ADEQ

A R K A N S A S
Department of Environmental Quality

November 23, 2015

Mr. Doug Szenher
Arkansas Department of Environmental Quality
Public Outreach and Assistance Division
5301 Northshore Drive
North Little Rock, Arkansas 72118

Re: Proposed Rulemaking by the Cities of Harrison and Yellville for Crooked Creek

Dear Mr. Szenher;

In the most recent third-party rulemaking public notice on behalf of the Cities of Harrison and Yellville for Crooked Creek, the Arkansas Pollution Control and Ecology Commission solicited public comments for two specific questions regarding calculation of site-specific criteria (SSC). The first question posed was whether calculated SSC for chlorides and sulfates could be rounded to the nearest whole number and whether total dissolved solids could be rounded to the nearest multiple of ten. The second question was whether calculated site-specific criteria for minerals (chlorides, sulfates, and total dissolved solids) could be derived from the 99$^{th}$ percentile of all available data, rather than the 95$^{th}$ percentile. Arkansas Department of Environmental (ADEQ) quality submits the following responses to these questions.

ADEQ understands concerns raised about the scientific significance of the evaluations and relationship to the data accuracy. Using normal rounding conventions, site-specific chloride or sulfate criteria may be increased or decreased to nearest whole number. Specific guidance on rounding is described in Part 1050 B of Standard Methods for Examination of Water and Wastewater (21$^{st}$ Ed.). Based on Standard Method guidance, SSC calculations should be performed prior to any rounding. If rounding percentiles with multiple significant digits and the digit to be dropped is between 6 and 9 (121.781), then the number will be increased (122). If significant digits to be dropped are within 1 and 4, the number remains unchanged (121.321, then 121). If rounded to the nearest whole number which is higher, the change may require further justification to demonstrate the criteria would not cause unintended consequences to stream quality.

ADEQ has evaluated rounding total dissolved solids criteria to the nearest multiple of ten. Rounding to the nearest multiple of ten, depending on the available instream data, could elevate SSC to greater than the 95$^{th}$ percentile.

Implementation of the 99$^{th}$ percentile SSC for sulfates, chlorides, or total dissolved solids would potentially violate Clean Water Act (CWA) ((Section 303(c)(3)), 40 CFR 131.11 (Criteria), and APC&EC Anti-Degradation policy (Reg. 2.201). States are authorized to adopt criteria that are based on sound scientific rationale and are protective of designated uses. To satisfy CWA and

40 CFR 131.11 requirements for SSC, Arkansas currently requires third parties to perform a Use Attainability Analysis (UAA) to document existing designated uses and whether they are attained under current conditions. Site-specific criteria would be established at concentrations observed during the UAA process with any additional historical physical, chemical, or biological data. In the 99th percentile example, criteria would be derived at concentrations that aquatic organisms may only be exposed to less than one percent of the time. Calculated 99th percentile SSC may be unrepresentative of observed ambient conditions and increase the possibility that designated uses would not be attained, specifically Aquatic Life and Domestic Water Supply (DWS).

Additionally, if the 99th percentile were approved and rounded to the nearest multiple of ten, SSC could equal the maximum observed instream concentrations or, in some instances, even exceed actual observed concentrations (Table 1).

As illustrated in Table 1, if the 99th percentile of WHI0066 TDS data, which is the data set used to calculate criteria for Crooked Creek from Harrison WWTP to Yellville WWTP, were rounded to the nearest multiple of ten, this value would exceed the highest concentration for TDS observed in the data set used to calculate the proposed SSC. For the same data set, if each consecutive percentile were rounded to the nearest multiple of ten (e.g. 96th, 97th,) rounding would increase the value to the next percentile (i.e. rounded 96th becomes the 97th percentile).

Table 1: Percentiles and rounding of actual instream data observed from Crooked Creek, Arkansas from 2003-2013.

| Site Name | Parameter | 95th Percentile | 96th Percentile | 97th Percentile | 98th Percentile | 99th Percentile | Rounded 99th Percentile to nearest 10 | Maximum Value Observed |
|---|---|---|---|---|---|---|---|---|
| WHI0066 | Cl | 22.6 | 23.2 | 23.5 | 24.7 | 25.5 | --- | 26.6 |
| WHI0066 | SO4 | 24.4 | 28.0 | 28.9 | 29.4 | 30.8 | --- | 37.7 |
| WHI0066 | TDS | 269.1 | 270.5 | 272.9 | 274.0 | 284.5 | **290** | 288.0 |
| WHI048C | Cl | 7.9 | 8.3 | 8.6 | 9.3 | 10.4 | --- | 11.7 |
| WHI048C | SO4 | 10.2 | 10.4 | 10.9 | 15.9 | 24.6 | --- | 36.5 |
| WHI048C | TDS | 237.7 | 240.2 | 244.0 | 244.7 | 257.2 | 260 | 281.0 |

Impacts and subsequent impairments to the aquatic life designated use from highly variable or elevated mineral concentrations are difficult to anticipate. Recent published data supports higher macroinvertebrate sensitivity to ion (mineral) concentrations than were previously reported through traditional toxicity testing (US EPA 2011). Many of Arkansas' ecoregions are among the naturally lowest ion concentrations in the United States (Griffith 2014). Empirical evidence that supports aquatic life sensitivity to low mineral constituents is advancing.

Domestic Water Supply designated uses would be vulnerable when an effluent has a high amount of mineral constituent variability and these constituents exceed Secondary Drinking

Water Maximum Containment Levels (MCLs)[1] one percent of the time, or less (Table 2). For this example, 95th percentile of TDS, rounded to the nearest multiple of ten, is below the 500 mg/L MCL for DWS or domestic water supply criteria. However, due to the variability of observed instream data the rounded 99th percentile would be 690 mg/L, which is above the maximum contaminant level established for DWS or the domestic water supply criteria contained in Regulation 2. ADEQ provides the latter example from common observances in recent mineral third-party rulemakings and urges the Commission to retain the 95th percentile.

States or authorized tribes are required by 40 CFR 130.7(d) to assess waterbody attainment every two years. Permit effluent limitations calculated using criteria developed for the 99th percentile of available instream data and assessed with either a 10% or 25% exceedance, would provide permittees the ability to avoid effluent limit violations, which would likely result in degradation of downstream designated uses.

The long-term implications and broad application of the 99th percentile to non-mineral constituents (i.e. nutrients) should be considered prior to approval. Site-specific criteria derived from the 99th percentile for non-mineral constituents would likely result in significant impacts to existing uses.

Thank you for your consideration of these comments.

If you have any questions or comments, please feel free to call 501-682-0660 or email me at clem@adeq.state.ar.us

Sincerely,

Sarah Clem
ADEQ Branch Manager
Water Quality Planning Branch
Water Division

[1] MCLs are established under the federal Safe Drinking Water Act. The secondary MCLs of 250 mg/L for chlorides, 250 mg/L for sulfates, and 500 mg/L for total dissolved solids are also criteria adopted to protect the domestic water supply use in Regulation 2.511(C).

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Table 2: Hypothetical scenario of when the 99th percentile and rounding of instream data exceeds secondary MCLs for domestic water supply.

| Site Name | Parameter | 95th Percentile | 96th Percentile | 97th Percentile | 98th Percentile | 99th Percentile | Rounded 99th Percentile to nearest 10 | Maximum Value Observed |
|---|---|---|---|---|---|---|---|---|
| Stream A | Cl | 182.2 | 203 | 214.8 | 227.7 | 248.9 | --- | 270 |
| Stream A | SO4 | 165 | 233 | 237.2 | 250.6 | 258.3 | --- | 266 |
| Stream A | TDS | 423 | 448.12 | 550.84 | 648.08 | 685.04 | **690** | 722 |

**References**

Griffith, M.B. 2014. Natural variation and current reference for specific conductivity and major ions in wadeable streams of the conterminous USA. Freshwater Science 33(1): p. 1-17.

U.S. EPA (Environmental Protection Agency). 2011. A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/R-10/023F.

Table 3. Randomly generated data for the designated use protection example.

| | Chlorides | Sulfate | TDS |
|---|---|---|---|
| | 59 | 20 | 303 |
| | 148 | 7 | 268 |
| | 58 | 13 | 93 |
| | 47 | 15 | 94 |
| | 87 | 5 | 207 |
| | 123 | 5 | 121 |
| | 71 | 16 | 219 |
| | 92 | 5 | 177 |
| | 32 | 8 | 208 |
| | 150 | 17 | 160 |
| | 136 | 20 | 225 |
| | 63 | 2 | 144 |
| | 97 | 3 | 255 |
| | 107 | 10 | 164 |
| | 80 | 13 | 315 |
| | 108 | 15 | 78 |
| | 22 | 5 | 205 |
| | 72 | 9 | 54 |
| | 27 | 6 | 309 |
| | 108 | 19 | 220 |
| | 80 | 18 | 250 |
| | 94 | 17 | 265 |
| | 147 | 13 | 246 |
| | 87 | 18 | 315 |
| | 126 | 20 | 181 |
| | 82 | 6 | 62 |
| | 98 | 3 | 81 |
| | 22 | 15 | 345 |
| | 67 | 10 | 320 |
| | 126 | 11 | 214 |
| | 132 | 5 | 251 |
| | 118 | 17 | 97 |
| | 93 | 2 | 153 |
| | 80 | 16 | 180 |
| | 51 | 8 | 172 |
| | 119 | 8 | 303 |
| | 81 | 7 | 275 |
| | 58 | 10 | 202 |
| | 103 | 19 | 150 |
| | 105 | 9 | 346 |
| | 119 | 4 | 188 |
| | 99 | 32 | 288 |
| | 109 | 47 | 341 |
| | 200 | 57 | 722 |
| | 39 | 71 | 431 |
| | 32 | 35 | 353 |
| | 225 | 44 | 645 |
| | 145 | 34 | 411 |
| | 270 | 21 | 387 |
| **95th** | **182.2** | 165 | **423.0** |
| **96th** | **203** | **223.3** | **448.1** |
| **97th** | **214.8** | **237.2** | **550.8** |
| **98th** | **227.7** | **250.6** | **648.1** |
| **99th** | **248.9** | **258.3** | **685.0** |
| **Maximum** | **270** | **266** | **722** |
| **Minimum** | **22** | **31** | **54** |