SECTION 5

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GROUND-WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES

SECTION 5

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GROUND-WATER MONITORING
FOR HOMESTAKE'S GRANTS PROJECT

FIGURES
(continued)

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GROUND-WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

TABLES

5.0 UPPER CHINLE AQUIFER MONITORING

5.1 UPPER CHINLE WELL COMPLETION

Chinle aquifer well locations are presented on Figures 5.1-1A and 5.1-1B. The Upper and Middle Chinle aquifers do not exist in the west area. Table 5.1-1 presents basic information for the Chinle wells located on the Homestake property. This table presents well coordinates, well depth, casing diameter, water level, measuring point in feet above land surface and elevation, and depth and elevation to the top of the Chinle aquifers. A "U" follows the elevation of the top of the Upper Chinle aquifer, and an "M" and an "L" have the same meanings for the Middle and Lower Chinle aquifers, respectively. Some of the wells also are used to define the depth to the base of the alluvium, and an "A" is presented following the elevation number to denote that these values are for the base of the alluvium. The casing perforation interval and aquifer unit are also presented in this table.

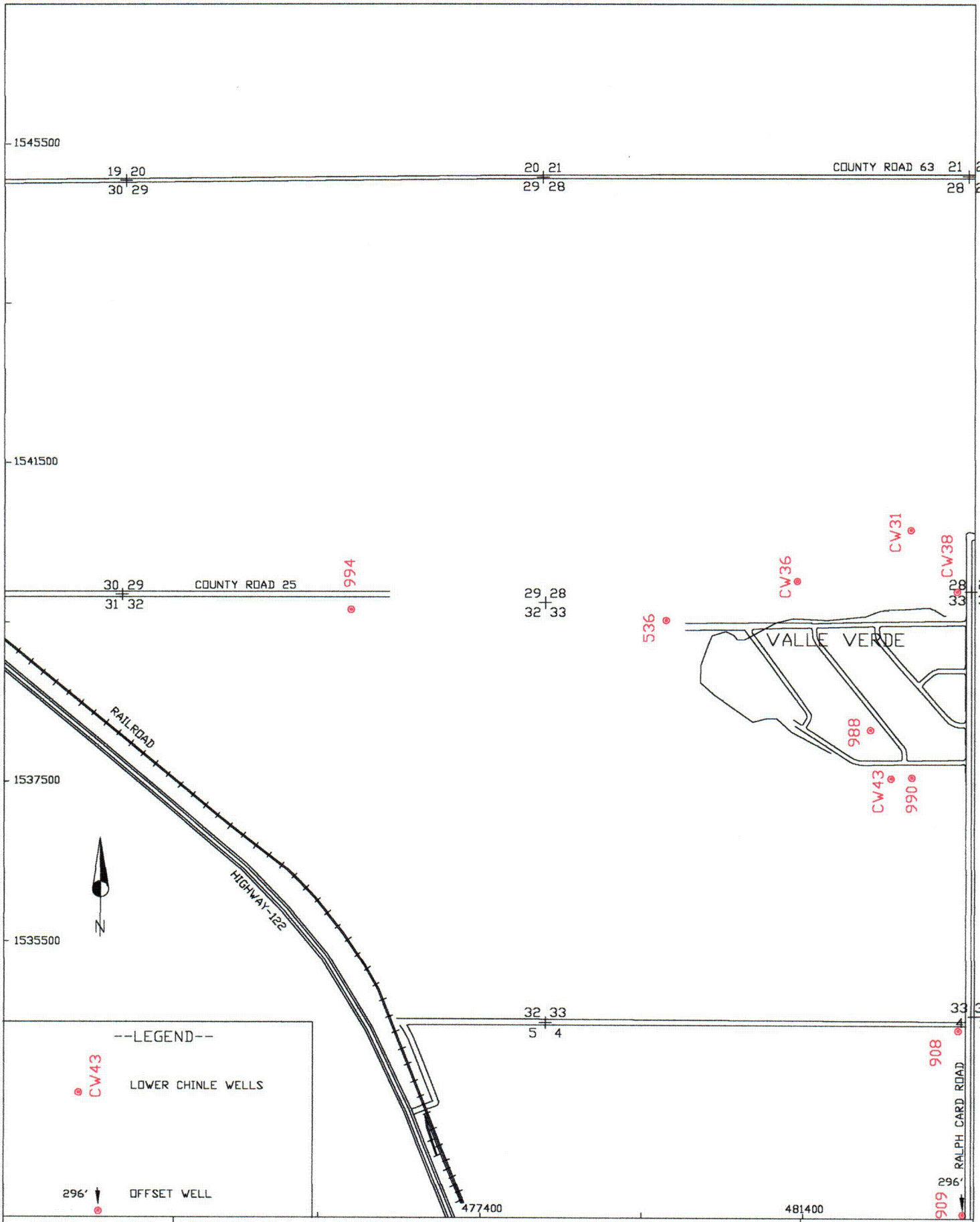
Table 5.1-2 presents basic well data for Chinle wells in Broadview and Felice Acres. Table 5.1-3 presents similar data for Murray Acres and Pleasant Valley Estates Chinle wells. Wells that are not located within the immediate Grants Project property or these four subdivision boundaries are shown on Table 5.1-4 as the regional Chinle wells (see Figure 5.1-1B for inner regional boundary). No additional Upper Chinle wells were drilled in 2002.

The background water quality for the Chinle aquifers is represented by the upgradient alluvial aquifer water quality because the alluvium recharges the Chinle aquifers in this area. As such, the background data listed in the upward left portions of the water-quality figures reflect the 2002 background values for the alluvial aquifer.

Each of the Upper Chinle wells are plotted on Figure 5.1-2, and the areal extent of the Upper Chinle aquifer at the Grants Project is also shown. Upper Chinle wells CW5, CW13, CW25 and 944 are shown in cyan to note that these are fresh-water injection wells. Upper Chinle wells CE2, CW3, 929 and 934 were pumped as a source for flushing of the tailings in 2002 and are shown in orange. Well CW18 is also shown in orange because this well was started as a supply for fresh water injection in late September of 2002. This figure also shows the location of the West and East Faults.

Two different patterns have been used to show the limits of the Upper Chinle sandstone where Chinle shale exists above the sandstone (green and blue, west and east of the East Fault, respectively). Figure 5.1-3 presents a typical geologic cross section to show the relative position of the alluvial and Chinle aquifers (see Figure 5.1-2 for location).

The subcrop of the Upper Chinle sandstone where the alluvium is saturated or unsaturated above the Upper Chinle sandstone is also shown on Figure 5.1-2 with red patterns. The alluvial and Upper Chinle aquifers are in direct contact where the red cross-hatched pattern is shown. The Upper Chinle sandstone is in contact with dry alluvium in the red dotted area. The Upper Chinle aquifer does not exist to the west and south of the subcrop area. The Upper Chinle sandstone, therefore, does not exist west of the West Fault.


1545500
19 20
30 29
20 21
29 28
COUNTY ROAD 63
21 22
28 27
1541500
30 29
31 32
COUNTY ROAD 25
994
29 28
32 33
CW31
CW38
CW36
536
28 27
33 34
VALLE VERDE
988
CW43
990
RAILROAD
1537500
HIGHWAY-122
N
1535500
32 33
5 4
33 34
4 3
908
RALPH CARD ROAD
909
296'
--LEGEND--
CW43
LOWER CHINLE WELLS
296'
OFFSET WELL
477400
481400
SCALE: 1"=1600'
HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W
DATE: 02/06/03
FIGURE 5.1-1A. CHINLE AQUIFER WELL LOCATIONS (WEST AREA)
D:\R13\HMC
BASE16 LH
page 5.1-3

C01

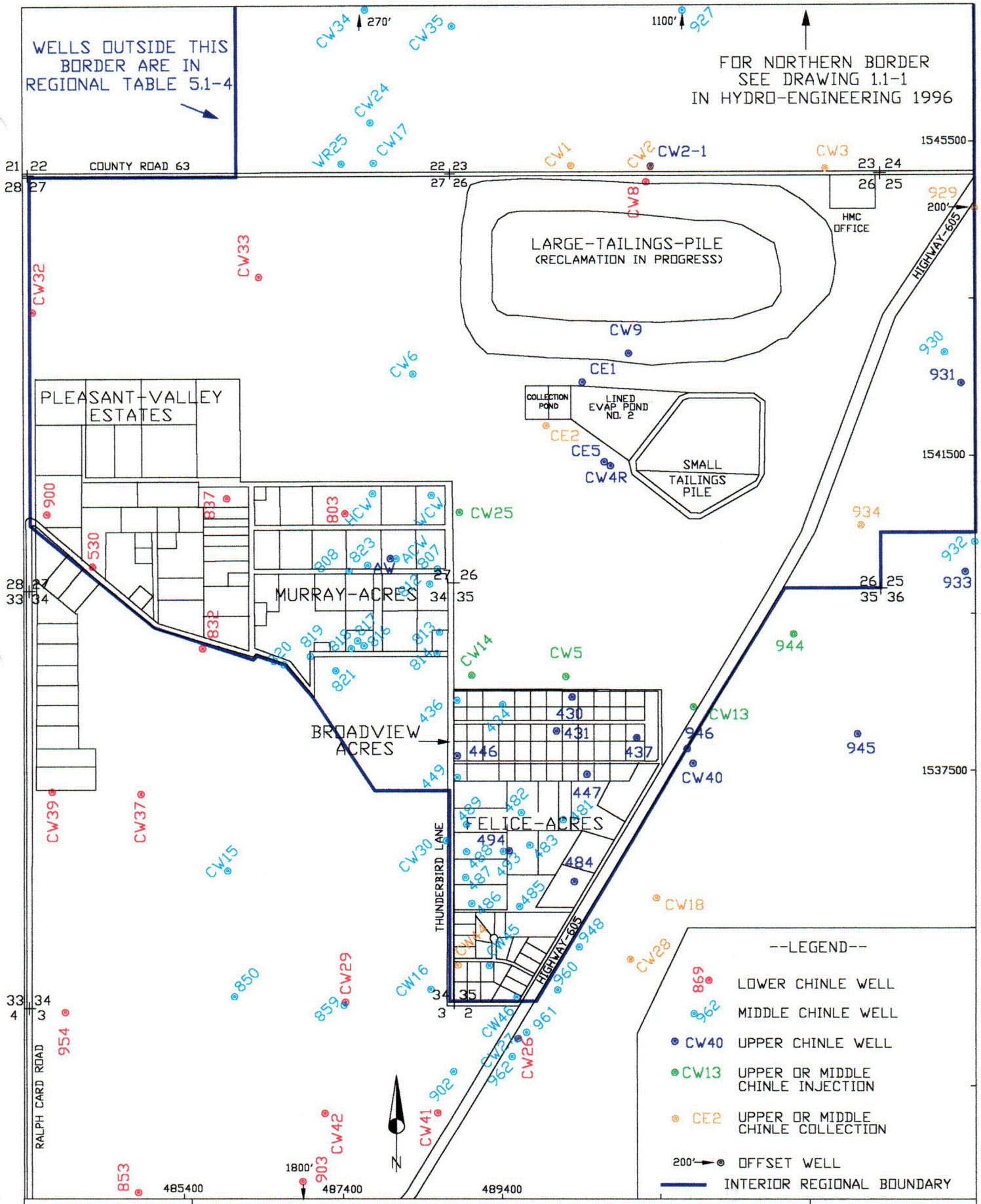
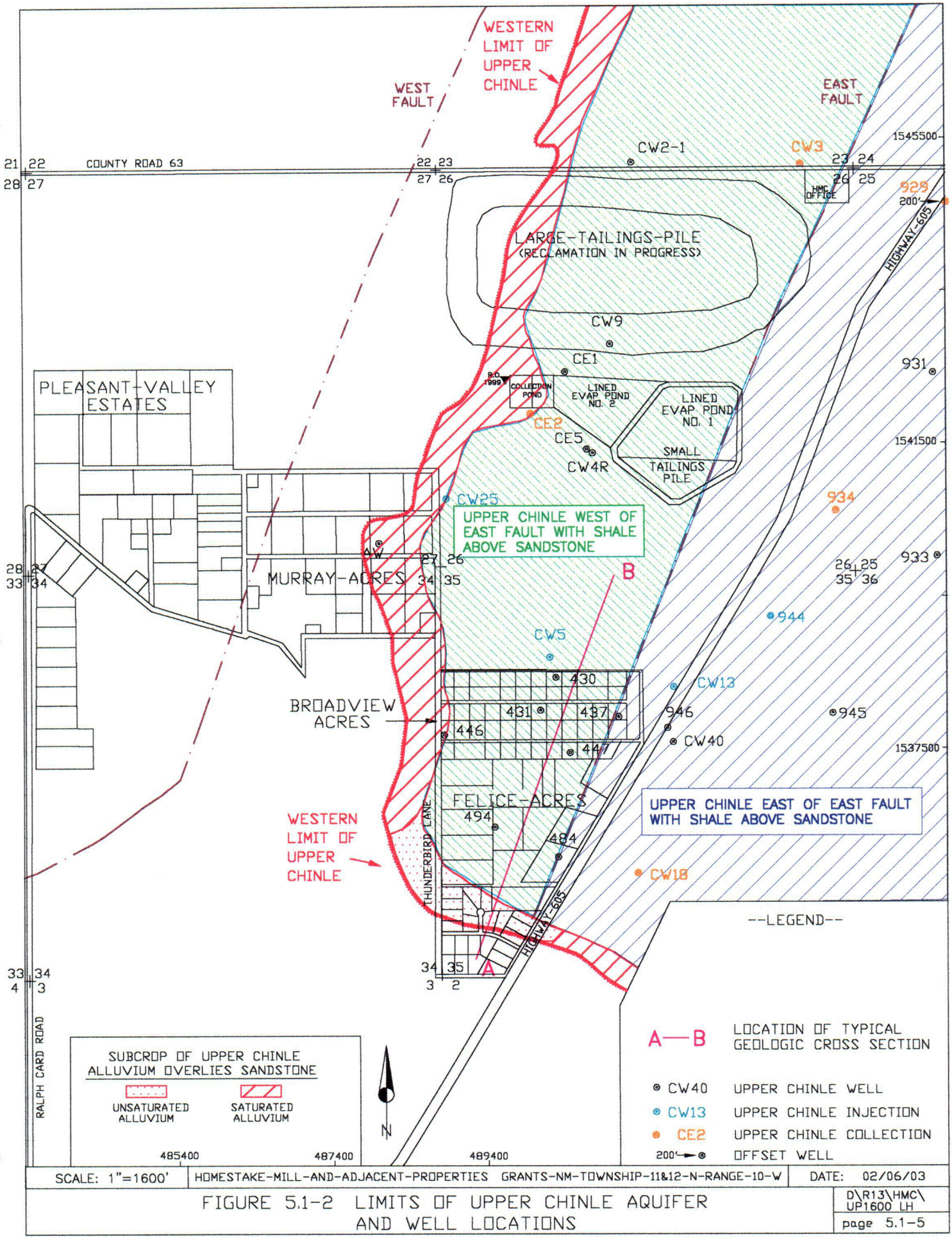


FIGURE 5.1-1B. CHINLE AQUIFER WELL LOCATIONS

D:\R13\HMC BASE16 LH

C02



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/06/03

FIGURE 5.1-2 LIMITS OF UPPER CHINLE AQUIFER AND WELL LOCATIONS

D\R13\HMC\UP1600 LH

C03

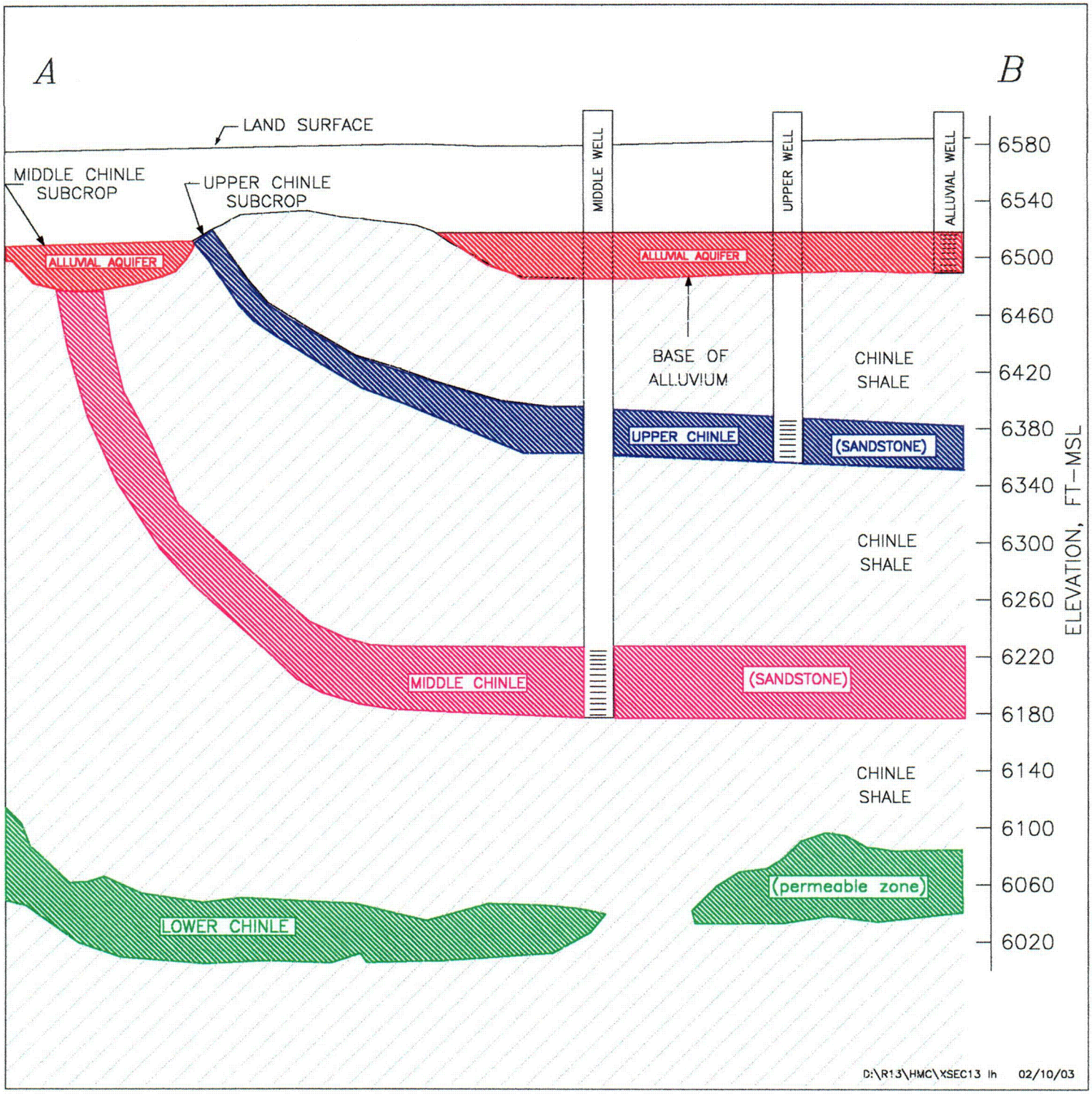


FIGURE 5.1-3. TYPICAL GEOLOGIC CROSS SECTION

C04

TABLE 5.1-1 BASIC 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	12/11/02	133.60	6464.94	0.0	6598.54	30	6569	A -	—
										335	6264	M 330-400	Middle
0931	1542461	495207	366.7	6.0	12/12/02	197.85	6412.71	0.9	6610.56	339	6271	U -	Upper
0934	1540641	493941	293.0	6.0	12/30/02	61.24	6524.35	2.0	6585.59	30	6554	A -	—
										282	6302	U 330-400	Upper
CE1	1541923	489979	137.0	5.0	12/12/02	45.91	6524.28	4.4	6570.19	75	6491	A -	—
										106	6460	U 98-138	Upper
CE2	1542475	490434	119.7	5.0	12/30/02	65.54	6510.81	1.8	6576.35	74	6501	A -	—
										74	6501	U 78-118	Upper
CE5	1541453	490695	140.0	5.0	12/12/02	40.83	6527.72	1.6	6568.55	63	6504	A -	—
										103	6464	U 100-140	Upper
CW1	1545235	490295	325.0	5.0	12/30/02	167.58	6417.64	0.7	6585.22	105	6480	A -	—
										272	6313	M 212-323	Middle
CW2	1545212	491302	355.0	5.0	12/30/02	166.11	6419.37	1.7	6585.48	85	6499	A -	—
										136	6448	U -	—
										305	6279	M 306-353	Middle
CW2-1	1545212	491302	168.0	5.0	12/12/02	62.73	6522.75	1.7	6585.48	85	6499	A -	—
										136	6448	U 243-253	Upper
CW3	1545200	493496	235.0	5.0	12/30/02	169.64	6417.54	0.7	6587.18	70	6516	A -	—
										209	6377	U 210-235	Upper
										348	6238	M -	—
* CW4	1541682	490874	145.0	5.0	9/7/94	39.06	6531.89	0.8	6570.95	70	6500	A -	—
										112	6458	U 110-145	Upper
CW4R	1541416	490787	138.9	6.0	12/30/02	41.12	6527.61	1.3	6568.73	61	6506	A -	—
										104	6463	U 102-142	Upper
CW5	1538729	490221	170.0	5.0	12/30/02	0.60	6568.74	1.6	6569.34	65	6503	A -	—
										137	6431	U 135-170	Upper
CW6	1542588	488301	282.0	4.0	12/12/02	127.14	6448.50	1.0	6575.64	236	6339	M 246-276	Middle
CW7	1545285	488773	—	—	10/17/95	60.80	6522.79	0.0	6583.59	—	—	C 120-130	Chinle
CW8	1545009	491238	285.0	6.0	12/5/00	38.90	6552.93	0.0	6591.83	—	—	C 276-286	Chinle
										85	6507	A -	—
CW9	1542840	491015	180.0	5.0	12/12/02	65.56	6526.27	0.0	6591.83	—	—	U 130-180	Upper
										80	6512	A -	—
* CW10	1542823	491803	185.0	5.0	11/13/95	50.03	6537.86	0.0	6587.89	75	6513	A -	—
										167	6421	U 155-185	Upper
CW13	1538349	491827	267.7	6.0	12/30/02	1.20	6575.50	2.7	6576.70	230	6344	U 225-265	Upper
										378	6196	M -	—
CW14	1538786	488884	360.9	6.0	12/30/02	39.55	6526.54	2.9	6566.09	56	6507	A -	—
										66	6497	U -	—
										310	6253	M 278-358	Middle

TABLE 5.1-1 BASIC 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	6/27/02	60.20	6529.12	3.1	6589.32	73	6513	A -	—
										85	6501	M 83-103	Middle
CW24	1545773	487760	118.0	5.0	10/3/00	57.79	6530.88	3.0	6588.67	61	6525	A -	—
										65	6521	M 78-118	Middle
CW25	1540802	488866	102.0	5.0	12/30/02	2.70	6564.50	3.0	6567.20	53	6511	U 62-102	Upper
										53	6511	A -	—
CW32	1543413	483523	300.0	6.0	12/12/02	120.83	6446.45	1.7	6567.28	70	6496	A -	—
										157	6409	L 158-188	Lower
										157	6409	L 218-303	—
CW33	1543814	486347	347.0	6.0	12/12/02	106.04	6468.85	1.8	6574.89	83	6490	A -	—
										272	6301	L 307-347	—
										272	6301	L 267-287	Lower
CW34	1547827	487707	65.7	6.0	8/27/96	65.65	6528.75	3.2	6594.40	20	6571	A -	—
										40	6551	M 33-63	Middle
CW35	1547001	488794	120.0	5.0	6/27/02	59.39	6531.78	1.9	6591.17	63	6526	A -	—
										90	6499	M 93-118	Middle
WR25	1545267	487430	113.3	5.0	10/3/00	61.10	6525.36	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

E = Estimated Depth

TABLE 5.1-2 BASIC 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	—	—	A -	Alluvium
										114	6454	U -	Upper
0431	1538045	490090	130.0	6.0	4/12/94	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	—	—	—	0.0	6563.68	75	6489	A -	—
										265	6299	M -	Middle
0436	1538430	488850	295.0	5.0	10/29/96	71.82	6490.91	0.0	6562.73	90	6473	A -	—
										280	6283	M 280-295	Middle
0437	1537940	491100	340.0	5.0	10/29/96	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	9/8/83	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	4/11/85	41.18	6526.82	0.0	6568.00	—	—	A 120-142	Alluvium
										80	6488	U 120-142	Upper
0449	1537440	488830	267.0	6.0	12/5/94	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	7/25/02	39.80	6522.86	0.0	6562.66	80	6483	A 220-260	Alluvium
										210	6353	M 220-260	Middle
0483	1536586	489753	280.0	—	7/24/96	36.93	6525.73	0.0	6562.66	—	—	M -	Middle
										—	—	A -	Alluvium
0484	1536448	490356	320.0	5.0	12/26/96	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	7/18/96	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	10/15/96	70.36	6488.04	0.0	6558.40	—	—	M 200-260	Middle
										21	6537	A -	—
										21	6537	U -	—
0487	1536175	488950	260.0	—	7/24/96	49.20	6511.80	0.0	6561.00	—	—	M -	Middle
0488	1536500	488950	—	—	8/7/96	78.10	6483.90	0.0	6562.00	—	—	M -	Middle
0489	1536850	488950	—	—	—	—	—	0.0	6562.00	—	—	M -	Middle
0493	1536510	489520	—	5.0	12/12/02	111.50	6448.78	0.9	6560.28	40	6519	A -	—
										65	6494	U -	—
										236	6323	M 270-300	Middle

TABLE 5.1-2 BASIC 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
0494	1536510	489590	---	5.0	12/12/02	34.69	6525.45	0.6	6560.14	40	6520	A -	---
										65	6495	U 65-85	Upper
CW44	1535048	488891	208.0	6.0	12/12/02	62.48	6498.26	2.5	6560.74	94	6464	A -	Alluvium
										130	6428	M 69-208	Middle
CW45	1535036	489494	193.0	5.0	12/12/02	58.54	6502.77	0.6	6561.31	90	6471	A -	---
										166	6395	M 163-193	Middle
CW46	1534642	489595	187.3	5.0	12/12/02	72.69	6489.57	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

E = Estimated Depth

TABLE 5.1-3 BASIC 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	9/19/83	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	—	—	7/22/95	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	—	5/9/02	99.20	6458.80	0.0	6558.00	—	—	M 125-230	Middle
0821	1538810	487320	260.0	7.0	11/1/94	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	8/16/96	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	1/5/98	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	7/20/00	75.61	6486.39	1.0	6562.00	82	6479	A -	—
										264	6297	M 264-295	Middle
WCW	1541045	488520	307.0	6.0	12/12/02	126.31	6441.06	0.8	6567.37	83	6484	A -	—
										254	6313	M 257-307	Middle
Pleasant Valley													
0530	1540229	484358	490.0	5.0	10/30/98	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	9/7/83	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 BASIC 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	—	7/24/95	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

E = Estimated Depth

TABLE 5.1-4 BASIC 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	9/12/00	144.70	—	-2.0	—	—	—	L -	Lower
0536R	1539560	479721	280.0	4.0	—	—	—	—	—	—	—	L -	Lower
0653	1533283	486570	206.0	6.0	12/11/02	73.98	6470.99	1.3	6544.97	97	6447	A 69-206	Alluvium
										135	6409	L -	Lower
0850	1534652	486044	54.0	5.0	12/12/02	55.98	6493.17	3.2	6549.15	37	6509	A -	—
										37	6509	M 29-54	Middle
0853	1532124	484824	95.0	5.0	12/12/02	76.41	6464.97	1.7	6541.38	60	6480	A -	—
										60	6480	L 55-95	Lower
0859	1534549	487426	83.0	5.0	12/12/02	75.69	6477.07	2.7	6552.76	52	6498	M 50-83	Middle
0901	1531900	492900	270.0	5.0	11/4/81	46.88	6552.12	0.0	6599.00	40	6559	A -	—
										190	6409	L 240-260	Lower
0902	1533700	488800	150.0	6.0	1/28/95	52.10	6507.90	0.0	6560.00	72	6488	M 78-102	Middle
										72	6488	A -	—
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	11/3/98	81.16	6463.21	1.5	6544.37	107	6436	A -	—
										232	6311	L -	Lower
0909	1531900	483400	140.0	4.0	11/19/82	77.45	6461.45	0.0	6538.90	112	6427	L 80-135	Lower
										112	6427	A 80-135	Alluvium
0927	1548300	491700	—	—	12/17/01	147.94	6447.06	1.0	6595.00	—	—	C -	Chinle
0929	1544684	495585	320.0	5.0	12/30/02	71.45	6521.12	2.0	6592.57	—	—	U 290-320	Upper
0932	1540434	495401	501.0	6.0	4/19/01	86.73	6515.38	0.0	6602.11	354	6248	U -	—
										492	6110	M 450-490	Middle
0933	1540050	499730	—	5.0	12/17/97	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	12/30/02	0.60	6588.01	1.6	6588.61	64	6523	A -	—
										252	6335	U 220-280	Upper
0945	1537986	493900	300.0	—	3/21/85	92.41	6498.08	0.0	6590.49	—	—	U -	Upper
0946	1537804	491754	260.0	5.0	10/17/96	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
										460	6102	S 505-551	San Andres
										460	6102	S 400-493	San Andres
0954	1534390	484260	307.0	5.0	12/27/94	77.22	6467.78	0.0	6545.00	225	6320	L 285-307	Lower
0960	1534730	490110	305.0	6.0	4/5/95	67.46	6497.54	0.0	6565.00	280	6285	M 285-305	Middle
0961	1534190	489720	240.0	5.0	4/5/95	67.40	6497.60	6.9	6565.00	200	6358	M 200-240	Middle

TABLE 5.1-4 BASIC 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
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	—	—	—	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	7/18/96	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	11/13/02	90.47	6464.53	0.0	6555.00	—	—	A 95-110	Alluvium
										—	—	L 95-110	Lower
CW15	1536259	485961	134.6	5.0	12/12/02	75.98	6475.34	2.6	6551.32	50	6499	A -	—
										91	6458	M 73-133	Middle
										311	6238	L -	—
CW16	1534747	488507	—	5.0	12/26/96	68.02	6490.52	0.0	6558.54	82	6477	M 112-152	Middle
										82	6477	A -	—
CW18	1535924	491378	230.7	5.0	12/30/02	49.94	6522.71	1.5	6572.65	90	6481	A -	—
										190	6381	U 177-232	Upper
										340	6231	M -	—
CW26	1534116	489593	300.0	5.0	12/12/02	91.55	6469.88	0.5	6561.43	50	6511	M -	—
										50	6511	A -	—
										231	6330	L 245-285	Lower
CW27	1534109	489600	110.0	5.0	12/12/02	74.07	6488.81	1.9	6562.88	50	6511	A -	—
										50	6511	M 80-110	Middle
CW28	1535112	491008	370.0	5.0	12/30/02	207.64	6364.04	1.9	6571.68	90	6480	A -	—
										110	6460	U -	—
										294	6276	M 280-360	Middle
CW29	1534551	487435	290.0	5.0	12/12/02	83.14	6469.08	1.7	6552.22	52	6499	A -	—
										52	6499	M -	—
										228	6323	L 230-270	Lower
CW30	1536642	488704	251.5	5.0	12/12/02	100.39	6457.92	2.0	6558.31	35	6521	A -	—
										220	6336	M 219-249	Middle
CW31	1540689	482738	311.0	6.0	12/12/02	83.82	6476.44	2.0	6560.26	111	6447	A -	—
										254	6304	L 291-311	—
										254	6304	L 136-156	Lower
										254	6304	L 231-271	—
CW36	1540053	481329	180.0	5.0	12/12/02	75.10	6475.99	2.8	6551.09	96	6452	A -	—

TABLE 5.1-4 BASIC 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
CW36	1540053	481329	180.0	5.0	12/12/02	75.10	6475.99	2.8	6551.09	152	6396	L 155-177	Lower
CW37	1537240	484853	150.1	5.0	12/12/02	60.46	6490.71	1.3	6551.17	55	6495	A -	—
										100	6450	L 100-150	Lower
CW38	1540103	483429	174.8	5.0	11/14/97	55.18	6500.42	2.1	6555.60	108	6446	A -	—
										130	6424	L 133-173	Lower
CW39	1537260	483754	126.3	5.0	12/12/02	63.22	6487.49	3.4	6550.71	40	6507	A -	—
										87	6460	L 90-123	Lower
CW40	1537624	491819	264.0	5.0	12/12/02	164.63	6414.31	2.6	6578.94	75	6501	A -	—
										220	6356	U 224-264	Upper
CW41	1533174	488584	206.0	6.0	12/12/02	86.00	6469.41	1.5	6555.41	59	6495	A -	—
										138	6416	L 146-206	Lower
CW42	1533169	487177	205.0	6.0	12/12/02	78.02	6470.76	0.0	6548.78	98	6451	A -	—
										124	6425	L 125-205	Lower
CW43	1537587	482493	104.1	5.0	12/12/02	66.36	6482.43	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

E = Estimated Depth

5.2 UPPER CHINLE WATER LEVELS

5.2.1 WATER LEVELS - UPPER CHINLE

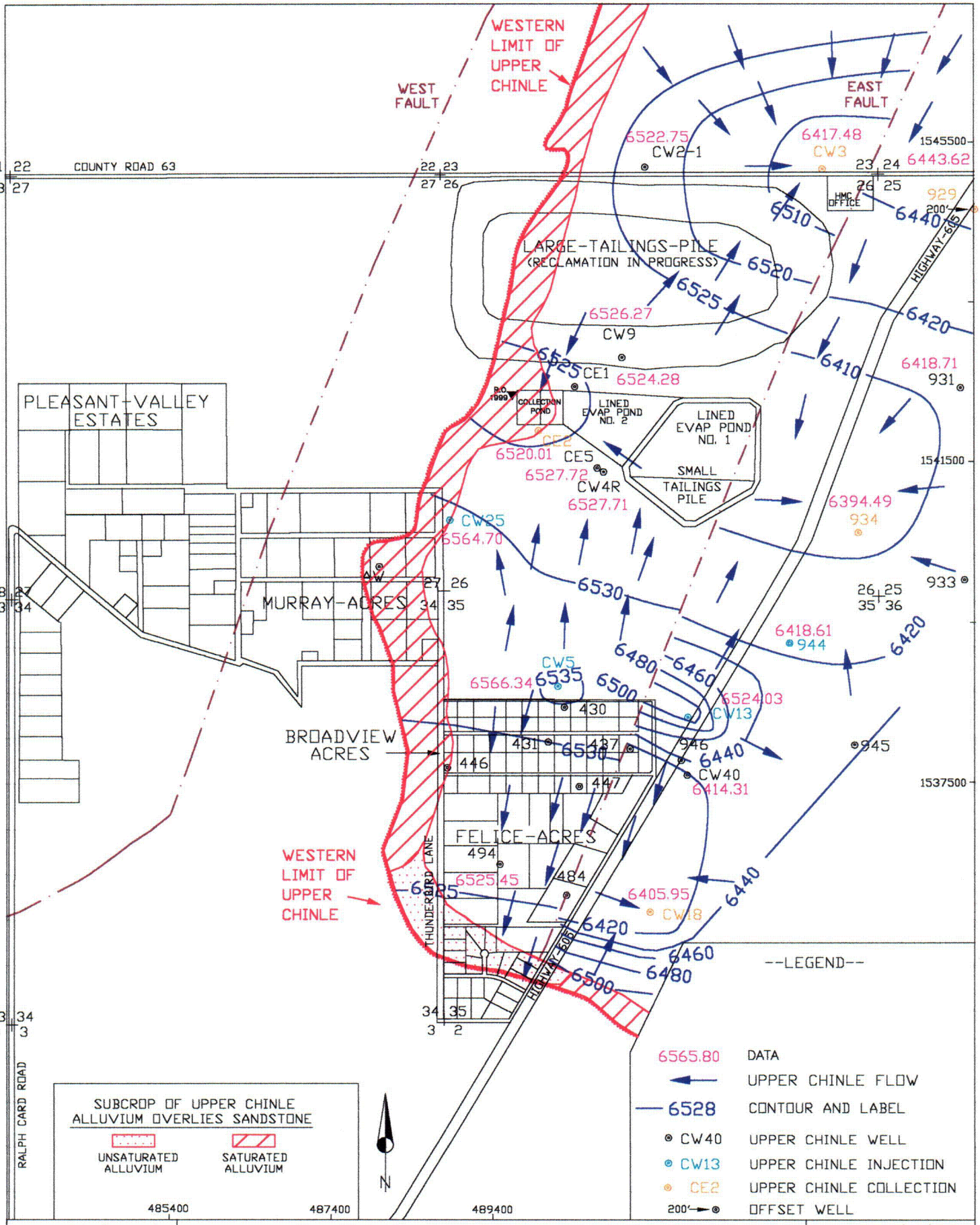
Water levels in Homestake's Upper, Middle and Lower Chinle aquifer wells are presented in Appendix A. Appendix A contains a table with Homestake, subdivision, and regional Chinle wells. Figure 5.2-1 presents water-level elevation contours of the Upper Chinle aquifer for the Fall of 2002. The blue arrows 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 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 at least out to 1000 feet east of the East Fault at well CW18. This injection combined with the pumping from wells 929, 934 and CW18 has created depressions along the east side of the East Fault near these wells and a mound near injection well CW13. The permeability decreases 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 flowing inward to the depressions adjacent to the East Fault caused by the pumping wells. The blue arrows show the direction of ground-water flow in this area.

The injection into Upper Chinle well CW5 causes 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 or moves to the north to collection wells CE2 or CW3. Injection into Upper Chinle well CW25 was started in 2000, which causes flow from this well back to collection well CE2. The natural flow in the Upper Chinle aquifer west of the East Fault is from the north. The collection in CW3 intercepts this flow and also pulls some Upper Chinle water from the south.

Figure 5.2-2 presents the location of the Upper Chinle wells that are used to monitor water-level changes with time. The color of the well name and symbol is the same on Figure 5.2-2 as on the water-level plots. Figure 5.2-3 presents the water-level elevations plotted versus time for Upper Chinle wells CW3, CW4R, CW5, CE2, 494 and CW25. Water levels in the Upper Chinle injection wells CW5 and CW25 were

maintained high during 2002. The changes in water levels from collection well CE2 are due to variations in pumping in this well. Water levels in wells CW4R and 494 were fairly steady in 2002 with little affect from the CW3 pumping on these water levels.

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 2002 were due to the pumping from these wells. The water-level elevation in wells CW18 and CW40 in the Upper Chinle declined in 2002 due to the CW18 pumping.

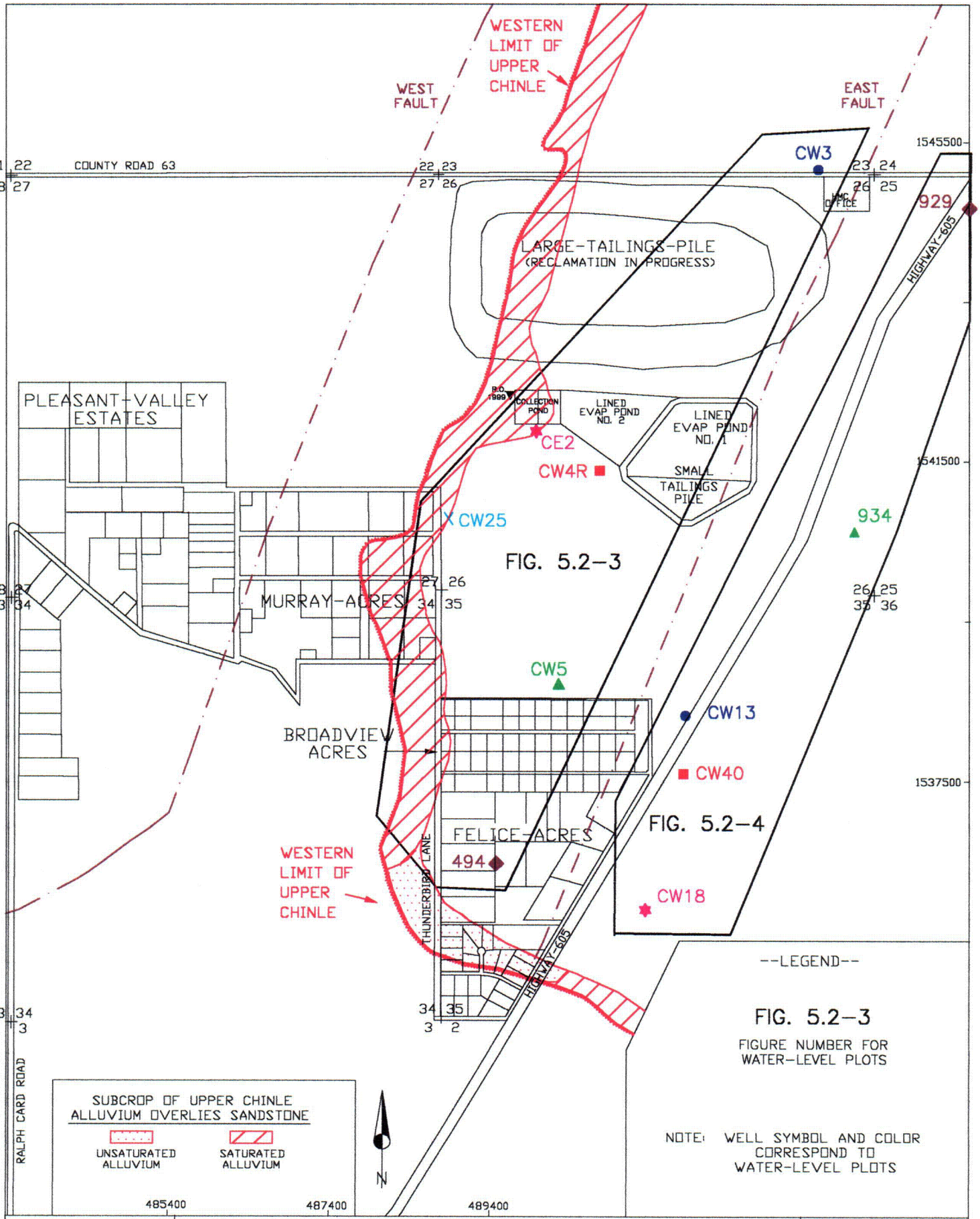


SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/06/03

FIGURE 5.2-1. WATER-LEVEL ELEVATIONS FOR THE UPPER CHINLE AQUIFER, 2002, FT-MSL

D\R13\HMC\UP1600 LH

C05



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/06/03

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

D\R13\HMC\UP1600 LH

page 5.2-4

C06

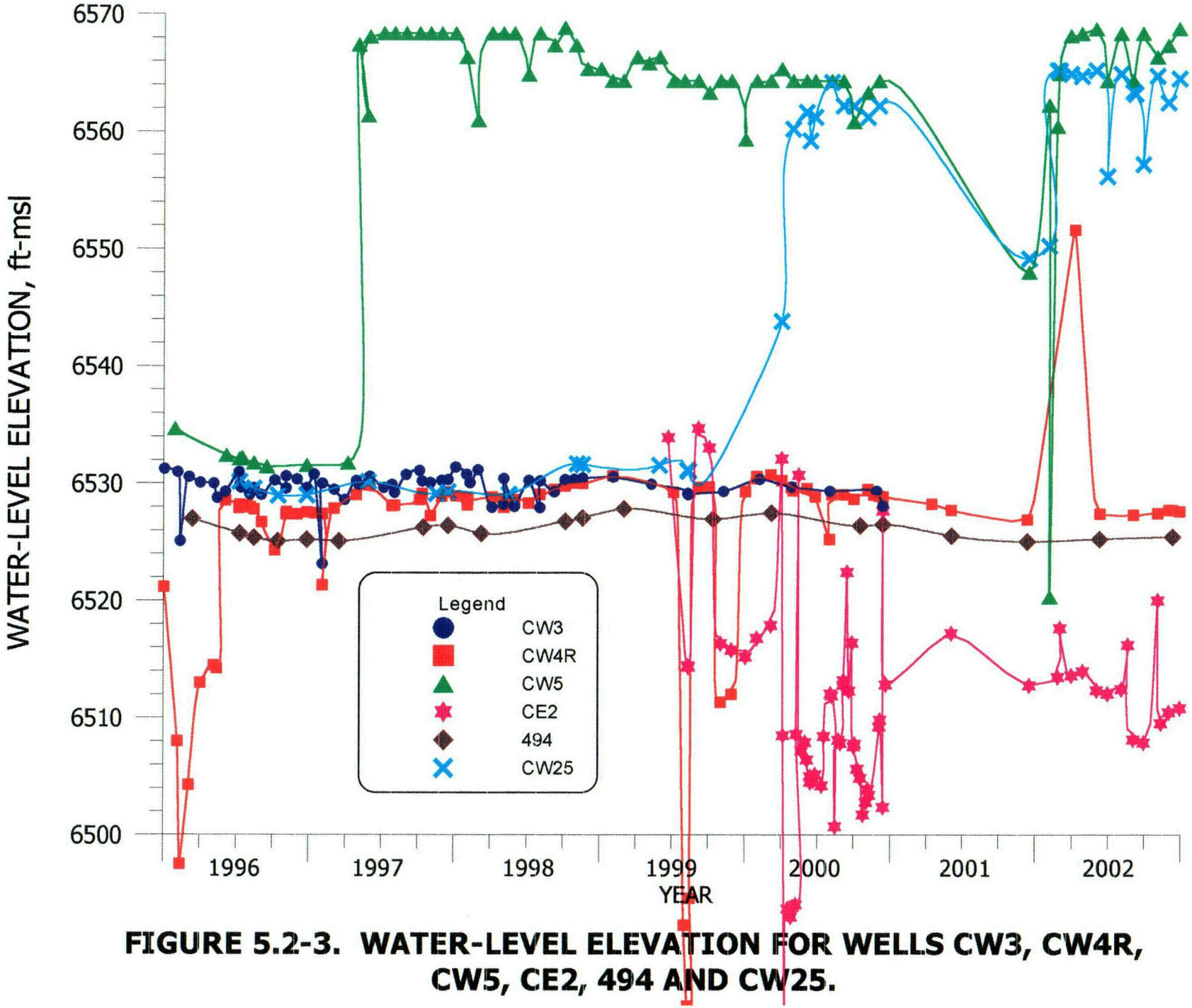


FIGURE 5.2-3. WATER-LEVEL ELEVATION FOR WELLS CW3, CW4R, CW5, CE2, 494 AND CW25.

C07

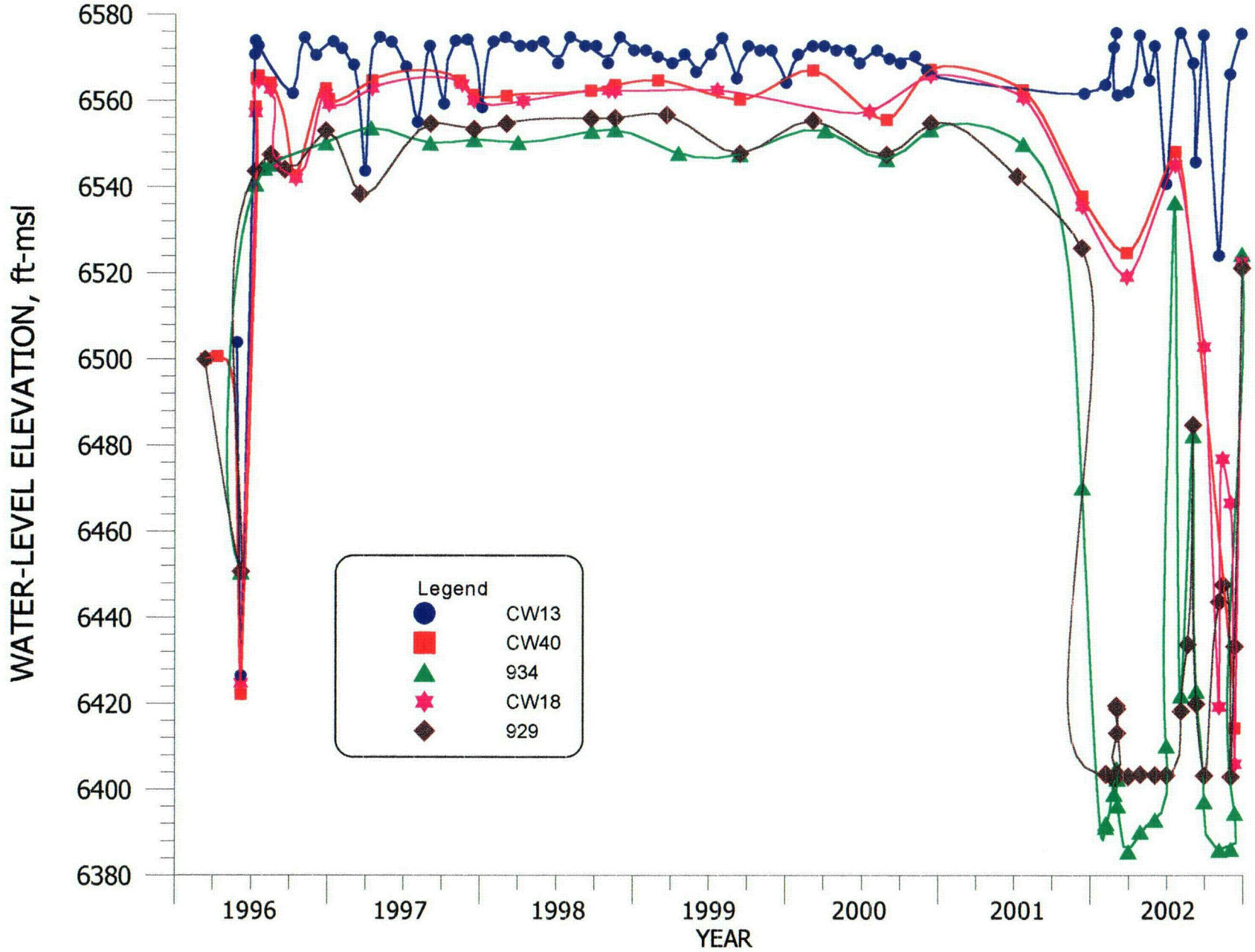


FIGURE 5.2-4. WATER-LEVEL ELEVATION FOR WELLS CW13, CW40, 934, CW18 AND 929.

C08

5.3 UPPER CHINLE WATER QUALITY

The water quality data for 2002 for the Chinle aquifers is presented in Tables B.5-1 and B.5-2 of Appendix B. The basic well data presented in Tables 5.1-1 through 5.1-4 and Figure 5.1-2 show which of the Chinle wells are completed in the Upper Chinle.

The water quality in the Upper Chinle aquifer exceeds background conditions in only a few locations. Sulfate concentrations have been adequately restored in the Upper Chinle aquifer. Selenium concentrations are less than or equal to the State site standard in all Upper Chinle wells in 2002. Uranium concentrations exceed background in five wells that are slowly being restored due to the leaching of this constituent during restoration. Molybdenum concentrations in the Upper Chinle aquifer exceed the significance level concentration in one well near the large tailings.

5.3.1 SULFATE - UPPER CHINLE

Figure 5.3-1 presents the sulfate concentrations for the Upper Chinle aquifer during the Fall of 2002. The Upper Chinle concentrations varied from 112 to 925 mg/l. No values exceeded the range in background concentrations in the Upper Chinle in 2002. Background data is presented for sulfate in 2002 in a box in the upper left corner of Figure 5.3-1. Therefore, sulfate in this aquifer has been adequately restored. Background data is considered to be upgradient alluvial wells because the alluvial aquifer recharges the Upper Chinle in this area. The reduction in sulfate concentration in well CE5 was caused by the R.O. product injection into well CW4R during early 2002.

The location of wells used in the water-quality plots versus time are presented in Figure 5.3-2. The color and symbol of the individual wells are the same as 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 used for other constituents also. Figure 5.3-2 shows that Upper Chinle wells CW3, CE2, CE5, 446 and 494 are grouped together on the water quality time plots and wells CW18, CW40, 929 and 934 are grouped together in a second plot.

Figure 5.3-3 presents the sulfate concentrations versus time for the above listed Upper Chinle wells. The sulfate concentrations in each of these wells are below background, showing restoration of all Upper Chinle wells west of the East Fault (see Figure 5.3-3). Sulfate concentrations in well CE2 near the subcrop area south of the large tailings have declined to a concentration similar to those in the remainder of the Upper Chinle values. A small increase in sulfate was observed in well CW3. The decline in sulfate concentration in well CE5 was due to the R.O. product injection into well CW4R.

Sulfate concentrations plotted versus time for Upper Chinle wells CW40, CW18, 929 and 934 are presented on Figure 5.3-4 (see Figure 5.3-2 for location of these wells). This plot shows a gradual increase in sulfate concentrations in 2002 in Upper Chinle wells after a decline for the previous two years.

5.3.2 TOTAL DISSOLVED SOLIDS - UPPER CHINLE

Figure 5.3-5 presents the total dissolved solids (TDS) concentrations for the Upper Chinle aquifer for the Fall of 2002. All concentrations are less than 2000 mg/l, with the exception of areas of the Upper Chinle near the large tailings and east of State Highway 605. The TDS concentration naturally increased to the east of the East Fault due to the slower movement of ground water in this less transmissive portion of the aquifer. No pattern is shown on Figure 5.3-5 because all of the Upper Chinle TDS concentrations are less than 3060 mg/l, which is the significance level for this constituent. No concentration time plots are presented for this constituent because sulfate time concentration plots adequately define the variation of major constituents with time. TDS concentrations in the Upper Chinle aquifer do not require restoration.

5.3.3 URANIUM - UPPER CHINLE

Uranium concentration in the Upper Chinle aquifer is an important parameter for the Upper Chinle. Figure 5.3-6 presents the uranium concentrations in the Upper Chinle aquifer for the Fall of 2002. Only three of the uranium concentrations in the Upper Chinle exceed the 0.43 mg/l concentration. The highest value east of the East

Fault for 2002 was observed in well 934 with a value of 0.36 mg/l. This increase needs to be confirmed prior to giving the concentration significance. Only five values exceed the 2002 upper limit of uranium background concentrations of 0.21 mg/l (see Figure 3.2-1 or upper left box in Figure 5.3-6). These concentrations should gradually be decreased to below background concentrations with the CE2 collection and the CW5 and CW25 injection.

Uranium concentrations plotted versus time for Upper Chinle wells CW3, CE2, CE5, 446 and 494 are presented in Figure 5.3-7 (see Figure 5.3-2 for location of these wells). The increase in well CW3 is due to the pumping of this well for supply for the tailings flushing. This plot shows that the uranium concentrations in Upper Chinle well CE5 declined in 2002 due to the R.O. product injection nearby. Uranium concentrations in well 494 were steady the last three years. The uranium concentrations in Upper Chinle collection well CE2 was fairly steady in 2002 after a decline from the 2001 value. All of the other uranium concentrations on this plot are very low.

The uranium concentrations in all of the Upper Chinle wells east of the Highway are very low except the last value for well 934. Figure 5.3-8 shows the uranium concentration for Upper Chinle wells CW18, CW40, 929 and 934. The low uranium concentration in well 934 increased in 2002 but needs to be confirmed. Concentrations in all of these wells are below the average background concentration except the most recent value from well 934.

5.3.4 SELENIUM - UPPER CHINLE

Selenium concentrations for the Upper Chinle aquifer are presented in Figure 5.3-9 for the Fall of 2002. This figure shows that all of the selenium concentrations are less than 0.27 mg/l. The 2001 selenium concentration in well CE2 was 0.15 mg/l compared to 0.06 mg/l for 2002. The 0.27 mg/l value is the upper background level based on the 95th percentile in the alluvial aquifer upgradient of the tailings.

Figure 5.3-10 presents the selenium concentration versus time for wells CW3, CE2, CE5, 446 and 494. The selenium concentrations in the Upper Chinle aquifer in well CW3 increased in 2002 and has been fairly steady since the increase. The

selenium concentration in collection well CE2 gradually declined in 2002 while the levels in CE5 decreased. The selenium concentrations for all of the remaining wells on this plot are low.

Figure 5.3-11 presents the selenium concentrations versus time for Upper Chinle wells CW18, CW40, 929 and 934. This plot shows that the selenium concentrations in 2002 for wells CW40 and CW18 have remained low after their restoration in 1997. These decreases in concentration were due to the fresh-water injection in Upper Chinle well CW13 east of the East Fault.

5.3.5 MOLYBDENUM - UPPER CHINLE

Figure 5.3-12 presents the molybdenum concentrations in the Upper Chinle aquifer during 2002. The molybdenum concentrations near the large tailings are above 0.73 mg/l. Concentrations are above 1.0 mg/l extending from the subcrop area toward well CW3. Additional restoration is needed in this area, which should be easily accomplished after the alluvial aquifer is restored in the subcrop area.

Figure 5.3-13 presents the molybdenum-time concentration plots for Upper Chinle wells between the two faults. Concentrations in wells CE2, 446 and 494 in 2002 were similar to their 2001 concentrations. Concentrations decreased in well CE5 in 2002 while an increase was observed in well CW3.

Figure 5.3-14 shows molybdenum concentrations for wells CW18, CW40, 929 and 934. This figure shows small molybdenum concentrations in each of these wells in 2002 except for an increase in well 934. Additional analyses are needed prior to giving this value any significance.

5.3.6 NITRATE - UPPER CHINLE

Nitrate monitoring for the Upper Chinle aquifer has been reduced due to all concentrations being lower than the State site standard of 12.4 mg/l. Nitrate concentrations are not expected to be significant in the future in the Upper Chinle aquifer due to the very limited extent of elevated concentrations in the alluvial aquifer.

5.3.7 RADIUM-226 AND RADIUM-228 - UPPER CHINLE

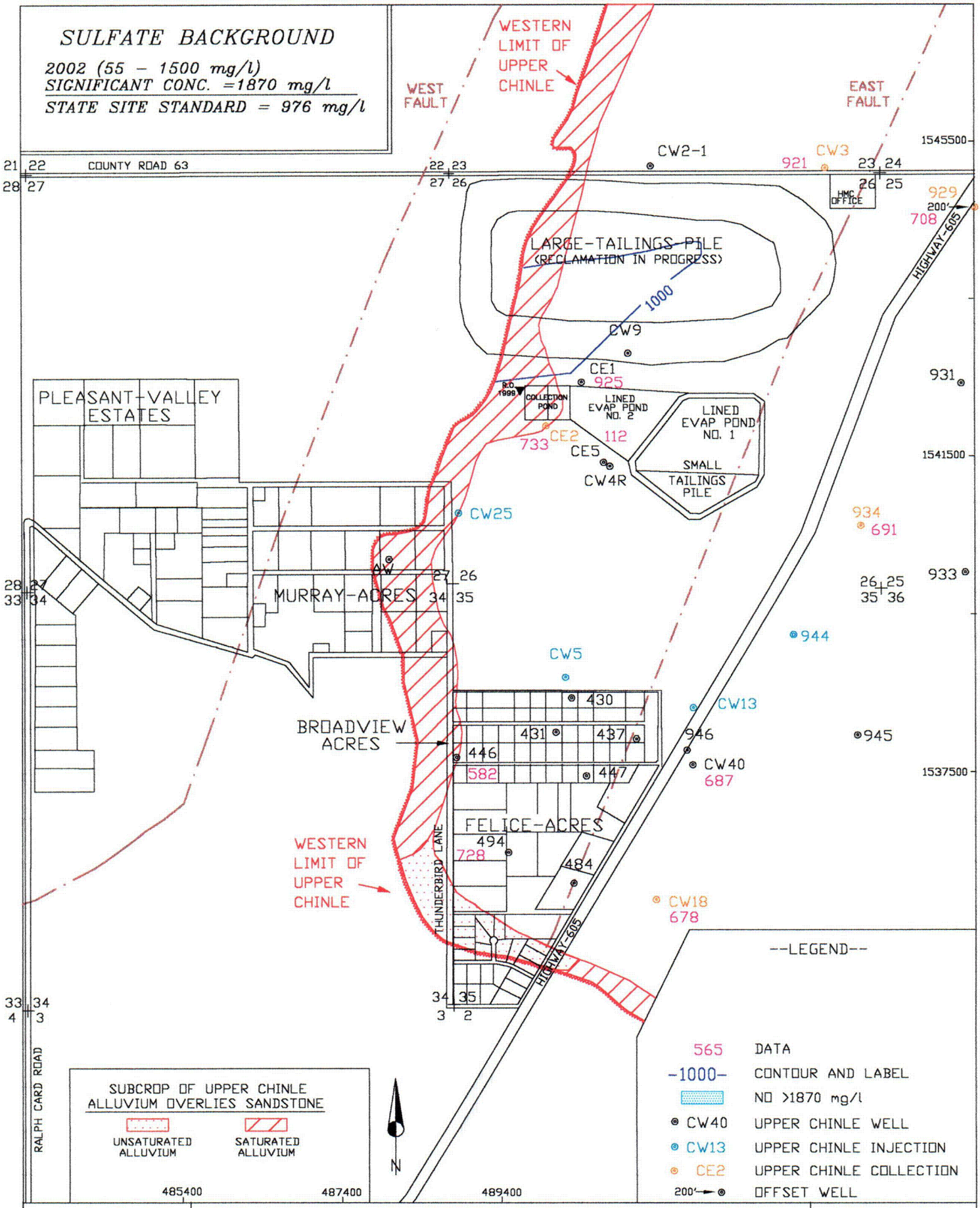
All radium concentrations have been low in past years in the Upper Chinle aquifer. Radium is not an important parameter relative to the Upper Chinle aquifer and should be considered for removal as an NRC site standard.

5.3.8 VANADIUM - UPPER CHINLE

Vanadium concentrations have always been low in the Upper Chinle aquifer. Significant concentrations in the Upper Chinle aquifer would not be expected because this constituent has been slightly elevated in the alluvial aquifer only near the tailings. Vanadium concentrations in the Upper Chinle aquifer have never supported the use of this constituent as a site standard.

5.3.9 THORIUM-230 - UPPER CHINLE

Thorium-230 concentrations have never been significant in the Upper Chinle aquifer and, therefore, should be dropped from the Upper Chinle monitoring list.

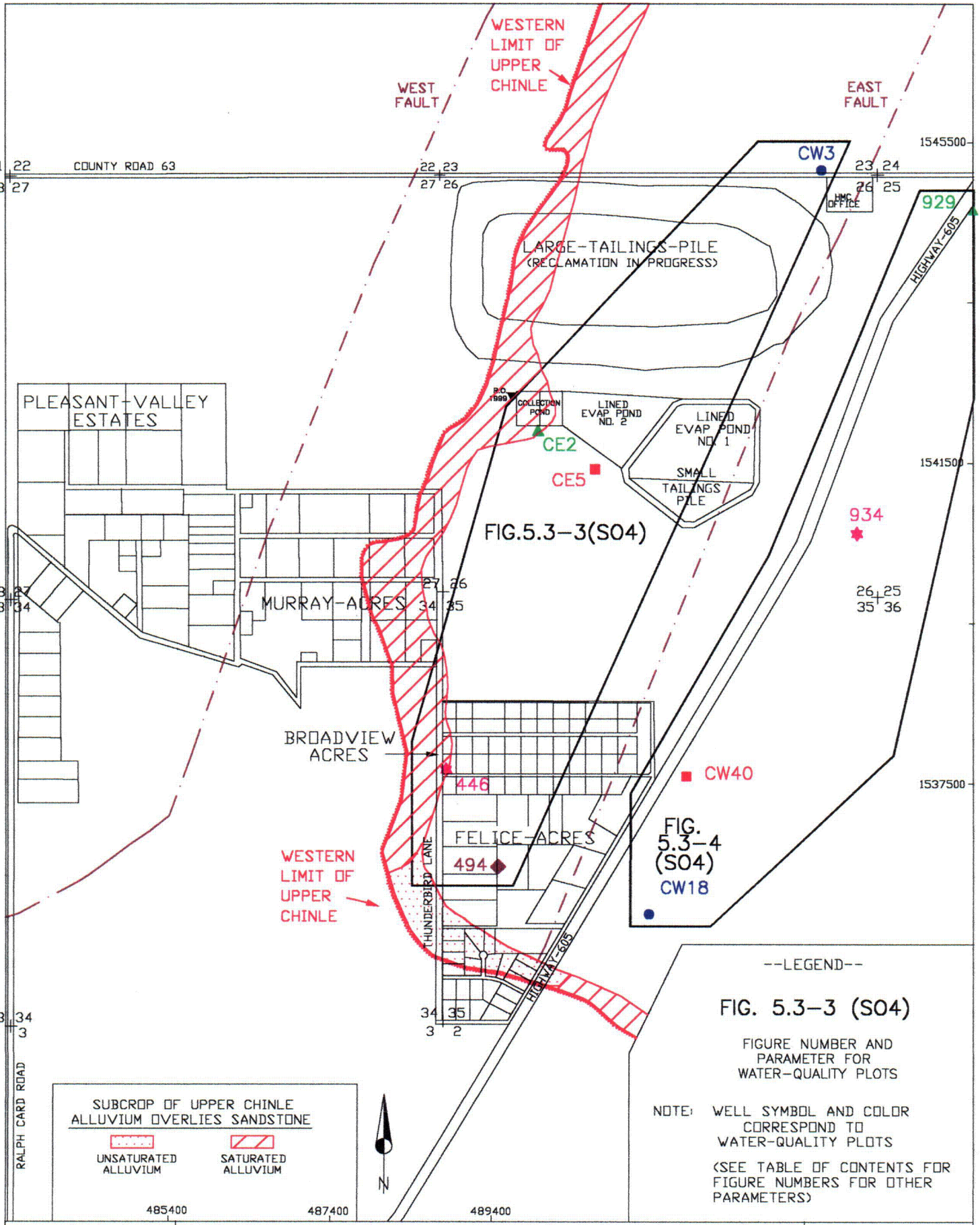


SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/27/03

FIGURE 5.3-1 SULFATE CONCENTRATIONS FOR THE UPPER CHINLE AQUIFER, FALL 2002, mg/l

c:\dd\projects\2003_06\up1600

C09



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/06/03

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

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C10

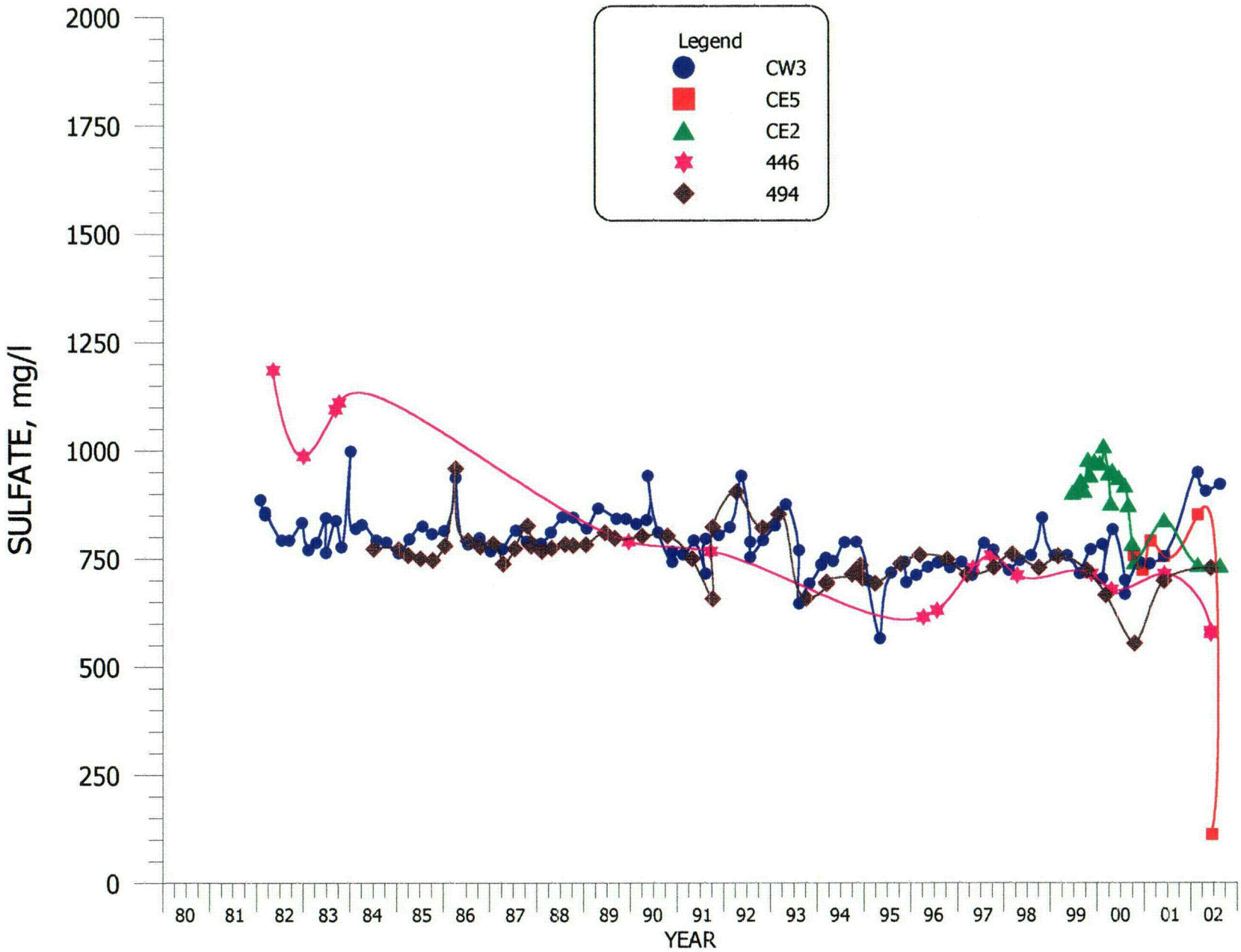

FIGURE 5.3-3. SULFATE CONCENTRATIONS FOR WELLS CW3, CE5, CE2, 446 AND 494.

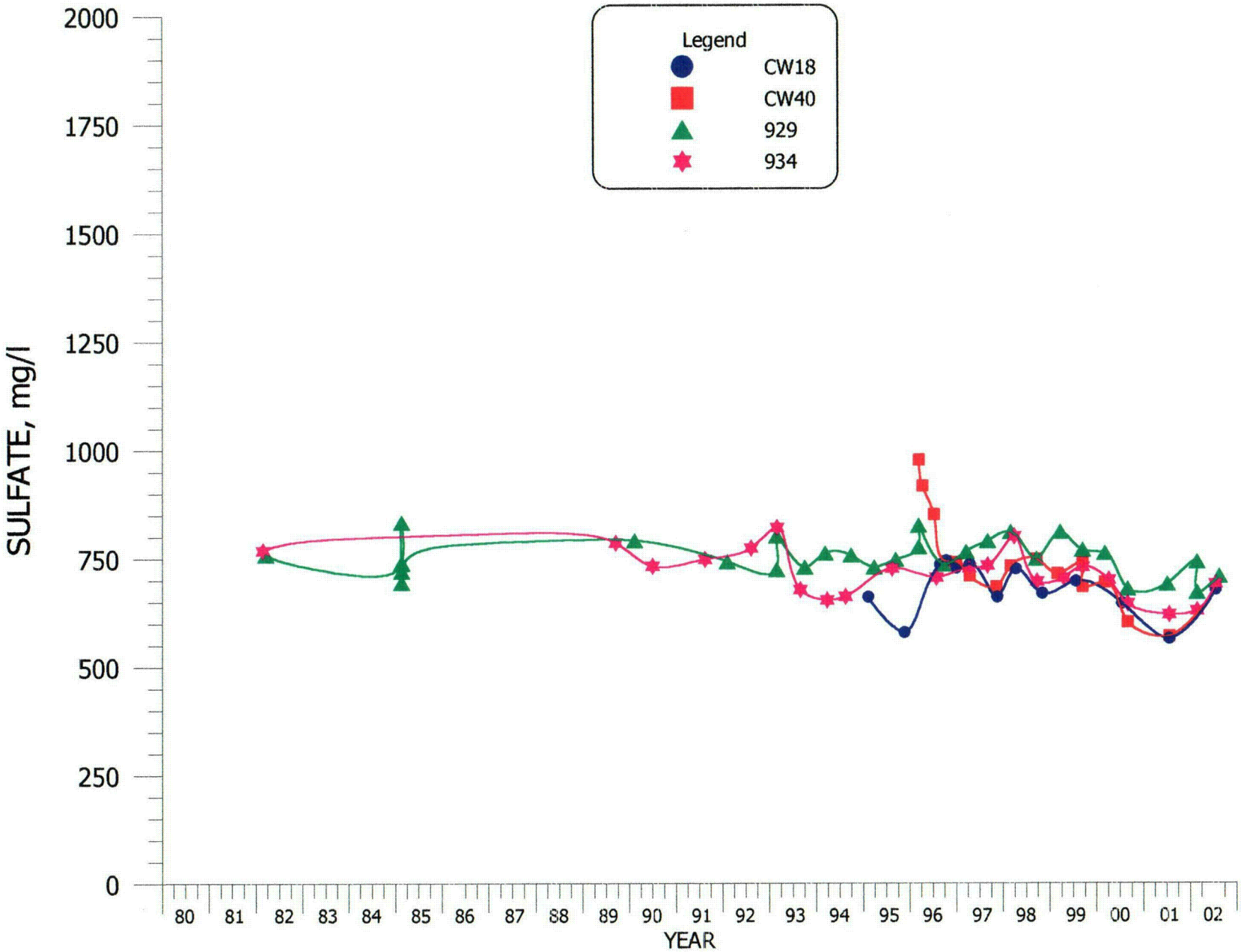

FIGURE 5.3-4. SULFATE CONCENTRATIONS FOR WELLS CW18, CW40, 929 AND 934.

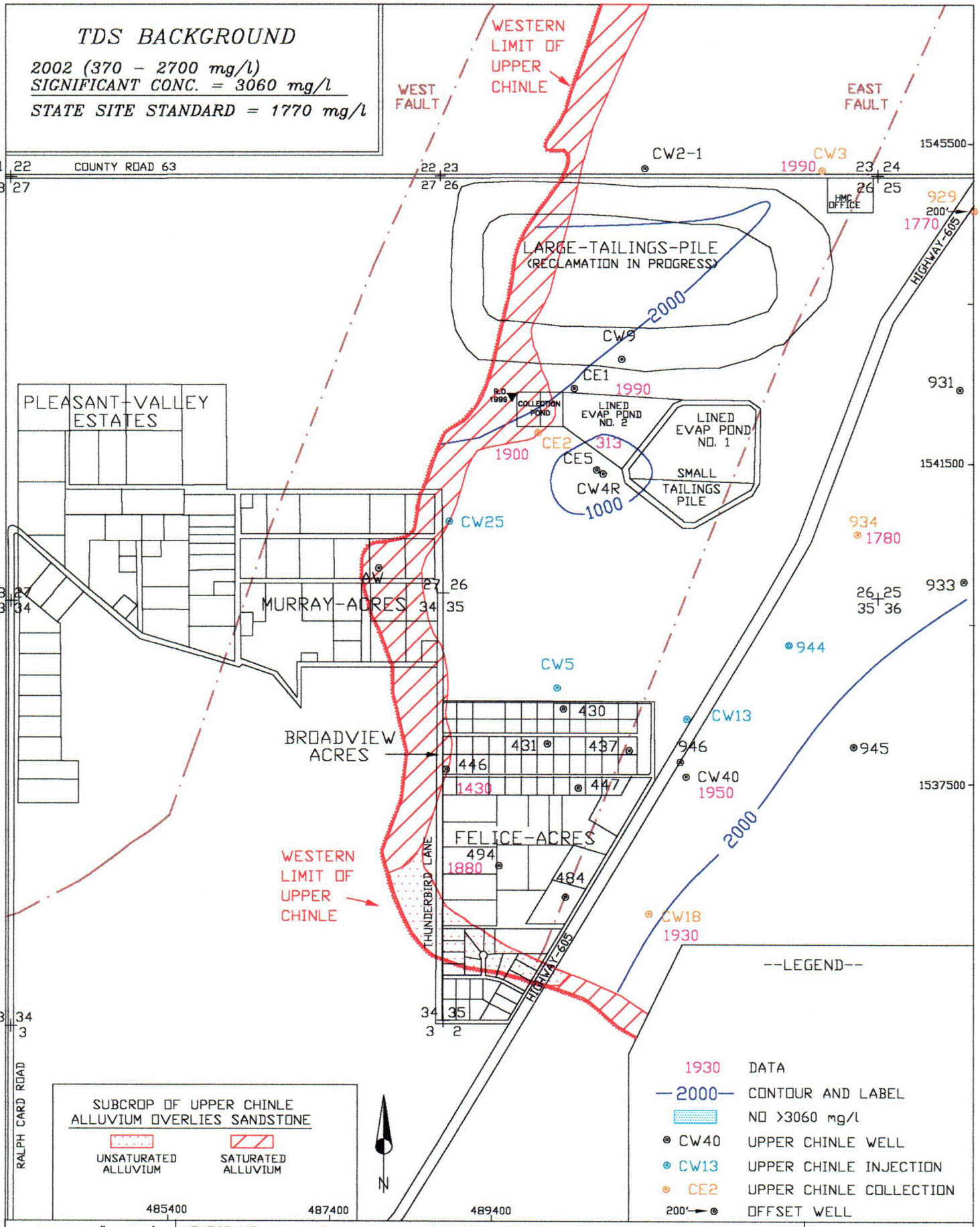

FIGURE 5.3-5 TDS CONCENTRATIONS FOR THE UPPER CHINLE AQUIFER, FALL 2002, mg/l

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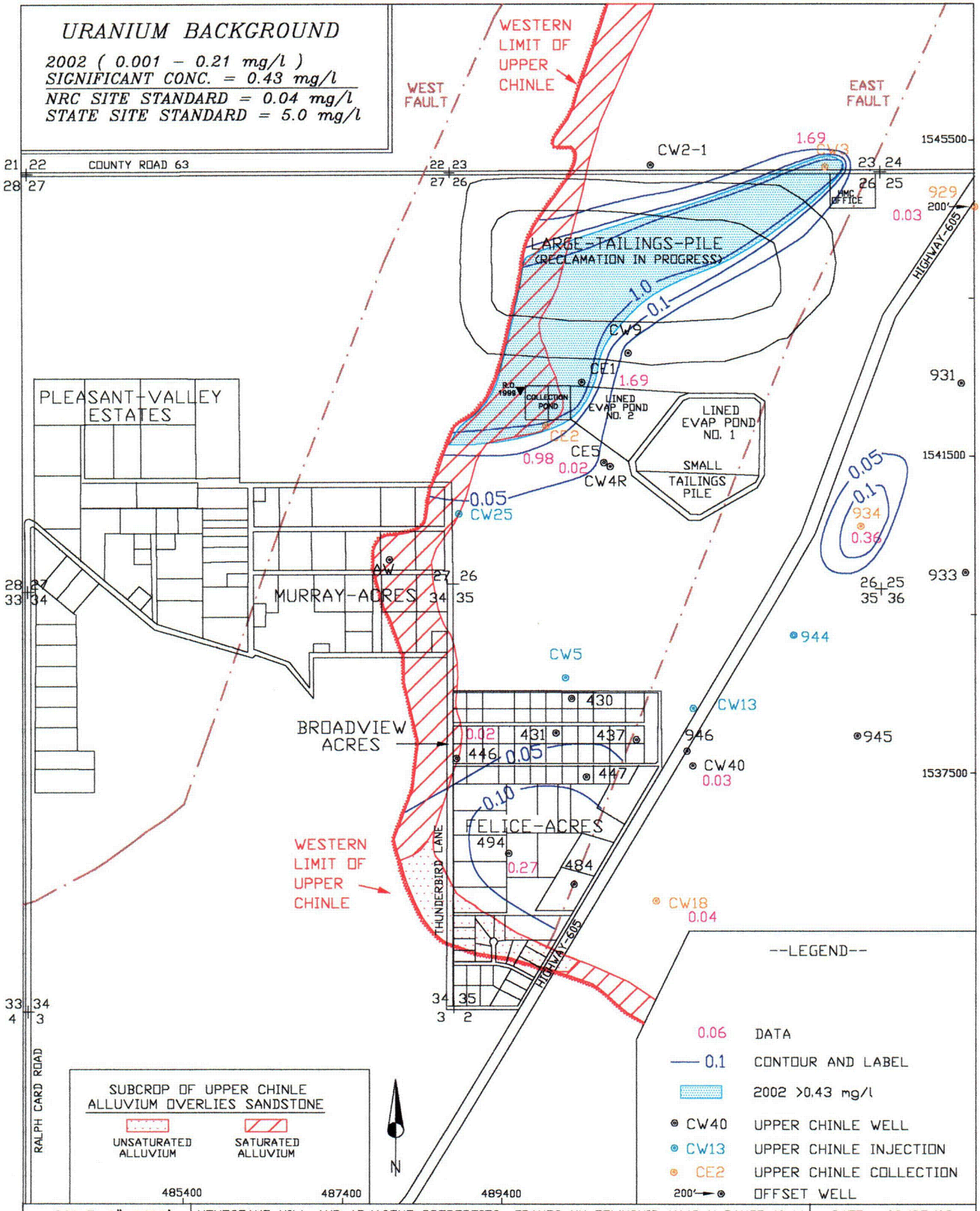

FIGURE 5.3-6. URANIUM CONCENTRATIONS FOR THE UPPER CHINLE AQUIFER, FALL 2002, mg/l

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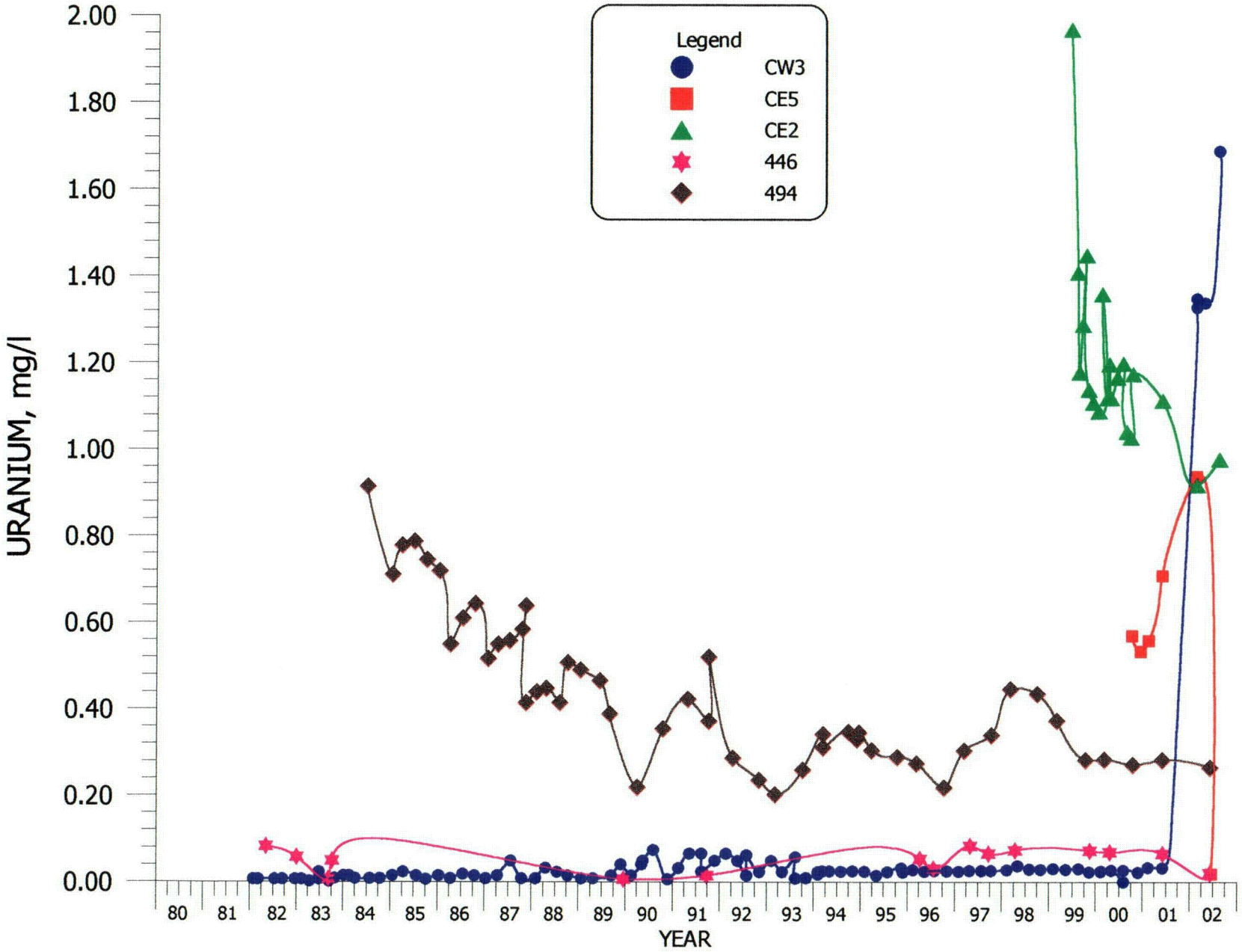

FIGURE 5.3-7. URANIUM CONCENTRATIONS FOR WELLS CW3, CE5, CE2, 446 AND 494.

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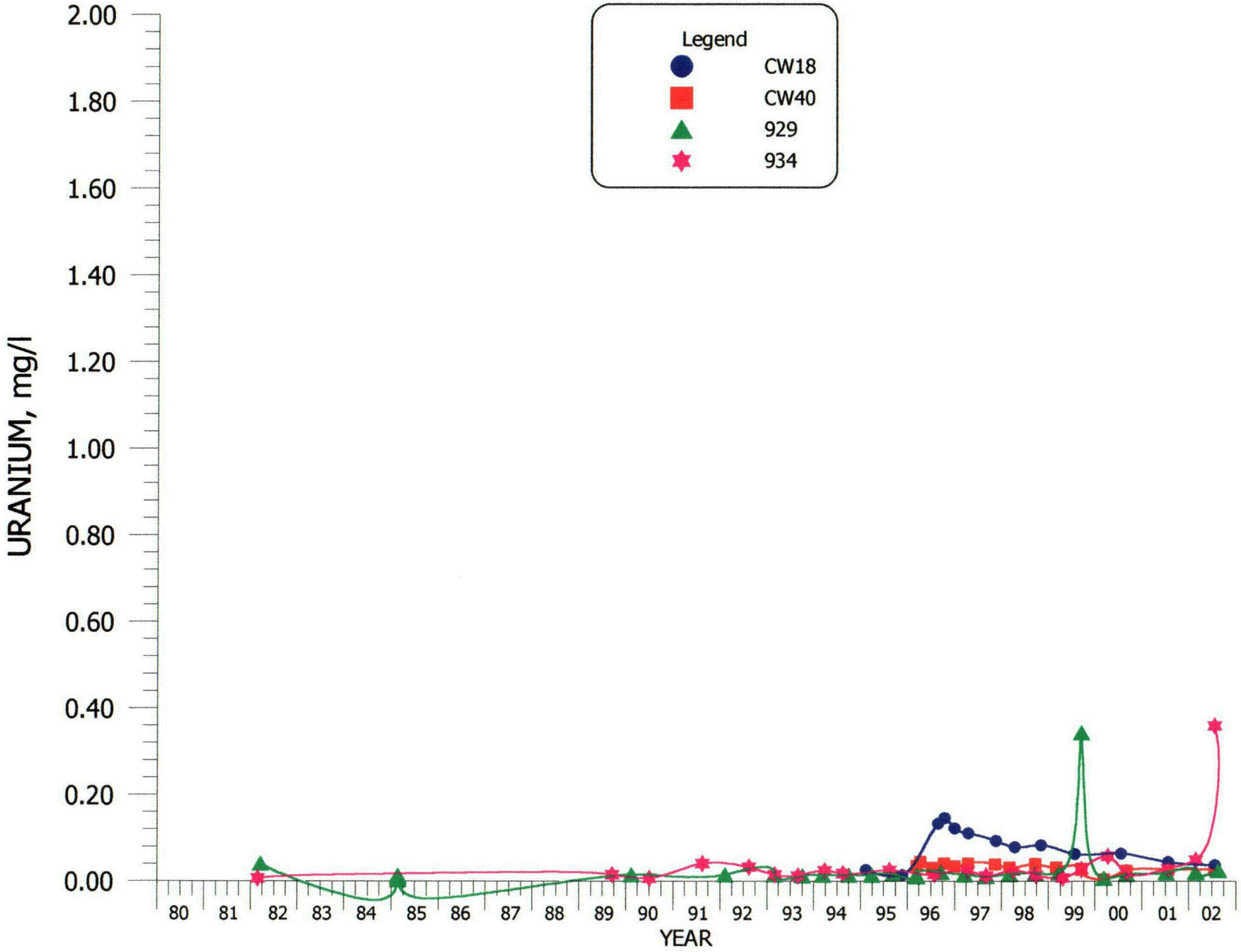
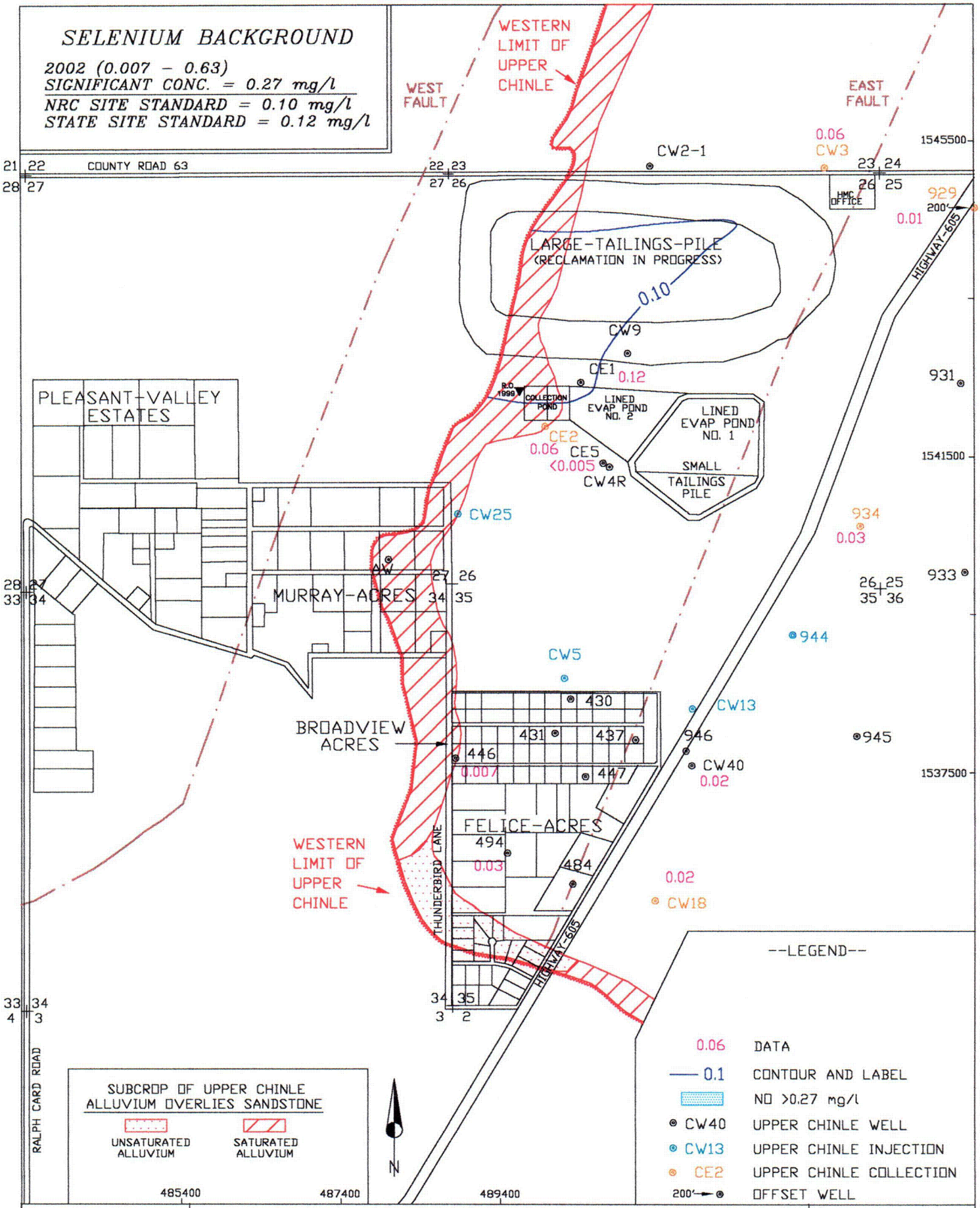


FIGURE 5.3-8. URANIUM CONCENTRATIONS FOR WELLS CW18, CW40, 929 AND 934.



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/27/03

FIGURE 5.3-9. SELENIUM CONCENTRATIONS FOR THE UPPER CHINLE AQUIFER, FALL 2002, mg/l

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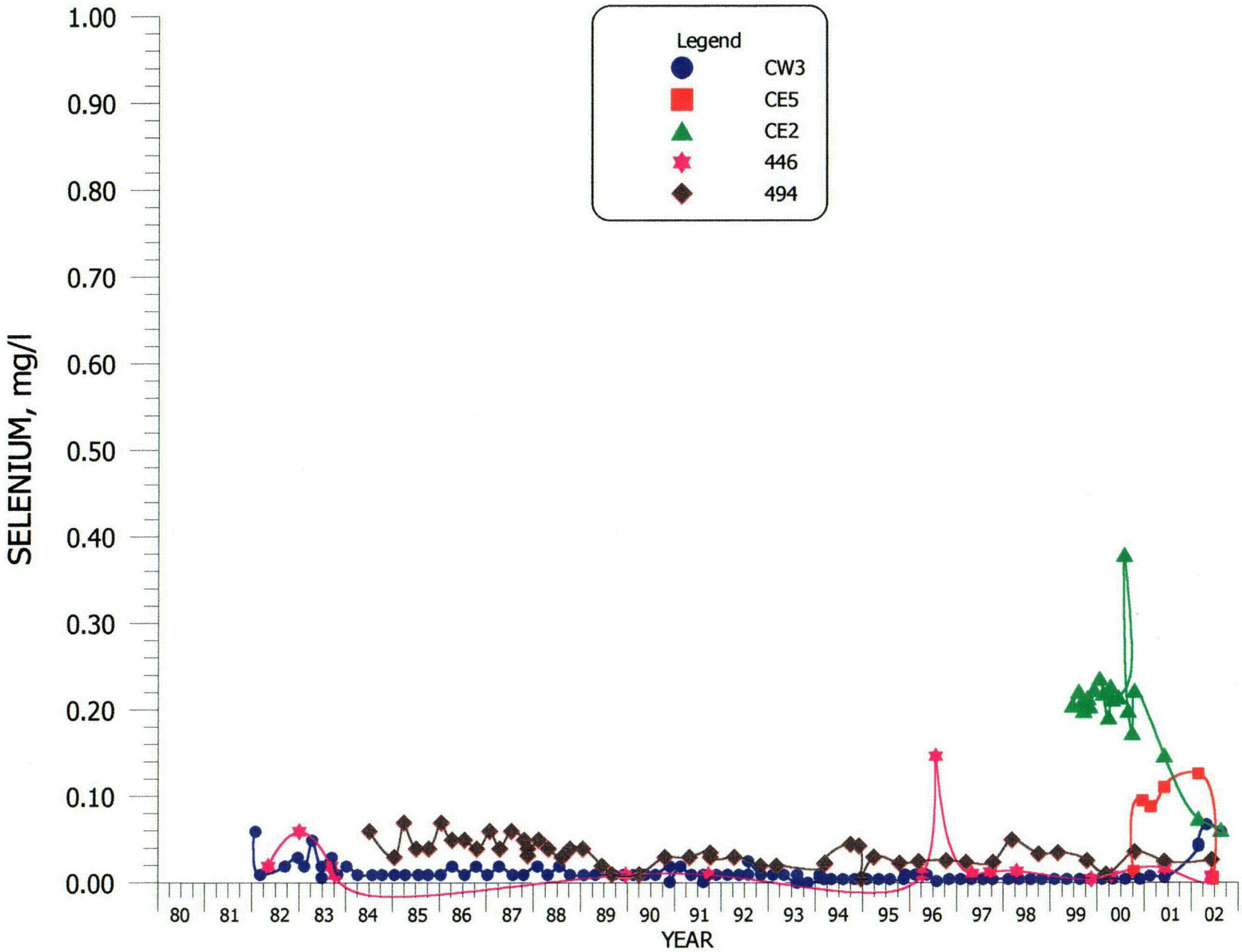

FIGURE 5.3-10. SELENIUM CONCENTRATIONS FOR WELLS CW3, CE5, CE2, 446 AND 494.

C18

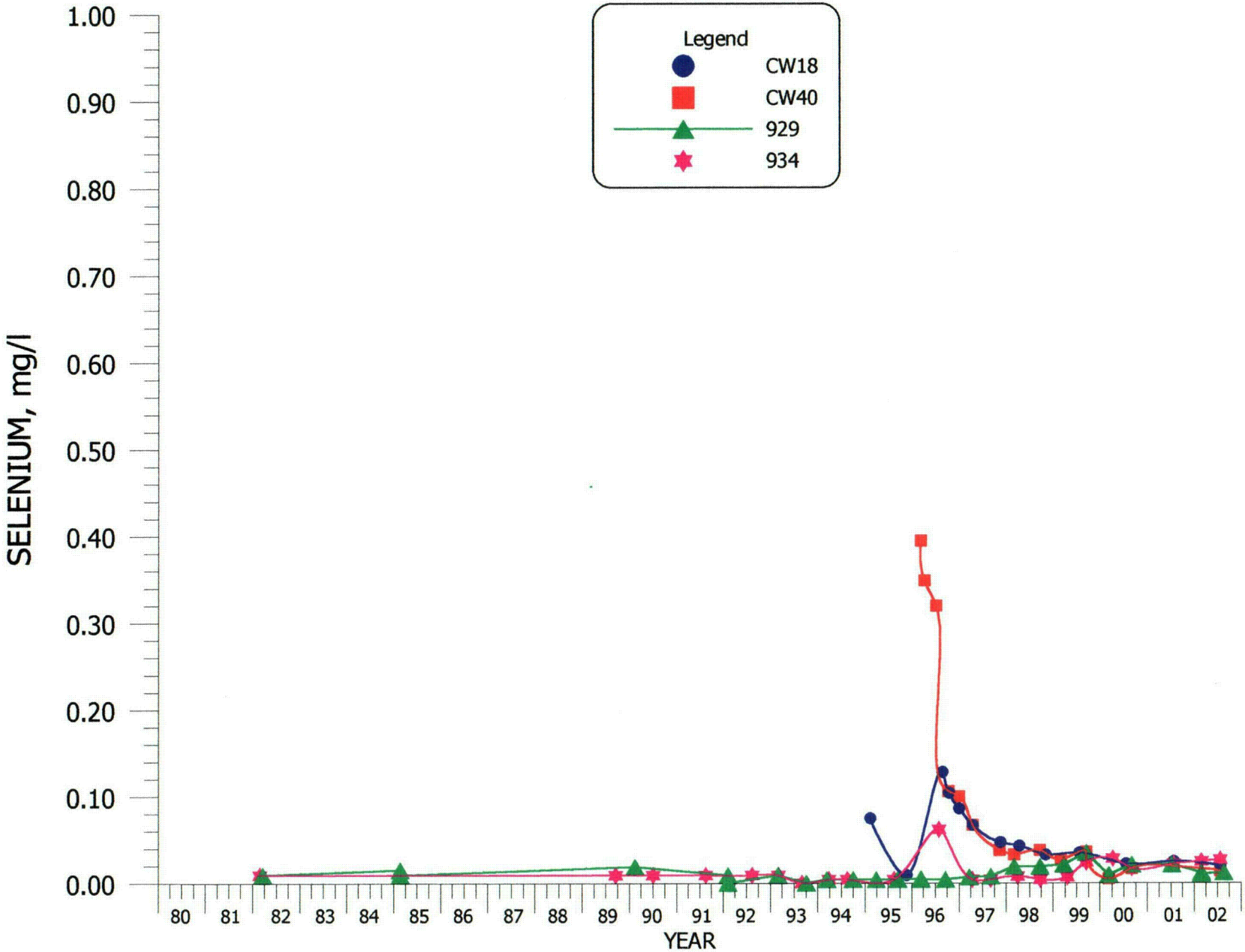

FIGURE 5.3-11. SELENIUM CONCENTRATIONS FOR WELLS CW18, CW40, 929 AND 934.

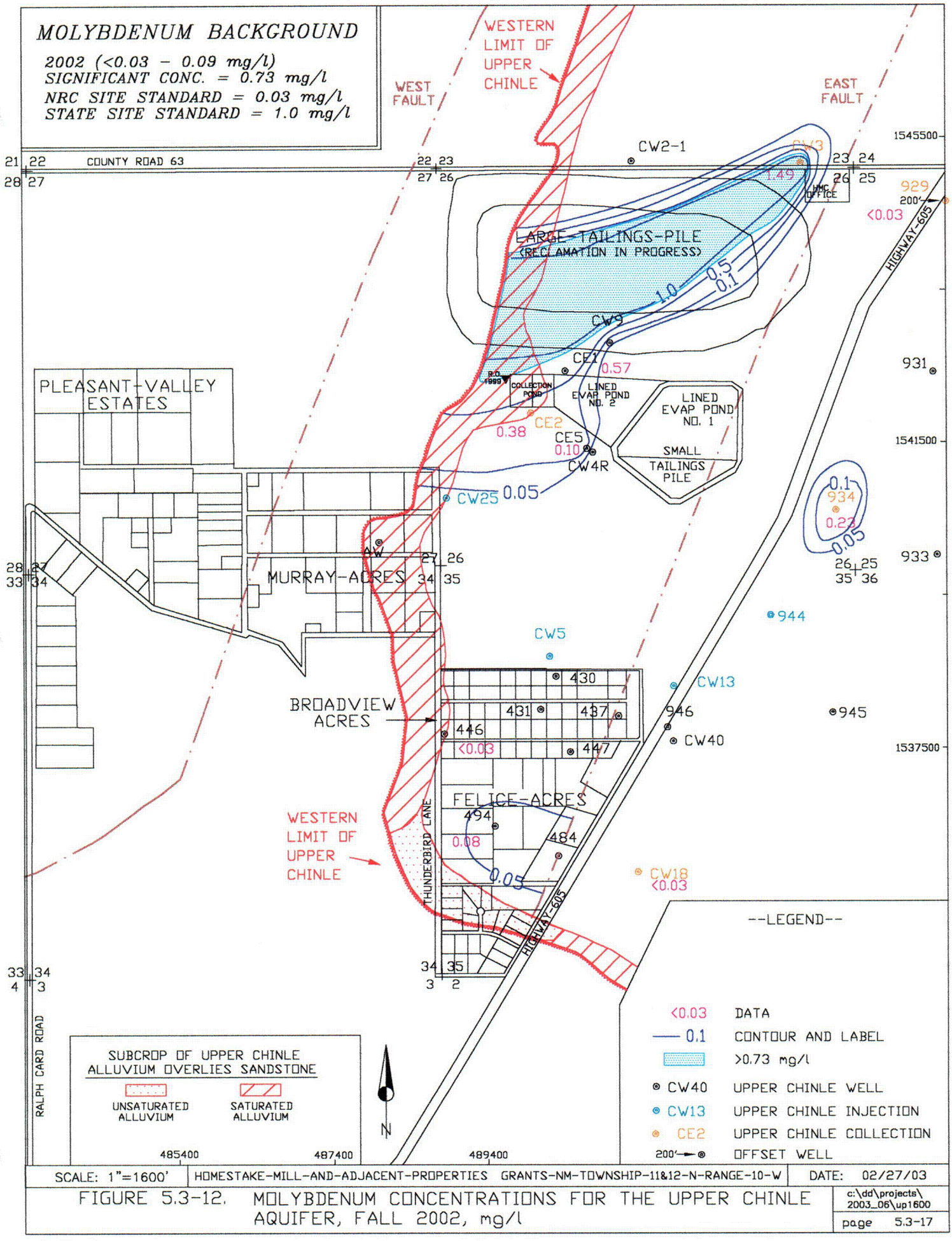

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FIGURE 5.3-12. MOLYBDENUM CONCENTRATIONS FOR THE UPPER CHINLE AQUIFER, FALL 2002, mg/l

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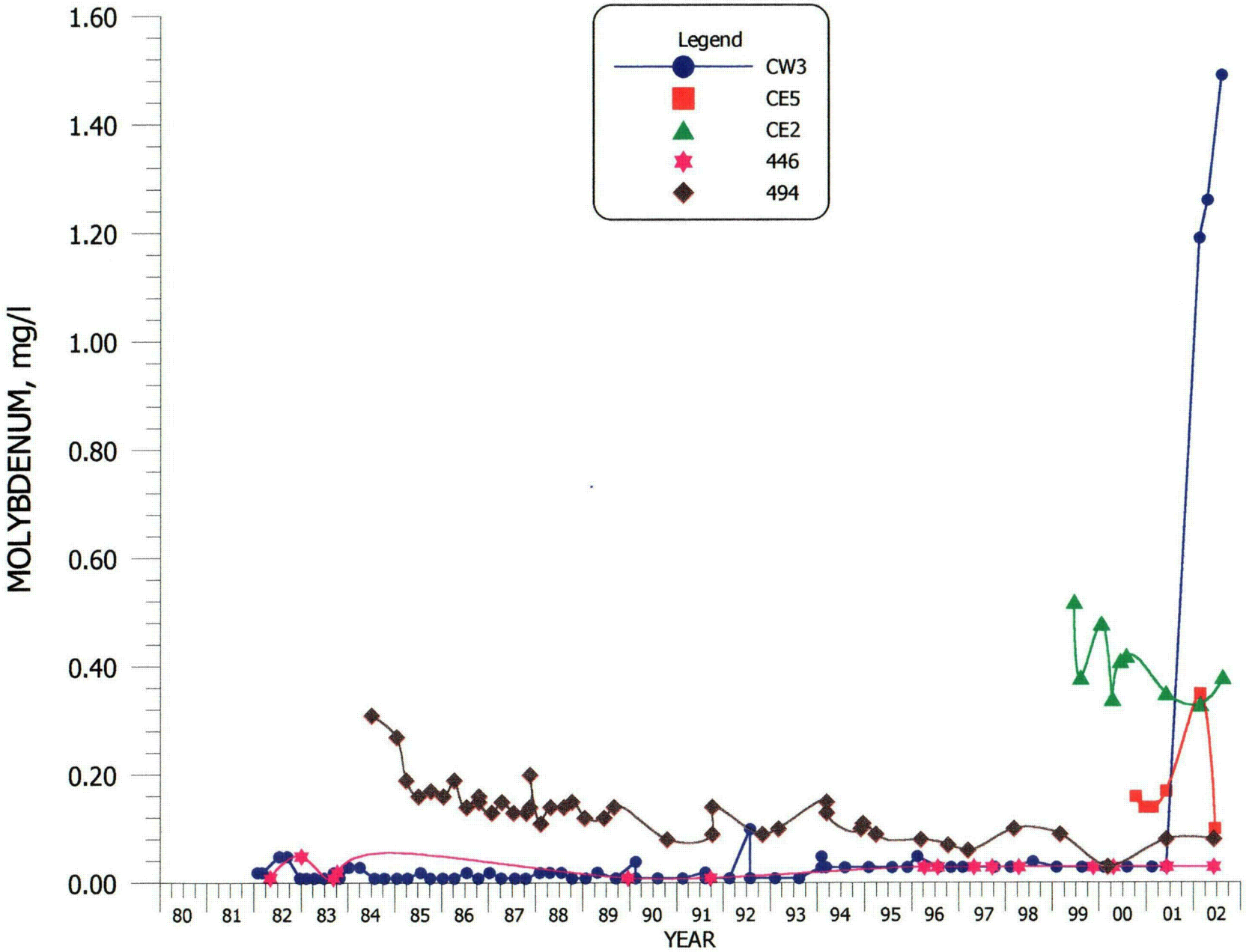

FIGURE 5.3-13. MOLYBDENUM CONCENTRATIONS FOR WELLS CW3, CE5, CE2, 446 AND 494.

C21

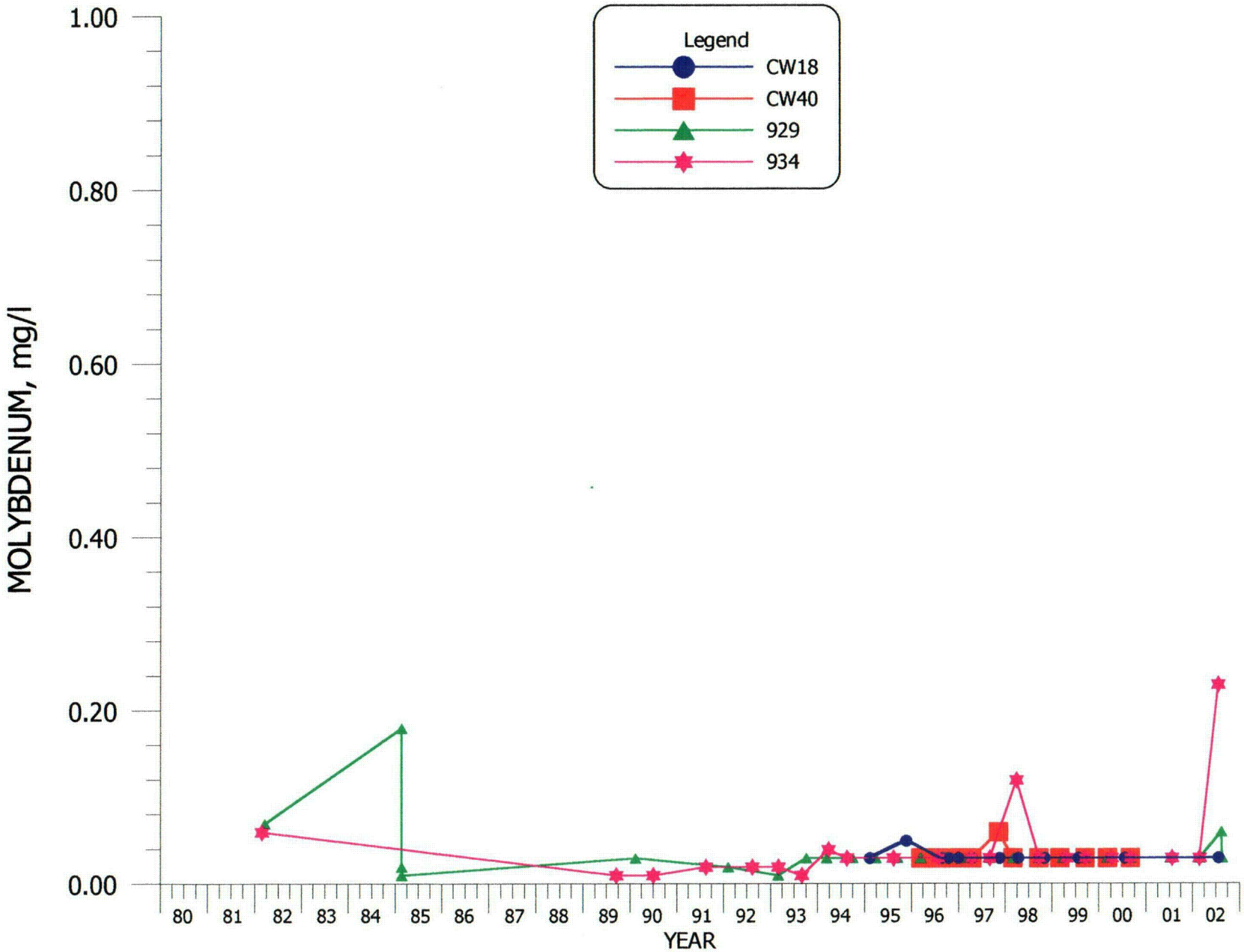

FIGURE 5.3-14. MOLYBDENUM CONCENTRATIONS FOR WELLS CW18, CW40, 929 AND 934.

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SECTION 6

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GROUND-WATER MONITORING FOR HOMESTAKE'S GRANTS PROJECT

FIGURES

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GROUND-WATER MONITORING
FOR HOMESTAKE'S GRANTS PROJECT

FIGURES
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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 basic 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 light blue area is where the Middle Chinle aquifer exists between the West and East Faults and has Chinle shale between the top of the Middle Chinle sandstone and the base of the alluvium. The green areas show where the alluvium overlies the Middle Chinle sandstone and produces direct contact between these two units. The area where the alluvium is saturated over the Middle Chinle sandstone is very important with respect to transfer of water between these two aquifers and is shown with the green cross hatch. The area where the Middle Chinle subcrops against alluvium that is not saturated is shown by the green plus (+) pattern. Middle Chinle wells CW1 and CW2 were used in 2002 as a source of water for the tailings flushing while well CW28 was used as source of fresh water injection in late 2002. Well CW44 was used for the third year as an irrigation supply well.

The Middle Chinle aquifer also exists east of the East Fault in the red pattern area with a subcrop zone on the south side of this area. A limited area (dark blue) of Middle Chinle aquifer exists west of the West Fault. All three of these areas in the Middle Chinle aquifers act as separate ground-water systems with the exception of some contact between the two areas where the East Fault ceases to the south.

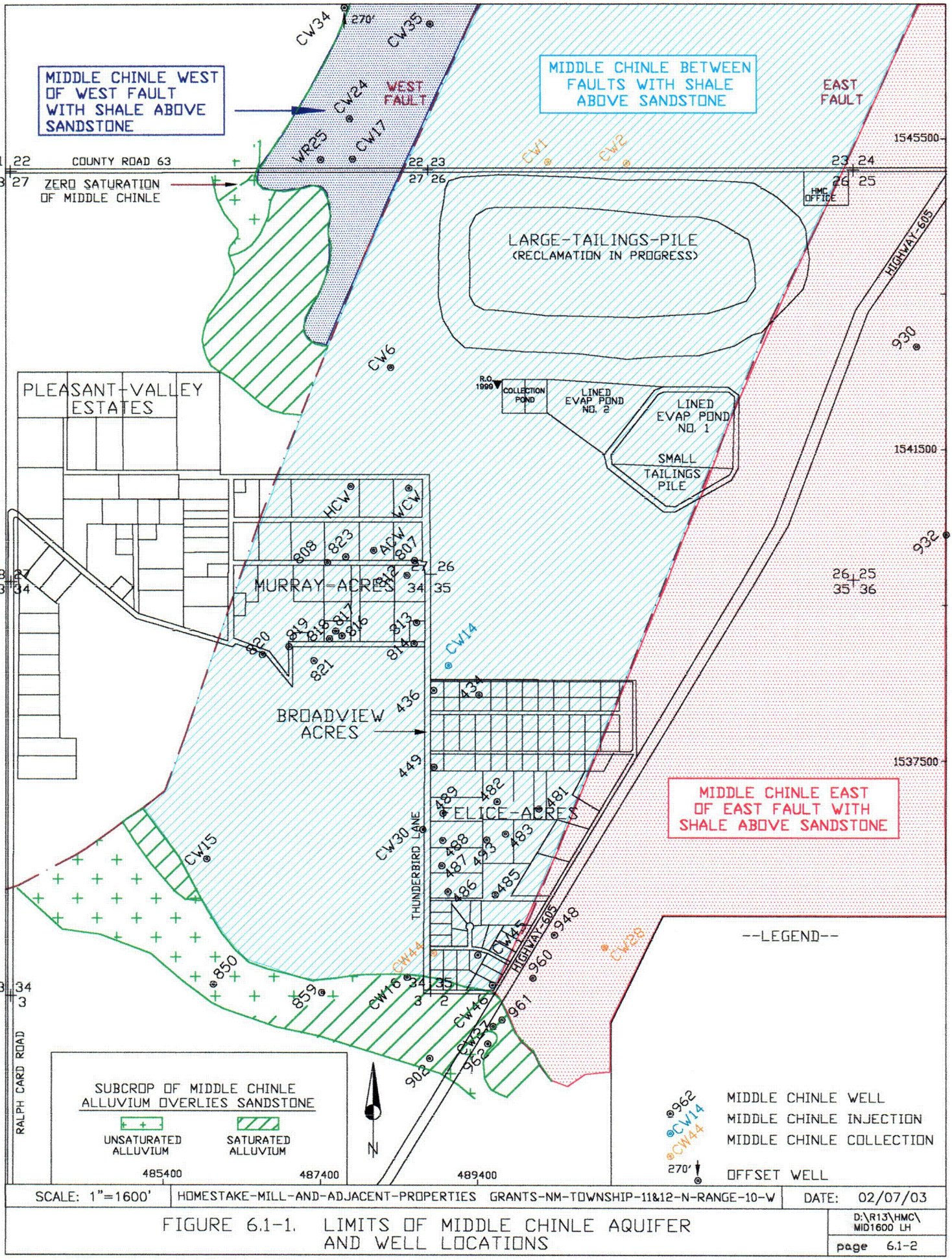

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FIGURE 6.1-1. LIMITS OF MIDDLE CHINLE AQUIFER AND WELL LOCATIONS

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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 of 2002 water-level elevations for the Middle Chinle aquifer are presented on Figure 6.2-1. The gradient in the Middle Chinle aquifer is steeper in its 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 in the area to the Middle Chinle aquifer from the alluvial aquifer. The green arrows show the direction of ground-water flow in the Middle Chinle aquifer. Flow on the east side of the East Fault is mainly to well CW28 near the East Fault.

Ground-water flow west of the West Fault in the Middle Chinle is to the southwest, discharging 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 upgradient of the site into the area west of the large tailings. The remainder of the Middle Chinle aquifer is recharged by the alluvial aquifer south of Felice Acres.

A mound of water around well CW14 has been created by the injection of fresh water into this well. This causes the ground-water flow to be to the north and south of well CW14. Collection from wells CW1 and CW2 intercepts the flow from the south in the Middle Chinle aquifer between the two faults. This pumping also pulls water flow from the north to these wells. 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 shows that the ground water is not readily connected on each side of these faults.

Figure 6.2-2 shows the location of the Middle Chinle wells that are used to present the water-level changes with time. This figure is color and symbol coded with the water-level elevation time plot. Figure 6.2-3 presents the water-level elevation changes versus time in Middle Chinle wells CW15, CW28, CW45 and 493. Water levels are higher in Middle Chinle well CW45 than to the north in well 493. The pumping of irrigation well CW44 has caused the water levels in wells CW15 and 493 to decline. Some of the 493 and CW15 decline could be due to the CW1 and CW2 pumping. Pumping of well CW28 caused the variable water levels in this well.

The water level plots for the Middle Chinle wells west of the West Fault and CW2 and CW1 are presented in Figure 6.2-4. This plot shows that the water levels have generally been gradually increasing in the Middle Chinle aquifer west of the West Fault. Water levels declined in pumping wells CW1 and CW2 in 2002 due to their pumping. As expected, water levels west of the West Fault in wells CW17 and CW35 did not respond to the CW1 and CW2 pumping.

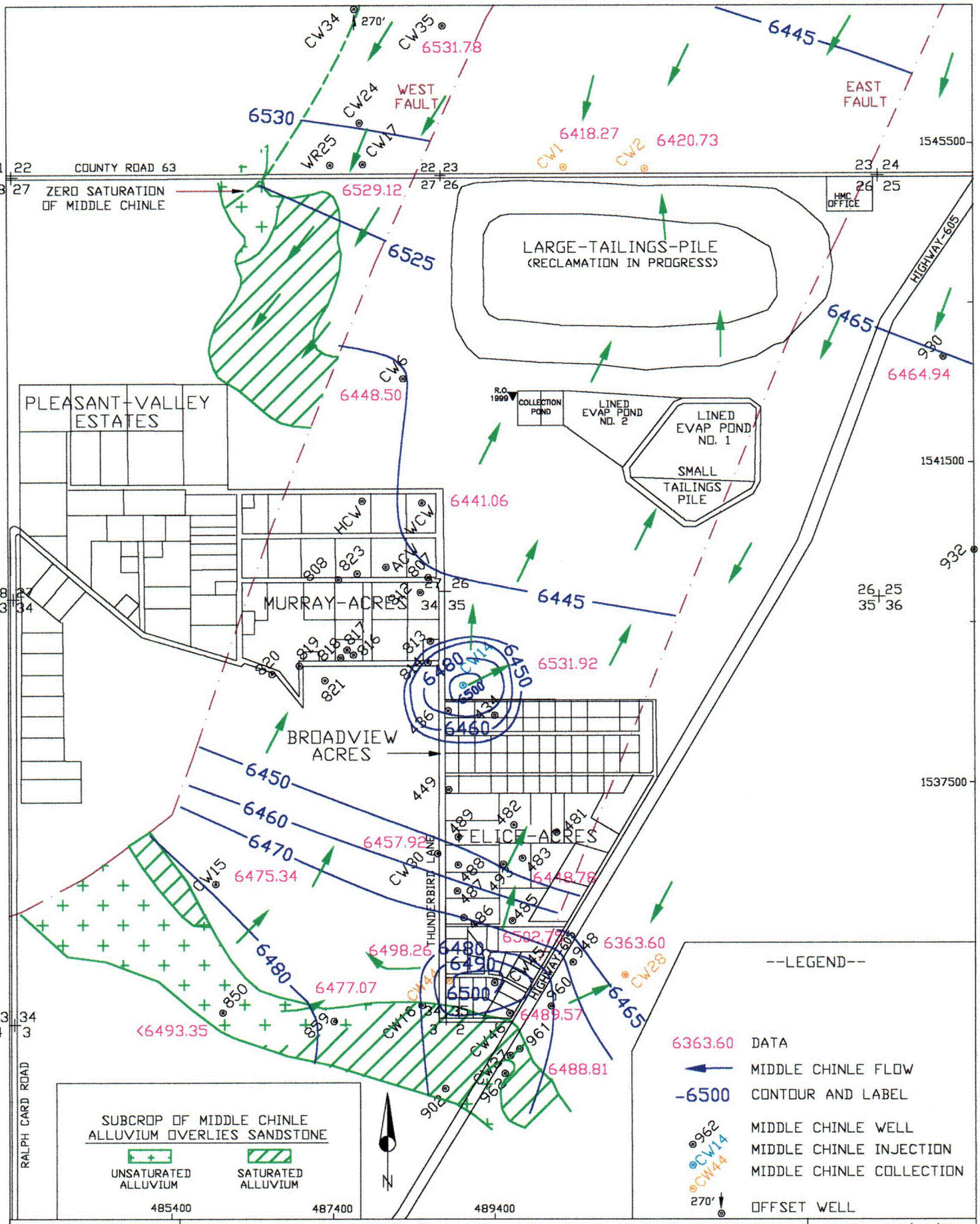

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FIGURE 6.2-1. WATER-LEVEL ELEVATIONS FOR THE MIDDLE CHINLE AQUIFER, 2002, FT-MSL

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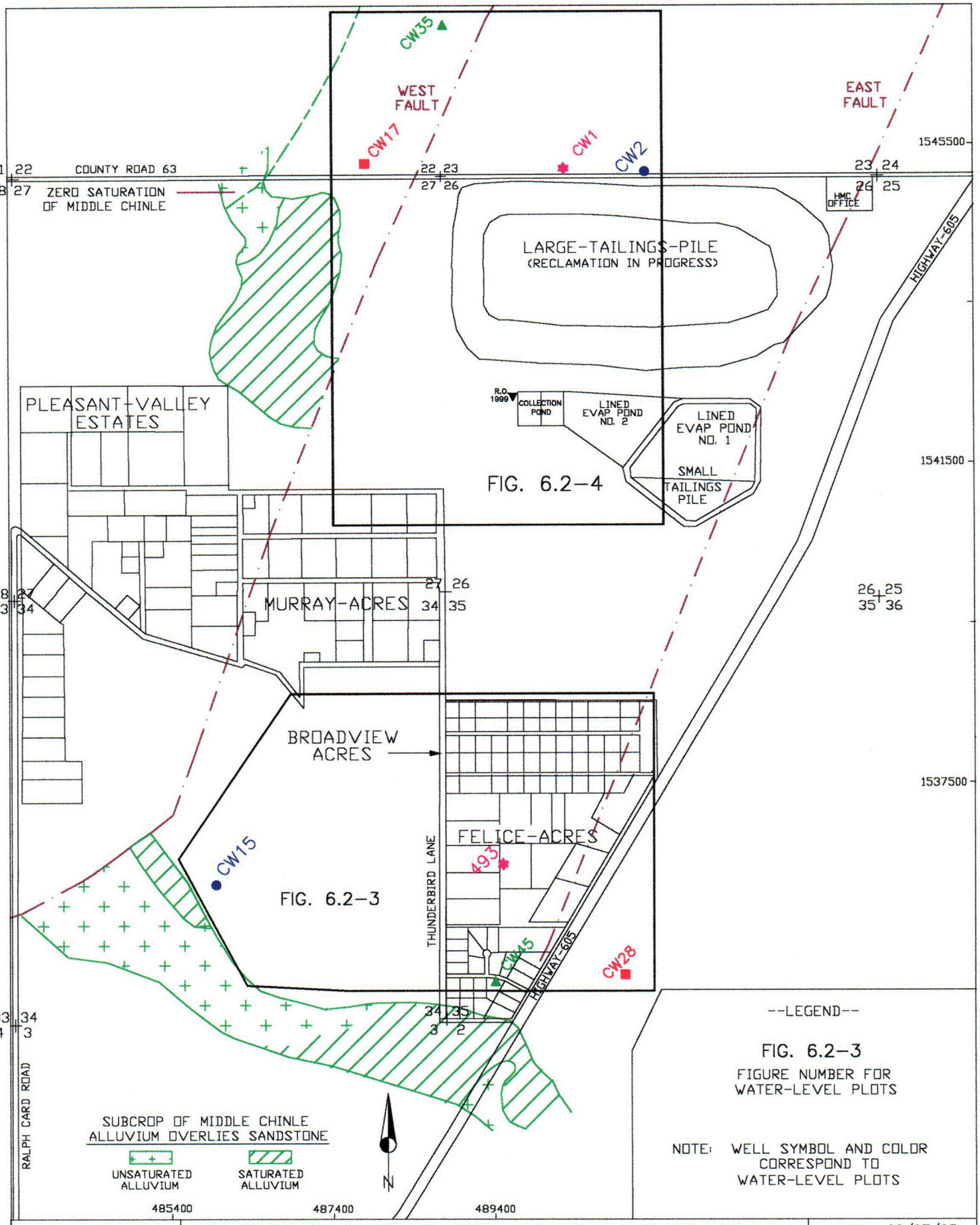

SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 02/07/03

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

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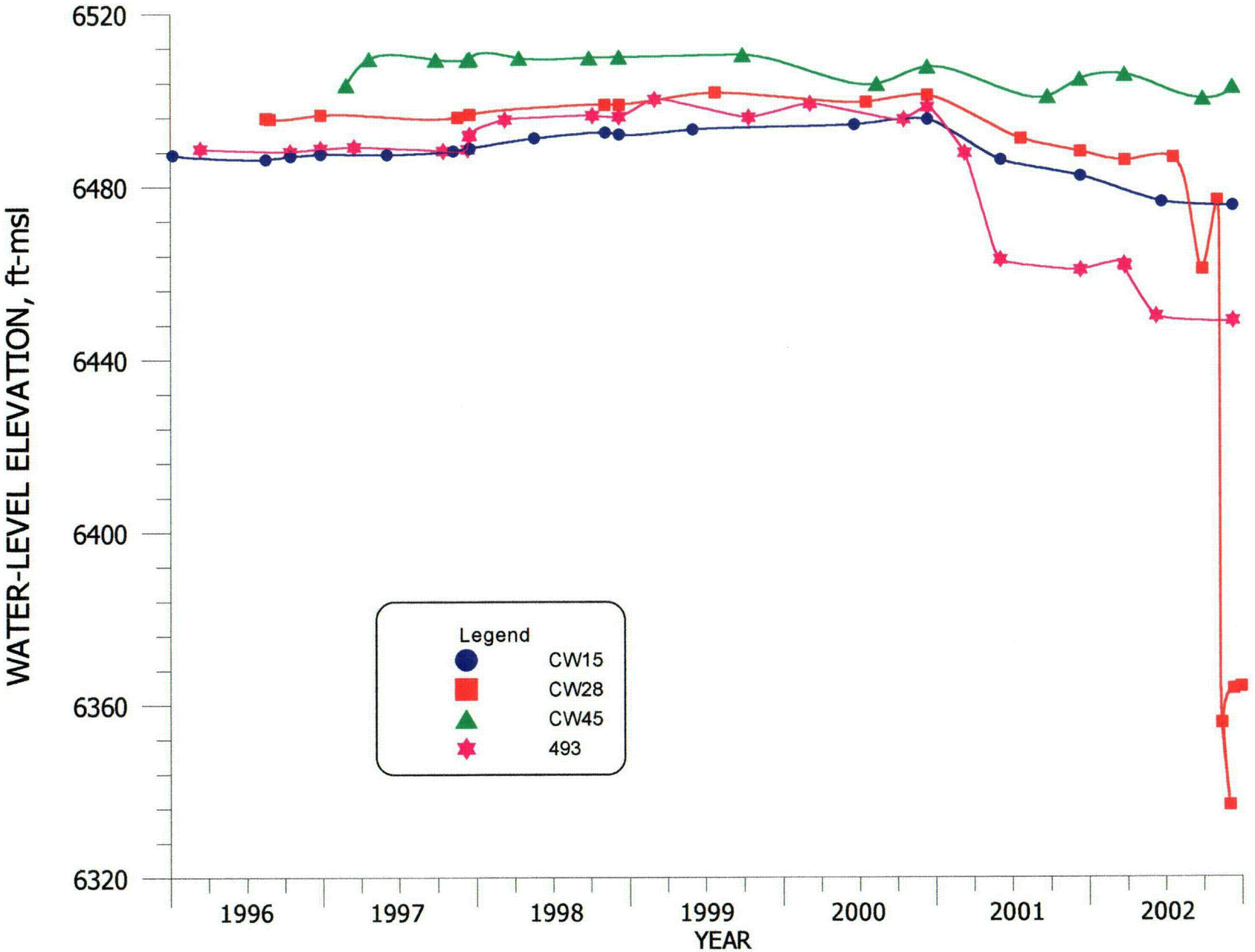

6.2-5

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

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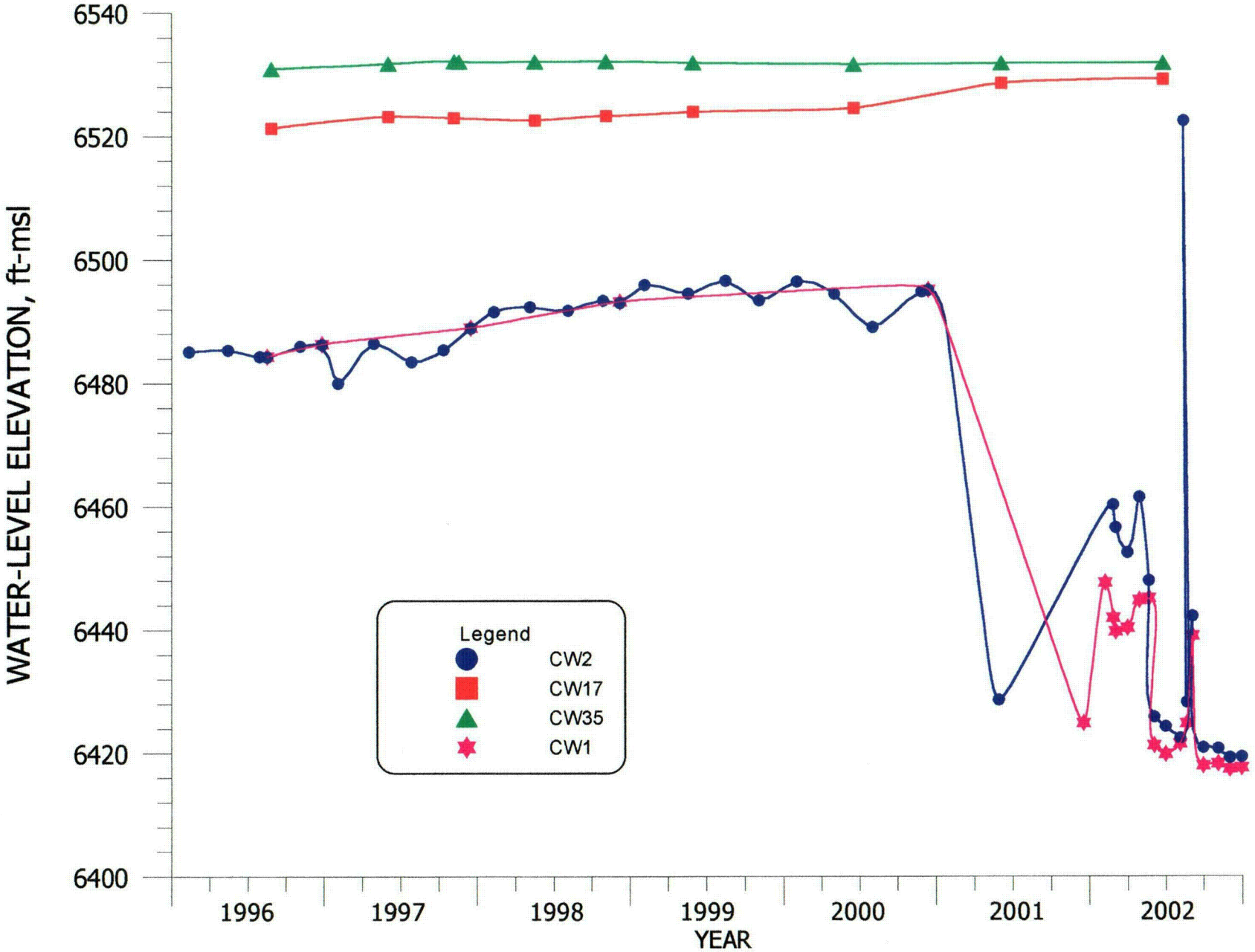

FIGURE 6.2-4. WATER-LEVEL ELEVATION FOR WELLS CW2, CW17, CW35 AND CW1.

6.3 MIDDLE CHINLE WATER QUALITY

The water-quality data for the Middle Chinle aquifer is presented along 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.

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. Uranium concentrations are above background only in western Felice Acres and just to the west and south of Felice Acres. Selenium concentrations also exceed the background values just south of Felice Acres. No significant molybdenum concentrations exist in the Middle Chinle aquifer.

6.3.1 SULFATE - MIDDLE CHINLE

Figure 6.3-1 presents the sulfate concentrations for the Middle Chinle aquifer for the Fall of 2002. This figure shows that the Middle Chinle sulfate concentrations range from 441 mg/l to a high of 1680 mg/l at well CW17. Sulfate background and site standard concentrations are given in a box in the upper left corner of Figure 6.3-1. All sulfate concentrations in the Middle Chinle aquifer are within the upper background level of 1870 mg/l. Sulfate concentrations in well CW17, which is located west of the West Fault, are natural. The sulfates are naturally occurring 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 Middle Chinle wells are within the natural background range and, therefore, do not indicate any need for restoration based on this parameter.

Figure 6.3-2 shows the locations of the Middle Chinle wells with time concentration plots for the 2002 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 are the same as those used in the concentration time plots.

Figure 6.3-3 presents the sulfate concentrations for Middle Chinle wells CW15, CW28, CW44, CW45 and 493. Concentrations in Chinle well CW28 have been fairly steady but lower than the other wells. A small rise in sulfate concentrations was also observed in 2002 in wells CW44 and CW45 after a previous small decline.

Figure 6.3-4 presents the sulfate concentration plot for the Middle Chinle wells CW17 and CW35 west of the West Fault and wells CW1, CW2 and 434. This plot shows that sulfate concentrations have been fairly steady in wells CW17 and CW35. These sulfate concentrations are natural 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 steady in 2002, with values less than the historical data. Sulfate concentrations were fairly steady in well 434 in 2002.

6.3.2 TOTAL DISSOLVED SOLIDS - MIDDLE CHINLE

Total dissolved solids (TDS) and sulfate are used to define changes in major constituents at this site. Figure 6.3-5 presents the TDS concentrations for the Middle Chinle aquifer for the Fall of 2002 and shows that a few values are close to 2000 mg/l near the alluvial subcrop area on the southwest side of Felice Acres.

Background data for 2002 varied from 370 to 2700 mg/l for TDS. All of the TDS values within the Middle Chinle aquifer are less than the upper limit of background of 3060 mg/l except a slightly higher value from well 820. No restoration of TDS is needed in the Middle Chinle aquifer except a small amount in well 820.

6.3.3 URANIUM - MIDDLE CHINLE

Uranium concentration is an important parameter in the Middle Chinle aquifer due to elevated concentrations that exist in the southern and western portions of Felice Acres from recharge to the Middle Chinle aquifer in this area. The saturated alluvial aquifer in this area 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 6.3-6 presents the uranium concentrations for the Fall of 2002 for the Middle Chinle aquifer. An area of concentrations of greater than 0.43 mg/l 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. Flow in the Middle Chinle aquifer west of the West Fault moves from the CW35 area to the subcrop area to the south. Uranium concentrations exceed 0.05 mg/l in three other areas of the Middle Chinle aquifer at wells 434, 820 and CW2.

Figure 6.3-7 presents the uranium concentration plots versus time for Middle Chinle wells CW15, CW28, CW44, CW45 and 493 (see Figure 6.3-2 for well locations). Uranium concentrations in this plot for 2002 have been less than 0.1 mg/l, except for those from wells CW44 and CW45, which shows an overall decline. This plot shows that Middle Chinle wells CW44 and CW45 contain significant amounts of uranium, which should gradually decline over the next several years. Additional monitoring of these wells with time will define this decline.

The uranium concentration plots for the Middle Chinle wells west of the West Fault and two wells between the faults are presented in Figure 6.3-8. This plot shows that the uranium concentrations in wells CW17 and CW35 have been fairly steady for the last few years. Uranium concentrations increased in well CW2. The uranium concentration from well 434 has declined the last two years.

6.3.4 SELENIUM - MIDDLE CHINLE

One well (CW27) in the Middle Chinle south of Felice Acres contained water with selenium concentrations exceeding 0.27 mg/l in 2002 (see Figure 6.3-9). The blue pattern is used to delineate the areas where selenium concentrations are thought to be greater than 0.27 mg/l. The selenium concentration of 0.27 mg/l is the significance level concentration for this site. These concentrations are a result of 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 concentrations from the subcrop area to move to the north. Background selenium concentrations for the Fall of

2002 vary from 0.007 to 0.63 mg/l (see note in upper left side of Figure 6.3-9). All of the Middle Chinle aquifer concentrations are within this range.

Selenium concentrations of roughly 0.1 mg/l exist west of the West Fault. These concentrations have to be natural levels in the Middle Chinle aquifer because the flow is from the north in this area. All other concentrations in the Middle Chinle aquifer beyond these two areas are low values.

Selenium concentrations for Middle Chinle wells CW15, CW28, CW44, CW45 and 493 are presented in Figure 6.3-10 for variations with time. This plot shows that the selenium concentrations have varied significantly in well 493 but have been fairly steady for the last three years. The connection between the alluvial aquifer and the Middle Chinle aquifer south of Felice Acres is the cause for the higher concentrations in well 493. The fresh-water injection into Middle Chinle well CW14 and use of Middle Chinle well CW44 for irrigation should cause this level to decrease. A decline in selenium concentrations has been observed in well CW45 for the last five years while concentrations have been fairly steady in well CW44.

Selenium concentrations in well CW2, further to the north, have gradually increased in 2002. Figure 6.3-11 presents the selenium concentrations for Middle Chinle wells west of the West Fault and wells CW1, CW2 and 434. This plot shows similar 2002 selenium concentrations for wells 434, CW17 and CW35 to those observed in 2001.

6.3.5 MOLYBDENUM - MIDDLE CHINLE

The molybdenum concentrations in the Middle Chinle aquifer during the Fall of 2002 are presented in Figure 6.3-12. None of the molybdenum concentrations for the Fall of 2002 exceed the detection limit, except for the molybdenum concentration of 0.05 mg/l in wells 482 and CW2. Molybdenum concentrations for well CW2 are generally less than detection. No significance should be given this value unless additional analysis with time show a trend is developing.

Figure 6.3-13 presents the molybdenum concentrations for Middle Chinle wells CW1, CW2, 434 and 493. This plot shows that the concentration in each of these

wells has been low for 2002 values with a small increase in well CW2 (see Figure 6.3-2 for location of these wells).

6.3.6 NITRATE - MIDDLE CHINLE

Nitrate concentrations have always been low in the Middle Chinle aquifer and therefore are not routinely monitored.

6.3.7 RADIUM-226 AND RADIUM-228 - MIDDLE CHINLE

Radium concentrations for 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. Radium should be considered for removal as an NRC site standard.

6.3.8 VANADIUM - MIDDLE CHINLE

Vanadium concentrations for the Middle Chinle aquifer have always been low. Previous monitoring of vanadium in the Middle Chinle aquifer shows that vanadium is not a significant parameter for this aquifer. Monitoring of vanadium should be dropped because only a few low values previously existed in the alluvial aquifer near the tailings.

6.3.9 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 dropped from future monitoring in the Middle Chinle aquifer.

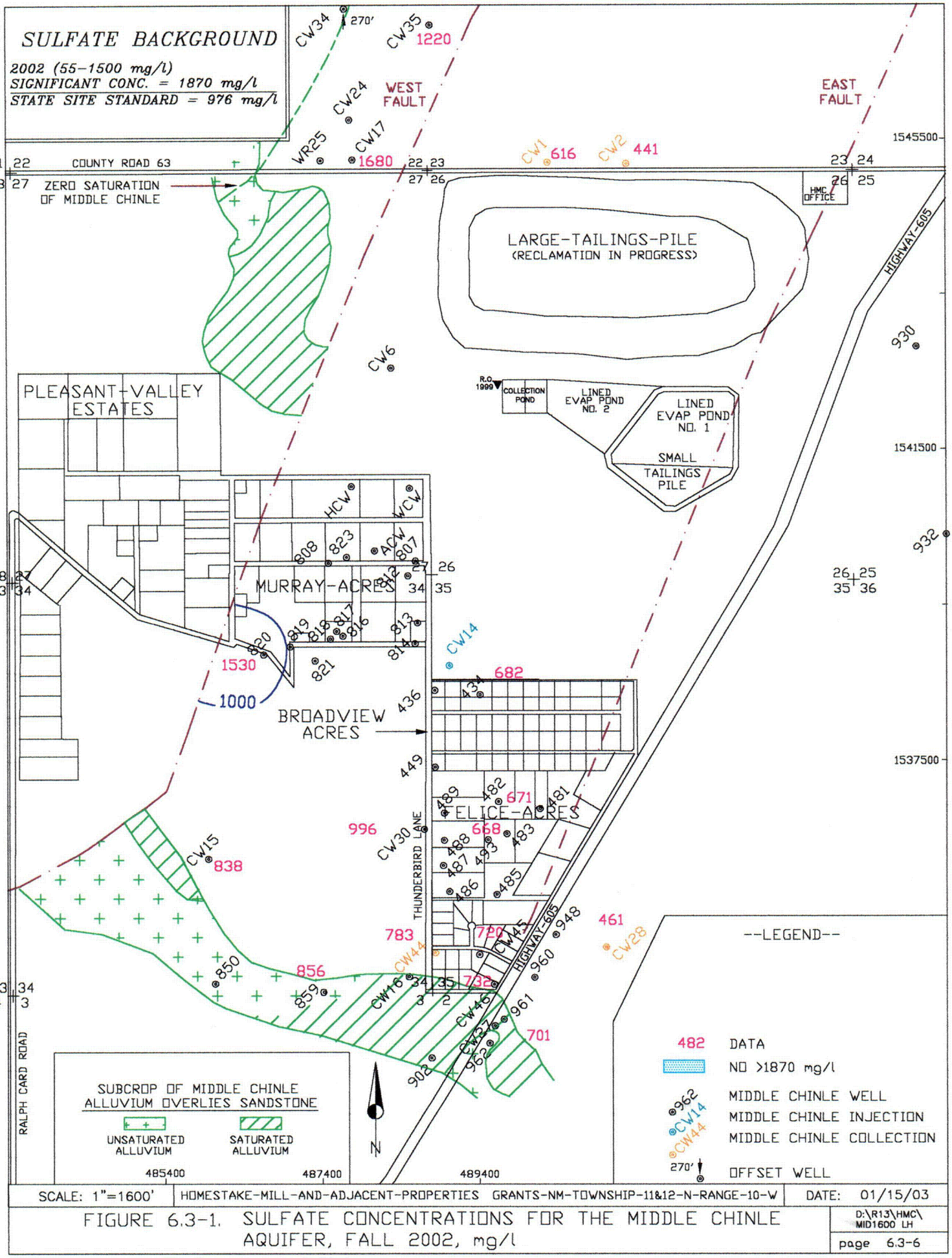

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FIGURE 6.3-1. SULFATE CONCENTRATIONS FOR THE MIDDLE CHINLE AQUIFER, FALL 2002, mg/l

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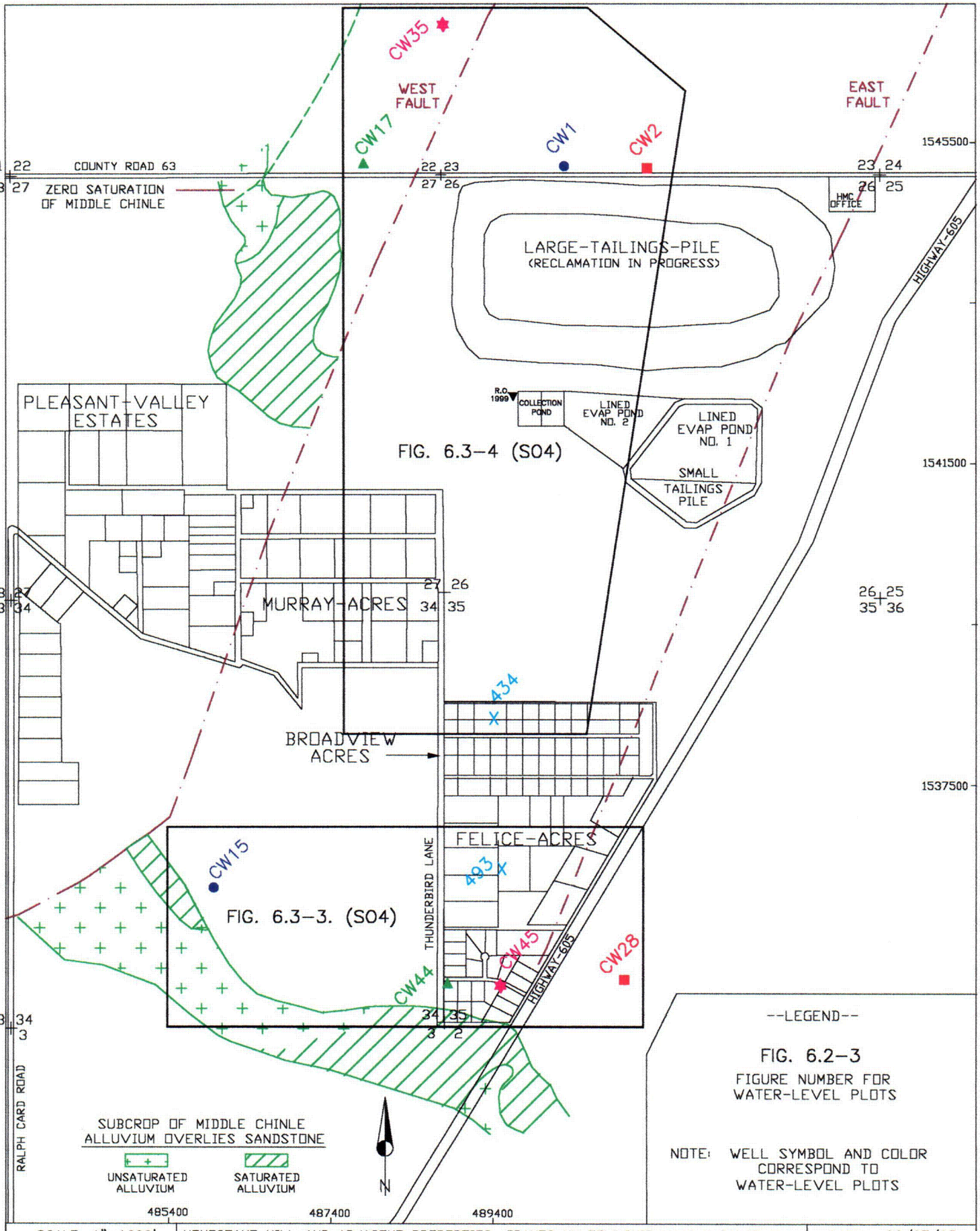

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FIGURE 6.3-2. LOCATION OF MIDDLE CHINLE WELLS WITH WATER-QUALITY PLOTS

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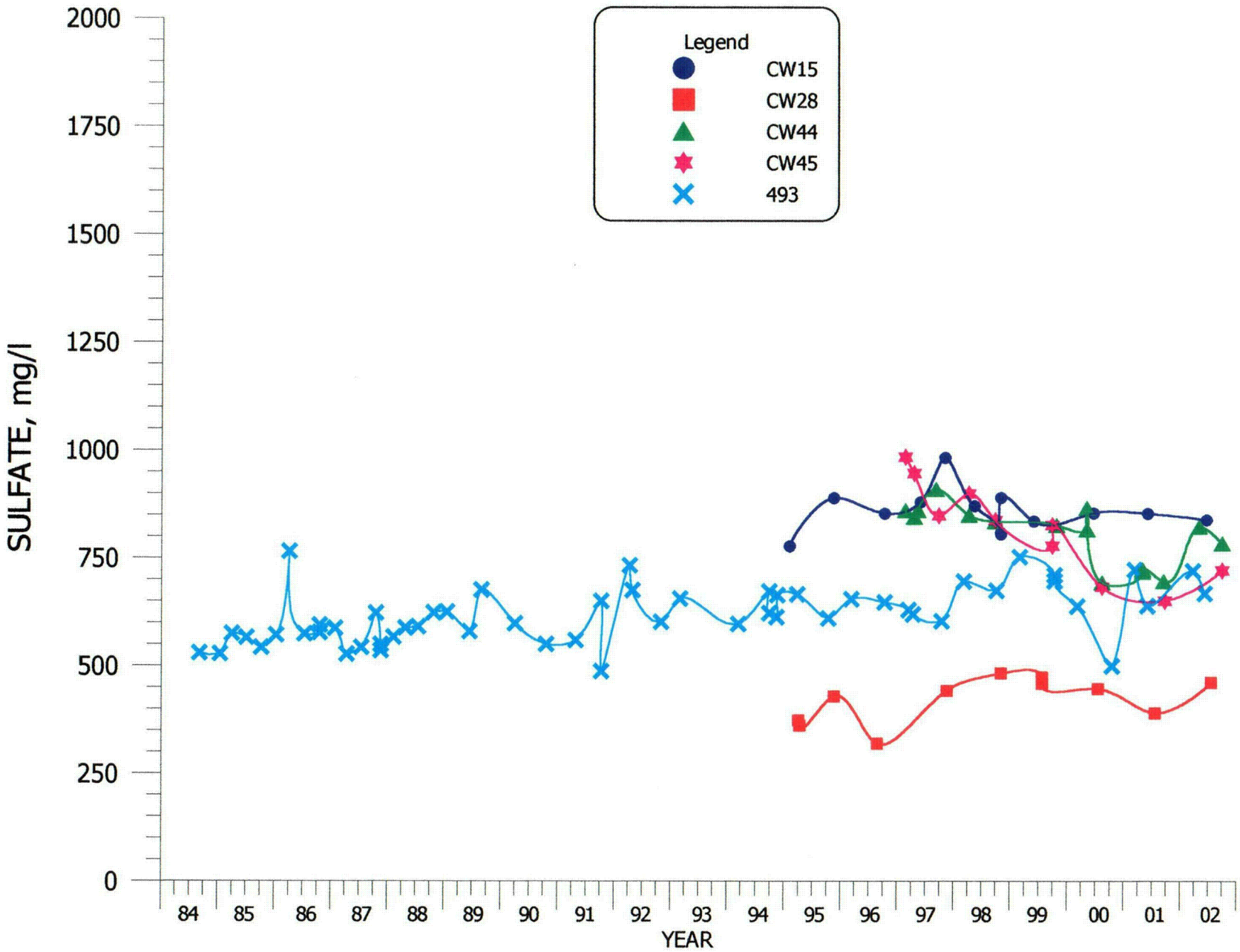

FIGURE 6.3-3. SULFATE CONCENTRATIONS FOR WELLS CW15, CW28, CW44, CW45 AND 493.

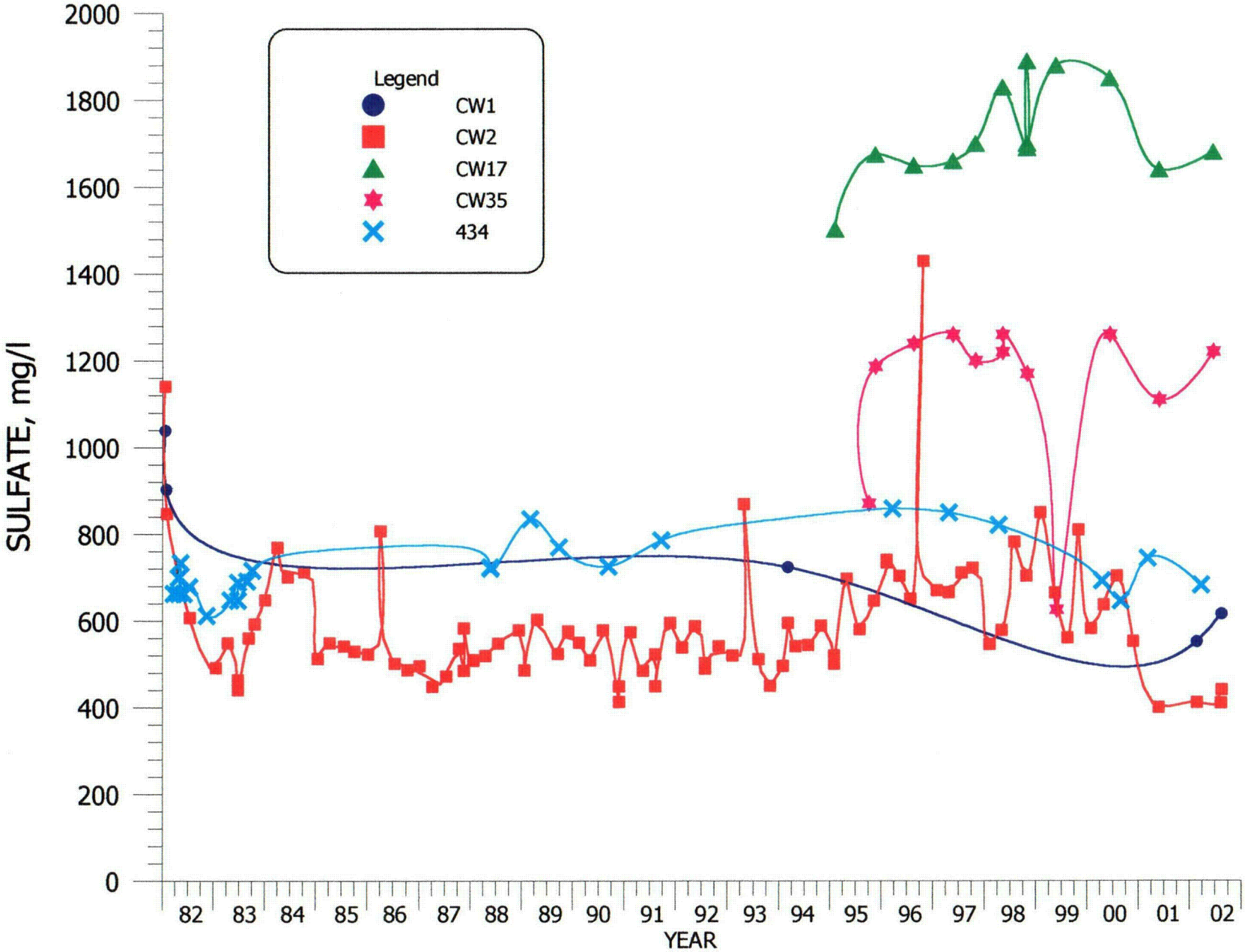

FIGURE 6.3-4. SULFATE CONCENTRATIONS FOR WELLS CW1, CW2, CW17, CW35 AND 434.

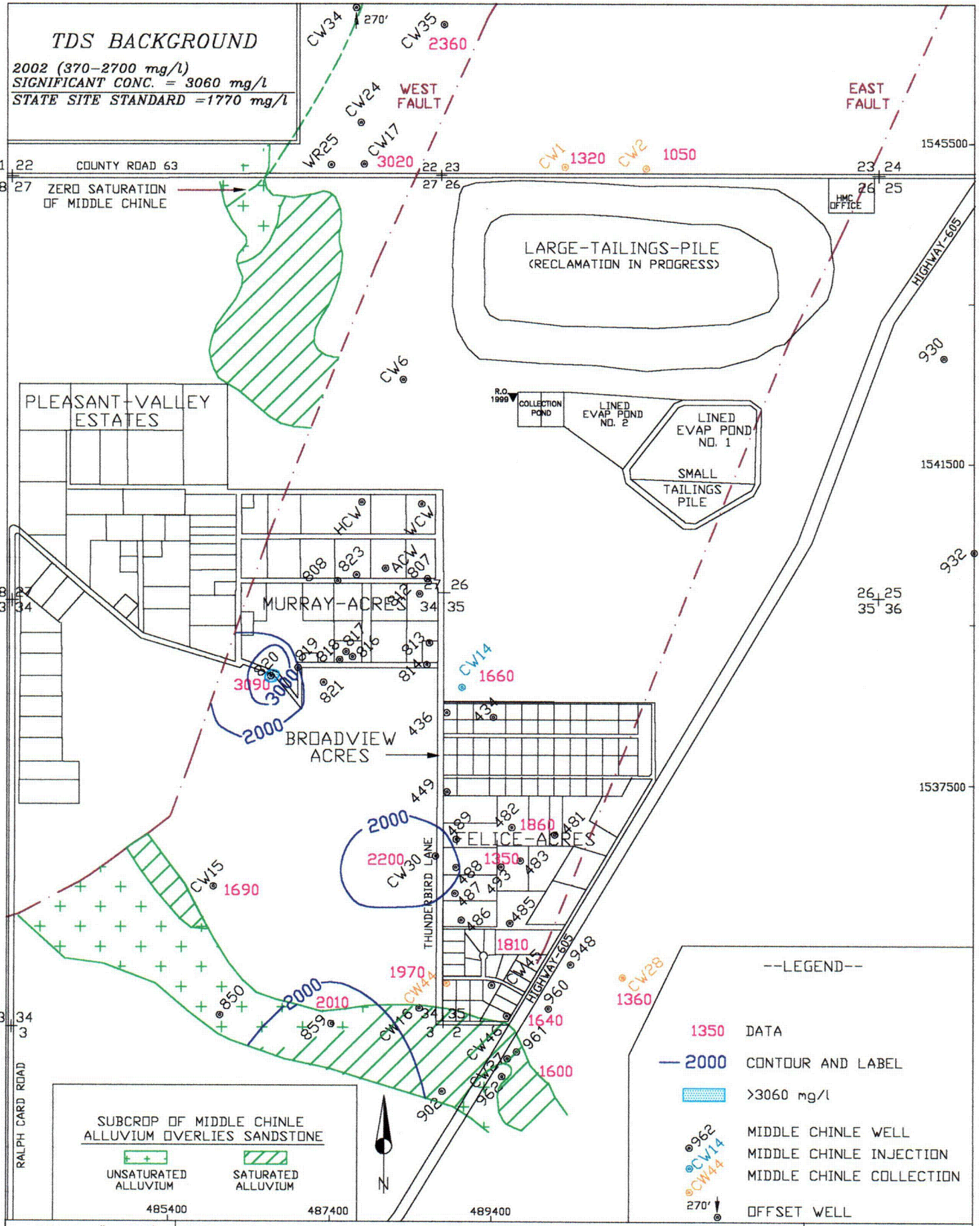

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FIGURE 6.3-5. TDS CONCENTRATIONS FOR THE MIDDLE CHINLE AQUIFER, FALL 2002, mg/l

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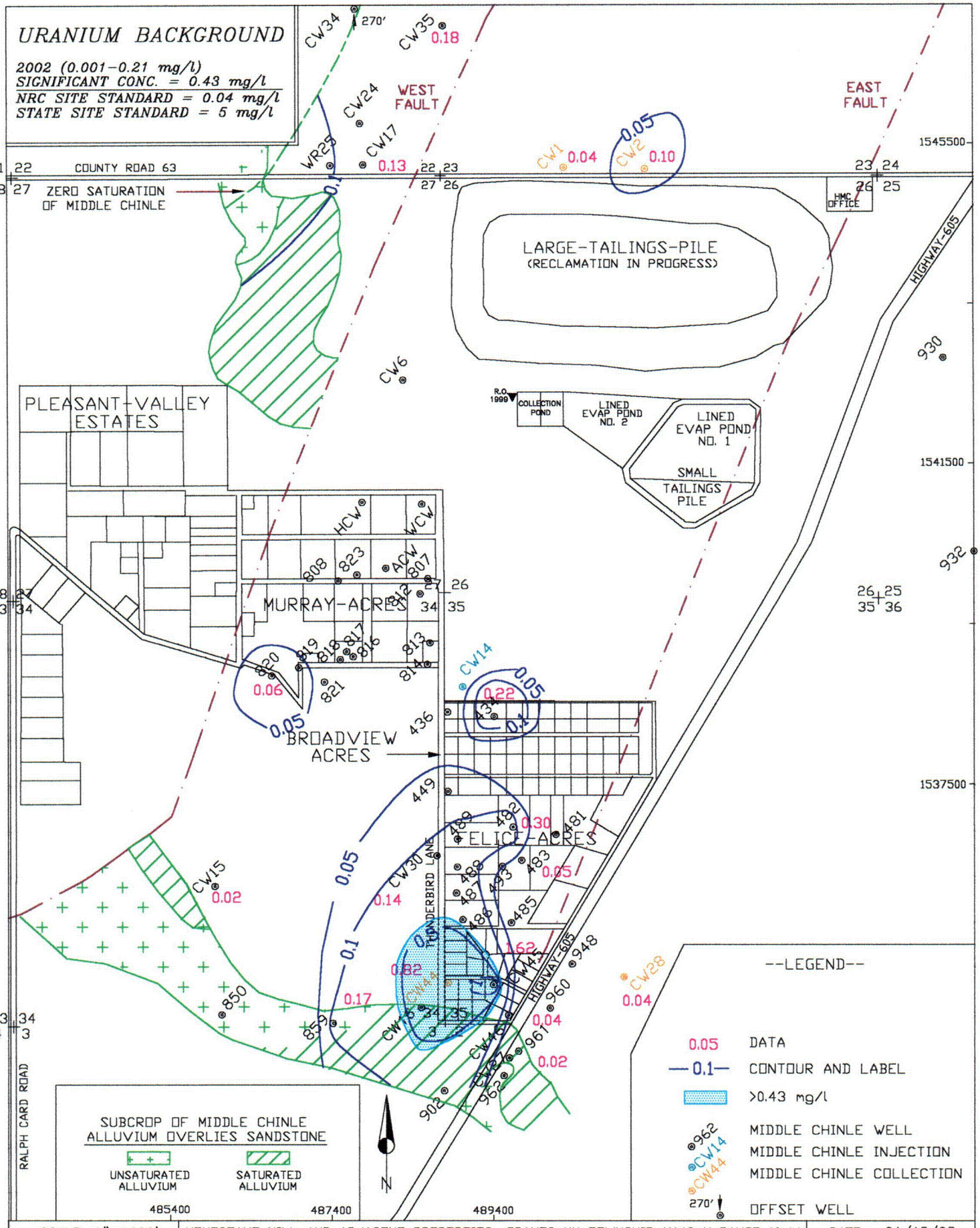


SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 01/15/03

FIGURE 6.3-6. URANIUM CONCENTRATIONS FOR THE MIDDLE CHINLE AQUIFER, FALL 2002, mg/l

D:\R13\HMC\MID1600 LH

C33

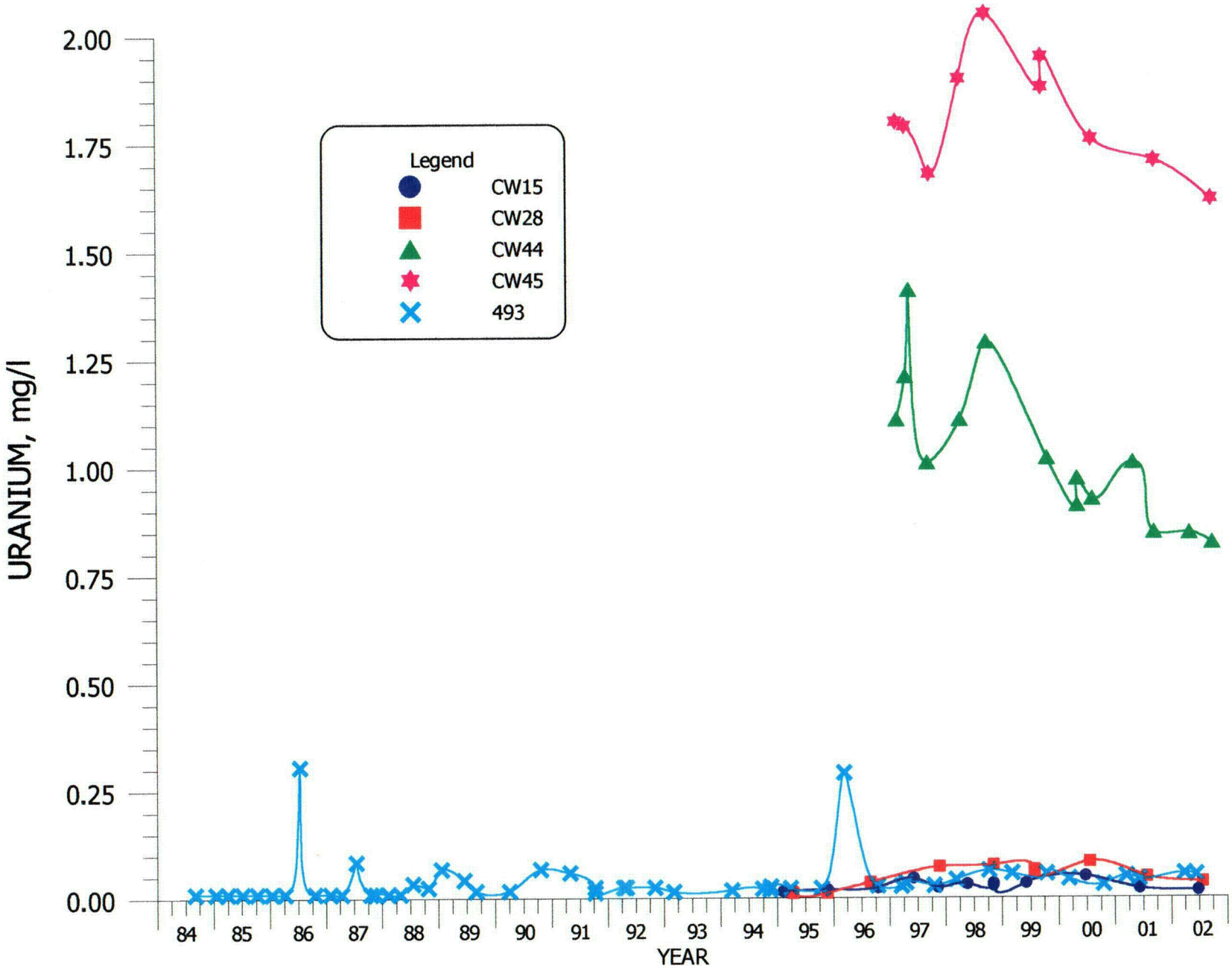


FIGURE 6.3-7. URANIUM CONCENTRATIONS FOR WELLS CW15, CW28, CW44, CW45 AND 493.

C34

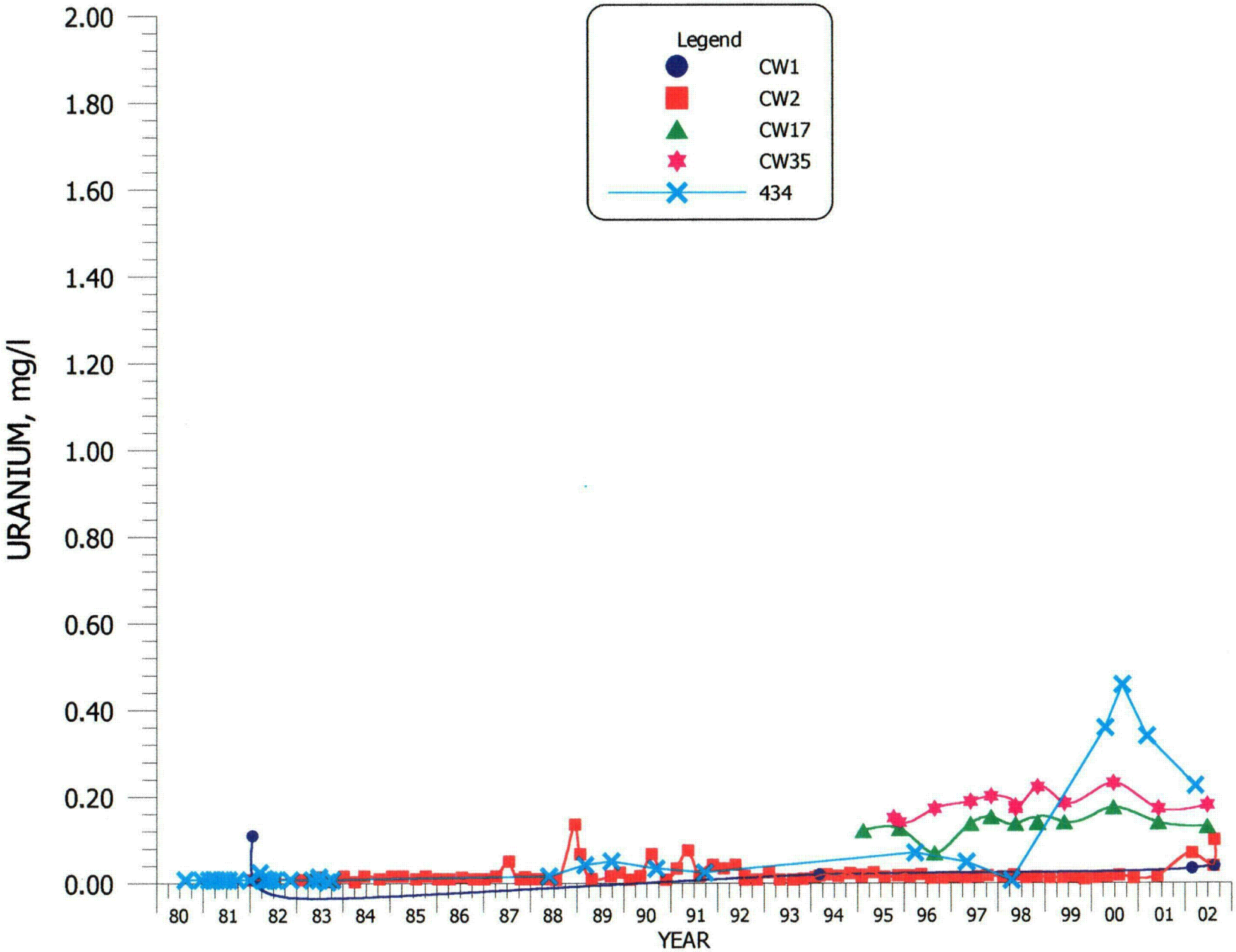
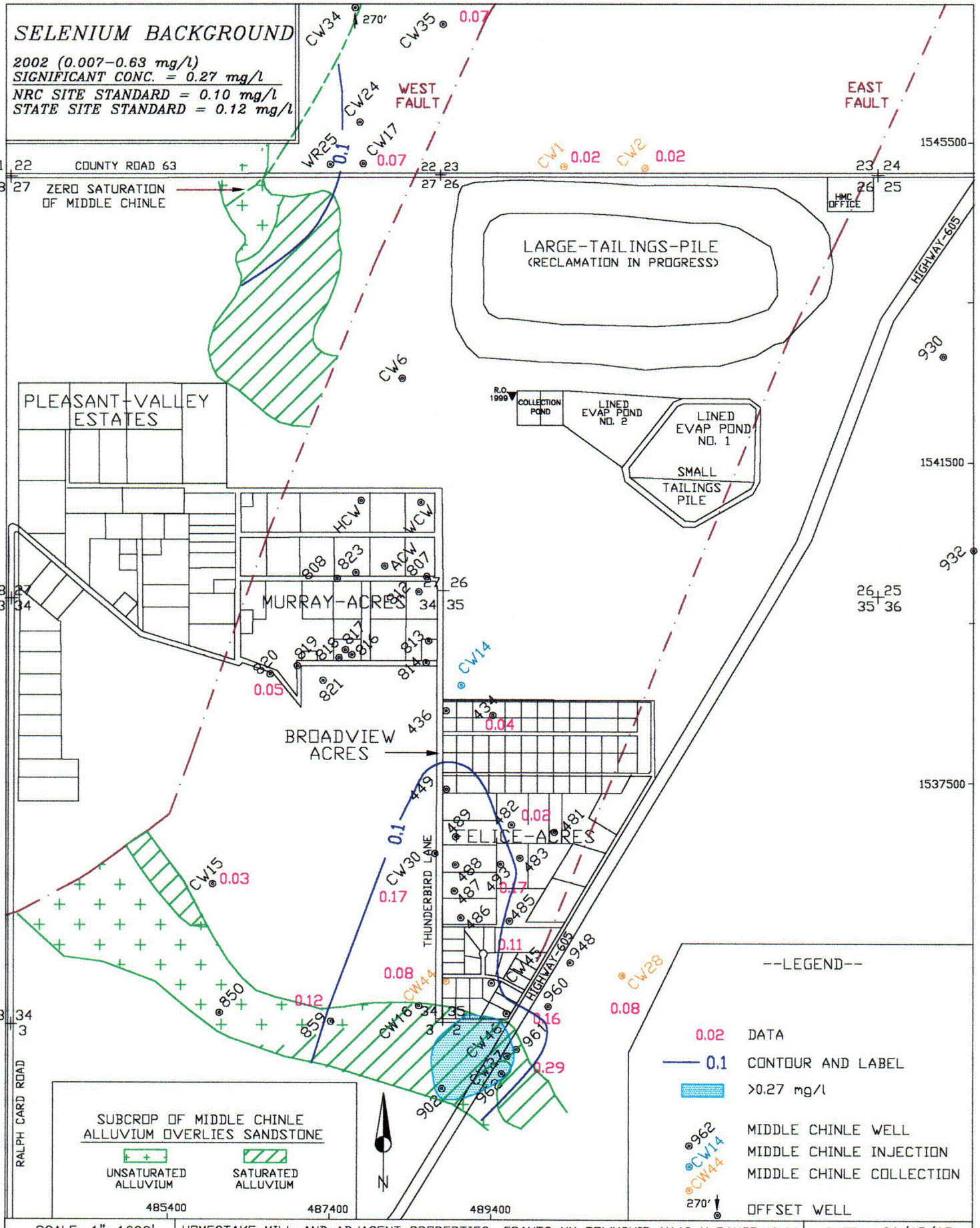


FIGURE 6.3-8. URANIUM CONCENTRATIONS FOR WELLS CW1, CW2, CW17, CW35 AND 434.

C35



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 01/15/03

FIGURE 6.3-9. SELENIUM CONCENTRATIONS FOR THE MIDDLE CHINLE AQUIFER, FALL 2002, mg/l

D:\R13\HMC\MID1600 LH

C36

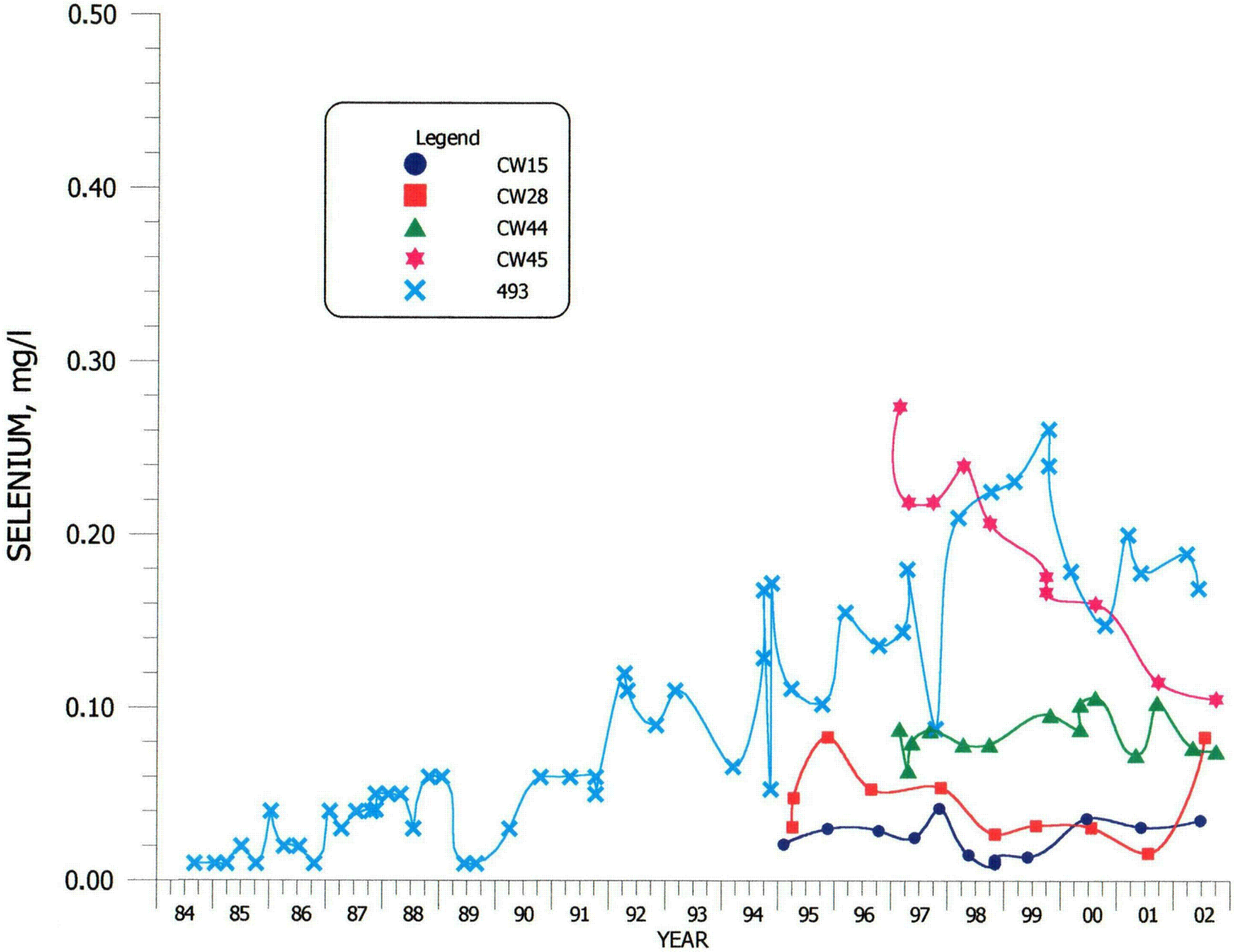


FIGURE 6.3-10. SELENIUM CONCENTRATIONS FOR WELLS CW15, CW28, CW44, CW45 AND 493.

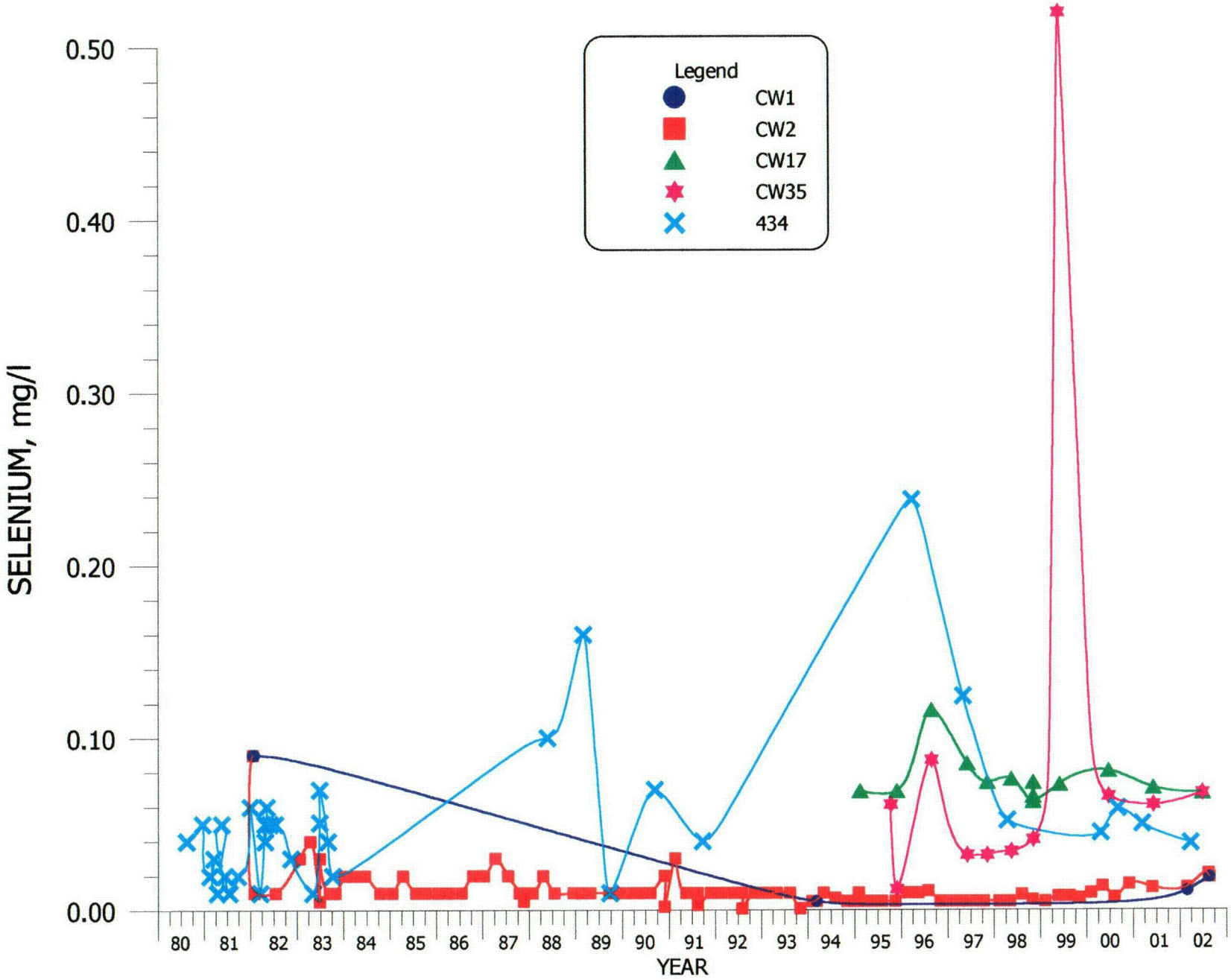
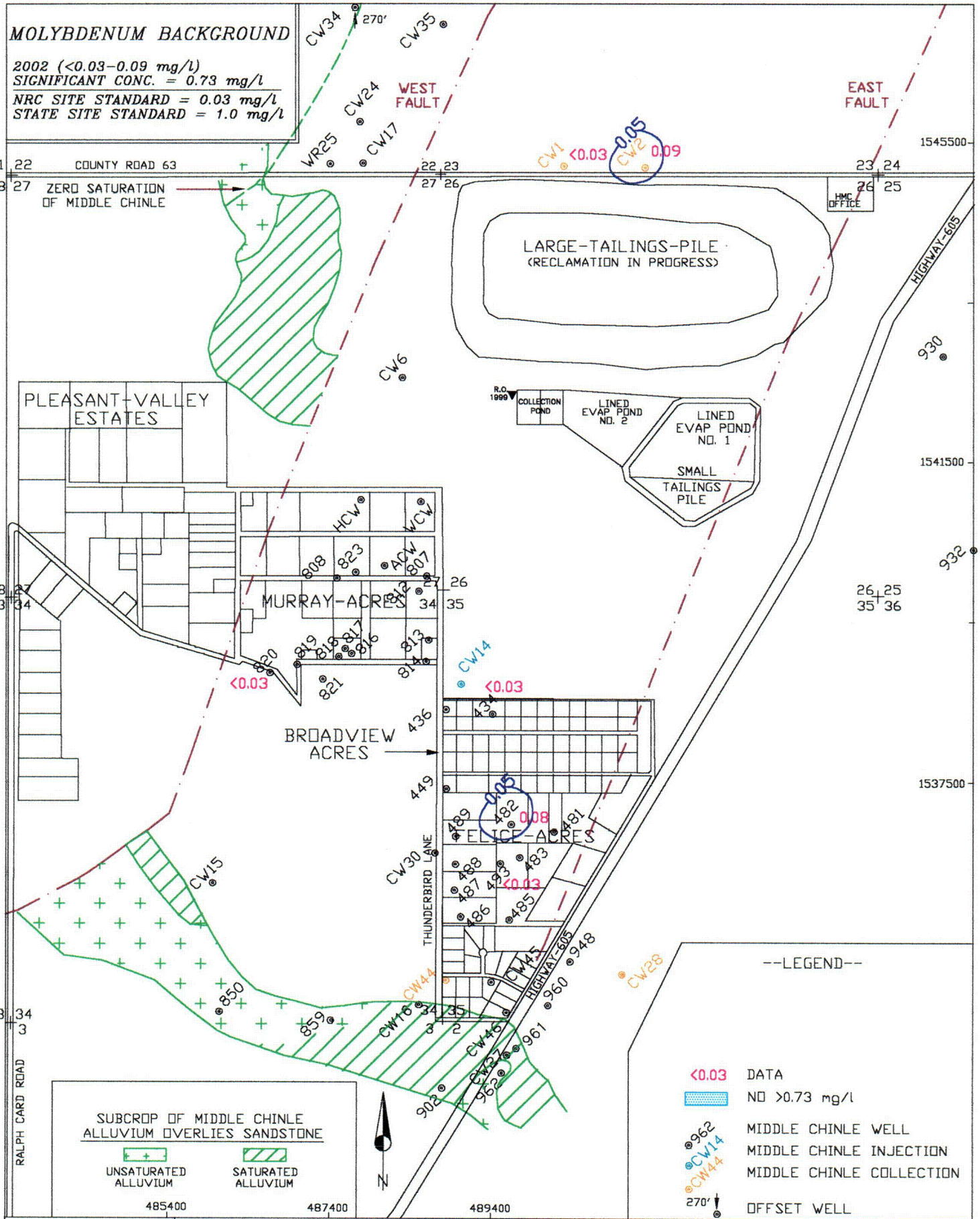


FIGURE 6.3-11. SELENIUM CONCENTRATIONS FOR WELLS CW1, CW2, CW17, CW35 AND 434.

C38



SCALE: 1"=1600' | HOMESTAKE-MILL-AND-ADJACENT-PROPERTIES GRANTS-NM-TOWNSHIP-11&12-N-RANGE-10-W | DATE: 01/15/03

FIGURE 6.3-12. MOLYBDENUM CONCENTRATIONS FOR THE MIDDLE CHINLE AQUIFER, FALL 2002, mg/l

D:\R13\HMC\MID1600 LH

C39

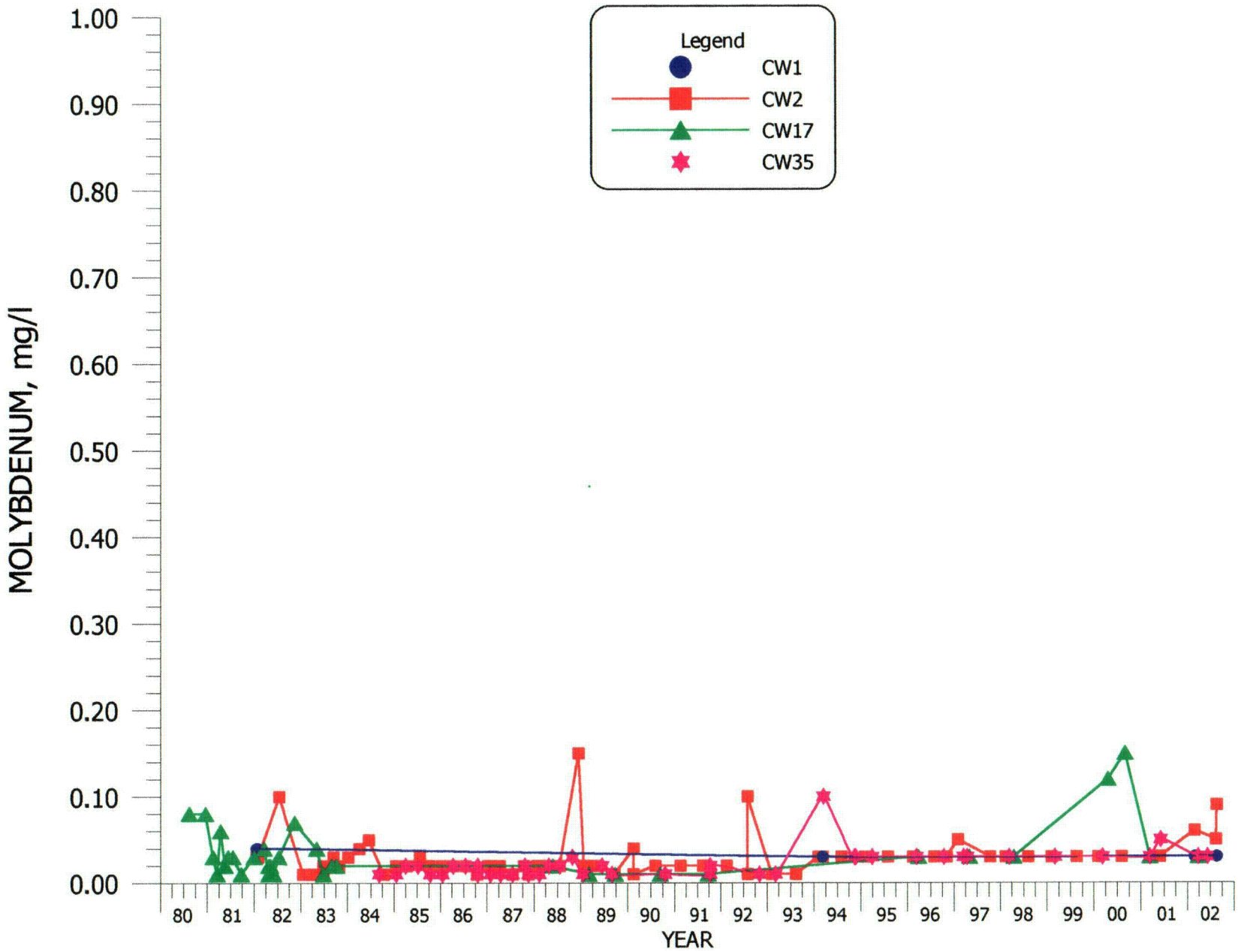


FIGURE 6.3-13. MOLYBDENUM CONCENTRATIONS FOR WELLS CW1, CW2, 434 AND 493.

C40