

## Memorandum

**To:** File

**CC:**

**From:** Chris Garrett, SWCA

**Date:** February 11, 2015

**Re:** Review of New Groundwater Quality Information and Potential Impact on Geochemical Pit Lake Model

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Additional water quality information was submitted by Rosemont Copper Company to the Coronado National Forest on January 17, 2015, representing the most complete database of groundwater quality available (Rosemont Copper Company 2015).

As part of the review conducted in the Supplemental Information Report to evaluate whether these additional data would change conclusions in the FEIS, the groundwater quality samples for wells PC-1 through PC-8 were evaluated and compared to the average concentrations used as ambient groundwater quality inputs in the geochemical pit lake model (Tetra Tech 2010). The samples used as inputs to the geochemical pit lake model were collected during the first round of groundwater sampling in 2008. Additional rounds were conducted in 2012 and 2014 and these results were part of the information provided by Rosemont Copper Company in January 2015

The additional samples were below laboratory detection limits for total and dissolved concentrations of the following constituents. If incorporated into the average groundwater quality from wells PC-1 through PC-8, these sample results would reduce the overall concentrations used in the pit lake analysis for these constituents: aluminum, antimony, arsenic, barium, beryllium, cadmium, carbonate, cobalt, copper, mercury, nickel, silver, thallium, uranium, and zinc.

For the constituents listed in Table 1, concentrations from post-2008 samples were above laboratory detection limits and had some potential to change the ambient

groundwater quality if averaged with the 2008 samples. Estimates of revised average ambient groundwater quality from wells PC-1 through PC-8 using all samples are shown below.

<b>Constituent<sup>1</sup></b>	<b>Original average used in pit lake model (mg/L)</b>	<b>Number of samples from 2008</b>	<b>New post-2008 sample results (mg/L)</b>	<b>New average based on post-2008 samples (mg/L)</b>	<b>Number of post-2008 samples</b>	<b>Weighted revised average for all samples (mg/L)</b>
Bicarbonate	187	25	110, 170, 190	157	3	184
Calcium <sup>3</sup>	131	25	47, 54, 74	58	3	123
Chloride	8.36	25	6.4, 7.8, 9.5	7.9	3	8.31
Fluoride	0.85	25	0.72, 1.2, 1.9	1.3	3	0.90
Chromium <sup>2</sup>	<0.01	24	0.00084, <0.001, <0.03	0.0056	3	0.005
Iron	0.554	24	0.36	0.36	1	0.546
Lead <sup>2</sup>	0.0092	25	<0.00099, <0.00099, <0.04	0.007	3	0.0089
Manganese	0.174	25	0.095	0.095	1	0.171
Molybdenum	0.121	25	0.25	0.25	1	0.126
Nitrate	0.49	25	0.52, 0.54	0.53	2	0.49
Selenium <sup>2</sup>	0.00212	25	<0.006, <0.006, <0.04	0.009	3	0.00285
Sulfate	300	25	7.7, 110, 120	79	3	276

<sup>1</sup> Chromium, iron, lead, manganese, molybdenum, and selenium are based on dissolved concentrations. Bicarbonate, calcium, chloride, fluoride, nitrate, and sulfate are based on total concentrations.

<sup>2</sup> Results below laboratory detection limits are calculated using half the detection limit.

<sup>3</sup> Number of 2008 samples unknown, estimated based on other constituents

## REFERENCES

Tetra Tech. 2010. *Geochemical Pit Lake Predictive Model—Revision 1. Project No. 114-320884*. Prepared for Rosemont Copper. Tucson, AZ: Tetra Tech. November.

Rosemont Copper Company. 2015. Correspondence from Kathy Arnold to Jim Upchurch. January 17.