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VARIABILITY OF FRESHWATER-SALTWATER TRANSITION ZONE CHARACTERISTICS AND RELATED PARAMETERS IN THE GREAT BEND PRAIRIE AQUIFER, SOUTH-CENTRAL KANSAS

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A cooperative investigation by

The Kansas Geological Survey and
Big Bend Groundwater Management District No. 5

In order to achieve the Mineral Intrusion project goal of describing and understanding the inventories and movements of freshwater and saltwater in the Great Bend Prairie aquifer, an extensive program of water level measurements, well logging, and sampling has been developed for the monitoring well network shown in figure 1. The figure also shows the locations of a "transect area" designated for more intensive study because of the presence of high salinity ground waters; the Siefkes site where intensive local investigations of the effects of irrigation pumpage on the saltwater interface are being carried out; and the newly installed Witt site on Rattlesnake Creek. Additional background information on the objectives, setting and methods of the overall project may be found in a report by Buddemeier et al. (1992) and the references contained therein.

This report updates the water level measurements from the monitoring well network presented by Young et al. (1994) to include data through the spring of 1995, and presents information on variations in transition zone elevations and characteristics based on the methods reported by Garneau et al. (1995). Updated results from the Siefkes intensive study site are presented in OFR 95-45c. See OFR 95-45d for initial monitoring results and installation details from the Witt site.

Logging of monitoring wells in 1995 was delayed because of needed repairs to logging equipment (see Garneau et al., 1995) and logging vehicle. The Permian monitoring wells at most of the KGS/GMD5 observation well sites (including nearly all the saline transition sites) were relogged during April-May, 1995. The remaining sites will be logged when time permits. Logging of the transect area wells will continue on an approximately bi-monthly schedule.

Water Level Variations

The water levels listed and discussed in this report are actual fluid levels measured in wells. These values provide an adequate basis for assessing relative changes at individual sites without the calculation of density effects considered by Garneau (1995).

As a result of the unusually high precipitation and recharge in 1993, water levels rose in virtually every well in the monitoring well network during 1993. January 1994 water levels were greater than or approximately equal to January 1993 water levels in all wells (see Young et al., 1994). Water levels generally declined through 1994. Measurements taken in early spring 1995 showed that water levels at most sites were comparable to spring 1993 levels. As a result of extremely heavy rains in May 1995, all

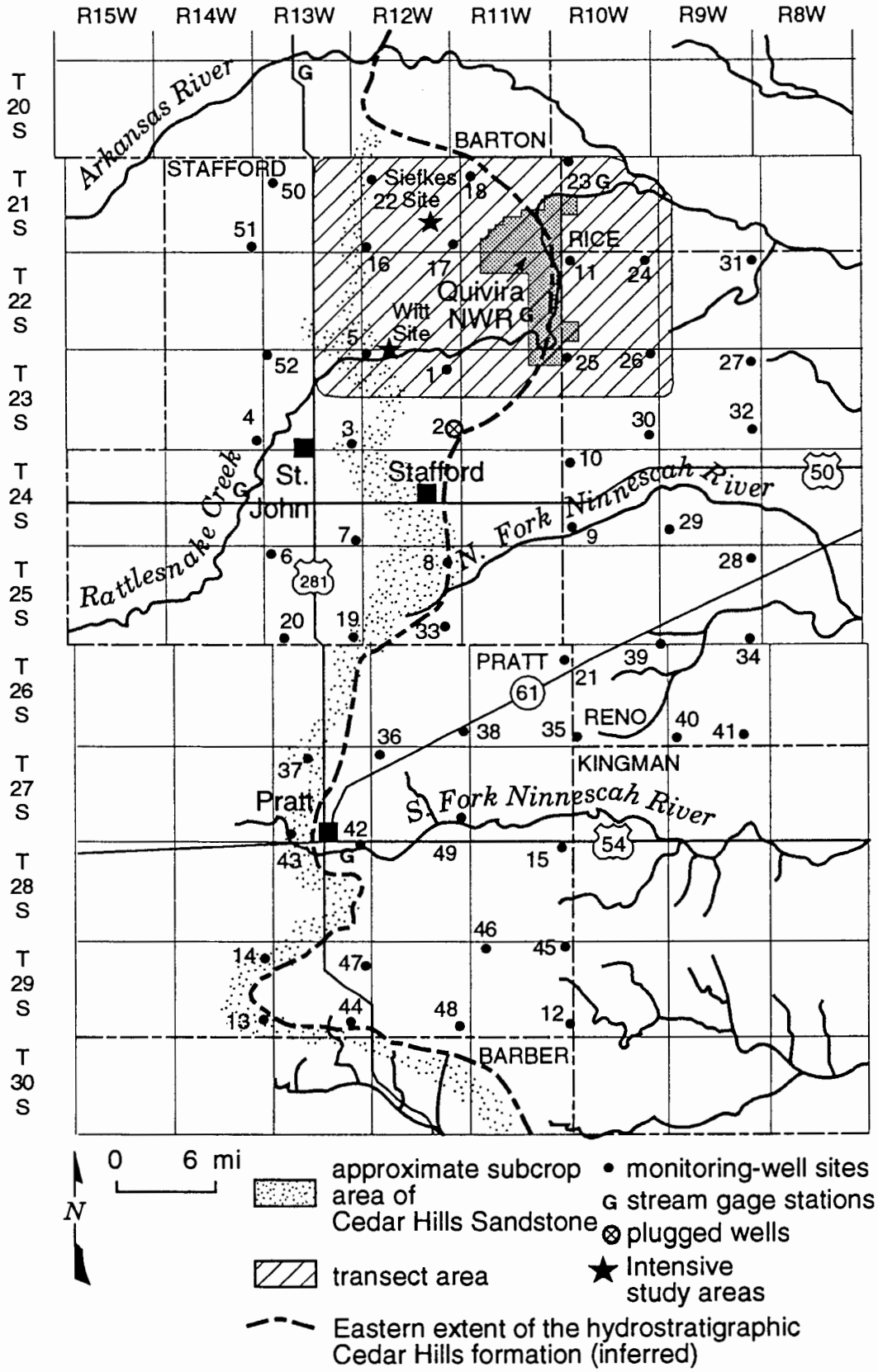

Figure 1. Observation wells and other physical features in the area of the KGS/GMD5 monitoring-well network.

sites with water level measurements available for the end of May (sites 3, 5, 16, 17, 18, 19, 22, and 32) showed significant water level rises in May.

A summary table of water levels from the KGS/GMD5 monitoring well network is contained in Appendix A. The summary table lists 1993-95 water level measurements from the study wells and calculated water level differences among the various wells at each site. Included for comparison are the averages and standard deviations of the water levels and water level differences for 1993-95 and the period 1987-93. The 1993-95 water levels are typically higher than those in previous years, particularly in the northern part of the study area, which received the most rainfall.

Hydrographs illustrating 1993-95 water level fluctuations in all wells at the saline transition zone sites are contained in Appendix B. The lines connecting data points do not necessarily represent the behavior of the water levels, but are merely for convenience in showing trends. While water level rises are synchronous in the different wells at many sites, Permian water level changes lag behind shallow aquifer well changes at certain sites, such as site 16. At sites 4 and 6, where a Cretaceous confining layer apparently separates the Permian from the Great Bend Prairie aquifer, Permian water levels fluctuated very little.

The Permian water elevation has remained above the deep aquifer water elevation at sites 5 and 25. At site 4, the Permian water elevation has remained above the shallow aquifer water level. At sites 4, 6, 18, 19, 37, and 43, the deep aquifer water level has dropped below the Permian water level in the summer, possibly due to nearby pumping (see well hydrographs in Appendix B).

The observed rises in the Permian wells at sites 1 and 7 in April 1994 have been attributed to prior well development. The development process may also be responsible for the observed rise in the Permian well water level at site 18. Those wells and wells at sites 5, 9, 11, and 19 were airlifted in late March 1994 in an attempt to redevelop and remove sediment from the bottom of the wells so they could be logged to greater depths. Fresh water was used during development because of the low yield of the Permian wells. It is likely that some fresh water left inside the casing of some wells after the development process results in higher water level readings than would the denser Permian formation water. This is a cause of uncertainty in all the Permian well heads, even if they are adjusted for density, unless a fluid conductivity log has been collected (discussed more by Garneau et al., 1995).

Transition Zone Characteristics

By processing and analyzing data from the logs and other available information (especially Whittemore, 1993), Young et al. (1993) designated the sites that exhibit elevated salinity (a chloride concentration greater than 250 mg/L) and/or a freshwater-saltwater interface or transition zone above the bedrock as saline transition zone sites; they are identified in figure 2.

Background data for each of the saline transition zone sites are listed in table 1. These data include land surface elevations, elevations of and depths to water and bedrock, and the specific conductance and chloride values of water samples from the Permian wells as reported by Whittemore (1993). Table 2 contains transition zone characteristics and parameter estimates. These data include D1, D2, 21k, sigma, R, and the depth to the 500 mg/L chloride concentration elevation. These values are discussed and defined by Garneau et al. (1995).

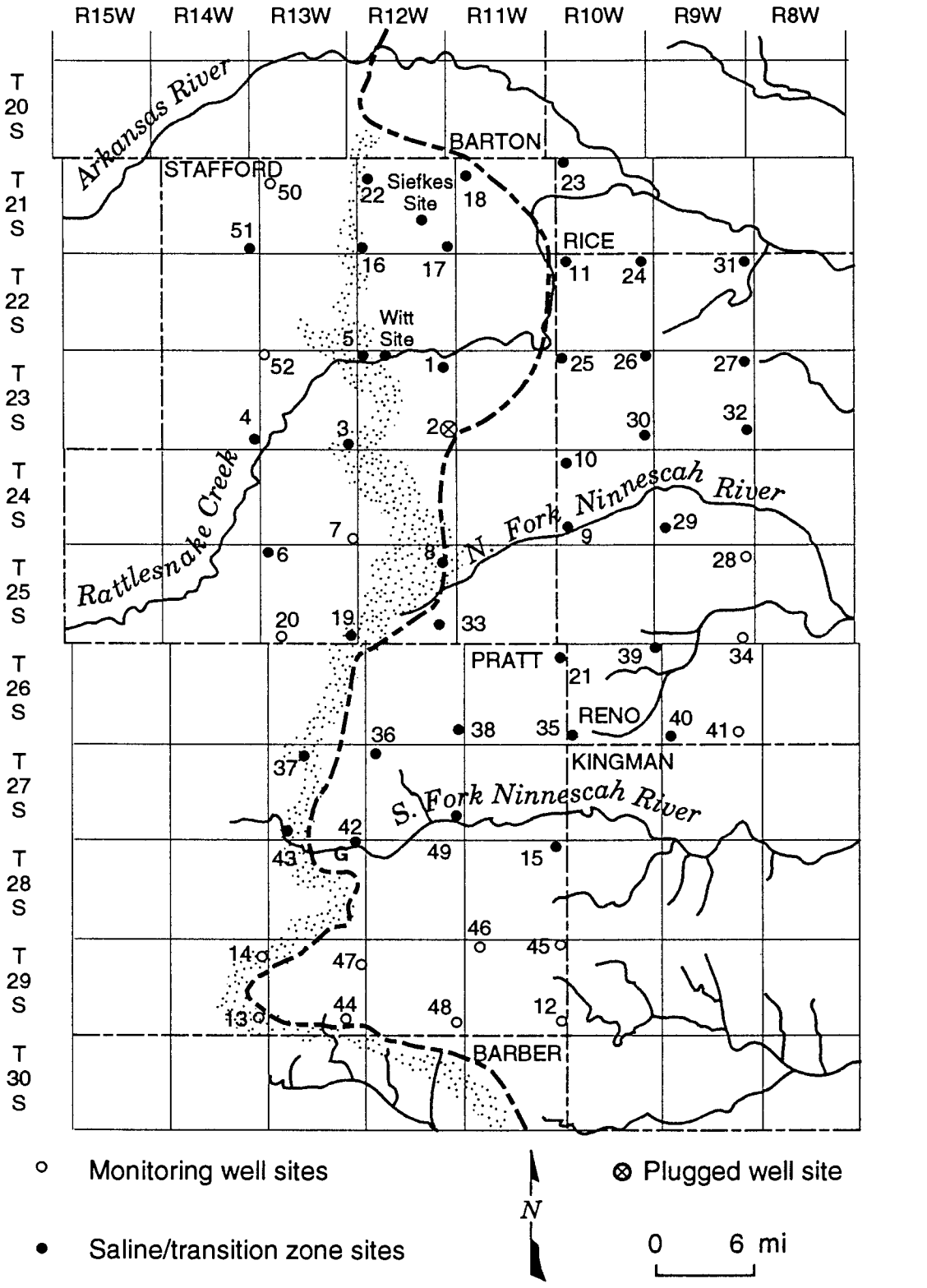

Figure 2. Monitoring well sites and site numbers, indicating the saline transition zone sites.

Table 1. Background data for saline transition zone sites.

SITE	LOCATION	LAND ELEV	DATE	DTW	DEPTH TO BR	WL ELEV	BR ELEV	COND (mS/m)	Cl (mg/L)
1	23-12-12BAA	1827	3/26/93	5.3	146	1821.7	1681	3690	- 13200
3	23-13-36DCC	1898	5/19/93	22	130	1876	1768	ND	ND
4	23-14-36DDC	1912	4/22/93	8.7	129	1903.3	1783	7760	31000
5	23-12-06BBB	1855	9/17/93	1.8	181	1853.2	1674	8550	41200
6	25-13-06BCB	1950	4/19/93	19.3	148	1930.7	1802	10200	42640
8	25-12-11AAA	1848	4/21/93	8.8	117	1839.2	1731	10600	43800
9	24-10-31CBC	1755	4/25/93	9	87	1746	1668	1070	3280
10	24-10-06DCC	1790	4/25/93	18.3	156	1771.7	1634	623	1710
11	22-10-06CBB	1763	3/27/93	13.5	208	1749.5	1555	6690	25000
15	28-11-01AAA	1725	4/22/93	29.7	128	1695.3	1597	213	466
16	21-12-31CCC	1872	3/25/93	12	220	1860	1652	8850	34800
17	21-12-36DDC	1804	3/25/93	11.6	114	1792.4	1690	2890	9880
18	21-11-07BBB	1810	3/25/93	19	214	1791	1596	3520	12200
19	25-13-36DCC	1901	4/19/93	11.7	163	1889.3	1738	1930	6210
21	26-11-01DDD	1801	5/20/93	21.6	137	1779.4	1664	3510	11700
22	21-12-06CCB	1855	3/25/93	16.1	215	1838.9	1640	8260	32500
23	21-10-06AAD	1743	4/20/93	22.4	94	1720.6	1649	2130	6480
24	22-10-01ADB	1743	4/20/93	27.3	123	1715.7	1620	631	1820
25	23-10-06BBA	1780	3/28/93	6.3	98	1773.7	1682	4100	17400
26	23-10-01AAA	1738	4/20/93	6.8	177	1731.2	1561	3710	13470
27	23-09-01ADA	1685	4/20/93	9.9	104	1675.1	1581	651	1841
29	24-10-36AAA	1732	4/25/93	38.6	151	1693.4	1581	6000	22000
30	23-10-36DAA	1750	4/25/93	13.1	134	1736.9	1616	652	2410
31	22-09-01ADA	1664	4/20/93	13.4	93	1650.6	1571	652	1771
32	23-09-25DDD	1689	4/24/93	2.5	172	1686.5	1517	715	1864
33	25-12-36CBB	1872	5/20/93	33.9	141	1838.1	1731	425	1160
35	26-10-31CCC	1760	4/21/93	19	153	1741	1607	2140	6750
36	27-12-06BAA	1892	4/21/93	28	195	1864	1697	5680	21800
37	27-13-05CAB	1971	4/21/93	58.7	240	1912.3	1731	770	2310
38	26-12-36ADD	1844	4/21/93	26	189	1818	1655	691	1908
39	26-10-01AAA	1679	10/22/93	3.2	55	1675.8	1624	3630	12300
40	26-09-31DCC	1735	4/22/93	56.2	158	1678.8	1577	272	663
42	28-13-01CBA	1829	4/22/93	13.1	160	1815.9	1669	1550	4900
43	27-13-31DDD	1872	4/22/93	5	65	1867	1807	750	2198
49	27-12-35AAA	1737	7/7/93	-1.3	105	1738.3	1632	8480	32700
51	21-14-36DDD	1916	3/26/93	17.3	200	1898.7	1716	ND	ND
SP	21-12-27DACC	1840	9/18/93	9	186	1831	1654	7080	26670
SDA	21-12-27DADD	1840	9/18/93					3840	13940
WP	23-12-5AADA	1844	9/15/94	6.8	147	1837	1697	9730	39230

DTW- Depth to water (feet below land surface) in shallow wells. Some values estimated.

Water levels in all wells are listed in Appendix A.

COND- Specific conductance of water from Permian wells and Siefkes deep aquifer well.

Cl- Chloride concentration of water from Permian wells and Siefkes deep aquifer well.

Table 2. Transition zone characteristics (see OFR 95-45a for definition of parameters).							
SITE	DATE	D1 ft	D2 ft	21k ft	sigma ft	R	500 mg/L ft
1	3/26/93	90	127.7	133.18	17.07	0.9909	94.6
1	4/15/94	90	127.7	134.54	17.894	0.9892	94.1
1	4/25/95	90	127.7	135.04	17.476	0.98619	95.519
3	5/19/93	94	119	197.41	43.008	0.8229	100.15
3	4/13/94	94	119	192.14	39.927	0.8102	101.85
3	4/26/95	94	119	175.17	31.153	0.79875	104.72
4	4/22/93	80	100	177.57	49.714	0.764	65.144
4	4/13/94	80	100	165.23	44.262	0.8814	65.127
4	5/4/95	80	100	167.48	44.599	0.81951	66.619
5	9/17/93	66	106	98.876	12.641	0.972	68.288
5	10/16/93	66	106	96.891	13.018	0.9755	67.452
5	4/19/94	66	106	97.269	12.539	0.9754	68.912
5	7/6/94	66	106	97.057	11.724	0.97142	70.542
5	8/10/94	66	106	97.396	11.963	0.97299	70.341
5	10/6/94	66	106	97.18	11.867	0.97203	70.344
5	4/25/95	66	106	97.811	12.011	0.97382	70.648
6 bad data	4/19/93						
6	4/13/94	78	97	156.2	31.731	0.88445	84.445
6	5/4/95	78	97	137.14	22.445	0.78373	86.381
8	4/18/93						118
8	4/7/94						118
8	4/25/95						118
9	4/18/93	40	79.5	90.065	17.336	0.5944	50.859
9	4/14/94	40	79.5	88.037	16.182	0.5655	51.442
9	5/4/95	40	79.5	84.717	14.147	0.53264	52.724
10	4/18/93	111	126	164.71	24.533	0.81843	109.23
10	4/7/94	111	126	160.34	21.824	0.82634	110.99
10	5/2/95	111	126	161.34	21.943	0.84105	111.72
11	3/27/93	82	167.1	216.97	60.108	0.9277	81.038
11	5/20/93	82	167.1	221.95	64.422	0.9289	76.259
11	7/9/93	82	167.1	220.58	63.57	0.9286	76.819
11	7/30/93	82	167.1	220.22	63.285	0.9279	77.103
11	9/22/93	82	167.1	221.78	65.076	0.9276	74.611
11	10/13/93	82	167.1	221.69	65.06	0.9291	74.56
11	4/8/94	82	167.1	226.16	66.184	0.912	76.429
11	5/26/94	82	167.1	222.89	64.193	0.91631	77.715
11	7/6/94	82	167.1	220.27	61.708	0.91444	80.713
11	7/19/94	82	167.1	223.05	63.782	0.91581	78.807
11	8/12/94	82	167.1	223.38	64.246	0.91709	78.092
11	10/6/94	82	167.1	218.48	60.946	0.91707	80.65
11	4/25/95	82	167.1	223.89	63.498	0.92236	80.286
16	3/25/93	122	187	176.97	21.62	0.9691	128.08
16	5/19/93	122	187	177.19	21.454	0.9695	128.67
16	7/8/93	122	187	177.19	21.757	0.9686	127.99
16	7/31/93	122	187	176.88	22.301	0.9734	126.44

SITE	DATE	D1 ft	D2 ft	21k ft	sigma ft	R	500 mg/L ft
16	9/8/93	122	187	176.03	19.329	0.9773	132.31
16	10/21/93	122	187	176.88	22.319	0.9704	126.41
16	3/31/94	122	187	176.63	21.89	0.974	127.13
16	5/26/94	122	187	176.87	22.098	0.97604	126.9
16	6/23/94	122	187	176.81	22.09	0.97455	126.86
16	7/20/94	122	187	177.63	21.387	0.97324	129.26
16	8/11/94	122	187	176.7	21.115	0.97523	128.95
16	10/6/94	122	187	177.2	21.174	0.97164	129.32
16	4/13/95	122	187	177.94	21.508	0.9694	129.3
16 (GMD5 t	4/13/95	122	187	179.21	22.754	0.97271	127.76
17	3/24/93	61	100	111.1	20.366	0.9412	65.046
17	5/19/93	61	100	112.15	21.578	0.9446	63.348
17	7/8/93	61	100	112.49	21.759	0.9447	63.281
17	7/28/93	61	100	112.95	22.45	0.9455	62.178
17	9/8/93	61	100	111.01	20.179	0.9384	65.372
17	10/21/93	61	100	111.08	20.447	0.9409	64.843
17	4/1/94	61	100	111.02	20.488	0.9395	64.681
17	5/26/94	61	100	110.87	20.314	0.93957	64.929
17	7/6/94	61	100	110.9	20.346	0.93851	64.892
17	7/19/94	61	100	111.55	21.037	0.94186	63.978
17	8/11/94	61	100	111.73	21.303	0.94094	63.554
17	10/26/94	61	100	111.48	21.034	0.94098	63.907
17	4/24/95	61	100	113.03	21.883	0.94487	63.537
18	3/25/93	107	172	182.26	31.753	0.8504	110.45
18	5/21/93	107	172	183.84	33.194	0.8618	108.77
18	7/9/93	107	172	183.09	32.716	0.85	109.1
18	7/29/93	107	172	183	32.624	0.844	109.22
18	10/14/93	107	172	182.55	32.282	0.8482	109.55
18	4/8/94	107	172	181.63	31.233	0.8407	110.99
18	5/26/94	107	172	181.28	30.684	0.84729	111.89
18	7/6/94	107	172	177.75	27.738	0.83438	115.07
18	7/20/94	107	172	179.06	28.73	0.83941	114.08
18	8/10/94	107	172	179.64	29.102	0.83505	113.82
18	10/7/94	107	172	178.39	28.301	0.84471	114.38
18	4/25/95	107	172	183.08	31.362	0.84795	112.15
19	4/19/93	142	174	237.37	41.181	0.78367	144.23
19	4/7/94	142	174	237.49	41.545	0.78048	143.54
19	5/4/95	142	174	251.03	47.336	0.83768	143.98
21	5/20/93	80	136.1	161.27	34.198	0.9653	83.934
21	4/7/94	80	136.1	160.13	32.164	0.9642	87.387
21	4/27/95	80	136.1	162.38	33.02	0.96396	87.708
22	3/25/93	133	204	198.15	25.648	0.9338	140.15
22	5/21/93	133	204	197.44	24.721	0.944	141.53
22	7/9/93	133	204	197.91	24.926	0.9262	141.53
22	7/30/93	133	204	197.93	25.114	0.9271	141.14
22	10/14/93	133	204	197.08	24.427	0.938	141.84
22	3/31/94	133	204	197.82	24.549	0.9523	142.3
22	5/26/94	133	204	197.17	25.474	0.93199	139.56

SITE	DATE	D1 ft	D2 ft	21k ft	sigma ft	R	500 mg/L ft
22	6/23/94	133	204	197.13	25.637	0.92303	139.16
22	7/20/94	133	204	197.7	24.173	0.94928	143.03
22	8/4/94	133	204	198.52	24.341	0.9374	143.47
22	10/7/94	133	204	197.12	25.045	0.93326	140.48
22	4/24/95	133	204	198.45	25.362	0.93596	141.1
23	4/20/93	52.5	82	123.87	21.585	0.5614	75.05
23	4/19/94	52.5	82	158.41	40.539	0.6778	66.732
23	5/3/95	52.5	82	143.25	33.27	0.63166	68.008
24	10/23/93	88	112	146.88	24.408	0.86403	91.68
24	4/19/94	88	112	148.55	25.444	0.8805	91.008
24	5/3/95	88	112	148.27	24.515	0.89022	92.829
25	3/28/93	8	38	35.675	11.43	0.9346	9.827
25	7/31/93	8	38	34.896	11.427	0.901	9.053
25	9/14/93	8	38	34.9	11.64	0.8947	8.577
25	10/22/93	8	38	34.91	11.568	0.8944	8.748
25	4/1/94	8	38	35.56	11.099	0.9477	10.46
25	8/18/94	8	38	35.814	11.5	0.95474	9.8067
25	4/25/95	8	38	35.326	10.357	0.96946	11.903
26	4/20/93	64	102	102.11	12.625	0.9278	73.56
26	4/15/94	64	102	106.61	17.432	0.9788	67.19
26	7/7/94	64	102	108.2	19.586	0.98397	63.903
26	5/5/95	64	102	108.93	19.155	0.98166	65.614
27	4/20/93	53	66	78.229	7.5943	0.9907	61.054
27	4/15/94	53	66	84.086	11.187	0.9905	58.788
27	5/3/95	53	66	85.361	11.66	0.98732	58.991
29	4/25/93	94	150	254.31	67.954	0.634	100.64
29	4/7/94	94	150	248.73	64.379	0.6457	103.13
29	5/4/95	94	150	248.33	64.735	0.58363	101.93
30	4/25/93	85	132	216.98	48.91	0.5368	106.36
30	4/14/94	85	132	204.65	42.662	0.4906	108.17
30	5/4/95	85	132	198.67	39.274	0.48003	109.85
31	4/20/93	73	90	196.27	52.737	0.8467	77.008
31	4/15/94	73	90	192	50.257	0.8138	78.345
32	4/24/93	75	135	158.26	31.292	0.6085	87.497
32	4/19/94	75	135	151.87	27.745	0.551	89.126
32	4/27/95	75	135	147.06	23.608	0.53067	93.67
33	5/20/93	120	139	191.41	26.976	0.794	130.41
33	4/7/94	120	139	176.71	18.718	0.8117	134.38
33	5/4/95	120	139	179.48	20.322	0.75274	133.53
35	4/21/93	115	142	186.37	27.447	0.8686	124.3
35	4/20/94	115	142	188.79	28.937	0.8685	123.34
35	4/27/95	115	142	196.5	32.407	0.86728	123.22
36	4/21/93	121	188	202.18	31.618	0.9544	130.67
36	9/17/93	121	188	199.77	28.096	0.9635	136.23
36	4/14/94	121	188	203.65	32.828	0.9462	129.41
36	4/27/95	121	188	204.73	32.218	0.95512	131.87
37	4/21/93	212	233	260.55	17.497	0.902	220.98
37	4/13/94	212	233	259.04	16.663	0.9271	221.36

SITE	DATE	D1 ft	D2 ft	21k ft	sigma ft	R	500 mg/L ft
37	4/27/95	212	233	263.92	19.108	0.90916	220.71
38	4/21/93	150	177	198.04	19.209	0.8461	154.6
38	4/14/94	150	177	197.33	18.805	0.8577	154.8
38	4/27/95	150	177	204.38	22.721	0.85736	152.99
39	10/22/93						55
39	4/20/94						55
42	4/22/93	74	149	187.52	37.412	0.93	102.91
42	4/14/94	74	149	188.01	37.263	0.9392	103.74
42	4/27/95	74	149	193.14	40.154	0.93284	102.33
43	4/22/93	40	55	61.092	7.1996	0.9387	44.81
43	4/14/94	40	55	60.55	6.8257	0.938	45.113
43	4/27/95	40	55	62.361	8.1126	0.9252	44.014
49	6/22/94	40	70	87.128	17.603	0.9264	47.139
SP	4/17/93	123	180	167.41	16.836	0.97614	129.34
SP	5/20/93	123	180	166.76	16.647	0.97414	129.12
SP	7/8/93	123	180	166.35	16.02	0.97034	130.12
SP	7/27/93	123	180	166.32	15.718	0.97175	130.77
SP	7/29/93	123	180	166.35	16.034	0.97393	130.09
SP	9/18/93	123	180	166.68	17.462	0.96892	127.19
SP	10/21/93	123	180	166.53	17.995	0.9648	125.83
SP	3/24/94	123	180	166.18	17.069	0.97529	127.57
SP	3/31/94	123	180	166.21	16.911	0.97632	127.97
SP	4/13/94	123	180	166.6	16.988	0.97741	128.18
SP	4/21/94	123	180	166.28	16.807	0.977	128.27
SP	5/19/94	123	180	166.33	17.633	0.97606	126.45
SP	6/21/94	123	180	166.41	17.503	0.97491	126.82
SP	7/5/94	123	180	166.47	17.314	0.97185	127.32
SP	7/8/94	123	180	166.47	17.971	0.97307	125.83
SP	8/9/94	123	180	166.42	18.031	0.96552	125.64
SP	8/17/94	123	180	166.65	18.539	0.96358	124.73
SP	9/16/94	123	180	166.3	18.178	0.96089	125.19
SP	10/26/94	123	180	166.26	18.434	0.96091	124.57
SP	11/16/94	123	180	166.25	18.431	0.95999	124.56
SP	4/12/95	123	180	166.97	17.067	0.97678	128.38
SP	5/15/95	123	180	166.84	16.852	0.97816	128.73
SP	6/20/95	123	180	166.57	16.748	0.97525	128.69
SD	4/17/93	123	155.8	165.63	15.956	0.83722	129.54
SD	5/20/93	123	155.8	164.05	15.296	0.84618	129.46
SD	7/8/93	123	155.8	163.87	15.334	0.85122	129.19
SD	7/27/93	123	155.8	163.33	14.602	0.83302	130.31
SD	7/29/93	123	155.8	163.63	15.026	0.84281	129.65
SD	9/18/93	123	155.8	163.79	15.061	0.86172	129.73
SD	10/21/93	123	155.8	164.27	15.379	0.8613	129.49
SD	3/31/94	123	155.8	164.27	15.454	0.80825	129.32
SD	4/13/94	123	155.8	163.98	15.241	0.82066	129.51
SD	4/21/94	123	155.8	164.18	15.492	0.8096	129.15
SD	5/19/94	123	155.8	164.31	15.265	0.81592	129.78
SD	6/21/94	123	155.8	163.81	14.744	0.8291	130.46

SITE	DATE	D1 ft	D2 ft	21k ft	sigma ft	R	500 mg/L ft
SD	7/5/94	123	155.8	163.45	14.028	0.84395	131.73
SD	7/8/94	123	155.8	163.81	14.806	0.83947	130.33
SD	8/17/94	123	155.8	163.78	14.708	0.86707	130.51
SD	9/16/94	123	155.8	163.86	14.744	0.86097	130.51
SD	4/12/95	123	155.8	163.15	14.02	0.83917	131.44
SD	5/15/95	123	155.8	163.83	14.547	0.80844	130.93
SD	6/19/95	123	155.8	162.55	13.595	0.83305	131.8
WP	9/15/94	12	140	93.891	31.993	0.98326	21.652
WP	10/7/94	12	140	93.055	30.507	0.9818	24.063
WP	10/12/94	12	140	93.091	29.896	0.98129	25.482
WP	10/27/94	12	140	92.91	28.571	0.97957	28.296
WP	4/12/95	12	140	94.702	27.012	0.98033	33.613
WP	5/2/95	12	140	94.255	27.703	0.9808	31.605
WP	5/19/95	12	140	94.112	27.626	0.98031	31.636
WP	6/20/95	12	140	94.233	27.139	0.98119	32.857

The 500 mg/L elevations listed are estimates based on the curve-fitting approach of the elevation below which fresh water is not expected to occur. See Garneau (1995) for an explanation of the curve-fitting approach and for figures showing corrected EM logs converted to chloride concentrations. We should mention that the exact elevation of the actual 500 mg/L level, particularly from the 1995 logs, is subject to uncertainties. The 500 mg/L level is based on fitted curves (see Garneau, 1995). Further, the logging tool was overhauled prior to 1995 logging and recalibration is still underway (see Garneau et al., 1995). The calculated 500 mg/L level may not be an extremely accurate indicator of the actual level at all sites, but it is a useful indicator of transition zone characteristics and changes.

Based on the 500 mg/L elevations in 1994, Young et al. (1994) differentiated a freshwater saturated thickness from saltwater saturated thickness in the Great Bend Prairie aquifer. See OFR 94-28e for information on salt inventories and budgets.

No definite trends or correlations regarding overall transition zone characteristics have been observed. Most sites have only been logged once in the spring of each year, and the 500 mg/L elevation from the spring logs from year to year typically has not changed more than a few feet. But, even though water levels have fluctuated greatly since 1993, *net* water level changes from spring to spring of each year generally have been on the same order as the 500 mg/L elevation fluctuations from the spring logs. So it is possible that larger transition zone fluctuations have occurred through the year(s) at some sites, but the variations have not been observed. Note that water levels at all sites have been measured at least quarterly, but logs have only been collected in the spring at most sites.

Data from sites with multiple logs through the year(s) suggest that the transition zone may be less stable and more variable than was previously implied by Young et al. (1993). Figures 3-9 illustrate variations in the 500 mg/L elevation and the Permian and alluvial aquifer water levels from transect area sites. At some sites, particularly those not heavily influenced by pumping wells, the 500 mg/L elevation may be related to the heads in the Permian wells and the alluvial wells (see figs. 3-9). The relationship may be stronger in discharge zones and/or where the Permian and Great Bend Prairie aquifer heads fluctuate synchronously. Research into these and other possible relationships is continuing.

The flooding conditions of 1993 have complicated interpretations of the data. For example, figure 10 shows evidence of a flushing of saline water in a sandy zone at site 11 in the spring of 1994, and the return of more saline water to the zone in 1995. It is believed that this phenomenon at site 11 (and possibly other sites) is a result of the extraordinary rainfall and consequent recharge that occurred in 1993.

Future analysis of the transition zone characteristics will be made to discern any trends in the overall freshwater-saltwater distribution and salt-mass inventories in the Great Bend Prairie aquifer. However, systematic variations in the redistribution of solute mass within the aquifer may become apparent only with comparisons made from several years worth of observations.

Intensive monitoring of the response to groundwater pumping is continuing at the Siefkes site. Stream-aquifer interactions are being monitored at the Witt site on Rattlesnake Creek. Stream-aquifer interaction may be an important factor affecting the overall salt budget in the Great Bend Prairie aquifer.

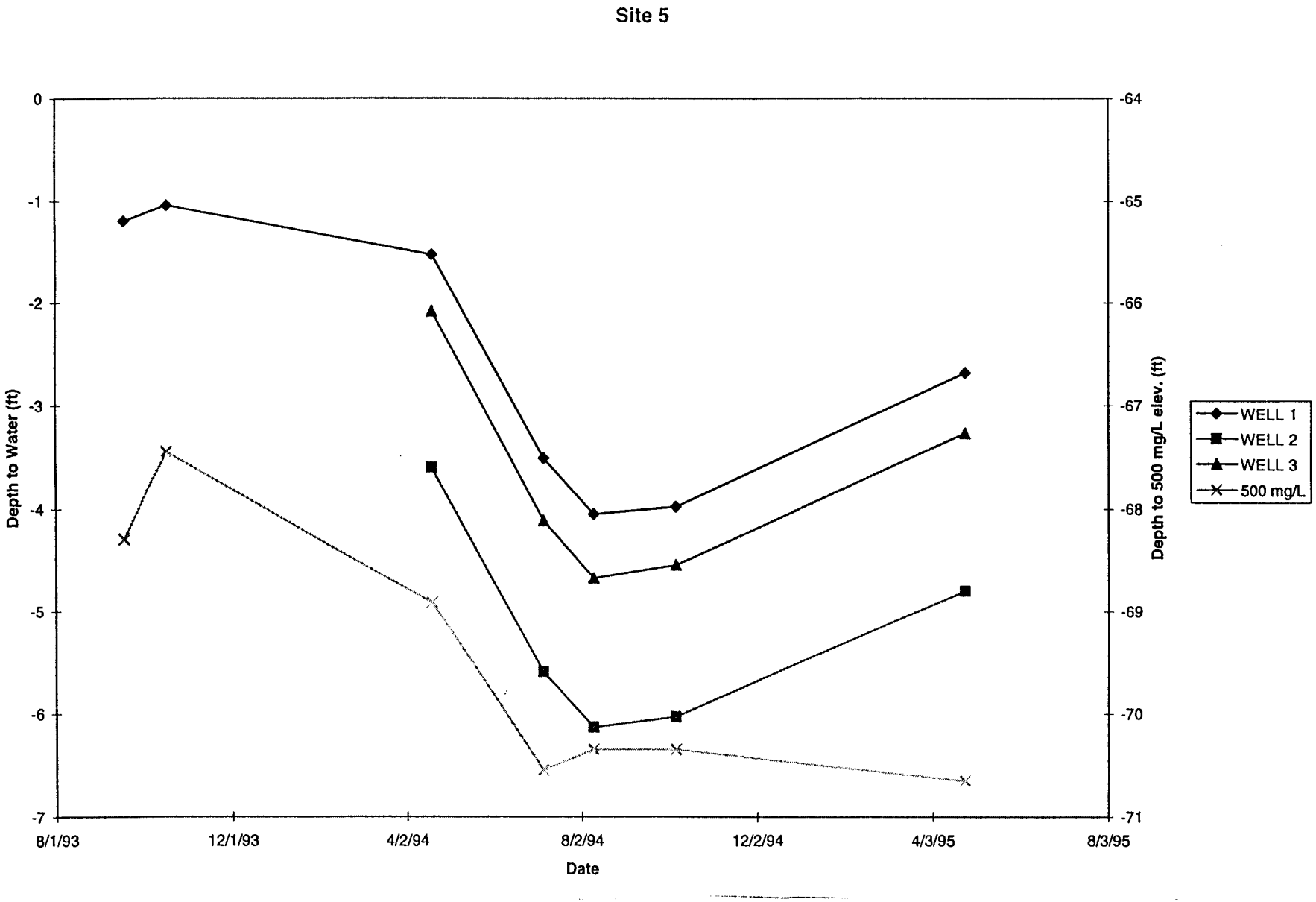

Figure 3. Hydrographs of wells at site 5, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

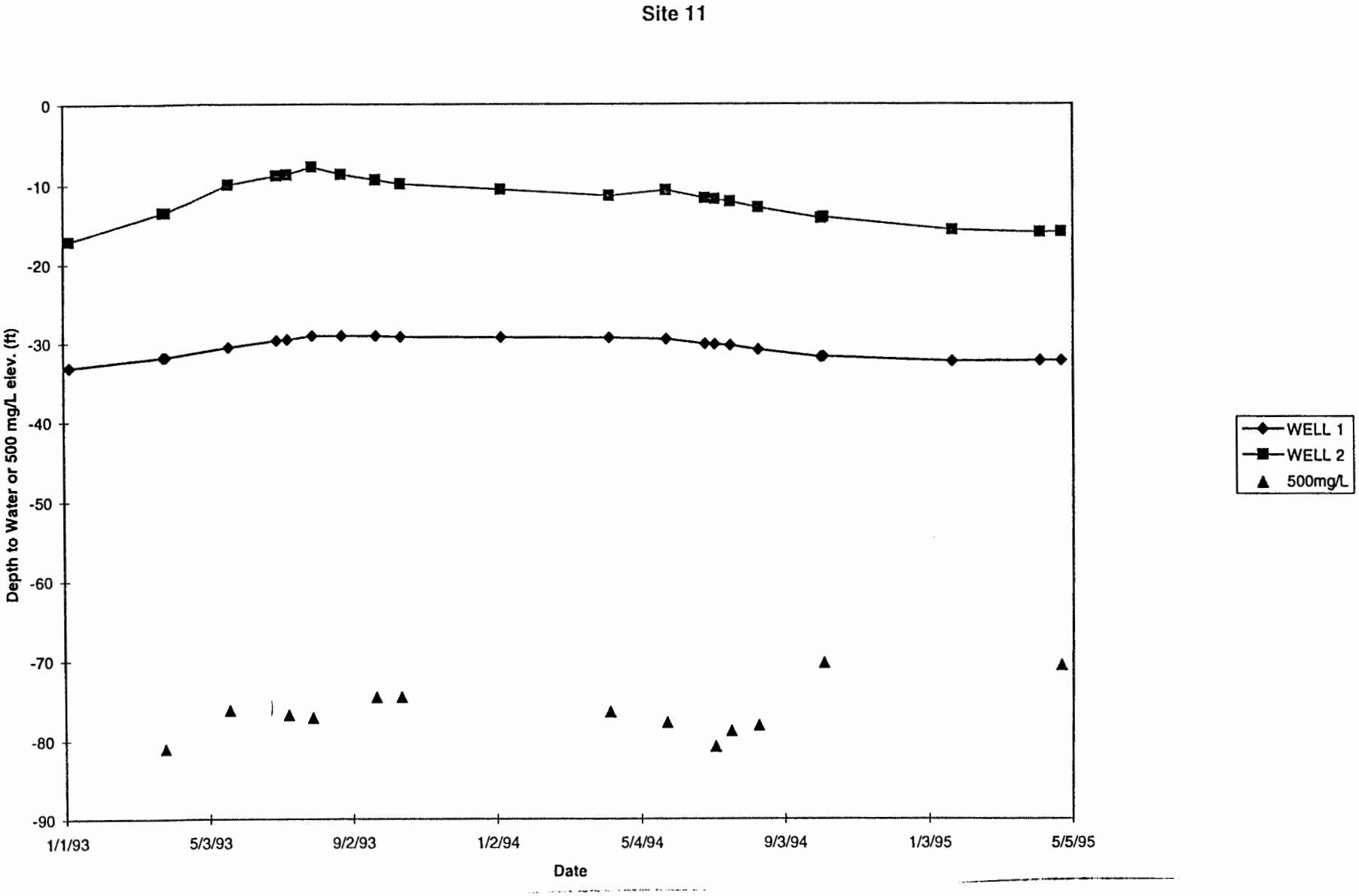

Figure 4. Hydrographs of wells at site 11, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

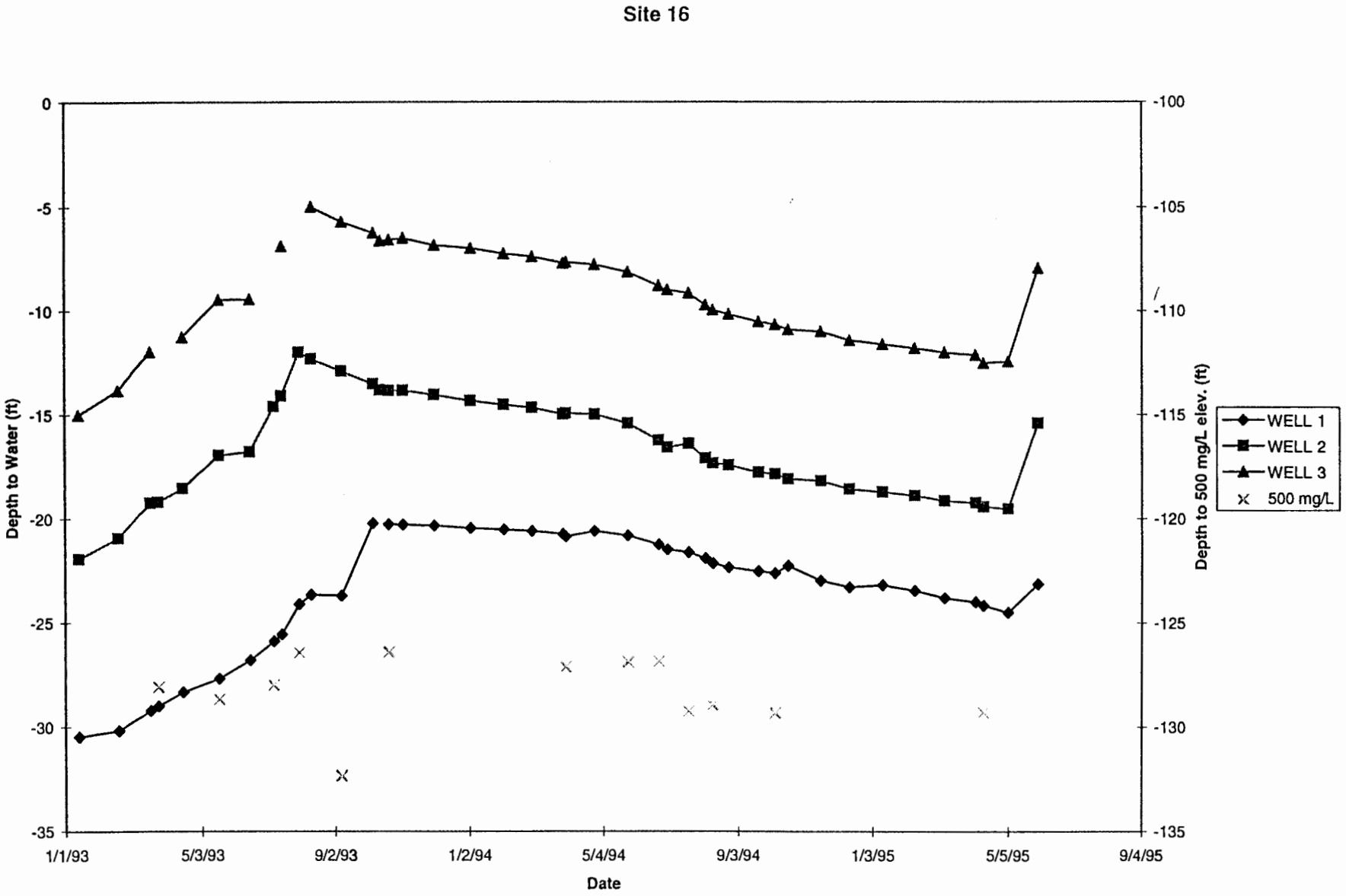

Figure 5. Hydrographs of wells at site 16, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

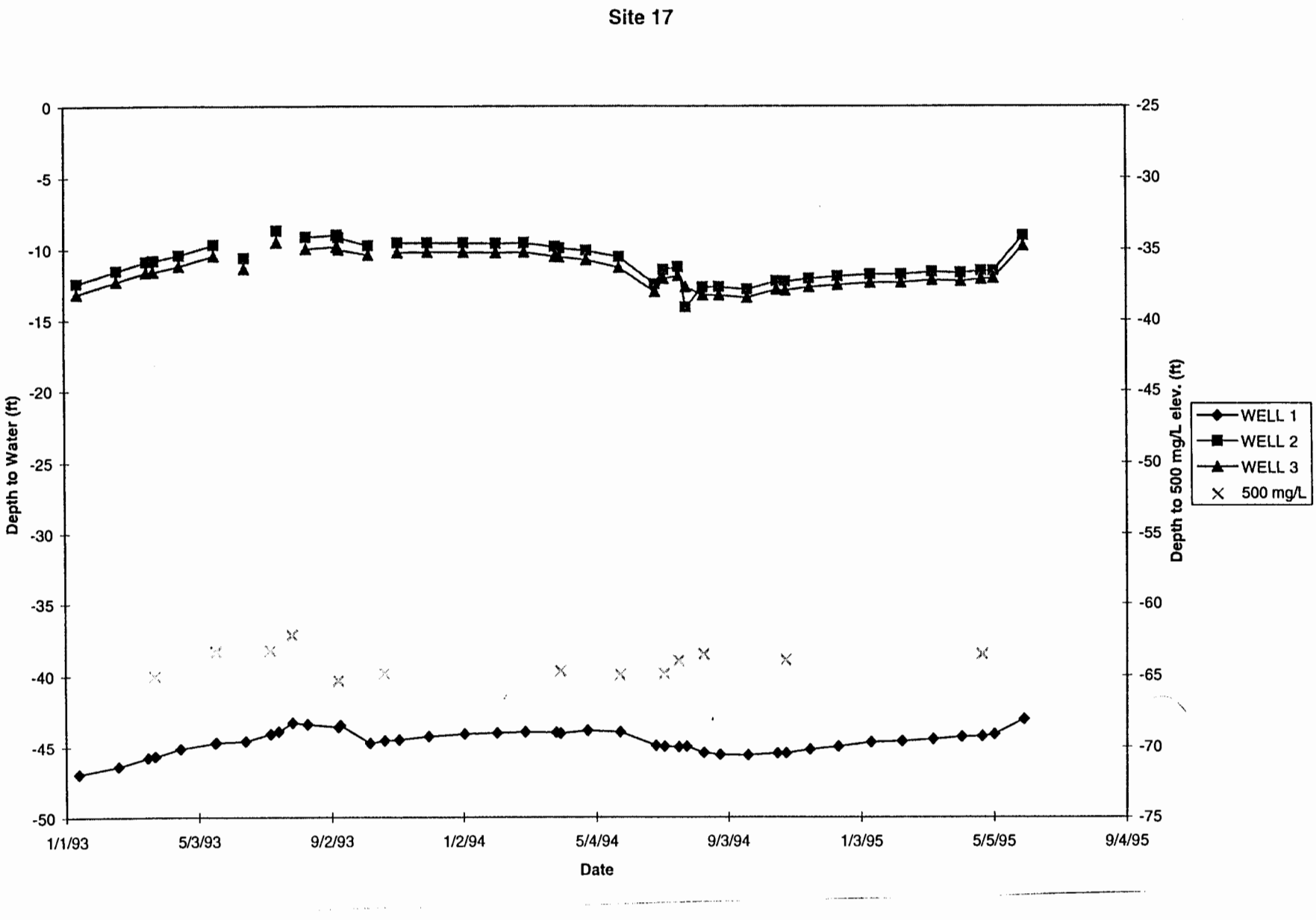

Figure 6. Hydrographs of wells at site 17, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

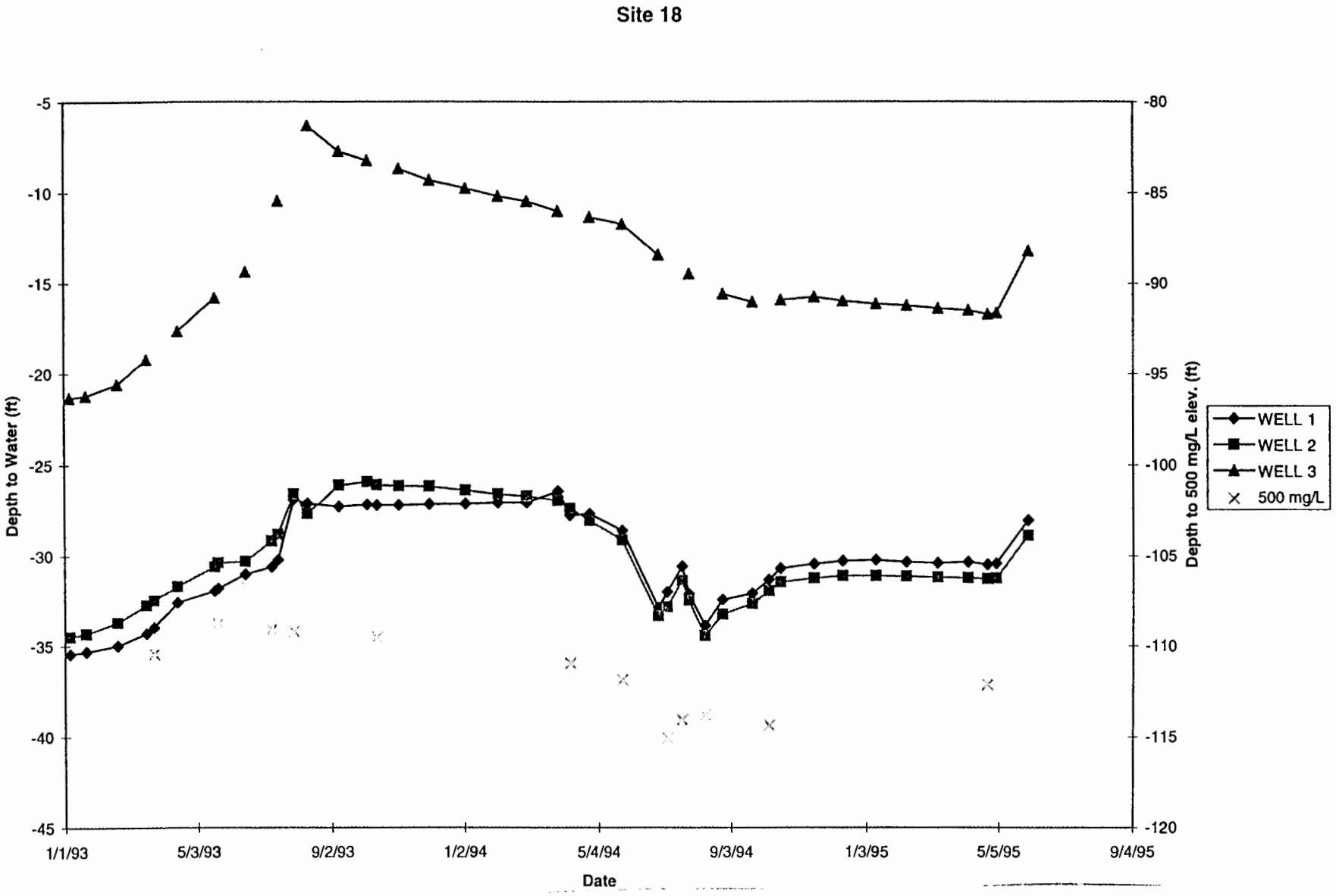

Figure 7. Hydrographs of wells at site 18, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

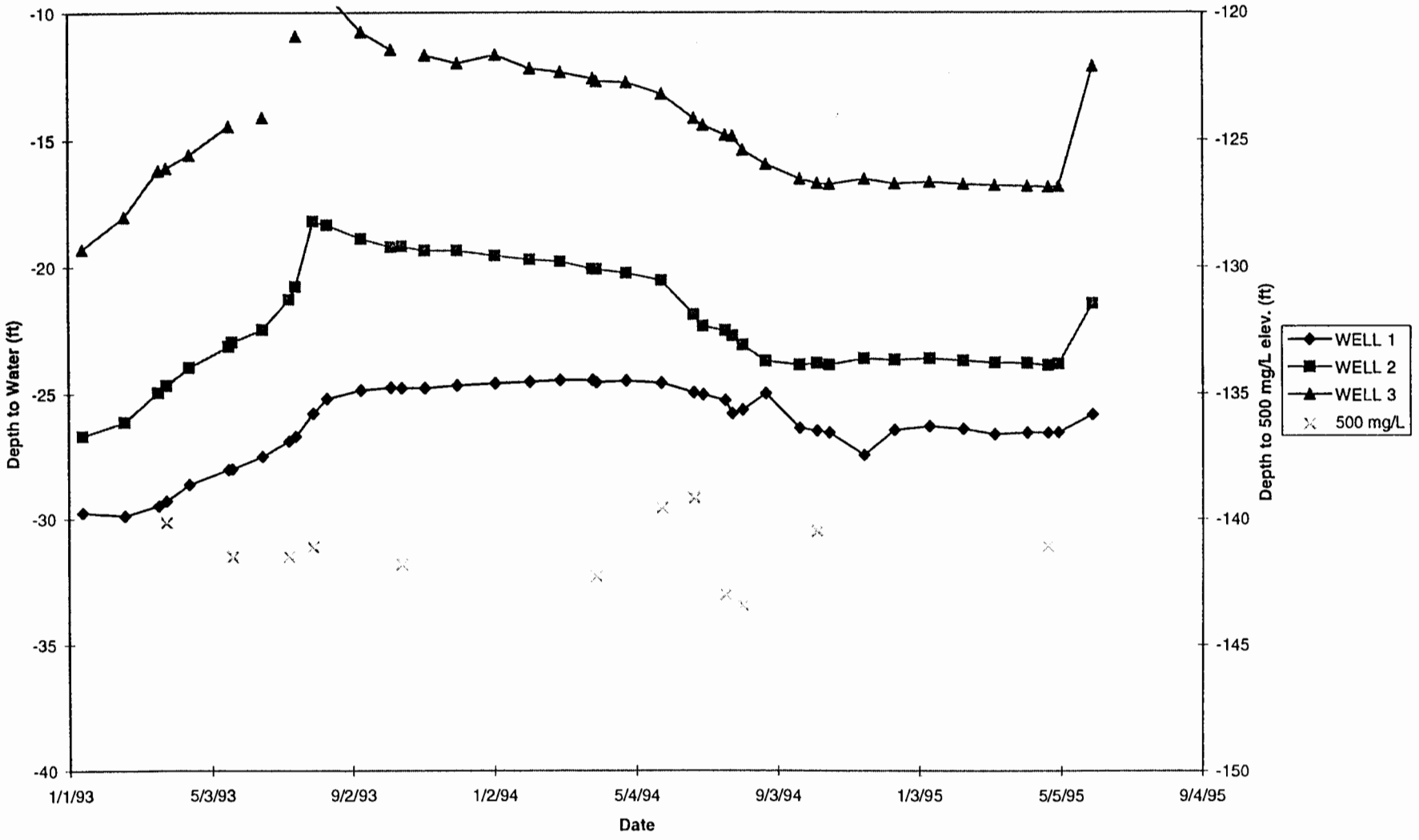

Figure 8. Hydrographs of wells at site 22, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

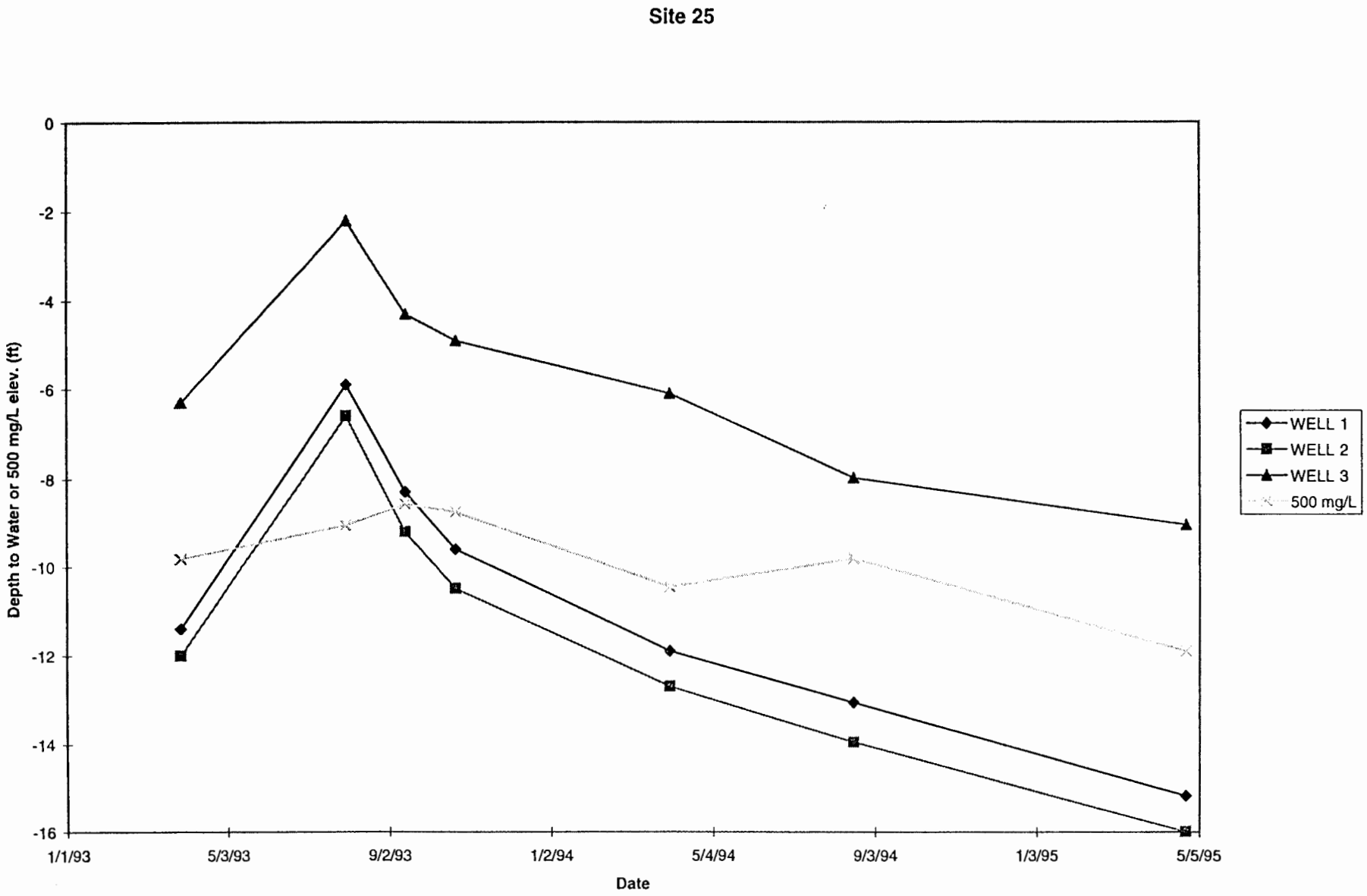

Figure 9. Hydrographs of wells at site 25, shown along with the 500 mg/L level estimated by Garneau et al. (1995).

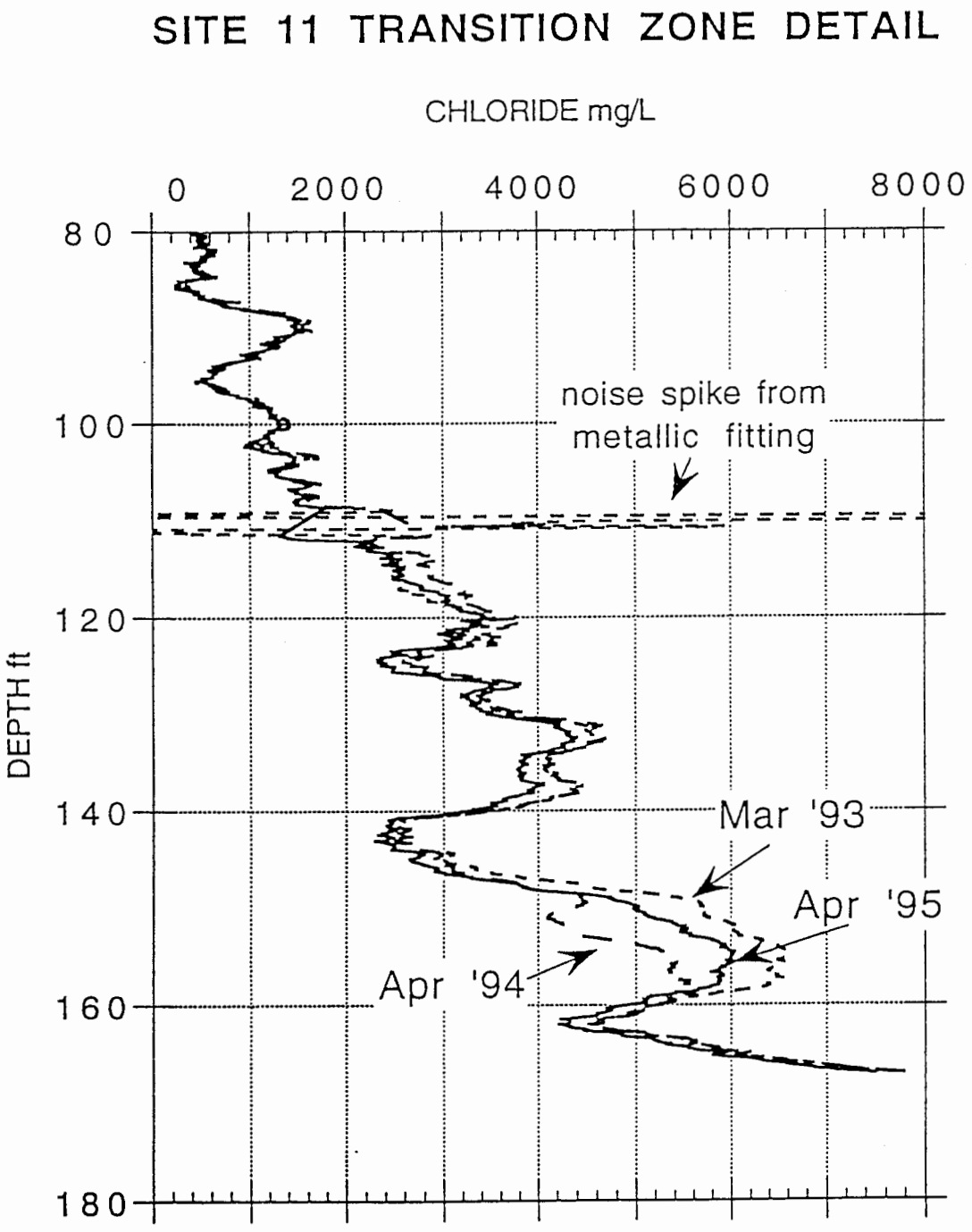

Figure 10. Detail of freshwater-saltwater transition zone changes at site 11.

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Appendix A: Depth to Water and Monitoring Site Water Level Differences

The following tables summarize recent water level information for the Mineral Intrusion monitoring well sites, with emphasis on 1993-95 observations and summary comparison data for the period 1987-93.

The data are grouped by site number. At each site, well 1 is the deepest and is normally completed in Permian bedrock. Well 2 is normally completed at or near the base of the Great Bend Prairie (alluvial) aquifer. At most sites, well 3 is the shallowest, completed at shallow to intermediate depths in the unconsolidated Quaternary aquifer; at a few sites there are four wells, the number 4 well is the shallowest and the number 3 well is at an intermediate depth between the number 2 and 4 wells.

The data presented in the "well" columns are depths to water (from local ground level) in feet on the dates indicated in the left-hand column. The right-hand group of columns (labeled 1-2, etc.) give the differences (in feet) between the water levels of the indicated wells. A negative number indicates that the deeper well has a higher water level elevation than the shallower well, creating a potential for the upward flow of water. These differences are calculated on the assumption that ground level is at the same elevation for all wells at the same site; this is a reasonable approximation, but is not strictly accurate and the actual elevations may differ by up to a foot at some sites.

The rows labeled AVG 93-95 and STD 93-95 for each site give the appropriate elevation and difference averages and standard deviations for 1993-95 measurements, respectively. The rows labeled AVG 87-93 and STD 87-93 give the averages and standard deviations, respectively, for all measurements during the years 1987-93. These values are included to give a longer term perspective on the values and variabilities, since 1993 was an unusually high recharge year.

SITE 1	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/13/93	9.60	8.52	8.17		1.08	1.43	0.35	
3/26/93	6.8	5.7	5.3		1.1	1.5	0.4	
3/29/93	6.90	5.75	5.34		1.15	1.56	0.41	
7/1/93	4.90	3.60	3.02		1.30	1.88	0.58	
8/25/93	7.0	5.8	5.2		1.2	1.8	0.6	
10/5/93	7.82	6.70	6.25		1.12	1.57	0.45	
1/6/94	8.0	6.83	6.51		1.14	1.46	0.32	
4/15/94	6.0	6.51	6.35		-0.49	-0.33	0.16	
5/26/94	6.5	6.89	6.67		-0.41	-0.19	0.22	
6/28/94	7.94	8.45	8		-0.51	-0.06	0.45	
10/5/94	9.65	10.2	9.85		-0.55	-0.2	0.35	
1/23/95	9.26	9.77	9.38		-0.51	-0.12	0.39	
4/5/95	9.09	9.36	8.76		-0.27	0.33	0.6	
AVG 93-95	7.65	7.24	6.83		0.41	0.82	0.41	
STD 93-95	1.41	1.84	1.86		0.81	0.86	0.13	
AVG 87-93	10.27	9.04	8.67		1.23	1.60	0.37	
STD 87-93	2.04	2.09	2.09		0.60	0.57	0.20	
SITE 3	WELL 1	WELL 2			1-2			
1/14/93	31.44	28.40			3.04			
2/19/93	30.64	27.86			2.78			
3/19/93	29.29	26.86			2.43			
4/19/93	28.31	25.73			2.58			
5/20/93	25.61	21.99			3.62			
6/16/93	24.97	21.75			3.22			
7/13/93	19.62	16.17			3.45			
8/10/93	17.17	13.56			3.61			
9/9/93	19.40	16.32			3.08			
10/5/93	21.05	18.00			3.05			
11/5/93	21.27	18.73			2.54			
12/1/93	21.60	18.90			2.7			
1/3/94	22.01	19.24			2.77			
2/2/94	22.40	19.55			2.85			
2/28/94	22.64	19.87			2.77			
3/28/94	23.04	20.24			2.8			
4/13/94	23.31	20.54			2.77			
5/5/94	23.52	20.64			2.88			
5/25/94	24.49	21.39			3.1			
7/6/94	26.84	23.81			3.03			
7/26/94	27.81	24.35			3.46			
8/25/94	28.31	24.94			3.37			
9/21/94	28.1	24.72			3.38			
10/19/94	28.03	24.88			3.15			
11/17/94	27.97	24.43			3.54			
12/13/94	27.84	24.6			3.24			
1/12/95	27.73	24.48			3.25			
2/9/95	27.85	24.47			3.38			

3/9/95	27.92	24.59			3.33			
4/6/95	27.89	24.54			3.35			
5/5/95	27.98	24.59			3.39			
6/2/95	20.76	14.12			6.64			
AVG 93-95	25.21	22.01			3.20			
STD 93-95	3.59	3.76			0.70			
AVG 87-93	28.19	25.00			3.20			
STD 87-93	4.17	4.12			0.42			
SITE 4	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/14/93	6.00	6.72	9.74		-0.72	-3.74	-3.02	
3/29/93	5.95	6.00	8.70		-0.05	-2.75	-2.70	
4/22/93	5.8	5.8	8.7		0	-2.9	-2.9	
7/1/93	5.44	5.07	7.74		0.37	-2.30	-2.67	
10/5/93	5.38	4.57	8.98		0.81	-3.60	-4.41	
1/5/94	5.12	3.62	8.10		1.5	-2.98	-4.48	
4/13/94	5.54	3.16	7.87		2.38	-2.33	-4.71	
7/6/94	5.18	4.16	9.9		1.02	-4.72	-5.74	
10/7/94	5.17	6.3	11.34		-1.13	-6.17	-5.04	
1/18/95	5.23	5.65	10.2		-0.42	-4.97	-4.55	
4/6/95	5.30	5.22	9.48		0.08	-4.18	-4.26	
AVG 93-95	5.46	5.12	9.16		0.35	-3.69	-4.04	
STD 93-95	0.30	1.08	1.05		0.97	1.16	1.00	
AVG 87-93	5.07	5.71	9.76		-0.64	-4.69	-4.05	
STD 87-93	1.74	1.41	1.29		0.90	1.33	0.81	
SITE 5	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/14/93	2.61	4.77	3.32		-2.16	-0.71	1.45	
2/9/93	1.55	3.75	2.25		-2.20	-0.70	1.50	
3/8/93	0.97	3.15	1.64		-2.18	-0.67	1.51	
3/29/93	1.43	3.60	2.09		-2.17	-0.66	1.51	
4/19/93	1.33	3.55	2.06		-2.22	-0.73	1.49	
5/20/93	0.75	3.00	1.50		-2.25	-0.75	1.50	
6/16/93	1.95	4.16	2.68		-2.21	-0.73	1.48	
7/15/93	-0.58	1.73	0.18		-2.31	-0.76	1.55	
8/10/93	0.23	2.50	1.00		-2.27	-0.77	1.50	
9/10/93	1.00	3.26	1.77		-2.26	-0.77	1.49	
10/7/93	1.29	3.5	2		-2.21	-0.71	1.5	
11/3/93	0.93	3.16	1.65		-2.23	-0.72	1.51	
12/2/93	0.82	3.04	1.51		-2.22	-0.69	1.53	
1/3/94	0.73	3.01	1.47		-2.28	-0.74	1.54	
2/2/94	0.83	3.05	1.5		-2.22	-0.67	1.55	
2/28/94	0.8	3.01	1.49		-2.21	-0.69	1.52	
3/28/94	1.25	3.47	1.94		-2.22	-0.69	1.53	
4/19/94	1.53	3.6	2.08		-2.07	-0.55	1.52	
5/5/94	1.09	3.27	1.73		-2.18	-0.64	1.54	
5/25/94	2.26	4.37	2.91		-2.11	-0.65	1.46	

7/6/94	3.51	5.6	4.11		-2.09	-0.6	1.49	
7/26/94	3.67	5.85	4.22		-2.18	-0.55	1.63	
8/10/94	4.05	6.13	4.67		-2.08	-0.62	1.46	
9/21/94	4.33	6.28	4.9		-1.95	-0.57	1.38	
10/6/94	3.98	6.03	4.54		-2.05	-0.56	1.49	
10/18/94	3.76	5.81	4.27		-2.05	-0.51	1.54	
11/17/94	3.50	5.56	4.03		-2.06	-0.53	1.53	
12/13/94	2.86	5.39	3.87		-2.53	-1.01	1.52	
1/12/95	2.92	5.12	3.58		-2.2	-0.66	1.54	
2/9/95	2.97	5.02	3.56		-2.05	-0.59	1.46	
3/9/95	2.83	4.96	3.38		-2.13	-0.55	1.58	
4/6/95	2.95	4.68	3.55		-1.73	-0.6	1.13	
5/5/95	2.61	4.66	3.18		-2.05	-0.57	1.48	
6/1/95	0.67	2.79	1.22		-2.12	-0.55	1.57	
AVG 93-95	1.98	4.14	2.64		-2.16	-0.66	1.50	
STD 93-95	1.26	1.20	1.22		0.13	0.10	0.08	
AVG 87-93	2.77	4.92	3.58		-2.05	-0.71	1.34	
STD 87-93	1.52	1.60	1.51		0.63	0.12	0.64	
SITE 6	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	22.22	15.48	19.84		6.74	2.38	-4.36	
4/1/93	21.96	14.13	19.37		7.83	2.59	-5.24	
4/19/93	21.9	13.8			8.1			
6/29/93	21.53	11.93	17.28		9.60	4.25	-5.35	
8/26/93	21.6	26.8	15.8		-5.2	5.8	11.0	
10/4/93	21.69	11.32	15.77		10.37	5.92	-4.45	
10/20/93	21.8	10.5	15.7		11.3	6.1	-5.2	
1/5/94	21.63	10.08	15.42		11.55	6.21	-5.34	
4/13/94	21.66	10.45	15.42		11.21	6.24	-4.97	
6/29/94	21.98	33.95	16.16		-11.97	5.82	17.79	
10/3/94	21.21	15.95	17.09		5.26	4.12	-1.14	
1/18/95	22.25	13.95	17.52		8.3	4.73	-3.57	
4/5/95	22.27	14.58	17.78		7.69	4.49	-3.2	
AVG 93-95	21.82	15.61	16.93		6.21	4.89	-1.17	
STD 93-95	0.30	6.72	1.44		6.70	1.31	7.19	
AVG 87-93	20.51	17.11	17.39		3.39	3.71	0.32	
STD 87-93	1.62	7.55	1.67		7.22	3.61	7.62	
SITE 7	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	39.94	21.23	24.14		18.71	15.80	-2.91	
4/1/93	39.54	18.56	21.72		20.98	17.82	-3.16	
4/18/93	39.4	18.2			21.2			
6/29/93	38.80	15.10	17.55		23.70	21.25	-2.45	
10/4/93	38.65	12.48	15.80		26.17	22.85	-3.32	
1/5/94	37.93	12.97	15.85		24.96	22.08	-2.88	
3/21/94	38.04	13.85			24.19			
4/21/94		15.75	16.92				-1.17	

6/30/94	30.2	23.82	19.14		6.38	11.06	4.68	
10/4/94	31.29	20.6	20.89		10.69	10.4	-0.29	
1/18/95	31.55	19.16	21.26		12.39	10.29	-2.1	
4/6/95	31.53	19.47	21.74		12.06	9.79	-2.27	
AVG 93-95	36.08	17.60	19.50		18.31	15.70	-1.59	
STD 93-95	3.79	3.41	2.72		6.47	5.17	2.27	
AVG 87-93	37.65	20.14	21.84		17.51	15.75	-1.62	
STD 87-93	2.64	4.04	2.99		3.36	2.49	1.95	
SITE 8	WELL 1	WELL 2	WELL 3	WELL 4	1-2	1-3	2-3	1-4
1/4/93	25.79	18.97	18.64	13.84	6.82	7.15	0.33	11.95
4/1/93	25.11	15.84	15.52	8.94	9.27	9.59	0.32	16.17
4/21/93	25.1	15.8	15.5	8.8	9.3	9.6	0.3	16.3
6/29/93	23.93	14	13.67	5.68	9.93	10.26	0.33	18.25
8/24/93	23.5	14.6	14.3	7.9	8.9	9.2	0.3	15.6
10/4/93	23.38	15.69	15.36	8.28	7.69	8.02	0.33	15.1
1/5/94	23.15	16.45	16.11	9.68	6.7	7.04	0.34	13.47
4/7/94	23.52	17.19	16.86	11.1	6.33	6.66	0.33	12.42
6/29/94	23.81	19.85	19.5	12.22	3.96	4.31	0.35	11.59
10/3/94	24.77	20.94	20.62	16.46	3.83	4.15	0.32	8.31
1/9/95	25.28	20.5	20.15	15.68	4.78	5.13	0.35	9.6
4/6/95	25.34	20.18	19.85	15.65	5.16	5.49	0.33	9.69
AVG 93-95	24.39	17.50	17.17	11.19	6.89	7.22	0.33	13.20
STD 93-95	0.89	2.35	2.35	3.40	2.06	2.06	0.02	2.99
AVG 87-93	24.58	18.05	17.74	12.53	6.53	6.84	0.31	
STD 87-93	1.25	2.20	2.19	3.70	1.54	1.55	0.04	
SITE 9	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	9.78	9.66	9.84		0.12	-0.06	-0.18	
4/2/93	8.94	8.75	8.93		0.19	0.01	-0.18	
4/25/93	9.0	8.8	9.0		0.2	0	-0.2	
6/30/93	8.46	8.25	8.42		0.21	0.04	-0.17	
10/4/93	9.10	8.93	9.10		0.17	0	-0.17	
1/5/94	9.07	9	9.1		0.07	-0.03	-0.1	
4/14/94	9.34	9.2	9.36		0.14	-0.02	-0.16	
7/1/94	10.44	10.34	10.48		0.1	-0.04	-0.14	
10/4/94	10.88	10.76	10.92		0.12	-0.04	-0.16	
1/23/95	10.29	10.16	10.33		0.13	-0.04	-0.17	
4/6/95	10.62	10.5	10.65		0.12	-0.03	-0.15	
AVG 93-95	9.63	9.49	9.65		0.14	-0.02	-0.16	
STD 93-95	0.77	0.80	0.79		0.04	0.03	0.02	
AVG 87-93	10.14	10.00	10.20		0.14	-0.06	-0.20	
STD 87-93	0.82	0.94	0.88		0.24	0.19	0.32	
SITE 10	WELL 1	WELL 2	WELL 3	WELL 4	1-2	1-3	2-3	1-4
1/6/93	25.92	25.68	23.69	20.69	0.24	2.23	1.99	5.23

3/29/93	23.89	23.71	21.77	19.25	0.18	2.12	1.94	4.64
4/25/93	22.9	22.7	20.8	18.3	0.2	2.1	1.9	4.6
6/30/93	19.29	19.06	17.19	14.03	0.23	2.10	1.87	5.26
10/4/93	17.72	17.48	15.45	11.31	0.24	2.27	2.03	6.41
1/6/94	19.25	19.02	16.98	12.76	0.23	2.27	2.04	6.49
4/7/94	20.4	20.16	18.12	13.75	0.24	2.28	2.04	6.65
7/1/94	21.72	21.49	19.42	14.81	0.23	2.3	2.07	6.91
10/4/94	22.88	22.68	20.62	16.17	0.2	2.26	2.06	6.71
1/23/95	23.86	23.57	21.55	17.37	0.29	2.31	2.02	6.49
4/6/95	24.26	24.05	22.03	18	0.21	2.23	2.02	6.26
AVG 93-95	22.01	21.78	19.78	16.04	0.23	2.22	2.00	5.97
STD 93-95	2.43	2.43	2.44	2.81	0.03	0.08	0.06	0.82
AVG 87-93	24.96	24.71	22.71	19.50	0.25	2.25	2.00	
STD 87-93	2.45	2.45	2.44	2.54	0.05	0.06	0.05	
SITE 11	WELL 1	WELL 2			1-2			
1/6/93	33.2	17.1			16.1			
3/27/93	31.9	13.5			18.4			
3/29/93	31.89	13.47			18.42			
5/20/93	30.6	10.0			20.6			
6/30/93	29.74	8.89			20.85			
7/9/93	29.6	8.8			20.8			
7/30/93	29.1	7.8			21.3			
8/24/93	29.1	8.7			20.4			
9/22/93	29.1	9.4			19.7			
10/13/93	29.2	9.9			19.3			
1/6/94	29.29	10.59			18.7			
4/8/94	29.37	11.39			17.98			
5/26/94	29.51	10.72			18.79			
6/28/94	30.14	11.7			18.44			
7/6/94	30.22	11.85			18.37			
7/19/94	30.33	12.12			18.21			
8/12/94	30.86	12.88			17.98			
10/6/94	31.74	14.06			17.68			
1/23/95	32.35	15.63			16.72			
4/7/95	32.33	15.97			16.36			
AVG 93-95	30.48	11.72			18.76			
STD 93-95	1.28	2.56			1.46			
AVG 87-93	32.07	13.49			18.56			
STD 87-93	1.72	3.09			1.49			
SITE 12	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	25.27	23.03	23.7		2.24	1.57	-0.67	
4/2/93	24.32	22.17	22.68		2.15	1.64	-0.51	
5/23/93	23.8	21.5	22.2		2.3	1.6	-0.7	
6/29/93	21.38	18.78	19.45		2.6	1.93	-0.67	
10/1/93	21.6	19.2	19.6		2.4	2	-0.4	

1/10/94	21.57	19.61	19.58		1.96	1.99	0.03	
4/20/94	22.04	19.87	20.25		2.17	1.79	-0.38	
6/29/94	23.68	21.96	21.26		1.72	2.42	0.7	
10/3/94	24.83	23.23	23.27		1.6	1.56	-0.04	
1/11/95	24.79	23.14	23.61		1.65	1.18	-0.47	
4/5/95	24.9	23.13	23.64		1.77	1.26	-0.51	
AVG 93-95	23.47	21.42	21.75		2.05	1.72	-0.33	
STD 93-95	1.45	1.66	1.69		0.32	0.34	0.40	
AVG 87-93	22.23	20.13	20.48		2.11	1.75	-0.35	
STD 87-93	2.36	2.55	2.65		0.34	0.52	0.46	
SITE 13	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	37.34	34.89	34.94		2.45	2.4	-0.05	
4/1/93	37.47	34.93	34.71		2.54	2.76	0.22	
4/23/93	37.4	34.8	34.7		2.6	2.7	0.1	
6/29/93	36.78	34.09	34.00		2.69	2.78	0.09	
8/25/93	36.2	33.4	33.3		2.8	2.9	0.1	
10/1/93	36.1	33.37	33.32		2.73	2.78	0.05	
1/10/94	36.12	33.44	33.41		2.68	2.71	0.03	
4/4/94	36.09	33.66	33.68		2.43	2.41	-0.02	
6/29/94	36.42	33.82	33.91		2.6	2.51	-0.09	
10/3/94	36.68	34.18	34.12		2.5	2.56	0.06	
1/17/95	36.8	34.45	34.41		2.35	2.39	0.04	
4/5/95	36.9	34.64	34.63		2.26	2.27	0.01	
AVG 93-95	36.69	34.14	34.09		2.55	2.60	0.05	
STD 93-95	0.50	0.57	0.56		0.15	0.19	0.08	
AVG 87-93	36.59	34.04	34.03		2.56	2.56	0.00	
STD 87-93	0.68	0.63	0.59		0.15	0.22	0.16	
SITE 14	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	100.55	99.88	99.64		0.67	0.91	0.24	
4/1/93	100.55	99.83	99.74		0.72	0.81	0.09	
4/23/93	100.6	99.7	99.7		0.9	0.9	0	
6/30/93	100.45	99.68	99.57		0.77	0.88	0.11	
8/25/93	100.5	99.7	99.8		0.8	0.7	-0.1	
10/1/93	100.43	99.7	99.56		0.73	0.87	0.14	
1/10/94	99.88	99.45	99.07		0.43	0.81	0.38	
4/4/94	100.11	99.3	99.18		0.81	0.93	0.12	
6/29/94	100.14	99.34	99.32		0.8	0.82	0.02	
10/4/94		99.73	99.53				0.2	
1/17/95	101.09	99.7	99.54		1.39	1.55	0.16	
2/8/95	101.14	99.7	99.52		1.44	1.62	0.18	
4/5/95	100.88	99.57	99.51		1.31	1.37	0.06	
5/30/95	100.8	99.73	99.55		1.07	1.25	0.18	
AVG 93-95	100.55	99.64	99.52		0.91	1.03	0.13	
STD 93-95	0.36	0.16	0.20		0.29	0.29	0.11	

AVG 87-93	99.86	99.16	99.01		0.70	0.84	0.15	
STD 87-93	0.50	0.51	0.52		0.20	0.22	0.12	
SITE 15	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	27.22	31.63	30.66		-4.41	-3.44	0.97	
4/2/93	26.78	30.81	30.00		-4.03	-3.22	0.81	
4/22/93	26.8	30.7	29.7		-3.9	-2.9	1.0	
6/30/93	26.70	28.08	26.99		-1.38	-0.29	1.09	
8/24/93	29.2	28.6	26.7		0.6	2.5	1.9	
10/4/93	25.76	28.17	26.87		-2.41	-1.11	1.30	
1/10/94	25.13	28.22	27.39		-3.09	-2.26	0.83	
4/14/94	25.19	29.16	28.02		-3.97	-2.83	1.14	
6/30/94	29.75	30.81	28.74		-1.06	1.01	2.07	
10/3/94	28.09	31.14	29.97		-3.05	-1.88	1.17	
1/11/95	27.8	31.45	30.42		-3.65	-2.62	1.03	
4/5/95	28.12	31.65	30.66		-3.53	-2.54	0.99	
AVG 93-95	27.21	30.04	28.84		-2.82	-1.63	1.19	
STD 93-95	1.40	1.40	1.50		1.44	1.76	0.38	
AVG 87-93	27.55	31.07	29.89		-3.52	-2.35	1.17	
STD 87-93	1.86	1.64	1.67		1.42	1.74	0.37	
SITE 16	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/13/93	30.44	21.93	14.99		8.51	15.45	6.94	
2/18/93	30.15	20.94	13.84		9.21	16.31	7.10	
3/18/93	29.20	19.25	11.98		9.95	17.22	7.27	
3/25/93	29.0	19.2			9.8			
4/16/93	28.32	18.52	11.26		9.80	17.06	7.26	
5/19/93	27.67	16.92	9.43		10.75	18.24	7.49	
6/16/93	26.79	16.75	9.42		10.04	17.37	7.33	
7/8/93	25.9	14.6			11.3			
7/15/93	25.57	14.1	6.86		11.47	18.71	7.24	
7/31/93	24.1	12.0			12.1			
8/11/93	23.64	12.3	4.98		11.34	18.66	7.32	
9/8/93	23.7	12.9	5.7		10.8	18.0	7.2	
10/7/93	20.21	13.52	6.23					
10/13/93		13.8	6.6				7.2	
11/3/93	20.28	13.83	6.49		6.45	13.79	7.34	
12/1/93	20.34	14.05	6.82		6.29	13.52	7.23	
1/3/94	20.45	14.34	6.97		6.11	13.48	7.37	
2/2/94	20.53	14.53	7.23		6	13.3	7.3	
2/28/94	20.6	14.67	7.37		5.93	13.23	7.3	
3/28/94	20.75	14.98	7.68		5.77	13.07	7.3	
3/31/94	20.85	14.93	7.64		5.92	13.21	7.29	
5/26/94	20.82	15.39	8.11		5.43	12.71	7.28	
6/23/94	21.25	16.22	8.78		5.03	12.47	7.44	
7/20/94	21.63	16.37	9.13		5.26	12.5	7.24	
8/4/94	21.92	17.07	9.71		4.85	12.21	7.36	
8/11/94	22.15	17.3	9.95		4.85	12.2	7.35	

10/6/94	22.63	17.84	10.66		4.79	11.97	7.18	
10/18/94	22.28	18.07	10.9		4.21	11.38	7.17	
11/17/94	22.99	18.16	10.99		4.83	12	7.17	
12/13/94	23.3	18.57	11.42		4.73	11.88	7.15	
1/12/95	23.2	18.71	11.6		4.49	11.6	7.11	
2/10/95	23.46	18.88	11.79		4.58	11.67	7.09	
3/9/95	23.81	19.15	12.01		4.66	11.8	7.14	
4/6/95	24	19.24	12.13		4.76	11.87	7.11	
5/5/95	24.5	19.52	12.44		4.98	12.06	7.08	
6/1/95	23.14	15.41	7.94		7.73	15.2	7.47	
AVG 93-95	23.70	16.50	9.37		7.14	14.00	7.24	
STD 93-95	2.99	2.49	2.48		2.58	2.39	0.12	
AVG 87-93	31.22	22.04	15.66		9.10	15.61	6.56	
STD 87-93	1.92	2.76	2.82		1.22	1.36	0.34	
SITE 17	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/13/93	46.95	12.42	13.16		34.53	33.79	-0.74	
2/18/93	46.41	11.53	12.27		34.88	34.14	-0.74	
3/18/93	45.81	10.87	11.63		34.94	34.18	-0.76	
3/24/93	45.7	10.8	11.6		34.9	34.1	-0.8	
4/16/93	45.16	10.42	11.18		34.74	33.98	-0.76	
5/18/93	44.73	9.68	10.47		35.05	34.26	-0.79	
5/19/93	44.7							
6/15/93	44.61	10.60	11.35		34.01	33.26	-0.75	
7/8/93	44.1							
7/15/93	43.91	8.68	9.5		35.23	34.41	-0.82	
7/28/93	43.3							
8/11/93	43.41	9.12	9.94		34.29	33.47	-0.82	
9/8/93	43.6	9.0	9.8		34.6	33.8	-0.8	
9/10/93	43.46	9.15	10.03		34.31	33.43	-0.88	
10/7/93	44.74	9.74	10.40		35.00	34.34	-0.66	
11/3/93	44.50	9.55	10.22		34.95	34.28	-0.67	
12/1/93	44.25	9.53	10.18		34.72	34.07	-0.65	
1/3/94	44.09	9.55	10.19		34.54	33.9	-0.64	
2/2/94	44.03	9.58	10.22		34.45	33.81	-0.64	
2/28/94	43.96	9.53	10.18		34.43	33.78	-0.65	
3/28/94	43.97	9.83	10.51		34.14	33.46	-0.68	
4/1/94	44.06	9.91	10.54		34.15	33.52	-0.63	
5/26/94	43.96	10.53	11.28		33.43	32.68	-0.75	
6/28/94	44.9	12.46	12.99		32.44	31.91	-0.53	
7/6/94	44.96	11.46	12.07		33.5	32.89	-0.61	
7/19/94	45.01	11.26	11.88		33.75	33.13	-0.62	
8/11/94	45.41	12.69	13.25		32.72	32.16	-0.56	
8/26/94	45.56	12.64	13.25		32.92	32.31	-0.61	
9/21/94	45.59	12.81	13.41		32.78	32.18	-0.6	
10/18/94	45.44	12.23	12.84		33.21	32.6	-0.61	
11/17/94	45.17	12.07	12.66		33.1	32.51	-0.59	
12/13/94	44.96	11.9	12.53		33.06	32.43	-0.63	

1/12/95	44.65	11.78	12.35		32.87	32.3	-0.57	
2/9/95	44.61	11.78	12.36		32.83	32.25	-0.58	
3/10/95	44.45	11.61	12.18		32.84	32.27	-0.57	
4/5/95	44.3	11.65	12.25		32.65	32.05	-0.6	
5/5/95	44.13	11.51	12.03		32.62	32.1	-0.52	
6/1/95	43.05	9.02	9.76		34.03	33.29	-0.74	
AVG 93-95	44.62	10.77	11.44		33.90	33.23	-0.67	
STD 93-95	0.84	1.25	1.20		0.87	0.81	0.09	
AVG 87-93	46.05	13.73	14.42		32.35	31.80	-0.70	
STD 87-93	3.01	1.71	1.72		2.66	2.58	0.19	
SITE 18	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	35.47	34.51	21.35		0.96	14.12	13.16	
1/21/93	35.32	34.34	21.25		0.98	14.07	13.09	
2/19/93	34.99	33.72	20.60		1.27	14.39	13.12	
3/18/93	34.32	32.76	19.25		1.56	15.07	13.51	
3/25/93	34.0	32.5			1.5			
4/14/93	32.60	31.70	17.66		0.90	14.94	14.04	
5/18/93	31.95	30.60	15.81		1.35	16.14	14.79	
5/21/93	31.8	30.4			1.4			
6/15/93	31.03	30.30	14.37		0.73	16.66	15.93	
7/9/93	30.6	29.2			1.4			
7/15/93	30.22	28.83	10.48		1.39	19.74	18.35	
7/29/93	26.9	26.6			0.3			
8/11/93	27.12	27.71	6.33		-0.59	20.79	21.38	
9/9/93	27.28	26.12	7.74		1.16	19.54	18.38	
10/5/93	27.18	25.94	8.27		1.24	18.91	17.67	
10/14/93	27.2	26.1			1.1			
11/3/93	27.2	26.15	8.7		1.05	18.5	17.45	
12/1/93	27.16	26.18	9.34		0.98	17.82	16.84	
1/3/94	27.12	26.4	9.78		0.72	17.34	16.62	
2/2/94	27.08	26.6	10.2		0.48	16.88	16.4	
2/28/94	27.07	26.73	10.49		0.34	16.58	16.24	
3/28/94	26.44	26.97	11.02		-0.53	15.42	15.95	
4/8/94	27.77	27.39			0.38			
5/26/94	28.62	29.15	11.73		-0.53	16.89	17.42	
6/28/94	32.87	33.34	13.43		-0.47	19.44	19.91	
7/6/94	31.99	32.84			-0.85			
7/20/94	30.59	31.38			-0.79			
8/10/94	33.87	34.45			-0.58			
9/22/94	32.08	32.66	16.03		-0.58	16.05	16.63	
10/7/94	31.33	31.95			-0.62			
10/18/94	30.7	31.46	15.94		-0.76	14.76	15.52	
11/17/94	30.46	31.23	15.77		-0.77	14.69	15.46	
12/13/94	30.28	31.09	15.99		-0.81	14.29	15.1	
1/12/95	30.23	31.09	16.14		-0.86	14.09	14.95	
2/9/95	30.34	31.14	16.22		-0.8	14.12	14.92	
3/10/95	30.4	31.19	16.4		-0.79	14	14.79	

4/7/95	30.33	31.2	16.51		-0.87	13.82	14.69	
5/3/95	30.42	31.23	16.64		-0.81	13.78	14.59	
6/1/95	28.05	28.89	13.19		-0.84	14.86	15.7	
AVG 93-95	30.27	30.05	14.02		0.21	16.13	15.95	
STD 93-95	2.64	2.69	4.11		0.91	2.06	1.94	
AVG 87-93	34.61	35.05	20.51		-0.45	13.80	14.16	
STD 87-93	2.27	2.89	4.07		1.84	1.98	1.75	
SITE 19	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/21/93	20.03	17.7	14.94		2.33	5.09	2.76	
2/19/93	19.92	16.6	13.44		3.32	6.48	3.16	
3/22/93	19.72	15.15	12.01		4.57	7.71	3.14	
4/16/93	19.52	14.59	11.65		4.93	7.87	2.94	
4/19/93	19.5	14.5			5			
5/20/93	19.21	12.66	10.25		6.55	8.96	2.41	
6/16/93	19.16	13.72	10.95		5.44	8.21	2.77	
7/15/93	18.77	11.75	9.45		7.02	9.32	2.3	
8/10/93	18.68	15.35	10.55		3.33	8.13	4.8	
8/25/93	18.8	17.0			1.8			
9/9/93	18.79	13.32	11.67		5.47	7.12	1.65	
10/6/93	18.65	13.6	11.73		5.05	6.92	1.87	
10/20/93	18.5	13.0			5.5			
11/4/93	18.49	12.97	11.59		5.52	6.9	1.38	
12/1/93	18.3	13.2	11.51		5.1	6.79	1.69	
1/4/94	18.15	13.16	11.56		4.99	6.59	1.6	
2/3/94	17.93	13.23	11.43		4.7	6.5	1.8	
3/1/94	17.92	13.32	11.49		4.6	6.43	1.83	
3/29/94		13.57	11.62				1.95	
5/4/94	18	13.67	11.38		4.33	6.62	2.29	
5/26/94	18.02	15.59	12.03		2.43	5.99	3.56	
6/29/94	18.44	20.41	14.47		-1.97	3.97	5.94	
7/26/94	18.78	23.19	15.87		-4.41	2.91	7.32	
8/26/94	19.38	19.89	17.2		-0.51	2.18	2.69	
9/23/94	19.64	18.81	16.82		0.83	2.82	1.99	
10/19/94	19.75	18.97	16.81		0.78	2.94	2.16	
11/16/94	19.88	18.74	16.41		1.14	3.47	2.33	
12/16/94	19.72	18.44	16.23		1.28	3.49	2.21	
1/13/95	19.8	18.37	16.14		1.43	3.66	2.23	
2/15/95	19.85	18.29	16.12		1.56	3.73	2.17	
3/10/95	19.82	18.27	16.01		1.55	3.81	2.26	
4/7/95	19.88	18.17	15.82		1.71	4.06	2.35	
5/4/95	19.78	18.14	15.7		1.64	4.08	2.44	
5/30/95	19.4	15.14	10.07		4.26	9.33	5.07	
AVG 93-95	19.10	15.96	13.32		3.07	5.74	2.74	
STD 93-95	0.68	2.76	2.45		2.49	2.11	1.31	

AVG 87-93	18.01	15.40	12.10		2.61	5.61	2.99	
STD 87-93	1.69	2.79	2.38		2.37	1.96	1.34	
SITE 20	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	30.77	24.40	25.90		6.37	4.87	-1.50	
4/1/93	30.05	21.08	22.06		8.97	7.99	-0.98	
4/19/93	29.8	20.4			9.4			
6/29/93	28.79	18.1	18.52		10.69	10.27	-0.42	
8/25/93	27.9	20.1	18.5		7.8	9.4	1.6	
10/4/93	27.54	18.66	18.61		8.88	8.93	0.05	
10/20/93	27.4	18.1	18.8		9.3	8.6	-0.7	
1/12/94	26.6	17.69	18.88		8.91	7.72	-1.19	
4/21/94	25.91	18.46	19.48		7.45	6.43	-1.02	
6/29/94	26.01	27.88	22.97		-1.87	3.04	4.91	
10/3/94	28	25.66	26.71		2.34	1.29	-1.05	
1/18/95	28.95	24.7	26.13		4.25	2.82	-1.43	
4/5/95	29.13	24.46	26.04		4.67	3.09	-1.58	
AVG 93-95	28.22	21.51	21.88		6.70	6.20	-0.28	
STD 93-95	1.47	3.32	3.34		3.39	2.92	1.77	
AVG 87-93	27.57	22.39	22.64		5.18	4.84	-0.18	
STD 87-93	2.72	4.01	3.95		3.14	2.48	1.58	
SITE 21	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	27.84	25.75	24.85		2.09	2.99	0.90	
4/2/93	26.70	24.43	23.24		2.27	3.46	1.19	
5/20/93	25.2	22.9	21.6		2.3	3.6	1.3	
6/30/93	24.83	22.50	21.24		2.33	3.59	1.26	
10/4/93	25.30	23.09	22.14		2.21	3.16	0.95	
1/6/94	25.52	23.49	22.74		2.03	2.78	0.75	
4/7/94	26.04	23.93	23.07		2.11	2.97	0.86	
6/30/94	27.59	25.41	24.61		2.18	2.98	0.8	
10/4/94	28.1	26.07	25.18		2.03	2.92	0.89	
1/23/95	28.26	26.12	25.48		2.14	2.78	0.64	
4/6/95	28.37	26.31	25.49		2.06	2.88	0.82	
AVG 93-95	26.70	24.55	23.60		2.16	3.10	0.94	
STD 93-95	1.31	1.37	1.51		0.10	0.29	0.21	
AVG 87-93	27.03	25.07	23.94		1.97	3.09	1.12	
STD 87-93	1.22	1.40	1.34		0.38	0.41	0.44	
SITE 22	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/13/93	29.75	26.68	19.31		3.07	10.44	7.37	
2/18/93	29.87	26.13	18.02		3.74	11.85	8.11	
3/18/93	29.47	24.96	16.21		4.51	13.26	8.75	
3/25/93	29.3	24.7	16.1		4.6	13.2	8.6	
4/14/93	28.62	24.00	15.58		4.62	13.04	8.42	
5/18/93	28.03	23.17	14.46		4.86	13.57	8.71	
5/21/93	28.0	23.0			5.0			

6/16/93	27.52	22.50	14.14		5.02	13.38	8.36	
7/9/93	26.9	21.3			5.6	26.9	21.3	
7/15/93	26.70	20.79	10.93		5.91	15.77	9.86	
7/30/93	25.8	18.2			7.6			
8/11/93	25.22	18.36	9.26		6.86	15.96	9.1	
9/9/93	24.89	18.89	10.76		6.00	14.13	8.13	
10/5/93	24.79	19.22	11.47		5.57	13.32	7.75	
10/14/93	24.8	19.2			5.6			
11/3/93	24.81	19.36	11.7		5.45	13.11	7.66	
12/1/93	24.71	19.36	12.01		5.35	12.7	7.35	
1/3/94	24.62	19.57	11.67		5.05	12.95	7.9	
2/2/94	24.56	19.72	12.22		4.84	12.34	7.5	
2/28/94	24.5	19.79	12.36		4.71	12.14	7.43	
3/28/94	24.5	20.09	12.61		4.41	11.89	7.48	
3/31/94	24.57	20.11	12.71		4.46	11.86	7.4	
4/26/94	24.51	20.25	12.75		4.26	11.76	7.5	
5/26/94	24.6	20.55	13.21		4.05	11.39	7.34	
6/23/94	24.97	21.91	14.16		3.06	10.81	7.75	
7/20/94	25.28	22.54	14.82		2.74	10.46	7.72	
8/4/94	25.65	23.11	15.4		2.54	10.25	7.71	
8/24/94	25.01	23.74	15.96		1.27	9.05	7.78	
9/22/94	26.37	23.9	16.53		2.47	9.84	7.37	
10/7/94	26.47	23.83	16.69		2.64	9.78	7.14	
10/18/94	26.57	23.89	16.74		2.68	9.83	7.15	
11/17/94	27.45	23.65	16.53		3.8	10.92	7.12	
12/13/94	26.46	23.71	16.71		2.75	9.75	7	
1/12/95	26.32	23.64	16.66		2.68	9.66	6.98	
2/10/95	26.42	23.73	16.73		2.69	9.69	7	
3/9/95	26.63	23.81	16.79		2.82	9.84	7.02	
4/6/95	26.56	23.83	16.82		2.73	9.74	7.01	
5/3/95	26.53	23.85	16.83		2.68	9.7	7.02	
6/1/95	25.83	21.48	12.13		4.35	13.7	9.35	
AVG 93-95	26.25	22.06	14.49		4.18	12.17	8.14	
STD 93-95	1.58	2.24	2.43		1.38	3.06	2.33	
AVG 87-93	30.18	27.80	20.17		2.38	10.32	8.01	
STD 87-93	1.68	2.95	2.94		1.46	2.41	1.56	
SITE 23	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	25.57	23.90	23.80		1.67	1.77	0.10	
3/29/93	24.22	22.99	21.42		1.23	2.80	1.57	
7/1/93	22.44	20.87	19.54		1.57	2.90	1.33	
10/5/93	21.25	18.57	19.20		2.68	2.05	-0.63	
1/6/94	22.89	20.37	21.40		2.52	1.49	-1.03	
4/19/94	23.93	21.95	22.40		1.98	1.53	-0.45	
6/28/94	23.52	22.64	23.04		0.88	0.48	-0.4	
10/5/94	25.44	23.48	23.99		1.96	1.45	-0.51	
1/23/95	25.95	24.38	24.48		1.57	1.47	-0.1	
4/7/95	26.09	24.62	24.55		1.47	1.54	0.07	

AVG 93-95	24.13	22.38	22.38		1.75	1.75	0.00	
STD 93-95	1.55	1.84	1.85		0.52	0.67	0.80	
AVG 87-93	25.26	23.98	23.79		1.28	1.48	0.19	
STD 87-93	1.29	1.55	1.73		0.67	1.08	0.96	
SITE 24	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	33.02	31.56			1.46			
3/29/93	31.06	28.48			2.58			
4/20/93	30.0	27.3			2.7			
6/30/93	26.57	22.44	22.46		4.13	4.11	-0.02	
10/5/93	23.18	20.75	20.5		2.43	2.68	0.25	
10/23/93	23.8	21.2	21.0		2.6	2.8	0.2	
1/6/94	24.59	22.64	22.36		1.95	2.23	0.28	
4/19/94	25.94	24.15	23.9		1.79	2.04	0.25	
7/7/94	26.74	25.19	24.98		1.55	1.76	0.21	
10/5/94	28.96	27.77	27.57		1.19	1.39	0.2	
1/23/95	30.52	29.79			0.73			
4/6/95	31.59	30.55			1.04			
AVG 93-95	28.00	25.99	23.25		2.01	2.43	0.20	
STD 93-95	3.15	3.60	2.27		0.90	0.82	0.09	
AVG 87-93	31.03	29.39	24.78		1.64	2.58	0.15	
STD 87-93	3.00	3.57	3.11		0.82	0.70	0.09	
SITE 25	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	15.12	15.81	9.28		-0.69	5.84	6.53	
3/28/93	11.4	12.0	6.3		-0.6	5.1	5.7	
3/29/93	11.41	12.01	6.30		-0.60	5.11	5.71	
6/30/93	7.00	7.67	2.81		-0.67	4.19	4.86	
7/31/93	5.9	6.6	2.2		-0.7	3.7	4.4	
9/14/93	8.3	9.2	4.3		-0.9	4.0	4.9	
10/5/93	9.15	9.97	4.70		-0.82	4.45	5.27	
10/13/93	9.4	10.2	4.8		-0.8	4.6	5.4	
10/22/93	9.6	10.5	4.9		-0.9	4.7	5.6	
1/6/94	10.53	11.69	5.54		-1.16	4.99	6.15	
4/4/94	11.8	12.64	6.02		-0.84	5.78	6.62	
7/7/94	12.27	13.12	7.02		-0.85	5.25	6.1	
8/18/94	13.05	13.94	7.98		-0.89	5.07	5.96	
10/4/94	14.11	15.02	8.79		-0.91	5.32	6.23	
1/23/95	14.83	15.9	9.22		-1.07	5.61	6.68	
4/7/95	15.13	15.93	9.04		-0.8	6.09	6.89	
AVG 93-95	11.19	12.01	6.20		-0.83	4.99	5.81	
STD 93-95	2.76	2.80	2.16		0.15	0.66	0.70	
AVG 87-93	13.72	14.34	8.29		-0.62	5.42	6.05	
STD 87-93	3.21	3.20	2.53		0.22	0.72	0.74	
SITE 26	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	

1/6/93	20.66	16.35	12.15		4.31	8.51	4.20	
3/29/93	17.23	12.21	7.78		5.02	9.45	4.43	
4/20/93	16.2	11.1	6.8		5.1	9.4	4.3	
6/30/93	14.79	9.86	5.70		4.93	9.09	4.16	
10/5/93	15.21	10.83	7.50		4.38	7.71	3.33	
1/6/94	16.07	11.88	8.28		4.19	7.79	3.6	
4/15/94	16.72	12.61	8.76		4.11	7.96	3.85	
7/7/94	17.64	13.72	10.09		3.92	7.55	3.63	
10/4/94	19.44	15.63	12.24		3.81	7.2	3.39	
1/23/95	20.02	16.39	12.57		3.63	7.45	3.82	
4/6/95	20.1	16.38	12.29		3.72	7.81	4.09	
AVG 93-95	17.64	13.36	9.47		4.28	8.17	3.89	
STD 93-95	1.99	2.34	2.39		0.50	0.77	0.36	
AVG 87-93	20.17	15.61	11.39		4.56	8.78	4.22	
STD 87-93	2.55	2.69	2.78		0.46	0.81	0.43	
SITE 27	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	13.81	13.36	13.45		0.65	0.63	-0.02	
3/29/93	10.75	10.10	10.12		0.66	1.04	0.38	
6/30/93	8.73	8.07	7.69		0.66	1.04	0.38	
10/5/93	9.80	9.29	9.46		0.51	0.34	-0.17	
1/6/94	10.77	10.22	10.38		0.55	0.39	-0.16	
4/15/94	11.52	11.05	11.22		0.47	0.3	-0.17	
7/7/94	11.98	11.29	11.13		0.69	0.85	0.16	
10/4/94	13.38	12.83	12.71		0.55	0.67	0.12	
1/23/95	14.33	13.68	13.66		0.65	0.67	0.02	
4/6/95	14.66	14.08	14.02		0.58	0.64	0.06	
AVG 93-95	11.97	11.40	11.38		0.60	0.66	0.06	
STD 93-95	1.91	1.92	1.95		0.07	0.25	0.20	
AVG 87-93	13.14	12.41	12.51		0.73	0.65	-0.08	
STD 87-93	1.92	2.07	2.10		0.53	0.52	0.17	
SITE 28	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	25.77	25.60	25.52		0.17	0.25	0.08	
3/29/93	24.90	24.37	24.27		0.53	0.63	0.10	
6/30/93	22.47	21.46	21.37		1.01	1.10	0.09	
10/4/93	21.87	21.28	21.18		0.59	0.69	0.10	
1/6/94	22.03	21.83	21.72		0.2	0.31	0.11	
4/20/94	22.62	22.55	22.46		0.07	0.16	0.09	
7/1/94	22.22	23.21	23.1		-0.99	-0.88	0.11	
10/4/94	24.1	24.13	24.04		-0.03	0.06	0.09	
1/23/95	24.61	24.65	24.57		-0.04	0.04	0.08	
4/6/95	24.88	24.95	24.88		-0.07	0	0.07	
AVG 93-95	23.55	23.40	23.31		0.14	0.24	0.09	
STD 93-95	1.37	1.48	1.48		0.50	0.50	0.01	
AVG 87-93	24.58	24.35	24.37		0.22	0.21	-0.02	

STD 87-93	1.35	1.60	1.53		0.35	0.34	0.24	
SITE 29	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	50.99	38.56	39.25		12.43	11.74	-0.69	
4/2/93	50.50	38.20	38.72		12.30	11.78	-0.52	
4/25/93	50.3	38.0	38.6		12.3	11.7	-0.6	
6/30/93	49.60	36.27	36.80		13.33	12.80	-0.53	
10/4/93	49.29	35.09	35.66		14.20	13.63	-0.57	
10/22/93	49.3	35.1	35.6		14.2	13.7	-0.5	
1/6/94	49.20	35.14	35.73		14.06	13.47	-0.59	
4/7/94	49.44	35.49	35.99		13.95	13.45	-0.5	
7/1/94	49.77	35.88	36.42		13.89	13.35	-0.54	
10/4/94	50.58	36.45	36.96		14.13	13.62	-0.51	
1/23/95	50.6	37.15	37.59		13.45	13.01	-0.44	
4/6/95	50.66	37.44	38		13.22	12.66	-0.56	
AVG 93-95	50.02	36.56	37.11		13.46	12.91	-0.55	
STD 93-95	0.62	1.22	1.24		0.72	0.74	0.06	
AVG 87-93	50.19	37.15	37.69		13.04	12.49	-0.55	
STD 87-93	0.93	1.52	1.55		0.69	0.71	0.05	
SITE 30	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	20.83	19.14	19.11		1.69	1.72	0.03	
3/29/93	17.30	14.57	14.54		2.73	2.76	0.03	
6/29/93	14.86	11.95	11.93		2.91	2.93	0.02	
10/1/93	16.52	14.94	14.97		1.58	1.55	-0.03	
1/6/94	17.60	16.47	16.53		1.13	1.07	-0.06	
4/14/94	18.59	17.15	17.19		1.44	1.4	-0.04	
7/1/94	19.61	18.86	18.89		0.75	0.72	-0.03	
10/4/94	20.9	20.37	20.42		0.53	0.48	-0.05	
1/23/95	21.64	21.04	21.06		0.6	0.58	-0.02	
4/6/95	21.52	20.46	20.45		1.06	1.07	0.01	
AVG 93-95	18.94	17.50	17.51		1.44	1.43	-0.01	
STD 93-95	2.21	2.85	2.86		0.78	0.81	0.03	
AVG 87-93	21.66	20.43	20.49		1.24	1.17	-0.06	
STD 87-93	2.50	3.14	3.19		0.86	0.95	0.21	
SITE 31	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/6/93	14.71	15.02	15.62		-0.31	-0.91	-0.6	
3/29/93	13.43	13.78	13.65		-0.35	-0.22	0.13	
4/20/93	13.1	13.4			-0.3			
6/30/93	12.28	12.66	12.25		-0.38	0.03	0.41	
10/5/93	13.65	14.01	13.67		-0.36	-0.02	0.34	
10/23/93	13.7	14.1	14.0		-0.4	-0.3	0.1	
1/6/94	13.98	14.14	14.73		-0.16	-0.75	-0.59	
4/15/94	14.3	14.6	15.06		-0.3	-0.76	-0.46	
7/7/94	14.7	15.03	15.65		-0.33	-0.95	-0.62	
10/4/94	15.15	15.42	16.29		-0.27	-1.14	-0.87	

1/23/95	14.97	15.32	16.55		-0.35	-1.58	-1.23	
4/6/95	15.08	15.42	16.6		-0.34	-1.52	-1.18	
AVG 93-95	14.09	14.41	14.92		-0.32	-0.74	-0.42	
STD 93-95	0.85	0.84	1.33		0.06	0.53	0.55	
AVG 87-93	14.66	14.69	15.67		-0.03	-0.95	-0.94	
STD 87-93	1.05	0.89	1.33		0.29	0.44	0.59	
SITE 32	WELL 1	WELL 2	WELL 3	WELL 4	1-2	1-3	2-3	1-4
1/6/93	48.58	48.40	5.57	7.68	0.18	43.01	42.83	40.90
3/29/93	45.83	45.88	1.48	2.60	-0.05	44.35	44.40	43.23
6/30/93	44.77	44.95	0.69	3.21	-0.18	44.08	44.26	41.56
10/4/93	45.79	46.01	2.54	6.00	-0.22	43.25	43.47	39.79
1/6/94	46.84	47.08	4.10	8.00	-0.24	42.74	42.98	38.84
4/19/94	48.64	47.87	4.95	9.10	0.77	43.69	42.92	39.54
7/1/94	48.31	48.58	6	10.11	-0.27	42.31	42.58	38.2
10/4/94	49.43	49.72	8.07	11.66	-0.29	41.36	41.65	37.77
10/18/94	49.67	49.8	8.26	11.99	-0.13	41.41	41.54	37.68
11/17/94	49.82	49.99	8.81	12.58	-0.17	41.01	41.18	37.24
12/13/94	49.89	50.12	9.04	13.11	-0.23	40.85	41.08	36.78
1/12/95	49.97	50.2	9.26	13.54	-0.23	40.71	40.94	36.43
2/8/95	50.15	50.34	9.56	13.96	-0.19	40.59	40.78	36.19
3/10/95	50.25	50.39	9.69	14.32	-0.14	40.56	40.7	35.93
4/6/95	50.2	50.39	9.65	14.22	-0.19	40.55	40.74	35.98
5/5/95	50.24	50.47	9.6	14.44	-0.23	40.64	40.87	35.8
5/30/95	49.31	49.34	6.91	8.08	-0.03	42.4	42.43	41.23
AVG 93-95	48.69	48.80	6.72	10.27	-0.11	41.97	42.08	38.42
STD 93-95	1.73	1.76	2.94	3.73	0.25	1.30	1.21	2.21
AVG 87-93	48.34	48.57	5.81	8.81	-0.23	42.54	42.76	
STD 87-93	1.69	1.86	2.96	3.51	0.42	1.47	1.31	
SITE 33	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	35.94	35.17	35.58		0.77	0.36	-0.41	
4/1/93	35.01	34.08	34.70		0.93	0.31	-0.62	
6/29/93	33.25	32.19	32.95		1.06	0.30	-0.76	
10/4/93	32.10	31.12	31.20		0.98	0.90	-0.08	
1/6/94	32.35	31.60	31.77		0.75	0.58	-0.17	
4/7/94	32.88	32.09	32.23		0.79	0.65	-0.14	
6/29/94	33.88	33.31	32.89		0.57	0.99	0.42	
10/3/94	35.01	34.43	34.14		0.58	0.87	0.29	
1/9/95	35.44	34.82	34.91		0.62	0.53	-0.09	
4/6/95	35.77	35.14	35.39		0.63	0.38	-0.25	
AVG 93-95	34.16	33.40	33.58		0.77	0.59	-0.18	
STD 93-95	1.38	1.46	1.49		0.17	0.25	0.34	
AVG 87-93	33.96	33.14	33.37		0.83	0.59	-0.24	
STD 87-93	1.28	1.44	1.49		0.42	0.46	0.24	

SITE 34	WELL 1	WELL 2			1-2			
1/5/93	9.19	8.34			0.85			
4/2/93	7.82	6.94			0.88			
6/30/93	7.73	6.75			0.98			
10/4/93	8.89	7.83			1.06			
1/10/94	8.7	7.83			0.87			
4/20/94	9.09	8.26			0.83			
6/30/94	9.93	9.08			0.85			
10/4/94	10.61	9.74			0.87			
1/23/95	10.02	9.14			0.88			
4/6/95	9.58	8.85			0.73			
AVG 93-95	9.16	8.28			0.88			
STD 93-95	0.88	0.92			0.08			
AVG 87-93	9.75	8.95			0.79			
STD 87-93	0.88	0.94			0.12			
SITE 35	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	25.90	25.17	20.93		0.73	4.97	4.24	
4/2/93	24.88	23.95	19.39		0.93	5.49	4.56	
6/30/93	22.79	21.74	16.34		1.05	6.45	5.40	
10/4/93	22.95	21.95	17.38		1.00	5.57	4.57	
1/10/94	22.95	21.98	17.89		0.97	5.06	4.09	
4/20/94	23.45	22.59	18.41		0.86	5.04	4.18	
6/30/94	25.32	24.59	19.54		0.73	5.78	5.05	
10/3/94	26	25.21	20.98		0.79	5.02	4.23	
1/23/95	26	25.26	21.32		0.74	4.68	3.94	
4/5/95	26.2	25.45	21.46		0.75	4.74	3.99	
AVG 93-95	24.64	23.79	19.36		0.86	5.28	4.43	
STD 93-95	1.37	1.48	1.72		0.12	0.52	0.45	
AVG 87-93	24.99	24.06	19.63		0.93	5.36	4.43	
STD 87-93	1.98	2.05	2.16		0.09	0.47	0.46	
SITE 36	WELL 1	WELL 2	WELL 3	WELL 4	1-2	1-3	2-3	1-4
1/5/93	30.64	28.85	27.12	29.53	1.79	3.52	1.73	1.11
4/1/93	30.05	27.96	26.19	28.12	2.09	3.86	1.77	1.93
4/21/93	29.9	27.8	26.0	28.0	2.1	3.9	1.8	1.9
6/29/93	28.68	26.59	24.79	26.77	2.09	3.89	1.8	1.91
9/16/93	28.7	26.6	24.8	27.1	2.1	3.9	1.8	1.6
10/4/93	28.64	27.66	24.8	27.14	0.98	3.84	2.86	1.5
10/15/93	28.6	27.6	24.8	27.2	1.0	3.8	2.8	1.4
1/12/94	28.36	27.61	24.78	27.1	0.75	3.58	2.83	1.26
4/14/94	28.43	27.65	24.83	27.84	0.78	3.6	2.82	0.59
6/30/94	29.66	28.93	25.1	28.76	0.73	4.56	3.83	0.9
10/3/94	30.58	29.85	27.08	29.89	0.73	3.5	2.77	0.69
1/9/95	30.78	29.97	27.22	29.77	0.81	3.56	2.75	1.01
4/6/95	30.89	30.13	27.36	30.08	0.76	3.53	2.77	0.81
AVG 93-95	29.53	28.25	25.76	28.25	1.29	3.77	2.49	1.28

STD 93-95	0.95	1.15	1.06	1.17	0.60	0.28	0.62	0.45
AVG 87-93	29.04	27.06	25.19	27.73	1.98	3.85	1.87	
STD 87-93	1.08	1.07	1.13	1.05	0.30	0.10	0.28	
SITE 37	WELL 1	WELL 2	WELL 3	WELL 4	1-3		3-4	1-4
1/4/93	60.93		59.61	59.14	1.32		0.47	1.79
4/1/93	60.84		59.06	58.63	1.78		0.43	2.21
6/29/93	60.16		58.77	58.26	1.39		0.51	1.90
10/1/93	60.38		59.55	58.99	0.83		0.56	1.39
1/12/94	59.58		58.09	57.65	1.49		0.44	1.93
4/13/94	59.09		57.53	57.10	1.56		0.43	1.99
6/29/94	59.51		61.89	59.32	-2.38		2.57	0.19
10/3/94	60.3		61.13	60.67	-0.83		0.46	-0.37
1/17/95	60.77		60.19	59.77	0.58		0.42	1.00
4/5/95	60.87		59.82	59.44	1.05		0.38	1.43
AVG 93-95	60.24		59.56	58.90	0.68		0.67	1.35
STD 93-95	0.62		1.25	0.99	1.24		0.64	0.80
AVG 87-93	59.15		58.43	57.70	0.71	1.44	0.73	
STD 87-93	1.29		1.63	1.45	1.14	0.73	0.65	
SITE 38	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	33.48	32.96	28.20		0.52	5.28	4.76	
4/1/93	32.17	31.70	26.35		0.47	5.82	5.35	
6/30/93	29.98	29.42	23.82		0.56	6.16	5.60	
10/4/93	29.94	29.41	24.37		0.53	5.57	5.04	
1/12/94	30.32	29.80	24.82		0.52	5.5	4.98	
4/14/94	30.95	30.42	25.81		0.53	5.14	4.61	
6/30/94	34.78	34.19	29.03		0.59	5.75	5.16	
10/3/94	33.46	32.96	28.51		0.5	4.95	4.45	
1/9/95	33.65	33.13	28.46		0.52	5.19	4.67	
4/6/95	34.03	33.51	29.08		0.52	4.95	4.43	
AVG 93-95	32.28	31.75	26.85		0.53	5.43	4.91	
STD 93-95	1.74	1.74	1.94		0.03	0.38	0.37	
AVG 87-93	31.80	31.32	26.38		0.48	5.42	4.94	
STD 87-93	2.46	2.49	2.55		0.09	0.40	0.38	
SITE 39	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	6.10	4.15	2.92		1.95	3.18	1.23	
2/19/93	5.51	3.19	2.04		2.32	3.47	1.15	
3/22/93	5.14	3.00	2.00		2.14	3.14	1.00	
4/16/93	4.98	2.93	1.92		2.05	3.06	1.01	
5/20/93	4.70	2.05	1.15		2.65	3.55	0.90	
6/19/93	4.77	3.02	2.22		1.75	2.55	0.80	
7/15/93	4.95	2.50	1.13		2.45	3.82	1.37	
8/10/93	4.98	3.02	2.30		1.96	2.68	0.72	
9/9/93	5.50	3.99	3.15		1.51	2.35	0.84	

10/6/93	5.97	4.35	3.40		1.62	2.57	0.95	
10/22/93	6.12	4.33	3.18		1.79	2.94	1.15	
11/3/93	6.03	4.25	3.03		1.78	3	1.22	
12/1/93	5.96	4.14	2.92		1.82	3.04	1.22	
1/4/94	5.80	4.22	2.97		1.58	2.83	1.25	
2/3/94	5.92	4.24	2.98		1.68	2.94	1.26	
3/1/94	5.86	4.25	2.97		1.61	2.89	1.28	
3/29/94	5.98	4.48	3.22		1.5	2.76	1.26	
4/20/94	6.00	4.42	3.13		1.58	2.87	1.29	
5/4/94	5.95	4.3	3.04		1.65	2.91	1.26	
5/26/94	6.21	5.07	3.95		1.14	2.26	1.12	
6/30/94	6.82	6.06	4.92		0.76	1.9	1.14	
7/26/94	7.28	6.34	5.27		0.94	2.01	1.07	
8/26/94	7.78	6.95	5.86		0.83	1.92	1.09	
9/20/94	7.93	6.99	5.85		0.94	2.08	1.14	
10/6/94	7.95	6.97	5.94		0.98	2.01	1.03	
1/23/95	7.5	6.24	4.91		1.26	2.59	1.33	
4/6/95	6.97	5.5	4.04		1.47	2.93	1.46	
AVG 93-95	6.10	4.48	3.35		1.62	2.75	1.13	
STD 93-95	0.94	1.36	1.33		0.48	0.49	0.18	
AVG 87-93	6.35	4.71	3.47		1.64	2.80	1.11	
STD 87-93	0.97	1.37	1.26		0.48	0.53	0.42	
SITE 40	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	58.46	58.44	58.57		0.02	-0.11	-0.13	
4/2/93	57.00	56.77	56.85		0.23	0.15	-0.08	
6/30/93	54.60	54.45	54.47		0.15	0.13	-0.02	
10/4/93	57.35	57.20	57.27		0.15	0.08	-0.07	
1/10/94	53.52	53.43	53.39		0.09	0.13	0.04	
4/20/94	53.55	53.41	53.31		0.14	0.24	0.1	
6/30/94	60.23	63.5	62.52		-3.27	-2.29	0.98	
10/4/94	60.07	59.95	60.45		0.12	-0.38	-0.5	
1/23/95	57.74	57.62	57.78		0.12	-0.04	-0.16	
4/6/95	56.89	56.8	56.79		0.09	0.1	0.01	
AVG 93-95	56.94	57.16	57.14		-0.22	-0.20	0.02	
STD 93-95	2.29	2.92	2.80		1.02	0.72	0.36	
AVG 87-93	57.22	57.10	56.86		0.12	0.36	0.24	
STD 87-93	3.49	3.48	3.18		0.40	0.71	0.74	
SITE 41	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	4.27	4.23	4.03		0.04	0.24	0.20	
4/2/93	3.09	2.55	2.50		0.54	0.59	0.05	
6/30/93	0.40	0.29	0.63		0.11	-0.23	-0.34	
10/4/93	1.39	1.40	1.40		-0.01	-0.01	0.00	
1/10/94	1.09	1.42	1.70		-0.33	-0.61	-0.28	
4/20/94	1.93	1.98	2.18		-0.05	-0.25	-0.2	
6/30/94	2.63	2.54	2.93		0.09	-0.3	-0.39	

10/4/94	3.6	3.88	4.12		-0.28	-0.52	-0.24	
1/23/95	3.87	3.83	3.7		0.04	0.17	0.13	
4/6/95	3.96	3.87	3.81		0.09	0.15	0.06	
AVG 93-95	2.62	2.60	2.70		0.02	-0.08	-0.10	
STD 93-95	1.29	1.26	1.16		0.23	0.35	0.20	
AVG 87-93	2.17	2.29	2.42		-0.11	-0.25	-0.13	
STD 87-93	1.74	1.72	1.60		0.21	0.36	0.28	
SITE 42	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	21.59	20.68	13.46		0.91	8.13	7.22	
4/1/93	21.28	20.36	13.03		0.92	8.25	7.33	
6/29/93	20.05	19.18	12.85		0.87	7.20	6.33	
10/1/93	19.34	18.47	13.13		0.87	6.21	5.34	
1/12/94	18.77	17.88	13.12		0.89	5.65	4.76	
4/14/94	18.48	17.61	13.01		0.87	5.47	4.6	
6/30/94	18.94	18.07	13.89		0.87	5.05	4.18	
10/3/94	19.01	18.12	13.61		0.89	5.4	4.51	
1/17/95	18.62	17.72	13.27		0.9	5.35	4.45	
4/5/95	18.33	17.48	13.35		0.85	4.98	4.13	
AVG 93-95	19.44	18.56	13.27		0.88	6.17	5.29	
STD 93-95	1.10	1.09	0.30		0.02	1.18	1.17	
AVG 87-93	19.43	18.54	13.37		0.89	6.06	5.17	
STD 87-93	0.83	0.69	0.56		0.41	1.07	0.88	
SITE 43	WELL 1	WELL 2						
1/4/93	5.48	5.08			0.40			
4/1/93	5.40	4.87			0.53			
6/29/93	5.32	5.20			0.12			
10/1/93	5.27	5.49			-0.22			
1/12/94	5.23	5.18			0.05			
4/19/94	5.19	5.14			0.05			
6/29/94	5.24	5.74			-0.5			
10/3/94	5.27	5.69			-0.42			
1/17/95	5.35	5.39			-0.04			
4/5/95	5.37	5.3			0.07			
AVG 93-95	5.31	5.31			0.00			
STD 93-95	0.08	0.26			0.31			
AVG 87-93	9.86	5.11			4.75			
STD 87-93	6.11	0.38			6.34			
SITE 44	WELL 1	WELL 2	WELL 3	WELL 4	1-2	1-3	2-3	1-4
1/4/93	68.73	68.72	76.63	DRY	0.01	-7.90	-7.91	
4/1/93	68.57	68.55	76.48	DRY	0.02	-7.91	-7.93	
6/29/93	68.13	68.03	75.85	DRY	0.10	-7.72	-7.82	
10/1/93	67.52	67.42	75.28	75.15	0.10	-7.76	-7.86	-7.63
1/10/94	67.26	67.19	75.11	75.07	0.07	-7.85	-7.92	-7.81

4/21/94	67.30	67.25	75.36	75.43	0.05	-8.06	-8.11	-8.13
6/29/94	67.53	67.56	75.71	77.36	-0.03	-8.18	-8.15	-9.83
10/3/94	68.08	68.08	76.15		0	-8.07	-8.07	
1/17/95	68.21	68.19	75.73		0.02	-7.52	-7.54	
4/5/95	68.3	68.25	76.35		0.05	-8.05	-8.1	
AVG 93-95	67.96	67.92	75.87	75.75	0.04	-7.90	-7.94	
STD 93-95	0.50	0.51	0.50	0.94	0.04	0.19	0.17	
AVG 87-93	67.50	67.47	75.73	75.53	0.03	-8.24	-8.26	
STD 87-93	0.91	0.91	0.70	1.28	0.05	0.28	0.26	
SITE 45	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	49.42	49.42	48.58		0.00	0.84	0.84	
4/2/93	48.65	48.69	47.77		-0.04	0.88	0.92	
6/29/93	47.23	47.30	46.44		-0.07	0.79	0.86	
10/1/93	46.66	46.71	45.78		-0.05	0.88	0.93	
1/10/94	46.49	46.54	45.62		-0.05	0.87	0.92	
4/20/94	46.70	46.73	45.69		-0.03	1.01	1.04	
6/29/94	46.97	47.03	45.94		-0.06	1.03	1.09	
10/3/94	47.69	47.69	46.62		0	1.07	1.07	
1/11/95	48.01	48.14	47.31		-0.13	0.7	0.83	
4/5/95	48.48	48.55	47.43		-0.07	1.05	1.12	
AVG 93-95	47.63	47.68	46.72		-0.05	0.91	0.96	
STD 93-95	0.94	0.93	0.96		0.04	0.12	0.10	
AVG 87-93	46.68	46.66	45.75		0.02	0.93	0.91	
STD 87-93	1.99	2.02	2.06		0.04	0.16	0.14	
SITE 46	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	52.03	47.89	47.83		4.14	4.20	0.06	
4/1/93	51.65	47.37	47.28		4.28	4.37	0.09	
6/29/93	50.74	45.17	45.13		5.57	5.61	0.04	
10/1/93	50.66	45.28	45.18		5.38	5.48	0.10	
1/10/94	50.07	44.55	44.48		5.52	5.59	0.07	
4/21/94	49.79	44.62	44.57		5.17	5.22	0.05	
6/29/94	50.18	45.94	45.73		4.24	4.45	0.21	
10/3/94	51.29	47.74	47.56		3.55	3.73	0.18	
10/18/94	51.29	47.63	47.55		3.66	3.74	0.08	
11/16/94	51.4	47.44	47.3		3.96	4.1	0.14	
12/16/94	51.35	47.43	47.38		3.92	3.97	0.05	
1/11/95	51.14	47.24	47.14		3.9	4	0.1	
2/8/95	51.49	47.38	47.23		4.11	4.26	0.15	
3/10/95	51.34	47.28	47.21		4.06	4.13	0.07	
4/5/95	51.28	47.22	47.16		4.06	4.12	0.06	
5/2/95	51.32	47.33	47.17		3.99	4.15	0.16	
5/30/95	51.15	47.03	47.03		4.12	4.12	0	
AVG 93-95	51.07	46.74	46.64		4.33	4.43	0.09	
STD 93-95	0.57	1.10	1.09		0.63	0.61	0.05	

AVG 87-93	49.51	44.80	44.72		4.71	4.79	0.08	
STD 87-93	1.96	2.65	2.63		0.79	0.77	0.04	
SITE 47	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/4/93	77.11	71.94	71.51		5.17	5.60	0.43	
4/1/93	77.05	71.86	71.44		5.19	5.61	0.42	
6/29/93	77.21	71.36	70.93		5.85	6.28	0.43	
10/1/93	77.56	71.59	71.15		5.97	6.41	0.44	
1/10/94	77.67	71.17	70.74		6.5	6.93	0.43	
4/4/94	77.68	70.56	70.04		7.12	7.64	0.52	
6/29/94	77.48	70.97	70.46		6.51	7.02	0.51	
10/3/94	77.58	71.5	71.13		6.08	6.45	0.37	
1/17/95	77.48	71.41	71.1		6.07	6.38	0.31	
4/5/95	77.42	71.2	70.75		6.22	6.67	0.45	
AVG 93-95	77.42	71.36	70.93		6.07	6.50	0.43	
STD 93-95	0.21	0.39	0.42		0.56	0.59	0.06	
AVG 87-93	76.25	70.74	70.30		5.51	5.95	0.44	
STD 87-93	0.66	0.80	0.82		0.26	0.27	0.04	
SITE 48	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/5/93	62.86	56.40	56.54		6.46	6.32	-0.14	
4/1/93	62.85	56.36	56.59		6.49	6.26	-0.23	
6/29/93	62.87	55.74	55.83		7.13	7.04	-0.09	
10/1/93	62.90	55.43	55.55		7.47	7.35	-0.12	
1/10/94	62.57	54.96	54.96		7.61	7.61	0	
4/21/94	62.52	55.06	55.18		7.46	7.34	-0.12	
6/29/94	62.73	55.81	55.78		6.92	6.95	0.03	
10/3/94	63.06	56.16	56.29		6.9	6.77	-0.13	
1/11/95	62.98	56.03	56.25		6.95	6.73	-0.22	
4/5/95	63.11	56.2	56.59		6.91	6.52	-0.39	
AVG 93-95	62.85	55.82	55.96		7.03	6.89	-0.14	
STD 93-95	0.18	0.49	0.56		0.37	0.43	0.11	
AVG 87-93	61.03	53.72	53.79		7.32	7.24	-0.07	
STD 87-93	1.25	1.78	1.80		0.78	0.80	0.25	
SITE 49	WELL 1	WELL 2	WELL 3	WELL 4			3-4	
4/1/93	CAPPED	CAPPED	0.33	-0.75			1.08	
6/30/93	CAPPED	CAPPED	0.74	-0.75			1.49	
7/7/93	CAPPED	CAPPED	-0.27	-1.30			1.00	
10/1/93	CAPPED	CAPPED	1.60	0.56			1.04	
1/12/94	CAPPED	CAPPED	0.92	-0.08			1.00	
4/4/94	CAPPED	CAPPED	1.02	-0.02			1.04	
6/22/94	CAPPED	CAPPED	1.92	0.87			1.05	
6/30/94	CAPPED	CAPPED	2.06	1.04			1.02	
10/7/94	CAPPED	CAPPED	2.11	1.09			1.02	
1/17/95	CAPPED	CAPPED	1.41	0.42			0.99	
4/6/95	CAPPED	CAPPED	1.34	0.29			1.05	

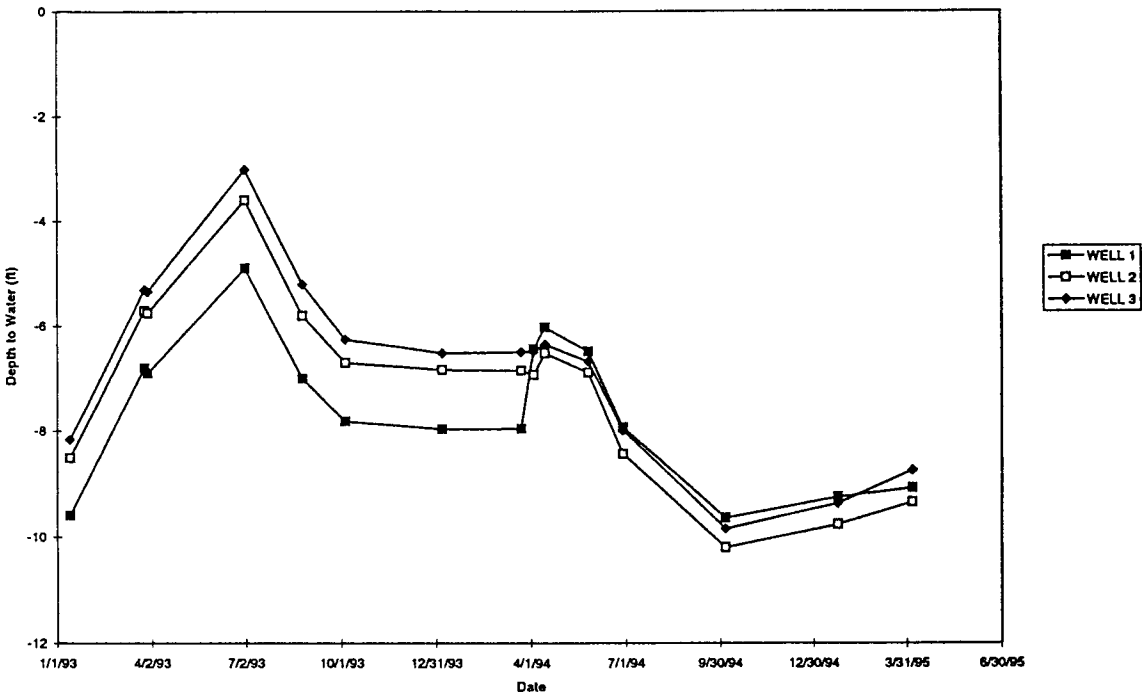
AVG 93-95			1.20	0.12			1.07	
STD 93-95			0.71	0.75			0.13	
AVG 87-93			1.06	-0.01			1.07	
STD 87-93			0.57	0.61			0.12	
SITE 50	WELL 1	WELL 2	WELL 3		1-2	1-3	2-3	
1/14/93	26.95	28.12	27.17		-1.17	-0.22	0.95	
3/29/93	25.94	26.09	26.15		-0.15	-0.21	-0.06	
7/1/93	24.82	25.04	25.09		-0.22	-0.27	-0.05	
9/22/93	22.60	22.84	22.96		-0.24	-0.36	-0.12	
10/20/93	22.32	22.48	22.57		-0.16	-0.25	-0.09	
1/5/94	21.91	22.08	22.09		-0.17	-0.18	-0.01	
3/31/94	22.20	22.29	22.34		-0.09	-0.14	-0.05	
5/26/94	22.96	23.23	23.07		-0.27	-0.11	0.16	
7/1/94	25.58	26.17	25.71		-0.59	-0.13	0.46	
7/20/94	24.80	25.04	25.10		-0.24	-0.3	-0.06	
10/6/94	24.84	25.01	25.11		-0.17	-0.27	-0.1	
1/18/95	24.65	24.75	24.78		-0.1	-0.13	-0.03	
4/6/95	24.63	24.83	24.83		-0.2	-0.2	0	
AVG 93-95	24.17	24.46	24.38		-0.29	-0.21	0.08	
STD 93-95	1.54	1.72	1.54		0.28	0.07	0.29	
AVG 87-93	26.28	26.55	26.50		-0.27	-0.22	0.05	
STD 87-93	1.61	1.67	1.56		0.22	0.14	0.24	
SITE 51	WELL 1	WELL 2			1-2			
1/14/93	19.57	19.00			0.57			
3/29/93	17.83	17.30			0.53			
7/1/93	15.94	15.59			0.35			
10/5/93	14.05	13.78			0.27			
1/5/94	13.74	13.28			0.46			
4/19/94	14.17	13.68			0.49			
7/1/94	15.95	15.32			0.63			
10/5/94	17	16.55			0.45			
1/18/95	16.92	16.42			0.5			
4/6/95	17.04	16.53			0.51			
AVG 93-95	16.22	15.75			0.48			
STD 93-95	1.75	1.71			0.10			
AVG 87-93	19.22	18.51			0.52			
STD 87-93	1.94	2.08			0.11			
SITE 52	WELL 1	WELL 2			1-2			
1/14/93	31.40	31.53			-0.13			
3/29/93	30.40	30.79			-0.39			
7/1/93	27.87	28.64			-0.77			
10/5/93	23.98	24.00			-0.02			
1/5/94	23.40	23.30			0.1			

4/19/94	23.83	23.67			0.16			
7/6/94	26.57	25.17			1.4			
10/5/94	27.42	26.89			0.53			
1/18/95	27.28	27.09			0.19			
4/6/95	27.34	27.17			0.17			
AVG 93-95	26.95	26.83			0.12			
STD 93-95	2.54	2.73			0.54			
AVG 87-93	29.02	28.80			0.22			
STD 87-93	2.55	2.49			0.43			

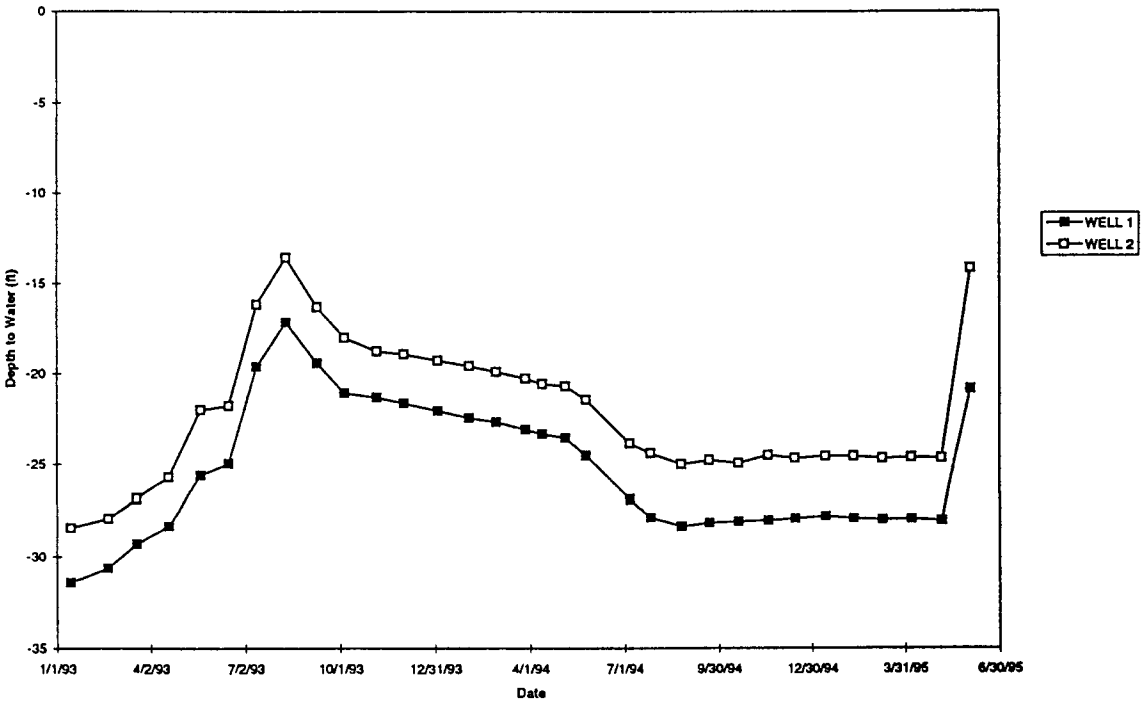
Appendix B: Monitoring Well Hydrographs, 1993-95

This appendix presents plots of measured water elevations during 1993-95 for the monitoring well sites, based on data contained in Appendix A. The lines connecting the data points are for visual assistance in identifying trends, and do not necessarily depict the actual behavior of the water elevations over those periods. See the introduction to Appendix A and the text for further discussion of the significance of the data.

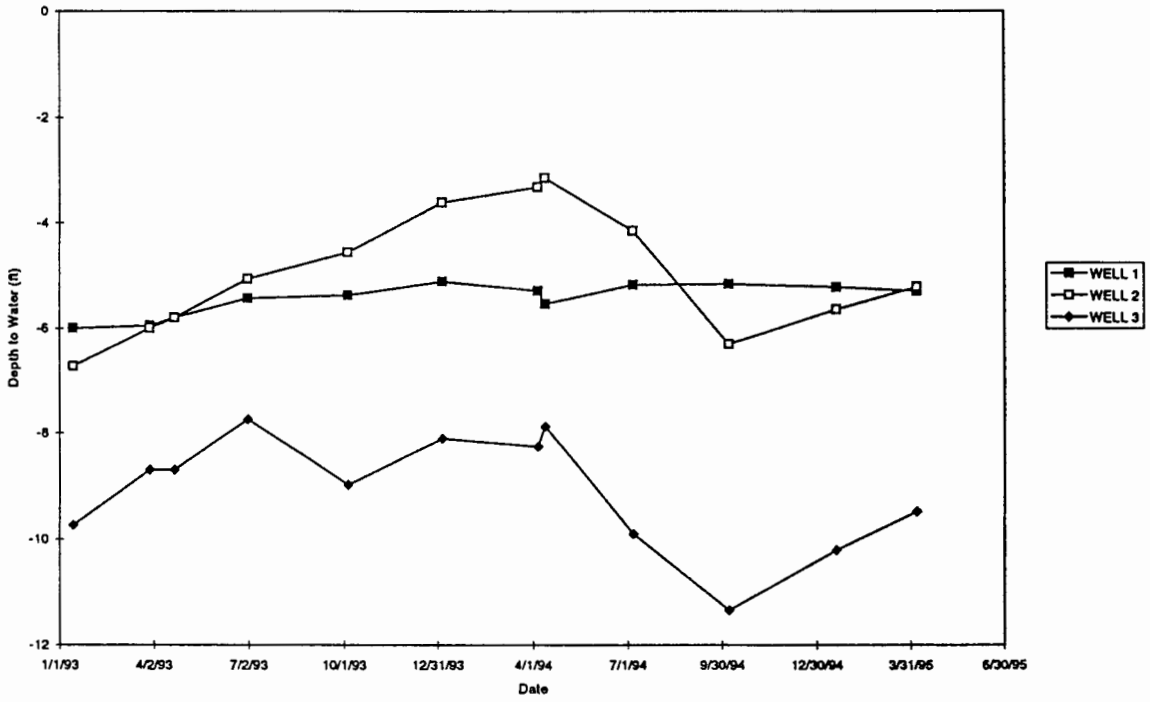
Site 1


0
-2
-4
-6
-8
-10
-12
Depth to Water (ft)
1/1/93
4/2/93
7/2/93
10/1/93
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2
WELL 3

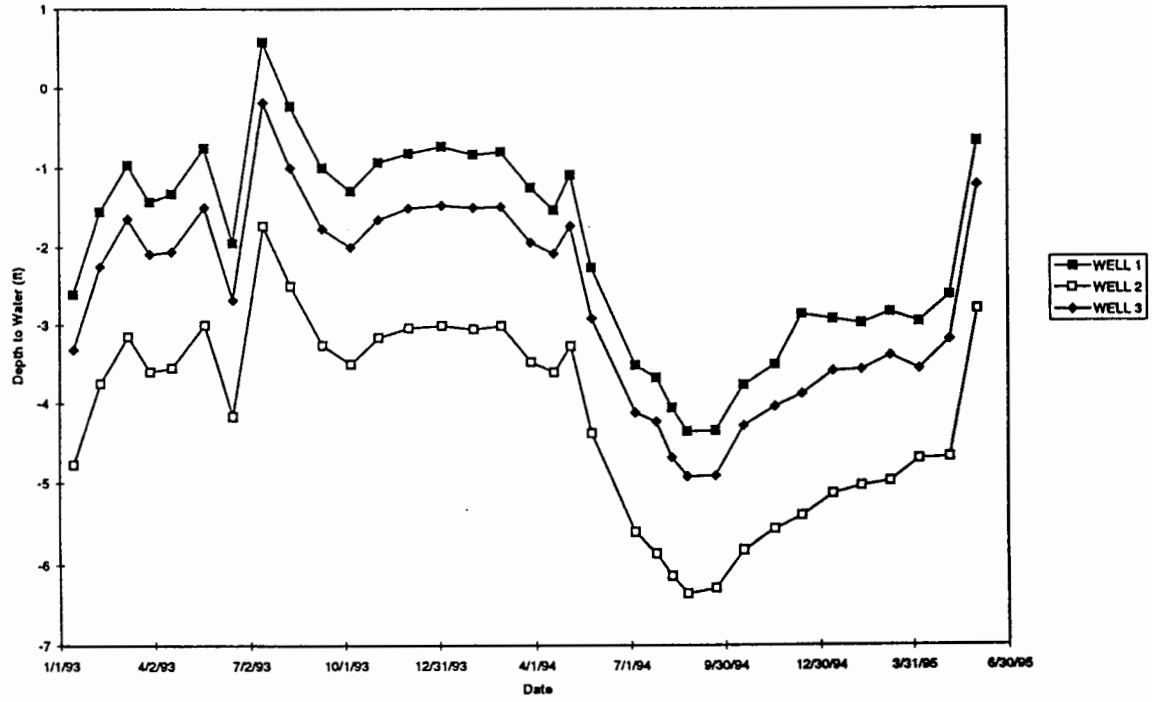
Site 3


0
-5
-10
-15
-20
-25
-30
-35
Depth to Water (ft)
1/1/93
4/2/93
7/2/93
10/1/93
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2

Site 4


0
-2
-4
-6
-8
-10
-12
Depth to Water (ft)
1/1/93
4/2/93
7/2/93
10/1/93
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2
WELL 3

Site 5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0
-1
-2
-3
-4
-5
-6
-7
Depth to Water (ft)
1/1/93
4/2/93
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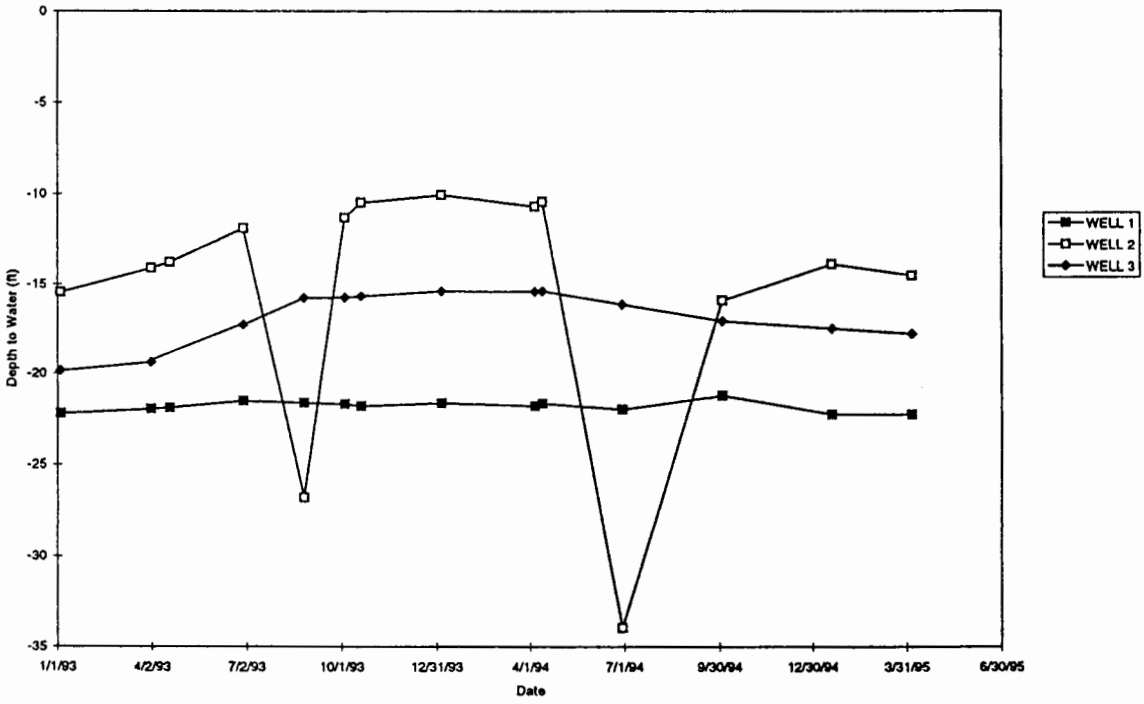
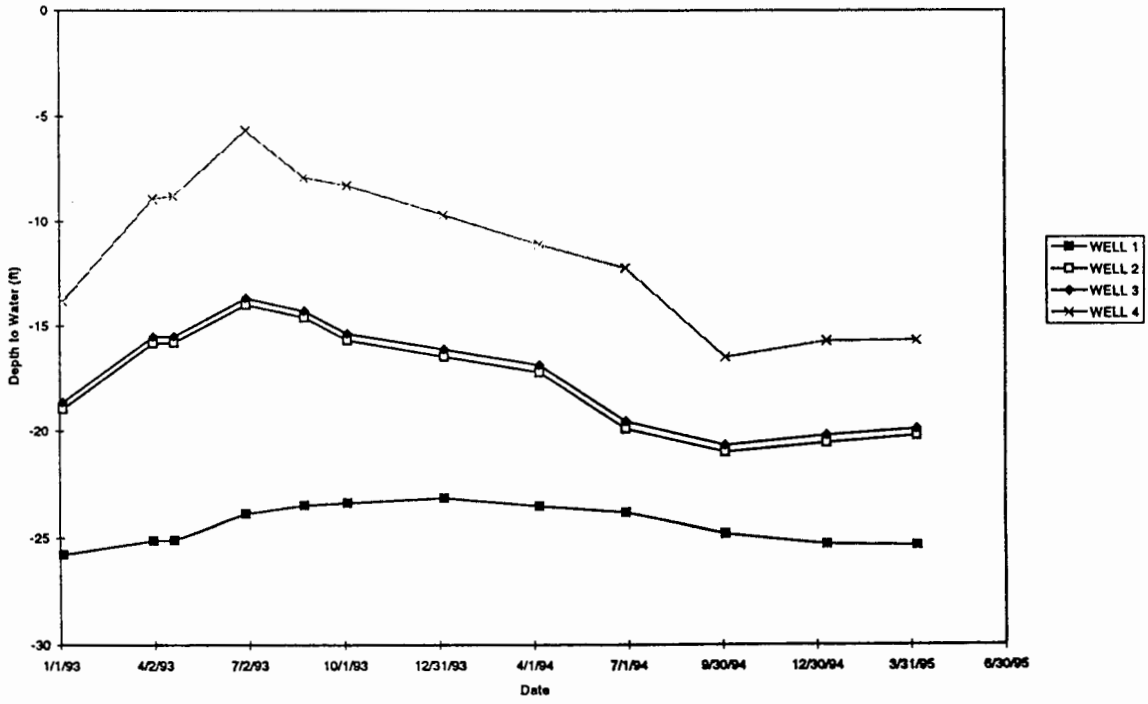
10/1/93
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2
WELL 3

Site 6


0
-5
-10
-15
-20
-25
-30
-35
Depth to Water (ft)
1/1/93
4/2/93
7/2/93
10/1/93
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2
WELL 3

Site 8


0
-5
-10
-15
-20
-25
-30
Depth to Water (ft)
1/1/93
4/2/93
7/2/93
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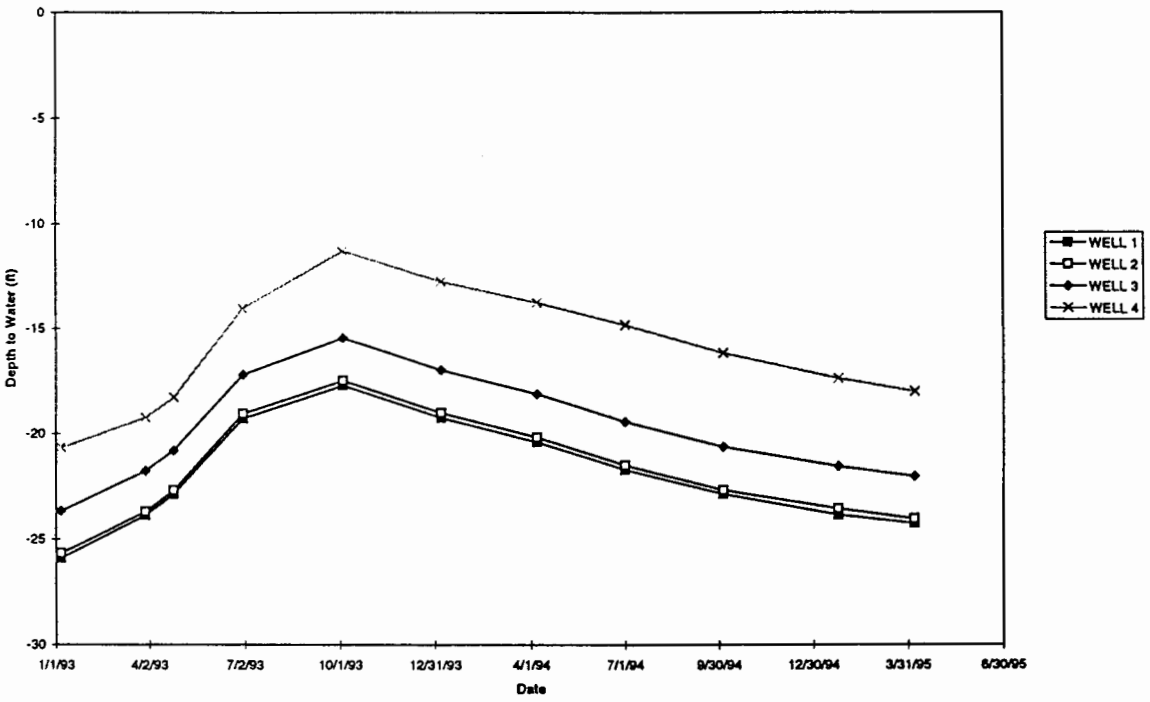
12/31/93
4/1/94
7/1/94
9/30/94
12/30/94
3/31/95
6/30/95
Date
WELL 1
WELL 2
WELL 3
WELL 4

Site 10



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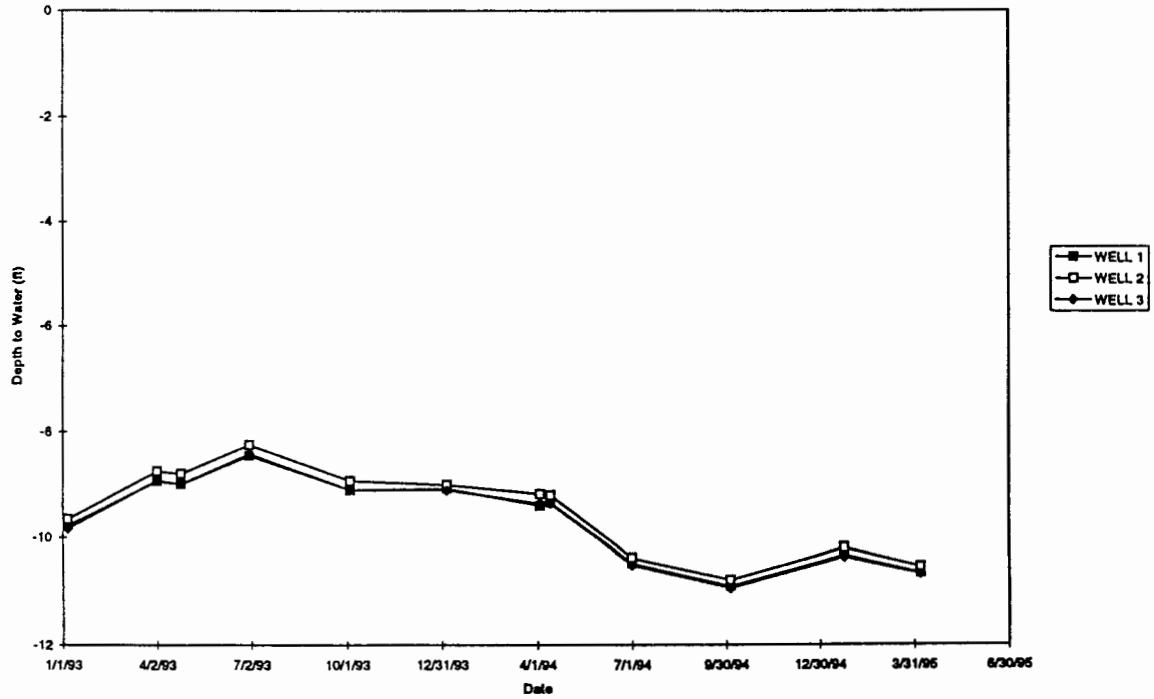

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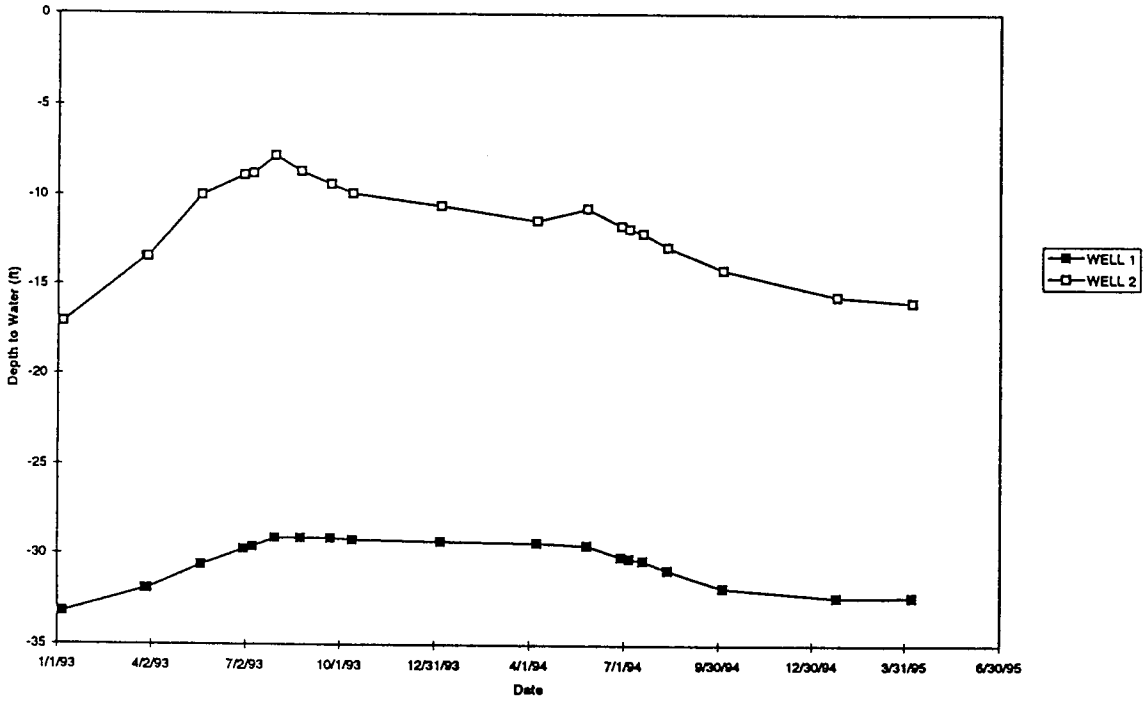

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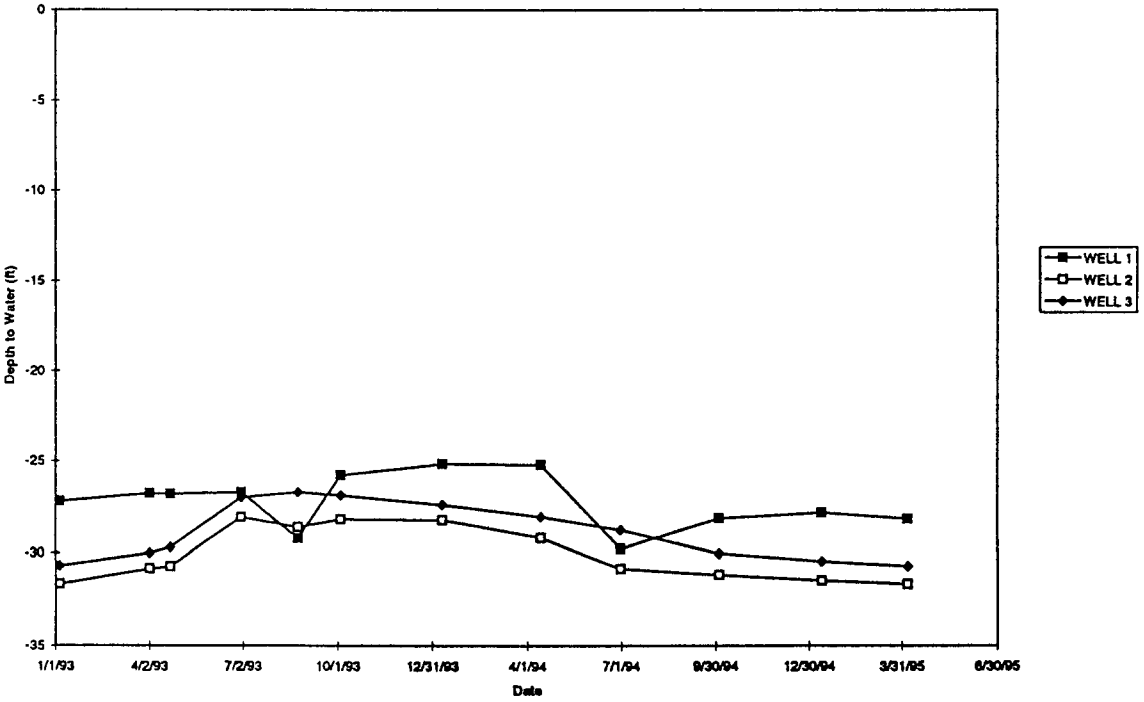

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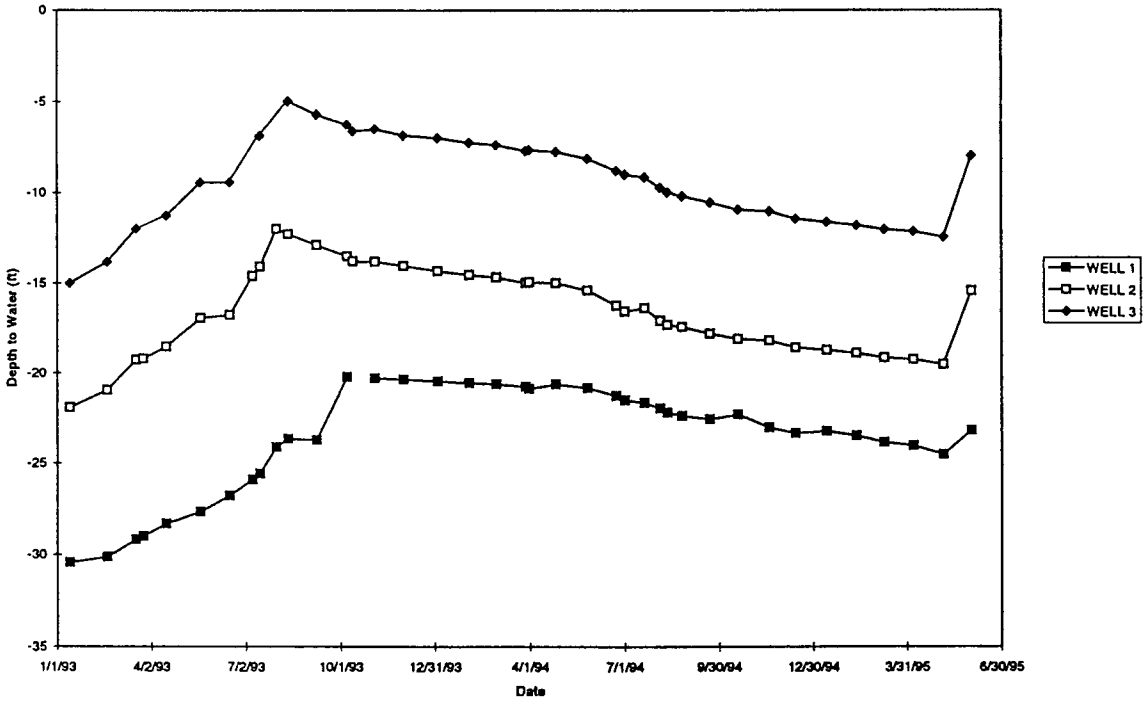
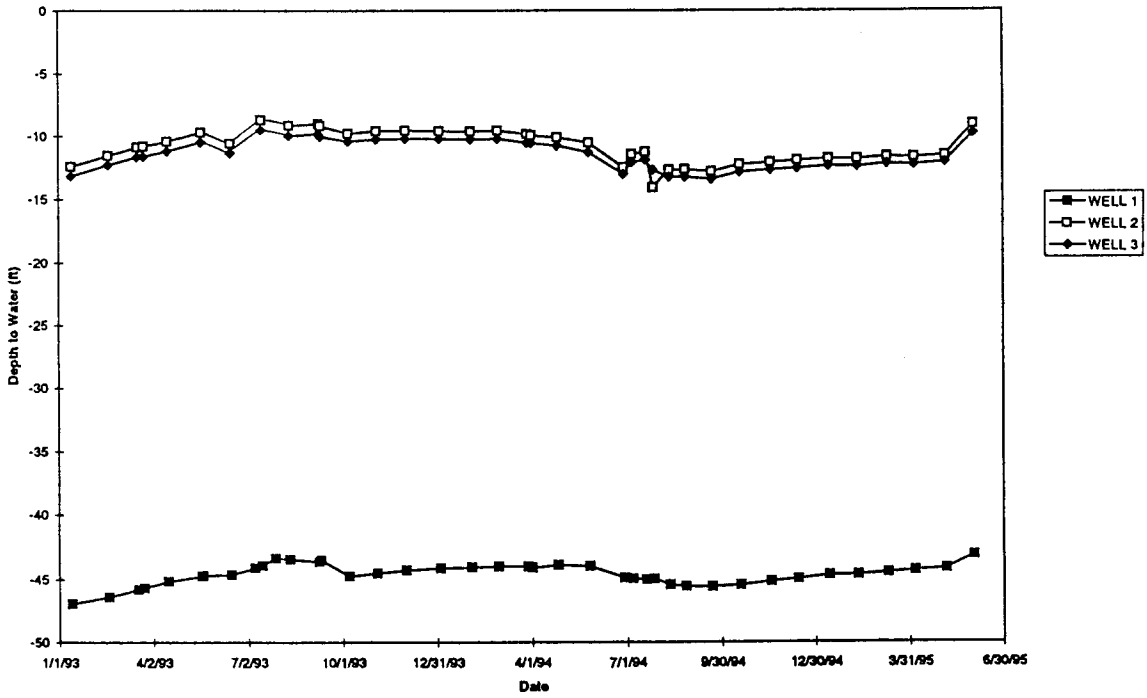
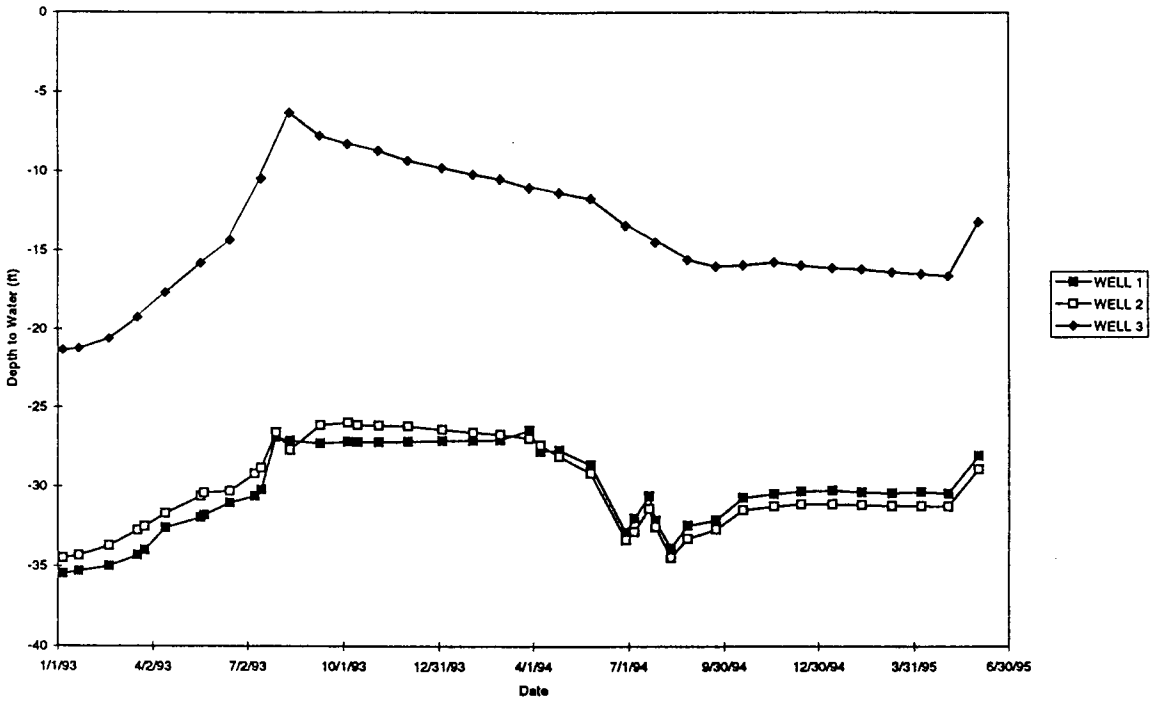


Site 17



Site 18



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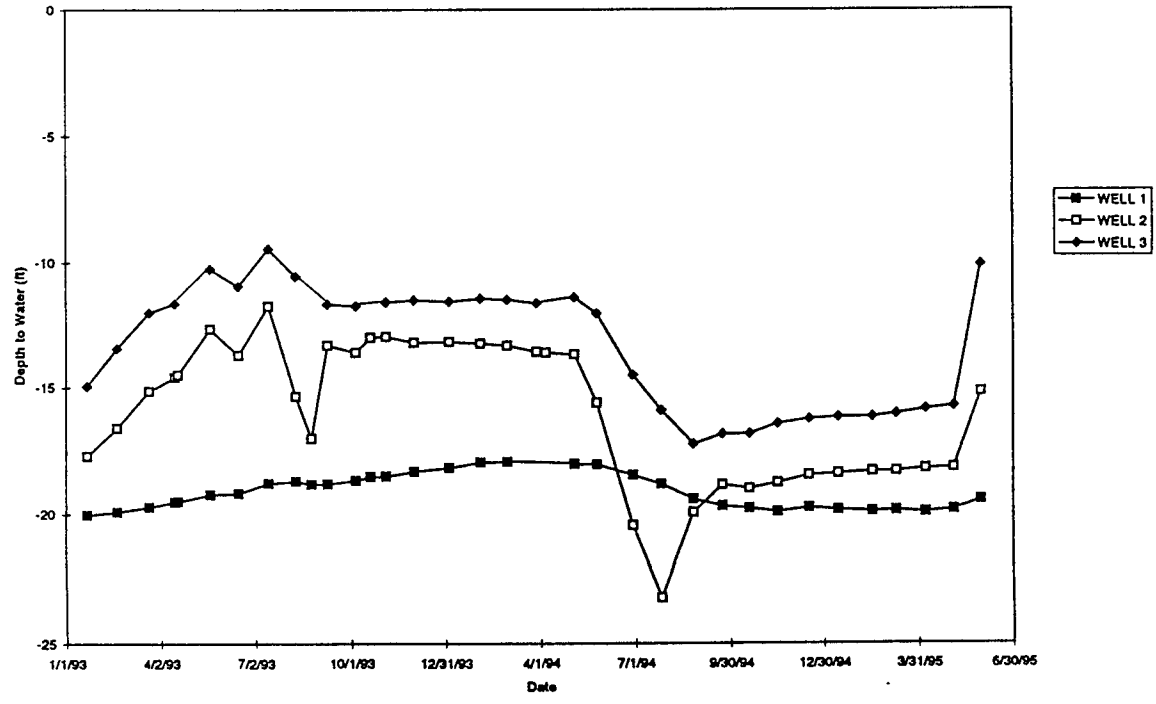

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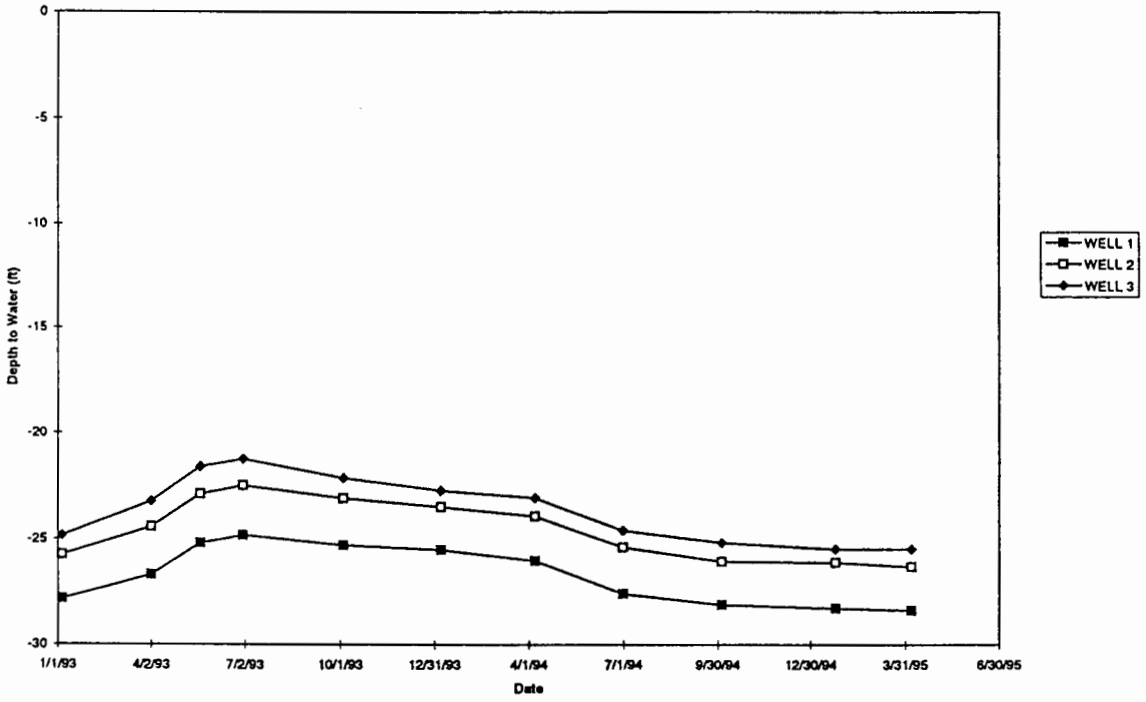

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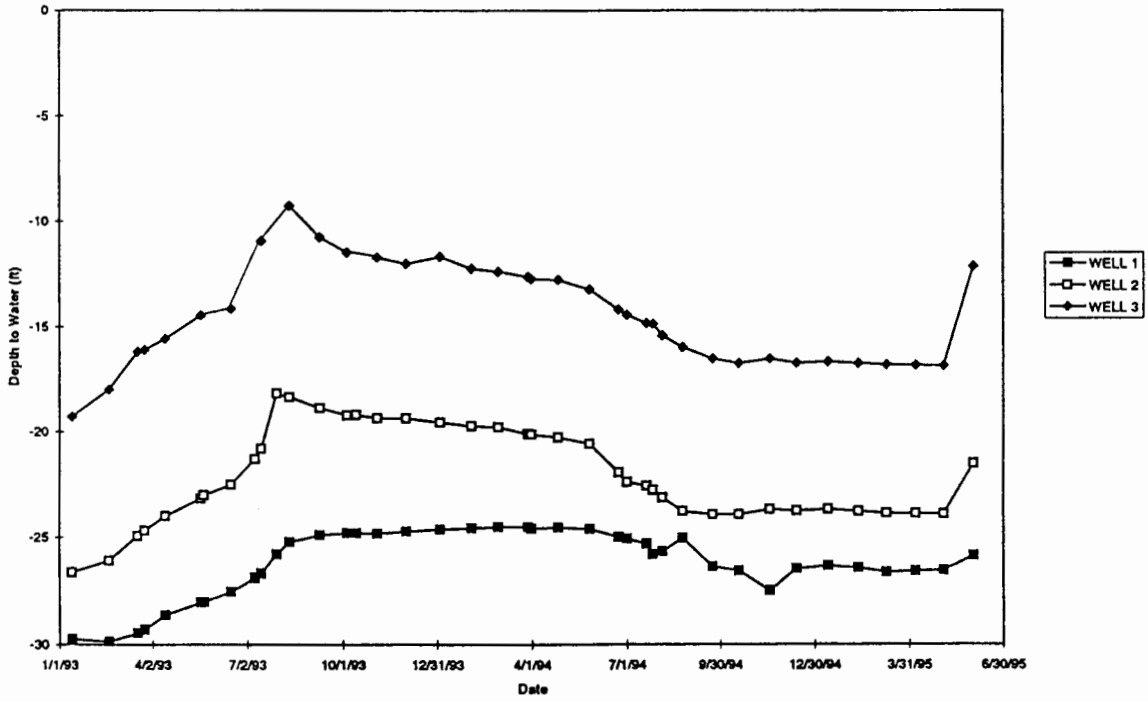
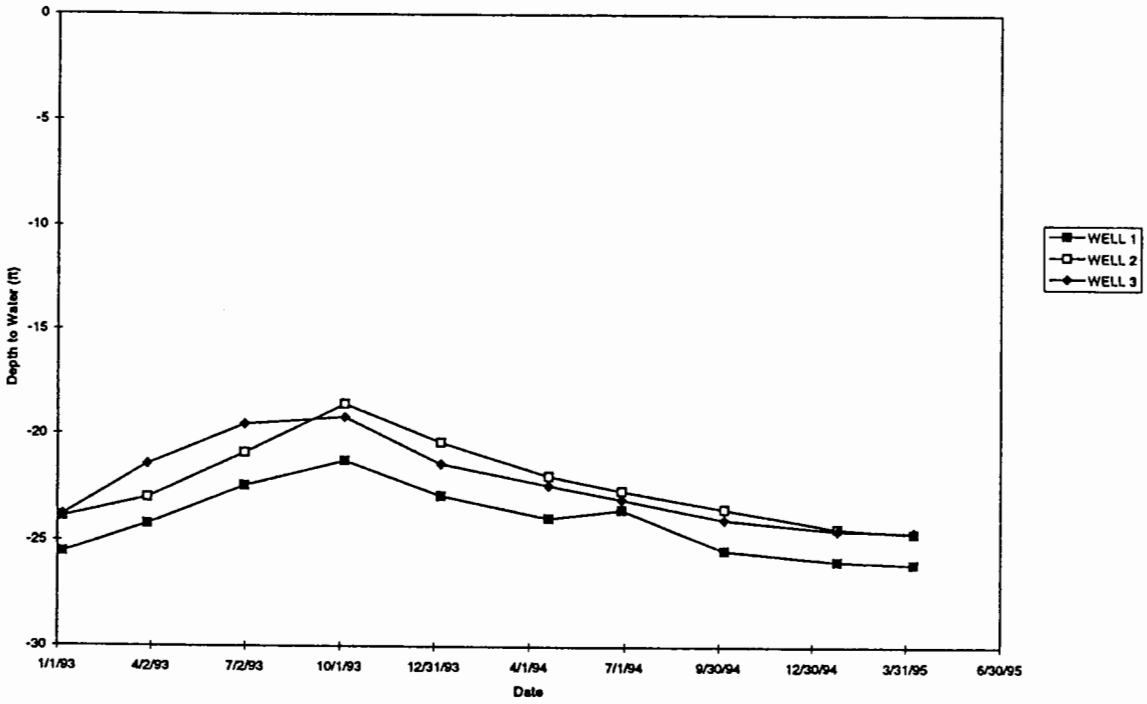


Site 23



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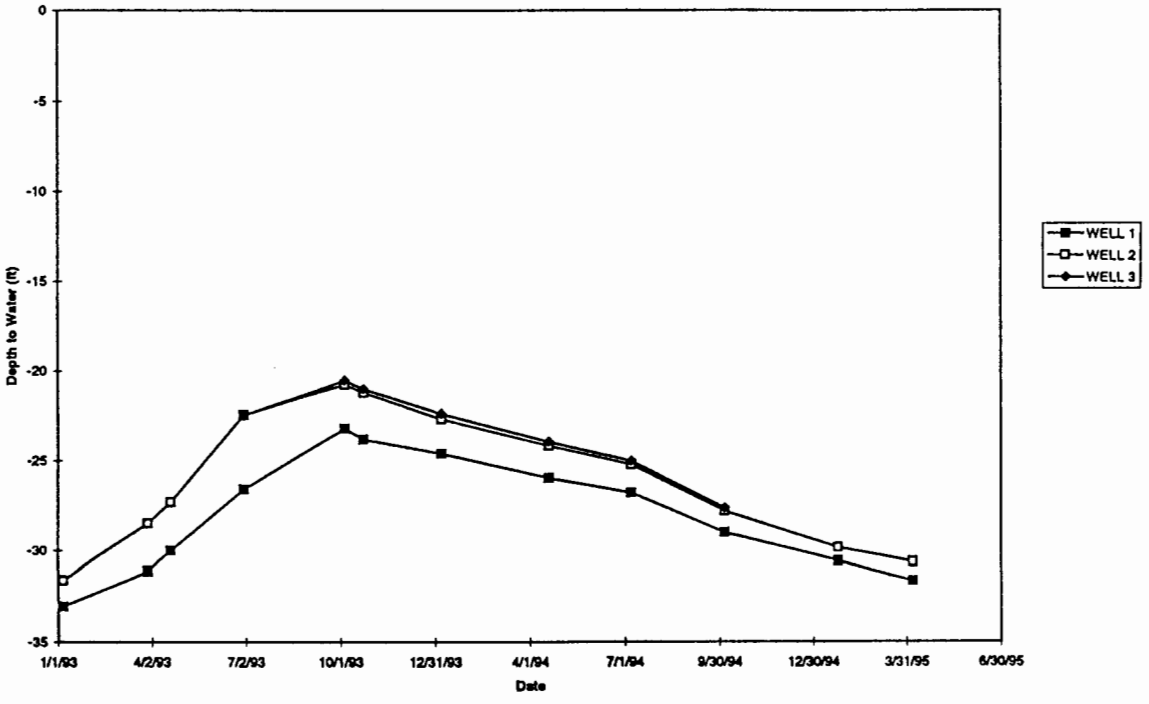

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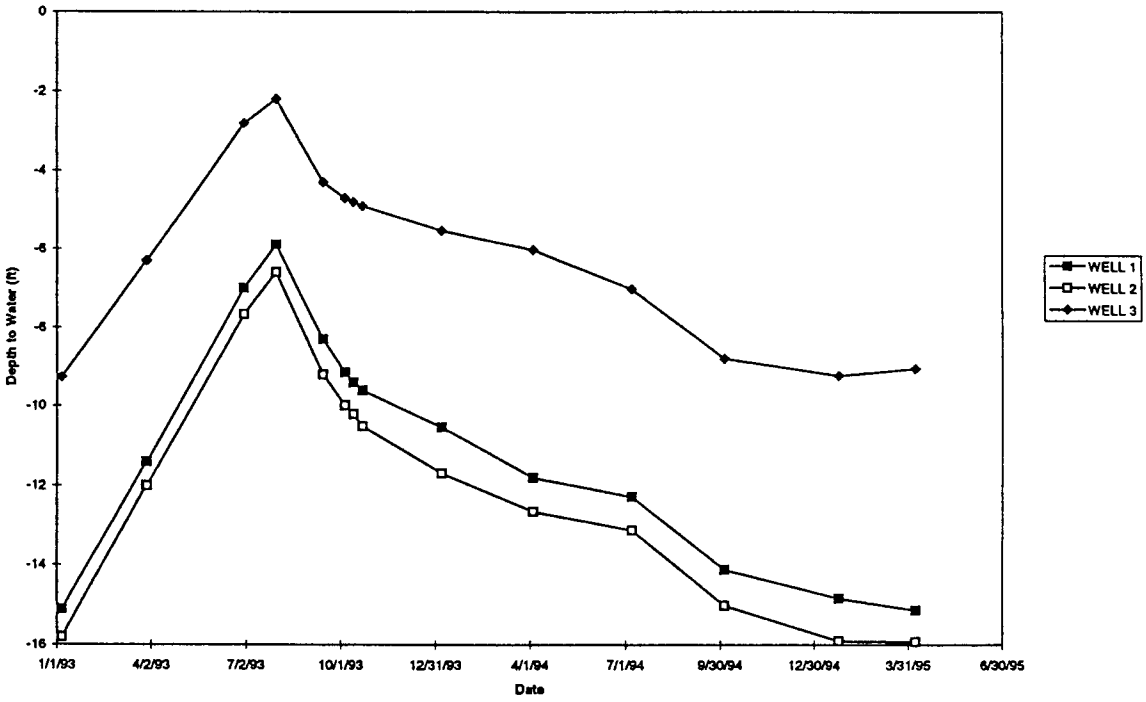

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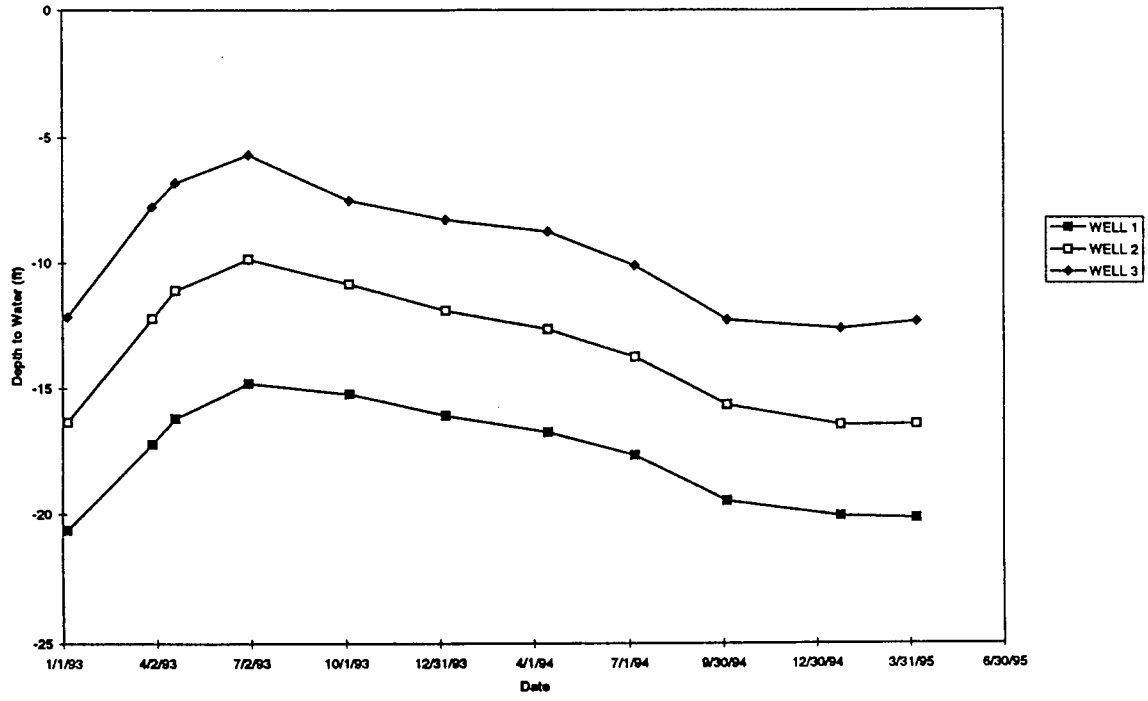

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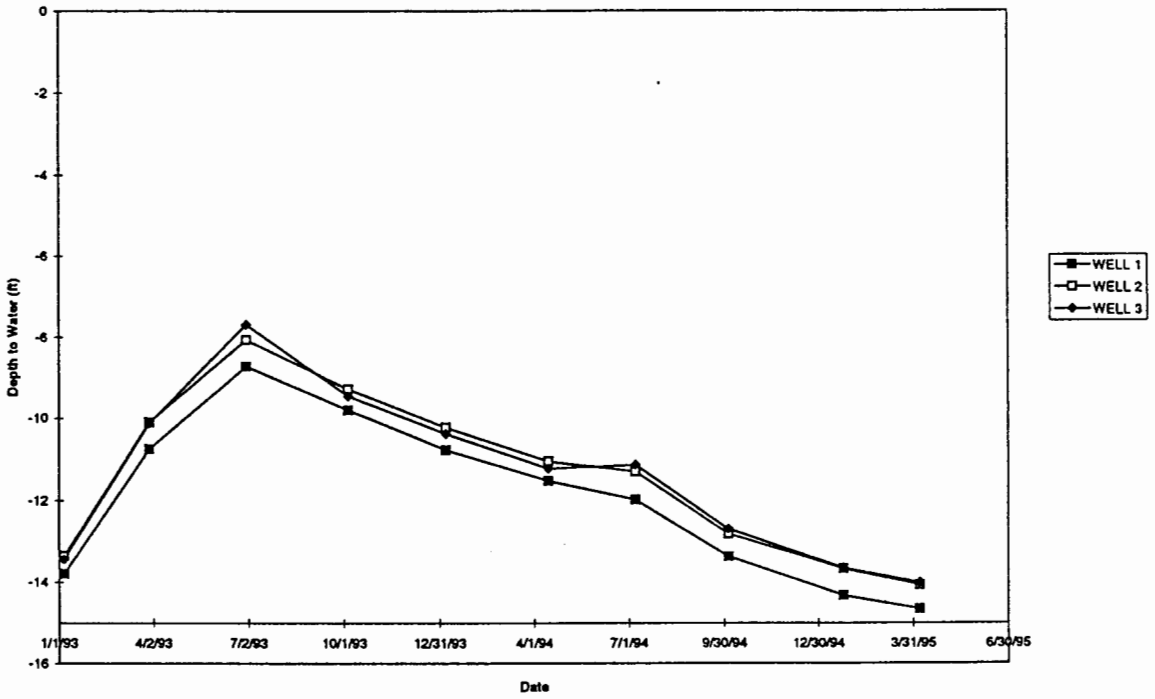

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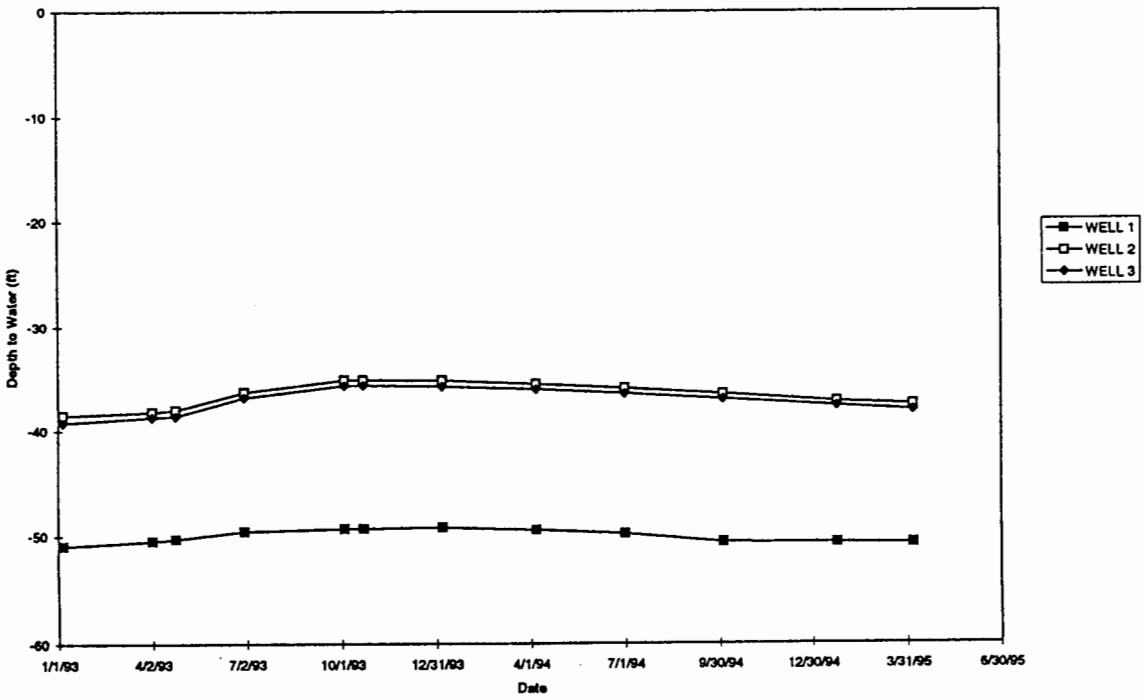

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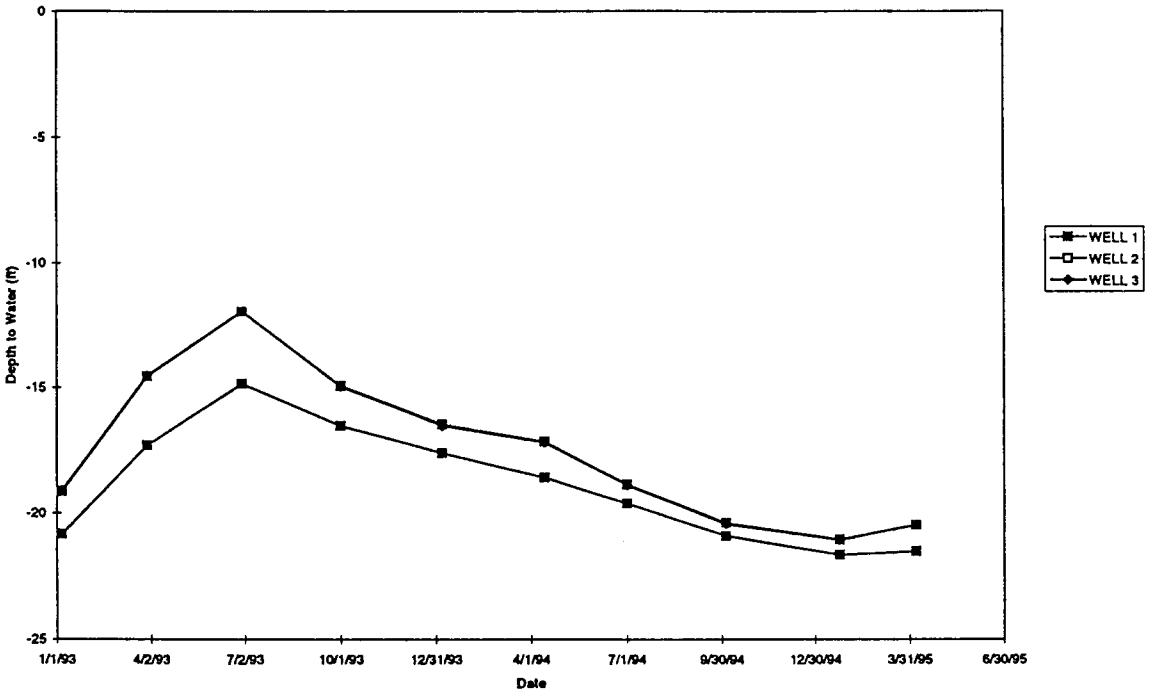

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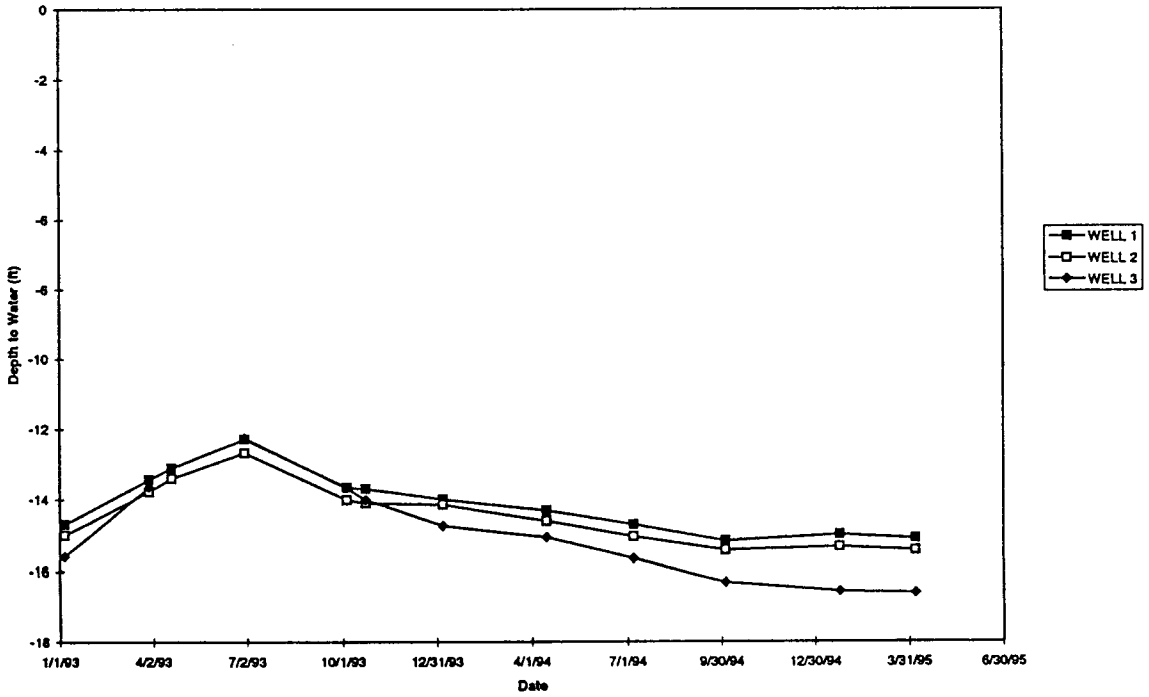

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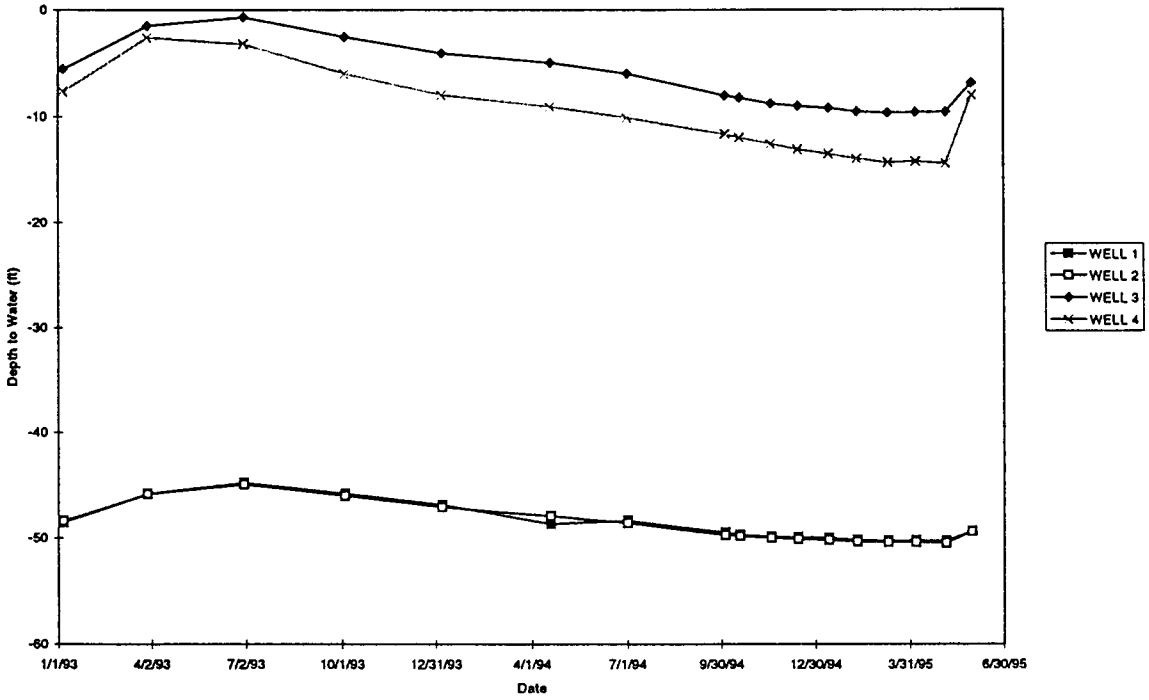

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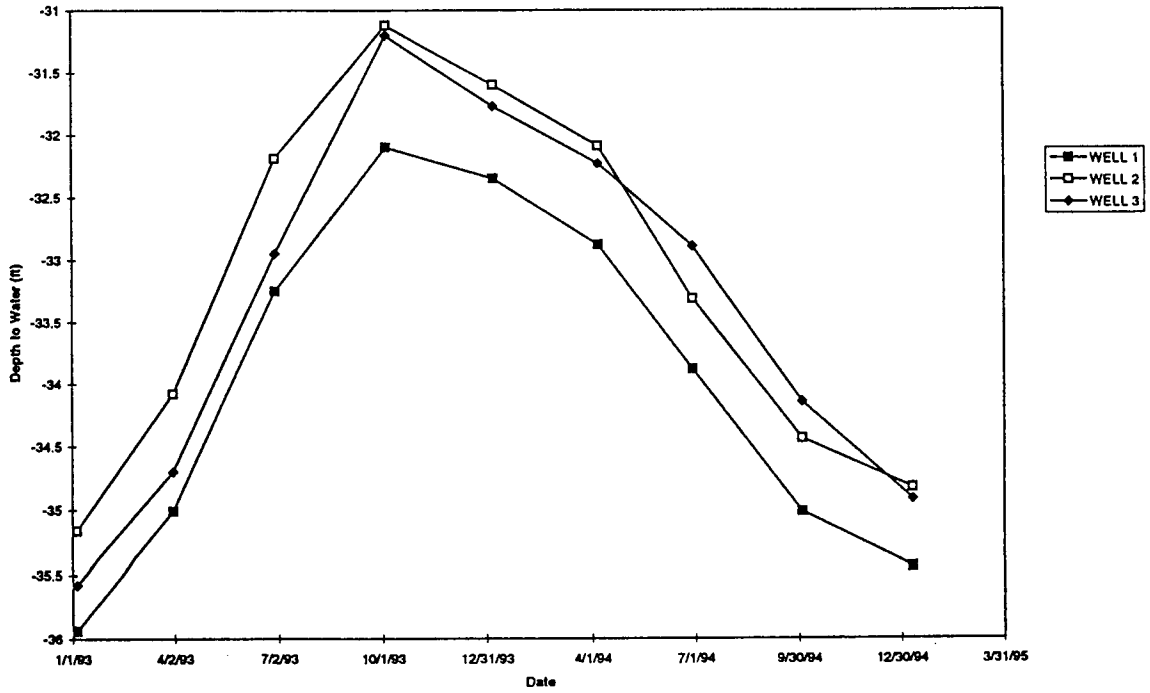

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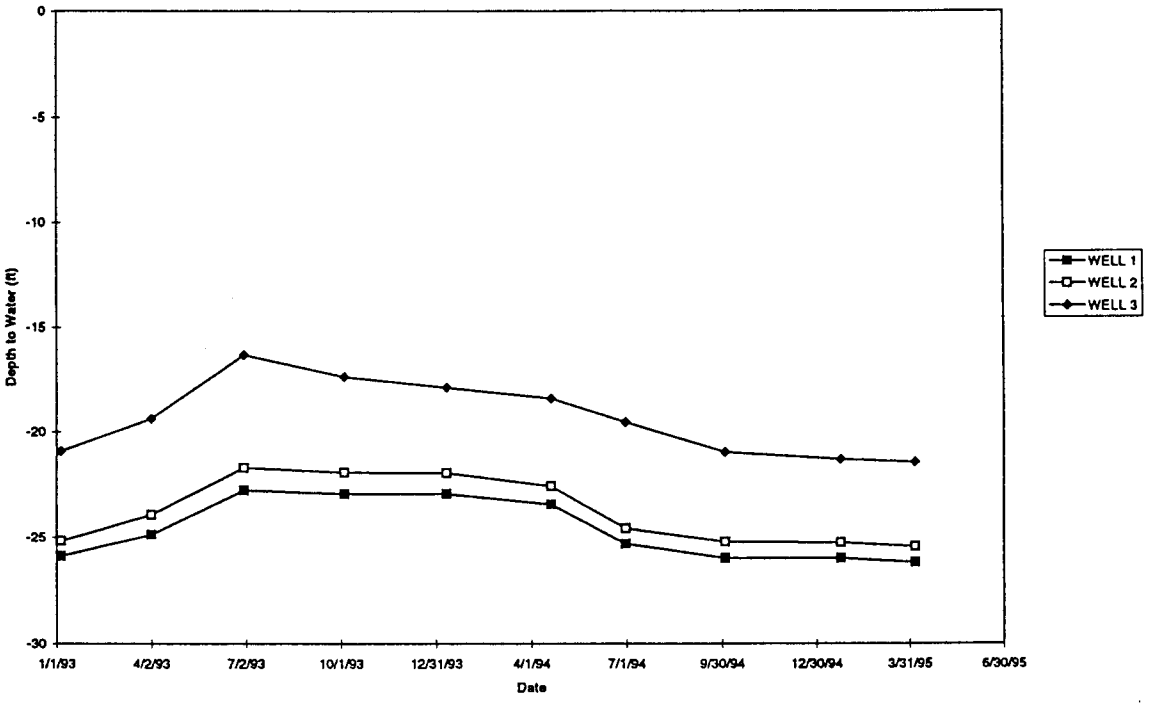

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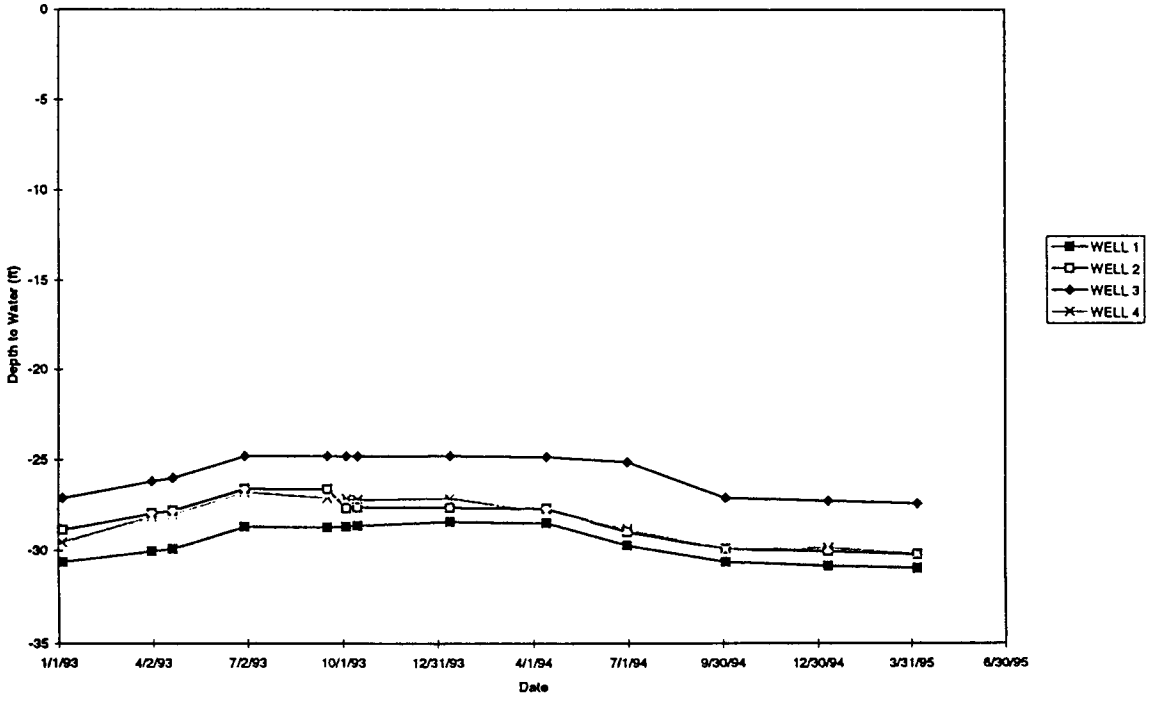

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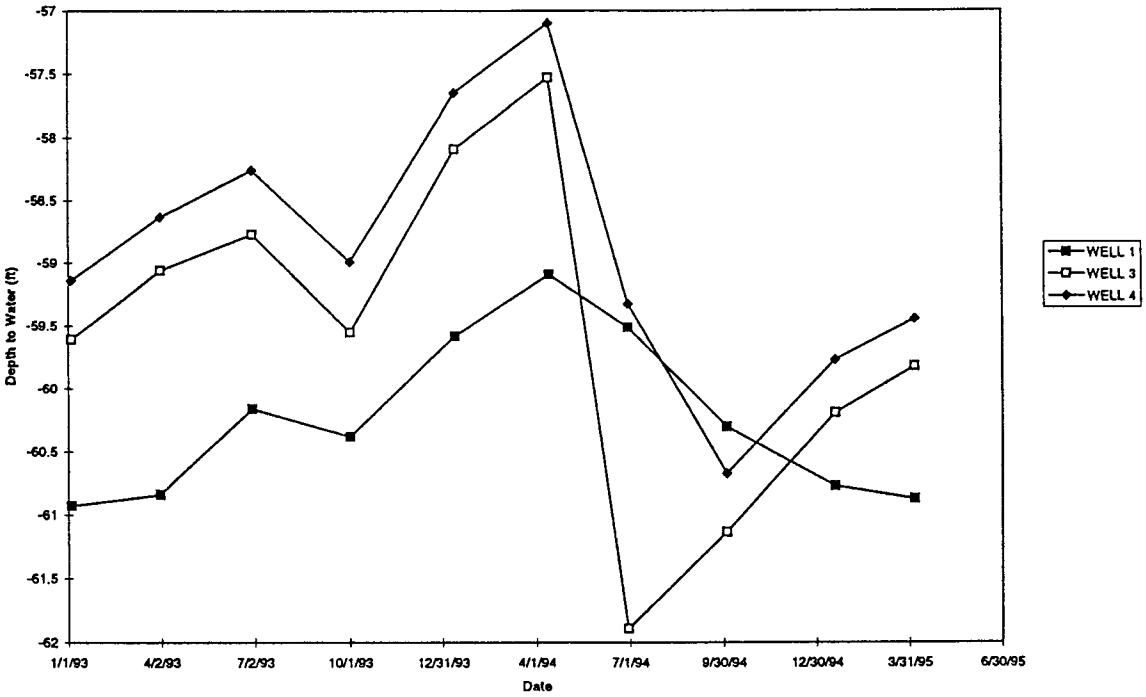

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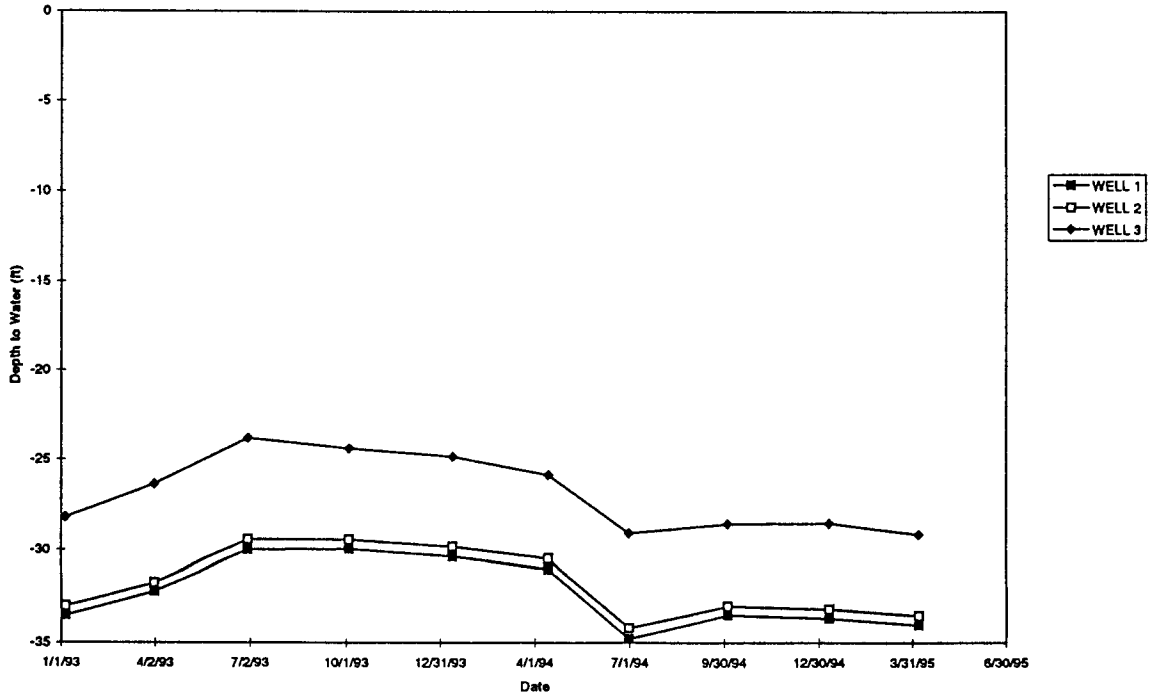

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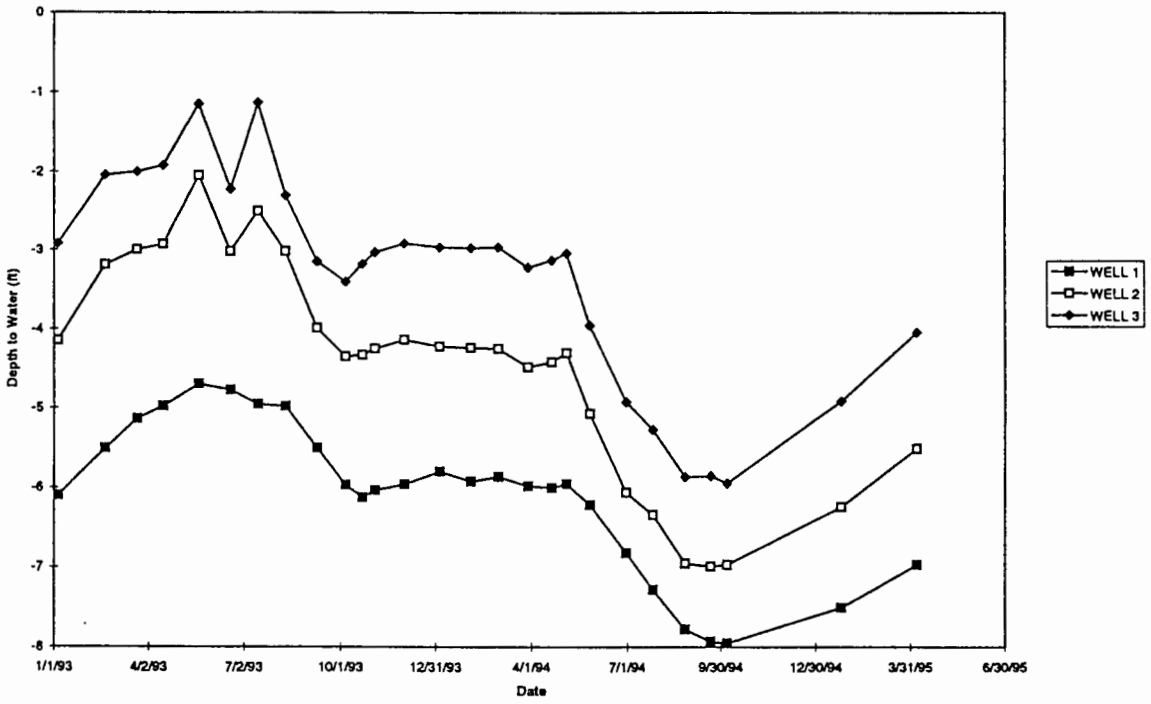

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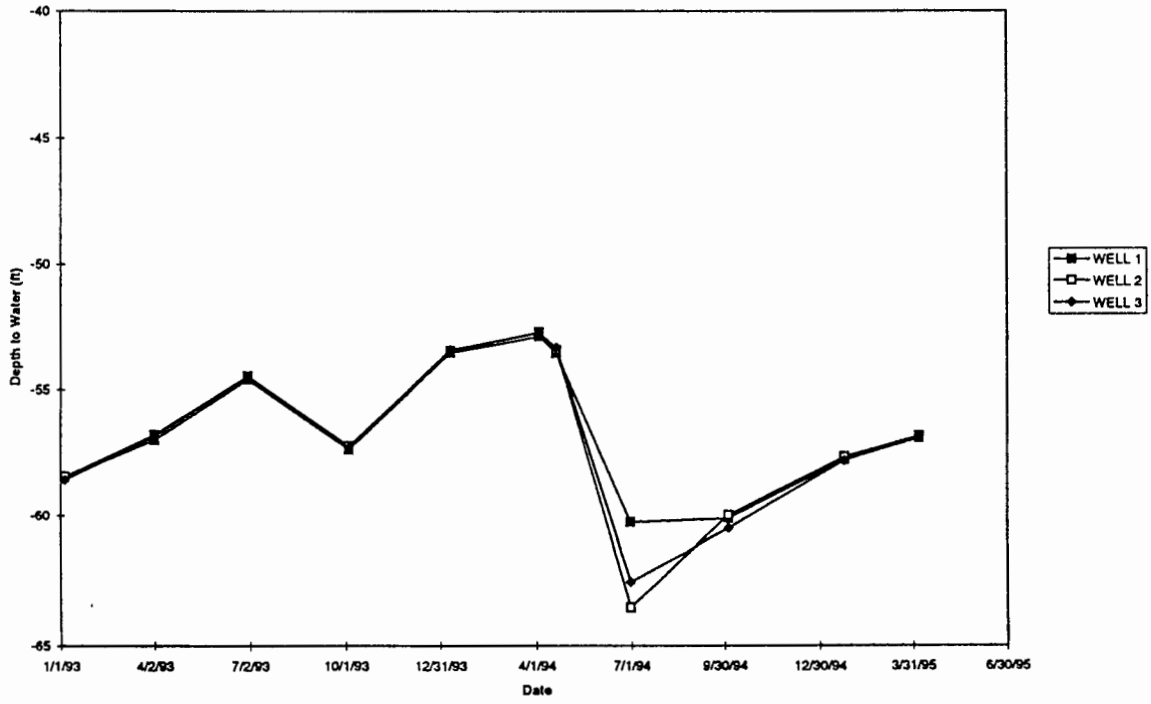

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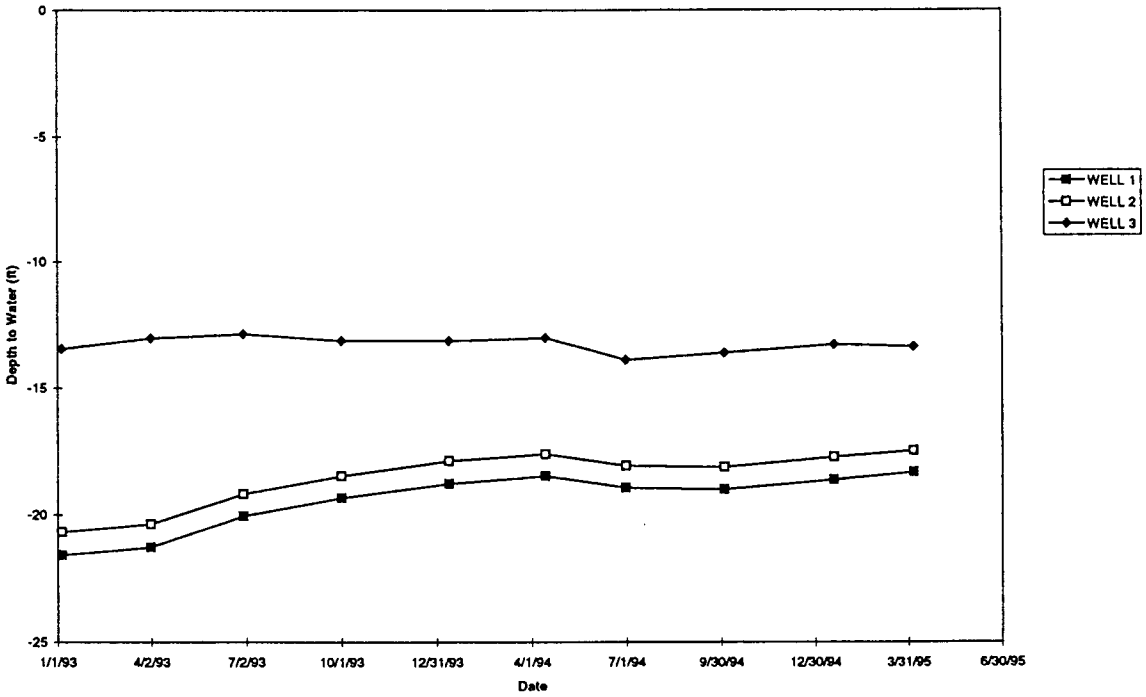

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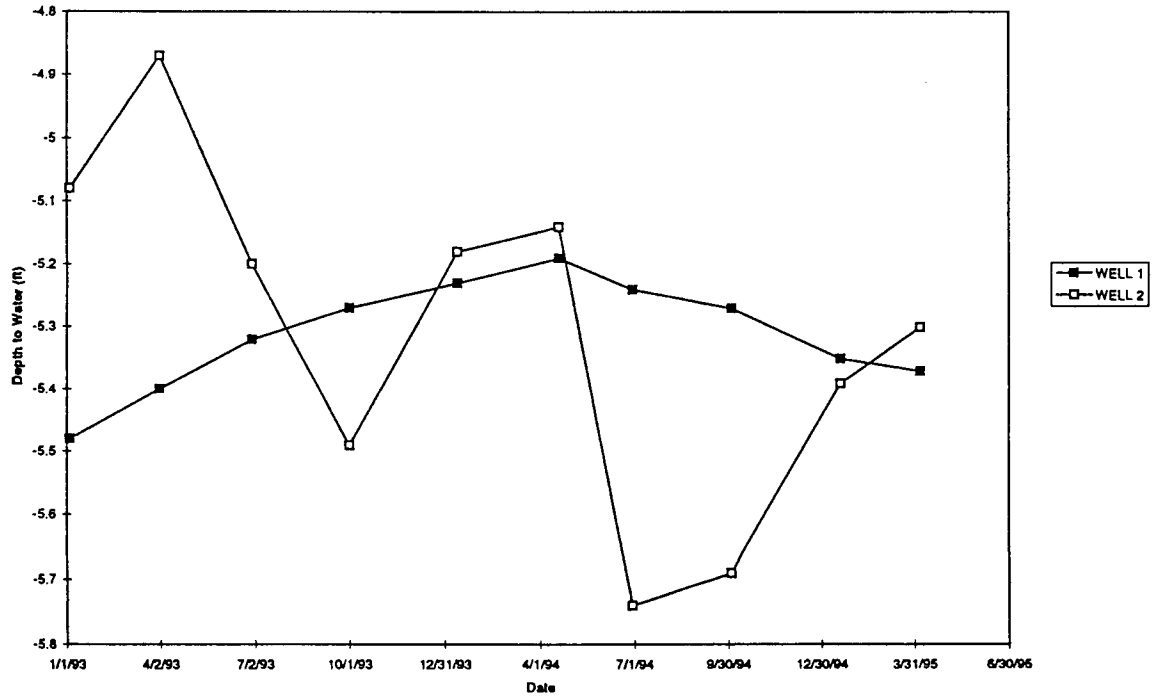

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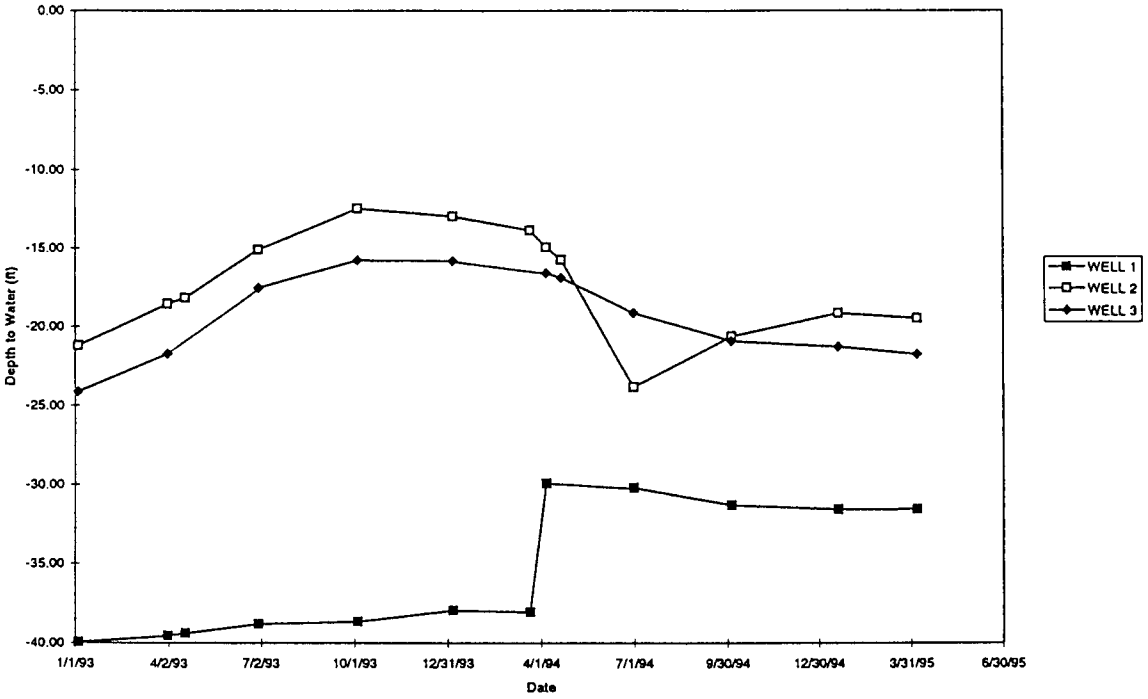

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