers shall be required to comply with the water allocation plan prescribed in Section X of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when one of the triggering events is determined to exist.

Requirements for termination - Water rationing may be rescinded when the requirements for termination of Stage 5 have been met.

Section IX: Drought Response Stages

The City Administrator, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of the Plan, shall request determination from the City Council that a mild, moderate, severe, critical, or emergency condition exists and shall implement the following actions upon publication of notice in a newspaper of general circulation:

Stage 1 - Mild Water Shortage Conditions

Goal: Achieve a voluntary 10 percent reduction in daily water demand.

Supply Management Measures:

A. Reduced flushing of water mains.
B. Reduced use of water for MVFD drills.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m to midnight on designated watering days.

(b) All operations of the City of Moulton shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 - Moderate Water Shortage Conditions

Goal: Achieve a 15 percent reduction in daily water demand.

Supply Management Measures:

A. Reduced flushing of water mains.
B. Reduced use of water for MVFD drills.
C. Cease any irrigation of public property.
D. Cease washing of all City Vehicles.

Water Use Restrictions Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held

bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c). Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the City of Moulton.

(f) All restaurants are prohibited from serving water to its patrons except when requested.

The following uses of water are defined as ***non-essential and are prohibited:***

(a) Wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;

(b) use of water to wash down buildings or structures for purposes other than immediate fire protection; use of water for dust control;

(c). flushing gutters or permitting water to run or accumulate in any gutter or street; and

(d) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 - Severe Water Shortage Conditions

Goal: Achieve a 20 percent reduction in daily water demand.

Supply Management Measures:

A. Cease flushing of water mains.
B. Cease use of water for MVFD drills.
C. Cease any irrigation of public property.
D. Cease washing of all City vehicles.

Water Use Restrictions. All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 - Critical Water Shortage Conditions

Goal: Achieve a 25 percent reduction in daily water demand.

Supply Management Measures:

A. Cease flushing of water mains.
B. Cease use of water for MVFD drills.
C. Cease any irrigation of public property.
D. Cease washing of all City vehicles.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c). The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(f) No applications for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be allowed or approved.

Stage 5 - Emergency Water Shortage Conditions

Goal: Achieve a 30 percent reduction in daily water demand.

Supply Management Measures:

A. Cease flushing of water mains.
B. Cease use of water for MVFD drills.
C. Cease any irrigation of public property.
D. Cease washing of all City Vehicles.

Water Use Restrictions. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Section X: Water Rationing

In the event that the City Council determine that water shortage conditions threaten public health, safety, and welfare, the City Administrator or his/her designee, is hereby authorized to ration water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	3,000
3 or 4	4,000
5 or 6	6,000
7 or 8	8,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the City of Moulton of a greater number of persons per household on a form prescribed by the City Administrator. The City Administrator shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City Hall offices of the City of Moulton to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the City Administrator. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of Moulton on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the City of Moulton in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the City Administrator or his/her designee shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the City of Moulton of a reduction in the number of person in a household shall be fined not less than $ 200.00 (two hundred dollars). Residential water customers shall pay the following surcharges:

$ 5.00 for the first 1,000 gallons over allocation.
$ 7.50 for the second 1,000 gallons over allocation.
$ 10.00 for the third 1,000 gallons over allocation.
$ 15.00 for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 3,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the City of Moulton of a greater number on a form prescribed by the City Administrator. The City Administrator shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the City Hall offices of the City of Moulton to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the City Administrator. If the number of dwelling units served by a master meter is reduced, the customer shall notify the City of Moulton in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the City Administrator shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the City of Moulton of a reduction in the number of person in a household shall be fined not less than $ 200.00 (two hundred dollars). Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$ 5.00 for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$ 7.50 thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$ 10.00 thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$ 15.00 thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

The non-residential customer's allocation shall be approximately 75% percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, 75 percent of whose monthly usage is less than 3,000 gallons, shall be allocated 3,000 gallons. The City Administrator shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the City of Moulton to determine the allocation. Upon request of the customer or at the initiative of the City Administrator the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may

appeal an allocation established hereunder to the City Administrator or alternatively to the City Council of the City of Moulton. Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is 3,000 gallons through 25,000 gallons per month:

$ 5.00 per thousand gallons for the first 1,000 gallons over allocation.
$ 7.50 per thousand gallons for the second 1,000 gallons over allocation.
$ 10.00 per thousand gallons for the third 1,000 gallons over allocation.
$ 15.00 per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is 25,000 gallons per month or more:

5 times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
7.5 times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
10 times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
15 times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section XI: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Moulton for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the City Administrator or his/her designee, in accordance with the direction of the City Council and the provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than two hundred dollars ($ 200.00) and not more than five hundred dollars ($ 500.00). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the City Administrator shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $ 100.00, all fines assessed by the Municipal Court, and any other costs incurred by the City of Moulton in discontinuing service. In addition, suitable

assurance must be given to the City Administrator that the same action shall not be repeated while the Plan is in effect. Compliance with this Plan may also be sought through injunctive relief in the district court.

(c). Any person, including a person classified as a water customer of the City of Moulton in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the City of Moulton, police officer, or other person or persons designated by the City Administrator may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the Municipal Court of the City of Moulton on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in the Municipal Court of the City of Moulton to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in the Municipal Court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in the Municipal Court before all other cases.

Section XII: Variances

The City Administrator, or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance

with the City of Moulton within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the City Administrator or his/her designee, and shall include the following

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of Moulton shall be subject to the following conditions, unless waived or modified by the City Administrator or his/her designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XIII: Severability

It is hereby declared to be the intention of the City Council of the City of Moulton that the sections, paragraphs, sentences, clauses, and phrases of this Ordinance are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the City Council of the City of Moulton without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

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WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN FOR THE CITY OF SHINER

I. INTRODUCTION

The water distribution system and the wastewater collection system in the City of Shiner, Texas, are both owned and operated by the City. Drinking water is obtained from water wells located within the boundaries of the City. Storage is maintained with the use of ground storage and elevated storage facilities. Wastewater is treated at the local wastewater treatment plant which is operated according to Texas Natural Resource Conservation Commission (TNRCC) permits.

A. Purpose of the Project

Although the City has not experienced any outstanding residential growth, recently, major industrial users who are served by the City have recently begun to expand. These expansions have resulted in overloads of both the water and wastewater systems. The expansions are expected continue, and the City has acted to accommodate the anticipated growth in demand for service.

This report outlines the City's water conservation and emergency management programs. The objectives of the water conservation program is intended to reduce the quantity required for each water using activity, insofar as practical, through the implementation of efficient water use practices. The emergency management program provides procedures for voluntary and/or mandatory actions to be put into effect to temporarily reduce the demand placed upon the City's water supply system during a water shortage emergency. Drought contingency procedures include water conservation, but may also include the prohibition of certain practices. Both programs are tools that the City will have available to effectively operate under a large range of situations.

B. Planning Area and Project Description

The City of Shiner, Lavaca County, Texas, is located in Southeast Central Texas, approximately midway between San Antonio and Houston. The water and wastewater service area for the City is shown on Appendix C.

Recent expansions of industries in the City has overloaded the existing water

Recent expansions of industries in the City has overloaded the existing water and wastewater systems and actions are being taken to address these problems. These actions include the installation of additional water supply and storage facilities as well as expansion of the City's water distribution system and wastewater treatment plant. While construction and/or expansion of these facilities will reduce the overload, use of water conservation methods will aid in relieving stress on the City's systems. The City is proposing a water conservation program that will reduce per capita consumption and provide long term relief.

C. Goals of the Program

The City of Shiner experiences diversified water usage. Residential per capita use on an average is normal for a community of its size. However, a large number of residents routinely experience consumptions rarely exceeding the minimum rate set by the City. On the other hand, there are a number of residential users whose usage constantly places them in the top ten category overall.

Commercial and industrial business, while small in number, consititute a large percentage of water and wastewater usage with the Spoetzl Brewery and Kaspar Wire Works as the leaders. Small percent reductions in flows to and from these facilities would provide major yields in the reduction effort.

Because of the diversified use, the City of Shiner has set the following goals to experience moderate reductions across the board.

Proposed reduction of 12%; 2% reduction in household use, 5% reduction in outdoor usage, and 5% reduction from repair and/or replacement of meters.

II. LONG TERM WATER CONSERVATION PLAN

A. Plan Elements

Elements critical to the development of the water conservation plan are:

1. *Public Education and Information*
2. *Conservation-oriented Water Rate Structures*
3. *Universal Metering and Meter Repair and/or Replacement.*
4. *Plumbing Fixture Retrofit Program*
5. *Water- Conserving Plumbing Code*
6. *Water-Conserving Landscaping*
7. *Water Recycling and Reuse*
8. *Implementation and Enforcement*
9. *Periodic Review and Evaluation*

1. Public Education and Information

a. *First Year Program - will include the distribution of educational materials including, but not limited to, brochures and/or newsletters to all customers at a minimum rate of once (1) per year or on a rate established by the Mayor. The initial distribution will explain the need for water conservation and the scope of the program. The educational materials will promote water conservation by informing customers about ways to save water inside homes, landscaping and lawn uses, and in recreational uses. Conservation methods that will be emphasized by the City will include:*

   1) *Bathroom Saving Hints*
   2) *Kitchen Saving Hints*
   3) *Laundry Saving Hints*
   4) *Appliance and Plumbing Practices*
   5) *Outdoor Water Conservation*

b. *New Customer Program*

New customers will receive the initial conservation educational materials that describe the water conservation program and other general information when they apply for City services.

c. *Long Term Program*

The long term program will include a distribution of educational materials and new releases annually, as well as public displays, including posters and/or advertisements in the local newspaper.

Emergency news releases will be distributed on an as needed basis.

2. *Conservation-Oriented Water Rates*

The City currently has a rate structure which does not discourage water waste. The current structure is uniform for all users. The City will adopt a policy of raising the over minimum rate whenever the rate structure has to be adjusted. The City will consider a higher rate per thousand gallons after a certain amount of water is used. See Appendix D for current and proposed rate schedules.

3. *Universal Metering and Meter Repairs and Replacement*

The City is 100% metered at the present time. The City will implement a plan to meter users from any unmetered locations.

In addition to the current water accounting and testing program, the City will establish the following meter testing procedures:

a. *Production meters - tested once per year*
b. *meters>1" - tested once per year*
c. *meters <1" - tested once every 10 years*

The City has a policy of testing meters which appear to have abnormally high or low water usage.

Metering and meter repair and/or replacement coupled with the ongoing water accounting will be used in conjunction with other programs such as leak detection and repair to potentially save significant amounts of water.

4. *Leak Detection and Repair Program*

The City has the following policy for leak detection and repair:

Monthly reports are analyzed to detect substantial differences in consumption rates. Upon discovery of such findings, inspections are made at the site. The meter is repaired or replaced as warranted.

If consumers register a complaint on their bill, the City will inspect water and connections at the location for leakage. The meter is repaired or replaced as warranted.

Comparisons between monthly pumping and consumption reports are made to detect differences in amounts. Upon discovery of such a condition, lines are inspected to determine the nature of the problems and repairs will be made if warranted.

5. *Plumbing Fixture Retrofit Program*

Customers and/or owners of buildings that do not have water conserving plumbing devices will be encouraged to retrofit their old fixtures. The educational program will help inform them of the advantages of installing water saving devices.

6. *Water Conserving Plumbing Code*

The City of Shiner does not currently have an official plumbing code. The City has been encouraged to adopt such a program. In the interim, residents will be encouraged to install water conserving fixtures.

7. *Water Conserving Landscape*

The public information and education program will include suggestions on landscaping and irrigation practices which will result in reduced water consumption.

8. *Water recycling and Reuse Programs*

At this time the City does not have a means of recycling or reusing water, as stated in the goals of the program. There are several industries in Shiner for which a recycling program is feasible. The City will take the necessary measures to insure that these industries research such programs and possibly include them in their processes.

9. *Implementation and Enforcement*

The water conservation plan will be officially adopted by the City of Shiner which will implement the necessary documents to enforce any regulation which arises from its adoption. The City will appoint personnel responsible for execution of the plan elements.

10. *Periodic Review and Evaluation*

The City will review the water conservation plan bi-annually to check its progression. An annual report shall be submitted by the administrator of the conservation plan to the City and a copy will be filed with the Executive Administrator of the Texas Water Development Board. The report will

address the program and effectiveness of the water conservation plan and will include:

a. *A list of all public information which has been issued,*
b. *Public response,*
c. *Consumption data in support of the effectiveness of the water conservation plan, and*
d. *Implementation program and status of the City's water conservation program.*

CITY OF SHINER

EMERGENCY WATER DEMAND MANAGEMENT PROGRAM

EMERGENCY CONTINGENCY PLAN FOR THE WATER & WASTEWATER SYSTEM

Based on weather conditions or 90% of City's plant capacity, the following measures will be implemented:

1. *Inform public by giving notices of a mild emergency to the customers within the system, the posting of the notice, and notifying news media of the mild emergency.*

2. *Included in the information to the public will be the recommendation that water users look for ways to conserve water.*

3. *Public will be advised of the existing condition.*

Emergency Rationing Program adopted for emergency use only during periods of acute water shortage is as follows:

1. *Declaration of Emergency*

   When the system demand exceeds supply or storage capability measured over a twenty-four hour (24) period, and refilling the storage facilities is rendered impossible, the City may declare an emergency to exist, and thereafter ration water in the following manner.

2. *Notice Requirements*

   Written notice of the proposed rationing shall be mailed or delivered to each paying customer seventy-two (72) hours before the City actually starts the program, and shall also be placed in a local newspaper. The customer notice shall contain the following information:

   a. *The date rationing shall begin,*
   b. *The date rationing shall end,*
   c. *The stage (level) of rationing to be employed, and*
   d. *A copy of this rationing authority*

3. *Stage Levels of Rationing*

a. *STAGE I (Mild Rationing Conditions) - Alternate day usage of water for outdoor purposes such as lawns, gardens, car washing, etc. The provisions for alternate day use shall be specified by the City in the written notice.*

b. *STAGE I-A (Limited Water Usage) - The City may limit water usage to a gallonage determined by the water system's supply capability to provide continuous service prorated over all customers served by the water plant. Water restrictors may be installed for customers that exceed the limited gallonage determined by the system's mechanical capability. A flow restrictor shall be installed at the customer's expense (not to exceed actual costs of $500.00). Tampering with the flow restrictor will result in water service termination for seven (7) days. The normal Service Tap Fee of the City shall apply for restoration of service. The maximum number of gallons per meter per month shall be contained in the notice to each customer.*

c. *STAGE II (Moderate Rationing Conditions) - All outdoor water usage is prohibited; however, usage for livestock is exempt.*

d. *STAGE III (Sever Rationing Conditions) - All outdoor water usage is prohibited; livestock may be exempted by the City. All consumption shall be limited to each citizen in one of the following ways:*

(1) *A fixed percentage of each customer's average use in the prior month, the percentage to be uniformly applied on a system wide basis, each customer being notified of the percentage amount, OR*

(2) *A maximum number of gallons per meter per week, with notice to each customer of this number.*

4. *Violation of Emergency Rationing Rules*

a. *First Violation - The City may install a flow restrictor in the line to limit the amount of water which will pass through the meter in a twenty-four (24) hour period. The cost to be charged to the customer's account shall be the actual installed cost to the City, not to exceed $500.00.*

b. *Subsequent Violations - The City may terminate service at the meter for a period of seven (7) days, or until the end of the calendar month, whichever is LESS. The normal Service Tap Fee of the City shall apply for restoration of service.*

5. *Exemptions or Variances From Rationing Rules*

The City may grant any customer an exemption or variance from the uniform rationing program, for good cause. The City shall treat all customers equally concerning exemptions and variances, and shall not employ discrimination in such grants.

6. *Rates*

All existing rate schedules shall remain in effect during the rationing period, and no charges may be levied against a customer other than the charges outlined in this plan.

The purpose of this Emergency Rationing Program is to conserve the total amount of water demanded from the City until the supply can be restored to normal levels. This rationing program shall not exceed sixty (60) days without extension by the City.

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CITY OF YOAKUM

DEWITT AND LAVACA COUNTY

TEXAS

WATER CONSERVATION AND

DROUGHT CONTINGENCY PLAN

SEPTEMBER 1995

HUNTER ASSSOCIATES, INC.
ENGINEERS/PLANERS/SURVEYORS

Dallas
214-369-9171

Austin
512-454-8716

TABLE OF CONTENTS

INTRODUCTION

The City of Yoakum Waterworks System is owned and operated by the City of Yoakum. The City Council has the managing control and operation of the City's waterworks and sewer system. The City Council must approve final budgets and rates.

The system serves approximately 2,880 acres. The City has two water plants. One is located on the Southwest side of the City and the other is located on the North side of the City. All residents and commercial activities use the City water and sewer system.

It is the goal of the City to enact a plan to achieve a 10 percent reduction in water usage per person upon implementation of this plan. Achieving this goal would, in effect, increase the life span of water and sewer facilities.

The unaccounted-for water use in the City of Yoakum is less than 10% which is within reasonable limits compared to other cities of its size.

Appendix A

Texas Water Development Board

MUNICIPAL WATER CONSERVATION PLANNING DATA: UTILITY SURVEY

The following form provides a concise and consistent format to insure that the most important information and data needed for the development of water conservation and emergency water demand management plans are considered. Please complete all blanks as completely and objectively as possible. This data will provide the information needed to establish the conservation goal(s) for your utility. Please see footnotes for assistance with calculations. If you would like assistance in completing this form and in developing your plan, please contact the Municipal Conservation Unit at (512) 475-2057.

Name of Applicant: City of Yoakum

Address: P.O. Drawer 738

Telephone Number: (512) 293-6321 **Fax:** (512) 293-3318

Completed by: Calvin Cook

Title: Director of Public Works

Signature: _____ **Date:** _____

I. CUSTOMER DATA

A. Population and Service Area Data

1. Description of service area. If the applicant has received a Certificate of Convenience and Necessity (CCN) from the Texas Natural Resource Conservation Commission, please include a copy of the CCN and a map.

Attached

2. Service area (square miles): 4.5

3. Current population of service area: 6,095 (est. GCRPC)

4. Current population served by utility:
   a. water 6,095
   b. wastewater 6,095

5. Population served by water utility for previous five years:

Year	Population
1990	5,611
1991	5,960
1992	5,934
1993	6,006
1994	6,083

6. Projected population for service area:

Year	Population
1995	6,095
2000	6,430
2005	
2010	6,730
2020	7,043

Indicate source(s), dates, and/or method for the calculation of current and projected population:

1990 - Census

1991 - 1993 - T.A & M State Data Center

1994 - GCRPC

1995 - 2020 - T.W.D.B.

B. Active Connections

1. Current number of active water meter connections by user type. Check whether multi-family service with a single meter is counted as Residential X or Commercial _____.

Treated water users:	Metered	Not metered	Total	
Residential	2,129	0	2,129	
Commercial	387	0	387	
Industrial	12	0	12	
Public	26	1 *	27	* (Golf Course)
Other				

2. Net number of new connections per year for previous five years:

Type	19 90	19 91	19 92	19 93	19 94
Residential	1	1	1	2	3
Commercial	1	0	2	2	7
Industrial	0	0	0	2	2
Public	0	0	1	1	0
Other					

II. WATER USE DATA FOR SERVICE AREA

A. Water Production and Sales

1. Total amount of water diverted and/or pumped for previous five years from all sources (in 1000 gallons):

	19 90	19 91	19 92	19 93	19 94
January	23,547	24,232	21,647	21,747	21,715
February	20,835	20,406	19,214	19,182	21,761
March	23,514	24,379	21,901	22,036	22,332
April	25,863	22,556	20,901	22,483	23,674
May	31,390	24,840	21,694	23,584	23,399
June	48,418	30,144	26,261	24,038	28,586
July	39,202	30,171	34,200	37,344	50,280
August	45,351	33,183	34,311	43,384	32,765
September	30,552	23,333	33,161	34,955	29,825
October	32,225	29,041	33,760	28,999	25,522
November	25,442	22,518	23,348	22,553	22,186
December	29,930	22,333	21,392	21,597	21,102
Total	376,269	307,136	311,826	321,902	323,152

2. Please indicate how the above figures were determined (for example, from a master meter located at the point of diversion from a stream or located at a point(s) where raw water enters the plant, or from water use sales).

From master meters at plant discharge into distribution system.

3. Amount of water delivered and/or sold as recorded by individual meter sales records (in 1000 gallons).[1] Again; check whether multi-family service with a single meter is counted as Residential X or Commercial _____.

Year	Total	Residential	Commercial	Industrial	Public	Other
1990	357,364	218,933	69,830		25,988	42,613
1991	285,697	180,954	53,784		17,175	33,784
1992	298,442	187,284	54,520		22,338	34,300
1993	293,037	184,031	49,813		23,784	35,409
1994	300,168	182,072	57,781		24,769	35,546

B. High Volume Customers: Give two-year average annual use.

1. Give two year average annual use for your ten highest volume retail customers in your service area that you serve directly.

	Customer	(1,000) gals/year	Type of Customer
(1)	Eddy Packing Co.	5,245	Industrial
(2)	Yoakum Packing Co.	3,597	Industrial
(3)	Stevens Nursing Home	3,339	Nursing Home (Commercial)
(4)	Village Oaks Apt.	2,729	Residential
(5)	Tex. Dept. Public Hwy/Trans	2,696	Commercial
(6)	La Mancha Inn	1,998	Commercial
(7)	Oak Meadows Apt.	1,684	Commercial/Res.
(8)	Ykm. Com. Hospital	1,600	Hospital
(9)	Roadrunner Trailer Park	1,328	Residential
(10)	Y.I.S.D. Stadium	1,060	School

2. Attach a list of your wholesale customers and indicate whether water sales are included in II.A.1. above.
NONE

C. **Water Accounting Data**

1. Unaccounted-for Water[2]:

Year	Unaccounted-for Percent
1990	5
1991	7
1992	4
1993	9
1994	7.1

2. Peak daily use to average daily use ratio[3]:

Year	Average Daily Annual Use (MGD)	Peak Day (MGD)	Date Peak Occurred	Ratio
1990	1.03	2.09	6/25	2:1
1991	.841	1.77	8/13	2.1:1
1992	.854	1.63	7/14	1.9:1
1993	.882	1.77	8/3	2:1
1994	.885	2.04	7/27	2.3:1

3. Per capita water use for previous five years (in gallons per capita per day, or gpcd).[4]

Year	Population	Residential Use (1,000 gallons)	Residential gpcd	Total Municipal Use (1,000 gallons)	Municipal gpcd
90	5,611	218,933	106.9	376,269	183.7
91	5,960	180,954	83.2	307,136	141.1
92	5,934	187,284	86.5	311,826	143.9
93	6,006	184,031	83.9	321,902	146.8
94	6,083	182,072	82	323,152	145.5
5-year average	5,919	190,654	88.2	328,057	151.8

4. Seasonal water use:[1]

Year	Average Daily Winter Use (Dec. - Feb. in MGD)	Average Daily Summer Use (Jun - Aug. in MGD)	Average Daily Annual Use (12 months in MGD)	For Office Use
90	.825	1.445	1.03	
91	.744	1.016	.841	
92	.692	1.030	.854	
93	.694	1.138	.881	
94	.717	1.213	.885	

5. Monthly Water Sales by User Category for the Last Full Calendar Year, based on customer meters (in 1,000 gallons)

	Residential	Commercial-Institutional	Industrial	Public	Total
January	13,411	4,092	329	19,449	37,281
February	11,089	4,524	267	14,493	30,373
March	11,425	3,619	172	15,637	30,853
April	14,747	4,321	301	23,281	42,650
May	12,687	3,721	276	18,469	35,153
June	13,239	3,831	318	22,081	39,469
July	18,933	4,388	388	26,460	50,169
August	22,074	6,595	473	23,270	52,412
September	20,914	5,884	351	24,233	51,382
October	16,829	5,438	322	22,542	45,131
November	13,460	3,457	294	17,541	34,752
December	13,261	4,100	319	20,230	37,910

D. **Projected Water Demands:** Provide estimates for total water demands for the planning horizon of the utility. Indicate sources of data and how projected water demands were determined. Attach additional sheet if needed.

III. WATER SUPPLY SYSTEM

A. Water Supply Sources: Identify all current water supply sources and the amount available.

	Source	Amount Available
Surface water:	NA	
Groundwater:	4 wells (950+850+825+600)	4,644,000 GPD
Contracts:	None	
Other:	NA	

B. Treatment and Distribution System

1. Design capacity of system: 4.6 MGD

2. If surface water, do you recycle filter backwash to the head of the plant? Yes_____ No_____

3. Please describe your water system. Include the number of treatment plants, wells and storage tanks. If possible, include a sketch of the system layout. 4 water wells, 2 pump plants
3 ground storage - 975,000 gals. (includes standpipe)
2 elevated storage - 550,000 gals.

IV. WASTEWATER UTILITY SYSTEM

A. Wastewater System Data

1. Design capacity of wastewater treatment plant(s): .950 MGD

2. Is treated effluent used for irrigation on-site NO, off-site NO, plant washdown NO, or chlorination/dechlorination NO?

3. Briefly describe the wastewater system(s) of the area serviced by the water utility. Describe how treated wastewater is disposed. Where relevant, identify treatment plant(s) with the TNRCC name and number, the operator, owner, and, if wastewater is discharged, the receiving stream. Please provide a sketch or map which locates the plant(s) and discharge points or disposal sites. (See Attached.)

B. Wastewater Data for Service Area

1. Percent of water service area served by wastewater utility system: 100 %

2. Monthly volume treated for previous five years (in 1,000 gallons):

	19 90	19 91	19 92	19 93	19 94
January	19,396	21,661	28,289	20,815	20,344
February	16,804	17,676	26,271	17,171	18,085
March	18,813	15,817	18,633	24,990	21,484
April	17,429	22,726	19,473	23,667	18,951
May	19,326	19,842	20,377	21,957	20,994
June	19,574	19,043	19,831	21,078	16,250

July	22,401	20,865	19,321	20,481	17,754
August	21,184	19,564	18,385	21,581	21,109
September	19,200	20,189	18,020	21,338	22,760
October	17,633	16,830	18,938	22,074	24,233
November	16,277	17,180	20,090	20,371	18,236
December	18,696	25,167	17,450	19,773	22,710
Total	229,733	236,510	246,078	255,296	242,910

V. UTILITY OPERATING DATA

A. **Water and Wastewater Rates and Rate Structure** (Indicate if there are different rate structures for industrial users). (See Attached.)

B. **Other Relevant Data:** Please indicate other data or information which are relevant to both the applicant's water management operations and design of a water conservation plan.

VI. CONSERVATION GOALS

PLEASE USE THE WATER CONSERVATION PLANNING DATA YOU HAVE PROVIDED IN THIS SURVEY TO ESTABLISH CONSERVATION GOALS.

A. Water Conservation goals for municipal utilities are generally established to maintain or reduce consumption as measured in:

1) gallons per capita per day use,
2) unaccounted-for water losses,
3) the peak day to average day ratio, and/or
4) an increase in reuse or recycling of water.

B. *Conservation review* staff assess the reasonableness of water conservation goals based on whether the applicant addresses the following steps:

1) identification of a water or wastewater problem,
2) performance of a system audit (completion of a planning data form),
3) selection of goals based on the potential to save water as identified in the audit, and
4) performance of a benefit-cost analysis of conservation strategies.

If at least the first three steps in the water conservation plan have been completed and are summarized, then staff can conclude that there is a substantiated basis for the goals and that the water conservation plan is integrated into water management. Therefore the established conservation goals are reasonable. Please contact Board for most current version of this form before submission.

ATTACHMENT NO. 3 - FOR PARAGRAPH NO. 10
DESCRIPTION OF WATER SERVICE AREA
CITY OF YOAKUM WATER DEPARTMENT - YOAKUM, DE WITT COUNTY, TEXAS

Beginning at a point on the DeWitt Lavaca County Line said point being in the centerline of Roundhouse Creek said beginning point being also 1300 feet West of U. S. Highway Alt. No. 77 in the City of Yoakum DeWitt and Lavaca County, Texas:

Thence, in a southerly direction with the meanders of the centerline of Roundhouse Creek to its intersection with Big Brushy Creek, and southeasterly, with the centerline of Big Brushy Creek, crossing the Southern Pacific Railroad and continuing down stream with the centerline of Big Brushy Creek to the centerline of a County Road which is down stream 4000 feet more or less from the Southern Pacific Railroad for a corner of this boundary;

Thence, in a northeasterly direction with the centerline of the foresaid County Road 3700 feet more or less to its intersection with Farm Market Road No. 682 for an angle point in this boundary;

Thence, in a northeasterly direction crossing Lakeside Drive and continuing and in all 2700 feet to a point on the Lavaca DeWitt County Line and on the centerline of Wilson-Wagoner Road for an angle point;

Thence, in a northwesterly direction with the foresaid County Line a distance of 12,300 feet more or less crossing the City of Yoakum to the place of beginning.

ATTACHMENT NO. 4 - FOR PARAGRAPH NO. 10
DESCRIPTION OF WATER SERVICE AREA
CITY OF YOAKUM WATER DEPARTMENT - YOAKUM, LAVACA COUNTY, TEXAS

Beginning at a point on the DeWitt Lavaca County Line said point being in the centerline of Roundhouse Creek 1300 feet more or less west of U.S. Highway Alt. No. 77 in the City of Yoakum DeWitt and Lavaca Counties, Texas:

Thence, up stream with the centerline of Roundhouse Creek with its meanders to the centerline of Yoakum Street for a corner of this boundary;

Thence, in a southeasterly direction with the centerline of Yoakum Street to a point on the East Right of Way of U.S. Highway Alt. No. 77 for an angle point;

Thence, in a northeasterly direction along the East Right of Way of U.S. Highway Alt. No. 77 a distance of 7400 feet to the North Property Line of Yoakum Municipal Airport for a corner of this boundary;

Thence, in a southeasterly direction with the North Property Line of Yoakum Municipal Airport, and the extension thereof to the centerline of Lavaca Street for an angle point;

Thence, in a southwesterly direction with the centerline of Lavaca Street to the centerline of Supplejack Creek;

Thence, in a southeasterly direction down Supplejack Creek with its meanders to the centerline of Farm Market Road No. 318 for an angle point;

Thence, in a southwesterly direction, with the centerline of Farm Market Road No. 318 to a point on the centerline of Maple Street for an angle point;

Thence, in a southeasterly direction with the centerline of Maple Street a distance of 2750 feet more or less to the point of intersection of the centerlines of said street at an angle point therein for a corner of this boundary;

Thence, in a southwesterly direction perpendicular to the foresaid Maple Street a distance of 1250 feet more or less to the centerline of State Highway No. 111 for an angle point;

Thence, in a southwesterly direction a distance of 1300 feet more or less to a point on the DeWitt Lavaca County Line and on the centerline of Wilson-Wagner Road for an angle point;

Thence, in a northwesterly direction with the foresaid DeWitt Lavaca County Line a distance of 12,300 feet more or less to the place of beginning.

ATTACHMENT NO. 5 - FOR PARAGRAPH NO. 10
DESCRIPTION OF SEWER SERVICE AREA
CITY OF YOAKUM SEWER DEPARTMENT-YOAKUM DE WITT COUNTY TEXAS

Beginning at a point on the DeWitt Lavaca County Line said point being in the centerline of Roundhouse Creek said beginning point being also 1300 feet West of U. S. Highway Alt. No. 77 in the City of Yoakum DeWitt and Lavaca County, Texas:

Thence, in a southerly direction with the meanders of the centerline of Roundhouse Creek to its intersection with Big Brushy Creek, and southeasterly, with the centerline of Big Brushy Creek, crossing the Southern Pacific Railroad and continuing down stream with the centerline of Big Brushy Creek to the centerline of a County Road which is down stream 4000 feet more or less from the Southern Pacific Railroad for a corner of this boundary;

Thence, in a northeasterly direction with the centerline of the foresaid County Road 3700 feet more or less to its intersection with Farm Market Road No. 682 for an angle point in this boundary;

Thence, in a northeasterly direction crossing Lakeside Drive and continuing and in all 2700 feet to a point on the Lavaca DeWitt County Line and on the centerline of Wilson-Wagoner Road for an angle point;

Thence, in a northwesterly direction with the foresaid County Line a distance of 12,300 feet more or less crossing the City of Yoakum to the place of beginning.

ATTACHMENT NO. 6 - FOR PARAGRAPH NO. 10
DESCRIPTION OF SEWER SERVICE AREA
CITY OF YOAKUM SEWER DEPARTMENT-YOAKUM LAVACA COUNTY TEXAS

Beginning at a point on the Lavaca DeWitt County Line at its intersection with the centerline of Roundhouse Creek for the place of beginning of this boundary in the City of Yoakum Lavaca County Texas;

Thence, in a northerly direction with the centerline of Roundhouse Creek to the centerline of the Southern Pacific Railroad for an angle point in this boundary;

Thence, in a southeasterly direction with the centerline of the Southern Pacific Railroad to a point on the centerline projection of Bingham Street for an angle point;

Thence, in a northerly direction with the centerline of Bingham Street and its projections south and north to the North Property Line of Yoakum Municipal Airport for an angle point;

Thence, in a southeasterly direction with the North Property Line of Yoakum Municipal Airport, and the extension thereof to the centerline of Lavaca Street for an angle point;

Thence, in a southwesterly direction with the centerline of Lavaca Street to the centerline of Supplejack Creek;

Thence, in a southeasterly direction down Supplejack Creek with its meanders to the centerline of Farm Market Road No. 318 for an angle point;

Thence, in a southwesterly direction, with the centerline of Farm Market Road No. 318 to a point on the centerline of Maple Street for an angle point;

Thence, in a southeasterly direction with the centerline of Maple Street a distance of 2,750 feet more or less to the point of intersection of the centerlines of said street at an angle point thence for a corner of this boundary;

Thence, in a southwesterly direction perpendicular to the foresaid Maple Street a distance of 1,250 feet more or less to the centerline of State Highway No. 111 for an angle point;

Thence, in a southwesterly direction a distance of 1,300 feet more or less to a point on the DeWitt Lavaca County Line and on the centerline of Wilson-Wagner Road for an angle point;

Thence, in a northwesterly direction with the foresaid DeWitt Lavaca County Line a distance of 11,100 feet more or less to the place of beginning.

PUBLIC INVOLVEMENT

Public At Large

The City Manager of Yoakum reports to the Council each month at regular Council meetings on water plant operating expenses and any unusual developments or operating problems. These meetings are open to the public and anyone is free to speak to the Mayor or Council. At these meetings, they hear the concerns of the public, and this input contributes to the decision-making process.

WATER CONSERVATION PLAN

I. EDUCATION AND INFORMATION

The City of Yoakum will inform the public in order to promote water conservation among its users. Plans are to inform both residential and commercial customers with the following type of information to encourage water conservation:

- Distribution of educational materials to all customers will be made two times during the first year of the program and once per year thereafter.
- Articles will be published in the local paper at times corresponding to the distribution mentioned above and more often if conditions warrant.
- New customers will receive general conservation information when applying for service.

The first mailout in the first year to current customers of the City's water system will include information promoting the Water Conservation Plan and the Drought Contingency Plan (see appendix for sample mailout). The mailout will seek to explain the need for this plan and encourage customers to start conserving water.

The second mailout in the first year will include a brochure promoting indoor water conservation.

During the first year of the plan another method used to reach the public and the City's water customers will be in the form

of a newspaper article referring to conserving water through the use of water saving fixtures both indoors and outdoors.

The fourth method used to inform the public during the first year will be a newspaper article promoting outdoor water conservation.

During subsequent years the City will distribute written water conservation information by customer mailouts or articles in the local newspaper.

Information as presented in Appendix A and as listed in Appendix B will be the basis for public education as well as pre-printed brochures available from:

CONSERVATION
Texas Water Development Board
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231

II. PLUMBING CODES

The City of Yoakum's plumbing code requires the use of water saving fixtures for all new construction and for replacement of plumbing in existing structures. The standards for residential and commercial fixtures are:

Maximum Allowable

Water Usage for Plumbing Fixtures

Water closets, flushometer tank or close-coupled 2-piece gravity-flush type	1.6 gal/flush
Water closets, one-piece	1.6 gal/flush
Water closets, nonresidential application	3.5 gal/flush
Urinals	1.0 gal/flush
Residential sink and lavatory faucets	2.2 gal/minute
Public lavatory faucets, matering type	0.25 gal/cycle
Public lavatory faucets, where metering type is not required	0.5 gal/minute
Showerheads	2.5 gal/minute

III. RETROFIT PROGRAM

Customers in existing buildings which do not have water saving devices should be encouraged to replace their old plumbing fixtures. The advertising program will help inform them of the advantages of installing water saving devices.

City water customers will be informed of where to obtain water saving kits to aid in their water conservation efforts. The City will also encourage local plumbing and hardware stores to stock water conserving fixtures and retrofit devices.

IV. WATER RATE STRUCTURES

A water rate structure which encourages water conservation was adopted on October 12, 1993. The City's water and sewer rates are conservative rates to discourage the use of large quantities of water. When a customer applies for service, information about the rates will be discussed and consumers will be given literature on how to conserve water. The current water rates are shown in Appendix C.

V. METERING

The City currently meters 100% of the water used, both residential and commercial. The City has a policy of removing all meters which appear to have abnormally high or low water usage. Incorporated into the Water Conservation Plan, the City will continue checking the meters in order to replace those that do not operate properly.

The City will also establish a regular schedule to test its meters. The schedule of testing when implemented will be as follows:

Production (Master) meters - Test annually

Meters two inch and larger - Test annually

Meters smaller than two inch - Test every ten years

The City uses a computer to handle all billings. This computer identifies any high or low rate users, and keeps track of all water use, as well as estimating consumption.

VI. WATER CONSERVATION LANDSCAPING

The City has not established regulations which would require developers to plant only low water using plants and grasses. However, our advertising program will include suggestions on landscaping and irrigation procedures which will save water usage and money. In addition, the City will encourage local plant nurseries, commercial landscapers and others in the landscaping industry to promote water conserving landscaping practices.

VII. LEAK DETECTION AND REPAIR

The City currently has a leak detection program which will be maintained. The program includes:

1. Monthly water use accounting by the billing computer.
2. Frequent monitoring of elevated and ground storage tanks to detect watermain breaks.
3. Visual inspection by meter readers and employees who keep a watch out for abnormal conditions including leaks and conditions which could lead up to leaks.
4. An adequate maintenance staff which is available to repair any leaks.
5. If several major leaks are detected in an area, the City will consider conducting a leak detection survey of the suspected area and possibly use the Texas Water Development Board personnel to assist the City in setting up a leak detection survey program.

VIII. IMPLEMENTATION AND ENFORCEMENT

The Water Conservation Plan will be enforced by the following methods:

1. Builders will be encouraged to use water-saving plumbing fixtures in proposed new buildings.

2. The water rate structure will be enforced; customers who do not pay their water bill will have their water disconnected.

3. Building Inspector will not certify new construction unless it meets adopted plumbing codes.

IX. CONSERVATION PLAN ANNUAL REPORT

A member of the City staff will file an Annual Report which addresses the progress and effectiveness of the Water Conservation Plan. The report will include:

1. Public information which has been issued
2. Implementation progress and status of the City's water conservation program
3. Effectiveness of water conservation plan in reducing water use by providing consumption data
4. Public response

X. CONTRACTS WITH OTHER POLITICAL SUBDIVISIONS OR WATER SUPPLY CORPORATIONS

If the City of Yoakum contracts to sell water to any other subdivisions or water supply corporations, the contract agreement will require that the purchaser adopt the City of Yoakum's water conservation and drought contingence plan or develop and adopt a plan of their own that is acceptable to the Texas Water Development Board.

DROUGHT CONTINGENCY PLAN

Drought or other uncontrollable circumstances can disrupt the normal availability of utility water supplies. Even though a City may have an adequate water supply, the supply could become contaminated, or a disaster could destroy the supply. During drought periods, consumer demand is often significantly higher than normal. System treatment, storage or distribution failures can also present a utility with an emergency situation.

The following guidelines pertain to the preparation of drought contingency plans. It is important to distinguish drought contingency planning from water conservation planning. While water conservation involves implementing permanent water use efficiency practices, drought contingency plans establish temporary methods or techniques designed to be used only as long as an emergency exists.

I. TRIGGER CONDITIONS

The City will establish trigger conditions that will indicate when drought contingency measures need to be implemented. This will include guidelines for normal operating procedures and drought conditions.

Trigger conditions are as follows:

A. **Mild Drought Trigger**

Mild drought conditions and contingency measures will be effective based on the following criteria:

1. When the daily water usage equals or exceeds 3.9 mgd (85% of treatment capacity) for seven (7) consecutive days.

B. **Moderate Drought Trigger**

Moderate drought conditions and contingency measures will be effective based on the following criteria:

1. When the daily water usage equals or exceeds 4.2 mgd (92% of treatment capacity) for seven (7) consecutive days, and
2. Reservoir levels continually recede on a daily basis and remain below 1,100,000 gallons (75% of storage capacity) for forty-eight (48) consecutive hours.

C. Severe Drought Trigger

Severe drought conditions and contingency measures will be effective based on the following criteria:

1. When the daily water usage equals or exceeds 4.6 mgd (100% of treatment capacity) for three (3) consecutive days, and
2. Reservoir levels continually recede on a daily basis and remain below 760,000 gallons (50% of storage capacity) for twenty-four (24) consecutive hours.

Severe drought or system limitations conditions will be in effect upon the failure of any system component which limits the treatment, storage, or distribution capabilities of the system and the Mayor determines that such conditions are a hazard to public health and safety.

II. DROUGHT CONTINGENCY MEASURES

The following measures will be taken during various phases of drought conditions:

A. Step 1. - The Mayor may restrict the use of water for outdoor sprinkling, watering of lawns and shrubs, and washing of driveways and automobiles to certain areas of the service area by days and to certain hours. Said restrictions will remain in effect until the Mayor lifts

the restrictions. More specifically stated shall be:

1. Inform the public through the news media and cable TV company that a mild, moderate or severe drought condition has been reached, and that they should look for ways to voluntarily reduce water use. One way is to only water outdoors in the early morning or late evening or implement odd/even outdoor watering based on the last digit of the street address.

2. Encourage the public not to waste water, such as:
   a. Allowing water from vehicle washing or landscape irrigation to run excessively onto streets and sidewalks
   b. Washing foundations, sidewalks and paved areas
   c. Recreational use of sprinklers, hoses or hydrants
   d. Obviously wasteful and non-essential uses

3. Notify major commercial water users of the situation and request voluntary use reductions.

4. City will monitor raw water availability daily.

B. Step 2. - Curtailment, the Mayor bans the use of water totally for outdoor sprinkling, watering of lawns and shrubs, and washing of driveways and automobiles. Said restriction will remain in effect until the Mayor lifts the ban. More specifically stated as follows:

1. Continue implementation of all relevant actions in preceding phase.

2. The following public water uses, not essential for public health or safety, are prohibited:

   a. Washing of pavements, windows, automobiles

   b. Water hydrant flushing

   c. Filling pools

3. Exceptions to the mandatory water use restrictions will be given for health or safety uses as well as variances given to businesses that use outdoor water as a primary activity. Examples of and not limited to are:

   a. Washing of sanitation vehicles

   b. Nurseries

   c. Commercial car washes

C. The curtailment will be effective upon the Mayor's giving notice of curtailment by posting of a notice of curtailment and notifying the news media of curtailment.

D. The curtailments will be terminated upon the Mayor giving notice of termination as he does for the institution of the curtailment.

E. The Mayor can amend, add or delete any of these Rules and Regulations and shall notify the City Council at its regular meeting of said amendments, additions or deletions.

F. Any violation of the rules and regulations contained within this plan shall be subject to a penalty and fine of not less than $10.00 per day nor more than $200.00 per day for each day of noncompliance and/or subject to disconnection or discontinuance of water services to users by the City.

G. The City proposes to enact the following Drought Contingency measures:

1. Mild Drought Contingency Measures

   a. Inform public by giving notice of a mild drought to residents and businesses by the posting of notices and notifying news media of the mild drought.

   b. Included in the information to the public will be the recommendation that water users look for ways to conserve water.

   c. Public will be advised of the drought condition daily by newspaper notices.

2. Moderate Drought Contingency Measures

   a. Residents and businesses will be informed as mentioned above.

   b. The Step 1 curtailment will be enacted.

   c. Residents will be advised of the drought conditions daily by posting notices on bulletin boards.

3. Severe Drought Contingency Measures

   a. Residents and businesses will be informed as mentioned above.

   b. The Step 2 curtailment will be enacted.

III. INFORMATION AND EDUCATION

Once trigger conditions and emergency measures have been approached, the residents, businesses and public will be informed of the conditions and measures to be taken. The process for notification includes:

A. Posting the Notice of Drought conditions at City Hall

B. General circulation to newspapers

C. Notifying all other media sources

D. Distributing information concerning the City's drought contingency plan and explaining the need for such a plan.

IV. TERMINATION NOTIFICATION

Termination of the drought measures will take place when the trigger conditions which initiated the drought measures have subsided, and an emergency situation no longer exists. Residents and businesses will be informed of the termination or of the downgrading to a lower condition of the drought measures in the same manner that they were informed of the initiation of the drought measures.

V. IMPLEMENTATION

This water conservation and drought contingency plan, upon approval of the Texas Water Development Board, will be adopted by the Yoakum City Council by Resolution. A copy of the approved Resolution will be forwarded to the TWDB.

APPENDIX A - LISTING OF WATER CONSERVATION LITERATURE

TEXAS WATER DEVELOPMENT BOARD

WATER CONSERVATION LITERATURE

Single copies of all of the following publications and materials can be obtained at no charge. The "*" indicates those publications that are available free to political subdivisions in small quantities. To make a request, write: CONSERVATION, Texas Water Development Board, Capitol Station, P.O. Box 13213, Austin, Texas 78711-3231.

Agricultural Conservation Literature

Title	Publisher	Description	Length
Agricultural Water Conservation in Texas*	TWDB	Pamphlet	8 pages
Have Your Irrigation System Evaluated Free*	TWDB	Pamphlet	4 pages
LEPA Irrigation*	TWDB	Pamphlet	6 pages
Drip Irrigation*	TWDB WC-8	Pamphlet	6 pages
Conserving Water in Irrigated Agriculture*	TWDB	Booklet	12 pages
Furrow Dikes*	HPUWCD #1	Pamphlet	4 pages
Soil Moisture Monitoring*	HPUWCD #1	Pamphlet	4 pages
Center Pivot Irrigation*	TAEX L-2219	Pamphlet	4 pages
Surge Flow Irrigation*	TAEX L-2220	Pamphlet	4 pages
Surge Irrigation*	SCS	Pamphlet	6 pages

MUNICIPAL CONSERVATION MATERIALS AVAILABLE FOR USE IN EDUCATION AND INFORMATION PROGRAMS

Title	Publisher	Description	Length
Water....Half-A-Hundred Ways to Save It*	TWDB WC-1	Pamphlet	8 pages
Municipal and Commercial Water Conservation Services*	TWDB WC-2	Pamphlet	4 pages
A Homeowner's Guide to Water Use and Water Conservation*	TWDB WC-3	Booklet	22 pages
How to Save Water Inside the Home*	TWDB WC-4	Pamphlet	8 pages
Water Saving Ideas for Business and Industry*	TWDB WC-5	Pamphlet	8 pages
How to Save Water Outside the Home*	TWDB WC-6	Pamphlet	8 pages
Texas Sesquicentennial Native Plant Landscape (Located in Austin)*	TDA TWDB WC-7	Pamphlet	8 pages
Drip Irrigation*	TWDB WC-8	Pamphlet	6 pages
Coloring Poster for Children*	TWDB WC-9	Poster	1 page
Water Conservation Coloring Book*	TWDB WC-10	Booklet	8 pages
Lawn Watering Guide*	TWDB WC-12	Card 3.5" x 5"	1 page
A Directory of Water Saving Plants and Trees for Texas*	TWDB WC-13	Booklet	26 pages
Xeriscape-Principles, Benefits*	TWDB WC-14A	Pamphlet	4 pages
Toilet Tank Leak Detector Tablets*			

GUIDEBOOKS AND CONSERVATION PLANNING LITERATURE (1)

Title	Publisher	Description	Length
The Authority of Cities, Water Utilities, and Water Districts to Regulate and Enforce Water Conservation Measures*	TWDB GB-1	Guidebook	5 pages
A Guidebook for Reducing Unaccounted for Water*	TWDB GB-2	Guidebook	34 pages
Guidelines for Municipal Water Conservation and Emergency Water Demand Management*	TWDB GB-3	Guidebook	54 pages
Guidelines for Water Reuse EPA600/8-80-036*	EPA	Guidebook	105 pages
Example Water Conservation Plans and Adoptions Ordinances For Cities*	TWDB GB-5	Guidebook	100 pages
Sources of Water Saving Devices*	TWDB GB-6	Guidebook	20 pages
Example Water Conservation Plans and Adoption Resolutions for Water Utilities and Water Districts*	TWDB GB-7	Guidebook	38 pages
Example Xeriscape Incentives and Landscape Watering Ordinances*	TWDB GB-9	Guidebook	58 pages
The Texas Water Education Network Directory*	TWDB GB-10	Guidebook	32 pages
Texas Water Development Board (Funding Programs)*	TWDB	Pamphlet	16 pages
Water for Texas....Today and Tomorrow (The Texas Water Plan)*	TWDB	Book	185 pages
Texas Water Facts*	TWDB	Booklet	30 pages

(1) These publications designed for Utility or individual planning purposes and not large scale distribution.

APPENDIX B - PUBLIC INFORMATION SUGGESTIONS

PUBLIC INFORMATION SUGGESTIONS

Suggested ways to save water:

1. Bathroom

A. Take a shower instead of a bath. Showers usually use less water than tub baths.

B. Install a low-flow shower head which restricts the quantity of flow at 60 psi to no more than 3 gallons per minute.

C. Take short showers and turn the water off while soaping and back on again only to rinse.

D. Do not use hot water when cold will do. Water and energy can be saved by washing hands with soap and cold water; hot water should only be added when hands are especially dirty.

E. Reduce the level of the water being used in a bath tub by one or two inches if a shower is not available.

F. Turn water off when brushing teeth until it is time to rinse.

G. Do not let water run when washing hands. Instead, hands should be wet, and water would be turned off while soaping and scrubbing and turned on again to rinse.

H. Shampoo hair in the shower. Shampooing in the shower takes only a little more water than is used to shampoo hair during a bath and much less than shampooing and bathing separately.

I. Hold water in the basin when shaving instead of letting the faucet continue to run.

J. Test toilets for leaks. To test a leak, a few drops of food coloring can be added to the water in the tank. The toilet should not be flushed. Then watch to see if the coloring appears in the bowl within a few minutes. If it does, the fixture needs adjustment or repair.

K. Use a toilet tank displacement device. A one-gallon plastic milk bottle can be filled with stones or with water, recapped, and placed in the toilet tank. This will reduce the amount of water in the tank but still provide enough for flushing. Displacement devices should never be used with new low-volume flush toilets.

L. Install faucet aerators to reduce water consumption.

M. Never use the toilet to dispose of cleansing tissues, cigarette butts or other trash. This can waste a great deal of water and also places an unnecessary load on the sewage treatment plant or septic tank.

N. Install a new low-volume flush toilet that uses 1.6 gallons or less per flush when building a new home or remodeling a bathroom.

2. Kitchen

A. Use a pan of water (or place a stopper in the sink) for rinsing pots and pans and cooking implements when cooking rather than turning on the water faucet each time a rinse in needed.

B. Never run the dishwasher without a full load. In addition to saving water, expensive detergent will last longer and a significant energy savings will appear on the utility bill.

C. Use the sink sparingly, and never use it for just a few scraps.

D. Keep a container of drinking water in the refrigerator. Running water from the tap until it is cool is wasteful.

E. Use a small pan of cold water when cleaning vegetables rather than letting the faucet run.

F. Use only a little water in the pot and put a lid on it for cooking most food. Not only does this method save water, but food is more nutritious since vitamins and minerals are not poured down the drain with the extra cooking water.

G. Use a pan of water for rinsing when hand washing dishes rather than running faucet.

H. Always keep water conservation in mind, and think of other ways to save water.

3. Laundry

A. Wash only a full load when using an automatic washing machine (32 to 59 gallons are required per load).

B. Use the lowest water level setting on the washing machine for light loads whenever possible.

C. Use cold water as often as possible to save energy and to conserve the hot water for uses which cold water cannot serve. (This is also better for clothing made of today's synthetic fabrics.)

4. Appliances and Plumbing

A. Check water requirements of various models and brands when considering purchasing any new appliance that uses water. Some use less water than others.

B. Check all water line connections and faucets for leaks.

5. Out-of-Door Use

A. Water lawns early in the morning during the hotter summer months. Much of the water used on the lawn can simply evaporate between the sprinkler and the grass.

B. Use a sprinkler that produces large drops of water, rather than a fine mist, to avoid evaporation.

C. Turn soaker hoses so the holes are on the bottom to avoid evaporation.

D. Water slowly for better absorption, and never water in high winds.

E. Forget about watering the streets, walks or driveways. They will never grow a thing.

F. Condition the soil with compost before planting grass or flower beds so that water will soak in rather than run off.

G. Fertilize lawns at least twice a year for root stimulation. Grass with a good root system makes better use of less water.

H. Learn to know when grass needs watering. If it has turned a dull grey-green or if footprints remain visible, it is time to water.

I. Do not water too frequently. Too much water can overload the soil so that air cannot get to the roots and can encourage plant diseases.

J. Do not over-water. Soil can absorb only so much moisture and the rest simply runs off. A timer will help, using either a kitchen timer or an alarm clock. An inch and one-half of water applied once a week will keep most Texas grasses alive and healthy.

K. Operate automatic sprinkler systems only when the demand on the town's water supply is lowest. Set the system to operate between four and six a.m.

L. Do not scalp lawns when mowing during hot weather. Taller grass holds moisture better. Rather, grass should be cut fairly often, so that only 1/4 inch is trimmed off. A better looking lawn will result.

M. Use a watering can or hand water with the hose in small areas of the lawn that need more frequent watering (those near walks or driveways or in especially hot, sunny spots).

N. Learn what types of grass, shrubbery and plants do best in the area and in which parts of the lawn, and then plant accordingly. In especially dry sections of the state, attractive arrangements of plants that are adapted to arid or semi-arid climates should be chosen.

O. Consider decorating areas of the lawn with rocks, gravel, wood chips, or other materials available that require no water at all.

P. Do not "sweep" walks and driveways with the hose. Use a broom or rake instead.

Q. Use a bucket of soapy water and use the hose only for rinsing when washing the car.

APPENDIX 7A
CURRENT WATER RIGHTS IN THE LAVACA REGIONAL WATER PLANNING AREA

Table 7A - Lavaca Regional Water Planning Area
TCEQ Active Water Rights - April 1, 2005

WR Number	Type	Permit #	WR Issue Date	Amendment	Owner Name	Owner Type	Amount (Ac-Ft/Yr)	Use	Priority Date	Expiration	Acreage	Reservoir Name	Reservoir Capacity (Ac-Ft)	Site Name	Basin Number	River Order	Stream Name	Other Stream	County
1947	9		12/14/1993		CITY OF CORPUS CHRISTI, TEXAS	2	41840	1	4/15/1994	12/14/2035		LAKE TEXANA			16	0500000000	NAVIDAD RIVER		Jackson
2077	6		7/3/1981		MATT J BOZKA	1	61	3	2/28/1949		61		10		16	3600000000	NAVIDAD RIVER		Lavaca
2077	6		7/3/1981		MATT J BOZKA	1	4	3	12/31/1956		16				16	3600000000	NAVIDAD RIVER		Lavaca
2078	6		7/3/1981		M T SIMONS JR ET AL	4	1138	3	9/30/1903		300				16	3200000000	NAVIDAD RIVER		Jackson
2078	6		7/3/1981		M T SIMONS JR ET AL	4	450	3	12/10/1938		300				16	3200000000	NAVIDAD RIVER		Jackson
2082	6		7/3/1981		EL RANCHO DE LOS PATOS INC	2	932	3	3/31/1929		233				16	2300000000	PINOAK CRK		Wharton
2083	6		7/3/1981		NORRIS RAUN	1	623	3	5/10/1948		312				16	2200000000	SANDY CRK		Wharton
2083	6		7/3/1981		NORRIS RAUN	1	2400	3	10/27/1969		1,200				16	2200000000	SANDY CRK		Wharton
2084	6		7/3/1981		E T ROSE ESTATE	5	400	3	11/10/1950		200				16	2000000000	SUTHERLAND BR		Jackson
2090	6		7/3/1981		WILLIAM J NAISER ET AL	4	527	3	3/31/1956		174				16	1410000000	W MUSTANG CRK		Wharton
2091	6		7/3/1981	B	JACK BIRKNER ET UX	3	290	3	3/31/1953		241				16	1400000000	W MUSTANG CRK		Wharton
2092	6		7/3/1981		MARK & CHARLOTTE DEFRIEND	1	990	3	3/30/1945		277				16	1390000000	PORTER'S CRK		Wharton
2093	6		7/3/1981		EVA REIGH TUCKER	1	1750	3	7/31/1964		350				16	1389700000	W MUSTANG CRK		Wharton
2094	6		7/3/1981		J K ALLEN ESTATE & GRADY ALLEN	5	640	3	4/30/1952		320				16	1350000000	STAGE STAND CRK		Wharton
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	42518	1	5/15/1972			LAKE TEXANA	170,300	STAGE 1, NAVIDAD RIVER	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	4000	1	5/24/1982			LAKE TEXANA		STAGE 1, NAVIDAD RIVER	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	32482	2	5/15/1972			LAKE TEXANA		STAGE 1, NAVIDAD RIVER	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2		7	5/15/1972			LAKE TEXANA		STAGE 1, NAVIDAD RIVER	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	D	LAVACA-NAVIDAD RIVER AUTH	2	7500	1	7/1/2002			LAKE TEXANA			16	0500000000	NAVIDAD RIVER		Jackson
2095	6		7/3/1981	D	LAVACA-NAVIDAD RIVER AUTH	2		2	7/1/2002			LAKE TEXANA			16	0500000000	NAVIDAD RIVER		Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	7150	1	5/15/1972				93,340	STAGE 2	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	22850	2	5/15/1972					STAGE 2	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2		7	5/15/1972					STAGE 2	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2095	6		7/3/1981	C	LAVACA-NAVIDAD RIVER AUTH	2	18122	8	10/6/1993					STAGE 2	16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
2096	6		7/3/1981		VLASTA MRAZ	1	33	3	2/28/1961		22	ROCKY CREEK			16	9500000000	ROCKY CRK		Lavaca
2096	6		7/3/1981		VLASTA MRAZ	1		13	2/28/1961			ROCKY CREEK	12		16	9500000000	ROCKY CRK		Lavaca
2097	6		7/3/1981		GEBRUEDER VIEHOF FARMS OHG	2	95	3	11/17/1939		48				16	6400020000	LAVACA RIVER		Jackson
2098	6		7/3/1981	A	HARRISON STAFFORD II ET AL	4	452.5	3	11/17/1939		226				16	6400010000	LAVACA RIVER		Jackson
2098	6		7/3/1981	A	HARRISON STAFFORD II ET AL	4	747.5	3	11/22/1982		174				16	6400010000	LAVACA RIVER		Jackson
2099	6		7/3/1981		HARRISON STAFFORD ET AL	4	226.25	3	11/17/1939						16	6400000000	LAVACA RIVER		Jackson
2100	6		7/3/1981		HARRISON STAFFORD II ET AL	4	226.25	3	11/17/1939						16	6400030000	LAVACA RIVER		Jackson
2101	6		7/3/1981		FRANCIS KOOP	1	1000	3	11/28/1939		500				16	5600000000	LAVACA RIVER		Jackson
2102	6		7/3/1981		JOHNNIE E KOTLAR	1	10	3	6/30/1967		47				17	5919000000	ARENOSA CRK		Jackson
2345	9		12/14/2001		CITY OF CORPUS CHRISTI	2	4500	1		12/14/2043		LAKE TEXANA			16	0500000000	NAVIDAD RIVER	LAVACA RIVER	Jackson
3958	1	3665	4/23/1979	A	JACK BIRKNER, ET UX	3	211	3	1/29/1979		100				16	1395000000	W MUSTANG CRK		Wharton
4019	1	3725	4/22/1980		CARL B BAIN	1	420	3	1/21/1980		107				16	1389850000	PORTERS CRK		Wharton
4021	1	3727	4/23/1980		GREGORY PAUL SCHMIDT ET AL	4	913	3	1/21/1980		234				16	1360000000	E MUSTANG CRK		Wharton
4123	1	3827	8/3/1981		ALBERT W & CLAUDIA SWENSON	1	100	3	5/11/1981		100				15	5590000000	LUNIS CRK		Jackson
4129	1	3876	6/4/1982	A	ALAN WAYNE MEEK	1	47.12	3	5/18/1981		12				16	1389800000	PORTERS CRK		Wharton
4129	1	3876	6/4/1982	A	BRIAN NELSON MEEK	1	208.05	3	5/18/1981		53				16	1389800000	PORTERS CRK		Wharton
4129	1	3876	6/4/1982	A	DALE CHARLES MEEK	1	208.05	3	5/18/1981		53				16	1389800000	PORTERS CRK		Wharton
4129	1	3876	6/4/1982	A	GARY KENNETH MEEK	1	160.93	3	5/18/1981		41				16	1389800000	PORTERS CRK		Wharton
4129	1	3876	6/4/1982	A	ALAN WAYNE MEEK ET AL	4	1.85	3	5/18/1981		0				16	1389800000	PORTERS CRK		Wharton
4132	1	3836	10/23/1981		HARRY E VITERA	1	550	3	5/26/1981		140				16	1389730000	PORTERS CRK		Wharton
4158	1	3903	10/14/1982		MUSTANG EXPLORATION CO INC	2	800	3	11/16/1981		200				16	1320000000	E MUSTANG CRK		Wharton
4161	1	3905	10/14/1982	A	EL RANCHO DE LOS PATOS INC	2	1332	3	11/16/1981						16	2300010000	PINOAK CRK		Wharton
4163	1	3907	10/14/1982		J K ALLEN ESTATE	5	640	3	11/16/1981		375		1		16	1350010000	E MUSTANG CRK		Wharton
4163	1	3907	10/14/1982		J K ALLEN ESTATE	5	520	3	11/16/1981				1		16	1350010000	E MUSTANG CRK	STAGE STAND CRK	Wharton
4165	1	3909	10/14/1982		KATHLEEN HALAMICEK	1	350	3	11/16/1981		120		45		16	1370000000	E MUSTANG CRK		Wharton
4166	1	3910	10/14/1982		EDMUND A WEINHEIMER III ET AL	4	1000	3	11/16/1981		290		63		16	2350000000	PINOAK CRK		Wharton
4174	1	3911	10/14/1982		GAYNARD & ELAINE WIGGINTON	1	400	3	12/7/1981		580		2		16	1389750000	PORTERS CRK		Wharton
4185	1	3912	10/14/1982	A	JOHN E LEAVESLEY ET AL	4	340	3	2/8/1982		460		100		16	3400020000	NAVIDAD RIVER		Lavaca
4192	1	3884	6/18/1982	B	FORMOSA PLASTICS CORP	2	9000	3	3/1/1982		5,900		1,120		15	5580000000	W CARANCAHUA CRK		Jackson
4296	1	3978	5/19/1983		THE ESTATE OF VELMA LEE ROBINSON	5	1800	3	1/3/1983		400		480		16	8500000000	LAVACA RIVER		Jackson
4327	1	4102	4/19/1984	A	T-BAR-D LLC	2	57	3	2/22/1983		18				16	3380000000	NAVIDAD RIVER		Lavaca
4353	1	4085	3/14/1984	B	JOHN B LAY ET AL	4	500	3	4/18/1983		350				16	2050000000	GOLDENROD CRK		Jackson

Table 7A - Lavaca Regional Water Planning Area
TCEQ Active Water Rights - April 1, 2005

WR Number	Type	Permit #	WR Issue Date	Amendment	Owner Name	Owner Type	Amount (Ac-Ft/Yr)	Use	Priority Date	Expiration	Acreage	Reservoir Name	Reservoir Capacity (Ac-Ft)	Site Name	Basin Number	River Order	Stream Name	Other Stream	County
4559	1	4252	10/3/1985	A	TRAVIS NORRIS RAUN ET AL	4	5500	3	4/16/1985		2,250		5		16	2200010000	WOLF RUN BRANCH	MOTT BRANCH AND SANDY CRK	Wharton
4560	1	4241	8/1/1985	B	EDMUND A WEINHEIMER JR	1	272.63	3	4/30/1985		185		25		16	1407000000	W MUSTANG CRK		Wharton
4791	6		1/20/1987		FORMOSA PLASTICS CORP	2	11035	3	12/20/1976		4,874		900		15	5755000000	KELLER		Jackson
5120	1	5120	6/10/1987		T J BABB HEIRS REVOCABLE TRUST	5	2500	3	2/19/1987		500				17	5900000000	DRY CRK		Jackson
5120	1	5120	6/10/1987		ROBERT MARTIN ET AL	4		3	2/19/1987						17	5900000000	DRY CRK		Jackson
5130	1	5130	7/15/1987	A	CITY OF MOULTON	2		7	4/24/1987				6		16	9900000000	W PRONG LAVACA RIVER		Lavaca
5168	1	5168	6/17/1988	A	JOHN L & SUSAN H RICHARDS ET AL	4	1092	3	2/2/1988		398				16	2250000000	PINOAK CRK		Wharton
5168	1	5168	6/17/1988	A	JOHN L & SUSAN H RICHARDS ET AL	4	651	7	2/2/1988				336		16	2250000000	PINOAK CRK		Wharton
5263	1	5263	3/8/1990	A	EDMUND A WEINHEIMER JR	1	90	3	11/21/1989		187				16	1361000000	E MUSTANG CRK		Wharton
5370	1	5370	10/15/1991	A	EVA RUTH HANCOCK ET AL	4	900	3	7/1/1991		500		356		16	2150000000	GOLDENROD CRK		Lavaca
5487	1	5487	8/8/1994		BRIAN M. SWENSON, ET AL	4	35	3	5/20/1994		35	OFF-CHANNEL RESERVOIR	8		15	5585000000	W CARANCAHUA CRK		Jackson
5579	1	5579	3/18/2003		RICHARD B COLLINS ET AL	4	200	3	3/7/1997		336				16	1389745000	PORTERS CRK		Wharton
5579	1	5579	3/18/2003		LEIGH ANN ALLEN LARSEN ET AL	4		3	3/7/1997						16	1389745000	PORTERS CRK		Wharton
5584	1	5584	10/27/1997		JACKSON COUNTY	2	1.52	2	4/24/1997						16	0400000000	DRY CRK		Jackson
5584	1	5584	10/27/1997		JACKSON COUNTY	2		2	4/24/1997						17	5910000000	DRY CRK		Jackson
5595	1	5595	9/27/2000		E G GOFF ET AL	4	1550	3	9/27/2000		769				16	2100000000	GOLDENROD CRK		Wharton
5678	1	5678	11/14/2000		PIN OAK FARMS 2	2	120	3	7/27/2000	SUBJECT TO: LEASE & ONGOING FARMING	80				16	1389910000	PORTER'S CRK		Wharton
5706	1	5706	3/27/2002		ANTON BRANDL JR ET UX	3	104.4	3	10/1/2000						16	1406000000	W MUSTANG CRK		Wharton

APPENDIX 8A
TPWD ECOLOGICALLY SIGNIFICANT STREAM SEGMENTS

Area Study: Jackson, Lavaca, and Wharton Counties

Evaluation of Natural Resources in Lavaca Water Planning Area (Region P)

Wetlands in Lake Texana State Park (D.W. Moulton)

TEXAS PARKS & WILDLIFE

RESOURCE PROTECTION DIVISION:
WATER RESOURCES TEAM

Evaluation of Natural Resources in Lavaca Water Planning Area (Region P)

By: Albert El-Hage
Peter D. Sorensen
Daniel W. Moulton

October 1999

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Acknowledgments

The authors wish to thank those individuals who cooperated in providing information on the selected natural resources in the study area. Additional thanks are given to those individuals whose comments and proofreading allowed us to produce this report. We appreciate and acknowledge the help and expertise of Gordon Linam, Cindy Loeffler, and David Bradsby.

EXECUTIVE SUMMARY

The study area is located in the mid-coastal region of Texas and includes Jackson and Lavaca counties, and part of Wharton County. It is located within the Lavaca, Colorado-Lavaca, Guadalupe, and Lavaca-Guadalupe river basins.

Drainage of the study area is by the Lavaca and Navidad rivers and their tributaries. Elevations range from sea level in Jackson County to about 503 feet in Lavaca County. The study area is entirely within the Upland Prairie and Woods natural subregion. The land surface of the area is generally rolling to prairie.

The economy of the area consists primarily of petroleum production and operations, agribusiness and tourism. Agricultural production is varied. It consists of cattle, poultry, corn, cotton, and rice with rice being the principal crop for Wharton County. The market value for the agriculture in the study area is around $192.4 million. Outdoor recreational facilities also contribute to the area's economy. The Lavaca-Navidad estuary, the estuarine wetlands along the east side of Garcitas Creek and Lake Texana provide opportunities for bird watching, fishing, waterfowl hunting, boating, and other water sports. All these areas are located in Jackson County.

The natural regions of Texas were delineated largely on the basis of soil types and major vegetation types. Soils in the study area vary from alluvial, sandy soils with loamy surface to black waxy soils with loamy or sandy surface. Most of the region is on the Beaumont and Lissie Geological Formations.

There are seven major vegetation types found in the study area (Figure 4). The main vegetation types are Crops, and Post Oak Woods/Forest, followed closely by Post Oak Woods, Forest and Grassland Mosaic. The Pecan-Elm Forest, Other Native or Introduced Grasses, Bluestem Grassland, and Marsh/Barrier Island types are also found with decreasing distributions, respectively, in the study area.

Region P has a variety of valuable aquatic, wetland, riparian, and estuarine habitats. The estuary of the Lavaca and Navidad Rivers, in Jackson County, provides habitats for economically important marine and estuarine animals as well as for freshwater and terrestrial animals.

The region has 5 rivers or stream segments that satisfy one or more of the criteria defined in Senate Bill 1 for ecologically unique river and stream segments. These are in Jackson and Wharton Counties.

INTRODUCTION

Location and Extent

The study area is located in the mid-coastal region of Texas and includes Jackson and Lavaca counties, and part of Wharton County (Figure 1). It is located within the Lavaca, Colorado-Lavaca, Guadalupe, and Lavaca-Guadalupe river basins (Figure 2).

Geography and Ecology

Drainage of the study area is by the Lavaca and Navidad rivers and their tributaries. Elevations range from about sea level in Jackson County to about 503 feet in Lavaca County (Dallas Morning News 1997). The study area includes the Uplands Prairie and Woods natural subregion (Lyndon B. Johnson School of Public Affairs 1978). The land surface of the area is generally rolling to prairie (Dallas Morning News 1997).

Long, hot summers and short, mild winters characterize the study area's climate. The average daily minimum temperature for January is about 41.5?F and the average daily maximum temperature for July is about 93.7?F. The average annual precipitation is 40 inches (Dallas Morning News 1997).

Population

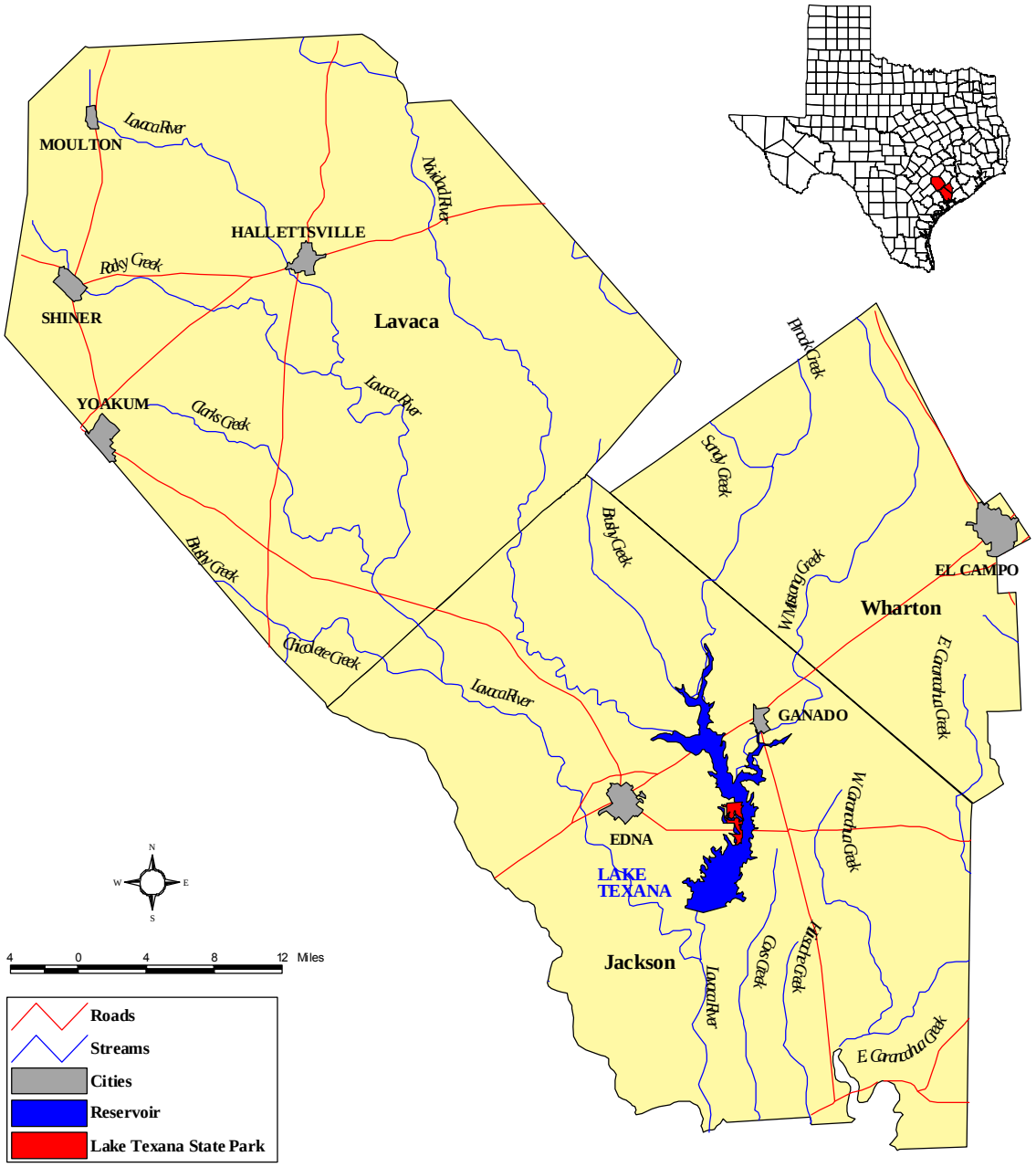
The 1990 census estimated the population of the study area to be 45,039 (Table 1, TWDB 1998). TWDB (1998) predicted a 2050 population of 58,958. Moderate increase in population is projected for all three counties, Jackson, Lavaca, and Wharton.

Table 1. Projections for Population Growth in the Study Area (TWDB 1998)

County ?	**Year** ? **City** ?	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Jackson		13,039	14,748	14,984	15,040	15,058	15,076	15,085
Jackson	Edna	5,343	6,193	6,324	6,355	6,365	6,375	6,385
Jackson	Ganado	1,701	1,892	1,922	1,928	1,930	1,932	1,934
Jackson	County-other	5,995	6,663	6,738	6,757	6,763	6,769	6,766
Lavaca		18,690	20,764	21,507	22,193	23,264	24,398	25,648
Lavaca	Hallettsville	2,718	3,052	3,257	3,413	3,626	3,828	4,041
Lavaca	Moulton	923	936	950	963	977	991	1,005
Lavaca	Shiner	2,074	2,348	2,432	2,510	2,631	2,759	2,901
Lavaca	Yoakum (P)	3,457	3,919	4,059	4,188	4,390	4,604	4,840
Lavaca	County-other	9,518	10,509	10,809	11,119	11,640	12,216	12,861
Wharton	(P)	13,310	13,830	14,615	15,501	16,325	17,241	18,225
Wharton	El Campo	10,511	10,851	11,355	11,961	12,486	13,100	13,744
Wharton	County-other	2,799	2,979	3,260	3,540	3,839	4,141	4,481
	Total	45,039	49,342	51,106	52,734	54,647	56,715	58,958

**P- partial*

Figure 1. Location of the Study Area

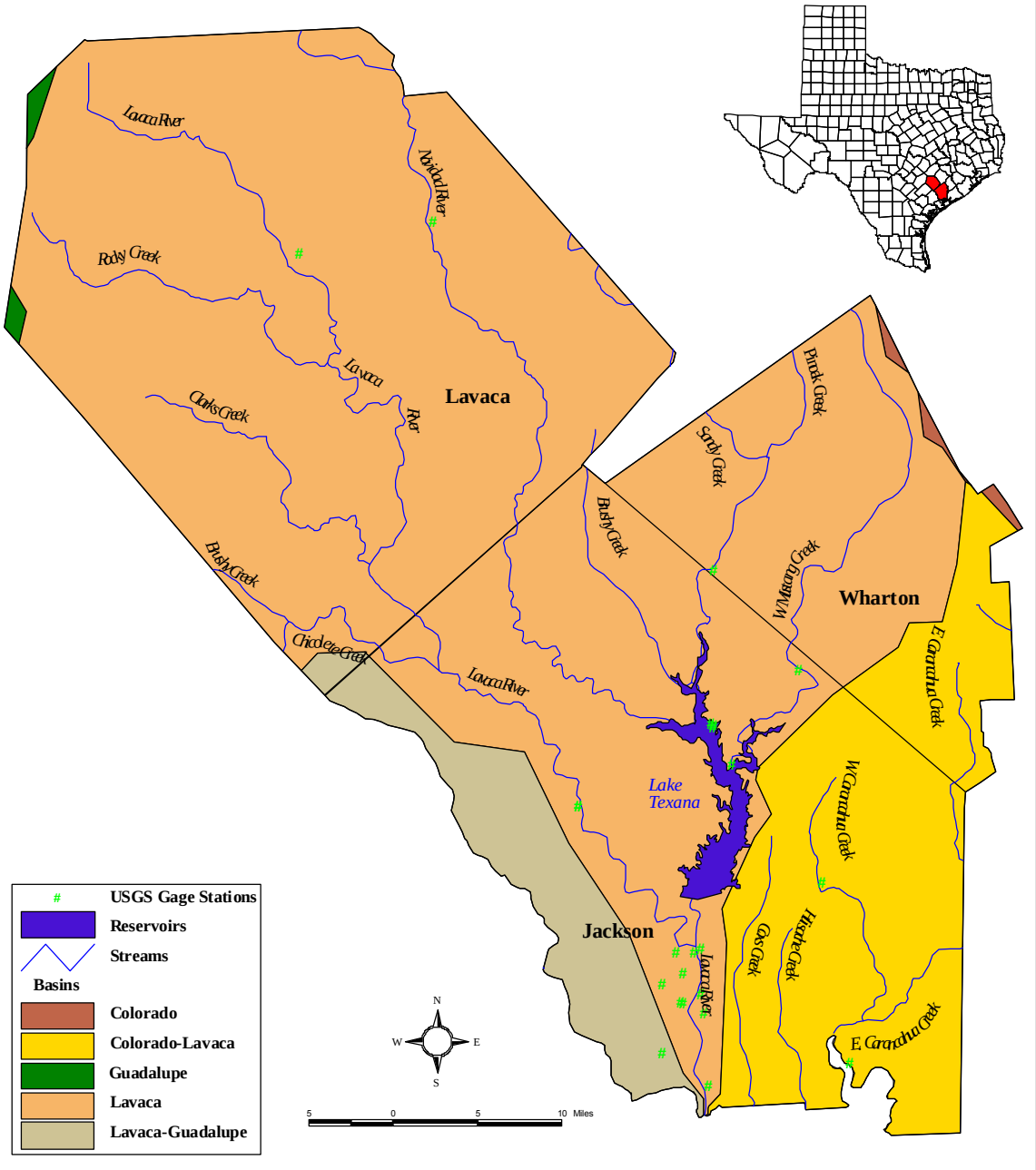


TEXAS PARKS & WILDLIFE

Produced by the TPWD Water Resources Team, June 1999. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Sources:
TPWD GIS lab archives 1998.
Texas Water Development Board
Texas Natural Resources Information System
Projection:
Texas Statewide Projection

Figure 2. Water Resources of the Study Area



TEXAS PARKS & WILDLIFE

Produced by the TPWD Water Resources Team, June 1999. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Sources:
TPWD GIS Lab archives data 1998.
Texas Water Development Board
EPA-823-C-98-008
Projection:
Texas Statewide Projection

Economy and Land Use

The economy of the area consists primarily of petroleum production and operation, agribusiness and tourism. Agricultural production is varied. It consists of cattle, poultry, corn, cotton, and rice, with rice being the principal crop for Wharton County. The market value for the agriculture in the study area is around $192.4 million (Dallas Morning News 1997).

Outdoor recreational facilities also contribute to the area's economy. Lake Texana, the estuarine areas of the Lavaca River, and Garcitas Creek provide opportunities for bird watching, fishing, waterfowl hunting, boating, and other water sports. All these areas are located in Jackson County.

The Texana Loop of the Great Texas Coastal Birding Trail (Central Texas Coast) includes 9 sites (Sites 17-25), all in Jackson County, on Lake Texana, the Lavaca/Navidad estuary, and on Arenosa/Garcitas Creek. Lake Texana SP alone contributes $ 5-6 million per year to the local economy in Jackson County (see Appendix B).

SELECTED NATURAL RESOURCES

Soils

The natural regions of Texas were delineated largely on the basis of soil types and major vegetation types. Soils in the study area vary from alluvial, sandy soils with loamy surface to black waxy soils with loamy or sandy surface (Godfrey et al. 1973). Soil associations found in the area are described as follows:

1. Level soils of the coast Prairie and Marsh

    (a) Somewhat poorly to moderatly well drained cracking clayey soils; and mostly poorly drained soils with loamy surface layers and cracking clayey subsoils: Vertisols.
    (b) Cracking clayey soil and friable loamy soils of the Brazos and Colorado River flood plains: Mollisols.
    (c) Soils with loamy surface layers and mottled clayey or mottled to gray loamy subsoils: Alfisols.

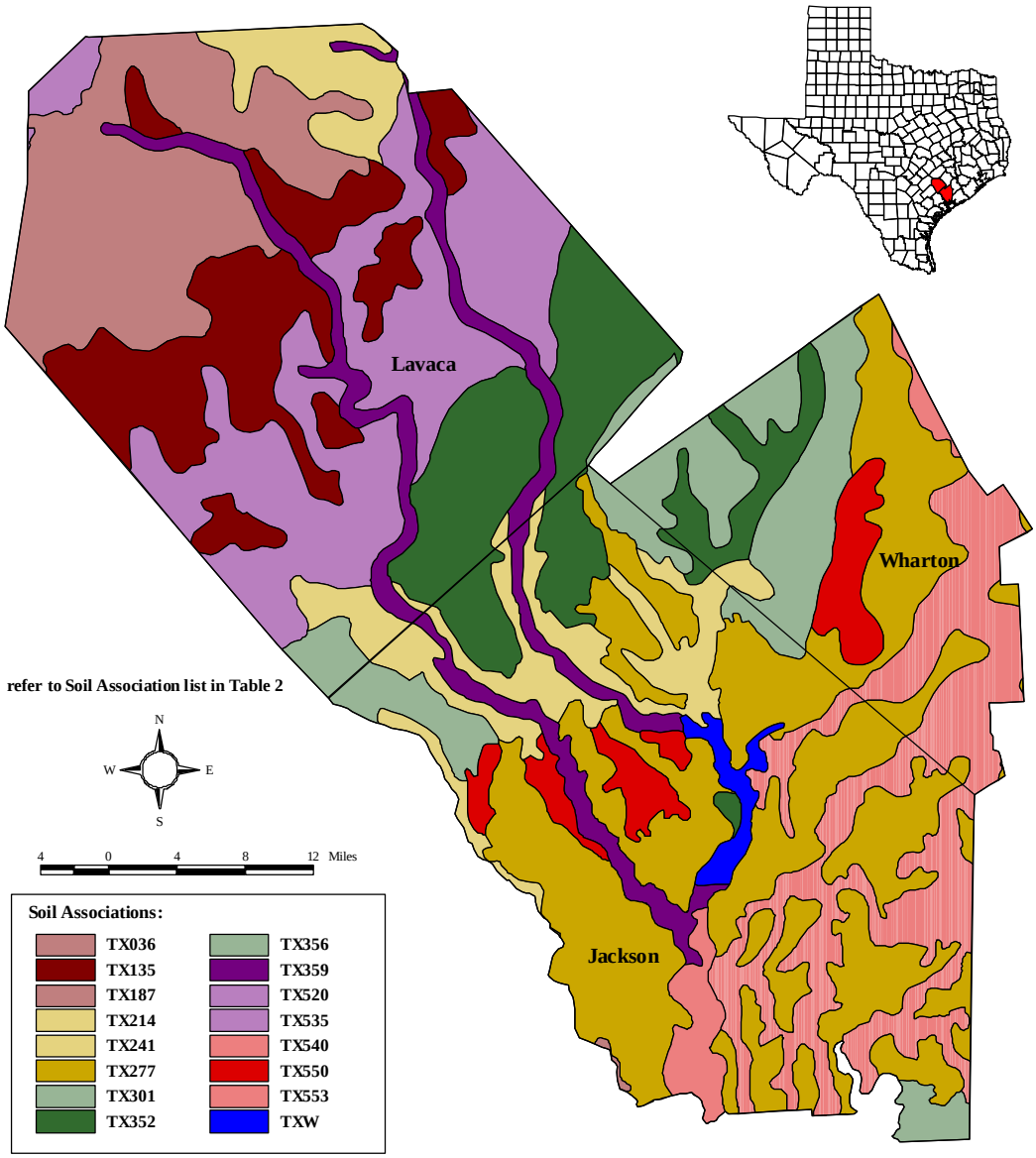
2. Undulating alkaline to slightly acid soils of the Blackland Prairie

    (a) Slightly acid soils with loamy surface layers and cracking clayey subsoils; and noncalcareous cracking clayey soils: Alfisols
    (b) Noncalcareous and calcareous cracking clayey soils; and slightly acid soils with loamy surface layers: Vertisols.
    (c) Soils with loamy surface layers and mottled gray and red or yellow cracking clayey subsoils: Alfisols.

Table 2. Soil Associations of the study area

Soil Association	Soil Name
TX036	Austwell-Aransas-Placedo
TX135	Denhawken-Elmendorf-Hallettsville
TX187	Frelsburg-Carbengle-Hallettsville
TX214	Hallettsville-Dubina-Straber
TX241	Inez-Milby-Kuy
TX277	Lake Charles-Dacosta-Contee
TX301	Livia-Palacios-Francitas
TX352	Morales-Cieno-Inez
TX356	Nada-Telferner-Cieno
TX359	Lavaca-Navidad-Ganado
TX520	Singleton-Burlewash-Shiro
TX535	Straber-Tremona-Catilla
TX540	Swan-Aransas-Placedo
TX550	Telferner-Edna-Cieno
TX553	Texana-Edna-Cieno
TXW	Water

Figure 3. Soil Types of the Study Area



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Produced by the TPWD Water Resources Team, June 1999. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Source:
TPWD Gis lab archives data 1998.
Projection:
Texas Statewide Projection

Vegetation

As stated in the introduction, the study area includes parts of the following natural subregions: Blackland Prairie, and the Upland Prairies and Woods subregions (Lyndon B. Johnson School of Public Affairs 1978).

There are seven major vegetation types found in the study area (Figure 4). The main vegetation types are Crops, and Post Oak Woods/Forest, followed closely by Post Oak Woods, Forest and Grassland Mosaic, Pecan-Elm Forest, Other Native or Introduced Grasses, Bluestem Grassland, and Marsh/Barrier Island are also found with decreasing distributions, respectively, in the study area. The scientific names for the plants mentioned below can be found in Appendix A (McMahan et al. 1984).

Commonly associated plants of the Crops type are: cultivated cover crops or row crops providing food and/or fiber for either man or domestic animals. This type also includes grassland associated with crop rotation.

Commonly associated plants of the Post Oak Woods/Forest, and Post Oak Woods, Forest, and Grassland Mosaic vegetation types are: Post oak, blackjack oak, eastern redcedar, mesquite, black hickory, live oak, sandjack oak, cedar elm, hackberry, yaupon, poison oak, American beautyberry, hawthorn, supplejack, trumpet creeper, dewberry, coral-berry, little bluestem, silver bluestem, sand lovegrass, beaked panicum, three-awn, sprangle-grass, and tickclover. These vegetation types are most apparent on the sandy soils of the Post Oak Savannah.

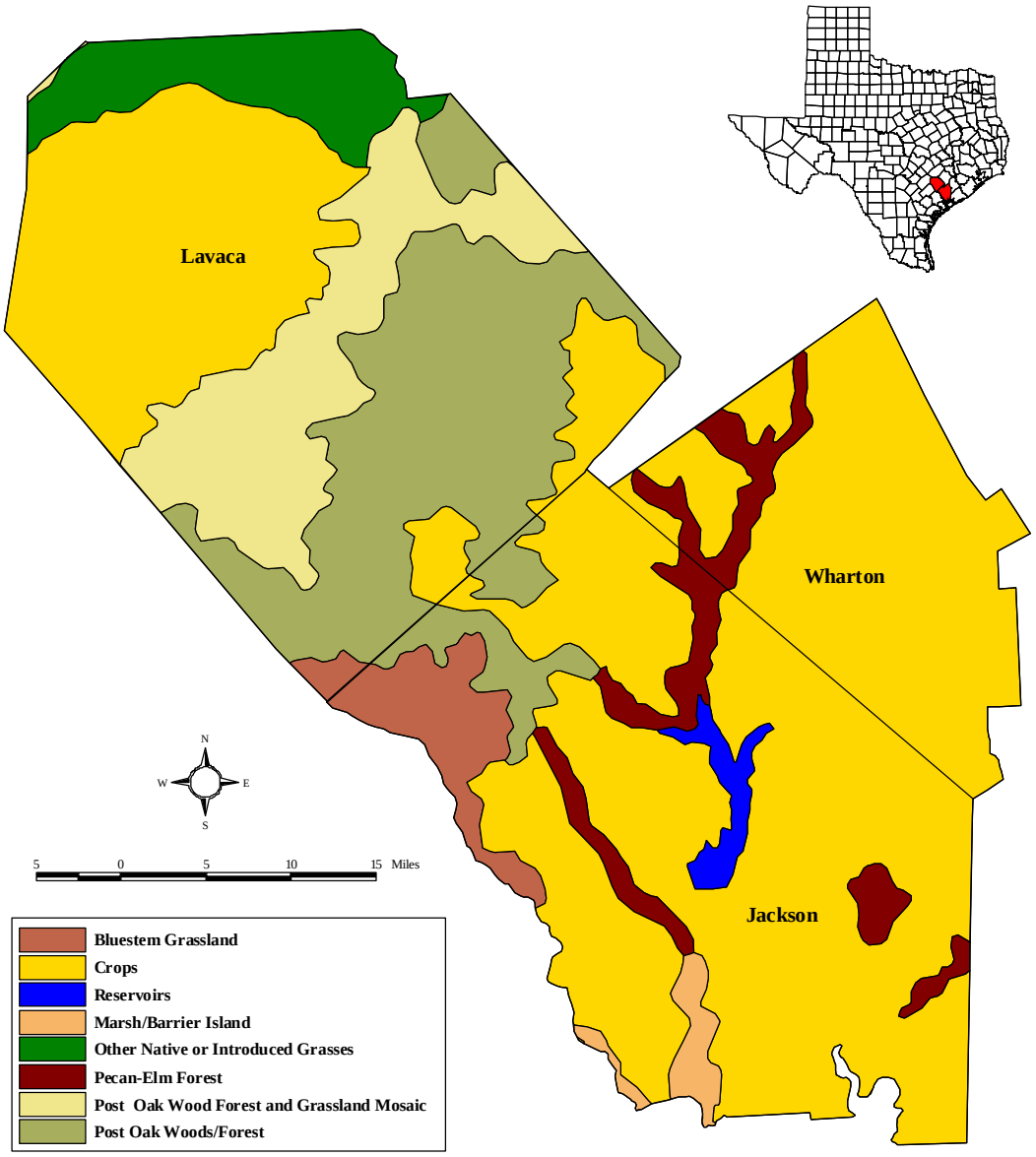
Pecan-Elm Forest includes: Pecan, American elm, cedar elm, cottonwood, sycamore, black willow, live oak, green ash, bald cypress, water oak, hackberry, virgin's bower, yaupon, greenbrair, mustang grape, poison oak, Johnsongrass, Virginia wildrye, Canada wildrye, rescuegrass, frostweed, and western ragweed.

Other Native or Introduced Grasses include: mixed native or introduced grasses and forbs on grassland sites or mixed herbaceous communities resulting from the clearing of woody vegetation. This type is associated with the clearing of forests and may portray early stages of Young Forest.

Bluestem Grassland includes: bushy bluestem, slender bluestem, little bluestem, silver bluestem, three-awn, buffalograss, bermudagrass, brownseed paspalum, single-spike paspalum, smutgrass, Gulf cordgrass, windmillgrass, southern dewberry, live oak, mesquite, huisache, baccharis, and Macartney rose.

Marsh/Barrier Island includes: marshhay cordgrass, Olney's bulrush, saltmarsh bulrush, widgeongrass, California bulrush, seashore paspalum, Gulf cordgrass, and common reed.

Figure 4. Vegetation Types of the Study Area



TEXAS PARKS & WILDLIFE

Produced by the TPWD Water Resources Team, June 1999. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Source: TPWD GIS lab archives. The vegetation represents a general summary of previously produced larger scale maps. Delineation of the vegetation occurs only where the actuall vegetation exhibit adequate resolution for delineation.
Projection:
Texas Statewide Projection

Rivers and Reservoirs

The study area includes four river basins: Lavaca, Colorado-Lavaca, Guadalupe, and Lavaca-Guadalupe river basins (Figure 2). Two major rivers run through the study area (Figure 1): the Lavaca River, in the northwest portion of the study area, and the Navidad River, in the northeast portion of the study area. The Navidad River flows into Lake Texana, the only lake in the study area. Lake Texana covers 11,000 surface acres, with approximately 125 miles of shoreline.

Texas Parks and Wildlife Department drafted a list (See Appendix C for Region P List) of Texas streams and rivers (Figure 2) satisfying at least one of the criteria (See Appendix D) for ecologically unique river and stream segments. Four (Table 3); streams met the high water quality/exceptional aquatic life/high aesthetic value criteria, while the threatened or endangered species/unique communities criteria was met by 2 streams (Table 4). Two stream segments, the Lavaca River and Garcitas Creek, were found to meet the biological function criteria (Appendix C).

Table 3. Streams that meet the high water quality/exceptional aquatic life/high aesthetic value criteria (31 TAC §357.8 (b) (4)); (Bayer et al. 1992; Davis, J.R. 1998) Refer to Appendix C.

River or Stream Segment	County	Criteria
Arenosa Creek	Jackson	Ecoregion Stream; Benthic macroinvertebrates
Garcitas Creek	Jackson	Ecoregion Stream, Dissolved oxygen; Benthic macroinvertebrates
West Carancahua Creek	Jackson	Ecoregion Stream, Dissolved oxygen; Benthic macroinvertebrates
West Mustang Creek	Jackson	Ecoregion Stream; Benthic macroinvertebrates
West Mustang Creek	Wharton	Ecoregion Stream; Benthic macroinvertebrates

Table 4. Streams that meet the threatened or endangered species/unique community criteria (31 TAC §357.8 (b) (5); (Ortego, B. 1999))

River or Stream Segment	County	Threatened/endangered species
Garcitas Creek	Jackson	Texas palmetto; Diamondback terrapin
Lavaca River	Jackson	Diamondback terrapin

Wetlands

The study area has significant wetland resources. There are extensive forested wetlands (pecan-elm bottomland forests) occurring along the Lower Lavaca River in Jackson County (Figure 4); north of Lake Texana along Sandy Creek and its tributaries in Jackson and western Wharton counties, along the Navidad River west of Lake Texana; and along West and East Carancahua Creeks in southeastern Jackson County.

Rather extensive estuarine wetlands occur in southwestern Jackson County (Figures 4 & 5). The Lavaca/Navidad estuary wetlands extend from the juncture of the two rivers at FM 616 about 10 miles downstream to Lavaca Bay. The lakes, marshes, and flats of this area (Figure 5) provide habitat for estuarine fish and shellfish, freshwater river fishes, birds, mammals, reptiles, and amphibians. The same is true for the estuarine wetlands along Garcitas Creek, which forms part of the western Jackson County line.

Lake Texana supports fringing freshwater wetlands including emergent marshes, pecan-elm bottomlands, and beds of floating aquatic plants. Lake Texana State Park (575 acres), located on the west-central shore of the lake, has all these wetland types (See cover photo).

There are nine sites on the Great Texas Coastal Birding Trail (the Texana Loop) in Jackson County. Six of these are associated with forested riparian habitats fringing Lake Texana as well as the Lake itself. The other three are associated with the estuarine and riparian habitats of the Lavaca/Navidad estuary and Garcitas/Arenosa Creeks.

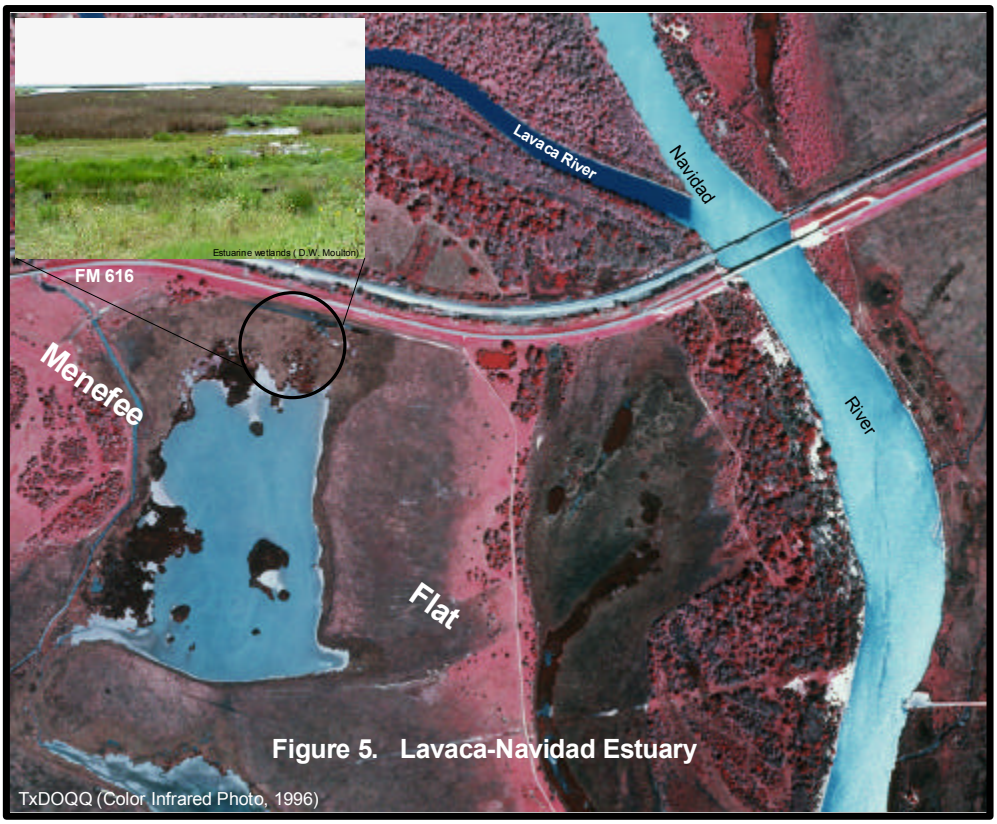


Figure 5. Lavaca-Navidad Estuary

Springs

The distribution and size, as of 1980, of springs and seeps in the area are given by county, in Table 5 (Brune 1981). Brune conducted most of the fieldwork, which produced the following information, during the period of February 11-17, 1977. Information on Lavaca County springs was not available at the time.

Jackson and Wharton Counties springs are not numerous or large due to the relatively flat topography of the Counties. Spring waters in the county are generally of the sodium bicarbonate type, hard, and alkaline (Brune 1981).

Table 5. Distribution and Estimated Size (in 1980) of Springs and Seeps in the Study Area (Brune 1981)

County	Large	Moderately large	Medium	Small	Very small	Seep	Former
Jackson	0	0	0	1	0	0	5
Lavaca	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wharton	0	0	0	0	0	1	3

The numbers above are a reflection of either a spring or a group of springs.
Codes:
Large = 280 to 2,800 cfs
Moderately large = 28 to 280 cfs
Medium = 2.8 to 28 cfs
Former = no flow or inundated
Small = 0.28 to 2.8 cfs
Very Small = 0.028 to 0.28 cfs
Seep = less than 0.028 cfs

Gulf Coast Aquifer

The Gulf Coast Aquifer forms an irregular shaped belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties and extends from the Rio Grande northeastward to the Louisiana-Texas border. Total pumpage was approximately 1.1 million acre-feet in 1994. Municipal pumpage accounted for 51 percent of the total, irrigation accounted for 36 percent, and industrial accounted for 12 percent. The Greater Houston Metropolitan Area is the largest user (Texas Water Development Board 1997).

Water quality is generally good in the shallower portion of the aquifer. Groundwater containing less than 500 mg/l dissolved solids is usually encountered to a maximum depth of 3,200 feet in the aquifer from San Antonio River Basin northeastward to Louisiana. From the San Antonio River Basin southward to Mexico, quality deterioration is evident in the form of increased chloride concentration and salt-water encroachment along the coast (Texas Water Development Board 1997).

Freshwater Mussels

Freshwater mussels (Family Unionidae) are sensitive biological indicators of environmental quality and are often the first organisms to decline when environmental quality of aquatic ecosystems begins to degrade (Howells et al. 1996). Consequently, freshwater mussels have become important elements of environmental impact considerations. Surveys of mussels in Texas show many of the 52 species recognized in the state have declined greatly in recent years. These population declines probably reflect poor land and water management practices and subsequent loss of mussel habitat (Howells et al. 1997). Over-grazing, the clearing of native vegetation, the design and construction of highways and bridges, and general land clearing and development have contributed to the increase of runoff and scouring floods. Scouring in upstream reaches often results in excessive deposits of soft silt or deep shifting sand on downstream substrates, eliminating mussel habitat. Mussels with reported occurrence in the study area are shown in Table 6.

Table 6. Freshwater Mussels (Howells et al. 1996)

Scientific Name	**Common Name**
Amblema plicata	Threeridge
Anodonta grandis	Giant floater
Anodonta imbecillis	Paper pondshell
Arcidens confragosus	Rock-pocket book
Cyrtonais tampicoensis	Tampico pearlymussel
Glebula rotundata	Round pearlshell
Lampsilis bracteata	Texas fatmucket
Lampsilis teres	Yellow sandshell
Leptodea fragilis	Fragile papershell
Ligumaia subrostrata	Pond mussel
Potamilus ohiensis	Pink papershell
Potamilus purpuratus	Bleufer
Quadrula apiculata	Southern Mapleleaf
Quadrula houstonensis	Smooth pimpleback
Toxolasma texasensis	Texas lilliput
Truncilla macrodon	Texas fawnsfoot
Uniomerus declivis	Tapered pondhorn
Uniomerus tetralasmus	Pondhorn

Fish

Most Texas estuaries that receive freshwater inflow from rivers provide habitats for over 200 species of fish and shellfish. Many of these are important to the commercial and recreational fishing industries. Species such as brown, white and pink shrimp, oysters, blue crab, redfish, sea trout, and flounder are very important to the economy of the Texas coast. The estuarine habitats of Jackson County contribute to this economy.

One of the species of fish reported in the area (Table 7) is included on the Special Species List (Table 8) produced by the Texas Parks and Wildlife Department (1998a). This species is Guadalupe bass, it is the official state fish of Texas (Hubbs et. al 1991). The Guadalupe bass is endemic to the streams of the northern and eastern Edwards Plateau including portions of the Brazos, Colorado, Guadalupe, and San Antonio basins.

Table 7. Fish Species Reported in the Study Area (Lee et al. 1980; Hubbs et al. 1991)

Species	Common Name
Ameiurus melas	Black bullhead
Ameiurus natalis	Yellow bullhead
Anguilla rostrata	American eel
Aplodinotus grunniens	Freshwater drum
Astyanax mexicanus	Mexican tetra
Campostoma anomalum	Central stoneroller
Carassius auratus	Goldfish
Carpiodes carpio	River carpsucker
Cycleptus elongatus	Blue sucker
Cyprinella lutrensis	Red shiner
Cyprinella venusta	Blacktail shiner
Cyprinodon variegatus	Sheepshead minnow
Cyprinus carpio	Common carp
Dorosoma cepedianum	Gizzard shad
Dorosoma petenense	Threadfin shad
Etheostoma gracile	Slough darter
Fundulus chrysotus	Golden topminnow
Fundulus grandis	Gulf killifish
Fundulus notatus	Blackstripe topminnow
Fundulus pulvereus	Bayou killifish
Gambusia affinis	Western mosquitofish
Ictalurus furcatus	Blue catfish
Ictalurus punctatus	Channel catfish
Ictiobus bubalus	Smallmouth buffalo
Lepisosteus oculatus	Spotted gar

Table 7 cont'd.

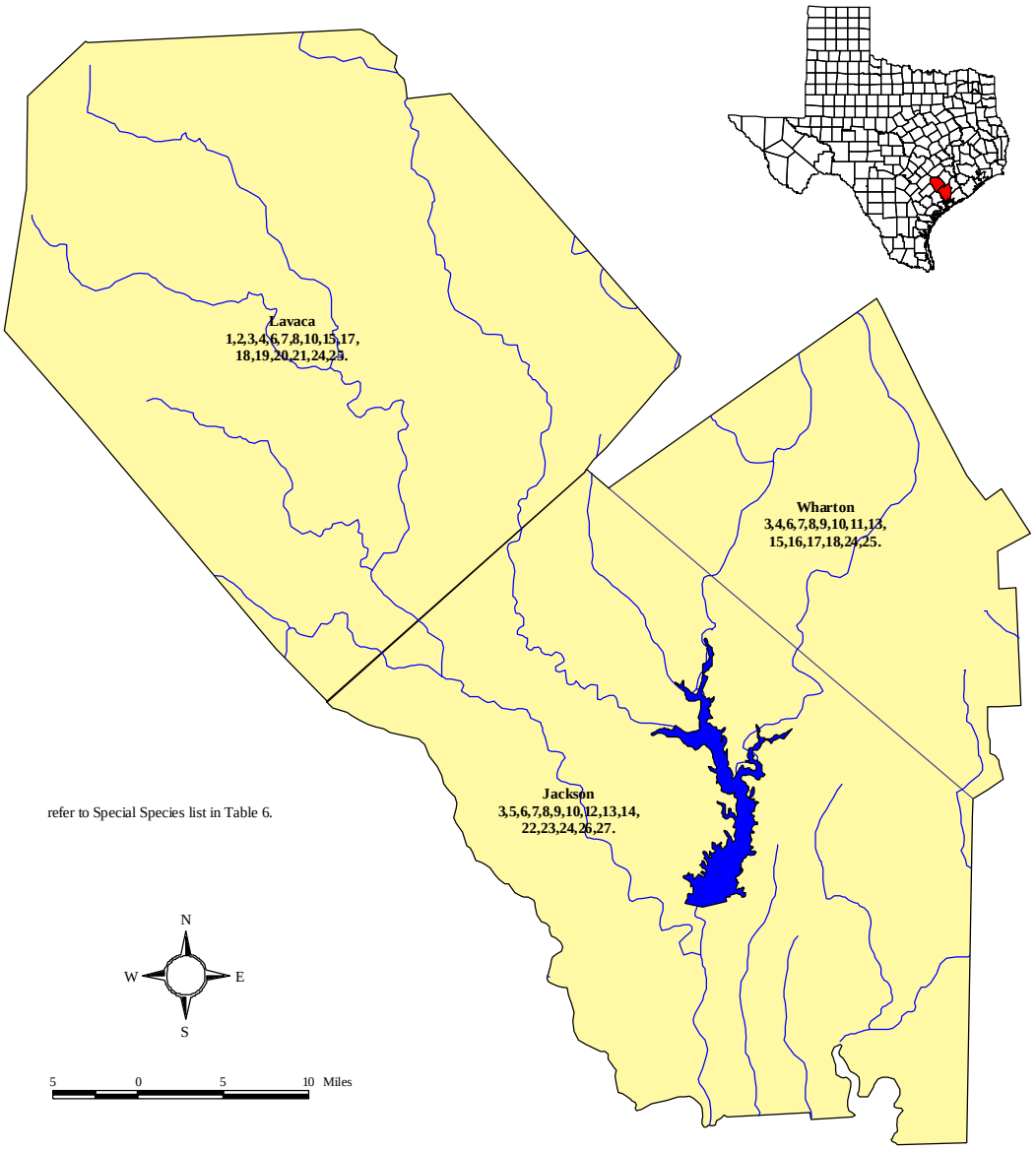
Lepisosteus osseus	Longnose gar
Lepisosteus spatula	Alligator gar
Lepomis auritus	Redbreast sunfish
Lepomis cyanellus	Green sunfish
Lepomis gulosus	Warmouth
Lepomis humilis	Orangespotted sunfish
Lepomis macrochirus	Bluegill
Lepomis megalotis	Longear sunfish
Lepomis microlophus	Redear sunfish
Lepomis punctatus	Spotted sunfish
Lythrurus fumeus	Ribbon shiner
Macrhybopsis aestivalis	Speckled chub
Menidia beryllina	Inland silverside
Micropterus treculi	Guadalupe bass
Micropterus salmoides	Largemouth bass
Morone chrysops	White bass
Mugil cephalus	Stiped mullet
Notemigonus crysoleucas	Golden shiner
Notropis amnis	Pallid shiner
Notropis buchanani	Ghost shiner
Notropis shumardi	Silverband shiner
Notropis texanus	Weed shiner
Notropis volucellus	Mimic shiner
Noturus gyrinus	Tadpole madtom
Opsopoeodus emiliae	Pugnose minnow
Percina macrolepida	Bigscale logperch
Pimephales promelas	Fathead minnow
Pimephales vigilax	Bullhead minnow
Pomoxis annularis	White crappie
Pomoxis nigromaculatus	Black crappie
Pylodictis olivaris	Flathead catfish
Syngnathus scovelli	Gulf pipefish

Table 8. Species of Special Concern in the Study Area (Texas Parks and Wildlife Department 1998a)

Map code*	Scientific name	Common name	Fed. Status	State Status
	AMPHIBIANS			
1	*Bufo houstonensis*	Houston toad	LE	E
	BIRDS			
2	*Ammodramus henslowii*	Henslow's sparrow		
3	*Buteo albicaudatus*	White-tailed hawk		T
4	*Charadrius montanus*	Mountain plover	PT	
5	*Egretta rufescens*	Reddish egret		T
6	*Falco peregrinus anatum*	American peregrine falcon	LE	E
7	*Falco peregrinus tundrius*	Arctic peregrine falcon	E/SA	T
8	*Grus americana*	Whooping crane	LE	E
9	*Haliaeetus leucocephalus*	Bald eagle	LT	T
10	*Mycteria americana*	Wood stork		T
11	*Numenius borealis*	Eskimo curlew	LE	E
12	*Pelecanus occidentalis*	Brown pelican	LE	E
13	*Plegadis chihi*	White-faced ibis		T
14	*Sterna antillarum athalassos*	Interior least tern	LE	E
15	*Tympanuchus cupido attwateri*	Attwater's greater prairie-chicken	LE	E
	FISHES			
16	*Micropterus treculi*	Guadalupe bass		
	MAMMALS			
17	*Spilogale putorius interrupta*	Plains spotted skunk		
	REPTILES			
18	*Crotalus horridus*	Timber/Canebrake rattlesnake		T
19	*Gopherus berlandieri*	Texas tortoise		T
20	*Graptemys caglei*	Cagle's map turtle	C1	
21	*Liochlorophis vernalis*	Smooth green snake		T
22	*Malaclemys terrapin littoralis*	Texas diamondback terrapin		
23	*Nerodia clarkii*	Gulf saltmarsh snake		
24	*Phrynosoma cornutum*	Texas horned lizard		T
25	*Thamnophis sirtalis annectens*	Texas garter snake		
	VASCULAR PLANTS			
26	*Psilactis heterocarpa*	Welder machaeranthera		
27	*Thurovia triflora*	Threeflower broomweed		

* Lookup code for map of Figure 6.
Status Code: LE, LT – Federally Listed Endangered/Threatened; E/SA – Federally Endangered by Similarity of Appearance; E, T – State Endangered/Threatened; PT – Federally Proposed Threatened;
C1 – Federal Candidate, Category 1, information supports proposing to list as endangered/threatened.

Figure 5. Special Species by County



TEXAS PARKS & WILDLIFE

Produced by the TPWD Water Resources Team, June 1999. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Sources:
TPWD Gis lab archives data 1998.
Projections:
Texas Statewide Projection

Birds and Waterfowl

Many species of neotropical songbirds, wintering shorebirds, and a large number of waterfowl stop-over in the study area to feed and rest along the river banks and creek bottoms. The Special Species List (Texas Parks and Wildlife Department 1998a) for the study area includes 14 birds (Table 8), some of which are riparian and/or wetland dependent. Several of the birds occur in the study area only as migrants (i.g. peregrine falcon, whooping crane). Migrating peregrine falcons utilize wetlands as they prey mostly on ducks and shorebirds. Migrating whooping cranes use wetlands for feeding and roosting. An extensive list of birds observed in Lake Texana State Park can be obtained at the park headquarters (also see http:www.tpwd.state.tx.us/park/laketexa/laketexa.htm).

Mammals, Amphibians, and Reptiles

There are 1,100 vertebrate species in Texas, 60 of which are endemic to the state (Texas Audubon Society 1997). There are at least 87 species of mammals (Table 9), amphibians (Table 10), and reptiles (Table 11), listed in the Texas Parks and Wildlife Biological Conservation Database (BCD), present in the study area.

The plains spotted skunk is the only mammal in Table 9 that is listed in the Special Species List. Table 10 includes one amphibian that is listed in the Special Species List, the Houston toad. Table 11 includes eight reptiles that are listed in the Special Species List (Table 8), the timber rattlesnake, Texas horned lizard, Texas garter snake, Texas tortoise, Cagle's map turtle, smooth green snake, Texas diamondback terrapin, and the Gulf saltmarsh snake. Figure 6 shows the county distribution of those species listed on the Special Species List.

The Houston Toad, a federally and state listed endangered species is found only in a small pocket of southeastern Texas, including Austin, Bastrop, Burleson, Colorado, Lavaca, Leon, Milam, and Robertson Counties. It is found in pine forests and prairies with sandy ridges (Texas Parks and Wildlife 1999).

The Houston Toad is endangered because many small natural breeding ponds have been drained. Clearing natural vegetation and planting pasture grasses such as bermudagrass also eliminates habitat. Also, fire ants may kill young toads as they leave the pond (Texas Parks and Wildlife 1999).

The Texas garter snake is found in wet or moist microhabitats, but not necessarily restricted to them. It hibernates underground or under surface cover. The Timber/Canebrake rattlesnake occurs in swamps, floodplains, upland pine, deciduous woodlands, riparian zones, and abandoned farms.

The Cagle's map turtle is endemic to the Guadalupe River System. It occurs in short stretches of shallow water with swift to moderate flow and gravel or cobble bottom, connected to deeper pools with a slower flow rate and a silt or mud bottom. It nests on gently sloping sand banks within 30 feet of the water.

Table 9. Mammals of the Study Area (Davis and Schmidly 1994; Texas Parks and Wildlife Department 1998a)

Scientific Name	Common Name
Baiomys taylori	Northern pygmy mouse
Canis rufus	Red wolf (extirpated)
Chaetodipus hispidus	Hispid pocket mouse
Didelphis virginiana	Virginia opossum
Geomys attwateri	Attwater's pocket gopher
Lasiurus borealis	Eastern red bat
Lepus californicus	Black-tailed jack rabbit
Mephitis mephitis	Striped skunk
Neotoma floridana	Eastern woodrat
Oryzomys palustris	Marsh rice rat
Peromyscus leucopus	White-footed mouse
Peromyscus maniculatus	Deer mouse
Reithrodontomys fulvescens	Fulvous harvest mouse
Sciurus niger	Eastern fox squirrel
Sigmodon hispidus	Hispid cotton rat
Spermophilus tridecemlineatus	Thirteen-lined ground squirrel
Spilogale putorius interrupta	Plains spotted skunk
Sylvilagus floridanus	Eastern cottontail
Urocyon cinereoargenteus	Gray fox

Table 10. Amphibians of the Study Area (Texas Parks and Wildlife Department 1998a)

Scientific Name	Common Name
Acris crepitans	Northern cricket frog
Ambystoma texanum	Smallmouth salamander
Bufo houstonensis	Houston toad
Bufo speciosus	Texas toad
Bufo valliceps	Gulf coast toad
Bufo woodhousii	Woodhouse's toad
Gastrophryne carolinensis	Eastern narrowmouth toad
Gastrophryne olivacea	Great plains narrowmouth toad
Hyla chrysoscelis	Cope's gray treefrog
Hyla cinerea	Green treefrog
Hyla versicolor	Northern gray treefrog
Notophthalmus viridescens	Eastern newt
Pseudacris clarkii	Spotted chorus frog
Pseudacris streckeri	Strecker's chorus frog
Pseudacris triseriata	Striped chorus frog
Rana catesbeiana	Bullfrog
Rana sphenocephala	Southern leopard frog
Scaphiopus holbrookii	Eastern spadefoot
Siren intermedia	Lesser siren

Table 11. Reptiles of the Study Area (Texas Parks and Wildlife Department 1998a)

Scientific Name	Common Name
Agkistrodon contortrix	Copperhead
Agkistrodon piscivorus	Cottonmouth
Alligator mississippiensis	American alligator
Anolis carolinensis	Green anole
Chelydra serpentina	Snapping turtle
Cnemidophorus gularis	Texas spotted whiptail
Cnemidophorus sexlineatus	Six-lined racerunner
Coluber constrictor	Racer
Crotalus atrox	Western diamondback rattlesnake
Crotalus horridus	Timber (canebrake) rattlesnake
Deirochelys reticularia	Chicken turtle
Elaphe obsoleta	Black rat snake
Eumeces fasciatus	Five-lined skink
Eumeces laticeps	Broadhead skink
Eumeces septentrionalis	Prairie skink
Farancia abacura	Mud snake
Gopherus berlandieri	Texas tortoise
Graptemys caglei	Cagle's map turtle
Hemidactylus turcicus	Mediterranean gecko
Heterodon platirhinos	Eastern hognose snake
Kinosternon flavescens	Yellow mud turtle
Kinosternon subrubrum	Eastern mud turtle
Lampropeltis calligaster	Prairie kingsnake
Lampropeltis getula	Common kingsnake
Liochlorophis aestivus	Rough green snake
Malaclemys terrapin littoralis	Texas diamondback terrapin
Masticophis flagellum	Coachwhip
Micrurus fulvius	Eastern coral snake
Nerodia cyclopion	Green water snake
Nerodia erythrogaster	Plainbelly water snake
Nerodia fasciata	Southern water snake
Nerodia rhombifer	Diamondback water snake
Ophisaurus attenuatus	Slender glass lizard
Phrynosoma cornutum	Texas horned lizard
Pseudemys texana	Texas river cooter
Regina grahamii	Graham's crayfish snake
Sceloporus undulatus	Eastern fence lizard
Scincella lateralis	Ground skink
Sistrurus miliarius	Pigmy rattlesnake
Storeria dekayi	Brown snake
Tantilla gracilis	Flathead snake
Terrapene carolina	Eastern box turtle

Table 11 cont'd.

Terrapene ornata	Western box turtle
Thamnophis marcianus	Checkered garter snake
Thamnophis proximus	Western ribbon snake
Trionyx muticus	Smooth softshell
Trionyx spiniferus	Spiny softshell
Virginia striatula	Rough earth snake

Conclusions

Region P has a variety of valuable aquatic, wetland, riparian, and estuarine habitats. The estuary of the Lavaca and Navidad Rivers provides habitats for economically important and ecologically characteristic marine and estuarine animals as well as for freshwater and terrestrial animals. This is true also for the smaller estuarine reach of Garcitas Creek from Lavaca Bay upstream to the Arenosa Creek confluence. The estuarine habitats are in southern Jackson County.

Extensive pecan-elm type bottomland hardwood forests occur along several rivers and streams in Jackson and Wharton Counties. The Lavaca River, Garcitas Creek, Arenosa Creek, West Carancahua Creek, and West Mustang Creek all satisfy at least one of the criteria for ecologically unique river and stream segments. These include: the Lavaca River from the Navidad river confluence upstream about 20 miles; the Navidad River west of Lake Texana; Sandy Creek and its tributaries north of Lake Texana in Jackson County and Wharton Counties; and West and East Carancahua Creeks in southeastern Jackson County. Arenosa Creek on the Western border of Jackson County and West Mustang Creek in Jackson and Wharton Counties have also been identified as ecologically significant stream segments (see Appendix C & D).

Lake Texana, in Jackson County, also supports fringing wetland and bottomland habitats as well as several recreational areas, including Lake Texana State Park, that are economic assets to the region.

The above habitats include 9 sites on the Texana loop of the Great Texana Coastal Birding Trail, all in Jackson County. These are also of high economic value to the region.

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APPENDIX A

Scientific Names of Plants Mentioned
(from McMahan et al. 1984)

APPENDIX A

Scientific Names of Plants Mentioned

American beautyberry	*Callicarpa americana*
Ash, green	*Fraxinus pennsylvanica*
Baccharis	*Baccharis spp.*
Bermudagrass	*Cynodon dactylon*
Bluestem, bushy	*Andropogon glomeratus*
_____, little	*Schizachyrium scoparium var. frequens*
_____, silver	*Bothriochloa saccharoides*
_____, slender	*Schizachyrium tenerum*
Buffalograss	*Buchloe dactyloides*
Bulrush, California	*Scirpus californicus*
_____, Olney's	*S. americanus*
_____, saltmarsh	*S. maritimus*
Coral-berry	*Symphoricarpos orbiculatus*
Cordgrass, Gulf	*Spartina spartinae*
_____, marshhay	*S. patens*
Cottonwood	*Populus deltoides*
Cypress, bald	*Taxodium distichum*
Dewberry	*Rubus spp.*
Elm, American	*Ulmus americana*
___, cedar	*U. crassifolia*
Frostweed	*Verbesina virginica*
Grape, mustang	*Vitis mustangensis*
Greenbriar	*Smilax spp.*
Hackberry	*Celtis spp.*
Hawthorn	*Crataegus spp.*
Hickory, black	*Carya texana*
Huisache	*Acacia farnesiana*
Johnsongrass	*Sorghum halepense*
Lovegrass, sand	*Eragrostis trichodes*
Mesquite	*Prosopis glandulosa*

Oak, blackjack	*Quercus marilandica*
___, live	*Q. virginiana*
___, post	*Q. stellata*
___, sandjack	*Q. incana*
___, water	*Q. nigra*
Panicum, beaked	*Panicum anceps*
Paspalum , brownseed	*Paspalum plicatulum*
_____, seashore	*P. vaginatum*
_____, single-spike	*P. monostachyum*
Pecan	*Carya illinoinensis*
Poison oak	*Rhus toxicodendron*
Ragweed, western	*Ambrosia psilostachya*
Reed, common	*Phragmites australis*
Redcedar, eastern	*Juniperus virginiana*
Rescuegrass	*Bromus unioloides*
Rose, Macartney	*Rosa bracteata*
Smutgrass	*Sporobolus indicus*
Sprangle-grass	*Chasmanthium sessiliflorum*
Supplejack	*Berchemia scandens*
Sycamore	*Platanus occidentalis*
Three-awn	*Aristida spp.*
Tickclover	*Desmondium spp.*
Trumpet creeper	*Campsis radicans*
Virgin's bower	*Clematis virginiana*
Widgeon grass	*Ruppia maritima*
Wildrye, Canada	*Elymus canadensis*
_____, Virginia	*E. virginicus*
Willow, black	*Salix nigra*
Windmillgrass	*Chloris spp.*
Yaupon	*Ilex vomitoria*

APPENDIX B

Estimated Economic Importance of Selected TPWD Facilities
(from Crompton et al. 1998)

LAKE TEXANA STATE RECREATION AREA

JACKSON COUNTY

AVERAGE PARTY SIZE:
Day Visitors = 3.62
Overnight Visitors = 3.41

AVERAGE DISTANCE TRAVELED TO SITE:
Day Visitors = 72.6 Miles
Overnight Visitors = 100.6 Miles

ACTUAL 1997 VISITATION (Fiscal Year):
Day Visitors = 556,092
Overnight Visitors = 58,659

PERCENT OF OUT-OF-COUNTY VISITORS:
Day Visitors = 80.95
Overnight Visitors = 94.43

PER PERSON PER DAY EXPENDITURES

Sector	Day Visitors*			Overnight Visitors			Visitor
	Adjacent	Enroute	Total	Adjacent	Enroute	Total	Average
Transportation	$1.68	$1.88	$3.56	$1.68	$0.45	$2.12	**$2.84**
Food	2.69	1.47	4.17	4.21	0.65	4.86	**4.51**
Lodging	0.31	0.15	0.46	0.04	0.00	0.04	**0.25**
Other	1.01	0.15	1.16	1.07	0.00	1.07	**1.12**
Total	**5.70**	**3.65**	**9.35**	**6.99**	**1.10**	**8.09**	**8.72**

ESTIMATED ANNUAL ECONOMIC IMPACT ON SALES

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$755,125	$755,125	$1,049,171	$92,918	$92,918	$129,100	**$1,178,271**
Food	1,211,854	1,211,854	2,164,249	233,044	233,044	416,194	**2,580,443**
Lodging	140,063	140,063	237,170	2,248	2,248	3,807	**240,976**
Other	456,729	456,729	882,400	59,198	59,198	114,370	**996,770**
Total	**2,563,771**	**2,563,771**	**4,332,989**	**387,408**	**387,408**	**663,471**	**4,996,460**

ESTIMATED ANNUAL ECONOMIC IMPACT ON PERSONAL INCOME

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$755,125	$330,292	$401,047	$92,918	$40,642	$49,349	**$450,396**
Food	1,211,854	354,588	572,601	233,044	68,189	110,113	**682,714**
Lodging	140,063	38,952	62,090	2,248	625	997	**63,087**
Other	456,729	152,410	253,621	59,198	19,754	32,873	**286,494**
Total	**2,563,771**	**876,242**	**1,289,359**	**387,408**	**129,211**	**193,331**	**1,482,691**

ESTIMATED ANNUAL ECONOMIC IMPACT ON EMPLOYMENT

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$755,125	10.62	15.43	$92,918	1.31	1.90	**17.33**
Food	1,211,854	39.56	55.22	233,044	7.61	10.62	**65.84**
Lodging	140,063	3.27	4.88	2,248	0.05	0.08	**4.96**
Other	456,729	20.11	27.36	59,198	2.61	3.55	**30.90**
Total	**2,563,771**	**73.56**	**102.88**	**387,408**	**11.57**	**16.14**	**119.03**

* Average PPPD expenditure data for Texas State Recreation Areas were used.

LAKE TEXANA STATE RECREATION AREA

JACKSON COUNTY

AVERAGE PARTY SIZE:
Day Visitors = 3.62
Overnight Visitors = 3.41

AVERAGE DISTANCE TRAVELED TO SITE:
Day Visitors = 72.6 miles
Overnight Visitors = 100.6 miles

ACTUAL 1997 VISITATION (Fiscal Year):
Day Visitors = 556,092
Overnight Visitors = 58,659

PERCENT OF OUT-OF-COUNTY VISITORS:
Day Visitors = 80.95
Overnight Visitors = 94.43

PER PERSON PER DAY EXPENDITURES

Sector	Day Visitors*			Overnight Visitors			Visitor
	Adjacent	Enroute	Total	Adjacent	Enroute	Total	Average
Transportation	$1.68	$1.88	$3.56	$1.68	$0.45	$2.12	**$2.84**
Food	2.69	1.47	4.17	4.21	0.65	4.86	**4.51**
Lodging	0.31	0.15	0.46	0.04	0.00	0.04	**0.25**
Other	1.01	0.15	1.16	1.07	0.00	1.07	**1.12**
Total	**5.70**	**3.65**	**9.35**	**6.99**	**1.10**	**8.09**	**8.72**

ESTIMATED ANNUAL ECONOMIC SURGE ON SALES (Including Local Visitors)

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$932,829	$932,829	$1,296,072	$98,399	$98,399	$136,715	**$1,432,788**
Food	1,497,040	1,497,040	2,673,563	246,791	246,791	440,743	**3,114,307**
Lodging	173,025	173,025	292,983	2,381	2,381	4,031	**297,014**
Other	564,211	564,211	1,090,056	62,690	62,690	121,116	**1,211,172**
Total	**3,167,104**	**3,167,104**	**5,352,674**	**410,260**	**410,260**	**702,606**	**6,055,280**

ESTIMATED ANNUAL ECONOMIC SURGE ON PERSONAL INCOME (Including Local Visitors)

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$932,829	$408,019	$495,425	$98,399	$43,040	$52,260	**$547,685**
Food	1,497,040	438,034	707,351	246,791	72,211	116,609	**823,960**
Lodging	173,025	48,118	76,702	2,381	662	1,055	**77,757**
Other	564,211	188,277	313,306	62,690	20,920	34,812	**348,118**
Total	**3,167,104**	**1,082,448**	**1,592,785**	**410,260**	**136,832**	**204,735**	**1,797,520**

ESTIMATED ANNUAL ECONOMIC SURGE ON EMPLOYMENT (Including Local Visitors)

Sector	Day Visitors*			Overnight Visitors			Visitor
	Expenditures	Direct Impact	Total Impact	Expenditures	Direct Impact	Total Impact	Total
Transportation	$932,829	13.12	19.06	$98,399	1.38	2.01	**21.07**
Food	1,497,040	48.87	68.22	246,791	8.06	11.25	**79.46**
Lodging	173,025	4.04	6.03	2,381	0.06	0.08	**6.11**
Other	564,211	24.84	33.80	62,690	2.76	3.76	**37.55**
Total	**3,167,104**	**90.87**	**127.10**	**410,260**	**12.26**	**17.09**	**144.19**

* Average PPPD expenditure data for Texas State Recreation Areas were used.

APPENDIX C

TPWD Information Supporting River and Stream Segment Designations

Texas Parks and Wildlife Department Draft List of Texas streams and rivers satisfying at least one of the criteria defined in Senate Bill 1 for ecologically unique river and stream segments.

REGION P (LAVACA)

Arenosa Creek - From the confluence with Garcitas Creek in Jackson/Victoria County upstream to its headwaters along the northern boundary of Victoria County

Aq. Life: Ecoregion Stream[1]; Benthic macroinvertebrates[1,2]

Garcitas Creek - From the confluence with Lavaca Bay in Jackson/Victoria/Calhoun County upstream to the Arenosa Creek confluence in Jackson/Victoria County

Aq. Life: Ecoregion Stream, Dissolved oxygen[1]; Benthic macroinvertebrates[1,2]

End/Threat: One of only a few locales in Texas where Texas palmetto occurs naturally[32]; Diamondback terrapin[32]

Biol. Function: Extensive estuarine wetland habitat

Lavaca River - From the confluence with Lavaca Bay in Calhoun/Jackson County to a point 5.3 miles downstream of US 59 in Jackson County (TNRCC stream segment 1601)

Biol. Function: Extensive freshwater and estuarine wetland habitat[14]

End/Threat: Diamondback terrapin[32]

Hydrologic Function: Forested riparian habitats perform all hydrologic functions

West Carancahua Creek - From the confluence with Carancahua Creek in Jackson County upstream to the FM 111 crossing east of Edna in Jackson County

Aq. Life: Ecoregion Stream, Dissolved oxygen[1]; Benthic macroinvertebrates[1,2]

Hydrologic Function: Forested riparian habitats perform all hydrologic functions

West Mustang Creek - From the point where East Mustang Creek and West Mustang Creek join to form Mustang Creek in Jackson County upstream to FM 1160 in Wharton County

Aq. Life: Ecoregion Stream[1]; Benthic macroinvertebrates[1,2]

REFERENCES

[1] Bayer, C.W., J.R. Davis, S.R. Twidwell, R. Kleinsasser, G. Linam, K. Mayes, and E. Hornig. 1992. Texas aquatic ecoregion project: an assessment of least disturbed streams (draft). Texas Water Commission, Austin, Texas.

[2] Davis, J.R. 1998. Personal communication. Texas Natural Resource Conservation Commission, Austin, Texas.

[14] Bauer J., R. Frye, and B. Spain. 1991. A Natural Resource Survey for Proposed Reservoir Sites and Selected Stream Segments in Texas. Texas Parks and Wildlife Dept., PWD-BK-0300-06 7/91, Austin, Texas

[32] Ortego, B. 1999. Personal communication. Texas Parks and Wildlife Department, Victoria, Texas.

Appendix D

§357.8 Ecologically Unique River and Stream Segments

Title 31. NATURAL RESOURCES AND CONSERVATION

Part X. TEXAS WATER DEVELOPMENT BOARD

Chapter 357. REGIONAL WATER PLANNING GUIDELINES

§ 357.8 Ecologically Unique River and Stream Segments

(a) Regional water planning groups may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment and a site characterization of the stream segment documented by supporting literature and data. The recommendation package shall address each of the criteria for designation of river and stream segments of ecological value found in subsection (b) of this section. The regional water planning group shall forward the recommendation package to the Texas Parks and Wildlife Department and allow the Texas Parks and Wildlife Department 30 days for its written evaluation of the recommendation. The adopted regional water plan shall include, if available, Texas Parks and Wildlife Department's written evaluation of each river and stream segment recommended as a river or stream segment of unique ecological value.

(b) A regional water planning group may recommend a river or stream segment as being of unique ecological value based upon the following criteria:

(1) biological function--stream segments which display significant overall habitat value including both quantity and quality considering the degree of biodiversity, age, and uniqueness observed and including terrestrial, wetland, aquatic, or estuarine habitats;

(2) hydrologic function--stream segments which are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization, or groundwater recharge and discharge;

(3) riparian conservation areas--stream segments which are fringed by significant areas in public ownership including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas, or other areas held by governmental organizations for conservation purposes, or stream segments which are fringed by other areas managed for conservation purposes under a governmentally approved conservation plan;

(4) high water quality/exceptional aquatic life/high aesthetic value--stream segments and spring resources that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on or associated with high water quality; or

(5) threatened or endangered species/unique communities--sites along streams where water development projects would have significant detrimental effects on state or federally listed

threatened and endangered species, and sites along streams significant due to the presence of unique, exemplary, or unusually extensive natural communities.

Source: The provisions of this § 357.8 adopted to be effective March 11, 1998, 23 TexReg 2338.

APPENDIX 9A
SOCIOECONOMIC IMPACTS OF UNMET WATER NEEDS IN LAVACA REGIONAL WATER PLANNING AREA

Socioeconomic Impacts of Unmet Water Needs in Lavaca Regional Water Planning Area

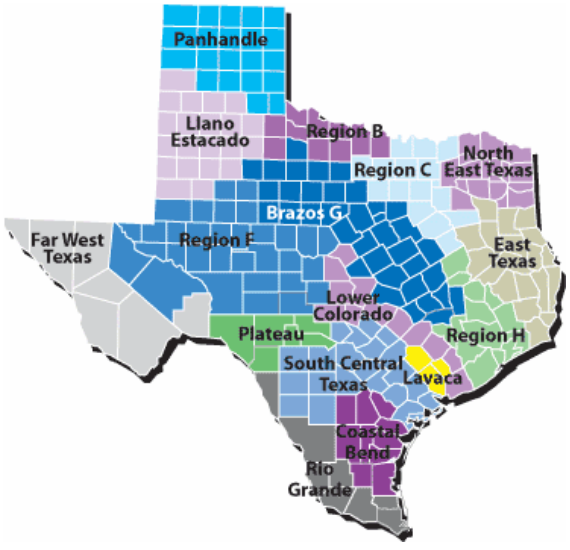
Prepared by:

Stuart Norvell and Kevin Kluge of The Texas Water Development Board's Office of Water Resources Planning

Prepared in support of the:

Lavaca Water Planning Group and the 2006 Texas State Water Plan

May 2005



Tables

Executive Summary

Background

Water shortages due to severe drought combined with infrastructure limitations would likely curtail or eliminate economic activity in business and industries heavily reliant on water. For example, without water farmers cannot irrigate; refineries cannot produce gasoline and paper mills cannot make paper. Unreliable water supplies would not only have an immediate and real impact on business and industry, but they might also bias corporate decision makers against plant expansion or plant location in Texas. From a societal perspective, water supply reliability is critical as well. Shortages would disrupt activity in homes, schools and government and could adversely affect public health and safety. For all of the above reasons, it is important to analyze and understand how restricted water supplies during drought could affect communities throughout the state.

Section 357.7(4) of the rules for implementing Texas Senate Bill 1 requires regional water planning groups to evaluate the social and economic impacts of projected water shortages (i.e., "unmet water needs") as part of the planning process. The rules contain provisions that direct the Texas Water Development Board (TWDB) to provide technical assistance to complete socioeconomic impact assessments. In response to requests from regional planning groups, staff of the TWDB's Office of Water Resources Planning designed and conducted analyses to evaluate socioeconomic impacts of unmet water needs.

Overview of Methodology

Two components make up the overall approach to this study: 1) an economic impact module and 2) a social impact module. Economic analysis addresses potential impacts of unmet water needs including effects on residential water consumers and losses to regional economies stemming from reductions in economic output for agricultural, industrial and commercial water uses. Impacts to agriculture, industry and commercial enterprises were estimated using regional "input-output" models commonly used by researchers to estimate how reductions in business activity might affect a given economy. Estimated impacts are *independent* and distinct "what if" scenarios for a given point in time (i.e., 2010, 2020, 2030, 2040, 2050 and 2060). Reported figures are scenarios that illustrate what could happen in a given year if: 1) water supply infrastructure and/or water management strategies do not change through time, 2) the drought of record recurs. Details regarding the methodology and assumptions for individual water use categories (i.e., municipal consumers including residential and commercial water users, manufacturing, steam-electric, mining, and agriculture) are in the main body of the report.

The social component focuses on demographic effects including changes in population and school enrollment. Methods are based on population projection models developed by the TWDB for regional and state water planning. With the assistance of the Texas State Data Center, TWDB staff modified these models and applied them for use here. Basically, the social impact module incorporates results from the economic impact module and assesses how changes in a region's economy due to water shortages could affect patterns of migration in a region.

Summary of Results

Table E-1 summarizes estimated economic impacts. Variables shown include:

- **sales** - economic output measured by sales revenue;
- **jobs -** number of full and part-time jobs required by a given industry including self-employment;
- **regional income -** total payroll costs (wages and salaries plus benefits) paid by industries, corporate income, rental income and interest payments for the region; and
- **business taxes -** sales, excise, fees, licenses and other taxes paid during normal operation of an industry (does not include any type of income tax).

If drought of record conditions return and water supplies are not developed, study results indicate that rice farmers in Wharton and Jackson County would suffer losses. Annual revenue losses for rice farmers and supporting businesses range from $4.7 million in 2010 to $1.6 million in 2060. Reported figures are probably conservative because they are based on estimated costs for a single year; but in much of Texas, the drought of record lasted several years. For example, potential revenues losses in 2020 amount to $4.4 million. Thus, if shortages lasted for three years total revenues losses could easily approach $15.0 million. Given that unmet needs relative to total regional water demand are small, social impact models do not show significant changes in population or school enrollment in any year.

Table E-1: Annual Economic Impacts of Unmet Water Needs in the Lavaca Regional Water Planning Area (years, 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)

Year	Sales ($millions)	Income ($millions)	Jobs	State and Local Taxes ($millions)
2010	$4.71	$3.25	125	$0.36
2020	$4.35	$3.00	115	$0.33
2030	$3.61	$2.49	95	$0.28
2040	$2.94	$2.03	80	$0.23
2050	$2.33	$1.61	60	$0.18
2060	$1.57	$1.08	40	$0.12

* Source: Texas Water Development Board, Office of Water Resources Planning

Introduction

Texas is one the nation's fastest growing states. From 1950 to 2000, population in the state grew from about 8 million to nearly 21 million. By the year 2050, the total number of people living in Texas is expected to reach 40 million. Rapid growth combined with Texas' susceptibility to severe drought makes water supply a crucial issue. If water infrastructure and water management strategies are not improved, Texas could face serious social, economic and environmental consequences - not only in our large metropolitan cities, but also on our farms and rural areas.

Water shortages due to severe drought combined with infrastructure limitations would likely curtail or eliminate economic activity in business and industries heavily reliant on water. For example, without water farmers cannot irrigate; refineries cannot produce gasoline and paper mills cannot make paper. Unreliable water supplies would not only have an immediate and real impact on business and industry, but they might also bias corporate decision makers against plant expansion or plant location in Texas. From a societal perspective, water supply reliability is critical as well. Shortages would disrupt activity in homes, schools and government and could adversely affect public health and safety. For all of the above reasons, it is important to analyze and understand how restricted water supplies during drought could affect communities throughout the state.

Section 357.7(4) of the rules for implementing Texas Senate Bill 1 requires regional water planning groups to evaluate the social and economic impacts of unmet water needs as part of the planning process. The rules contain provisions that direct the Texas Water Development Board (TWDB) to provide technical assistance to complete socioeconomic impact analyses. In response to requests from regional planning groups, TWDB staff designed and conducted required studies. The following document prepared by the TWDB's Office of Water Resources Planning summarizes analysis and results for the Far West Texas Water Planning Area (Region E). Section 1 provides an overview of concepts and methodologies used in the study. Sections 2 and 3 provide detailed information and analyses for each water use category employed in the planning process (i.e., irrigation, livestock, municipal, manufacturing, mining and steam-electric).

1. Overview of Terms and Methodology

Section 1 provides a general overview of how economic and social impacts were measured. In addition, it summarizes important clarifications, assumptions and limitations of the study.

1.1 Measuring Economic Impacts

Economic analysis as it relates to water resources planning generally falls into two broad areas. Supply side analysis focuses on costs and alternatives of developing new water supplies or implementing programs that provide additional water from current supplies. Demand side analysis concentrates on impacts and benefits of providing water to people, businesses and the environment. Analysis in this report focuses strictly on demand side impacts. Specifically, it addresses the potential economic impacts of unmet water needs including: 1) losses to regional economies stemming from reductions in economic output, and 2) costs to residential water consumers associated with implementing emergency water procurement and conservation programs.

1.1.1 Impacts to Agriculture, Business and Industry

As mentioned earlier, severe water shortages would likely affect the ability of business and industry to operate resulting in lost output, which would adversely affect the regional economy. A variety tools are available to estimate such impacts, but by far, the most widely used today are input-output models (IO models) combined with social accounting matrices (SAMs). Referred to as IO/SAM models, these tools formed the basis for estimating economic impacts for agriculture (irrigation and livestock water uses) and industry (manufacturing, mining, steam-electric and commercial business activity for municipal water uses).

Basically, an IO/SAM model is an accounting framework that traces spending and consumption between different economic sectors including businesses, households, government and "foreign" economies in the form of exports and imports. As an example, Table 1 shows a highly aggregated segment of an IO/SAM model that focuses on key agricultural sectors in a local economy. The table contains transactions data for three agricultural sectors (cattle ranchers, dairies and alfalfa farms). Rows in Table 1 reflect sales from each sector to other local industries and institutions including households, government and consumers outside of the region in the form of exports. Columns in the table show purchases by each sector in the same fashion. For instance, the dairy industry buys $11.62 million worth of goods and services needed to produce milk. Local alfalfa farmers provide $2.11 million worth of hay and local households provide about $1.03 million worth of labor. Dairies import $4.17 million worth of inputs and pay $2.61 million in taxes and profits. Total economic activity in the region amounts to about $807.45 million. The entire table is like an accounting balance sheet where total sales equal total purchases.

Table 1: Example of a County-level Transaction and Social Accounting Matrix for Agricultural Sectors ($millions)

Sectors	Cattle	Dairy	Alfalfa	All other Industries	Taxes, govt. & profits	Households	Exports	Total
Cattle	$3.10	$0.01	$0.00	$0.03	$0.02	$0.06	$10.76	$13.98
Dairy	$0.07	$0.13	$0.00	$0.25	$0.01	$0.00	$11.14	$11.60
Alfalfa	$0.00	$2.11	$0.00	$0.01	$0.02	$0.01	$10.38	$12.53
Other industries	$2.20	$1.56	$2.90	$50.02	$70.64	$66.03	$48.48	$241.83
Taxes, govt. & profits	$2.37	$2.61	$5.10	$77.42	$0.23	$49.43	$83.29	$220.45
Households	$0.82	$1.03	$1.38	$50.94	$45.36	$7.13	$14.64	$121.30
Imports	$5.41	$4.17	$3.16	$63.32	$104.17	$5.53	$0.00	$185.76
Total	$13.97	$11.62	$12.54	$241.99	$220.45	$128.19	$178.69	$807.45

* Columns contain purchases and rows represent sales. Source: Adapted from Harris, T.R., Narayanan, R., Englin, J.E., MacDiarmid, T.R., Stoddard, S.W. and Reid, M.E. "*Economic Linkages of Churchill County.*" University of Nevada Reno. May 1993.

To understand how an IO/SAM model works, first visualize that $1 of additional sales of milk is injected into the dairy industry in Table 1. For every $1 the dairies receive in revenue, they spend 18 cents on alfalfa to feed their cows; nine cents is paid to households who provide farm labor, and another 13 cents goes to the category "other industries" to buy items such as machinery, fuel, transportation, accounting services etc. Nearly 22 cents is paid out in the form of profits (i.e., returns to dairy owners) and taxes/fees to local, state and federal government. The value of the initial $1 of revenue in the dairy sector is referred to as a first-round or **direct effect.**

As the name implies, first-round or direct effects are only part of the story. In the example above, alfalfa farmers must make 18 cents worth of hay to supply the increased demand for their product. To do so, they purchase their own inputs, and thus, they spend part of the original 18 cents that they received from the dairies on firms that support their own operations. For example, 12 cents is spent on fertilizers and other chemicals needed to grow alfalfa. The fertilizer industry in turn would take these 12 cents and spend them on inputs in its production process and so on. The sum of all re-spending is referred to as the **indirect effect** of an initial increase in output in the dairy sector.

While direct and indirect impacts capture how industries respond to a change, **induced impacts** measure the behavior of the labor force. As demand for production increases, employees in base industries and supporting industries will have to work more; or alternatively, businesses will have to hire more people. As employment increases, household spending rises. Thus, seemingly unrelated businesses such as video stores, supermarkets and car dealers also feel the effects of an initial change.

Collectively, indirect and induced effects are referred to as **secondary impacts**. In their entirety, all of the above changes (direct and secondary) are referred to as **total economic impacts**. By nature, total impacts are greater than initial changes because of secondary effects. The magnitude of the increase is what is popularly termed a multiplier effect. Input-output models generate numerical multipliers that estimate indirect and induced effects.

In an IO/SAM model impacts stem from changes in output measured by sales revenue that in turn come from changes in consumer demand. In the case of water shortages, one is not assuming a change in demand, but rather a supply shock – in this case severe drought. Demand for a product such as corn has not necessarily changed during a drought. However, farmers in question lack a crucial input (i.e., irrigation water) for which there is no *short-term* substitute. Without irrigation, she cannot grow irrigated crops. As a result, her cash flows decline or cease all together depending upon the severity of the situation. As cash flows dwindle, the farmer's income falls, and she has to reduce expenditures on farm inputs such as labor. Lower revenues not only affect her operation and her employees directly, but they also indirectly affect businesses who sell her inputs such as fuel, chemicals, seeds, consultant services, fertilizer etc.

The methodology used to estimate regional economic impacts consists of three steps: 1) develop IO/SAM models for each county in the region and for the region as whole, 2) estimate direct impacts to economic sectors resulting from water shortages, and 3) calculate total economic impacts (i.e., direct plus secondary effects).

Step 1*: Generate IO/SAM Models and Develop Economic Baseline*

IO/SAM models were estimated using propriety software known as IMPLAN PRO™ (Impact for Planning Analysis). IMPLAN is a modeling system originally developed by the U.S. Forestry Service in the late 1970s. Today, the Minnesota IMPLAN Group (MIG Inc.) owns the copyright and distributes data and software. It is probably the most widely used economic impact model in existence. IMPLAN comes with databases containing the most recently available economic data from a variety of sources.[1] Using IMPLAN software and data, transaction tables

[1]The basic IMPLAN database consists of national level technology matrices based on the Benchmark Input-Output Accounts generated the U.S. Bureau of Economic Analysis and estimates of final demand, final payments, industry output and employment for various economic sectors. IMPLAN's regional data (i.e. states, a counties or groups of counties within a state) are divided into two basic categories: 1) data on an industry basis including value-added, output and employment and 2) data on a commodity basis including final demands and institutional sales. State-level data are balanced to the national totals using a matrix ratio allocation system and county data are balanced to state totals. In other words, much of the data in IMPLAN is based on a national average for all industries.

conceptually similar to the one discussed previously (see Table 1 on page 9) were estimated for each county in the region and for the region as a whole. Each transaction table contains 528 economic sectors and allows one to estimate a variety of economic statistics including:

- **total sales** - total production measured by sales revenues;
- **intermediate sales** - sales to other businesses and industry within a given region;
- **final sales** – sales to end users in a region and exports out of a region;
- **employment** - number of full and part-time jobs (annual average) required by a given industry including self-employment;
- **regional income** - total payroll costs (wages and salaries plus benefits) paid by industries, corporate income, rental income and interest payments; and
- **business taxes** - sales, excise, fees, licenses and other taxes paid during normal operation of an industry (does not include income taxes).

TWDB analysts developed an economic baseline containing each of the above variables using year 2000 data. Since the planning horizon extends through 2060, economic variables in the baseline were allowed to change in accordance with projected changes in demographic and economic activity. Growth rates for municipal water use sectors (i.e., commercial, residential and institutional) are based on TWDB population forecasts. Projections for manufacturing, agriculture, and mining and steam-electric activity are based on the same underlying economic forecasts used to estimate future water use for each category. Monetary impacts in future years are reported in year 2000 dollars.

It is important to stress that employment, income and business taxes are the most useful variables when comparing the relative contribution of an economic sector to a regional economy. Total sales as reported in IO/SAM models are less desirable and can be misleading because they include sales to other industries in the region for use in the production of other goods. For example, if a mill buys grain from local farmers and uses it to produce feed, sales of both the processed feed and raw corn are counted as "output" in an IO model. Thus, total sales double-count or overstate the true economic value of goods and services produced in an economy. They are not consistent with commonly used measures of output such as Gross National Product (GNP), which counts only final sales.

Another important distinction relates to terminology. Throughout this report, the term *sector* refers to economic subdivisions used in the IMPLAN database and resultant input-output models (528 individual sectors based on Standard Industrial Classification Codes). In contrast, the phrase *water use category* refers to water user groups employed in state and regional water planning including irrigation, livestock, mining, municipal, manufacturing and steam electric. All sectors in the IMPLAN database were assigned to a specific water use category (see Attachment A of this report).

Step 2: *Estimate Direct Economic Impacts of Water Shortages*

As mentioned above, direct impacts accrue to immediate businesses and industries that rely on water. Without water industrial processes could suffer. However, output responses would likely vary depending upon the severity of a shortage. A small shortage relative to total water use may have a nominal effect, but as shortages became more critical, effects on productive capacity would increase.

For example, farmers facing small shortages might fallow marginally productive acreage to save water for more valuable crops. Livestock producers might employ emergency culling strategies, or they may consider hauling water by truck to fill stock tanks. In the case of manufacturing, a good example occurred in the summer of 1999 when Toyota Motor

Manufacturing experienced water shortages at a facility near Georgetown, Kentucky. As water levels in the Kentucky River fell to historic lows due to drought, plant managers sought ways to curtail water use such as reducing rinse operations to a bare minimum and recycling water by funneling it from paint shops to boilers. They even considered trucking in water at a cost of 10 times what they were paying. Fortunately, rains at the end of the summer restored river levels, and Toyota managed to implement cutbacks without affecting production. But it was a close call. If rains had not replenished the river, shortages could have severely reduced output.[2]

Note that the efforts described above are not planned programmatic or long-term operational changes. They are emergency measures that individuals might pursue to alleviate what they consider a temporary condition. Thus, they are not characteristic of long-term management strategies designed to ensure more dependable water supplies such as capital investments in conservation technology or development of new water supplies.

To account for uncertainty regarding the relative magnitude of impacts to farm and business operations, the following analysis employs the concept of elasticity. Elasticity is a number that shows how a change in one variable will affect another. In this case, it measures the relationship between a percentage reduction in water availability and a percentage reduction in output. For example, an elasticity of 1.0 indicates that a 1.0 percent reduction in water availability would result in a 1.0 percent reduction in economic output. An elasticity of 0.50 would indicate that for every 1.0 percent of unavailable water, output is reduced by 0.50 percent and so on. Output elasticities used in this study are:[3]

- if unmet water needs are 0 to 5 percent of total water demand, no corresponding reduction in output is assumed;
- if water shortages are 5 to 30 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 0.25 percent reduction in output;
- if water shortages are 30 to 50 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 0.50 percent reduction in output; and
- if water shortages are greater than 50 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 1.0 percent (i.e., a proportional reduction).

Once output responses to water shortages were estimated, direct impacts to total sales, employment, regional income and business taxes were derived using regional level economic multipliers estimating using IO/SAM models. When calculating direct effects for the municipal, steam electric, manufacturing and livestock water use categories, sales to final demand were applied to avoid double counting impacts. The formula for a given IMPLAN sector is:

$$D_{i,t} = Q_{i,t} *, S_{i,t} * E_Q * RFD_i * DM_{i(Q, L, I, T)}$$

where:

[2] See, Royal, W. "*High And Dry - Industrial Centers Face Water Shortages*." in Industry Week, Sept, 2000.

[3] Elasticities are based on one of the few empirical studies that analyze potential relationships between economic output and water shortages in the United States. The study, conducted in California, showed that a significant number of industries would suffer reduced output during water shortages. Using a survey based approach researchers posed two scenarios to different industries. In the first scenario, they asked how a 15 percent cutback in water supply lasting one year would affect operations. In the second scenario, they asked how a 30 percent reduction lasting one year would affect plant operations. In the case of a 15 percent shortage, reported output elasticities ranged from 0.00 to 0.76 with an average value of 0.25. For a 30 percent shortage, elasticities ranged from 0.00 to 1.39 with average of 0.47. For further information, see, California Urban Water Agencies, "*Cost of Industrial Water Shortages*." Prepared by Spectrum Economics, Inc. November, 1991.

$D_{i,t}$ = direct economic impact to sector *i* in period *t*

$Q_{i,t}$ = total sales for sector *i* in period *t* in an affected county

$RFD_{i,}$ = ratio of final demand to total sales for sector *i* for a given region

$S_{i,t}$ = water shortage as percentage of total water use in period *t*

E_Q = elasticity of output and water use

$DM_{i(L, I, T)}$ = direct output multiplier coefficients for labor (L), income (I) and taxes (T) for sector *i*.

Direct impacts to irrigation and mining are based upon the same formula; however, total sales as opposed to final sales were used. To avoid double counting, secondary impacts in sectors other than irrigation and mining (e.g., manufacturing) were reduced by an amount equal to or less than direct losses to irrigation and mining. In addition, in some instances closely linked sectors were moved from one water use category to another. For example, although meat packers and rice mills are technically manufacturers, in some regions they were reclassified as either livestock or irrigation. All direct effects were estimated at the county level and then summed to arrive at a regional figure. See Section 2 of this report for additional discussion regarding methodology and caveats used when estimating direct impacts for each water use category.

Step 3: *Estimate Secondary and Total Economic Impacts of Water Shortages*

As noted earlier, the effects of reduced output would extend well beyond sectors directly affected. Secondary impacts were derived using the same formula used to estimate direct impacts; however, regional level *indirect* and *induced* multiplier coefficients were applied and only final sales were multiplied.

1.1.2 Impacts Associated with Domestic Water Uses

IO/SAM models are not well suited for measuring impacts of shortages for domestic uses, which make up the majority of the municipal category.[4] To estimate impacts associated with domestic uses, municipal water demand and thus needs were subdivided into two categories – residential and commercial. Residential water is considered "domestic" and includes water that people use in their homes for things such as cooking, bathing, drinking and removing household waste and for outdoor purposes including lawn watering, car-washing and swimming pools. Shortages to residential uses were valued using a tiered approach. In other words, the more severe the shortage, the more costly it becomes. For instance, a 2 acre-foot shortage for a group of households that use 10 acre-feet per year would not be as severe as a shortage that amounted to 8 acre-feet. In the case of a 2 acre-foot shortage, households would probably have to eliminate some or all outdoor water use, which could have implicit and explicit economic costs including losses to the horticultural and landscaping industry. In the case of an 8 acre-foot shortage, people would have to forgo all outdoor water use and most indoor water consumption. Economic costs would be much higher in this case because people could probably not live with such a reduction, and would be forced to find emergency alternatives. The alternative assumed in this study is a very uneconomical and worst-case scenario (i.e., hauling water in from other communities by truck or rail). Section 2.3.3 of this report discusses methodology for municipal uses in greater detail.

[4] A notable exception is the potential impacts to the nursery and landscaping industry that could arise due to reductions in outdoor residential uses and impacts to "water intensive" commercial businesses (see Section 2.3.3).

1.2 Measuring Social Impacts

As the name implies, the effects of water shortages can be social or economic. Distinctions between the two are both semantic and analytical in nature – more so analytic in the sense that social impacts are much harder to measure in quantitative terms. Nevertheless, social effects associated with drought and water shortages usually have close ties to economic impacts. For example, they might include:

- demographic effects such as changes in population,
- disruptions in institutional settings including activity in schools and government,
- conflicts between water users such as farmers and urban consumers,
- health-related low-flow problems (e.g., cross-connection contamination, diminished sewage flows, increased pollutant concentrations),
- mental and physical stress (e.g., anxiety, depression, domestic violence),
- public safety issues from forest and range fires and reduced fire fighting capability,
- increased disease caused by wildlife concentrations,
- loss of aesthetic and property values, and
- reduced recreational opportunities.[5]

Social impacts measured in this study focus strictly on demographic effects including changes in population and school enrollment. Methods are based on models used by the TWDB for state water planning and by the U.S. Census Bureau for national level population projections. With the assistance of the Texas State Data Center (TSDC), TWDB staff modified population projection models used for state water planning and applied them here. Basically, the social impact model incorporates results from the economic component of the study and assesses how changes in labor demand due to unmet water needs could affect migration patterns in a region. Before discussing particulars of the approach model, some background information regarding population projection models is useful in understanding the overall approach.

1.2.1 Overview of Demographic Projection Models

More often than not, population projections are reported as a single number that represents the size of an overall population. While useful in many cases, a single number says nothing about the composition of projected populations, which is critical to public officials who must make decisions regarding future spending on public services. For example, will a population in the future have more elderly people relative to today, or will it have more children? More children might mean that more schools are needed. Conversely, a population with a greater percentage of elderly people may need additional healthcare facilities. When projecting future populations, cohort-survival models break down a population into groups (i.e., cohorts) based on factors such as age, sex and race. Once a population is separated into cohorts, one can estimate the magnitude and composition of future population changes.

Changes in a population's size and makeup in survival cohort models are driven by three factors:

[5] Based on information from the website of the National Drought Mitigation Center at the University of Nebraska Lincoln. Available online at: http://www.drought.unl.edu/risk/impacts.htm. See also, Vanclay, F. "*Social Impact Assessment*." in Petts, J. (ed) International Handbook of Environmental Impact Assessment. 1999.

1. *Births:* Obviously, more babies mean more people. However, only certain groups in a population are physically capable of bearing children– typically women between the ages of 13 and 49. The U.S. Census Bureau and the TSDC continually updates fertility rates for different cohorts. For each race/ethnicity category, birth rates decline and then stabilize in the future.

2. *Deaths:* When people die, populations shrink. Unlike giving birth, however, everyone is capable of dying and mortality rates are applied to all cohorts in a given population. Hence their name, cohort-survival models use survival rates as opposed to mortality rates. A survival rate is simply the probability that a given person with certain attributes (i.e., race, age and sex) will survive over a given period of time.

3. *Migration*: Migration is the movement of people in or out of a region. Migration rates used to project future changes in a region are usually based on historic population data. When analyzing historic data, losses or increases that are not attributed to births or deaths are assumed to be the result of migration. Migration can be further broken down into changes resulting from economic and non-economic factors. Economic migrants include workers and their families that relocate because of job losses (or gains), while non-economic migrants move due to lifestyles choices (e.g., retirees fleeing winter cold in the nation's heartland and moving to Texas).

In summary, knowledge of a population's composition in terms of age, sex and race combined with information regarding birth and survival rates, and migratory patterns, allows a great deal of flexibility and realism when estimating future populations. For example, an analyst can isolate population changes due to deaths and births from changes due to people moving in and out of a region. Or perhaps, one could analyze how potential changes in medical technology would affect population by reducing death rates among certain cohorts. Lastly, one could assess how changes in *economic conditions* might affect a regional population

1.2.2 Methodology for Social Impacts

Two components make up the model. The first component projects populations for a given year based on the following six steps:

1) *Separate "special" populations from the "general" population of a region:* The general population of a region includes the portion subject to rates of survival, fertility, economic migration and non-economic migration. In other words, they live, die, have children and can move in and out of a region freely. "Special populations," on the other hand, include college students, prisoners and military personnel. Special populations are treated differently than the general population. For example, fertility rates are not applied to prisoners because in general inmates at correctional facilities do not have children, and they are incapable of freely migrating or out of a region. Projections for special populations were compiled by the TSDC using data from the Higher Education Coordinating Board, the Texas Department of Criminal Justice and the U.S. Department of Defense. Starting from the 2000 Census, general and special populations were broken down into the following cohorts:

- age cohorts ranging from age zero to 75 and older,
- race/ethnicity cohorts, including Anglo, Black, Hispanic and "other," and
- gender cohorts (male and female).

2) *Apply survival and fertility rates to the general population* : Survival and fertility rates were compiled by the TSDC with data from the Texas Department of Health (TDH). Natural decreases (i.e., deaths) are estimated by applying survival rates to each cohort and then subtracting estimated deaths from the total population. Birth rates were then applied to females in each age

and race cohort in general and special populations (college and military only) to arrive at a total figure for new births.

3) *Estimate economic migration based on labor supply and demand*: TSDC year 2000 labor supply estimates include all non-disabled and non-incarcerated civilians between the ages of 16 and 65. Thus, prisoners are not included. Labor supply for years beyond 2001 was calculated by converting year 2000 data to rates according to cohort and applying these rates to future years. Projected labor demand was estimated based on historical employment rates. Differences between total labor supply and labor demand determines the amount of in or out migration in a region. If supply is greater than demand, there is an out-migration of labor. Conversely, if demand is greater than supply, there is an in-migration of labor. The number of migrants does not necessarily reflect total population changes because some migrants have families. To estimate how many people might accompany workers, a migrant worker profile was developed based on the U.S. Census Bureau's Public Use Microdata Samples (PUMs) data. Migrant profiles estimate the number of additional family members, by age and gender that accompany migrating workers. Together, workers and their families constitute economic migration for a given year.

4) *Estimate non-economic migration*: As noted previously, migration patterns of individuals age 65 and older are generally independent of economic conditions. Retirees usually do not work, and when they relocate, it is primarily because of lifestyle preferences. Migratory patterns for people age 65 or older are based on historical PUMs data from the U.S. Census.

5) *Calculate ending population for a given year*: The total year-ending population is estimated by adding together: 1) surviving population from the previous year, 2) new births, 3) net economic migration, 4) net non-economic migration and 5) special populations. This figure serves as the baseline population for the next year and the process repeats itself.

The second component of the social impact model is identical to the first and includes the five steps listed above for each year where water shortages are reported (i.e., 2010, 2020, 2030, 2040, 2050 and 2060). The only difference is that labor demand changes in years with shortages. Shifts in labor demand stem from employment impacts estimated as part of the economic analysis component of this study with some slight modifications. IMPLAN employment data is based on the number of full and part-time jobs as opposed to the number of people working. To remedy discrepancies, employment impacts from IMPLAN were adjusted to reflect the number of people employed by using simple ratios (i.e., labor supply divided by number of jobs) at the county level. Declines in labor demand as measured using adjusted IMPLAN data are assumed to affect net economic migration in a given regional water planning area. Employment losses are adjusted to reflect the notion that some people would not relocate but would seek employment in the region and/or public assistance and wait for conditions to improve. Changes in school enrollment are simply the proportion of lost population between the ages of 5 and 17.

1.3 Clarifications, Assumptions and Limitations of Analysis

As with any attempt to measure and quantify human activities at a societal level, assumptions are necessary and every model has limitations. Assumptions are needed to maintain a level of generality and simplicity such that models can be applied on several geographic levels and across different economic sectors. In terms of the general approach used here several clarifications and cautions are warranted:

1) While useful for planning purposes, this study is not a benefit-cost analysis (BCA). BCA is a tool widely used to evaluate the economic feasibility of specific policies or projects as

opposed to estimating economic impacts of unmet water needs. Nevertheless, one could include some impacts measured in this study as part of a BCA if done so properly.

2) Since this is not a BCA, future impacts are not weighted differently. In other words, estimates are not "discounted." If used as a measure of benefits in a BCA, one must consider the uncertainty of estimated monetary impacts.

3) All monetary figures are reported in constant year 2000 dollars.

4) Shortages reported by regional planning groups are the starting point for socioeconomic analyses. No adjustments or assumptions regarding the magnitude or distributions of unmet needs among different water use categories are incorporated in the analysis.

5) Estimated impacts are point estimates for years in which needs are reported (i.e., 2010, 2020, 2030, 2040, 2050 and 2060).They are independent and distinct "what if" scenarios for each particular year and water shortages are assumed to be temporary events resulting from severe drought conditions combined with infrastructure limitations. In other words, growth occurs and future shocks are imposed on an economy at 10-year intervals and resultant impacts are measured. Given, that reported figures are not cumulative in nature, it is inappropriate to sum impacts over the entire planning horizon. Doing so, would imply that the analysis predicts that drought of record conditions will occur every ten years in the future, which is not the case. Similarly, authors of this report recognize that in many communities needs are driven by population growth, and in the future total population will exceed the amount of water available due to infrastructure limitations, *regardless of whether or not there is a drought*. This implies that infrastructure limitations would constrain economic growth. However, since needs as defined by planning rules are based upon water supply and demand under the assumption of drought of record conditions, it improper to conduct economic analysis that focuses on growth related impacts over the planning horizon. Figures generated from such an analysis would presume a 50-year drought of record, which is unrealistic. Estimating lost economic activity related to constraints on population and commercial growth due to lack of water would require developing water supply and demand forecasts under "normal" or "most likely" future climatic conditions. *It is critical to stress that this is a modeling assumption necessary to maintain consistency with planning criteria, which states that water availability be evaluated assuming drought of record conditions. Analysis in this report does not predict that the drought of record will recur, nor does it predict or imply that growth will or should occur as projected.*

6) IO multipliers measure the strength of backward linkages to supporting industries (i.e., those who sell inputs to an affected sector). However, multipliers say nothing about forward linkages consisting of businesses that purchase goods from an affected sector for further processing. For example, ranchers in many areas sell most of their animals to local meat packers who process animals into a form that consumers ultimately see in grocery stores and restaurants. Multipliers do not capture forward linkages to meat packers, and since meat packers sell livestock purchased from ranchers as "final sales," multipliers for the ranching sector do fully account for all losses to a region's economy. Thus, as mentioned previously, in some cases closely linked sectors were moved from on water use category to another.

7) Cautions regarding interpretations of direct and secondary impacts are warranted. IO/SAM multipliers are based on "fixed-proportion production functions," which basically means that input use - including labor - moves in lockstep fashion with changes in levels of output. In a scenario where output (i.e., sales) declines, losses in the immediate sector or supporting sectors could be much less than predicted by an IO/SAM model for several reasons. For one, businesses will likely expect to continue operating so they might maintain spending on inputs for future use; or they may be under contractual obligations to purchase inputs for an extended period regardless of external conditions. Also,

employers may not lay-off workers given that experienced labor is sometimes scarce and skilled personnel may not be readily available when water shortages subside. Lastly people who lose jobs might find other employment in the region. As a result, direct losses for employment and secondary losses in sales and employment should be considered an *upper bound*. Similarly, since population projections are based on reduced employment in the region, they should be considered an upper bound as well.

8) IO models are static in nature. Models and resultant multipliers are based upon the structure of the U.S. and regional economies in the year 2000. In contrast, unmet water needs are projected to occur well into the future (i.e., 2010 through 2060). Thus, the analysis assumes that the general structure of the economy remains the same over the planning horizon.

9) With respect to municipal needs, an important assumption is that people would eliminate all outdoor water use before indoor water uses were affected, and people would implement emergency indoor water conservation measures before commercial businesses had to curtail operations, and households had to seek alternative sources of water. Section 2.3.3 discusses this in greater detail.

10) Impacts are annual estimates. If one were to assume that conditions persisted for more than one year, figures should be adjusted to reflect the extended duration. The drought of record in Texas for many communities lasted several years.

2. Economic Impacts

Part 2 of this report summarizes economic analysis for each water use category. Section 2.1 presents the year 2000 economic baseline for the Lavaca Regional Water Planning Area (LRWPA). Section 2.2 presents results for agricultural water uses including livestock and irrigated crop production, while Section 2.3 reviews impacts to municipal and industrial water uses including manufacturing, mining, steam-electric and municipal demands.

2.1 Economic Baseline

Table 2 summarizes baseline economic variables for the LRWPA. In year 2000, the region produced $1.4 billion in output that generated nearly $640 million worth of income for regional residents. Economic activity supported an estimated 17,488 full and part-time jobs. Business and industry also generated about $47 million in state and local taxes.

Table 2: Year 2000 Economic Baseline (monetary figures reported in $millions)						
	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Irrigation	$6.97	$0.07	$6.90	358	$4.56	$0.44
% of Total	< 1%	< 1%	1%	2%	1%	1%
Livestock	$72.61	$14.44	$58.17	1,855	$33.01	$1.46
% of Total	5%	5%	5%	11%	5%	3%
Manufacturing	$521.13	$17.17	$503.96	3,929	$158.60	$3.93
% of Total	37%	6%	45%	22%	25%	8%
Mining	$44.20	$13.66	$30.53	87	$20.38	$2.39
% of Total	3%	5%	3%	0%	3%	5%
Steam Electric	$10.03	$2.77	$7.26	27	$7.17	$1.28
% of Total	1%	1%	1%	< 1%	1%	3%
Municipal	$745.07	$236.06	$509.02	11,230	$416.83	$37.36
% of Total	53%	83%	46%	64%	65%	80%
Total	$1,400.01	$284.17	$1,115.84	17,488	$640.54	$46.98
% of Total	100%	100%	100%	100%	100%	100%
Figures are rounded. Source: Generated using IMPLAN models and data from MIG, Inc.						

2.2 Irrigation

The first step in estimating impacts to irrigation required calculating gross sales for IMPLAN crop sectors. Default IMPLAN data do not distinguish irrigated production from dry-land production. Once gross sales were known other statistics such as employment and income were derived using IMPLAN direct multiplier coefficients. Gross sales for a given crop are based on two data sources:

1) county-level statistics collected and maintained by the TWDB and the USDA Natural Resources Conservation Service (NRCS) including the number of irrigated acres by crop type and water application per acre, and

2) regional-level data published by the Texas Agricultural Statistics Service (TASS) including prices received for crops (marketing year averages), crop yields and crop acreages.

Table 4 summarizes irrigated acreage and estimated annual water use for each crop classification (year 2000). As shown in Table 5, rice is the primary irrigated crop in the LRWPA. Total output in 2000 amounted to $6.7 million.

Table 3: Crop Classifications Used in TWDB Water Use Survey and Corresponding IMPLAN Crop Sectors Applied in Socioeconomic Impact Analysis	
IMPLAN Sector	TWDB Sector
Cotton	Cotton
Feed Grains	Corn, sorghum and “forage crops”
Food Grains	Rice, wheat and "other grains"
Fruits	Citrus
Hay and Pasture	Alfalfa and “other hay and pasture”
Oil Crops	Peanuts, soybeans and “other oil crops”
Sugar Crops	Sugarbeets and sugarcane
Tree Nuts	Pecans
Vegetables *	Deep-rooted vegetables, shallow-rooted vegetables and potatoes
Other Crops	"All other crops" "other orchards" and vineyards
* includes melons.	

Table 4. Summary of Irrigated Crop Acreage and Water Demand (Year 2000)				
Sector	Acres (1000s)	Distribution of Acres	Water Use (1000s of AF)	Distribution of Water Use
Rice	16,786	97%	49,636	99%
Source: Water demand figures are taken from the Texas Water Development Board 2006 Water Plan Projections data for year 2000. Statistics for irrigated crop acreage are based upon annual survey data collected by the TWDB and the National Resources Conservation Service (USDA).				

Table 5: Direct Economic Activity Associated with Irrigated Crop Production (Year 2000).						
	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Sales	Final			
Rice	$6.76	$0.06	$6.70	355	$4.39	$0.43
Other	$0.21	$0.01	$0.20	3	$0.17	$0.01
Total	$6.97	$0.07	$6.90	358	$4.56	$0.44
Dollar figures are rounded. Source: Generated using IMPLAN models and data from MIG, Inc, and the Texas Agricultural Statistics Service.						

The LRWPA 2006 Water Plan indicates that under drought of record conditions, shortages to irrigation would occur in Wharton and Jackson counties. Table 6 summarizes estimated impacts in both counties. Attachment B of this report shows estimates at the county level.

Table 6: Annual Economic Impacts of Unmet Water Needs for Irrigation in the LRWPA (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)				
Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$4.71	$3.25	125	$0.36
2020	$4.35	$3.00	115	$0.33
2030	$3.61	$2.49	95	$0.28
2040	$2.94	$2.03	80	$0.23
2050	$2.33	$1.61	60	$0.18
2060	$1.57	$1.08	40	$0.12
Source: Based on economic impact models developed by the Texas Water Development Board, Office of Water Planning.				

2.3 Livestock

No shortages for livestock water uses were reported for the LRWPA.

2.4 Municipal and Industrial

No shortages for manufacturing, mining, municipal or steam-electric water uses were reported for the LRWPA.

3. Regional Social Impacts

Given that unmet needs relative to total water demand are small, social impact models do not show significant changes in population or school enrollment in any year.

Attachment A: Baseline Regional Economic Data

Tables A-1 through A-6 contain data from several sources that form a basis of analyses in this report. Economic statistics were extracted and processed via databases purchased from MIG, Inc. using IMPLAN Pro™ software. Values for gallons per employee (i.e. GED coefficients) for the municipal water use category are based on several secondary sources.[6] County-level data sets along with multipliers are not included given their large sizes (i.e., 528 sectors per county each with 12 different multiplier coefficients). Fields in Tables A-1 through A-6 contain the following variables:

- *GED* - average gallons of water use per employee per day (municipal use only);
- *total sales* - total industry production measured in millions of dollars (equal to shipments plus net additions to inventories);
- *intermediate sales* - sales to other industries in the region measured in millions of dollars;
- *final sales* - all sales to end-users including sales to households in the region and exports out of the region;
- *jobs* - number of full and part-time jobs (annual average) required by a given industry;
- *regional income* - total payroll costs (wages and salaries plus benefits), proprietor income, corporate income, rental income and interest payments; and
- *business taxes* - sales taxes, excise taxes, fees, licenses and other taxes paid during normal business operations (includes all payments to federal, state and local government except income taxes).

[6] Sources for GED coefficients include: Gleick, P.H., Haasz, D., Henges-Jeck, C., Srinivasan, V., Wolff, G. Cushing, K.K., and Mann, A. "*Waste Not, Want Not*: *The Potential for Urban Water Conservation in California*." Pacific Institute. November 2003. U.S. Bureau of the Census. 1982 Census of Manufacturers: Water Use in Manufacturing. USGPO, Washington D.C. See also: "*U.S. Army Engineer Institute for Water Resources, IWR Report 88-R-6*.," Fort Belvoir, VA. See also, Joseph, E. S., 1982, "*Municipal and Industrial Water Demands of the Western United States*." Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, v. 108, no. WR2, p. 204-216. See also, Baumann, D. D., Boland, J. J., and Sims, J. H., 1981, "*Evaluation of Water Conservation for Municipal and Industrial Water Supply*." U.S. Army Corps of Engineers, Institute for Water Resources, Contract no. 82-C1.

Table A-1: Baseline Economic Data for Predominant Irrigated Crops in rhe LRWPA (Year 2000)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Rice	$6.76	$0.06	$6.70	355	$4.39	$0.43
Cotton	$0.21	$0.01	$0.20	3	$0.17	$0.01
Total	$6.97	$0.07	$6.90	358	$4.56	$0.44

Table A-2: Baseline Economic Data for Livestock Sectors, the LRWPA (Year 2000)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Cattle Feedlots	$1.22	$1.19	$0.03	8	$1.07	$0.09
Dairy Farm Products	$2.69	$0.01	$2.68	49	$2.56	$0.02
Hogs, Pigs and Swine	$0.76	$0.75	$0.01	35	$0.49	$0.06
Miscellaneous Livestock	$0.90	$0.04	$0.85	118	$0.61	$0.01
Poultry and Eggs	$16.96	$0.28	$16.68	291	$10.62	$0.18
Ranch Fed Cattle	$16.30	$6.17	$10.13	878	$10.78	$0.77
Range Fed Cattle	$7.19	$2.98	$4.22	401	$5.15	$0.33
Sheep, Lambs and Goats	$0.02	$0.01	$0.00	4	$0.01	$0.00
Total	$46.04	$11.43	$34.61	1,784	$31.30	$1.46

* Baseline data in Table 2 in the main body of this report included the meat-packing sector, which is classified as “manufacturing” in this appendix.

Table A-3: Baseline Economic Data for Manufacturing Sectors, the LRWPA (Year 2000)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Apparel	$32.39	$0.79	$31.60	330	$6.05	$0.10
Bags, Plastic	$4.11	$0.04	$4.07	21	$1.23	$0.04
Bottled and Canned Soft Drinks & Water	$49.80	$0.07	$49.73	161	$7.23	$0.26
Chemical Preparations, N.E.C	$0.28	$0.19	$0.09	1	$0.10	$0.00
Commercial Fishing	$0.30	$0.02	$0.28	13	$0.27	$0.01
Commercial Printing	$0.40	$0.23	$0.17	4	$0.09	$0.00
Concrete Products, N.E.C	$0.35	$0.00	$0.35	3	$0.11	$0.00
Cottonseed Oil Mills	$1.69	$0.15	$1.53	5	$0.12	$0.01
Fabricated Plate Work (Boiler Shops)	$0.27	$0.00	$0.27	3	$0.15	$0.00
Fabricated Structural Metal	$41.31	$0.54	$40.78	275	$13.96	$0.36
Forest Products	$0.25	$0.01	$0.25	12	$0.20	$0.01
Glass and Glass Products	$0.37	$0.30	$0.07	4	$0.14	$0.00
Greenhouse and Nursery Products	$1.01	$0.30	$0.71	25	$0.95	$0.01
Industrial Machines N.E.C.	$3.77	$0.04	$3.73	32	$1.81	$0.04
Industrial Patterns	$0.32	$0.00	$0.32	6	$0.16	$0.00
Industrial Trucks and Tractors	$0.57	$0.05	$0.52	4	$0.09	$0.00
Instruments To Measure Electricity	$2.40	$0.08	$2.32	13	$0.69	$0.02
Leather Goods, N.E.C	$9.02	$0.21	$8.80	264	$6.83	$0.06
Malt Beverages	$2.37	$0.00	$2.37	8	$0.77	$0.43
Meat Packing Plants	$26.57	$3.01	$23.56	72	$1.71	$0.12
Millwork	$11.80	$1.63	$10.16	127	$3.80	$0.09
Miscellaneous Fabricated Wire Products	$35.13	$2.63	$32.50	440	$10.68	$0.20
Miscellaneous Plastics Products	$280.35	$4.40	$275.95	1,592	$81.42	$1.91
Newspapers	$5.25	$3.68	$1.57	69	$2.31	$0.05
Oil Field Machinery	$0.31	$0.04	$0.26	3	$0.09	$0.00
Plating and Polishing	$17.48	$0.62	$16.85	373	$14.03	$0.17
Prefabricated Metal Buildings	$4.89	$0.04	$4.85	39	$2.10	$0.04
Sausages and Other Prepared Meats	$8.55	$0.46	$8.09	41	$1.14	$0.04
Secondary Nonferrous Metals	$1.68	$0.02	$1.66	5	$0.20	$0.01
Sheet Metal Work	$2.08	$0.04	$2.05	17	$0.76	$0.02
Special Dies and Tools and Accessories	$2.66	$0.60	$2.06	39	$1.11	$0.02
Total	$547.70	$20.18	$527.52	4,001	$160.30	$4.05

NEC = not elsewhere classified. “na” = not available.

Table A-3: Baseline Economic Data for Municipal Sectors, the LRWPA (Year 2000)

Sector	GED	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Accounting, Auditing and Bookkeeping	120	$18.69	$6.36	$12.34	306	$14.73	$0.17
Agricultural, Forestry, Fishery Services	-	$3.44	$1.79	$1.65	129	$2.06	$0.09
Air Transportation	171	$0.22	$0.08	$0.14	2	$0.11	$0.02
Amusement and Recreation Services	427	$0.87	$0.00	$0.87	27	$0.51	$0.05
Apparel & Accessory Stores	68	$0.42	$0.02	$0.40	12	$0.23	$0.07
Arrangement Of Passenger	130	$0.92	$0.10	$0.82	5	$0.63	$0.03
Automobile Rental and Leasing	147	$0.41	$0.27	$0.14	3	$0.24	$0.03
Automobile Repair and Services	55	$7.56	$2.20	$5.36	118	$3.58	$0.32
Automotive Dealers & Service Stations	49	$18.42	$3.15	$15.27	278	$10.98	$2.85
Banking	59	$51.60	$13.53	$38.07	249	$33.34	$0.83
Beauty and Barber Shops	216	$0.73	$0.03	$0.70	39	$0.42	$0.01
Building Materials & Gardening	35	$3.45	$0.40	$3.06	101	$2.46	$0.57
Business Associations	160	$2.60	$0.58	$2.01	75	$1.67	$0.00
Child Day Care Services	120	$3.01	$0.00	$3.01	82	$0.80	$0.02
Colleges, Universities, Schools	75	$0.03	$0.00	$0.03	1	$0.02	$0.00
Communications, Except Radio and TV	47	$24.72	$8.94	$15.79	111	$12.21	$1.30
Computer and Data Processing Services	40	$1.11	$0.88	$0.23	16	$0.90	$0.02
Credit Agencies	156	$13.50	$7.11	$6.39	402	$6.90	$0.45
Doctors and Dentists	203	$10.08	$0.00	$10.08	141	$6.24	$0.12
Domestic Services	-	$2.87	$2.87	$0.00	401	$2.90	$0.00
Eating & Drinking	157	$17.24	$1.13	$16.12	556	$7.28	$1.02
Electrical Repair Service	37	$0.91	$0.34	$0.57	13	$0.34	$0.03
Elementary and Secondary Schools	169	$0.02	$0.00	$0.02	1	$0.01	$0.00
Engineering, Architectural Services	87	$7.37	$6.33	$1.04	85	$3.04	$0.04
Equipment Rental and Leasing	29	$0.90	$0.67	$0.22	14	$0.19	$0.01
Federal Government - Military	-	$2.51	$2.51	$0.00	88	$2.51	$0.00
Federal Government - Non-Military	-	$3.04	$3.04	$0.00	52	$3.04	$0.00
Food Stores	98	$15.12	$0.44	$14.68	512	$11.33	$2.42
Funeral Service and Crematories	111	$1.69	$0.00	$1.69	54	$1.12	$0.05
Furniture & Home Furnishings Stores	42	$2.34	$0.21	$2.13	77	$1.52	$0.37
Gas Production and Distribution	51	$22.46	$6.55	$15.91	23	$5.45	$1.51
General Merchandise Stores	47	$6.67	$0.24	$6.44	231	$4.20	$1.06
Hotels and Lodging Places	230	$1.29	$0.54	$0.75	32	$0.66	$0.08
Insurance Agents and Brokers	89	$3.23	$0.84	$2.39	89	$2.51	$0.03
Insurance Carriers	136	$3.31	$0.29	$3.02	35	$1.60	$0.16
Labor and Civic Organizations	122	$2.33	$0.01	$2.32	197	$1.59	$0.00
Landscape and Horticultural Services	-	$2.06	$1.54	$0.52	122	$1.17	$0.05
Laundry, Cleaning and Shoe Repair	517	$2.20	$0.41	$1.79	120	$1.62	$0.06
Legal Services	76	$3.47	$1.08	$2.39	56	$2.67	$0.03
Local, Interurban Passenger Transit	68	$0.64	$0.09	$0.54	13	$0.40	$0.01
Maintenance and Repair Oil and Gas	25	$13.68	$2.37	$11.31	137	$7.90	$0.54
Maintenance and Repair Other Facilities	25	$16.54	$8.41	$8.13	307	$11.11	$0.07
Maintenance and Repair, Residential	25	$12.54	$3.49	$9.05	97	$3.26	$0.04
Management and Consulting Services	87	$8.28	$6.17	$2.10	52	$5.60	$0.07
Membership Sports and Recreation	427	$0.28	$0.01	$0.27	10	$0.15	$0.01
Miscellaneous Personal Services	129	$0.66	$0.04	$0.62	11	$0.14	$0.01
Miscellaneous Repair Shops	124	$2.41	$1.65	$0.75	35	$1.12	$0.07
Miscellaneous Retail	132	$10.79	$0.72	$10.07	322	$6.77	$1.65
Motion Pictures	113	$2.58	$1.12	$1.46	40	$0.59	$0.02
Motor Freight Transport and	85	$27.39	$20.09	$7.30	225	$12.54	$0.39
New Government Facilities	63	$21.18	$0.00	$21.18	147	$7.53	$0.12
New Highways and Streets	45	$5.18	$0.00	$5.18	50	$1.85	$0.03
New Industrial and Commercial	63	$20.50	$0.00	$20.50	184	$6.69	$0.14
New Mineral Extraction Facilities	63	$12.84	$0.15	$12.69	217	$7.66	$0.62
New Residential Structures	35	$39.76	$0.00	$39.76	262	$6.81	$0.23
New Utility Structures	63	$8.84	$0.00	$8.84	90	$3.39	$0.04
Nursing and Protective Care	197	$20.99	$0.00	$20.99	696	$15.14	$0.51
Other Business Services	84	$10.53	$10.20	$0.33	110	$4.16	$0.15
Other Educational Services	116	$0.28	$0.06	$0.22	7	$0.08	$0.01
Other Medical and Health Services	168	$8.28	$0.28	$8.01	180	$4.27	$0.13
Other Nonprofit Organizations	122	$5.41	$0.06	$5.35	208	$2.94	$0.04
Other State and Local Govt Enterprises	-	$15.57	$4.24	$11.33	90	$4.50	$0.00
Owner-occupied Dwellings	89	$70.56	$0.00	$70.56	0	$44.30	$9.15
Personnel Supply Services	484	$0.16	$0.13	$0.02	16	$0.15	$0.00
Portrait and Photographic Studios	184	$0.34	$0.02	$0.32	7	$0.18	$0.01
Radio and TV Broadcasting	64	$0.95	$0.84	$0.10	6	$0.38	$0.01
Railroads and Related Services	68	$3.64	$2.36	$1.28	32	$1.01	$0.05
Real Estate	89	$20.26	$7.87	$12.39	123	$12.01	$2.40
Residential Care	111	$0.21	$0.00	$0.21	10	$0.11	$0.00
Sanitary Services and Steam Supply	51	$0.62	$0.45	$0.17	3	$0.26	$0.11
Security and Commodity Brokers	59	$2.15	$1.38	$0.76	19	$0.09	$0.03
Services To Buildings	67	$5.76	$2.16	$3.60	122	$2.97	$0.12
State & Local Government - Education	-	$29.98	$29.98	$0.00	1,003	$29.98	$0.00
State & Local Government - Non-	-	$27.52	$27.52	$0.00	817	$27.52	$0.00

Table A-3: Baseline Economic Data for Municipal Sectors, the LRWPA (Year 2000)

State and Local Electric Utilities	-	$1.55	$0.43	$1.13	4	$0.50	$0.00
Theatrical Producers, Bands Etc.	36	$0.24	$0.10	$0.14	4	$0.07	$0.01
Transportation Services	40	$1.18	$0.85	$0.34	11	$0.88	$0.01
U.S. Postal Service	-	$4.91	$1.98	$2.93	74	$3.44	$0.00
Watch, Clock, Jewelry and Furniture	50	$0.22	$0.00	$0.22	3	$0.09	$0.01
Wholesale Trade	43	$46.87	$26.37	$20.51	632	$25.57	$6.65
Total	na	$745.07	$236.06	$509.02	11,230	$416.83	$37.36

NEC = not elsewhere classified. "na" = not available.

Table A-5: Baseline Economic Data for Mining Sectors, the LRWPA (Year 2000)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Dimension Stone	$0.03	$0.00	$0.03	1	$0.02	$0.00
Natural Gas & Crude Petroleum	$44.15	$13.66	$30.49	85	$20.35	$2.39
Sand and Gravel	$0.02	$0.00	$0.02	1	$0.01	$0.00
Total	$44.20	$13.66	$30.53	87	$20.38	$2.39

Table A-6: Baseline Economic Data for the Steam Electric Sector, the LRWPA (Year 2000)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Electric Services	$10.03	$2.77	$7.26	27	$7.17	$1.28

na = "not available"

Attachment B: Distribution of Economic Impacts at the County Level

Table B-1 shows economic impacts by county; however, **caution** is warranted. Figures shown for specific counties are *direct* impacts only. For the most part, figures reported in the main text for all water use categories uses include *direct and secondary* impacts. Secondary effects were estimated using regional level multipliers that treat each regional water planning area as an aggregate and autonomous economy. Multipliers do not specify where secondary impacts will occur at a sub-regional level (i.e., in which counties or cities). All economic impacts that would accrue to a region as a whole due to secondary economic effects are reported in Table B-1 as "secondary regional level impacts."

For example, assume that in a given county (or city) water shortages caused significant reductions in output for a manufacturing plant. Reduced output resulted in lay-offs and lost income for workers and owners of the plant. This is a *direct* impact. Direct impacts were estimated at a county level; and thus one can say with certainty that direct impacts occurred in that county. However, secondary impacts accrue to businesses and households throughout the region where the business operates, and it is impossible using input-output models to determine where these businesses are located spatially.

The same logic applies to changes in population and school enrollment. Since employment losses and subsequent out-migration from a region were estimated using *direct* and *secondary* multipliers, it is impossible to say with any degree of certainty how many people a given county would lose regardless of whether the economic impact was direct or secondary. For example, assume the manufacturing plant referred to above is in County A. If the firm eliminated 50 jobs, one could state with certainty that water shortages in County A resulted in a loss of 50 jobs in that county. However, one could not unequivocally say whether 100 percent of the population loss due to lay-offs at the manufacturing would accrue to County A because many affected workers might commute from adjacent counties. This is particularly true in large metropolitan areas that overlay one or counties. Thus, population and school enrollment impacts cannot be reported at a county level.

Irrigation

Table B-1: Distribution of Economic Impacts by County and Water User Groups: (Irrigation)						
Lost Sales, $millions)						
County	2010	2020	2030	2040	2050	2060
Jackson						
Direct	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33
Secondary Regional Level Impacts	$0.03	$0.03	$0.03	$0.03	$0.03	$0.03
Wharton						
Direct	$3.93	$3.60	$2.94	$2.33	$1.78	$1.09
Secondary Regional Level Impacts	$0.41	$0.38	$0.31	$0.24	$0.19	$0.11
Total	$4.71	$4.35	$3.61	$2.94	$2.33	$1.57
Lost Income ($millions)						
County	2010	2020	2030	2040	2050	2060
Jackson						
Direct	$0.23	$0.23	$0.23	$0.23	$0.23	$0.23
Secondary Regional Level Impacts	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02
Wharton						
Direct	$2.76	$2.53	$2.06	$1.64	$1.25	$0.77
Secondary Regional Level Impacts	$0.23	$0.21	$0.18	$0.14	$0.11	$0.06
Total	$3.25	$3.00	$2.49	$2.03	$1.61	$1.08
Lost Jobs (job figures may sum to those in main body of report due to rounding)						
Jackson	2010	2020	2030	2040	2050	2060
Direct	9	9	9	9	9	9
Secondary Regional Level Impacts	0	0	0	0	0	0
Wharton						
Direct	110	101	82	65	50	30
Secondary Regional Level Impacts	4	4	3	3	2	1
Total	124	114	95	77	61	41
Lost Business Taxes ($millions)						
Jackson	2010	2020	2030	2040	2050	2060
Direct	$0.03	$0.03	$0.03	$0.03	$0.03	$0.03
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Wharton						
Direct	$0.31	$0.28	$0.23	$0.18	$0.14	$0.09
Secondary Regional Level Impacts	$0.03	$0.02	$0.02	$0.02	$0.01	$0.01
Total	$0.36	$0.33	$0.28	$0.23	$0.18	$0.12
Source: Texas Water Development Board, Office of Water Resources Planning						

APPENDIX 9B
SURVEY QUESTIONNAIRE

Appendix 9B – Survey Questionnaire

Lavaca Regional Water Planning Area:
Water Utility Infrastructure Survey

The following table summarizes the TWDB water demands approved by the Lavaca Regional Water Planning Board for the WUG that your system serves. The peak well capacity, as reported by TCEQ, represents the total production of your utility's wells. This has been included as a reference and may not represent the most complete information for your utility.

WUG Name	Average Water Demands							TCEQ Peak Well Capacity	Units
	2000	2010	2020	2030	2040	2050	2060		
EL CAMPO	1,876	1,933	2,001	2,028	2,024	2,010	1,989	6,450	(ac-ft/yr)
	1.7	1.7	1.8	1.8	1.8	1.8	1.8	5.8	(mgd)

1. According to the information presented here, does your utility have adequate well capacity to meet current and future demands through the year 2060?

Yes _____ **No** _____

2. If you answered "No" to Question 1, what improvements do you currently intend to make in order to meet these demands? What are the expected costs for these improvements?

Improvement	**Cost ($)**
Total Cost of Improvements	

3. Are any of the wells currently in service for your utility scheduled for replacement over the next 60 years? If so, what are your anticipated costs to replace these wells?

Well	**Cost ($)**
Total Cost of Well Replacement	

Please return completed survey by mail to the address below or by fax to (713) 267-3110. If you have any questions please contact Mark Lowry with TCB by email at mark.lowry@tcb.aecom.com.

Mail to: Turner Collie & Braden Inc., P.O. Box 130089, Houston, TX 77219-0089

APPENDIX 9C
COMPLETED SURVEY QUESTIONNAIRE

Appendix 9B

Lavaca Regional Water Planning Area:
Water Utility Infrastructure Survey

The following table summarizes the TWDB water demands approved by the Lavaca Regional Water Planning Board for the WUG that your system serves. The peak well capacity, as reported by TCEQ, represents the total production of your utility's wells. This has been included as a reference and may not represent the most complete information for your utility.

WUG Name	Average Water Demands							TCEQ Peak Well Capacity	Units
	2000	2010	2020	2030	2040	2050	2060		
SHINER	501	482	475	455	426	397	367	3,983	(ac-ft/yr)
	0.4	0.4	0.4	0.4	0.4	0.4	0.3	3.6	(mgd)

1. According to the information presented here, does your utility have adequate well capacity to meet current and future demands through the year 2060?

Yes X **No** _____

2. If you answered "No" to Question 1, what improvements do you currently intend to make in order to meet these demands? What are the expected costs for these improvements?

Improvement	Cost ($)
Total Cost of Improvements	

3. Are any of the wells currently in service for your utility scheduled for replacement over the next 60 years? If so, what are your anticipated costs to replace these wells?

Well	Cost ($)
Will add Well	$600,000. Est.
Total Cost of Well Replacement	$600,000.

Please return completed survey by mail to the address below or by fax to (713) 267-3110. If you have any questions please contact Mark Lowry with TCB by email at mark.lowry@tcb.aecom.com.

Mail to: Turner Collie & Braden Inc., P.O. Box 130089, Houston, TX 77219-0089

APPENDIX 9D
FUNDING PROGRAM INFORMATION

Appendix 9D – Program Funding Information

TWDB. 2003. Drinking Water SRF. *Funding Opportunities for Public Drinking Water Projects & Source Water Protection Projects*. Texas Water Development Board Letter, November 15, 2001, with attachments.

———. *Agricultural Water Conservation Loan Program*. Summary information. www.twdb.state.tx.us.

Texas Administrative Code: Title 31, Chapter 367, Agricultural Water Conservation Program.

———: Title 31, Chapter 363, Financial Assistance Programs.

———: Title 31, Chapter 355, Research and Planning Funding.

TNRCC. *Regulatory Guidance RG-220, rev. May 2001, Funding Sources for Utilities.*

U.S. Department of Agriculture. Water and Waste Disposal Programs. Fiscal Year 2001.

U.S. Department of Agriculture Rural Utilities Service. July 1, 2001.

APPENDIX 10A
MEETING MINUTES

**Minutes of Lavaca Regional Water Planning Group
February 5, 2003
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Wednesday, February 5, 2003, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, Glen Blundell, John Butschek, Gerald Clark, Pat Hertz, Philip Miller, Paul Morkovsky, L. G. Raun, Bob Shoemate, Ed Weinheimer, and Bob Weiss.

Absent Voting Group Members were: Griffin, Henneke, Ottis, Popp, Schmidt and Ramey.

Non-Voting Members present was Bill Roberts of TWDB and Mike Fields.

Also present were: Mark Lowry, TCB; Patrick Brzozowski, Charles Reckaway and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Minutes

Chairman Stafford called for comments on the minutes of the April 25, 2002, regular meeting. Weiss moved the minutes be approved as presented. Butschek seconded the motion. Motion passed.

Lavaca-Navidad River Authority's Representative

Chairman Stafford requested recommendations for a representative from Lavaca-Navidad River Authority for Lavaca Regional Water Planning Group to replace Jack Nelson. Clark moved to appoint Patrick Brzozowski as Lavaca-Navidad River Authority's representative for the Lavaca Regional Water Planning Group. Miller seconded the motion. Motion passed.

Election of Officers

Chairman Stafford called for nominations for election of officers. Hertz moved to re-elect Stafford as Chairman. Raun seconded the motion. Motion passed. Stafford abstained from voting.

Weiss moved to re-elect Blundell as Vice-Chairman. Clark seconded the motion. Motion passed. Blundell abstained from voting.

Raun moved to elect Brzozowski as Secretary. Blundell seconded the motion. Motion passed.

Review of Draft Population Projections

Lowry reviewed the draft population projections with the Group.

Demand Projections

Lowry discussed the demand projections with the Group. Raun recommended conducting a meeting with region rice farmers to discuss water use for agricultural purposes.

Raun moved to conduct a meeting with region rice farmers and Turner Collie & Braden. Clark seconded the motion. Motion passed.

TWDB Desalination Project

Roberts reviewed the Texas Water Development Board Desalination Demonstration Project with the group.

TWDB Update

Roberts provided the Group with an update of the Texas Water Development Board as follows:

- Water Demand Projections (June 2, 2003, is the deadline to request revisions)
- Agriculture Conservation Fund
- Budget

Liaison to Region L

Weiss informed the Group that he would not be able to continue as the liaison to Region L (South Central Texas Regional Water Planning Group).

Clark moved to appoint Brzozowski as the Group's liaison to Region L. Weinheimer seconded the motion. Motion passed.

Public Comments

There were no public comments.

Other Business

Lowry recommended that a press release be sent to the regional newspapers regarding the May 7, 2003, meeting.

Weiss commended Raun for his time, effort and expertise in preparing water demand and use projections. Weiss moved to present a memorandum of commendation to Raun. Miller seconded the motion. Motion passed.

Miller moved to adjourn the meeting. Butschek seconded the motion. Motion passed.

The meeting adjourned at 2:55 p.m.

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Harrison Stafford
Chairman

Minutes of Lavaca Regional Water Planning Group
May 5, 2003
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, May 5, 2003, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, Philip Miller, L. G. Raun, Richard Ottis and Roy Griffin.

Absent Voting Group Members were: Blundell, Butschek, Clark, Hertz, Morkovsky, Shoemate, Weinheimer, Weiss, Henneke, Popp, Schmidt and Ramey.

Non-Voting Members present were: Garry N. McCauley, Texas A&M University, Rick Jahn, Texas Cooperative Extension of Wharton, Marvin Lesikar, County Extension Services of Jackson County and Neil Hudgin of Coastal Bend GCD/Coastal Plains GCD.

Also present were: Mark Lowry, Turner Collie & Braden and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order. Judge Stafford noted that there was not a quorum of members present, but that the meeting was informational in nature and no official action was to be taken.

Public Comments

There were no public comments.

Agricultural Demands

Lowry and Raun presented agricultural demand data. The group reviewed and discussed the demand data and asked the opinions of the other attendees about water use quantities and acreages of various crops in the region. This data will be reviewed and analyzed by the consultant team and the agricultural members of the planning group, and comparisons of various alternative demand scenarios made to the full Regional Planning Group for approval and subsequent submission to the Texas Water Development Board.

The meeting adjourned at 3:40 p.m.

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Harrison Stafford
Chairman

Minutes of Lavaca Regional Water Planning Group
June 9, 2003
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, June 9, 2003, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, John Butschek, Gerald Clark, Ray Griffin, Ken Henneke, Pat Hertz, Paul Morkovsky, Patrick Brzozowski, Richard Ottis, L.G. Raun, Dean Schmidt, Robert Shoemate, and Bob Weiss.

Absent Voting Group Members were: Blundell, Miller, Popp, Ramey and Weinheimer.

Also present were: Non-Voting Member David Meesey; Mark Lowry, Turner Collie & Braden; John Seifert, LBG-Guyton Associates; and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the February 5, 2003, and May 5, 2003, regular meetings were reviewed. Ottis moved the minutes be approved as presented. Morkovsky seconded the motion. Motion passed.

Agricultural Demands

Lowry and Raun presented agricultural demand data. The group reviewed and discussed the demand data. Morkovsky recommended a press release to be published in area newspapers to solicit additional data regarding non-municipal water demands that may have been overlooked in Region P's updating process.

Stafford moved to approve the methodology used in the demand data (five year average) for presentation to the Texas Water Development Board. Raun seconded the motion. Motion passed.

Henneke moved to delegate responsibility to the Executive Committee to accept the data using the methodology approved to be presented to the Texas Water Development Board. Butschek seconded the motion. Motion passed.

The meeting adjourned at 2:55 p.m.

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Harrison Stafford
Chairman

Minutes of Lavaca Regional Water Planning Group
September 29, 2003
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, September 29, 2003, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, Pat Hertz, Phillip Miller, Patrick Brzozowski, Richard Ottis, L.G. Raun and Ed Weinheimer.

Absent Voting Group Members were: Blundell, Butschek, Clark, Griffin, Henneke, Morkovsky, Popp, Ramey, Schmidt, Shoemate and Weiss.

Also present were: Non-Voting Member David Meesey, Kelly Innerarity, Texas Water Development Board, Lavaca County Judge Ronnie Leck, Connie Townsend, Turner Collie & Braden; John Seifert, LBG-Guyton Associates and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order and noted that a quorum of the voting members was not present. He further noted that any action taken by the group at this meeting would have to be confirmed at the next meeting that a quorum of the voting members was present.

Public Comments

There were no public comments.

Minutes

The minutes of the June 9, 2003, meeting were reviewed. Ottis moved the minutes be approved as presented. Hertz seconded the motion. Motion passed.

Resignation of Commissioner Glen Blundell

Miller moved to accept the resignation of Commissioner Glen Blundell of the Lavaca Regional Water Planning Group. Otis seconded the motion. Motion passed.

Appoint Member to LRWPG

Miller moved to appoint Lavaca County Judge Ronnie Leck to the Lavaca Regional Water Planning Group. Otis seconded the motion. Motion passed.

TWDB Contract Amendment

Miller moved to request an amendment to Contract No. 2002-483-464 between Lavaca-Navidad River Authority and the Texas Water Development Board to address the overage on Task No. 2. Raun seconded the motion. Motion passed.

Water Demand

The group discussed the final numbers on water demand projections. Raun indicated that Richard Young of Greenleaf Nursery, Wharton County reported that he utilizes 2500-acre feet annually. Miller moved to approve the water demand projections with revision to the irrigation water demand projections for Wharton County in the year 2060 to 94,603. Otis seconded the motion. Motion passed

The meeting adjourned at 3:05 p.m.

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Harrison Stafford
Chairman

**Minutes of Lavaca Regional Water Planning Group
November 3, 2003
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, November 3, 2003, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, John Butschek, Patrick Brzozowski, Gerald Clark, Roy Griffin, Ken Henneke, Pat Hertz, Ronald Leck, Phillip Miller, Paul Morkovsky, Richard Ottis, Wayne Popp, L. G. Raun, Dean Schmidt, Ed Weinheimer and Bob Weiss.

Absent Voting Group Members were: Shoemate and Ramey.

Also present were: Non-Voting Member David Meesey, Mark Lowry of Turner Collie & Braden, Mike Fields of American Electric Power (AEP) and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Ratification of Action of September 29, 2003 Meeting

Otis moved to ratify the action of the September 29, 2003, meeting of the Lavaca Regional Water Planning Group. Clark seconded the motion. Motion passed.

Minutes

The minutes of the September 29, 2003, meeting were reviewed. Hertz moved the minutes be approved as presented. Henneke seconded the motion. Motion passed.

Water Management Strategies

Lowry informed the group that the next meeting of the Lavaca Regional Water Planning Group should be posted as a public meeting to discuss water management strategies to be evaluated as part of the regional water plan development. Lowry will have a press release prior to the public meeting.

Population Figures

Clark moved to approve the population figures as approved by the Texas Water Development Board. Morkovsky seconded the motion. Motion passed.

Election of Vice Chair

Weiss moved to nominate Ronnie Leck to serve on the Lavaca Regional Water Planning Group. Clark seconded the motion. Motion passed. Morkovsky moved to appoint Leck as Vice Chair of the Lavaca Regional Water Planning Group. Otis seconded the motion. Motion passed.

Other Business

Meesey informed the group that there is approximately $1.6 million remaining from the Texas Water Development Board's budget of $18.0 million that has been targeted to address changed conditions that have occurred during preparation of the current regional water plans.

Clark moved to allow the Executive Committee to approve a funding request to Texas Water Development Board if necessary before the next scheduled RWPG meeting. Butschek seconded the motion. Motion passed.

The meeting adjourned at 2:30 p.m.

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Harrison Stafford
Chairman

**Minutes of Lavaca Regional Water Planning Group
March 22, 2004
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, March 22, 2004, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, John Butschek, Patrick Brzozowski, Gerald Clark, Roy Griffin, Ken Henneke, Pat Hertz, Ronald Leck, Paul Morkovsky, Richard Ottis, L. G. Raun, Robert Shoemate, Ed Weinheimer and Bob Weiss.

Absent Voting Group Members were: Miller, Popp, Schmidt and Ramey.

Also present were: Non-Voting Member David Meesey, Mark Lowry of Turner Collie & Braden, B. J. Jimenez, LNRA Board member, Patrick Brzozowski and Karen Gregory, LNRA staff, Red Rodger of the Texana Groundwater District and Laura Brock, Texas Center for Policies Studies.

Chairman Stafford called the meeting to order.

Public Comments

Laura Brock of the Texas Center for Policies Studies introduced herself to the Group. She informed the Group of a seminar sponsored by Environmental Defense entitled *Texas Water: What's in Store?* to be held on Friday, April 23, 2004, at the Lady Bird Johnson Wildflower Center in Austin, Texas.

Minutes

The minutes of the November 3, 2003, meeting were reviewed. Raun moved the minutes be approved as presented. Otis seconded the motion. Motion passed.

Election of Officers

Clark moved to re-elect the current slate of officers for the Lavaca Regional Water Planning Group. Otis seconded the motion. Motion passed.

Review of Potential Water Management Strategies

Lowry presented the Group with Potentially Feasible Management Strategies and screening process for the Lavaca Regional Planning Group. Morkovsky moved to approve the Management Strategies and screening process as presented. Weiss seconded the motion. Motion passed.

Supplemental Funding

Lowry presented the Group information regarding supplemental funding from the Texas Water Development Board and Region P Supplemental Funding Tasks. Weiss moved to table the application for Supplemental Funding. Henneke seconded the motion. Motion passed.

TWDB Proposed Policy Issues

Meesey informed the Group of Texas Water Development Board's proposed policy issues. He recommended appointing a LRWPG subcommittee to review TPWD policy issues relevant to the Group with information presented to the Board. Weinheimer moved to form a subcommittee with Raun as Chairman and Weinheimer, Clark, Weiss, Brzozowski and Butschek as members. Wiess seconded the motion. Motion passed.

TWDB Instream Flow Methodology

Meesey discussed with the Group the Texas Water Development Board's instream flow methodology. Brzozowski recommended control points for the Water Availability Model (WAM) and indicated he would send a map showing these points to all members of the Group. Raun moved to approve the control points as recommended by Brzozowski. Otis seconded the motion. Motion passed.

Supply and Demand

Lowry presented the Group with comparison of supply and demand for the region.

Other Business

A copy of the groundwater management plan for the Coastal Bend GCD was received and reviewed by the Group.

The meeting adjourned at 3:30 p.m.

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Harrison Stafford
Chairman

**Minutes of Lavaca Regional Water Planning Group
January 31, 2005
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Navidad Room of the Harry Hafernick Recreation Center in Brackenridge Plantation Park & Campground, approximately 7 miles southeast of Edna, Jackson County, Texas off Highway 111 on Monday, January 31, 2005, at 1:30 p.m.

Voting Group Members present were: Judge Harrison Stafford II, John Butschek, Patrick Brzozowski, Gerald Clark, Roy Griffin, Pat Hertz, Ronald Leck, Lavaca County Judge, Richard Ottis, L. G. Raun, and Robert Shoemate.

Absent Voting Group Members were: Henneke, Miller, Morkovsky Popp, Schmidt, Weinheimer, and Weiss.

Also present were: Non-Voting Member David Meesey and Bill Millican, Texas Water Development Board, Mark Lowry of Turner Collie & Braden, John Seifert, LBG-Guyton Associates, Mike Fields, American Electric Power, Ed Garaña, City of Corpus Christi, John Wedig, Lower Colorado River Authority, Cindy Loeffler and Josh Harper, Texas Parks & Wildlife, B. J. Jimenez, Kay Frels and Ronald Kubecka, LNRA Board members, and Patrick Brzozowski and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the March 22, 2004, meeting were reviewed. Clark moved the minutes be approved as presented. Raun seconded the motion. Motion passed.

Election of Officers

Clark moved to re-elect the current slate of officers for the Lavaca Regional Water Planning Group. Raun seconded the motion. Motion passed.

Appointment of New Voting Members

The group discussed potential new voting members for the LRWPG. It was agreed that members of the Texana Groundwater District and Coastal Bend Groundwater District would be potential candidates. The group agreed to present nominations for new members at their next meeting.

Discussion Items:

Texas Water Development Board future planning initiatives

2005 Freshwater Inflow Needs Study for Matagorda Bay

Unique Stream Segments and Unique Reservoir Sites

Central Gulf Coast GAM and options for water supply

Chapter 1, Description of Region of the Region P Regional Water Plan

Chapter 6, Water Conservation and Drought Contingency of the Region P Regional Water Plan

Preliminary Results on irrigation return flows and conservation

Results of water level monitoring program

Schedule of events for upcoming meetings for draft plan development

The meeting adjourned at 3:25 p.m.

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Harrison Stafford
Chairman

**Minutes of Lavaca Regional Water Planning Group
February 28, 2005
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Monday, February 28, 2005, at 1:30 p.m.

Voting Group Members present were: Chairman Judge Harrison Stafford II, Patrick Brzozowski, Pat Hertz, Ronald Leck, Lavaca County Judge, Paul Morkovsky, Richard Ottis, L. G. Raun, Dean Schmidt, Robert Shoemate, Ed Weinheimer and Bob Weiss.

Absent Voting Group Members were: Butschek, Clark, Griffin, Henneke, Miller, and Popp.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, John Seifert, LBG-Guyton Associates, Josh Harper, Texas Parks & Wildlife, Jennifer Bailey, TDA, Ronald Kubecka and Willard Ulbricht, LNRA Board members, Jack Maloney, Larry Waits, and LNRA staff, Karen Gregory.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the January 31, 2005, meeting were reviewed. Raun moved the minutes be approved as presented. Morkovsky seconded the motion. Motion passed.

Appointment of New Voting Members

Brzozowski informed the Group of the two prospective members submitted by Region P members. Otis moved to elect Larry Waits and Jack Maloney to the Lavaca-Regional Water Planning Group as voting members. Hertz seconded the motion. Motion passed.

Comments and Revisions to Chapter 1 of Region P Regional Water Plan

Brzozowski moved to approve *Chapter 1, Description of Region* of the Region P Regional Water Plan as presented. Hertz seconded the motion. Motion passed.

Comments and Revisions to Chapter 2 of Region P Regional Water Plan

Raun moved to approve *Chapter 2, Population and Water Demand* of the Region P Regional Water Plan as presented. Brzozowski seconded the motion. Motion passed.

Comments and Revisions to Chapter 6 of Region P Regional Water Plan

Hertz moved to approve *Chapter 6, Water Conservation and Drought Contingency* of the Region P Regional Water Plan as presented. Brzozowski seconded the motion. Motion passed.

Review of draft Chapter 3 of the Region P Regional Water Plan

The group was presented a draft *Chapter 3, Water Supplies* of the Region P Regional Water Plan. After review, the group will submit comments to Lowry by March 18, 2005.

Review of Surplus and Shortage Analysis

The group was presented a surplus and shortage analysis for their review and discussion.

Review of Management Strategies

The group was presented with Potential Management Strategies for their review and discussion. A general discussion of the management strategies was held and the previous conclusion that there is only one feasible management strategy for the Lavaca plan was reaffirmed. Discussion followed about using $100 per acre foot as the criteria threshold for agricultural users. L.G. Raun Jr. noted that the upper limit could be set at a level lower than $100 for agricultural use and still be appropriate. Paul Morkovsky questioned whether or not there was a credibility issue at setting the level so low when most of the strategies were much higher than that in cost. David Meesey responded that the criteria was appropriate and defensible.

Review of Policy Statements

The group was presented a copy of Policy Recommendations from the current plan for their review and discussion. Raun moved to designate the Executive Committee of LRWPG to approve and forward Region P's Policy Recommendations to the appropriate legislative body in Austin. Otis seconded the motion. Motion passed.

Briefing on Preliminary Results on Irrigation

The group was presented preliminary results on irrigation return flows and conservation.

Briefing on Schedule of Events

The group was presented a proposed schedule of consultant topics to complete the Lavaca Regional Water Planning Group Regional Plan.

The meeting adjourned at 3:04 p.m.

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Harrison Stafford

Chairman

**Minutes of Lavaca Regional Water Planning Group
March 29, 2005
Edna, Texas**

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Tuesday, March 20, 2005, at 1:30 p.m.

Voting Group Members present were: Chairman Judge Harrison Stafford II, John Butschek, Patrick Brzozowski, Gerald Clark, Jack Maloney, Phillip Miller, Paul Morkovsky, Richard Ottis, Ed Weinheimer and Bob Weiss.

Absent Voting Group Members were: Griffin, Henneke, Hertz, Leck, Popp, Raun, Schmidt, Shoemate, and Waits.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, John Seifert, LBG-Guyton Associates, Josh Harper, Texas Parks & Wildlife, Mike Fields, American Electric Power (AEP), Ed Garaña, City of Corpus Christi, B. J. Jimenez, LNRA Board member, and LNRA staff, Karen Gregory and Doug Anders.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the February 28, 2005, meeting were reviewed. Clark moved the minutes be approved as presented. Weiss seconded the motion. Motion passed.

Chapter 3, Water Supplies of Region P Regional Water Plan

Lowry presented the group with comments and revisions to Chapter 3, Water Supplies of Region P Regional Water Plan. Brzozowski moved to approve the revisions to Chapter 3, Water Supplies of Region P Regional Water Plan as presented. Morkovsky seconded the motion. Motion passed.

Surpluses and Shortages for Water User Groups

Lowry presented the group with a report indicating surpluses and shortages for WUGs in Region P. Maloney moved to approve the surpluses and shortages of WUGs as presented. Morkovsky seconded the motion. Motion passed.

Review of Draft Chapter 5 of the Region P Regional Water Plan

The group was presented a draft *Chapter 5, Impacts of Water Management Strategies on Water Quality and Impacts of Moving Water from Rural and Agricultural Areas of the* Region P Regional Water Plan. After review, the group will submit comments to Lowry by April 15, 2005.

Review of Draft Chapter 4 of the Region P Regional Water Plan

The group was presented a draft *Chapter 4, Water Management Strategies* of the Region P Regional Water Plan. After review, the group will submit comments to Lowry by April 15, 2005.

Review of Draft Chapter 8 of the Region P Regional Water Plan

The group was presented a draft *Chapter 8, Unique Stream Segments/Reservoir Sites* of the Region P Regional Water Plan. After review, the group will submit comments to Lowry by April 15, 2005.

Other Business

Chairman Stafford informed the group that a resignation from Kenneth Henneke had been received. Weiss moved to accept Ken Henneke's resignation from Lavaca Regional Water Planning Group. Otis seconded the motion. Motion passed.

Brzozowski stated that he would seek a new member recommendation from Judge Leck to replace the Small Business Lavaca County vacancy.

The next meeting for the Lavaca Regional Water Planning Group P is scheduled for Monday, April 25, 2005, at 1:30 p.m. in the LNRA Meeting Room.

The meeting adjourned at 2:41 p.m.

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Harrison Stafford
Chairman

Minutes of Lavaca Regional Water Planning Group
April 25, 2005
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Monday, April 25, 2005, at 1:30 p.m.

Voting Group Members present were: Chairman Judge Harrison Stafford II, John Butschek, Patrick Brzozowski, Gerald Clark, Roy Griffin, Pat Hertz, Judge Ronald Leck, Jack Maloney, Richard Ottis, L. G. Raun, and Robert Shoemate.

Absent Voting Group Members were: Miller, Morkovsky, Popp, Schmidt, Waits, Weinheimer, and Weiss.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, Mike Fields, Coleto Creek Power, Neil Hudgins, CBGCD, B. J. Jimenez, LNRA Board member, and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the March 29, 2005, meeting were reviewed. Ottis moved the minutes be approved as presented. Butschek seconded the motion. Motion passed.

Chapter 5 of Region P Regional Water Plan

Lowry presented the group with comments and revisions to *Chapter 5, Impacts of Water Management Strategies on Water Quality and Impacts of Moving Water from Rural and Agricultural Areas* of Region P Regional Water Plan. Raun moved to approve the revisions to *Chapter 5* of Region P Regional Water Plan as presented. Clark seconded the motion. Motion passed.

Chapter 4 of Region P Regional Water Plan

Lowry presented the group with comments and revisions to *Chapter 4, Water Management Strategies* of the Region P Regional Water Plan. Ottis moved to approve *Chapter 4* of Region P Regional Water Plan as presented. Brzozowski seconded the motion. Motion passed.

Chapter 8 of Region P Regional Water Plan

Lowry presented the group with comments and revisions to *Chapter 8, Unique Stream Segments/Reservoir Sites* of the Region P Regional Water Plan. Clark moved to approve *Chapter 8* of Region P Regional Water Plan as presented. Griffin seconded the motion. Motion passed.

Review of Draft Chapter 7 of the Region P Regional Water Plan

The group was presented a draft *Chapter 7, Regional Plan Consistency with State's Long Term Protection Goals of* the Region P Regional Water Plan. After review, the group will submit comments to Lowry by May 13, 2005.

Review of Draft Chapter 9 of the Region P Regional Water Plan

The group was presented a draft *Chapter 9, Water Infrastructure Funding Recommendations* of the Region P Regional Water Plan. After review, the group will submit comments to Lowry by May 13, 2005.

Executive of the Region P Regional Water Plan

The group was presented a copy of the Executive Summary of the Region P Regional Water Plan. After review, the group will submit revisions and/or comments to Lowry by May 13, 2005.

Chapter 10 of the Region P Regional Water Plan

The group was presented a copy of *Chapter 10, Public Participation* of the Region P Regional Water Plan. After review, the group will submit revisions and/or comments to Lowry by May 13, 2005.

Scheduling of Public Hearing and Public Meetings

Meetings were scheduled as follows:

Public Meeting
Tuesday, June 21, 2005
7:00 p.m.
Lavaca County Courthouse
Commissioners Court Room
105 North LaGrange
Hallettsville, Texas 77964

Public Meeting
Thursday, June 23, 2005
7:00 p.m.
El Campo Chamber of Commerce
P. O. Box 1400
201 East Jackson Street
El Campo, Texas 77437

Public Hearing
Wednesday, June 29, 2005
7:00 p.m.
Jackson County Services Building
317 West Main Street
Edna, Texas 77957

The next meeting for the Lavaca Regional Water Planning Group P is scheduled for Monday, May 23, 2005 at 1:30 p.m. in the LNRA Meeting Room.

The meeting adjourned at 3:22 p.m.

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Harrison Stafford
Chairman

Minutes of Lavaca Regional Water Planning Group
May 23, 2005
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Monday, May 23, 2005, at 1:30 p.m.

Voting Group Members present were: Chairman Judge Harrison Stafford II, Patrick Brzozowski, Roy Griffin, Pat Hertz, Judge Ronald Leck, Jack Maloney, Paul Morkovsky, L. G. Raun, Dean Schmidt, Robert Shoemate, Larry Waits, Ed Weinheimer, and Bob Weiss.

Absent Voting Group Members were: Butschek, Clark, Miller, Ottis, and Popp.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, Mike Fields, Coleto Creek Power, Josh Harper, Texas Parks & Wildlife, Ronald Kubecka, LNRA Board member, and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

Public Comments

There were no public comments.

Minutes

The minutes of the April 25, 2005, meeting were reviewed. Hertz moved the minutes be approved as presented. Brzozowski seconded the motion. Motion passed.

Chapter 7 of Region P Regional Water Plan

Lowry presented the group with comments and revisions to *Chapter 7, Regional Plan Consistency with State's Long Term Protection Goals* of Region P Regional Water Plan. Morkovsky moved to approve the revisions to *Chapter 7* of Region P Regional Water Plan as presented. Weinheimer seconded the motion. Motion passed.

Chapter 9 of Region P Regional Water Plan

Lowry presented the group with comments and revisions to *Chapter 9, Water Infrastructure Funding Recommendations* of the Region P Regional Water Plan. Raun moved to approve *Chapter 9* of Region P Regional Water Plan as presented. Morkovsky seconded the motion. Motion passed.

Executive Summary of Region P Regional Water Plan

Lowry presented the group with comments and revisions to the *Executive Summary* of the Region P Regional Water Plan. Morkovsky moved to approve the *Executive Summary* of Region P Regional Water Plan as presented. Leck seconded the motion. Motion passed.

Review of Draft Chapter 10 of the Region P Regional Water Plan

The group was presented a draft *Chapter 10, Public Participation* of the Region P Regional Water Plan. Raun moved to approve *Chapter 10* of Region P Regional Water Plan as presented. Brzozowski seconded the motion. Motion passed.

Adoption of Draft Region P Regional Water Plan

There was a general discussion of some minor changes that were made to the various chapters to incorporate changes that were discussed at previous meetings. These changes were made to chapters that had already been approved by the group and were presented to the Group as a reapproval for the Initially Prepared Plan Draft. The Planning Group was informed that these minor changes could be incorporated into the plan in approving the entire document as a draft plan.) Weiss moved to adopt the draft Region P Regional Water Plan and authorize the Lavaca Regional Water Planning Group Chair to transmit the Plan to the Texas Water Development Board and conduct public meetings and the required public hearing to solicit public input on the Plan. Brzozowski seconded the motion. Motion passed.

Locations for Copies of the Draft Region P Regional Water Plan

The Draft Region P Regional Water Plan will be available for public review at Jackson, Lavaca, and Wharton County Clerk's offices and public libraries thirty (30) days prior to the Public Hearing on June 29, 2005. A Public Hearing Notice will also be filed in the three (3) counties. A news release indicating the public meetings and public hearing will be forwarded to all newspapers in circulation in the three (3) counties.

The meeting adjourned at 2:42 p.m.

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Harrison Stafford
Chairman

Lavaca Regional Water Planning Group Public Meeting
Hallettsville, Lavaca County, Texas
June 21, 2005

A Public Meeting of the Lavaca Regional Water Planning Group was held at the Lavaca County Courthouse, Commissioners Court Room, 105 North LaGrange, Hallettsville, Texas on Tuesday, June 21, 2005, at 7:00 p.m. to discuss and receive a brief summary of the Lavaca Regional Water Planning Group, Region P, draft Regional Water Plan and to receive comments from the public on the draft Plan. Approximately 30 people were present. A sign-in sheet is attached to the minutes.

Voting Group Members present were: Judge Harrison Stafford, II, Patrick Brzozowski, Jack Maloney, Dean Schmidt, Bob Weiss, Judge Ronald Leck, and Paul Morkovsky.

Absent Voting Group Members were: Butschek, Clark, Griffin, Hertz, Miller, Ottis, Popp, Raun, Shoemate, Waits, and Weinheimer.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, John Seifert of LBG-Guyton Associates, LNRA Board member Ronald Kubecka, and Charles Reckaway, LNRA staff.

Lowry called the meeting to order. In addressing the audience, Lowry introduced LRWPG members present, LNRA Board members present, Jackson County Judge Harrison Stafford II, Lavaca County Judge Ronald Leck, John Seifert of LBG-Guyton Associates, and Jason Afinowicz of Turner, Collie & Braden. Judge Leck introduced the Lavaca County Commissioners present.

Lowry explained the purpose of the Regional Water Planning Group. A copy of Lowry's presentation to the group is attached to the minutes.

Comments received from the audience were:

William G. Horton: There is the same amount of water in the world as was thousands of years ago and will continue to be forever. I presently own the water beneath my property, with State and other thieves trying to steal it using the lasts 50 year plan. Warning! Do not trespass on my property, it is sovereign to the maximum effective range of my rifle and will be defended.

N. R. Jackowski: Who empowered the Lavaca Regional Water Planning Group? Who sets the budget? I request a written list of names of Regional Planning Group. What is overdraft?

Jim Gimler: Looking at your charts and graphs, Lavaca County experience or anticipated experience of 20 percent drop in population. But you show your demand as static. How can you show the population drop 20 percent and have demand the same.

I totally oppose any effort to manage what little resources we have. If we retain our water maybe we can encourage industry to come here and enjoy. Why give our water to San Antonio, Houston or Corpus Christi. Why can't we use it for ourselves? Are we getting greedy because we haven't paid taxes? Is it anti-American? I think the people in Region P deserve a consideration and I don't think your organization or any other organization that is stealing our water is someone we should give it to.

B. J. Nolen: Pumping should be limited to acreage controlled or owned by pumper – less than one (1) acre-foot per acre, water level should be monitored at all times to keep aquifer water level from falling. Dropping our neighbor's water level is stealing his water. Southern Lavaca and northern Jackson counties do not have a shortage of surface or surplus of groundwater. I live there. Groundwater is private property and should be treated as such – not as a commodity. We need our water for own use.

Paul H. Newton: How is this plan to be financed?

With no further comments, the comment period was closed.

Lowry responded to questions from the audience.

An audio recording of the comments, questions, and responses and written comment cards are attached to the minutes.

The meeting adjourned at 8:15 p.m.

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Harrison Stafford
Chairman

Lavaca Regional Water Planning Group Public Meeting
El Campo, Wharton County, Texas
June 23, 2005

A Public Meeting of the Lavaca Regional Water Planning Group was held at the El Campo Chamber of Commerce, 201 East Jackson Street, El Campo, Texas on Thursday, June 23, 2005, at 7:00 p.m. to discuss and receive a brief summary of the Lavaca Regional Water Planning Group, Region P, draft Regional Water Plan and to receive comments from the public on the draft Plan. Approximately 10 people were present. A sign-in sheet is attached to the minutes.

Voting Group Members present were: Judge Harrison Stafford II, Patrick Brzozowski, Ed Weinheimer, and Richard Ottis.

Absent Voting Group Members were: Butschek, Clark, Griffin, Hertz, Leck, Maloney, Miller, Morkovsky, Popp, Raun, Schmidt, Shoemate, Waits, and Weiss.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, John Seifert of LBG-Guyton Associates, LNRA Board member Basilio Jimenez, and Charles Reckaway, LNRA staff.

Lowry called the meeting to order.

There were no public comments.

The meeting adjourned at 7:05 p.m.

_____

Harrison Stafford
Chairman

Lavaca Regional Water Planning Group Public Hearing
Edna, Jackson County, Texas
June 29, 2005

A Public Hearing of the Lavaca Regional Water Planning Group was held at the Jackson County Services Building, 411 N. Wells, Edna, Texas on Wednesday, June 29, 2005, at 7:00 p.m. to discuss and receive a brief summary of the Lavaca Regional Water Planning Group, Region P, draft Regional Water Plan and to receive comments from the public on the draft Plan. Approximately 18 people were present. A sign-in sheet is attached to the minutes.

Voting Group Members present were: Jack Maloney, Gerald Clark, Roy Griffin, Larry Waits, and Bob Weiss.

Absent Voting Group Members were: Butschek, Brzozowski, Hertz, Leck, Miller, Morkovsky, Ottis, Popp, Raun, Schmidt, Shoemate, Stafford, and Weinheimer.

Also present were: Mark Lowry and Jason Afinowicz, Turner Collie & Braden, John Seifert of LBG-Guyton Associates, LNRA Board members Basilio Jimenez, Ronald Kubecka and Kay Frels and Charles Reckaway, Karen Gregory and Doug Anders, LNRA staff.

Lowry called the hearing to order. In addressing the audience, Lowry introduced LRWPG members present, LNRA Board members present, John Seifert of LBG-Guyton Associates, and Jason Afinowicz of Turner, Collie & Braden.

Lowry explained the purpose of the Regional Water Planning Group. A copy of Lowry's presentation to the group is attached to the minutes.

Comments received from the audience were:

Roy Griffin: I do not agree with population projection numbers in Jackson County in the study. What period is the drought of record?

An audio recording of the comments and responses are attached to the minutes.

The meeting adjourned at 7:40 p.m.

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Harrison Stafford
Chairman

Lavaca Regional Water Planning Group Public Hearing
Edna, Jackson County, Texas
August 17, 2005

A Public Hearing of the Lavaca Regional Water Planning Group was held at the Jackson County Services Building, 411 N. Wells, Edna, Texas on Wednesday, August 17, 2005, at 7:00 p.m. at the Jackson County Services Building to discuss and receive a brief summary of the Lavaca Regional Water Planning Group, Region P, draft Regional Water Plan and to receive comments from the public on the draft Plan. Approximately 19 people were present. A sign-in sheet is attached to the minutes.

Voting Group Members present were: Jack Maloney, Roy D. Griffin, Judge Harrison Stafford II, Patrick Brzozowski, Ed Weinheimer, and L. G. Raun.

Absent Voting Group Members were: Butschek, Clark, Hertz, Miller, Morkovsky, Ottis, Popp, Schmidt, Shoemate, Waits, and Weiss.

Also present were: Non-Voting Member David Meesey, Texas Water Development Board, Mark Lowry and Jason Afinowicz, Turner Collie & Braden, LNRA Board member Basilio Jimenez, and Charles Reckaway and Karen Gregory, LNRA staff.

Lowry called the hearing to order. In addressing the audience, Lowry introduced LRWPG members present, LNRA Board members present and Jason Afinowicz of Turner, Collie & Braden.

Lowry explained the purpose of the Regional Water Planning Group. A copy of Lowry's presentation to the group is attached to the minutes.

There were no public comments.

The meeting adjourned at 7:35 p.m.

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Harrison Stafford
Chairman

APPENDIX 10B
PUBLIC COMMENTS

Public Hearing Comments

No public comments received during the public meetings or hearings requested changes to the Plan.

TEXAS WATER DEVELOPMENT BOARD

September 28, 2005

The Honorable Harrison Stafford II
Jackson County Judge and Chairman
Lavaca Regional Water Planning Group
115 West Main, Room 207
Edna, TX 77957

Mr. Patrick Brzozowski
General Manager
Lavaca Navidad Regional Water Authority
4631 FM 3131
Edna, TX 77957

Re: Texas Water Development Board Comments for the Lavaca Regional Water Planning Group (Region P) Initially Prepared Plan, Contract No. 2002-483-464

Gentlemen:

Texas Water Development Board (TWDB) staff completed a review of the Initially Prepared Plan (IPP) submitted June 1, 2005 on behalf of the Lavaca Regional Water Planning Group. The two sets of attached comments ("A" addresses the IPP, and "B" the electronic database) follow a format similar to those used in developing the prior regional plans, including:

- Level 1: Comments and questions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements; and
- Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional plan.

Also, the TWDB's statutory requirement for review of potential interregional conflict will not be completed until all applicable data and information has been provided by any potentially affected planning group. TWDB's streamflow assessment, based on full implementation of the region's IPP, will be provided under separate cover.

Title 31, Texas Administrative Code (TAC) §357.11(b) requires the regional water planning group to consider timely agency and public comment. Section 357.10(a)(3) of the TAC requires the final adopted plan include summaries of all timely written and oral comments received, along with a response explaining any resulting revisions or why changes are not warranted.

These comments are based on an extensive review by staff with varied expertise and specialties. If you have questions, please contact Carolyn Brittin at (512) 475-0933.

Sincerely,

William F. Mullican III
Deputy Executive Administrator
Office of Planning

Attachments

c w/atts.: Mr. Mark Lowry, Turner Collie & Braden, Inc.

Attachment A

Lavaca Regional Planning Group – Region P

LEVEL 1. Comments and questions *must be satisfactorily addressed* in order to meet statutory, agency rule, and/or contract requirements.

Chapter 1: Planning Area Description

1. The planning group must determine and identify major demand centers by water use category. [*Title 31, Texas Administrative Code (TAC) §357.7(a)(1)(E)*]
2. Please provide information on the plan's impact to navigation. [*Title 31, TAC §357.5(e)(8)*]

Chapter 3: Water Supply Analysis

3. Table 3B2 in Appendix 3B contains a typo – the source type for WUG2966 should be "00" (surface water).
4. Table 3.1, Page 3-9 incorrectly reports permitted diversions for Sandy Creek (8,023 ac-ft) and Porters Creek (3,306 ac-ft). According to the Texas Commission on Environmental Quality (TCEQ) water right database, the permitted diversions are 3,023 ac-ft for Sandy Creek and 2,196 ac-ft for Porters Creek.
5. It is unclear if GAM results were used to estimate available groundwater supply from the Gulf Coast aquifer. Gam is mentioned in Chapter 3, but only in relation to aquifer transmissivity. Please clarify. *[Contract, Exhibit "B", Section 2.2 & 3.2.2]*
6. Please identify and describe groundwater quality problems in the planning region. The provided information is limited to tables containing major ions data from the TWDB database and the provided discussion (p. 3-5 and 3-6) is generic and focuses mainly on vulnerability to contamination. For example, at least one of the infrequent constituents, gross alpha radiation, exceeds maximum concentration levels in several wells in Lavaca County. *[Title 31, TAC §357.7(a)(1)(C)]*
7. Please provide wholesale water provider details (allocation by county, category of use, and river basins, demands, and contractual obligations). This information is listed in DB07 but is not reported in the plan. *[Title 31, TAC §357.7(a)(3)(B)]*
8. Provide data obtained from the well sampling and water level data analysis. [*Contract, Supplemental Scope-of-Work, Task 3.2.1 through 3.1.7]*
9. The Gulf Coast aquifer availability number for year 2060 in Appendix 3B does not match the one listed in DB07. Please make the appropriate correction.

Chapter 4: Identification, Evaluation, and Selection of Water Management Strategies Based on Needs

10. Please ensure the costing information for irrigation water management strategies is consistent in the plan. For example, Appendix 4B pages 1-3 and 1-5, the costs per acre-ft for the shown strategies shown in these pages is $33 (less than the $50 per acre-ft threshold.).

11. In Section 4.4.2, page 4-6, cost estimates for the conservation measures discussed - precision leveling and multiple outlets – were not found. Please provide these estimates. *[Title 31, TAC §357.7(a)(8)(A)(i)]*

12. Include the savings that have already been achieved through agricultural water conservation strategies – laser leveling, multiple inlets, canal lining, replacement of canals by pipes, and improved seed varieties. [*Contract, Supplemental Scope-of-Work, Task 4.2.1]*

Attachment B
Lavaca - Region P
DB07-Specific Comments

LEVEL 1. Comments and questions must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

REGION-WIDE

Comment: No sources show entry of the methodologies used to determine water availability. Action required- Enter the methodologies used to determine water availabilty for each source in the Sources Module, Methodology Field.

[Contract, Exhibit "B," Section 3.3.1, page 22-23 and page 24]

SOURCES MODULE

Comment: Source availability is overallocated. Action required- Adjust current or future WUG Supply amounts for the following sources so that the sum is equal to or less than the Total Available Supply Volume.

[Contract, Exhibit "B," Section 3.2.1, page 15-16]

	DBSOID	SOURCE REGION	SOURCE NAME	SOURCE COUNTY	SOURCE BASIN	SOURCE ID
1.	926	P	TEXANA LAKE/RESERVOIR	RESERVOIR	LAVACA	16010

Location on Interface: SOURCE MODULE

Comment: The following source is overallocated and is used by multiple regions. Potential interregional conflicts should be identified and resolved prior to final data entry. Action required- Please review to determine if this is a potential interregional conflict and coordinate with other user regions to resolve this issue.

[Contract, Exhibit "B," Section 2.2, page 13]

	DBSOID	SOURCE REGION	SOURCE NAME	SOURCE COUNTY	SOURCE BASIN	SOURCE ID
1.	926	P	TEXANA LAKE/RESERVOIR	RESERVOIR	LAVACA	16010

Location on Interface: SOURCE MODULE

Comment: Total Available Supply 2010-2060 requires data values; data values missing. Action required- Please review to verify that Total Available Supply Volumes are zero for 2010-2060 or correct as necessary.

[Contract, Exhibit "B," Sections 2.2, page 13 and 3.3.1, page 22-23]

	DBSOID	SOURCE REGION	SOURCE NAME	SOURCE COUNTY	SOURCE BASIN	SOURCE ID
1.	4001	P	GULF COAST AQUIFER	WHARTON	COLORADO	24115

Location on Interface: EDIT SOURCE PAGE- TOTAL AVAILABILE SUPPLY 2010 - 2060

WWP MODULE

Comment: WWP Supply Source requires entry of water right information. Action required- Enter water right information for the following.

[Contract, Exhibit "B," Section 5.3.4, page 76]

	DBWWPID	WWP REGION	WWP NAME	DBCUSTID	CUST RWPG	CUSTOMER NAME	CUSTOMER COUNTY	CUSTOMER BASIN
1.	33	P	LAVACA NAVIDAD RIVER AUTHORITY	607	P	INTEPLAST	JACKSON	COLORADO-LAVACA

DBSOID	SOURCE REGION	SOURCE NAME	SOURCE COUNTY	SOURCE BASIN	SOURCE ID
926	P	TEXANA LAKE/RESERVOIR	RESERVOIR	LAVACA	16010

Location on Interface: WWP MODULE

WMS MODULE

Comment: Each WMS Project requires an associated source. Action required-Enter the source(s) that are associated with the following WMS Project(s).

[Contract, Exhibit "B," Section 2.2, page 13, 4.3.5, page 64-65, and 5.3.8, page 79]

	DBPROJECTID	PROJECT REGION	PROJECT NAME	PROJECT INFRASTRUCTURE	PROJECT TYPE	WMS PROJECT ID
1.	72	P	REUSE OF MUNICIPAL EFFLUENT	OTHER INFRASTRUCTURE	REUSE	P-JLW-IL-1

Location on Interface: WMS MODULE

Comment: Capital Cost field requires entry of data value; data values missing. Action required- Enter Capital Cost values for the following or review to confirm that capital costs are zero.

[Contract, Exhibit "B," Sections 2.2, page 13 and either 4.3.5, page 67 or 5.3.8, page 81]

1. PROJECT

DBPROJECTID	PROJECT REGION	PROJECT NAME	PROJECT INFRASTRUCTURE	PROJECT TYPE	WMS PROJECT ID
44	P	TEMPORARY OVERDRAFTING OF THE GULF COAST AQUIFER - JACKSON COUNTY	NO INFRASTRUCTURE	EXISTING SOURCE OR EXPANDED USE OF AN EXISTING SOURCE (SURFACE WATER OR GROUNDWATER)	P-J-IL-1

SOURCE

DBSOID	SOURCE REGION	SOURCE NAME	SOURCE COUNTY	SOURCE BASIN	SOURCE ID
1818	P	GULF COAST AQUIFER	JACKSON	COLORADO-LAVACA	12015

WUG(S)

WUG ID	WUG REGION	WUG NAME
161004120	P	IRRIGATION

Location on Interface: EDIT WUG WMS PAGE- WUG CAPITAL COST

Comment Responses to the Texas Water Development Board

Chanter 1: Planning Area Description

1. *The planning group must determine and identify major demand centers by water use category.* [Title 31, Texas Administrative Code (TAC) §357.7(a)(1)(E)]

   Demand centered for municipal water use were not specifically stated in Section 1.3. Section 1.3.1 was added to summarize major water users within the LRWPA.

2. *Please provide information on the plan's impact to navigation.* [Title 31, TAC§357,5(e)(8)]

   The plan contains no strategies to move or change the allocation of surface water supplies. In addition, there are no known springs in the area that are currently flowing or that have flowed in the past several decades. As a result of these factors, there is no known impact on navigation that would result from the implementation of the plan.

Chapter 3: Water Supply Analysis

3. *Table 3B2 in Appendix 3B contains a typo - the source type for WUG2966 should be "00" (surface water).*

   This has been corrected in the text.

4. *Table 3.1. Page 3-9 incorrectly reports permitted diversions for Sandy Creek (8,023 ac-ft) and Porters Creek (3,306 ac-ft). According to the Texas Commission on Environmental Quality (TCEQ) water right database, the permitted diversions are 3,023 ac-ft for Sandy Creek and 2,196 ac-ft for Porters Creek.*

   The permitted diversion for Sandy Creek has been corrected to the value of 3,023 ac-ft. However, the permitted diversions for Porters Creek were again found to total 3,036 ac-ft, as shown in the table below.

WR Number	Permit Number	Owner Name	Amount	Priority Date	Stream Name	County
4019	3725	CARL B BAIN	420	1/21/1980	PORTERS CRK	Wharton
4129	3876	ALAN WAYNE MEEK	47.12	5/18/1981	PORTERS CRK	Wharton
4129	3876	BRIAN NELSON MEEK	208.05	5/18/1981	PORTERS CRK	Wharton
4129	3876	DALE CHARLES MEEK	208.05	5/18/1981	PORTERS CRK	Wharton
4129	3876	GARY KENNETH MEEK	160.93	5/18/1981	PORTERS CRK	Wharton
4129	3876	ALAN WAYNE MEEK ET AL	1.85	5/18/1981	PORTERS CRK	Wharton
4132	3836	HARRY E VITERA	550	5/26/1981	PORTERS CRK	Wharton
4174	3911	GAYNARD & ELAINE WIGGINTON	400	12/7/1981	PORTERS CRK	Wharton
5579	5579	RICHARD B COLLINS ET AL	200	3/7/1997	PORTERS CRK	Wharton
5579	5579	LEIGH ANN ALLEN LARSEN ET AL		3/7/1997	PORTERS CRK	Wharton
2092		MARK & CHARLOTTE DEFRIEND	990	3/30/1945	PORTER'S CRK	Wharton
5678	5678	PIN OAK FARMS 2	120	7/27/2000	PORTER'S CRK	Wharton

5. *It is unclear if GAM results were used to estimate available groundwater supply from the Gulf Coast aquifer. GAM is mentioned in Chapter 3, but only in relation to aquifer transmissivity. Please clarify.* [Contract, Exhibit "B", Section 2.2 & 3.2.21]

   The estimates of groundwater availability were developed from historical groundwater pumpage and aquifer water level response data and previous estimates by the TWDB. The estimates of groundwater availability were checked utilizing the Central Gulf Coast GAM while realizing at the time that the GAM had just been reviewed by the TWDB.

6. *Please identify and describe groundwater quality problems in the planning region. The provided information is limited to tables containing major ions data from the TWDB database and the provided discussion (p. 3-5 and 3-6) is generic and focuses mainly on vulnerability to contamination. For example, at least one of the infrequent constituents, gross alpha radiation, exceeds maximum concentration levels in several wells in Lavaca County.* [little 31, TAC $35 7.7(a)(l)(C)]

   Analysis of the 2001 TWDB infrequent constituent report data show that almost all of the infrequent constituents are within the maximum contaminant level (MCL) in the Lavaca Region. There are a few wells screening the Evangeline aquifer in northern Lavaca County that have nitrite, manganese, or iron values which slightly exceed the MCL's. Two domestic wells and one unused well had sample values which exceeded the MCL of 1 mg/L for nitrite. One unused well, about 80 feet deep, screening sands

of the Evangeline aquifer in Lavaca County had a gross alpha value greater than the MCL of 15.0 pCi/L. Two wells screening Evangeline aquifer sands in Lavaca County exceeded the secondary limit of 0.3 mg/L for iron in water to be used for public supply. A Lavaca County unused Evangeline aquifer well had a manganese value greater than the secondary limit of 0.05 mg/L for water to be used for public supply.

A public supply well located in northwest Lavaca County had a manganese value that was greater than then secondary MCL. TCEQ data from 2003 indicates water from the distribution system served by the well has manganese levels below the secondary MCL. A public supply well screening sands in the Oakville formation located in western Lavaca County had a reported iron level greater than the secondary limit in 2001.

There is a small area of the Gulf Coast aquifer that has been impacted by an industrial facility that operated in El Campo. A release from the facility contaminated a small area of shallow sands of the Gulf Coast aquifer. An assessment of the affects of the release and a mitigation plan is being addressed through the TCEQ.

In general, the areas with groundwater quality issues, which are minor, occur in Lavaca County where water demand is lower than the estimates of available groundwater supply. In Jackson and Wharton Counties, data show that the groundwater for large capacity production is of good quality, has not been adversely impacted by past pumping and should not be adversely impacted by estimated future pumping.

7. *Please provide wholesale water provider details (allocation by county, category of use, and river basins, demands, and contractual obligations). This information is listed in DB07 but is not reported in the plan.* [Title 31, *TAC 9357,7(a)(3)(B)]*

   A discussion of the only WWP in the LRWPA, the LNRA, was mistakenly left out of Chapter 3, although some of this information can be found under Section 3.3.1. Section 3.4 has been added to address these issues in a separate section.

8. *Provide data obtained from the well sampling and water level data analysis.* [Contract, Supplemental Scope-of-Work, Task 3.2.1 through 3.1.7]

   This information has been incorporated into the plan. Please see attached text and accompanying figures.

9. The Gulf Coast aquifer availability number for year 2060 in Appendix 3B does not match the one listed in DB07. Please make the appropriate correction.

The value entered in DB07 for availability of the Gulf Coast Aquifer in Wharton County and the Colorado River basin has been changed to reflect the 290 ac-ft shown in Appendix 3B. No change to the document has been made.

Chapter 4: Identification, Evaluation, and Selection of Water Management Strategies Based on Needs

10. *Please ensure the costing information for irrigation water management strategies is consistent in the plan. For example, Appendix 4B pages 1-3 and 1-5, the costs per acre-ft for the shown strategies shown in these pages is $33 (less than the $50 per acre-ft threshold.).*

    The $50 per ac-ft threshold was used in this study to represent the *maximum* cost that farmers could afford for new water supplies. The aquifer overdraft strategy, with a cost of $33 per ac-ft, was the only selected strategy that was below this limit.

11. *In Section 4.4.2, page 4-6, cost estimates for the conservation measures discussed – precision leveling and multiple outlets - was not found. Please provide these estimates.* [Title 31, TAC §357.7(0)(8)(A)(i)]

    These costs were shown in *Table 9.3* of the draft Plan. A table has been included in Section 4.4.2 to show estimated costs for conservation measures within Chapter 4.

12. *Include the savings that have already been achieved through agricultural water conservation strategies - laser leveling, multiple inlets, canal lining, replacement of canals by pipes, and improved seed varieties.* [Contract. Supplement01 Scope+ Work, Task 4.2. I]

    The LRWPA includes nearly 150,000 acres of land that could be irrigated for rice in any given year. As indicated by local farmers, approximately 25 percent, or roughly 37,500 of these acres, have improvements such as irrigation pipelines and laser leveled fields in place. In any given year, approximately one-third of the available land is used for rice production, meaning that 12,500 acres of improved land are flooded for rice irrigation. From these estimates it was determined that approximately 6,250 acre-feet of water are conserved annually from conservation practices that are already in use assuming one half-foot of conservation per improved acre. Section 4.4.2 has been updated to include these figures.

Post-it® Fax Note 7671	Date 10-25-05	# of pages ▶ 2
To MARK LOWRY	From [illegible]	
Co./Dept. TCB	Co.	
Phone #	Phone #	
Fax # 713 267 2805	Fax #	

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TEXAS PARKS & WILDLIFE

October 19, 2005

Mr. Patrick Brzozowski
Secretary
Lavaca Regional Water Planning Group
P.O. Box 429
Edna, Texas 77957

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1600
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TO FILE

Re: Review of Region P Lavaca Initially Prepared Regional Water Plan

Dear Mr. Brzozowski:

Thank you for the opportunity to review and comment on the 2005 Initially Prepared Regional Water Plan (IPP) for the Lavaca Region (Region P). Texas Parks and Wildlife Department (TPWD) acknowledges the time, money and effort required to produce the regional water plan as mandated by Senate Bill 1 of the 75th Legislature. A number of positive steps have been taken since the first planning cycle to advance the issue of environmental protection. For example, the regional water planning groups were faced with a new requirement under 31 TAC §357.7(a)(8)(A), to perform a "quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico" when evaluating water management strategies. TPWD recognizes that each region's unique natural resources, water management strategies and funding limitations dictated the level of quantitative analysis for each regional plan. Nonetheless, TPWD feels strongly that quantification of environmental impacts is a critical step in planning for our state's future water needs while also protecting environmental resources.

TPWD staff has reviewed the IPP to determine if the following questions were addressed:

- Does the plan include a quantitative reporting of environmental factors including the effects on environmental water needs, habitat?
- Does the plan include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the plan discuss how these threats will be addressed?
- Does the plan describe how it is consistent with long-term protection of natural resources?
- Does the plan include water conservation as a water management strategy? Reuse?
- Does the plan recommend any stream segments be nominated as ecologically unique?
- If the plan includes strategies identified in the 2000 regional water plan, does it address concerns raised by TPWD at that time?

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

www.tpwd.state.tx.us

In general the Lavaca Region IPP does not include a detailed quantitative reporting of environmental factors. The plan includes a very brief description of recreational and natural resources in the Lavaca Region. Consideration of environmental flows is lacking. The IPP mentions that Lake Texana is operated to provide freshwater inflows for bays and estuaries and to protect coastal habitats. At a minimum environmental flow alterations and loss of habitat caused by Palmetto Bend Stage II should be evaluated. For areas in the Region where groundwater is the primary source of water supply, emphases should be placed on protecting any remaining springs that support fish and wildlife.

According to the Lavaca Region IPP most of the region's projected 50 year water demands can be met through less-impacting alternatives such as continued use of water groundwater supplies. However, a new reservoir, Palmetto Bend Stage II, has been proposed as a water management strategy to meet projected demands during drought-of-record conditions. New reservoirs should be considered carefully, particularly ones that directly impact freshwater inflows, because of their potential for negative impacts. TPWD encourages cheaper, less-impacting alternatives such as conservation be pursued before new reservoir construction. According to the IPP, no municipalities in the Lavaca Region are expected to experience water shortages by 2060. Rice irrigation accounts for 88% of all water used in the region.

Conservation is not included as a water management strategy. Reasons cited include the high cost of conservation, the potentially negative impact on streamflows and potential loss of habitat associated with conversion of irrigation canals to pipelines. Reuse of municipal effluent from El Campo, Edna, and Ganado is proposed for meeting 42,000 acre-feet of irrigation demand by 2030. TPWD especially encourages the Region's consideration of brush control/management as an additional means of conserving water. If done properly, brush management can also benefit wildlife habitat.

It is disappointing that the plan does not recommend nomination of any stream segments as ecologically unique. The Region P planning group concluded that additional information is needed regarding potential impacts of designation. TPWD is also disappointed that positive aspects of the 2001 Region P plan (i.e. conservation for all water user groups that offset the need for new reservoirs) have not been carried forward to the 2005 IPP.

Thank you for your consideration of these comments. Please be assured that TPWD will continue to explore all possibilities to meet future water supply needs and assure the ecological health of the region's aquatic resources. Please contact Cindy Loeffler if you have any questions at (512) 917-7015.

Sincerely,

Larry D. McKinney, Ph.D.
Director of Coastal Fisheries

LDM:CL:dh

Comment Responses to the Texas Parks and Wildlife Department

13. *In general the Lavaca Region IPP does not include a detailed quantitative reporting of environmental factors. The plan includes a very brief description of recreational and natural resources in the Lavaca Region. Consideration of environmental flows is lacking. The IPP mentions that Lake Texana is operated to provide freshwater inflows for bays and estuaries and to protect coastal habitats. At a minimum environmental flow alterations and loss of habitat caused by Palmetto Bend Stage II should be evaluated.*

    Impacts to environmental flows resulting from Palmetto Bend Phase II are subject to review by TCEQ. As this reservoir has not been recommended as a strategy to meet needs within the LRWPG, the LRWPA feels that there is no need at this time to include this analysis. Palmetto Bend Phase II is a strategy in the Region L plan and those results will be reported in the Region L plan. It was screened out of the Region P plan primarily based on cost and affordability to agriculture.

14. *For areas in the Region where groundwater is the primary source of water supply, emphases should be placed on protecting any remaining springs that support fish and wildlife.*

    Groundwater is the major water source for the entire LRWPA and protecting this resource is a primary goal of the Plan. However, there are no springs of significant size within the Region that are known by the LRWPG to support habitat for fish and wildlife (Section 1.4.2).

15. *According to the Lavaca Region IPP, most of the region's projected 50 year water demands can be met through less-impacting alternatives such as continued use of groundwater supplies. However, a new reservoir, Palmetto Bend Stage II, has been proposed as a water management strategy to meet projected demands during drought-of-record conditions. New Reservoirs should be considered carefully, particularly ones that directly impact freshwater inflows, because of their potential for negative impacts. TPWD encourages cheaper, less-impacting alternatives such as conservation be pursued before new reservoir construction. According to the IPP, no municipalities in the Lavaca Region are expected to experience water shortages by 2060. Rice irrigation accounts for 88 percent of all water used in the region.*

    The Lavaca Region IPP does not recommend the construction of Palmetto Bend Stage II to meet water demands within the Region through the year 2060. The development of this reservoir was immediately recognized as too costly an alternative to be considered for meeting water shortages. This is especially due to the fact that the anticipated shortages are associated with agricultural users that cannot afford the cost of funding a new reservoir. Palmetto Bend Stage II is also mentioned in this Plan as a unique reservoir site, but is not recommended to meet water needs within the LRWPA.

16. *Conservation is not included as a water management strategy. Reasons cited include the high cost of conservation, the potentially negative impact on streamflows and potential loss of habitat associated with conservation of irrigation canals to pipelines. Reuse of municipal effluent from El Campo, Edna, and Ganado is proposed for meeting 42,000 acre-feet of irrigation demand by 2030. TPWD especially encourages the Region's consideration of brush control/management as an additional means of conserving water. If done properly, brush management can also benefit wildlife habitat.*

    The LRWPG reaffirms its view that conservation is not a viable alternative for meeting future water demands without financial assistance to farmers for field improvements. Municipal water demands are not of enough significance to make conservation useful for meeting regional shortages and the costs would be placed on municipalities that do not anticipate shortages through the year 2060. The Plan indicates a potential for using 1,350 ac-ft of reclaimed municipal effluent annually from El Campo, Edna, and Ganado. However, this supply is insufficient to satisfy the unmet water demands of irrigators in the Region as well having a cost that the irrigators cannot afford. The most likely means of providing water in this fashion is for some municipality which has a shortage to pay for these improvements. There are no municipalities in the LRWPA that have anticipated shortages and therefore no financial incentive to consider reuse. Brush control has not been considered for the LRWPA as much of the land in the area is used for agricultural production and is already clear of these invasive species. Any benefit from brush control would be expected to be minor in comparison to the magnitude of shortages projected for irrigation users.

    However, the LRWPG has repeatedly recommended conservation as a policy for protecting the region's water resources from excess use and these practices have been incorporated into water usage in the LRWPA. Section 8.2.3 of the IPP clearly indicates that this is a goal of the LRWPG.

17. *It is disappointing that the plan does not recommend nomination of any stream segments as ecologically unique. The Region P planning group concluded that additional information is needed regarding potential impacts of designation.*

    The LRWPG reaffirms its decision not to nominate any stream segments as ecologically unique until such a point that the impacts and benefits of this designation are fully understood. Legally, approval of such a designation requires legislative approval that may be carried out at any time, with or without nomination by the LRWPG.

18. *TPWD is also disappointed that positive aspects of the 2001 Region P plan (i.e. conservation for all water user groups that offset the need for new reservoirs) have not been carried forward to the 2005 IPP.*

The 2001 Regional Water Plan for the LRWPA did not include any recommendation of water conservation to meet anticipated shortages. Such a strategy was found at the time, as now, to be cost prohibitive and not capable of effectively meeting WUG shortages. The LRWPG would also like to reiterate that the 2005 IPP makes no recommendation for new reservoirs to meet demands within the LRWPA. It should also be noted that there were no municipal shortages in the 2001 plan and there are no municipal shortages identified in this revision.

October 20, 2005

Lavaca Regional Water Planning Group
c/o Patrick Brzozowski
P.O. Box 429
Edna, Texas 77957

Re: Comments on Initially Prepared 2006 Lavaca Regional Water Plan

Dear Judge Stafford and Planning Group Members:

The National Wildlife Federation, Lone Star Chapter of the Sierra Club, and Environmental Defense appreciate this opportunity to provide written comments on the Initially Prepared Lavaca Regional Water Plan (Region P). We consider the development of comprehensive water plans to be a high priority for ensuring a healthy and prosperous future for Texas. Our organizations also appreciate the extensive efforts of the planning group to produce the initially prepared regional plan. As you know, our organizations - whether individually or collectively - have provided periodic input during the process of developing the plan. The written comments in this letter build upon those previous comments in an effort to contribute to a better plan for all residents of the Lavaca Region and for all Texans.

I. BACKGROUND

Our organizations support a comprehensive approach to water planning that considers all implications of water use and development. The process that Senate Bills 1 and 2 (SB1, SB2) established has the potential to produce major, positive changes in the way Texans approach water planning. Fully realizing that potential depends on the information that water plans provide, which must be sufficient to evaluate the likely costs and impacts that may result from each water management strategy. Only by providing sufficient information and evaluating it carefully can regional planning groups ensure compliance with the overarching requirement that "strategies shall be selected so that cost effective water management strategies which are consistent with long-term protection of the state's water resources, agricultural resources, and natural resources are adopted." 31 TAC § 357.7 (a)(9). Complying with this requirement can and will help regional water planning groups develop plans that actually contain workable water management strategies capable of implementation as opposed to a list of expensive and damaging proposals that will likely produce more controversy than water supply.

This letter comments on the initially prepared Lavaca Regional Water Plan in two different ways. First, we consider the extent to which the initially prepared plan complies with requirements in SB1 and SB 2, as well as the rules that the Texas Water Development Board (TWDB) adopted to implement those statutes. Second, our

comments also address important policy considerations that should inform the regional water plan that statutes or rules may not specifically address.

We recognize that the regional water planning group faces financial constraints that may restrict the group's ability to address some issues raised in these comments as much as you would like. We submit these comments in the spirit of an ongoing dialogue intended to make the planning process as effective as possible. We strongly support the state's water planning process and we want the regional water plans and the state plan to be comprehensive templates that all Texans can endorse. In the remainder of this letter, you will find a summary of key principles that inform our comments followed by specific comments that address different aspects of the draft water plan.

II. KEY PRINCIPLES AND GENERAL COMMENTS

A. MAXIMIZE WATER EFFICIENCY

We strongly believe that improved efficiency in the use of water must be pursued to the maximum extent reasonable. New provisions included in SB 2 and TWDB rules since the first round of planning require strengthened consideration of water efficiency. Potentially damaging and expensive new supply sources simply should not be considered unless, and until, all reasonable efforts to improve efficiency have been exhausted. In fact, that approach is now mandated.

The Texas Water Code, as amended by SB1 and 2, along with the TWDB guidelines, require regional water planning groups to consider water conservation and drought management and to incorporate both types of measures into their plans. After the first round of regional planning, the legislature added §16.053 (h)(7)(B) to prohibit TWDB from approving any regional plan that omits water conservation and drought management measures at least as stringent as those required pursuant to Tex. Water Code §§ 11.1271 and 11.1272. In other words, each regional plan must incorporate at least the amount of water savings that other law mandates. This is a common-sense requirement. We certainly should not be basing planning on an assumption of less water conservation than the law already requires.[1]

In addition, the Board's rules require the consideration of more stringent conservation and drought management measures for all water user groups with water needs. The rules provide that the planning group may choose not to include those more stringent measures if it adequately explains that decision. 31 TAC § 357.7(a)(7)(A)(ii)). Consistent with the TWDB rules, our comments treat water conservation and drought management as separate issues from reuse, which is discussed separately below. 31 TAC § 357.7 (a)(7)(A) of the TWDB rules sets out detailed requirements for evaluation of water management strategies consisting of "water conservation practices." 31 TAC §

[1] TWDB guidelines also recognize the water conservation requirements of Section 11.085 for interbasin transfers and require the inclusion of the "highest practicable levels of water conservation and efficiency achievable" for entities for which interbasin transfers are recommended as a water management strategy.

357.7(a)(7)(B) addresses water management strategies that consist of drought management measures. The separate evaluation of water management strategies that rely on reuse is mandated by 31 TAC § 357.7 (a)(7)(C).

Water is a finite resource. In order to meet the water needs of a growing population while ensuring the long-term protection of the state's natural resources and agricultural resources, we must use water as efficiently as possible.

It appears that the Regional Planning Group has reasonably evaluated irrigation water conservation issues and noted constraints on its implementation. However, as discussed below, we are concerned that the Regional Group's decision not to recommend irrigation conservation measures might result in a level of groundwater use that is not sustainable long-term.

B. LIMIT NONESSENTIAL USE DURING DROUGHT

Drought management measures aimed at reducing demands during periods of unusually dry conditions are important components of good water management. As noted above, SB2 and TWDB rules mandate consideration and inclusion in regional plans of reasonable levels of drought management as water management strategies. It just makes sense to limit some nonessential uses of water during times of serious shortage instead of spending vast sums of money to develop new supply sources simply to meet those nonessential demands during rare drought periods. Drought management includes documentation of the water savings each supplier anticipates as a result of drought measures. Because drought management measures are not included as water management strategies, the Initially Prepared Plan does not comply with applicable requirements.

C. PLAN TO ENSURE ENVIRONMENTAL FLOWS

Designing and selecting new water management strategies that minimize adverse effects on environmental flows is critical to the future of our state's rivers, estuaries, and the massive economies that depend on them. New rules applicable to this round of planning require a *quantitative analysis* of environmental impacts of water management strategies to ensure a more careful consideration of those additional impacts. The rules specifically require that each potentially feasible water management strategy must be evaluated by including a quantitative reporting of "environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico." 31 TAC § 357.7 (a)(8)(A)(ii). However, designing and selecting such strategies represents just one aspect of the planning necessary to meet environmental flow needs.

If existing water rights, when used as projected, would cause serious disruption of environmental flows resulting in harm to natural resources, then merely minimizing additional harm from new strategies would not produce a water plan that would be consistent with the long-term protection of natural resources or the economic activities that rely on them. Demonstrating such consistency is a prerequisite to approval of a regional water plan. As a result, regional water planning groups should recognize

environmental flows as a water demand critical to the state's ecology and economy, and should devise water plans that protect reasonable environmental flow levels. For example, Region K, in its initially prepared plan, has recognized environmental water needs as a category of water demand. We appreciate the careful consideration given in the initially prepared plan to the need to protect environmental flows. However, the required quantitative assessment of environmental flow impacts appears to be missing from the evaluation of potentially feasible management strategies.

D. MINIMIZE NEW RESERVOIRS

Because of the associated adverse impacts, new reservoirs should be considered only after existing sources of water, including water efficiency and reuse, are utilized to the maximum extent reasonable. When new reservoirs are considered, adverse impacts to regional economies and natural resources around the reservoir site must be minimized. Regardless of whether the proposed reservoir is located inside or outside the boundaries of the region, reservoir development must be shown to be consistent with long-term protection of the state's water, agricultural, and natural resources.

We support the planning group's decision not to include the Palmetto Bend Phase II reservoir on the Lavaca River as a water management strategy. As the initially prepared plan notes, there is no in-basin demand that could feasibly be met with water from the reservoir. Accordingly, we also feel that the site should not be recommended for designation as a unique reservoir site. One of the prerequisites for such a recommendation is the identification of the expected beneficiaries of the water supply to be developed. See 31 TAC § 357.9. Because there are no expected beneficiaries, the recommendation of such a designation is premature.

E. MANAGE GROUNDWATER SUSTAINABLY

Wherever possible, groundwater resources should be managed on a sustainable basis. Mining groundwater supplies will, in many instances, adversely affect surface water resources and constitute a tremendous disservice to future generations of Texans. Generally speaking, depleting groundwater sources will not be consistent with long-term protection of the state's water resources, natural resources, or agricultural resources. We support the planning group's adoption of a sustainable management approach. However, as discussed below, we do have some concerns about the absence of constraints on the "temporary overdrafting" recommended during drought conditions.

F. FACILITATE SHORT-TERM TRANSFERS

Senate Bill 1 directs consideration of voluntary and emergency transfers of water as a key mechanism for meeting water demands. Those approaches seem to have received little attention in the planning process to date. Water Code Section 16.051 (d) directs that rules governing the development of the state water plan shall give specific consideration to "principles that result in the voluntary redistribution of water resources." Similarly, Section 16.053 (e)(5)(H) directs that regional water plans must include consideration of "voluntary transfers of water within the region using, but not limited to, regional water banks, sales, leases, options, subordination agreements, and financing arrangements…." Thus, there is a clear legislative directive that the regional planning process must include

strong consideration of mechanisms for facilitating voluntary transfers of existing water rights within the region, particularly on a short-term basis as a way to meet drought demands.

In addition, emergency transfers are intended as a way to address serious water shortages for municipal purposes. They are a way to address short-term problems without the expense and natural resource damage associated with development of new water supplies. Water Code Section 16.053 (e)(5)(I), as added by SB 1, specifically directs that emergency transfers of water, pursuant to Section 11.139 of the Water Code, are to be considered, including by providing information on the portion of each non-municipal water right that could be transferred without causing undue damage to the holder of the water right. Thus, the water planning process is intended as a mechanism to facilitate voluntary transfers, particularly as a means to address drought situations, by collecting specific information on rights that might be transferred on such a basis and by encouraging a dialogue between willing sellers and willing buyers on that approach. It is not clear if there is significant potential for this approach in the Lavaca Region, but the issue merits discussion.

III. PAGE-SPECIFIC COMMENTS

CHAPTER 1, REGIONAL PLANNING IN TEXAS

Section 1.4.1, Page 1-6. Groundwater Sources. It would be helpful to include here an explanation of the basis for the groundwater availability determinations listed in this Section as coming from the 2001 Regional Water Plan and the 1997 State Water Plan. For instance, are these volumes based solely on annual recharge volumes?

Section 1.4.2, Page 1-7. Surface Water Sources. The plan states that there are no major springs in the region. In addition, Section 4.2.2, Page 4-3, second paragraph, states that there are no springs in the area expected to experience the highest water use demands. It appears from the book *Springs of Texas* by Gunnar Brune that, although never numerous, there were springs in the area until heavy groundwater pumping caused them to cease flowing. Continued recovery of groundwater levels could result in re-establishing some springflows in the area, which could make surface water rights more dependable.

Section 1.5.2, Page 1-11. Recreational and Natural Resources. The information on endangered or threatened species has limited utility. This discussion would be much more useful if it were to highlight species occurring in habitats dependent on the region's rivers and streams. Those are the habitats and the species most likely to be affected by water management decisions.

Section 1.7.1, Page 1-15. Unique Reservoir Sites. In order to make discussion of the permitting status of the Palmetto Bend Phase II Reservoir more complete, we suggest that

the text acknowledge that environmental flow protection is an outstanding permitting issue that would need to be addressed prior to construction.

CHAPTER 1, General.

This chapter is lacking in discussion of various components. There is almost no discussion of agricultural activity in the region. For the listed activities by county, it is apparent that livestock operations are significant. However, we did not find information about the location of those operations or about their water sources. That type of information is needed to evaluate the potential for adverse impacts, such as the impacts on livestock operations (relying on shallow wells) that might result from the temporary overdrafting of aquifers.

CHAPTER 2, PRESENTATION OF POPULATION AND WATER DEMANDS

We urge the planning group to acknowledge environmental flows as a category of water demand. There is precedent for such action: the initially prepared plan for the Lower Colorado River Basin (Region K) does include such recognition of environmental flows as a water demand. While we recognize limitations on the availability of information needed to quantify this water demand, the category could be acknowledged qualitatively during this round of planning with additional effort devoted to quantitative analysis in the future.

Section 2.2.2.2 (a)(3), Page 2-8. This section describes how the Year 2000 water use data takes into account the water use savings that have resulted to date from the 1991 State Water-Efficient Plumbing Act. However, there is no mention of how related reductions are incorporated into the future water demand projections. In other words, the plan needs to state **w**hat rate of plumbing fixture replacement was assumed in developing those projections. We request that the planning group include that information, in the form of per capita reductions in water use, in the plan. We believe that is valuable information to help the public understand those savings. The inclusion of information about per capita water use rates also would be helpful in identifying potential for additional water efficiency savings.

CHAPTER 3, ANALYSIS OF CURRENT WATER SUPPLIES

Section 3.2.3, Page 3-5. The second paragraph states that the TWDB estimates total groundwater availability for the region is 207,599 ac-ft/year, with 87,876 ac-ft/year for Jackson, 38,123 ac-ft/year for Lavaca and 81,600 ac-ft/year for Wharton. The following paragraph states that the planning group found support for an estimate of 81,600 ac-ft/year annually. However, it is not clear that the paragraph is referring only to Wharton County. Clarification would be helpful.

On page 1-7, the initially prepared plan indicates that groundwater pumping in Jackson County averaged about 75,000 acre-feet during the 1984 to 1997 period. Figure 3.6

appears to show a substantial recovery of groundwater levels in the Gulf Coast Aquifer in eastern Jackson County during that period for at least two of the four wells. For the other two wells, there are some variations in levels, but generally the levels at the beginning and end of that period appear to be relatively unchanged. Levels for all of the wells appear to have risen since 1997. The text on page 3-4 indicates that pumping during the 1997 to 2004 time period has averaged about 51,960 acre-feet/year in Jackson County. However, the proposed availability amount for the Gulf Coast Aquifer in Jackson County is 87,876 acre-feet/year or about a 17% increase in pumping over the average level for that 1984 to 1997 period and almost a 70% increase in pumping over the average level for the 1997 to 2004 period. It is not clear from the data provided that a pumping increase of that magnitude would not result in a long-term decline in water levels. We urge the planning group either to give further consideration to identifying the sustainable level of pumping in Jackson County or to provide further explanation of the basis for the determination that a pumping level of 87,876 acre-feet/year would be sustainable.

CHAPTER 4, IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES BASED ON NEEDS

Section 4.2.2, Page 4-3, second paragraph. We appreciate the thoughtful discussion set out in the initially prepared plan. The endorsement of "pumping of additional groundwater beyond the sustainable yield" or "overdrafting the aquifer," as is stated on pages 4B.1-3 and 4B.1-5, is troubling and may not accurately reflect the planning group's intent. As we understand the discussion in the initially prepared plan, it seems that the underlying concept might more accurately be described as involving a conjunctive management approach. During non-drought years, a combination of surface water and groundwater supplies would be used, but with groundwater use levels somewhat below the sustainable yield level for the aquifer. During drought years, when surface water is not available or is very limited, pumping of groundwater above the annual limit that would be sustainable on an ongoing basis would occur. However, on an average basis, groundwater pumping would continue to be no higher than the sustainable levels.

We urge the planning group to consider describing a conjunctive management approach that explicitly endorses the limits on groundwater pumping needed to ensure that sustainable limits are not exceeded on any long-term basis. If groundwater levels recover to the point that surface flow contributions from groundwater are restored, a new balance might need to be struck to reflect the improve reliability of surface water rights and to provide appropriate protection for any such springs or seeps.

The plan states that there are no springs in the area with the highest water demands. Please see comment for Section 1.4.2, Page 1-7 above.

Section 4.4.4, Page 4-8. Impacts of Irrigation Return Flows. The plan states that there is no reduction of flow from the streams or from any springs as a result of the production of the groundwater. It would be helpful to have additional discussion explaining the absence of a potential for groundwater contributions to surface water flow

through seeps or other means. This is especially important given that recent estimates show that up to 25% of recharge to the Gulf Coast Aquifer in Wharton and Matagorda counties ends up as freshwater discharge to near-coast waters.[2] Historical contributions are noted in *Springs of Texas.* Declines in groundwater levels may have resulted in the loss of the potential for such contributions, but some specific explanation of the situation would be helpful.

Drought Management Measures. As required by 357.7 (a)(7)(B) of TWDB's rules, drought management is a water management strategy that must be evaluated. The initially prepared plan does not contain the required consideration of drought management.

CHAPTER 6, WATER CONSERVATION AND DROUGHT MANAGEMENT PLANS

The model water conservation plan templates provide useful information but do not appear to represent actual model water conservation plans, as contemplated by the Board's rules. See 31 TAC § 357.7 (c). The model drought contingency plan template for irrigation users appears to be very much developed for irrigators with a surface water reservoir as a supply source and with a complicated irrigation district structure. Accordingly, it does not appear to be a particularly good model for irrigation users in the Lavaca Region.

CHAPTER 7, LONG-TERM PROTECTION OF THE STATE'S WATER RESOURCES, AGRICULTURAL RESOURCES, AND NATURAL RESOURCES

(Page 7-1) **Section 7.1 Water Resources Within the Lavaca Regional Water Planning Area.**
To ensure consistency with long-term protection of the state's water resources, groundwater water sources should be managed on a sustainable basis. Although that is what we understand to be intended by the planning group, the issue should be discussed here. As noted elsewhere in these comments, we urge the planning group to explicitly indicate its intention regarding long-term sustainable management of groundwater supplies.

Section 7.1.3 Lavaca River Basin

The existing language in this section could be read as endorsing long-term overdrafting of groundwater resources. We urge the planning group to explicitly indicate its intention regarding long-term sustainable management of groundwater supplies.

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[2] Dutton, A.R., and Richter, B.C., 1990 Regional geohydrology of the Gulf Coast Aquifer in Matagorda and Wharton Counties, Texas: Development of a numerical model to estimate the impact of water management strategies: The University of Texas at Austin, Bureau of Economic Geology.

Section 7.2 Agricultural Resources within the Lavaca Regional Water Planning Area
Although protection of rice irrigation is acknowledged, there is no discussion about other aspects of agriculture in the planning area. In order to demonstrate consistency with long-term protection of agriculture, the presence or absence of impacts on other agricultural operations, including livestock operations, should be discussed.

CHAPTER 8, UNIQUE STREAM SEGMENTS, RESERVOIR SITES, AND LEGISLATIVE RECOMMENDATIONS

Section 8.1, Page 8-1. Unique Stream Segments and Reservoir Sites. The Initially Prepared Plan recommends the designation of the Palmetto Bend Phase II reservoir site on the Lavaca River as a Unique Reservoir Site. According to TWDB rules §357.9, the plan needs to include a description of the site, reasons for the unique designation, and expected beneficiaries of the water supply to be developed at the site. We believe any such site should be described with sufficient specificity to allow landowners in the area to know where the boundaries of the designation would be. The only stated reason for the proposed designation is that the site was evaluated as one of the management strategies for the region's agricultural shortages. However, for reasons described elsewhere in the plan, the planning group determined that the reservoir is not a viable water management strategy for agricultural users or other users in the planning region. Thus, there are no described reasons for the proposed designation and no identified beneficiaries for the water supply. Accordingly, we urge the planning group to reconsider this recommendation.

Section 8.1, Page 8-1. Unique Stream Segments and Reservoir Sites. It is disappointing to see that the Planning Group has again declined to recommend any stream segments for designation as unique stream segments. If the Texas Parks and Wildlife Department has provided information on stream segments it recommends for consideration, we urge the planning group to include that information in the regional plan.

Page 4B.1-1 Strategy P-JW-IL-1 Construction of Palmetto Bend Phase II on the Lavaca River. The first sentence of the "Environmental Impacts" discussion, which talks about water currently leaving the basin being returned, does not appear to fit here and should be deleted. The last sentence under the "Cost" heading notes that due to cost, any yield from the reservoir likely would be sold out of the basin. That sentence is very inconsistent with the discussions under the other headings all of which assume that the water would be used for irrigation within the region.

Page 4B.1-3. **Strategy P-W-I-1 Overdrafting the Aquifer, Wharton County Irrigation.**
As noted above, we urge the planning group to consider reconfiguring this strategy as one expressly acknowledging conjunctive management of surface and groundwater. We also urge the planning group to stress the concept that overdrafting of groundwater would occur only for short periods during serious drought periods with long-term management

of the aquifer being based on a sustained yield approach designed to avoid declines in groundwater levels.

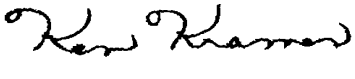
Page 4B.1-4. **Strategy P-JLW-IL-1 Reuse of Municipal Effluent.**
Some quantitative analysis of the impacts of reuse on stream flows is needed. As noted elsewhere in the plan, surface flow contributions from springs and seeps are either non-existent or greatly diminished, as a result return flows have increased importance in the region. TWDB rules expressly require a quantitative evaluation of environmental impacts, including impacts on environmental water needs. See 31 TAC § 357.7 (a)(8)(A)(ii).

Page 4B.1-5. **Strategy P-W-I-1 Overdrafting the Aquifer, Jackson County Irrigation.**
As noted above, we urge the planning group to consider reconfiguring this strategy as one expressly acknowledging conjunctive management of surface and groundwater. We also urge the planning to stress the concept that overdrafting of groundwater would occur only for short periods during serious drought periods with long-term management of the aquifer being based on a sustained yield approach designed to avoid declines in groundwater levels. Finally, as noted above, we urge the planning group to revisit the amount of pumping that would be sustainable on a long-term basis.

Thank you for your consideration of these comments and please free to contact us if you have any questions. We look forward to a continuing positive dialogue with the planning group during this and future planning cycles.

Sincerely,





Myron Hess	Mary Kelly	Ken Kramer
National Wildlife Federation	Environmental Defense	Sierra Club, Lone Star Chapter

cc: David Meesey, Region P liaison, TWDB
Kevin Ward, TWDB
Cindy Loeffler, TPWD
Mark Lowry, Turner, Collie, and Braden

Comment Responses to the National Wildlife Federation, Environmental Defense, and the Sierra Club

1. *Drought management measures aimed at reducing demands during periods of unusually dry conditions are important components of good water management. As noted above, SB2 and TWDB rules mandate consideration and inclusion in regional plans of reasonable levels of drought management as water management strategies. It just makes sense to limit some nonessential uses of water during times of serious shortage instead of spending vast sums of money to develop new supply sources simply to meet those nonessential demands during rare drought periods. Drought management includes documentation of the water savings each supplier anticipates as a result of drought measures. Because drought management measures are not included as water management strategies, the Initially Prepared Plan does not comply with applicable requirements.*

   The Lavaca RWPG's consultant team presented information on drought management plans and conservation plans in accordance with the TWDB requirements that they be considered as management strategies. In the case of conservation, TWDB rules required that an explanation be provided if there were entities that had shortages that did not use conservation as their first strategy. However, for drought contingency measures, the TWDB required only that they be considered. The Consultant Team noted that long term changes in water use that would take place over the 10 years of a repeat of the drought of record are more properly termed conservation measures. Drought contingency measures are generally measures that are taken when faced with an imminent shortage and are more often the response to a need to reduce the peak demand rather than the overall average. Drought contingency plans are generally implemented by municipalities, water authorities, and others in response to lowering lake levels or aquifer levels, or in response to approaching 100 percent capacity in critical transmission or distribution system components, and they have the necessary authority to require their customers to implement those plan. For Region P, there are no municipalities with shortages, and there are no major uses of canals or other facilities where there is central control. Ninety-five percent of the total water usage in the region is for agriculture. Groundwater is obtained from individually owned wells and the surface water is obtained from individual rights for the most part. Production of rice takes up approximately 85 percent of the total water usage. Under drought of record conditions, there will be no surface water available and all supplies will be obtained from groundwater. As a result, the individual farmer will make the decision of whether or not to plant rice. Once that decision is made, the amount of water he needs will be based on climate conditions and length of the growing season. If the farmer desires to make a rice crop, he will have to use the water he needs to suppress the weeds and provide a reasonable harvest. His only choice in a drought contingency scenario is not to plant in the first place.

   A second reason that a drought contingency plan is not appropriate as a water management strategy for agriculture in the LRWPA is the fact that agriculture has the greatest price sensitivity to the cost of water. As noted above, rice production

accounts for 85 percent of the total water used. Rice production is an extremely low margin operation and the cost of water plays a significant part in that analysis. If the water levels in the wells fall an additional 100 feet during the rice growing season, then some of the farmers with more marginal fields will probably choose not to plant for the next year. This makes the demand somewhat self limiting. Agriculture, which uses the majority of the water, cannot afford to produce it if the drawdown is too great. Reductions in agricultural use will result in recovery of the water table. The intent of a drought contingency plan is achieved through economics instead.

2. *If existing water rights, when used as projected, would cause serious disruption of environmental flows resulting in harm to natural resources, then merely minimizing additional harm from new strategies would not produce a water plan that would be consistent with the long-term protection of natural resources or the economic activities that rely on them. Demonstrating such consistency is a prerequisite to approval of a regional water plan. As a result, regional water planning groups should recognize environmental flows as a water demand critical to the state's ecology and economy, and should devise water plans that protect reasonable environmental flow levels. For example, Region K, in its initially prepared plan, has recognized environmental water needs as a category of water demand. We appreciate the careful consideration given in the initially prepared plan to the need to protect environmental flows. However, the required quantitative assessment of environmental flow impacts appears to be missing from the evaluation of potentially feasible management strategies.*

   The protection of water resources for all uses, including environmental flows, is a significant goal of the regional planning process. No flows were designated during the demand development phase of the planning process for the LRWPA. The only management strategy recommended by the IPP is the use of groundwater resources for irrigated agriculture which would be beneficial to streamflows during dry periods throughout the year.

3. *We support the planning group's decision not to include the Palmetto Bend Phase II reservoir on the Lavaca River as a water management strategy. As the initially prepared plan notes, there is no in-basin demand that could feasibly be met with water from the reservoir. Accordingly, we also feel that the site should not be recommended for designation as a unique reservoir site. One of the prerequisites for such a recommendation is the identification of the expected beneficiaries of the water supply to be developed. See 31 TAC § 357.9. Because there are no expected beneficiaries, the recommendation of such a designation is premature.*

   Although Palmetto Bend Phase II has not been recommended by the LRWPG as the preferred alternative for meeting the demands of the Region through the year 2060, the group acknowledges that it is a potential alternative for meeting the needs of future growth if it becomes viable as an option. In addition, Palmetto Bend Phase II is included as a management strategy for the Region L plan. For this reason, the LRWPG reaffirms its decision to select the location as a unique reservoir site.

4. *Senate Bill 1 directs consideration of voluntary and emergency transfers of water as a key mechanism for meeting water demands. Those approaches seem to have received little attention in the planning process to date. Water Code Section 16.051 (d) directs that rules governing the development of the state water plan shall give specific consideration to "principles that result in the voluntary redistribution of water resources." Similarly, Section 16.053 (e)(5)(H) directs that regional water plans must include consideration of voluntary transfers of water within the region using, but not limited to, regional water banks, sales, leases, options, subordination agreements, and financing arrangements…." Thus, there is a clear legislative directive that the regional planning process must include strong consideration of mechanisms for facilitating voluntary transfers of existing water rights within the region, particularly on a short-term basis as a way to meet drought demands.*

   In addition, emergency transfers are intended as a way to address serious water shortages for municipal purposes. They are a way to address short-term problems without the expense and natural resource damage associated with development of new water supplies. Water Code Section 16.053 (e)(5)(I), as added by SB 1, specifically directs that emergency transfers of water, pursuant to Section 11.139 of the Water Code, are to be considered, including by providing information on the portion of each non-municipal water right that could be transferred without causing undue damage to the holder of the water right. Thus, the water planning process is intended as a mechanism to facilitate voluntary transfers, particularly as a means to address drought situations, by collecting specific information on rights that might be transferred on such a basis and by encouraging a dialogue between willing sellers and willing buyers on that approach. It is not clear if there is significant potential for this approach in the Lavaca Region, but the issue merits discussion.

   The LRWPG acknowledges the merits of plans that work to utilize water resources at their maximum efficiency before investigating new alternatives for water. However, as the LRWPA is based almost entirely on groundwater, there is little opportunity for such an option to be considered. In other locations, a water provider may be able to shift water delivery from customers with a surplus to those experiencing shortages with little effort, but since individual users in the LRWPA are able to pump exactly the amount of water they require, emergency transfers are not a necessary consideration.

Chapter 1: Planning Area Description

5. ***Section 1.4.1, Page 1-6. Groundwater Sources.*** *It would be helpful to include here an explanation of the basis for the groundwater availability determinations listed in this Section as coming from the 2001 Regional Water Plan and the 1997 State Water Plan. For instance, are these volumes based solely on annual recharge volumes?*

   The estimates of groundwater availability obtained from the 2001 Regional Water Plan and the 1997 State Water Plan were developed by analyzing historic pumpage

and well level patterns in the region. These results were then verified using the latest available GAM results. Text has been added to the IPP to indicate this.

6. ***Section 1.4.2, Page 1-7. Surface Water Sources.*** *The plan states that there are no major springs in the region. In addition, Section 4.2.2, Page 4-3, second paragraph, states that there are no springs in the area expected to experience the highest water use demands. It appears from the book Springs of Texas by Gunner Brunet that, although never numerous, there were springs in the area until heavy groundwater pumping caused them to cease flowing. Continued recovery of groundwater levels could result in reestablishing some springflows in the area, which could make surface water rights more dependable.*

   According to the book Springs of Texas by Gunnar Brune, springs in the region were never numerous or large. The springs could contribute very small quantities of water to streams and would have little affect on the dependability of surface water rights. Today seeps provide small amounts of water during periods of normal to above normal precipitation.

7. ***Section 1.5.2, Page 1-11. Recreational and Natural Resources.*** *The information on endangered or threatened species has limited utility. This discussion would be much more useful if it were to highlight species occurring in habitats dependent on the region's rivers and streams. Those are the habitats and the species most likely to be affected by water management decisions.*

   The information provided came directly from the Texas Parks and Wildlife Department from their files. As far as we are aware, it is a representative listing of all threatened and endangered species in the area, regardless of habitat. The RWPG feels that it satisfies the requirements of the plan.

8. ***Section 1.7.1, Page 1-15. Unique Reservoir Sites****. In order to make discussion of the permitting status of the Palmetto Bend Phase II Reservoir more complete, we suggest that the text acknowledge that environmental flow protection is an outstanding permitting issue that would need to be addressed prior to construction.*

   This comment has been noted and changes have been made to Section 1.7.1 to reflect that environmental flow impacts are subject to consideration by TCEQ for this reservoir.

9. ***Chapter 1.*** *This chapter is lacking in discussion of various components. There is almost no discussion of agricultural activity in the region. For the listed activities by county, it is apparent that livestock operations are significant. However, we did not find information about the location of those operations or about their water sources. That type of information is needed to evaluate the potential for adverse impacts, such as the impacts on livestock operations (relying on shallow wells) that might result from the temporary overdrafting of aquifers.*

Lavaca County has the largest concentration of Livestock demands throughout the LRWPA. However, livestock still only accounts for less than 2 percent of the agricultural water demand for the region. These demands are likely to be reduced in the event of a long-term drought when low rainfalls will contribute to reduced forage needed for raising cattle. Therefore, the sustainability of livestock is not directly related to the amount of water required by the livestock themselves.

Intermittent over drafting of the aquifers is anticipated to occur in Wharton County and potentially Jackson County. The estimated quantities of pumpage are not as high as the pumpage amounts that occurred in these counties at times in the 1960s and 1970s, when there was more irrigated agriculture. If and when overdrafting does occur, this pumpage occurs from deeper irrigation wells and, generally, the pumpage should not adversely affect shallow livestock wells so that water would not be available from them.

Chapter 2: Presentation of Population and Water Demands

10. ***Chapter 2.*** *We urge the planning group to acknowledge environmental flows as a category of water demand. There is precedent for such action: the initially prepared plan for the Lower Colorado River Basin (Region K) does include such recognition of environmental flows as a water demand. While we recognize limitations on the availability of information needed to quantify this water demand, the category could be acknowledged qualitatively during this round of planning with additional effort devoted to quantitative analysis in the future.*

    As stated above, the water demands developed and approved by several parties, including TWDB and the LRWPG, do not include environmental flow requirements. Such requirements are included in the water rights issued to the Lavaca-Navidad River Authority with 4,500 acre-feet of the firm yield of the reservoir dedicated to downstream flow conditions. Additionally, LNRA has entered into an agreement with TPWD for bay and estuary releases into Lavaca Bay. These freshwater release rates are based on historical mean and median stream flows in the Lavaca Basin. At the present time, the TCEQ is handling the assignment of environmental flows on an individual permit basis. However, this comment has been noted as a consideration for future planning activities.

11. ***Section 2.2.2.2 (a)(3), Page 2-8.*** *This section describes how the Year 2000 water use data takes into account the water use savings that have resulted to date from the 1991 State Water-Efficient Plumbing Act. However, there is no mention of how related reductions are incorporated into the future water demand projections. In other words, the plan needs to state what rate of plumbing fixture replacement was assumed in developing those projections. We request that the planning group include that information, in the form of per capita reductions in water use, in the plan. We believe that is valuable information to help the public understand those savings. The*

inclusion of information about per capita water use rates also would be helpful in identifying potential for additional water efficiency savings.

As noted in the IPP, the use of water by all Municipal WUG's in the Lavaca RWPA accounts for approximately 2 percent of the total water used in the region. In addition, the TWDB population statistical analysis shows that Lavaca County, in particular, will see a decrease in population over the 50 year planning horizon. There was considerable disagreement within the planning group members concerning these numbers but there were no studies to cite that could be used for support to change them. There was a potential challenge to the Census Numbers by one of the WUGs but no further information was provided so it is unknown whether or not that challenge was accepted. As a result of the concern over the population data, the RWPG requested that they be allowed to use their highest demand during the planning period. These demands were included in the IPP. None of the municipal WUGs had any shortages, no further analysis was done to identify additional water efficiency savings. A table of the projected per capita usages by decade will be included in this response to the comments in Chapter 10.

Year 2000 Per Capita Water Use - LRWPA

City	Water Demand (Gallons/capita/day)
Edna	120
El Campo	153
Ganado	116
Hallettsville	219
Moulton	156
Shiner	216
Yoakum	147

Chapter 3: Analysis of Current Water Supplies

12. ***Section 3.2.3, Page 3-5.*** *The second paragraph states that the TWDB estimates total groundwater availability for the region is 207,599 ac-ft/year, with 87,876 ac-ft/year for Jackson, 38,123 ac-ft/year for Lavaca and 81,600 ac-ft/year for Wharton. The following paragraph states that the planning group found support for an estimate of 81,600 ac-ft/ year annually. However, it is not clear that the paragraph is referring only to Wharton County. Clarification would be helpful.*

    Your recommendation has been incorporated into the text to indicate that this value refers to Wharton County, and more specifically only that portion of Wharton County, Precinct Three and the City of El Campo, that is in the LRWPA.

13. *On page 1-7, the initially prepared plan indicates that groundwater pumping in Jackson County averaged about 75,000 acre-feet during the 1984 to 1997 period. Figure 3.6 appears to show a substantial recovery of groundwater levels in the Gulf Coast Aquifer in eastern Jackson County during that period for at least two of the four wells. For the other two wells, there are some variations in levels, but generally the levels at the beginning and end of that period appear to be relatively unchanged. Levels for all of the wells appear to have risen since 1997. The text on page 3-4 indicates that pumping during the 1997 to 2004 time period has averaged about 51,960 acre-feet/year in Jackson County. However, the proposed availability amount for the Gulf Coast Aquifer in Jackson County is 87,876 acre-feet/year or about a 17 percent increase in pumping over the average level for that 1984 to 1997 period and almost a 70 percent increase in pumping over the average level for the 1997 to 2004 period. It is not clear from the data provided that a pumping increase of that magnitude would not result in a long-term decline in water levels. We urge the planning group either to give further consideration to identifying the sustainable level of pumping in Jackson County or to provide further explanation of the basis for the determination that a pumping level of 87,876 acre-feet/year would be sustainable.*

    Ground work pumpage data available for Jackson County show that pumpage was about 90,000 acre-feet per year in 1964 and increased to about a 120,000 acre-feet a year by 1975 and for the period from 1974 through 1980 averaged about 115,000 acre-feet per year. Well water level hydrographs as given on Figure 3.6 show the response of the aquifer to the higher rates of pumping and this information along with previous estimates of groundwater availability provide a basis for developing an estimate of sustainable yield in Jackson County of about 87,876 acre-feet per year.

Chapter 4: Identification, Evaluation, and Selection of Management Strategies Based on Needs

14. ***Section 4.2.2, Page 4-3, second paragraph.*** *We appreciate the thoughtful discussion set out in the initially prepared plan. The endorsement of "pumping of additional groundwater beyond the sustainable yield" or "overdrafting the aquifer," as is stated on pages 4B.1-3 and 4B.1-5, is troubling and may not accurately reflect the planning group's intent. As we understand the discussion in the initially prepared plan, it seems that the underlying concept might more accurately be described as involving a conjunctive management approach. During non-drought years, a combination of surface water and groundwater supplies would be used, but with groundwater use levels somewhat below the sustainable yield level for the aquifer. During drought years, when surface water is not available or is very limited, pumping of groundwater above the annual limit that would be sustainable on an ongoing basis would occur. However, on an average basis groundwater pumping would continue to be no higher than the sustainable levels. We urge the planning group to consider describing a conjunctive management approach that explicitly endorses the limits on groundwater pumping needed to ensure that sustainable limits are not exceeded on any long-term basis. If groundwater levels recover to the point that surface flow contributions from groundwater are restored, a new balance might need to be struck to reflect the*

improve reliability of surface water rights and to provide appropriate protection for any such springs or seeps. The plan states that there are no springs in the area with the highest water demands. Please see comment for Section 1.4.2, Page 1-7 above.

Your recommendation for describing the planned pumpage of additional groundwater supplies when necessary as conjunctive groundwater use has been incorporated into the plan. It is the intention of the LRWPG that this strategy be used only in extreme situations to meet short term demands. It has been noted in the IPP that agriculture is the most sensitive to price issues, and the additional drawdown that would occur from mining of the aquifer, or taking out more than can be replaced over time, would be disastrous to the rice industry in particular. For that reason, the RWPG is in total agreement with the need to maintain pumpage at long term levels that do not negatively impact the groundwater producers. It is noted that water levels have risen since the years in the 1970's when rice production peaked in the area, but the RWPG has no knowledge of what level of recovery would cause the springs to flow again.

Spring flow in the area, as described by those who have studied them, was not large and the springs were not numerous. For these reasons small seeps or springs would contribute only very small amounts of water to the surface water resources in the area. Small seeps are estimated to occur after periods of above normal precipitation or periods of prolonged precipitation. Water can discharge from permeable sediments to washes, creeks or stream beds that cross the region.

15. ***Section 4.4.4, Page 4-8. Impacts of Irrigation Return Flows.*** *The plan states that there is no reduction of flow from the streams or from any springs as a result of the production of the groundwater. It would be helpful to have additional discussion explaining the absence of a potential for groundwater contributions to surface water flow through seeps or other means. This is especially important given that recent estimates show that up to 25 percent of recharge to the Gulf Coast Aquifer in Wharton and Matagorda counties ends up as freshwater discharge to near-coast waters. Historical contributions are noted in Springs of Texas. Declines in groundwater levels may have resulted in the loss of the potential for such contributions, but some specific explanation of the situation would be helpful.*

    Inventory of springs in the area is presented in the book "Springs of Texas" by Gunnar Brune. The publication notes that springs were not numerous nor large and thus contributed only small quantities of water. Any small contribution from springs and seep to streams is estimated to be essentially about the same in the future as groundwater pumping is projected to be no higher than it has been at times in the past. During times of above normal rainfall or during periods of extended higher precipitation, it is estimated that seeps will continue to occur along streams or washes where they have incised through the relatively flat topography of most of the Lavaca Region.

16. ***Drought Management Measures****. As required by 357.7 (a)(7)(B) of TWDB's rules, drought management is a water management strategy that must be evaluated. The*

initially prepared plan does not contain the required consideration of drought management.

This item was responded to more fully in response to Question 1. The RWPG did consider drought contingency plans but did not include them as a management strategy as noted above.

Chapter 6: Water Conservation and Drought Management Plans

17. *The model water conservation plan templates provide useful information but do not appear to represent actual model water conservation plans, as contemplated by the Board's rules. See 31 TAC § 357.7 (c). The model drought contingency plan template for irrigation users appears to be very much developed for irrigators with a surface water reservoir as a supply source and with a complicated irrigation district structure. Accordingly, it does not appear to be a particularly good model for irrigation users in the Lavaca Region.*

    The purpose of the conservation plan templates was to provide additional useful information on conservation issues. It is the RWPG's opinion that they fulfill the requirements of the TWDB. In addition, there is another template developed by the TCEQ that can also be used.

    The Drought Contingency Plan template that was included is more appropriate for a surface water source and a district, as these are the elements that are conducive to a structure that will allow the enforcement of such plans. Individual farmers have only economic incentives to guide their decisions about the use or non-use of water in their business. While some irrigation can be on a wait and see basis and only if there is inadequate rainfall, rice irrigation must take place regardless of rainfall conditions, so the only real decision that a rice farmer faces is whether to plant or not. Once planted, there is little he can do to reduce his water usage without negatively affecting the quality and yield of his crop. In addition, if conditions are such that the farmer faces additional drawdown of the water table, at some point, more and more farmers will be forced to stop farming and that reduction in use, if significant enough, will result in a rise in water levels. For these reasons, there is little productivity in developing a revised drought contingency plan. The primary rice growing areas in the LRWPG, namely western Wharton County and Jackson County are both included in GCDs. These districts may provide the necessary legal authority to develop drought contingency plans that would be enforceable, but such plans are still some time in the future if at all.

Chapter 7: Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

18. *(Page 7-1)* ***Section 7.1 Water Resources Within the Lavaca Regional Water Planning Area.*** *To ensure consistency with long-term protection of the state's water*

resources, groundwater water sources should be managed on a sustainable basis. Although that is what we understand to be intended by the planning group, the issue should be discussed here. As noted elsewhere in these comments, we urge the planning group to explicitly indicate its intention regarding long-term sustainable management of groundwater supplies.

As indicated in response to an earlier question, it is the intent of the LRWPG to limit the long term withdrawals from the aquifer so that additional drawdowns will be experienced only during the driest years of the drought of record. The only reason that the additional drawdown is allowed during the drought of record is because the plan anticipates the recovery of the aquifer during times where surface water is plentiful, since surface water is less costly to produce than groundwater. As a result, the net long term demand on the aquifer is anticipated to remain at or below the sustainable yield.

19. ***Section 7.1.3 Lavaca River Basin*** *The existing language in this section could be read as endorsing long-term overdrafting of groundwater resources. We urge the planning group to explicitly indicate its intention regarding long-term sustainable management of groundwater supplies.*

    The language in this section and throughout the document has been adjusted to show that the water management strategy recommended by the planning group is for conjunctive use of groundwater and surface water resources. It has also been clarified that withdrawals of groundwater beyond sustainable yield are not intended for long term periods in a way that would permanently reduce aquifer levels.

20. ***Section 7.2 Agricultural Resources within the Lavaca Regional Water Planning Area.*** *Although protection of rice irrigation is acknowledged, there is no discussion about other aspects of agriculture in the planning area. In order to demonstrate consistency with longterm protection of agriculture, the presence or absence of impacts on other agricultural operations, including livestock operations, should be discussed.*

    Throughout the LRWPA, rice production consumes over 91 percent of the irrigation water demand. This dependence on large volumes of water makes rice more sensitive to changes in the availability of water resources than any other facet of agricultural production. Therefore, rice production is an indicator of agricultural economic health of the LRWPG. For this reason, the planning group has chosen to focus primarily on this industry in protecting agricultural resources as a whole. In addition, the carrying capacity of any land for livestock depends to a large extent on the amount of forage available. During times of drought, the reduced rainfall significantly reduces the amount of forage available and the livestock producers reduce their numbers to what their land can produce food for in most cases. This results in a reduced demand for drinking water for livestock as well. Irrigators other than rice producers will face similar issues with regard to the cost of irrigation water in terms of the price to lift it

from the aquifer to the surface. Minimizing the additional lift is a strategy that benefits all irrigation users.

Chapter 8: Unique Stream Segments, Reservoir Sites, and Legislative Recommendations

21. ***Section 8.1, Page 8-1. Unique Stream Segments and Reservoir Sites.*** *The Initially Prepared Plan recommends the designation of the Palmetto Bend Phase II reservoir site on the Lavaca River as a Unique Reservoir Site. According to TWDB rules §357.9, the plan needs to include a description of the site, reasons for the unique designation, and expected beneficiaries of the water supply to be developed at the site. We believe any such site should be described with sufficient specificity to allow landowners in the area to know where the boundaries of the designation would be. The only stated reason for the proposed designation is that the site was evaluated as one of the management strategies for the region's agricultural shortages. However, for reasons described elsewhere in the plan, the planning group determined that the reservoir is not a viable water management strategy for agricultural users or other users in the planning region. Thus, there are no described reasons for the proposed designation and no identified beneficiaries for the water supply. Accordingly, we urge the planning group to reconsider this recommendation.*

    Due to economic conditions, the Palmetto Bend Phase II site is not recommended as a water management strategy in the near term. However, it is foreseeable that this resource may be required in the future to guarantee sufficient water supplies for the LRWPA and, therefore, the LRWPG believes that recommending the location as a unique reservoir site is appropriate. Additionally, the LRWPG feels that designating this unique reservoir site encourages the assessment of the site for environmental impacts so that they may be known in the future if the reservoir is, indeed, required.

22. ***Section 8.1, Page 8-1. Unique Stream Segments and Reservoir Sites.*** *It is disappointing to see that the Planning Group has again declined to recommend any stream segments for designation as unique stream segments. If the Texas Parks and Wildlife Department has provided information on stream segments it recommends for consideration, we urge the planning group to include that information in the regional plan.*

    The LRWPG reaffirms its decision not to nominate any stream segments as ecologically unique until such a point that the impacts and benefits of this designation are fully understood. Legally, approval of such a designation requires legislative approval that may be carried out at any time, with or without nomination by the LRWPG. However, information from TPWD will be included as an appendix to Chapter 8.

Appendix 4B

23. ***Page 4B.1-1 Strategy P-JW-IL-1 Construction of Palmetto Bend Phase II on the Lavaca River.*** *The first sentence of the "Environmental Impacts" discussion, which talks about water currently leaving the basin being returned, does not appear to fit here and should be deleted. The last sentence under the "Cost" heading notes that due to cost, any yield from the reservoir likely would be sold out of the basin. That sentence is very inconsistent with the discussions under the other headings all of which assume that the water would be used for irrigation within the region.*

    This sentence was intended to show that, because of cost, this water would be more likely purchased by a user outside of the basin than by irrigators within the basin as the strategy proposes.

24. ***Page 4B.1-3. Strategy P-W-I-1 Overdrafting the Aquifer, Wharton County Irrigation.*** *As noted above, we urge the planning group to consider reconfiguring this strategy as one expressly acknowledging conjunctive management of surface and groundwater. We also urge the planning group to stress the concept that overdrafting of groundwater would occur only for short periods during serious drought periods with long-term management of the aquifer being based on a sustained yield approach designed to avoid declines in groundwater levels.*

    This change has been made, per your recommendation, to better indicate that this is a short-term strategy of conjunctive management of both surface water and groundwater resources.

25. ***Page 4B.1-4. Strategy P-JLW-IL-1 Reuse of Municipal Effluent.*** *Some quantitative analysis of the impacts of reuse on stream flows is needed. As noted elsewhere in the plan, surface flow contributions from springs and seeps are either nonexistent or greatly diminished, as a result return flows have increased importance in the region. TWDB rules expressly require a quantitative evaluation of environmental impacts, including impacts on environmental water needs. See 31 TAC § 357.7 (a)(8)(A)(ii).*

    As this strategy was not found to be feasible on the basis of cost, the LRWPG does not find it reasonable to expend resources on further environmental analysis of this strategy. It is indicated in 31 TAC *§ 3*57.7 (a)(8)(A)(ii) that this analysis should only be performed for "all water management strategies the regional water planning group determines to be potentially feasible."

26. ***Page 4B.1-5. Strategy P-W-I-1 Overdrafting the Aquifer, Jackson County Irrigation.*** *As noted above, we urge the planning group to consider reconfiguring this strategy as one expressly acknowledging conjunctive management of surface and groundwater. We also urge the planning to stress the concept that overdrafting of groundwater would occur only for short periods during serious drought periods with long-term management of the aquifer being based on a sustained yield approach designed to avoid declines in groundwater levels. Finally, as noted above, we urge*

the planning group to revisit the amount of pumping that would be sustainable on a long-term basis.

The region is conjunctively using surface water and groundwater to provide the overall supply. The strategy of periodically pumping additional groundwater to meet demands is planned to be utilized only when necessary. A history of groundwater usage in the region dating back to 1950 shows that larger amounts of groundwater have been pumped on a periodic basis, normally during years of below normal precipitation. Pumping was lowered during years of normal or above normal precipitation or when fewer acres were irrigated. The aquifer system in the region has been pumped at rates higher than the estimates of the future sustainable supply. The availability of groundwater and surface water supplies will continue to be evaluated and revised if warranted based on data and other evaluation tools including models.