2015 MONITORING OF FORMER IRRIGATION AREAS

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Executive Summary

This report describes and summarizes the 2015 monitoring efforts for the former irrigation areas near the Homestake Grants Reclamation Project.

Meteoric Water Mobility Testing (MWMT) was done on the soils of the four former irrigation areas. The samples were composited from multiple holes in one foot intervals down to the basalt or the water table, whichever was shallower. With the exception of the TDS, suflate, chloride, uranium, and selenium values in the upper few feet of the Section 34 flood area and the selenium and chloride values in the three to five foot intervals in the Section 33 center pivot; all of the concentrations presented are small and do not indicate significant effects from past irrigation of these areas. The MWMT results also indicate that even under fairly aggressive leaching conditions, the future mobilization of the COCs is minimal.

Lysimeters installed within the soil profile in irrigation areas in Sections 28, 33 and 34 were sampled to evaluate constituent of concern (COC) concentration in soil moisture. Soil moisture COC concentrations in the Section 34 flood area have been generally stable in recent years. The uranium concentrations in the Section 28 center pivot soil moisture have declined to very low levels since irrigation has ceased. A small increase in the soil moisture selenium concentrations occurred in the Section 33 center pivot area since 2009. In the Section 34 flood area, the bulk of the TDS, sulfate and chloride remains within the upper ten feet of the soil profile, while the sandier soils in Section 28 allows movement of the TDS, sulfate and chloride to greater depth within the profile. Soil moisture instruments were added in the upper soil profile in 2012 and they indicate a gradual drying of the soil since irrigation has ceased.

The long-term human health risks were assessed using data from the Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water (ERG and HYDRO, 2014). The radiological dose to existing or future occupants of the land on or near the irrigation areas is extremely small compared to the average dose that the population receives from natural background and medical exposures. Based on the Soil Screen Levels from the New Mexico Environmental Department, the uranium and selenium levels in the soil within the irrigation areas do not pose an unacceptable health risk.

1.0 Introduction

This report is a summation of the 2015 monitoring efforts for the former irrigation areas near the Homestake Grants Reclamation Project. The sampling and monitoring done for this report is in accordance with the Land Application Closure Plan (HMC, 2015) as approved by the New Mexico Environmental Department (NMED) in April 2015.

Four fields have been irrigated with water containing elevated concentrations of uranium and selenium. Figure 1-1 shows the locations of the four former irrigations fields. Ground water from wells adjacent to the Grants Reclamation Project was applied to fields situated in portions of Section 33 pivot (150 acres) during the 2000 through 2009 growing seasons, Section 34 flood (120 acres) during the 2000 through 2010 and 2012, and to a field in Section 28 (60 acres) during the 2002, 2003 and 2004 growing seasons. The field in Section 28 was expanded to 100 acres prior to the 2005 season and irrigated from 2005 to 2009 and in 2011 and 2012. Only the Section 34 area was irrigated in 2010 and the Section 28 area was the only one irrigated in 2011. Only the Section 28 and 34 fields were irrigated in 2012. No irrigation was done after the 2012 season. Fields in Sections 33 and 28 were irrigated using a center pivot irrigation system, whereas the field in Section 34 was irrigated by flooding. An additional 24 acres were flood irrigated in Section 33 in 2004, 2005, 2008 and 2009, but not in 2006 and 2007. All sections discussed in this report are located in Township 12 North, Range 10 West.

Historical measurements of COC concentrations in the applied irrigation water, affected soils (see Figure 1-1 for water application locations) and vegetation can be found in the Evaluation of Years 2000 through 2013 Irrigation with Alluvial Ground Water (ERG and HYDRO, 2014). Historical information can also be found in earlier copies of the same annual (see ERG and HYDRO, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, and 2013).

The remainder of this report is organized as follows. Section 2 presents concentration data for several constituents in the soil moisture from meteoric water mobility testing and lysimeters. Section 3 presents the ground-water quality for the alluvial aquifer in the area of the former irrigation fields. Section 4 presents the human health risks from non-radiological sources from the former irrigation fields. The report ends with conclusions and references.

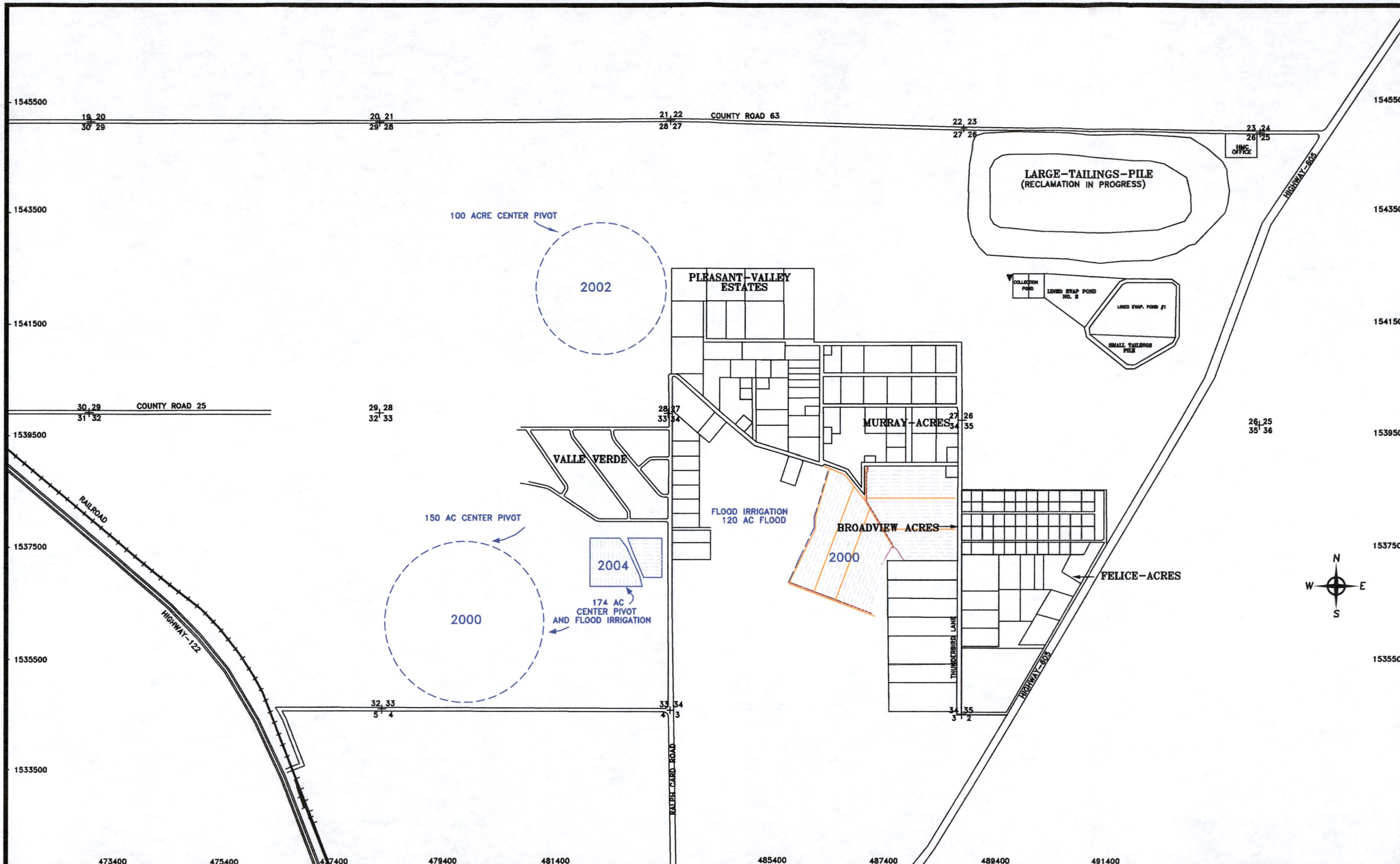

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FIGURE 1-1. LOCATION OF FORMER IRRIGATION AREAS

2.0 Soil and Soil Moisture Concentrations

Meteoric water mobility testing (MWMT) was done on the soil samples collected in the four former irrigation areas in 2015. The bottle roll method outlined in ASTM E2242-13 was used by ACZ Laboratories, Inc., to evaluate mobility of COCs in soil samples. Uranium, selenium, molybdenum, TDS, sulfate, chloride, and nitrate concentrations and pH were measured in the extraction water produced in the bottle roll testing.

The bottle roll method was used for the MWMT testing because a smaller sample mass could be utilized and many of the samples were fine grained soils. The bottle roll method required only one kilogram of soil while five kilograms would be needed for the column percolation. The low permeability of these fine grained soils also makes the column percolation approach impractical. When applied to the samples collected from borings in the irrigation area, the MWMT testing is a measure of the quantity of COCs that can be mobilized under fairly aggressive leaching conditions. The aggressiveness of the leaching conditions results from the profound disturbance of the soil during sample collection, and the mechanical agitation during the bottle roll procedure. Although the COC concentrations in the bottle roll extract are generally correlated with COC mass within a soil interval, the mobilization of COCs during the MWMT is not a direct measure of COC concentrations that will be mobilized by natural recharge to the soil profile. Hence the MWMT results should be interpreted only as a very qualitative measure of the potentially mobile COC mass.

Soil moisture COC concentrations from lysimeters were initially measured in the irrigated fields in 2009. Lysimeters were installed in selected locations to collect the soil moisture water samples. Three lysimeters that were not functional were replaced in 2011. Suction lysimeters use an applied vacuum to extract small volumes of water from partially saturated soils immediately surrounding the ceramic suction cup. The quantity and frequency of sampling from lysimeters is thus limited by the moisture content of the surrounding soil, and as soils get drier, the potential for successful sample collection diminishes.

Soil moisture content instruments were added in the upper soil profile in the Section 28 and 34 areas in 2012 to measure the soil moisture content variations. These instruments use a measure of electrical conductivity or heat dissipation to indicate soil moisture content.

The uranium and selenium soil concentrations were measured in the top foot interval of the Section 34 flood area using the same methods as used in previous years. The uranium concentration was 4.27 mg/kg and the selenium concentration was 0.98 mg/kg.

2.1 Meteoric Water Mobility Test Concentrations

Figure 2-1 shows the sample locations for 2015 in Sections 33 and 34 while Figure 2-2 shows the sampling locations for Section 28. Composite samples were prepared from the aforementioned locations within each irrigation area. The samples were taken in one foot increments with the exception of the lowest two increments (16' & 17') for the Section 28 center pivot samples. Those two sample intervals were composited in order to reach the minimum sample mass for testing. The MWMT bottle roll results are presented in Table 2-1 with the number in the first column indicating the bottom of each interval sample in feet from land surface. As an example, the numbers 1, 2, and 3 in the first column of Table 2-1 indicate the 0-1 foot, 1-2 foot, and 2-3 foot intervals, respectively.

2.1.1 Sections 33 and 34 Flood Areas

Composite soil samples from five different sites were collected down to a depth of 35 feet in the Section 34 flood irrigation area. The uranium, selenium, and molybdenum concentrations with depth are presented in Figure 2-3. A number of the samples were below the detection limit of 0.02 mg/l for molybdenum (see Table 2-1) and those values were plotted at the detection limit. The molybdenum concentrations in the MWMT extract for nearly all samples are at or just slightly above the detection limit indicating very limited molybdenum mobility. Figure 2-4 presents the TDS, sulfate, and chloride concentrations for the Section 34 irrigation area MWMT samples. The chloride concentrations presented in this figure are multiplied by 10 to allow plotting on a common concentration scale. The TDS, sulfate, chloride, uranium, and selenium results indicate that some higher concentrations are mobilized in the upper five feet of Section 34 soils, and this indicates greater mass of these COCs is present in the upper five feet of the soil profile. The historical soil concentrations for the Section 34 soils have also indicated higher concentrations in the upper soil profile, as would be expected with the clay soils (ERG and HYDRO, 2014).

Samples were collected to a depth of 33 feet in four different locations in the Section 33 flood area. Measured uranium, selenium, and molybdenum concentrations in the Section 33 flood irrigation area are presented in Figure 2-5. The uranium and selenium concentrations are low but still above the detection limit while some of the molybdenum concentrations are at or below the detection limit. TDS, sulfate, and chloride concentrations are presented in Figure 2-6. The sulfate value at the 2 foot depth is thought to be anomalously large. Slightly higher concentrations of TDS, sulfate, chloride, and uranium exist in the upper five feet of the soil profile in the Section 33 flood area, while concentrations below five feet are low. These results also indicate that clay soils have limited the migration of COCs to greater depth in the soil profile.

Table 2-1. Irrigation Soil Meteoric Water Mobility Test Results, 2015

Sample Site	Date	U (mg/l)	Se (mg/l)	Mo (mg/l)	pH (units)	Nitrate/Nitrite (mg/l)	TDS (mg/l)	Cl (mg/kg)	SO4 (mg/kg)
				SECTION 34 FLOOD					
1	8/20/2015	0.0996	0.0227	<0.02	7.75	9.60	2640	107.0	1430
2	8/20/2015	0.0526	0.0242	<0.02	7.74	5.87	4500	255.0	2750
3	8/20/2015	0.0391	0.0128	<0.02	7.78	3.16	3660	269.0	2170
4	8/20/2015	0.0201	0.0086	<0.02	7.81	0.39	3130	212.0	1740
5	8/20/2015	0.0144	0.0063	<0.02	8.09	0.17	1590	131.0	860
6	8/20/2015	0.0071	0.0035	<0.02	8.34	<0.02	778	70.4	390
7	8/20/2015	0.0068	0.0034	0.02	8.50	<0.02	450	31.1	210
8	8/20/2015	0.0050	0.0027	0.02	8.49	<0.02	376	27.1	170
9	8/20/2015	0.0040	0.0028	0.02	8.71	<0.02	302	25.4	120
10	8/20/2015	0.0043	0.0027	0.03	8.68	<0.02	412	29.6	200
11	8/20/2015	0.0052	0.0047	0.04	8.53	<0.02	462	47.6	220
12	8/20/2015	0.0060	0.0052	0.04	8.25	<0.02	970	60.4	540
13	8/20/2015	0.0079	0.0066	0.03	8.33	0.12	588	53.6	280
14	8/20/2015	0.0060	0.0069	0.03	8.42	0.09	468	46.9	190
15	8/20/2015	0.0056	0.0072	0.03	8.41	<0.02	418	40.6	150
16	8/20/2015	0.0059	0.0061	0.03	8.40	<0.02	384	43.1	160
17	8/20/2015	0.0071	0.0068	0.03	8.53	<0.02	394	37.2	160
18	8/20/2015	0.0064	0.0053	0.03	8.63	<0.02	390	30.6	190
19	8/20/2015	0.0051	0.0057	0.02	8.61	<0.02	420	20.4	210
20	8/20/2015	0.0053	0.0057	<0.02	8.68	<0.02	380	20.5	180
21	8/20/2015	0.0044	0.0055	0.02	8.65	<0.02	364	11.8	250
22	8/20/2015	0.0043	0.0066	<0.02	8.73	<0.02	344	12.2	170
23	8/20/2015	0.0060	0.0052	0.03	8.74	<0.02	358	19.3	170
24	8/20/2015	0.0056	0.0048	0.02	8.64	<0.02	494	19.8	1610
25	8/20/2015	0.0036	0.0056	0.02	8.66	<0.02	438	16.6	250
26	8/20/2015	0.0025	0.0060	0.03	8.44	0.65	460	16.7	240
27	8/20/2015	0.0029	0.0060	<0.02	8.38	0.53	772	19.1	450
28	8/20/2015	0.0025	0.0052	0.02	8.66	0.05	332	15.6	150
29	8/20/2015	0.0021	0.0050	0.02	8.76	0.02	322	17.0	160
30	8/20/2015	0.0023	0.0055	0.02	8.62	<0.02	308	17.8	130
31	8/20/2015	0.0026	0.0064	0.02	8.72	<0.02	326	23.3	150
32	8/20/2015	0.0027	0.0061	0.03	8.69	<0.02	338	24.8	160
33	8/20/2015	0.0030	0.0067	0.02	8.66	<0.02	392	28.5	190
34	8/20/2015	0.0027	0.0048	0.03	8.64	<0.02	384	23.7	200
35	8/20/2015	0.0025	0.0050	<0.02	8.67	<0.02	420	28.7	210

Table 2-1. Irrigation Soil Meteoric Water Mobility Test Results, 2015 (cont.)

Sample Site	Date	U (mg/l)	Se (mg/l)	Mo (mg/l)	pH (units)	Nitrate/Nitrite (mg/l)	TDS (mg/l)	Cl (mg/kg)	SO4 (mg/kg)
				SECTION 33 FLOOD					
1	8/21/2015	0.0151	0.0084	<0.02	8.00	2.21	492	28.1	390
2	8/21/2015	0.0056	0.0088	<0.02	8.03	2.22	808	57.8	890
3	8/21/2015	0.0038	0.0068	<0.02	8.12	1.07	808	41.5	460
4	8/21/2015	0.0032	0.0041	<0.02	8.20	0.23	508	19.9	280
5	8/21/2015	0.0036	0.0036	<0.02	8.54	0.02	424	15.5	230
6	8/21/2015	0.0016	0.0043	<0.02	8.53	<0.02	326	17.7	160
7	8/21/2015	0.0012	0.0031	<0.02	8.73	<0.02	222	11.9	90
8	8/21/2015	0.0012	0.0016	<0.02	8.93	0.04	178	7.9	50
9	8/21/2015	0.0016	0.0018	<0.02	8.99	<0.02	152	7.9	40
10	8/21/2015	0.0018	0.0016	<0.02	8.87	<0.02	166	8.3	50
11	8/21/2015	0.0022	0.0013	<0.02	8.95	0.09	170	7.0	60
12	8/21/2015	0.0025	0.0015	0.02	8.88	<0.02	184	8.2	60
13	8/21/2015	0.0024	0.0014	0.05	8.67	<0.02	190	6.6	50
14	8/21/2015	0.0027	0.0014	0.04	8.73	<0.02	172	6.8	50
15	8/21/2015	0.0030	0.0015	0.04	8.75	<0.02	192	7.5	60
16	8/21/2015	0.0033	0.0014	0.03	8.76	0.02	188	7.0	60
17	8/21/2015	0.0023	0.0015	0.03	8.56	0.02	216	8.7	70
18	8/21/2015	0.0029	0.0018	0.03	8.72	<0.02	202	8.2	60
19	8/21/2015	0.0023	0.0018	0.02	8.65	<0.02	206	9.7	70
20	8/21/2015	0.0027	0.0019	0.02	8.67	<0.02	212	9.2	70
21	8/21/2015	0.0025	0.0020	0.02	8.63	0.08	214	9.0	70
22	8/21/2015	0.0028	0.0019	0.03	8.39	<0.02	224	9.7	80
23	8/21/2015	0.0023	0.0015	0.03	8.42	0.03	224	8.8	80
24	8/21/2015	0.0025	0.0018	0.02	8.31	<0.02	218	9.6	70
25	8/21/2015	0.0022	0.0012	0.02	8.48	<0.02	208	8.8	90
26	8/21/2015	0.0019	0.0023	0.03	8.36	<0.02	240	9.7	100
27	8/21/2015	0.0017	0.0017	0.03	8.46	0.04	240	10.6	100
28	8/21/2015	0.0018	0.0017	0.03	8.57	<0.02	236	10.1	100
29	8/21/2015	0.0017	0.0017	0.02	8.61	0.06	200	8.8	90
30	8/21/2015	0.0017	0.0015	<0.02	8.69	0.09	212	9.1	90
31	8/21/2015	0.0018	0.0015	0.02	8.68	<0.02	222	9.3	90
32	8/21/2015	0.0013	0.0020	<0.02	8.81	0.06	190	7.6	70
33	8/21/2015	0.0018	0.0011	<0.02	8.93	0.02	128	4.4	60

Table 2-1. Irrigation Soil Meteoric Water Mobility Test Results, 2015 (cont.)

Sample Site	Date	U (mg/l)	Se (mg/l)	Mo (mg/l)	pH (units)	Nitrate/Nitrite (mg/l)	TDS (mg/l)	Cl (mg/kg)	SO4 (mg/kg)
SECTION 28 CENTER PIVOT									
1	8/24/2015	0.0225	0.0094	0.03	8.11	3.58	232	2.6	60
2	8/24/2015	0.0214	0.0053	0.04	8.41	1.38	526	13.7	290
3	8/24/2015	0.0241	0.0205	<0.02	8.26	1.93	940	30.8	550
4	8/24/2015	0.0214	0.0090	<0.02	8.49	0.59	570	18.0	340
5	8/24/2015	0.0130	0.0051	<0.02	8.18	0.50	626	19.6	380
6	8/24/2015	0.0135	0.0032	<0.02	8.41	0.53	386	16.9	230
7	8/24/2015	0.0141	0.0067	<0.02	8.19	0.31	552	44.5	280
8	8/24/2015	0.0167	0.0124	<0.02	8.15	0.81	636	67.6	320
9	8/24/2015	0.0086	0.0100	<0.02	8.27	0.74	478	74.2	180
10	8/24/2015	0.0063	0.0050	<0.02	8.39	0.63	344	69.7	120
11	8/24/2015	0.0054	0.0050	<0.02	8.30	1.19	558	133.0	180
12	8/24/2015	0.0111	0.0058	0.02	7.96	0.83	756	96.5	350
13	8/24/2015	0.0078	0.0049	<0.02	8.29	0.56	608	71.0	580
14	8/24/2015	0.0017	0.0100	0.02	8.35	0.95	630	75.1	290
15	8/24/2015	0.0020	0.0130	0.03	8.21	1.55	760	72.7	390
17	8/24/2015	0.0032	0.0099	0.02	8.18	1.71	668	28.6	380
SECTION 33 CENTER PIVOT									
1	8/25/2015	0.0468	0.0437	0.02	7.89	22.90	2240	115.0	1250
2	8/25/2015	0.0360	0.0265	<0.02	7.94	12.40	2180	126.0	1260
3	8/25/2015	0.0089	0.0857	<0.02	7.97	2.22	2140	243.0	1060
4	8/25/2015	0.0057	0.0691	<0.02	8.11	0.70	1360	238.0	580
5	8/25/2015	0.0052	0.0850	<0.02	7.87	0.50	2020	312.0	950
6	8/25/2015	0.0021	0.0209	<0.02	7.96	0.45	730	189.0	240
7	8/25/2015	0.0018	0.0086	<0.02	8.19	0.25	342	56.2	130
8	8/25/2015	0.0026	0.0098	<0.02	8.28	0.28	344	45.9	140
9	8/25/2015	0.0010	0.0091	<0.02	8.04	0.22	266	36.5	100
10	8/25/2015	0.0014	0.0079	<0.02	8.10	0.40	264	32.0	110
11	8/25/2015	0.0021	0.0128	<0.02	7.98	0.78	1460	43.0	840
12	8/25/2015	0.0015	0.0058	<0.02	8.26	0.65	448	28.5	230
13	8/25/2015	0.0013	0.0067	<0.02	8.03	0.80	384	20.9	180
14	8/25/2015	0.0014	0.0073	<0.02	8.26	0.92	380	22.0	210
15	8/25/2015	0.0014	0.0056	<0.02	8.20	0.62	328	32.1	150
16	8/25/2015	0.0015	0.0150	<0.02	8.24	0.26	316	49.7	120
17	8/25/2015	0.0010	0.0130	<0.02	8.20	0.41	278	40.9	110

2.1.2 Section 28 Center Pivot

Samples in the Section 28 center pivot were collected down to the basalt in five different locations. Figure 2-7 presents the uranium, selenium, and molybdenum concentrations from the MWMT. Majority of the measured molybdenum concentrations were below the detection limit and are plotted at the detection limit. TDS, sulfate, and chloride concentrations are presented in Figure 2-8. The concentrations for all three constituents were low. The MWMT results from the Section 28 irrigation area indicate that any COCs from the sprinkler irrigation have been transported or distributed through the soil profile with very little variation in the COC concentrations with depth.

2.1.3 Section 33 Center Pivot

Soil samples from five different locations were composited in one foot depth intervals to the basalt in the Section 33 center pivot. The uranium, selenium, and molybdenum concentrations are presented in Figure 2-9. All of the samples with the exception of the first foot interval were below the detection limit of 0.02 mg/l for molybdenum. The three through five foot interval selenium concentrations indicate that low levels of selenium have likely migrated to this depth from the Section 33 irrigation. Figure 2-10 shows the TDS, sulfate, and chloride concentrations and shows that slightly higher chloride concentrations have moved to a depth similar to that of the selenium. The soil moisture measurements from the Section 33 lysimeters also indicate higher selenium concentrations for the Section 33 Center Pivot irrigated area (see Section 2.2.3). The actual soil moisture COC concentration measurements from the lysimeters are a more direct indicator of COCs in solution within the soil profile, while the MWMT results are a more qualitative indicator of COC mass that could be mobilized under extraordinary leaching conditions.

2.1.4 Summary of Meteoric Water Mobility Test Concentrations

The data collected in 2015 shows the highest COC concentrations in each irrigation area to be within the top six feet, with the exception of the Section 28 center pivot where COC concentrations are small at all depths. Aside from TDS, sulfate, chloride, uranium, and selenium values in the upper few feet from the Section 34 flood area and the selenium and chloride values from the three through five foot intervals from the Section 33 center pivot, all of the concentrations are small and do not indicate effects from the former irrigation of these areas.

The results from this MWMT testing should be used with only as a qualitative indicator of the maximum mass of COCs that could possibly be mobilized. The bottle roll method involves saturating the soil to a level that is much greater than could realistically occur beyond the top one or two feet of the soil profile. The profound disturbance during sampling and the soil agitation for 24 hours also creates significantly more contact between the water and the soil than would occur naturally within an undisturbed profile.

2.2 Observed Soil Moisture COC Concentrations

Lysimeters have been installed in the irrigation field areas to collect soil moisture samples and enable the measurement of the soil moisture constituent concentrations. The lysimeters were installed in augured holes at the desired depths. The porous cups were sand packed with a very fine flour sand to enhance the contact with the surrounding soil and the ability to pull moisture into the cup. A vacuum is placed on the lysimeter, which causes the soil moisture water to enter the cup. The soil moisture samples are then collected by purging the lysimeter cup. Lysimeters have been placed in each of the irrigation areas. Table 2-2 presents the completion information for the eight lysimeters in Section 33, the five lysimeters in Section 28, and three lysimeters in Section 34. The sand pack interval is given in the fourth column of Table 2-2 while the depth to the top of the basalt is noted in the third column. A bentonite seal was placed above the sand pack that exists around the lysimeter to prevent soil moisture from moving down the annulus. Lysimeters LY34-2, LY28-2 and LY28-3 were washed out and reinstalled in 2011 due to them not functioning. As noted previously, the suction lysimeters may not function when the soil is too dry or if the contact between the porous cup and soil is broken. When this occurs, it may not be possible to collect samples from individual lysimeters.

Tables 2-3 and 2-4 present the soil moisture concentration data collected from the lysimeters. Table 2-5 presents the yearly representative soil moisture COC concentrations from each of the lysimeters.

2.2.1 Section 34

Four lysimeters have been placed in the clay soils in Section 34 and 33 flood areas. Lysimeters LY34-1, LY34-2 and LY34-3 are in the Section 34 flood while LY34-4 is in the Section 33 flood area. Figure 2-1 shows the location of these lysimeters. Three lysimeters were installed in the Section 34 area and were completed at intervals 8-10 feet below the land surface. The completion interval for the LY34-4 lysimeter was 10-11 feet (see Table 2-2 for completion details). The Section 34 lysimeters were installed in October 2009. LY34-1 produced a sample in October and December of 2009 and then continually from February of 2010. Lysimeter LY34-2 had produced a sample each month until mid-2011 when a vacuum could not be applied. This lysimeter was reinstalled in October of 2011 and has produced multiple samples since. LY34-3 produced samples through June of 2014. LY34-4 produced a sample for each month until February of 2010 and then again in August and September of 2010.

The soil moisture concentration time plots for TDS, sulfate, chloride, uranium, selenium, and molybdenum for lysimeter LY34-1 are presented in Figures 2-11 and 2-12. These plots show that the typical TDS, sulfate, uranium and selenium concentrations have been 5800, 2750, 0.26 and 0.07 mg/l respectively in 2015 with a gradual increase in TDS concentration and decrease in uranium concentration. Figure 2-13 presents TDS, sulfate and chloride concentrations for lysimeter LY34-2. These concentrations generally show steady concentrations for TDS, a slight rise in sulfate and a sharp decline in chloride. A TDS and sulfate concentration of 4200 and 2000 mg/l, respectively, are thought to best represent the 2015 values. The uranium, selenium and molybdenum concentrations for lysimeter LY34-2 are presented in Figure 2-14 which shows a very gradual increasing trend for uranium and selenium until the two most recent samples in 2015. Molybdenum concentrations have been steady. This data indicates that a uranium concentration of 0.06 is representative of the 2015 values for LY34-2. The results from lysimeter LY34-3 samples are presented in Figures 2-15 and 2-16. TDS, sulfate, chloride, uranium and selenium concentrations of 4300, 2000, 520, 0.40 and 0.16 mg/l, respectively, are representative of the 2014 values for LY34-3. TDS, sulfate, uranium, and selenium concentrations all show a gradual increase from 2013 through 2014. No samples were collected from LY34-3 in 2015.

Table 2-2. Irrigation Field Lysimeter Completion Information

LYSIMETER NUMBER	LYSIMETER INTERVAL (FT-LSD)	DEPTH TO TOP OF BASALT (FT-LSD)	INTERVAL OF SAND PACK (FT-LSD)	INTERVAL OF BENTONITE SEAL (FT-LSD)
		SECTION 33		
LY1	16-17	17	15-17	0-15
LY2	15-16	16	14-16	0-14
LY3	6-7	7	5-7	0-5
LY3M	30-31	7	29-31	0-29
LY4	14-15	15	13-15	0-13
LY4MU	24-25	14	24-25	0-24
LY4ML	44-45	14	44-45	25-44
LY5	3-4	4	3-4	0-3
		SECTION 28		
LY28-1	15-16	16	14-16	0-14
LY28-1M	20-21	16	19-21	0-19
LY28-2	7-8	8	6-8	0-6
LY28-2M	20-21	14	19-21	0-19
LY28-3	9-10	10	8-10	0-8
		SECTION 34 AND 33 FLOOD		
LY34-1	8-9	DNE	7-9	0-7
LY34-2	10-11	DNE	9-11	0-9
LY34-3	10-11	DNE	9-11	0-9
LY34-4	10-11	26	8-10	0-8

NOTE: DNE= DOES NOT EXIST AT THIS LOCATION

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY1	7/22/2009	ENER	---	---	---	---	---	---	121	337	1240	---	---
	8/13/2009	ENER	---	---	---	---	---	---	152	543	1530	---	---
	9/23/2009	ENER	201	118	2.90	61.3	529	< 1.000	168	489	1500	* 2010	0.951
	10/16/2009	ENER	---	---	---	---	---	---	179	508	1550	* 2082	---
	11/13/2009	ENER	189	154	2.80	61.5	488	< 5.00	218	590	1560	* 2270	0.934
	12/18/2009	ENER	230	141	2.60	60.1	467	< 5.00	235	647	1640	* 2338	0.922
	12/30/2009	ENER	286	127	2.40	61.2	430	< 5.00	248	719	1770	* 2075	0.940
	1/31/2010	ENER	---	---	---	---	---	---	266	770	1940	---	---
	2/22/2010	ENER	---	---	---	---	---	---	275	814	1850	* 2560	---
	3/25/2010	ENER	---	---	---	---	---	---	289	840	2100	* 2650	---
	4/29/2010	ENER	---	---	---	---	---	---	313	927	2160	* 2750	---
	5/31/2010	ENER	---	---	---	---	---	---	321	1020	2360	* 2870	---
	6/30/2010	ENER	---	---	---	---	---	---	350	1200	2670	* 3136	---
	7/27/2010	ENER	---	---	---	---	---	---	372	1370	2870	* 3310	---
	12/16/2011	ENER	---	---	---	---	---	---	661	1940	4100	* 4640	---
	1/31/2012	ENER	---	---	---	---	---	---	678	1930	4290	* 5036	---
	2/29/2012	ENER	---	---	---	---	---	---	663	1900	4180	* 5012	---
	4/30/2012	ENER	---	---	---	---	---	---	690	1910	4460	* 5033	---
	5/31/2012	ENER	---	---	---	---	---	---	659	1890	4420	* 4993	---
	6/30/2012	ENER	---	---	---	---	---	---	641	1890	4340	* 4941	---
	7/27/2012	ENER	---	---	---	---	---	---	643	1900	4420	* 4910	---
	8/31/2012	ENER	---	---	---	---	---	---	648	1850	4240	* 4944	---
	9/28/2012	ENER	---	---	---	---	---	---	707	1860	4510	* 5017	---
	10/31/2012	ENER	---	---	---	---	---	---	776	1880	4250	* 5082	---
	11/28/2012	ENER	---	---	---	---	---	---	825	1930	4220	* 5174	---
	1/31/2013	ENER	---	---	---	---	---	---	855	1840	4170	* 5245	---
	2/22/2013	ENER	---	---	---	---	---	---	892	1840	4320	* 5239	---
	3/26/2013	HMC	---	---	---	---	---	---	882	1800	4320	5292	---
	4/30/2013	ENER	---	---	---	---	---	---	907	1810	4390	* 5297	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY1	12/12/2013	ENER	---	---	---	---	---	---	287	1730	3340	* 3810	---
	3/28/2014	ENER	---	---	---	---	---	---	266	1680	3230	---	---
	6/27/2014	ENER	---	---	---	---	---	---	245	1660	3220	---	---
	9/30/2014	ENER	---	---	---	---	---	---	234	1740	3170	---	---
	12/23/2014	ENER	---	---	---	---	---	---	233	1720	3350	---	---
	3/31/2015	ENER	---	---	---	---	---	---	256	1860	3500	* 3870	---
	6/30/2015	ENER	---	---	---	---	---	---	246	1870	3500	* 2932	---
	9/30/2015	ENER	---	---	---	---	---	---	248	1840	3410	* 3819	---
LY2	6/24/2009	ENER	---	---	---	---	---	---	225	654	1720	* 2308	---
	12/16/2011	ENER	---	---	---	---	---	---	593	1980	4420	* 5068	---
	1/31/2012	ENER	---	---	---	---	---	---	460	2130	4430	* 5013	---
	3/31/2012	ENER	---	---	---	---	---	---	421	2140	4480	* 4920	---
	4/30/2012	ENER	---	---	---	---	---	---	399	2160	4500	* 4988	---
	5/31/2012	ENER	---	---	---	---	---	---	374	2240	4420	* 4871	---
	6/30/2012	ENER	---	---	---	---	---	---	340	2140	4540	* 4844	---
	7/27/2012	ENER	---	---	---	---	---	---	596	2000	4470	* 5090	---
	8/31/2012	ENER	---	---	---	---	---	---	803	1640	4380	* 5351	---
	9/28/2012	ENER	---	---	---	---	---	---	597	1820	4310	* 4984	---
	11/28/2012	ENER	---	---	---	---	---	---	482	2080	4310	* 4831	---
	12/30/2012	ENER	---	---	---	---	---	---	472	2000	4250	* 4892	---
	1/31/2013	ENER	---	---	---	---	---	---	471	1970	4120	* 4777	---
	3/28/2014	ENER	---	---	---	---	---	---	275	1530	3100	---	---
LY4	12/4/2008	ENER	---	---	---	---	---	---	269	1430	3180	---	---
	12/5/2008	ENER	---	---	---	---	---	---	310	1700	3730	---	---
	12/8/2008	ENER	---	---	---	---	---	---	317	1720	3700	---	---
	12/11/2008	ENER	---	---	---	---	---	---	336	1850	4100	---	---
	12/12/2008	ENER	---	---	---	---	---	---	337	1860	4070	---	---
	1/7/2009	ENER	---	---	---	---	---	---	330	1870	4120	---	---
	2/18/2009	ENER	702	138	5.20	412	783	< 1.000	353	2050	4150	---	0.984

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4	3/20/2009	ENER	---	---	---	---	---	---	326	1940	4220	---	---
	4/18/2009	ENER	---	---	---	---	---	---	336	1990	3970	* 4522	---
	5/15/2009	ENER	---	---	---	---	---	---	328	1950	3990	---	---
	6/10/2009	ENER	---	---	---	---	---	---	336	1880	3870	* 4370	---
	6/24/2009	ENER	---	---	---	---	---	---	324	1920	4180	* 4503	---
	7/22/2009	ENER	---	---	---	---	---	---	315	1990	4220	---	---
	8/13/2009	ENER	---	---	---	---	---	---	354	2170	4380	---	---
	9/23/2009	ENER	728	142	3.50	392	842	< 1.000	339	2250	4530	* 4870	0.928
	10/16/2009	ENER	---	---	---	---	---	---	340	2270	4240	* 5040	---
	11/13/2009	ENER	652	147	3.80	430	634	< 5.00	338	2220	4170	* 5100	0.957
	12/18/2009	ENER	757	149	4.00	425	712	< 5.00	343	2260	4170	* 5096	1.00
	12/30/2009	ENER	699	153	4.00	468	837	< 5.00	342	2260	4250	* 3091	0.962
	1/31/2010	ENER	---	---	---	---	---	---	343	2210	4470	---	---
	2/22/2010	ENER	---	---	---	---	---	---	331	2160	4140	* 5020	---
	3/25/2010	ENER	---	---	---	---	---	---	339	2170	4520	* 5020	---
	4/29/2010	ENER	---	---	---	---	---	---	357	2280	4400	* 5040	---
	5/31/2010	ENER	---	---	---	---	---	---	349	2300	4410	* 5100	---
	6/30/2010	ENER	---	---	---	---	---	---	357	2320	4570	* 5100	---
	7/27/2010	ENER	---	---	---	---	---	---	357	2270	4500	* 4900	---
	8/31/2010	ENER	---	---	---	---	---	---	363	2190	4160	* 4900	---
	9/30/2010	ENER	---	---	---	---	---	---	366	2170	3970	---	---
	10/31/2010	ENER	---	---	---	---	---	---	381	2180	4110	* 4670	---
	11/30/2010	ENER	---	---	---	---	---	---	383	2100	4150	* 4660	---
	1/31/2011	ENER	---	---	---	---	---	---	411	1880	3220	* 4510	---
	2/25/2011	ENER	---	---	---	---	---	---	424	2000	3820	* 4490	---
	3/31/2011	ENER	---	---	---	---	---	---	464	2040	3350	---	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	4490	---
	8/31/2011	ENER	---	---	---	---	---	---	507	1890	3770	* 4515	---
	9/30/2011	ENER	---	---	---	---	---	---	508	1900	3740	---	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4	10/31/2011	ENER	---	---	---	---	---	---	508	1920	3640	---	---
	11/30/2011	ENER	---	---	---	---	---	---	499	1770	3800	---	---
	1/31/2012	ENER	---	---	---	---	---	---	515	1810	3730	---	---
	4/30/2012	ENER	---	---	---	---	---	---	540	1850	4090	---	---
	5/31/2012	ENER	---	---	---	---	---	---	509	1770	4060	---	---
	6/30/2012	ENER	---	---	---	---	---	---	517	1760	3260	---	---
	7/27/2012	ENER	---	---	---	---	---	---	566	1810	3830	---	---
	9/28/2012	ENER	---	---	---	---	---	---	541	1770	3790	---	---
	11/28/2012	ENER	---	---	---	---	---	---	591	1950	3760	---	---
	12/30/2012	HMC	---	---	---	---	---	---	---	---	---	4513	---
	3/26/2013	HMC	---	---	---	---	---	---	579	1790	3480	---	---
	3/28/2014	ENER	---	---	---	---	---	---	597	1800	3670	---	---
	6/27/2014	ENER	---	---	---	---	---	---	596	1700	3730	---	---
	6/30/2015	ENER	---	---	---	---	---	---	625	1850	3790	---	---
LY4ML	4/18/2009	ENER	---	---	---	---	---	---	142	409	---	---	---
	6/24/2009	ENER	---	---	---	---	---	---	684	5510	12000	---	---
	7/22/2009	ENER	---	---	---	---	---	---	650	5460	11600	---	---
	8/13/2009	ENER	---	---	---	---	---	---	663	5050	10400	---	---
	9/23/2009	ENER	180	29.6	6.00	2180	1140	< 1.000	629	3460	7340	* 9310	0.981
	10/16/2009	ENER	---	---	---	---	---	---	568	2570	5840	* 7904	---
	11/13/2009	ENER	166	98.2	11.0	2820	1570	72.0	591	3930	7830	* 7250	1.10
	12/18/2009	ENER	113	25.5	5.00	1520	1190	< 5.00	562	1760	4520	* 6490	1.03
	4/29/2010	ENER	---	---	---	---	---	---	571	1070	3700	* 5330	---
	5/31/2010	ENER	---	---	---	---	---	---	567	917	3080	---	---
	6/30/2010	ENER	---	---	---	---	---	---	581	907	3130	---	---
	7/27/2010	ENER	---	---	---	---	---	---	574	866	3190	* 4860	---
	8/31/2010	ENER	---	---	---	---	---	---	588	851	3080	* 4820	---
	9/30/2010	ENER	---	---	---	---	---	---	580	805	2980	---	---
	10/31/2010	ENER	---	---	---	---	---	---	575	777	2970	* 4660	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4ML	11/30/2010	ENER	---	---	---	---	---	---	566	751	3180	* 4670	---
	4/29/2011	ENER	---	---	---	---	---	---	597	763	2520	---	---
	10/31/2011	ENER	---	---	---	---	---	---	727	1150	4240	---	---
LY4MU	7/22/2009	ENER	---	---	---	---	---	---	660	3240	8210	---	---
	8/13/2009	ENER	---	---	---	---	---	---	903	6990	13900	---	---
	9/23/2009	ENER	263	90.0	14.0	3510	1580	< 1.000	712	6130	11700	* 13860	1.000
	10/16/2009	ENER	---	---	---	---	---	---	592	4850	9780	---	---
	11/13/2009	ENER	100.0	31.7	5.00	1790	1030	< 5.00	584	2210	5160	* 10600	1.08
	1/31/2010	ENER	---	---	---	---	---	---	600	2010	5730	---	---
	2/22/2010	ENER	---	---	---	---	---	---	631	1260	4630	* 6740	---
	3/25/2010	ENER	---	---	---	---	---	---	634	920	4500	* 6390	---
	4/29/2010	ENER	---	---	---	---	---	---	674	742	4210	* 6200	---
	5/31/2010	ENER	---	---	---	---	---	---	697	694	4090	* 6160	---
	6/30/2010	ENER	---	---	---	---	---	---	711	675	4220	* 6150	---
	7/27/2010	ENER	---	---	---	---	---	---	717	657	4190	* 6050	---
	8/31/2010	ENER	---	---	---	---	---	---	722	662	4140	* 6140	---
	9/30/2010	ENER	---	---	---	---	---	---	717	679	4210	---	---
	10/31/2010	ENER	---	---	---	---	---	---	724	718	4080	* 6170	---
	11/30/2010	ENER	---	---	---	---	---	---	724	760	4350	* 6280	---
	1/31/2011	ENER	---	---	---	---	---	---	730	885	4160	* 6300	---
	2/25/2011	ENER	---	---	---	---	---	---	721	898	4230	* 6340	---
	4/29/2011	ENER	---	---	---	---	---	---	735	955	4310	---	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	6410	---
	6/30/2011	ENER	---	---	---	---	---	---	740	1050	4240	* 6460	---
	7/15/2011	ENER	---	---	---	---	---	---	701	1030	4380	* 6460	---
	8/31/2011	ENER	---	---	---	---	---	---	754	1090	4410	* 6582	---
	9/30/2011	ENER	---	---	---	---	---	---	749	1140	4330	* 6500	---
	10/31/2011	HMC	---	---	---	---	---	---	---	---	---	6600	---
	11/30/2011	ENER	---	---	---	---	---	---	733	1130	4490	---	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4MU	1/31/2012	ENER	---	---	---	---	---	---	723	1170	4480	* 6667	---
	2/29/2012	ENER	---	---	---	---	---	---	725	1180	4530	* 6600	---
	3/31/2012	HMC	---	---	---	---	---	---	---	---	---	6585	---
	4/30/2012	ENER	---	---	---	---	---	---	721	1190	4740	* 6600	---
	5/31/2012	ENER	---	---	---	---	---	---	723	1220	4640	* 6589	---
	6/30/2012	ENER	---	---	---	---	---	---	691	1160	4720	---	---
	7/27/2012	ENER	---	---	---	---	---	---	775	1260	4550	* 6568	---
	8/31/2012	ENER	---	---	---	---	---	---	759	1250	4820	* 6554	---
	9/28/2012	ENER	---	---	---	---	---	---	736	1190	4370	* 6519	---
	10/31/2012	ENER	---	---	---	---	---	---	757	1220	4340	* 6476	---
	11/28/2012	ENER	---	---	---	---	---	---	791	1300	4220	* 6513	---
	1/31/2013	ENER	---	---	---	---	---	---	766	1240	4340	* 6540	---
	2/22/2013	ENER	---	---	---	---	---	---	777	1240	4270	* 6416	---
	3/26/2013	HMC	---	---	---	---	---	---	766	1230	4170	5467	---
	4/30/2013	ENER	---	---	---	---	---	---	789	1250	4240	* 5137	---
	12/12/2013	ENER	---	---	---	---	---	---	761	1250	4370	* 6454	---
	3/28/2014	ENER	---	---	---	---	---	---	753	1240	4400	---	---
	12/23/2014	ENER	---	---	---	---	---	---	731	1220	4510	---	---
	3/31/2015	ENER	---	---	---	---	---	---	799	1240	4600	---	---
	6/30/2015	ENER	---	---	---	---	---	---	782	1290	4520	* 5097	---
	9/30/2015	ENER	---	---	---	---	---	---	791	1260	4460	* 6404	---
	11/11/2015	ENER	---	---	---	---	---	---	787	1270	4410	---	---
LY28-1	10/16/2009	ENER	---	---	---	---	---	---	101	358	852	* 1286	---
	11/13/2009	ENER	187	74.2	3.80	331	232	< 5.00	174	1040	1850	* 2650	0.980
	12/18/2009	ENER	308	61.7	3.40	345	399	< 5.00	184	1240	2320	* 3130	0.942
	12/30/2009	ENER	298	61.4	3.20	354	378	< 5.00	180	1220	2460	* 3163	0.961
	1/31/2010	ENER	---	---	---	---	---	---	187	1350	2550	---	---
	2/22/2010	ENER	---	---	---	---	---	---	186	1350	2450	* 3250	---
	3/25/2010	ENER	---	---	---	---	---	---	183	1300	2660	* 3240	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-1	4/29/2010	ENER	---	---	---	---	---	---	190	1340	2580	* 3250	---
	5/31/2010	ENER	---	---	---	---	---	---	191	1350	2550	* 3270	---
	6/30/2010	ENER	---	---	---	---	---	---	197	1380	2650	* 3280	---
	7/27/2010	ENER	---	---	---	---	---	---	201	1410	2670	* 3250	---
	8/31/2010	ENER	---	---	---	---	---	---	200	1360	2610	* 3270	---
	9/30/2010	ENER	---	---	---	---	---	---	192	1350	2700	---	---
	10/31/2010	ENER	---	---	---	---	---	---	190	1330	2600	* 3290	---
	11/30/2010	ENER	---	---	---	---	---	---	191	1310	2660	* 3300	---
	1/31/2011	ENER	---	---	---	---	---	---	198	1400	2530	* 3260	---
	2/25/2011	ENER	---	---	---	---	---	---	187	1290	2590	* 3240	---
	3/29/2011	HMC	---	---	---	---	---	---	---	---	---	3410	---
	4/29/2011	ENER	---	---	---	---	---	---	194	1340	2540	* 3220	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	3200	---
	6/30/2011	ENER	---	---	---	---	---	---	197	1350	2540	* 3220	---
	7/15/2011	ENER	---	---	---	---	---	---	193	1330	2510	* 3200	---
	8/31/2011	ENER	---	---	---	---	---	---	187	1350	2530	* 3200	---
	9/30/2011	ENER	---	---	---	---	---	---	176	1370	2660	* 3290	---
	10/31/2011	ENER	---	---	---	---	---	---	192	1390	2670	* 3470	---
	11/30/2011	ENER	---	---	---	---	---	---	183	1380	2770	---	---
	12/16/2011	ENER	---	---	---	---	---	---	181	1440	2830	* 3575	---
	1/31/2012	ENER	---	---	---	---	---	---	179	1400	2630	* 3568	---
	2/29/2012	ENER	---	---	---	---	---	---	176	1380	2870	* 3540	---
	4/30/2012	ENER	---	---	---	---	---	---	190	1360	3080	* 3658	---
	5/31/2012	ENER	---	---	---	---	---	---	193	1400	3040	* 3594	---
	6/30/2012	ENER	---	---	---	---	---	---	176	1310	3000	* 3547	---
	7/27/2012	ENER	---	---	---	---	---	---	192	1400	2920	* 3538	---
	8/31/2012	ENER	---	---	---	---	---	---	181	1360	3010	* 3542	---
	9/28/2012	ENER	---	---	---	---	---	---	187	1370	2860	* 3526	---
	10/31/2012	ENER	---	---	---	---	---	---	186	1380	2920	* 3558	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-1	11/28/2012	ENER	---	---	---	---	---	---	248	1180	2570	* 3297	---
	12/30/2012	ENER	---	---	---	---	---	---	291	1280	2590	* 3524	---
	1/31/2013	ENER	---	---	---	---	---	---	229	1070	2280	* 3295	---
	2/22/2013	ENER	---	---	---	---	---	---	261	1190	26900	* 33.5	---
	3/26/2013	HMC	---	---	---	---	---	---	266	1170	2680	3332	---
	4/30/2013	ENER	---	---	---	---	---	---	270	1210	2670	* 3382	---
	9/17/2013	ENER	---	---	---	---	---	---	261	1180	2660	* 3377	---
	12/12/2013	ENER	---	---	---	---	---	---	269	1240	2690	* 3380	---
	3/28/2014	ENER	---	---	---	---	---	---	268	1290	2710	---	---
	6/27/2014	ENER	---	---	---	---	---	---	276	1320	2720	---	---
	12/23/2014	ENER	---	---	---	---	---	---	264	1240	2650	---	---
	3/31/2015	ENER	---	---	---	---	---	---	276	1290	2680	* 3350	---
	6/30/2015	ENER	---	---	---	---	---	---	278	1340	2670	* 2510	---
	9/30/2015	ENER	---	---	---	---	---	---	354	1780	3470	* 4100	---
	11/11/2015	ENER	---	---	---	---	---	---	339	1790	3380	---	---
LY28-1M	10/16/2009	ENER	---	---	---	---	---	---	114	84.0	440	* 698	---
LY28-2	10/16/2009	ENER	---	---	---	---	---	---	335	218	954	* 1580	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	1240	---
	10/31/2011	ENER	---	---	---	---	---	---	178	3280	5170	* 6660	---
	11/30/2011	ENER	---	---	---	---	---	---	128	3560	6090	---	---
	12/16/2011	ENER	---	---	---	---	---	---	139	3790	6100	* 7151	---
	1/31/2012	ENER	---	---	---	---	---	---	144	3680	6110	* 6988	---
	2/29/2012	ENER	---	---	---	---	---	---	149	3150	5350	* 6110	---
	4/30/2012	ENER	---	---	---	---	---	---	107	3130	5630	* 6062	---
	5/31/2012	ENER	---	---	---	---	---	---	90.0	3270	5500	* 6165	---
	6/30/2012	ENER	---	---	---	---	---	---	102	3630	6310	* 6761	---
	7/27/2012	ENER	---	---	---	---	---	---	156	4050	6690	* 7611	---
	8/31/2012	ENER	---	---	---	---	---	---	195	2940	5130	* 5980	---
	9/28/2012	ENER	---	---	---	---	---	---	246	2580	4860	* 5437	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-2	10/31/2012	ENER	---	---	---	---	---	---	217	2300	4170	* 4840	---
	11/28/2012	ENER	---	---	---	---	---	---	257	2270	3920	* 4641	---
	12/30/2012	ENER	---	---	---	---	---	---	262	2160	3820	* 4591	---
	1/31/2013	ENER	---	---	---	---	---	---	267	2160	3830	* 4594	---
	2/22/2013	ENER	---	---	---	---	---	---	271	2060	3590	* 4429	---
	3/26/2013	HMC	---	---	---	---	---	---	276	2070	3890	4470	---
	4/30/2013	ENER	---	---	---	---	---	---	279	2120	3840	* 4509	---
	9/17/2013	ENER	---	---	---	---	---	---	263	2280	4320	* 4894	---
	12/12/2013	ENER	---	---	---	---	---	---	266	2510	4410	* 4964	---
	3/28/2014	ENER	---	---	---	---	---	---	267	2490	4310	---	---
	6/27/2014	ENER	---	---	---	---	---	---	284	2550	4410	---	---
	12/23/2014	ENER	---	---	---	---	---	---	310	2710	4720	---	---
	3/31/2015	ENER	---	---	---	---	---	---	365	2910	4910	---	---
	6/30/2015	ENER	---	---	---	---	---	---	734	5750	4900	---	---
	9/30/2015	ENER	---	---	---	---	---	---	277	2810	4860	* 5392	---
	11/11/2015	ENER	---	---	---	---	---	---	331	2880	4910	---	---
LY28-2M	10/16/2009	ENER	---	---	---	---	---	---	158	255	773	* 1176	---
	11/13/2009	ENER	147	60.5	7.80	106	414	6.00	128	304	937	* 1560	1.01
	12/18/2009	ENER	150	54.5	6.90	83.6	447	< 5.00	123	247	980	* 1482	0.980
	12/30/2009	ENER	143	51.5	7.30	80.2	438	< 5.00	120	202	939	* 1544	1.01
	1/31/2010	ENER	---	---	---	---	---	---	115	156	901	---	---
	2/22/2010	ENER	---	---	---	---	---	---	113	132	756	* 1280	---
	3/25/2010	ENER	---	---	---	---	---	---	107	111	858	* 1260	---
	4/29/2010	ENER	---	---	---	---	---	---	120	106	778	* 1250	---
	5/31/2010	ENER	---	---	---	---	---	---	110	95.0	787	* 1300	---
	6/30/2010	ENER	---	---	---	---	---	---	112	93.0	847	* 1290	---
	7/27/2010	ENER	---	---	---	---	---	---	109	89.0	842	* 1230	---
	8/31/2010	ENER	---	---	---	---	---	---	112	88.0	841	* 1260	---
	9/30/2010	ENER	---	---	---	---	---	---	108	83.0	896	---	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-2M	10/31/2010	ENER	---	---	---	---	---	---	110	84.0	891	* 1200	---
	11/30/2010	ENER	---	---	---	---	---	---	108	83.0	956	* 1220	---
	1/31/2011	ENER	---	---	---	---	---	---	108	99.0	763	* 1230	---
	2/25/2011	ENER	---	---	---	---	---	---	111	96.0	813	* 1210	---
	6/30/2011	ENER	---	---	---	---	---	---	109	99.0	760	* 1190	---
	7/15/2011	ENER	---	---	---	---	---	---	104	97.0	753	* 1160	---
	8/31/2011	ENER	---	---	---	---	---	---	902	3540	7150	* 8320	---
	9/30/2011	ENER	---	---	---	---	---	---	865	3490	6850	* 8060	---
	10/31/2011	ENER	---	---	---	---	---	---	801	3330	6450	* 7780	---
	11/30/2011	ENER	---	---	---	---	---	---	696	2820	5760	---	---
	12/16/2011	ENER	---	---	---	---	---	---	651	2500	5000	* 5995	---
	1/31/2012	ENER	---	---	---	---	---	---	560	2110	4080	* 5476	---
	2/29/2012	ENER	---	---	---	---	---	---	491	1890	3750	* 4986	---
	4/30/2012	ENER	---	---	---	---	---	---	412	1570	3570	* 4284	---
	5/31/2012	ENER	---	---	---	---	---	---	320	1090	2580	* 3305	---
	6/30/2012	ENER	---	---	---	---	---	---	248	725	1900	* 2587	---
	7/27/2012	ENER	---	---	---	---	---	---	210	483	1470	* 2044	---
	8/31/2012	ENER	---	---	---	---	---	---	777	3340	6760	* 8112	---
	9/28/2012	ENER	---	---	---	---	---	---	774	2940	6240	* 7836	---
	10/31/2012	ENER	---	---	---	---	---	---	874	3120	6530	* 8181	---
	11/28/2012	ENER	---	---	---	---	---	---	953	2470	6770	* 8672	---
	12/30/2012	ENER	---	---	---	---	---	---	1030	3390	7140	* 1344	---
	1/31/2013	ENER	---	---	---	---	---	---	1050	3470	7280	* 9181	---
	2/22/2013	ENER	---	---	---	---	---	---	1020	3560	7340	* 9070	---
	3/26/2013	HMC	---	---	---	---	---	---	954	3540	7550	8840	---
	4/30/2013	ENER	---	---	---	---	---	---	919	3590	7010	* 7171	---
	9/17/2013	ENER	---	---	---	---	---	---	848	3050	6180	* 8350	---
	12/12/2013	ENER	---	---	---	---	---	---	834	3000	6170	* 7816	---
	3/28/2014	ENER	---	---	---	---	---	---	813	2900	6290	---	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-3	10/16/2009	ENER	---	---	---	---	---	---	190	781	1710	* 2476	---
	11/13/2009	ENER	306	96.9	10.00	983	421	< 5.00	290	2300	4110	* 5560	1.05
	12/18/2009	ENER	392	126	11.0	1200	399	< 5.00	318	3030	5220	* 6638	1.05
	12/30/2009	ENER	426	126	11.0	1260	394	< 5.00	339	3260	5720	* 6961	1.03
	1/31/2010	ENER	---	---	---	---	---	---	339	3380	5770	---	---
	2/22/2010	ENER	---	---	---	---	---	---	344	3520	5880	* 7360	---
	3/25/2010	ENER	---	---	---	---	---	---	347	3360	6360	* 7320	---
	4/29/2010	ENER	---	---	---	---	---	---	350	3590	6340	* 7470	---
	5/31/2010	ENER	---	---	---	---	---	---	410	3730	6600	* 7920	---
	6/30/2010	ENER	---	---	---	---	---	---	471	3850	7210	* 8340	---
	7/27/2010	ENER	---	---	---	---	---	---	597	3690	7160	* 8200	---
	8/31/2010	ENER	---	---	---	---	---	---	786	3420	6660	---	---
	10/31/2011	ENER	---	---	---	---	---	---	171	943	1950	* 2760	---
	11/30/2011	ENER	---	---	---	---	---	---	353	2610	4830	---	---
	12/16/2011	ENER	---	---	---	---	---	---	444	2910	5570	* 6614	---
	1/31/2012	ENER	---	---	---	---	---	---	578	3420	6560	* 7946	---
	2/29/2012	ENER	---	---	---	---	---	---	560	3390	6810	* 7983	---
	4/30/2012	ENER	---	---	---	---	---	---	668	3590	8150	* 8922	---
	5/31/2012	ENER	---	---	---	---	---	---	767	3730	8090	* 9556	---
	6/30/2012	ENER	---	---	---	---	---	---	864	3640	8600	* 9967	---
	7/27/2012	ENER	---	---	---	---	---	---	1150	3830	9000	* 10950	---
	8/31/2012	ENER	---	---	---	---	---	---	1130	4310	9540	* 11460	---
	9/28/2012	ENER	---	---	---	---	---	---	1150	4350	9830	* 11790	---
	10/31/2012	ENER	---	---	---	---	---	---	1170	4260	8950	* 11370	---
	11/28/2012	ENER	---	---	---	---	---	---	610	4240	8050	* 10000	---
	12/30/2012	HMC	---	---	---	---	---	---	---	---	---	9920	---
	1/31/2013	ENER	---	---	---	---	---	---	755	4240	8310	* 10330	---
	2/22/2013	ENER	---	---	---	---	---	---	726	4110	8550	* 10250	---
	3/26/2013	HMC	---	---	---	---	---	---	781	4340	8380	10240	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-3	4/30/2013	ENER	---	---	---	---	---	---	747	4300	9450	* 8585	---
	9/17/2013	ENER	---	---	---	---	---	---	740	4080	8330	* 10180	---
	12/12/2013	ENER	---	---	---	---	---	---	766	4190	8130	* 10090	---
	12/30/2013	ENER	---	---	---	---	---	---	713	4210	8400	---	---
	3/28/2014	ENER	---	---	---	---	---	---	777	4150	8370	---	---
	6/27/2014	ENER	---	---	---	---	---	---	779	4090	8520	---	---
	9/30/2014	ENER	---	---	---	---	---	---	824	4440	8650	---	---
	12/23/2014	ENER	---	---	---	---	---	---	803	4090	8590	---	---
	3/31/2015	ENER	---	---	---	---	---	---	851	4240	8700	* 10230	---
	6/30/2015	ENER	---	---	---	---	---	---	832	4190	8620	* 8582	---
	9/30/2015	ENER	---	---	---	---	---	---	873	4290	8820	* 10400	---
	11/11/2015	ENER	---	---	---	---	---	---	908	4330	8560	---	---
LY34-1	10/16/2009	ENER	---	---	---	---	---	---	124	239	1060	* 1620	---
	12/30/2009	ENER	292	77.1	2.50	543	667	< 5.00	310	1160	2630	* 3763	1.01
	2/22/2010	ENER	---	---	---	---	---	---	321	1230	2760	* 3940	---
	3/25/2010	ENER	---	---	---	---	---	---	326	1240	3120	* 4030	---
	4/29/2010	ENER	---	---	---	---	---	---	359	1350	3130	* 4090	---
	5/31/2010	ENER	---	---	---	---	---	---	353	1340	3050	* 4140	---
	6/30/2010	ENER	---	---	---	---	---	---	362	1370	3250	* 4190	---
	7/27/2010	ENER	---	---	---	---	---	---	362	1380	3220	* 3920	---
	8/31/2010	ENER	---	---	---	---	---	---	362	1410	3490	* 4190	---
	9/30/2010	ENER	---	---	---	---	---	---	375	1450	3530	---	---
	10/31/2010	ENER	---	---	---	---	---	---	514	1910	5220	* 5390	---
	11/30/2010	ENER	---	---	---	---	---	---	501	1890	4230	* 5360	---
	1/31/2011	ENER	---	---	---	---	---	---	482	1910	4370	* 5310	---
	2/25/2011	ENER	---	---	---	---	---	---	498	1970	4170	* 5400	---
	3/31/2011	ENER	---	---	---	---	---	---	532	2080	4370	* 5400	---
	4/29/2011	ENER	---	---	---	---	---	---	506	1980	4240	* 5420	---
	6/30/2011	ENER	---	---	---	---	---	---	514	2040	4240	* 5430	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-1	7/15/2011	ENER	---	---	---	---	---	---	489	1970	4180	* 5640	---
	8/31/2011	ENER	---	---	---	---	---	---	508	2030	4070	* 5760	---
	9/30/2011	ENER	---	---	---	---	---	---	498	2030	4140	* 5580	---
	10/31/2011	ENER	---	---	---	---	---	---	488	2040	4070	* 6620	---
	11/30/2011	ENER	---	---	---	---	---	---	494	1960	4080	---	---
	12/16/2011	ENER	---	---	---	---	---	---	501	2060	4210	* 5590	---
	2/29/2012	ENER	---	---	---	---	---	---	476	1960	4000	* 5560	---
	4/30/2012	ENER	---	---	---	---	---	---	491	1980	4670	* 5623	---
	5/31/2012	ENER	---	---	---	---	---	---	465	1920	4330	---	---
	6/30/2012	ENER	---	---	---	---	---	---	468	1900	3920	* 5598	---
	7/27/2012	ENER	---	---	---	---	---	---	511	1970	4130	* 5254	---
	8/31/2012	ENER	---	---	---	---	---	---	663	2460	5060	* 6475	---
	9/28/2012	ENER	---	---	---	---	---	---	524	2560	5130	* 6571	---
	10/31/2012	ENER	---	---	---	---	---	---	426	2380	4970	* 6012	---
	11/28/2012	ENER	---	---	---	---	---	---	436	2490	5090	* 6046	---
	12/30/2012	ENER	---	---	---	---	---	---	445	2510	4810	* 6102	---
	1/31/2013	ENER	---	---	---	---	---	---	451	2500	4810	* 6091	---
	2/22/2013	ENER	---	---	---	---	---	---	437	2410	4920	* 6017	---
	3/26/2013	HMC	---	---	---	---	---	---	464	2470	4990	4990	---
	4/30/2013	ENER	---	---	---	---	---	---	462	2460	4690	* 4814	---
	9/17/2013	ENER	---	---	---	---	---	---	471	2370	4600	* 6153	---
	12/12/2013	ENER	---	---	---	---	---	---	479	2390	4920	* 6044	---
	3/28/2014	ENER	---	---	---	---	---	---	497	2510	5090	---	---
	6/27/2014	ENER	---	---	---	---	---	---	507	2530	5340	---	---
	9/30/2014	ENER	---	---	---	---	---	---	535	2810	5460	---	---
	12/23/2014	ENER	---	---	---	---	---	---	493	2640	5530	---	---
	6/30/2015	ENER	---	---	---	---	---	---	526	2800	5830	* 5454	---
	9/30/2015	ENER	---	---	---	---	---	---	473	2780	6030	* 6996	---
LY34-2	10/16/2009	ENER	---	---	---	---	---	---	96.0	214	590	* 1000	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-2	11/13/2009	ENER	175	69.4	12.3	354	457	< 5.00	315	676	1850	* 2950	0.985
	12/18/2009	ENER	231	84.8	10.8	387	372	< 5.00	397	868	1220	* 3413	1.00
	12/30/2009	ENER	192	85.6	11.8	436	567	< 5.00	377	799	2250	* 3339	0.977
	1/31/2010	ENER	---	---	---	---	---	---	467	1020	2500	---	---
	2/22/2010	ENER	---	---	---	---	---	---	514	1190	2960	* 4160	---
	3/25/2010	ENER	---	---	---	---	---	---	515	1250	3460	* 4710	---
	4/29/2010	ENER	---	---	---	---	---	---	653	1600	3720	---	---
	5/31/2010	ENER	---	---	---	---	---	---	659	1710	3660	---	---
	6/30/2010	ENER	---	---	---	---	---	---	723	1950	4180	---	---
	7/27/2010	ENER	---	---	---	---	---	---	710	1910	4450	* 5660	---
	8/31/2010	ENER	---	---	---	---	---	---	686	1550	3470	---	---
	9/30/2010	ENER	---	---	---	---	---	---	651	1350	3640	---	---
	10/31/2010	ENER	---	---	---	---	---	---	689	1880	3090	* 5650	---
	11/30/2010	ENER	---	---	---	---	---	---	632	2220	4930	* 6060	---
	1/31/2011	ENER	---	---	---	---	---	---	810	2770	5400	* 6970	---
	2/25/2011	ENER	---	---	---	---	---	---	856	2900	6220	* 7500	---
	3/31/2011	ENER	---	---	---	---	---	---	884	2940	6250	* 7620	---
	4/29/2011	ENER	---	---	---	---	---	---	911	2930	6130	---	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	7860	---
	6/30/2011	ENER	---	---	---	---	---	---	939	2950	5980	* 7880	---
	7/13/2011	HMC	---	---	---	---	---	---	---	---	---	5640	---
	10/31/2011	ENER	---	---	---	---	---	---	57.0	124	464	* 786	---
	11/30/2011	ENER	---	---	---	---	---	---	134	321	1130	* 7740	---
	12/16/2011	ENER	---	---	---	---	---	---	143	400	1360	* 1913	---
	1/31/2012	ENER	---	---	---	---	---	---	384	868	2440	---	---
	2/29/2012	ENER	---	---	---	---	---	---	219	537	1860	---	---
	8/31/2012	ENER	---	---	---	---	---	---	453	1910	3930	* 5085	---
	9/28/2012	ENER	---	---	---	---	---	---	501	2170	4610	* 5584	---
	10/31/2012	ENER	---	---	---	---	---	---	444	2320	4670	* 5557	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-2	11/28/2012	ENER	---	---	---	---	---	---	417	2230	4360	* 5307	---
	12/30/2012	ENER	---	---	---	---	---	---	403	2110	4140	* 5077	---
	1/31/2013	ENER	---	---	---	---	---	---	413	2100	4080	* 5168	---
	2/22/2013	ENER	---	---	---	---	---	---	402	2010	4240	* 5080	---
	3/26/2013	HMC	---	---	---	---	---	---	424	2040	4190	5052	---
	4/30/2013	ENER	---	---	---	---	---	---	420	1990	4120	* 4023	---
	9/17/2013	ENER	---	---	---	---	---	---	442	1960	4190	* 5288	---
	12/12/2013	ENER	---	---	---	---	---	---	449	2000	4200	* 5246	---
	3/28/2014	ENER	---	---	---	---	---	---	441	1980	4160	---	---
	12/23/2014	ENER	---	---	---	---	---	---	456	1960	4320	---	---
	9/30/2015	ENER	---	---	---	---	---	---	71.0	2520	4190	* 4926	---
	11/11/2015	ENER	---	---	---	---	---	---	80.0	2840	4600	---	---
LY34-3	10/16/2009	ENER	---	---	---	---	---	---	96.0	102	637	* 920	---
	11/13/2009	ENER	90.9	44.0	4.30	229	488	6.00	128	277	956	* 1660	1.04
	12/18/2009	ENER	178	78.0	3.90	338	648	< 5.00	184	766	1900	* 2760	0.943
	12/30/2009	ENER	234	105	4.70	456	680	< 5.00	211	904	2170	* 3030	1.12
	1/31/2010	ENER	---	---	---	---	---	---	231	983	2410	---	---
	2/22/2010	ENER	---	---	---	---	---	---	244	1030	2370	* 3350	---
	3/25/2010	ENER	---	---	---	---	---	---	250	1020	2630	* 3460	---
	4/29/2010	ENER	---	---	---	---	---	---	279	1100	2580	* 3520	---
	5/31/2010	ENER	---	---	---	---	---	---	287	1120	2580	* 3610	---
	6/30/2010	ENER	---	---	---	---	---	---	293	1120	2790	* 3680	---
	7/27/2010	ENER	---	---	---	---	---	---	321	1220	2780	* 3700	---
	8/31/2010	ENER	---	---	---	---	---	---	302	1130	2780	* 3780	---
	9/30/2010	ENER	---	---	---	---	---	---	322	1210	2990	---	---
	10/31/2010	ENER	---	---	---	---	---	---	315	1150	2330	* 3850	---
	11/30/2010	ENER	---	---	---	---	---	---	323	1160	3030	* 3920	---
	1/31/2011	ENER	---	---	---	---	---	---	314	1170	2990	* 3960	---
	2/25/2011	ENER	---	---	---	---	---	---	329	1040	3530	* 3880	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-3	3/31/2011	ENER	---	---	---	---	---	---	394	1050	2790	* 3860	---
	4/29/2011	ENER	---	---	---	---	---	---	428	996	2850	* 3950	---
	6/30/2011	ENER	---	---	---	---	---	---	541	1010	2980	* 4100	---
	7/15/2011	ENER	---	---	---	---	---	---	566	1020	3050	* 4380	---
	8/31/2011	ENER	---	---	---	---	---	---	631	1070	3200	* 4570	---
	9/30/2011	ENER	---	---	---	---	---	---	620	1090	3210	* 4540	---
	10/31/2011	ENER	---	---	---	---	---	---	580	1140	3080	* 45.1	---
	11/30/2011	ENER	---	---	---	---	---	---	603	1170	3140	---	---
	12/16/2011	ENER	---	---	---	---	---	---	606	1250	3340	* 4640	---
	1/31/2012	ENER	---	---	---	---	---	---	601	1290	3410	* 4748	---
	2/29/2012	ENER	---	---	---	---	---	---	577	1280	3380	* 4610	---
	4/30/2012	ENER	---	---	---	---	---	---	552	1290	3600	* 4591	---
	5/31/2012	ENER	---	---	---	---	---	---	645	1600	4100	* 5226	---
	6/30/2012	ENER	---	---	---	---	---	---	830	2150	5800	* 6719	---
	7/27/2012	ENER	---	---	---	---	---	---	826	2310	5230	* 6765	---
	8/31/2012	ENER	---	---	---	---	---	---	1100	3310	7090	* 8925	---
	9/28/2012	ENER	---	---	---	---	---	---	871	2850	5900	* 7942	---
	10/31/2012	ENER	---	---	---	---	---	---	742	2580	5450	* 6955	---
	11/28/2012	ENER	---	---	---	---	---	---	652	2510	4570	* 6417	---
	12/30/2012	ENER	---	---	---	---	---	---	550	2270	4580	* 6023	---
	1/31/2013	ENER	---	---	---	---	---	---	466	2010	4320	* 5469	---
	2/22/2013	ENER	---	---	---	---	---	---	386	1700	3890	* 48.5	---
	3/26/2013	HMC	---	---	---	---	---	---	401	1700	3860	4830	---
	4/30/2013	ENER	---	---	---	---	---	---	407	1720	3670	* 3763	---
	9/17/2013	ENER	---	---	---	---	---	---	537	2070	4480	* 5968	---
	12/12/2013	ENER	---	---	---	---	---	---	542	2080	4580	* 5830	---
	3/28/2014	ENER	---	---	---	---	---	---	495	1930	4250	---	---
	6/27/2014	ENER	---	---	---	---	---	---	547	2170	4610	---	---
LY34-4	10/16/2009	ENER	---	---	---	---	---	---	74.0	322	854	* 1245	---

* Signifies Specific Conductivity from HMC

Table 2-3 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-4	11/13/2009	ENER	58.4	18.3	4.20	289	335	6.00	106	384	977	* 1660	1.03
	12/18/2009	ENER	80.3	20.7	3.70	347	329	13.0	130	501	1260	* 1996	1.05
	12/30/2009	ENER	110	22.6	3.40	331	295	8.00	146	608	1470	* 2038	0.998
	1/31/2010	ENER	---	---	---	---	---	---	163	763	1630	---	---
	7/27/2010	HMC	---	---	---	---	---	---	---	---	---	4850	---
	8/31/2010	ENER	---	---	---	---	---	---	259	1350	2960	* 3930	---
	9/30/2010	ENER	---	---	---	---	---	---	269	1480	3450	---	---

* Signifies Specific Conductivity from HMC

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY1	7/22/2009	ENER	---	0.0420	0.0400	0.0300	1.14	---	---	---	---
	8/13/2009	ENER	---	0.0878	< 0.0300	0.0500	1.10	---	---	---	---
	9/23/2009	ENER	7.77	0.0519	0.0300	0.0350	1.90	---	---	---	---
	10/16/2009	ENER	---	0.0540	< 0.0300	0.0400	1.70	---	---	---	---
	11/13/2009	ENER	8.17	0.0487	< 0.0300	0.0390	2.80	---	---	---	---
	12/18/2009	ENER	7.81	0.0656	< 0.0300	0.0470	2.20	---	---	---	---
	12/30/2009	ENER	7.80	0.0585	< 0.0300	0.0790	1.80	---	---	---	---
	1/31/2010	ENER	---	0.0506	< 0.0300	0.0720	1.60	---	---	---	---
	2/22/2010	ENER	---	0.0506	< 0.0300	0.0820	1.50	---	---	---	---
	3/25/2010	ENER	---	0.0471	< 0.0300	0.105	1.40	---	---	---	---
	4/29/2010	ENER	---	0.0471	< 0.0300	0.0860	1.30	---	---	---	---
	5/31/2010	ENER	---	0.0527	0.0300	0.116	1.20	---	---	---	---
	6/30/2010	ENER	---	0.0574	< 0.0300	0.115	1.30	---	---	---	---
	7/27/2010	ENER	---	0.0532	< 0.0300	0.127	1.30	---	---	---	---
	12/16/2011	ENER	---	0.0496	< 0.0300	0.115	---	---	---	---	---
	1/31/2012	ENER	---	0.0493	< 0.0300	0.142	---	---	---	---	---
	2/29/2012	ENER	---	0.0447	< 0.0300	0.152	---	---	---	---	---
	4/30/2012	ENER	---	0.0481	< 0.0300	0.149	---	---	---	---	---
	5/31/2012	ENER	---	0.0445	< 0.0300	0.134	---	---	---	---	---
	6/30/2012	ENER	---	0.0460	< 0.0300	0.129	---	---	---	---	---
	7/27/2012	ENER	---	0.0442	< 0.0300	0.127	---	---	---	---	---
	8/31/2012	ENER	---	0.0471	< 0.0300	0.143	---	---	---	---	---
	9/28/2012	ENER	---	0.0443	< 0.0300	0.134	---	---	---	---	---
	10/31/2012	ENER	---	0.0470	< 0.0300	0.168	---	---	---	---	---
	11/28/2012	ENER	---	0.0488	< 0.0300	0.150	---	---	---	---	---
	1/31/2013	ENER	---	0.0467	< 0.0300	0.178	---	---	---	---	---
	2/22/2013	ENER	---	0.0504	< 0.0300	0.187	4.70	---	---	---	---
	3/26/2013	HMC	---	0.0475	< 0.0300	0.182	5.00	---	---	---	---
	4/30/2013	ENER	---	0.0487	< 0.0300	0.174	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY1	12/12/2013	ENER	---	0.0296	< 0.0300	0.0780	7.80	---	---	---	---
	3/28/2014	ENER	---	0.0287	< 0.0300	0.0910	8.40	---	---	---	---
	6/27/2014	ENER	---	0.0277	< 0.0300	0.100	8.10	---	---	---	---
	9/30/2014	ENER	---	0.0257	< 0.0300	0.0970	---	---	---	---	---
	12/23/2014	ENER	---	0.0262	< 0.0300	0.103	---	---	---	---	---
	3/31/2015	ENER	---	0.0268	< 0.0300	0.131	9.60	---	---	---	---
	6/30/2015	ENER	---	0.0270	< 0.0300	0.124	9.30	---	---	---	---
	9/30/2015	ENER	---	0.0259	< 0.0300	0.109	8.60	---	---	---	---
LY2	6/24/2009	ENER	---	0.0406	0.0400	0.0140	3.31	---	---	---	---
	12/16/2011	ENER	---	0.0630	< 0.0300	0.161	---	---	---	---	---
	1/31/2012	ENER	---	0.0652	< 0.0300	0.140	---	---	---	---	---
	3/31/2012	ENER	---	0.0636	< 0.0300	0.110	---	---	---	---	---
	4/30/2012	ENER	---	0.0544	< 0.0300	0.124	---	---	---	---	---
	5/31/2012	ENER	---	0.0475	< 0.0300	0.110	---	---	---	---	---
	6/30/2012	ENER	---	0.0470	< 0.0300	0.100	---	---	---	---	---
	7/27/2012	ENER	---	0.0538	< 0.0300	0.171	---	---	---	---	---
	8/31/2012	ENER	---	0.0758	< 0.0300	0.271	---	---	---	---	---
	9/28/2012	ENER	---	0.0640	< 0.0300	0.171	---	---	---	---	---
	11/28/2012	ENER	---	0.0635	< 0.0300	0.131	---	---	---	---	---
	12/30/2012	ENER	---	0.0563	< 0.0300	0.138	---	---	---	---	---
	1/31/2013	ENER	---	0.0606	< 0.0300	0.148	---	---	---	---	---
	3/28/2014	ENER	---	0.0423	< 0.0300	0.101	16.0	---	---	---	---
LY4	12/4/2008	ENER	---	0.0566	< 0.0300	0.0400	1.20	---	---	---	---
	12/5/2008	ENER	---	0.0624	< 0.0300	0.0600	0.900	---	---	---	---
	12/8/2008	ENER	---	0.0715	0.0400	0.0460	0.600	---	---	---	---
	12/11/2008	ENER	---	0.0644	< 0.0300	0.0450	0.660	---	---	---	---
	12/12/2008	ENER	---	0.0641	< 0.0300	0.0440	0.650	---	---	---	---
	1/7/2009	ENER	---	0.0813	< 0.0300	0.0410	0.870	---	---	---	---
	2/18/2009	ENER	7.44	0.0655	< 0.0300	0.0410	1.40	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4	3/20/2009	ENER	---	0.0732	< 0.0300	0.0430	1.72	---	---	---	---
	4/18/2009	ENER	---	0.0589	< 0.0300	0.0350	0.800	---	---	---	---
	5/15/2009	ENER	---	0.0611	< 0.0300	0.0380	1.46	---	---	---	---
	6/10/2009	ENER	---	0.0630	< 0.0300	0.0550	0.800	---	---	---	---
	6/24/2009	ENER	---	0.0621	< 0.0300	0.0500	0.560	---	---	---	---
	7/22/2009	ENER	---	0.0636	< 0.0300	0.0430	0.460	---	---	---	---
	8/13/2009	ENER	---	0.0718	< 0.0300	0.0400	0.600	---	---	---	---
	9/23/2009	ENER	7.29	0.0664	< 0.0300	0.0340	0.500	---	---	---	---
	10/16/2009	ENER	---	0.0701	< 0.0300	0.0310	0.500	---	---	---	---
	11/13/2009	ENER	7.84	0.0652	< 0.0300	0.0330	0.600	---	---	---	---
	12/18/2009	ENER	7.58	0.0651	< 0.0300	0.0310	0.500	---	---	---	---
	12/30/2009	ENER	7.60	0.0643	< 0.0300	0.0340	0.600	---	---	---	---
	1/31/2010	ENER	---	0.0702	< 0.0300	0.0380	0.500	---	---	---	---
	2/22/2010	ENER	---	0.0732	< 0.0300	0.0350	0.500	---	---	---	---
	3/25/2010	ENER	---	0.0720	< 0.0300	0.0360	0.500	---	---	---	---
	4/29/2010	ENER	---	0.0699	< 0.0300	0.0380	0.600	---	---	---	---
	5/31/2010	ENER	---	0.0833	< 0.0300	0.0540	0.600	---	---	---	---
	6/30/2010	ENER	---	0.0766	< 0.0300	0.0420	0.600	---	---	---	---
	7/27/2010	ENER	---	0.0707	< 0.0300	0.0420	0.700	---	---	---	---
	8/31/2010	ENER	---	0.0708	< 0.0300	0.0420	0.800	---	---	---	---
	9/30/2010	ENER	---	0.0682	< 0.0300	0.0450	1.10	---	---	---	---
	10/31/2010	ENER	---	0.0672	< 0.0300	0.0440	---	---	---	---	---
	11/30/2010	ENER	---	0.0610	< 0.0300	0.0520	---	---	---	---	---
	1/31/2011	ENER	---	0.0514	< 0.0300	0.0590	---	---	---	---	---
	2/25/2011	ENER	---	0.0460	< 0.0300	0.0600	---	---	---	---	---
	3/31/2011	ENER	---	0.0421	< 0.0300	0.0570	---	---	---	---	---
	8/31/2011	ENER	---	0.0295	< 0.0300	0.0670	---	---	---	---	---
	9/30/2011	ENER	---	< 0.0003	< 0.0300	< 0.0050	---	---	---	---	---
	10/31/2011	ENER	---	0.0227	< 0.0300	0.0810	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4	11/30/2011	ENER	---	0.0287	< 0.0300	0.0770	---	---	---	---	---
	1/31/2012	ENER	---	0.0183	< 0.0300	0.0950	---	---	---	---	---
	4/30/2012	ENER	---	0.0226	< 0.0300	0.0980	---	---	---	---	---
	5/31/2012	ENER	---	0.0217	< 0.0300	0.0920	---	---	---	---	---
	6/30/2012	ENER	---	0.0232	< 0.0300	0.0880	---	---	---	---	---
	7/27/2012	ENER	---	0.0270	< 0.0300	0.0900	---	---	---	---	---
	8/31/2012	ENER	---	0.0288	< 0.0300	0.104	---	---	---	---	---
	9/28/2012	ENER	---	0.112	< 0.0300	< 0.0050	---	---	---	---	---
	11/28/2012	ENER	---	0.0258	< 0.0300	0.108	---	---	---	---	---
	3/26/2013	HMC	---	0.0169	< 0.0300	0.114	1.10	---	---	---	---
	3/28/2014	ENER	---	0.0122	< 0.0300	0.119	1.10	---	---	---	---
	6/27/2014	ENER	---	0.0118	< 0.0300	0.131	1.20	---	---	---	---
	9/30/2014	ENER	---	0.0139	< 0.0300	0.134	---	---	---	---	---
	6/30/2015	ENER	---	0.0105	< 0.0300	0.146	1.90	---	---	---	---
LY4ML	4/18/2009	ENER	---	0.0188	0.120	0.0050	0.200	---	---	---	---
	6/24/2009	ENER	---	0.358	0.110	<. 0.0050	10.00	---	---	---	---
	7/22/2009	ENER	---	0.552	0.0900	0.0100	0.0200	---	---	---	---
	8/13/2009	ENER	---	0.421	0.0600	< 0.0050	< 0.100	---	---	---	---
	9/23/2009	ENER	7.76	0.268	0.0400	0.0100	< 0.100	---	---	---	---
	10/16/2009	ENER	---	0.244	0.0400	0.0060	< 0.100	---	---	---	---
	11/13/2009	ENER	8.35	0.508	0.0900	0.0110	< 0.100	---	---	---	---
	12/18/2009	ENER	7.55	0.214	< 0.0300	0.0050	< 0.100	---	---	---	---
	4/29/2010	ENER	---	0.292	0.0500	0.0110	< 0.100	---	---	---	---
	5/31/2010	ENER	---	0.463	0.0900	0.0150	< 0.100	---	---	---	---
	6/30/2010	ENER	---	0.482	0.110	0.0120	< 0.100	---	---	---	---
	7/27/2010	ENER	---	0.375	0.0900	0.0170	< 0.100	---	---	---	---
	8/31/2010	ENER	---	0.366	0.0900	0.0150	< 0.100	---	---	---	---
	9/30/2010	ENER	---	0.394	0.100	0.0130	< 0.100	---	---	---	---
	10/31/2010	ENER	---	0.394	0.100	0.0140	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4ML	11/30/2010	ENER	---	0.453	0.140	0.0180	---	---	---	---	---
	4/29/2011	ENER	---	0.461	0.570	0.0430	---	---	---	---	---
	10/31/2011	ENER	---	0.660	0.0600	0.0260	---	---	---	---	---
LY4MU	7/22/2009	ENER	---	0.261	0.140	0.0100	0.0200	---	---	---	---
	8/13/2009	ENER	---	0.596	0.160	0.0060	< 0.100	---	---	---	---
	9/23/2009	ENER	7.68	0.563	0.120	0.0090	< 0.100	---	---	---	---
	10/16/2009	ENER	---	0.557	0.100	0.0090	< 0.100	---	---	---	---
	11/13/2009	ENER	8.04	0.212	0.0300	0.0090	< 0.100	---	---	---	---
	1/31/2010	ENER	---	0.504	0.0500	0.0100	< 0.100	---	---	---	---
	2/22/2010	ENER	---	0.516	0.0500	0.0100	0.800	---	---	---	---
	3/25/2010	ENER	---	0.574	0.0500	0.0100	1.80	---	---	---	---
	4/29/2010	ENER	---	0.546	0.0400	0.0120	2.30	---	---	---	---
	5/31/2010	ENER	---	0.626	0.0400	0.0130	3.20	---	---	---	---
	6/30/2010	ENER	---	0.617	0.0400	0.0090	3.50	---	---	---	---
	7/27/2010	ENER	---	0.600	0.0400	0.0110	3.50	---	---	---	---
	8/31/2010	ENER	---	0.0395	0.350	0.0460	4.10	---	---	---	---
	9/30/2010	ENER	---	0.691	0.0500	0.0060	3.80	---	---	---	---
	10/31/2010	ENER	---	0.633	0.0400	0.0060	---	---	---	---	---
	11/30/2010	ENER	---	0.628	0.0400	0.0100	---	---	---	---	---
	1/31/2011	ENER	---	0.644	0.0400	0.0130	---	---	---	---	---
	2/25/2011	ENER	---	0.662	0.0400	0.0140	---	---	---	---	---
	4/29/2011	ENER	---	0.632	0.0500	0.0120	---	---	---	---	---
	6/30/2011	ENER	---	0.649	0.0500	0.0180	---	---	---	---	---
	7/15/2011	ENER	---	0.569	0.0600	0.0100	---	---	---	---	---
	8/31/2011	ENER	---	0.582	0.0600	0.0100	---	---	---	---	---
	9/30/2011	ENER	---	0.646	0.0600	0.0060	---	---	---	---	---
	11/30/2011	ENER	---	0.640	0.0600	0.0180	---	---	---	---	---
	1/31/2012	ENER	---	0.593	0.0600	0.0130	---	---	---	---	---
	2/29/2012	ENER	---	0.610	0.0900	0.0170	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4MU	4/30/2012	ENER	---	0.582	0.0600	0.0100	---	---	---	---	---
	5/31/2012	ENER	---	0.600	0.0600	0.0110	---	---	---	---	---
	6/30/2012	ENER	---	0.586	0.0600	0.0120	---	---	---	---	---
	7/27/2012	ENER	---	0.592	0.0600	0.0050	---	---	---	---	---
	8/31/2012	ENER	---	0.573	0.0600	< 0.0050	---	---	---	---	---
	9/28/2012	ENER	---	0.145	0.0400	0.518	---	---	---	---	---
	10/31/2012	ENER	---	0.554	0.0600	0.0060	---	---	---	---	---
	11/28/2012	ENER	---	0.550	0.0600	< 0.0050	---	---	---	---	---
	1/31/2013	ENER	---	0.544	0.0600	0.0060	---	---	---	---	---
	2/22/2013	ENER	---	0.526	0.0700	0.0130	7.10	---	---	---	---
	3/26/2013	HMC	---	0.491	0.0600	0.0050	7.10	---	---	---	---
	4/30/2013	ENER	---	0.497	0.0600	0.0090	---	---	---	---	---
	12/12/2013	ENER	---	0.463	0.0700	0.0090	9.90	---	---	---	---
	3/28/2014	ENER	---	0.426	0.0700	0.0150	8.90	---	---	---	---
	12/23/2014	ENER	---	0.449	0.0600	0.0140	---	---	---	---	---
	3/31/2015	ENER	---	0.397	0.0800	0.0170	9.10	---	---	---	---
	6/30/2015	ENER	---	0.420	0.0900	0.0160	8.80	---	---	---	---
	9/30/2015	ENER	---	0.370	0.0900	0.0130	8.10	---	---	---	---
	11/11/2015	ENER	---	0.358	0.100	0.0090	8.50	---	---	---	---
LY28-1	10/16/2009	ENER	---	0.0224	0.0500	0.0100	2.60	---	---	---	---
	11/13/2009	ENER	8.19	0.0489	< 0.0300	0.0250	4.40	---	---	---	---
	12/18/2009	ENER	7.77	0.131	< 0.0300	0.0310	0.900	---	---	---	---
	12/30/2009	ENER	7.83	0.161	< 0.0300	0.0420	6.60	---	---	---	---
	1/31/2010	ENER	---	0.149	< 0.0300	0.0370	6.70	---	---	---	---
	2/22/2010	ENER	---	0.161	< 0.0300	0.0380	6.10	---	---	---	---
	3/25/2010	ENER	---	0.161	< 0.0300	0.0400	7.90	---	---	---	---
	4/29/2010	ENER	---	0.150	< 0.0300	0.0390	7.50	---	---	---	---
	5/31/2010	ENER	---	0.194	0.0300	0.0490	7.60	---	---	---	---
	6/30/2010	ENER	---	0.183	< 0.0300	0.0410	7.20	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-1	7/27/2010	ENER	---	0.171	< 0.0300	0.0440	8.00	---	---	---	---
	8/31/2010	ENER	---	0.187	< 0.0300	0.0470	7.50	---	---	---	---
	9/30/2010	ENER	---	0.194	< 0.0300	0.0450	7.30	---	---	---	---
	10/31/2010	ENER	---	0.191	0.0800	0.0610	---	---	---	---	---
	11/30/2010	ENER	---	0.168	< 0.0300	0.0470	---	---	---	---	---
	1/31/2011	ENER	---	0.149	< 0.0300	0.0550	---	---	---	---	---
	2/25/2011	ENER	---	0.135	0.0500	0.0590	---	---	---	---	---
	4/29/2011	ENER	---	0.132	0.0400	0.0630	---	---	---	---	---
	6/30/2011	ENER	---	0.111	< 0.0300	0.0670	---	---	---	---	---
	7/15/2011	ENER	---	0.112	< 0.0300	0.0570	---	---	---	---	---
	8/31/2011	ENER	---	0.114	< 0.0300	0.0510	---	---	---	---	---
	9/30/2011	ENER	---	0.137	< 0.0300	0.0500	---	---	---	---	---
	10/31/2011	ENER	---	0.128	< 0.0300	0.0780	---	---	---	---	---
	11/30/2011	ENER	---	0.194	< 0.0300	0.0700	---	---	---	---	---
	12/16/2011	ENER	---	0.193	< 0.0300	0.0540	---	---	---	---	---
	1/31/2012	ENER	---	0.198	< 0.0300	0.0750	---	---	---	---	---
	2/29/2012	ENER	---	0.210	< 0.0300	0.0650	---	---	---	---	---
	4/30/2012	ENER	---	0.200	< 0.0300	0.0560	---	---	---	---	---
	5/31/2012	ENER	---	0.206	< 0.0300	0.0590	---	---	---	---	---
	6/30/2012	ENER	---	0.200	< 0.0300	0.0530	---	---	---	---	---
	7/27/2012	ENER	---	0.202	< 0.0300	0.0500	---	---	---	---	---
	8/31/2012	ENER	---	0.198	< 0.0300	0.0560	---	---	---	---	---
	9/28/2012	ENER	---	0.206	< 0.0300	0.0490	---	---	---	---	---
	10/31/2012	ENER	---	0.201	< 0.0300	0.0560	---	---	---	---	---
	11/28/2012	ENER	---	0.212	< 0.0300	0.0460	---	---	---	---	---
	12/30/2012	ENER	---	0.195	< 0.0300	0.0430	---	---	---	---	---
	1/31/2013	ENER	---	0.200	< 0.0300	0.0460	---	---	---	---	---
	2/22/2013	ENER	---	0.203	< 0.0300	0.0460	21.0	---	---	---	---
	3/26/2013	HMC	---	0.196	< 0.0300	0.0430	21.0	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-1	4/30/2013	ENER	---	0.188	0.0600	0.0380	---	---	---	---	---
	9/17/2013	ENER	---	0.153	< 0.0300	0.0440	21.0	---	---	---	---
	12/12/2013	ENER	---	0.131	< 0.0300	0.0340	21.0	---	---	---	---
	3/28/2014	ENER	---	0.107	< 0.0300	0.0410	21.0	---	---	---	---
	6/27/2014	ENER	---	0.0418	< 0.0300	0.0410	19.0	---	---	---	---
	12/23/2014	ENER	---	0.0875	< 0.0300	0.0440	---	---	---	---	---
	3/31/2015	ENER	---	0.0642	< 0.0300	0.0460	23.0	---	---	---	---
	6/30/2015	ENER	---	0.0642	< 0.0300	0.0450	22.0	---	---	---	---
	9/30/2015	ENER	---	0.0845	< 0.0300	0.0480	14.2	---	---	---	---
	11/11/2015	ENER	---	0.0808	< 0.0300	0.0490	15.0	---	---	---	---
LY28-1M	10/16/2009	ENER	---	0.0009	0.160	0.0070	1.40	---	---	---	---
LY28-2	10/16/2009	ENER	---	0.0031	0.0500	0.0140	1.10	---	---	---	---
	10/31/2011	ENER	---	0.415	0.180	0.0760	---	---	---	---	---
	11/30/2011	ENER	---	0.770	0.0400	0.0430	---	---	---	---	---
	12/16/2011	ENER	---	0.932	0.0600	0.0190	---	---	---	---	---
	1/31/2012	ENER	---	0.884	0.0300	0.0310	---	---	---	---	---
	2/29/2012	ENER	---	0.762	< 0.0300	0.0470	---	---	---	---	---
	4/30/2012	ENER	---	0.641	< 0.0300	0.0470	---	---	---	---	---
	5/31/2012	ENER	---	0.572	< 0.0300	0.0480	---	---	---	---	---
	6/30/2012	ENER	---	0.533	< 0.0300	0.0480	---	---	---	---	---
	7/27/2012	ENER	---	0.432	< 0.0300	0.0510	---	---	---	---	---
	8/31/2012	ENER	---	0.867	< 0.0300	0.0510	---	---	---	---	---
	9/28/2012	ENER	---	0.814	< 0.0300	0.0490	---	---	---	---	---
	10/31/2012	ENER	---	0.624	< 0.0300	0.0530	---	---	---	---	---
	11/28/2012	ENER	---	0.521	< 0.0300	0.0560	---	---	---	---	---
	12/30/2012	ENER	---	0.418	< 0.0300	0.0600	---	---	---	---	---
	1/31/2013	ENER	---	0.411	< 0.0300	0.0660	---	---	---	---	---
	2/22/2013	ENER	---	0.374	< 0.0300	0.0750	21.0	---	---	---	---
	3/26/2013	HMC	---	0.328	< 0.0300	0.0770	22.0	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-2	4/30/2013	ENER	---	0.283	0.0600	0.0740	---	---	---	---	---
	9/17/2013	ENER	---	0.190	< 0.0300	0.0960	32.0	---	---	---	---
	12/12/2013	ENER	---	0.136	< 0.0300	0.0870	30.0	---	---	---	---
	3/28/2014	ENER	---	0.116	< 0.0300	0.0920	26.0	---	---	---	---
	6/27/2014	ENER	---	0.249	< 0.0300	0.110	28.0	---	---	---	---
	9/30/2014	ENER	---	0.110	< 0.0300	0.108	---	---	---	---	---
	12/23/2014	ENER	---	0.0619	< 0.0300	0.112	---	---	---	---	---
	3/31/2015	ENER	---	0.0483	< 0.0300	0.103	31.0	---	---	---	---
	6/30/2015	ENER	---	0.0706	< 0.0300	0.107	32.0	---	---	---	---
	9/30/2015	ENER	---	0.560	< 0.0300	0.170	< 0.100	---	---	---	---
	11/11/2015	ENER	---	0.406	< 0.0300	0.111	10.00	---	---	---	---
LY28-2M	10/16/2009	ENER	---	0.0044	0.160	0.0110	1.80	---	---	---	---
	11/13/2009	ENER	8.15	0.0327	0.120	< 0.0050	2.30	---	---	---	---
	12/18/2009	ENER	7.73	0.0567	0.100	< 0.0050	5.90	---	---	---	---
	12/30/2009	ENER	7.87	0.0641	0.0900	< 0.0050	6.30	---	---	---	---
	1/31/2010	ENER	---	0.0489	0.0900	< 0.0050	6.40	---	---	---	---
	2/22/2010	ENER	---	0.0558	0.0900	0.0060	7.10	---	---	---	---
	3/25/2010	ENER	---	0.0581	0.100	0.0070	7.40	---	---	---	---
	4/29/2010	ENER	---	0.0552	0.0800	0.0060	7.60	---	---	---	---
	5/31/2010	ENER	---	0.0619	0.110	0.0090	8.70	---	---	---	---
	6/30/2010	ENER	---	0.0117	< 0.0300	< 0.0050	9.00	---	---	---	---
	7/27/2010	ENER	---	0.0502	0.0900	0.0080	10.00	---	---	---	---
	8/31/2010	ENER	---	0.0504	0.0800	0.0080	9.70	---	---	---	---
	9/30/2010	ENER	---	0.0534	0.100	0.0060	9.70	---	---	---	---
	10/31/2010	ENER	---	0.0475	0.140	0.0090	---	---	---	---	---
	11/30/2010	ENER	---	0.0396	0.100	0.0090	---	---	---	---	---
	1/31/2011	ENER	---	0.0480	0.100	0.0110	---	---	---	---	---
	2/25/2011	ENER	---	0.0433	0.150	0.0130	---	---	---	---	---
	6/30/2011	ENER	---	0.0368	0.130	0.0130	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-2M	7/15/2011	ENER	---	0.0344	0.130	0.0080	---	---	---	---	---
	8/31/2011	ENER	---	0.340	0.0400	0.150	---	---	---	---	---
	9/30/2011	ENER	---	0.369	0.0500	0.133	---	---	---	---	---
	10/31/2011	ENER	---	0.367	0.0600	0.153	---	---	---	---	---
	11/30/2011	ENER	---	0.334	0.0800	0.157	---	---	---	---	---
	12/16/2011	ENER	---	0.263	0.0800	0.108	---	---	---	---	---
	1/31/2012	ENER	---	0.222	0.0900	0.103	---	---	---	---	---
	2/29/2012	ENER	---	0.199	0.0900	0.0840	---	---	---	---	---
	4/30/2012	ENER	---	0.153	0.0900	0.0720	---	---	---	---	---
	5/31/2012	ENER	---	0.100	0.0900	0.0550	---	---	---	---	---
	6/30/2012	ENER	---	0.0659	0.100	0.0370	---	---	---	---	---
	7/27/2012	ENER	---	0.0512	0.100	0.0220	---	---	---	---	---
	8/31/2012	ENER	---	0.444	0.260	0.109	---	---	---	---	---
	9/28/2012	ENER	---	0.313	0.280	0.122	---	---	---	---	---
	10/31/2012	ENER	---	0.346	0.230	0.150	---	---	---	---	---
	11/28/2012	ENER	---	0.368	0.160	0.148	---	---	---	---	---
	12/30/2012	ENER	---	0.334	0.180	0.155	---	---	---	---	---
	1/31/2013	ENER	---	0.389	0.160	0.161	---	---	---	---	---
	2/22/2013	ENER	---	0.382	0.150	0.158	54.0	---	---	---	---
	3/26/2013	HMC	---	0.418	0.120	0.132	45.0	---	---	---	---
	4/30/2013	ENER	---	0.401	0.110	0.124	---	---	---	---	---
	9/17/2013	ENER	---	0.341	0.110	0.134	45.0	---	---	---	---
	12/12/2013	ENER	---	0.338	0.110	0.0990	38.0	---	---	---	---
	3/28/2014	ENER	---	0.330	0.100	0.110	32.0	---	---	---	---
LY28-3	10/16/2009	ENER	---	0.0875	0.100	0.0230	21.0	---	---	---	---
	11/13/2009	ENER	8.11	0.487	0.100	0.0500	43.5	---	---	---	---
	12/18/2009	ENER	7.87	0.553	< 0.0300	0.0420	53.7	---	---	---	---
	12/30/2009	ENER	7.90	0.628	< 0.0300	0.0480	55.3	---	---	---	---
	1/31/2010	ENER	---	0.694	< 0.0300	0.0490	60.0	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-3	2/22/2010	ENER	---	0.758	< 0.0300	0.0520	63.7	---	---	---	---
	3/25/2010	ENER	---	0.707	< 0.0300	0.0450	58.9	---	---	---	---
	4/29/2010	ENER	---	0.710	0.0500	0.0580	52.0	---	---	---	---
	5/31/2010	ENER	---	0.971	0.110	0.0940	54.0	---	---	---	---
	6/30/2010	ENER	---	0.973	0.0400	0.0910	62.0	---	---	---	---
	7/27/2010	ENER	---	0.781	< 0.0300	0.105	72.0	---	---	---	---
	8/31/2010	ENER	---	0.809	< 0.0300	0.167	74.0	---	---	---	---
	10/31/2011	ENER	---	0.0790	0.0500	0.0150	---	---	---	---	---
	11/30/2011	ENER	---	0.587	0.0400	0.0430	---	---	---	---	---
	12/16/2011	ENER	---	0.677	0.0400	0.0440	---	---	---	---	---
	1/31/2012	ENER	---	0.796	0.0500	0.0880	---	---	---	---	---
	2/29/2012	ENER	---	0.870	0.0600	0.0730	---	---	---	---	---
	4/30/2012	ENER	---	0.864	0.0600	0.0840	---	---	---	---	---
	5/31/2012	ENER	---	0.929	0.0500	0.0920	---	---	---	---	---
	6/30/2012	ENER	---	1.03	0.0500	0.104	---	---	---	---	---
	7/27/2012	ENER	---	1.22	0.0400	0.117	---	---	---	---	---
	8/31/2012	ENER	---	1.50	< 0.0300	0.126	---	---	---	---	---
	9/28/2012	ENER	---	1.67	< 0.0300	0.144	---	---	---	---	---
	10/31/2012	ENER	---	1.55	< 0.0300	0.148	---	---	---	---	---
	11/28/2012	ENER	---	1.57	< 0.0300	0.0580	---	---	---	---	---
	1/31/2013	ENER	---	1.59	< 0.0300	0.0780	---	---	---	---	---
	2/22/2013	ENER	---	1.49	< 0.0300	0.0850	151	---	---	---	---
	3/26/2013	HMC	---	1.49	< 0.0300	0.0740	147	---	---	---	---
	4/30/2013	ENER	---	1.42	0.0400	0.0700	---	---	---	---	---
	9/17/2013	ENER	---	1.01	0.0400	0.0810	156	---	---	---	---
	12/12/2013	ENER	---	0.855	0.0500	0.0730	156	---	---	---	---
	12/30/2013	ENER	---	1.33	< 0.0300	0.0650	---	---	---	---	---
	3/28/2014	ENER	---	0.718	0.0500	0.0810	160	---	---	---	---
	6/27/2014	ENER	---	0.620	0.0600	0.0850	162	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-3	9/30/2014	ENER	---	0.696	0.0500	0.0800	---	---	---	---	---
	12/23/2014	ENER	---	0.559	0.0600	0.0930	---	---	---	---	---
	3/31/2015	ENER	---	0.437	0.0500	0.0990	175	---	---	---	---
	6/30/2015	ENER	---	0.447	0.0500	0.100	177	---	---	---	---
	9/30/2015	ENER	---	0.548	0.0500	0.0920	154	---	---	---	---
	11/11/2015	ENER	---	0.439	0.0500	0.0870	154	---	---	---	---
LY34-1	10/16/2009	ENER	---	0.0837	0.0800	0.0090	2.80	---	---	---	---
	12/30/2009	ENER	7.80	0.375	< 0.0300	0.0540	10.1	---	---	---	---
	2/22/2010	ENER	---	0.368	0.0400	0.0470	11.7	---	---	---	---
	3/25/2010	ENER	---	0.312	< 0.0300	0.0450	13.7	---	---	---	---
	4/29/2010	ENER	---	0.279	< 0.0300	0.0460	14.5	---	---	---	---
	5/31/2010	ENER	---	0.324	0.0500	0.0610	15.2	---	---	---	---
	6/30/2010	ENER	---	0.332	0.0400	0.0470	14.8	---	---	---	---
	7/27/2010	ENER	---	0.272	0.0400	0.0450	15.0	---	---	---	---
	8/31/2010	ENER	---	0.231	< 0.0300	0.0490	15.9	---	---	---	---
	9/30/2010	ENER	---	0.317	< 0.0300	0.0610	30.0	---	---	---	---
	10/31/2010	ENER	---	0.310	< 0.0300	0.0680	---	---	---	---	---
	11/30/2010	ENER	---	0.339	< 0.0300	0.0720	---	---	---	---	---
	1/31/2011	ENER	---	0.340	< 0.0300	0.0610	---	---	---	---	---
	2/25/2011	ENER	---	0.362	< 0.0300	0.0780	---	---	---	---	---
	3/31/2011	ENER	---	0.367	< 0.0300	0.0670	---	---	---	---	---
	4/29/2011	ENER	---	0.401	0.0500	0.0940	---	---	---	---	---
	6/30/2011	ENER	---	0.328	< 0.0300	0.0960	---	---	---	---	---
	7/15/2011	ENER	---	0.345	0.0400	0.0880	---	---	---	---	---
	8/31/2011	ENER	---	0.328	0.0600	0.0720	---	---	---	---	---
	9/30/2011	ENER	---	0.292	0.0600	0.0680	---	---	---	---	---
	10/31/2011	ENER	---	0.284	0.0700	0.0720	---	---	---	---	---
	11/30/2011	ENER	---	0.279	0.0700	0.0800	---	---	---	---	---
	12/16/2011	ENER	---	0.267	0.0800	0.0620	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-1	2/29/2012	ENER	---	0.285	0.0700	0.0760	---	---	---	---	---
	4/30/2012	ENER	---	0.265	0.0600	0.0780	---	---	---	---	---
	5/31/2012	ENER	---	0.279	0.0600	0.0730	---	---	---	---	---
	6/30/2012	ENER	---	0.271	0.0600	0.0660	---	---	---	---	---
	7/27/2012	ENER	---	0.178	< 0.0300	0.0560	---	---	---	---	---
	8/31/2012	ENER	---	0.309	< 0.0300	0.0870	---	---	---	---	---
	9/28/2012	ENER	---	0.377	< 0.0300	0.0570	---	---	---	---	---
	10/31/2012	ENER	---	0.432	< 0.0300	0.0540	---	---	---	---	---
	11/28/2012	ENER	---	0.432	< 0.0300	0.0490	---	---	---	---	---
	12/30/2012	ENER	---	0.420	< 0.0300	0.0500	---	---	---	---	---
	1/31/2013	ENER	---	0.460	< 0.0300	0.0540	---	---	---	---	---
	2/22/2013	ENER	---	0.456	< 0.0300	0.0590	69.0	---	---	---	---
	3/26/2013	HMC	---	0.445	< 0.0300	0.0540	68.0	---	---	---	---
	4/30/2013	ENER	---	0.446	< 0.0300	0.0500	---	---	---	---	---
	9/17/2013	ENER	---	0.353	< 0.0300	0.0570	72.0	---	---	---	---
	12/12/2013	ENER	---	0.340	< 0.0300	0.0500	72.0	---	---	---	---
	3/28/2014	ENER	---	0.330	< 0.0300	0.0600	78.0	---	---	---	---
	6/27/2014	ENER	---	0.350	< 0.0300	0.0670	78.0	---	---	---	---
	9/30/2014	ENER	---	0.323	< 0.0300	0.0720	---	---	---	---	---
	12/23/2014	ENER	---	0.317	< 0.0300	0.0820	---	---	---	---	---
	6/30/2015	ENER	---	0.311	< 0.0300	0.0860	115	---	---	---	---
	9/30/2015	ENER	---	0.212	< 0.0300	0.0830	148	---	---	---	---
LY34-2	10/16/2009	ENER	---	0.0067	0.140	0.0060	< 0.100	---	---	---	---
	11/13/2009	ENER	8.34	0.0695	0.110	0.0150	2.40	---	---	---	---
	12/18/2009	ENER	7.94	0.0871	0.0800	0.0190	7.50	---	---	---	---
	12/30/2009	ENER	7.98	0.0876	0.100	0.0210	8.30	---	---	---	---
	1/31/2010	ENER	---	0.0962	0.0800	0.0300	12.5	---	---	---	---
	2/22/2010	ENER	---	0.118	0.0900	0.0330	9.40	---	---	---	---
	3/25/2010	ENER	---	0.126	0.0800	0.0350	14.0	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-2	4/29/2010	ENER	---	0.142	0.0800	0.0440	12.0	---	---	---	---
	5/31/2010	ENER	---	0.192	0.110	0.0550	11.4	---	---	---	---
	6/30/2010	ENER	---	0.222	0.120	0.0600	12.8	---	---	---	---
	7/27/2010	ENER	---	0.202	0.100	0.0590	12.1	---	---	---	---
	8/31/2010	ENER	---	0.104	0.0500	0.0430	8.00	---	---	---	---
	9/30/2010	ENER	---	0.0932	0.0400	0.0370	6.20	---	---	---	---
	10/31/2010	ENER	---	0.195	0.0600	0.0600	---	---	---	---	---
	11/30/2010	ENER	---	0.406	0.0700	0.0690	---	---	---	---	---
	1/31/2011	ENER	---	0.379	0.0400	0.0700	---	---	---	---	---
	2/25/2011	ENER	---	0.388	0.0500	0.0850	---	---	---	---	---
	3/31/2011	ENER	---	0.389	0.0400	0.0830	---	---	---	---	---
	4/29/2011	ENER	---	0.394	0.0900	0.114	---	---	---	---	---
	6/30/2011	ENER	---	0.311	0.0400	0.113	---	---	---	---	---
	10/31/2011	ENER	---	0.0861	0.260	0.0130	---	---	---	---	---
	11/30/2011	ENER	---	0.184	0.300	0.0140	---	---	---	---	---
	12/16/2011	ENER	---	0.169	0.210	0.0070	---	---	---	---	---
	1/31/2012	ENER	---	0.183	0.120	0.0640	---	---	---	---	---
	2/29/2012	ENER	---	0.0973	0.180	0.0100	---	---	---	---	---
	8/31/2012	ENER	---	0.0998	0.0400	0.0450	---	---	---	---	---
	9/28/2012	ENER	---	0.0642	< 0.0300	0.0580	---	---	---	---	---
	10/31/2012	ENER	---	0.0660	< 0.0300	0.0560	---	---	---	---	---
	11/28/2012	ENER	---	0.0706	< 0.0300	0.0510	---	---	---	---	---
	12/30/2012	ENER	---	0.0664	< 0.0300	0.0500	---	---	---	---	---
	1/31/2013	ENER	---	0.0722	< 0.0300	0.0490	---	---	---	---	---
	2/22/2013	ENER	---	0.0737	< 0.0300	0.0530	10.7	---	---	---	---
	3/26/2013	HMC	---	0.0737	< 0.0300	0.0500	10.00	---	---	---	---
	4/30/2013	ENER	---	0.0758	0.0400	0.0450	---	---	---	---	---
	9/17/2013	ENER	---	0.0913	< 0.0300	0.0520	12.0	---	---	---	---
	12/12/2013	ENER	---	0.0932	,0.0300	0.0440	16.0	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-2	3/28/2014	ENER	---	0.0993	< 0.0300	0.0540	17.1	---	---	---	---
	9/30/2014	ENER	---	0.0877	0.0300	0.0560	---	---	---	---	---
	12/23/2014	ENER	---	0.122	0.0300	0.0710	---	---	---	---	---
	9/30/2015	ENER	---	0.0576	< 0.0300	0.0100	1.50	---	---	---	---
	11/11/2015	ENER	---	0.0704	< 0.0300	0.0080	1.80	---	---	---	---
LY34-3	10/16/2009	ENER	---	0.0051	0.130	0.0070	1.50	---	---	---	---
	11/13/2009	ENER	8.24	0.0749	0.210	0.0250	3.60	---	---	---	---
	12/18/2009	ENER	7.91	0.239	0.0800	0.0420	7.10	---	---	---	---
	12/30/2009	ENER	7.92	0.349	0.0600	0.0740	7.60	---	---	---	---
	1/31/2010	ENER	---	0.269	0.0700	0.0600	9.20	---	---	---	---
	2/22/2010	ENER	---	0.292	0.0700	0.0630	0.500	---	---	---	---
	3/25/2010	ENER	---	0.282	0.0700	0.0640	10.5	---	---	---	---
	4/29/2010	ENER	---	0.243	0.0600	0.0620	9.60	---	---	---	---
	5/31/2010	ENER	---	0.291	0.0900	0.0880	9.60	---	---	---	---
	6/30/2010	ENER	---	0.266	0.0600	0.0700	8.80	---	---	---	---
	7/27/2010	ENER	---	0.254	0.0600	0.0710	8.20	---	---	---	---
	8/31/2010	ENER	---	0.250	0.0500	0.0800	6.70	---	---	---	---
	9/30/2010	ENER	---	0.287	0.0600	0.0730	5.00	---	---	---	---
	10/31/2010	ENER	---	0.275	0.120	0.103	---	---	---	---	---
	11/30/2010	ENER	---	0.279	0.0500	0.0720	---	---	---	---	---
	1/31/2011	ENER	---	0.285	0.0500	0.0920	---	---	---	---	---
	2/25/2011	ENER	---	0.274	0.110	0.102	---	---	---	---	---
	3/31/2011	ENER	---	0.224	0.0300	0.0620	---	---	---	---	---
	4/29/2011	ENER	---	0.267	0.120	0.0940	---	---	---	---	---
	6/30/2011	ENER	---	0.223	< 0.0300	0.103	---	---	---	---	---
	7/15/2011	ENER	---	0.229	< 0.0300	0.0990	---	---	---	---	---
	8/31/2011	ENER	---	0.266	0.0300	0.0710	---	---	---	---	---
	9/30/2011	ENER	---	0.222	0.0300	0.0660	---	---	---	---	---
	10/31/2011	ENER	---	0.201	0.0400	0.122	---	---	---	---	---

Table 2-4 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-3	11/30/2011	ENER	---	0.274	0.0400	0.112	---	---	---	---	---
	12/16/2011	ENER	---	0.288	0.0300	0.0770	---	---	---	---	---
	1/31/2012	ENER	---	0.268	0.0400	0.0990	---	---	---	---	---
	2/29/2012	ENER	---	0.291	0.0400	0.0930	---	---	---	---	---
	4/30/2012	ENER	---	0.260	0.0400	0.0900	---	---	---	---	---
	5/31/2012	ENER	---	0.339	0.0400	0.121	---	---	---	---	---
	6/30/2012	ENER	---	0.458	0.0600	0.174	---	---	---	---	---
	7/27/2012	ENER	---	0.436	0.0600	0.177	---	---	---	---	---
	8/31/2012	ENER	---	0.544	0.0800	0.280	---	---	---	---	---
	9/28/2012	ENER	---	0.536	0.0700	0.248	---	---	---	---	---
	10/31/2012	ENER	---	0.509	0.0600	0.223	---	---	---	---	---
	11/28/2012	ENER	---	0.467	0.0300	0.172	---	---	---	---	---
	12/30/2012	ENER	---	0.427	0.0500	0.169	---	---	---	---	---
	1/31/2013	ENER	---	0.412	0.0500	0.142	---	---	---	---	---
	2/22/2013	ENER	---	0.384	0.0400	0.137	15.9	---	---	---	---
	3/26/2013	HMC	---	0.376	0.0400	0.133	16.0	---	---	---	---
	4/30/2013	ENER	---	0.368	< 0.0300	0.122	---	---	---	---	---
	9/17/2013	ENER	---	0.416	0.0600	0.173	15.0	---	---	---	---
	12/12/2013	ENER	---	0.396	0.0700	0.149	19.6	---	---	---	---
	3/28/2014	ENER	---	0.353	0.0600	0.158	15.7	---	---	---	---
	6/27/2014	ENER	---	0.414	0.0700	0.199	5.30	---	---	---	---
LY34-4	10/16/2009	ENER	---	0.0261	0.280	0.0050	1.40	---	---	---	---
	11/13/2009	ENER	8.38	0.0613	0.310	0.0110	4.20	---	---	---	---
	12/18/2009	ENER	8.34	0.0714	0.280	0.0130	12.4	---	---	---	---
	12/30/2009	ENER	8.36	0.0671	0.230	0.0180	15.8	---	---	---	---
	1/31/2010	ENER	---	0.0574	0.270	0.0220	22.9	---	---	---	---
	8/31/2010	ENER	---	0.0397	0.320	0.0480	49.0	---	---	---	---
	9/30/2010	ENER	---	0.0749	0.460	0.0510	53.0	---	---	---	---

Table 2-5. Land Treatment Field Lysimeter Key Concentrations, in mg/l

LYSIMETER NUMBER	YEAR	URANIUM	SELENIUM	TDS	SULFATE	CHLORIDE	NITRATE	MOLYBDENUM
				SECTION 34				
LY34-1	2010	0.33	0.06	3500	1500	400	15	0.03
	2011	0.35	0.08	4200	2000	500	--	0.05
	2012	0.35	0.06	4800	2400	470	--	0.04
	2013	0.35	0.05	4800	2400	470	70	0.02
	2014	0.34	0.07	5400	2600	510	78	0.02
	2015	0.26	0.08	5800	2750	500	130	0.02
LY34-2	2010	0.22	0.06	4400	1900	630	12	0.08
	2011	0.38	0.1	6100	2900	900	--	0.2
	2012	0.08	0.06	4400	2200	450	--	0.1
	2013	0.1	0.05	4200	2000	430	12	0.03
	2014	0.1	0.06	4200	2000	450	17	0.03
	2015	0.06	0.01	4200	2500	450	2	0.03
LY34-3	2010	0.3	0.08	2800	1200	310	8	0.06
	2011	0.27	0.1	3100	1100	600	--	0.03
	2012	0.4	0.18	5500	2600	700	--	0.05
	2013	0.39	0.14	4300	1900	500	16	0.05
	2014	0.4	0.16	4300	2000	520	10	0.06
				SECTION 28				
LY28-1	2010	0.2	0.05	2700	1300	190	7	0.02
	2011	0.16	0.07	2700	1400	190	--	0.02
	2012	0.2	0.06	2900	1300	200	--	0.02
	2013	0.18	0.04	2670	1200	265	21	0.02
	2014	0.08	0.04	2700	1300	270	20	0.02
	2015	0.07	0.05	2900	1500	300	20	0.02
LY28-2	2011	0.78	0.04	6100	3500	160	--	0.05
	2012	0.65	0.05	5500	3200	170	--	0.02
	2013	0.3	0.08	4100	2200	270	26	0.02
	2014	0.16	0.11	4500	2500	280	27	0.02
	2015	0.06	0.13	4900	3000	330	30	0.02
LY28-2M	2010	0.04	0.01	900	100	110	9	0.09
	2011	0.34	0.15	6000	3200	720	--	0.1
	2012	0.34	0.12	6000	3000	800	--	0.2
	2013	0.38	0.13	6700	3300	920	45	0.12
	2014	0.33	0.11	6300	3000	800	32	0.1
LY28-3	2010	0.8	0.14	7000	3500	700	70	0.04
	2011	0.6	0.04	5000	2400	350	--	0.04
	2012	1.2	0.1	8000	3600	800	--	0.04
	2013	1.2	0.08	8400	4200	750	152	0.04
	2014	0.6	0.09	8500	4100	790	161	0.05
	2015	0.5	0.1	8800	4250	850	170	0.05

Table 2-5. Land Treatment Field Lysimeter Key Concentrations, in mg/l (cont.)

LYSIMETER NUMBER	YEAR	URANIUM	SELENIUM	TDS	SULFATE	CHLORIDE	NITRATE	MOLYBDENUM
				SECTION 33				
LY1	2009	0.05	0.04	1600	550	230	2	0.02
	2010	0.05	0.11	2600	1200	350	1.3	0.02
	2011	0.05	0.11	4100	1940	661	--	0.02
	2012	0.05	0.15	4200	1860	720	--	0.02
	2013	0.05	0.18	4200	1820	880	6	0.02
	2014	0.03	0.1	3200	1700	240	8	0.02
	2015	0.03	0.12	3500	1850	250	9	0.02
LY2	2011	0.063	0.16	4420	1980	493	--	0.03
	2012	0.05	0.15	4300	2000	500	--	0.02
	2013	0.06	0.15	4120	1970	471	--	0.02
	2014	0.04	0.1	3100	1500	270	16	0.02
LY4	2009	0.07	0.04	4200	2150	340	0.6	0.02
	2010	0.08	0.05	4200	2150	370	0.8	0.02
	2011	0.03	0.08	3700	1900	500	--	0.02
	2012	0.03	0.1	3800	1800	540	--	0.02
	2013	0.02	0.11	3480	1790	579	1.1	0.02
	2014	0.02	0.13	3700	1750	600	1.1	0.02
	2015	0.01	0.15	3800	1850	630	1.9	0.02
LY4MU	2009	0.55	0.02	10000	5000	700	0.1	0.1
	2010	0.64	0.02	4400	1000	740	3	0.04
	2011	0.65	0.02	4300	1100	740	--	0.05
	2012	0.59	0.02	4100	1200	750	--	0.06
	2013	0.52	0.01	4300	1240	770	8	0.06
	2014	0.44	0.02	4450	1200	750	9	0.07
	2015	0.4	0.02	4600	1300	790	8	0.09
LY4ML	2009	0.4	0.01	8000	3500	640	0.6	0.02
	2010	0.4	0.02	3200	800	570	0.6	0.1

2.2.2 Section 28

Lysimeters were installed at three locations in the Section 28 Center Pivot area. Table 2-2 shows that five lysimeters were installed at these three locations. In addition to the alluvial lysimeters at the LY28-1 and LY28-2 locations, there is also a basalt lysimeter. The completion details of these lysimeters are presented in Table 2-2. Lysimeter LY28-2 and LY28-3 were reinstalled in 2011 while lysimeter LY28-1M was not successfully washed out.

Tables 2-3 and 2-4 presents the water quality results obtained from the LY28 series of lysimeters. Only one sample was obtained from the basalt lysimeter LY28-1M. Samples have routinely been obtained from lysimeter LY28-1. Only an initial sample was collected from LY28-2 prior to being reinstalled. Consistent samples have been taken from LY28-2 since its reinstallation. Samples have been obtained from the basalt lysimeter at LY28-2M through March 2014 and routine samples were collected from lysimeter LY28-3 through August of 2010 prior to it becoming non-functional. LY28-3 has routinely produced samples since its reinstallation.

The time concentration plots for lysimeter LY28-1 are presented in Figure 2-17 and 2-18. The TDS, sulfate and chloride concentrations each have been fairly steady over the last two years with the exception of the two most recent samples in 2015. TDS, sulfate and chloride values of 2700, 1300 and 270 mg/l, respectively, are typical for this lysimeter in 2015. The uranium and selenium concentrations show typical 2015 values of 0.07 and 0.05 mg/l. The uranium has shown a gradual increase after a large decreasing trend in 2013 and 2014. The selenium has shown a very slight overall increasing trend. The molybdenum concentrations have been low in lysimeter LY28-1.

The results from LY28-2 for 2015 indicate values of 4900, 3000, 330, 0.06 and 0.13 mg/l for TDS, sulfate, chloride, uranium, and selenium, respectively (see Figures 2-19 and 2-20). Uranium had shown a significant declining trend in 2013 that continued in 2015 until an increase was observed in the third quarter of 2015. Molybdenum has remained consistently low. A very gradual increasing trend was observed in selenium over the last two years. The unusually large sulfate and chloride concentrations from June 2015 and the uranium concentration from September 2015 are most likely analytical errors.

The monitoring data for lysimeter LY28-2M is presented in Figures 2-21 and 2-22. TDS, chloride, sulfate, uranium and selenium concentrations in this lysimeter showed a slight declining trend through the last sample in March 2014. Molybdenum had shown a gradual increasing trend in late 2011 and 2012 until sharp increase occurred in late 2012. The low and relatively stable major constituent concentrations prior to mid 2011 indicate that measured COC concentrations in LY28-2M may be natural prior to the increase in the last half of 2011. After 2011, the significant changes in COC concentrations likely reflect irrigation effects. Lysimeter 28-2M did not yield samples in 2015.

The soil moisture COC concentrations for lysimeter LY28-3 show a gradual increasing trend for the major constituents of TDS, sulfate and chloride (see Figure 2-23) over the last two years. For 2012, an increasing trend is also observed for uranium in soil moisture samples (see Figure 2-24) and this was followed by a declining trend in 2013 through 2015. This data is interpreted as indicating transport of COCs in soil moisture to and through the interval sampled by LY28-3 in 2012 and 2013.

2.2.3 Section 33

A total of seven lysimeters have been installed in Section 33 Center Pivot irrigation area. These lysimeters have been installed at five different locations as shown in Figure 2-1. Lysimeters were placed in the alluvial material above the basalt except at the locations LY-3 and LY-4. A hole was drilled to a depth of 31 feet at LY-3M and the lysimeter placed in the bottom of this hole with the top of the lysimeter being located 23 feet below the top of the basalt. Two lysimeters were installed in a drill hole at the LY-4M site. These lysimeters were installed ten and thirty feet below the top of the basalt at this location. Successful sampling from the Section 33 lysimeters is expected to become increasingly difficult and unlikely as the soil profile has dried without irrigation since 2009.

Tables 2-3 and 2-4 present the water quality analysis of the soil moisture for the lysimeters. Lysimeter LY1 was installed in July, 2009 and monthly samples have been obtained for this lysimeter each time the vacuum has been applied through July 2010 and fairly consistently since 2012. LY2 was installed in June of 2009 and a sample was obtained from this lysimeter shortly after installation. Samples were obtained throughout 2012 but only one sample was produced for each year in 2013 and 2014. Lysimeters LY3 and LY3M were installed in June 2009 and neither of these lysimeters have ever produced a soil moisture sample. LY4 was installed in December of 2008 and samples from this lysimeter have been obtained each time the vacuum was applied to the lysimeter until April 2011. In 2012, this lysimeter produced samples for the majority of the times a vacuum was applied but only one sample was collected in 2013. Three samples were collected in 2014 and one sample was collected in 2015. Lysimeter LY-4ML was installed in June of 2009 and monthly samples were collected from this lysimeter through December 2009. Eight samples were produced from LY4ML in 2010, and only two samples were produced from this lysimeter in 2011. No samples have been collected from LY4ML since October of 2011. Lysimeter LY4MU was installed in July of 2009 and samples from this lysimeter have been collected fairly consistently through April 2013. The fourth quarter sample was the only sample with enough water in the second half of 2013. One sample was collected in 2014 and four samples were collected in 2015 from LY4MU.

Figure 2-25 shows the TDS, sulfate and chloride concentrations for samples from LY1, which is installed 16 feet below the land surface. These concentrations gradually increased during the last half of 2009 and 2010 until sample could no longer be collected. Both the increasing COC concentrations prior to mid-2010 and the inability to collect samples between August of 2010 and November of 2011 is attributed to drying of the soil profile after cessation of irrigation. The samples obtained in 2012 and early 2013 showed an increasing trend in chloride, and fairly steady values for TDS and sulfate. The fourth quarter sample of 2013 showed a decrease in chloride concentration followed by relatively stable chloride concentration through 2015. The TDS and sulfate concentrations show a very gradual increase in 2014 and 2015. Figure 2-26 presents the uranium, selenium and molybdenum concentrations for LY1, which show overall low concentrations in each of these constituents with an increase in selenium concentrations in 2010. Selenium concentration showed a sharp decline in the fourth quarter of 2013 followed by a steady increase in 2014 and another decrease through 2015. Uranium and molybdenum concentrations remained steady and low in 2014 and 2015.

Lysimeter LY2 was installed in 2009 but only produced one sample (June of 2009) until November of 2011. Monthly samples were collected from November of 2011 through January 2013. Since then, only one sample in March of 2014 has been collected. Figures 2-27 and 2-28 show the concentration data for this lysimeter. Selenium and chloride have both shown cycling of concentrations in 2012 that likely indicate minor effects from irrigation. Concentrations of the other constituents remained fairly steady during 2012. The uranium and molybdenum concentrations in the soil moisture from LY2 are small. The COC concentrations in the initial 2009 sample may have been biased by the water used in the installation of the lysimeter and may not be representative.

Figure 2-29 presents the TDS, sulfate, chloride concentrations for lysimeter LY4. The TDS and sulfate scales are shown on the left of the graph and the chloride scale is presented on the right axis. The first 2 to 3 samples from this lysimeter likely show some effect from the water that was used to install the fine flour sand pack around this lysimeter. Subsequent sample results indicate a gradual increasing trend in concentrations of chloride but not those of sulfate or TDS. Figure 2-30 presents the uranium, selenium and molybdenum concentrations for LY4 lysimeter. The uranium concentration changes are similar to the TDS and sulfate concentration changes while the selenium changes are similar to the chloride changes. A typical uranium concentration of 0.02 is significantly less than the concentration of 0.24 mg/l that was present in irrigation water applied in 2009. The 2015 selenium concentration of 0.15 mg/l in the lysimeter is thrice the selenium concentration of the irrigation water. No measurable molybdenum concentrations above the detection limit of 0.03 mg/l are indicated at this lysimeter.

Plots of TDS, sulfate and chloride concentrations for lysimeter LY4MU are presented in Figure 2-31. Lysimeter LY4MU was placed ten feet below the top of the basalt. The constituent concentrations in the soil moisture gradually declined in late 2009 to early 2010, when the TDS and sulfate concentrations became fairly steady and the chloride concentrations gradually increased. The first sample from this lysimeter may have been biased by water used in installation, and the results may not be representative. This data shows much higher TDS, sulfate and chloride concentrations existing in the soil moisture until the last part of 2009. The concentrations then declined to levels that are fairly similar to the levels in lysimeter LY4 which is located at a shallower depth at the base of the alluvial material above the basalt. Figure 2-32 presents the uranium concentrations for LY4MU. This data shows that a gradual increasing trend in uranium concentrations was observed in the soil moisture samples from LY4MU during 2010 and fairly steady uranium in 2011. The uranium plot shows a slight decline in concentrations from 2011 through 2015. The anomalous November 2009 values from LY4MU and LY4ML should not be given much significance because the data indicates that the two samples may have been switched. The selenium concentration in Figure 2-32 has been steady while the molybdenum concentration decreased to a low value in late 2009 and has shown a very gradual increase from 2011 through the present.

2.3 Observed Soil Moisture Content

In July of 2012, two types of soil moisture measurement devices were installed in the Section 34 flood area and the Section 28 center pivot. The Campbell Scientific CS655 is a water content reflectometer. This device measures volumetric water content, electrical conductivity and temperature in porous materials such as soil. The volumetric water content is calculated using the relationship between the travel time of electromagnetic waves along the rods. The electrical conductivity is determined by the signal attenuation of a known non-polarizing waveform and the temperature is measured by a thermistor attached to one of the rods.

The Campbell Scientific CS229 is a heat dissipation matric water potential sensor. The sensor indirectly measures soil water matric potential using an empirical relationship between heat dissipation and the soil water matric potential. The device has a heating element and a thermocouple encased in a porous ceramic cylinder. To measure the heat dissipation, the heating element is turned on for 30 seconds while the thermocouple takes a measurement at the beginning and at the end of the heating cycle. A decrease in the delta temperature indicates an increase in soil moisture content.

2.3.1 Section 34

Instrumentation for the Section 34 flood area was installed next to lysimeter LY34-3 (see Figure 2-1). A CS655 and a CS229 were installed at depths of 5 feet, 10 feet, and 15 feet. Completion information and initial soil moisture content in the installation interval are shown in Table 2-6. The initial soil moisture contents for the three Section 34 flood intervals were very low. The instruments were attached to a data logger that collected the data every 15 minutes through October 8, 2012, after which the measurement frequency was changed to one hour.

Table 2-6. Irrigation Field Soil Moisture Instruments

INSTRUMENT DETPH	INTERVAL (FT-LSD)	DEPTH TO TOP OF BASALT (FT-LSD)	INTERVAL OF BENTONITE SEAL (FT-LSD)	SOIL MOISTURE CONTENT (% BY WEIGHT)
		SECTION 28		
4'	3-4	8	0.5-2.5	15.34
6'	5-6	8	2.5-4.5	4.87
8'	7-8	8	4.5-6.5	18.46
		SECTION 34 FLOOD		
5'	4-5	DNE	1.5-3.5	3.79
10'	9-10	DNE	7.5-9.5	5.31
15'	14-15	DNE	11.5-13.5	2.71

Figure 2-33 presents the volumetric water content values for the instruments in Section 34. The slight increases in water content in the 5 foot depth and the 15 foot depth are reasonably consistent with expected water content changes resulting from the irrigation in 2012. However, the cause of the sharp increase in the 5 foot and the sharp decrease in the 10 foot water content measurements in October 2012 is not known. The values are within the accepted range for the water content in these clay soils, but the manner of change is questionable. The decline in moisture content in the 5 foot depth observed over the last three years is consistent with the expectation of drying of the soil profile without irrigation. The majority of the 10 and 15 foot data is out of the accuracy range and should be used with caution.

The electrical conductivity of the soil in Section 34 is presented in Figure 2-34. The rapid initial increase in conductivity is attributed to the first measurements reflecting the low conductivity RO water used for installation. The cause of the sharp conductivity increase shown in the 5 foot depth, like the increase in water content, is unknown. The subsequent conductivity changes shown at all three depths appear to be seasonal soil moisture cycling.

Figure 2-35 presents the data collected from the CS229's in Section 34. The average daily delta temperature is the change in temperature from the start of the heating cycle to the end of it. The change in temperature is inversely proportional to the water content (higher delta temperature equals lower water content). All three depths have shown an increase in delta temperature over the course of measurement, indicating a steady decrease in the water content. The sensor for the 5 foot depth appears to have malfunctioned in October of 2013 and attempts to fix it were unsuccessful.

2.3.2 Section 28

The soil moisture measurement devices were installed next to lysimeters LY28-2 and LY28-2M (see Figure 2-2). One of each instrument was installed at 4, 6, and 8 feet below the ground surface (see Table 2-6 for completion information and initial soil moisture contents). Data was collected by a data logger every fifteen minutes before October 8, 2012 and every hour after that date.

The volumetric water content is presented in Figure 2-36. The sharp increase shown in all three depths early in the irrigation season is much larger than reasonable water content values. It is highly unlikely that the water content of the soil reached 78% at the 8 foot depth and is likely due to the imprecision of the equipment beyond a certain range of measurement. The disturbance of the soil during instrument installation could also have contributed to anomalous readings shortly after installation. The inverse relationship between depth and water content is expected given the increase in clay content with depth. Data from the six foot interval was not recorded from the middle of November through the end of 2012 due to a wire to the data logger coming loose. The rate of decline for two to three weeks after irrigation is slightly steeper than the rate before and after this period, indicating some decrease in the moisture content shortly after irrigation ceased in each of the three depths. These measurements indicate movement of soil moisture through all three depths during the 2012 irrigation season. The rate of decline has been steady since the end of 2012 in all three depths.

Figure 2-37 presents the electrical conductivity for Section 28. The trends shown follow a very similar pattern to the water content, however all three depths show a possible seasonal variation in conductivity that isn't correlated to water content. The larger rate of decline in the electrical conductivity for a few weeks after irrigation in 2012 was also observed.

The data collected from the CS229's in Section 28 is presented in Figure 2-38. All three intervals showed an increase initially until a sharp decrease that coincides with the spike in water content and electrical conductivity. After the initial changes, the four foot depth shows changes in moisture content after some of the center pivot irrigation cycles. The center pivot rotation rate was set at 1.5 days per revolution. Both the six and eight foot depths show some variations during the irrigation with some overall decrease in the delta temperature in the last half of the irrigation season. The four foot depth showed more variation than the other depths with an increase in delta temperature after the irrigation ceased. A smaller increase in delta temperature at the six and eight foot depths after irrigation also indicates a decrease in moisture content in these two deeper instrument depths after irrigation. A steady overall increasing trend in delta temperature has been observed at the eight foot depth while the four foot and six foot intervals have shown a significantly higher level of variability.

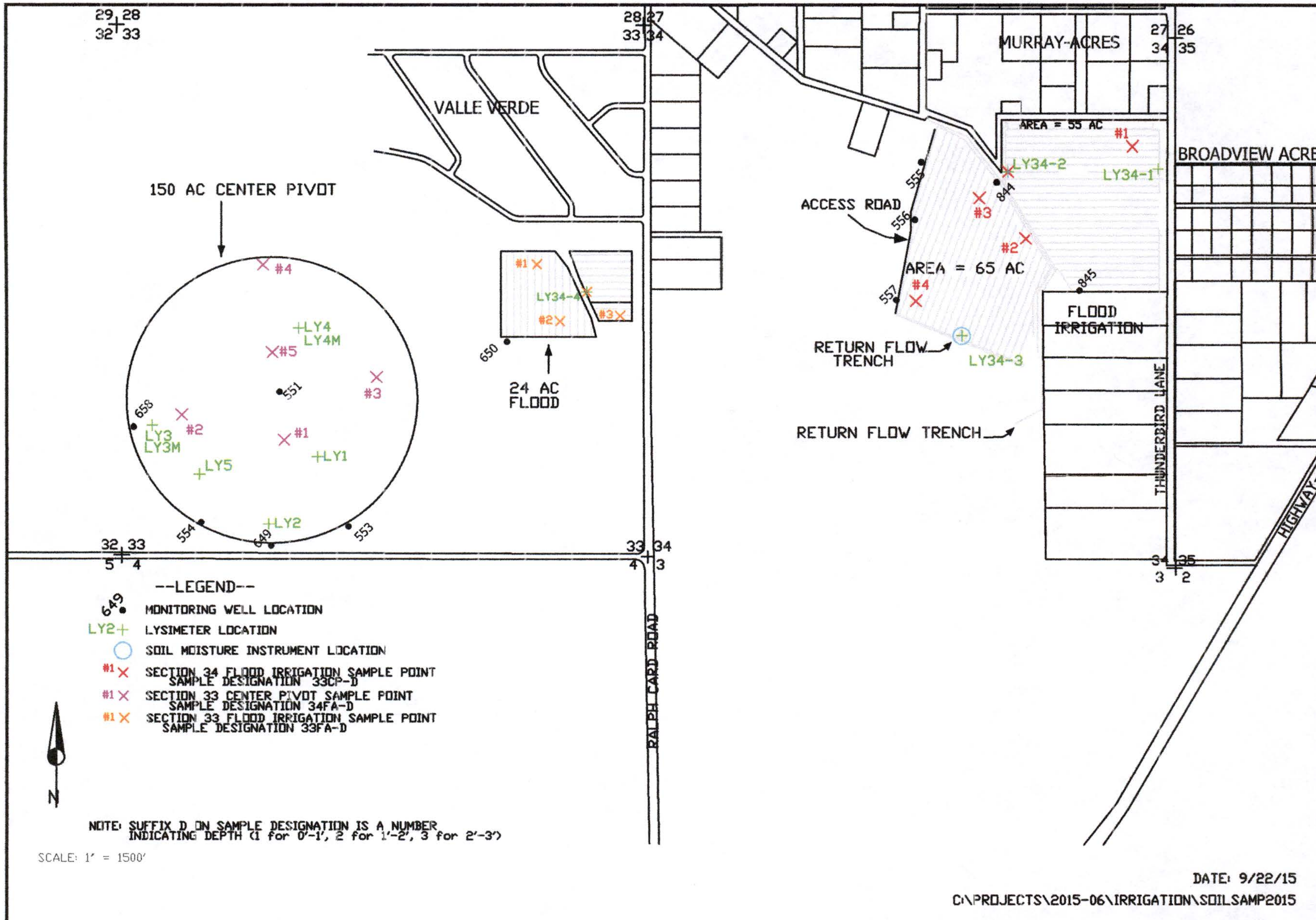

FIGURE 2-1. FORMER SECTION 33 & 34 IRRIGATION AREAS WITH MONITORING WELL, SOIL MOISTURE INSTRUMENT, LYSIMETER, AND SOIL SAMPLE LOCATIONS

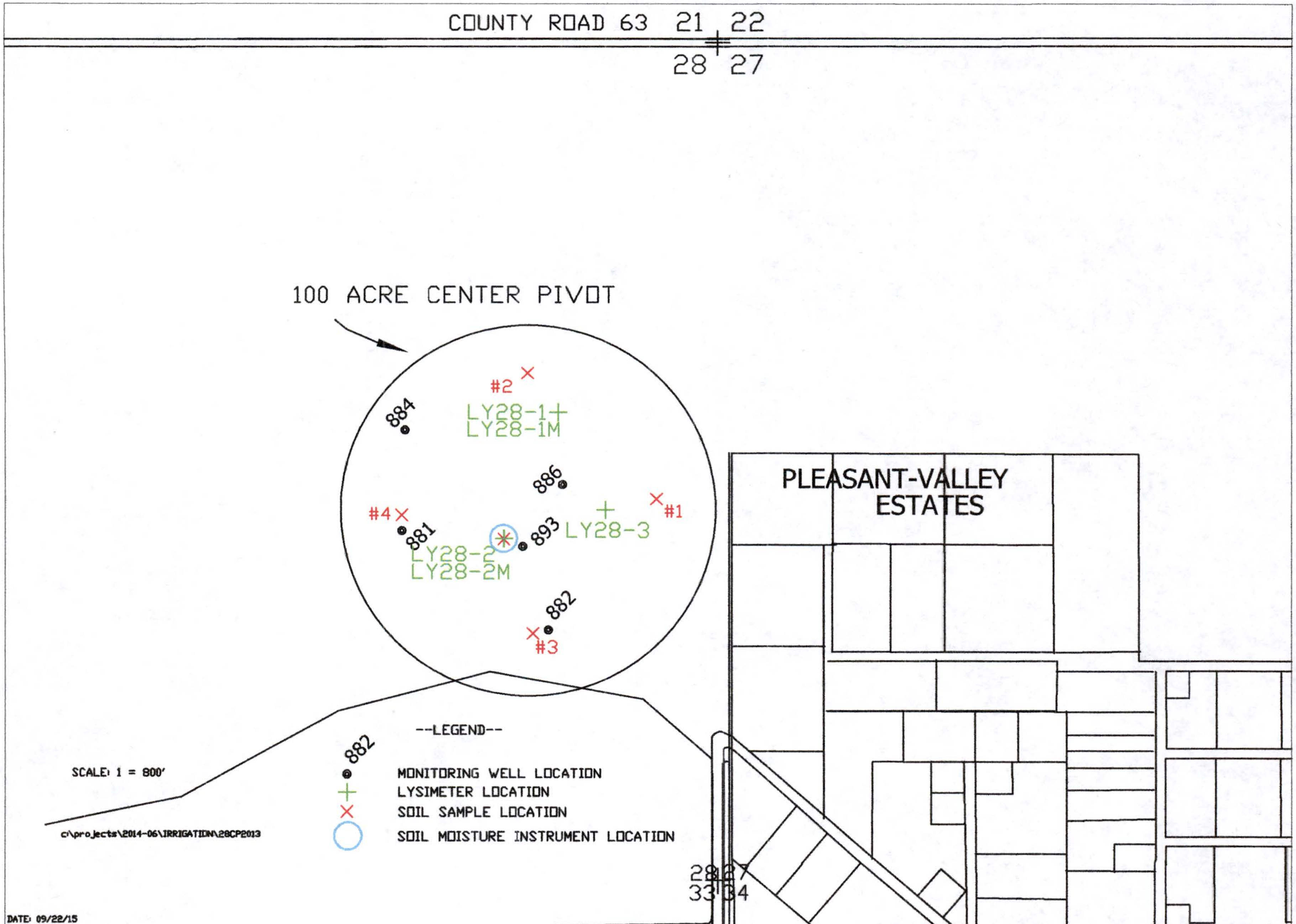

FIGURE 2-2. FORMER SECTION 28 IRRIGATION AREA WITH MONITORING WELL, SOIL MOISTURE INSTRUMENT, LYSIMETER, AND SOIL SAMPLE LOCATIONS

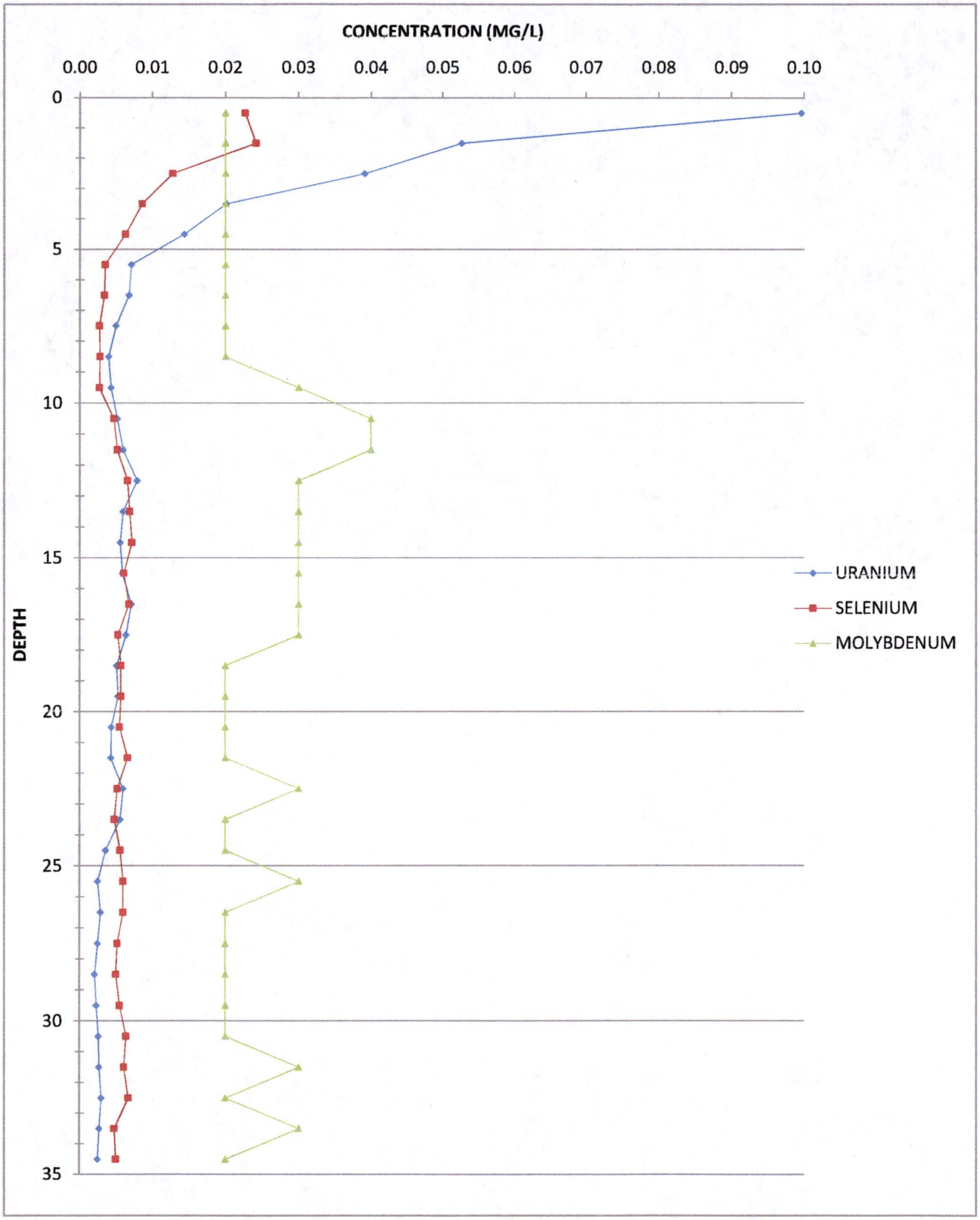

Figure 2-3. Uranium, Selenium, and Molybdenum Concentrations with Depth in the Section 34 Flood Area from the MWMT

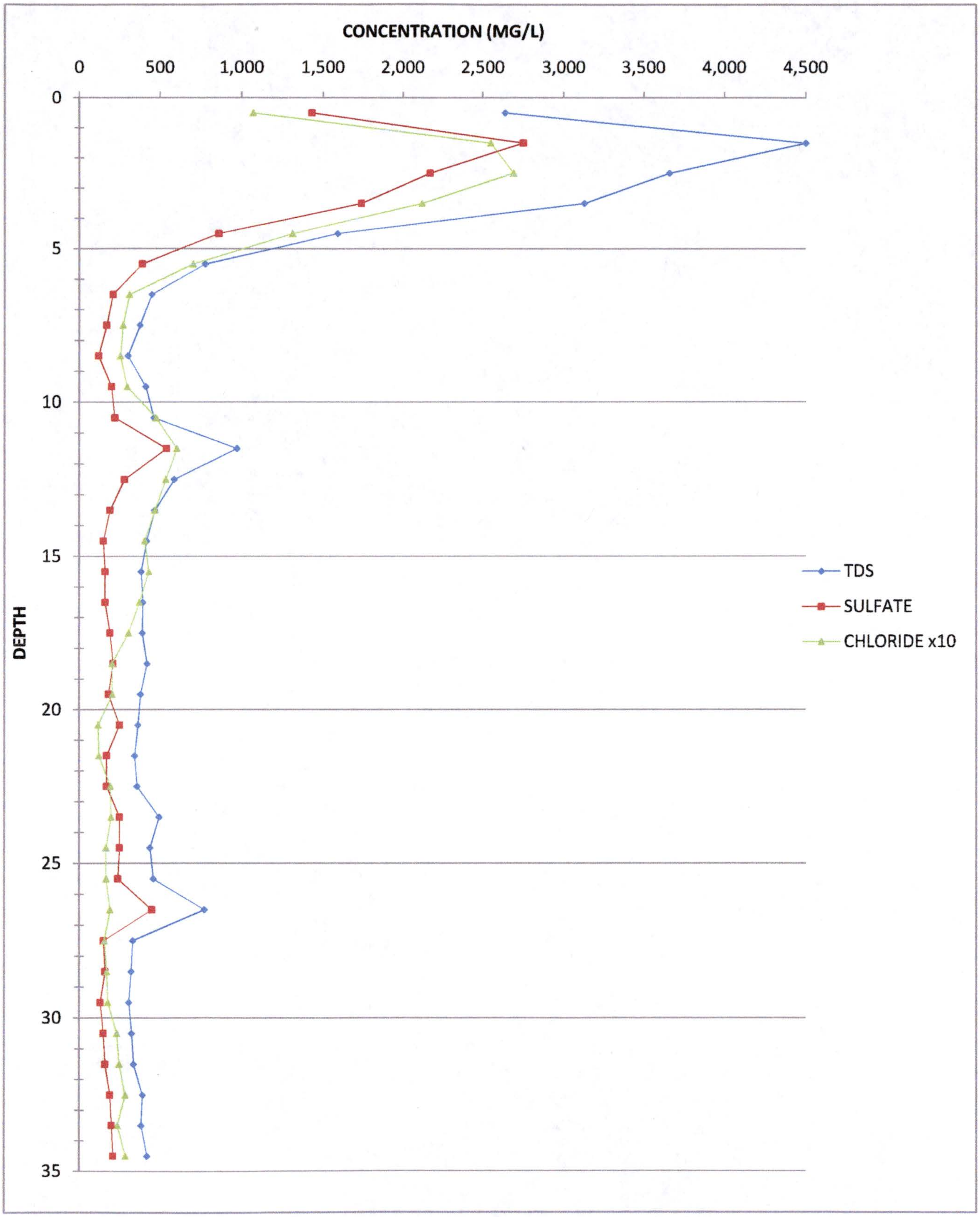

Figure 2-4. TDS, Sulfate, and Chloride Concentrations with Depth in the Section 34 Flood Area from the MWMT

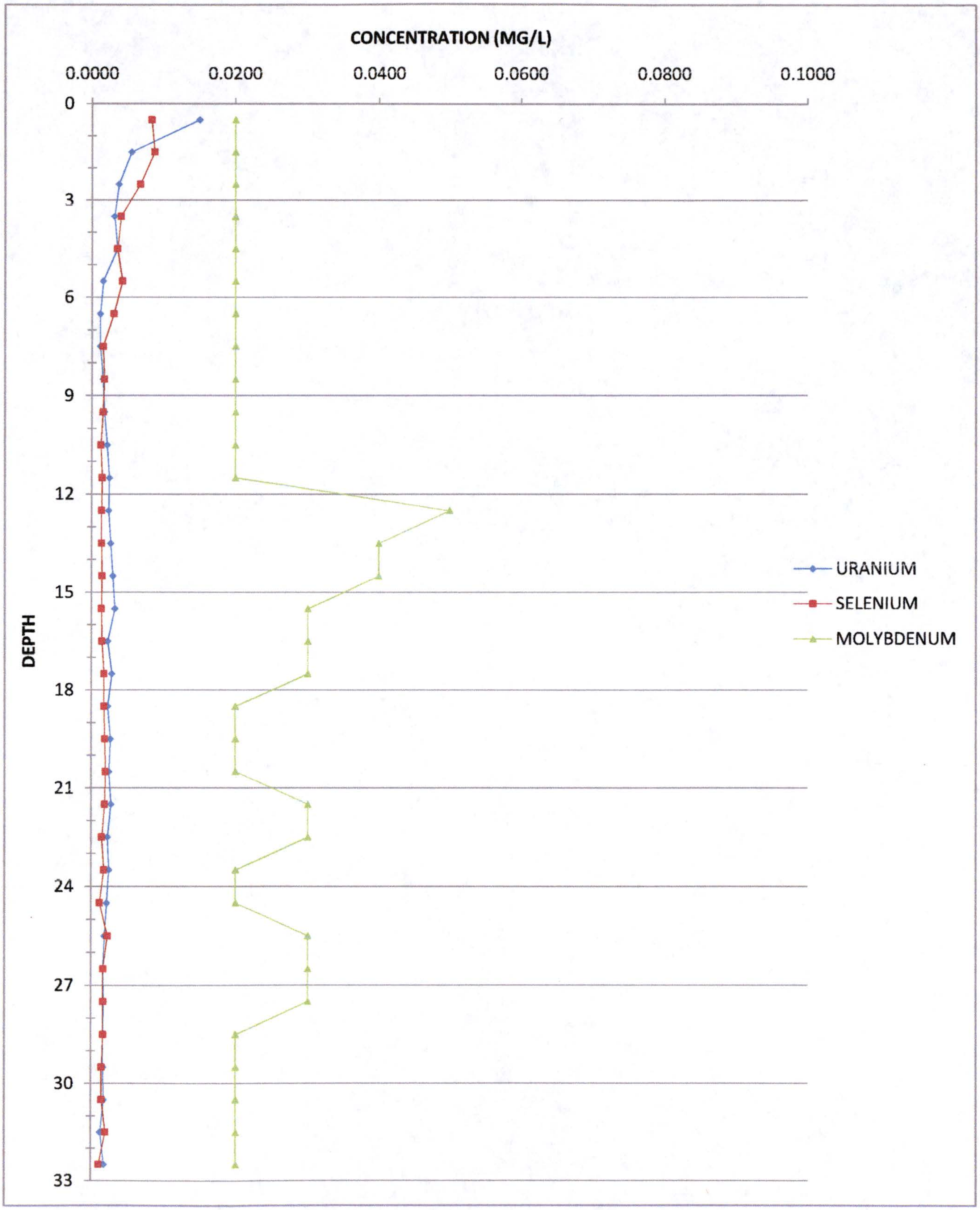

Figure 2-5. Uranium, Selenium, and Molybdenum Concentrations with Depth in the Section 33 Flood Area from the MWMT

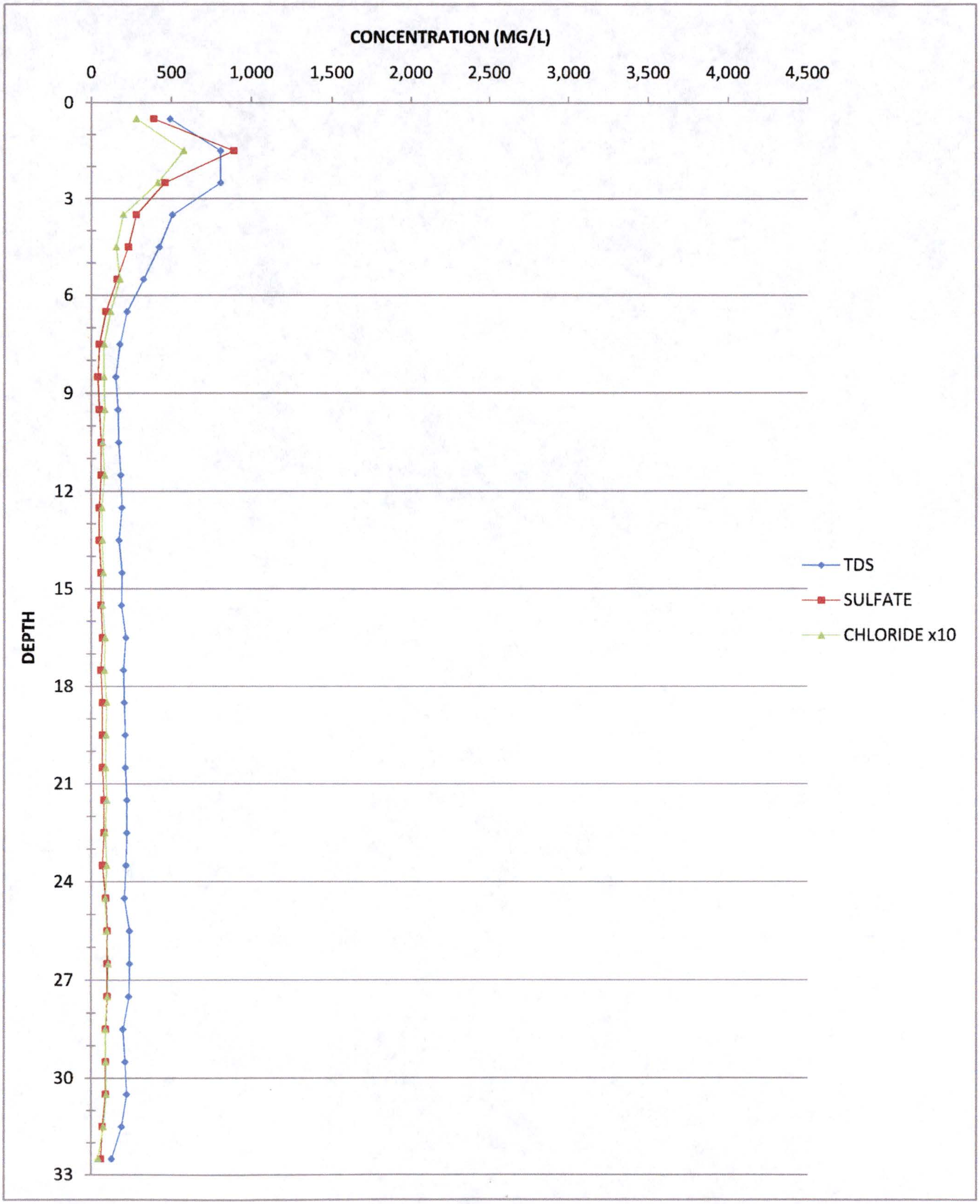

Figure 2-6. TDS, Sulfate, and Chloride Concentrations with Depth in the Section 33 Flood Area from the MWMT

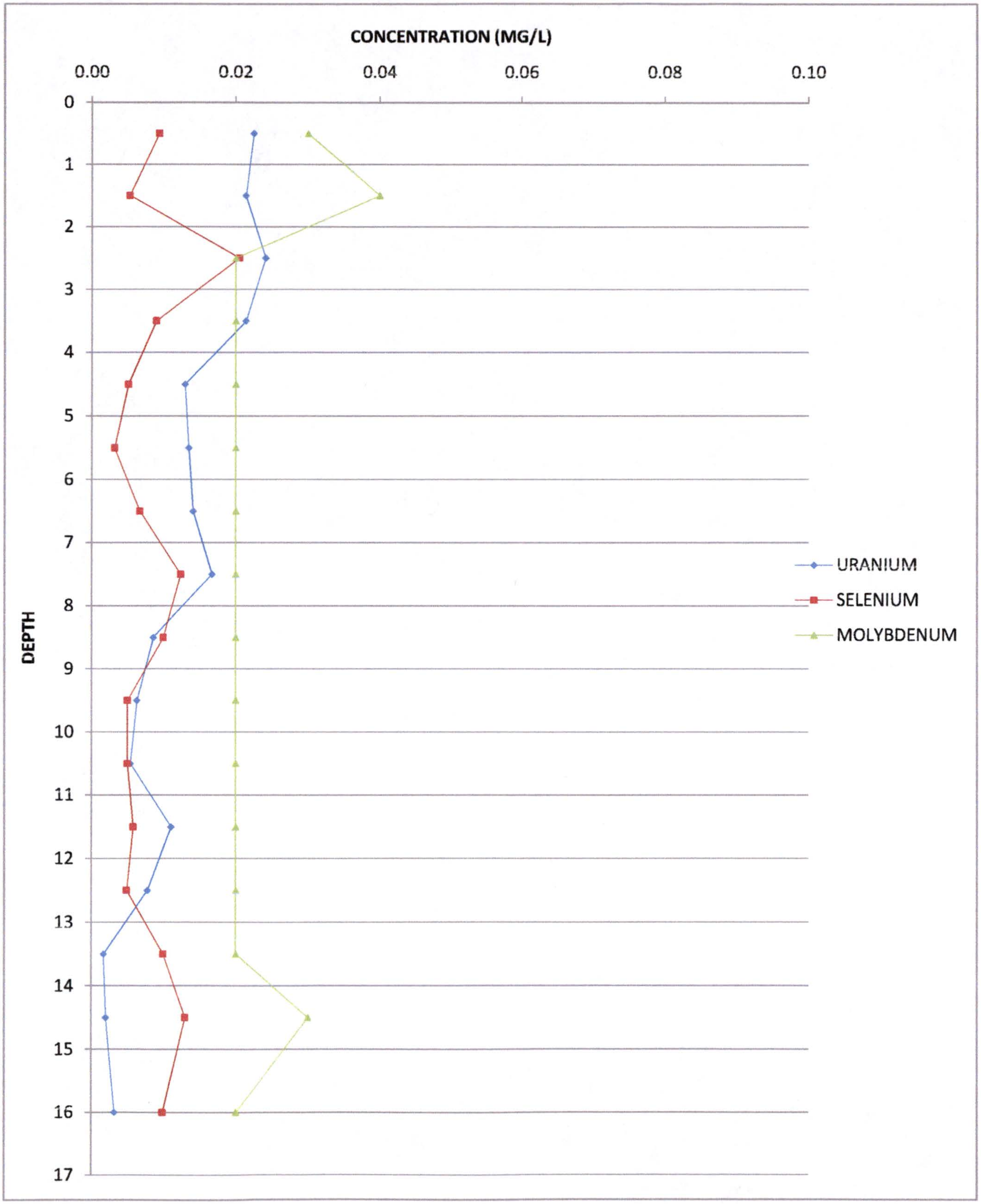

Figure 2-7. Uranium, Selenium, and Molybdenum Concentrations with Depth in the Section 28 Center Pivot from the MWMT

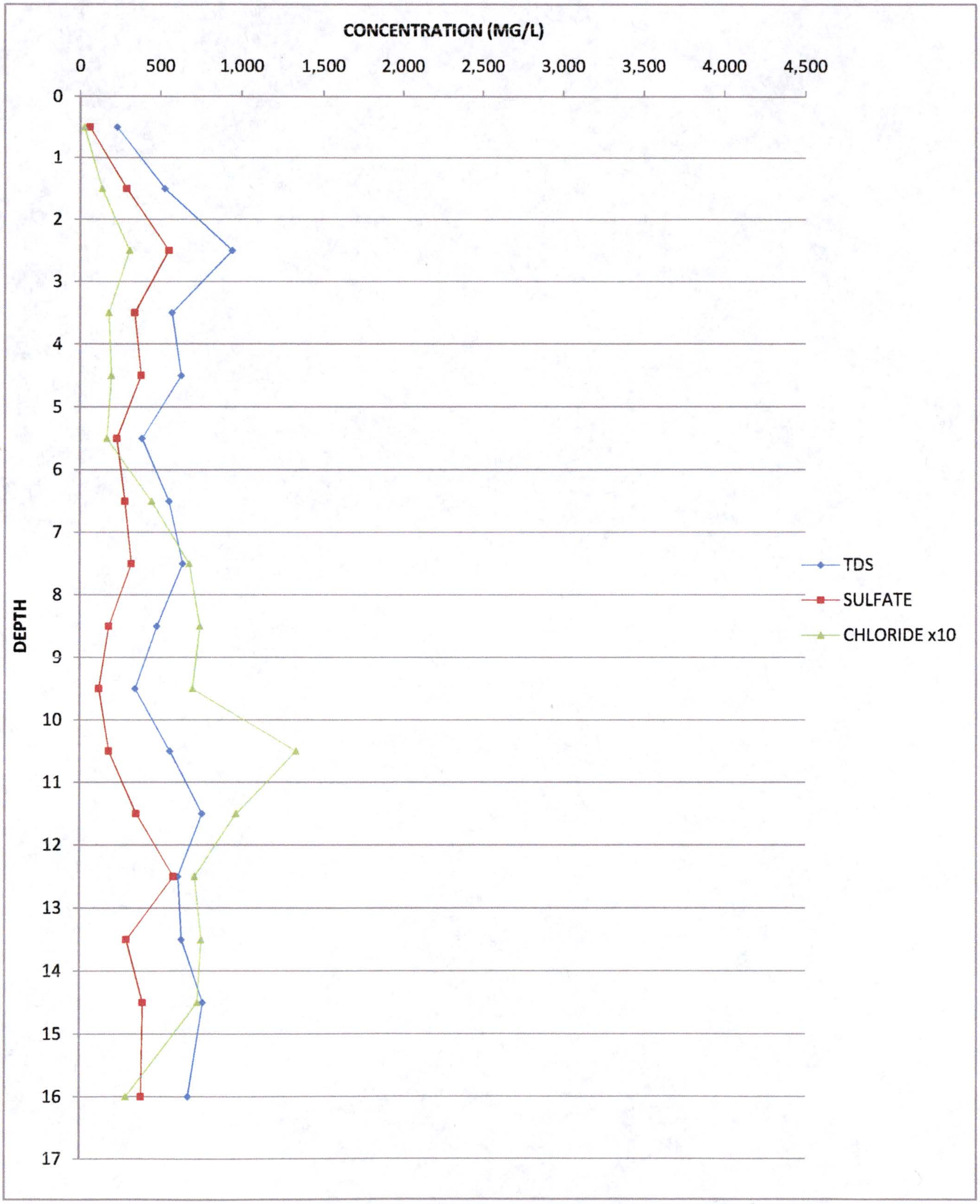

Figure 2-8. TDS, Sulfate, and Chloride Concentrations with Depth in the Section 28 Center Pivot from the MWMT

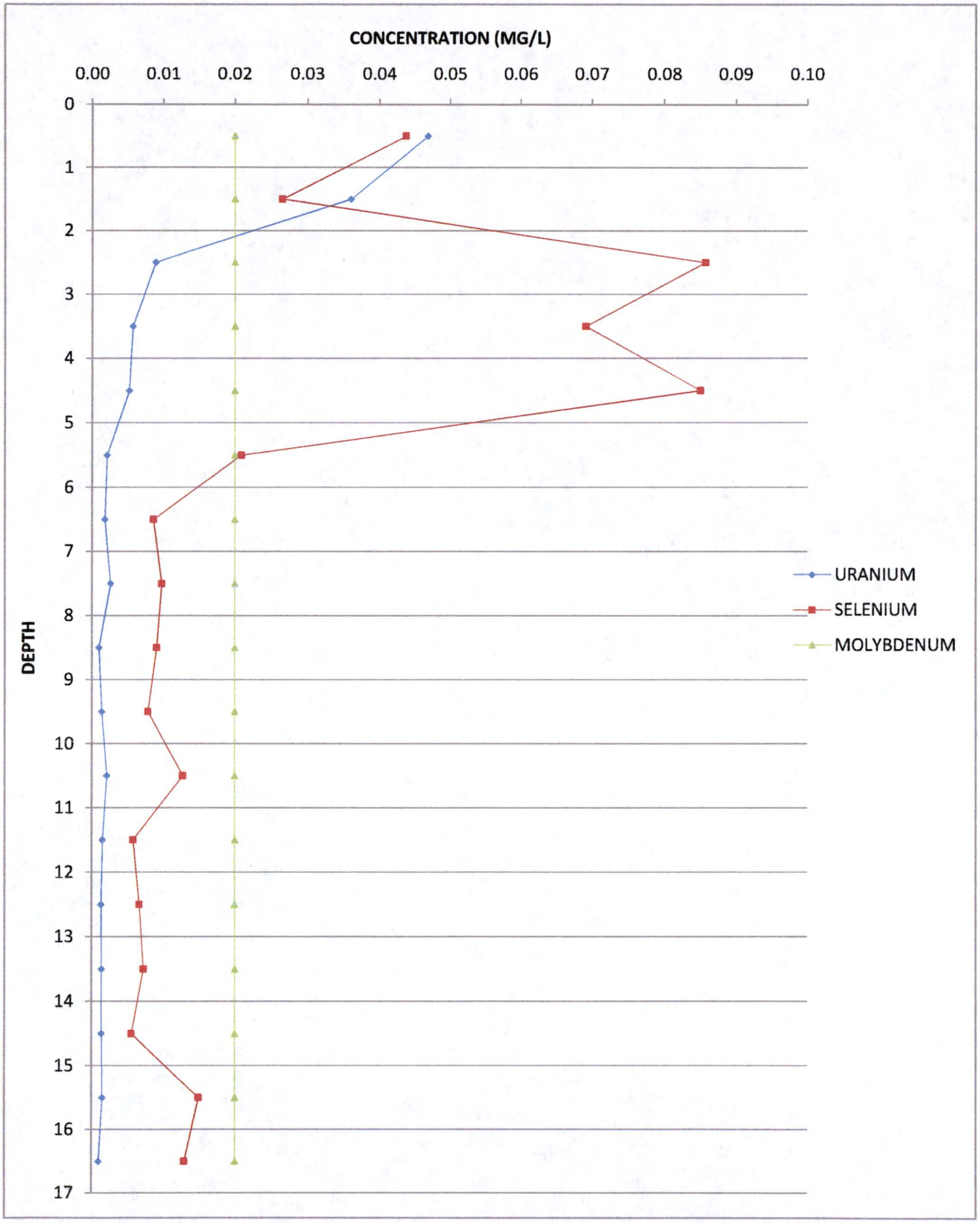

Figure 2-9. Uranium, Selenium, and Molybdenum Concentrations with Depth in the Section 33 Center Pivot from the MWMT

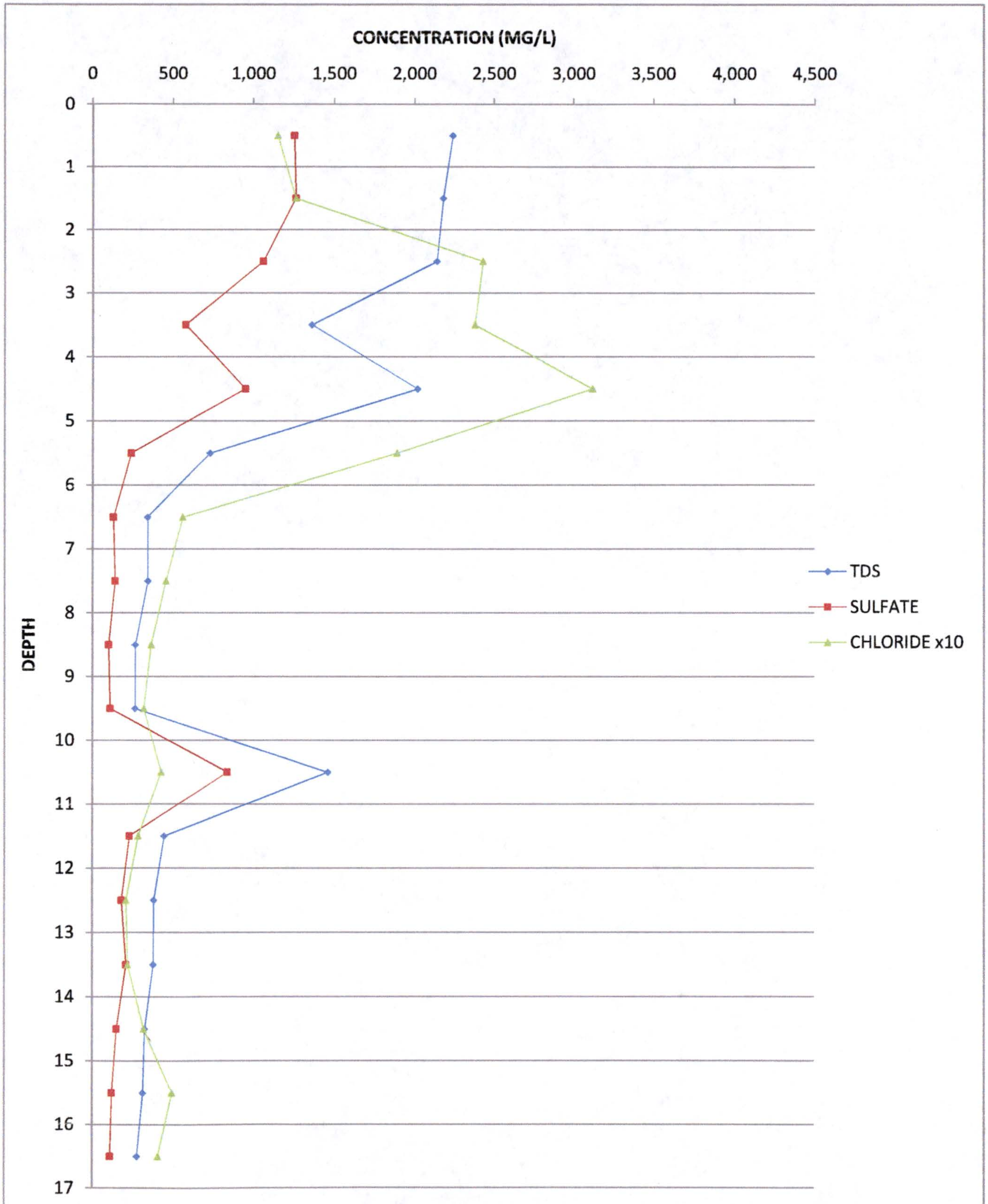

Figure 2-10. TDS, Sulfate, and Chloride Concentrations with Depth in the Section 33 Center Pivot from the MWMT

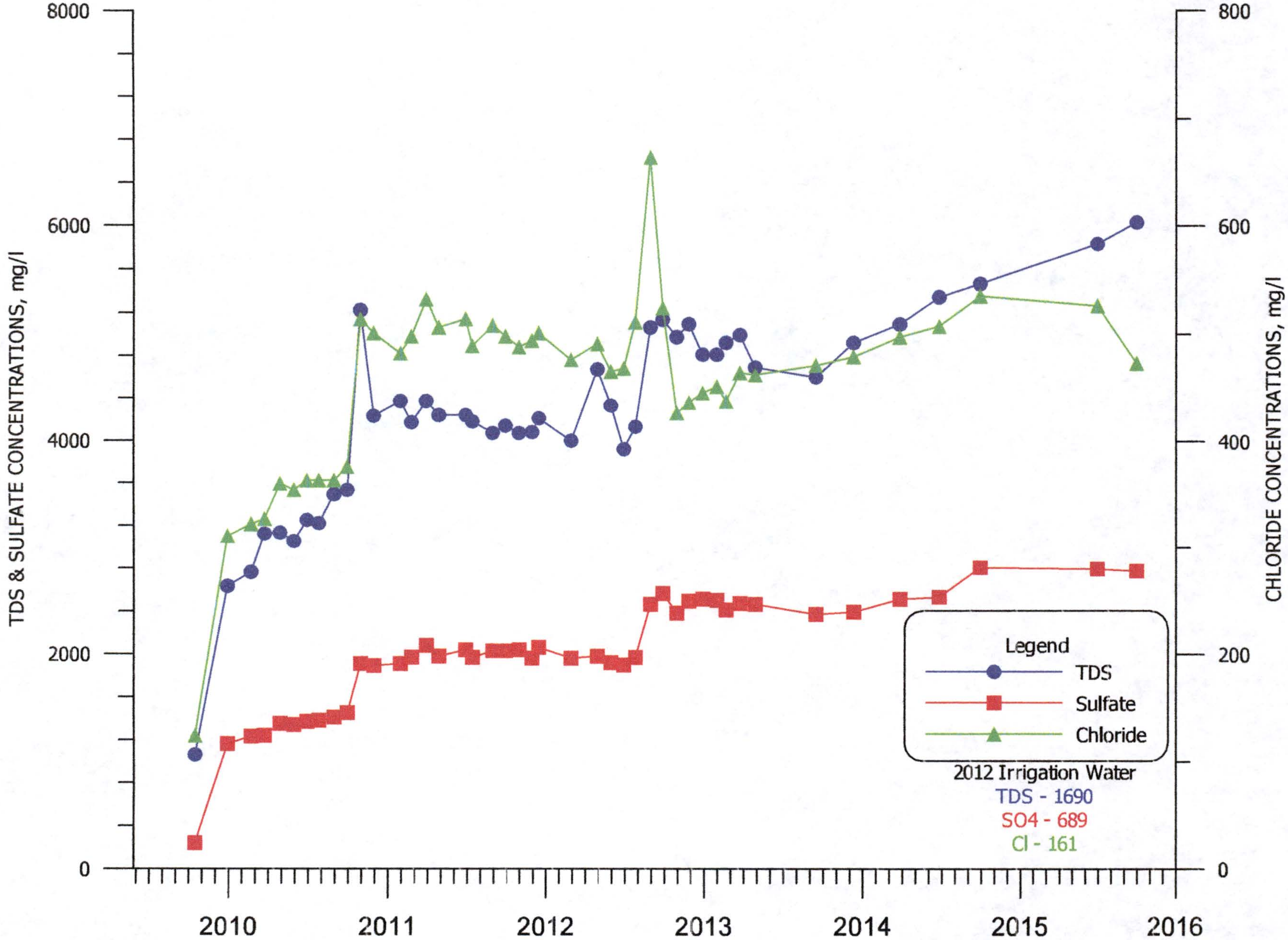

FIGURE 2-11. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-1.

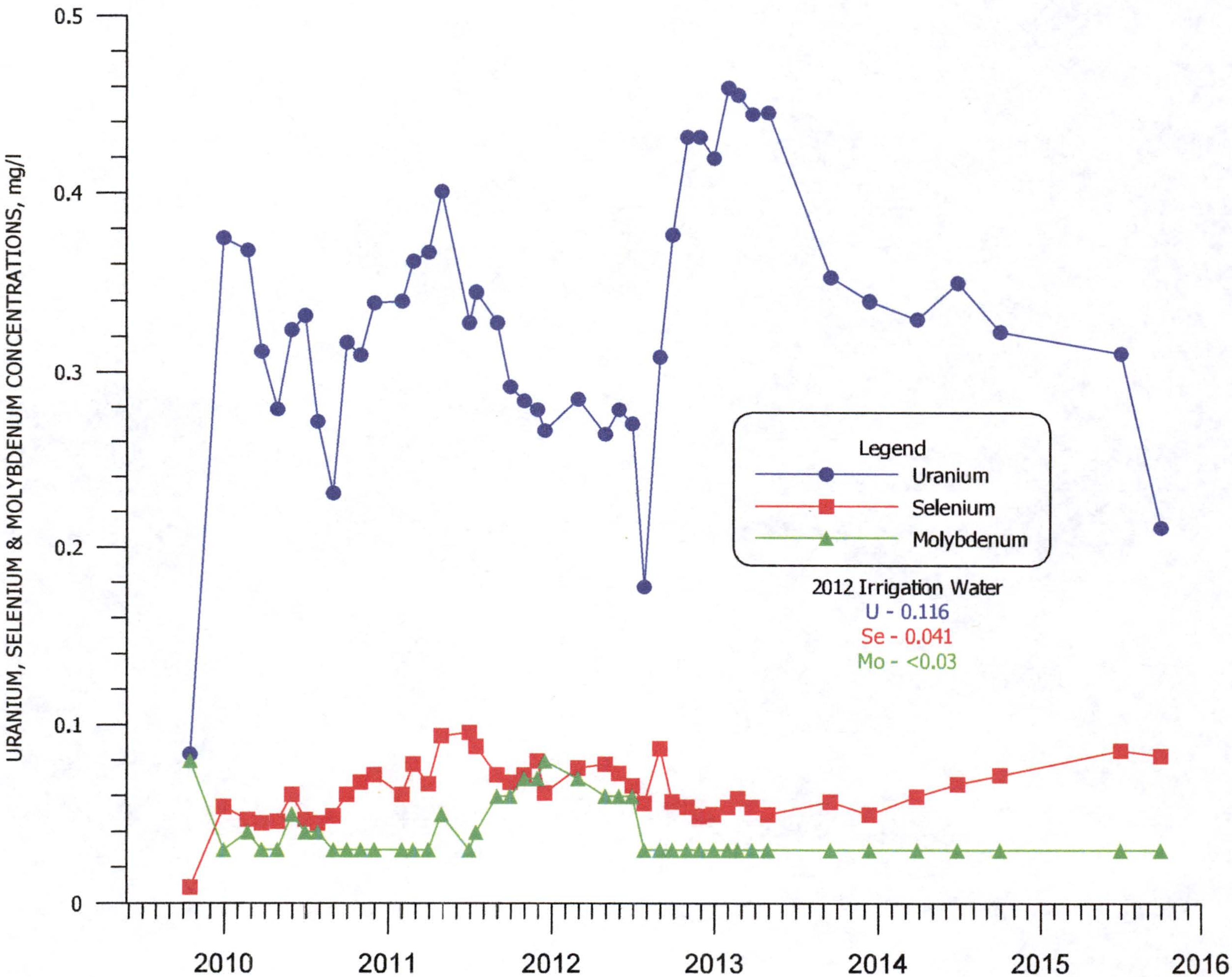

FIGURE 2-12. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-1.

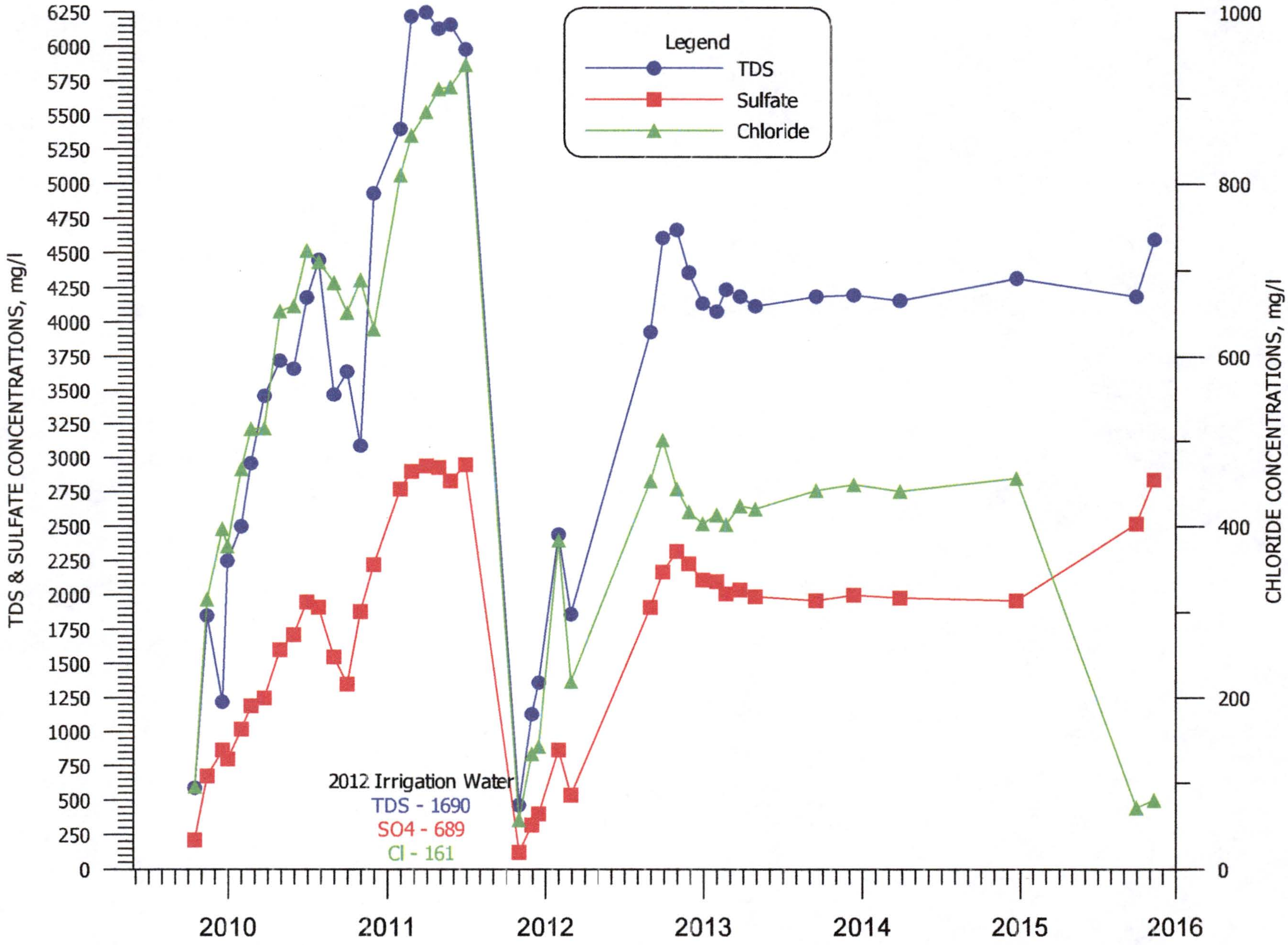

FIGURE 2-13. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-2.

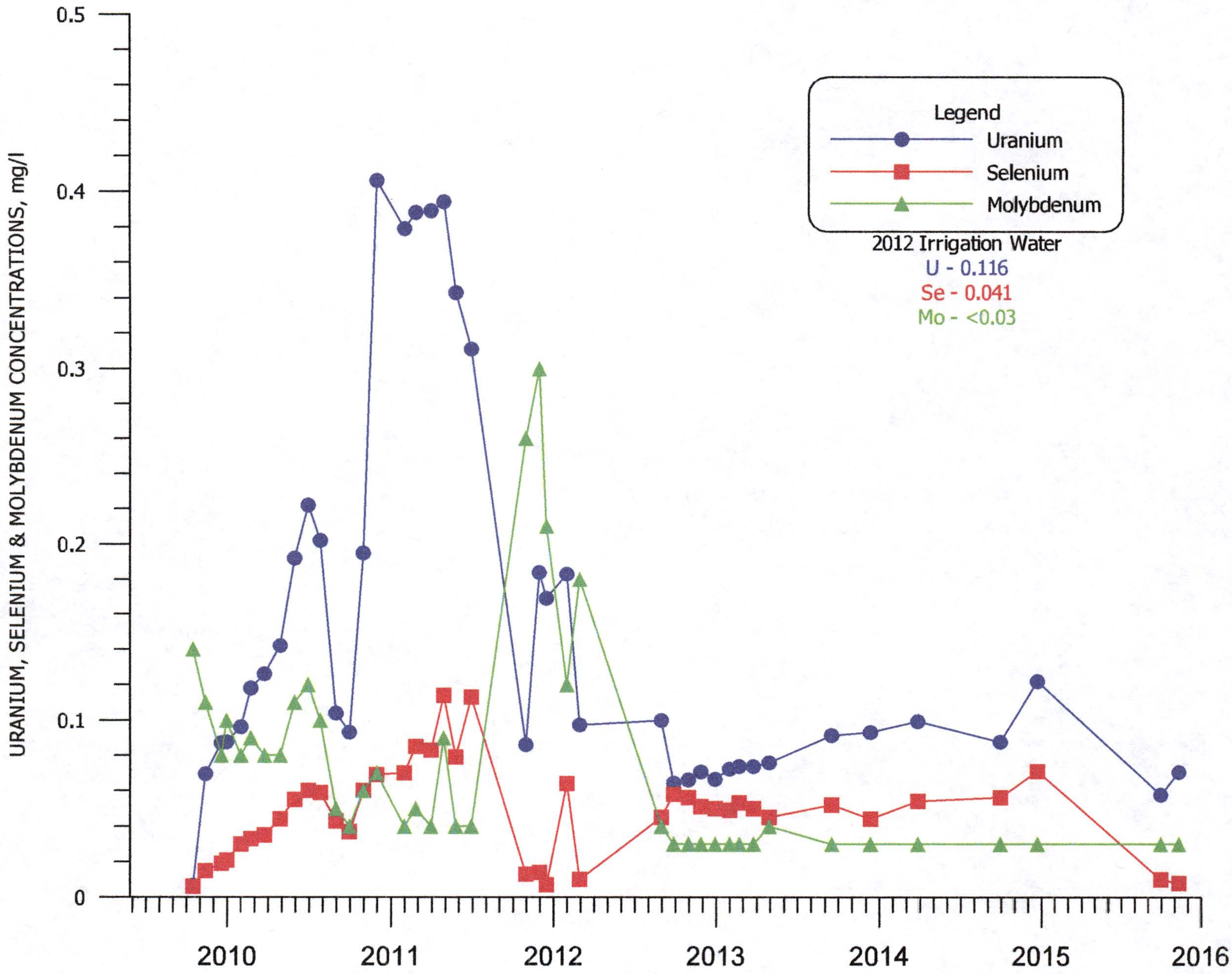

FIGURE 2-14. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-2.

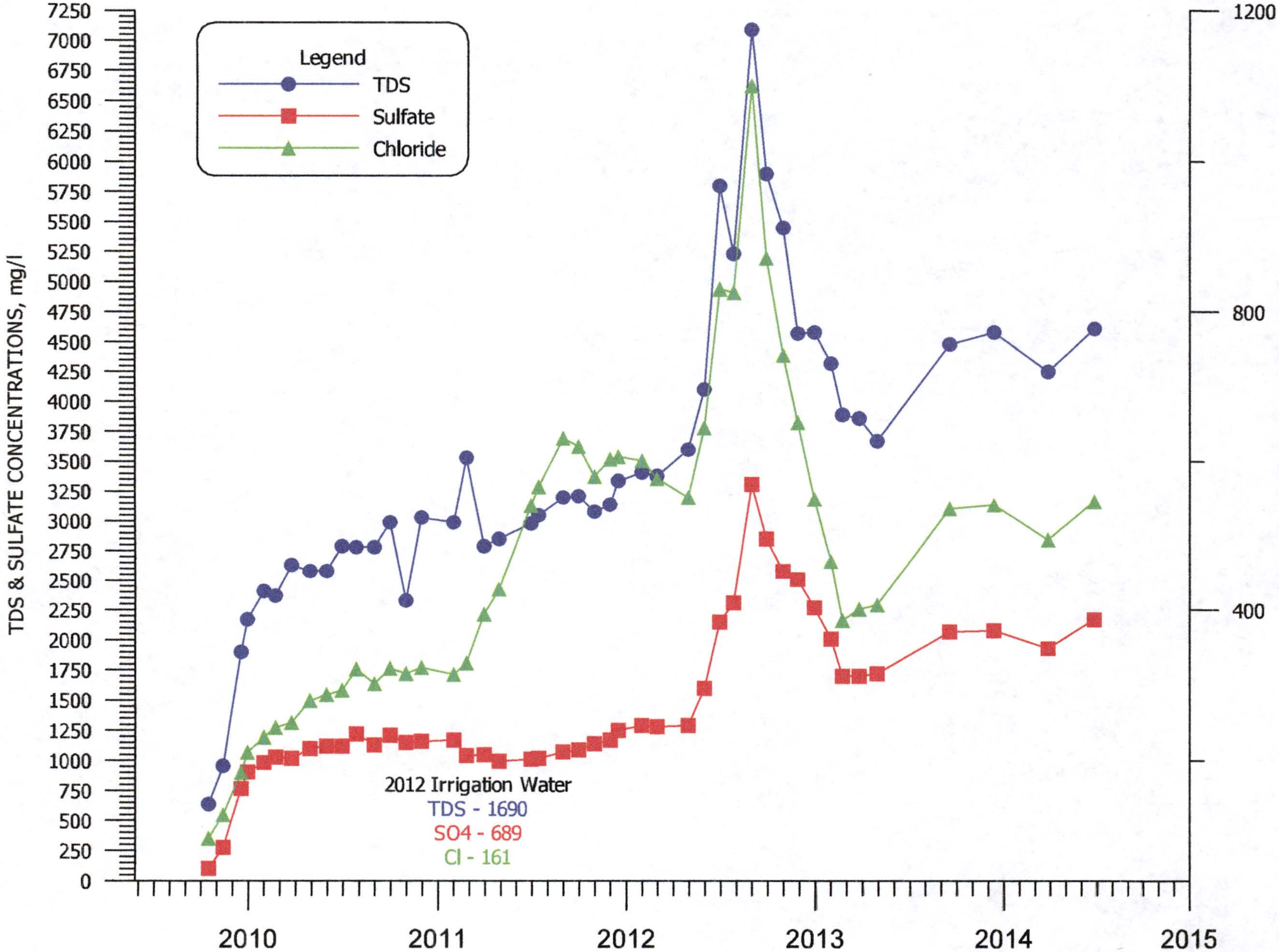

FIGURE 2-15. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-3.

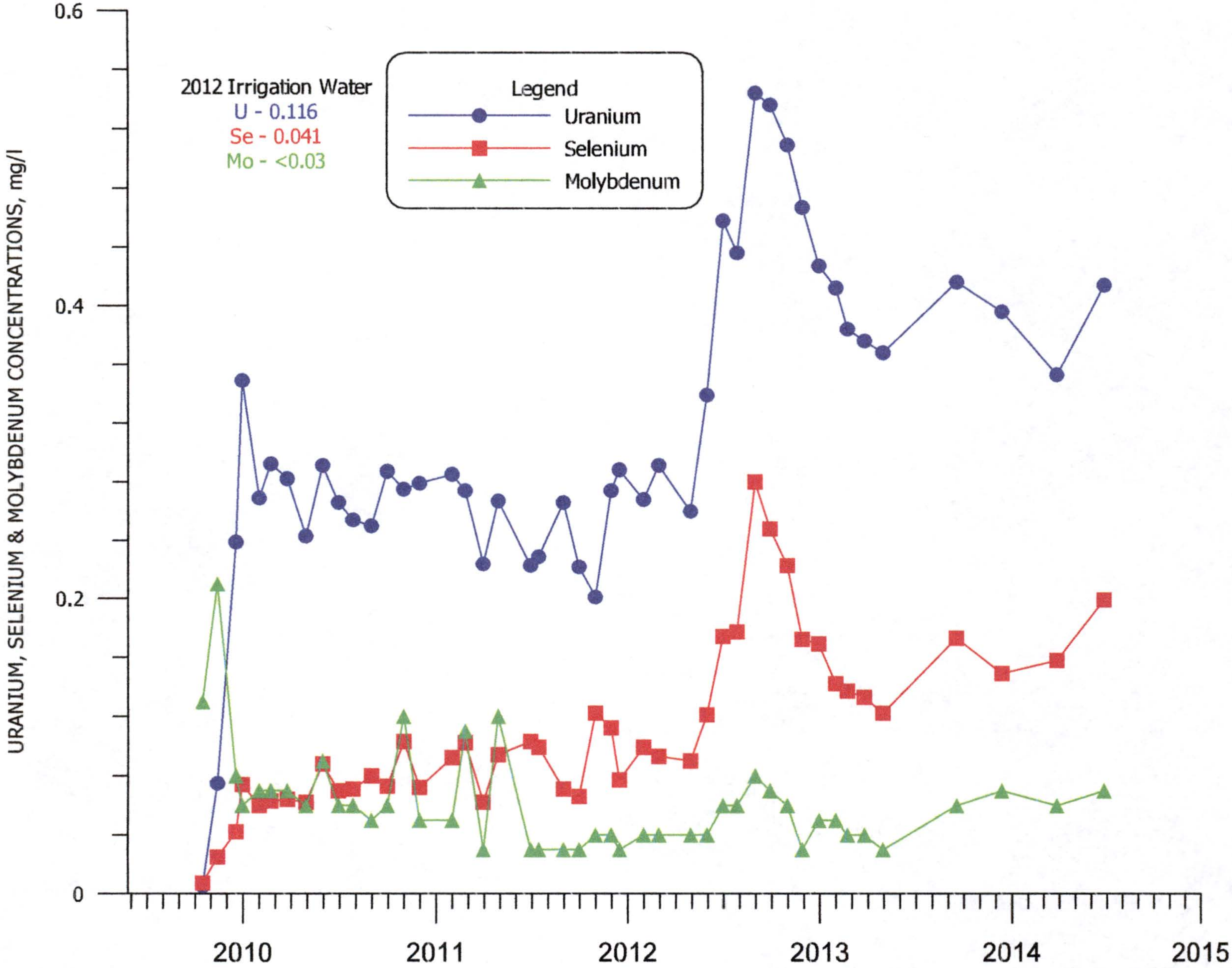

FIGURE 2-16. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-3.

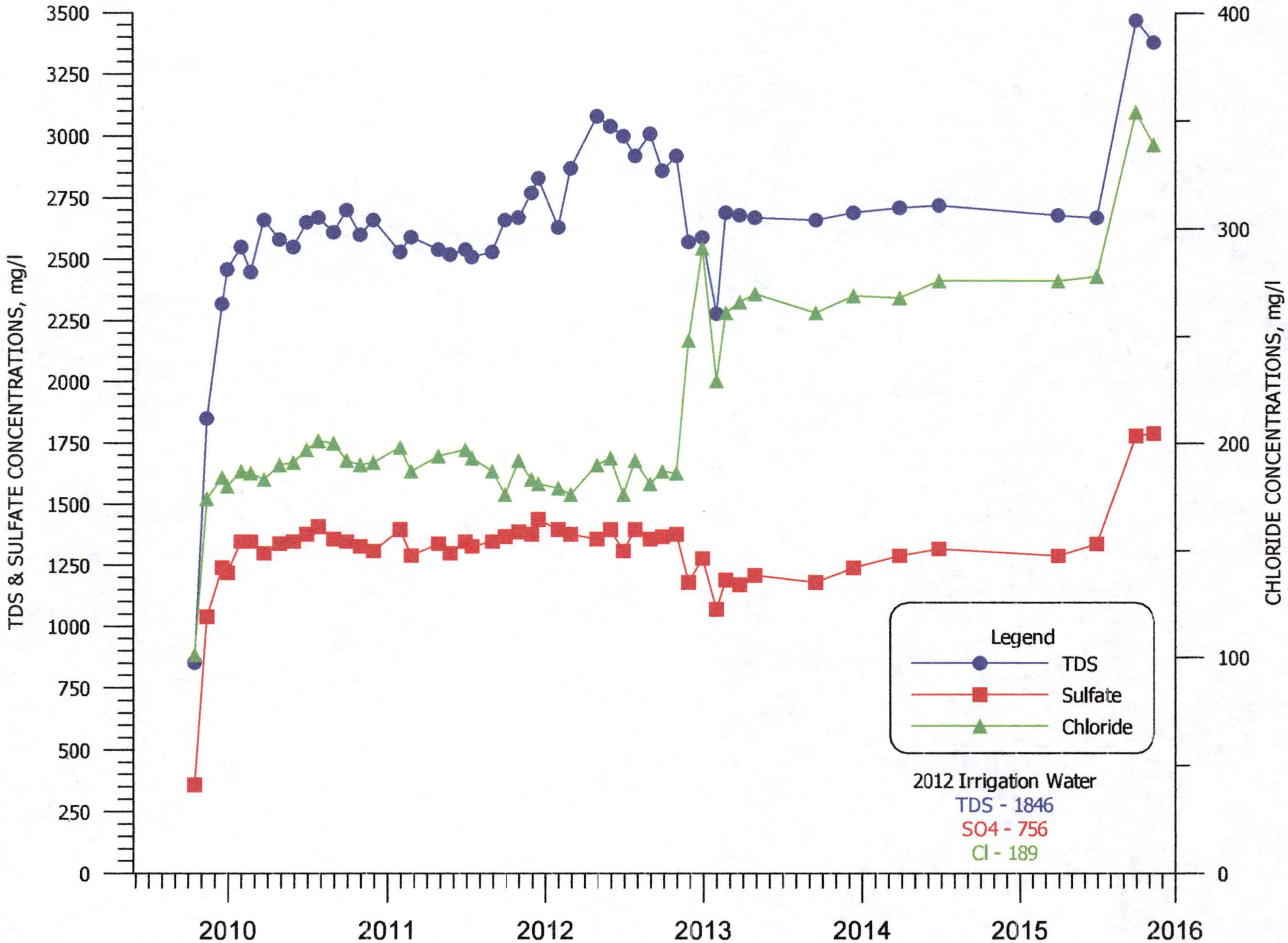

FIGURE 2-17. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-1.

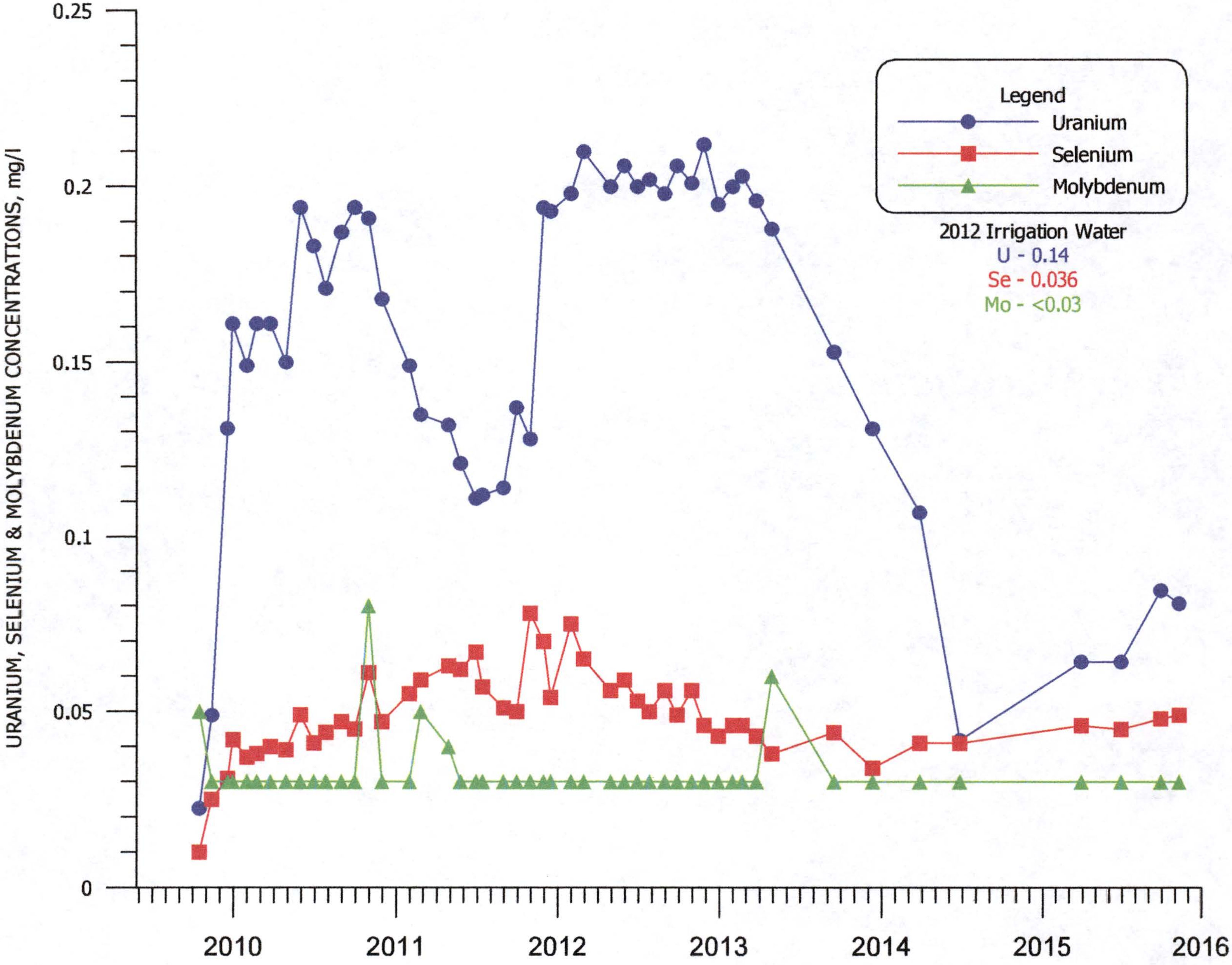

FIGURE 2-18. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-1.

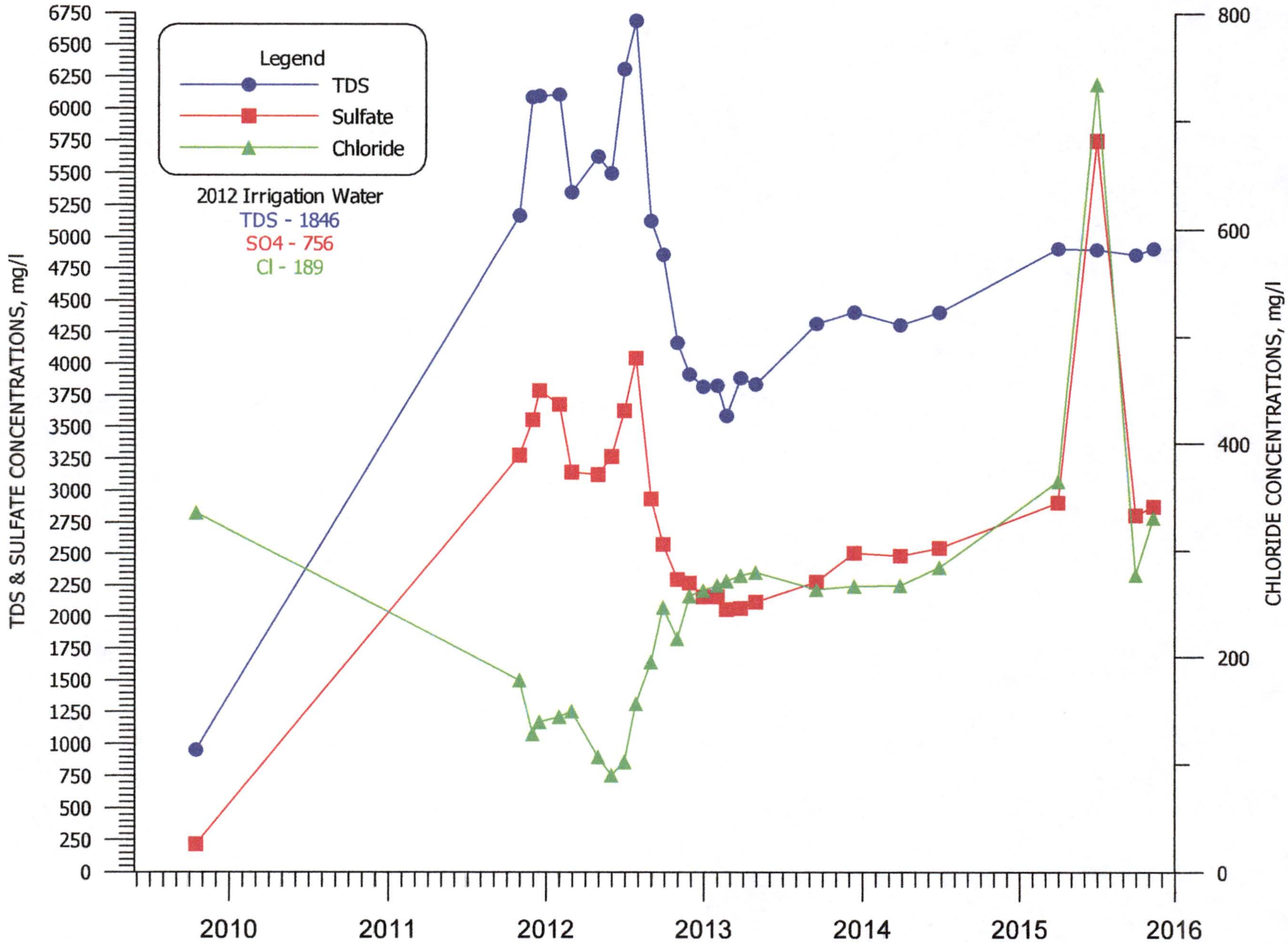

FIGURE 2-19. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-2.

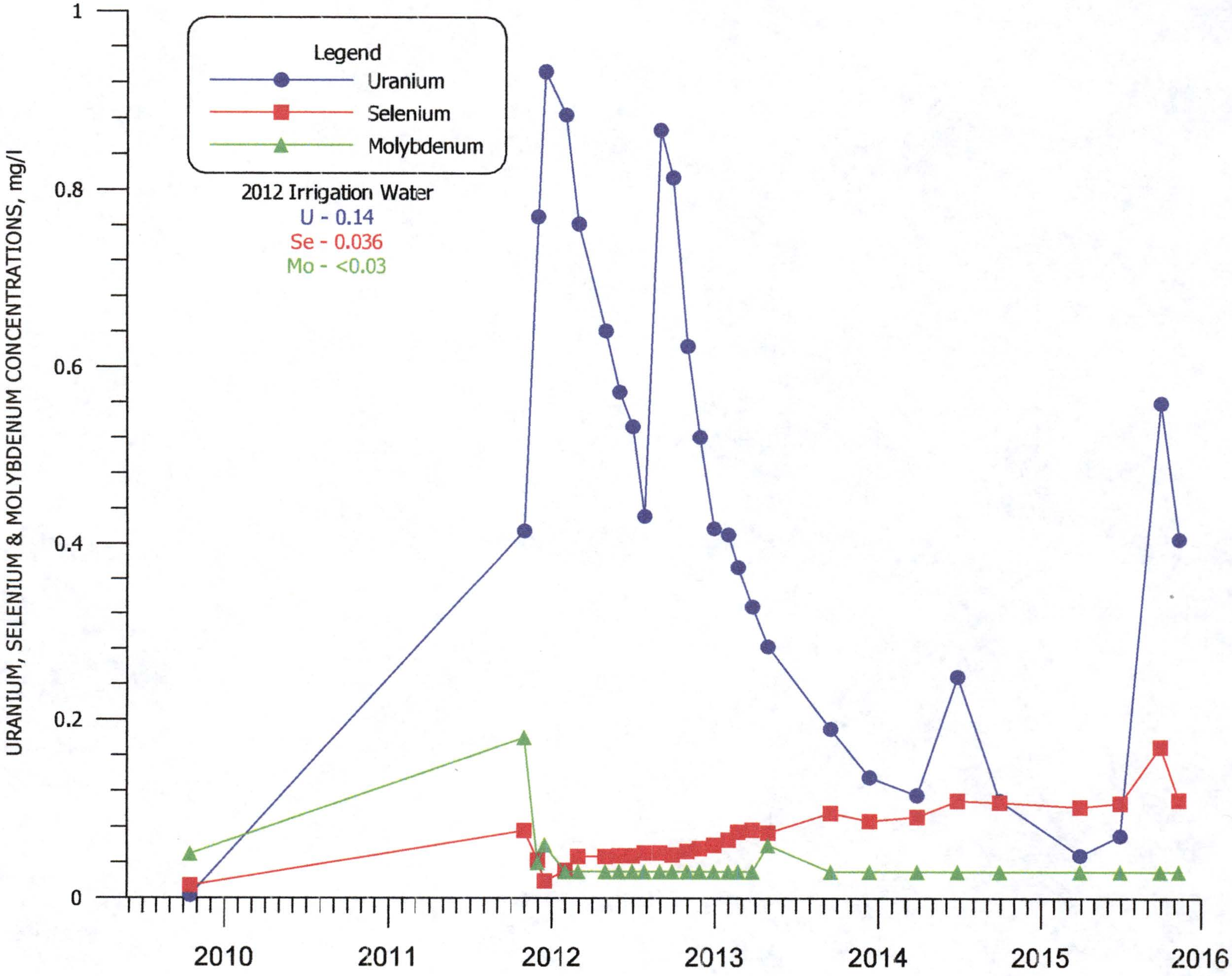

FIGURE 2-20. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-2.

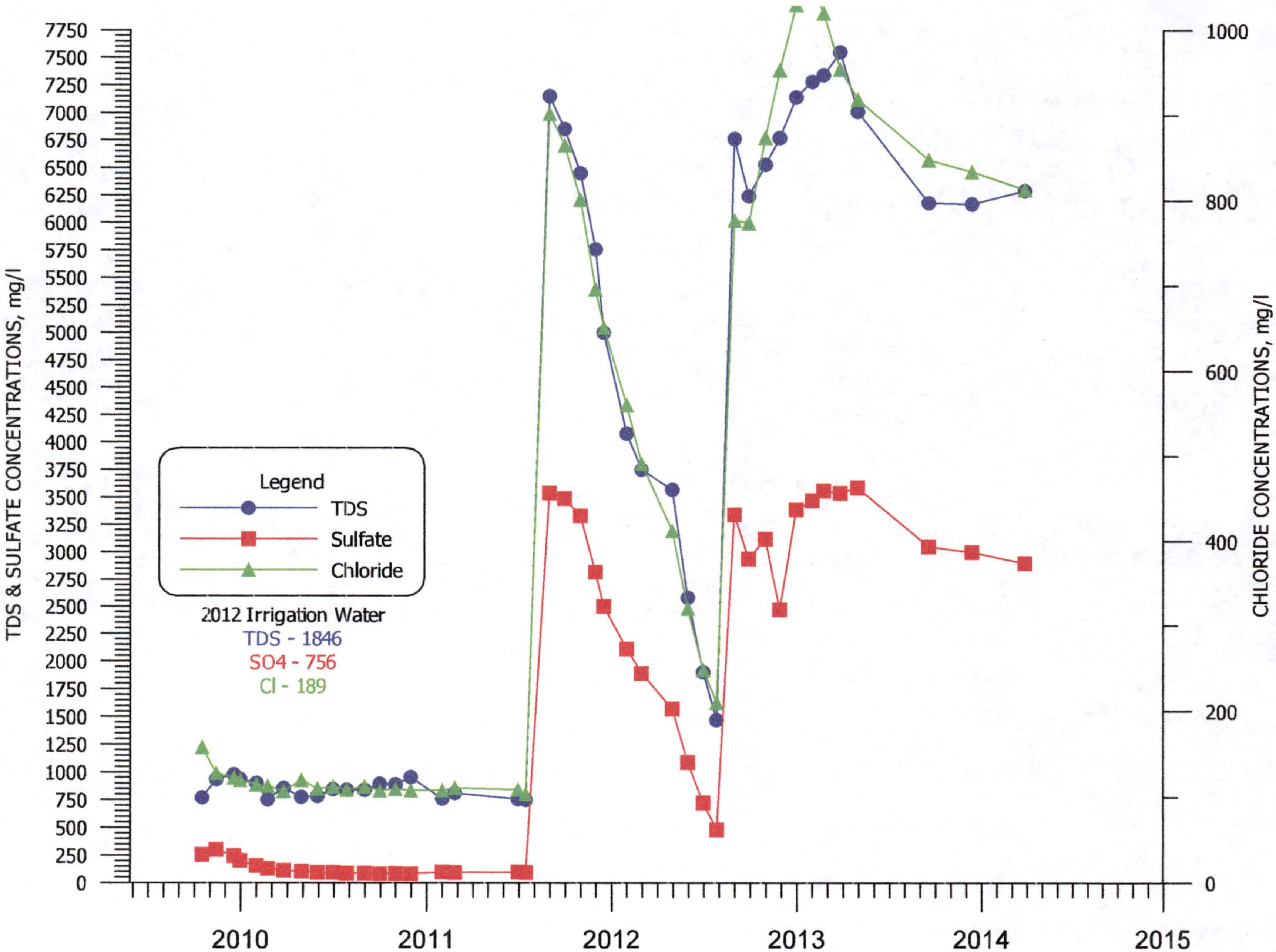

FIGURE 2-21. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-2M.

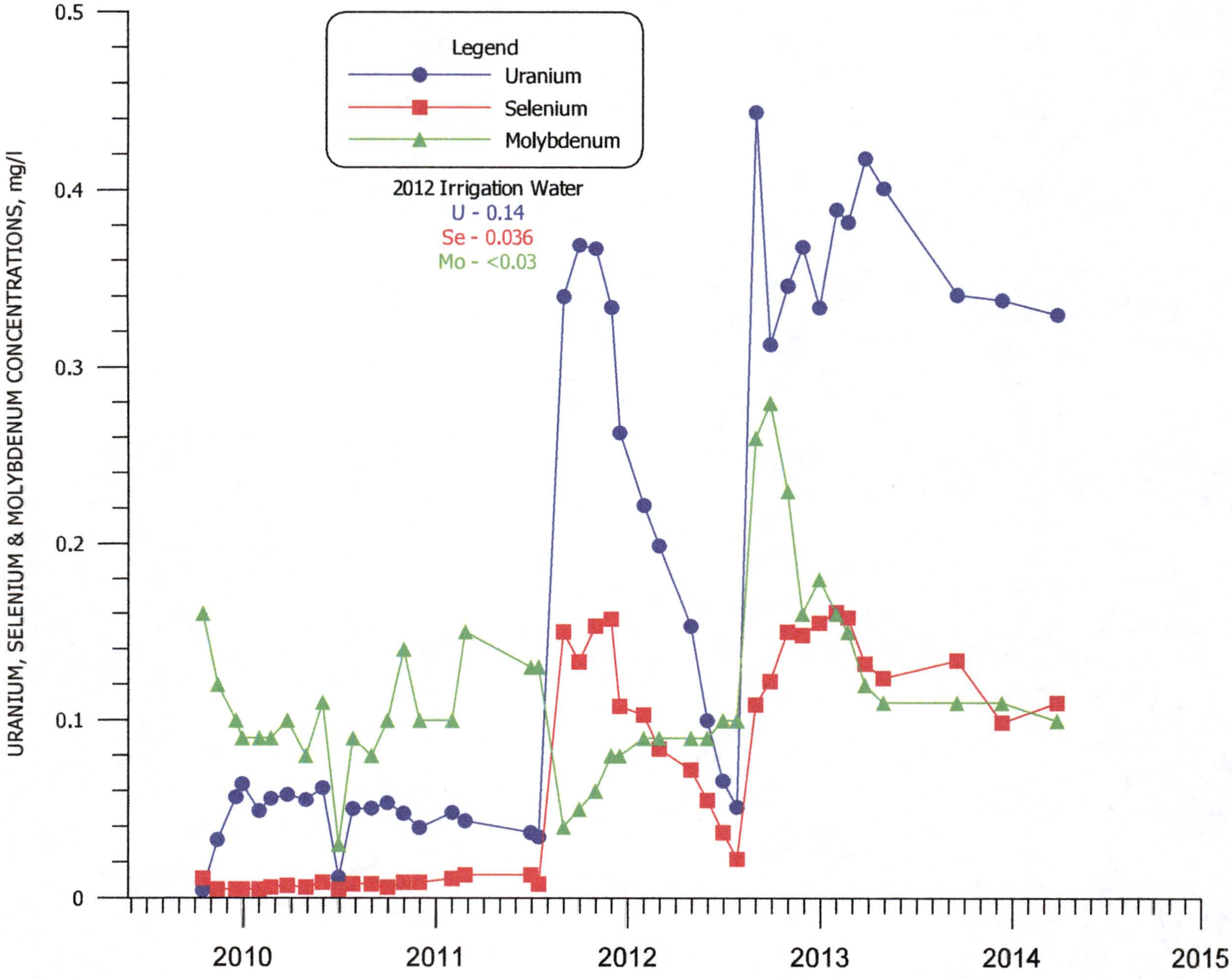

FIGURE 2-22. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-2M.

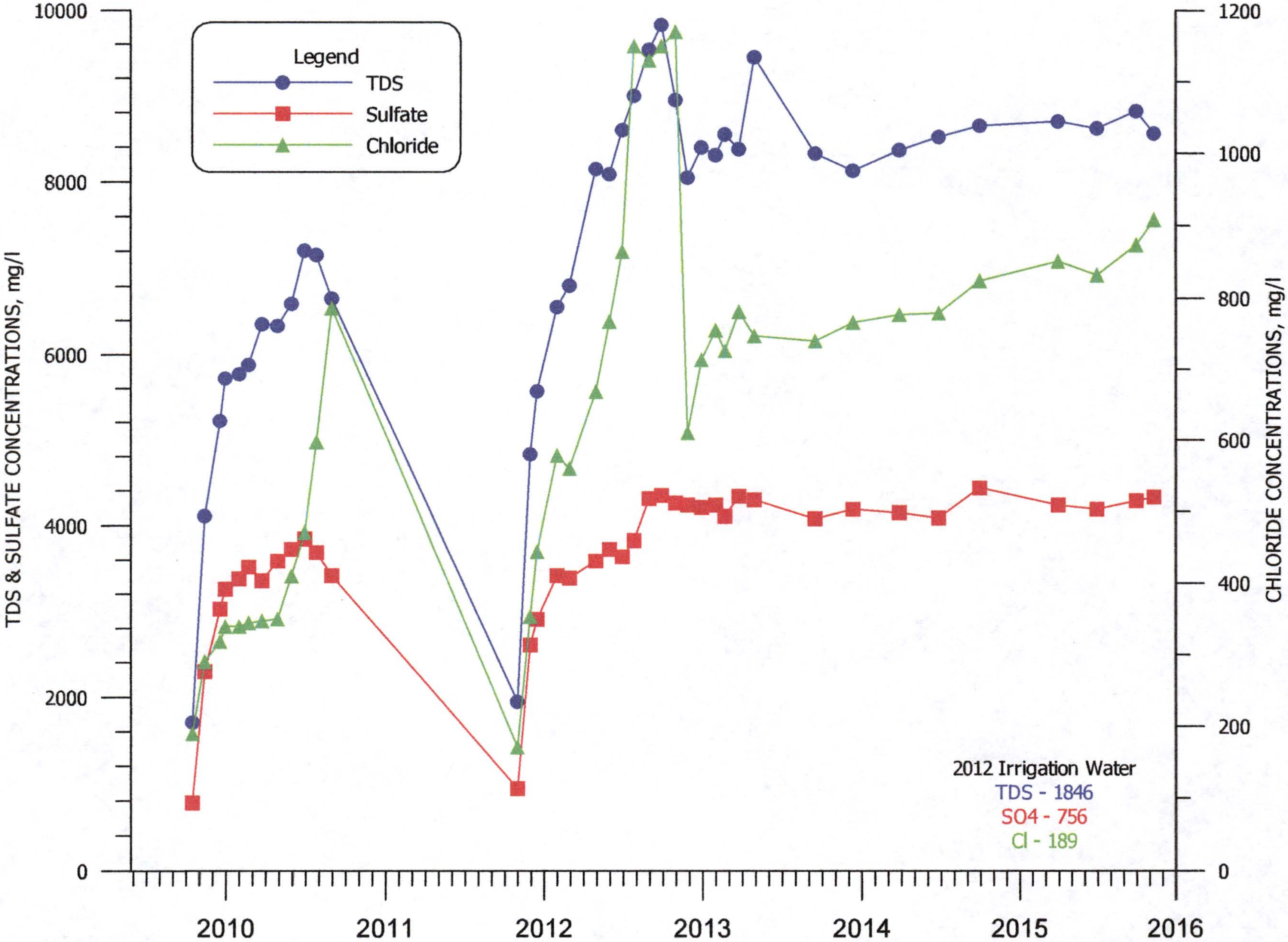

FIGURE 2-23. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-3.

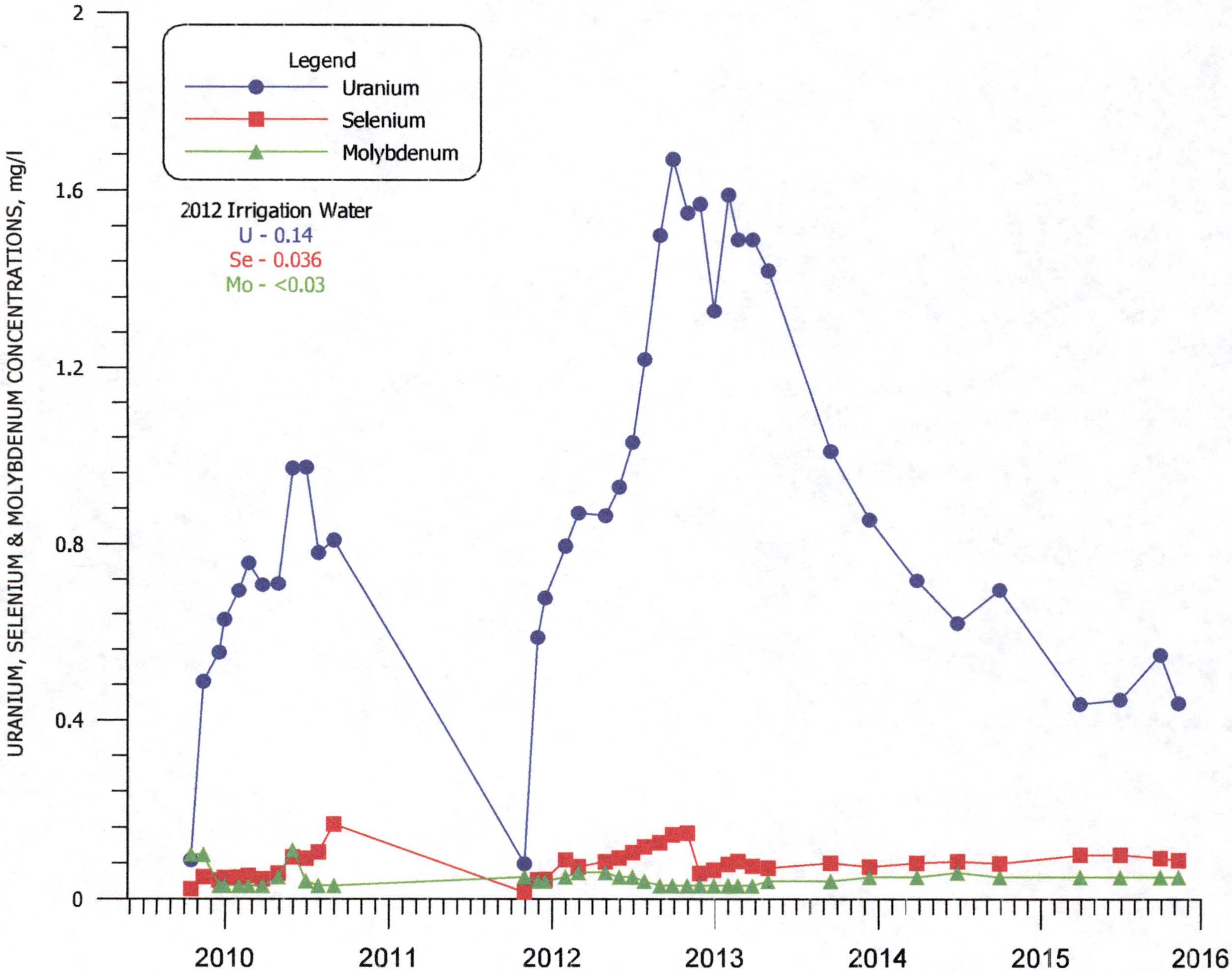

FIGURE 2-24. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-3.

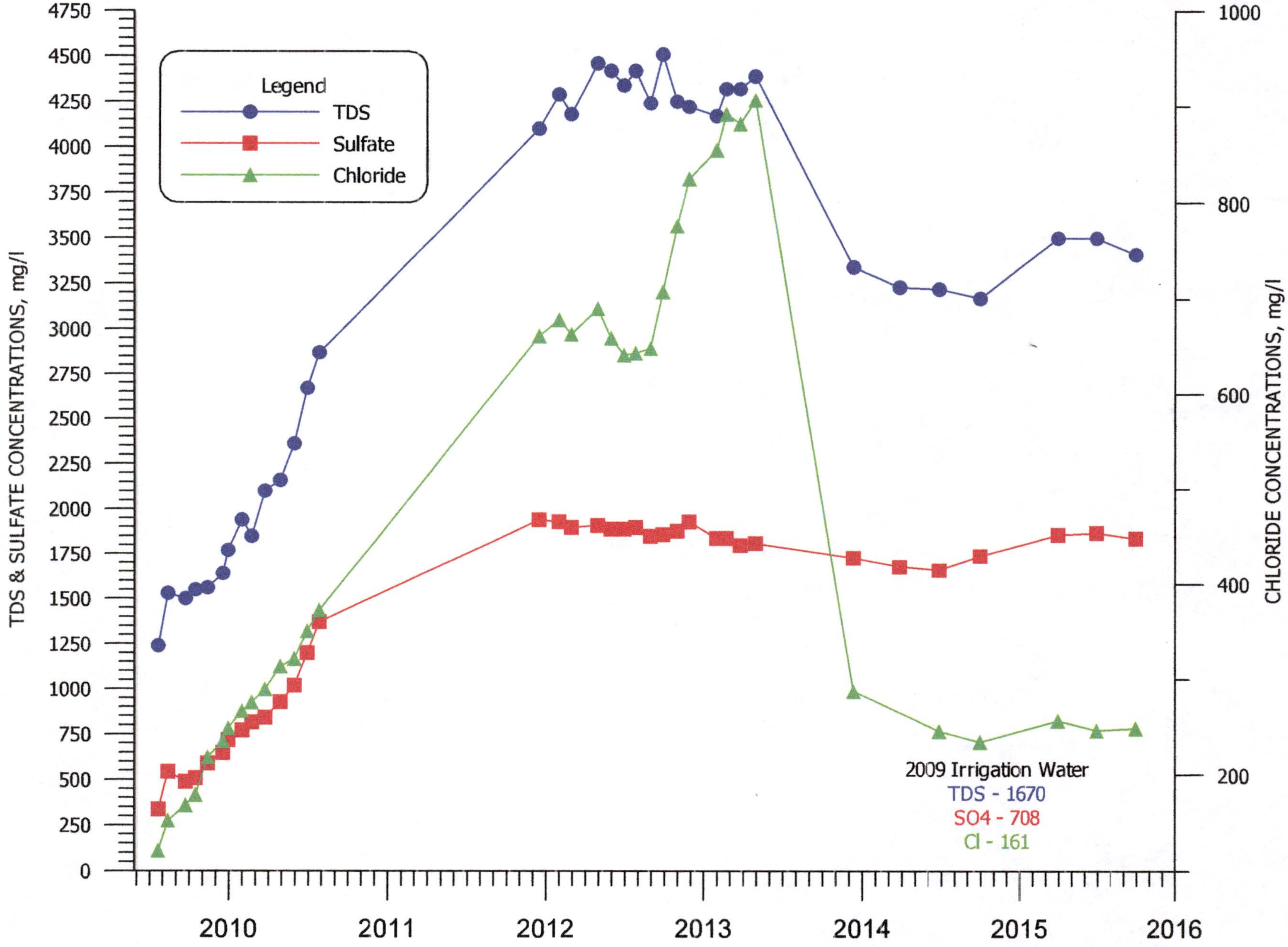

FIGURE 2-25. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY1.

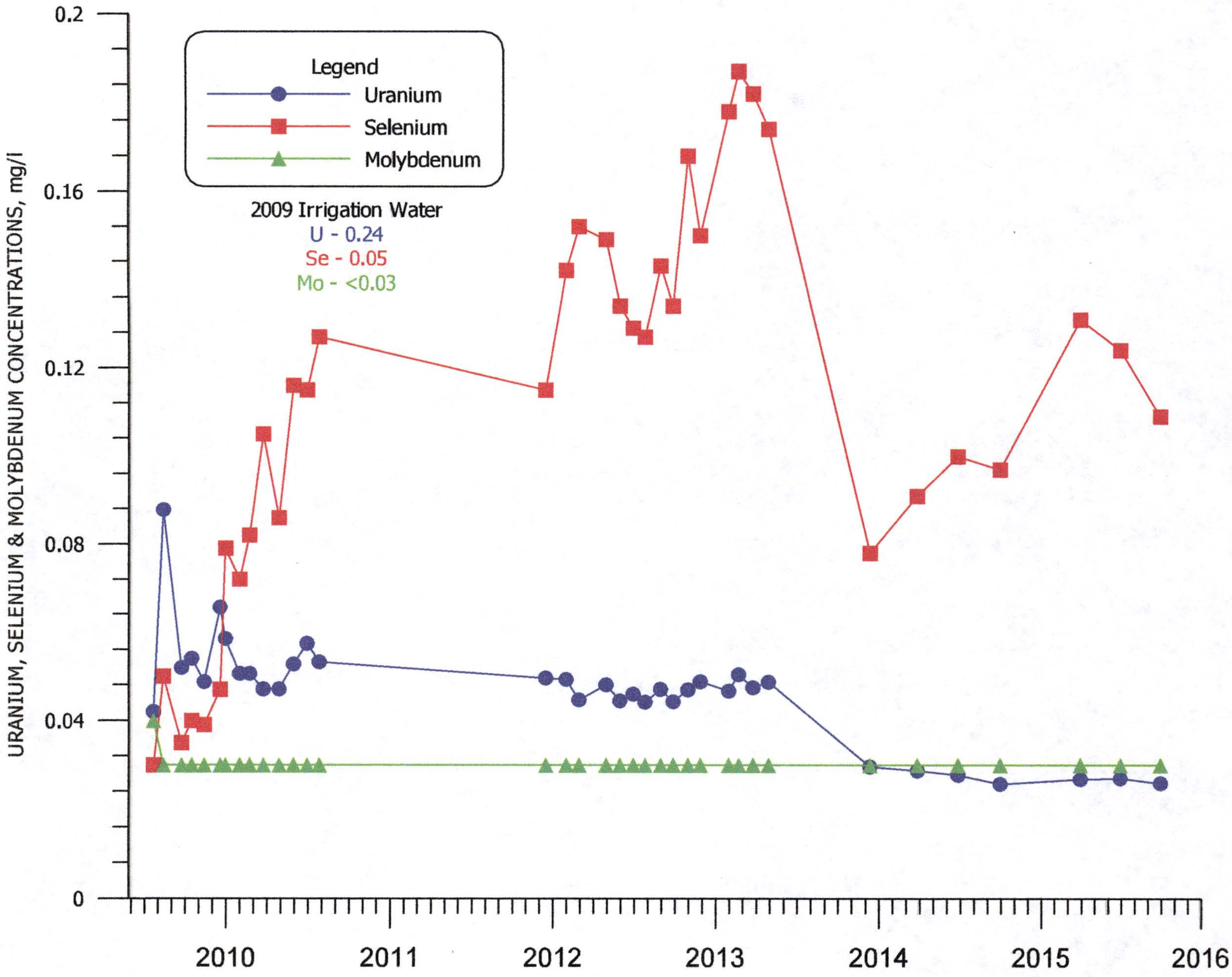

FIGURE 2-26. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY1.

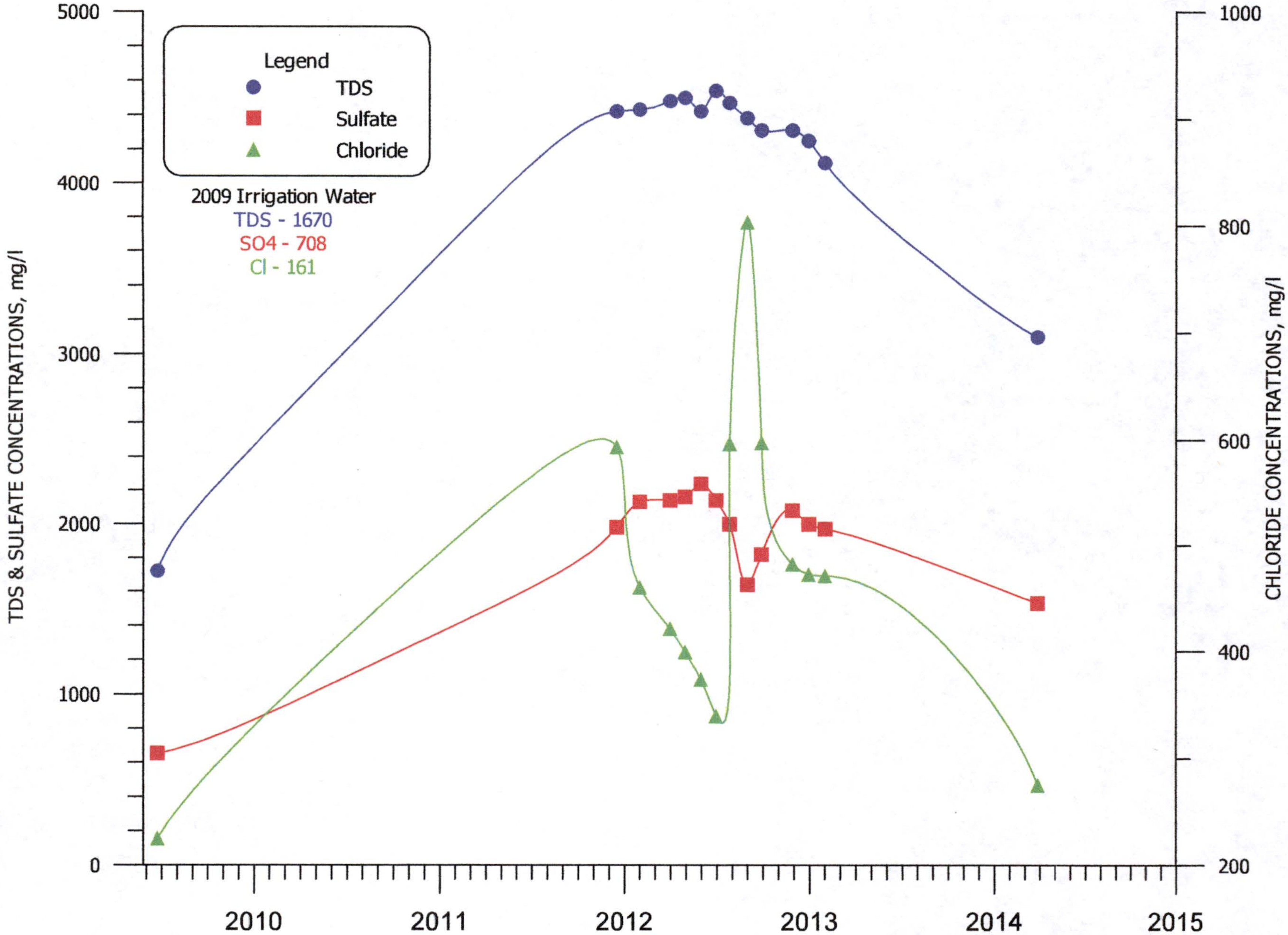

FIGURE 2-27. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY2.

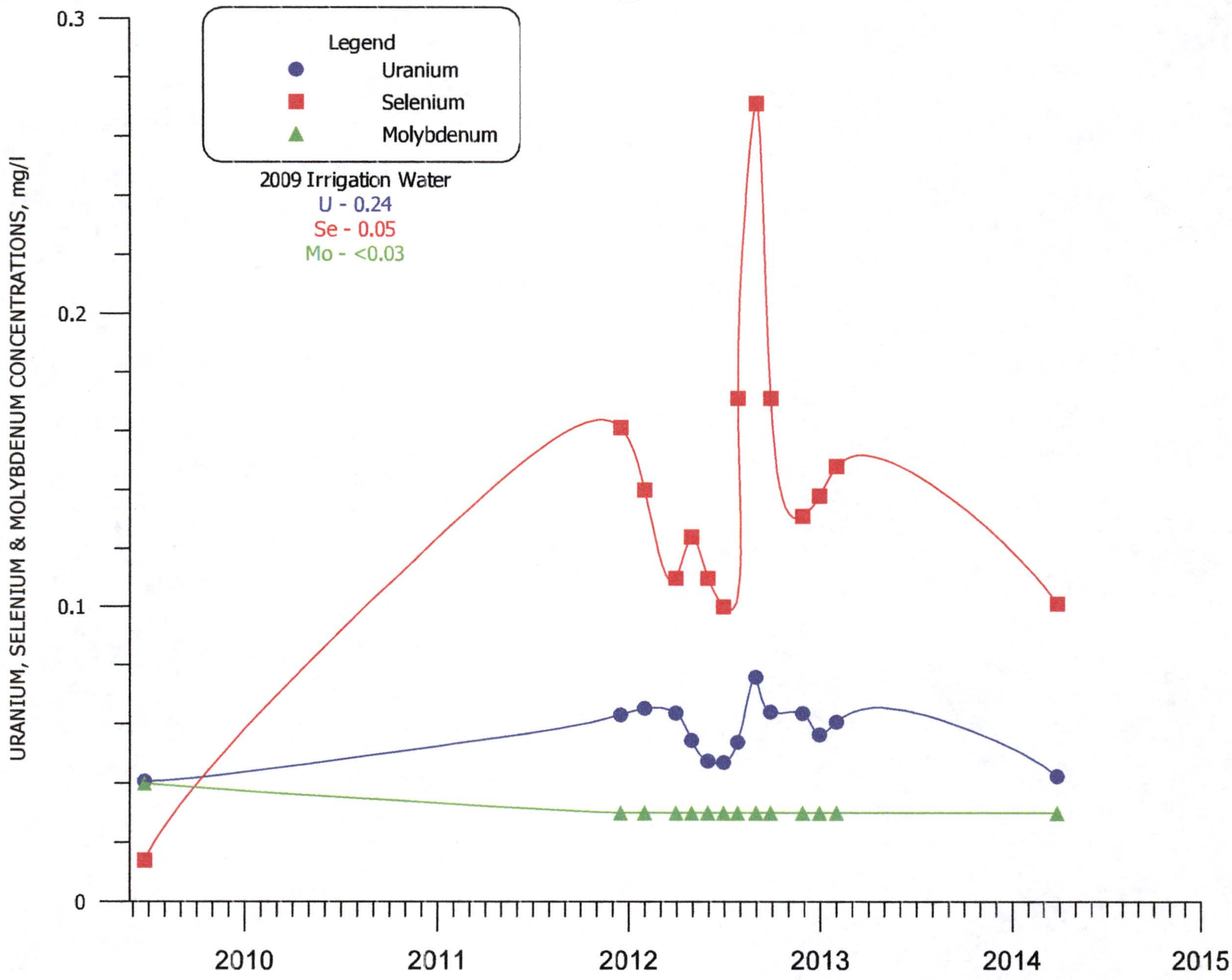

FIGURE 2-28. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY2.

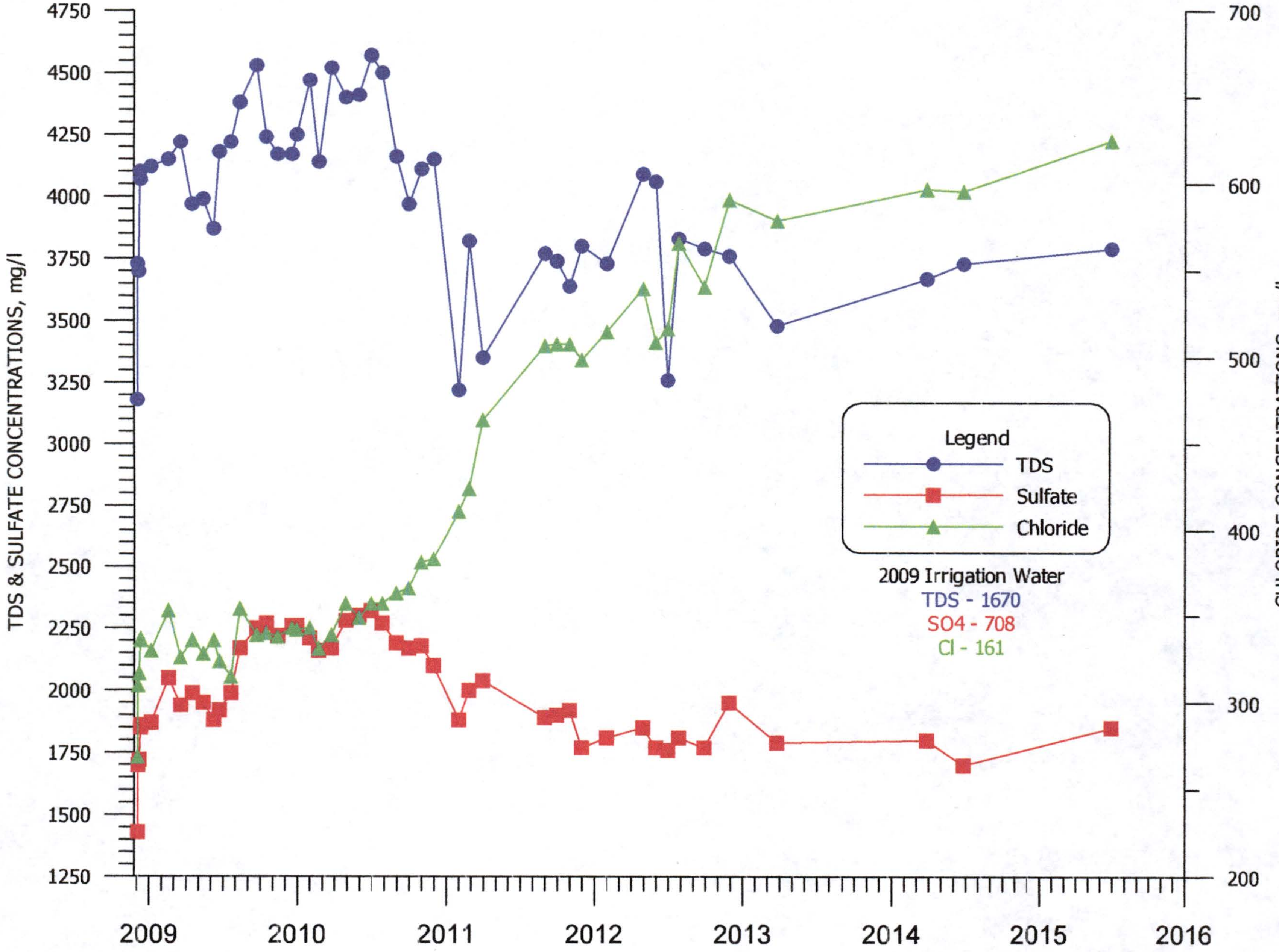

FIGURE 2-29. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY4.

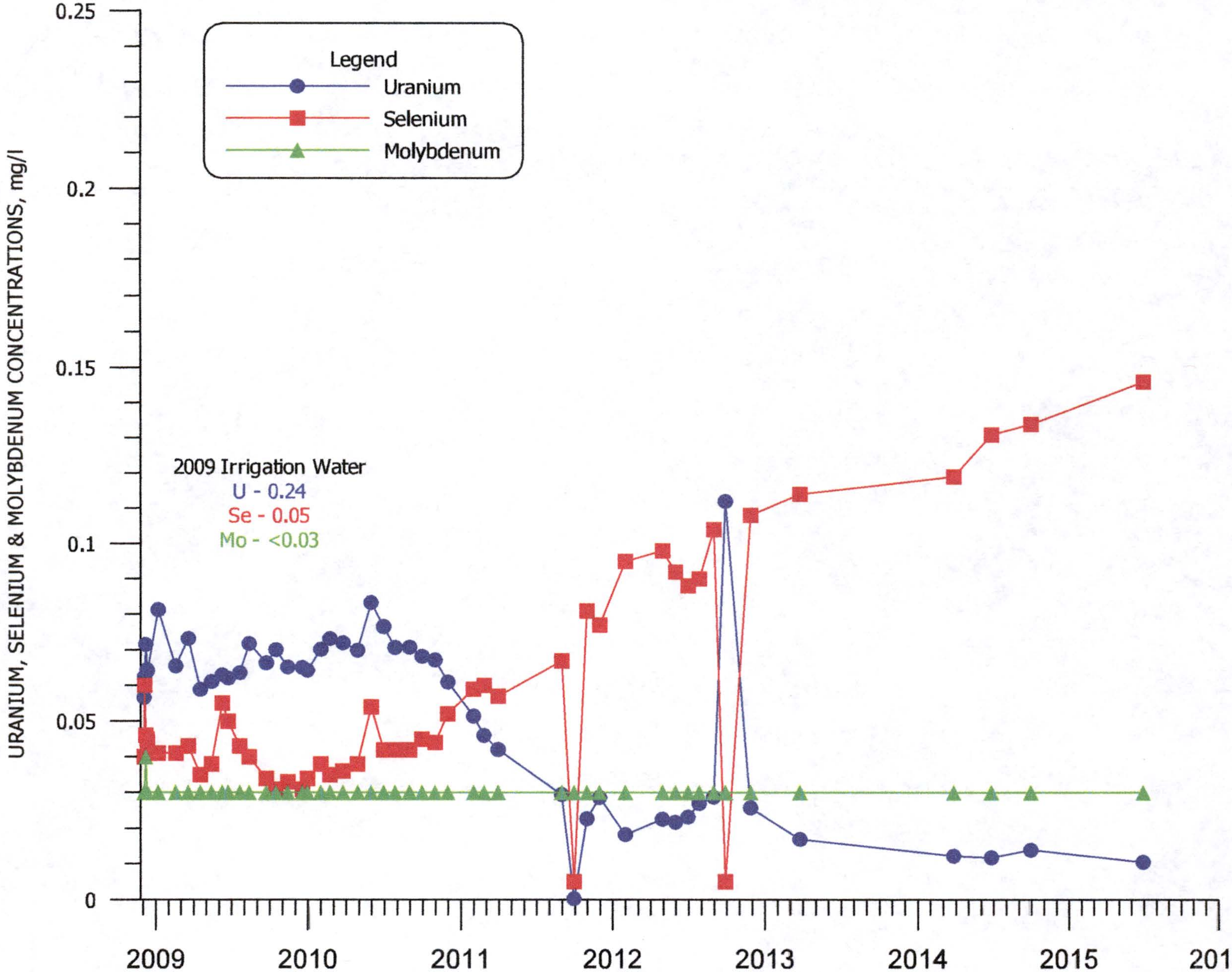

FIGURE 2-30. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY4.

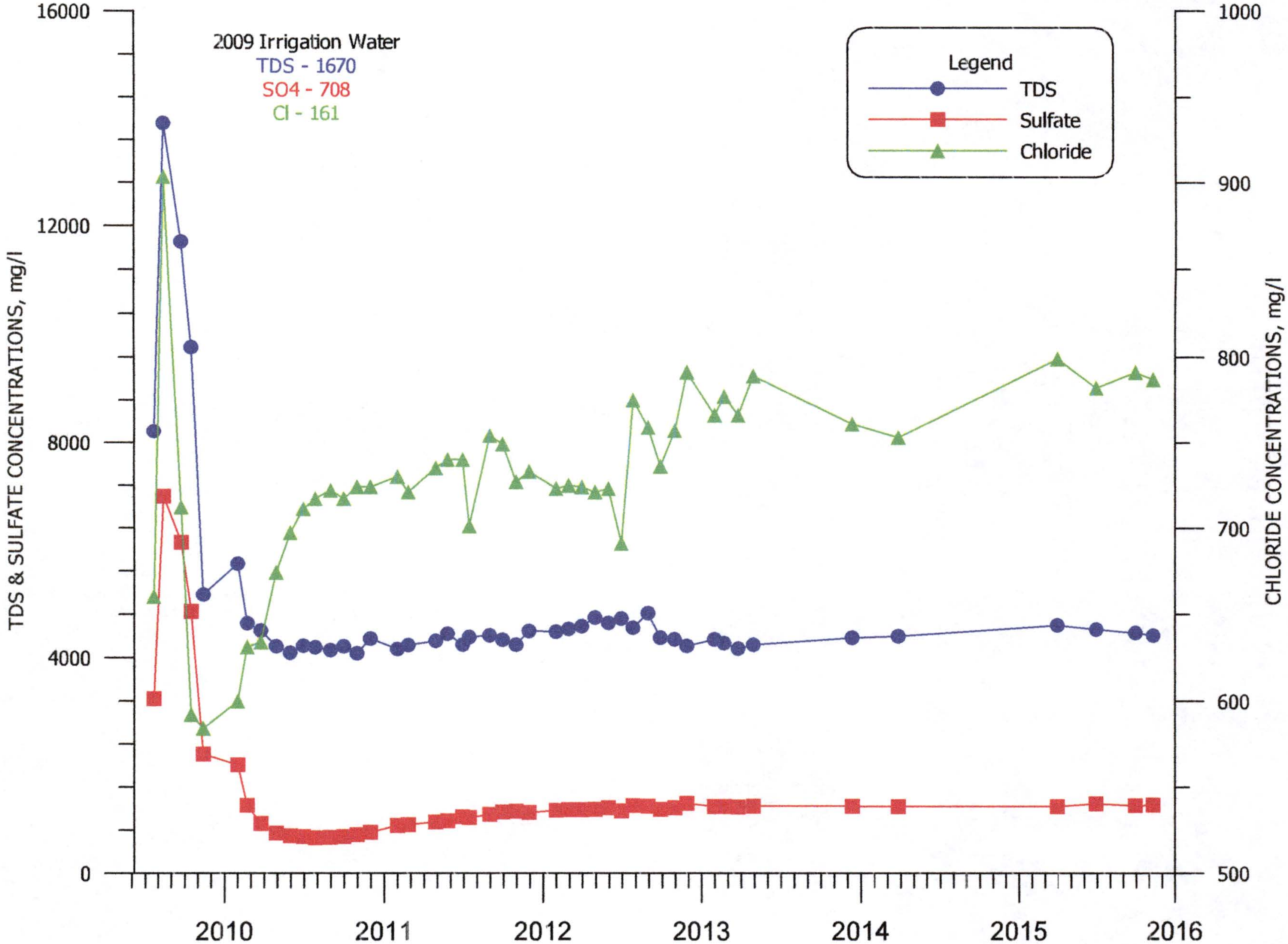

FIGURE 2-31. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY4MU.

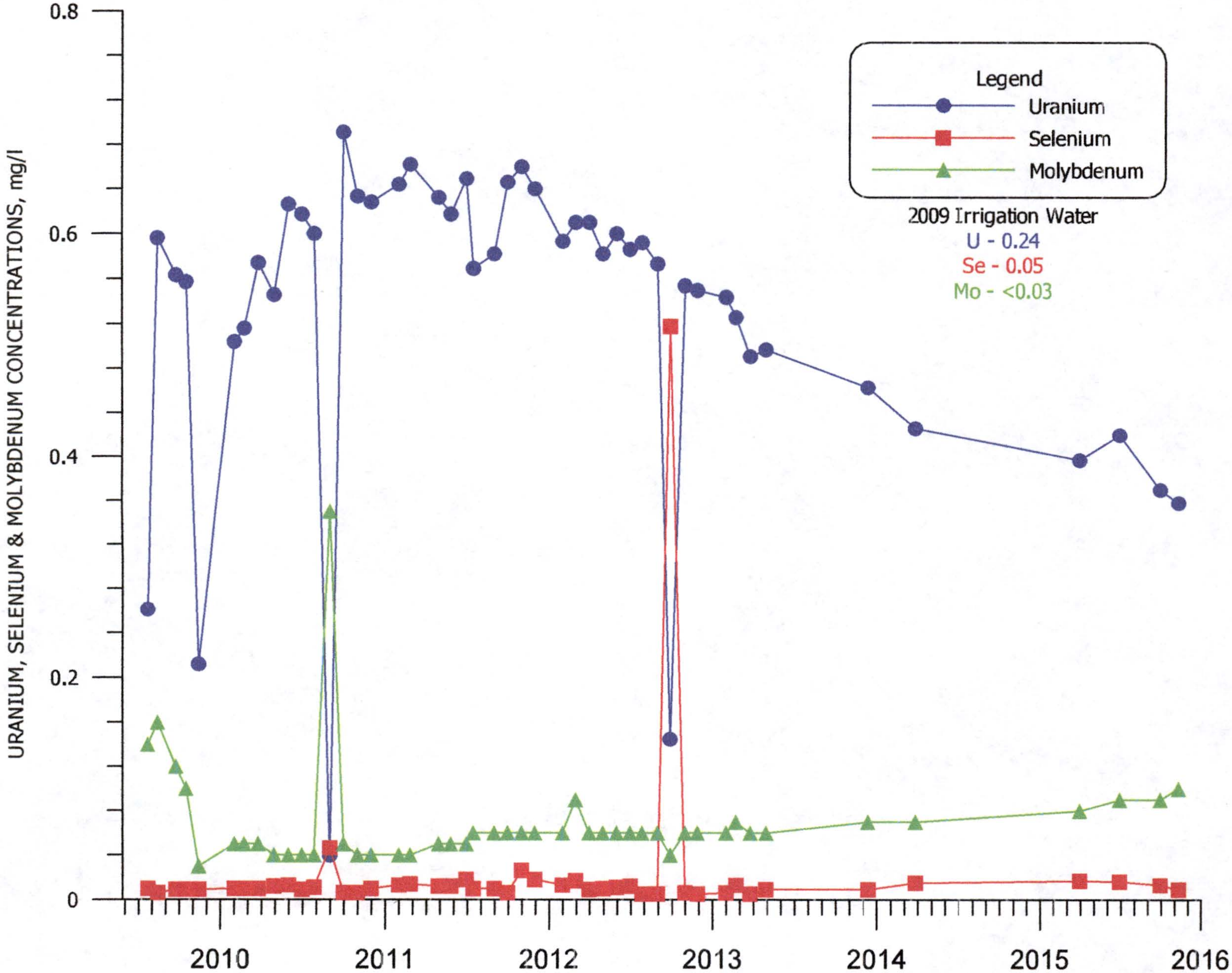

FIGURE 2-32. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY4MU.

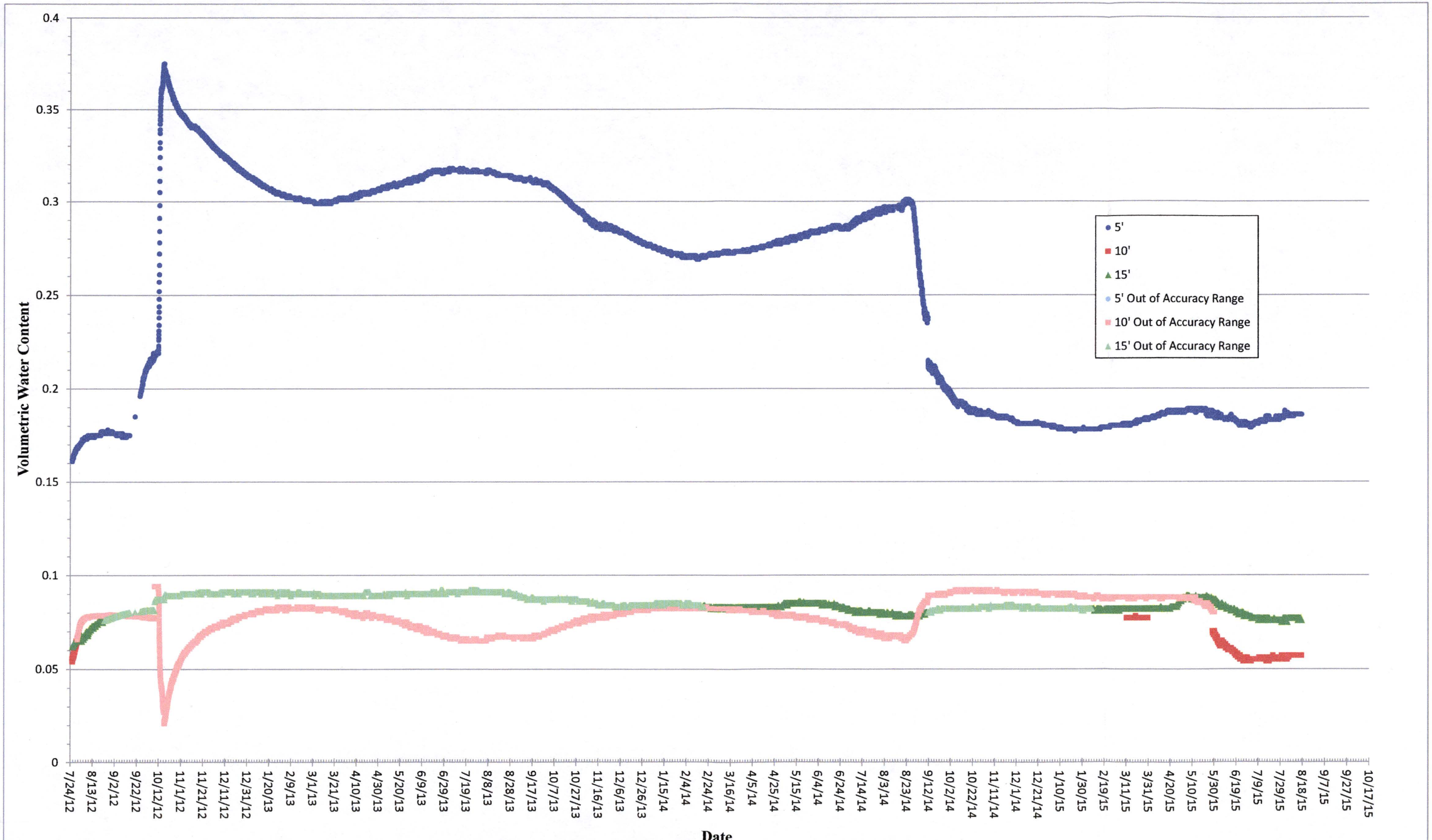

Figure 2-33. Volumetric Water Content, Section 34 Flood Area

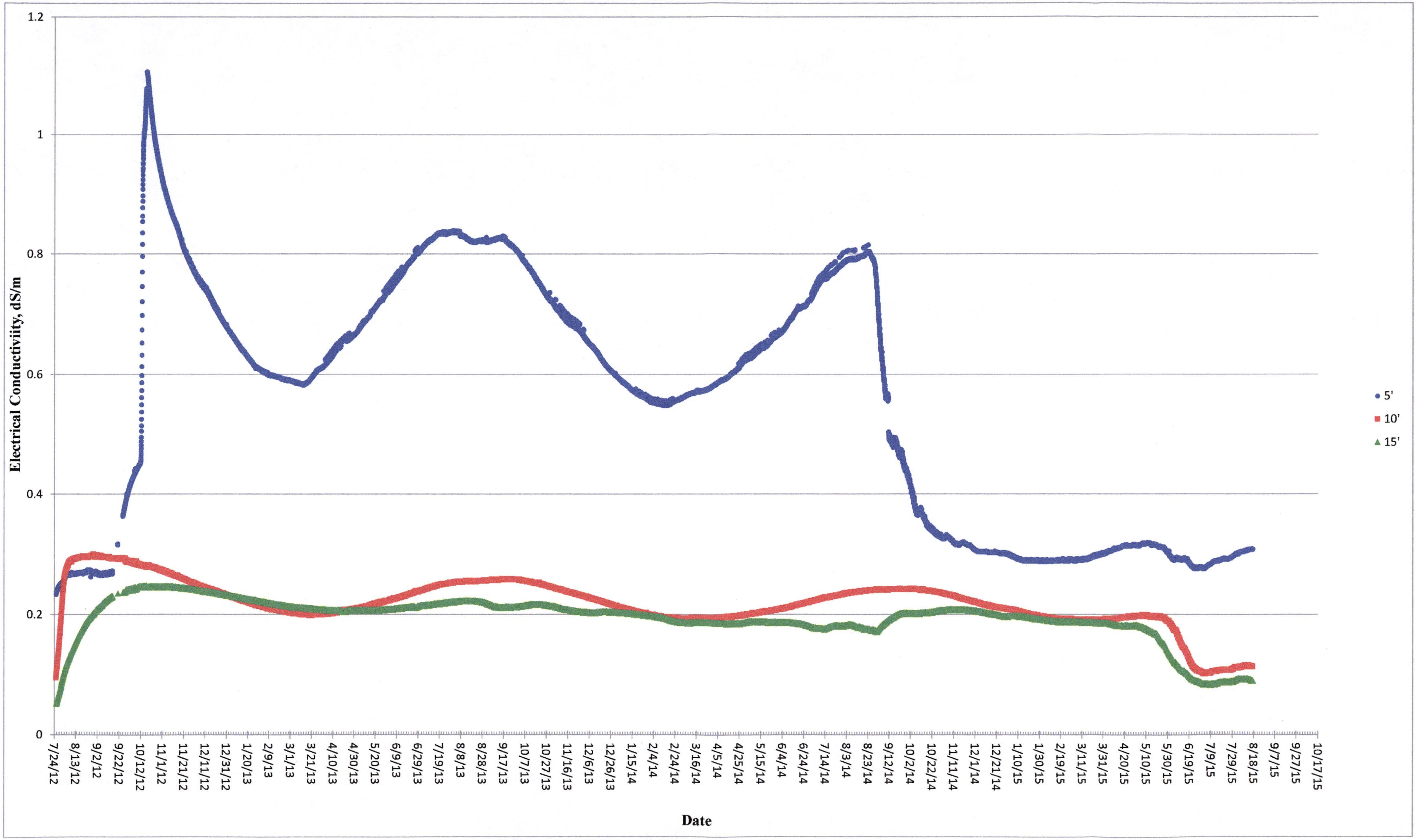

Figure 2-34. Electrical Conductivity, Section 34 Flood Area

Figure 2-35. Average Daily Delta Temperature, Section 34 Flood Area

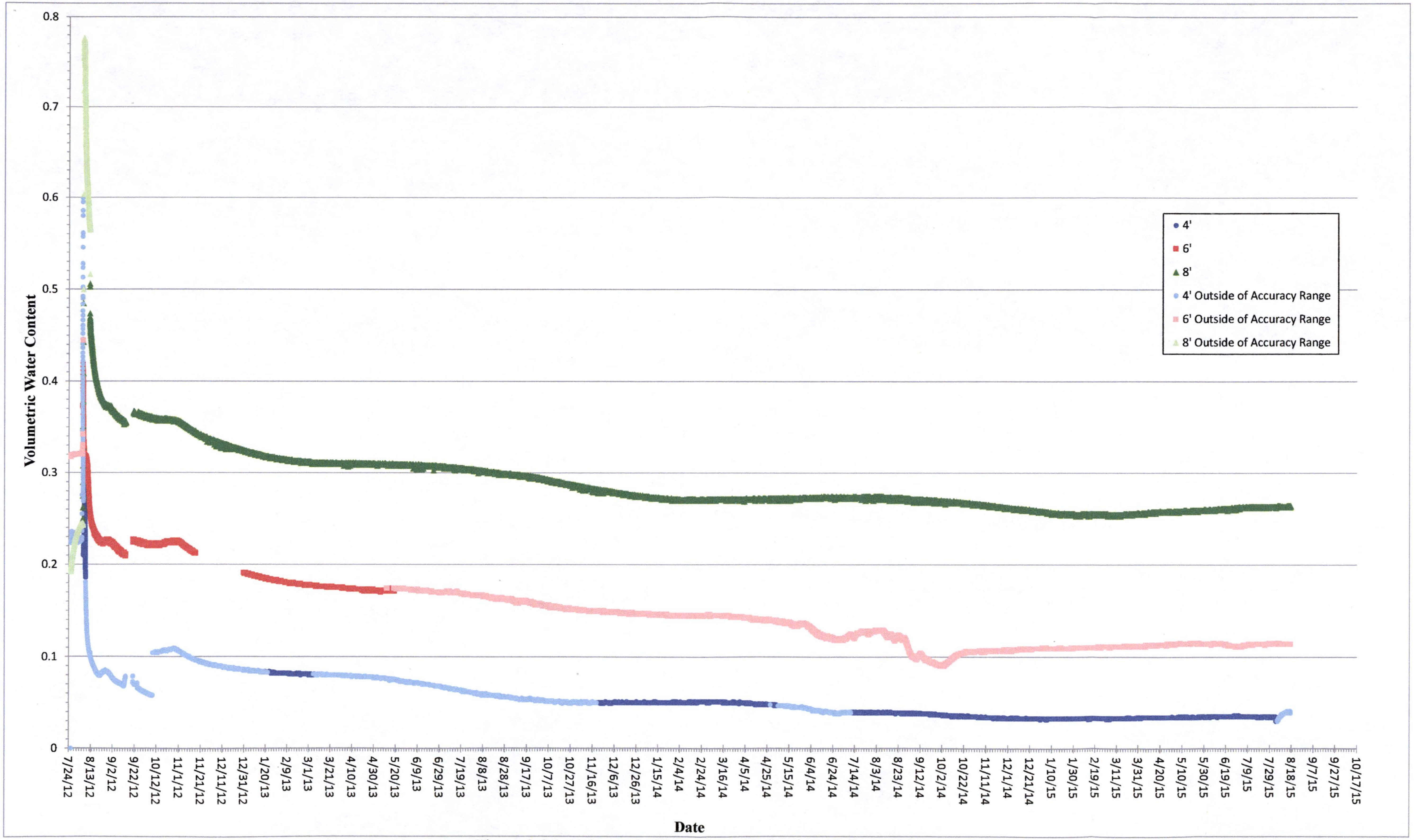

Figure 2-36. Volumetric Water Content, Section 28 Center Pivot

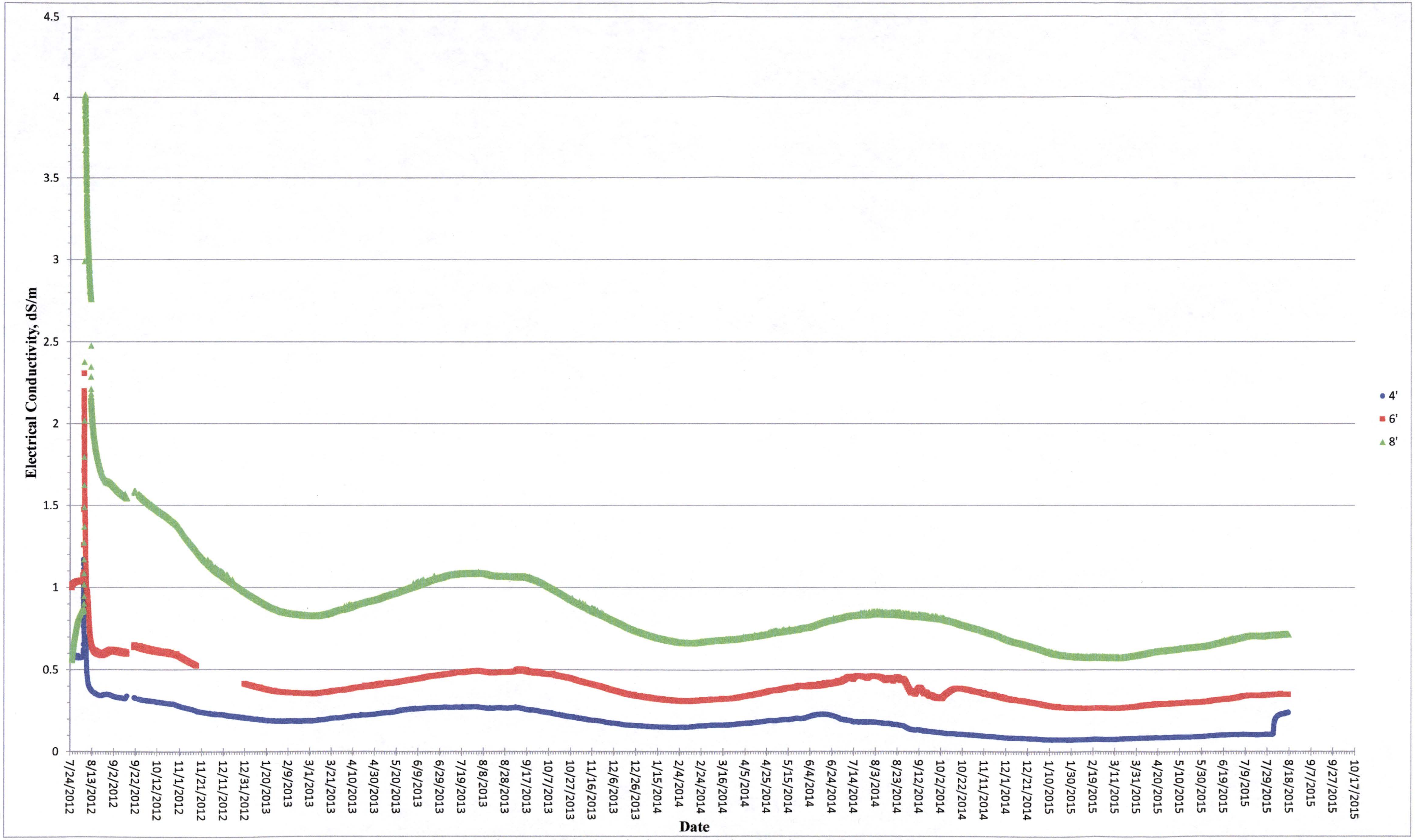

Figure 2-37. Electrical Conductivity, Section 28 Center Pivot

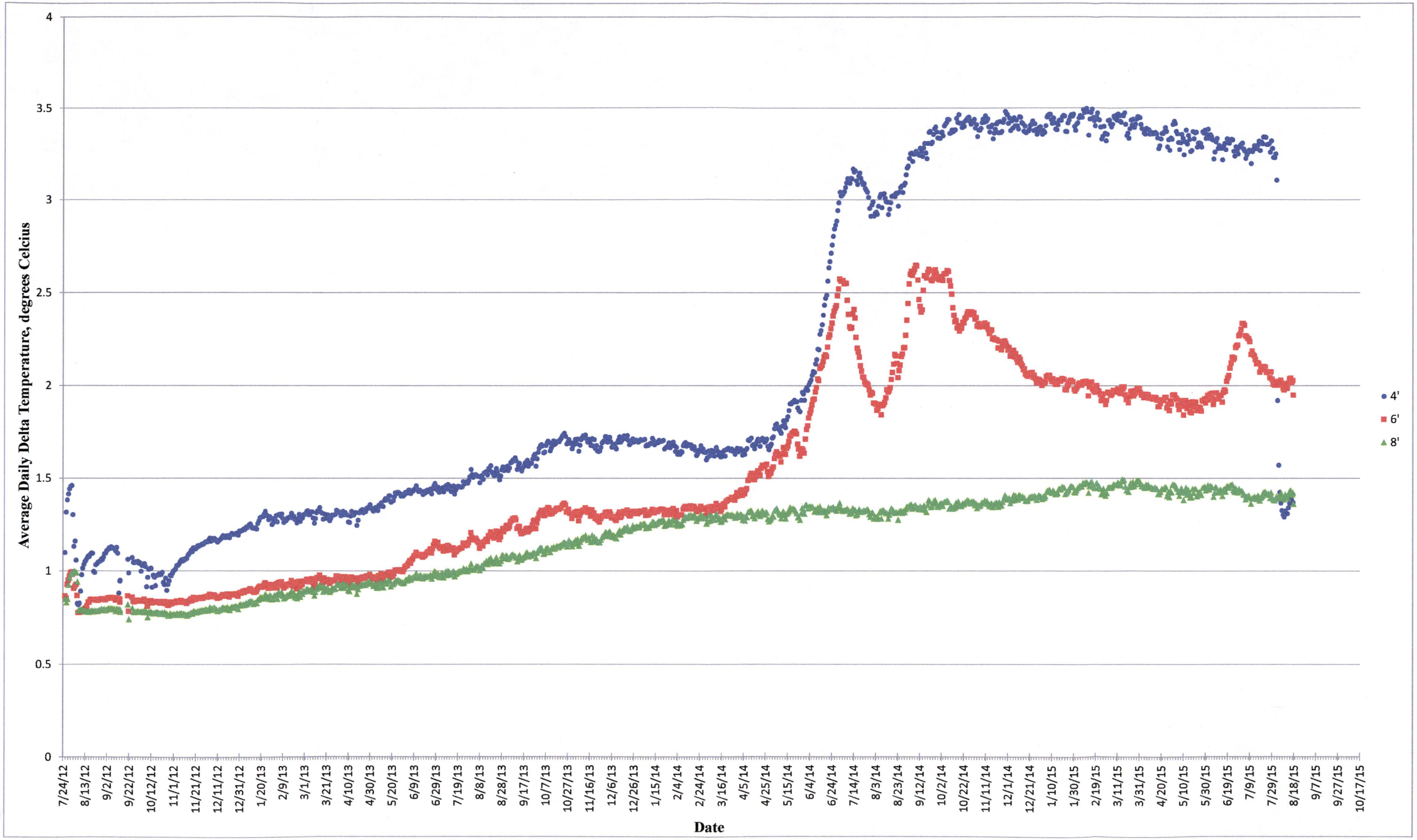

Figure 2-38. Average Daily Delta Temperature, Section 28 Center Pivot

3.0 Ground-Water Quality

Monitoring ground-water quality in the former irrigated area is a very important part of assessing the effects of the irrigation program. Additional monitoring wells have been added to the Section 33 and Section 34 areas for additional ground-water monitoring. The present ground-water monitoring program in the former irrigation areas is adequate. This ground-water monitoring is being used to determine if the irrigation program has any measurable impact on the ground-water system.

3.1 Section 34

The Section 34 irrigation consisted of 120 acres of flood irrigation in the northeastern portion in Section 34. This irrigation extended slightly into the other 3 quarters of Section 34 as shown in Figure 2-1. The Section 34 flood area all exists over the alluvial aquifer. Ground-water monitoring wells 555, 556 and 557 were added in 2010. Existing monitoring wells 844 and 845 have been used to monitor the ground-water quality in this area (see Table 3-1 for well data).

Table 3-1. Section 34 Monitoring Well Data

WELL NAME	NORTH. COORD.	EAST COORD.	WELL DEPTH (FT-MSP)	CASING DIAM. (IN)	WATER LEVEL DATE	DEPTH (FT-MP)	ELEV. (FT-MSL)	ABOVE LSD (FT)	MP ELEV. (FT-MSL)	BASE OF ALLUVIUM (FT-LSD)	BASE OF ALLUVIUM (FT-MSL)		PERFORA TIONS (FT-LSD)	SATURATED THICKNESS
						Existing Alluvial Wells								
555	1538575	486249	80	5	9/3/2014	42.34	6514.66	2	6557	80	6477	A	60-80	37.7
556	1537722	485957	80	5	9/3/2014	49.35	6506.65	2	6556	78	6478	A	60-80	28.6
557	1537235	485729	70	5	9/3/2014	42.59	6513.41	2	6556	70	6486	A	50-70	27.4
844	1538376	487002	75	4	9/3/2014	36.4	6519.73	1.2	6556.13	70	6484.9	A	35-75	34.8
845	1537280	487833	65	4	9/3/2014	34.48	6522.57	1.7	6557.05	55	6500.4	A	45-65	22.2

3.1.1 Sulfate Concentrations

The sulfate concentrations in alluvial wells 844 and 845 prior to the start of the irrigation in 2000 were gradually declining with time (see Figure 3-1). Sulfate concentrations in well 844 and 845 have since exhibited a general increase during the period of irrigation, but their concentrations are slightly less than concentrations that were observed prior to the mid-1990s. Concentrations is well 844 have continued to increase while well 845 concentrations have declined since 2012. The sulfate concentrations are not likely to be affected by the Section 34 flood irrigation but more likely to have been affected by the changes in the restoration program to the east of this area. Sulfate concentrations increased into 2013 in well 555 while concentrations have generally been steady in wells 556 and 557.

A map of the 2014 sulfate concentrations is presented in Figure 4.3-1 in the 2014 Annual Performance Report (2015). An area with sulfate concentrations above the site standard of 1500 mg/l, shown in green, exists around well 844.

3.1.2 TDS Concentrations

The TDS concentrations in wells 555, 844 and 845 show similar trend to sulfate over the last five years (see Figure 3-2). Concentrations in wells 556 and 557 have remained fairly steady since they were drilled. Because the TDS concentrations in the area are generally similar to those present prior to irrigation, it is difficult to say whether these TDS concentrations have been affected by the Section 34 irrigation. It is more likely the changes in TDS concentrations in these two wells are due to changes in concentrations to the east of these wells.

Figure 4.3-19 in the 2014 Annual Performance Report (2015) shows an area where the TDS concentration exceeds the site standard of 2734 mg/l with green hatching. Wells 844 and 845 are encompassed within this area.

3.1.3 Chloride Concentrations

Figure 3-3 shows the chloride concentrations for monitoring wells 555, 556, 557, 844, and 845. These chloride concentrations were similar to the freshwater injection concentration and were thought to be due to the freshwater injection that occurred to the east of this area. The chloride concentrations in monitoring wells 555, 844 and 845 had been relatively steady during the operation of the Section 34 flood irrigation through 2010 when all three showed an increasing trend. Well 844 has continued this trend through 2015 while well 845 has been steady and well 555 has shown a slight decrease. Wells 556 and 557 has remained steady since their installation.

An area where the chloride concentration exceeds site standard of 250 mg/l encompassing wells 844 and 845 is shown in green in Figure 4.3-36 in the Annual Performance Report (2015).

3.1.4 Uranium Concentrations

Figure 3-4 presents the uranium concentrations versus time for wells 555, 556, 557, 844, and 845. This figure shows fairly small uranium concentration changes with a slight increase in 2004 through 2012 in well 844 followed by a decrease through 2015. This small increase could be due to higher levels moving into this area or it could be due to the Section 34 irrigation. Since 2012, the concentrations have shown a steady decline in this well. Uranium concentrations from the irrigation should move slower vertically than chloride concentrations. The fact that uranium concentrations in wells 845, 555, 556, and 557 have been relatively steady, and the decline of concentrations in well 844 to similar levels as surrounding wells likely indicates that changes in concentration at well 844 are the result of ground-water movement caused by the restoration program.
Figure 4.3-53 from the Annual Performance Report (2015) show no areas that exceed the site standard of 0.16 mg/l near the flood area.

3.1.5 Selenium Concentrations

Figure 3-5 presents the selenium concentrations for the Section 34 monitoring wells and shows an increase in selenium concentrations in 2002 and 2003 in wells 844 and 845, respectively. The selenium concentrations are thought to be caused by variations in ground water moving through this area, but the small increases in wells 844 and 845 could plausibly be a result of the irrigation program. Figure 4.3-70 of the 2014 Annual Performance Report (2015) shows the selenium concentrations of the alluvial aquifer.

3.1.6 Molybdenum Concentrations

Figure 3-6 shows the molybdenum concentrations versus time and shows that these concentrations have been low since the start of irrigation in 2000. The molybdenum concentrations for 2014 are presented in Figure 4.3-87 of the Annual Performance Report.

3.1.7 Nitrate Concentrations

The nitrate concentration time plots are presented in Figure 3-7. Nitrate concentrations have stayed fairly steady and low in wells 844 and 845 during the irrigation operation which ceased in 2012. An increase was observed in 2013 in these two wells and well 555. Well 555 has since shown a decrease in concentrations while 844 and 845 have remained steady after the increase. Well 556 has shown a steady decrease in concentrations while well 557 has shown an increase since installation. Figure 4.3-104 of the Annual Performance Report (2015) presents the nitrate concentrations for 2014 and shows a small area around well 844 that exceeds the site standard of 12 mg/l.

3.2 Section 28

The Section 28 area has consisted of 60 acres of center pivot irrigation from 2002 through 2004, and, after expansion of the center pivot area, 100 irrigated acres from 2005 through 2009 and in 2011 and 2012. Figure 2-2 shows the location of the 100 acre center pivot. The Section 28 irrigation area exists over the alluvial aquifer which extends to the west of the center pivot. The San Mateo alluvium joins the Rio San Jose alluvium in the western portion of Section 28. Numerous monitoring wells exist in this area and have been used to define the water quality changes with time (see Table 3-2). San Andres well 951R was used to supply fresh water for injection and irrigation water, and replaced well 951 in 2012. The TDS, sulfate, and chloride concentrations in well 951R are naturally higher than the values in well 951.

Table 3-2. Section 28 Monitoring Well Data

WELL NAME	NORTH. COORD.	EAST COORD.	WELL DEPTH (FT-MSP)	CASING DIAM. (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LS (FT)	MP ELEV. (FT-MSL)	BASE OF ALLUVIUM (FT-LSD)	BASE OF ALLUVIUM (FT-MSL)		PERFORATIONS (FT-LSD)	SATURATED THICKNESS
EXISTING ALLUVIAL WELLS														
881	1542034	481478	96	4.5	8/25/2014	70.3	6494.74	2.0	6565.04	103	6460	A	76-96	34.74
882	1541404	482396	110	4.5	10/17/2014	58.14	6503.02	2.0	6561.16	95	6461.2	A	70-110	41.82
884	1542677	481498	90	5	2/25/2013	70.81	6495.29	1.0	6566.1	85	6480.2	A	58-88	15.09
886	1542327	482487	90	5	12/23/2014	63.22	6501.33	1.5	6564.55	87	6476.1	A	60-90	25.23
893	1541934	482244	98	4.5	8/26/2014	66.54	6497.43	2.1	6563.97	93	6468.9	A	78-98	25.5

3.2.1 Sulfate Concentrations

The sulfate concentration plot for wells 881, 882, 884, 886, and 893 is shown on Figure 3-8. Sulfate concentrations in wells 884 and 886 declined in 2007, but concentrations increased in levels that similar to those of surrounding wells in late 2010 and 2011. Sulfate concentrations have remained fairly steady in the other wells over the last five years.

Figure 4.3-1C in the Annual Performance Report (2015) shows the sulfate concentrations for the area surrounding the north pivot. None of the concentrations in the vicinity of the pivot were above the site standard of 1500 mg/l.

3.2.2 TDS Concentrations

Figure 3-9 shows a decline in TDS concentrations in wells 881, 882, 884, and 886 in 2015. Concentrations in well 893 remained steady in that time. Figure 4.3-19C in the Annual Performance Report shows no wells exceeding the 2734 mg/l site standard for TDS.

3.2.3 Chloride Concentrations

Aside from well 884, the chloride concentrations have remained fairly steady in the Section 28 area wells (see Figure 3-10). The chloride concentrations in the fresh water injection supply increased from 60 to 150 mg/l in 2012 due to switching from well 951 to well 951R. Figure 4.3-36C in the Annual Performance Report presents the chloride concentrations for the North Off-Site Area. No wells in the vicinity of the pivot exceeded the site standard of 250 mg/l for chloride.

3.2.4 Uranium Concentrations

Figure 3-11 shows the decrease in uranium concentrations that has been observed in monitoring wells 881 and 886. An increase in uranium concentrations has been observed in well 893 while concentrations in wells 882 and 884 have remained fairly steady over the last two years. The uranium concentrations for 2014 are presented in Figure 4.3-53C for the North Off-Site Area. The green hatching shows the area that exceeds the site standard of 0.16 mg/l. Because the uranium concentration in alluvial ground water in the Section 28 area has been impacted by tailings seepage, any contribution by the irrigation program is obscured and is likely insignificant.

3.2.5 Selenium Concentrations

Figure 3-12 presents the selenium concentration time plot for the Section 28 monitoring wells. This plot shows a decline in the selenium concentrations in wells 884 and 886. Selenium concentrations in wells 882 and 893 are presently fairly similar to those observed prior to the start of the irrigation. Figure 4.3-70C in the Annual Performance Report (2015) shows none of the wells in the area are above the site standard of 0.32 mg/l.

3.2.6 Molybdenum Concentrations

Figure 3-13 shows that these molybdenum concentrations have been small in the past with a small increase in wells 881 and 886. These small molybdenum concentrations in Section 28 are likely from the movement of alluvial water from Section 27 into this area. Figure 4.3-87C of the Annual Performance Report (2015) shows the molybdenum concentrations in 2014 don't exceed 0.1 mg/l in the pivot area.

3.2.7 Nitrate Concentrations

Figure 3-14 presents the nitrate concentrations with time and shows a decrease in concentrations for wells 881, 884, 886, and 893. Figure 4.3-104 from the Annual Performance Report (2015) shows that no wells were above the site standard of 12 mg/l in 2014.

3.3 Section 33

Irrigation in Section 33 consisted of the 150 acre center pivot and 24 acres of flood irrigation. The Section 33 pivot and the Section 33 flood area overlie the alluvial aquifer. The 24 acre flood area is typically included in the Section 34 analysis because the soil properties in the Section 33 flood area are similar to those in the Section 34 flood area. However, the ground-water evaluation for the Section 33 flood is included in the Section 33 ground-water evaluation. Figure 2-1 shows the location of the 3 monitoring wells; 551, 553 and 554. These wells were added in 2009 to further define the ground-water concentrations in this area. Wells 551, 553, 554, 649, and 658 are used in evaluating the ground-water concentrations adjacent to the 150 acre center pivot while alluvial well 650 is used to monitor the Section 33 flood area (see Table 3-3 for well completion information).

Table 3-3. Section 33 Monitoring Well Data

WELL NAME	NORTH. COORD.	EAST COORD.	WELL DEPTH (FT-MSP)	CASING DIAM. (IN)	WATER LEVEL DATE	WATER LEVEL DEPTH (FT-MP)	WATER LEVEL ELEV. (FT-MSL)	MP ABOVE LSD (FT)	MP ELEV. (FT-MSL)	BASE OF ALLUVIUM (FT-LSD)	BASE OF ALLUVIUM (FT-MSL)		PERFORATIONS (FT-LSD)	SATURATED THICKNESS
EXISTING ALLUVIAL WELLS														
551	1536280	4798001	130	5	8/27/2014	95.2	6452.1	2	6547.3	120	6433	A	90-130	19.1
553	1534840	480510	120	5	8/25/2014	103.48	6444	2	6547.48	110	6433	A	80-120	11
554	1534840	479110	140	5	2/13/2014	104.71	6442.46	2	6547.17	130	6411	A	100-140	31.46
649	1534730	479798	124	4.5	4/1/2014	102.1	6441.19	0.3	6543.29	115	6428	A	84-124	13.19
650	1536779	482135	109	4.5	9/3/2014	87.35	6459.76	2.2	6547.11	103	6441.9	A	89-109	17.86
658	1535922	478436	130	6	8/25/2014	102.78	6447.4	0.4	6550.18	129	6420.8	A	89-130	26.6

3.3.1 Sulfate Concentrations

Figure 3-15 shows the sulfate concentrations for alluvial wells 551, 553, 554, 649, 650, and 658. All of the wells aside from the most recent sample from well 551 have shown a very gradual increase in concentrations since 2011. It is difficult to determine whether any increase in sulfate concentrations has occurred due to the Section 33 irrigation. A very small increase in sulfate concentration could result from the Section 33 irrigation, but it could also result from migration of the slightly higher sulfate concentrations that exist to the northwest in the alluvial aquifer, or from the shifting of higher concentrations to the west in Section 33.

Figure 4.3-1 in the Annual Performance Report (2015) shows the sulfate concentrations around the south pivot area for 2014.

3.3.2 TDS Concentrations

Figure 3-16 presents the TDS concentrations for wells 551, 553, 554, 649, 650, and 658. The TDS concentrations show a very similar trend as the sulfate concentrations with a gradual increase since 2011. This very small increase could possibly be showing an effect on TDS in the alluvial aquifer from the Section 33 center pivot, but it could also easily result from movement of the slightly higher concentrations from the north or the westerly movement of ground water. Therefore, it is difficult to determine from the TDS concentrations whether the Section 33 irrigation has had a measurable impact on the ground-water quality in this area.

The TDS concentrations have been monitored in Section 33 since 1997 when the original monitoring wells were drilled. Figure 4.3-19 in the Annual Performance Report presents the TDS concentrations for 2014.

3.3.3 Chloride Concentrations

Figure 3-17 presents the chloride concentrations for the monitoring wells in the Section 33 area. This figure shows fairly steady chloride concentrations prior to 2009, with a small increase in chloride concentrations over the last few years in all of the wells with the exception of the most recent sample in well 551. A small decrease was observed in 2010 and 2011 in well 658, but this was followed by a return to the slight increasing trend. It is difficult to determine whether the changes in the chloride concentrations in the alluvial aquifer in the area of Section 33 center pivot are due to the operation of the center pivot. The higher chloride concentrations in well 551 likely represent the small increase due to the Section 33 center pivot irrigation. The chloride concentrations in alluvial well 650 could possibly be showing the effects on the ground water from the Section 33 flood irrigation but the value is well within natural range of this constituent. The alluvial chloride concentrations are presented in Figure 4.3-36 for 2014.

3.3.4 Uranium Concentrations

Figure 3-18 presents the uranium concentrations versus time for the Section 33 alluvial wells. This plot shows that the uranium concentrations for the ten years during the operation of the Section 33 center pivot and six years after ceasing irrigation have been relatively steady. The observed uranium concentrations do not indicate any measurable effect on the ground-water quality that is attributable to the Section 33 center pivot irrigation. The small and steady concentrations from alluvial well 650 do not indicate any effects from the Section 33 flood system.

Figure 4.3-53 of the Annual Performance Report presents the 2014 uranium concentrations for the alluvial aquifer in the Section 33 area. A decrease in the area of significant uranium concentrations has occurred in the Section 33 center pivot irrigation area from 1999 to 2013.

3.3.5 Selenium Concentrations

Figure 3-19 presents the selenium concentrations for the Section 33 monitoring wells. Selenium concentrations in the Section 33 monitoring wells have varied from 0.02 to 0.05 mg/l over this period of time with no consistent trends. These selenium concentration changes are not significant enough to determine if the Section 33 irrigation has had any effect on the selenium concentrations in the alluvial aquifer. The 2014 selenium concentrations are presented in Figure 4.3-70 in the Annual Performance Report.

3.3.6 Molybdenum Concentrations

Figure 3-20 shows the molybdenum concentrations with time and that no effects on molybdenum concentrations have been observed from the Section 33 irrigation. The molybdenum concentrations for 2014 are presented in Figure 4.3-87 of the Annual Performance Report with all but one of the molybdenum concentrations less than the detection limit of 0.03 mg/l. Well 554 had a value at the detection limit in 2014. Molybdenum concentrations in all other samples from this well have been below that detection limit.

3.3.7 Nitrate Concentrations

Figure 3-21 presents the nitrate concentrations with time and shows that the nitrate concentrations generally have been fairly steady except for a very gradual increase over the last five years. These nitrate concentrations do not indicate any significant impacts on alluvial nitrate concentrations as a result of the Section 33 irrigation.

The nitrate concentrations for 2014 are presented in Figure 4.3-104 in the Annual Performance Report. The highest measured concentration in 2014 in this area was 5.6 mg/l from well 650.

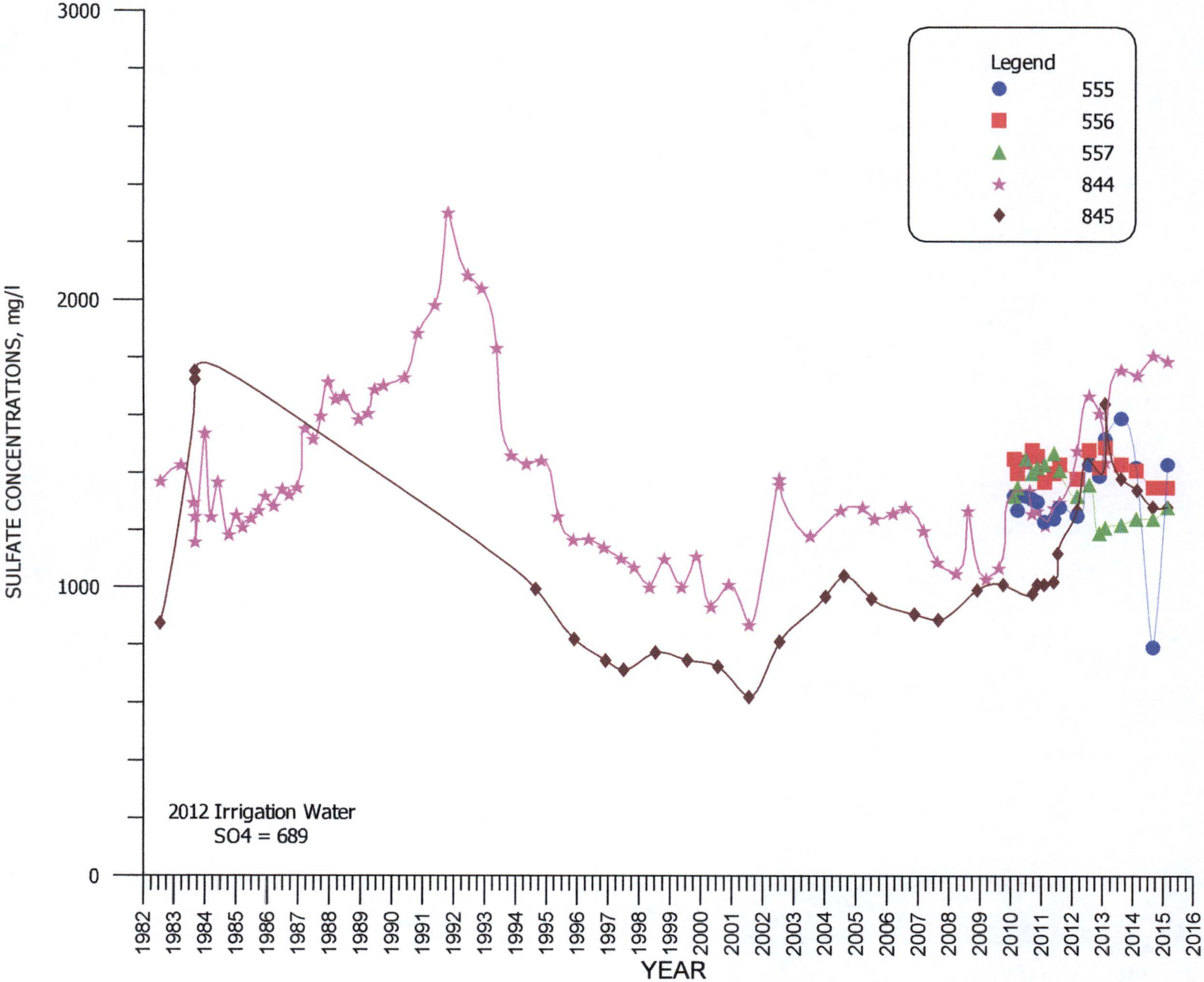

FIGURE 3-1. SULFATE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, and 845.

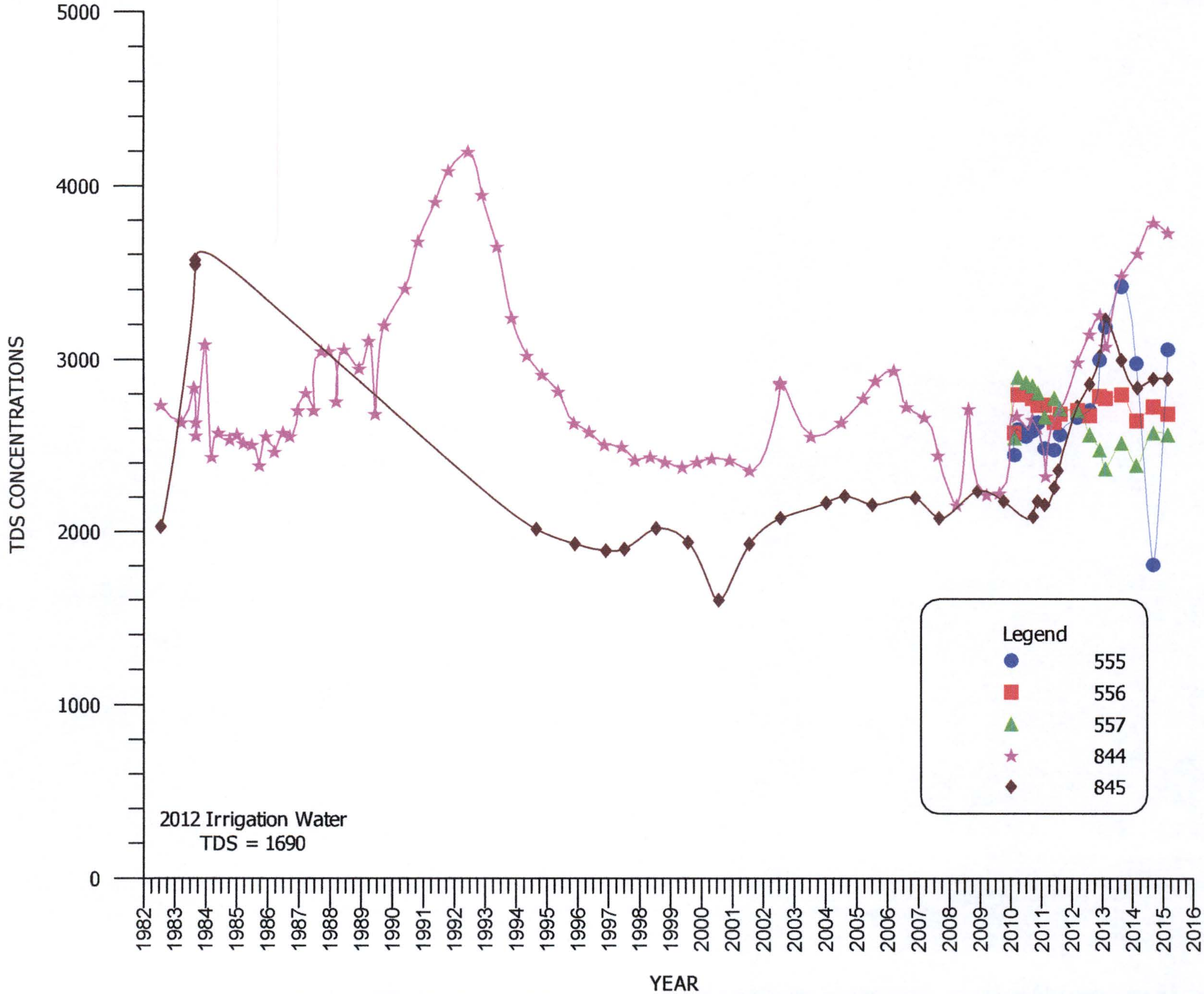

FIGURE 3-2. TDS CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

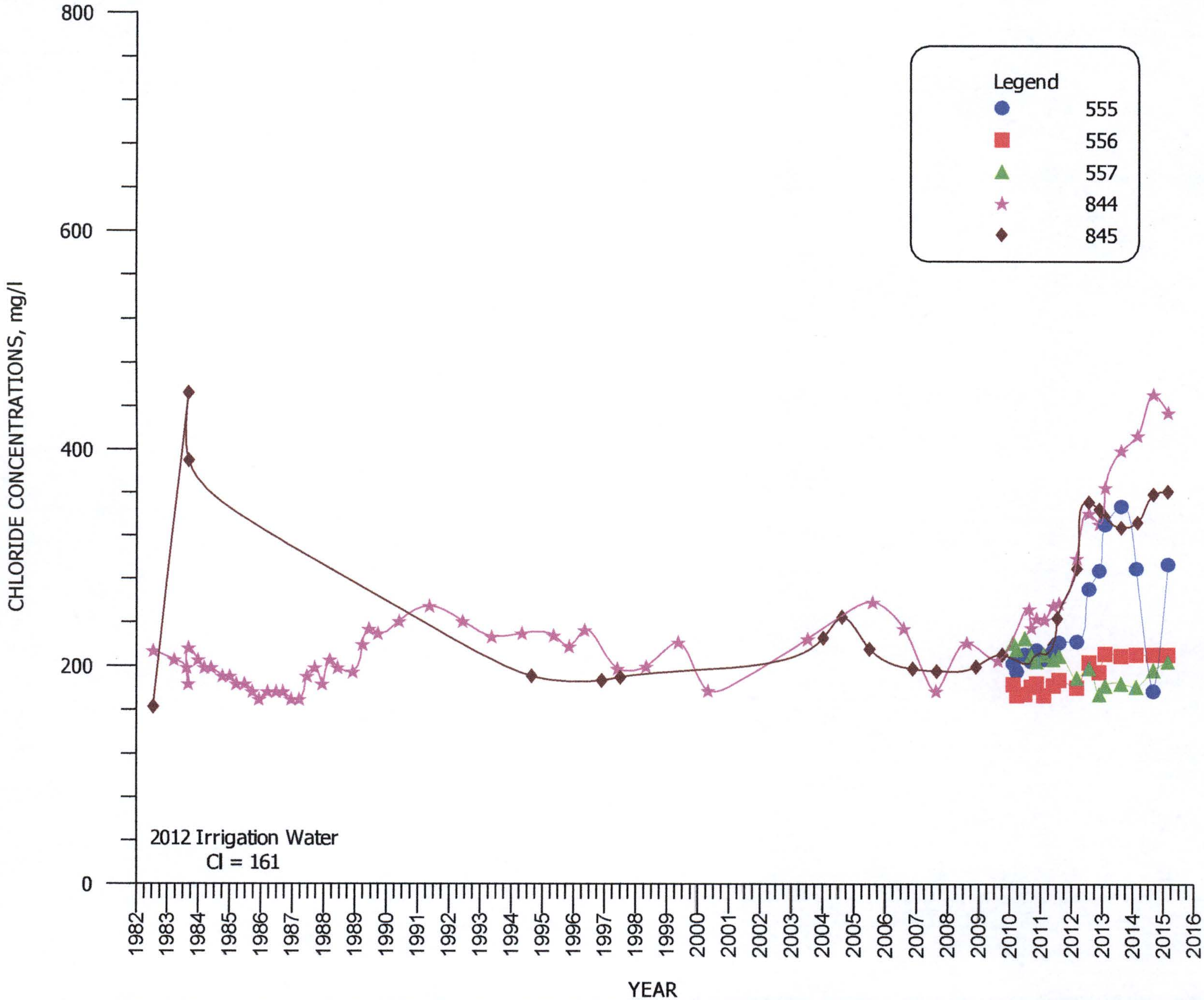

FIGURE 3-3. CHLORIDE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

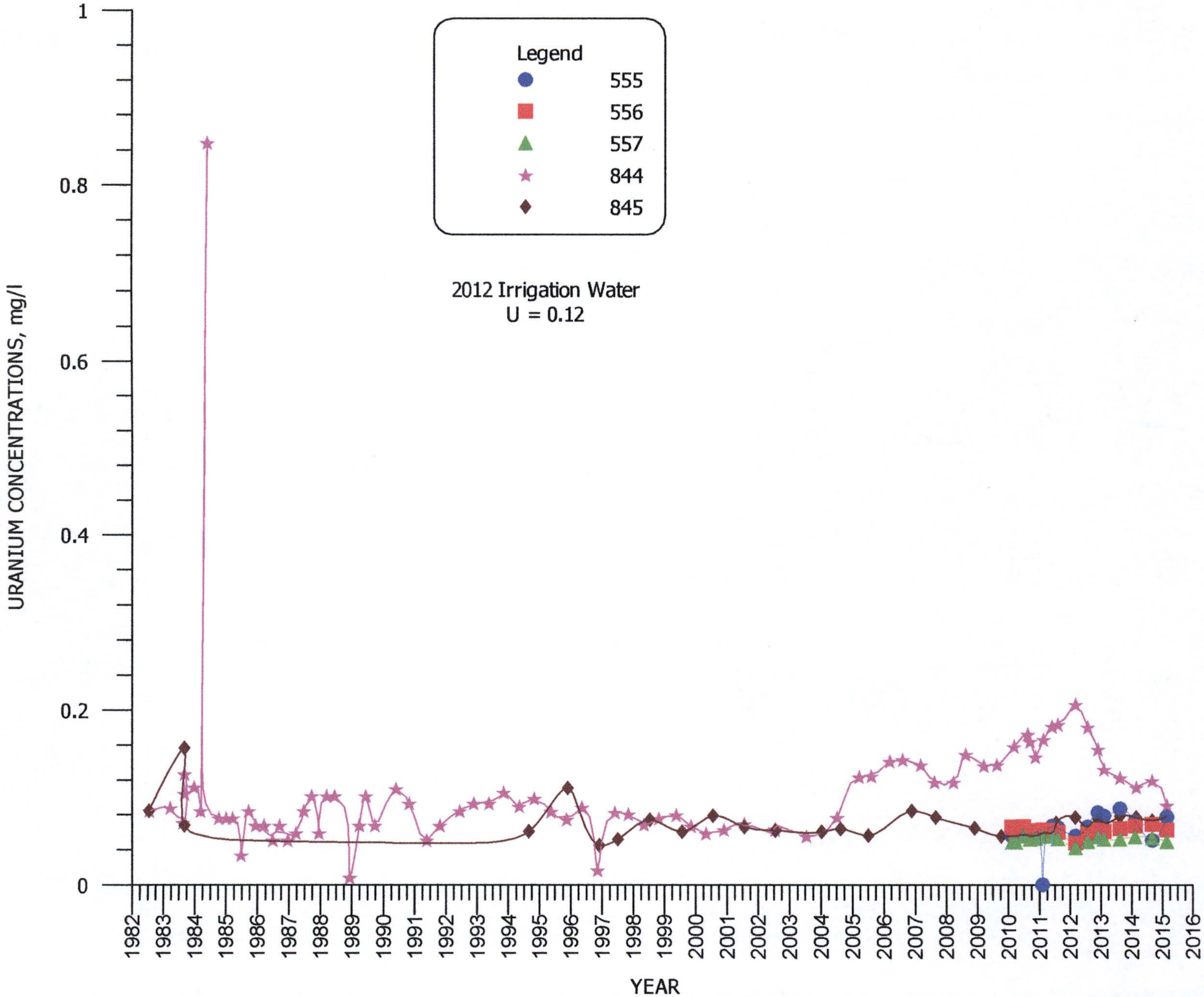

FIGURE 3-4. URANIUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

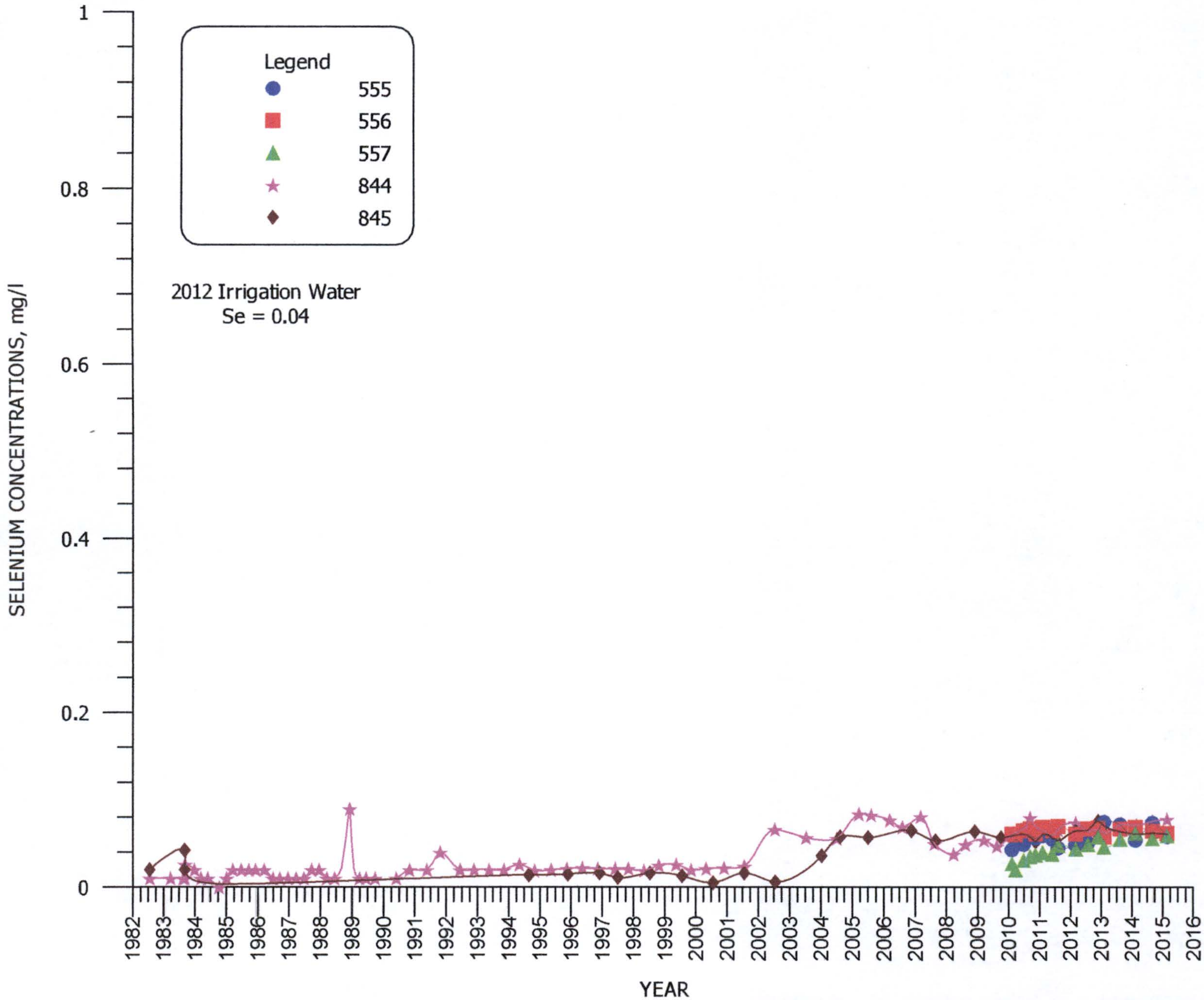

FIGURE 3-5. SELENIUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

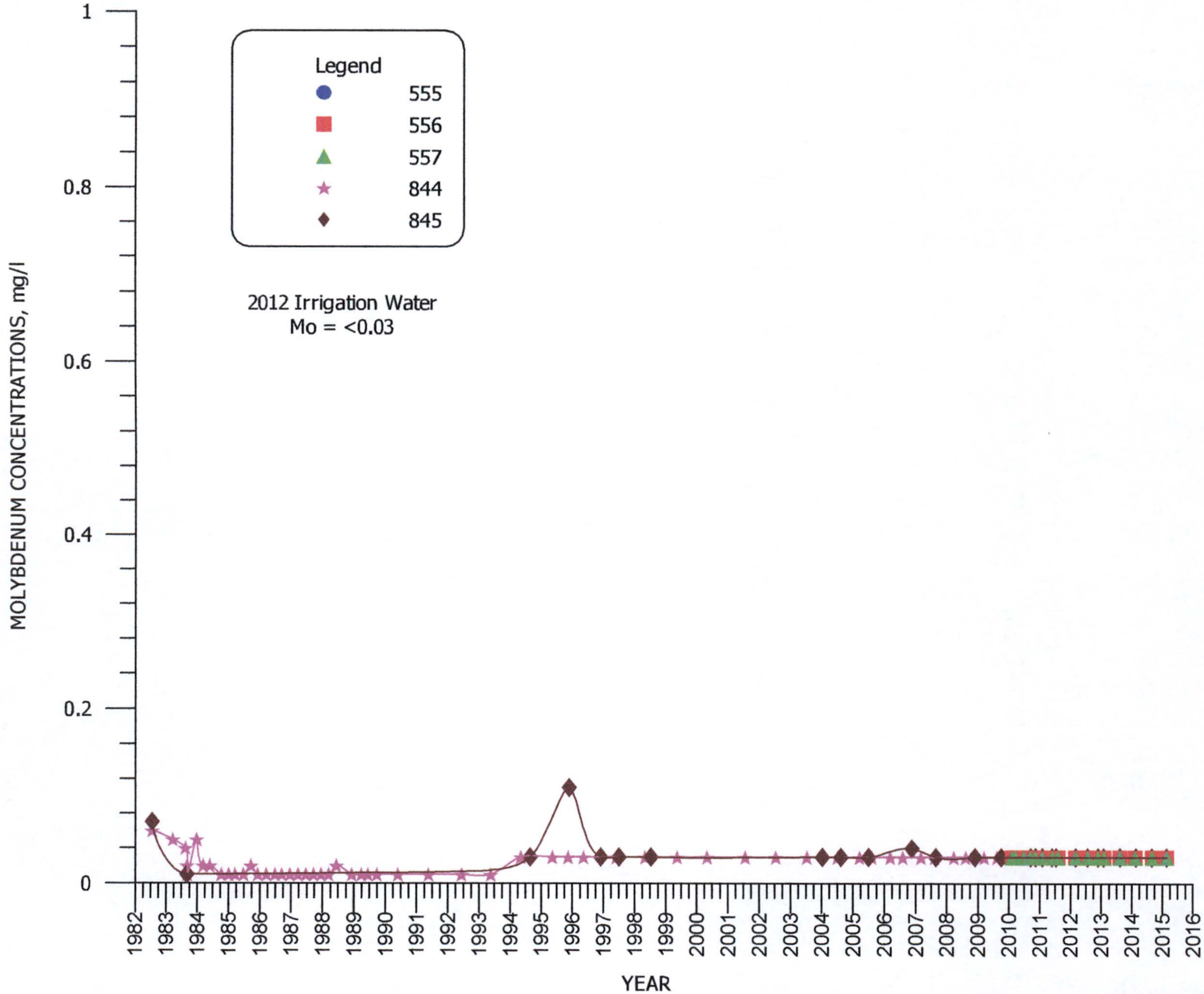

FIGURE 3-6. MOLYBDENUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

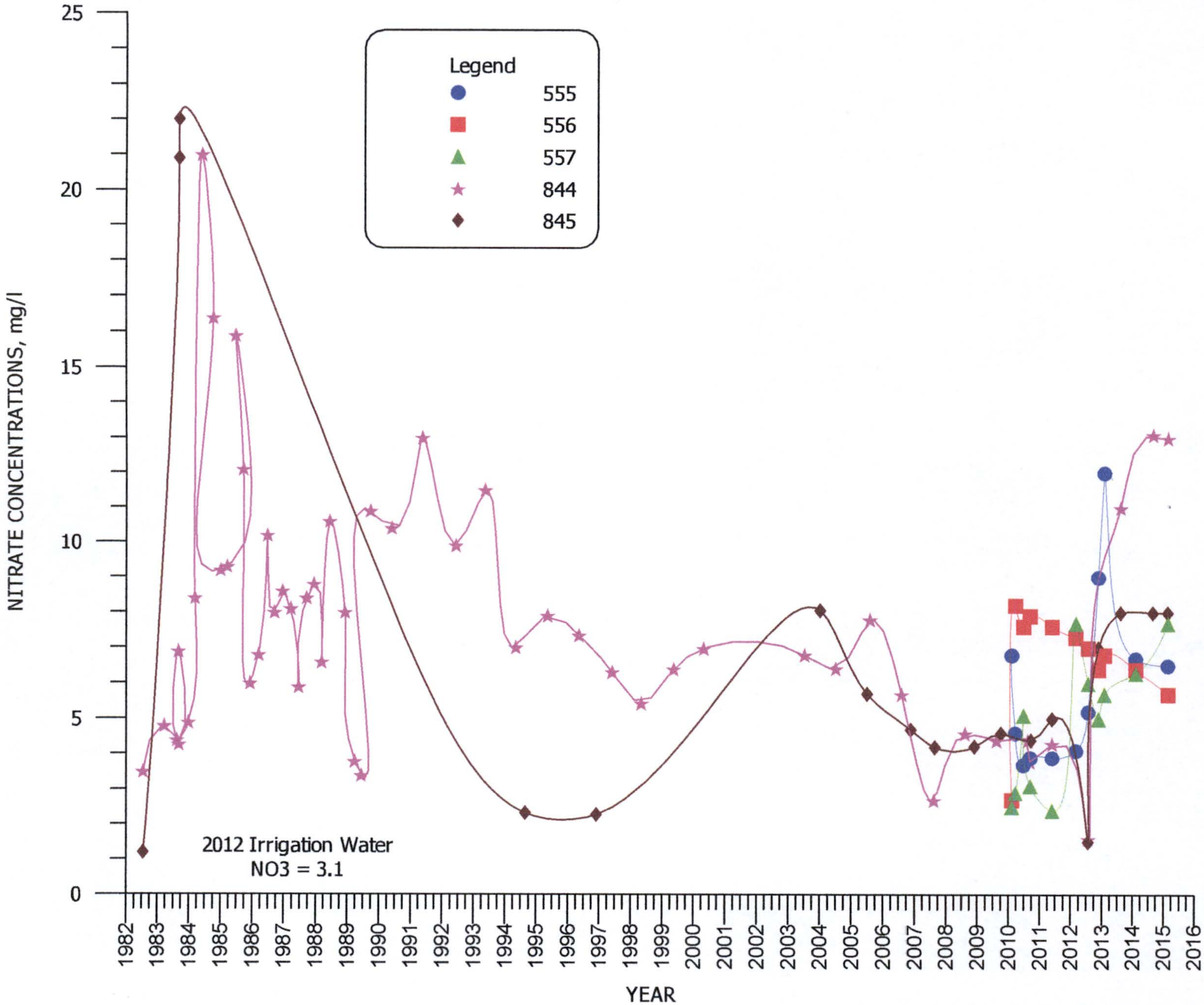

FIGURE 3-7. NITRATE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, AND 845.

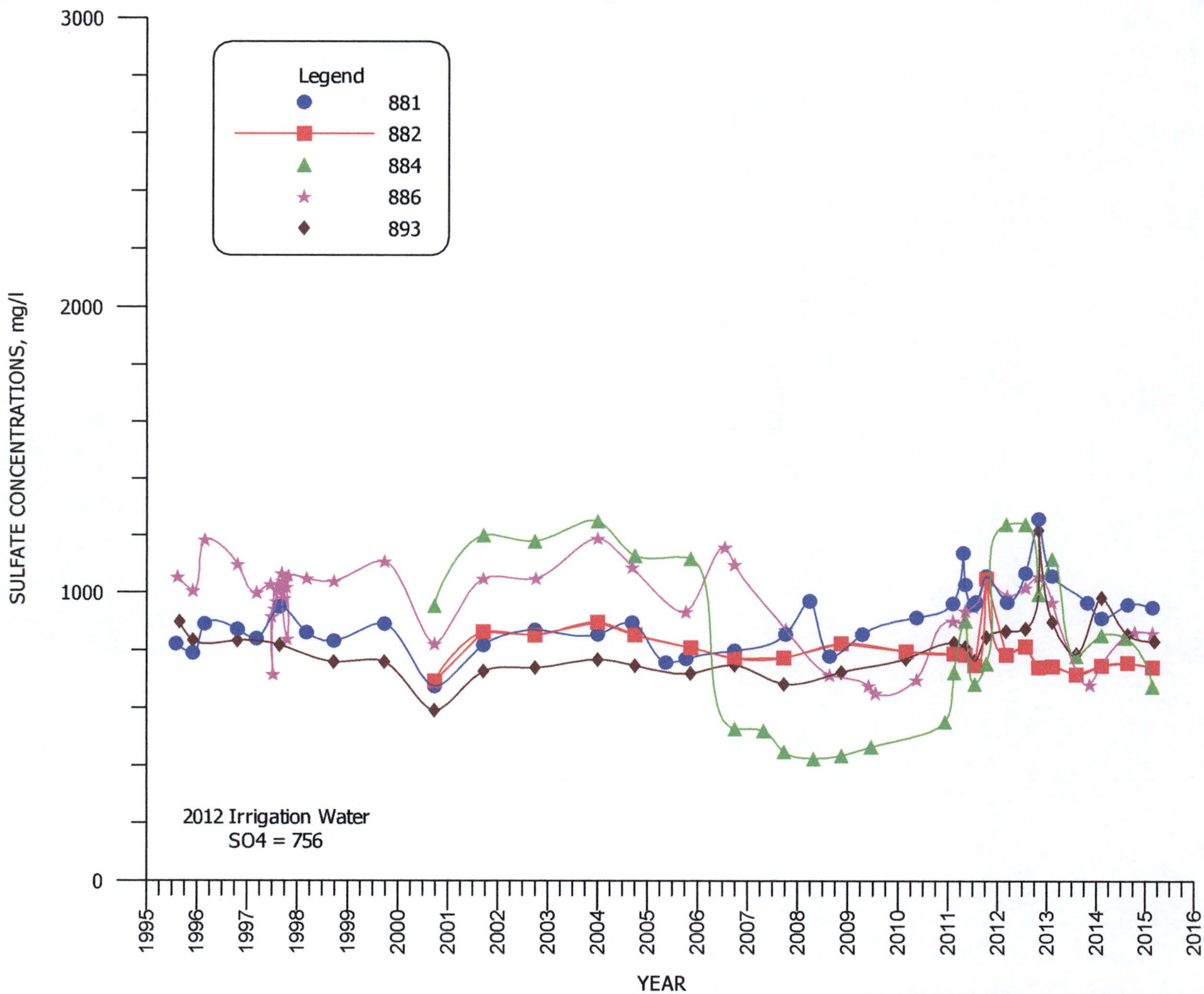

FIGURE 3-8. SULFATE CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

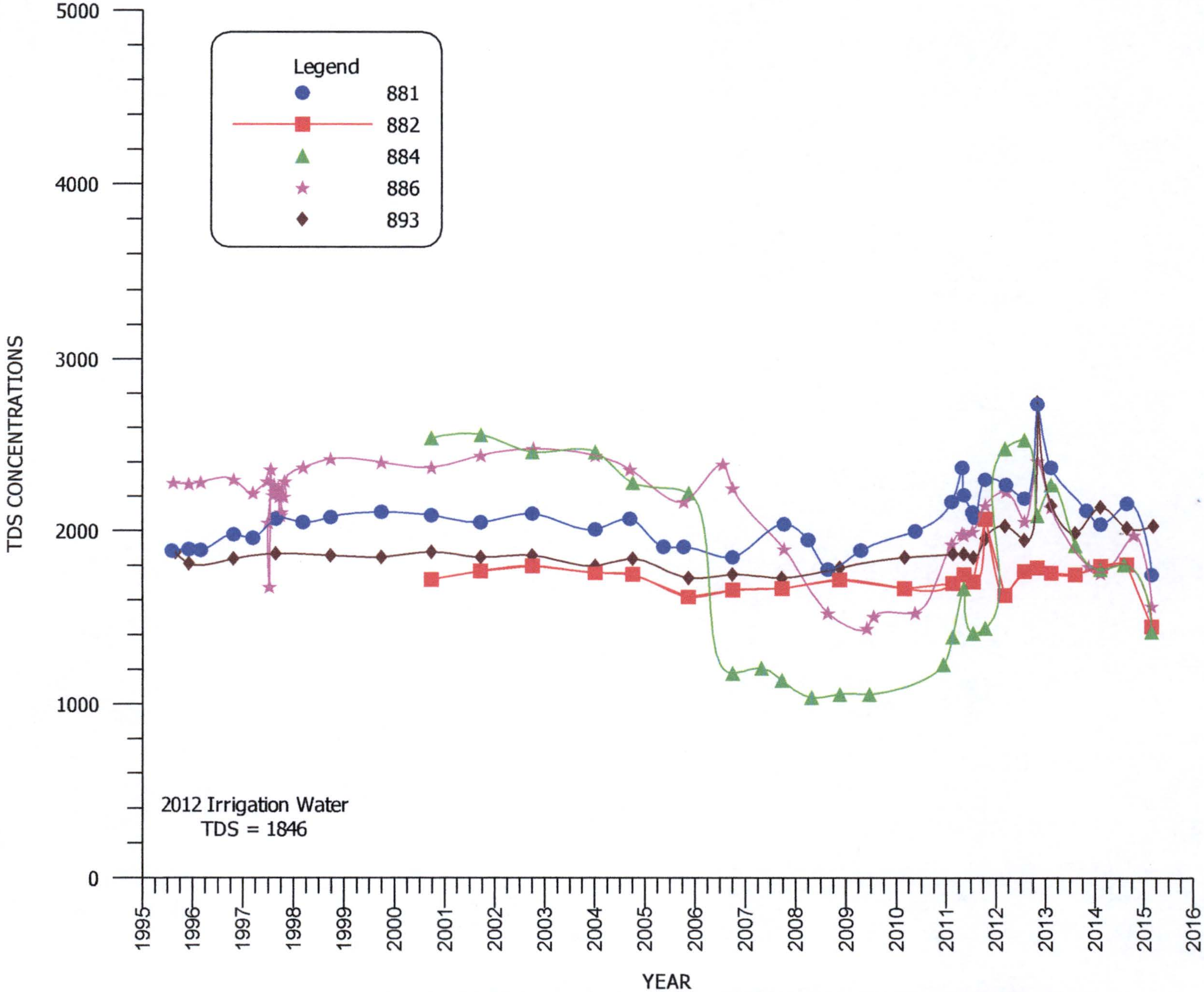

FIGURE 3-9. TDS CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

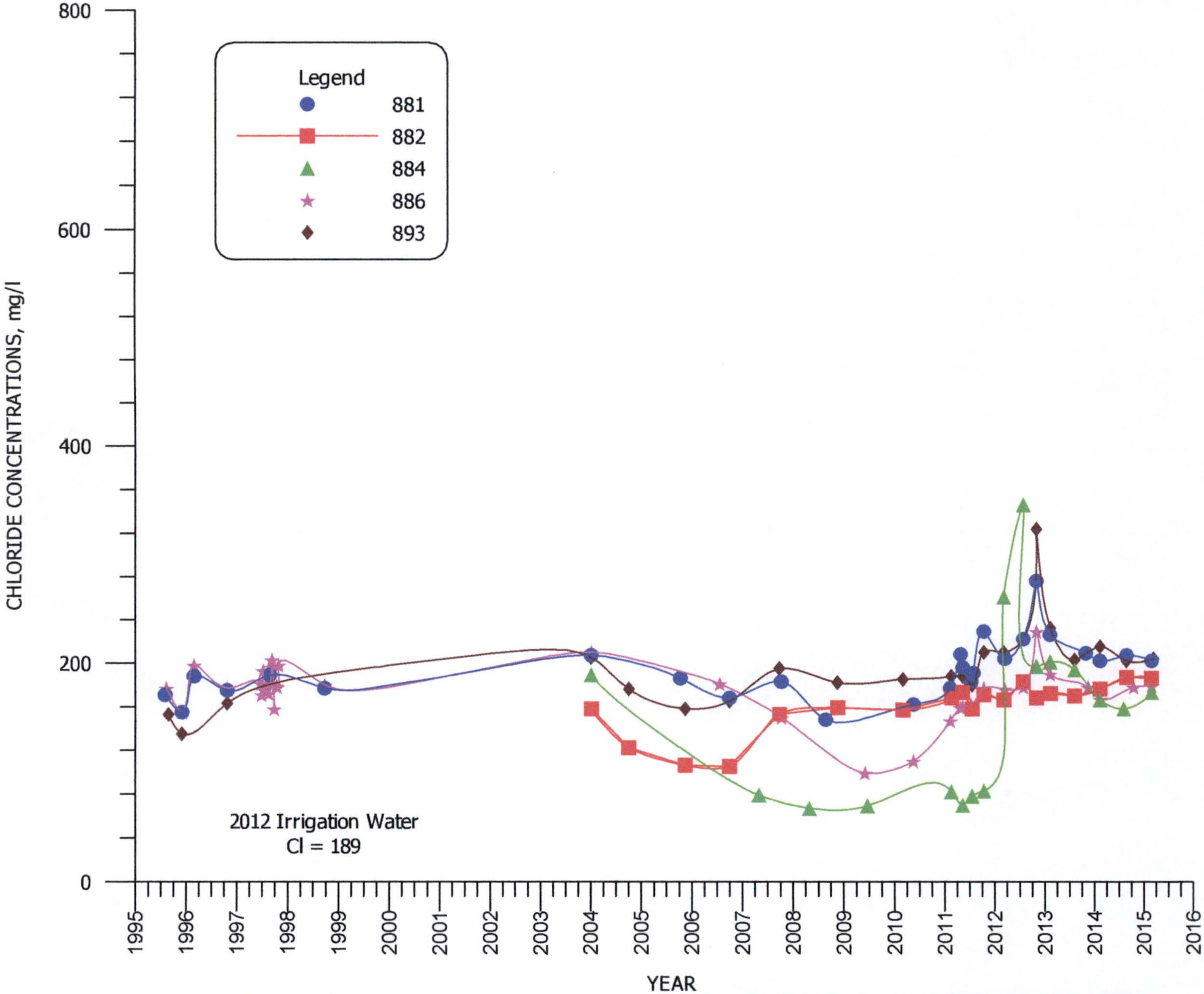

FIGURE 3-10. CHLORIDE CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

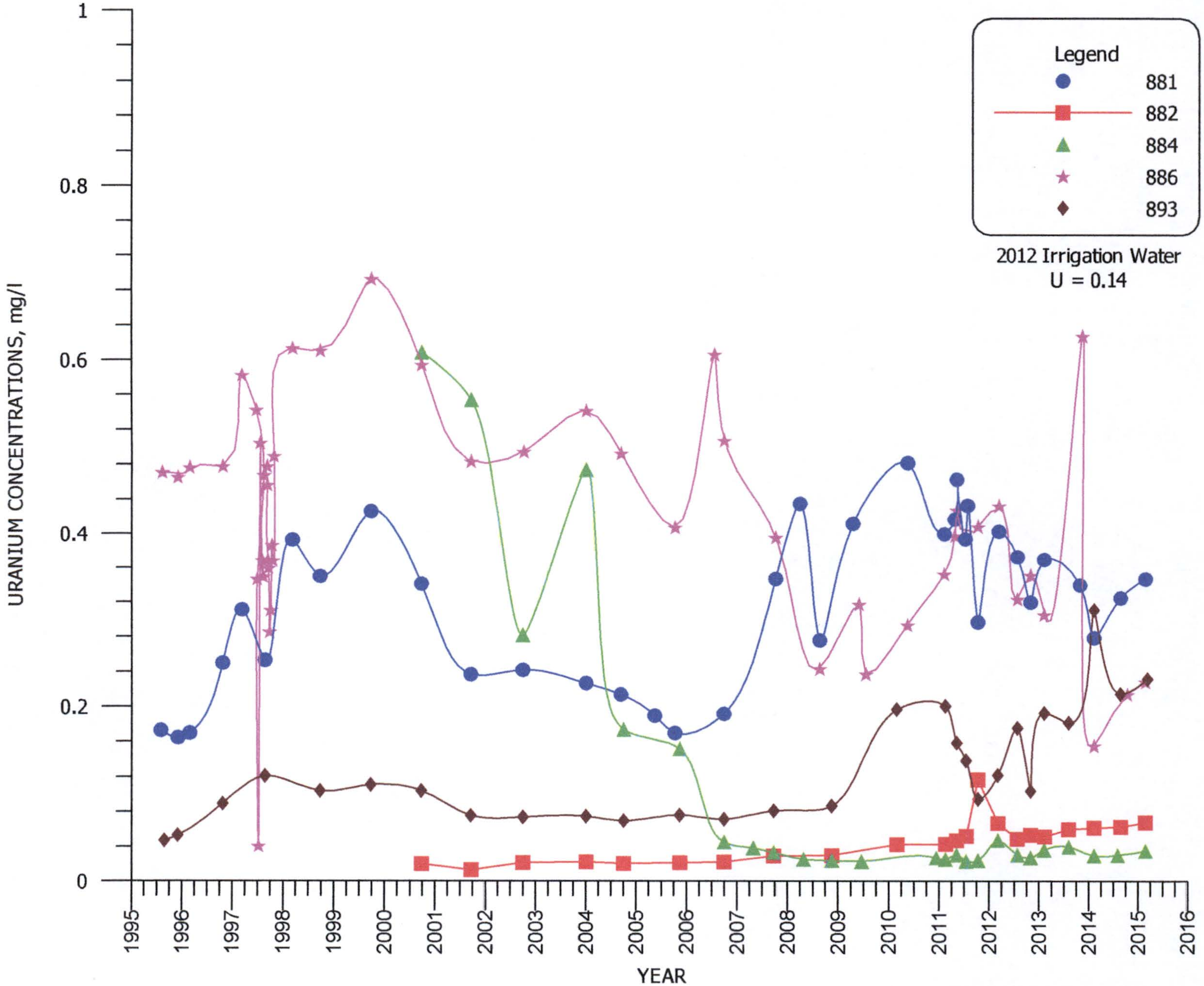

FIGURE 3-11. URANIUM CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

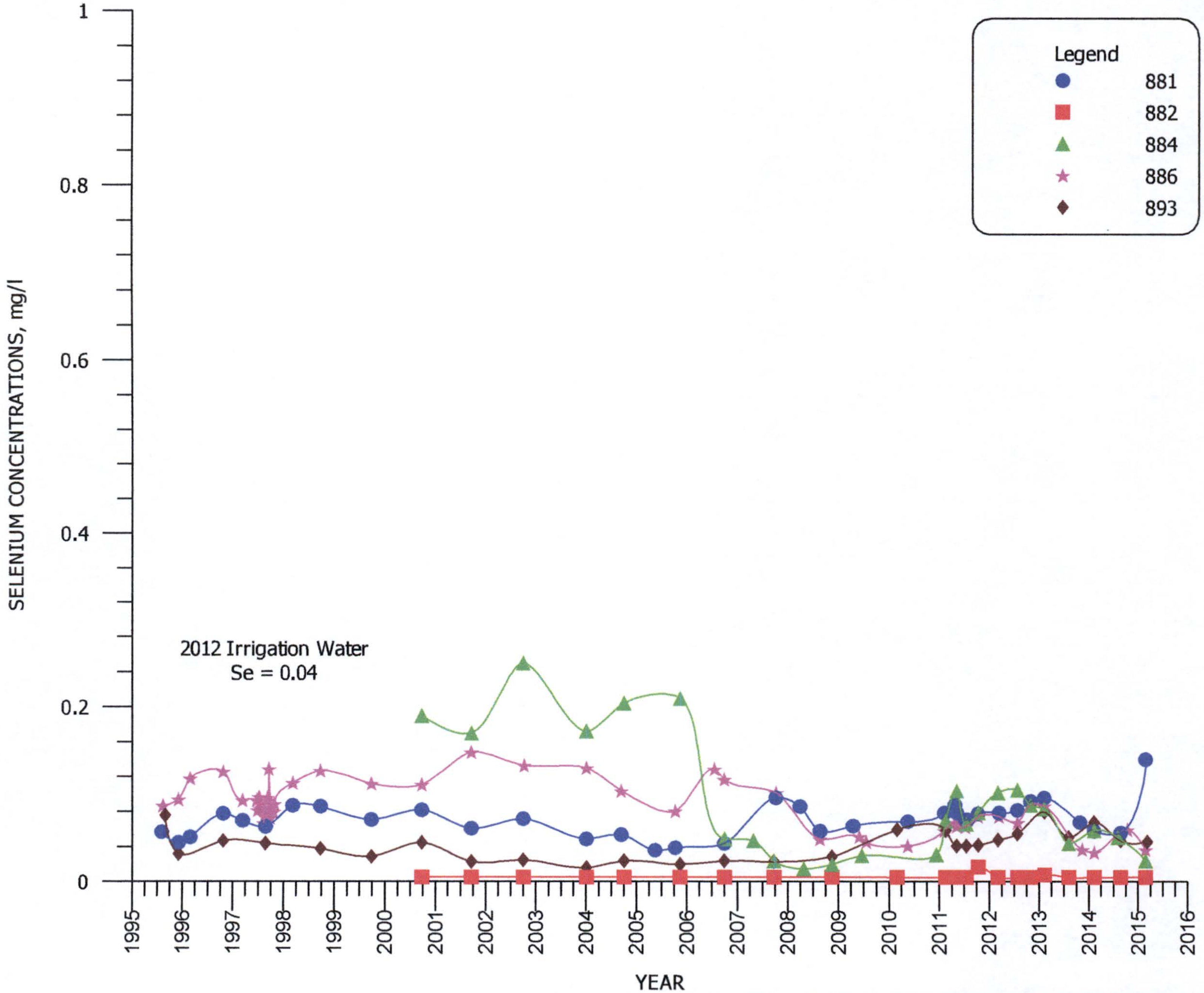

FIGURE 3-12. SELENIUM CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

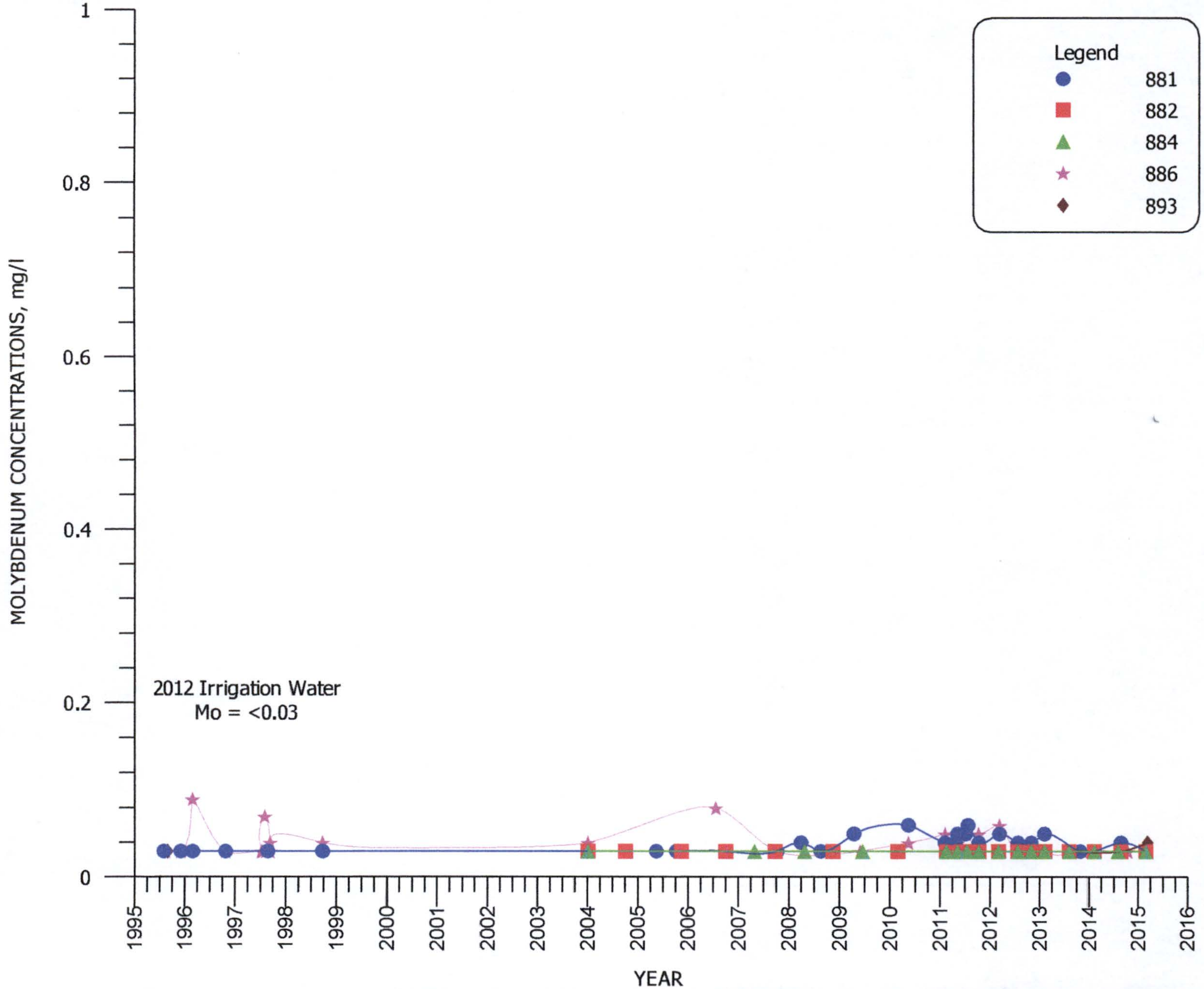

FIGURE 3-13. MOLYBDENUM CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

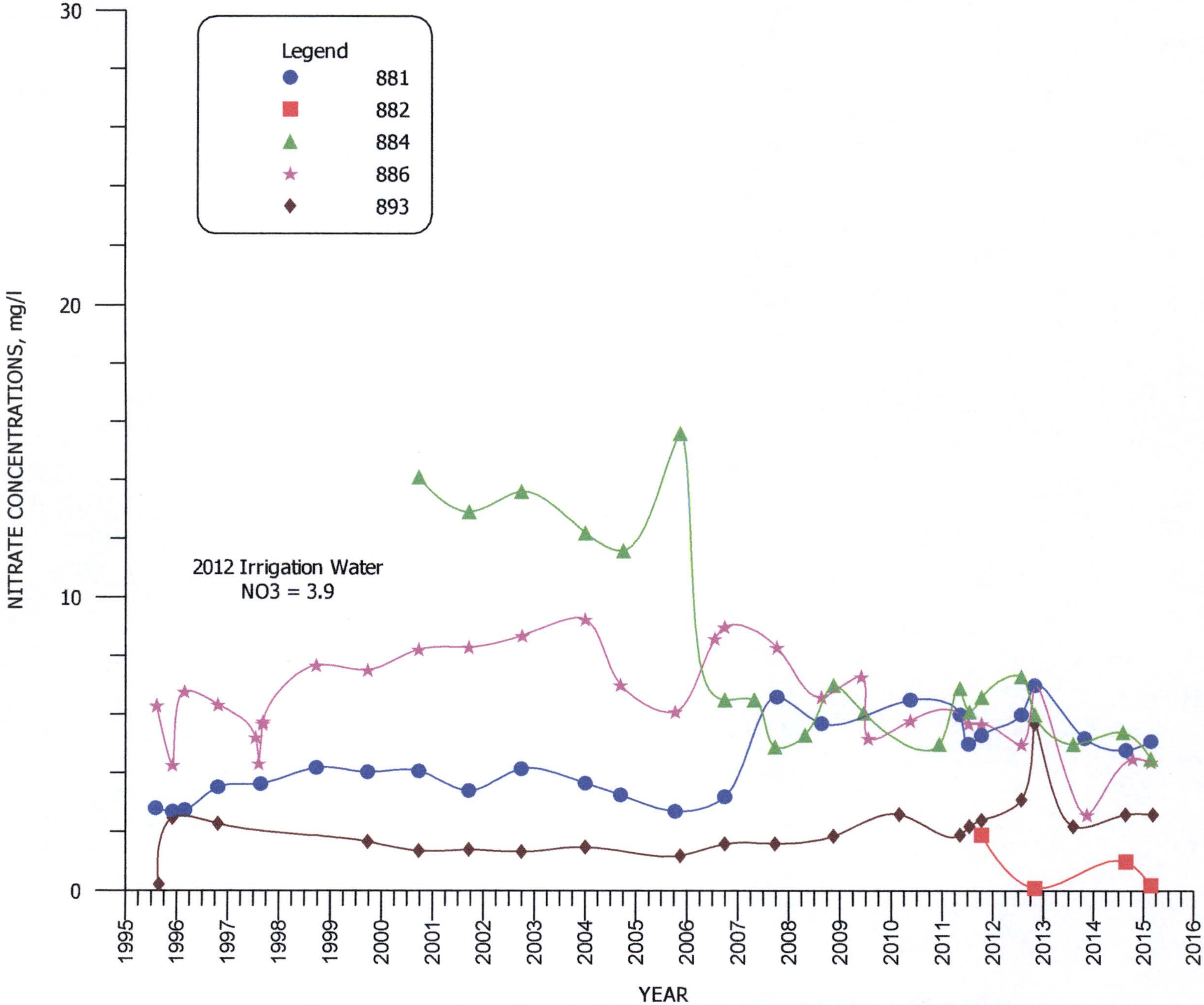

FIGURE 3-14. NITRATE CONCENTRATIONS FOR WELLS 881, 882, 884, 886, AND 893.

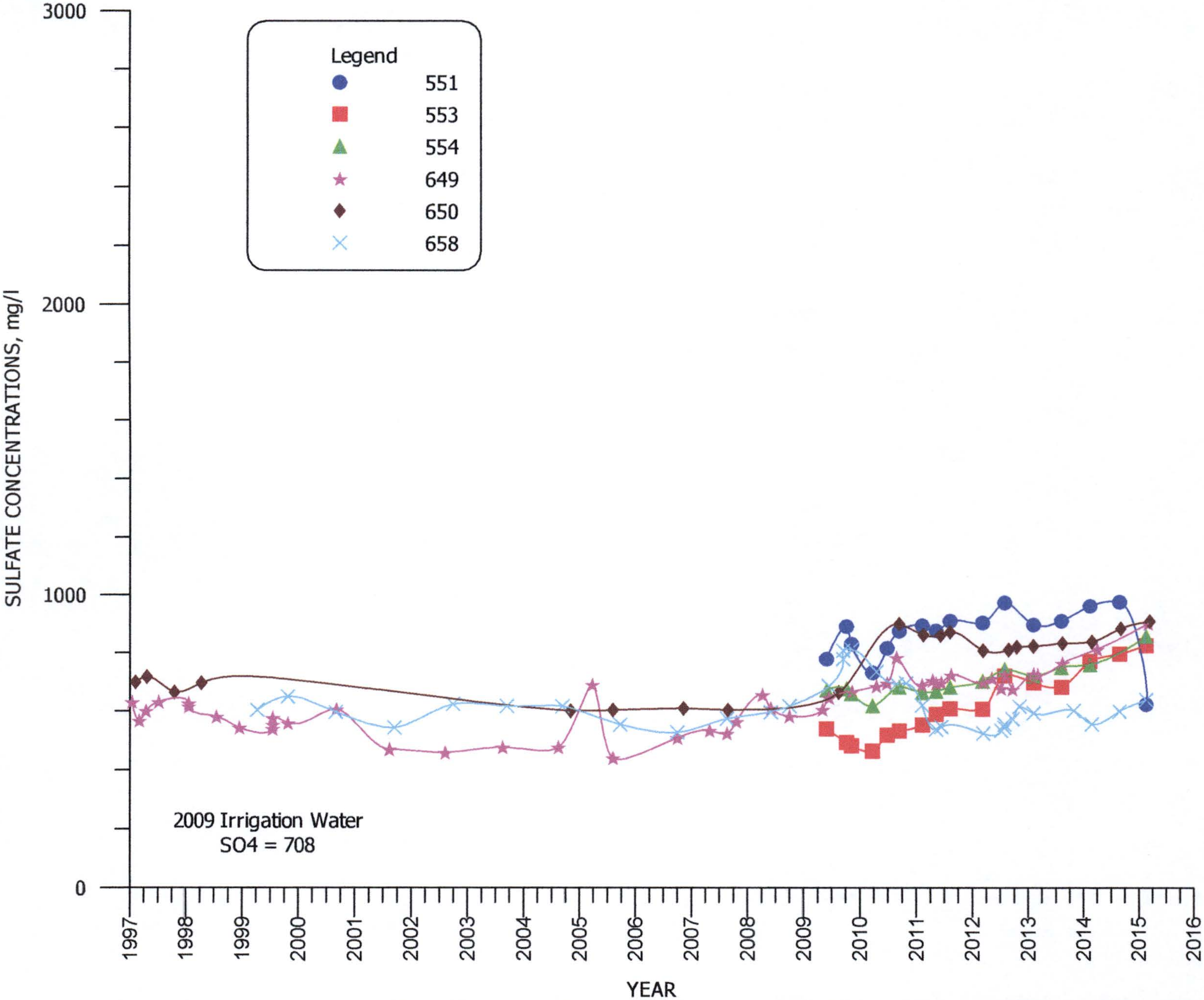

FIGURE 3-15. SULFATE CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

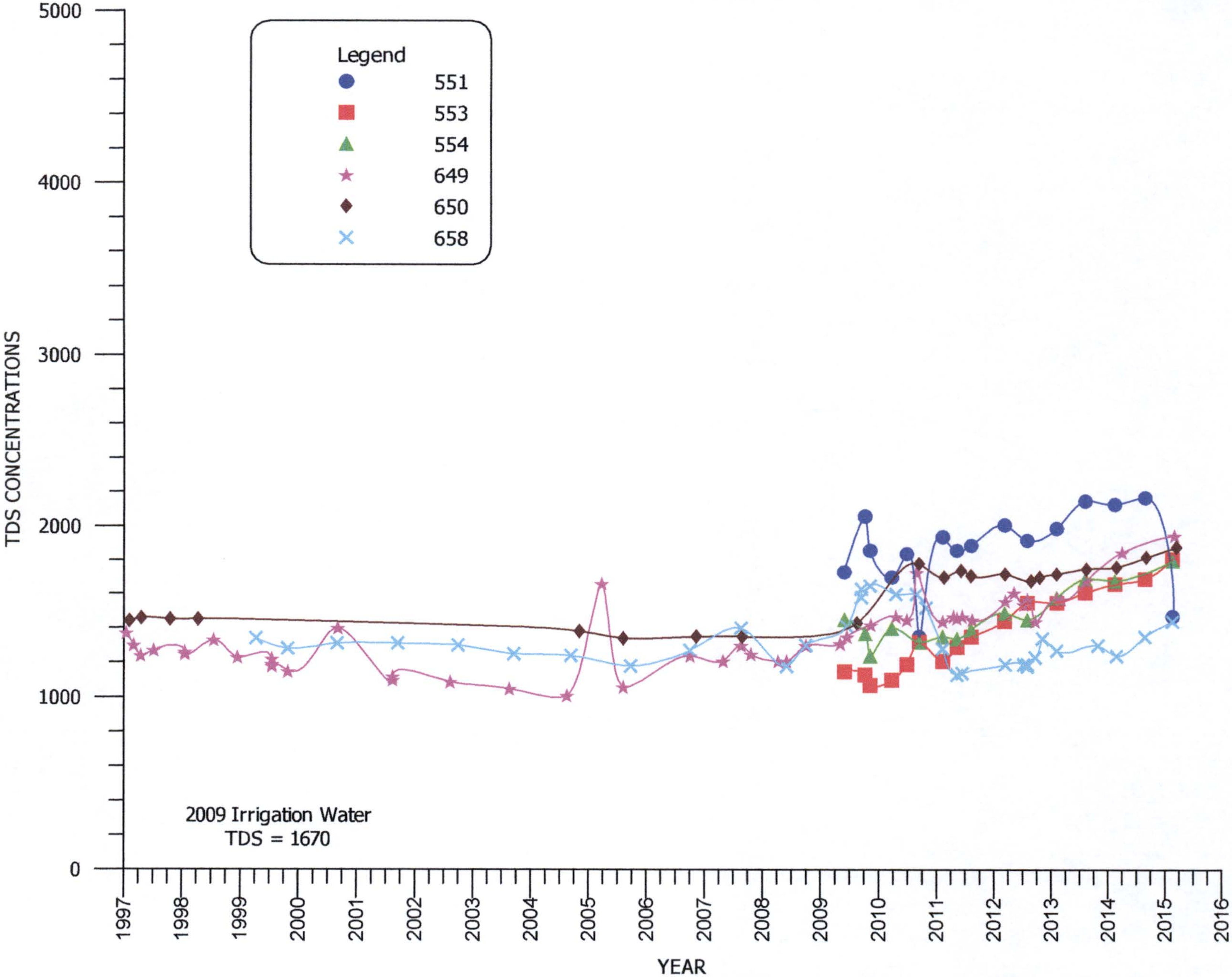

FIGURE 3-16. TDS CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

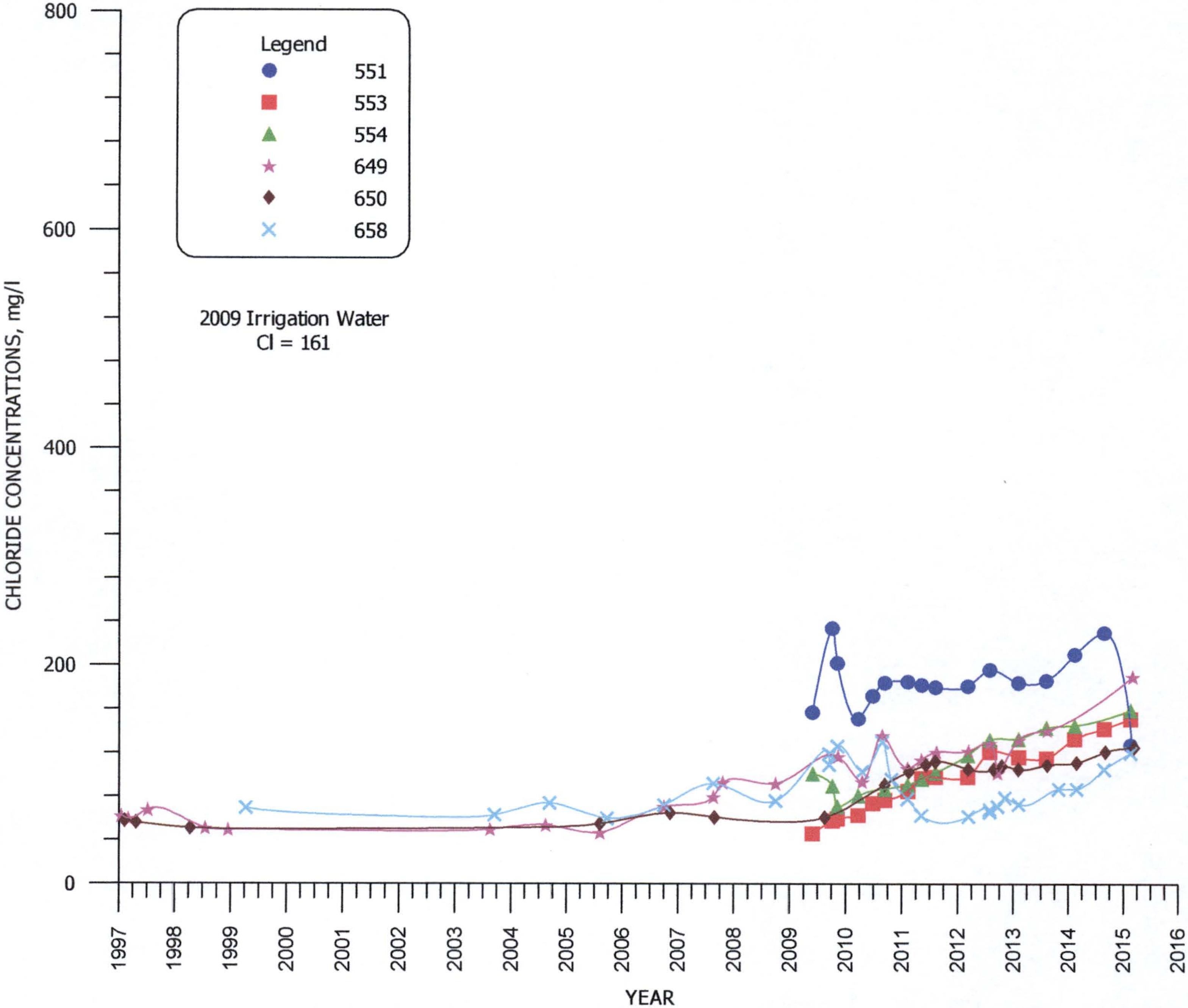

FIGURE 3-17. CHLORIDE CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

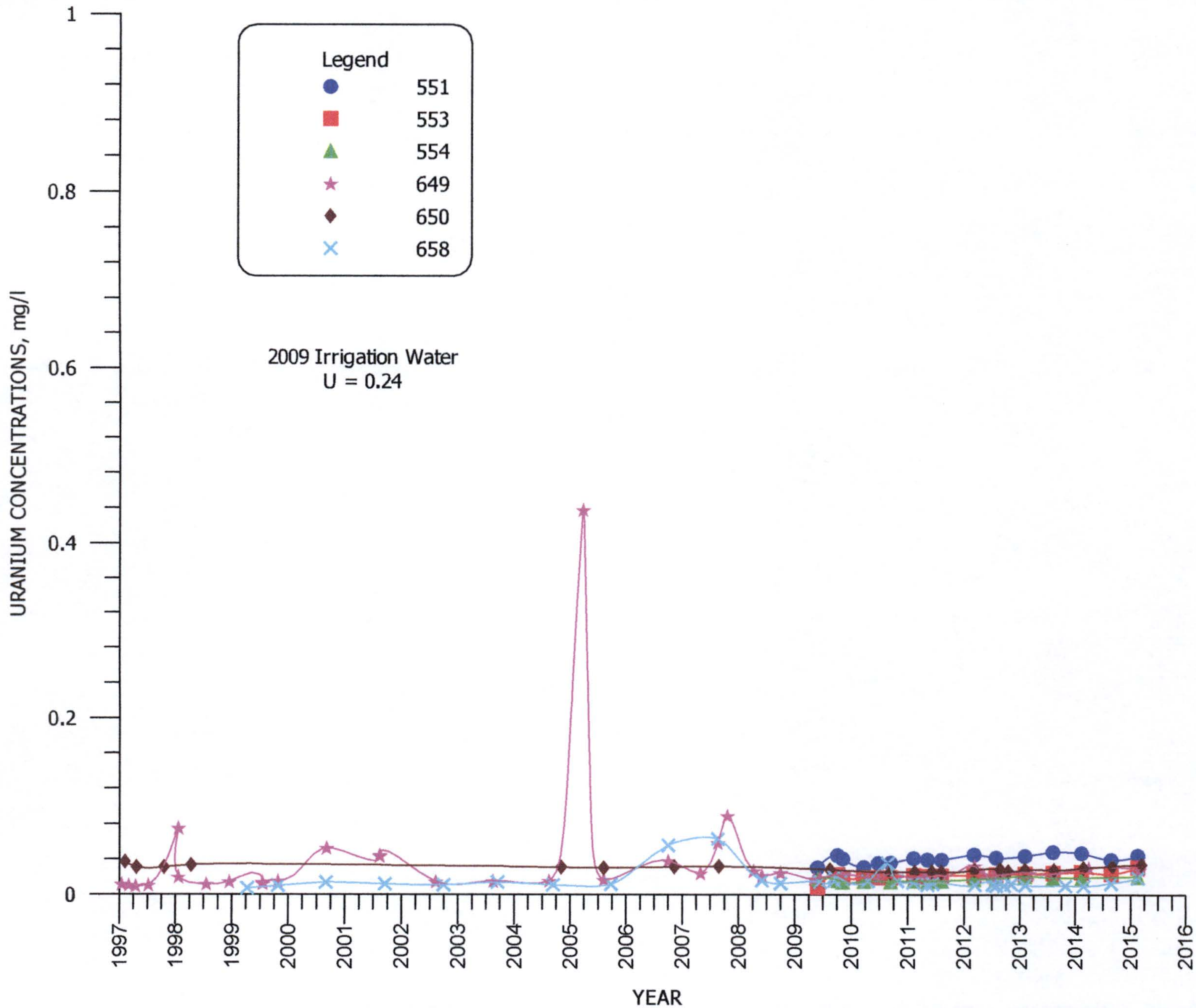

FIGURE 3-18. URANIUM CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

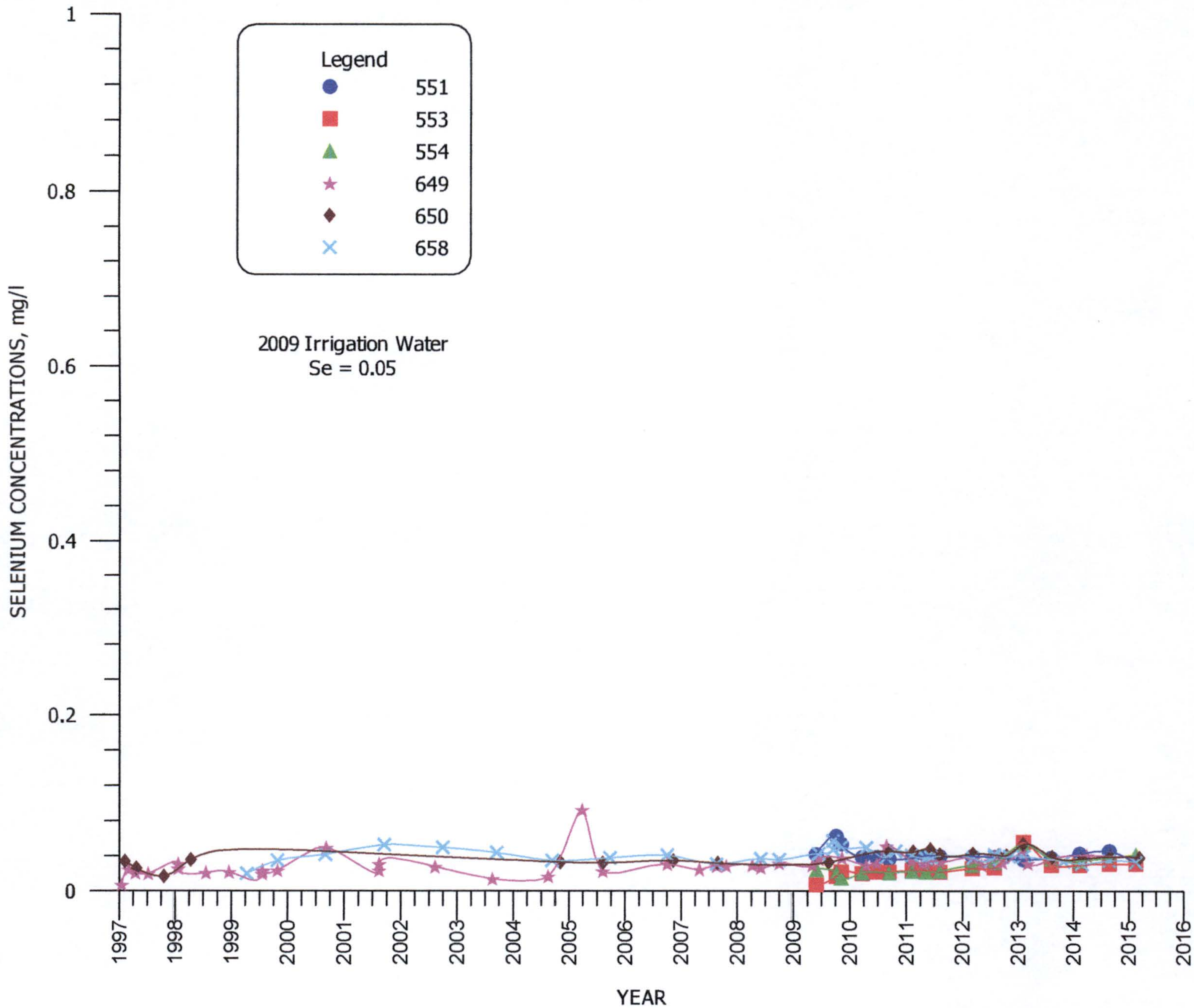

FIGURE 3-19. SELENIUM CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

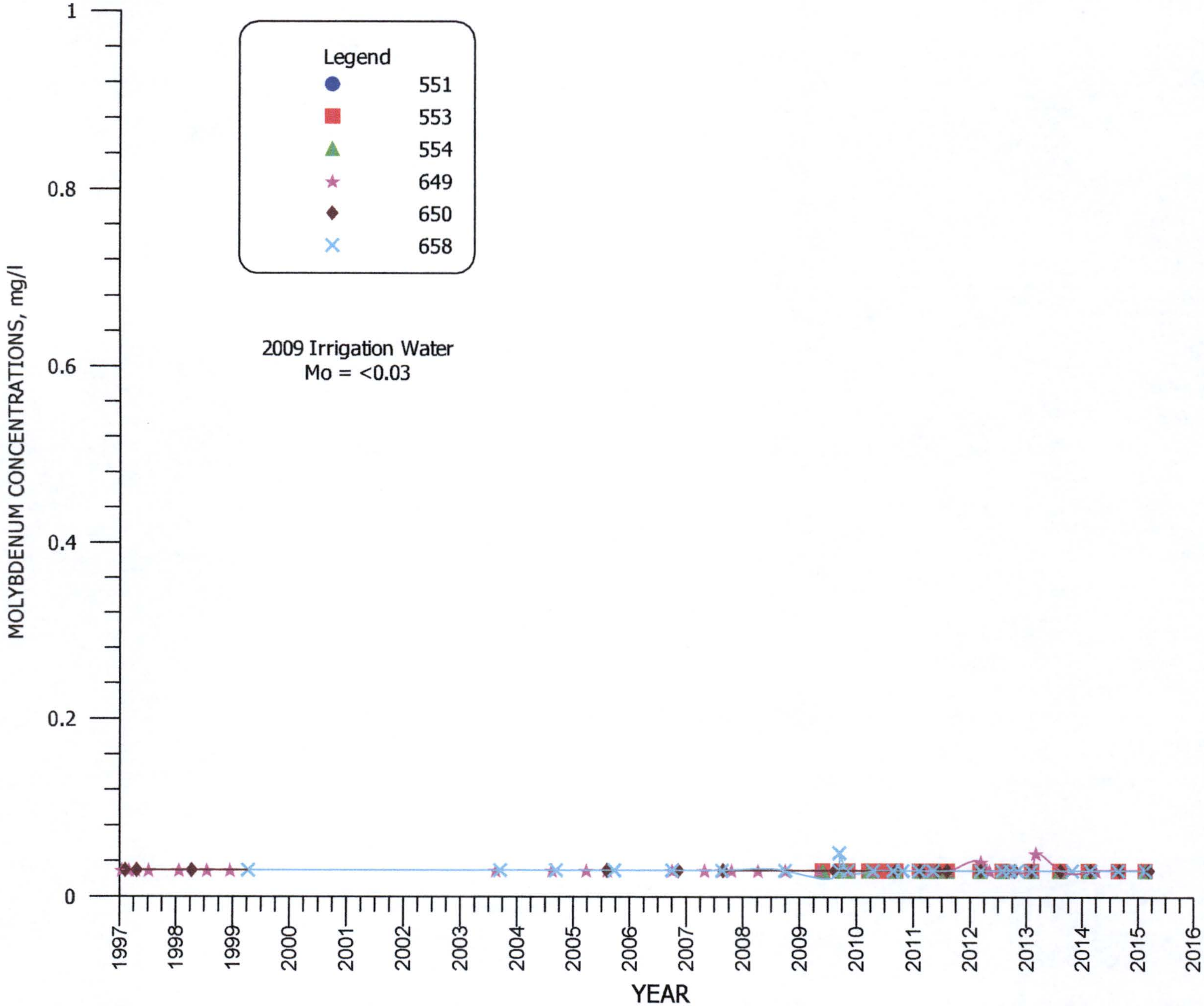

FIGURE 3-20. MOLYBDENUM CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

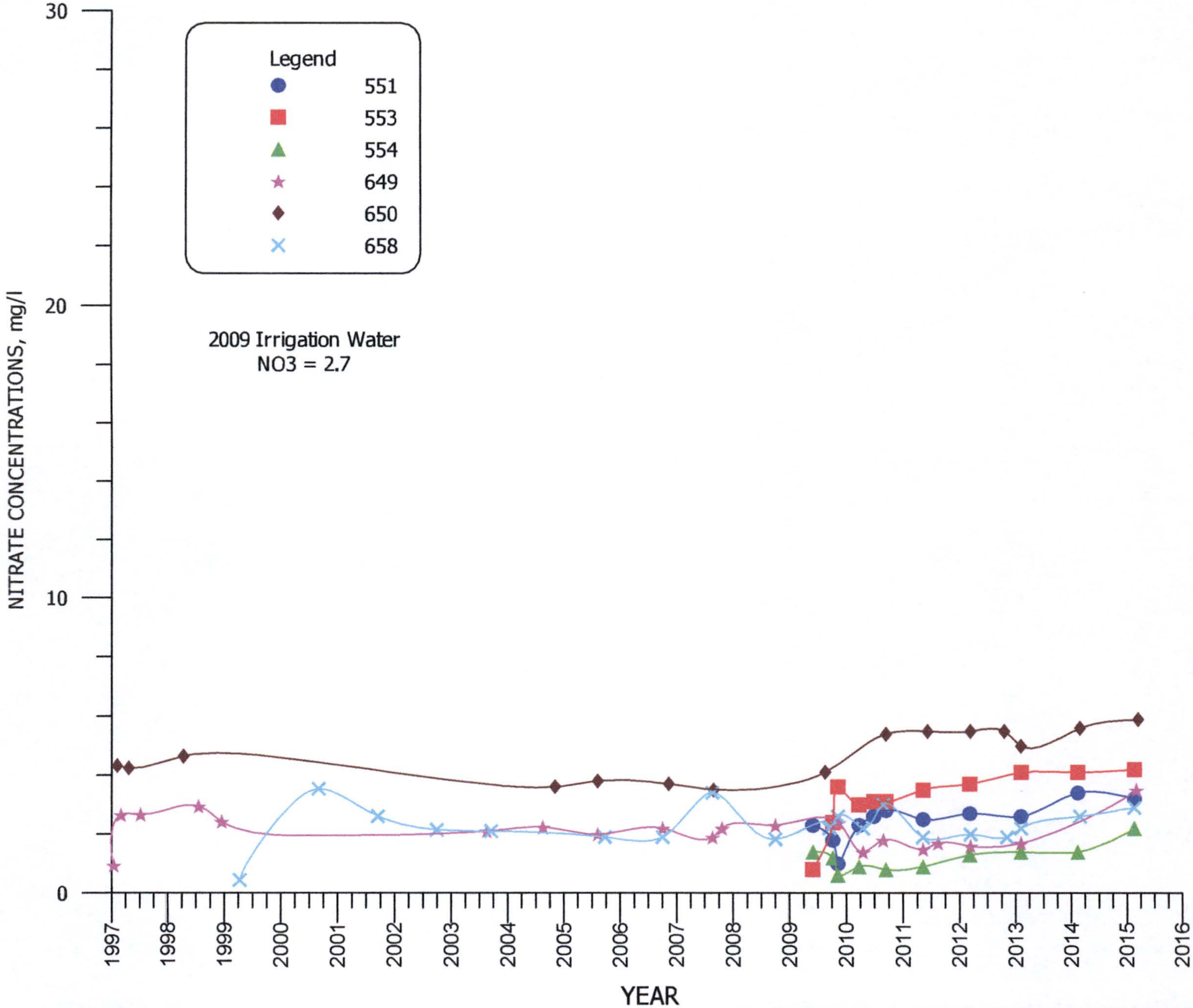

FIGURE 3-21. NITRATE CONCENTRATIONS FOR WELLS 551, 553, 554, 649, 650 AND 658.

4.0 Potential Long-Term Human Health Impacts

This report summarizes potential long-term human health impacts from the practice of irrigation. This includes potential impacts from radiological and non-radiological constituents of the irrigation water.

4.1 Potential Human Health Impacts from Radiological Constituents of Irrigation Water

In terms of risk to human health from radiological components, uranium levels are acceptable. The dose to man under a variety of plausible present and future land use scenarios, as presented in *Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water* (ERG and HYDRO, 2014) are extremely small.

Potential radiation doses to the public were evaluated for:

- Residents eating beef that were fed hay grown on the irrigated areas.
- An assumed resident farmer, living on and farming the Section 34 irrigated area.
- Current residents living near the irrigated areas of Sections 28 and 33 during crop irrigation activities.

Each analysis shows that the radiological dose to existing or future occupants of the land on and near the irrigation areas is extremely small (less than one percent) compared to the average dose that the population receives from natural background and medical exposures.

An additional sample of the upper 12 inches of soil of Section 34 was collected in 2015 and the result was 4.27 mg/kg. This concentration is lower than the concentration used in the *Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water* (ERG and HYDRO, 2014) therefore the conclusion therein are still applicable if this year's concentration was used in the evaluation.

4.2 Potential Human Health Impacts from Non-Radiological Constituents of Irrigation Water

Long-term human health risks associated with non-radiological constituents (uranium and selenium) were evaluated in the *Land Application Closure Plan* (HMC et al, 2014) by comparisons of measured values in soil from 1998 to 2013 contained in the *Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water* (ERG and HYDRO, 2014) against the latest New Mexico Environmental Department Soil Screening Levels (SSLs) for soils under residential use scenario and groundwater protection pathway assuming conservatively a dilution attenuation factor (DAF) of 1 or 20 (NMED, 2012). The SSLs used for these comparisons are applicable to sites in the state and are based on carcinogenesis or other health hazards such as chemical toxicity (NMED, 2012). The conclusion of this evaluation was that uranium and selenium levels in soil within the irrigation areas do not likely pose an unacceptable health risk to future human receptors assuming the most conservative future land use practices.

An additional sample of the upper 12 inches of soil of Section 34 was collected in 2015 and analyzed for uranium and selenium. The uranium value was 4.27 mg/kg whereas the selenium value was 0.98 mg/kg. The uranium concentration is well below the (SSL) of 235 mg/kg for the residential land use scenario and the groundwater pathway SSL with a dilution attenuation factor (DAF) of 1 which is 146.3 mg/kg. The selenium concentration is less than the maximum observed value used in *Land Application Closure Plan* (HMC et al, 2014) analysis, is below the SSL for residential land used of 391 mg/kg and the groundwater pathway SSL with a DAF of 20 which is 19.3 mg/kg. The conclusions of the long-term human health evaluation in the *Land Application Closure Plan* (HMC et al, 2014) that the uranium and selenium levels in soil within the irrigation areas do not likely pose an unacceptable health risk to future human receptors assuming the most conservative future land use practices are still applicable.

5.0 Conclusions

The Meteoric Water Mobility Testing produced concentration profiles with depth that are very similar in appearance to that of the soil sampling done in the past (ERG and HYDRO, 2014). However, the purpose and nature of the MWMT testing and the soil sampling are very different and only a qualitative comparison between the two testing procedures is reasonable. In the Section 34 flood area, the elevated concentrations of COCs mobilized in the MWMT are only observed within the first few feet. At greater depth, concentrations of COCs in the MWMT extract were small and relatively uniform indicating natural levels or minimal impacts by irrigation. The retention of the COCs in the top few feet of the profile in the Section 34 flood area is attributed to the finer soils having more adsorptive capacity for reactive constituents.

In the Section 33 center pivot area, the selenium and chloride values in the three to five foot interval are the only elevated COC concentrations in the MWMT extract. For the remainder of the soil profile and the other COCs, the concentrations are small and reflect either a uniform distribution of irrigation applied COCs through the profile, or relatively natural COC concentrations. The results of the MWMT testing indicate that small concentrations of COCs were more readily transported through the sandier Section 33 soils when contrasted with the finer soils in Section 34. However, the continued movement of reactive COCs is limited by the very small natural recharge for the area.

The MWMT COC concentrations measured for both the Section 33 flood area and the Section 28 center pivot are small. In Section 28, the COC concentration profiles with depth are relatively uniform and likely indicate the COCs have been transported and distributed through the soil profile. The ground-water restoration program in the Section 28 area is ongoing and will capture impacted ground water beneath the center pivot irrigation area. The relatively minor elevated concentrations of TDS, sulfate and chloride in the upper few feet of the Section 33 flood area are not expected to have a measurable impact on ground water under the very small rate of natural recharge.

The MWMT produced results that indicated the presence of relatively small concentrations of COCs in the soil that could be mobilized by recharge. The presence of these COCs in the soil profile is confirmed by the historical soil sampling (ERG and HYDRO, 2014). However, the rate of natural recharge to the irrigation area soils is very small, and combined with the small concentrations mobilized by the MWMT, the potential for significant future transport of COCs through the soil profile is very small.

The soil moisture concentrations obtained from the lysimeters in the Section 34 flood area are not demonstrating a consistent trend. With few exceptions, the COC concentrations from lysimeters have been relatively steady since 2013. The COC concentration in lysimeter samples are typically much greater than those measured in the MWMT because the quantity of water in the soil profile is dramatically smaller than that produced by the MWMT. Hence, the concentration results cannot be compared directly between the two tests. With the cessation of irrigation, the continued movement of COCs through the fine grained Section 34 flood area soils is at a very slow rate.

The uranium concentrations measured in lysimeters in the Section 28 center pivot soil moisture have declined to very low levels since irrigation ceased. The uranium, selenium and molybdenum concentrations are very small, and given the very small quantity of water moving through the soil, the gradual transport of these COCs through the profile will not have a significant impact on the ground water.

A small increase in the selenium soil moisture concentrations from the lysimeters has occurred in the Section 33 center pivot area, correlating with the data obtained from the MWMT. Like Section 28, the sandier soils in the Section 33 center pivot area have allowed movement of the TDS, sulfate and chloride to greater depth within the profile, as observed in the lysimeter data.

The soil moisture instruments were added in the upper soil profile in 2012 and they have shown a general decline in moisture content of the soil profile since irrigation ceased.

Long-term human health risk from radiological constituents in soil was evaluated in *Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water* (ERG and HYDRO, 2014) and shows that the radiological dose to existing or future occupants of the land on and near the irrigation areas is extremely small (less than one percent) compared to the average dose that the population receives from natural background and medical exposures. Additional soil sample information obtained from Section 34 does not change this conclusion.

The non-radiological human health risks were assessed using data from the Evaluation of the Year 2000 Through 2013 Irrigation with Alluvial Ground Water (ERG and HYDRO, 2014). Based on the Soil Screen Levels from the New Mexico Environmental Department, the uranium and selenium levels in the soil within the irrigation areas do not pose an unacceptable health risk. Additional soil data from 2015 in Section 34 do not change this conclusion.

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