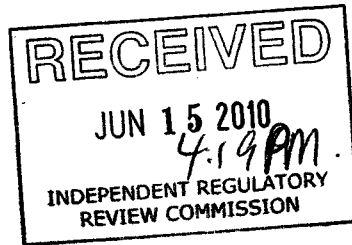


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AMD Reclamation, Inc.

June 4, 2010

Environmental Quality Board
Rachael Carson State Office Building
400 Market Street, 16th Floor
Harrisburg, PA 17101-8477



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ENVIRONMENTAL QUALITY BOARD

Re: Proposed Ambient Water Quality Criterion – Chloride
40 Pa.B. 2264 – May 1, 2010

Dear Environmental Quality Board,

In response to the referenced proposal, please consider the following comments:

The Department has proposed to adopt the following criteria:

4 day average Criteria Continuous Concentration (CCC) = 230 mg/l
1 hour average Criteria Maximum Concentration (CMC) = 860 mg/l

These criteria originate from the USEPA's "Ambient Water Quality Criteria for Chloride – 1988", EPA Publication # 440/5-88-001, dated February, 1988. According to that publication, the criteria were developed based upon EPA's "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses", EPA Publication # PB85-227049, by Stephan, et al., 1985.

Department personnel should be aware that, since 1988, significant subsequent research has been conducted on the toxicity of chloride to aquatic organisms. And, as the Department's Rationale Document concludes, "Scientists at the USEPA are currently conducting research to determine if the national criterion for chloride should be updated".

Of particular note, the state of Iowa proposed chloride criteria in 2004. Specifically, they proposed to use 860 mg/l as the acute criterion, and 372 mg/l as the chronic criterion. This proposal garnered much attention and scientific review. Notably, written comments were submitted by Dr. Wesly Birge, Professor at the University of Kentucky's Graduate Center for Toxicology and Department of Biology. Dr. Birge was an internationally recognized expert in aquatic toxicology, and worked extensively with the USEPA. Dr Birge provided most of the toxicity test data used by EPA in development of the 1988 national chloride guidelines. For February 16, 2004 testimony before Iowa's Department of Natural Resources, Environmental Protection Commission¹, Dr. Birge provided the following written statements:

"Based on the available information, I feel that establishing a chronic aquatic life criterion for chloride of 564 mg/L is scientifically justifiable and is protective of aquatic life, and that establishing a chronic criterion of 372 mg/L based on only one chronic test

¹ <http://www.iowadnr.gov/epc/archive/04feb16m.pdf>

AMDRI Comments to "Coordinating National Pollutant Discharge Elimination System (NPDES) Permitting in the Monongahela River Watershed
with *Daphnia pulex* in reconstituted water is not justified."

"US EPA proposed a chronic value of 230 mg chloride/L. This was based solely on laboratory toxicity tests and acute-chronic ratios. The former most always overestimates risk and the ratios are clearly invalid (*emphasis added*). The basic mechanisms involved in acute toxicity most always are significantly different from those involved in chronic toxicity."

"The basis for my opinions in this matter stems largely from our extensive laboratory and field studies with chloride pollution. Our study was undertaken at the request of the Commonwealth of Kentucky for the purpose of establishing chloride standards for freshwater systems. This involved laboratory toxicity tests with a number of aquatic species following US EPA procedures. These data were used by US EPA in developing their recommendations on chloride.

In addition, we conducted an extensive field study on the effects of chloride from an abandoned oil well that was fed by a saline aquifer and emptied into a typical freshwater stream system in the Red River watershed of eastern Kentucky. Among other things, this involved a coordinated study of ecological collections and field toxicity testing (i.e. mobile laboratory). Chloride was substantially less toxic under typical field conditions and the results were highly significant statistically."

"To further evaluate the differing results, laboratory "Water Effect Ratios" were determined. This included simultaneous tests with a cladoceran, *Daphnia pulex*. Specifically, this involved a standard laboratory tests with reconstituted water versus a test identical in nature except natural water from a typical freshwater stream was used to house the test organisms. Chloride was at least two times less toxic in natural water (*emphasis added*) and these results agreed closely with those from our field study and support of 564 mg/L suggested by Dr. Baumann. The State of Kentucky has used 600 mg/L in a wide variety of watershed systems and rivers. I know of no problems with implementation or adequate protection of aquatic biota."

From Dr. Birge's comments, we see that:

- The 1988 EPA CCC criterion for chloride was based upon only one chronic test, with *Daphnia pulex* in reconstituted water. (*emphasis added*)
- Laboratory tests using reconstituted water overstate risks
- The acute-chronic ratio analysis used by EPA to develop the 230 mg/l CCC criterion is "clearly invalid"
- Chloride toxicity is far less toxic in natural waters than in reconstituted laboratory waters

Facing concerns that their initial proposed chloride criteria were not scientifically defensible, Iowa then worked closely with EPA over several years to refine the criteria. Results of the subsequent research and toxicity testing completed for chloride showed that chloride toxicity is heavily dependent on water hardness, and to a lesser degree, sulfate levels in the water. Using all of the literature and this most recent toxicity testing,

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EPA developed the following equations² for the acute and chronic chloride criteria to protect Iowa's waters:

Acute Chloride Criteria Equation

$$287.8(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452} = \text{Acute Criteria Value (mg/L)}$$

Chronic Chloride Criteria Equation

$$177.87(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452} = \text{Chronic Criteria Value (mg/L)}$$

Conclusions/Recommendations

From our review, it is apparent that the 1988 EPA criteria for chloride are obsolete. In the February 16, 2004 testimony before Iowa's Department of Natural Resources, Environmental Protection Commission, representatives from academia (including Dr. Birge, the key researcher behind EPA's 1988 chloride criteria) characterized EPA's earlier research as "spurious", and their use of acute-chronic ratio's as "invalid". Subsequent research has significantly advanced the scientific understanding of chloride toxicity to aquatic organisms. And, as the PADEP acknowledges in their Rationale document, "Scientists at the USEPA are currently conducting research to determine if the national criterion for chloride should be updated".

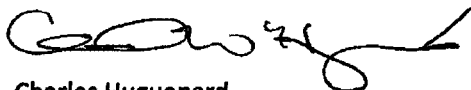
As EPA's "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses" instructs,

"Criteria should attempt to provide a reasonable and adequate amount of protection with only a small possibility of considerable overprotection or underprotection."

Based upon the information provided, the PADEP's proposed CCC chloride criterion is significantly overprotective, and would lead to unnecessary and excessive additional costs. The PADEP's May 1, 2010 proposal relies upon obsolete criteria, but omits the significant findings of more recent research and review. Therefore, AMDRI objects to the PADEP's proposed chloride criteria. AMDRI respectfully requests that the PADEP collaborate with EPA following Iowa's example, and refine the proposed chloride criteria using the significant body of updated information now available.

Thank you for your consideration of these comments.

Sincerely,



Charles Huguenard
Vice President
AMD Reclamation, Inc.

² http://www.iowadnr.gov/water/standards/files/ws_fact.pdf