UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
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DALLAS, TX 75202-2733

DEC - 6 2011

James P. Bearzi, Chief
Surface Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building (N2050)
P.O. Box 5469
Santa Fe, NM 87502-5469

Dear Mr. Bearzi:

Miguel Flores has asked that I respond to the few remaining issues from the State's 2008-10 triennial revision contained in your June 20, 2011, letter. As outlined in our Record of Decision, there were new/revised amendments that the Environmental Protection Agency (EPA) did not take action on. This was intended to allow both the New Mexico Environment Department (NMED) time to provide additional supporting information and to allow ourselves additional time for a more detailed review of some of the State's new metals criteria. Your letter provided requested information for the majority of the provisions that EPA did not act on.

We have completed the detailed review of the metals criteria, considered your response, and would like to provide you with the enclosed response. We have provided specific recommendations and have additional questions based on our detailed review. I would appreciate NMED providing any responses directly to Russell Nelson, our Regional Water Quality Standards Coordinator on the following components:

- Review of Standards; Need for Additional Studies (20.6.4.10(D)(1)(e) NMAC);
- General Criteria – Turbidity (20.6.4.16 NMAC);
- Marginal Warm Water Aquatic Life Use criteria (Subsection H of 20.6.4.900);
- Adoption of a footnote to supplement the hardness-based aluminum criteria,
- Revised derivation of the cadmium criteria; and
- Revised derivation of the zinc criteria.

We would appreciate receiving your response by January 15, 2012, to allow us to come to closure on these issues. If you need additional information concerning the enclosed response, please call me at (214) 665-6653 or Russell Nelson at (214) 665-6646.

Sincerely,

Jane B. Watson

Jane B. Watson, Ph.D.
Associate Director
Ecosystems Protection Branch

Enclosure

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Response to the New Mexico Environment Department

Review of Standards; Need for Additional Studies (20.6.4.10 D(1)(e) NMAC)

In our ROD on page 112-113, we asked that the State provide supporting documentation or a methodology that explains what the following statement means and how it would be applied within the existing federal regulatory structure: "...other factors or combinations of factors that...may warrant modifications of default criteria." The Department's June 2011 letter did not provide the requested supporting information. It's important that NMED inform EPA if it intends to provide any additional information that may affect EPA determination on this portion of the new provision.

General Criteria – Turbidity (20.6.4.16 NMAC)

EPA identified several concerns with this revised provision on page 114 of its ROD. EPA requested that the State provide an explanation of how this provision could be implemented consistent with its antidegradation implementation and how it would prevent long-term or permanent degradation that would assist EPA in making a determination. The Department's June 2011 letter did not provide the requested explanation. Please let us know if the Department intends to provide any supporting information that may affect EPA determination on the revised provision.

Marginal Warmwater Aquatic Life Use Criteria (Subsection H of 20.6.4.900 NMAC)

Given the Department's disagreement with the need for a UAA to support a segment-specific maximum temperature higher than 32.2°C (90°F), it is important to explain how we interpreted the revised provision. As described on page 90 of our ROD, we consider the revised provision to be internally inconsistent since the Marginal Warmwater designated use clearly specifies a maximum temperature of 32.2°C yet allows higher temperatures on a segment-specific basis.

Although adopting a segment-specific temperature criterion is not the same as removing a designated use (as specified in the Clean Water Act (CWA) §101(a)(2)), EPA considers the development of a segment-specific criterion to be significant, warranting support through a UAA. Variations in certain hydrologic parameters including temperature, flow and dissolved oxygen, can significantly impact aquatic life even if other factors remain constant. A segment-specific criterion can be considered equivalent to establishing a subcategory of the Marginal Warmwater use. Further, EPA believes that the Department's Air-Water Temperature Correlation is the type of document that would be used to address segments that have been misclassified and to support a segment-specific temperature criterion in a natural water body that routinely exceeds the defined maximum of 32.2°C.

Metals Criteria (Subsection I of 20.6.4.900 NMAC)

As noted in the Department's response, EPA approved the majority of the new/revised provisions adopted by the State but did not take action on the hardness-based criteria for aluminum, cadmium and zinc to allow for a more detailed review. EPA has concluded that review and has considered the additional information provided by the Department and GEI Consultants, Inc. (GEI). While we believe hardness-based metals criteria can be an appropriate approach to protection, we continue to have concerns about how some of the equation-based criteria were developed and if they would be protective of all waters in New Mexico. We have outlined our concerns below and look forward to the Department's response prior to EPA taking final action.

Derivation of the Equation-based Aluminum Criteria

Applicability of the hardness-based equations:

The stated purpose of GEI's analysis in its document *Ambient Water Quality Standards for Aluminum - Review and Update* (GEI 2009) is to revise and update acute and chronic aluminum standards following EPA's 1985 Guidelines. While GEI generally followed the 1985 Guidelines in revising the toxicity dataset, the authors appear to have utilized a very small number of studies specific to New Mexico that would not fully take into account the relevant differences between the sensitivities of the aquatic organisms in the national dataset versus those for organisms found in New Mexico's waters.

To understand this point, EPA believes it is important to describe both the relationship between GEI's document entitled *Ambient Water Quality Standards for Aluminum - Review and Update* (GEI 2009) and the Arid West Water Quality Research Project documents it draws from, as well as the approach taken in developing the hardness-based equations the State's has adopted. For example, the GEI *Review and Update* only references a single report (Buhl 2002) that was conducted in New Mexico. The Buhl report looked at the relative toxicity of waterborne inorganic contaminants including aluminum, using reconstituted lab water simulating water in the Rio Grande. The report indicated that the concentrations of individual contaminants, including aluminum at EPA's recommended 304(a) criteria levels did not pose a hazard to the species tested. The key point is not the results of the toxicity tests themselves but the fact that the study only focused on the Angostura reach of the Rio Grande where effluents comprise a significant portion of river flow. The results of a toxicity study carried out in a single effluent-impacted reach of the Rio Grande would not be appropriate to use in deriving statewide criteria in New Mexico.

As another example, the GEI *Review and Update* also states that it is based primarily on the Arid West Water Quality Research Project *Evaluation of the EPA Recalculation Procedure in the Arid West – Technical Report* (AWWQRP 2006). That *Technical Report* states that it was intended to evaluate the use of the 1985 Guideline *Recalculation Procedure* on selected water quality criteria with different modes of toxicity in specific arid west waters. Since the the GEI *Review and Update* draws from the AWWQRP *Technical Report*, the *Report* also references Buhl (2002) and

other studies conducted in New Mexico by Hamilton and Buhl (1997a and 1997b). The Hamilton and Buhl studies were hazard assessments looking at toxicity from inorganic mixtures and not specifically aluminum toxicity. These studies along the San Juan River represent a single geographic location in New Mexico that would not necessarily be representative of conditions throughout New Mexico. Looking closer, the *Technical Report* also draws from the AWWQRP *Habitat Characterization Study* (AWWQRP 2002), which represents an effort to characterize the habitat of selected effluent-dependent waters across the western U.S. The only site in New Mexico referenced in this *Habitat Characterization Study* is the Santa Fe River, which is accurately referred to as an effluent-dependent water. Given that the Santa Fe River is an effluent-dominated river, data drawn from this study cannot be considered representative of the majority of waters in New Mexico.

Derivation of the hardness-based equations:

GEI reported that it followed EPA's1985 Guidelines, relied on selected studies from EPA's 1988 aluminum criteria document and a literature search in updating the toxicity database in deriving the hardness-based equations that have been adopted. GEI stated that a pH range of 6.5 to 9.0 was established as a limit for data used in updating the databases because EPA established this as an acceptable range for pH in ambient freshwater (Red Book, USEPA 1976) and noted that this circumneutral pH gradient was the same range used to derive current criteria in the 1988 Aluminum Document. While GEI may have generally followed EPA's approach, it does not mean that the resulting criteria provide adequate protection for the conditions that may be found in waters outside of the circumneutral (6.5 to 9.0) pH and 25 to 250 mg/L hardness ranges.

The GEI *Review and Update* explains that the pH of a solution is a major driver of aluminum speciation and that over the range of acceptable circumneutral pH values one could expect that the fraction of monomeric aluminum in solution will change, most notably at lower (approximately 6.5) and higher pH values (approximately 9). Dr. Gensemer's[1] direct testimony to the Commission noted that the existing data suggest that aluminum toxicity increases with increasing water hardness, or with other water quality parameters that covary with hardness such as pH. Focusing on studies conducted at circumneutral pH doesn't consider and appears to discount that monomeric aluminum is more available and is much more toxic at pH outside and particularly below the circumneutral range.

In response to EPA concerns about pH, the Department's response stated that the occurrence of concentrations outside the circumneutral range is rare, basing this statement on an analysis of over 5,000 measured pH data points. Of these, the Department reported that only a small percentage had pH concentrations less than 6.5 and exceeding 9.0. Although EPA doesn't doubt these data, it's difficult to determine their usefulness since no information was provided as to where these monitoring points were, whether they were replicates of a defined set of waters or if they are geographically widespread and representative of all types of waters in New Mexico.

1 Robert W. Gensemer, Ph.D, GEI Consultants Inc., Pleading Log (PL) 51, NMED Exhibit 2-8-29-10

Even if they were, this only confirms that there are waters that fall outside the circumneutral range and would not be fully protected by the criteria that have been adopted. Further, while we agree with the Department's contention that a waterbody with a pH outside the circumneutral range would be assessed as not supporting the aquatic life use, the fact that the waterbody would be considered impaired as a result of aluminum toxicity as an effect of the pH has no bearing on the adequacy of the criteria that an impairment determination would be based on.

In his direct testimony, Dr. Gensemer's noted that EPA's 1985 Guidelines provide methods for adjusting criteria if it can be demonstrated that toxicity varies as a function of a given water quality parameter such as the relationship between water hardness and toxicity for some divalent metals. For aluminum, the existing data suggest that toxicity increases with increasing water hardness, or with other water quality parameters that covary with hardness. However, as Dr. Gensemer testimony also notes, there is evidence that the toxicity of aluminum to aquatic life is hardness-dependent (i.e., aluminum toxicity is greater in softer waters and decreases as water hardness increases). While we agree with the conclusion that expressing updated aluminum criteria on the basis of a hardness equation rather than as a single fixed value is warranted, there is potential for toxicity increases with both low and high water hardness outside of the 25 to 250 mg/L range that was used for derivation of the aluminum criteria.

Through the Department's response, GEI also noted that the proposed chronic criteria equation would generate criteria in very soft waters (e.g., 12-14 mg/L) that would be protective of the two most chronically sensitive species (striped bass and brook trout). However, the GEI *Review and Update* also refers to Dr. Gensemer's direct testimony, which noted that these two tests were conducted at the lowest pH allowable in the criteria range (6.5). While this may support the protectiveness of the hardness equations at the lowest end of the criteria pH range, it does not give EPA any confidence that the hardness-based criteria will be protective in waters below a pH of 6.5 or in the upper end or outside of the circumneutral range. EPA recognizes that little data is available below 20 mg/L hardness for most metals, but has evaluated the limited data for several metals and determined that capping hardness at 25 mg/L without additional data or justification may result in criteria that provide less protection then intended by EPA's 1985 Guidelines. As a result, EPA recommended in its National Water Quality Criteria (2002) that hardness not be capped at 25 mg/L, or any other hardness on the low end. Further, given that only studies in the 25 to 250 mg/L range were used, the 250 mg/L upper end of this range may be much less than the hardness of some waters in New Mexico. For hardness over 400 mg/L, EPA recommends two options: (1) calculate the criterion using a default Water Effect Ratio (WER) of 1.0 and using a hardness of 400 mg/L in the hardness equation; or (2) calculate the criterion using a WER and the actual ambient hardness of the surface water in the equation.

Conclusions:

Although GEI generally followed the approach in EPA's 1985 Guidelines in recalculating the national toxicity database, we are concerned that most of the studies that were carried out in New Mexico to derive these criteria were either carried out in effluent-impacted and effluent-dependent waters or were not looking at aluminum toxicity and would not be appropriate for use

in the development of statewide criteria. EPA considers the hardness-dependent equations for aluminum to be an improvement over the existing criteria for waters within the circumneutral pH range (6.5 - 9.0) but would not be appropriate as statewide criteria. The characteristics that may be found in all waters in New Mexico must be considered.

To gain EPA approval, the State should consider revising the current provision, adopting language or a footnote to the hardness-based criteria table that recognizes that aluminum toxicity increases at low pH. This language or footnote should require that where pH is equal to or greater than 7.0 the chronic hardness-dependent equation will apply. Where pH is less than 7.0, in the receiving water after mixing, either the 87 µg/l chronic total recoverable aluminum criterion or the criterion resulting from the chronic hardness-dependent equation will apply, whichever is more stringent.

Derivation of the Equation-based Cadmium Criteria

Adjusting the calculated acute criteria for the protection of commercially important trout species by incorporating new data with different species and new tests on species already in the dataset is an appropriate approach. However, we have a number of concerns that are outlined below:

- The GEI *Review and Update* included data on the arctic grayling (*Thymallus arcticus*) which is not indigenous to New Mexico from Buhl and Hamilton (1991). EPA specifically excluded this test from the 2001 criteria document database because the toxicity test was conducted improperly due to low dissolved oxygen and should not be used here.

- The Davies et al. (1993) tests should not have been included in the calculation of chronic cadmium since this data provides information about chronic toxicity of juveniles, which are not necessarily the most sensitive lifestage. This study should not be used in the criteria calculation but could be used as supplementary information to support the derived criterion (i.e., to support the toxicity of cadmium to rainbow trout (*O. mykiss*).

- Inclusion of juvenile fathead minnow data is not justified, as this is not the most sensitive lifestage. Furthermore, inclusion of this data markedly increases the data variability reflected in the low R^2 value of 0.29 for the species slope.

- The GEI *Review* takes exception with EPA's decision related to fathead minnow data acceptability in the 2001 cadmium criteria update. The 2001 cadmium criteria update made it clear that no juvenile Fathead minnow data was used due to data availability for a more sensitive stage (< 24 hours stage and fry stage). There is also data that shows that adults are approximately 10X more resistant than fry, (24 hour stage). The decision in 2001 was made to limit data to sensitive stages and adults in agreement with Section IV G and H of the 1985 Guidelines. In section IV.G, the Guidelines states that data for the more resistant life stages should not be used in the calculation of the species mean acute

value (SMAV) because a species can only be considered protected from acute toxicity if all life stages are protected.

- In calculating the final acute value (FAV), the authors should use the four genus mean acute values (GMAV) to come closer to the 5th percentile consistent with the 1985 Guidelines.

EPA considers the approach used in developing the hardness-dependent equations for cadmium to be appropriate, but believes that the Department should address the issues outlined above to allow EPA to act on these criteria.

Derivation of the Equation-based Zinc Criteria

EPA identified a few problems that are outlined below that we believe should be addressed.

- In determining the final acute/chronic ratio (FACR), it is unclear whether or not the chronic values follow a pattern with the acute values. EPA's 1985 Guidelines (Section VI.K(1)(2)(3)(4)) provide methods for determining the FACR in the presence or absence of a pattern.

- There appears to be a miscalculation of the GMAV using a species mean acute value (SMAV) of 1649 ug/L. The studies provided in Appendix A all have different LC50s and water hardness levels, but the SMAV remains the same (1649 ug/L) for all tests (see page A-14). The GMAV for brook trout is correct at 1649 ug/L since the acute data in the report is normalized to a hardness of 50 mg/L. New Mexico's revised criteria were derived using the top four most sensitive GMAVs. Instead they should use the second to fifth ranked most sensitive GMAVs to be consistent with the 1985 Guidelines.

- According to the data presented in Table 6 of Appendix A, the brook trout ACR should be 1649/854.7=1.929. However, it is presented as 2.335 in Table 7 of the report. This slight difference alters the FACR from 2.66 to 2.59. The report should identify more clearly that the brook trout ACR is taken directly from the EPA 1987 document to avoid confusion. In addition, the 1987 zinc criteria document acute value (1996 ug/L) is the geometric mean of 1550 ug/L, 2120 ug/L and 2420 ug/L from Holcombe and Andrews (1978) divided by the chronic value of 854.7 ug/L (Holcombe et al, 1979) resulting in ACR = 2.335.

- The newly calculated pooled slope of 0.9094 is slightly greater than the EPA 1985 Guidelines slope of 0.8473, and has an R^2=0.53 which is small for this type of test. The Department should use tests that are more appropriate for the final pooled slope calculation. Regarding the newly calculated pooled slope of 0.9094, the steps describing

the data acceptability and calculations are all acceptable as reported in the document.

As with the other metals discussed here, EPA considers the approach used in developing the hardness-dependent equations for zinc to be appropriate. However, we believe that the Department should address the issues outlined above to better support the zinc criteria.