

Implementation of Action Levels for Copper and Zinc in NPDES Permits

October 25, 2000

North Carolina Division of Water Quality

Background

During the adoption of the National Toxics Rule in 1992, EPA did not mandate that North Carolina promulgate new numeric criteria for copper and zinc. The Agency recognized the extremely variable nature of the toxic effects caused by these pollutants. North Carolina was allowed to use an action level approach to these toxicants as a result of an extensive set of biological data, implementation of aggressive, systematic whole-effluent toxicity (WET) testing in NPDES permits, and the overall quality of the program.

Representatives of EPA Region IV, EPA Headquarters, and North Carolina Division of Water Quality (Division) met in Atlanta on June 2, 1998. In this meeting, EPA stated their need to make a decision regarding the acceptability of the Division's approach to the use of action levels for copper and zinc. The two major concerns were:

- Understanding the Division's implementation process, especially in terms of permitting decisions.
- Prompt progress on toxicity identification evaluations (TIEs) and toxicity reduction evaluations (TREs).

Purpose

The purpose of this policy paper is to clarify the Division's implementation policy and procedures for controlling levels of copper and zinc in point source discharges.

Current Control Methodologies

Control of copper and zinc is achieved by promoting pollution prevention, pretreatment requirements, and through the Division's whole-effluent toxicity testing program. It should also be noted that limits for total residual chlorine (another action level standard) are routinely placed in NPDES permits.

North Carolina continues to promote pollution prevention, recycle, and reuse as positive/proactive approaches to control pollution. Emphasis has been so great in North Carolina that a separate non-regulatory Division, the Division of Pollution Prevention and Environmental Assistance (DPPEA), was created. DPPEA provides free consulting in the area of waste reduction to industrial and municipal dischargers. Furthermore, the Division of Water Quality routinely requires new and expanding discharges to assess pollution prevention and waste minimization approaches in engineering alternatives analyses performed to support the need for their projects.

Pretreatment permits issued by municipalities with industrial users routinely contain restrictions on the discharge of copper and zinc. These limits are imposed to protect inhibition of biological treatment at the wastewater treatment plant, to control toxicity of sludge, or to control whole effluent toxicity.

Toxicity testing limits exist in over 450 permits in North Carolina. The compliance rate of these facilities not under Special Order by Consent (SOC) is greater

than 90% in any given month. North Carolina's investigators and others have demonstrated the predictive ability of whole effluent toxicity tests with respect to instream impacts of wastewater discharges^{1,2}.

In terms of NPDES permitting, the general approach towards limiting all toxicants is the same. All facilities with complex waste streams or major facilities receive WET limits, in addition to copper and/or zinc monitoring requirements, where copper and/or zinc are present in the effluent. Based on EPA's 1991 *Technical Support Document for the Water Quality-Based Toxics Control*, the Division determines if a parameter is a pollutant of concern (i.e., if it is present in amounts greater than "background" or source levels). If so, monitoring is required in NPDES permits or through the Pretreatment Long-Term Monitoring Plan (LTMP). Once a database is developed that adequately characterizes the wastewater (defined in the Technical Support Document as being a minimum of eight to 12 data points), a reasonable potential analysis is performed to assess if a permit limit is necessary. This process usually takes place at the time of permit renewal. The procedure for determining reasonable potential is included in the Division's Permit Writer's Guidance Manual.

If there is a reasonable potential for the pollutant to violate water quality standards, a limit is imposed for those toxicants not codified as action level parameters. In the case of copper and zinc, "monitoring only" is required until it is demonstrated that copper and/or zinc are significant causative factors in whole-effluent toxicity. Typically, this determination has been made on a case-by-case basis.

Problems with the Existing Process

There are two major concerns regarding the existing process that this paper will address:

- 1) The reasonable potential analysis assumes that total recoverable metals are comparable to the numeric criteria in the Division's action levels. In other words, total metals are equivalent to the dissolved or bioavailable portions.
- 2) It is unclear under what specific circumstances the Division makes the determination that metals are "significant causative factors" in WET.

Proposed Policy

Each month, Aquatic Toxicology Unit personnel review the compliance status of each facility whose NPDES permit contains a whole effluent toxicity limit. During the course of this review, noncompliant facilities that also monitor for copper and zinc will be identified. This subset of facilities would be forwarded to the NPDES Unit. A prospective permit limit would be derived applying the best available data to the following process:

¹ Eagleson, KW, DR Lenat, L. Ausley, and F. Winborne. Comparison of Instream Biological Responses with Responses Predicted by *Ceriodaphnia* Chronic Toxicity Tests. *Env. Toxicology and Chem.* 9:1019-28.

² U.S. Environmental Protection Agency. 1991. Technical Support Document For Water Quality-Based Toxics Control. EPA/505/2-90-001. Office of Water, Washington, DC, p. 21.

Permit Limit based on AL standards using translator and default assumptions³

- Convert AL standard to dissolved (AL_d) using EPA conversion factors⁴
- Determine site-specific total suspended solids (TSS) using period of record and 15th percentile (data for another measure of organic matter such as POC may be used at such time that the state has sufficient data to support).
- Using the following equation⁵, the fraction of dissolved is calculated:
- $C_d/C_t = 1/[1+(K_p)(TSS)(10^{-6})]$
 - Where: C_d = concentration of metal as dissolved
 - C_t = concentration of metal as total
 - K_p = partition coefficient = $[(K_{po})(TSS^{-})]$
 - TSS = 15th percentile TSS for period of record
- Divide AL_d by C_d/C_t to get criteria as total for site = AL_{total}
- Calculate permit limits using AL_{total} , critical flow (7Q10) and permitted flow

The total recoverable metal monitoring data and AL_{total} will be input into the reasonable potential analysis. Each facility that demonstrates a potential to produce a level of copper or zinc in its receiving stream in excess of AL_{total} will receive notification that includes a requirement to perform at least two follow-up WET tests over the two months following the initial WET noncompliance.⁶ The notification will also include the prospective metal limit and a description of the process (described below) that will ensue upon failure of any of the follow-up tests. This notification will be incorporated within the Notice of Violation (NOV) generated by the Division in response to the WET noncompliance. Upon the failure of any follow-up test performed as required above, the permittee will receive formal notice that their permit will be reopened in nine months and the prospective permit limit described above applied unless the permittee can provide one of the following:

1. Instream measurements of dissolved metal during low flow conditions that demonstrate compliance with the Action Level standard
2. A revision of the prospective permit limit using improved inputs that in concert with existing or additional monitoring data demonstrates compliance with the Action Level standard
3. Toxicity Identification Evaluation (TIE) results that definitively rule out copper and/or zinc as causes of toxicity

³ U.S. Environmental Protection Agency. 1996. The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion. EPA 823-B-96-007.

⁴ 63 FR 68354-64, December 10, 1998.

⁵ U. S. Environmental Protection Agency. 1996. The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion. EPA 823-B-96-007. Page 6. Table 3. Calculation of Default Partition Coefficients.

⁶ The Division's most recent chronic toxicity special condition language requires at least two follow-up tests following a failure. However, this language will be applied only as permit renewals occur. In the meantime, the follow-up monitoring requirement in these letters should ensure that at least two tests are performed during the two months following a failure.

4. Demonstration by an alternative method approved by the Division and EPA that copper and/or zinc is not the cause of toxicity

The permittee will be required to respond in writing to the Division within 30 days after the date of the second WET Notice of Violation to either accept the prospective metal(s) limit **or** to indicate choice of option(s) 1-4 above. If the Division does not receive notification within the required time frame, reopening of the permit and application of the metal(s) limit will proceed after an additional 30 days.

The trigger for the facility to provide DWQ with written notification to accept the prospective metal(s) limit **or** exercise option(s) 1-4 is the second WET limit violation which occurs during a toxicity testing calendar quarter specified by the NPDES Permit.

The permittee will have nine (9) months after the date of the second WET Notice of Violation to demonstrate whether copper and/or zinc are causative effluent toxicants.

Each of the options available is outlined below.

Option 1: Instream Measurement of Dissolved Metal

The discharger measures the dissolved portion of the metal in question instream at critical low-flow conditions

- Based on 15A NCAC 2B .0211
- Requires receiving stream flow measurements
- Receiving stream flow must be at or below 7Q10 each day samples are collected
- Monitoring required to collect data for translator development
- Opportunity to use “clean” sampling and analytical techniques
- Minimum of 5 datapoints required
- If the arithmetic average of the measurements is below the Action Level standard, then no permit limits for copper and/or zinc are given

Option 2: Revised Permit Limit based on AL standards using translator and default assumptions

A revised permit limit would be derived as above

- Apply improved inputs:
 - Additional metal monitoring data
 - Measurement of receiving stream TSS (if not previously available)
 - Use of “clean” sampling and analytical techniques
- Calculate permit limits using AL_{total} , critical flow (7Q10) and permitted flow
- Use AL_{total} to determine if reasonable potential exists. If so, put permit limits into permit. If not, continue monitoring and WET limits

Option 3: Toxicity Identification Evaluation (TIE)

The discharger uses a TIE to determine if metals are a source of toxicity.

- Monitoring required to collect data for translator development
- If TIE results indicate metals are not a problem, then no permit limits for copper and/or zinc are given

- If TIE results indicate metals are causing or contributing to toxicity, or the results are inconclusive for copper and/or zinc, then the prospective permit limit will be applied or a more site-specific limit if Option 1 or 2 was also conducted

Option 4: Alternative Methods

The Division will consider proposals for alternative methods for eliminating zinc and copper as suspected toxicants in the effluent. These proposals must be reviewed and approved by the Division and EPA.

Should the permittee conduct more than one of the options, the results will be considered in the following priority:

1. TIE
2. Instream chemical monitoring
3. Limit based on translator

All methods of determining toxicity and permit limits would require monitoring of total and dissolved metal(s) in the effluent and instream. WET limits would remain in permits as well as additional sampling to verify environmental protection. The period of nine months is based on the amount of time needed to complete a TIE and to account for seasonal variability in effluent data.

Permittees will be advised of the availability of Special Orders by Consent (SOCs) to provide regulatory relief from WET violations during the process. The resulting SOC will include the Division's standard TRE requirements and milestones used for SOCs entered into for WET.

If the permittee decides not to determine whether metals are the source of toxicity, limits will be applied for the appropriate metals as described above.

Regardless of whether metals are determined to be the source of toxicity, the WET limit will remain in the permit.

This policy in no way supercedes actions that are normally taken in reviewing a request for reissuance or renewal of a permit. North Carolina uses all available information, including WET test data, when determining whether to reissue or deny a request for a permit renewal. The state does not specifically require a discharge to cease or be relocated unless there is a regulatory reason to do so; for example, if an expansion of a discharge into a zero-flow stream is proposed or if water quality impairment is being caused by a discharge, then the Division would move to deny or require removal of the discharge.

Conclusion

The proposed policy contains triggers for the evaluation of the appropriateness of copper and zinc limits during the course of the standard permit renewal process. Those triggers are based on 1) whole effluent toxicity monitoring data, and 2) a reasonable potential analysis incorporating total recoverable metals monitoring data and a prospective limit derived using a translator. The policy incorporates the use of accepted methods for developing "site-specific metals criteria" and/or TIEs to determine if these two metals are potential sources of toxicity observed in the effluent. If so, permit limits are applied.

The “site-specific metals criteria” would be developed per 15A NCAC 2b .0211 & .0220. These rules specify that the bioavailable portion of the AL metals can be used to determine permit limits. The state interprets that language to include translators and is in the process of adding language referencing EPA’s guidance for translator development. Therefore, rule-making will not be necessary for each individual site.

As with any new policy, details of implementation will be modified and refined as staff gain experience with the technical and procedural issues involved in the process. Any modifications will be reviewed and approved by EPA.