

2/2/2017

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R. Mark Owens
SteelCats, LLC

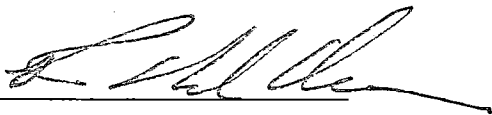
Mr. Andrew Persinko, Deputy Director
Decom and Uranium Recovery Licensing Directorate
Division of Waste Mgmt and Env Protection,
Office of Federal and State Materials and Environmental Management Programs
Mail Stop T8-F5
U.S. Nuclear Regulatory Commission
11545 Rockville, MD 20852-2738

Ref: Docket No. 40-2259, Source Material License No. SUA-672
Groundwater Semi-Annual Report

Dear Mr. Persinko,

On Behalf of AREVA, enclosed please find two copies of the semi-annual ground water monitoring report covering the third and fourth quarters of 2016 as required by condition 60B of the referenced license. Please let me know if there are any questions regarding the report.

Sincerely,



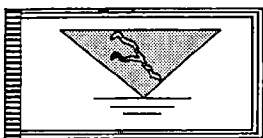
R. Mark Owens
Consultant for AREVA, Inc.

Enclosure

Cc: D. B. Spitzberg, USNRC Region IV
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**SEMI-ANNUAL
GROUND-WATER MONITORING
FOR LUCKY Mc MINE**



HYDRO - ENGINEERING, LLC

**SEMI-ANNUAL
GROUND-WATER MONITORING
FOR LUCKY Mc MINE**

PREPARED FOR:

**AREVA
LUCKY Mc MINE**

BY:

HYDRO-ENGINEERING, L.L.C.

JANUARY, 2017

Brandon Weaver
BRANDON WEAVER

George L. Hoffman
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HYDROLOGIST**
1/19/2017

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1.0 Introduction and Summary of Results

This semi-annual report presents the results of ground-water monitoring for the second half of 2016 for the Lucky Mc tailings area. This report covers the requirement of NRC License SUA-672, License Condition 60B.

The following table lists the site standards that are in effect at Lucky Mc tailings POC well T1-12. The tabulation also lists the measured October 2016 concentrations for POC well T1-12. All of the present concentrations in POC well T1-12 are significantly below the site standards except for Ra226 + Ra228 which is below the site standard.

GROUND-WATER PROTECTION STANDARDS FOR POINT-OF-COMPLIANCE WELL T1-12 AND OCTOBER 2016 POC CONCENTRATION									
POC STANDARD & CONCENTRATION	CONSTITUENT								
	Arsenic	Beryllium	Cadmium	Chromium	Nickel	RA- 226+Ra- 228	Selenium	Thorium- 230	Uranium
SITE STANDARD	0.05	0.07	0.02	0.05	0.85	7.5	1.1	13.2	1.7
T1-12, OCTOBER 2016	<0.001	<0.001	<0.001	<0.01	0.23	5	0.164	0.1	0.325

NOTE: All concentrations in mg/l except for radium and thorium in pCi/l.

Figure 1.3-2 in the Lucky Mc ACL report shows the base of the Lucky Mc aquifer which shows that a narrow outlet exists on the east side of the No. 1 and No. 2 Tailings connecting them to the Wind River Channel. The No. 1 and the No. 2 Tailings should not be presently contributing any seepage to the Wind River Channel and the Fraser Draw alluvium because the water levels in these tailings are below the base of the aquifer. Figures 1.3-4 (see channel close to the B side of the cross section) and 1.3-5 (see the ridge near well OBS-2) in the Lucky Mc ACL report show that the outlets to the No. 2 and No. 1 Tailings were dry or essentially dry in 2000. Therefore these tailings should not be contributing any additional source to the Lucky Mc aquifer with time. Stable concentrations in POC well T1-12 support this conclusion.

Modeling of key parameters, uranium, selenium and radium-226 + 228 are presented in the Lucky Mc ACL report. The following table presents a comparison between the model predictions and the 2016 observed concentrations for POC well T1-12 and wells AL-1 and AL-6. These comparisons show that the present concentrations agree fairly well with the model predictions for 2016. Concentrations at the POC well are not expected to ever exceed the site standards based on the present levels and the model predictions.

COMPARISON OF MODEL PREDICTION AND 2016 CONCENTRATIONS									
CONSTITUENT	URANIUM			SELENIUM			RA-226 + RA-228		
WELL	T1-12	AL-1	AL-6	T1-12	AL-1	AL-6	T1-12	AL-1	AL-6
MODEL PREDICTIONS	0.6	1.1	1.1	0.2	0.4	0.3	7	1	1
2016 CONCENTRATIONS	0.325	1.26	0.638	0.164	0.285	0.157	5	4.3	2.2

NOTE: All concentrations in mg/l except for radium in pCi/l.

2.0 Piezometric Data

The water-level data collected during the fourth quarter of 2016 are presented in Table 1 along with the 2013 through 2016 water-level data. Figure 1 presents the piezometric surface of the Lucky Mc aquifer from the POC well through the Fraser Draw alluvium, while Figure 2 presents plots of the water-level elevations versus time for wells AL-6, T1-6, T1-12, AL-1 and AL-7. The corresponding water-level elevation or constituent concentration is posted adjacent to the well location on the plan view figures of the area (such as Figure 1). Water-level elevations through the fourth quarter of 2016 were fairly steady.

3.0 Water-Quality Data

License Condition 60B requires monitoring of water from the POC and POE wells and other selected wells for the constituents presented in Table 1. An analysis of the selenium, uranium, combined radium-226 plus radium-228, sulfate, chloride and TDS concentrations is required.

Figure 3 presents the October 2016 chloride concentrations for the Lucky Mc aquifer. The chloride concentrations are highest in the Fraser Draw alluvial well AL-1 and Wind River Channel at POC well T1-12 and decrease significantly to levels similar to background levels at well AL-7. The chloride concentration in well AL-1 is higher showing the concentration gradient from the east to the west. Chloride concentration in well AL-1 have been steady in the past three years. Figure 4 presents the plots of chloride concentration versus time for the five monitored wells. Chloride concentrations in POC well T1-12 overall have been fairly steady in 2013 through 2016 while a very gradual decrease was observed in POE well AL-6 and well AL-7 during the last couple of years. The decrease in the chloride and sulfate concentrations in June 2015 in well T1-12 is not supported by measurement before and after this value and therefore is considered an outlier. A larger increase was observed in the last half of 2010 and 2011 in well AL-1. These chloride changes are thought to be natural fluctuations in this alluvial aquifer.

Figure 5 presents the TDS concentrations for October 2016 water samples from the Lucky Mc aquifer. The TDS concentrations are greater than 5000 mg/l at POC well T1-12, slightly less in Fraser Draw alluvial well AL-1 and are less than 4000 mg/l in the western portion of the Fraser Draw alluvium at wells AL-6 and AL-7. Figure 6 presents the plots of TDS concentrations versus time and illustrates that the 2016 TDS concentrations are similar to the average value for the previous few years for well T1-12. An increase in concentrations in 2011 and 2012 was observed in well AL-1 but concentrations have declined to fairly steady levels since 2014. A gradual increase in TDS had been observed in well AL-7 and AL-6 in recent years and then

becoming fairly steady prior to a gradual decline the last year. This change is likely due to the concentration gradient naturally shifting.

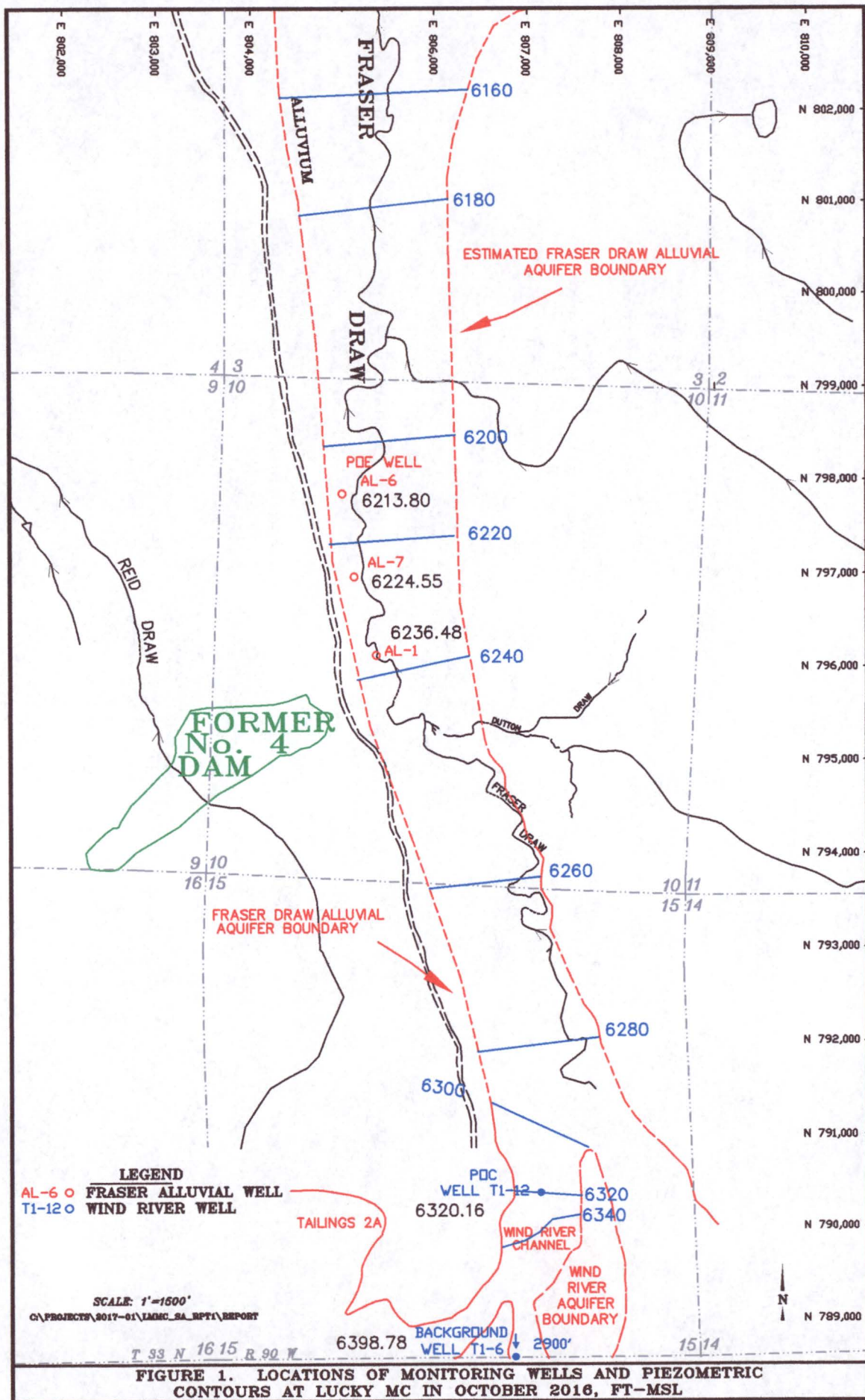
The measured sulfate concentrations for the Lucky Mc aquifer during October of 2016 are presented in Figure 7 and show that the sulfate concentrations are highest in the Fraser Draw alluvial well AL-1 and Wind River Channel at POC well T1-12 and decrease in the eastern half. The sulfate concentration versus time plots are shown in Figure 8. The increase in sulfate in the 2nd half of 2010 and 2011 in well AL-1 shows the effect of the shift in concentrations to the east. An overall decline in sulfate concentrations was observed in well AL-1 in 2012 through the 2014 and then were fairly steady through 2016. These sulfate concentrations are thought to be natural for this shallow aquifer which is underlain by the Cody Shale.

Uranium concentrations for the Lucky Mc aquifer during October of 2016 are presented in Figure 9, and this figure shows the highest observed uranium concentrations at well AL-1. Figure 10 shows that the uranium concentration in the POE well had overall gradually increased but gradually declined in 2014 through 2016. A larger increase had been observed in well AL-1 in 2010 and 2011 with an overall decline in uranium concentrations until the fourth quarter of 2013. Values have been fairly steady since. The uranium concentrations have been relatively steady in POC well T1-12 for the last several years.

Figure 11 presents the selenium concentrations for October 2016 for the Lucky Mc aquifer. Selenium concentrations were greatest at POC well T1-12 and have overall gradually declined for the last several years to a value similar to those observed in POE well AL-6 (see Figure 12). The selenium concentrations in well AL-1 increased from 2007 through 2014 to a level higher than the value in well T1-12 which could be due to alluvial water shifting to the east in this area. Values have been fairly steady for the last two years in well AL-1. All of these selenium concentrations are likely natural with recent concentrations defining variations that may occur.

Figure 13 presents the radium-226 plus radium-228 activity for October 2016 in the Lucky Mc aquifer in pCi/l. The activity at POC well T1-12 has remained below the radium-226 plus radium-228 site standard of 7.5 pCi/l until the first quarter of 2015 when it was 13.0 pCi/l. A similar jump in Ra226 + Ra228 concentrations was observed in all of the wells at the Lucky Mc Mine and appears to be a laboratory error. Measured radium activities generally exhibit more variability than other constituents, and little significance is given to occasional outliers. Figure 14 shows plots of the radium-226 plus radium-228 activity versus time for the monitored wells. These plots show significant variability in measured activity, especially since the fourth quarter of 2014, which is thought to be due to variability in the laboratory analysis. Previous recent values for well AL-6 had been near 6 pCi/l while the October 2016 value is 2.2 pCi/l. The higher radium levels are not supported by increases in other parameters and should not be given any significance at this time. The radium-226 plus radium-228 activity in upgradient well T1-6 was recently also higher while the second half of 2016 values are less than 5 pCi/l. The radium values measured from the Lucky Mc wells define the expected laboratory variability and are considered natural levels for this aquifer.

Concentrations of the remainder of the constituents at the site not significant at POC well T1-12.



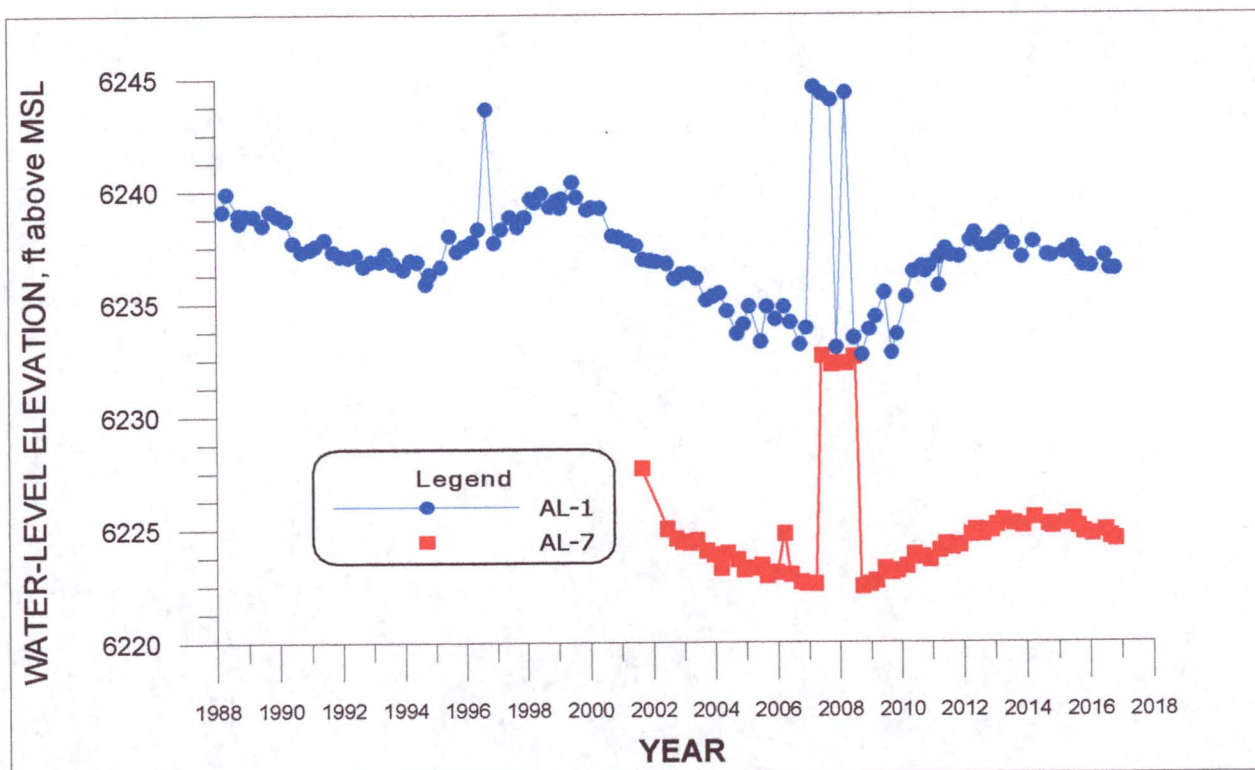
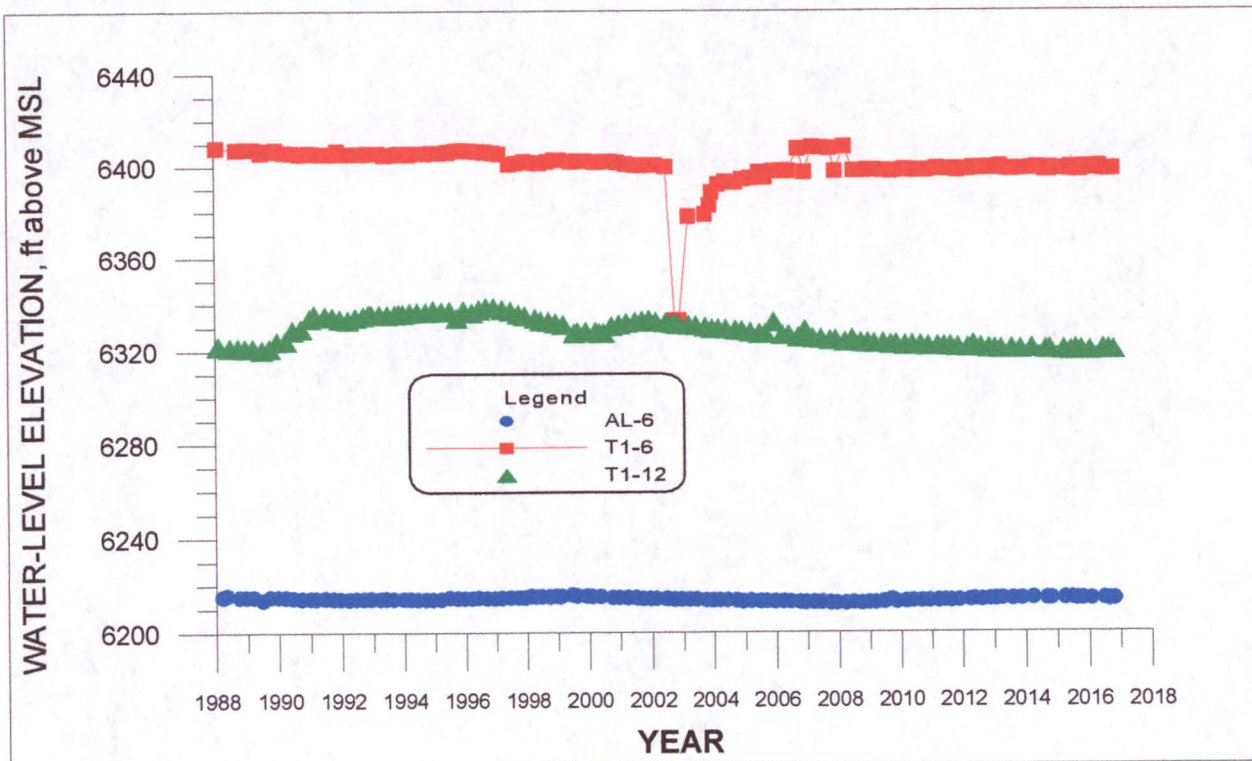


FIGURE 2. WATER-LEVEL ELEVATION VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.

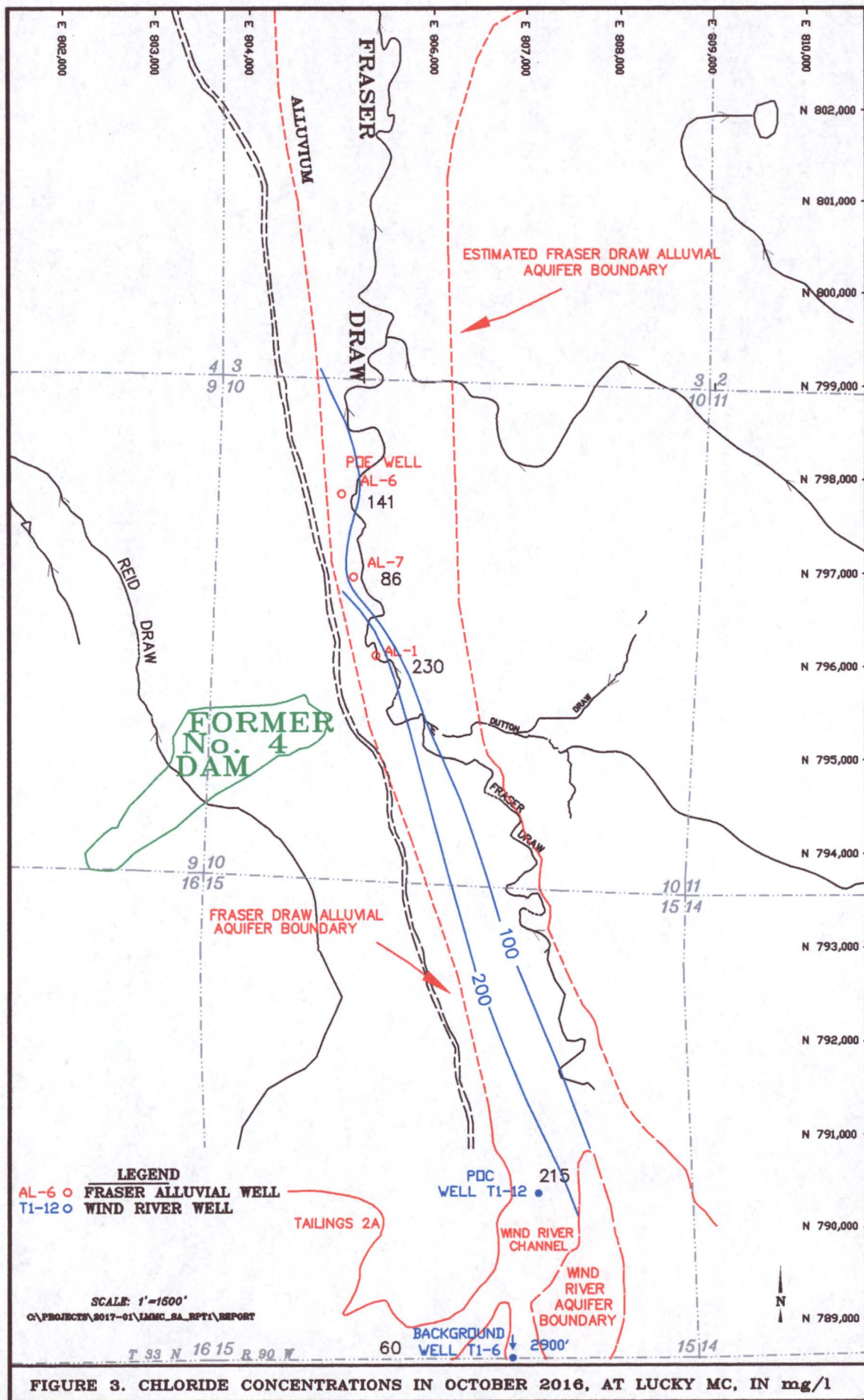


FIGURE 3. CHLORIDE CONCENTRATIONS IN OCTOBER 2016, AT LUCKY MC, IN mg/l

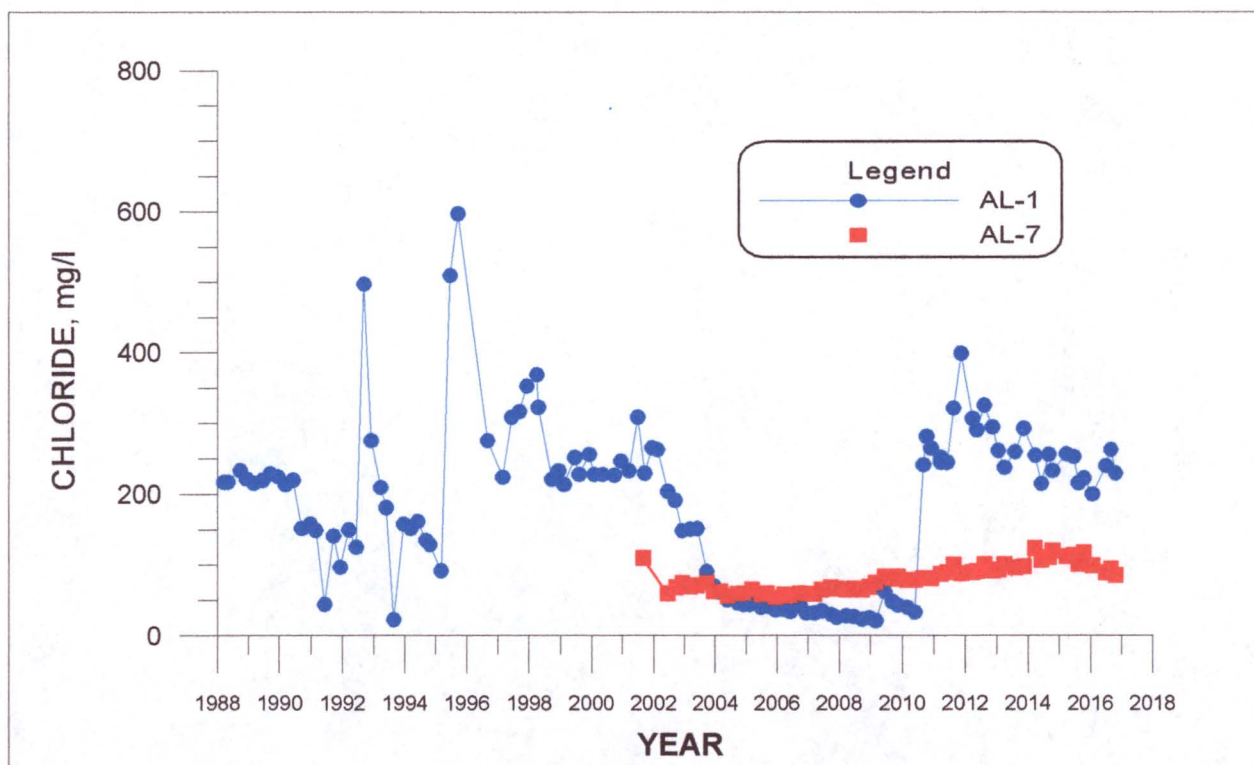
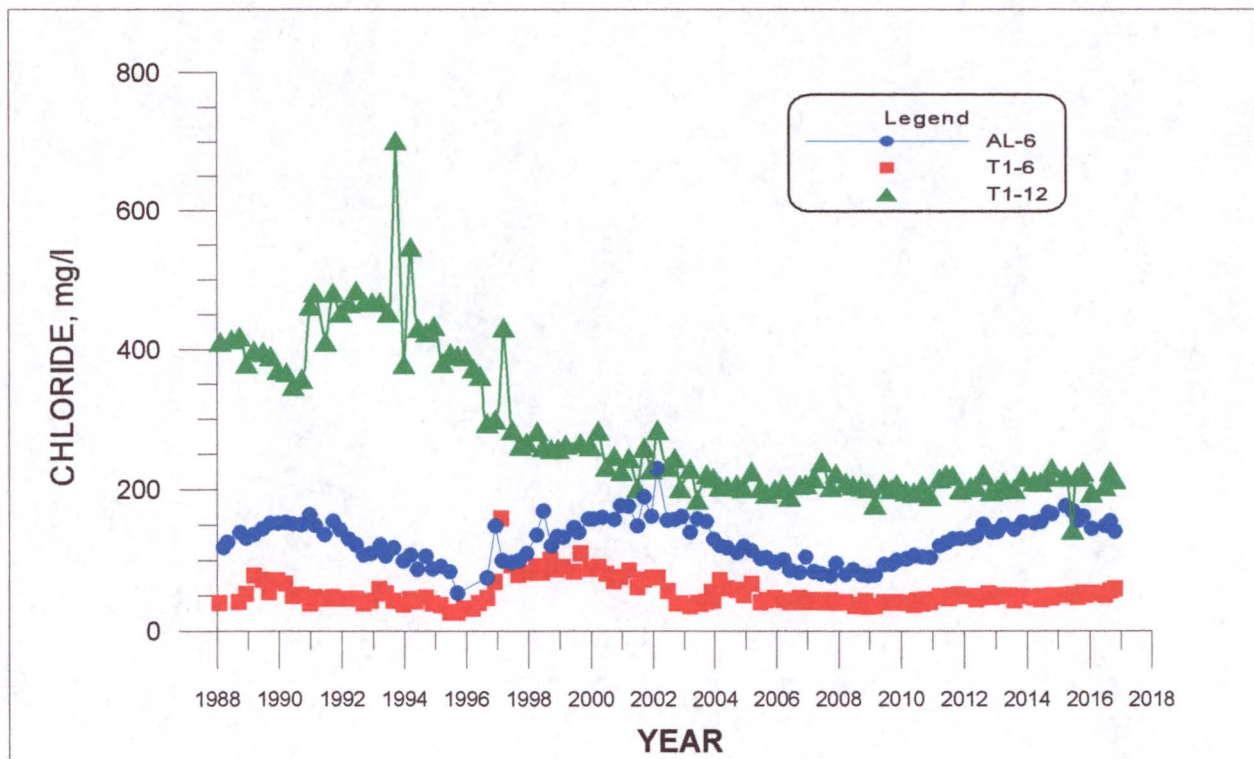


FIGURE 4. CHLORIDE CONCENTRATIONS VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.

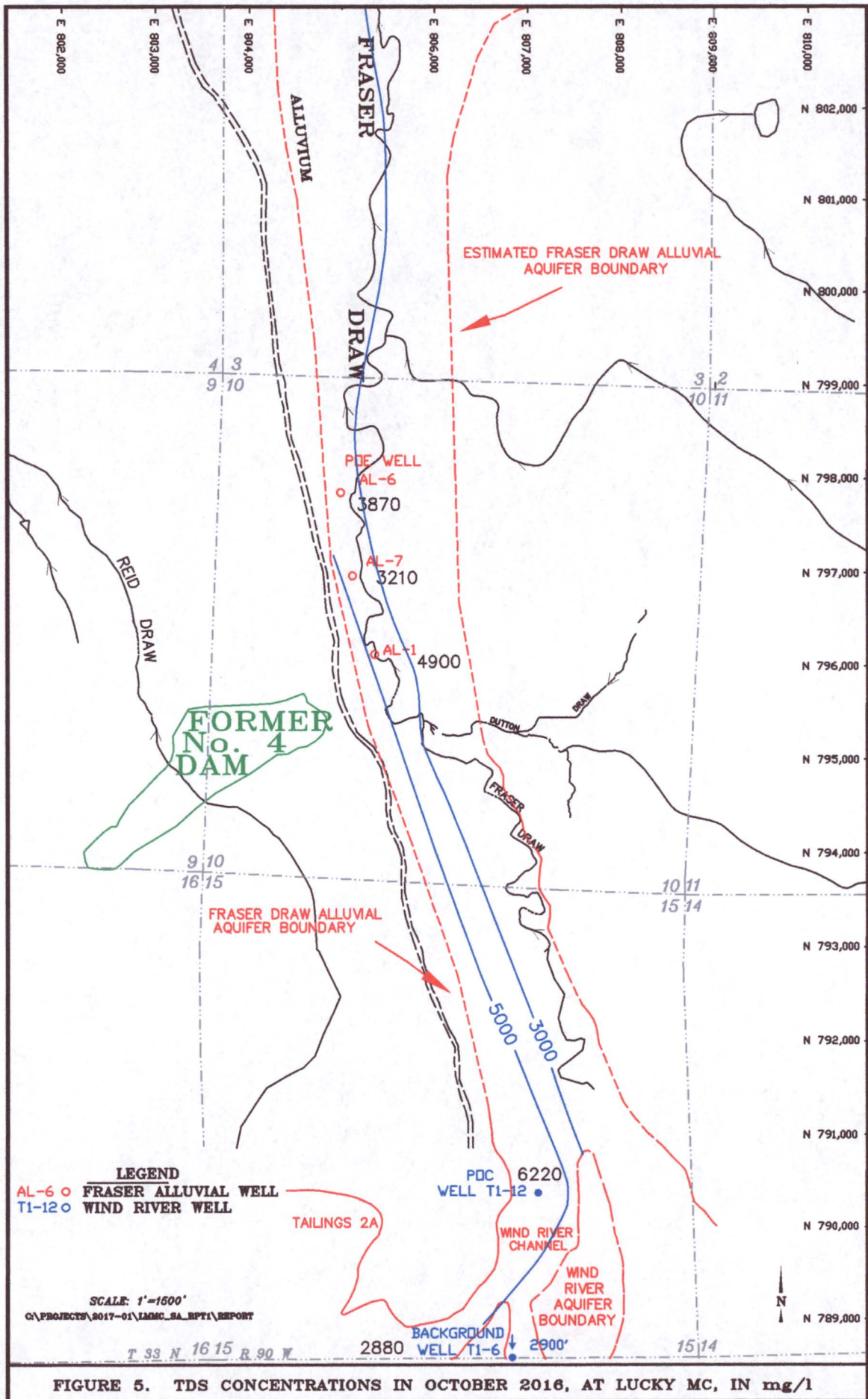


FIGURE 5. TDS CONCENTRATIONS IN OCTOBER 2016, AT LUCKY MC, IN mg/l

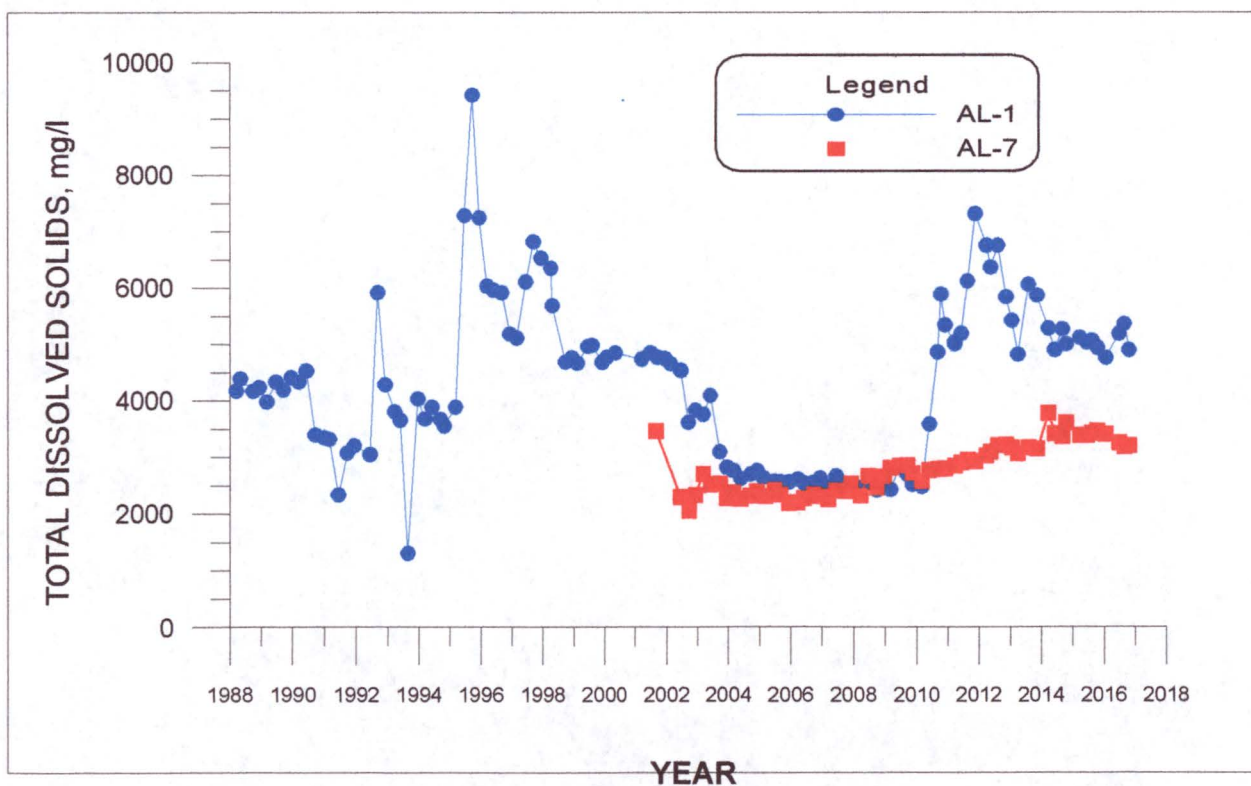
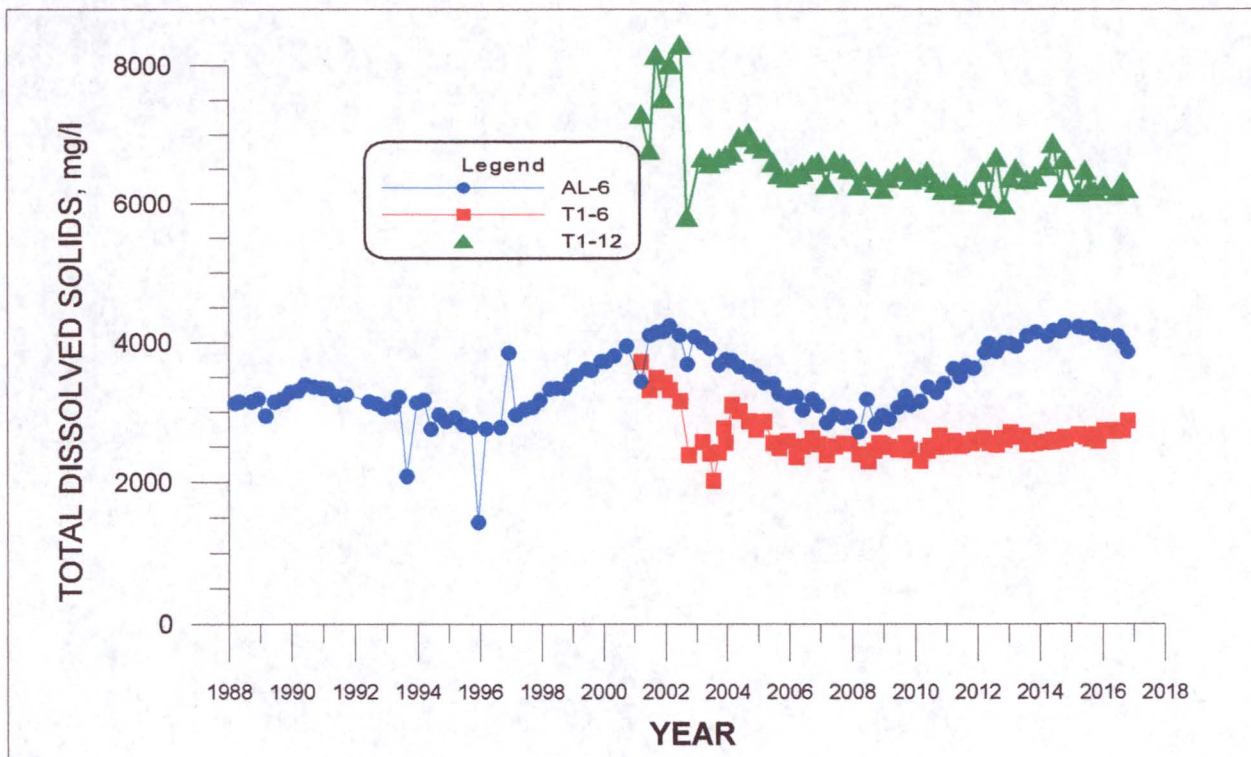
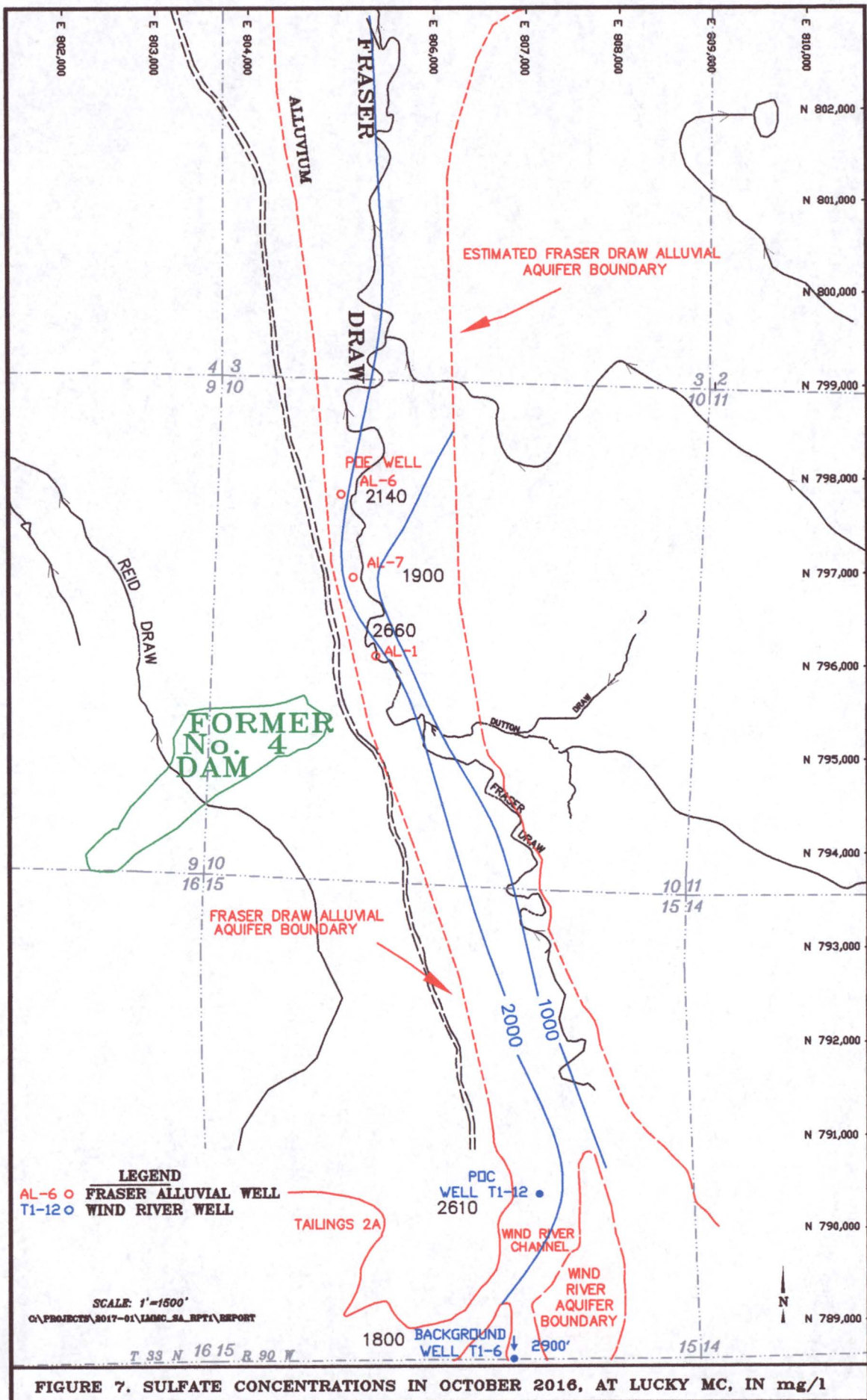


FIGURE 6. TDS CONCENTRATIONS VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.



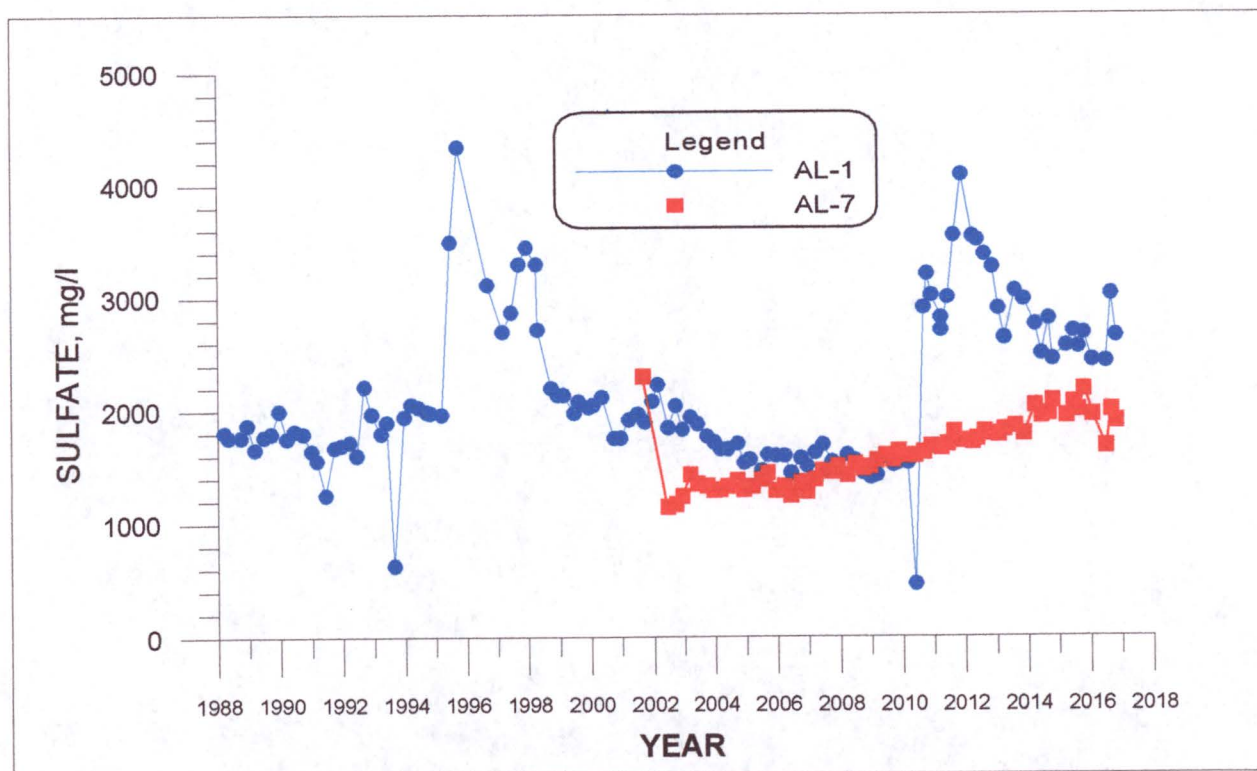
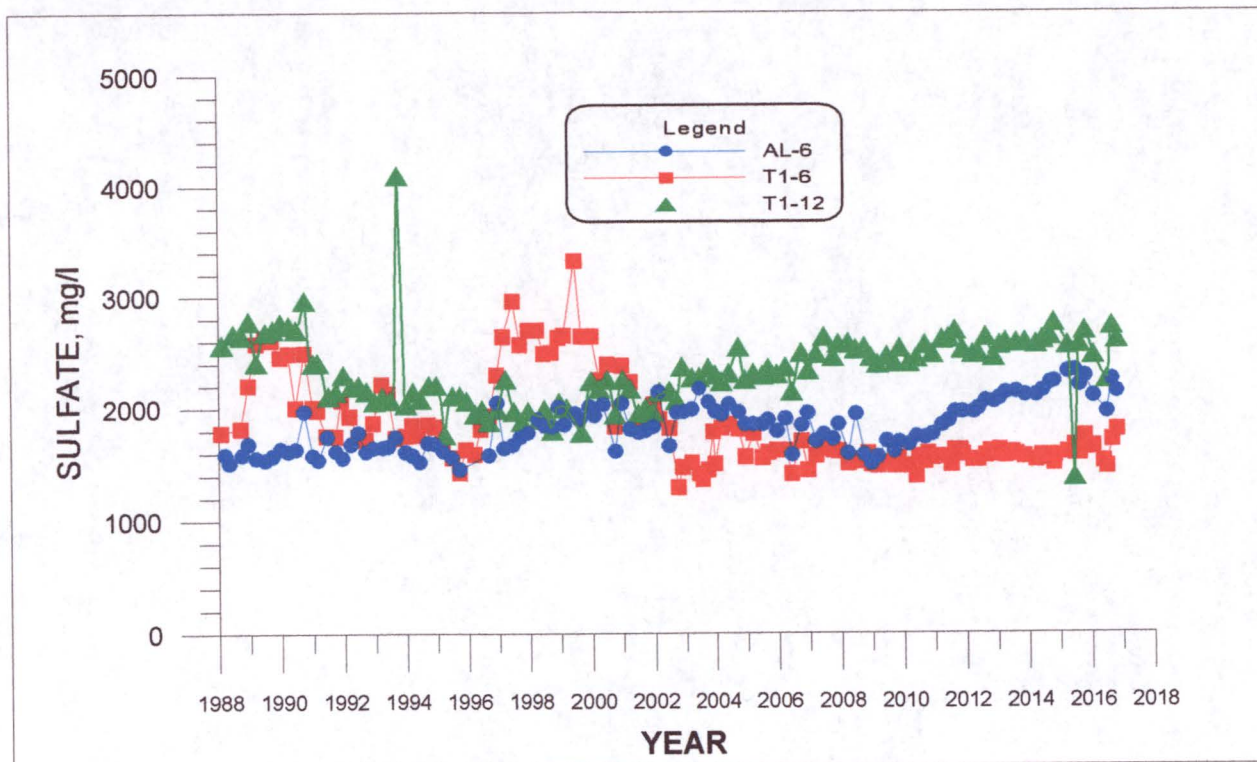
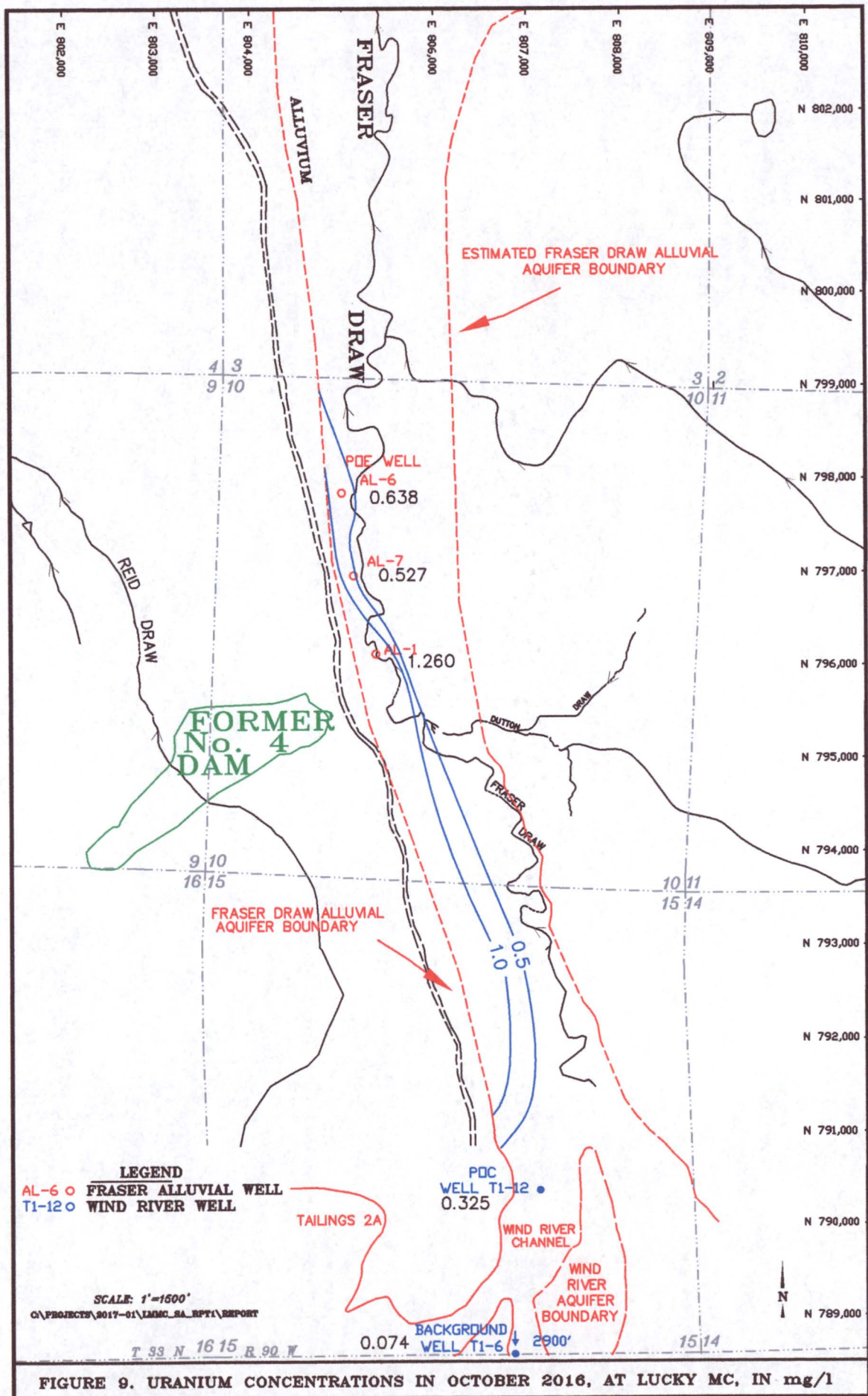


FIGURE 8. SULFATE CONCENTRATIONS VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.



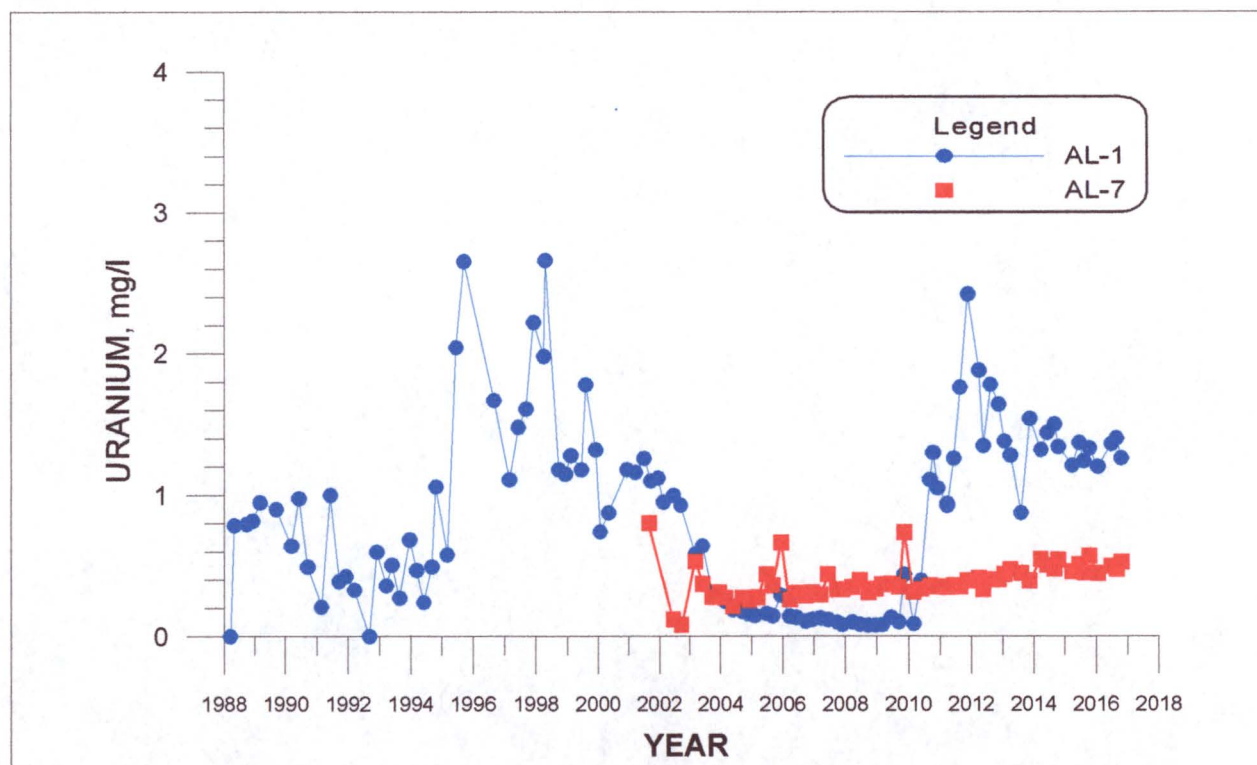
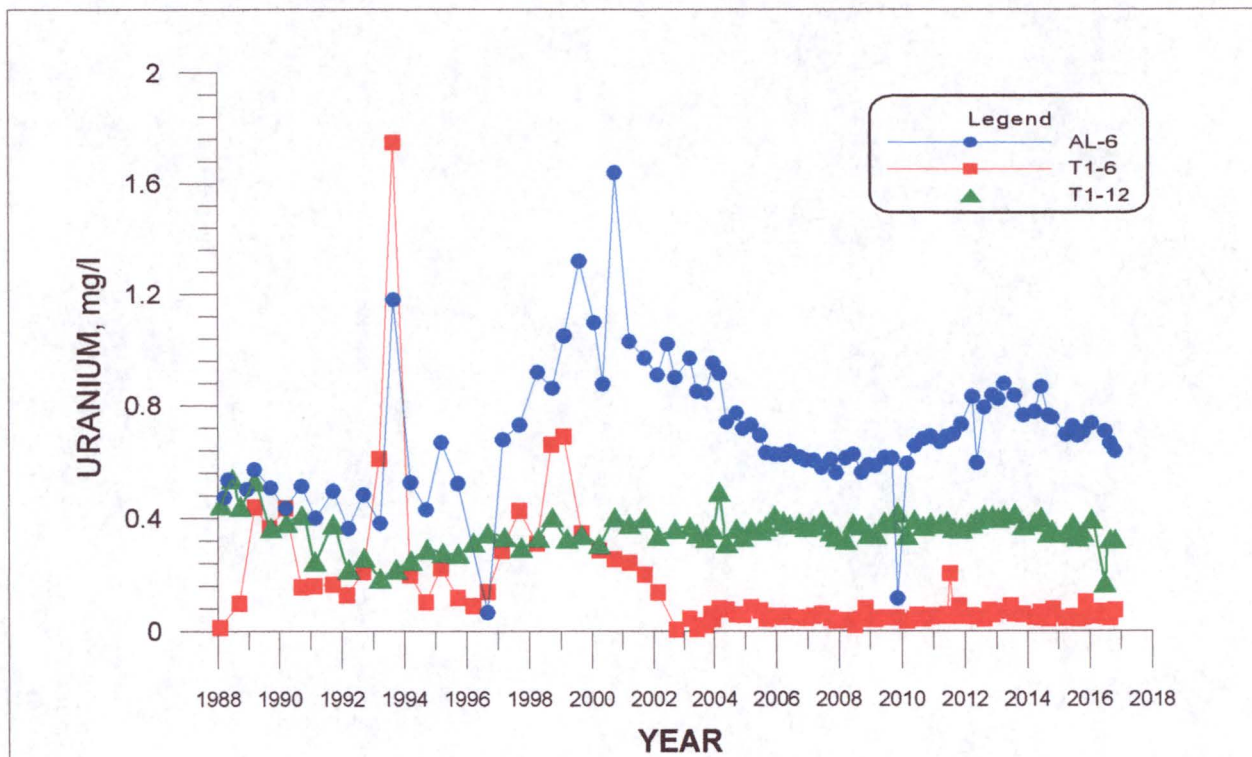


FIGURE 10. URANIUM CONCENTRATIONS VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.

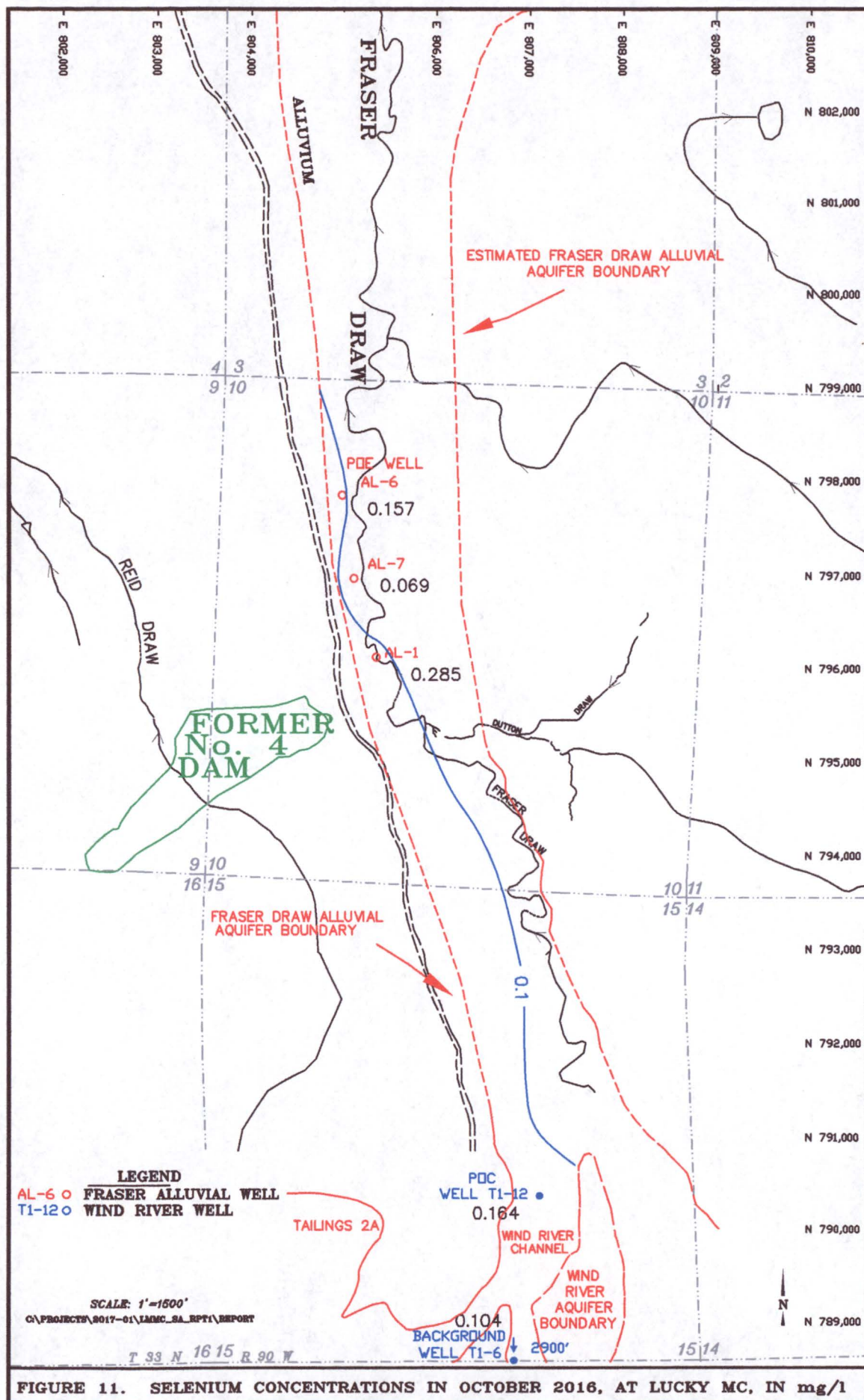


FIGURE 11. SELENIUM CONCENTRATIONS IN OCTOBER 2016, AT LUCKY MC, IN mg/l

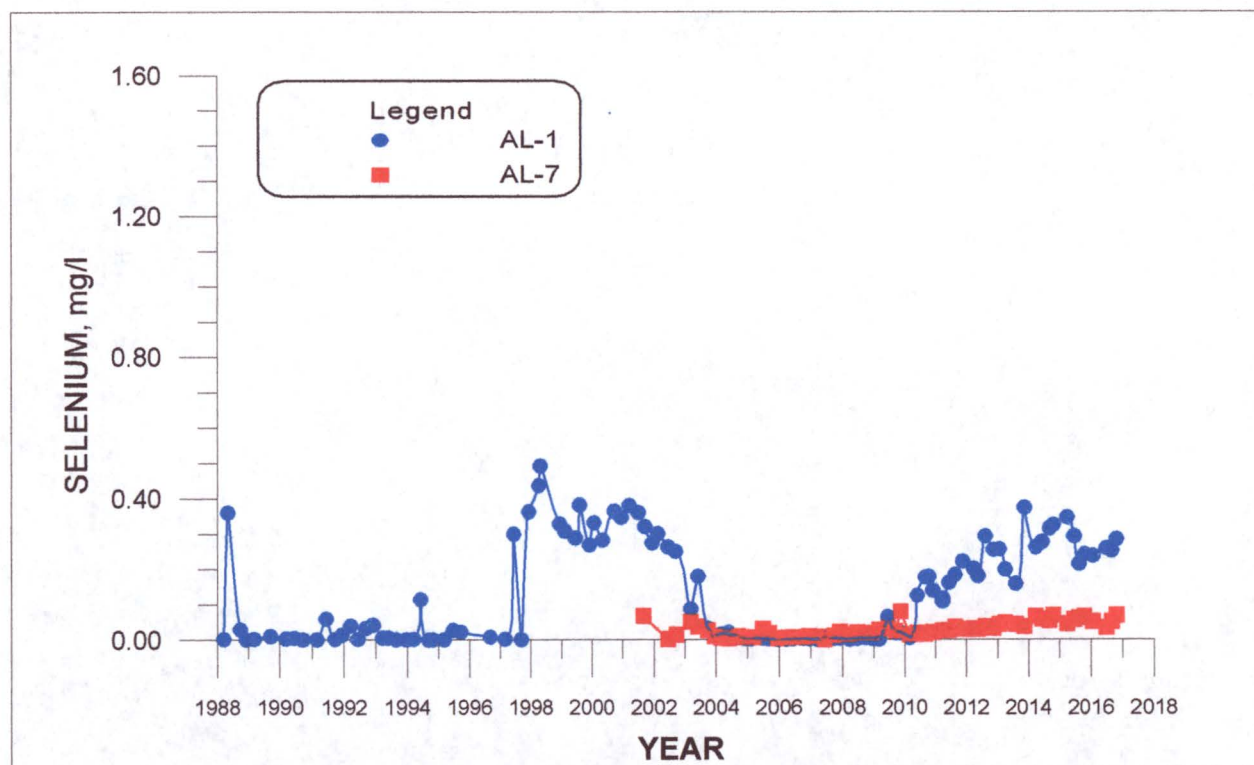
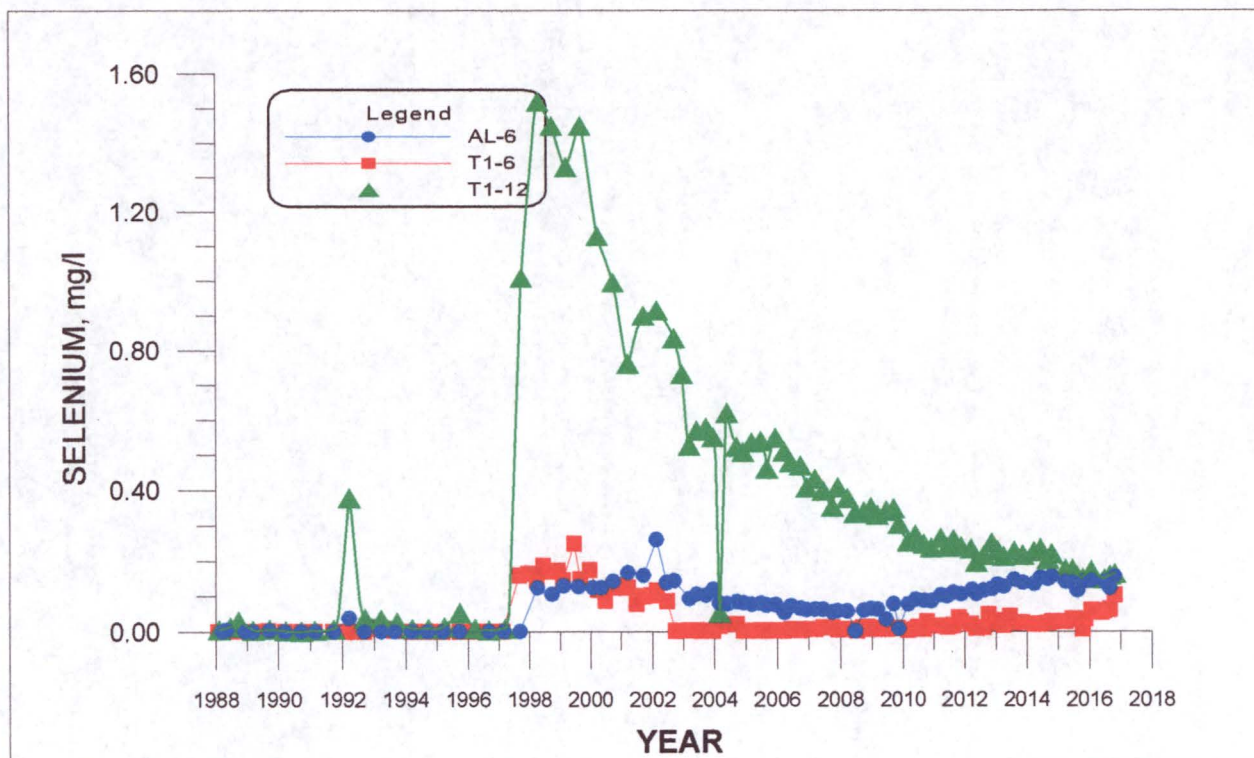
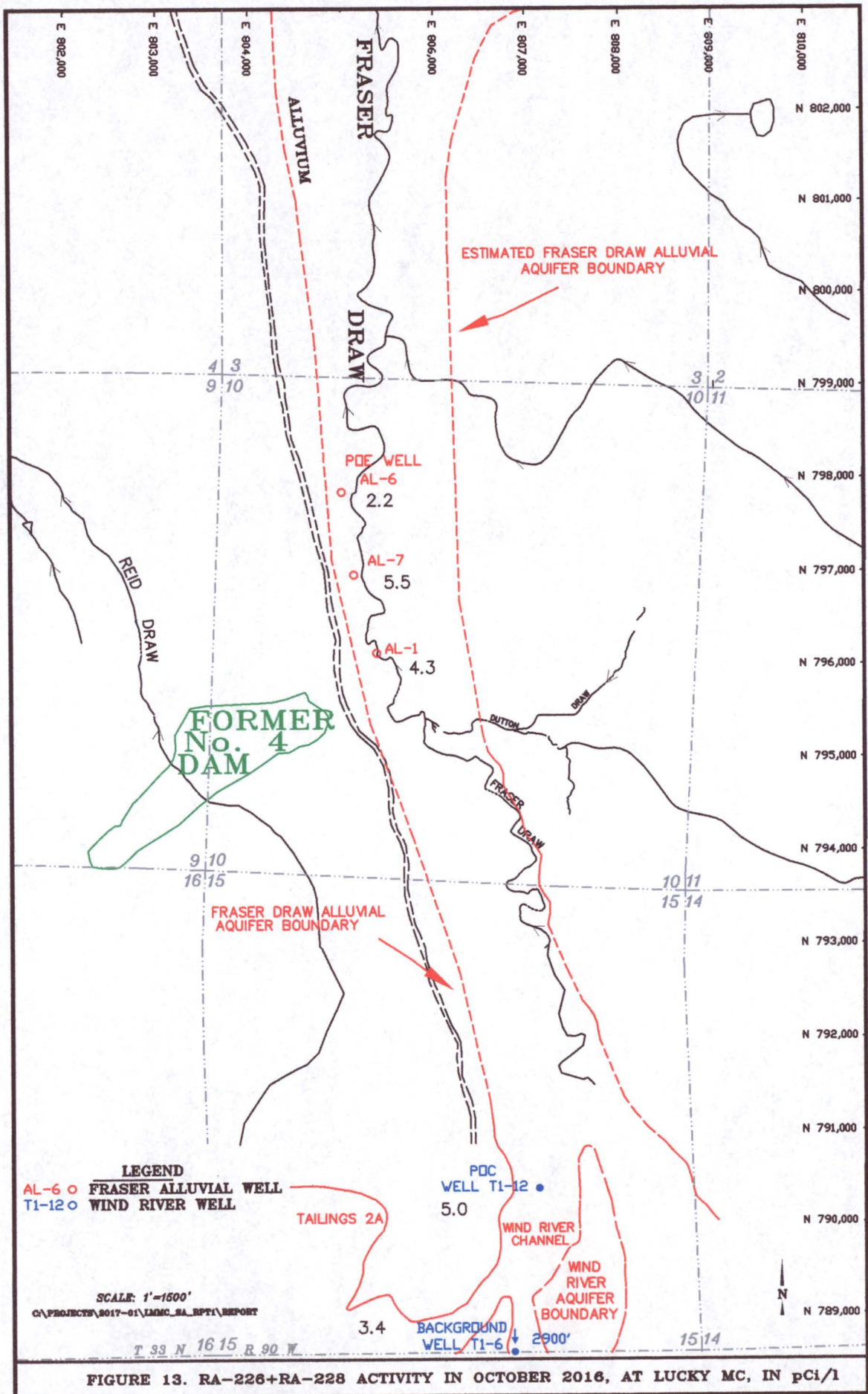


FIGURE 12. SELENIUM CONCENTRATIONS VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.



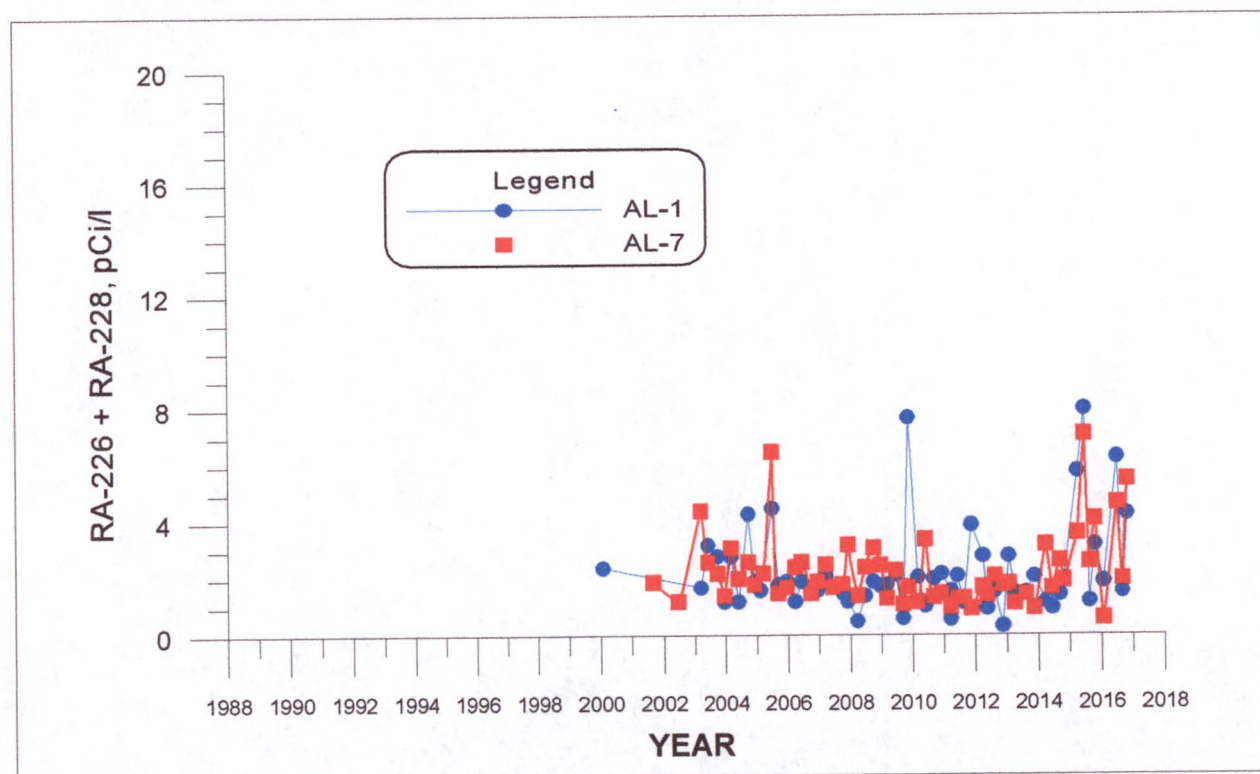
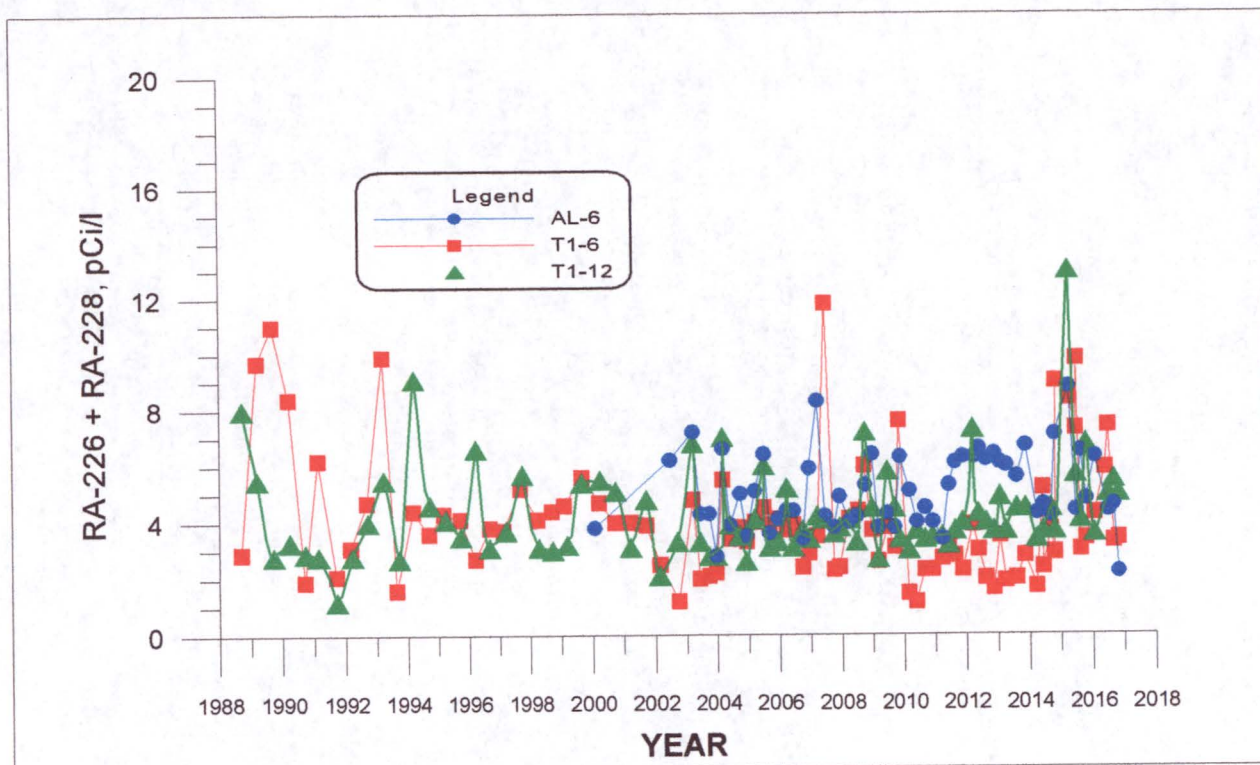


FIGURE 14. RADIUM-226 + RADIUM-228 ACTIVITY VERSUS TIME FOR WELLS T1-6, T1-12, AL-1, AL-6 AND AL-7.

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	WL (feet)	WL_ELEV (ft-msl)	pH(f) (std. units)	Cond(f) (µmhos)	TDS (mg/l)	SO4 (mg/l)	Cl (mg/l)	NO3+NO2 (mg/l)	Unat (mg/l)
AL-1	1/22/2013	26.78	6237.82	6.4	1690	5420	2900	262.0	67.0	1.380
	4/1/2013	26.54	6238.06	6.9	5870	4820	2640	238.0	61.0	1.280
	8/2/2013	27.00	6237.60	7.3	6440	6060	3060	260.0	117.0	0.873
	11/12/2013	27.58	6237.02	7.4	6880	5870	2980	293.0	117.0	1.540
	3/26/2014	26.91	6237.69	7.2	6210	5280	2760	255.0	94.0	1.320
	6/6/2014	—	—	6.9	6020	4900	2500	215.0	103.0	1.440
	9/5/2014	27.50	6237.10	7.4	2950	5270	2810	256.0	126.0	1.500
	10/17/2014	27.54	6237.06	6.9	5310	5000	2450	233.0	114.0	1.340
	3/24/2015	27.38	6237.22	7.5	5520	5120	2570	257.0	98.0	1.210
	6/16/2015	27.17	6237.43	7.3	6600	5030	2700	253.0	98.0	1.370
	8/11/2015	27.61	6236.99	7.4	6460	5070	2560	216.0	105.0	1.240
	10/16/2015	27.96	6236.64	6.7	3340	4940	2680	223.0	84.0	1.330
	1/22/2016	28.00	6236.60	7.1	5830	4760	2440	200.0	73.0	1.200
	6/28/2016	27.54	6237.06	7.6	5420	5190	2430	240.0	88.0	1.360
	8/26/2016	28.10	6236.50	7.5	6570	5360	3030	263.0	92.0	1.400
	10/21/2016	28.12	6236.48	7.5	5830	4900	2660	230.0	84.0	1.260
AL-6	1/22/2013	22.80	6214.00	6.5	1349	3980	2080	141.0	77.0	0.824
	4/1/2013	22.68	6214.12	7.0	4600	3940	2130	150.0	59.0	0.879
	8/2/2013	22.82	6213.98	7.4	4280	4090	2140	144.0	84.0	0.836
	11/12/2013	22.72	6214.08	7.5	4790	4150	2110	154.0	79.0	0.765
	3/26/2014	22.45	6214.35	7.3	4720	4090	2110	153.0	84.0	0.778
	6/6/2014	—	—	7.1	4880	4170	2150	155.0	81.0	0.868
	9/5/2014	22.68	6214.12	7.7	4550	4160	2220	168.0	86.0	0.764
	10/17/2014	22.61	6214.19	6.8	4660	4240	2230	166.0	77.0	0.757
	3/24/2015	22.58	6214.22	7.4	4600	4220	2320	177.0	72.0	0.697
	6/16/2015	22.43	6214.37	7.4	5510	4200	2330	170.0	70.0	0.726
	8/11/2015	22.77	6214.03	7.4	5420	4210	2200	156.0	81.0	0.692
	10/16/2015	22.82	6213.98	7.4	5470	4130	2280	163.0	65.0	0.705
	1/22/2016	22.85	6213.95	7.1	4760	4110	2100	145.0	66.0	0.736
	6/28/2016	22.74	6214.06	7.6	4450	4090	1960	149.0	64.0	0.708
	8/26/2016	23.05	6213.75	7.5	4880	4000	2250	156.0	58.0	0.666
	10/21/2016	23.00	6213.80	7.7	4590	3870	2140	141.0	61.0	0.638
AL-7	1/22/2013	26.83	6225.17	6.4	1256	3170	1780	93.0	19.0	0.439
	4/1/2013	26.62	6225.38	7.0	3910	3070	1830	101.0	18.0	0.474
	8/2/2013	26.76	6225.24	7.4	3680	3170	1860	96.0	18.0	0.445
	11/12/2013	26.86	6225.14	7.4	3910	3150	1790	98.0	16.0	0.393
	3/26/2014	26.52	6225.48	7.5	4320	3780	2040	124.0	56.0	0.544
	6/6/2014	—	—	7.3	4170	3420	1950	107.0	28.0	0.503
	9/5/2014	26.81	6225.19	7.5	3860	3370	1970	111.0	23.0	0.477
	10/17/2014	26.88	6225.12	6.8	4060	3610	2080	120.0	30.0	0.542
	3/24/2015	26.76	6225.24	7.2	3970	3390	1950	112.0	14.0	0.457
	6/16/2015	26.58	6225.42	7.3	4720	3390	2070	114.0	16.1	0.507
	8/11/2015	26.91	6225.09	7.3	4540	3430	2000	102.0	20.0	0.450
	10/16/2015	27.15	6224.85	7.1	4820	3470	2180	118.0	18.0	0.569

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	WL (feet)	WL_ELEV (ft-msl)	pH(f) (std. units)	Cond(f) (µmhos)	TDS (mg/l)	SO4 (mg/l)	Cl (mg/l)	NO3+NO2 (mg/l)	Unat (mg/l)
AL-7	1/22/2016	27.23	6224.77	7.1	4220	3410	1960	99.0	14.0	0.447
	6/28/2016	27.07	6224.93	7.6	3640	3260	1680	89.0	6.3	0.495
	8/26/2016	27.35	6224.65	7.3	4120	3190	2000	95.0	10.0	0.479
	10/21/2016	27.45	6224.55	7.5	4080	3210	1900	86.0	13.0	0.527
T1-6	1/22/2013	29.36	6398.86	6.7	1058	2710	1620	49.0	1.0	0.069
	4/1/2013	28.41	6399.81	6.7	3400	2650	1570	50.0	0.6	0.070
	6/17/2013	29.53	6398.69	7.5	1886	2660	1600	50.0	< 0.1	0.089
	8/2/2013	29.67	6398.55	7.7	3280	2540	1580	43.0	0.9	0.061
	11/7/2013	29.55	6398.67	7.7	2990	2560	1560	49.0	0.8	0.059
	3/26/2014	29.18	6399.04	7.6	3460	2570	1530	47.0	0.7	0.048
	5/29/2014	28.69	6399.53	7.8	3340	2580	1570	49.0	0.7	0.067
	6/6/2014	—	—	6.6	3520	2600	1540	45.0	0.8	0.047
	9/5/2014	30.00	6398.22	7.2	3420	2600	1560	47.0	0.8	0.043
	10/17/2014	29.89	6398.33	6.9	3590	2640	1500	47.0	0.9	0.059
	10/29/2014	29.01	6399.21	7.2	3320	2620	1570	50.0	1.1	0.078
	3/24/2015	29.50	6398.72	7.5	3300	2680	1600	51.0	0.8	0.045
	6/16/2015	29.66	6398.56	8.0	3970	2660	1660	52.0	0.9	0.048
	6/24/2015	28.86	6399.36	7.4	3160	2650	1590	51.0	1.0	0.051
	8/11/2015	29.95	6398.27	7.2	3840	2620	1590	48.0	1.0	0.043
	10/16/2015	29.82	6398.40	7.4	3890	2680	1740	54.0	1.1	0.049
	11/17/2015	28.64	6399.58	7.8	3130	2590	1640	51.0	1.3	0.102
	1/22/2016	29.37	6398.85	6.7	3050	2740	1650	54.0	1.8	0.053
	5/23/2016	28.40	6399.82	7.4	2960	2730	1520	53.0	0.4	0.070
	6/28/2016	29.60	6398.62	7.5	3240	2740	1470	51.0	1.8	0.051
	8/26/2016	29.66	6398.56	7.7	3640	2740	1710	57.0	2.1	0.047
	10/21/2016	29.44	6398.78	7.9	3700	2880	1800	60.0	3.1	0.074
T1-12	1/22/2013	19.96	6320.84	5.8	1713	6370	2560	200.0	213.0	0.399
	4/1/2013	20.15	6320.65	6.3	7300	6520	2590	210.0	220.0	0.409
	8/2/2013	20.03	6320.77	7.7	3280	6350	2580	201.0	221.0	0.415
	11/12/2013	20.23	6320.57	6.8	7480	6400	2590	218.0	215.0	0.373
	3/26/2014	19.78	6321.02	6.7	7690	6550	2570	212.0	262.0	0.384
	6/6/2014	—	—	6.6	7760	6880	2610	211.0	268.0	0.402
	9/5/2014	20.23	6320.57	6.7	3390	6230	2640	218.0	209.0	0.345
	10/17/2014	20.30	6320.50	6.5	7560	6640	2760	231.0	246.0	0.358
	3/24/2015	20.58	6320.22	6.7	6450	6170	2560	219.0	199.0	0.345
	6/16/2015	20.85	6319.95	6.5	8510	6490	1380	143.0	185.0	0.379
	8/11/2015	20.00	6320.80	6.5	8970	6240	2570	218.0	223.0	0.333
	10/16/2015	20.45	6320.35	8.0	3340	6180	2690	225.0	173.0	0.348
	1/22/2016	20.95	6319.85	6.9	7230	6260	2470	196.0	187.0	0.396
	6/28/2016	19.90	6320.90	6.9	6490	6180	2250	205.0	177.0	0.170
	8/26/2016	20.31	6320.49	6.8	7580	6320	2730	226.0	224.0	0.325
	10/21/2016	20.64	6320.16	6.8	7400	6220	2610	215.0	215.0	0.325

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	Th230 (pCi/l)	Th230(e) (pCi/l)	Ra226 (pCi/l)	Ra226(e) (pCi/l)	Ra228 (pCi/l)	Ra228(e) (pCi/l)	Ra226+Ra228 (pCi/l)
AL-1	1/22/2013	0.080	± 0.1	1.2	± 0.2	1.6	± 0.7	2.8
	4/1/2013	0.090	± 0.1	1.2	± 0.2	0.3	± 0.9	1.5
	8/2/2013	0.100	± 0.1	0.7	± 0.2	0.8	± 0.8	1.5
	11/12/2013	0.100	± 0.1	0.4	± 0.2	1.7	± 0.7	2.1
	3/26/2014	0.060	± 0.1	0.7	± 0.2	0.5	± 0.8	1.2
	6/6/2014	0.200	± 0.1	0.4	± 0.1	0.6	± 0.8	1.0
	9/5/2014	-0.030	± 0.4	0.5	± 0.2	0.9	± 0.9	1.4
	10/17/2014	0.100	± 0.1	0.5	± 0.2	1.5	± 0.9	2.0
	3/24/2015	0.100	± 0.1	3.5	± 0.7	2.3	± 0.8	5.8
	6/16/2015	0.090	± 0.1	3.8	± 0.8	4.2	± 1.1	8.0
	8/11/2015	0.300	± 0.2	0.8	± 0.2	0.4	± 0.6	1.2
	10/16/2015	0.200	± 0.1	1.8	± 0.4	1.4	± 0.7	3.2
	1/22/2016	0.004	± 0.1	1.2	± 0.3	0.7	± 0.6	1.9
	6/28/2016	-0.030	± 0.1	1.0	± 0.3	5.3	± 1.5	6.3
	8/26/2016	1.600	± 0.3	0.5	± 0.2	1.1	± 0.7	1.6
	10/21/2016	0.030	± 0.1	0.4	± 0.1	3.9	± 1.1	4.3
AL-6	1/22/2013	0.100	± 0.1	4.0	± 0.4	2.1	± 0.8	6.1
	4/1/2013	0.070	± 0.1	4.3	± 0.4	1.7	± 1.1	6.0
	8/2/2013	0.060	± 0.1	3.7	± 0.4	1.9	± 0.9	5.6
	11/12/2013	0.200	± 0.1	4.8	± 0.4	1.9	± 0.8	6.7
	3/26/2014	0.030	± 0.1	3.0	± 0.3	1.3	± 0.8	4.3
	6/6/2014	0.100	± 0.1	3.5	± 0.3	1.1	± 0.7	4.6
	9/5/2014	0.080	± 0.4	2.5	± 0.3	1.7	± 0.9	4.2
	10/17/2014	0.100	± 0.1	3.0	± 0.3	4.1	± 0.9	7.1
	3/24/2015	0.040	± 0.1	6.0	± 1.2	2.8	± 0.8	8.8
	6/16/2015	3.200	± 0.6	3.6	± 0.8	0.8	± 0.7	4.4
	8/11/2015	0.100	± 0.2	5.5	± 1.1	1.0	± 0.6	6.5
	10/16/2015	0.100	± 0.1	2.4	± 0.5	2.4	± 0.8	4.8
	1/22/2016	0.090	± 0.1	4.2	± 0.9	2.1	± 0.7	6.3
	6/28/2016	0.070	± 0.1	2.4	± 0.5	2.0	± 1.3	4.4
	8/26/2016	0.300	± 0.2	2.4	± 0.5	2.2	± 0.9	4.6
	10/21/2016	0.100	± 0.1	0.0	± 0.1	2.2	± 1.0	2.2
AL-7	1/22/2013	0.300	± 0.2	0.8	± 0.2	1.0	± 0.7	1.8
	4/1/2013	0.090	± 0.1	0.7	± 0.2	0.4	± 1.0	1.1
	8/2/2013	0.100	± 0.1	0.7	± 0.2	0.8	± 0.8	1.5
	11/12/2013	0.100	± 0.1	0.4	± 0.2	0.6	± 0.6	1.0
	3/26/2014	0.040	± 0.1	0.9	± 0.2	2.3	± 1.0	3.2
	6/6/2014	0.100	± 0.1	0.9	± 0.2	0.8	± 0.7	1.7
	9/5/2014	0.010	± 0.1	0.8	± 0.2	1.8	± 1.0	2.6
	10/17/2014	0.100	± 0.1	0.5	± 0.2	1.4	± 0.9	1.9
	3/24/2015	0.100	± 0.1	1.4	± 0.4	2.2	± 0.8	3.6
	6/16/2015	0.100	± 0.1	6.6	± 1.3	0.5	± 0.8	7.1
	8/11/2015	0.090	± 0.1	1.6	± 0.4	1.0	± 0.6	2.6
	10/16/2015	0.100	± 0.2	0.8	± 0.2	3.3	± 0.9	4.1

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	Th230 (pCi/l)	Th230(e) (pCi/l)	Ra226 (pCi/l)	Ra226(e) (pCi/l)	Ra228 (pCi/l)	Ra228(e) (pCi/l)	Ra226+Ra228 (pCi/l)
AL-7	1/22/2016	0.100	± 0.1	0.6	± 0.2	0.0	± 0.6	0.6
	6/28/2016	0.050	± 0.1	0.3	± 0.1	4.4	± 1.6	4.7
	8/26/2016	0.100	± 0.1	0.9	± 0.2	1.1	± 0.7	2.0
	10/21/2016	0.070	± 0.2	0.7	± 0.2	4.8	± 1.2	5.5
T1-6	1/22/2013	1.400	± 0.4	2.5	± 0.3	1.0	± 0.7	3.5
	4/1/2013	0.020	± 0.1	2.1	± 0.3	-0.2	± 1.2	1.9
	6/17/2013	—	—	5.9	± 0.5	—	—	—
	8/2/2013	0.100	± 0.1	1.3	± 0.2	0.7	± 0.8	2.0
	11/7/2013	0.300	± 0.2	1.9	± 0.3	0.9	± 1.2	2.8
	3/26/2014	-0.020	± 0.1	1.5	± 0.2	0.2	± 0.7	1.7
	5/29/2014	—	—	2.8	± 0.3	2.4	± 0.7	5.2
	6/6/2014	0.100	± 0.1	1.9	± 0.3	0.5	± 0.8	2.4
	9/5/2014	0.040	± 0.2	1.7	± 0.3	2.0	± 0.9	3.7
	10/17/2014	-0.010	± 0.1	1.4	± 0.2	1.5	± 0.8	2.9
	10/29/2014	—	—	7.3	± 0.5	1.7	± 0.8	9.0
	3/24/2015	0.009	± 0.1	5.4	± 1.1	3.0	± 0.9	8.4
	6/16/2015	0.070	± 0.1	6.3	± 1.3	1.0	± 0.8	7.3
	6/24/2015	—	—	7.6	± 1.5	2.2	± 0.7	9.8
	8/11/2015	0.100	± 0.1	2.4	± 0.5	0.6	± 0.6	3.0
	10/16/2015	0.060	± 0.1	1.5	± 0.4	1.9	± 0.7	3.4
	11/17/2015	—	—	11.0	± 0.2	4.6	± 0.9	—
	1/22/2016	0.070	± 0.1	2.2	± 0.5	2.1	± 0.8	4.3
	5/23/2016	—	—	4.8	± 1.0	1.1	± 0.7	5.9
	6/28/2016	0.004	± 0.1	3.9	± 0.8	3.5	± 1.4	7.4
	8/26/2016	0.200	± 0.2	2.1	± 0.5	1.2	± 0.7	3.3
	10/21/2016	0.006	± 0.1	1.4	± 0.3	2.0	± 0.9	3.4
T1-12	1/22/2013	1.900	± 0.5	3.0	± 0.3	1.9	± 0.7	4.9
	4/1/2013	0.040	± 0.1	2.8	± 0.4	0.9	± 1.5	3.7
	8/2/2013	0.200	± 0.2	2.1	± 0.4	2.4	± 1.6	4.5
	11/12/2013	0.080	± 0.1	1.7	± 0.3	2.8	± 1.1	4.5
	3/26/2014	0.006	± 0.1	1.9	± 0.3	1.5	± 1.1	3.4
	6/6/2014	0.100	± 0.1	1.8	± 0.4	1.9	± 1.7	3.7
	9/5/2014	0.090	± 0.4	2.5	± 0.7	2.0	± 2.9	4.5
	10/17/2014	0.070	± 0.1	1.4	± 0.2	2.3	± 0.8	3.7
	3/24/2015	-0.030	± 0.3	9.6	± 2.0	3.4	± 1.2	13.0
	6/16/2015	0.400	± 0.8	4.9	± 1.0	0.8	± 0.7	5.7
	8/11/2015	0.090	± 0.7	2.6	± 0.6	1.5	± 0.6	4.1
	10/16/2015	0.500	± 0.6	1.7	± 0.4	5.1	± 1.4	6.8
	1/22/2016	0.400	± 0.7	2.3	± 0.5	1.3	± 0.8	3.6
	6/28/2016	0.100	± 0.6	1.8	± 0.4	3.2	± 1.4	5.0
	8/26/2016	-0.060	± 0.5	2.1	± 0.5	3.4	± 1.2	5.5
	10/21/2016	0.100	± 0.6	1.9	± 0.4	3.1	± 1.1	5.0

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	As (mg/l)	Be (mg/l)	Cd (mg/l)	Cr (mg/l)	Ni (mg/l)	Se (mg/l)
AL-1	1/22/2013	0.004	< 0.001	< 0.001	0.01	0.03	0.256
	4/1/2013	0.004	< 0.001	< 0.001	< 0.01	0.02	0.199
	8/2/2013	0.001	< 0.001	< 0.001	< 0.01	0.02	0.159
	11/12/2013	0.005	< 0.001	< 0.001	< 0.01	0.03	0.374
	3/26/2014	0.002	< 0.001	< 0.001	< 0.01	0.04	0.262
	6/6/2014	0.003	< 0.001	< 0.001	< 0.01	0.02	0.277
	9/5/2014	0.005	< 0.001	< 0.001	< 0.01	0.04	0.315
	10/17/2014	0.002	< 0.001	< 0.001	< 0.01	0.02	0.325
	3/24/2015	0.011	< 0.001	< 0.001	< 0.01	0.02	0.346
	6/16/2015	0.005	< 0.001	< 0.001	< 0.01	0.02	0.293
	8/11/2015	0.003	< 0.001	< 0.001	< 0.01	0.02	0.215
	10/16/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.05	0.242
	1/22/2016	0.002	< 0.001	< 0.001	< 0.01	0.02	0.238
	6/28/2016	0.013	< 0.001	< 0.001	< 0.01	0.02	0.260
	8/26/2016	0.013	< 0.001	< 0.001	< 0.01	0.02	0.253
	10/21/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.285
AL-6	1/22/2013	0.008	< 0.001	< 0.001	< 0.01	0.01	0.133
	4/1/2013	0.007	< 0.001	< 0.001	< 0.01	< 0.01	0.128
	8/2/2013	0.008	< 0.001	< 0.001	< 0.01	0.01	0.147
	11/12/2013	0.008	< 0.001	< 0.001	< 0.01	< 0.01	0.138
	3/26/2014	0.008	0.001	< 0.001	< 0.01	0.01	0.135
	6/6/2014	0.006	< 0.001	< 0.001	< 0.01	0.01	0.153
	9/5/2014	0.009	< 0.001	< 0.001	< 0.01	0.01	0.149
	10/17/2014	0.005	< 0.001	< 0.001	< 0.01	0.01	0.157
	3/24/2015	0.006	< 0.001	< 0.001	< 0.01	< 0.01	0.142
	6/16/2015	0.011	< 0.001	0.003	< 0.01	0.01	0.139
	8/11/2015	0.007	< 0.001	< 0.001	< 0.01	< 0.01	0.117
	10/16/2015	0.004	< 0.001	< 0.001	< 0.01	0.04	0.141
	1/22/2016	0.009	< 0.001	< 0.001	< 0.01	< 0.01	0.144
	6/28/2016	0.013	< 0.001	< 0.001	< 0.01	< 0.01	0.141
	8/26/2016	0.012	< 0.001	< 0.001	< 0.01	< 0.01	0.123
	10/21/2016	0.002	< 0.001	< 0.001	< 0.01	< 0.01	0.157
AL-7	1/22/2013	0.001	< 0.001	< 0.001	< 0.01	0.02	0.044
	4/1/2013	0.001	< 0.001	< 0.001	< 0.01	0.01	0.048
	8/2/2013	0.003	< 0.001	< 0.001	< 0.01	0.01	0.043
	11/12/2013	0.002	< 0.001	< 0.001	< 0.01	0.01	0.037
	3/26/2014	0.001	0.001	< 0.001	< 0.01	0.02	0.066
	6/6/2014	0.001	< 0.001	< 0.001	< 0.01	0.02	0.059
	9/5/2014	0.002	< 0.001	< 0.001	< 0.01	0.02	0.054
	10/17/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.069
	3/24/2015	0.003	< 0.001	< 0.001	< 0.01	0.02	0.045
	6/16/2015	0.002	< 0.001	< 0.001	< 0.01	0.02	0.057
	8/11/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.061
	10/16/2015	0.002	< 0.001	< 0.001	< 0.01	0.04	0.066

TABLE 1. WATER-LEVEL AND WATER-QUALITY DATA. (cont'd)

Lucky MC Mine - Pathfinder Mines Corp.

Sample Point Name	Date	As (mg/l)	Be (mg/l)	Cd (mg/l)	Cr (mg/l)	Ni (mg/l)	Se (mg/l)
AL-7	1/22/2016	0.001	< 0.001	< 0.001	< 0.01	0.01	0.051
	6/28/2016	0.001	< 0.001	< 0.001	< 0.01	0.02	0.034
	8/26/2016	0.002	< 0.001	< 0.001	< 0.01	0.01	0.051
	10/21/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.069
T1-6	1/22/2013	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.031
	4/1/2013	0.003	< 0.001	< 0.001	< 0.01	0.02	0.018
	6/17/2013	0.004	—	< 0.005	< 0.05	< 0.05	0.044
	8/2/2013	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.023
	11/7/2013	< 0.001	< 0.010	< 0.005	< 0.05	< 0.05	0.026
	3/26/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.021
	5/29/2014	< 0.001	—	< 0.005	< 0.05	< 0.05	0.023
	6/6/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.022
	9/5/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.024
	10/17/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.027
	10/29/2014	< 0.001	—	< 0.005	< 0.05	< 0.05	0.029
	3/24/2015	0.001	< 0.001	< 0.001	< 0.01	0.02	0.029
	6/16/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.02	0.034
	6/24/2015	< 0.001	—	< 0.005	< 0.05	< 0.05	0.037
	8/11/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.03	0.035
	10/16/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.008
	11/17/2015	< 0.001	—	< 0.005	< 0.05	< 0.05	0.036
	1/22/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.061
	5/23/2016	0.002	—	< 0.005	< 0.05	< 0.05	0.055
	6/28/2016	0.001	< 0.001	< 0.001	< 0.01	0.01	0.059
	8/26/2016	0.003	< 0.001	< 0.001	< 0.01	0.01	0.063
	10/21/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.01	0.104
T1-12	1/22/2013	0.002	< 0.001	< 0.001	0.02	0.30	0.229
	4/1/2013	0.003	< 0.001	< 0.001	0.01	0.26	0.213
	8/2/2013	< 0.001	< 0.001	< 0.001	0.01	0.30	0.228
	11/12/2013	0.003	< 0.001	< 0.001	< 0.01	0.26	0.217
	3/26/2014	0.002	< 0.001	< 0.001	< 0.01	0.25	0.226
	6/6/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.26	0.235
	9/5/2014	0.003	< 0.001	< 0.001	< 0.01	0.29	0.204
	10/17/2014	< 0.001	< 0.001	< 0.001	< 0.01	0.26	0.220
	3/24/2015	0.005	< 0.001	< 0.001	0.01	0.27	0.176
	6/16/2015	0.004	< 0.001	< 0.001	< 0.01	0.25	0.176
	8/11/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.24	0.156
	10/16/2015	< 0.001	< 0.001	< 0.001	< 0.01	0.27	0.151
	1/22/2016	0.002	< 0.001	< 0.001	< 0.01	0.27	0.173
	6/28/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.14	0.149
	8/26/2016	0.007	< 0.001	< 0.001	< 0.01	0.24	0.160
	10/21/2016	< 0.001	< 0.001	< 0.001	< 0.01	0.23	0.164