

Agenda
Meeting with CASA and Board Member Maguire on Proposed Toxicity Provisions
Thursday, June 6, 10:00 – 12:00
CalEPA Building

1. Basic Overview of Toxicity Testing **(Ann H.)**
2. History of Working with Water Board on Toxicity Provisions and High-Level Alternatives **(Adam L. / Tom G. / Melissa T.)**
3. Primary Issues for POTW Dischargers
 - a. Use of the *ceriodaphnia dubia* reproduction endpoint for chronic toxicity compliance testing **(Ann H. / Phil M.)**
 - b. Flexibility in use of Instream Waste Concentration (IWC) and dilution and interaction with the State Implementation Policy (SIP) **(Tom G. / Debbie W.)**
 - c. Changes in approach to determination of reasonable potential (RP) **(Lorien F.)**
 - d. Regional Board discretion on use of acute testing in addition to chronic testing **(Ann H. / Phil M.)**
4. Other Issues of Interest (If Time Allows)
 - a. MMEL and “calendar month” alternatives **(Lorien F.)**
 - b. Language encouraging reduced frequency of monitoring during a TRE
5. Next Steps

Cerio Issue in Brief

Requested Action: Eliminate use of the *Ceriodaphnia dubia* (water flea) reproduction test for compliance purposes under the proposed Toxicity Provisions. The Board can substitute the next most sensitive species (e.g. fathead minnow or algae for freshwater) for compliance purposes while working to address the variability and inaccuracy issues with the *Ceriodaphnia* reproduction test.

Toxicity Provision Reference (Prior Version): Page 6, Table 1

Issue in Brief: The *Ceriodaphnia dubia* reproduction test has a high inherent rate of variability, which has been shown to lead to inaccurate determinations of toxicity. Under the proposed Provisions, POTWs are required to test the chronic endpoint for the “most sensitive species”, which in many cases is determined to be *Ceriodaphnia dubia* reproduction.

When combined with numeric limits and mandatory use of the TST (which eliminates several safeguards used in other statistical approaches), as the provisions propose to do, this will result in increased “toxicity” compliance problems and NPDES permit violations across the state, in many cases when no actual toxicity exists. Under the new provisions, lower than expected reproduction will result in a violation of a numeric water quality limit, with potential enforcement liability, third party lawsuits, and public perception issues associated with labeling effluent as “toxic.”

CASA Suggestion: Modification of section IV.B.1.b. to specify that the *ceriodaphnia dubia* chronic freshwater reproduction test method NOT be used for compliance purposes. However, it could still be used for monitoring purposes with possible implementation of numeric triggers, but such an application would not result in violations of the MDEL or MMEL. We agree with State Water Board staff that actions are needed to reevaluate the *C. dubia* reproduction test methods to improve the precision of the test and to reduce variability, if possible.

Staff Recommendation: The staff Recommendation is to use the *C. dubia* reproduction test for compliance but also include a resolution to look at ways to improve the test. This is a non-starter. If there are acknowledged reliability issues with the validity of the test (as identified in our comments and white paper), then the *C. Dubia* reproduction endpoint absolutely should not be relied upon as an accurate measure for compliance purposes. Accuracy and variability issues MUST be addressed BEFORE it can be used as a compliance species.

FAQ

Cerio reproduction is already used as a chronic test now in NPDES permits, what is the difference? Most permits that currently use the *C. dubia* reproduction test do so in conjunction with a narrative standard, not numeric limits. Under a narrative standard, the result of a false indication of toxicity was a trigger to conduct additional testing (e.g. acceleration of monitoring, conduct a TRE and

identify the source). So long as the permittee was pursuing these actions, there was no compliance violation or liability associated with a toxicity indication. With the imposition of numeric water quality limits, any indication of toxicity, whether due to a toxicant or not, will result in violations that have serious additional consequences in terms of compliance, liability and the potential for third party lawsuits.

Moreover, currently approved USEPA methods, including NOEC and IC/EC25, include quality assurance/quality control measures that are absent from the TST. For example, the NOEC includes a dilution series which might allow a discharger to identify anomalies in the *Cerio* reproduction test and discount clearly erroneous results. The TST does not. Prior litigation required USEPA to amend the *Cerio* test method to include safeguards to protect against identifying non-toxic samples as toxic, including a requirement to run multiple concentrations and look at the response to see if the results made sense. The TST includes no such safeguards. The safeguards also included application of variability criteria. The TST as required in the provisions strips away USEPA's safeguards by only looking at 100% effluent. Therefore, since it has been documented that variability in the *C. dubia* test is significantly greater than the other test species, there inevitably will be greater incidences of false violations when this species is used. Under the proposed provisions, the combination of numeric limits associated with the high variability *C. dubia* reproduction test and the TST statistic will result in an increase in toxicity violations, despite no increase in actual toxicity.

Can't improvements in lab methods address this variability? Not at this time. Laboratories have been using this species for decades with limited success in improving variability. In many cases, improved lab procedures and performance can improve reliability of results, as it applies to most tests. However, there are no recognized/sanctioned specific refinements to the existing method that would address the types of variability and false indications of toxicity that continue to be observed in the *Ceriodaphnia* reproduction test.

How does the requested change fit appropriately into the proposed toxicity provisions? From CASA's perspective, the road to addressing this is straightforward. The Board can use a readily available alternative species with far less variability and a higher degree of reliability (fathead minnow), has the option of pursuing additional research over time to address the variability of the *Cerio* reproduction test and potentially improve lab methods, and can then revisit future use of *Cerio* reproduction for compliance purposes if and when those issues have been addressed. Removal of this species for compliance purposes can be accomplished without disrupting the vast majority of the toxicity provisions.

Summary

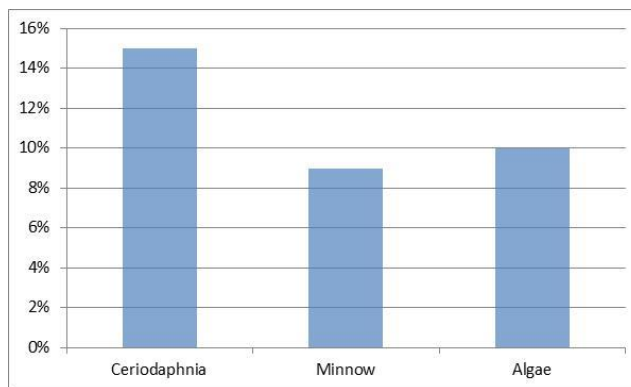
From the POTW perspective, the use of the *C. dubia* reproduction endpoint for compliance purposes is our central concern with the proposed provisions. While we still believe that numeric limits are inappropriate in the context of toxicity, and that the Board should not be using an un-promulgated method like the TST, eliminating

the *Cerio* reproduction endpoint is anticipated to address a significant number of our concerns. Making this change is fundamental to our ability to have some amount of buy-in to the toxicity provisions as currently written.

Toxicity Testing Brief: Variability and Unreliability in the Cerio Chronic Reproduction Test

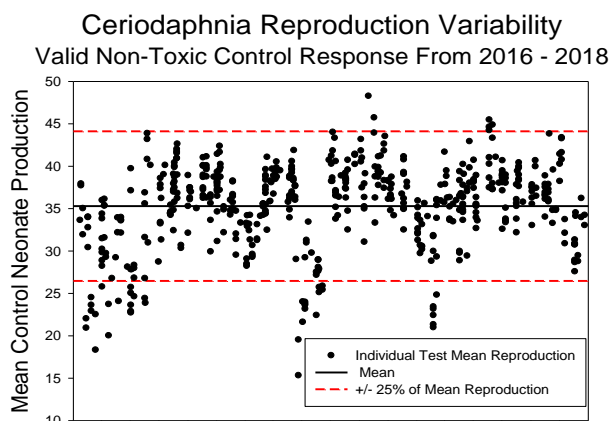
Biological Testing Is Inherently Uncertain, and the Cerio Reproduction Test is the Most Unreliable

While testing of water for chemical constituents (e.g. arsenic) is typically very accurate and precise, biological testing is not because it relies on living organisms. The freshwater test organisms are generally water fleas (*Ceriodaphnia dubia*) or fathead minnows, whichever is most sensitive. Inherent biological variability and methodological variability are higher in *Ceriodaphnia* testing. As the national average control variability for freshwater whole effluent toxicity (WET) tests demonstrates, the average *Ceriodaphnia* control variability is nearly 50% higher than the fathead minnow test and 33% higher than the green algae test.



Using the *Ceriodaphnia* Reproduction Endpoint, the Toxicity Provisions Would Regularly Identify Results as “Toxic” That Are Within the Noise of High Purity Lab Water

The draft Toxicity Plan would declare any sample exhibiting an effect greater than 25% to be toxic. The *Ceriodaphnia dubia* reproduction effect observed frequently exceeds 25% in valid, non-toxic controls consisting of high purity lab water. Historical results from one accredited lab showed that nearly 7% of the controls exhibited a 25% effect or greater relative to the overall average. Statistically speaking, if an agency were to run toxicity tests on clean, non-toxic control water for 14 months, it is more likely than not that the lab would receive a hit (violation) for toxicity, despite all of the water being completely non-toxic.



Results from Multiple Studies Raise Serious Questions Regarding the Reliability of the *Ceriodaphnia* Reproduction Test

Multiple studies have been conducted over the years to assess the rate at which known non-toxic blank samples testing the *Ceriodaphnia dubia* chronic reproduction test incorrectly indicate toxicity. Many of these studies are being relied upon as support for the validity of using the TST in the proposed Toxicity provisions (1999-2000 USEPA study, 2016 Stormwater Monitoring Coalition study, and 1997 study of 17 laboratories looking at the *Ceriodaphnia dubia* chronic reproduction endpoint.) The somewhat limited data from these studies indicates that the rate of incorrect determination of toxicity in the *Ceriodaphnia dubia* chronic reproduction endpoint test is unacceptably high, ranging from 36% when using the NOEC to 55% when using the TST.

| Study Name | NOEC | IC25 | TST |
|--------------------|------|------|-----|
| EPA ^[a] | 3.6% | 7.1% | 14% |
| SMC | 36% | 45% | 55% |
| WC | 33% | 33% | 38% |

The “Test Drive” Study Relied Upon by Water Board Staff is Insufficient to Assess Errors and Accuracy

The “test drive” cited in support of the toxicity provisions concluded that the frequency of identifying toxicity with the TST are similar to the NOEC, but that summary is misleading. While this may be true when combining all species and endpoints, the TST identified far more samples as toxic than the NOEC for *Ceriodaphnia* reproduction and fathead minnow survival and growth endpoints. This discrepancy between the *Ceriodaphnia* reproduction endpoint for TST and NOEC results was clearly acknowledged in the peer-reviewed publication:

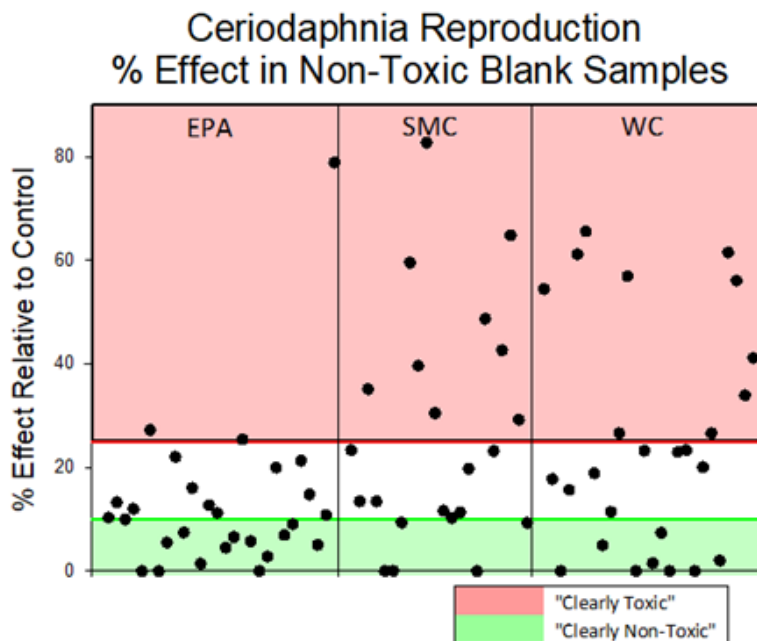
“Although most of the test endpoints or methods examined had either a similar or a higher percentage of tests declared toxic using the NOEC approach when the mean effect at the IWC was less than the toxic RMD, the Ceriodaphnia reproduction and the Pimephales survival and biomass endpoints exhibited a somewhat opposite pattern (Table 1).”

Moreover, any conclusion that the TST improved result accuracy is completely unfounded. The “Test Drive” Study utilized toxicity results from tests conducted using effluent and receiving water samples (no blank samples). Therefore, the “true” or “actual” toxicity of the sample was not known.

State Water Board staff made the assumption that if a sample exhibited a 25% or greater effect, it was “clearly toxic” and if a sample exhibited an effect of 10% or less, it was “clearly non-toxic.” As noted above, the *Ceriodaphnia dubia* reproduction effect frequently exceeds 25% in valid, non-toxic controls consisting of high purity lab water. Based on these assumptions, State Water Board staff concluded that the TST correctly identified “clearly toxic” and “clearly non-toxic” samples more frequently than the NOEC. Evaluating accuracy in this manner is technically flawed and completely unsupported scientifically.

We know based on the limited studies that have been conducted using clean, non-toxic control water that effects of greater than 25% are commonly observed. Therefore, the assumption that a “clearly toxic” sample is one that exhibits an effect of 25% or more is completely false. Below is a summary figure of the currently available *Ceriodaphnia* reproduction results conducted on clean, non-toxic control water showing the number of samples that would have been incorrectly assumed to be “truly toxic” (in red), even though in each every case, the tested sample was known to be completely non-toxic.

Performance of a properly designed and implemented blank study with sufficient statistical power could have the potential to resolve concerns by better quantifying the occurrence of incorrect determinations of toxicity using this species and endpoint. However, the *Ceriodaphnia dubia* chronic reproduction endpoint should not be used to set numeric effluent limitations until these known issues with false determinations of toxicity have been resolved.



Reasonable Potential Issue in Brief

Requested Action: Modify toxicity provisions to only require effluent limits for those POTWs that have measurable reasonable potential to cause or contribute to instream toxicity in receiving waters, based on the water quality objective.

Toxicity Provision Reference (Prior Version): Section IV.B.2.b on Page 15.

Issue in Brief: Under federal regulations, effluent limits are only required in NPDES permits where it is demonstrated that an effluent has a reasonable potential to cause or contribute to an exceedance of a narrative or numeric water quality objective. "Reasonable potential" is normally determined by comparing effluent quality to the applicable water quality objective(s). This is also the approach used for toxic pollutants under the State Implementation Plan (SIP).

The proposed provisions' new toxicity water quality objective, as measured in ambient waters, is to pass the Test of Significant Toxicity (TST). The reasonable potential approach proposed by staff requires a far more conservative approach than would be required for a regular chemical constituent under the SIP, since (1) the proposed provisions make the reasonable potential threshold even more stringent than the objective by lowering the 25% regulatory management decision to be just 10% when determining reasonable potential; and (2) the TST penalizes variability in the data, even when the results are below the regulatory management decision of 25%. The 10% threshold is within the inherent variability of the toxicity test, and will push most POTWs into having effluent limits.

Setting the reasonable potential bar this low, or automatically giving all POTW numeric limits absent the determination of reasonable potential as staff have proposed, will unfairly penalize POTWs that do not threaten exceedances of the proposed toxicity water quality objective. POTWs that might not otherwise have reasonable potential will be required to perform additional monitoring and have an increased risk of incurring violations and TRE costs before having any opportunity to investigate the cause of the apparent toxicity. This is a significant problem for many smaller POTWs, which will struggle to perform the toxicity monitoring and TRE work that goes along with having an unnecessary effluent limit.

CASA Suggestion: Make simple language changes that base the "Reasonable Potential" on the actual objective of not causing toxicity in the receiving water, not on an arbitrary threshold that is a fraction of the objective. As with other constituents under the SIP, an agency with no history of toxicity (no reasonable potential) would not have a limit. Only if routine monitoring showed reasonable potential could that agency then be given a limit. This would provide the agency an opportunity to investigate and address the cause of this apparent toxicity before being put in compliance jeopardy. CASA suggests that, for POTWs with a proven track record of not causing instream toxicity, agencies would receive reduced monitoring frequencies no greater than the reduced frequencies specified in the provisions (or less if determined appropriate by the Regional Board), but without an effluent limit. This could be re-evaluated at each permit renewal.

Response to Staff Recommendation: The Water Board staff proposal is to determine reasonable potential based on a metric that is not the water quality objective, or to give all POTWs numeric limits irrespective of an appropriate requisite determination as would be required in other circumstances. This automatic imposition of numeric limits (essentially automatic reasonable potential) is a huge cost of compliance issue for agencies, particularly smaller agencies, and is wholly unnecessary for those who would not otherwise receive numeric limits. Eliminating this “automatic” imposition of limits in the Provisions is equitable, consistent with federal regulations and other Board plans and policies, and is still protective of beneficial uses.

Instream Waste Concentration (IWC) Issue in Brief

Requested Action: Incorporate specific language changes in the Toxicity Provisions which allow Regional Boards flexibility to properly consider the actual dilution of POTW discharges in setting toxicity limits in NPDES permits.

Toxicity Provision Reference (Prior Version): Section IV.B.2.d, Pages 20 and 21.

Issue in Brief: Whole effluent toxicity (WET) measurements are intended to be an approximate indicator of toxicity in receiving waters in the vicinity of POTW discharges. Best available scientific literature, including USEPA documents, indicates that chronic WET results are not strongly related to instream conditions and that proper consideration of dilution is essential to connecting chronic WET results to instream effects. The IWC determination is where this consideration of dilution occurs in the NPDES permitting process.

The proposed Toxicity Provisions prescribe a conservative, simplistic approach which unnecessarily limits the consideration of actual dilution. This results in overly conservative effluent limits, which create unnecessary compliance problems and overpredicts effluent effects, if any, in receiving waters.

CASA Suggestion: Modify the language of the proposed Toxicity Provisions to provide the Regional Water Boards flexibility to consider actual dilution in setting the IWC. Examples could include seasonal limits, limits based on actual stream flow conditions during discharge, dynamic modeling, stochastic (statistical) approaches, or others. The SIP already allows similar flexibility for effluent limits for priority pollutants, and this change to the policy is consistent with USEPA guidance.

Specific language changes are:

Page 20, last paragraph, last sentence:

"The dilution ratio shall be determined using the parameters specified in Table 3, or, alternatively, shall be determined using a method approved by the Permitting Authority that accounts for actual dilution conditions occurring in the receiving water during the period of the toxicity test, including, but not limited to, consideration of seasonality."

Specific conforming language changes to Table 3 are also suggested.

Response to Staff Recommendation: Staff continues to state that its proposal is taken directly from the SIP, and that any change from the proposed language is beyond the scope of the Toxicity Provisions. CASA disagrees. The Toxicity Provisions were originally scoped to allow Regional Boards flexibility to set the IWC in the TST testing method. The latest proposed version of the Toxicity Provisions remove much of that flexibility.

FAQ

Is the CASA proposal consistent with the SIP? Yes. In Section 1.4.D on page 13 of the SIP, it states that “in determining the appropriate available receiving water flow, the RWQCBs may take into account actual and seasonal variations of the receiving water and the effluent.”

Will the CASA proposal reduce POTW compliance problems and costs? Yes. Many of the observed chronic toxicity trigger exceedances for advanced treatment POTWs are low level occurrences which would be eliminated by consideration of dilution in the range of 1:1 to 2:1. During periods of modest dilution, proper accounting for this condition would result in significant savings, including Toxicity Reduction Evaluation (TRE) and monitoring costs.

Summary

From the POTW perspective, in setting chronic toxicity effluent limits, actual dilution of POTW discharges must be considered. The language changes requested by CASA allow Regional Board to properly account for actual dilution in determining the IWC used in the TST procedure.