

TABLE S1: Location, anion concentration and isotope data for samples used in this study.

GROUNDWATER															
Sample name	Site	Date	Latitude °	Longitude °	Screen upper m bgs	Screen lower m bgs	Cl ppm	SO ₄ ppm	Cl/SO ₄ (wt)	100/SO4	δ ³⁴ S ‰	δ ¹⁸ O(SO4) ‰	δ ¹⁸ O ‰	δ ² H ‰	Source
Mountain front wells (MF)															
SYP		2003	31.883	-106.436	131.1	137.2	90	64	1.40	1.55	6.9		-8.8	-62	[15]
SYP		2003	31.883	-106.436	149.4	155.5	27	49	0.54	2.04					[15]
SYP		2003	31.883	-106.436	175.3	181.4	25	48	0.52	2.09	9.8		-8.9	-61	[15]
SYP		2003	31.883	-106.436	189.0	195.1	20	35	0.58	2.87					[15]
SYP		2003	31.883	-106.436	211.9	218.0	33	37	0.87	2.67	7.8		-8.8	-65	[15]
SYP		2003	31.883	-106.436	222.6	228.7	25	36	0.70	2.75					[15]
SYP		2003	31.883	-106.436	271.3	277.4	37	30	1.24	3.37	7.9		-9.2	-64	[15]
SYP		2003	31.883	-106.436	247.0	253.0	26	37	0.68	2.67					[15]
SYP		2003	31.883	-106.436	298.8	304.9	145	82	1.76	1.22	7.2		-9.7	-69	[15]
Wainwright		2003	31.589	-106.438	146.3	152.4	70	87	0.81	1.15	9.2		-8.7	-62	[15]
Wainwright		2003	31.589	-106.438	169.2	175.3	17	43	0.39	2.33	9.8		-8.8	-62	[15]
Wainwright		2003	31.589	-106.438	186.0	192.1	23	44	0.52	2.26	9.4		-8.9	-61	[15]
Wainwright		2003	31.589	-106.438	207.3	213.4	28	50	0.56	1.99	10.0		-8.8	-62	[15]
Wainwright		2003	31.589	-106.438	227.1	233.2	26	40	0.65	2.53	9.5				[15]
Wainwright		2003	31.589	-106.438	248.5	254.6	53	33	1.60	2.99	9.0				[15]
Wainwright		2003	31.589	-106.438	269.8	275.9	209	26	8.19	3.92	8.2		-9.5	-66	[15]
Wainwright		2003	31.589	-106.438	288.1	294.2	520	17	30.65	5.90	6.7				[15]
Wainwright		2003	31.589	-106.438	301.8	307.9	559	16	35.58	6.37	7.2		-9.7	-68	[15]
Central Basin wells (CB)															
FBT2		11/8/2002	31.941	-106.201	207.3	213.4	1740	605	2.87	0.17	6.7	11.4	-9.6	-69	[15]
FBT2		11/8/2002	31.941	-106.201	225.6	231.7	1096	456	2.41	0.22	9.9	10.4	-9.8	-71	[15]
FBT2		11/8/2002	31.941	-106.201	234.8	240.9	1826	614	2.98	0.16	10.3	10.0	-9.8	-70	[15]
FBT2		11/7/2002	31.941	-106.201	268.3	274.4	2708	669	4.05	0.15	7.8		-9.6	-69	[15]
FBT2		11/7/2002	31.941	-106.201	292.7	298.8	8398	1750	4.80	0.06	8.7	11.0	-9.2	-68	[15]
FBT2		2002	31.941	-106.201	304.9	311.0	8354	1963	4.26	0.05	10.9	11.1	-8.9	-66	[15]
FBT3		2002	31.815	-106.312	149.4	155.5	289	133	2.17	0.75	9.2		-10.1	-71	[15]
FBT3		2002	31.815	-106.312	164.6	170.7	390	137	2.85	0.73	11.1		-10.0	-71	[15]
FBT3		2002	31.815	-106.312	182.9	189.0	391	124	3.15	0.81	10.2		-10.1	-72	[15]
FBT3		2002	31.815	-106.312	198.2	204.3	444	133	3.34	0.75	10.5		-10.3	-73	[15]
FBT3		2002	31.815	-106.312	228.7	234.8	1539	432	3.56	0.23	10.6		-10.4	-75	[15]
FBT3		2002	31.815	-106.312	243.9	250.0	2170	715	3.03	0.14	10.5		-10.3	-74	[15]
FBT3		2002	31.815	-106.312	292.7	298.8	5008	1143	4.38	0.09	10.3		-9.7	-71	[15]
FBT6		10/20/2002	31.893	-106.288	140.2	146.3	802	341	2.35	0.29	15.9	14.7	-9.6	-69	[15]
FBT6		10/20/2002	31.893	-106.288	164.6	170.7	733	151	4.84	0.66	9.4	5.9	-10.3	-73	[15]
FBT6		10/19/2002	31.893	-106.288	189.0	195.1	1010	101	9.97	0.99	6.2	5.9	-10.7	-76	[15]
FBT6		10/19/2002	31.893	-106.288	210.4	216.5	1529	269	5.69	0.37	9.2		-10.6	-75	[15]
FBT6		10/19/2002	31.893	-106.288	227.1	233.2	1849	478	3.87	0.21	8.1	10.7	-10.5	-75	[15]
FBT6		10/18/2002	31.893	-106.288	269.8	275.9	2810	944	2.98	0.11	13.7	10.8	-10.0	-71	[15]
FBT6		11/1/2002	31.893	-106.288	310.4	316.5	4462	1936	2.31	0.05	13.5		-9.5	-69	[15]
FBT8		11/1/2002	31.838	-106.207	146.3	152.4	360	673	0.54	0.15	12.8		-8.0	-63	[15]
FBT8		10/31/2002	31.838	-106.207	155.5	161.6	361	714	0.51	0.14	8.7		-8.1	-64	[15]
FBT8		10/31/2002	31.838	-106.207	170.7	176.8	435	314	1.39	0.32	4.6		-9.0	-66	[15]
FBT8		10/31/2002	31.838	-106.207	189.0	195.1	748	198	3.78	0.51	4.9		-8.9	-67	[15]
FBT8		10/31/2002	31.838	-106.207	240.9	247.0	862	155	5.58	0.65	5.4		-10.0	-72	[15]
FBT8		10/30/2002	31.838	-106.207	259.1	265.2	2277	391	5.82	0.26	9.5		-9.6	-71	[15]
FBT9		11/20/2002	31.853	-106.281	112.8	118.9	420	127	3.30	0.79	12.8		-8.2	-58	[15]
FBT9		11/20/2002	31.853	-106.281	141.8	147.9	318	77	4.12	1.30	7.5		-9.6	-67	[15]
FBT9		11/20/2002	31.853	-106.281	181.4	187.5	1057	244	4.33	0.41	4.6		-9.0	-66	[15]
FBT9		11/19/2002	31.853	-106.281	237.8	243.9	1388	342	4.05	0.29	18.1		-9.7	-69	[15]
FBT9		11/19/2002	31.853	-106.281	277.4	283.5	4550	1559	2.92	0.06	11.2		-9.8	-70	[15]
FBT9		11/19/2002	31.853	-106.281	295.7	301.8	4863	1661	2.93	0.06	11.3		-9.8	-71	[15]

[illegible]

Floodplain Groundwater post-dam

Fabens Flores/Church	8	11/14/2002	31.486	-106.204
Rangel	9	1/5/2003	31.674	-106.278
Fabens Church Well	8	3/21/2004	31.486	-106.204
5R #7	3	6/5/2003	31.401	-106.082
5R 30S	10	6/5/2003	31.420	-106.069
Blue Thief Well	11	5/3/2004	31.533	-106.231
Augustine Well	12	5/4/2004	31.477	-106.157
Hansen 4-T Well	13	7/14/2004	31.499	-106.187
Oriando Flores Well	14	5/4/2004	31.499	-106.204
Felipe Payan well	15	5/5/2004	31.462	-106.184
Vasquez Well	16	5/5/2004	31.442	-106.149
Aliens 2000	17	5/5/2004	31.471	-106.197
JL-49-21-324	1	7/8/2002	31.311	-106.327
JL-49-21-320	1	7/9/2002	31.311	-106.327
JL-49-21-319	1	7/9/2002	31.311	-106.327

11.5
37.6
57.9

38
124
191

285	345	0.83	0.29	3.4	11.4	-7.5	-66	[18]
671	1201	0.56	0.08	1.7	7.8	-8.0	-68	[18]
321	204	1.58	0.49	22.5	13.3	-6.6	-58	[18]
290	397	0.73	0.25	3.7	9.3	-7.5	-66	U
511	939	0.54	0.11	2.1	7.8	-7.3	-65	U
301	468	0.64	0.21	0.1		-8.1	-68	U
248	366	0.68	0.27	1.7		-8.4	-72	U
938	678	1.38	0.15	1.5		-8.8	-73	U
452	688	0.66	0.15	1.1		-7.8	-68	U
373	591	0.63	0.17	2.2		-7.1	-65	U
582	889	0.65	0.11	0.8		-8	-69	U
1852	1106	1.67	0.09	4.5		-8.7	-70	U
211	351	0.60		1.1		-7.2	-66	T
168	240	0.70		2.9		-8	-70	T
291	274	1.06		3.3		-8.3	-71	T

Floodplain Groundwater pre-dam

5R Fences Down	18	6/5/2003	31.434	-106.064
JL-49-21-323	1	7/11/2002	31.311	-106.327
JL-49-21-318	1	7/9/2002	31.311	-106.327
Miller House well	19	1/2/2003	31.288	-105.867
WWM Shallow well	20	Dec 2003	31.018	-105.576
Hansen 4T2	21	7/14/2004	31.499	-106.187
Fabens 10th St.	22	11/13/2002	31.497	-106.147
Tornillo #2	23	9/19/2002	31.461	-106.072
Skov farms house well	24	1/7/2003	31.382	-105.974

174.5
108.5

576
358

346	184	1.87	0.54	8.2	8.9	-11.1	-87	[18]
				8.8	11.6	-10.3	-77	T
1196	398	3.01		7.3		-9.8	-76	T
360	200	1.80	0.50	8.4	5.6	-10.9	-84	[18]
3386	747	4.53	0.13	10.4	14.9	-9.2	-75	T
914	582	1.57	0.17	3.9	7.4	-10.2	-81	T
241	226	1.07	0.44	9.0	10.8	-11.1	-86	T
173	204	0.85	0.49	4.8	11	-11.5	-90	T
762	361	2.11	0.28	4.8	9.1	-9.3	-74	[18]

Drains

Riverside Drain	25	6/2/2003	31.496	-106.156
Tornillo Drain	26	6/5/2003	31.444	-106.097
Drain @ Alamo Arroyo	27	3/20/2004	31.313	-105.908
Drain @ Caseta	28	3/19/2004	31.273	-105.855
Drain @ F	29	3/20/2004	31.120	-105.662
Island Drain Midpoint	30	3/22/2004	31.460	-106.160
Island Drain Downstream	31	3/22/2004	31.443	-106.145
Island Drain Upstream	32	3/22/2004	31.501	-106.205
Fabens Drain Downstream	33	3/22/2004	31.445	-106.140
Fabens Drain Upstream	34	3/22/2004	31.500	-106.168
Border Spur Drain 1	35	5/4/2004	31.475	-106.202
Border Spur Drain 1.5	36	5/4/2004	31.473	-106.198
Border Spur Drain 2	37	5/4/2004	31.471	-106.193
Island Tornillo Seep 2	38	7/13/2004	31.433	-106.106
Island Drain Upstream	32	9/4/2004	31.501	-106.205
Island Drain Midpoint	30	9/4/2004	31.460	-106.160
Island Drain Downstream	31	9/4/2004	31.443	-106.145
Island Drain 0.3 Mi.	39	9/4/2004	31.465	-106.163
Island Drain Farmers 0.3 Mi.	40	9/4/2004	31.475	-106.172
Fabens Drain Downstream Seep	33	9/4/2004	31.445	-106.140
Island Drain Seep 1	41	9/5/2004	31.457	-106.157
Fabens Drain Seep 2	42	9/5/2004	31.452	-106.136
Island Drain Redhouse Seep	43	9/6/2004	31.459	-106.157
Fabens Drain Seep @ Confluence	44	9/7/2004	31.442	-106.143
Fabens Intercepting Drain Seep 1	45	9/8/2004	31.539	-106.23
Fabens Drain Seep 3	46	9/9/2004	31.456	-106.139

126.4	249.3	0.51	0.40	2.6		-5.7	-59	[18]
754.1	908.7	0.83	0.11	3.3		-7.4	-67	[18]
907.6	916.8	0.99	0.11	3.5		-6.6	-62	[18]
471.8	438.3	1.08	0.23	9.4		-8.2	-71	[18]
2206.8	1695.9	1.30	0.06	5.5		-5.9	-59	[18]
1059.0	848.6	1.25	0.12	2.4		-7.3	-65	U
1522.3	1045.9	1.46	0.10	3.1		-7.4	-65	U
419.5	681.3	0.62	0.15	1.6		-7.2	-64	U
198.7	235.6	0.84	0.42	2.4		-6.2	-57	U
533.9	700.8	0.76	0.14	4.4		-7.9	-67	U
950.1	1365.4	0.70	0.07	2.6		-7.7	-67	U
1904.3	1341.8	1.42	0.07	2.9		-8.1	-68	U
2350.4	1373.7	1.71	0.07	3.2		-8.2	-69	U
4503.6	542.9	8.30	0.18	9.2		-9.7	-79	U
428.1	660.7	0.65	0.15	1.8		-7.5	-65	U
553.8	708.1	0.78	0.14	1.4		-7.4	-66	U
1511.0	960.3	1.57	0.10	3.3		-7.6	-67	U
1125.8	897.0	1.26	0.11	2.1		-7.4	-66	U
757.4	810.6	0.93	0.12	1.9		-7.4	-66	U
783.1	1272.1	0.62	0.08	2.0		-7.2	-65	U
1612.3	1486.7	1.08	0.07	4.0		-8.3	-71	U
2004.8	1528.4	1.31	0.07	3.2		-8.3	-71	U
420.9	703.0	0.60	0.14	0.7		-6.7	-61	U
537.7	724.7	0.74	0.14	1.0		-7.5	-66	U
445.7	1246.7	0.36	0.08	1.7		-6.6	-61	U
1477.6	1476.7	1.00	0.07	2.0		-8.4	-72	U

Mesilla Valley Terminus

Sulfate crust @ Racetrack bridge	47	1/25/2005	31.799	-106.556
Salt crust, Racetrack Drive	48	3/2/2005	31.803	-106.553
Salt crust, Racetrack Drive	48	3/2/2005	31.803	-106.553
Seep at Racetrack bridge	47	1/25/2005	31.799	-106.556
Seep at McNutt bridge	49	1/25/2005	31.803	-106.541

16.9
11.3
15.8
5.8
12.1

-7.2
-7.0

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T
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T

SURFACE WATER

Sample name		Date	Latitude °	Longitude °	km	Cl ppm	SO ₄ ppm	Cl/SO ₄ (wt)	100/SO ₄	δ ³⁴ S ‰	δ ¹⁸ O(SO ₄) ‰	δ ¹⁸ O ‰	δ ² H ‰	Source
Mesilla Valley terminus														
Bridge	47	1/23/2005	31.799	-106.556	1015	109	177	0.62	0.56	5.1		-5.5	-56	T
Rio Grande at McNutt Bridge	49	1/23/2005	31.803	-106.541	1016	630	760	0.83	0.13	6.9		-8.0	-68	T
Rio Grande at McNutt Bridge	49	3/2/2005	31.803	-106.541	1016	328	282	1.16	0.35	7.3		-8.4	-68	T
Bridge	47	8/18/2005	31.799	-106.556	1015	57	112	0.51	0.89	1.4		-10.3	-81	T
El Paso (USGS well nest) to Clint, 1035-1060 km														
Rio Grande #1	1	7/11/2002	31.739	-106.393	1035	93	200	0.47	0.50	2.6		-6.0	-64	T
Rio Grande #2	1	8/23/2002	31.739	-106.393	1035	109	204	0.53	0.49	2.7	8.5	-6.2	-61	T
Rio Grande #3	1	11/13/2002	31.739	-106.393	1035	273	396	0.69	0.25			-7.3	-66	T
Rio Grande #4	1	2/27/2003	31.739	-106.393	1035					4.3	9.3	-8.5	-68	T
Rio Grande #5	1	1/6/2003	31.739	-106.393	1035						8.5	-7.6	-67	T
Rio Grande #6	1	9/16/03	31.739	-106.393	1035	768	1028	0.75	0.10	5.8	9.0	-1.7	-43	T
Rio Grande @ well nest	1	9/16/2003	31.739	-106.393	1035							-5.3	-56	T
Rio Grande #7	1	3/20/2004	31.739	-106.393	1035	202	241	0.84	0.41	2.7	8.0	-5.6	-56	T
Rio Grande at Nest-5-6-04	1	5/6/2004	31.739	-106.393	1035	615	688	0.89	0.15			-6.9	-65	T
Rio Grande @ El Paso*	1	8/22/2001	31.739	-106.393	1035		208.5		0.48	1.9		-7.0	-66	T
Rio Grande @ Socorro*	50	8/22/2001	31.642	-106.317	1047		310.7		0.32	2.5				T
Rio Grande @ Clint*	51	8/22/2001	31.550	-106.257	1060		316.3		0.32	3.3				T
Rio Grande @ Socorro*	50		31.642	-106.317	1047		324.7		0.31	2.4				T
Rio Grande @ Clint*	51		31.550	-106.257	1060		495.3		0.20	3.2				T
Rio Grande TR4	52	7/12/2004	31.658	-106.328	1058	442	477	0.93	0.21	10.5	9.6	-6.5	-63	T
Rio Grande TR4	52	5/6/2004	31.658	-106.328	1058	319	340	0.94	0.29			-7.5	-68	T
Fabens area, 1065-1073 km														
Rio Grande @ Isla/Fabens	53	8/10/2003	31.457	-106.179	1069	731	740	0.99	0.14	8.9		-6.9	-64	T
Rio Grande Isla	53	12/03	31.457	-106.179	1069	325	335	0.97	0.30	4.1		-8.1	-68	T
Rio Grande @ Isla/Fabens	53	3/20/2004	31.457	-106.179	1069	349	345	1.01	0.29	6.2		-6.8	-61	T
Rio Grande Isla	53	5/6/2004	31.457	-106.179	1069	625	652	0.96	0.15			-7.8	-69	T
Rio Grande Isla	53	7/12/2004	31.457	-106.179	1069	443	460	0.96	0.22	8.0		-8.1	-68	T
Rio Grande Cemetery	54	7/12/2004	31.481	-106.219	1072	365	384	0.95	0.26	7.4		-6.1	-60	T
Rio Grande @ Fabens*	53	8/22/2001	31.457	-106.179	1073		328.5		0.30	4.5				T

Fort Hancock-Fort Quitman					
		km			
Rio Grande at Alamo Arroyo	27	5/6/2004	31.313	-105.908	1106
Rio Grande at Alamo Arroyo	27	7/15/2004	31.313	-105.908	1106
Rio Grande @ Ft. Hancock	55	1/2/2003	31.273	-105.855	1113
Rio Grande @ Ft. Hancock	55	12/10/03	31.273	-105.855	1113
Rio Grande @ Caseta	55	3/19/2004	31.273	-105.855	1113
Rio Grande @ Ft. Hancock	55	3/20/2004	31.273	-105.855	1113
Rio Grande at Caseta	55	7/12/2004	31.273	-105.855	1113
Rio Grande at Fort Hancock	55	7/15/2004	31.273	-105.855	1113
Rio Grande at Fort Hancock	55	5/6/2004	31.273	-105.855	1113
Rio Grande at Fort Hancock*	55	2003	31.273	-105.855	1113
Rio Grande at Caseta	55	5/6/2004	31.273	-105.855	1113
Rio Grande @ F	29	3/20/2004	31.120	-105.662	1147
Rio Grande at F	29	7/15/2004	31.120	-105.662	1147
Rio Grande site E	56	5/18/2003	31.018	-105.576	1158
Rio Grande @ E	56	12/10/03	31.018	-105.576	1158
Rio Grande @ E	56	3/20/2004	31.018	-105.576	1158
Rio Grande @ Fort Quitman*	57	8/22/2001	31.087	-105.609	1152
Rio Grande @ Fort Quitman*	57	Summer 2003	31.087	-105.609	1153
Downstream of Fort Quitman					
		1172-1200 km			
Rio Grande @ salt fields	58	12/03	30.875	-105.392	1185
Rio Grande	59	1/4/2003	30.847	-105.360	1193
Rio Grande site A	60	5/18/2003	30.824	-105.319	1200
Rio Grande @ A	60	12/03	30.824	-105.319	1200
Rio Grande site B	61	5/18/2003	30.823	-105.325	1193
Rio Grande site C	62	5/18/2003	30.890	-105.402	1182
Rio Grande site D	63	5/18/2003	30.940	-105.480	1172

SOIL AMENDMENTS

Gypsum	Sep 2004			13.0	13.1	T
H2SO4	Jan 2005			1.8	18.2	T

FORMATION

EVAPORITIC GYPSUM

Neely Arroyo	Jan 2003	31.019	-105.568		7.4	T
Neely Arroyo	Jan 2003	31.019	-105.568		5.9	T

869	722	1.20	0.14			T
946	751			5.0		T
421	407	1.03	0.25		-8.5	T
471	390	1.21	0.26		-8.7	T
479	447	1.07	0.22	9.6	7.9	T
880	812	1.08	0.12	4.2	9.1	T
405	344	1.18	0.29	12.9	10.1	T
919	821	1.12	0.12	5.2		T
833	746	1.12	0.13		-6.6	T
	681		0.15	4.4		T
473	454	1.04	0.22			T
1181	1062	1.11	0.09	5.0	-6.1	T
1200	1102	1.09	0.09	4.9		T
	982		0.10	5.3	-5.1	T
677	516	1.31	0.19		-8.1	T
1565	1173	1.33	0.09	5.5	9.4	T
	730.5		0.14	4.0		T
	1110		0.09	5.1		T
676	530	1.28	0.19		-8.1	T
	597		0.17	9.1	-8.1	T
	1027		0.10	5.9	-4.5	T
688	534	1.29	0.19		-8.0	T
	1041		0.10	5.2	-4.5	T
	961		0.10	5.2	-5.1	T
	939		0.11	5.1	-4.4	T

Explanation: m bgs = meters below ground surface; T = this study; U = unpublished data of Barry Hibbs and Mercedes Merino; [15], [18], [19], [34]: see references in article.
Site numbers refer to sample location maps, Fig. S1, for previously unpublished data only.
km = kilometers from source of Rio Grande