

Wednesday, December 11, 2013

Ms. Melanie Humphrey
 Michigan Department of Environmental Quality
 1504 W. Washington St.
 Marquette, MI 49855

Subject: Q4 2013 Benchmark Deviations and Temporary Development Rock Storage Area (TDRSA) Sump Results – Eagle Mine, Marquette County Michigan

The following compliance monitoring well locations reported results that were outside of established benchmarks, for at least two consecutive sampling events for the parameters listed below.

Location	Parameter	Unit	Benchmark	Q1 2013	Q2 2013	Q3 2013	Q4 2013
QAL024A	Chloride	mg/L	4.0	<1.0	340	120	180
	Sodium	mg/L	1.2	0.78	180	55	29
QAL044B	Sulfate	mg/L	8.4	12.0	9.9	20.0	34
	Sodium	mg/L	2.6	5.9	4.0	4.8	4.2
QAL060A	Nitrate	mg/L	0.12	0.091	0.13	0.15	0.18
QAL066D	pH	SU	10.4-11.4 p	11.5	9.9	9.2	8.8
QAL067A	Nitrogen, Nitrate	mg/L	0.25 t	0.27	0.29	0.50	0.86
	Chloride	mg/L	1.9	<1.0	1.5	61	660
QAL071A	Alkalinity, Bicarbonate	mg/L	44 t	49	54	62	70
	Chloride	mg/L	1.5	1.5	1.8	3.3	3.2

Notes: Results in **BOLD** are equal to or greater than the calculated benchmark. Benchmarks listed as “pending” (p) or “trending” (t) cannot be statistically derived with accuracy utilizing the baseline data collected to date, either because there are insufficient values (p) or the sequence of values suggest a trend is present (t).

The chloride result at location QAL067A is up from results previously reported. Water quality data from this location and QAL029A/D (GWDP wells) indicate a spatial trend likely associated with construction activities near the coarse ore storage area (COSA) and backfill plant. Elevated specific conductivity and sodium results were also reported at these locations. Results will continue to be closely monitored to determine if the deviations are temporary and associated with current construction activities or are the result of mining activities. In addition, a review of laboratory results for locations QAL067A and QAL029A/D indicate no evidence that the deviations are a result of liner leakage from the TDRSA or CWBs.

The benchmarks at each of these locations were calculated based on a small sample set of between 4-6 results. With such a limited sample set, it is highly probable that the deviations being seen are consistent with natural groundwater variations. Benchmarks will be revisited in 2014 and will be updated for stations or parameters that are currently pending.

TDRSA Results


As previously discussed during a phone conversation on Tuesday, December 3rd, sulfate results from the Q4 sampling event on November 14th were reported at 540 mg/L. As stated in Mine Permit MP 01 2007, if a sulfate concentration exceeds 500mg/L and/or the average daily flow rate exceeds 25 gallons per acre per day then it is indicative of leakage from the primary lining system or contact sump. Although the 500 mg/L threshold was exceeded the average daily flow rate of the leak detection sump is only 0.016 gal/acre/day (only 4 gallons accumulated in the sump over the course of 100 days).

In a letter to the Department dated January 9, 2013 Eagle Mine outlined the steps that have been taken to "fingerprint" the water in both the contact and leak detection sumps. This allowed for a direct comparison of the water quality to determine if the leak detection sump was receiving water from the contact sump indicating a leak in the composite lining system.

Review of the data (attached) has identified clear differences in the concentrations of sulfate, magnesium, chloride, nitrate, and ammonia between the two sumps. This indicates that it is highly unlikely that the elevated sulfate results was due to a leak in the lining system. The prominent difference between the two sumps are the nitrate results. The solubility of nitrate is not controlled by any materials in the sump, which is not the case for sulfate, therefore there would be elevated nitrate in the leak detection sump if there was a leakage from the primary lining system. Results will continue to be reviewed and trends documented. Any upward trending will be reported to the Department.

If you have any questions or concerns, or would like copies of the field or analytical results, please do not hesitate to call me at 906-204-6500.

Sincerely,



Amanda Zeidler
Environmental Analyst
Eagle Mine

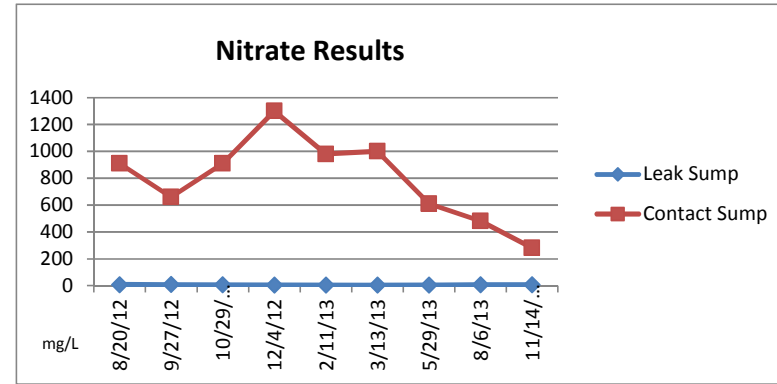
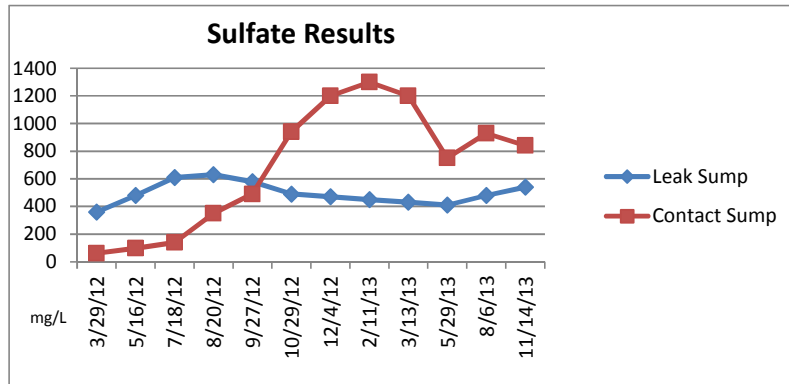
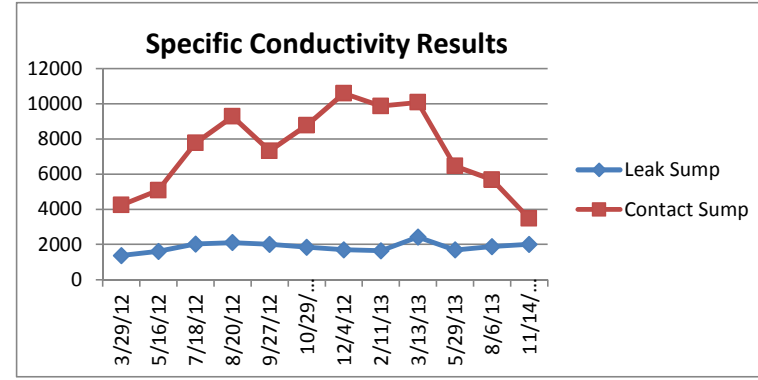
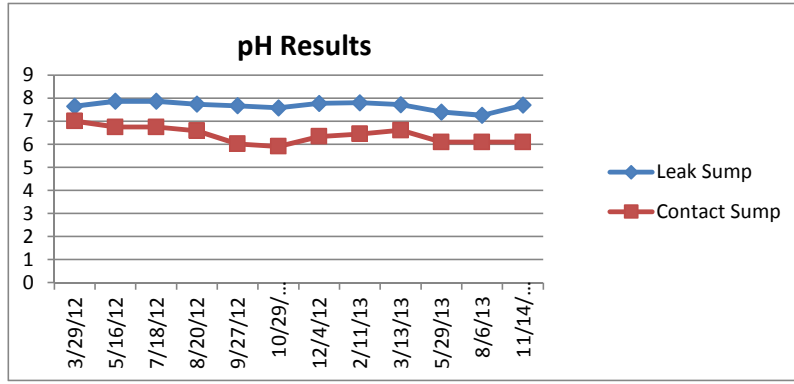
TDRSA Leak Dection and Contact Sump Results

Parameter	3/29/12 TDRSA Leak Sump (mg/L)	3/29/12 TDRSA Contact Sump (mg/L)	5/16/12 TDRSA Leak Sump (mg/L)	5/16/12 TDRSA Contact Sump (mg/L)	7/18/12 TDRSA Leak Sump (mg/L)	7/18/12 TDRSA Contact Sump (mg/L)	8/20/12 TDRSA Leak Sump (mg/L)	8/20/12 TDRSA Contact Sump (mg/L)	9/27/12 TDRSA Leak Sump (mg/L)	9/27/12 TDRSA Contact Sump (mg/L)	10/29/12 TDRSA Leak Sump (mg/L)	10/29/12 TDRSA Contact Sump (mg/L)	12/4/12 TDRSA Leak Sump (mg/L)	12/4/12 TDRSA Contact Sump (mg/L)	2/11/13 TDRSA Leak Sump (mg/L)	2/11/13 TDRSA Contact Sump (mg/L)	3/13/13 TDRSA Leak Sump (mg/L)	3/13/13 TDRSA Contact Sump (mg/L)	5/29/13 TDRSA Leak Sump (mg/L)	5/29/13 TDRSA Contact Sump (mg/L)	8/6/13 TDRSA Leak Sump (mg/L)	8/6/13 TDRSA Contact Sump (mg/L)	11/14/13 TDRSA Leak Sump (mg/L)	11/14/13 TDRSA Contact Sump (mg/L)
Magnesium	NS	NS	9.1	93	13	190	12	240	12	220	10	390	7.4	420	7	440	NS	NS	7.6	160	8.4	140	9.4	98
Sodium	NS	NS	280	370	390	440	400	550	390	420	420	580	330	620	320	750	NS	NS	350	660	340	530	370	270
Chloride	NS	NS	5	530	5.2	350	7.3	340	8.2	260	7.4	140	6.5	170	5.7	180	5.7	250	6.2	480	6.6	220	7.8	130
Sulfate	360	61	480	97	610	140	630	350	580	490	490	940	470	1200	450	1300	430	1200	410	750	480	930	540	840
Nitrate	NS	NS	NS	NS	NS	NS	7	910	7.8	660	5	910	4.4	1300	2.7	980	3.3	1000	4.4	610	5.4	480	6.0	280
Nitrite	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.94	39	0.64	4	0.3	0.57	0.42	2.3	0.67	0.11	0.47	<0.05
Ammonia	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.37	76	0.31	23	0.64	55	0.16	25	0.15	13	0.13	0.85
Gallons Purged	54	NS	39	NS	111	NS	122	NS	86	NS	95	NS	26	NS	28	NS	7	NS	8	NS	8	NS	4	NS
pH	7.65	7.01	7.87	6.75	7.87	6.75	7.74	6.59	7.67	6.02	7.58	5.91	7.78	6.34	7.8	6.45	7.72	6.61	7.4	6.1	7.26	6.1	7.7	6.1
Specific Conductivity	1369	4245	1611	5079	2019	7765	2108	9280	2007	7323	1846	8776	1697	10590	1639	9864	2420	10080	1686	6455	1874	5680	2013	3474

NS = Not sampled

Development mining ended in early June 2013 and is likely the reason for the decrease in nitrate, nitrite, and ammonia results for the remainder of 2013.

TDRSA Leak Dection and Contact Sump Results



TDRSA Leak Dection and Contact Sump Results

