



MEMORANDUM

TO: Byron O'Connor, Project Manager; Eric Domingue, Project Manager
DATE: December 9th, 2013
FROM: Tracey Parkin; Environmental Coordinator and Sukie Sidhu; Chemist
SUBJECT: Rose Creek Additional Monitoring 1

Background

During periods of Cross Valley Pond (CVP) discharge, samples are collected from the compliance point X5 and from Rose Creek at sampling location X14 on a daily basis. For each sample, the field parameters of Temperature, pH and Conductivity (EC) are recorded. The samples are also analysed for total and dissolved Zinc at the Faro Mine Complex (FMC) Laboratory to ensure that X5 is not exceeding the effluent water quality standard limit of 0.500 mg/L as outlined in Appendix C of the Care and Maintenance contract. An unofficial Zinc limit of 0.150 mg/L has been applied to X14 to prevent loading.

During 2013, X5 experienced Turbidity fluctuations resulting in sporadic discharge events. On October 22nd, 2013, the X5 siphon was opened and since the Turbidity results were compliant discharge took place. Daily analysis, however, revealed that Zinc levels at X14 were above the internal trigger level of 0.100 mg/L and the X5 discharge values resulting in the X5 siphon being turned off. On October 23rd, 2013, the X5 siphon was again turned on and allowed to discharge. Daily analysis once again returned high Zinc levels at X14 which were again above the internal trigger and X5 discharge values. The siphon was turned off and an investigation into potential sources of increased zinc began.

Details of the investigation and subsequent results have been summarized in a memorandum, "Elevated Zinc Levels in Rose Creek" (Parkin, T. 2013), and submitted to the Yukon Government (YG) on November 4th, 2013. On November 5th, 2013, YG requested increased monitoring to occur in Rose Creek until a further plan has been developed

Monitoring Program

Increased monitoring in Rose Creek was to include the following:

- Twice a week sampling to occur on Monday and Thursday at monitoring locations R8, R9, R10, NF1 - Oct, NF2, X2, X3A, X10 and X14;
- Maxxam Analytics analysis for the full surface water suite outlined in Appendix C of the Care and Maintenance contract with a one (1) day reporting turnaround time;
- In-house sampling to occur Monday – Thursday and Saturday at monitoring locations R8, R9, R10, NF1 - Oct, NF2, X2, X3A, X10 and X14 with Zinc and Turbidity analysis to be performed at FMC Laboratory; and
- The field parameters Temperature, pH and Conductivity (EC) will also be recorded for each sample collected.

On November 8th, 2013, an amendment was made to the scope of work and sample collection for Maxxam Analytics was removed.

On November 18th, 2013, the scope of work was amended to include sample collection for Maxxam Analytics on November 19th and 21st, 2013.



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On December 2nd, 2013, the scope of work was amended to include NF2 – A and NF2 – B in the in-house sampling.

Methodology

All samples were collected in accordance with “Standard Methods for the Examination of Water and Waste Water.”

The field parameters, Temperature, pH and Conductivity, were measured with a Hanna combo meter.

NF1- Oct is located close to the shore and due to prevailing weather conditions and flow; a sample could no longer be obtained. Due to this, new sample locations were created (NF-L and NF1-N) to determine the suspected migration path of NF1-Oct and to allow for continued monitoring of the elevated Zinc levels.

Results

All sampling locations are illustrated in Appendix A.

A summary of all field parameters are located in Appendix B.

A summary of all field parameters are illustrated in Appendix C.

Analytical results available to date are located in Appendix D.

Appendix A

Map Sheets



Map Sheet 1: Additional Rose Creek Monitoring Locations





Map Sheet 2: Additional Rose Creek Monitoring Locations – North Fork Rock Drain



Appendix B

Tables



Table 1: Rose Creek Historical Averages

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Site	pH	EC ($\mu\text{S/cm}$)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)
R8	7.91	181	0.006	0.006	0.91
R9	7.94	201	0.006	0.006	0.91
R10	7.90	202	0.011	0.011	0.91
NF1	7.70	179	0.040	0.035	
NF2	7.85	200	0.021	0.020	1.00
X2	7.84	221	0.039	0.037	1.12
X3A	7.85	238	0.045	0.059	2.12
X10	7.98	238	0.040	0.036	1.29
X14	7.92	505	0.053	0.041	2.75



Table 2: R8 - Field Parameters

Table 2: R8 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	11:14 AM	<0.0	7.73	178	0.002	-0.002	0.81	
06-Nov-13	9:36 AM	0.1	7.21	178	0.000	-0.002		
07-Nov-13	12:56 PM	<0.0	7.47	188	<RDL	<RDL	0.76	
09-Nov-13	9:24 AM	<0.0	7.72	7	<RDL	<RDL		EC was rechecked. Value verified.
11-Nov-13	10:50 AM	1.4	7.83	197	0.000	<RDL		
12-Nov-13								No sample collected due to equipment issues.
13-Nov-13	9:37 AM	< 0.0	7.82	206	<RDL	<RDL		
14-Nov-13	12:39 PM	<0.0	7.80	225	0.004	0.002		
16-Nov-13	8:36 AM	<0.0	7.67	186	0.001	0.000		
18-Nov-13								No sample collected due to equipment issues.
19-Nov-13	10:50 AM	<0.0	7.25	174	<RDL	<RDL		
20-Nov-13	9:30 AM	<0.0	7.45	243	0.003	0.003		
21-Nov-13	10:50 AM	<0.0	7.25	174	0.002	0.000		
23-Nov-13	10:21 AM	3.9	7.31	265	0.002	0.001		
25-Nov-13	10:09 AM	<0.0	7.42	212	0.002	0.001		
26-Nov-13	9:30 AM	2.3	7.42	214	0.001	0.000		
27-Nov-13	10:32 AM	<0.0	7.31	201	0.001	0.000		
28-Nov-13	9:58 AM	<0.0	7.14	212	0.002	0.001		
30-Nov-13	12:37 PM	0.6	7.62	210	0.002	0.001		
02-Dec-13								No sample collected due to weather conditions.
03-Dec-13	10:58 AM	0.3	7.88	213	0.003	0.001		
04-Dec-13	10:45 AM	0.4	7.84	218	0.000	0.002		
05-Dec-13	11:03 AM	0.5	7.95	228	0.004	0.000		
07-Dec-13	12:10 PM	1.0	7.73	234	0.001	0.000		



Table 3: R9 – Field Parameters

Table 3: R9 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	1:30 PM	0.3	7.62	213			0.86	No in-house sample collected as site was added to scope of work after sample collection was completed.
06-Nov-13	9:15 AM	<0.0	7.28	202	0.000	-0.002		
07-Nov-13	12:33 PM	<0.0	7.48	206	<RDL	<RDL	0.93	
09-Nov-13	9:26 AM	<0.0	7.42	224	<RDL	<RDL		
11-Nov-13	11:06 AM	0.4	7.94	225	<RDL	<RDL		
12-Nov-13	12:48 PM	3.5	7.66	262	<RDL	<RDL		
13-Nov-13	9:25 AM	< 0.0	7.31	222	0.000	0.003		
14-Nov-13	12:38 PM	3.1	7.47	250	<RDL	<RDL		
16-Nov-13	8:50 AM	<0.0	7.63	213	<RDL	<RDL		
18-Nov-13	2:48 PM	0.2	7.55	77	<RDL	<RDL		
19-Nov-13	10:59 AM	<0.0	7.36	261	<RDL	<RDL		
20-Nov-13	9:40 AM	< 0.0	7.50	273	0.007	0.005		
21-Nov-13	10:59 AM	< 0.0	7.36	261	0.003	0.001		
23-Nov-13	10:31 AM	1.7	7.50	232	0.001	0.000		
25-Nov-13	9:57 AM	<0.0	7.26	236	0.004	0.001		
26-Nov-13	9:42 AM	2.5	7.42	246	0.002	0.000		
27-Nov-13	10:37 AM	<0.0	7.33	228	0.002	0.000		
28-Nov-13	10:17 AM	<0.0	7.19	240	0.002	0.000		
30-Nov-13	12:25 PM	0.6	7.60	247	0.002	0.000		
02-Dec-13								No sample collected due to weather conditions.
03-Dec-13	10:30 AM	0.4	7.85	231	0.003	0.002		
04-Dec-13	10:36 AM	0.7	7.81	236	0.010	0.011		
05-Dec-13	10:52 AM	0.4	7.95	240	0.005	0.004		
07-Dec-13	11:43 AM	1.4	7.60	245	0.002	0.001		



Table 4: R10 – Field Parameters

Table 4: R10 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:56 AM	<0.0	7.51	207	0.006	0.005	0.91	
06-Nov-13	9:05 AM	<0.0	7.19	201	0.011	0.005		
07-Nov-13	12:22 PM	<0.0	7.54	219	0.007	0.004	0.93	
09-Nov-13	9:17 AM	<0.0	6.74	271	0.003	0.002		
11-Nov-13	11:17 AM	0.3	7.88	226	0.010	0.002		
12-Nov-13	12:55 PM	2.3	7.74	230	0.005	0.003		
13-Nov-13	9:20 AM	< 0.0	7.26	220	0.007	0.005		
14-Nov-13	12:46 PM	1.5	7.71	236	0.008	0.006		
16-Nov-13	9:01 AM	<0.0	7.41	220	0.009	0.008		
18-Nov-13	2:39 PM	0.1	7.26	247	0.017	0.013		
19-Nov-13	10:15 AM	<0.0	7.54	220	0.017	0.015		
20-Nov-13	9:49 AM	< 0.0	7.44	250	0.022	0.018		
21-Nov-13	10:15 AM	< 0.0	7.54	220	0.025	0.018		
23-Nov-13	10:41 AM	0.6	7.46	238	0.016	0.013		
25-Nov-13	9:50 AM	<0.0	7.26	239	0.017	0.014		
26-Nov-13	9:50 AM	0.6	7.44	239	0.014	0.010		
27-Nov-13	10:26 AM	0.1	7.14	233	0.014	0.009		
28-Nov-13	10:09 AM	<0.0	6.98	233	0.012	0.009		
30-Nov-13	12:14 PM	2.0	7.41	241	0.012	0.008		
02-Dec-13								No sample collected due to weather conditions.
03-Dec-13	10:10 AM	0.9	7.69	231	0.017	0.012		
04-Dec-13	10:30 AM	0.6	7.45	240	0.023	0.024		
05-Dec-13	10:44 AM	0.7	7.72	236	0.012	0.010		
07-Dec-13	11:32 AM	1.7	7.48	269	0.012	0.008		



Table 5: NF1 - Oct – Field Parameters

Table 5: NF1 - Oct – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:45 AM	0.0	5.26	1080	2.485	2.804	16.57	Sample taken from location established in October. Strong sulphur like smell at sampling location, sediment in sample and once capped the bottle began to expand. Dissolved Zn greater than total Zn; Reanalysis verified the result
06-Nov-13	8:54 AM	1.3	5.30	1064	2.437	2.463		
07-Nov-13	2:58 PM	<0.0	6.83	0	2.525	2.312	22.10	Strong sulphur like smell at sampling location, sediment in sample and once capped the bottle began to expand. High range meter used for EC therefore value would not register.
09-Nov-13	9:37 AM	0.1	5.51	1092	2.081	2.269		Sample taken from location established in October. Dissolved Zn greater than total Zn; Reanalysis verified the result
11-Nov-13	11:38 AM	0.3	7.86	239	0.003	0.002		Sampled from near the middle of the pond. Once broken through ice at Oct-established site was all mud
12-Nov-13	1:10 PM	1.6	5.53	1046	2.309	2.257		Lots of suspended material in sample.
13-Nov-13	9:10 AM	< 0.0	5.54	1017	2.153	2.137		Lots of suspended material in sample. Sample produced gas when shaken in bottle
14-Nov-13	12:54 PM	<0.0	5.37	1138	2.449	2.175		
16-Nov-13	9:20 AM	<0.0	5.59	1047	2.211	2.313		Dissolved Zn greater than total Zn; Reanalysis verified the result.



Table 6: NF1 - L – Field Parameters

Table 6: NF1 - L – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
26-Nov-13	11:00 AM	0.5	5.67	1054	2.567	2.378		20 meters South of the original NF1 OCT location Northing: 6913080 Easting: 585063
27-Nov-13	10:17 AM	<0.0	6.43	1085	2.555	2.506		
28-Nov-13	9:45 AM	0.1	5.45	633	1.342	1.228		
30-Nov-13	11:59 AM	0.8	5.81	430	0.486	0.415		
02-Dec-13								No sample collected due to weather conditions.
03-Dec-13	10:02 AM							Hit the bottom of the pond soil and dirt, no sample to collect
04-Dec-13								Sample site not checked as previous comments stated there was insufficient water.
05-Dec-13								Sample site not checked as previous comments stated there was insufficient water.
07-Dec-13	11:20 AM							Overtopping on ice occurred; unsafe to collect sample.



Table 7: NF1 - M – Field Parameters

Table 7: NF1 - M – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
25-Nov-13	9:36 AM	<0.0	7.18	235	0.622	0.015		As NF1 - Oct could not be sampled, NF1 pond was sampled at the EDI sample location between NF1 - E and NF1 -F. Northing: 6913043 Easting: 584969



Table 8: NF1 - N – Field Parameters

Table 8: NF1 - N – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
26-Nov-13	11:08 AM	0.4	6.88	284	0.061	0.041		40 meters South of the original NF1 OCT location Northing: 6913070 Easting: 585053
27-Nov-13	10:16 AM	0.1	6.70	246	0.023	0.019		
28-Nov-13	9:37 AM	3.8	6.75	284	0.021	0.017		
30-Nov-13	11:54 AM	2.5	7.04	283	0.019	0.019		
02-Dec-13								No sample collected due to weather conditions.
03-Dec-13	9:59 AM	1.0	7.40	266	0.139	0.023		
04-Dec-13	10:20 AM	0.9	7.30	259	0.021	0.000		
05-Dec-13	10:20 AM							Frozen. No sample collected.
07-Dec-13	11:20 AM							Overtopping on ice occurred; unsafe to collect sample.



Table 9: NF2 - A – Field Parameters

Table 9: NF2 - A – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
02-Dec-13	12:25 PM	< 0.0	7.59	294	1.395	1.308		
03-Dec-13	11:49 AM	0.7	7.42	272	1.647	1.467		
04-Dec-13	11:05 AM	0.4	7.41	284	1.678	1.522		
05-Dec-13	10:09 AM	1.5	7.42	286	1.588	1.439		
07-Dec-13	10:32 AM	0.5	7.34	286	1.939	1.759		



Table 10: NF2 - B – Field Parameters

Table 10: NF2 - B – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
02-Dec-13	12:25 PM	< 0.0	7.68	262	0.024	0.019		
03-Dec-13	11:49 AM	0.5	7.72	234	0.017	0.015		
04-Dec-13	11:05 AM	0.3	7.01	239	0.015			A turbidity sample was not collected.
05-Dec-13	10:09 AM	0.4	7.65	242	0.013	0.011		
07-Dec-13	10:33 AM							The sample bottle was lost.



Table 11: NF2 – Field Parameters

Table 11: NF2 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:15 AM	0.7	7.04	276	0.904	0.824	1.94	
06-Nov-13	9:28 AM	<0.0	7.46	228	0.676	0.631		
07-Nov-13	10:08 AM	<0.0	7.42	245	0.769	0.665	2.53	
09-Nov-13	10:04 AM	<0.0	7.02	294	0.563	0.502		
11-Nov-13	12:04 PM	0.3	7.54	263	0.555	0.555		
12-Nov-13	1:30 PM	0.9	7.14	243	0.631	0.580		
13-Nov-13	10:05 AM	< 0.0	7.56	227	0.215	0.193		Collected a new sample at 3:30pm to verify the result. Dissolved Zn - 0.212 mg/L
14-Nov-13	10:48 AM	2.3	7.36	238	0.270	0.236		Sampled collected mid-stream; an additional sample was collected along the bank of the stream (after chipping away the ice) NF2 @ bank [Zn]Total = 0.912; [Zn]Dissolved = 0.828.
16-Nov-13	9:16 AM	0.2	7.72	230	0.137	0.125		EC measured in FMC Lab.
18-Nov-13	1:50 PM	1.7	7.73	254	0.289	0.271		
19-Nov-13	11:45 AM	<0.0	6.95	239	0.398	0.106		
20-Nov-13	10:37 AM	< 0.0	8.38	252	0.105	0.096		
21-Nov-13	12:45 PM	< 0.0	7.50	214	0.131	0.109		Significant ice cover (~20cm). Auger needed to sample.
23-Nov-13	12:29 PM	0.5	7.18	298	1.338	1.144		
25-Nov-13	10:35 AM	<0.0	7.27	261	0.205	0.560		Ran both samples twice.
26-Nov-13	10:31 AM	<0.0	6.89	583	0.669	0.588		
27-Nov-13	10:55 AM	<0.0	6.87	255	0.744	0.653		
28-Nov-13	10:55 AM	< 0.0	6.87	255	0.822	0.730		
30-Nov-13	11:22 AM	<0.0	7.24	264	0.599	0.481		
02-Dec-13	12:05 PM	< 0.0	7.33	292	0.483	0.429		
03-Dec-13	11:42 AM	2.2	7.51	291	0.572	0.518		
04-Dec-13	10:59 AM	0.0	7.54	257	0.608	0.549		
05-Dec-13	10:08 AM	1.9	7.50	289	0.592	0.544		
07-Dec-13	10:30 AM	0.9	7.28	255	0.811	0.741		



Table 12: X2 – Field Parameters

Table 12: X2 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	9:58 AM	<0.0	7.33	250	0.359	0.329	1.68	
06-Nov-13	9:13 AM	<0.0	7.51	233	0.311	0.283		
07-Nov-13	12:53 PM	0.2	7.74	242	0.358	0.303	1.33	
09-Nov-13	8:46 AM	0.3	7.61	261	0.304	0.321		
11-Nov-13	9:37 AM	0.3	7.71	265	0.336	0.300		
12-Nov-13	10:45 AM	1.1	7.53	242	0.307	0.280		
13-Nov-13	9:44 AM	0.2	7.66	213	0.315	0.002		
14-Nov-13	10:23 AM	1.2	7.52	247	0.337	0.267		
16-Nov-13	9:03 AM	0.2	8.14	270	0.352	0.313		EC measured in FMC Lab.
18-Nov-13	2:05 PM	<0.0	7.39	40	0.393	0.350		
19-Nov-13	11:25 AM	<0.0	7.87	259	0.199	0.368		
20-Nov-13	10:12 AM	< 0.0	7.64	272	0.426	0.395		
21-Nov-13	11:59 AM	0.1	7.34	264	0.412	0.381		
23-Nov-13	12:41 PM	0.6	7.30	262	0.417	0.365		
25-Nov-13	10:31 AM	0.8	7.35	256	0.229	0.376		Ran both samples twice
26-Nov-13	10:17 AM	<0.0	7.01	302	0.436	0.378		
27-Nov-13	10:24 AM	0.2	7.37	234	0.433	0.359		
28-Nov-13	10:10 AM	0.5	7.27	259	0.465	0.416		
30-Nov-13	10:01 AM	<0.0	7.30	272	0.409	0.330		
02-Dec-13	11:37 AM	< 0.0	7.22	317	0.408	0.346		
03-Dec-13	11:11 AM	1.1	7.61	267	0.406	0.360		
04-Dec-13	12:22 PM	< 0.0	7.01	250	0.425	0.385		
05-Dec-13	11:00 AM	0.1	7.20	276	0.425	0.375		
07-Dec-13	10:02 AM	0.6	7.55	263	0.453	0.423		



Table 13: X3A – Field Parameters

Table 13: X3A – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	11:16 AM	0.8	7.00	306	0.505	0.444	13.77	
06-Nov-13	9:00 AM	<0.0	7.47	335	0.513	0.439		
07-Nov-13	12:39 PM	0.2	7.90	262	0.291	0.203	9.55	
09-Nov-13	8:36 AM	0.2	7.85	278	0.186	0.176		
11-Nov-13	9:50 AM	1.5	7.95	321	0.197	0.172		
12-Nov-13	10:35 AM	1.6	7.58	264	0.177	0.157		
13-Nov-13	9:32 AM	0.3	7.77	252	0.179	0.160		
14-Nov-13	10:13 AM	1.8	7.88	294	0.375	0.301		
16-Nov-13	8:53 AM	0.3	8.07	261	0.202	0.186		
18-Nov-13	1:52 PM	<0.0	7.56	251	0.221	0.205		
19-Nov-13	11:10 AM	<0.0	7.88	269	0.227	0.204		
20-Nov-13	10:00 AM	< 0.0	7.70	287	0.249	0.216		
21-Nov-13	11:45 AM	0.4	7.61	286	0.243	0.205		
23-Nov-13	12:16 PM	0.6	7.44	278	0.247	0.206		
25-Nov-13	10:19 AM	1.0	7.44	277	0.409	0.231		
26-Nov-13	10:00 AM	0.2	7.12	304	0.267	0.235		
27-Nov-13	10:13 AM	0.3	7.44	274	0.255	0.223		
28-Nov-13	9:45 AM	1.3	7.30	269	0.276	0.243		Small amount of orange foam floating in creek
30-Nov-13	9:48 AM	<0.0	7.22	287	0.264	0.215		
02-Dec-13	11:23 AM	< 0.0	7.72	327	0.256	0.228		
03-Dec-13	10:57 AM	1.6	7.66	290	0.275	0.249		
04-Dec-13	11:31 AM	0.2	7.18	262	0.269	0.242		
05-Dec-13	10:49 AM	0.5	7.31	296	0.268	0.241		
07-Dec-13	9:52 AM	1.1	7.58	306	0.289	0.267		



Table 14: X10 – Field Parameters

Table 14: X10 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:51 AM	0.1	7.30	261	0.215	0.184	2.77	
06-Nov-13	8:48 AM	<0.0	8.25	249	0.190	0.172		
07-Nov-13	12:23 PM	0.1	8.11	271	0.192	0.157	1.97	
09-Nov-13	8:24 AM	0.1	7.85	273	0.209	0.178		
11-Nov-13	9:17 AM	0.3	7.94	291	0.195	0.179		
12-Nov-13	10:15 AM	0.8	7.71	259	0.194	0.173		
13-Nov-13	9:19 AM	0.3	7.85	255	0.185	0.164		
14-Nov-13	10:02 AM	1.5	7.58	288	0.200	0.167		
16-Nov-13	8:40 AM	0.6	8.05	266	0.199	0.178		
18-Nov-13	1:38 PM	0.5	7.66	285	0.148	0.141		
19-Nov-13	10:54 AM	<0.0	7.95	290	0.164	0.147		
20-Nov-13	9:46 AM	0.3	7.58	312	0.210	0.190		
21-Nov-13	11:19 AM	< 0.0	8.67	332	0.128	0.110		
23-Nov-13	12:04 PM	0.4	7.52	290	0.197	0.178		
25-Nov-13	10:03 AM	0.4	7.51	286	0.259	0.185		
26-Nov-13	9:40 AM	1.6	7.02	265	0.251	0.224		
27-Nov-13	9:58 AM	1.7	7.51	279	0.246	0.218		
28-Nov-13	9:33 AM	2.1	7.32	272	0.258	0.229		
30-Nov-13	9:31 AM	<0.0	7.24	298	0.247	0.230		
02-Dec-13	11:02 AM	0.4	7.32	343	0.243	0.219		
03-Dec-13	10:40 AM	1.1	7.30	287	0.249	0.217		
04-Dec-13	10:24 AM	< 0.0	7.06	270	0.248	0.221		
05-Dec-13	10:23 AM	< 0.0	7.65	270	0.246	0.222		
07-Dec-13	9:41 AM	1.0	7.36	290	0.266	0.238		



Table 15: X14 – Field Parameters

Table 15: X14 – Field Parameters

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	9:38 AM	0.2	7.47	829	0.186	0.153	8.44	
06-Nov-13	8:38 AM	<0.0	7.74	744	0.163	0.137		
07-Nov-13	11:43 AM	0.1	7.77	845	0.162	0.136	7.09	
09-Nov-13	8:13 AM	0.2	7.50	1010	0.172	0.135		
11-Nov-13	9:05 AM	0.2	7.74	920	0.168	0.137		
12-Nov-13	10:00 AM	1.3	7.61	827	0.168	0.126		
13-Nov-13	9:06 AM	1.1	7.57	861	0.164	0.135		
14-Nov-13	8:54 AM	3.3	7.53	906	0.176	0.139		
16-Nov-13	8:29 AM	3.1	7.94	437	0.179	0.165		
18-Nov-13	1:30 PM	<0.0	7.54	417	0.197	0.181		
19-Nov-13	10:45 AM	<0.0	7.61	445	0.208	0.183		
20-Nov-13	9:30 AM	0.6	7.30	486	0.219	0.200		
21-Nov-13	10:23 AM	1.4	7.70	487	0.221	0.199		
23-Nov-13	11:51 AM	1.0	7.33	481	0.231	0.174		
25-Nov-13	9:49 AM	4.5	7.27	471	0.002	0.207		ZnT sample for X14 was likely mixed up for a blank sample during sample treatment; disregard analysis
26-Nov-13	9:30 AM	4.2	6.99	268	0.222	0.191		
27-Nov-13	9:43 AM	4.3	7.32	455	0.218	0.186		Frozen foam covering entire sampling hole. Foam was cleared before sampling took place.
28-Nov-13	9:57 AM	0.8	7.40	475	0.226	0.200		
30-Nov-13	9:15 AM	<0.0	7.28	509	0.219	0.186		
02-Dec-13	10:30 AM	< 0.0	7.18	650	0.212	0.189		
03-Dec-13	10:25 AM	1.5	7.55	554	0.220	0.189		
04-Dec-13	10:02 AM	0.7	7.09	504	0.212	0.190		
05-Dec-13	9:42 AM	1.1	7.17	504	0.216	0.194		
07-Dec-13	9:35 AM	1.8	7.34	574	0.232	0.208		

Appendix C

Figures



Figure 3: Total Zinc

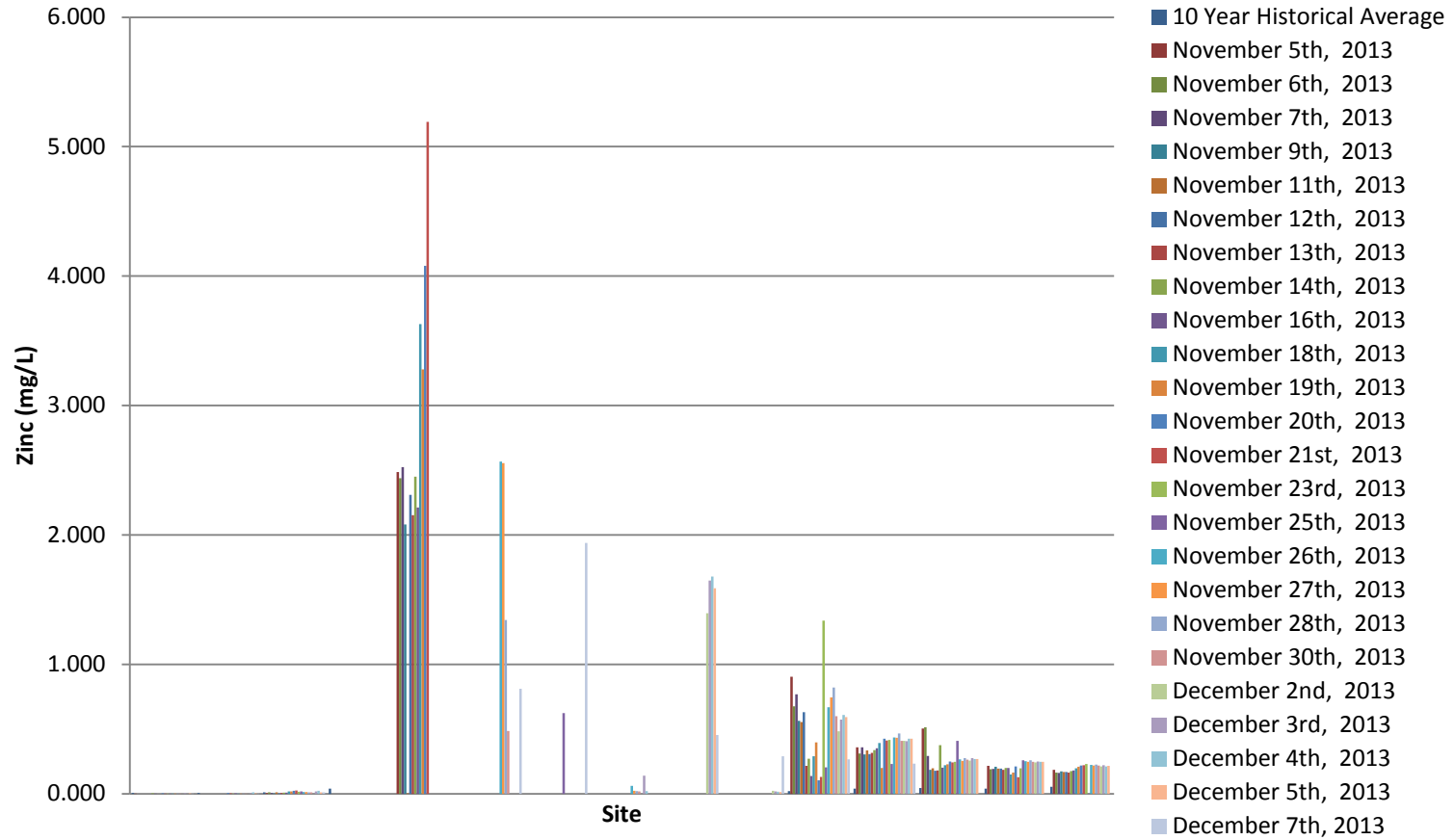
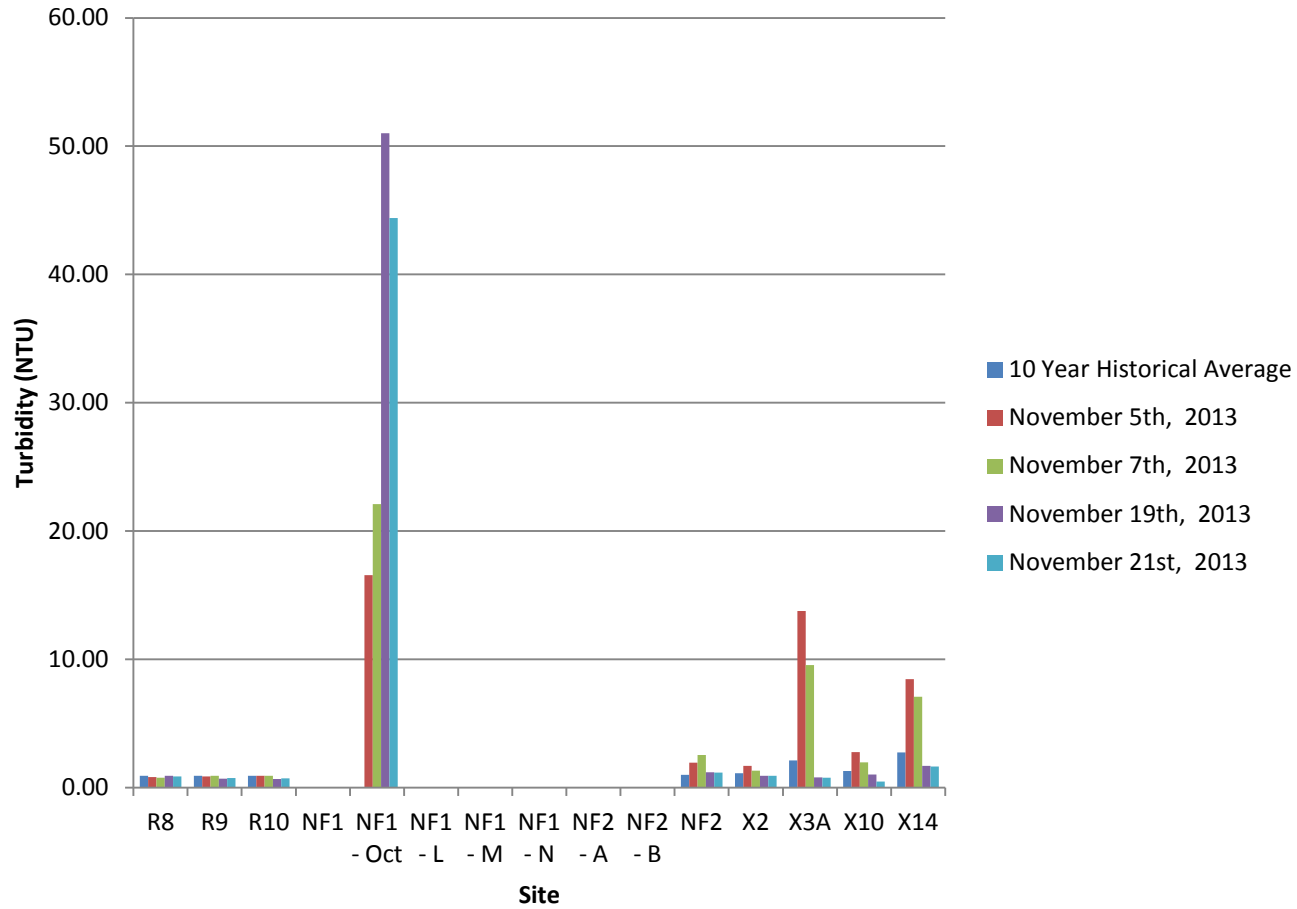




Figure 5: Turbidity



Appendix D

Analytical Results



Rose Creek Additional Monitoring 1 - Maxxam Analytics Results General Chemistry

Station	Date	Sample Type	ALK mg/L	ALKPP mg/L	CaCO3 mg/L	CaCO3-d mg/L	Chloride mg/L	CO3 mg/L	COND µmho/cm	COND µS/cm	DOC mg/L	HCO3 mg/L as CaCO3	Ion Balance	NH3 mg/L	NO2 mg/L	NO2/3 mg/L	NO3 mg/L	OH mg/L	pH	pHF	SO4-d mg/L	TDS mg/L	TEMP-F °C	TOC mg/L	TSS mg/L
NF1 - Oct	11/5/2013	Surface	347.00	<0.5	517	474	1.10	<0.5	1070.0	1080.0	3.9	423.0	0.97	0.23	<0.5	<2.0	<2.0	<0.5	6.10	5.26	229.0	788.00	0.00	9.72	755
NF1 - Oct	11/7/2013	Surface	113.00	<0.5	166	168	0.67	<0.5	316.0	0.0	2.3	138.0	1.10	0.03	<0.5	<2.0	<2.0	<0.5	7.61	6.83	44.5	204.00	0.00	3.34	188
NF1 - Oct	11/19/2013	Surface	318.00	<0.5	525	517	1.10	<0.5	1100.0	1073.0	4.1	389.0	1.00	0.32	<0.5	<2.0	<2.0	<0.5	6.22	6.38	289.0	804.00	<0.0	7.14	1760
NF1 - Oct	11/21/2013	Surface	332.00	<0.5	703	685	2.70	<0.5	1270.0	1073.0	6.1	405.0	1.00	0.42	<0.5	<2.0	<2.0	<0.5	6.34	6.38	382.0	944.00	<0.0	6.29	2480
NF2	11/5/2013	Surface	97.70	<0.5	124	127	<0.5	<0.5	243.0	276.0	1.9	119.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.69	7.04	28.6	150.00	0.70	2.19	5
NF2	11/7/2013	Surface	95.70	<0.5	122	124	0.58	<0.5	251.0	245.0	1.6	117.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.96	7.42	28.5	166.00	0.00	1.67	4
NF2	11/19/2013	Surface	105.00	<0.5	118	118	<0.5	<0.5	246.0	239.0	1.8	128.0	0.98	0.03	<0.5	<2.0	<2.0	<0.5	7.84	6.95	21.5	140.00	<0.0	2.83	3
NF2	11/21/2013	Surface	105.00	<0.5	128	127	<0.5	<0.5	250.0	214.0	2.1	128.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.77	7.50	21.2	118.00	<0.0	2.30	2
R10	11/5/2013	Surface	94.10	<0.5	110	115	<0.5	<0.5	213.0	207.0	2.1	115.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.87	7.51	15.2	150.00	0.00	2.15	2
R10	11/7/2013	Surface	92.60	<0.5	113	116	<0.5	<0.5	218.0	219.0	2.5	113.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.01	7.54	15.4	140.00	0.00	1.92	<1.0
R10	11/19/2013	Surface	104.00	<0.5	109	113	<0.5	<0.5	241.0	220.0	1.6	127.0	0.96	0.03	<0.5	<2.0	<2.0	<0.5	7.92	7.54	20.1	128.00	<0.0	1.91	<1.0
R10	11/21/2013	Surface	104.00	<0.5	127	129	0.56	<0.5	243.0	220.0	2.4	126.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.85	7.54	19.9	122.00	<0.0	2.39	<1.0
R8	11/5/2013	Surface	88.20	<0.5	98	102	<0.5	<0.5	185.0	178.0	2.0	108.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.70	7.73	8.4	84.00	0.00	2.25	<1.0
R8	11/7/2013	Surface	84.60	<0.5	93	95	<0.5	<0.5	183.0	188.0	1.6	103.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	8.02	7.47	7.8	120.00	0.00	2.12	<1.0
R8	11/19/2013	Surface	103.00	<0.5	108	109	<0.5	<0.5	218.0	174.0	1.9	126.0	1.00	0.02	<0.5	<2.0	<2.0	<0.5	7.87	7.25	11.1	116.00	<0.0	2.02	2
R8	11/21/2013	Surface	98.30	<0.5	113	109	0.59	<0.5	211.0	174.0	2.1	120.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.64	7.25	10.3	68.00	<0.0	2.48	2
R9	11/5/2013	Surface	92.90	<0.5	115	112	<0.5	<0.5	211.0	213.0	2.0	113.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.85	7.62	14.3	94.00	0.30	2.14	<1.0
R9	11/7/2013	Surface	93.50	<0.5	112	109	<0.5	<0.5	218.0	206.0	3.1	114.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	8.06	7.48	14.9	146.00	0.00	2.76	<1.0
R9	11/19/2013	Surface	106.00	<0.5	114	120	<0.5	<0.5	245.0	261.0	1.8	129.0	1.00	0.03	<0.5	<2.0	<2.0	<0.5	7.94	7.36	19.2	136.00	<0.0	2.54	1
R9	11/21/2013	Surface	103.00	<0.5	118	126	<0.5	<0.5	244.0	261.0	2.1	126.0	1.10	0.03	<0.5	<2.0	<2.0	<0.5	7.93	7.36	18.5	170.00	<0.0	2.18	<1.0
X10	11/5/2013	Surface	113.00	<0.5	147	148	0.61	<0.5	272.0	261.0	1.8	138.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.97	7.30	28.3	184.00	0.10	2.11	<1.0
X10	11/7/2013	Surface	108.00	<0.5	138	142	0.61	<0.5	261.0	271.0	2.4	131.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.11	8.11	27.7	174.00	0.10	1.73	<1.0
X10	11/19/2013	Surface	118.00	<0.5	129	134	<0.5	<0.5	287.0	290.0	1.7	145.0	0.93	0.08	<0.5	<2.0	<2.0	<0.5	7.99	7.95	32.3	152.00	<0.0	1.74	<1.0
X10	11/21/2013	Surface	127.00	<0.5	177	171	0.51	<0.5	308.0	332.0	1.4	156.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.90	8.67	30.3	138.00	<0.0	1.89	<1.0
X14	11/5/2013	Surface	145.00	<0.5	447	458	0.84	<0.5	818.0	829.0	1.7	177.0	1.10	0.14	<0.5	<2.0	<2.0	<0.5	7.88	7.47	289.0	586.00	0.20	2.16	4
X14	11/7/2013	Surface	144.00	<0.5	433	421	0.80	<0.5	818.0	845.0	1.6	176.0	1.10	0.13	<0.5	<2.0	<2.0	<0.5	8.10	7.77	255.0	610.00	0.10	2.20	3
X14	11/19/2013	Surface	127.00	<0.5	225	208	<0.5	<0.5	440.0	445.0	1.9	155.0	0.93	0.06	<0.5	<2.0	<2.0	<0.5	7.85	7.61	106.0	204.00	<0.0	1.91	<1.0
X14	11/21/2013	Surface	133.00	<0.5	238	241	0.92	<0.5	472.0	487.0	2.0	162.0	0.99	0.05	<0.5	<2.0	<2.0	<0.5	7.84	7.70	120.0	178.00	1.40	2.20	<1.0
X2	11/5/2013	Surface	97.80	<0.5	127	127	<0.5	<0.5	237.0	250.0	2.0	119.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.81	7.33	24.2	146.00	0.00	2.19	1
X2	11/7/2013	Surface	96.00	<0.5	124	123	<0.5	<0.5	241.0	242.0	2.3	117.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.04	7.74	22.6	156.00	0.20	2.18	<1.0
X2	11/19/2013	Surface	107.00	<0.5	123	128	<0.5	<0.5	261.0	259.0	1.6	130.0	0.98	0.02	<0.5	<2.0	<2.0	<0.5	7.76	7.87	31.3	158.00	<0.0	1.83	<1.0
X2	11/21/2013	Surface	106.00	<0.5	136	135	<0.5	<0.5	266.0	264.0	2.0	129.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.76	7.34	29.1	100.00	0.10	2.04	<1.0
X3A	11/5/2013	Surface	102.00	<0.5	133	139	0.67	<0.5	262.0	306.0	1.7	125.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.76	7.00	28.1	146.00	0.80	2.21	5
X3A	11/7/2013	Surface	103.00	<0.5	133	138	0.74	<0.5	263.0	262.0	2.0	126.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.09	7.90	27.9	174.00	0.20	2.05	2
X3A	11/19/2013	Surface	112.00	<0.5	134	133	<0.5	<0.5	272.0	269.0	1.9	137.0	0.99	0.07	<0.5	<2.0	<2.0	<0.5	7.90	7.88	29.3	146.00	<0.0	2.01	<1.0
X3A	11/21/2013	Surface	113.00	<0.5	141	143	0.64	<0.5	281.0	286.0	2.7	138.0	1.10	0.03	<0.5	<2.0	<2.0	<0.5	8.00	7.61	28.8	106.00	0.40	2.67	<1.0



Rose Creek Additional Monitoring 1 - Maxxam Analytics Results

Dissolved Metals

Station	Date	Sample Type	Ag-d µg/L	Al-d µg/L	As-d µg/L	Ba-d µg/L	B-d µg/L	Be-d µg/L	Bi-d µg/L	Ca-d mg/L	Cd-d µg/L	Co-d µg/L	Cr-d µg/L	Cu-d µg/L	Fe-d µg/L	K-d mg/L	Li-d mg/L	Mg-d mg/L	Mn-d µg/L	Mo-d µg/L	Na-d mg/L	Ni-d µg/L	Pb-d µg/L	Sb-d µg/L	S-d mg/L	Se-d µg/L	Si-d µg/L	Sn-d µg/L	Sr-d µg/L	Ti-d µg/L	Tl-d µg/L	U-d µg/L	V-d µg/L	Zn-d µg/L	Zr-d µg/L
NF1 - Oct	11/5/2013	Surface	<0.005	81.90	0.86	135.00	<50.0	0.07	<0.005	123.00	1.84	105.00	0.31	0.28	27700.00	3.46	0.04	40.50	6780.00	0.12	11.90	45.30	0.58	0.03	83.90	<0.04	13600.00	<0.2	693.00	<0.5	0.08	1.04	<0.2	2200.00	0.17
NF1 - Oct	11/7/2013	Surface	<0.005	10.90	0.74	76.10	<50.0	<0.01	<0.005	47.60	0.15	2.70	<0.1	0.40	1350.00	1.20	0.01	11.90	428.00	0.54	3.48	6.93	1.00	0.09	17.80	0.38	7220.00	<0.2	200.00	<0.5	0.01	1.95	<0.2	338.00	<0.1
NF1 - Oct	11/19/2013	Surface	0.01	93.80	0.87	109.00	<50	0.06	<0.0050	140.00	2.29	103.00	0.23	0.50	38200.00	4.26	45.80	40.40	6110.00	0.13	12.50	52.50	0.66	0.03	96.80	0.06	15500.00	<0.20	766.00	<0.50	0.12	1.01	<0.20	2400.00	0.21
NF1 - Oct	11/21/2013	Surface	0.01	66.20	0.27	91.70	<50	0.05	<0.0050	183.00	2.95	130.00	0.38	4.50	38100.00	5.96	55.60	55.50	7000.00	0.16	18.90	57.70	0.67	0.11	153.00	0.06	20400.00	<0.20	902.00	0.91	0.14	2.18	<0.20	2990.00	0.12
NF2	11/5/2013	Surface	<0.005	9.50	0.60	60.20	<50.0	<0.01	<0.005	35.50	0.43	4.15	<0.1	0.42	274.00	0.85	0.01	9.36	252.00	0.62	2.72	6.71	1.07	0.07	9.50	0.37	6240.00	<0.2	149.00	<0.5	0.00	1.63	<0.2	918.00	<0.1
NF2	11/7/2013	Surface	<0.005	7.37	0.49	62.40	<50.0	<0.01	<0.005	34.00	0.35	3.43	<0.1	0.44	221.00	0.86	0.01	9.42	221.00	0.60	2.73	5.64	1.01	0.08	10.80	0.36	6270.00	<0.2	142.00	<0.5	0.00	1.58	<0.2	718.00	<0.1
NF2	11/19/2013	Surface	<0.005	4.18	0.42	60.90	<50.0	<0.01	<0.005	34.10	0.07	0.53	<0.1	0.48	95.40	0.93	0.00	7.88	72.00	0.62	2.54	1.19	0.25	0.07	7.50	0.39	5490.00	<0.2	152.00	<0.5	0.00	1.79	<0.2	106.00	<0.1
NF2	11/21/2013	Surface	<0.005	3.37	0.44	65.60	<50.0	<0.01	<0.005	37.10	0.08	0.56	<0.1	0.37	99.30	0.91	0.01	8.30	75.10	0.70	2.81	1.23	0.23	0.07	6.60	0.41	5990.00	<0.2	161.00	<0.5	<0.002	1.80	<0.2	113.00	<0.1
R10	11/5/2013	Surface	<0.005	5.07	0.49	56.70	<50.0	<0.01	<0.005	35.30	0.01	0.05	<0.1	0.42	94.00	0.79	0.00	6.62	26.10	0.59	2.41	0.51	0.07	0.07	5.90	0.35	6410.00	<0.2	134.00	<0.5	<0.002	1.60	<0.2	8.02	<0.1
R10	11/7/2013	Surface	<0.005	5.52	0.49	57.90	<50.0	<0.01	<0.005	33.80	0.01	0.07	0.14	0.49	95.10	0.81	0.00	7.60	25.80	0.66	2.55	0.53	0.17	0.05	6.80	0.40	6460.00	<0.2	137.00	<0.5	<0.002	1.56	<0.2	9.63	<0.1
R10	11/19/2013	Surface	<0.005	5.53	0.44	58.80	<50.0	<0.01	<0.005	32.40	0.17	0.06	<0.1	0.43	69.50	0.88	0.00	7.74	25.20	0.70	2.65	0.39	0.33	0.06	6.80	0.37	5580.00	<0.2	160.00	<0.5	0.00	1.76	<0.2	15.80	<0.1
R10	11/21/2013	Surface	<0.005	3.67	0.40	64.20	<50.0	<0.01	<0.005	38.30	0.02	0.04	<0.1	0.33	55.30	0.89	0.01	8.04	24.60	0.69	2.78	0.33	0.07	0.07	6.50	0.38	6370.00	<0.2	160.00	<0.5	<0.002	1.82	<0.2	13.60	<0.1
R8	11/5/2013	Surface	<0.005	5.49	0.58	52.60	<50.0	<0.01	<0.005	31.30	0.02	0.06	<0.1	0.42	121.00	0.63	0.00	5.79	25.50	0.63	2.45	0.36	0.06	0.07	<3.0	0.31	6550.00	<0.2	122.00	<0.5	<0.002	1.41	<0.2	10.00	<0.1
R8	11/7/2013	Surface	<0.005	5.02	0.59	55.80	<50.0	<0.01	<0.005	28.30	0.01	0.04	0.17	0.51	118.00	0.73	0.00	5.84	20.50	0.65	2.48	0.43	0.07	0.07	3.10	0.28	6430.00	<0.2	121.00	<0.5	<0.002	1.27	<0.2	5.15	<0.1
R8	11/19/2013	Surface	<0.005	5.30	0.52	60.50	<50.0	<0.01	<0.005	32.50	0.01	0.04	<0.1	0.53	98.20	0.87	0.00	6.66	26.30	0.72	2.63	0.31	0.24	0.09	3.30	0.41	5910.00	<0.2	147.00	<0.5	<0.002	1.66	<0.2	3.59	<0.1
R8	11/21/2013	Surface	<0.005	3.52	0.52	62.20	<50.0	<0.01	<0.005	33.10	0.01	0.04	<0.1	0.33	86.60	0.80	0.00	6.49	25.40	0.65	2.75	0.27	0.05	0.07	3.10	0.35	6210.00	<0.2	137.00	<0.5	<0.002	1.60	<0.2	1.17	<0.1
R9	11/5/2013	Surface	<0.005	4.46	0.52	53.80	<50.0	<0.01	<0.005	33.70	0.01	0.03	<0.1	0.41	92.70	0.80	0.00	6.71	23.50	0.64	2.47	0.39	0.07	0.06	4.80	0.33	6240.00	<0.2	134.00	<0.5	<0.002	1.60	<0.2	2.63	<0.1
R9	11/7/2013	Surface	<0.005	4.45	0.48	58.20	<50.0	<0.01	<0.005	31.80	0.02	0.07	<0.1	0.43	99.70	0.83	0.00	7.30	26.00	0.58	2.58	0.39	0.08	0.06	6.80	0.33	6140.00	<0.2	136.00	<0.5	<0.002	1.59	<0.2	20.70	<0.1
R9	11/19/2013	Surface	<0.005	5.26	0.46	59.70	<50.0	<0.01	<0.005	35.30	0.01	0.04	<0.1	0.39	71.40	0.87	0.00	7.73	23.00	0.78	2.62	0.30	0.14	0.07	5.50	0.42	5820.00	<0.2	165.00	<0.5	<0.002	1.82	<0.2	0.87	<0.1
R9	11/21/2013	Surface	<0.005	3.96	0.45	66.80	<50.0	<0.01	<0.005	37.30	0.01	0.03	<0.1	0.37	54.30	0.91	0.01	8.06	24.50	0.66	2.83	0.32	0.03	0.06	6.30	0.37	6170.00	<0.2	165.00	<0.5	<0.002	1.85	<0.2	0.86	<0.1
X10	11/5/2013	Surface	<0.005	2.78	0.29	61.40	<50.0	<0.01	<0.005	43.80	0.08	0.82	<0.1	0.38	257.00	0.94	0.00	9.46	130.00	0.55	2.53	1.84	0.37	0.07	9.10	0.36	5840.00	<0.2	173.00	<0.5	<0.002	2.00	<0.2	199.00	<0.1
X10	11/7/2013	Surface	<0.005	3.14	0.27	66.10	<50.0	<0.01	<0.005	41.20	0.07	0.70	<0.1	0.42	322.00	1.03	0.00	9.61	117.00	0.58	2.63	1.77	0.32	0.06	10.00	0.37	6270.00	<0.2	176.00	<0.5	<0.002	1.83	<0.2	177.00	<0.1
X10	11/19/2013	Surface	<0.005	2.72	0.21	66.40	<50.0	<0.01	<0.005	37.70	0.09	0.48	<0.1	0.41	91.00	1.00	0.00	9.69	79.40	0.62	2.39	1.55	0.11	0.07	9.70	0.44	4740.00	<0.2	179.00	<0.5	0.00	1.84	<0.2	173.00	<0.1
X10	11/21/2013	Surface	<0.005	3.80	0.19	77.40	<50.0	<0.01	<0.005	50.30	0.08	0.26	<0.1	0.39	49.90	1.12	0.00	11.10	41.70	0.94	2.36	1.05	0.06	0.11	10.10	0.54	5480.00	<0.2	174.00	<0.5	<0.002	1.60	<0.2	90.00	<0.1
X14	11/5/2013	Surface	<0.005	1.74	0.21	56.90	<50.0	<0.01	<0.005	136.00	0.09	13.20	<0.1	0.33	366.00	1.93	0.01	28.60	7590.00	0.57	7.46	10.50	0.10	0.06	101.00	0.34	6310.00	<0.2	388.00	<0.5	0.01	2.74	<0.2	160.00	<0.1
X14	11/7/2013	Surface	<0.005	1.82	0.19	56.90	<50.0	<0.01	<0.005	119.00	0.08	13.90	<0.1	0.35	316.00	2.15	0.01	30.10	7660.00	0.56	7.72	10.60	0.08	0.06	114.00	0.30	5820.00	<0.2	409.00	<0.5	0.01	2.58	<0.2	144.00	<0.1
X14	11/19/2013	Surface	<0.005	1.98	0.22	63.20	<50.0	<0.01	<0.005	60.80	0.11	1.37	<0.1	0.35	260.00	1.30	0.00	13.70	1300.00	0.58	3.92	3.49	0.09	0.06	34.00	0.37	5120.00	<0.2	263.00	<0.5	0.01	2.13	<0.2	193.00	<0.1
X14	11/21/2013	Surface	<0.005	2.26	0.20	68.40	<50.0	<0.01	<0.005	69.90	0.11	1.58	<0.1	0.36	222.00	1.53	0.01	16.20	1600.00	0.56	4.57	3.78	0.21	0.06	42.30	0.37	5910.00	<0.2	268.00	<0.5	0.00	2.40	<0.2	204.00	<0.1
X2	11/5/2013	Surface	<0.005	5.86	0.55	56.60	<50.0	<0.01	<0.005	37.00	0.17	1.73	<0.1	0.44	194.00	0.86	0.01	8.44	175.00	0.64	2.64	3.15	1.01	0.08	9.50	0.32	6410.00	<0.2	142.00	<0.5	<0.002	1.75	<0.2	365.00	<0.1
X2	11/7/2013	Surface	<0.005	5.37	0.45	60.70	<50.0	<0.01	<0.005	34.90	0.16	1.66	<0.1	0.42	149.00	0.88	0.00	8.74	152.00	0.61	2.68	2.93	0.68	0.08	8.80	0.33	6430.00	<0.2	146.00	<0.5	0.00	1.59	<0.2	331.00	<0.1
X2	11/19/2013	Surface	<0.005	4.47	0.28	66.40	<50.0	<0.01	<0.005	35.80	0.22	1.58	<0.1	0.55	74.50	0.85	0.01	9.47	137.00	0.70	2.77	2.96	0.25	0.06	8.60	0.40	5900.00	<0.2	152.00	<0.5	0.00	1.71	<0.2	375.00	<0.1
X2	11/21/2013	Surface	<0.005	4.18	0.32	70.60	<50.0	<0.01	<0.005	37.60	0.24	1.70	<0.1	0.36	79.40	0.99	0.01	10.00	154.00	0.67	3.04	3.13	0.25	0.07	10.50	0.34	5960.00	<0.2	173.00	<0.5	0.00	1.88	<0.2	388.00	<0.1
X3A	11/5/2013	Surface	<0.005	2.55	0.27	57.70	<50.0	<0.01	<0.005	40.60	0.09	1.02	<0.1	0.40	2140.00	1.02	0.00	9.08	181.00	0.49	2.63	2.10	0.47	0.06	12.50	0.34	5710.00	<							



Rose Creek Additional Monitoring 1 - Maxxam Analytics Results

Total Metals

Station	Date	Sample Type	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Be µg/L	Bi µg/L	Ca mg/L	Cd µg/L	Co µg/L	Cr µg/L	Cu µg/L	Fe µg/L	K mg/L	Li mg/L	Mg mg/L	Mn µg/L	Mo µg/L	Na mg/L	Ni µg/L	Pb µg/L	S mg/L	Sb µg/L	Se µg/L	Si µg/L	Sn µg/L	Sr µg/L	Ti µg/L	Tl µg/L	U µg/L	V µg/L	Zn µg/L	Zr µg/L
NF1 - Oct	11/5/2013	Surface	0.0240	3450	7	<50.0	213.000	0.51	0.05	137.00	3.79	125.0000	2.8100	16.6000	35200.00	4.05	0.05	42.80	7470.000	0.155	12.40	74.8000	76.7	93.80	0.0790	0.1160	14700.00	<0.2	716.00	46.7000	0.2030	4.1300	8.5100	2730.0	0.75
NF1 - Oct	11/7/2013	Surface	0.0410	1040.00	4	<50.0	128.000	0.18	0.06	46.10	0.59	3.7500	2.0400	8.3600	3790.00	1.38	0.01	12.40	466.000	0.469	3.40	11.0000	59.9000	16.30	0.1270	0.3880	8040.00	<0.2	194.00	21.8000	0.0340	2.5700	4.1300	458.000	0.33
NF1 - Oct	11/19/2013	Surface	0.0410	2670.00	7	<50	171.000	0.42	0.03	134.00	3.84	120.0000	3.3900	16.4000	48900.00	4.54	46.50	46.00	6600.000	0.179	14.60	66.1000	73.4000	106.00	0.0910	0.1180	16400.00	<0.20	775.00	44.5000	0.2290	2.9100	7.4500	2730.000	0.84
NF1 - Oct	11/21/2013	Surface	0.0750	8340.00	13	<50	222.000	1.24	0.04	184.00	8.68	163.0000	7.2000	40.4000	60300.00	6.41	61.40	59.20	7860.000	0.161	19.50	103.0000	192.0000	150.00	0.2050	0.1480	22400.00	<0.20	1070.00	89.4000	0.4860	9.6100	19.500	3960.000	1.59
NF2	11/5/2013	Surface	<0.005	43	1	<50.0	62.300	<0.01	<0.005	35.10	0.45	4.0900	0.1300	0.7810	506.00	0.85	0.01	8.81	262.000	0.604	2.59	6.6200	6.8	10.20	0.0770	0.3540	6300.00	<0.2	146.00	1.4600	0.0080	1.6100	<0.2	907.000	<0.1
NF2	11/7/2013	Surface	0.0090	68.60	1	<50.0	63.200	<0.01	0.01	33.20	0.41	3.7300	0.2100	0.9750	536.00	0.90	0.01	9.46	234.000	0.592	2.79	5.9400	9.5400	9.90	0.0820	0.3380	6200.00	<0.2	141.00	3.7500	0.0070	1.6700	0.2700	757.000	<0.1
NF2	11/19/2013	Surface	<0.005	19.20	1	<50.0	63.100	<0.01	<0.005	33.90	0.07	0.5380	<0.1	0.5810	198.00	0.88	0.01	8.12	74.600	0.586	2.81	1.3300	1.4100	7.80	0.0630	0.4500	5670.00	<0.2	160.00	0.5900	0.0040	1.7700	<0.2	111.000	<0.1
NF2	11/21/2013	Surface	<0.005	28.00	1	<50.0	69.400	<0.01	<0.005	37.20	0.08	0.6210	<0.1	0.5010	207.00	0.93	0.01	8.63	78.200	0.618	2.84	1.2400	1.2100	7.50	0.0680	0.3800	6100.00	<0.2	165.00	1.5000	0.0040	1.8600	<0.2	117.000	<0.1
R10	11/5/2013	Surface	<0.005	14.10	1	<50.0	52.700	<0.01	<0.005	33.00	0.02	0.0610	0.1200	0.4360	151.00	0.81	0.00	6.65	25.800	0.588	2.43	0.4390	0.1760	5.80	0.0650	0.3210	6010.00	<0.2	133.00	0.7400	<0.002	1.5700	<0.2	8.210	<0.1
R10	11/7/2013	Surface	<0.005	12.90	1	<50.0	58.500	<0.01	<0.005	32.90	0.02	0.0630	0.1300	2.3400	181.00	0.84	0.00	7.49	25.700	0.578	2.62	0.4700	0.2390	6.20	0.0660	0.3190	6170.00	0.29	138.00	<0.5	<0.002	1.5700	<0.2	9.130	0.11
R10	11/19/2013	Surface	<0.005	18.70	0	<50.0	61.900	<0.01	<0.005	31.40	0.02	0.0630	<0.1	0.3820	121.00	0.81	0.00	7.42	26.300	0.669	2.59	0.4550	0.2500	6.10	0.0610	0.3830	5170.00	<0.2	148.00	<0.5	<0.002	1.7800	<0.2	14.900	<0.1
R10	11/21/2013	Surface	<0.005	16.80	0	<50.0	63.700	<0.01	<0.005	37.60	0.02	0.0520	<0.1	0.3460	121.00	0.90	0.01	8.07	26.400	0.615	2.85	0.4480	0.1650	6.80	0.0670	0.3860	6240.00	<0.2	156.00	<0.5	<0.002	1.7500	<0.2	13.900	<0.1
R8	11/5/2013	Surface	<0.005	13.30	1	<50.0	51.600	<0.01	<0.005	30.40	0.01	0.0370	<0.1	0.4320	162.00	0.69	0.00	5.42	24.200	0.596	2.24	0.3300	0.1000	3.40	0.0650	0.3700	6310.00	<0.2	116.00	<0.5	<0.002	1.3800	<0.2	0.620	<0.1
R8	11/7/2013	Surface	<0.005	9.03	1	<50.0	53.500	<0.01	<0.005	27.50	0.01	0.0390	<0.1	0.5190	158.00	0.69	0.00	5.92	20.600	0.596	2.43	0.4020	0.2200	3.20	0.0630	0.3140	6220.00	<0.2	115.00	0.6800	<0.002	1.3600	<0.2	2.170	<0.1
R8	11/19/2013	Surface	<0.005	22.90	1	<50.0	59.100	<0.01	<0.005	33.10	0.01	0.0480	<0.1	0.4620	174.00	0.73	0.00	6.26	24.600	0.635	2.56	0.3250	0.2240	<3.0	0.0610	0.4200	6140.00	<0.2	141.00	0.7000	<0.002	1.5500	<0.2	1.700	<0.1
R8	11/21/2013	Surface	<0.005	8.75	1	<50.0	62.600	<0.01	<0.005	34.10	0.01	0.0350	<0.1	0.3460	142.00	0.78	0.00	6.73	24.100	0.584	2.62	0.3040	0.0900	<3.0	0.0650	0.3630	6470.00	<0.2	139.00	<0.5	<0.002	1.5600	<0.2	0.670	<0.1
R9	11/5/2013	Surface	<0.005	14.50	1	<50.0	54.600	<0.01	<0.005	34.90	0.01	0.0440	<0.1	0.4750	147.00	0.83	0.00	6.68	24.700	0.587	2.44	0.3940	0.1560	5.50	0.0660	0.3300	6410.00	<0.2	134.00	<0.5	<0.002	1.5200	<0.2	8.550	<0.1
R9	11/7/2013	Surface	<0.005	9.41	1	<50.0	58.900	<0.01	<0.005	32.60	0.01	0.0400	<0.1	0.4490	138.00	0.79	0.00	7.42	23.900	0.642	2.62	0.3730	0.1970	5.30	0.0510	0.3000	6210.00	<0.2	136.00	<0.5	<0.002	1.5600	<0.2	1.570	<0.1
R9	11/19/2013	Surface	<0.005	13.80	1	<50.0	56.800	<0.01	<0.005	32.30	0.01	0.0410	<0.1	0.4160	120.00	0.84	0.00	8.01	24.600	0.595	2.65	0.3180	0.1700	6.00	0.0610	0.4280	5740.00	<0.2	140.00	<0.5	<0.002	1.6100	<0.2	0.700	<0.1
R9	11/21/2013	Surface	<0.005	12.70	1	<50.0	64.200	<0.01	<0.005	34.30	0.01	0.0420	<0.1	0.3340	122.00	0.91	0.00	7.83	24.900	0.715	2.70	0.3010	0.1170	6.00	0.0640	0.3990	5900.00	<0.2	161.00	0.7300	<0.002	1.7900	<0.2	0.910	<0.1
X10	11/5/2013	Surface	<0.005	7.92	0	<50.0	60.300	<0.01	<0.005	43.00	0.08	0.8330	<0.1	0.4950	551.00	0.98	0.00	9.54	131.000	0.520	2.47	1.8700	1.1200	9.70	0.0760	0.3700	5870.00	<0.2	173.00	<0.5	<0.002	1.9700	<0.2	206.000	<0.1
X10	11/7/2013	Surface	<0.005	15.50	0	<50.0	63.400	<0.01	<0.005	39.00	0.08	0.7060	<0.1	0.4660	483.00	1.03	0.00	9.81	119.000	0.535	2.65	1.8100	0.5970	8.70	0.0600	0.3680	5670.00	<0.2	168.00	<0.5	<0.002	1.7700	<0.2	186.000	<0.1
X10	11/19/2013	Surface	<0.005	6.27	0	<50.0	67.600	<0.01	<0.005	34.80	0.09	0.5260	<0.1	0.5470	162.00	1.10	0.00	10.10	87.400	0.602	2.63	1.6400	0.3030	11.30	0.0690	0.4150	4480.00	<0.2	169.00	<0.5	<0.002	1.7600	<0.2	185.000	<0.1
X10	11/21/2013	Surface	<0.005	4.38	0	<50.0	77.600	<0.01	<0.005	52.00	0.08	0.2560	<0.1	0.4390	95.60	1.15	0.00	11.50	42.600	0.987	2.46	1.0800	0.1000	11.40	0.1150	0.5460	5620.00	<0.2	177.00	<0.5	<0.002	1.6200	<0.2	91.900	<0.1
X14	11/5/2013	Surface	<0.005	10.20	0	<50.0	57.100	<0.01	<0.005	132.00	0.11	13.9000	<0.1	0.3890	1220.00	2.05	0.01	28.80	7530.000	0.593	7.61	10.7000	0.9160	107.00	0.0700	0.3270	6220.00	<0.2	400.00	<0.5	0.0090	2.7200	<0.2	178.000	<0.1
X14	11/7/2013	Surface	<0.005	14.40	0	<50.0	57.900	<0.01	<0.005	124.00	0.10	13.9000	<0.1	0.4750	1210.00	2.14	0.01	29.90	7290.000	0.680	7.93	11.1000	0.7240	115.00	0.0600	0.3250	6130.00	<0.2	403.00	0.5500	0.0090	2.6400	<0.2	160.000	<0.1
X14	11/19/2013	Surface	<0.005	9.44	0	<50.0	65.100	<0.01	<0.005	67.40	0.11	1.2900	<0.1	0.4210	445.00	1.31	0.00	13.80	1330.000	0.479	3.82	3.5100	0.3040	31.60	0.0520	0.4260	6040.00	<0.2	233.00	<0.5	0.0030	2.1300	<0.2	187.000	<0.1
X14	11/21/2013	Surface	<0.005	6.23	0	<50.0	69.800	<0.01	<0.005	69.20	0.12	1.5300	<0.1	0.3660	396.00	1.48	0.00	15.90	1560.000	0.560	4.36	3.8500	0.2250	40.10	0.0660	0.3610	5880.00	<0.2	272.00	<0.5	0.0040	2.3700	<0.2	202.000	<0.1
X2	11/5/2013	Surface	<0.005	18.20	1	<50.0	60.900	<0.01	<0.005	36.90	0.18	1.7800	0.1300	0.6520	315.00	0.88	0.01	8.52	179.000	0.642	2.75	3.2700	3.4600	9.20	0.0810	0.3370	6510.00	<0.2	145.00	<0.5	0.0050	1.5800	<0.2	372.000	<0.1
X2	11/7/2013	Surface	<0.005	21.30	1	<50.0	62.500	<0.01	<0.005	34.90	0.18	1.6900	<0.1	0.5770	269.00	0.91	0.01	9.03	154.000	0.570	2.83	3.0700	2.5900	9.10	0.0730	0.3420	6350.00	<0.2	142.00	1.2100	0.0040	1.6800	<0.2	338.000	<0.1
X2	11/19/2013	Surface	<0.005	10.90	0	<50.0	61.800	<0.01	<0.005	34.00	0.21	1.6600	<0.1	0.4630	143.00	0.92	0.01	9.22	145.000	0.590	2.74	3.1200	0.8480	9.40	0.0570	0.3810	5550.00	<0.2	152.00	<0.5	0.0030	1.6700	<0.2	382.000	<0.1
X2	11/21/2013	Surface	<0.005	12.30	0	<50.0	67.700	<0.01	<0.005	38.60	0.23																								