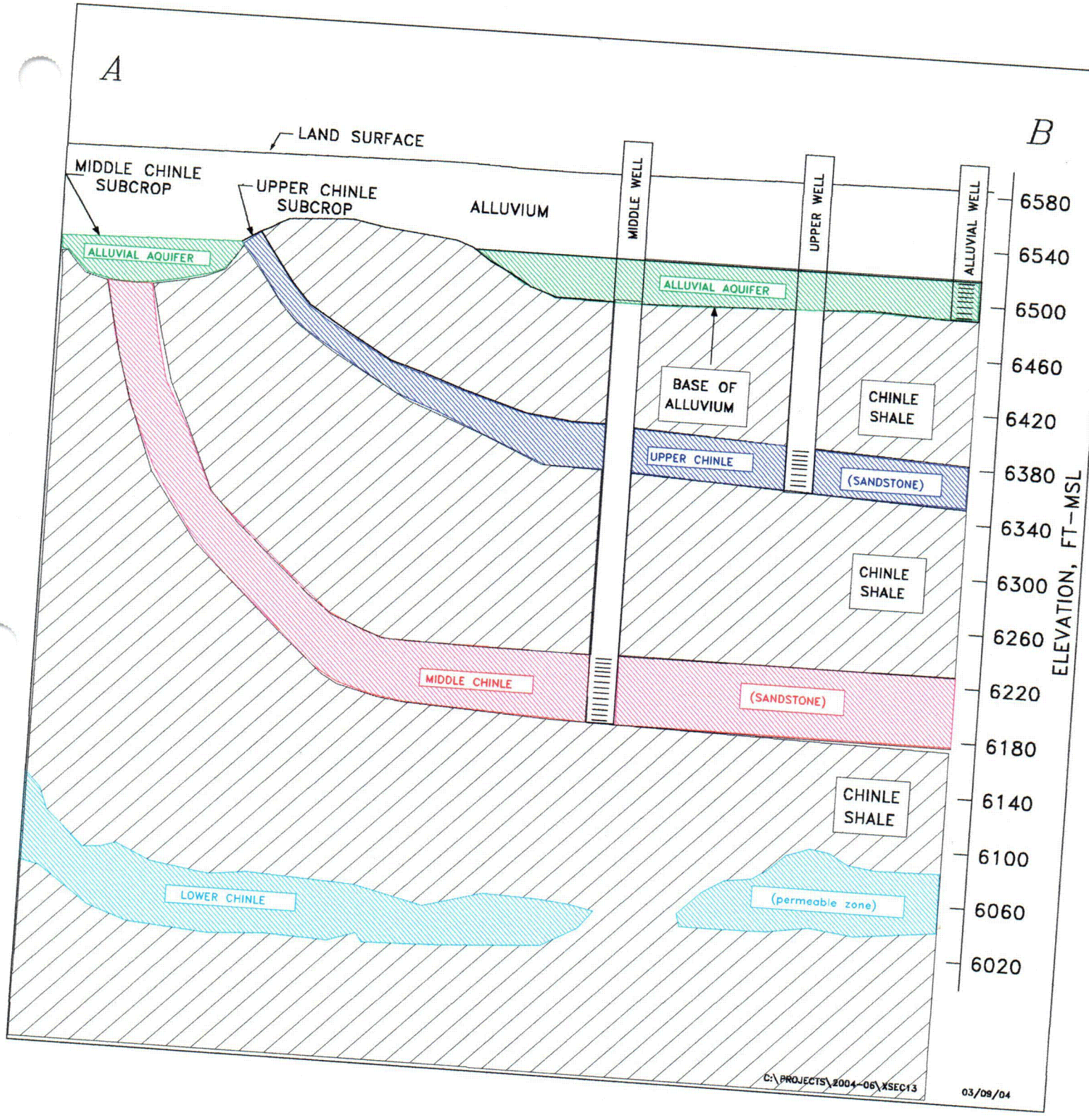

FIGURE 5.1-3. TYPICAL GEOLOGIC CROSS SECTION

TABLE 5.1-1. WELL DATA FOR THE CHINLE HOMESTAKE WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)		CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
0930	1542848	494997	410.0	6.0	7/8/2003	136.18	6462.36	0.0	6598.54	30	6569	A	-	—
										335	6264	M	330-400	Middle
0931	1542461	495207	366.7	6.0	12/23/2003	192.94	6417.62	0.9	6610.56	339	6271	U	-	Upper
0934	1540641	493941	293.0	6.0	12/29/2003	198.38	6387.21	2.0	6585.59	30	6554	A	-	—
										282	6302	U	330-400	Upper
CE1	1541923	489979	137.0	5.0	12/23/2003	49.58	6520.61	4.4	6570.19	75	6491	A	-	—
										106	6460	U	98-138	Upper
CE2	1542475	490434	119.7	5.0	12/29/2003	61.56	6514.79	1.8	6576.35	74	6501	U	78-118	Upper
										74	6501	A	-	—
CE5	1541453	490695	140.0	5.0	12/23/2003	40.46	6528.09	1.6	6568.55	63	6504	A	-	—
										103	6464	U	100-140	Upper
CW1	1545235	490295	325.0	5.0	12/29/2003	154.83	6430.39	0.7	6585.22	105	6480	A	-	—
										272	6313	M	212-323	Middle
CW2	1545212	491302	355.0	5.0	12/29/2003	162.15	6423.33	1.7	6585.48	85	6499	A	-	—
										136	6448	U	-	—
										305	6279	M	306-353	Middle
CW2-1	1545212	491302	168.0	5.0	12/23/2003	61.00	6524.48	1.7	6585.48	85	6499	A	-	—
										136	6448	U	243-253	Upper
CW3	1545200	493496	235.0	5.0	12/29/2003	138.18	6449.00	0.7	6587.18	70	6516	A	-	—
										209	6377	U	210-235	Upper
										348	6238	M	-	—
* CW4	1541682	490874	145.0	5.0	9/7/1994	39.06	6531.89	0.8	6570.95	70	6500	A	-	—
										112	6458	U	110-145	Upper
CW4R	1541416	490787	138.9	6.0	12/29/2003	8.15	6560.58	1.3	6568.73	61	6506	A	-	—
										104	6463	U	102-142	Upper
CW5	1538729	490221	170.0	5.0	12/29/2003	12.58	6556.76	1.6	6569.34	65	6503	A	-	—
										137	6431	U	135-170	Upper
CW6	1542588	488301	282.0	4.0	12/23/2003	121.90	6453.74	1.0	6575.64	236	6339	M	246-276	Middle
CW7	1545285	488773	—	—	10/17/1995	60.80	6522.79	0.0	6583.59	—	—	C	120-130	Chinle
CW8	1545009	491238	285.0	6.0	12/5/2000	38.90	6552.93	0.0	6591.83	—	—	C	276-286	Chinle
										85	6507	A	-	—
CW9	1542840	491015	180.0	5.0	7/8/2003	65.63	6526.20	0.0	6591.83	—	—	U	130-180	Upper
										80	6512	A	-	—
* CW10	1542823	491803	185.0	5.0	11/13/1995	50.03	6537.86	0.0	6587.89	75	6513	A	-	—
										167	6421	U	155-185	Upper
CW13	1538349	491827	267.7	6.0	12/29/2003	17.69	6559.01	2.7	6576.70	230	6344	U	225-265	Upper
										378	6196	M	-	—
CW14	1538786	488884	360.9	6.0	12/29/2003	49.71	6516.38	2.9	6566.09	56	6507	A	-	—
										66	6497	U	-	—
										310	6253	M	278-358	Middle

TABLE 5.1-1. WELL DATA FOR THE CHINLE HOMESTAKE WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
CW17	1545279	487771	108.0	5.0	12/23/2003	60.65	6528.67	3.1	6589.32	73	6513	A -	—
										85	6501	M 83-103	Middle
CW24	1545773	487760	118.0	5.0	12/23/2003	57.30	6531.37	3.0	6588.67	61	6525	A -	—
										65	6521	M 78-118	Middle
CW25	1540802	488866	102.0	5.0	12/29/2003	14.69	6552.51	3.0	6567.20	53	6511	A -	—
										53	6511	U 62-102	Upper
CW32	1543413	483523	300.0	6.0	12/23/2003	121.15	6446.13	1.7	6567.28	70	6496	A -	—
										157	6409	L 218-303	—
										157	6409	L 158-188	Lower
CW33	1543814	486347	347.0	6.0	12/23/2003	106.21	6468.68	1.8	6574.89	83	6490	A -	—
										272	6301	L 267-287	Lower
										272	6301	L 307-347	—
CW34	1547827	487707	65.7	6.0	8/27/1996	65.65	6528.75	3.2	6594.40	20	6571	A -	—
										40	6551	M 33-63	Middle
CW35	1547001	488794	120.0	5.0	12/23/2003	49.95	6541.22	1.9	6591.17	63	6526	A -	—
										90	6499	M 93-118	Middle
CW50	1546687	491159	170.0	5.0	12/23/2003	62.15	6526.41	3.0	6588.56	128	6458	U 130-170	Upper
CW52	1548171	491887	180.0	5.0	12/23/2003	82.80	6509.60	2.0	6592.40	138	6452	U 140-180	Upper
WR25	1545267	487430	113.3	5.0	12/23/2003	55.40	6531.05	2.8	6586.46	50	6534	A -	—
										71	6513	M 71-111	Middle

NOTE: A = Alluvial Aquifer, Base
U = Upper Chinle Aquifer, Top
M = Middle Chinle Aquifer, Top
L = Lower Chinle Aquifer, Top
* = Abandoned

TABLE 5.1-2. WELL DATA FOR THE CHINLE BROADVIEW AND FELICE ACRES WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)		CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
Broadview														
0430	1538469	490300	145.0	—	—	—	—	0.0	6568.00	72	6496	A	-	Alluvium
										135	6433	U	-	Upper
0431	1538045	490090	130.0	6.0	4/12/1994	35.00	6533.00	0.0	6568.00	60	6508	A	125-130	Alluvium
										118	6450	U	125-130	Upper
0434	1538370	489420	280.0	6.0	4/22/2003	36.41	6527.27	0.0	6563.68	75	6489	A	-	—
										265	6299	M	-	Middle
0436	1538430	488850	295.0	5.0	10/29/1996	71.82	6490.91	0.0	6562.73	90	6473	A	-	—
										280	6283	M	280-295	Middle
0437	1537940	491100	340.0	5.0	10/29/1996	63.23	6508.77	1.8	6572.00	90	6480	A	-	—
										180	6390	U	-	—
										280	6290	M	240-300	Middle
0446	1537720	488850	110.0	6.0	9/8/1983	41.28	6518.72	0.0	6560.00	60	6500	A	60-95	Alluvium
										60	6500	U	60-95	Upper
0447	1537490	490480	142.0	6.0	4/11/1985	41.18	6526.82	0.0	6568.00	80	6488	A	120-142	Alluvium
										138	6430	U	120-142	Upper
0449	1537440	488830	267.0	6.0	12/5/1994	63.42	6496.58	0.0	6560.00	—	—	M	-	Middle
Felice Acres														
0481	1538350	490180	320.0	4.0	—	—	—	0.0	6568.00	110	6458	A	270-310	Alluvium
										270	6298	M	270-310	Middle
0482	1536985	489604	260.0	5.0	12/12/2003	40.00	6522.66	0.0	6562.66	80	6483	A	220-260	Alluvium
										210	6353	M	220-260	Middle
0483	1536586	489753	280.0	5.0	7/24/1996	36.93	6525.73	0.0	6562.66	40	6523	A	-	Alluvium
										65	6498	U	-	—
										236	6327	M	270-300	Middle
0484	1536448	490356	320.0	5.0	12/26/1996	39.43	6524.55	0.0	6563.98	38	6526	A	-	—
										129	6435	U	-	—
										280	6284	M	220-300	Middle
0485	1535800	489630	260.0	6.0	7/18/1996	70.90	6494.10	0.0	6565.00	35	6530	A	-	—
										70	6495	U	-	—
										223	6342	M	220-260	Middle
0486	1535800	489024	179.2	4.0	10/15/1996	70.36	6488.04	0.0	6558.40	—	—	M	200-260	Middle
										21	6537	U	-	—
										21	6537	A	-	—
0487	1536175	488950	260.0	—	7/24/1996	49.20	6511.80	0.0	6561.00	—	—	M	-	Middle
0488	1536500	488950	—	—	8/19/2003	113.80	6448.20	0.0	6562.00	—	—	M	-	Middle
0489	1536850	488950	—	—	—	—	—	0.0	6562.00	—	—	M	-	Middle
0493	1536524	489586	—	5.0	12/23/2003	111.60	6448.68	0.9	6560.28	40	6519	A	-	—
										65	6494	U	-	—

TABLE 5.1-2. WELL DATA FOR THE CHINLE BROADVIEW AND FELICE ACRES WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
0493	1536524	489586	—	5.0	12/23/2003	111.60	6448.68	0.9	6560.28	236	6323 M	270-300	Middle
0494	1536510	489590	—	5.0	12/23/2003	34.30	6525.84	0.6	6560.14	40	6520 A	-	—
										65	6495 U	65-85	Upper
0498	1534580	488740	150.0	6.0	1/19/2004	57.80	6502.20	2.0	6560.00	80	6478 A	70-110	Alluvium
										80	6478 M	130-150	Middle
CW44	1535048	488891	208.0	6.0	12/23/2003	61.50	6499.24	2.5	6560.74	94	6464 A	-	Alluvium
										130	6428 M	69-208	Middle
CW45	1535036	489494	193.0	5.0	12/23/2003	57.45	6503.86	0.6	6561.31	90	6471 A	-	—
										166	6395 M	163-193	Middle
CW46	1534642	489595	187.3	5.0	12/23/2003	72.75	6489.51	1.5	6562.26	88	6473 A	-	—
										112	6449 M	125-185	Middle

NOTE: A = Alluvial Aquifer, Base
U = Upper Chinle Aquifer,Top
M = Middle Chinle Aquifer,Top
L = Lower Chinle Aquifer,Top
* = Abandoned

TABLE 5.1-3. WELL DATA FOR THE CHINLE MURRAY ACRES AND PLEASANT VALLEY WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)		CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
Murray														
0803	1540800	487430	—	6.0	9/19/1983	84.86	6476.14	0.0	6561.00	—	—	C	85-180	Chinle
										85	6476	A	85-180	Alluvium
0807	1540100	488605	287.0	6.0	—	—	—	0.0	6565.00	63	6502	A	-	—
										275	6290	M	275-285	Middle
0808	1540080	487490	290.0	5.0	—	—	—	1.6	6561.00	85	6474	A	-	—
										255	6304	M	260-290	Middle
0812	1539910	488505	300.0	6.0	—	—	—	0.6	6566.00	68	6497	A	-	—
										268	6297	M	264-284	Middle
0813	1539300	488620	280.0	6.0	—	—	—	0.0	6565.00	63	6502	A	-	—
										230	6335	M	235-255	Middle
0814	1539030	488590	—	—	—	—	—	0.0	6565.00	—	—	M	-	Middle
0816	1539110	487705	255.0	6.0	—	—	—	0.0	6557.00	35	6522	A	-	—
										240	6317	M	240-250	Middle
0817	1539190	487590	—	—	7/22/1995	70.34	6486.66	0.0	6557.00	—	—	M	-	Middle
0818	1539090	487510	243.0	4.0	—	—	—	0.0	6557.00	62	6495	A	-	—
										230	6327	M	223-243	Middle
0819	1539000	487000	222.0	6.0	—	—	—	0.0	6557.00	62	6495	A	-	—
										210	6347	M	210-220	Middle
0820	1538890	486660	230.0	—	5/9/2002	99.20	6458.80	0.0	6558.00	—	—	M	125-230	Middle
0821	1538810	487320	260.0	7.0	11/1/1994	35.88	6524.12	0.0	6560.00	—	—	M	-	Middle
0823	1540150	487720	265.0	6.0	—	—	—	0.0	6561.00	—	—	M	257-267	Middle
										40	6521	A	-	—
ACW	1540235	488070	325.0	6.0	8/16/1996	77.85	6485.95	1.2	6563.80	40	6523	A	-	—
										57	6506	U	-	—
										264	6299	M	265-325	Middle
AW	1540235	488015	156.0	6.0	1/5/1998	15.00	6548.43	0.1	6563.43	63	6500	A	-	Alluvium
										100	6463	U	66-155	Upper
HCW	1541060	487785	295.0	6.0	7/20/2000	75.61	6486.39	1.0	6562.00	82	6479	A	-	—
										264	6297	M	264-295	Middle
WCW	1541045	488520	307.0	6.0	7/17/2003	138.16	6429.21	0.8	6567.37	83	6484	A	-	—
										254	6313	M	257-307	Middle
Pleasant Valley														
0530	1540229	484358	490.0	5.0	10/30/1998	95.78	6463.41	1.5	6559.19	265	6293	L	-	Lower
0832	1539320	485670	280.0	4.0	—	—	—	0.0	6557.00	85	6472	A	-	—
										240	6317	L	238-278	Lower
0837	1540995	485950	200.0	5.0	9/7/1983	59.87	6507.13	0.0	6567.00	80	6487	A	-	—
										160	6407	L	160-200	Lower
* 0842	1541650	483980	250.0	—	—	—	—	0.0	6558.00	—	—	L	-	Lower

TABLE 5.1-3. WELL DATA FOR THE CHINLE MURRAY ACRES AND PLEASANT VALLEY WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
0900	1540800	483700	172.1	—	7/24/1995	91.41	6468.59	1.5	6560.00	—	—	L -	Lower

NOTE: A = Alluvial Aquifer, Base
U = Upper Chinle Aquifer,Top
M = Middle Chinle Aquifer,Top
L = Lower Chinle Aquifer,Top
* = Abandoned

TABLE 5.1-4. WELL DATA FOR THE CHINLE REGIONAL WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
0536	1539560	479701	160.0	5.0	9/12/2000	144.70	—	-2.0	—	—	—	L -	Lower
0536R	1539560	479721	264.0	4.0	6/1/2001	75.00	6480.00	2.0	6555.00	62	6491	A -	—
										160	6393	L -	Lower
0538	1533390	486900	170.0	6.0	1/19/2004	80.40	6467.60	2.2	6548.00	95	6451	A 50-90	Alluvium
										133	6413	L 130-170	Lower
0539	1533920	487570	210.0	6.0	1/22/2004	82.26	6471.74	2.0	6554.00	100	6452	A 80-100	Alluvium
										100	6452	A 50-70	Alluvium
										175	6377	L 170-210	Lower
0653	1533283	486570	206.0	6.0	12/18/2003	78.35	6466.62	1.3	6544.97	97	6447	A 69-206	Alluvium
										135	6409	L -	Lower
0850	1534652	486044	54.0	5.0	12/12/2002	55.98	6493.17	3.2	6549.15	37	6509	A -	—
										37	6509	M 29-54	Middle
0853	1532124	484824	95.0	5.0	12/23/2003	80.68	6460.70	1.7	6541.38	60	6480	L 55-95	Lower
										60	6480	A -	—
0859	1534549	487426	83.0	5.0	12/23/2003	75.85	6476.91	2.7	6552.76	52	6498	M 50-83	Middle
0901	1531900	492900	270.0	5.0	11/4/1981	46.88	6552.12	0.0	6599.00	40	6559	A -	—
										190	6409	L 240-260	Lower
0902	1533700	488800	150.0	6.0	1/28/1995	52.10	6507.90	0.0	6560.00	72	6488	A -	—
										72	6488	M 78-102	Middle
0903	1530250	486900	281.0	5.0	—	—	—	0.0	6559.00	220	6339	L 120-260	Lower
0904	1531100	487150	200.0	4.0	—	—	—	0.0	6560.00	—	—	L 170-200	Lower
0908	1534430	483325	282.8	5.0	11/3/1998	81.16	6463.21	1.5	6544.37	107	6436	A -	—
										232	6311	L -	Lower
0909	1531900	483400	140.0	4.0	11/19/1982	77.45	6461.45	0.0	6538.90	112	6427	L 80-135	Lower
										112	6427	A 80-135	Alluvium
0927	1548300	491700	—	—	12/17/2001	147.94	6447.06	1.0	6595.00	—	—	M -	Middle
0929	1544684	495585	320.0	5.0	12/29/2003	163.09	6429.48	2.0	6592.57	—	—	U 290-320	Upper
0932	1540434	495401	501.0	6.0	4/19/2001	86.73	6515.38	0.0	6602.11	354	6248	U -	—
										492	6110	M 450-490	Middle
0933	1540050	499730	—	5.0	12/17/1997	52.78	6547.73	0.5	6600.51	—	—	U -	Upper
0937	1542200	481250	182.0	5.0	—	—	—	0.0	6578.00	70	6508	A -	—
										160	6418	L 95-182	Lower
0944	1539280	493091	300.0	5.0	12/29/2003	182.33	6406.28	1.6	6588.61	64	6523	A -	—
										252	6335	U 220-280	Upper
0945	1537986	493900	300.0	—	3/21/1985	92.41	6498.08	0.0	6590.49	—	—	U -	Upper
0946	1537804	491754	260.0	5.0	10/17/1996	37.45	6541.59	0.0	6579.04	220	6359	U 230-260	Upper
0948	1535190	490400	255.0	5.0	—	—	—	0.0	6568.10	200	6368	M 200-255	Middle
0949	1540350	483600	551.0	—	—	—	—	0.0	6562.30	112	6450	A -	—
										155	6407	L 260-290	Lower

TABLE 5.1-4. WELL DATA FOR THE CHINLE REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
0949	1540350	483600	551.0	—	—	—	—	0.0	6562.30	460	6102	S 505-551	San Andres
										460	6102	S 400-493	San Andres
0954	1534390	484260	307.0	5.0	12/27/1994	77.22	6467.78	0.0	6545.00	225	6320	L 285-307	Lower
0960	1534730	490110	305.0	6.0	4/5/1995	67.46	6497.54	0.0	6565.00	280	6285	M 285-305	Middle
0961	1534190	489720	240.0	5.0	4/5/1995	67.40	6497.60	6.9	6565.00	200	6358	M 200-240	Middle
0962	1533880	489530	238.0	6.0	—	—	—	0.0	6560.00	225	6335	M 220-238	Middle
0963	1532700	488900	—	4.0	—	—	—	0.0	6557.00	—	—	L -	Lower
0964	1531500	488000	200.0	6.0	—	—	—	0.0	6560.00	170	6390	L 170-200	Lower
0965	1531550	489100	200.0	4.0	8/21/2003	3.00	6572.00	0.0	6575.00	—	—	L 130-200	Lower
0966	1531300	489000	—	—	—	—	—	0.0	6575.00	—	—	L -	Lower
0967	1530500	487600	—	—	—	—	—	0.0	6570.00	—	—	L -	Lower
0968	1529700	488400	—	—	—	—	—	0.0	6630.00	—	—	L -	Lower
0969	1529400	488450	—	—	—	—	—	0.0	6640.00	—	—	L -	Lower
0970	1529100	488500	—	5.0	—	—	—	0.0	6660.00	—	—	L -	Lower
0988	1538140	482200	155.0	5.0	7/18/1996	59.86	6589.14	1.3	6649.00	18	6630	A -	—
										152	6496	L 152-155	Lower
0990	1537600	482750	—	—	—	—	—	0.5	6550.00	—	—	L -	Lower
0994	1539700	476240	144.0	6.0	12/2/2003	90.52	6464.48	0.0	6555.00	—	—	A 95-110	Alluvium
										—	—	L 95-110	Lower
CW15	1536259	485961	134.6	5.0	12/23/2003	76.25	6475.07	2.6	6551.32	50	6499	A -	—
										91	6458	M 73-133	Middle
										311	6238	L -	—
CW16	1534747	488507	—	5.0	12/26/1996	68.02	6490.52	0.0	6558.54	82	6477	M 112-152	Middle
										82	6477	A -	—
CW18	1535924	491378	230.7	5.0	12/29/2003	113.17	6459.48	1.5	6572.65	90	6481	A -	—
										190	6381	U 177-232	Upper
										340	6231	M -	—
CW26	1534116	489593	300.0	5.0	12/23/2003	101.05	6460.38	0.5	6561.43	50	6511	M -	—
										50	6511	A -	—
										231	6330	L 245-285	Lower
CW27	1534109	489600	110.0	5.0	12/23/2003	74.00	6488.88	1.9	6562.88	50	6511	A -	—
										50	6511	M 80-110	Middle
CW28	1535112	491008	370.0	5.0	12/29/2003	212.15	6359.53	1.9	6571.68	90	6480	A -	—
										110	6460	U -	—
										294	6276	M 280-360	Middle
CW29	1534551	487435	290.0	5.0	12/29/2003	137.74	6414.48	1.7	6552.22	52	6499	A -	—
										52	6499	M -	—
										228	6323	L 230-270	Lower
CW30	1536642	488704	251.5	5.0	12/29/2003	100.60	6457.71	2.0	6558.31	35	6521	A -	—

TABLE 5.1-4. WELL DATA FOR THE CHINLE REGIONAL WELLS. (cont'd.)

WELL NAME	NORTH. COORD.	EAST. COORD.	WELL DEPTH (FT-MP)	CASING DIAM (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	DEPTH TO AQUIFER (FT-LSD)	ELEV. OF AQUIFER (FT-MSL)	CASING PERFOR-ATIONS (FT-LSD)	AQUIFER
CW30	1536642	488704	251.5	5.0	12/29/2003	100.60	6457.71	2.0	6558.31	220	6336	M 219-249	Middle
CW31	1540689	482738	311.0	6.0	12/23/2003	84.60	6475.66	2.0	6560.26	111	6447	A -	—
										254	6304	L 136-156	Lower
										254	6304	L 291-311	—
										254	6304	L 231-271	—
CW36	1540053	481329	180.0	5.0	12/23/2003	75.85	6475.24	2.8	6551.09	96	6452	A -	—
										152	6396	L 155-177	Lower
CW37	1537240	484853	150.1	5.0	12/23/2003	62.05	6489.12	1.3	6551.17	55	6495	A -	—
										100	6450	L 100-150	Lower
CW38	1540103	483429	174.8	5.0	11/14/1997	55.18	6500.42	2.1	6555.60	108	6446	A -	—
										130	6424	L 133-173	Lower
CW39	1537260	483754	126.3	5.0	12/23/2003	61.88	6488.83	3.4	6550.71	40	6507	A -	—
										87	6460	L 90-123	Lower
CW40	1537624	491819	264.0	5.0	12/23/2003	102.18	6476.76	2.6	6578.94	75	6501	A -	—
										220	6356	U 224-264	Upper
CW41	1533174	488584	206.0	6.0	12/23/2003	85.65	6469.76	1.5	6555.41	59	6495	A -	—
										138	6416	L 146-206	Lower
CW42	1533169	487177	205.0	6.0	12/23/2003	83.95	6464.83	0.0	6548.78	98	6451	A -	—
										124	6425	L 125-205	Lower
CW43	1537587	482493	104.1	5.0	12/23/2003	68.50	6480.29	2.0	6548.79	57	6490	A -	—
										57	6490	L 81-101	Lower

NOTE: A = Alluvial Aquifer, Base
U = Upper Chinle Aquifer, Top
M = Middle Chinle Aquifer, Top
L = Lower Chinle Aquifer, Top
* = Abandoned

5.2 UPPER CHINLE WATER LEVELS

Measured water levels in Homestake's Upper, Middle and Lower Chinle aquifer wells are presented in Appendix A. Appendix A contains a table with information about Homestake, subdivision, and regional Chinle wells. Figure 5.2-1 presents water-level elevation contours of the Upper Chinle aquifer during the Fall of 2003. The blue arrows on Figure 5.2-1 show the direction of ground-water flow, which is greatly influenced by the fresh-water injection into the Upper Chinle at wells CW4R, CW5, CW13, CW25 and 944 and collection from wells CE2, CW3, CW18, 929 and 934. Well CW13, an injection well on the east side of the East Fault, is in the high permeability zone of the Upper Chinle aquifer that parallels the East Fault. This high permeability zone exists to a distance of at least 1000 feet perpendicular to the East Fault near well CW18. Injection of fresh water, combined with pumping from wells 929, 934 and CW18, has created piezometric-surface depressions along the east side of the East Fault near these wells and a mound in the piezometric surface near injection well CW13. The permeability decreases at greater distances to the east of the East Fault and, therefore, an easterly gradient occurs in the Upper Chinle away from the East Fault near injection well CW13. Upper Chinle flow is presently inward toward the depressions, and this phenomenon is caused by the pumping of wells adjacent to the East Fault. The blue arrows on Figure 5.2-1 show the direction of ground-water flow in this area.

Injection of fresh water into Upper Chinle well CW5 is causing ground water flow to the north and south of this area. The flow that moves to the south discharges to the alluvial aquifer in the subcrop area of the Upper Chinle, and the flow that moves to the north converges toward collection wells CE2 or CW3. Injection into Upper Chinle well CW25 was started in 2000, and this injection is causing ground water to flow from this well back toward collection well CE2. The naturally occurring flow direction in the Upper Chinle aquifer west of the East Fault is from the north. The collection of water from well CW3 intercepts this flow and also pulls some Upper Chinle water from the south.

Figure 5.2-2 shows the location of the Upper Chinle wells that are used to monitor water-level changes with time. Figure 5.2-3 presents water-level elevations for Upper Chinle wells 494, CE2, CW3, CW4R, CW5, CW25 and CW50. Water levels in the Upper Chinle injection wells CW5 and CW25 remained high during 2003. The changes in water levels from

collection well CE2 are due to variations in pumping rates in this well. Water levels in well CW4R were increased in 2003 due to the initiation of fresh-water injection into this well. Water levels in well 494 and well CW50 were fairly steady in 2003.

Figure 5.2-4 presents the water-level elevation changes for the Upper Chinle wells east of the East Fault. The large water-level variations in wells 929 and 934 in 2003 were due to the pumping from these wells. The water-level elevation in well CW40 in the Upper Chinle varied in 2003 due to the variation in CW13 injection and CW18 pumping rates.

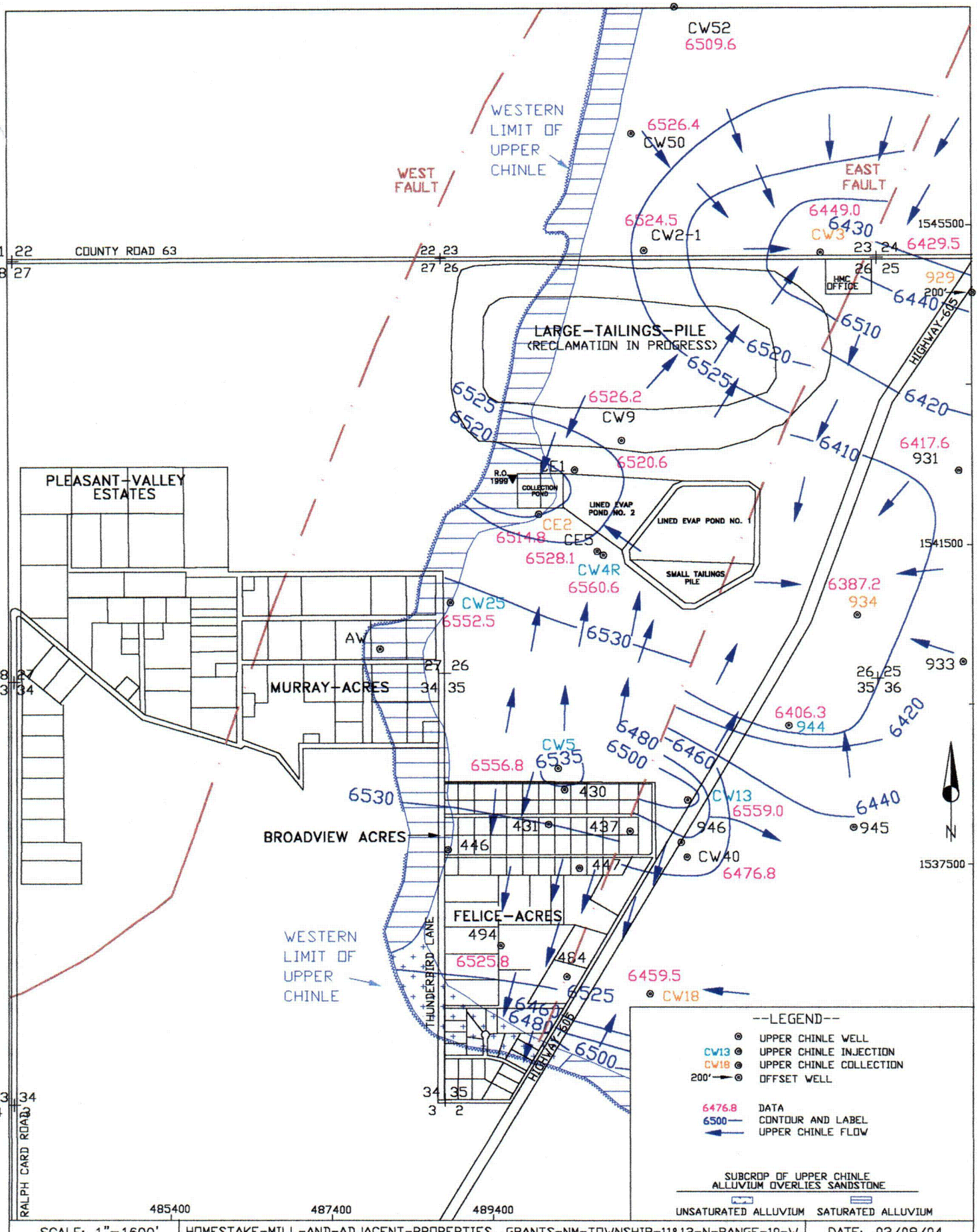

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FIGURE 5.2-1. WATER-LEVEL ELEVATIONS OF THE UPPER CHINLE AQUIFER, FALL 2003, FT-MSL

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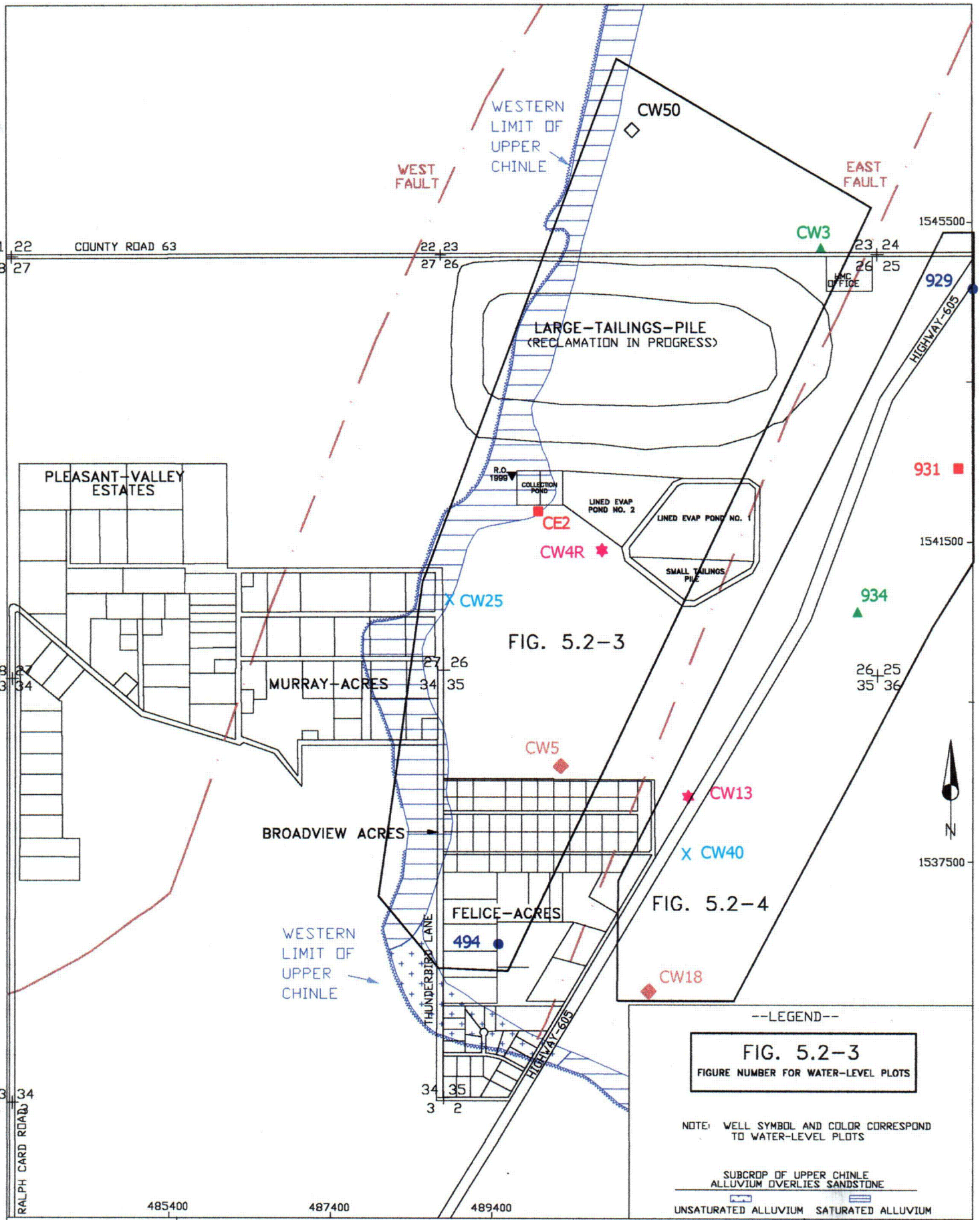
C152



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/09/04

FIGURE 5.2-2. LOCATION OF UPPER CHINLE WELLS WITH WATER-LEVEL PLOTS

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C153

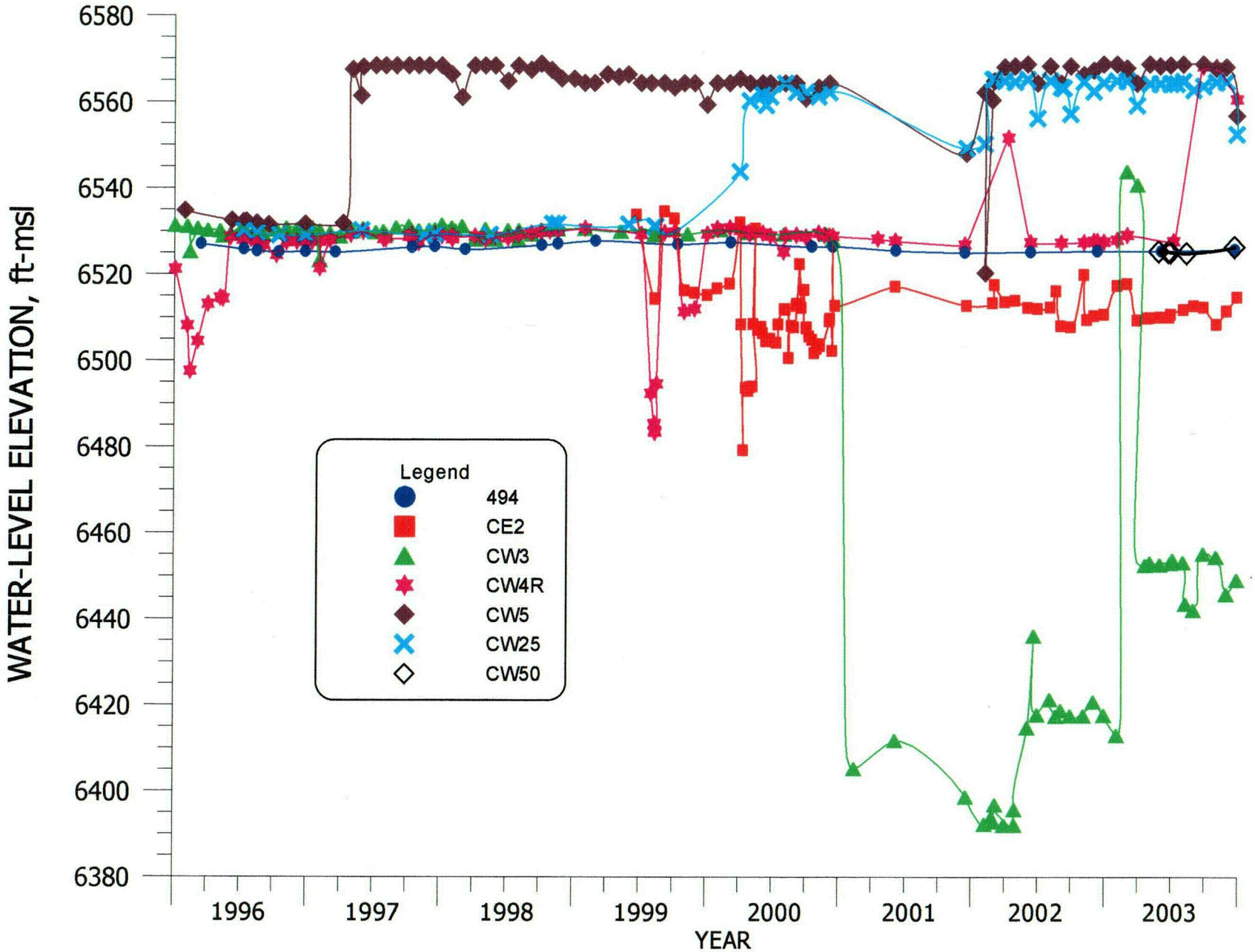

FIGURE 5.2-3. WATER-LEVEL ELEVATION FOR WELLS 494, CE2, CW3, CW4R, CW5, CW25 AND CW50.

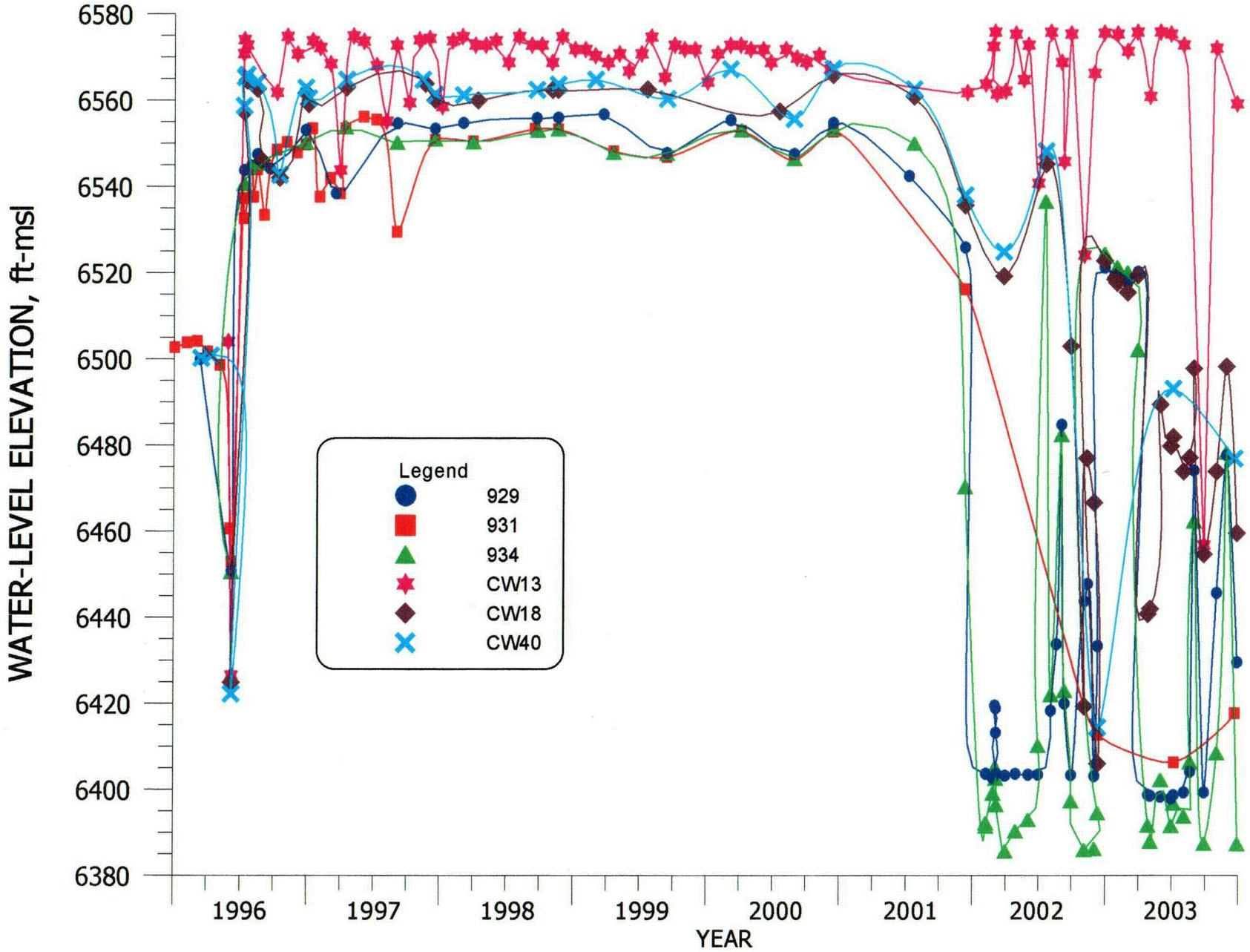

FIGURE 5.2-4. WATER-LEVEL ELEVATION FOR WELLS 929, 931, 934, CW13, CW18 AND CW40.

5.3 UPPER CHINLE WATER QUALITY

Water-quality data for 2003 for the Chinle aquifers is presented in Tables B.5-1 and B.5-2 of Appendix B. The basic well data is presented in Tables 5.1-1 through 5.1-4 and Figure 5.1-2 shows locations of the Upper Chinle wells.

Concentrations of key constituents exceed background conditions for the Upper Chinle aquifer in only a few locations. Sulfate concentrations have been adequately restored in the Upper Chinle aquifer except for an area near the northeast corner of the Large Tailings pile. Selenium concentrations during 2003 are less than or equal to the proposed NRC site standard in all Upper Chinle wells except well CE5 and well 945 where measured concentrations slightly exceed the standards. Uranium concentrations exceed the full range of background in six wells. The slower pace of restoration is attributed to leaching of this constituent from the formation. Molybdenum concentrations in the Upper Chinle aquifer exceed the background level in five wells located near the Large Tailings pile.

5.3.1 SULFATE - UPPER CHINLE

Figure 5.3-1 presents sulfate concentrations in the Upper Chinle aquifer during 2003. Upper Chinle sulfate concentrations varied from 249 to 1050 mg/l. Only the value from well CW3 exceeded the full range of the non-mixing zone background concentration of 914 mg/l in the Upper Chinle in 2003. None of the Upper Chinle concentrations in the mixing zone (see Section 3 or Figure 5.3-2 for zone areas) exceeded the mixing-zone sulfate background value of 1750 mg/l. Proposed NRC Upper Chinle standards based on background data are presented for sulfate in the legend of Figure 5.3-1. These proposed site standards have a greater than sign in front of the numeric value which is associated with the pattern for the particular zone. Therefore, only a small area near well CW3 requires restoration with respect to sulfate. Earlier in this report, Section 3 presented information about the analysis of background results that were used to develop the proposed background and NRC standards.

The locations of wells used in the time plots of water quality are presented on Figure 5.3-2. The color and symbol of the individual wells correspond with those used on the various water-quality time plots. Sulfate time-plot figure numbers are also shown on Figure 5.3-2 for each group. The same color and symbol scheme is also used for other constituents in the Upper Chinle. Notations on Figure 5.3-2 indicate that Upper Chinle wells 446, 494, CW3, CE2, CE5

and CW50 are grouped together on the water-quality time plots, and wells 929, 934, CW18 and CW40 are grouped together on a second plot.

Figure 5.3-3 presents sulfate concentrations versus time for the first group of the above listed Upper Chinle wells. The sulfate concentrations in water sampled from each of these wells are less than the mixing-zone background value, indicating that restoration of the Upper Chinle is not needed west of the East Fault in the mixing zone (see Figure 5.3-3). Sulfate concentrations in well CE2, near the subcrop area south of the Large Tailings pile, have declined to a level below those in the remainder of the Upper Chinle wells. A small increase in sulfate concentration was observed in well CW3 due to the continued pumping of this well. The increase in sulfate concentration in well CE5, subsequent to a dramatic decrease, was due to the cessation of R.O. product water injection into well CW4R. Injection into CW4R with fresh water was reinitiated in August of 2003.

A plot of sulfate concentrations versus time for Upper Chinle wells 929, 934, CW18 and CW40 is presented on Figure 5.3-4 (see Figure 5.3-2 for location of these wells). This plot shows some variability, but an overall gradual decrease in sulfate concentrations in these Upper Chinle wells over the last few years.

5.3.2 TOTAL DISSOLVED SOLIDS - UPPER CHINLE

Figure 5.3-5 presents contours of total dissolved solids (TDS) concentrations for the Upper Chinle aquifer during 2003. All concentrations are less than 2000 mg/l, with the exception of areas of the Upper Chinle near the Large Tailings pile and east of State Highway 605 in Section 35. The TDS concentration naturally increases with increasing distance east of the East Fault due to the slower movement of ground water in this less transmissive portion of the aquifer. The blue pattern on Figure 5.3-5 shows where the Upper Chinle TDS concentrations are greater than 2010 mg/l, which is the non-mixing zone proposed site standard. The Upper Chinle aquifer near the northeast corner of the Large Tailings pile still requires a small amount of restoration with respect to TDS concentration.

Figure 5.3-6 presents TDS concentrations for Upper Chinle wells 446, 494, CE2, CE5, CW3 and CW50. The TDS concentrations in well CE2 have continued to decline in 2003. All of these wells contain water with TDS concentrations less than the mixing- zone background

level of 3140 mg/l. A small additional increase in the TDS concentration in well CW3 occurred in 2003 and is attributable to the continuous pumping of this well.

Time plots of TDS concentrations for wells 929, 934, CW18 and CW40 are presented in Figure 5.3-7. This figure shows an overall gradual increase in TDS concentrations in wells 929 and 934 over the last two years. These small changes are well within the natural fluctuation in TDS in the Upper Chinle aquifer.

5.3.3 CHLORIDE – UPPER CHINLE

Chloride concentrations in the Upper Chinle aquifer during 2003 are presented on Figure 5.3-8. In the two new up-gradient Upper Chinle wells CW50 and CW52, chloride concentrations are slightly greater than 100 mg/l. Chloride concentrations are typically measured to be between 100 and 220 mg/l in the Upper Chinle aquifer, because this range encompasses natural variations and the range of injection water chloride concentration. The chloride concentrations in the two very low permeability wells south of the Large Tailings pile, CE1 and CW9, are less than 100 mg/l. East of the East Fault chloride concentrations naturally increase due to the slower movement of ground water with increasing distance east of the East Fault. The chloride concentration in well 945 is naturally occurring and is substantially greater than the remainder of chloride concentrations measured in the Upper Chinle aquifer.

The chloride concentrations in water collected from Upper Chinle wells 494, CE2, CE5, CW3 and CW50 are presented on Figure 5.3-9. In Upper Chinle well CE2 chloride concentrations have been steadily decreasing the last few years, and a significant increase in concentrations in well CW3 was observed in 2003 due to the continual pumping of this Upper Chinle well. Overall, the chloride concentrations in well 494 and CE5 have not changed significantly.

The chloride concentrations in the wells east of the East Fault are presented on Figure 5.3-10. This plot shows a significant increase in chloride concentrations in 2003 in wells 929 and 934 due to the fresh-water injection into Upper Chinle well CW13. The chloride concentrations in Upper Chinle wells CW18 and CW40 have increased slightly but were similar to the fresh-water injection concentration prior to the injection into well CW13. Fresh water is injected into well CW13 to maintain water levels east of the East Fault in the Upper Chinle aquifer.

5.3.4 URANIUM - UPPER CHINLE

Uranium is an important parameter for identifying impacts to the Upper Chinle aquifer. Figure 5.3-11 presents contours of uranium concentrations in the Upper Chinle aquifer for 2003. Only six of the uranium concentrations measured in Upper Chinle water in 2003 exceeded the corresponding mixing or non-mixing zone background concentrations. The highest value measured east of the East Fault in 2003 was observed in well 934 with a value of 0.07 mg/l. This value is below the corresponding non-mixing zone value of 0.09 mg/l. Six values in 2003 exceeded the proposed NRC Upper Chinle mixing and non-mixing zone standards for uranium (see legend for mixing and non-mixing zone limits in Figure 5.3-11). These concentrations are expected to gradually decrease to below background concentrations with the ongoing ground water-quality restoration efforts in the Large Tailings pile area.

Plots of uranium concentrations versus time for Upper Chinle wells 494, CE2, CE5, CW3 and CW50 are presented on Figure 5.3-12 (see Figure 5.3-2 for location of these wells). The increase in uranium concentration at well CW3 is due to the pumping of this well to supply water for flushing the tailings. This plot demonstrates that the uranium concentrations in Upper Chinle well CE5 declined in 2002 as a result of the nearby R.O. product injection, and subsequently rebounded in 2003 after the injection was stopped. Uranium concentrations in well 494 decreased very gradually over the last two years. The uranium concentrations in Upper Chinle collection well CE2 declined significantly in 2003 after an overall decline for the last few years. Uranium concentrations for background well CW50 (drilled in 2003) are low.

The uranium concentrations in all of the Upper Chinle wells east of Highway 605 are very low except for a slightly larger value measured in well 934. Figure 5.3-13 shows uranium concentration plotted versus time for Upper Chinle wells 929, 934, CW18 and CW40. The low uranium concentrations detected in well 934 during 2003 are within the natural background range. Concentrations in all of these wells are less than the proposed NRC site standard.

5.3.5 SELENIUM - UPPER CHINLE

Contours of 2003 selenium concentrations in the Upper Chinle aquifer are presented on Figure 5.3-14. This figure shows that all of the selenium concentrations are less than the mixing-zone site standard of 0.14 mg/l except at well CE5. The non-mixing zone NRC site

standard of 0.06 mg/l is slightly exceeded at well 945 and in the Upper Chinle aquifer in the area near the northeast corner of the Large Tailings pile. The mixing and non-mixing zone proposed standards are equal to the upper background levels based on the 95th percentile in the aquifer.

Figure 5.3-15 presents selenium concentrations for wells 494, CE2, CE5, CW3 and CW50. The selenium concentration in water collected from Upper Chinle well CW3 was fairly steady in 2003 and has remained fairly steady since an increase was detected in 2001 and 2002. The selenium concentration in collection well CE2 stabilized in 2002 and 2003 following a steady decline previously, whereas in well CE5, selenium concentration increased to a level slightly larger than that observed in 2001. The selenium concentrations for all of the remaining wells on this plot are low.

Figure 5.3-16 presents the selenium concentrations for Upper Chinle wells 929, 934, CW18 and CW40. This plot shows that selenium concentrations during 2003 for these wells have remained low. The previously observed decreases in selenium concentrations in wells CW40 and CW18 were due to the injection of fresh water in Upper Chinle well CW13 east of the East Fault.

5.3.6 MOLYBDENUM - UPPER CHINLE

Figure 5.3-17 presents the molybdenum concentrations in the Upper Chinle aquifer during 2003. Molybdenum concentrations near the Large Tailings pile exceeded both the mixing and non-mixing zone proposed NRC site standards. Concentrations are greater than 1.0 mg/l in a region extending from the Upper Chinle-alluvium subcrop area, below the Large Tailings pile, and toward well CW3. Additional restoration is needed in this area, and should be easily accomplished after the alluvial aquifer is restored in the subcrop area. All molybdenum concentrations south of the Small Tailings pile and east of the East Fault in the Upper Chinle aquifer are below the proposed site standards.

Figure 5.3-18 presents molybdenum concentrations for Upper Chinle wells between the two faults. In 2003, concentrations in wells 494, CE2 and CE5 were fairly similar to those observed in previous years. Concentrations increased slightly at well CW3 in 2003 after a larger increase was reported in 2001.

Figure 5.3-19 contains time plots of molybdenum concentrations for wells 929, 934, CW18 and CW40. Small concentrations of molybdenum are generally present in each of these wells except for a prior-year increase observed in well 934, which subsequently decreased again in 2003.

5.3.7 NITRATE - UPPER CHINLE

Nitrate monitoring for the Upper Chinle aquifer was updated in 2003 to confirm that concentrations are significantly below the proposed background levels of 15 mg/l for the mixing zone and 4.9 mg/l for the non-mixing zone. Figure 5.3-20 presents nitrate concentrations in the Upper Chinle aquifer during 2003. The largest nitrate concentration observed in 2003 was 2.2 mg/l in well CE2 immediately south of the Collection Ponds. Therefore, all of the nitrate concentrations are significantly less than the two background levels. Routine monitoring of nitrate concentrations in the Upper Chinle aquifer is not warranted because concentrations are well below levels of concern.

Plots of nitrate concentration versus time were not prepared, because historic values in Upper Chinle wells are similar to the low concentrations measured in 2003. In the future, nitrate concentrations in the Upper Chinle aquifer are not expected to be significant because of the very limited extent of elevated concentrations in the alluvial aquifer. Therefore, a site standard for nitrate for the Upper Chinle aquifer is not considered necessary.

5.3.8 RADIUM-226 AND RADIUM-228 - UPPER CHINLE

All radium concentrations in the Upper Chinle aquifer have been low in past years. Radium concentrations were analyzed for all Upper Chinle wells in 2003 to update the database. Figure 5.3-21 presents the radium-226 and the radium-228 concentrations. All of the radium-228 concentrations are less than 1 pCi/l except for wells CE1 and CW52. Laboratory measurements of radium-228 concentrations typically vary more than other constituents. The two previous radium-228 concentrations for well CW52 were less than the detection limit. This data shows that radium-226 and radium-228 are not present at concentrations that are significant in the Upper Chinle aquifer at the Homestake site. No concentration plots were prepared for

radium because observed concentrations have been low and remained so through 2003. A radium site standard is not considered to be necessary for the Upper Chinle aquifer.

5.3.9 VANADIUM - UPPER CHINLE

Vanadium concentrations have always been low in the Upper Chinle aquifer. The occurrence of significant concentrations in the Upper Chinle aquifer is unlikely because this constituent is not present at elevated concentrations in the alluvial aquifer with the exception of the immediate tailings area. Vanadium concentrations in the Upper Chinle aquifer have never been large enough to justify inclusion of this constituent as a site standard. Vanadium concentrations were measured in 2003 samples from the Upper Chinle aquifer. Figure 5.3-22 shows that all these vanadium concentrations are less than detection except for a value of 0.03 mg/l in well CW3. A small amount of restoration is needed in this area of the Upper Chinle aquifer based on the 2003 vanadium concentration. Additional measurement of vanadium concentrations in well CW3 is needed to confirm whether this value is representative of concentrations in this well.

5.3.10 THORIUM-230 - UPPER CHINLE

Thorium-230 concentrations have never been significant in the Upper Chinle aquifer. The thorium-230 concentrations for the Upper Chinle aquifer for 2003 are presented in Figure 5.3-23. This figure shows that the largest measured thorium-230 concentrations were 0.5 pCi/l in the two new up-gradient mixing zone wells CW50 and CW52. None of the concentrations exceed the proposed mixing zone or non-mixing zone background values of 0.97 and 0.55 pCi/l, respectively. No plots of the thorium-230 concentration with time were developed due to the lack of any significant change in the low concentrations over the period of record. Thorium-230 levels do not warrant this parameter being a site standard.

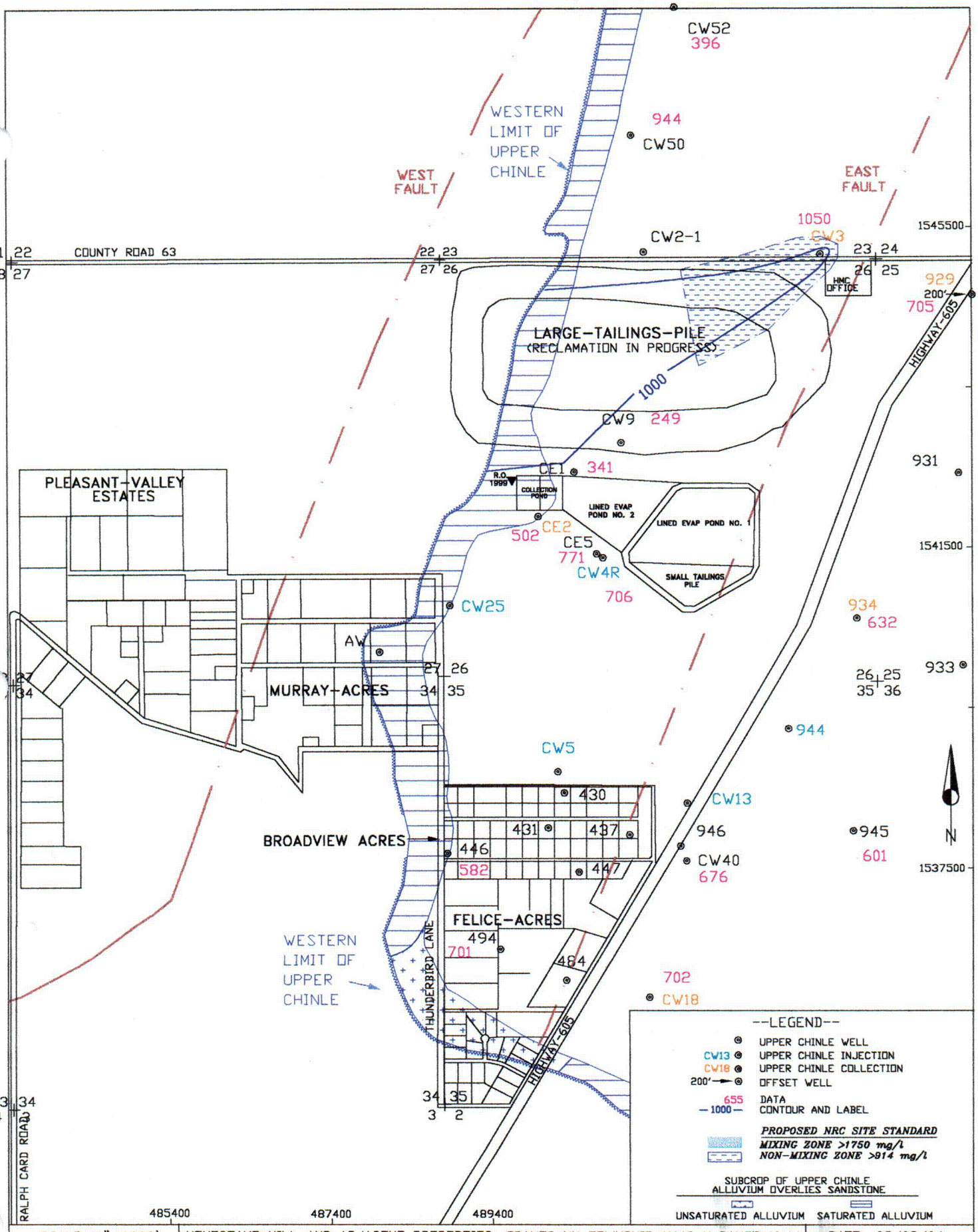

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FIGURE 5.3-1. SULFATE CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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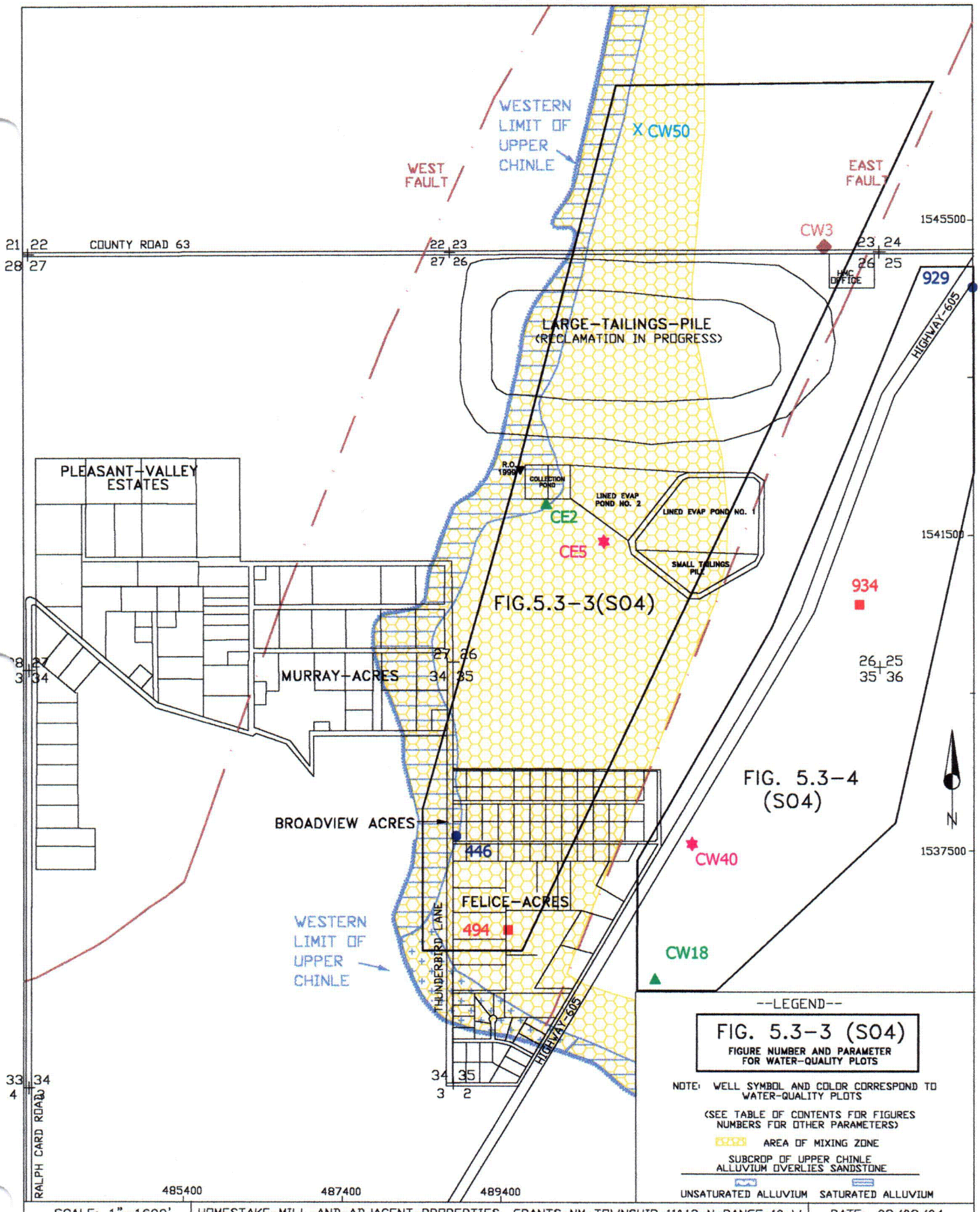
C156



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-2. LOCATION OF UPPER CHINLE WELLS WITH WATER-QUALITY PLOTS

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C157

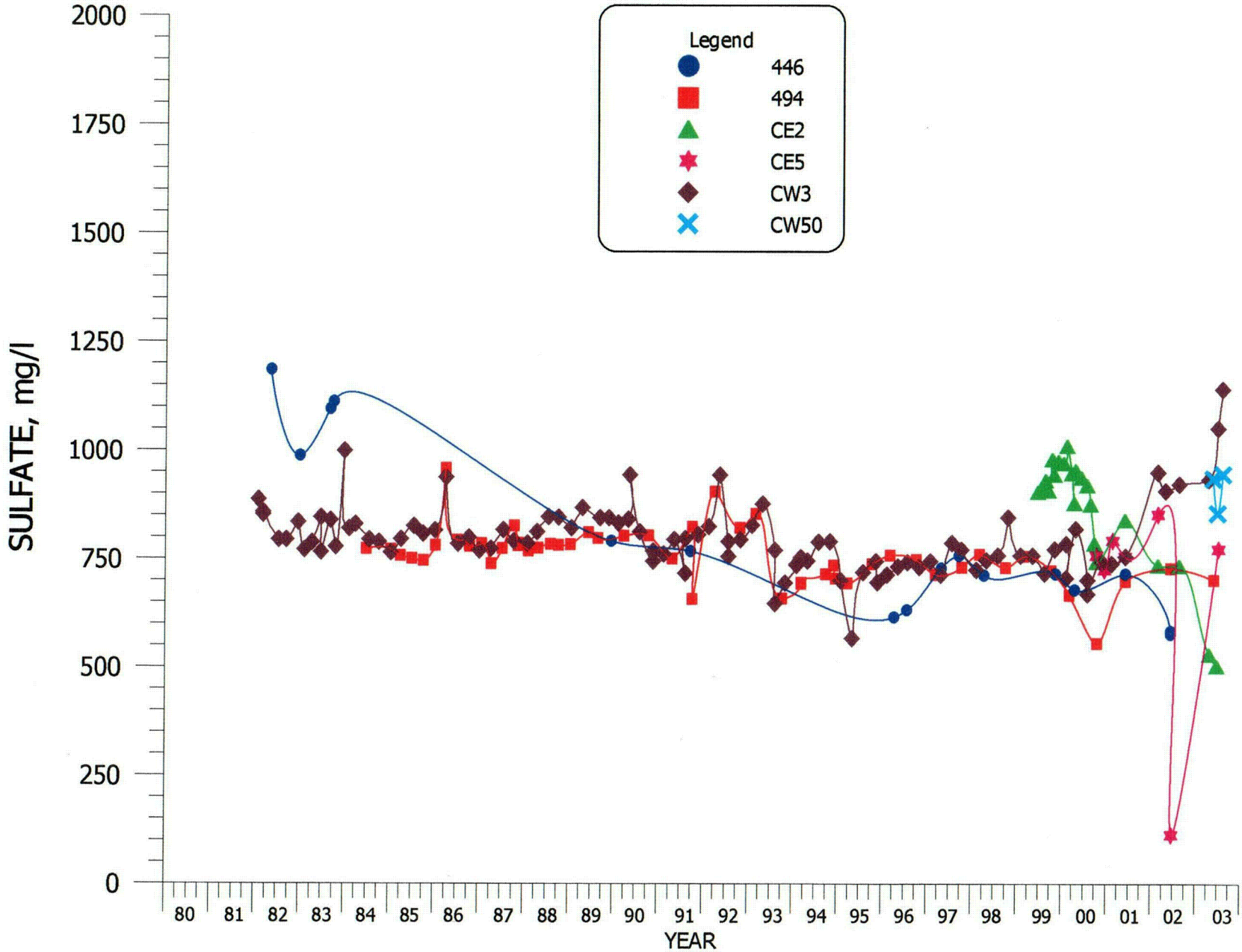


FIGURE 5.3-3. SULFATE CONCENTRATIONS FOR WELLS 446, 494, CE2, CE5, CW3 AND CW50.

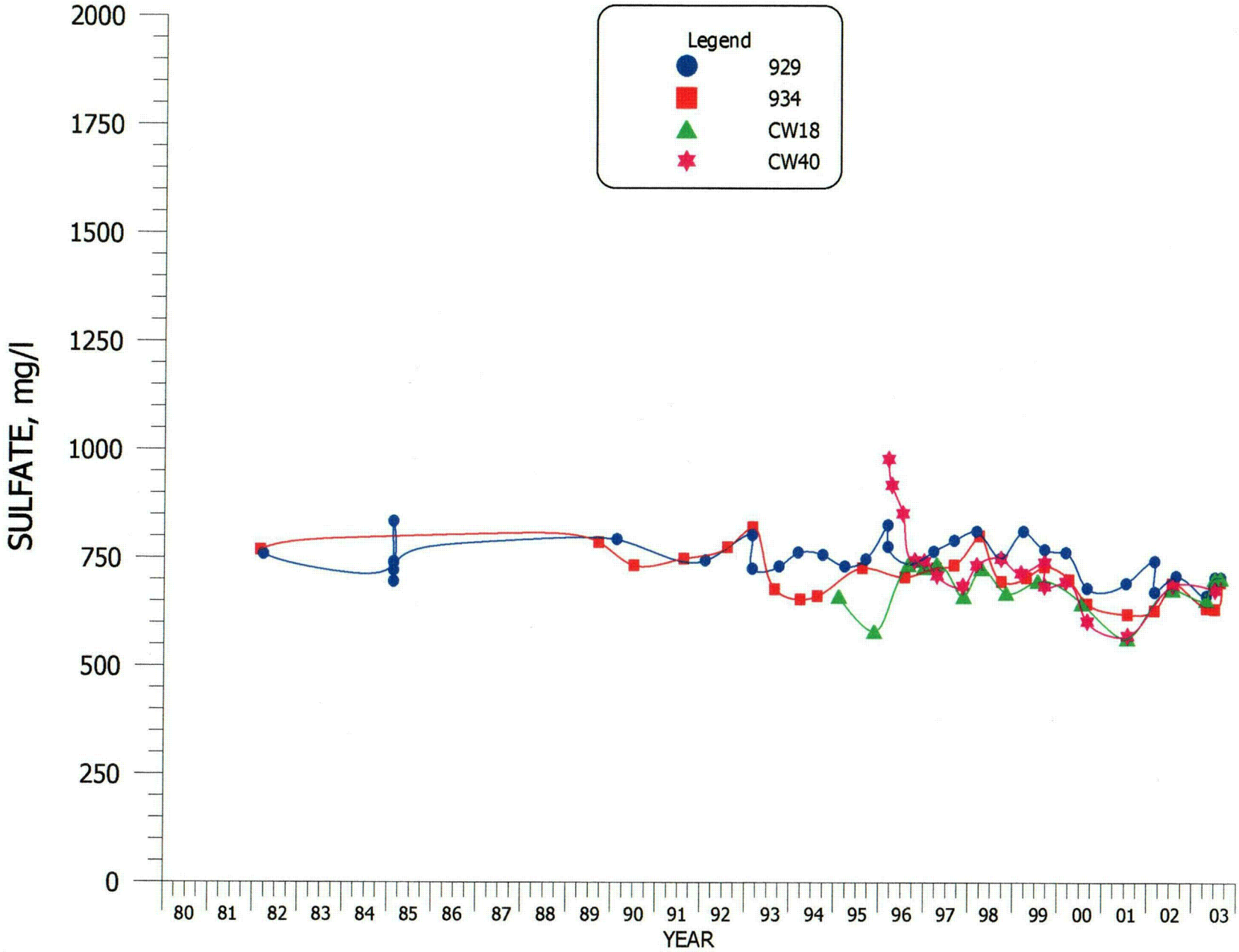
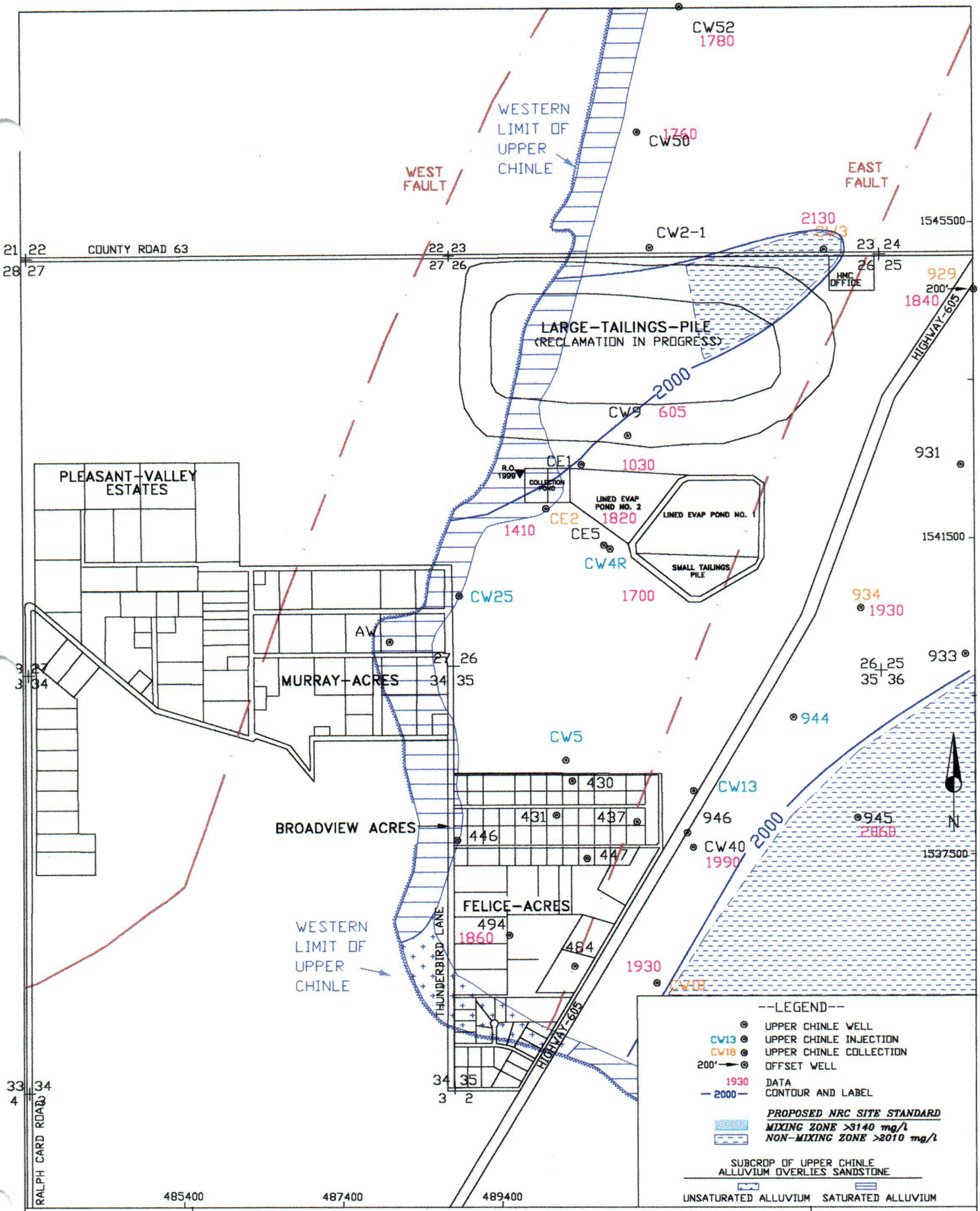


FIGURE 5.3-4. SULFATE CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-5. TDS CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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C160

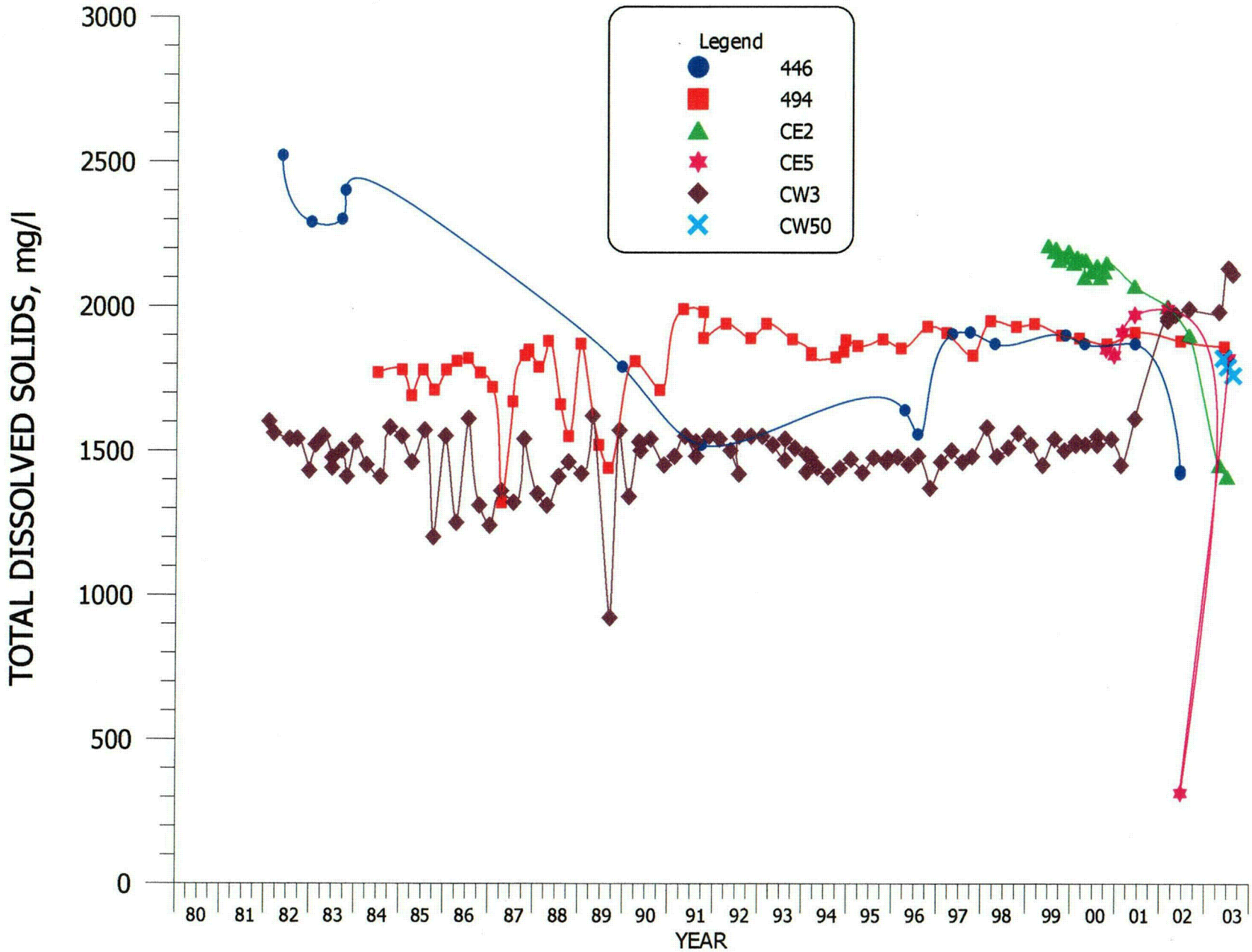


FIGURE 5.3-6. TDS CONCENTRATIONS FOR WELLS 446, 494, CE2, CE5, CW3 AND CW50.

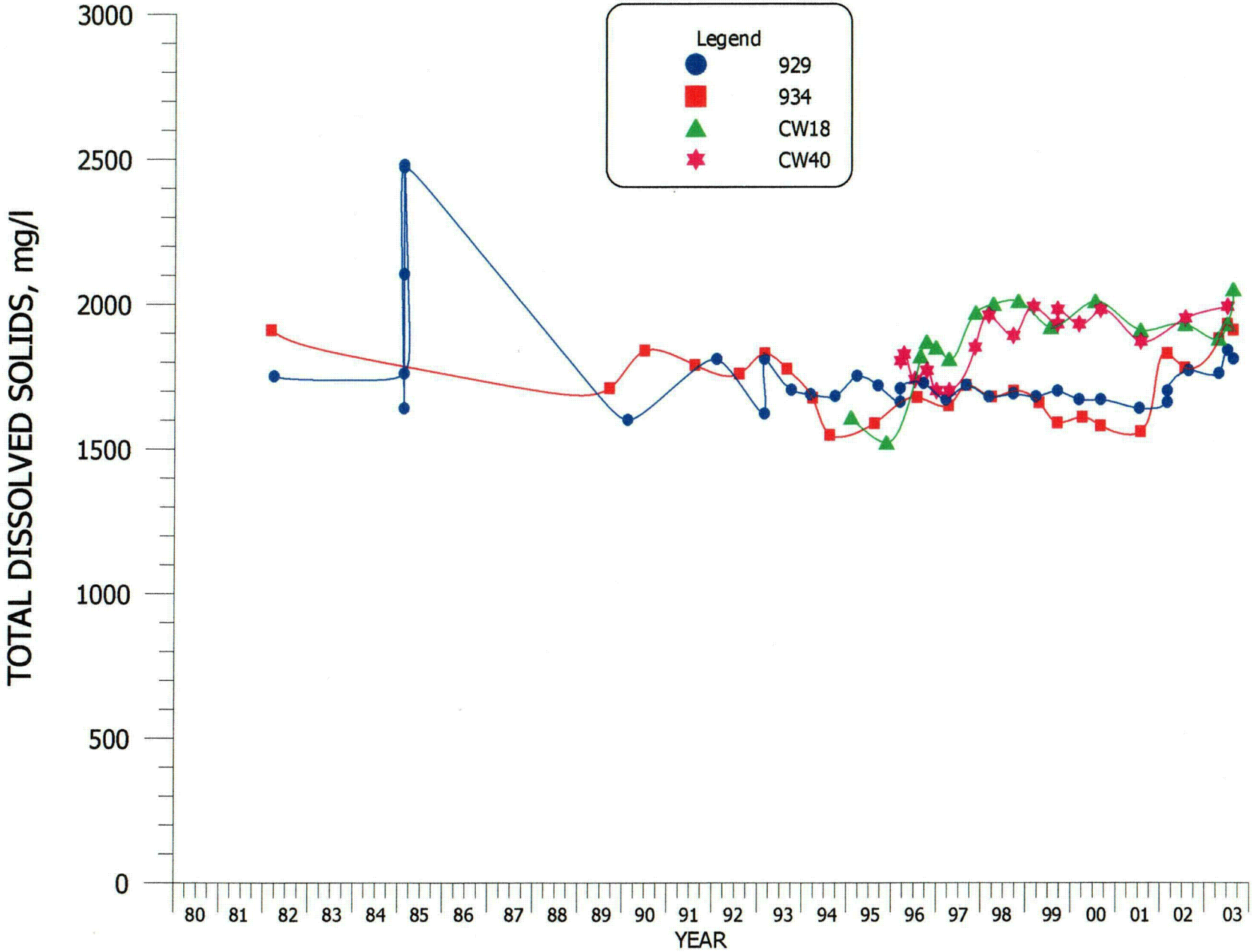
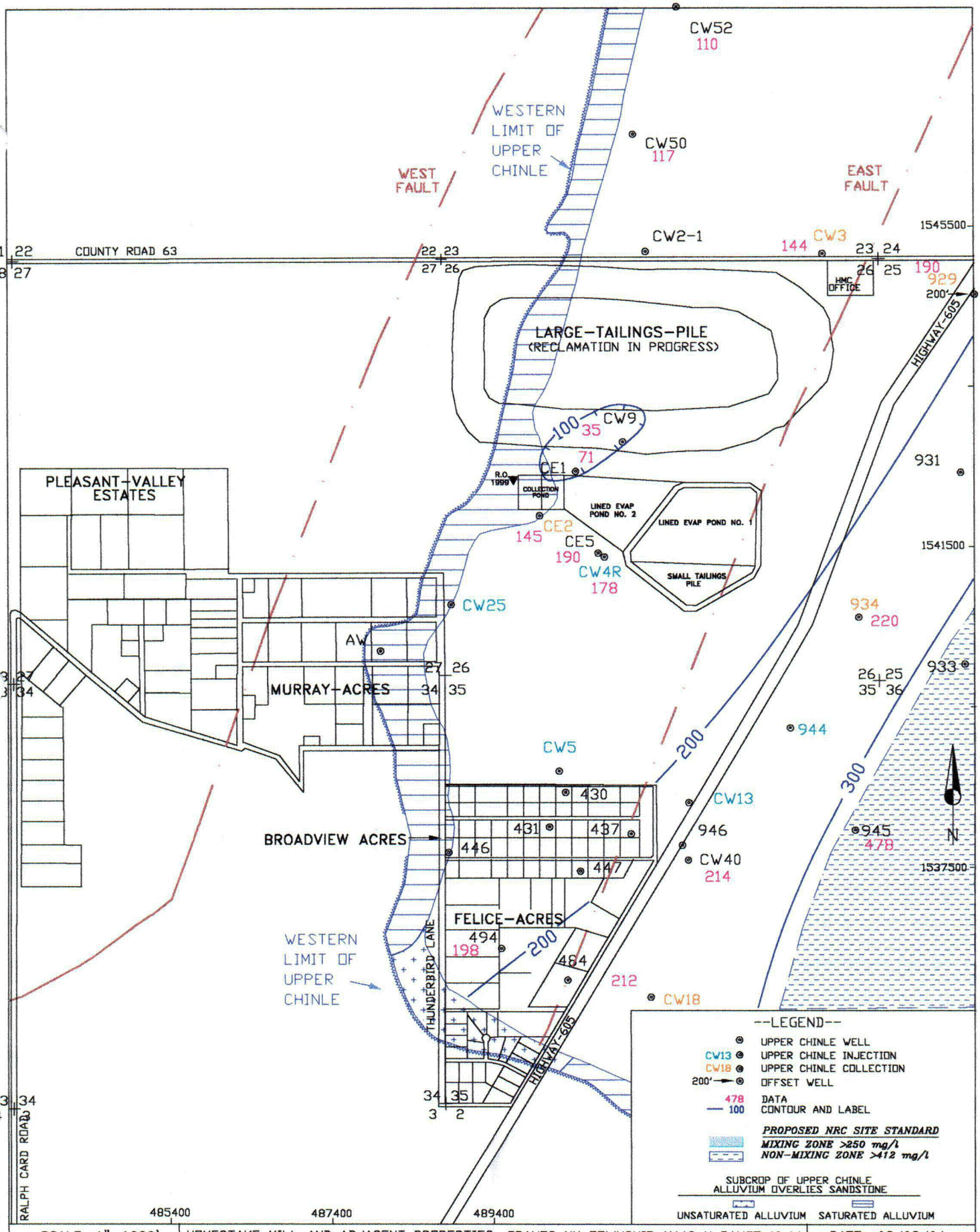


FIGURE 5.3-7. TDS CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/09/04

FIGURE 5.3-8. CHLORIDE CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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C163

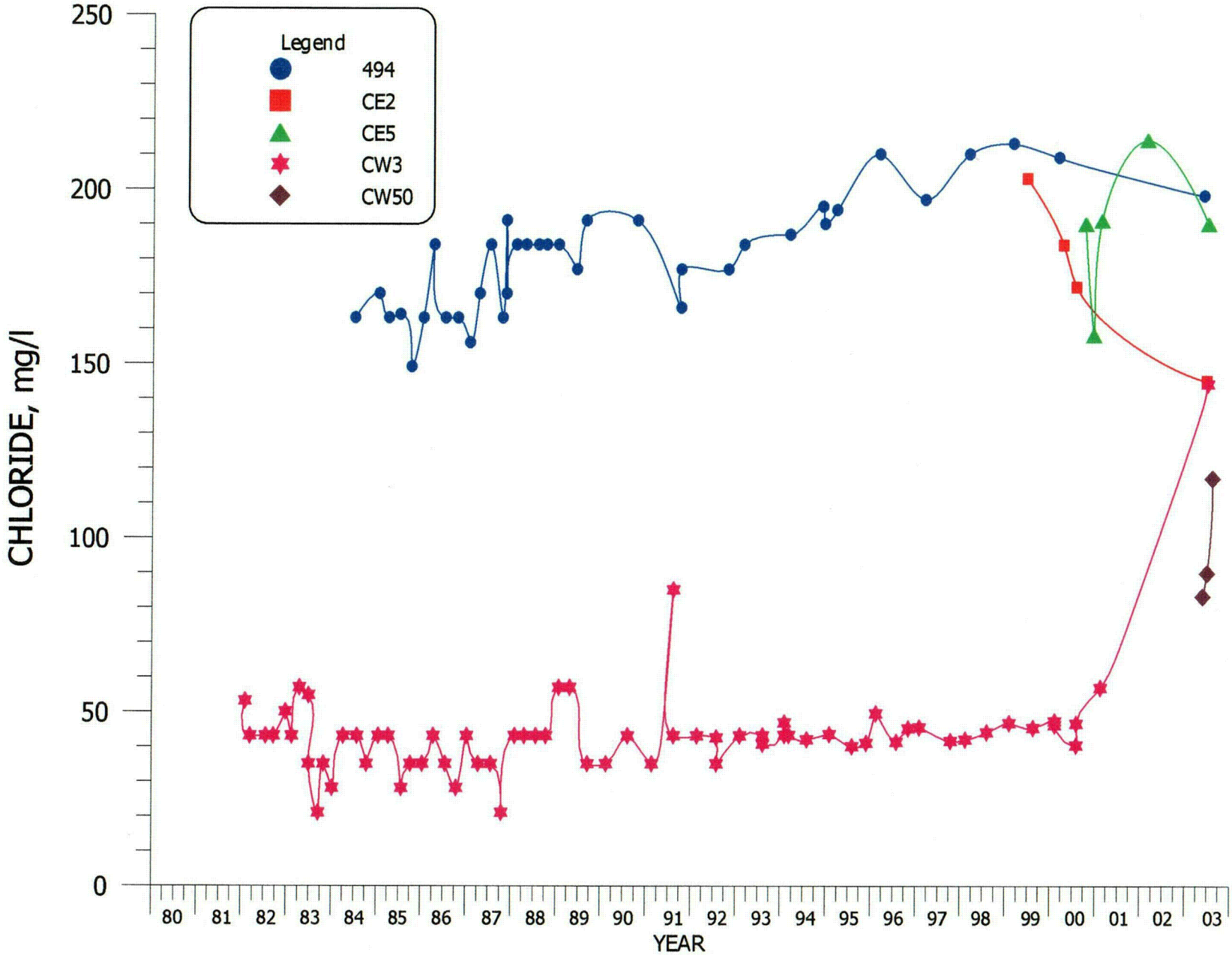


FIGURE 5.3-9. CHLORIDE CONCENTRATIONS FOR WELLS 494, CE2, CE5, CW3 AND CW50.

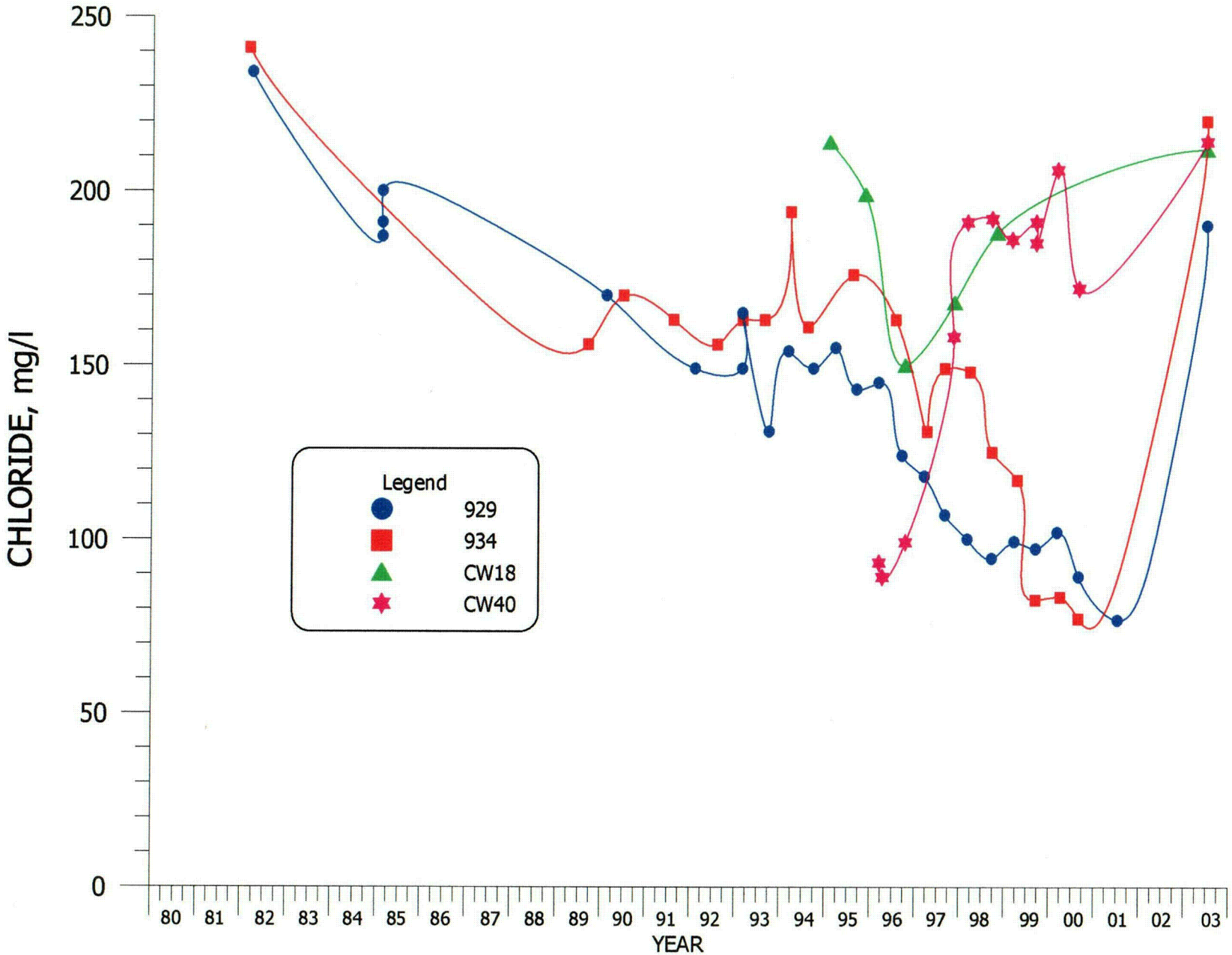
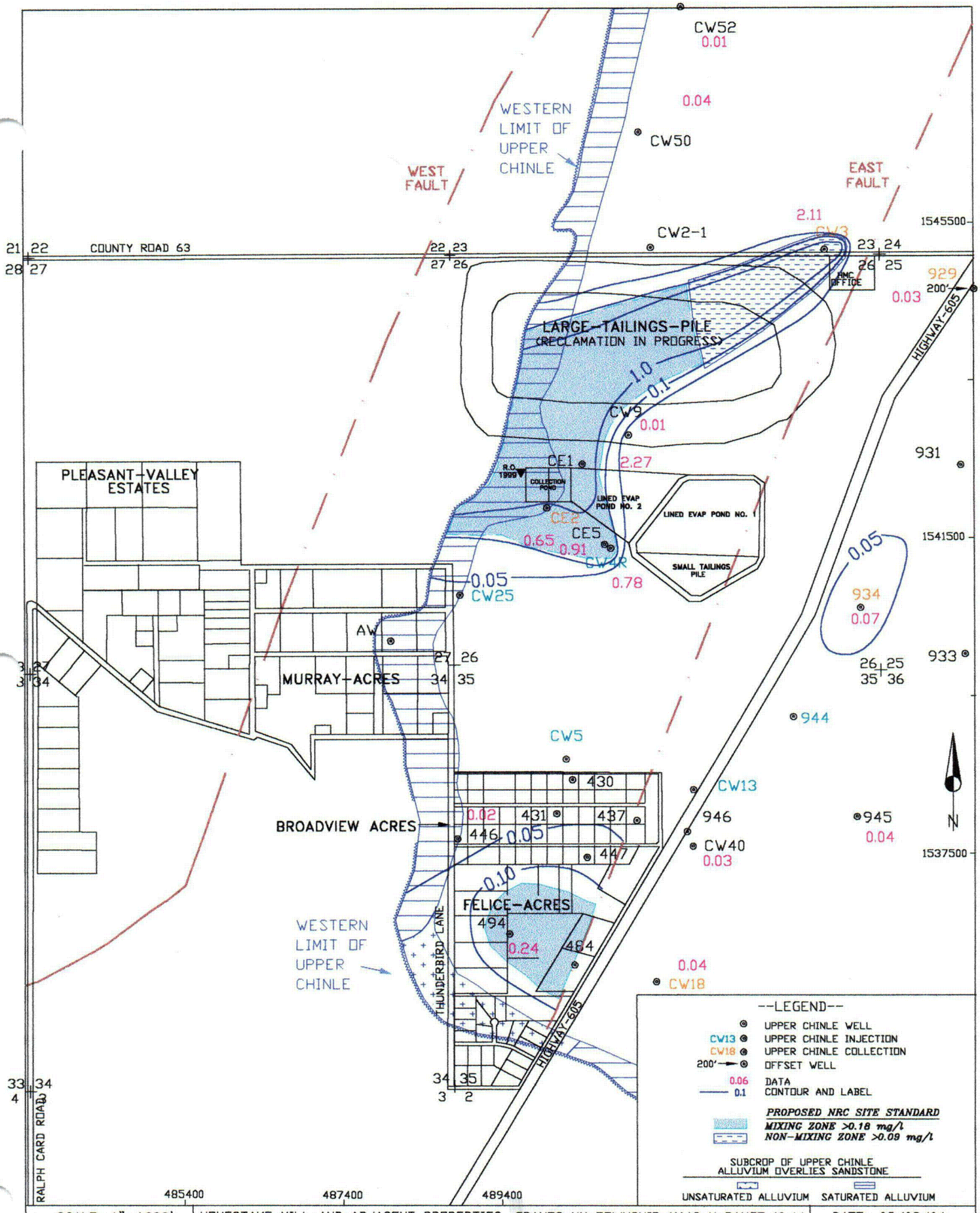


FIGURE 5.3-10. CHLORIDE CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-11. URANIUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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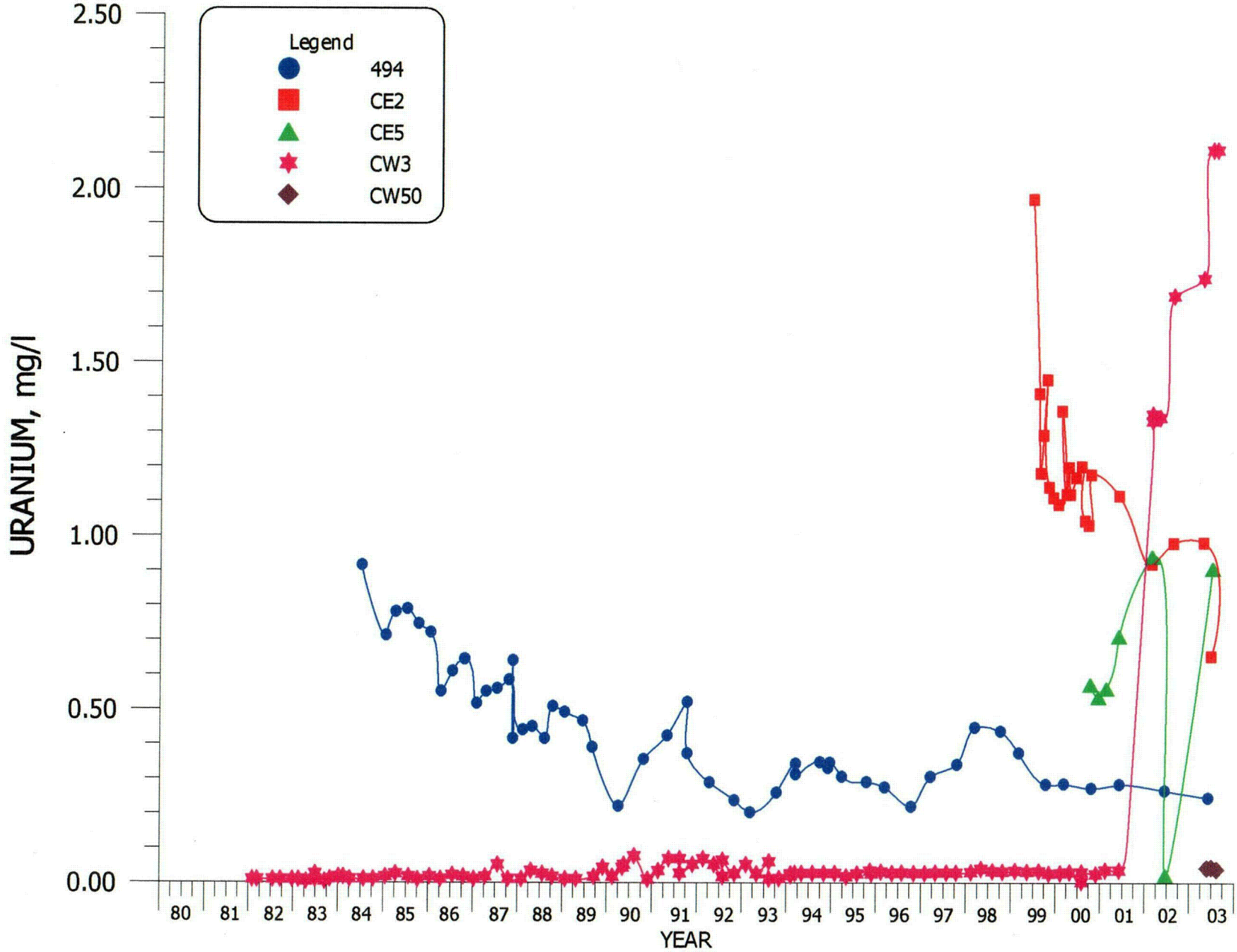


FIGURE 5.3-12. URANIUM CONCENTRATIONS FOR WELLS 494, CE2, CE5, CW3 AND CW50.

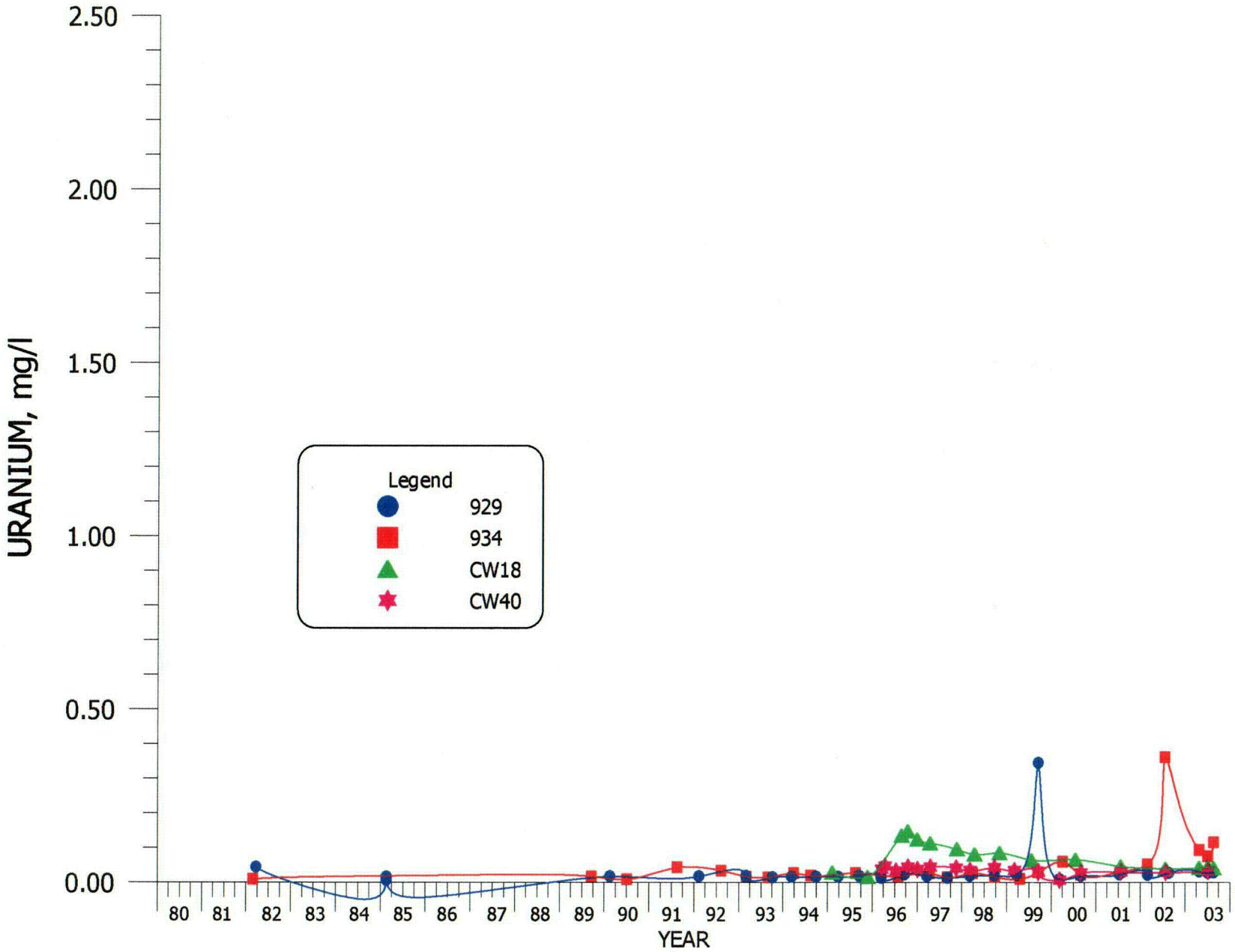
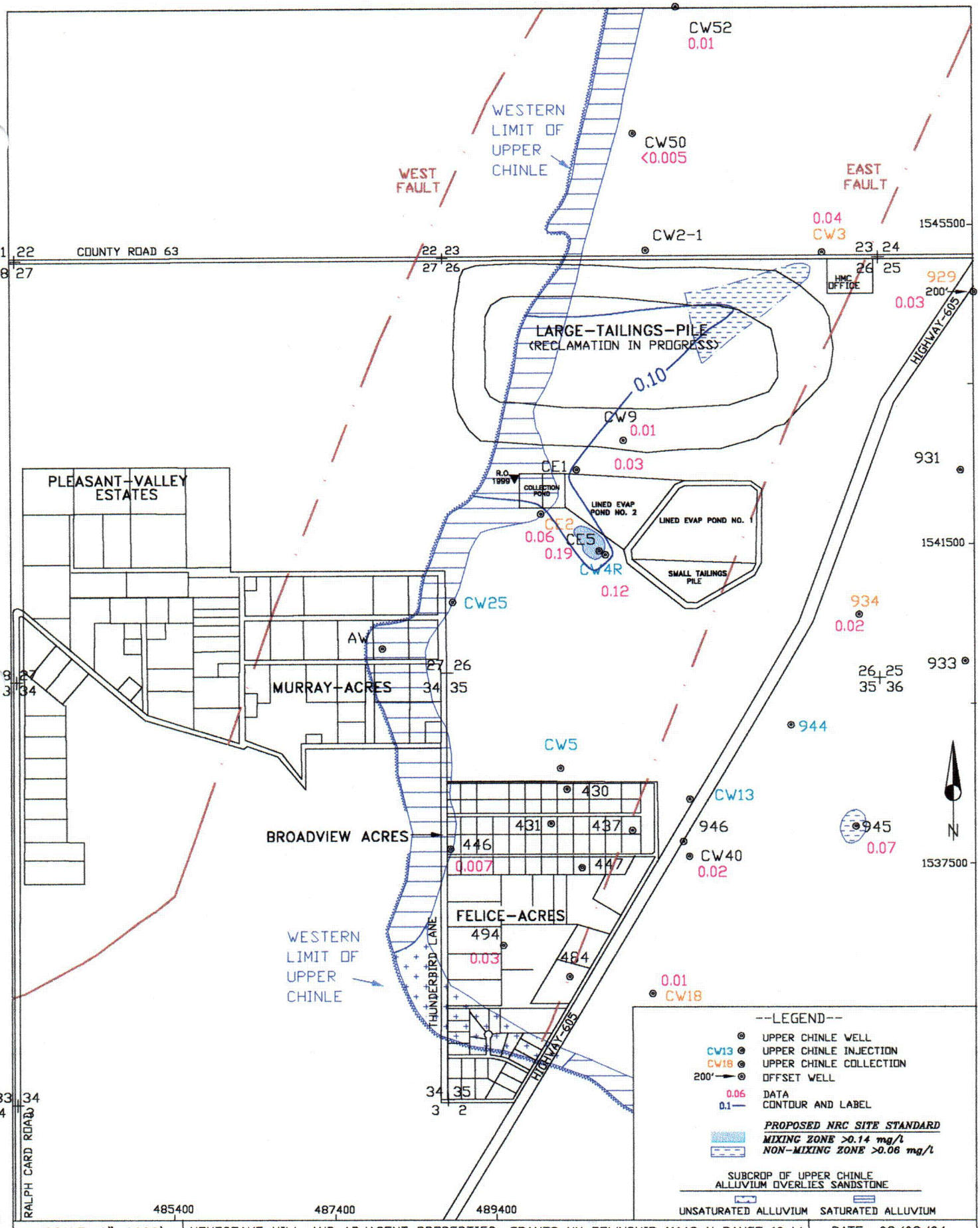


FIGURE 5.3-13. URANIUM CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/09/04

FIGURE 5.3-14. SELENIUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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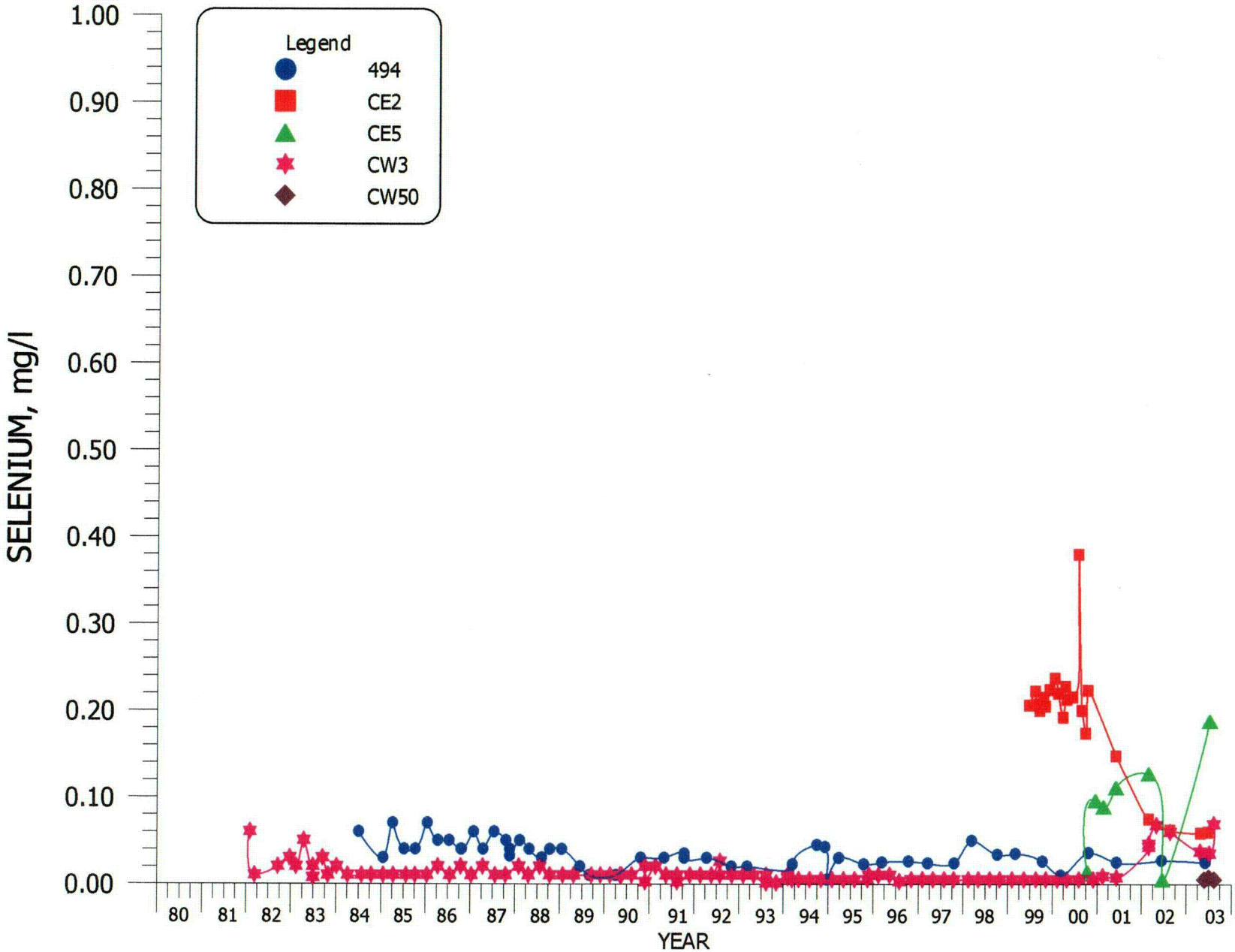


FIGURE 5.3-15. SELENIUM CONCENTRATIONS FOR WELLS 494, CE2, CE5, CW3 AND CW50.

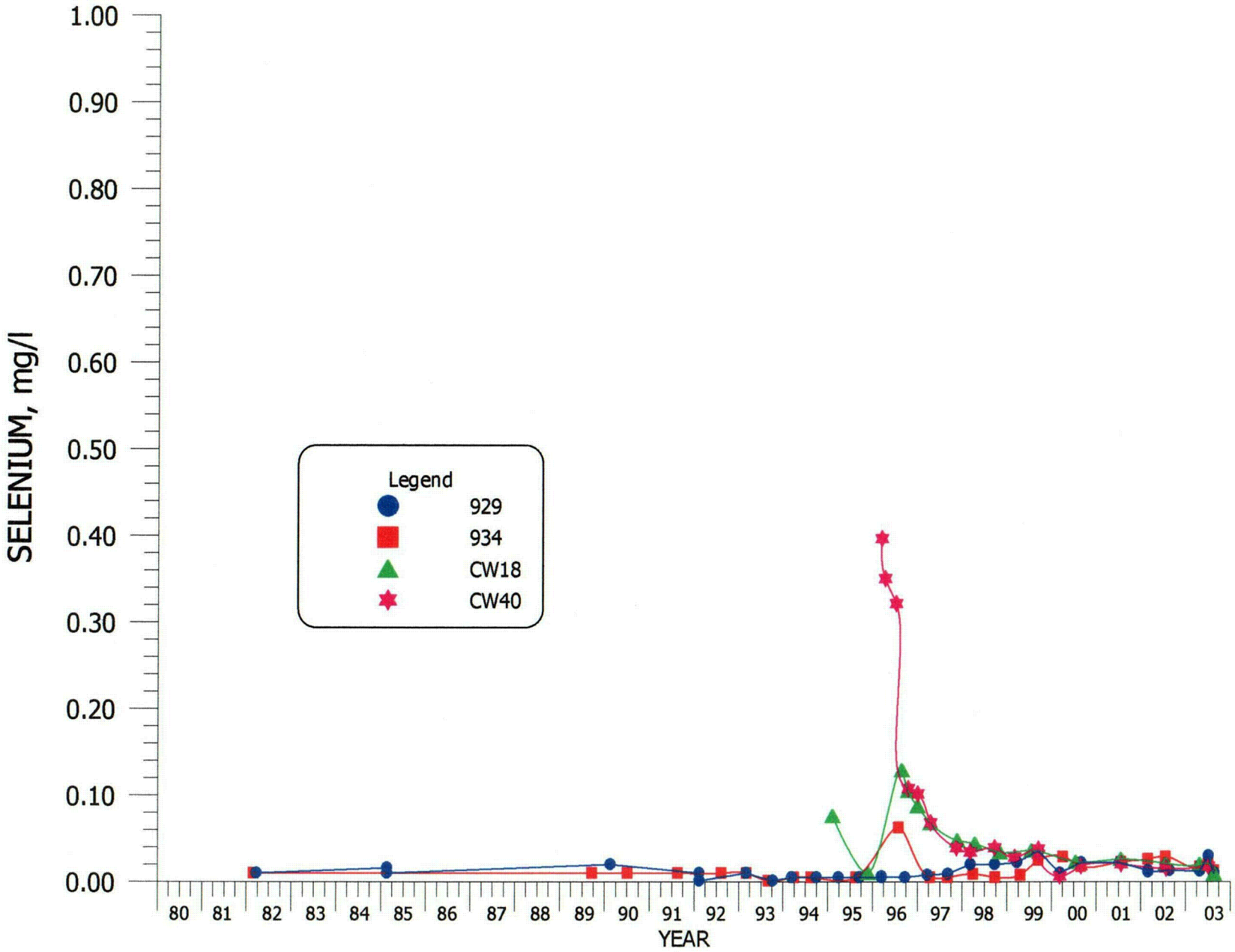
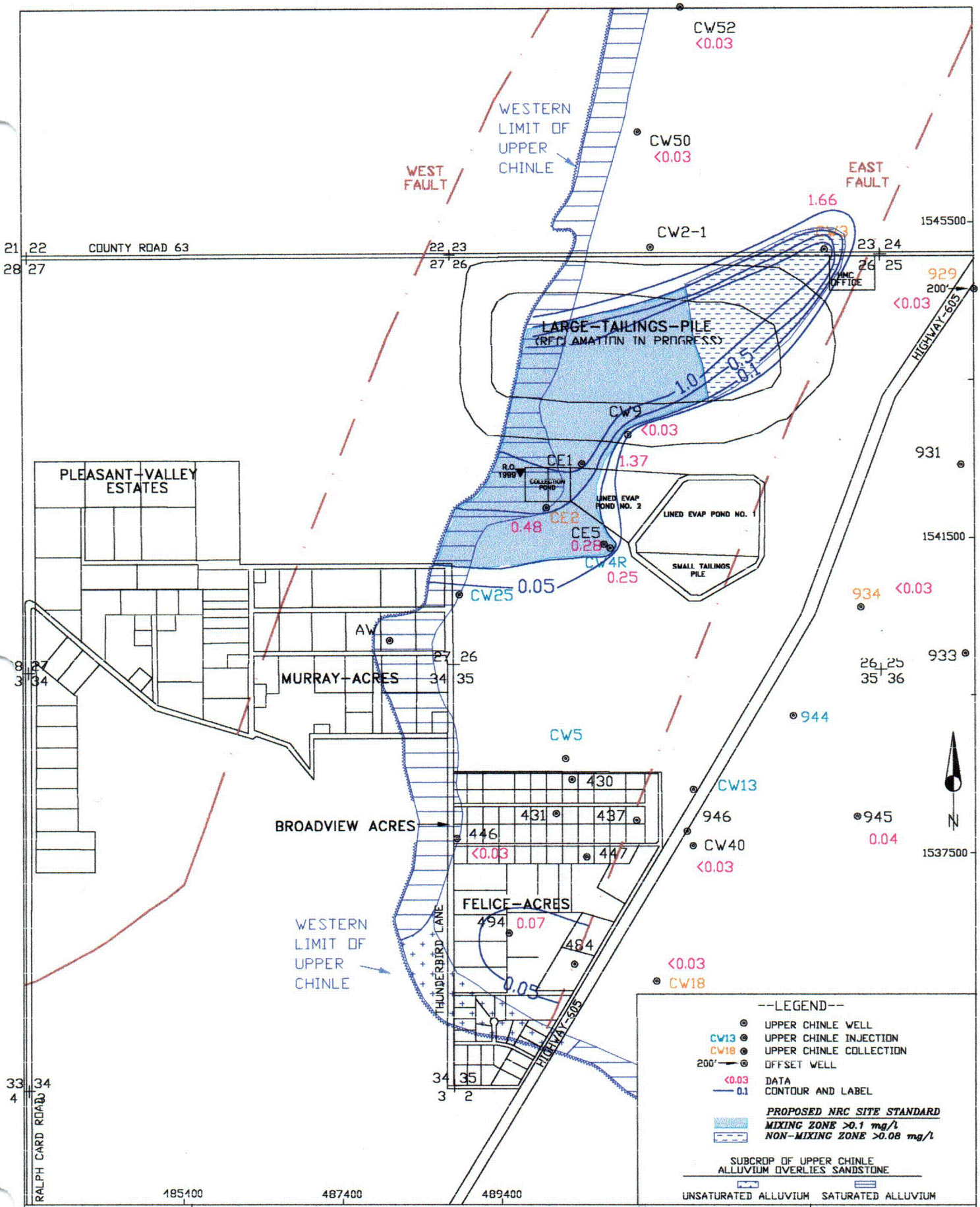


FIGURE 5.3-16. SELENIUM CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-17. MOLYBDENUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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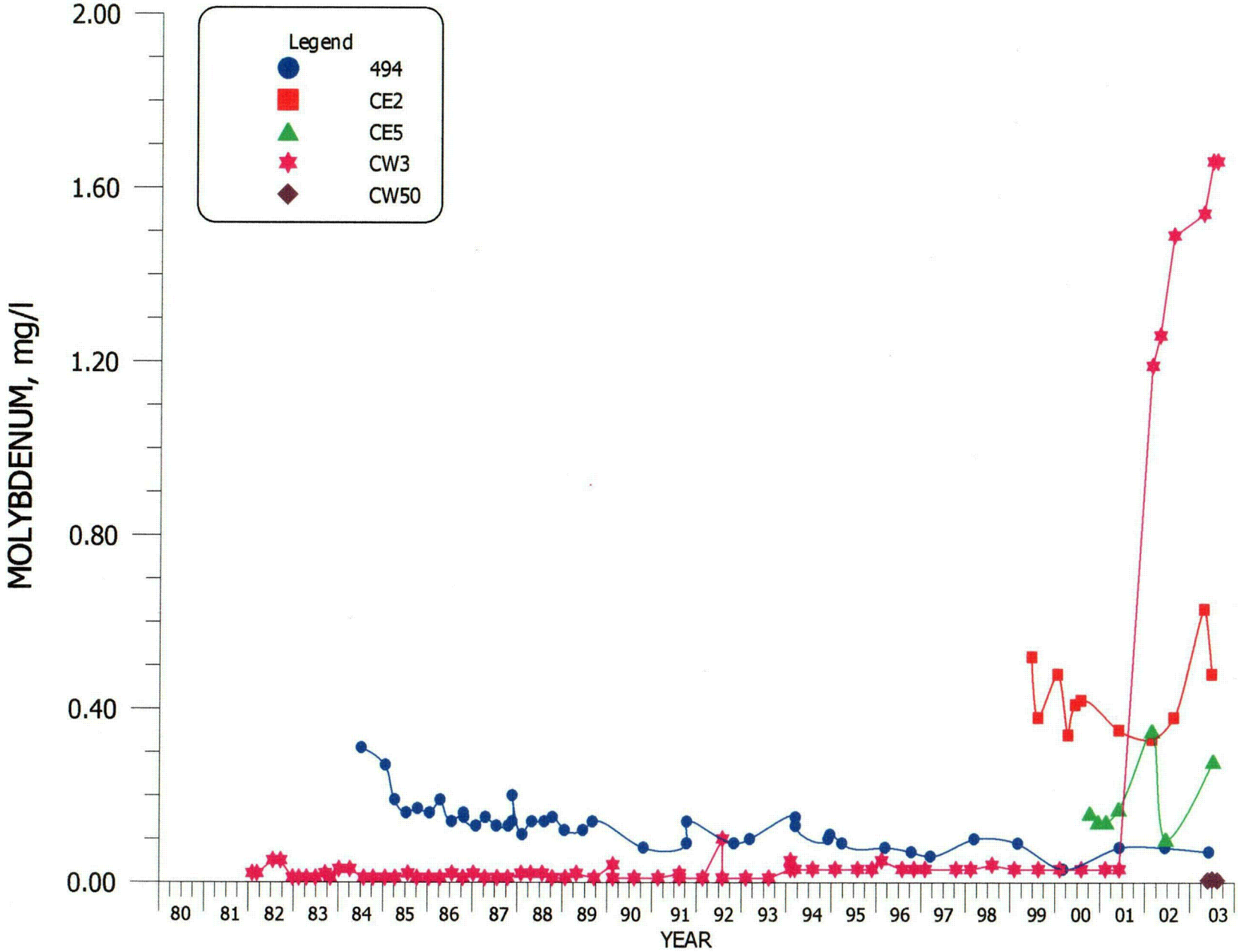


FIGURE 5.3-18. MOLYBDENUM CONCENTRATIONS FOR WELLS 494, CE2, CE5, CW3 AND CW50.

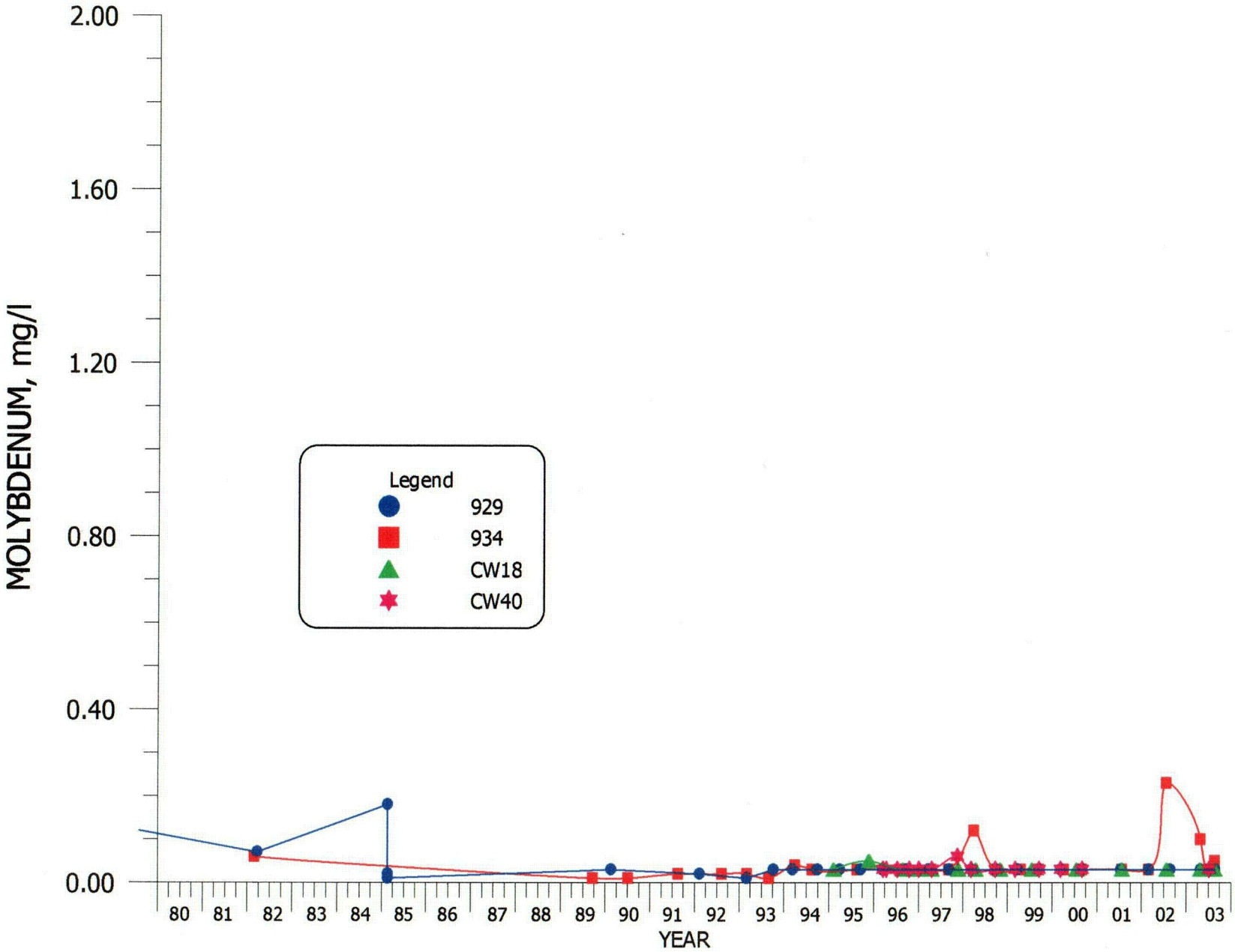
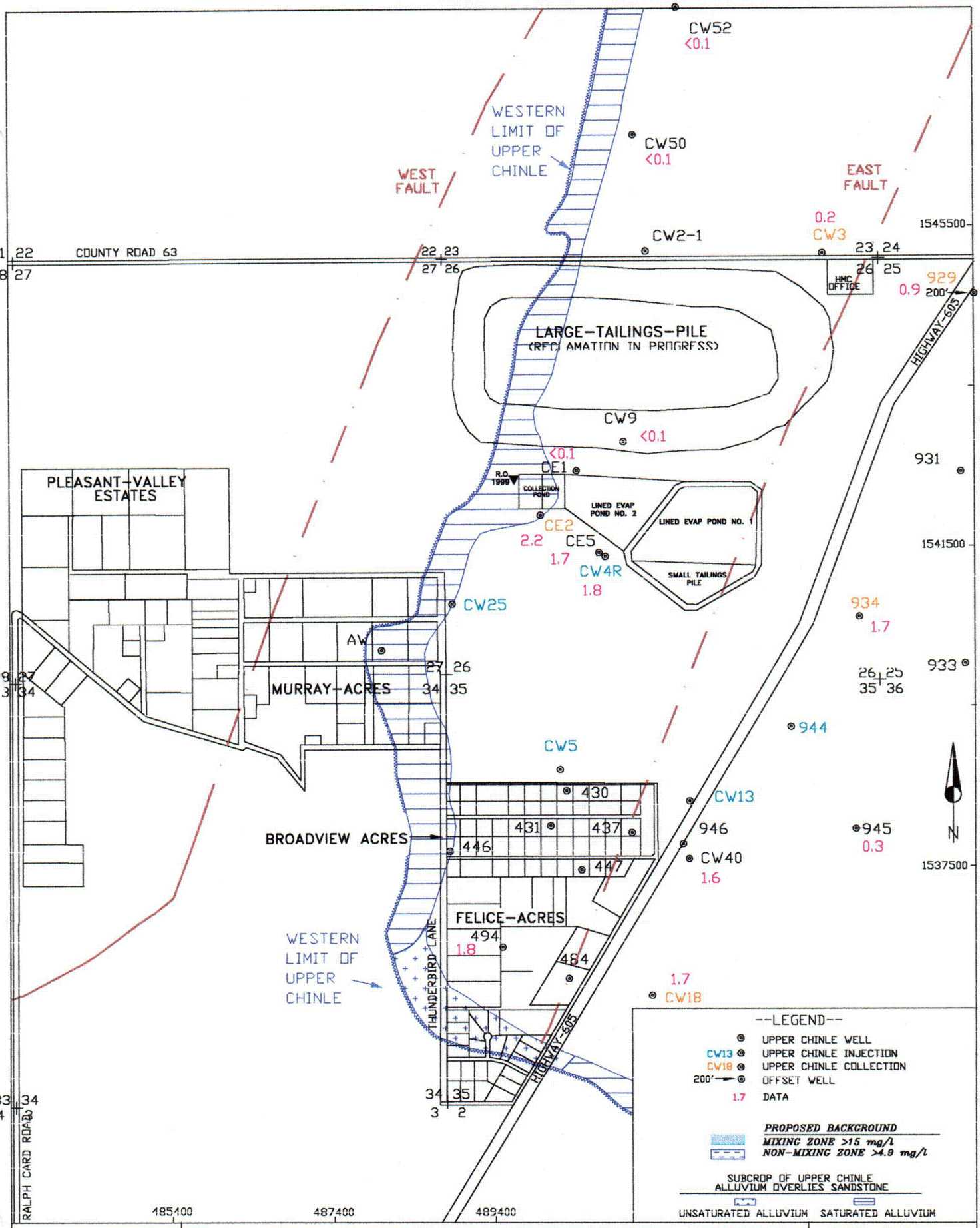


FIGURE 5.3-19. MOLYBDENUM CONCENTRATIONS FOR WELLS 929, 934, CW18 AND CW40.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-20. NITRATE CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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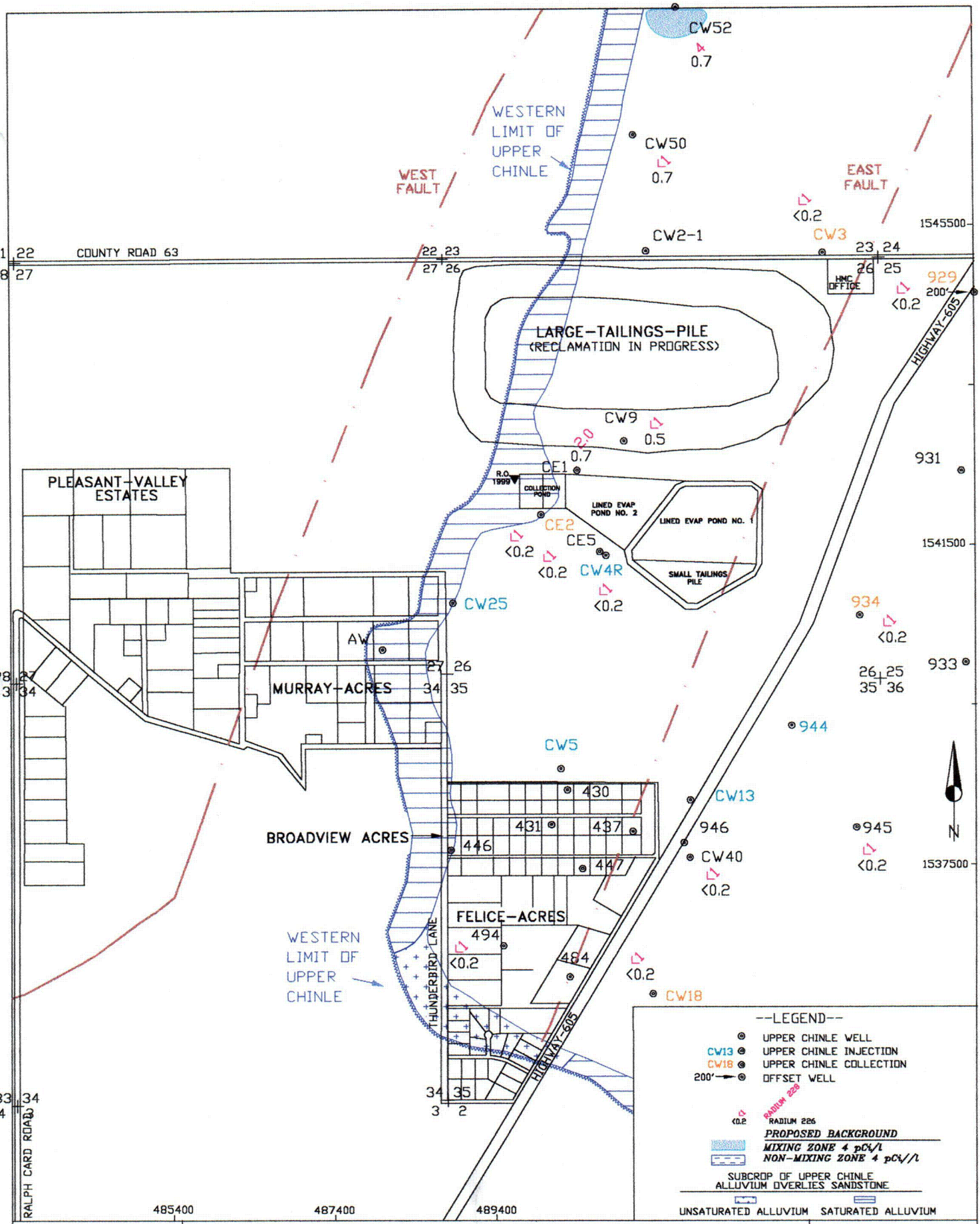
C175



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/09/04

FIGURE 5.3-21. RADIUM-226 AND RADIUM-228 CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, pCi/l

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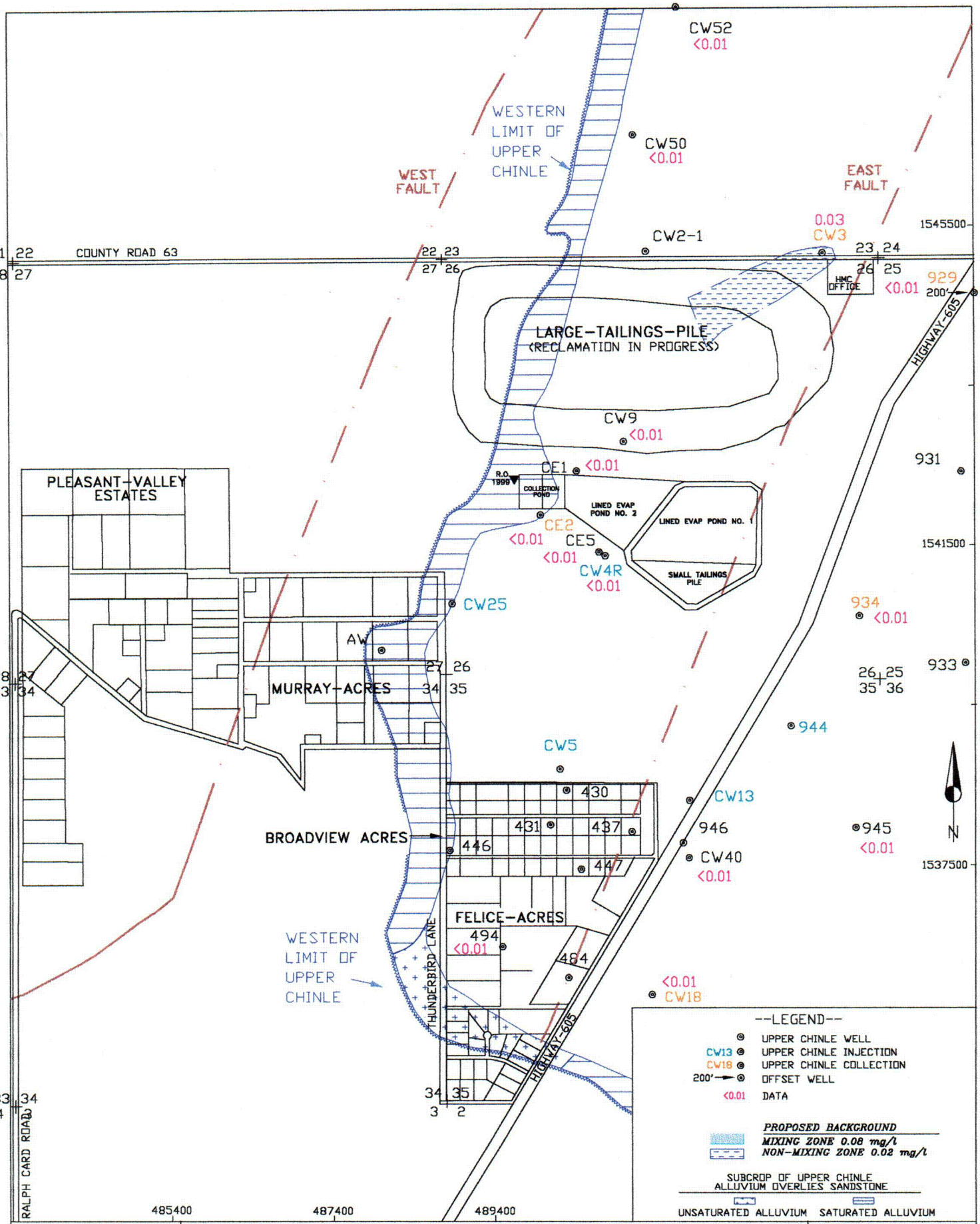
C176



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/09/04

FIGURE 5.3-22. VANADIUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, mg/l

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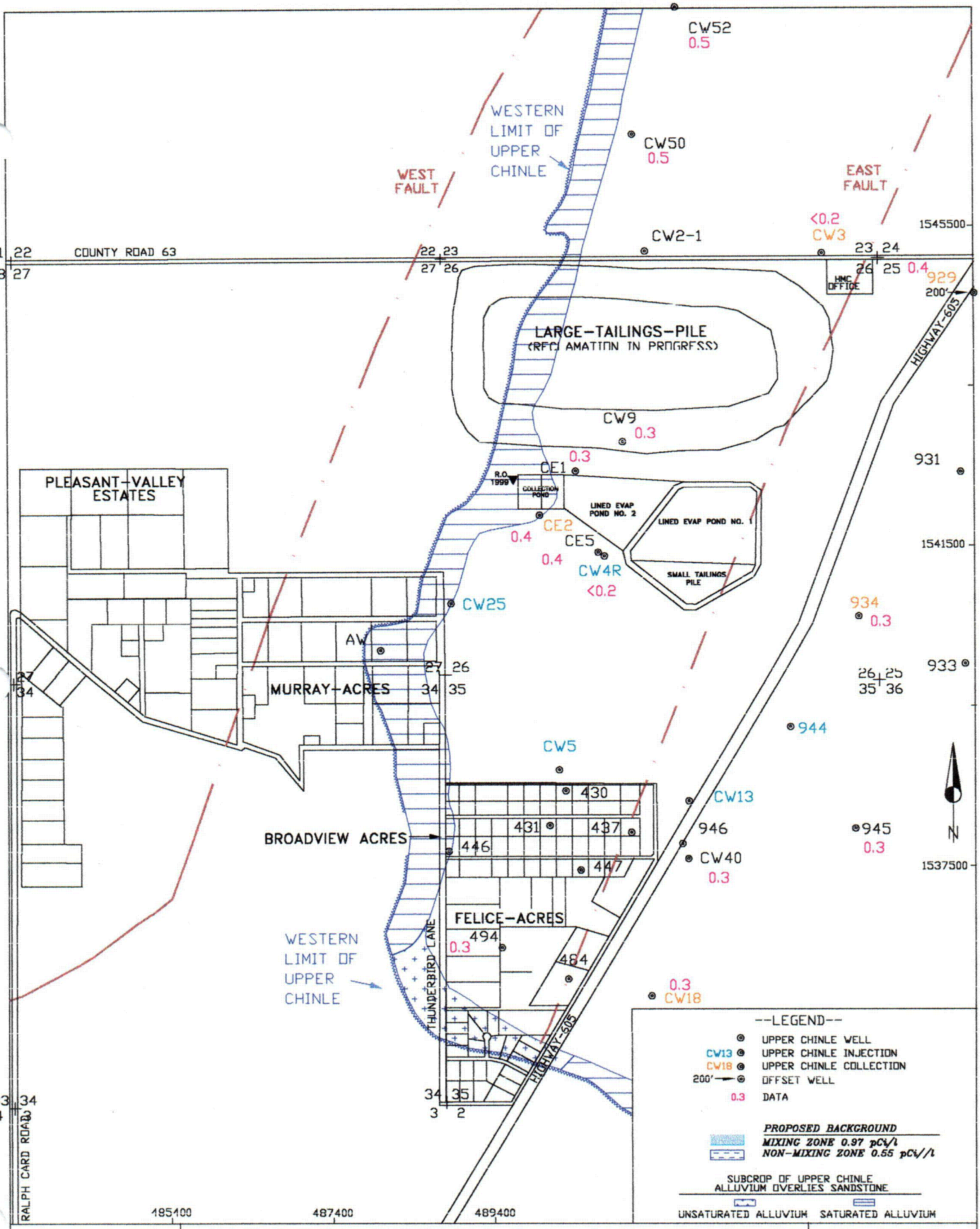
C177



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/03/04

FIGURE 5.3-23. THORIUM-230 CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2003, pCi/l

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(continued)

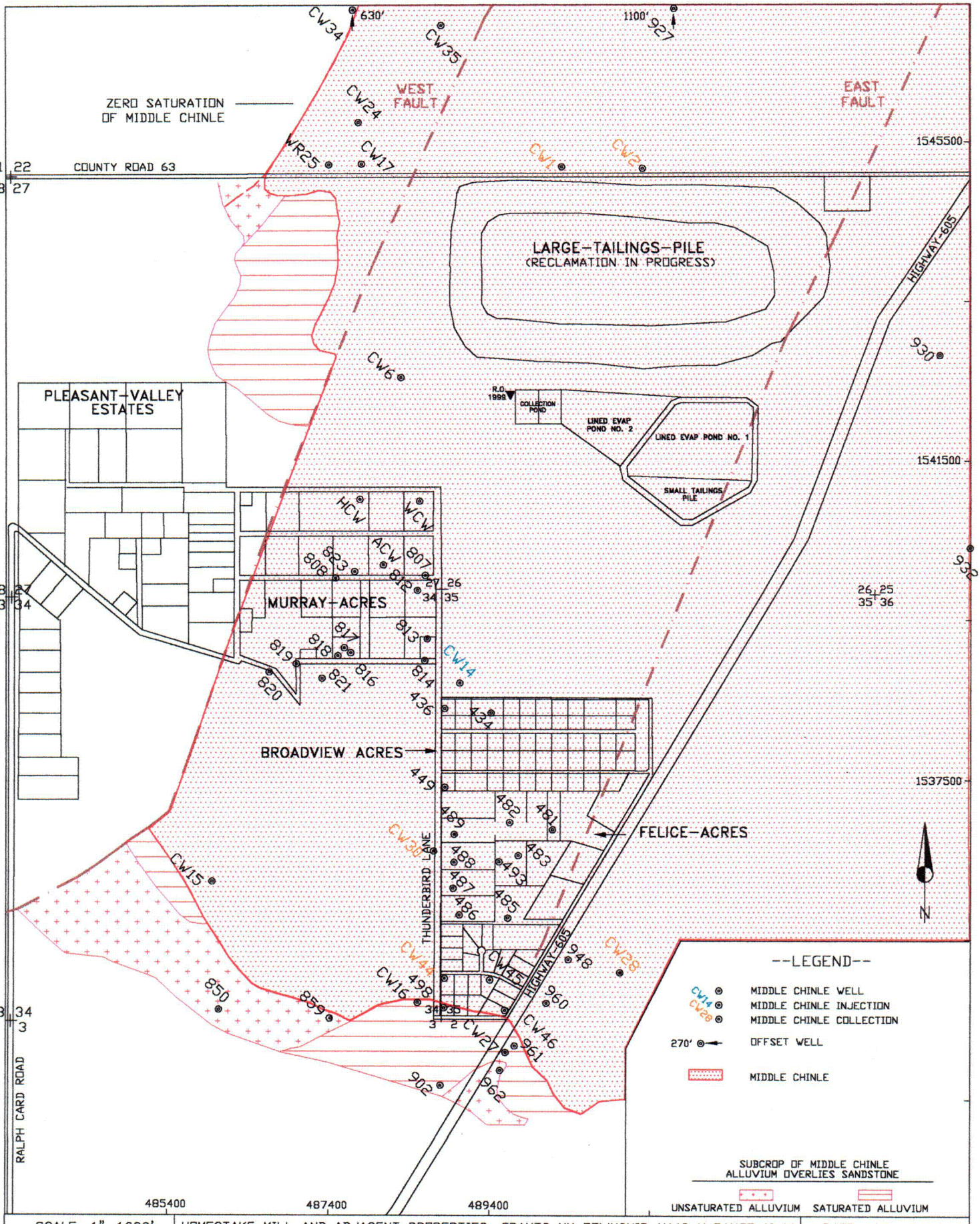
6.0 MIDDLE CHINLE AQUIFER MONITORING

6.1 MIDDLE CHINLE WELL COMPLETION AND LOCATION

Tables 5.1-1 through 5.1-4 (previous section) present the Middle Chinle well data along with other Chinle aquifer wells. Figure 6.1-1 shows the locations of the Middle Chinle wells and areas where the Middle Chinle aquifer exists at the Grants Project. The area where the alluvium is saturated and has direct contact with the Middle Chinle sandstone is very important with respect to transfer of water between these two aquifers and is shown with the red cross hatch pattern. The area where the Middle Chinle subcrops against alluvium that is not saturated is shown by the red plus (+) pattern.

The Middle Chinle aquifer also exists east of the extension of the East Fault (shown as a red pattern area on Figure 6.1-1) with an alluviam-Middle Chinle subcrop zone on the south side of this area. A limited area of Middle Chinle aquifer exists west of the West Fault. All three of these areas in the Middle Chinle aquifer act as separate ground water systems, except that there is some contact between two of the three areas of the Middle Chinle where the East Fault is not present to the south in the southwest corner of Section 35.

Middle Chinle wells CW1 and CW2 were used in 2003 as a source of water for the tailings flushing effort, while well CW28 was used as source of fresh water injection in 2003. Well CW30 was used as a source of fresh-water injection in portions of June, July and August of 2003. Well CW44 was used for the fourth straight year as an irrigation supply well.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/15/04

FIGURE 6.1-1. LIMITS OF MIDDLE CHINLE AQUIFER AND WELL LOCATIONS

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6.2 MIDDLE CHINLE WATER LEVELS

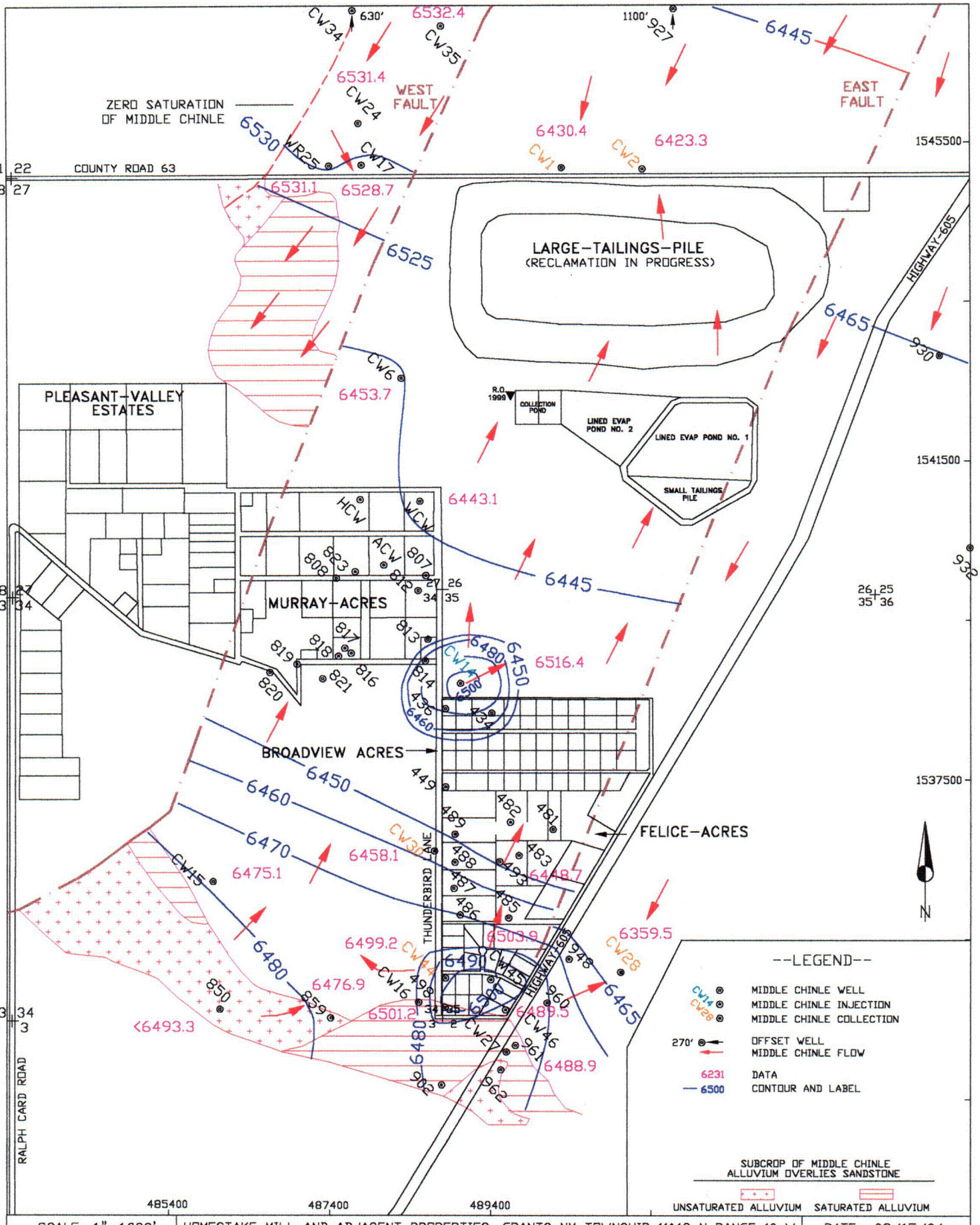
Water levels in Homestake's Upper, Middle and Lower Chinle wells are presented in Appendix A. Fall, 2003 water-level elevation contours for the Middle Chinle aquifer are presented on Figure 6.2-1. The hydraulic gradient in the Middle Chinle aquifer is steeper in its alluvial subcrop area in the southern portion of Felice Acres near wells CW44, CW45 and CW46. This increase in gradient is due to an influx of water to the Middle Chinle aquifer from the alluvial aquifer. The red arrows on Figure 6.2-1 show the direction of ground water flow in the Middle Chinle aquifer. Flow on the east side of the East Fault is mainly toward well CW28 near the East Fault.

Ground water flow west of the West Fault in the Middle Chinle aquifer is to the southwest, and it discharges into the alluvial aquifer. This prevents the alluvial aquifer from affecting the water quality of the Middle Chinle aquifer on the west side of the West Fault. This Middle Chinle water flows from up-gradient of the site into the area west of the Large Tailings pile. The remainder of the Middle Chinle aquifer is recharged by the alluvial aquifer south of Felice Acres.

The injection of fresh water into well CW14 (north of Broadview Acres) has created a ground water mound in this area. This mound causes the ground water to flow both north and south from well CW14. Collection of ground water from wells CW1 and CW2 intercepts the water flowing from the south in the Middle Chinle aquifer between the two faults. Pumping from these wells also draws water flow from the north. The head in the Middle Chinle aquifer on each side of the two faults is significantly different than the head between the two faults, which demonstrates that the ground water is not readily connected on each side of these faults.

Figure 6.2-2 shows the locations of the Middle Chinle wells that are used to present the water-level changes with time. This colors and symbols used on this figure are the same as those used on the water-level elevation time plots. Figure 6.2-3 presents the water-level elevation changes versus time in Middle Chinle wells 493, 859, CW15, CW27, CW28, CW45 and CW46. Water levels are higher in Middle Chinle well CW45 than they are farther north in well 493. The pumping of irrigation well CW44 has caused the water levels in wells 493, 859 and CW15 to decline. Some of this decline could also be attributable collection of water from wells CW1 and CW2. Variations in the pumping rate of well CW28 caused its variable water levels.

The water-level plots for the Middle Chinle wells located west of the West Fault and wells CW1, CW2 and WCW are presented on Figure 6.2-4. Water levels have generally been gradually increasing in the Middle Chinle aquifer west of the West Fault. Water levels were variable in pumping wells CW1 and CW2 in 2003 due to their variable pumping rates. Water levels have decreased in well WCW as a result of the pumping of wells CW1 and CW2 since 2001. As expected, water levels west of the West Fault have not responded to the pumping of water from wells CW1 and CW2.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/15/04

FIGURE 6.2-1. WATER-LEVEL ELEVATIONS OF THE MIDDLE CHINLE AQUIFER, FALL 2003, FT-MSL

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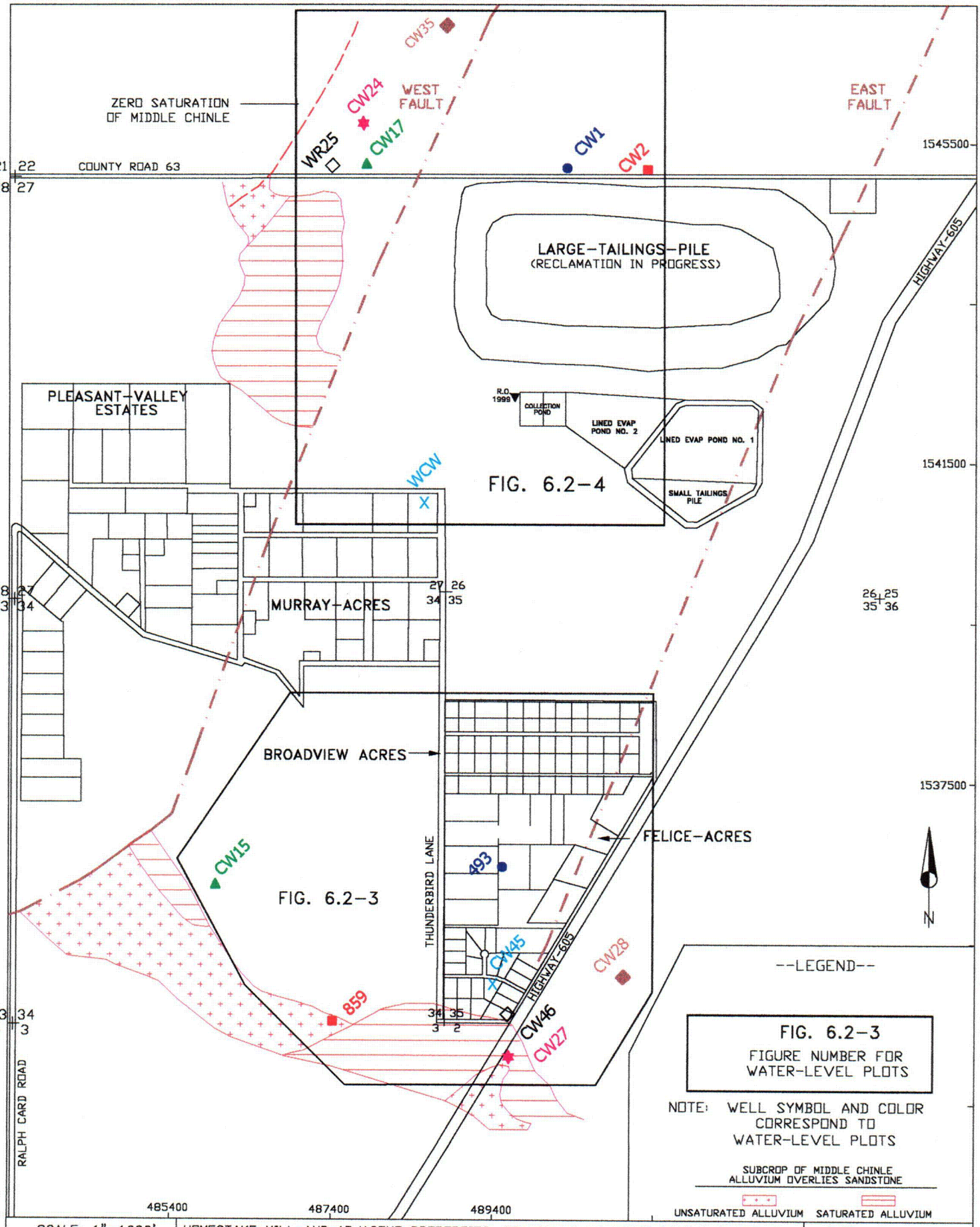

SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/15/04

FIGURE 6.2-2. LOCATION OF MIDDLE CHINLE WELLS WITH WATER-LEVEL PLOTS

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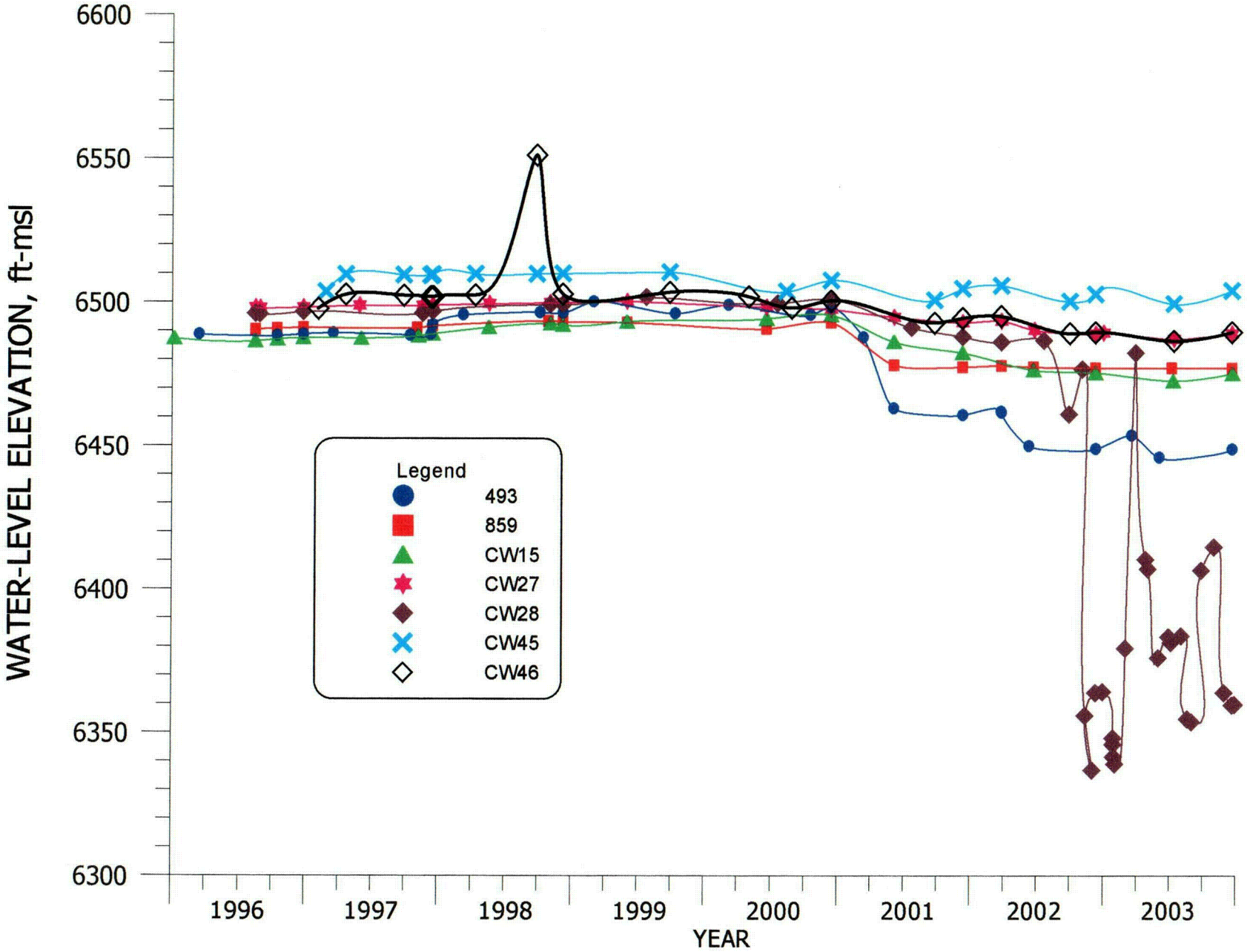


FIGURE 6.2-3. WATER-LEVEL ELEVATION FOR WELLS 493, 859, CW15, CW27, CW28, CW45 AND CW46.

C182

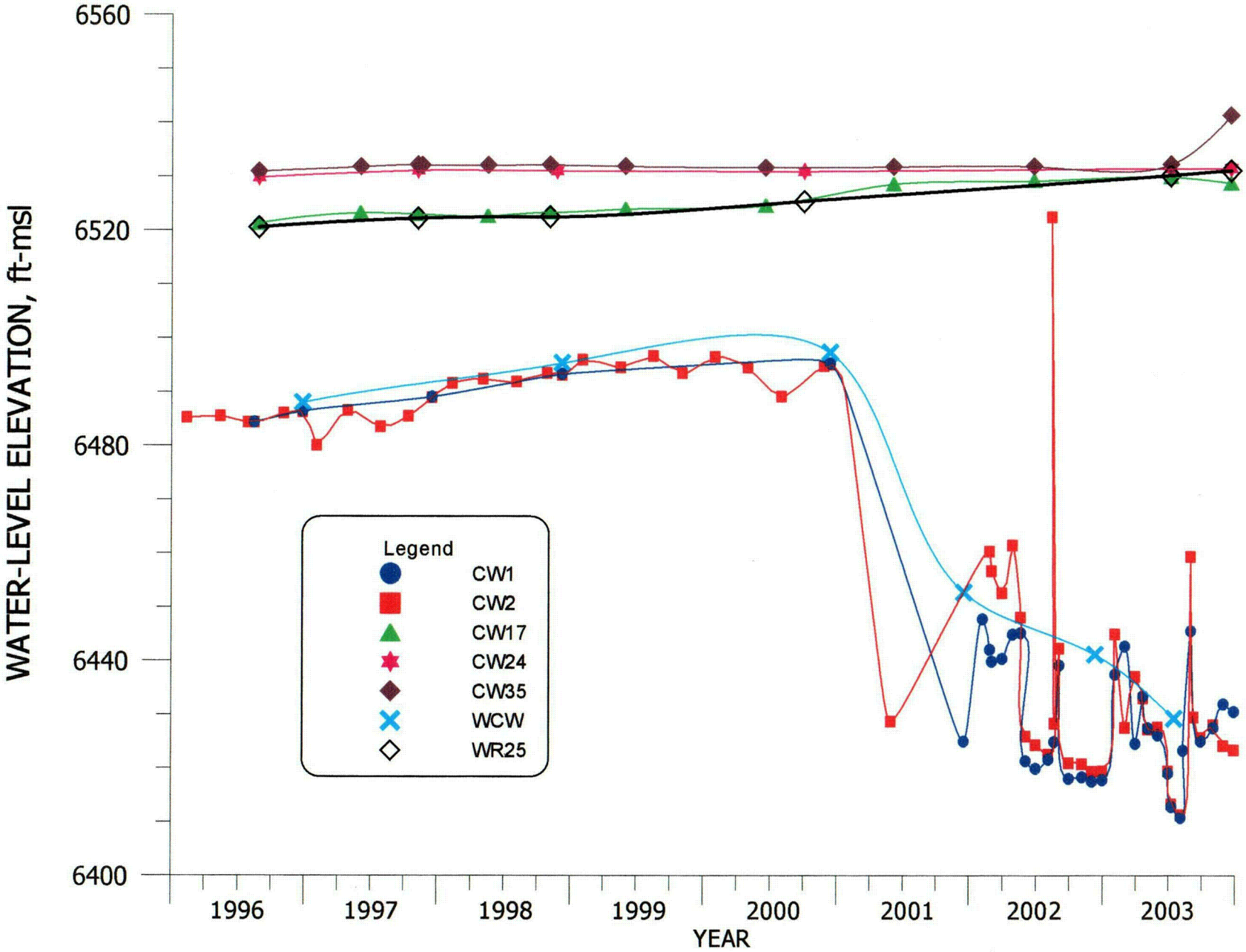


FIGURE 6.2-4. WATER-LEVEL ELEVATION FOR WELLS CW1, CW2, CW17, CW24, CW35, WCW AND WR25.

6.3 MIDDLE CHINLE WATER QUALITY

The water-quality data for Homestake's Middle Chinle aquifer is presented with all of the other Chinle aquifer wells in Tables B.5-1 and B.5-2 of Appendix B. The Chinle aquifer water-quality results for subdivision wells are also presented in these tables. The basic well data for the Middle Chinle aquifer wells is presented in Tables 5.1-1 through 5.1-4 in the Upper Chinle aquifer monitoring section (Section 5).

The area of water-quality concern in the Middle Chinle aquifer exists in the western portion of Broadview Acres and Felice Acres. All sulfate concentrations are within the range of background concentrations except for the concentration from well WR25, located in the mixing zone and well WCW, which is located in the non-mixing zone. Uranium concentrations are above background levels only in western Broadview Acres and Felice Acres and immediately to the west and south of Felice Acres. Selenium concentrations also exceed the background values in the same area. The only significant molybdenum concentrations exist in the Middle Chinle aquifer at wells 434 and 482.

6.3.1 SULFATE - MIDDLE CHINLE

Figure 6.3-1 presents sulfate concentration contours for the Middle Chinle aquifer for 2003. This figure shows that the Middle Chinle sulfate concentrations range from 430 to a high of 1950 mg/l at well WR25. Sulfate proposed site standard concentrations are given in the legend of Figure 6.3-1. All mixing-zone sulfate concentrations in the Middle Chinle aquifer are within the upper background level of 1750 mg/l except for the value in well WR25. Sulfate concentrations in well WR25, which is located west of the West Fault, are natural. The sulfates are naturally occurring there, because the ground water flow in the Middle Chinle aquifer west of the West Fault is from the north to the southwest. All sulfate concentrations in the non-mixing zone of the Middle Chinle are within the natural background range except the sulfate value from well WCW. Additional monitoring with time is needed to determine if this area needs additional restoration.

Figure 6.3-2 shows the locations of the Middle Chinle wells for which time concentration plots were developed for this report. The sulfate figure number is shown in the group area to define the figure number for each group of wells. Two groups of wells for the

Middle Chinle aquifer are presented. The colors and symbols on Figure 6.3-2 correspond to those used in the concentration time plots.

Figure 6.3-3 presents sulfate concentrations for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46. Concentrations in Middle Chinle well CW28 have been fairly steady with time, and they are at lower levels than those in the other wells. Fairly stable sulfate concentrations were also observed in 2003 in wells CW44, CW45 and CW46. A small increase was observed in the sulfate concentration of well CW15 water.

Figure 6.3-4 presents the sulfate concentrations for Middle Chinle wells CW17 and CW35, which are west of the West Fault, and Middle Chinle wells 434, CW1, CW2 and WCW, located between the two Faults. This plot demonstrates that sulfate concentrations have been fairly steady over time in wells CW17 and CW35. These sulfate concentrations have been determined to be naturally occurring, because ground water flows from the north to the southwest in the Middle Chinle in this area. The sulfate concentration in Middle Chinle well CW2 was stable in 2003. The concentrations measured in well CW2 water over the past few years were slightly lower than the historical data. Sulfate concentrations were fairly steady in well 434 in 2003. An increase in the sulfate concentration in well WCW was observed in 2003.

6.3.2 TOTAL DISSOLVED SOLIDS - MIDDLE CHINLE

Total dissolved solids (TDS) and sulfate are used to define changes in major constituents at the Grants Project site. Figure 6.3-5 presents contours of TDS concentrations for the Middle Chinle aquifer during 2003 and shows that a few values are approximately equal to 2000 mg/l near the alluvial subcrop area on the southwest side of Felice Acres.

Background data for the Middle Chinle aquifer were used to obtain proposed TDS NRC site standards of 3140 and 1560 mg/l for the mixing and non-mixing zones, respectively. All of the TDS values measured in Middle Chinle aquifer water were less than these values in 2003, except for well WR25, located in the mixing zone, and wells 434, 482 and WCW in the non-mixing zone. No restoration of TDS is needed in the Middle Chinle aquifer at well WR25 because concentrations from this well are natural.

Plots of TDS concentrations for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46 are presented in Figure 6.3-6. Gradually decreasing concentrations have been

observed in wells CW45 and CW46, while the TDS concentration has been fairly steady over time in well CW44. An increase was observed in the latest TDS concentration in well CW28 water. Additional sampling of this well will be done prior to determining whether this increase is significant. A very gradual increasing trend has been observed in wells 493 and CW15 during the last few years.

Figure 6.3-7 presents TDS concentration-time plots for Middle Chinle wells 434, CW1, CW2, CW17, CW35 and WCW. Analysis of this data indicates stable TDS concentrations in water collected from these wells in 2003 compared to 2002, except for a gradual increase in TDS concentration in Middle Chinle well WCW. Additional sampling of well WCW is needed to determine the significance of this increase.

6.3.3 CHLORIDE - MIDDLE CHINLE

Figure 6.3-8 presents chloride concentrations in the Middle Chinle aquifer during 2003, and observed concentrations varied from slightly less than 50 to slightly greater than 200 mg/l. None of the concentrations exceeded the proposed NRC site standard of 250 mg/l for the mixing and non-mixing zones of the Middle Chinle aquifer. Therefore, chloride concentrations are not useful for defining the degree of or the need for restoration of the Middle Chinle aquifer.

Time plots of chloride concentration are presented on Figure 6.3-9 for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46. In water from these wells, chloride concentrations have been fairly steady except for a gradually increasing trend for numerous years in well 493. The increased chloride concentrations are still well within the range of naturally occurring chloride concentrations in the Middle Chinle aquifer, but some of the increase could be due to the alluvial recharge to the Middle Chinle aquifer in southern Felice Acres.

The second set of chloride concentration plots for the Middle Chinle aquifer is presented in Figure 6.3-10. Data plotted on this figure shows an increase in 2003 in wells CW35 and WCW. The changes in well CW35 are naturally occurring based on the flow direction in the Middle Chinle west of the West Fault. The increase in chloride concentrations in well WCW are also within the range of background concentrations in the Middle Chinle aquifer. Chloride concentrations have been fairly steady over time in water collected from wells CW1 and CW2.

6.3.4 URANIUM - MIDDLE CHINLE

Uranium is an important parameter in the Middle Chinle aquifer due to the presence of elevated concentrations in the aquifer in the southern and western portions of Felice Acres. These elevated concentrations are a result of alluvial recharge to the Middle Chinle aquifer in this area. Water in the saturated portion of the alluvial aquifer flows across a subcrop of the Middle Chinle aquifer just south of Felice Acres, and alluvial ground water has entered the Middle Chinle aquifer in this area. Figure 6.3-11 presents contours of uranium concentrations in the Middle Chinle aquifer during 2003. An area of concentrations greater than the proposed mixing-zone site standard exists in the southwestern portion of Felice Acres. Uranium concentrations in the Middle Chinle aquifer, west of the West Fault, naturally exceed 0.1 mg/l. The 2003 value from well WR25 slightly exceeds the mixing-zone concentration, but it is naturally occurring due to the location. Flow in the Middle Chinle aquifer west of the West Fault moves from the area near well CW35 toward the subcrop area to the south. Uranium concentrations exceed 0.07 mg/l (non-mixing zone proposed site standard) in two areas of the Middle Chinle aquifer, at wells 434 and 482 in Broadview Acres and Felice Acres, respectively.

Figure 6.3-12 presents uranium concentration plots versus time for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46 (see Figure 6.3-2 for well locations). The 2003 uranium concentrations shown on this plot are less than 0.1 mg/l, except for those from wells CW44 and CW45. This plot shows that water taken from Middle Chinle wells CW44 and CW45 contain significant amounts of uranium, which are gradually decreasing and should continue to decrease over the next several years. Additional monitoring of these wells with time will better define this trend. A small increase in uranium concentration occurred in well 493 in 2003.

The uranium concentration plots for the Middle Chinle wells west of the West Fault and four wells between the faults are presented on Figure 6.3-13. Uranium concentrations in water sampled from wells CW17 and CW35 have been fairly steady for the last few years. Uranium concentrations were small in well CW2 in 2003. The uranium concentration in well 434 water had previously been observed to be decreasing during the last two years, but it was fairly steady in 2003.

6.3.5 SELENIUM - MIDDLE CHINLE

Four wells (493, 952, CW27 and CW30) in the Middle Chinle near southern and western Felice Acres contained water with selenium concentrations exceeding 0.14 mg/l in 2003 (see Figure 6.3-14). These areas of elevated concentrations have resulted from recharge to the Middle Chinle aquifer from the alluvium in the subcrop area just south of Felice Acres. Flow in the Middle Chinle aquifer is toward the north causing chemical constituents introduced into the Middle Chinle from the alluvium in the subcrop area to move to the north. Analysis of background selenium concentrations in the mixing and non-mixing zones produced proposed NRC site standards of 0.14 and 0.07 mg/l, respectively (see legend of Figure 6.3-14). Two small areas in the Middle Chinle aquifer non-mixing zone contain concentrations greater than this site standard.

Selenium concentrations slightly less than 0.1 mg/l have been measured in Middle Chinle wells west of the West Fault. These concentrations have been determined to be naturally occurring, because the flow is from the north in this area, and therefore the ground water could not have been influenced by tailings seepage. All other selenium concentrations in the Middle Chinle aquifer beyond these areas are low values.

Selenium concentrations with time for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46 are presented in Figure 6.3-15. Selenium concentrations have varied significantly in well 493. The steady increase in selenium concentrations in water collected from well 493, observed over the past twenty years, continued in 2003. The connection between the alluvial aquifer and the Middle Chinle aquifer south of Felice Acres is the cause for the elevated concentrations in well 493. The injection of fresh water into Middle Chinle well CW14 and the use of Middle Chinle well CW44 for irrigation should cause these elevated concentrations to decrease. A decline in selenium concentrations has been observed in wells CW45 and CW46 for the last six years, while concentrations have been fairly steady to slightly declining in 2003 in well CW44. The 2003 selenium concentration in well CW28 was similar to the 2002 concentration.

Selenium concentrations in wells CW1 and CW2, which are located north of the Large Tailings pile, have increased gradually over the past two years. Figure 6.3-16 presents the selenium concentrations for Middle Chinle wells west of the West Fault and wells 434, CW1,

CW2 and WCW, which are located between the two faults. In 2003, selenium concentrations measured in water collected from wells 434, CW17, CW35 and WCW were similar to those observed in 2002.

6.3.6 MOLYBDENUM - MIDDLE CHINLE

The 2003 molybdenum concentrations in the Middle Chinle aquifer are presented on Figure 6.3-17. None of the molybdenum concentrations for 2003 exceed the detection limit, except for values of 0.08 and 0.10 mg/l in wells 482 and 434, respectively.

Figure 6.3-18 presents the molybdenum concentrations with time for Middle Chinle wells 493, CW15, CW28, CW44, CW45 and CW46, while Figure 6.3-19 presents the molybdenum concentrations with time for wells 434, CW1, CW2, CW35 and WCW. These plots show that the concentration in each of these wells has been low for 2003 with a small increase in well 434. Additional monitoring with time is needed to determine if increases in molybdenum concentration in this well is significant.

6.3.7 NITRATE - MIDDLE CHINLE

Nitrate concentrations have always been low in the Middle Chinle aquifer and therefore are not routinely monitored. However, nitrate concentrations were measured in the Middle Chinle aquifer wells in 2003 in order to update the database. Figure 6.3-20 presents the nitrate concentrations in the Middle Chinle aquifer and shows that the only significant levels of nitrate in the Middle Chinle aquifer are west of the West Fault. Nitrate concentrations are greater than 10 mg/l in three of the four Middle Chinle wells west of West Fault. Due to the flow direction in the Middle Chinle aquifer west of the West Fault, these concentrations are determined to be naturally occurring. Therefore, no restoration of nitrate concentrations in the Middle Chinle aquifer is needed and this parameter does not need to be a site standard for the Middle Chinle aquifer.

6.3.8 RADIUM-226 AND RADIUM-228 - MIDDLE CHINLE

Radium concentrations in the Middle Chinle aquifer have always been low, showing that these two parameters are not important relative to the restoration of the Middle Chinle

aquifer. The 2003 updated radium-226 and radium-228 concentrations in the Middle Chinle aquifer are presented in Figure 6.3-21. Radium-226 values are all less than the detection limit of 0.2 pCi/l except for the value from well CW46, which was slightly above the detection level at 0.3 pCi/l, as well as the values from wells CW24 (1.1 pCi/l), CW35 (0.7 pCi/l) and WR25 (0.3 pCi/l) west of the West Fault. As with the other parameters discussed previously, the three higher values observed west of the West Fault are naturally occurring, and, in addition, are significantly low radium-226 levels. The only radium-228 concentration above the detection level of 1 pCi/l is the value from well WCW, which was determined to be 1.9 pCi/l. Laboratory results for radium-228 vary randomly, and therefore, no significance should be given to this one low value of radium-228. Radium-226 and radium-228 are not important parameters relative to the Middle Chinle aquifer and a site standard is not warranted for these two constituents.

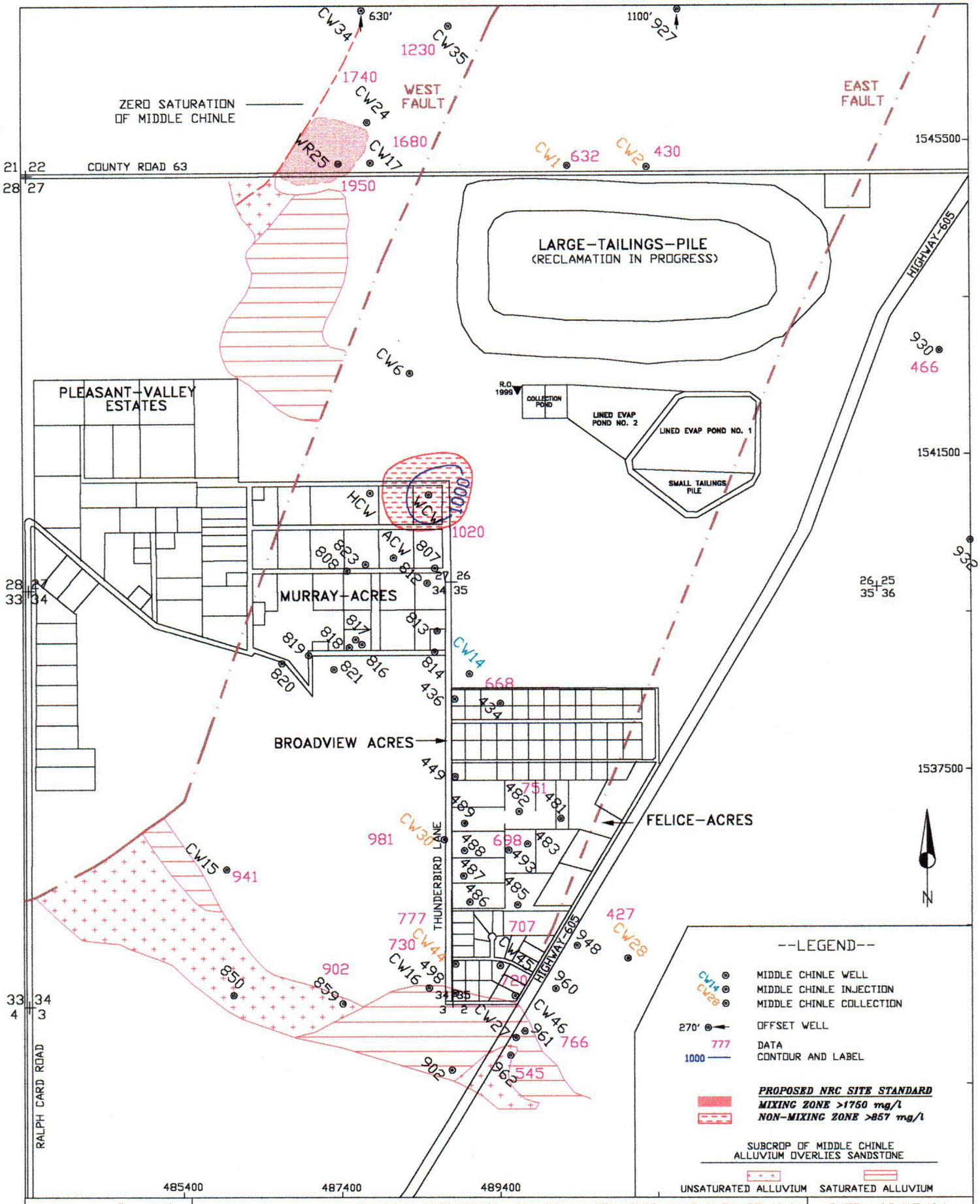
6.3.9 VANADIUM - MIDDLE CHINLE

Vanadium concentrations in the Middle Chinle aquifer have always been low. Previous monitoring of vanadium in the Middle Chinle aquifer has demonstrated that vanadium is not a significant parameter in this aquifer. Monitoring of vanadium should be eliminated, because only a few low values have previously been detected in the alluvial aquifer near the tailings piles. The 2003 updated vanadium measurements for the Middle Chinle aquifer are presented on Figure 6.3-22. All water samples contained vanadium concentrations in amounts less than the detection level of 0.01 mg/l. These values are consistent with values observed previously and, therefore, continued monitoring of vanadium concentrations in the Middle Chinle aquifer should not be required. A site standard for vanadium is not needed for the Middle Chinle aquifer.

6.3.10 THORIUM-230 - MIDDLE CHINLE

Thorium-230 concentrations are not significant in the alluvial aquifer. Therefore, the Middle Chinle aquifer does not have the potential for containing significant thorium concentrations from the tailings seepage. Thorium-230 is, therefore, not a significant parameter in the Middle Chinle aquifer and should be eliminated from future monitoring in the Middle Chinle aquifer. Thorium-230 concentrations were measured in water sampled from Middle

Chinle wells in 2003, and these values are presented on Figure 6.3-23. All of the thorium-230 values were less than the detection limit except for one well with an observed concentration of 0.3 pCi/l (well 930), which is only slightly above the detection level. These thorium-230 levels are consistent with concentrations previously measured in the Middle Chinle aquifer, which shows that thorium-230 is not an important parameter in the Middle Chinle aquifer and does not warrant to be a site standard.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 03/15/04

FIGURE 6.3-1. SULFATE CONCENTRATIONS OF THE MIDDLE CHINLE AQUIFER, 2003, mg/l

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C184

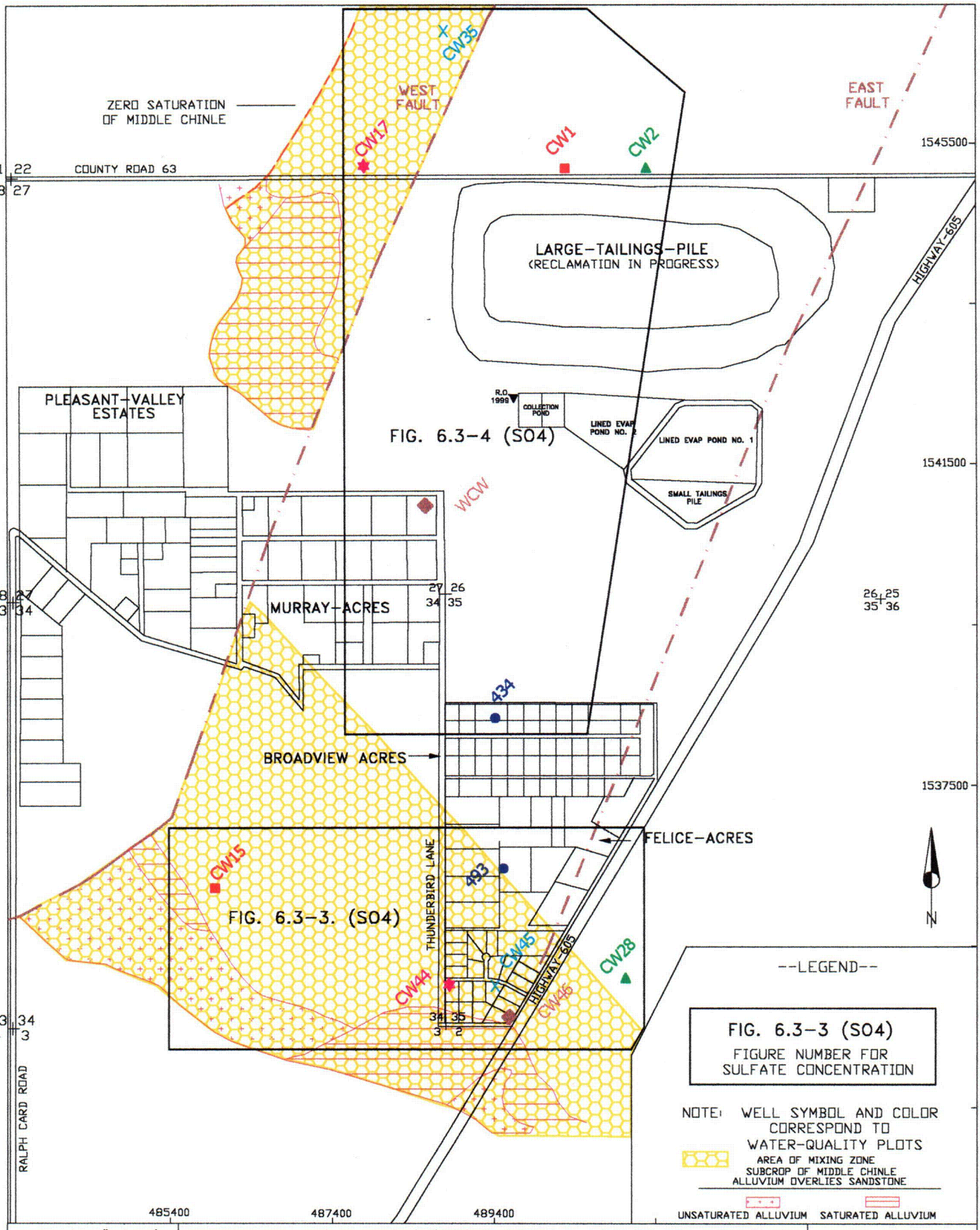

FIGURE 6.3-2. LOCATION OF MIDDLE CHINLE WELLS WITH WATER-QUALITY PLOTS

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C185

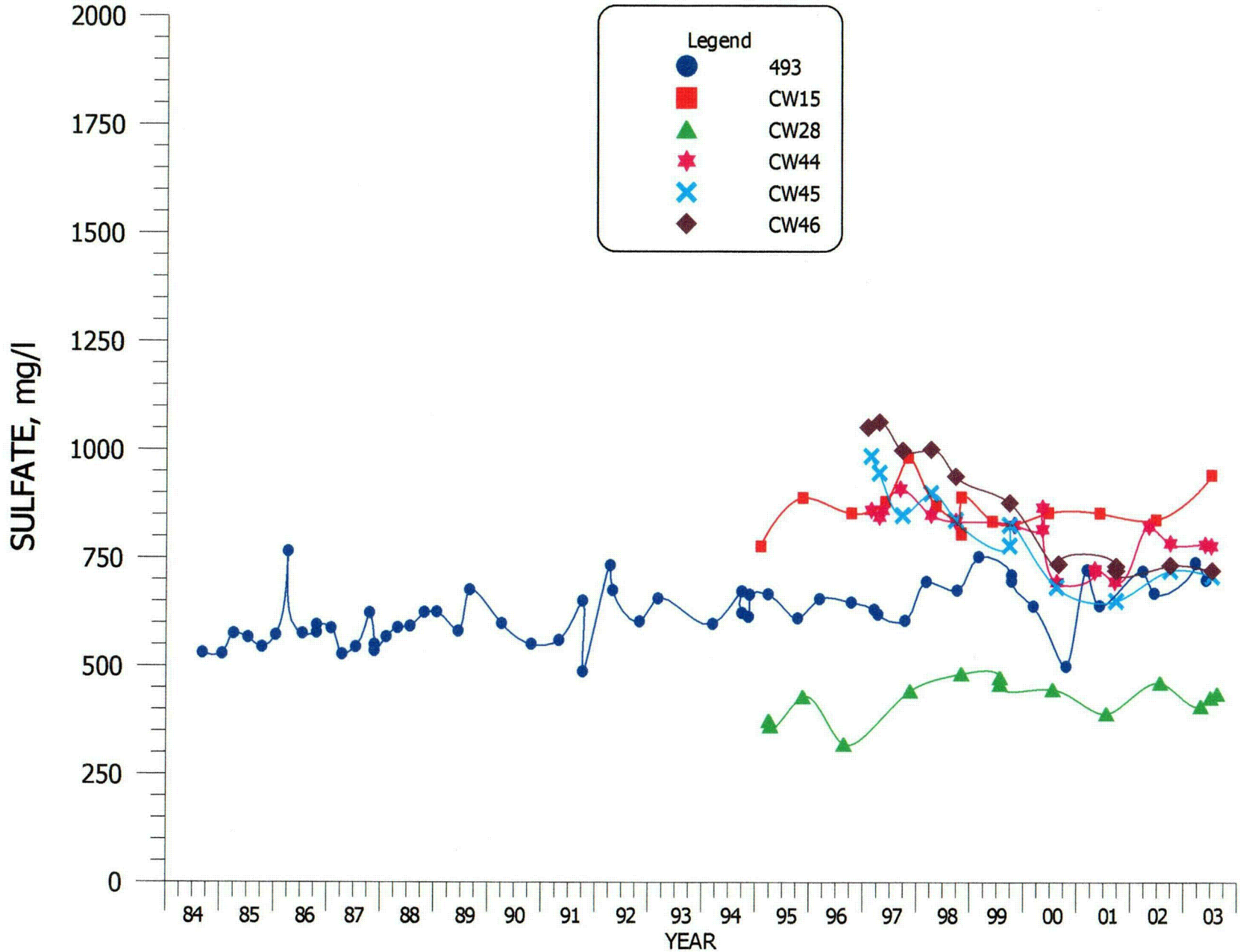

FIGURE 6.3-3. SULFATE CONCENTRATIONS FOR WELLS 493, CW15, CW28, CW44, CW45 AND CW46.

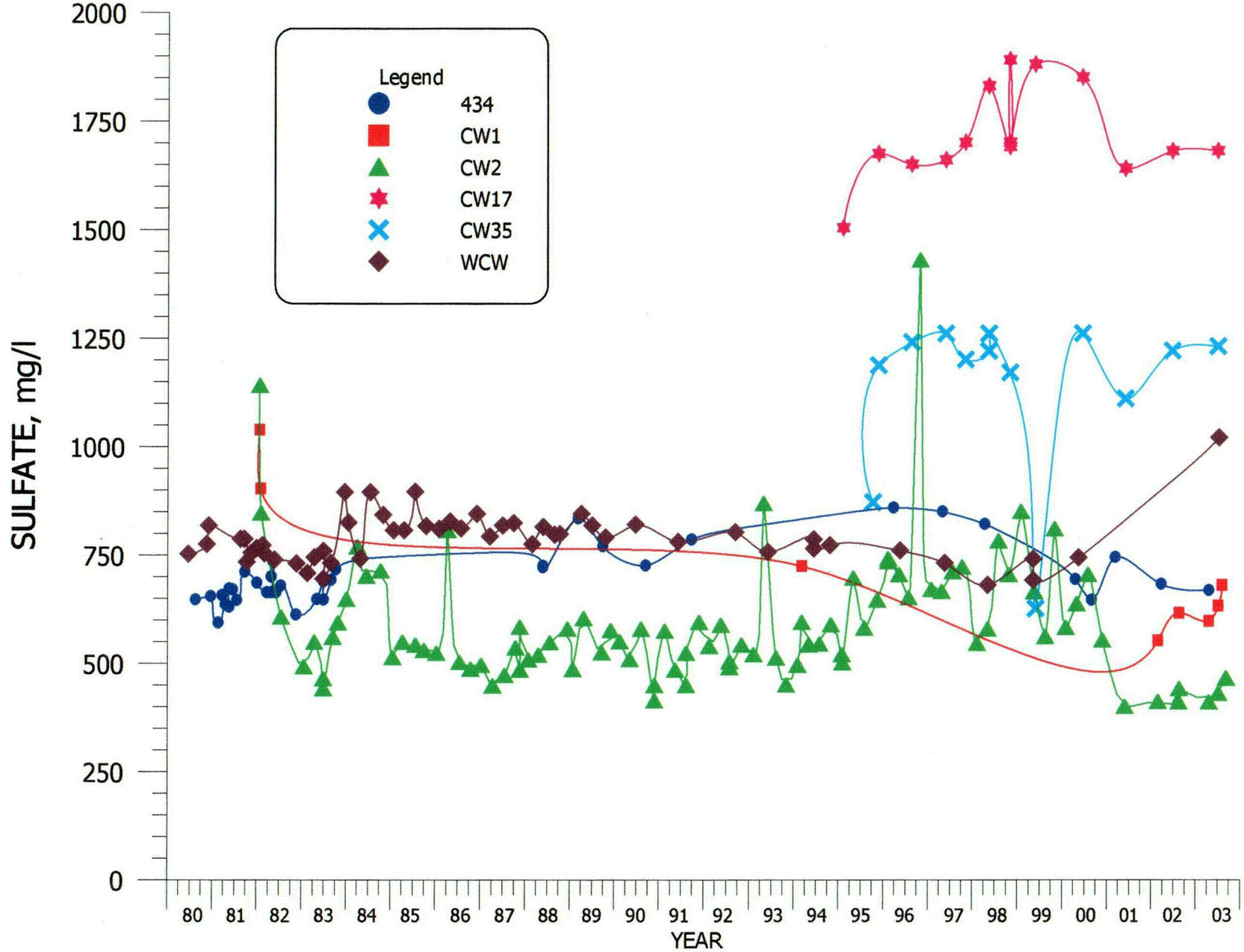

FIGURE 6.3-4. SULFATE CONCENTRATIONS FOR WELLS 434, CW1, CW2, CW17, CW35 AND WCW.

C187

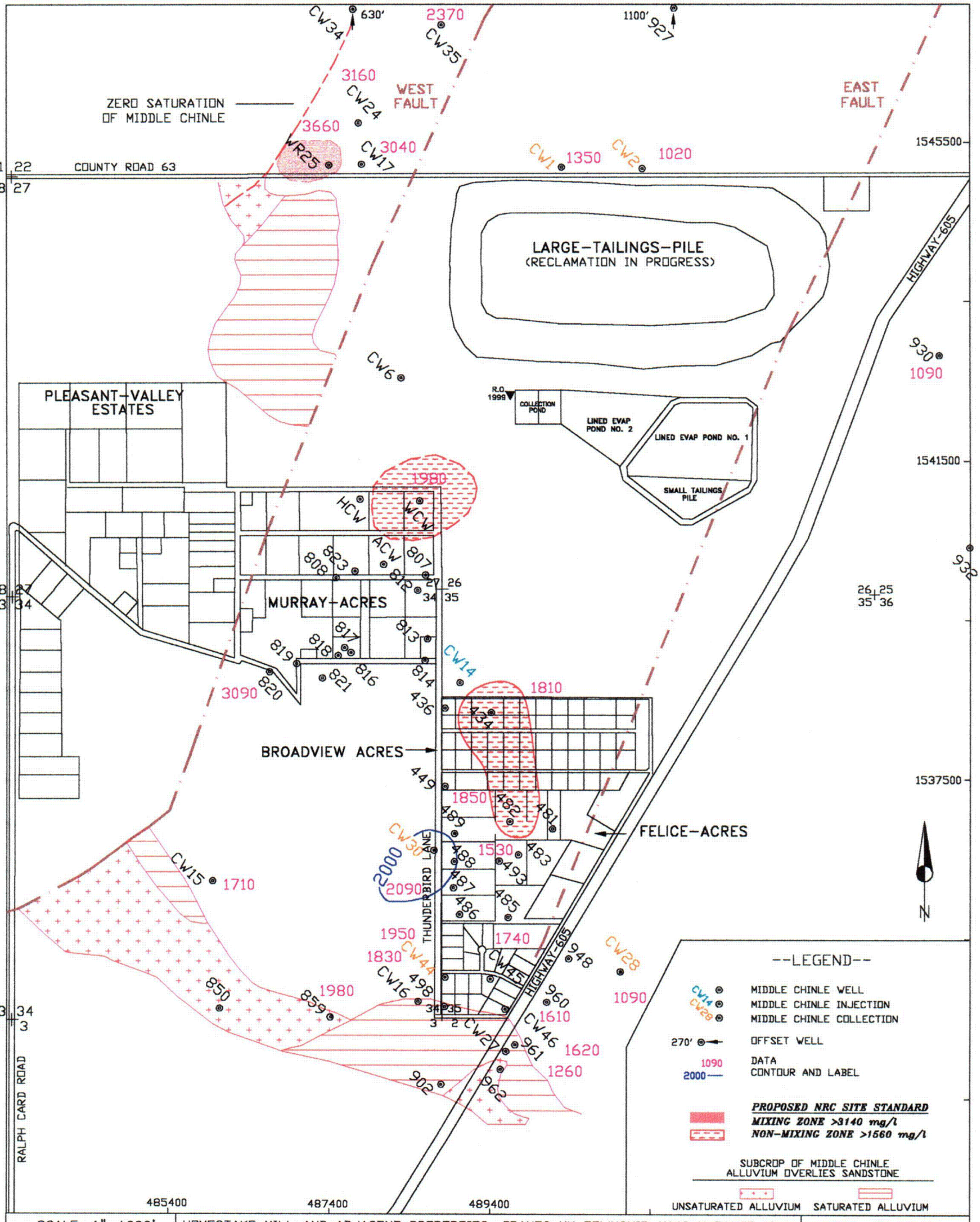

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FIGURE 6.3-5. TDS CONCENTRATIONS OF THE MIDDLE CHINLE AQUIFER, 2003, mg/l

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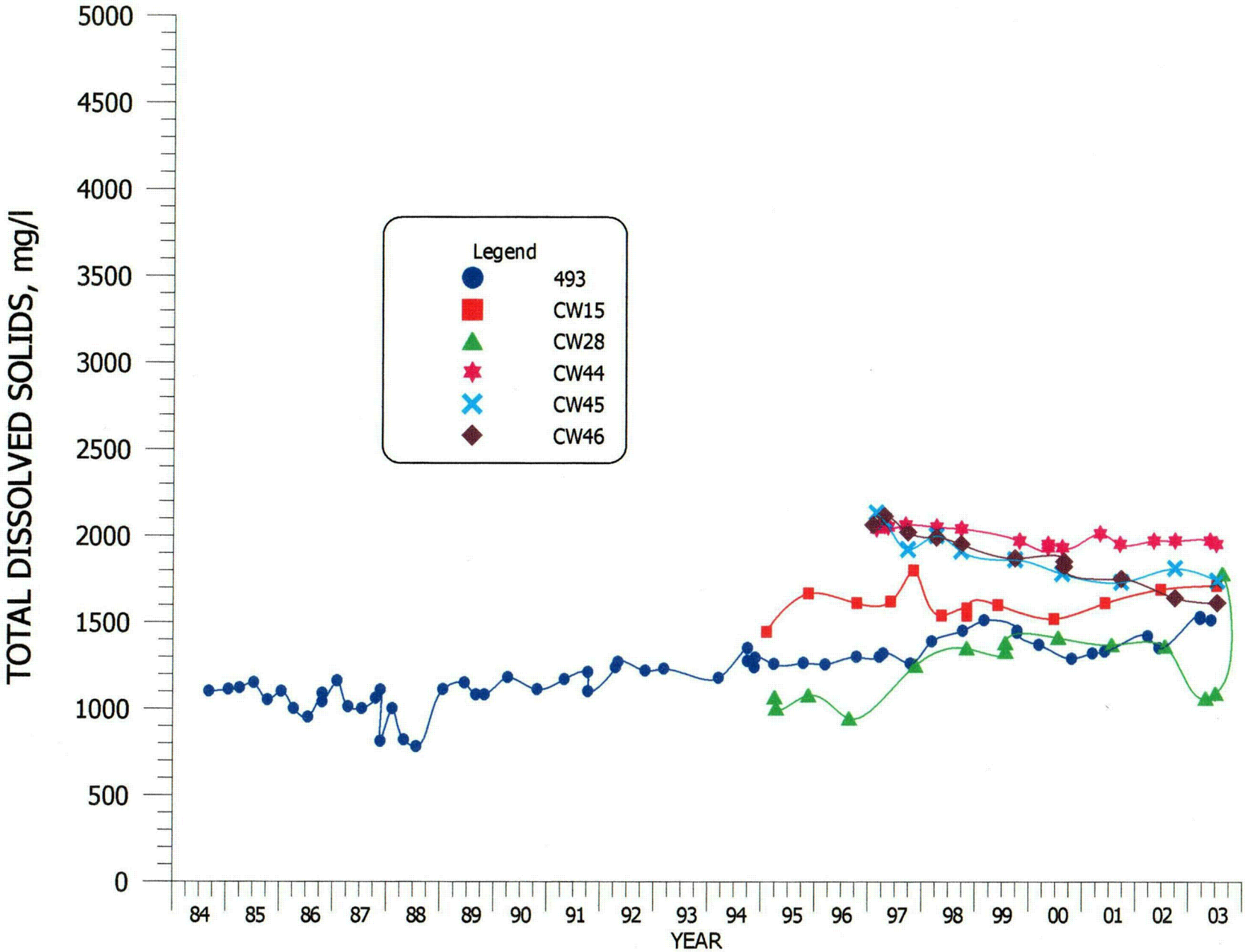

FIGURE 6.3-6. TDS CONCENTRATIONS FOR WELLS 493, CW15, CW28, CW44, CW45 AND CW46.

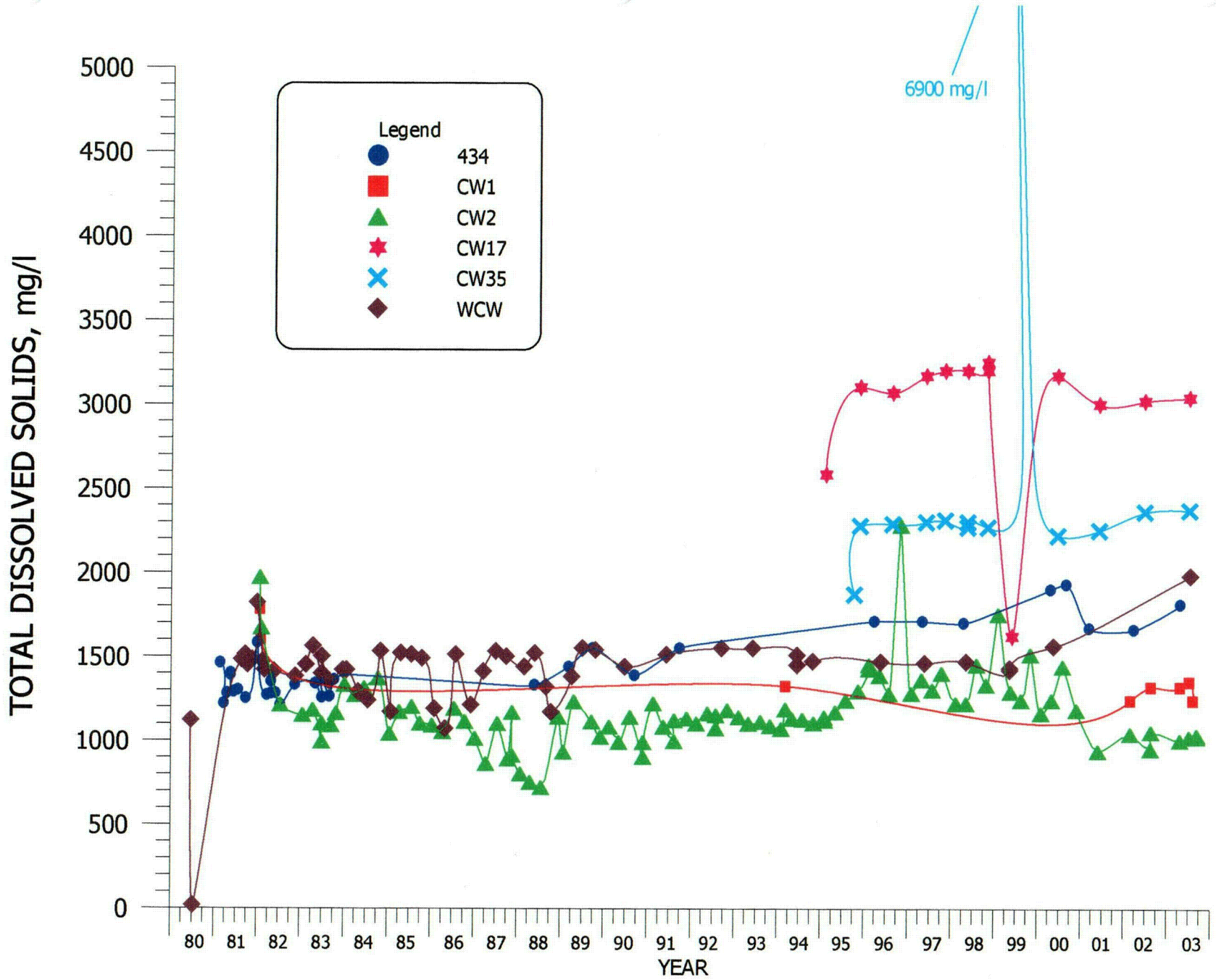

FIGURE 6.3-7. TDS CONCENTRATIONS FOR WELLS 434, CW1, CW2, CW17, CW35 AND WCW.