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December 20, 2018

Via e-mail to the Clerk to the Board at commentletters@waterboards.ca.gov

Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-2000

Re: Comment Letter – Toxicity Provisions

Dear Ms. Townsend:

Attached are the Utility Water Act Group's (UWAG's) comments in response to the State Water Board's *Proposed Establishment of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California; and Toxicity Provisions*. In addition, Attachment 1 includes a presentation from the SETAC North America 38th Annual Meeting that we reference in the comments.

We appreciate the opportunity to provide our views. Please contact me at (804) 783-7145 if you have any questions.

Sincerely,

Penny Shamblin

Penny A. Shamblin

THE UTILITY WATER ACT GROUP'S COMMENTS ON THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD'S PROPOSED ESTABLISHMENT OF THE WATER QUALITY CONTROL PLAN FOR INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES OF CALIFORNIA; AND TOXICITY PROVISIONS

December 20, 2018

I. Introduction

These are the Utility Water Act Group's ("UWAG's")[1] comments on the California State Water Resources Control Board's (State Water Board's) *Proposed Establishment of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California; and Toxicity Provisions* (proposed ISWEBE Plan).

UWAG members operate power plants and other facilities that generate, transmit, and distribute electricity. Some of these activities require a National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act (CWA). Therefore, UWAG members are interested in any action that potentially affects NPDES permittees.

Although the NPDES program is a federal program, the U.S. Environmental Protection Agency (EPA) delegated authority to implement the program to California through its State Water Board and its nine Regional Water Quality Control Boards (Regional Water Boards). Under this authority, the State Water Board's proposed ISWEBE Plan and toxicity provisions seek to make the Test for Significant Toxicity (TST) the only method for analyzing whole effluent test data. The TST Method is different than those promulgated by EPA in 40 C.F.R. Part 136. And the inherent technical flaws in the TST Method may negatively affect UWAG members by causing

[1] UWAG is a voluntary, *ad hoc*, non-profit, unincorporated group of 148 individual energy companies and three national trade associations of energy companies: the Edison Electric Institute (EEI), the National Rural Electric Cooperative Association (NRECA), and the American Public Power Association (APPA). The individual energy companies operate power plants and other facilities that generate, transmit, and distribute electricity to residential, commercial, industrial, and institutional customers. EEI is the association that represents all U.S. investor-owned electric companies. Its members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers. EEI's mission is to ensure members' success by advocating public policy, expanding market opportunities, and providing strategic business information. NRECA is the association of not-for-profit energy cooperatives supplying central station service through generation, transmission, and distribution of electricity to rural areas of the United States. APPA is the national service organization for the more than 2,000 not-for-profit, community-owned electric utilities in the U.S. Collectively, APPA member utilities serve more than 48 million Americans in 49 states (all but Hawaii), representing 16 percent of the market.

unwarranted (false positive) NPDES permit violations. Thus, for the reasons discussed below, UWAG urges the State Water Board not to adopt the TST as the method for analyzing whole effluent toxicity (WET) in its proposed ISWEBE plan.

II. EPA's promulgated WET data analysis methods were subject to rigorous testing to determine suitability that the TST Method has not undergone.

EPA's promulgated WET test methods are listed in 40 C.F.R. § 136.3, Table IA. Those methods identify specific aquatic organisms to test for acute and chronic toxicity in freshwater, estuarine, and marine waters. The test methods for WET incorporate by reference three manuals[2] that discuss in detail all of the WET testing and data analysis methods. *Id.*; *see also* EPA, *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing* (40 CFR Part 136), EPA-821-B-00-004, p. 1-1 (July 2000).

The data analysis methods EPA included in its Acute Toxicity Manual were "chosen primarily because they are (1) well-tested and well-documented, (2) applicable to most types of test data sets for which they are recommended, but still powerful, and (3) most easily understood by non-statisticians." EPA, *Acute Toxicity Manual*, § 11.1.4, p. 71. EPA considered many other methods in the selection process, and it is recognized that the methods selected are not the only possible methods of analysis of acute toxicity data. *Id.*, § 11.1.4, p. 71.

In both of EPA's Chronic Toxicity Manuals, it made similar statements about the statistical methods it chose to publish. EPA chose those statistical methods "because they are (1) applicable to most of the different toxicity test data sets for which they are recommended, (2) powerful statistical tests, (3) hopefully 'easily' understood by nonstatisticians, and

[2] EPA, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, EPA-821-R-02-012, Fifth Ed. (Oct. 2002); EPA, *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, EPA-821-R-02-013, Fourth Ed. (Oct. 2002); and EPA, *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, EPA-821-R-02-014, Third Ed. (Oct. 2002).

(4) amenable to use without a computer, if necessary." EPA, *Chronic Toxicity for Freshwater Organisms Manual*, EPA-821-R-02-013, § 9.4.1.2, p. 40; EPA, *Chronic Toxicity for Marine and Estuarine Organisms Manual*, EPA-821-R-02-014, § 9.4.1.2, p. 43.

EPA recommended the statistical methods in its three WET test method manuals after years of extensive study and testing. EPA "assembled a comprehensive data base to examine variability in the WET test methods from the EPA Regions, several States, and private laboratories, which represent[ed] a widespread sampling of typical laboratories and laboratory practices." EPA, *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination System Program*, EPA 833-R-00-003, p. xii (June 30, 2000). To ensure reliability, "EPA applied several criteria to the data before they were accepted, including detailed sample information, strict adherence to published EPA WET test methods, and test acceptability criteria (TAC)." *Id.* The result was a data base containing "data from 75 laboratories for 23 methods for tests concluded between 1988 and 1999." *Id.*

In addition, from 1999 to 2000, EPA conducted an interlaboratory variability study of 12 EPA-approved WET test methods. EPA, *Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods*, EPA 821-B-01-004, Vol. 1, p. xii (Sept. 2001). During the study, EPA required participating laboratories to "analyze each blind test sample according to the promulgated WET test method manuals and specific instructions in participant laboratory standard operating procedures (SOPs) developed for the study…." *Id.* at xiii. In other words, EPA required the laboratories "to analyze data in accordance with the statistical programs specified in the WET test method manuals. Statistical methods and programs used had to be reported along with sample calculations." *Id.* at 42. "In

total, the WET Variability Study generated interlaboratory precision data from testing more than 700 blind samples among 55 participant laboratories." *Id.* at xiii. And EPA used its approved and recommended statistical methods to validate its WET test methods.

In contrast to EPA's extensive review of its statistical methods, in 2010, the State Water Board recommended a "test drive" to evaluate the TST Method. California State Water Resources Control Board, *Effluent, Stormwater, and Ambient Toxicity Test Drive Analysis of the Test of Significant Toxicity (TST)*, p. viii (Dec. 13, 2011). During the test drive, "WET data from over 25 dischargers were compiled and analyzed…." *Id.* Although 890 tests were used, those tests only represented the WET test methods and endpoints used in California's toxicity programs. *Id.* And all of the data and tests used during the test drive were analyzed over the course of just over a year.[3]

EPA evaluated the statistical methods in its three WET test method manuals over more than a decade and used data from facilities all over the country. But the State Water Board's test drive limited its evaluation of the TST Method to only WET test methods used in and data collected from California over the course of approximately one year. Because the State Water Board's test drive was not as comprehensive as EPA's evaluation of currently promulgated statistical methods, the State Water Board's conclusions about the TST Method are likely less accurate.

III. The proposed ISWEBE Plan ignores EPA's strong recommendation that point estimation techniques be used to determine WET.

EPA has stated that, for the NPDES program, point estimation techniques are the preferred statistical methods. EPA, *Chronic Toxicity for Freshwater Organisms Manual*, EPA-

[3] The State Water Board recommended the test drive on November 16, 2010, and the final TST Test Drive Report was published on December 13, 2011. *Id.*

821-R-02-013, § 9.5.1, p. 41; EPA, *Chronic Toxicity for Marine and Estuarine Organisms Manual*, EPA-821-R-02-014, § 9.5.1, p. 44. EPA made this preference after considering the "advantages and disadvantages of hypothesis testing and point estimation approaches … discussed in the scientific literature (Chapman et al., 1996) and by EPA (USEPA, 1994a; USEPA, 2000a)." EPA, *Response to Comments on the Whole Effluent Toxicity Proposed Rule*, EPA-HQ-OW-2002-0024-0064, p. 155 (Nov. 8, 2002). EPA concluded point estimation approaches were "substantially less variable than NOEC for the same method and endpoint." EPA, *Method Variability in WET Applications under the NPDES Program*, EPA 833-R-00-003, § 3.4.1, p. 3-10; *see also* EPA, *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I*, EPA/600/6-91/005F, p. 5-4 (May 1992) (stating "the NOEC/LOEC are heavily affected by choice of test concentrations and test design … hypothesis testing is not suitable for Phase I purposes and a point estimate method must be used").

The TST Method is a hypothesis-testing approach and, therefore, not a point estimation method or approach. The proposed ISWEBE Plan seeks to make the TST Method the sole statistical evaluation method for all WET testing in California. So the TST Method is contrary to EPA's strong recommendation that point estimation approaches be used to evaluate WET because they are "substantially less variable." *Id.* The TST Method will likely lead to more variability and uncertainty regarding the true effect level than point estimation approaches for evaluating WET test data. So, the State Water Board should abandon its use in the proposed ISWEBE Plan.

IV. The TST Method ignores data from tests required to be conducted in order to comply with the approved WET test methods.

The three WET test method manuals incorporated by reference into 40 C.F.R. Part 136 require a minimum of five effluent test concentrations (*i.e.* multiple dilutions) and a control. *See,*

e.g., EPA, *Acute Toxicity Manual*, EPA 821-R-02-012, pp. 51-66 (Tables 12-19 summarizing test conditions for principal test organisms). And those same manuals approve statistical methods using one of two types of approaches to determine whether an effluent sample is toxic—a point estimation approach or a hypothesis test approach. The statistical methods in the WET test method manuals, using either approach, evaluate data from all of the required test concentrations and the control.

In contrast to the statistical methods in the WET test method manuals, the TST Method does not evaluate biological response in multiple dilutions. The TST Method analyzes one control sample and one effluent sample at the In-stream Waste Concentration (IWC), despite the fact that EPA does not recommend the use of pass/fail tests consisting of a single effluent concentration (*e.g.*, the IWC) and a control. EPA, *Acute Toxicity Manual*, EPA-821-R-02-012, p. 2; EPA, *Chronic Toxicity for Freshwater Organisms*, EPA-821-R-02-013, p. 5; and EPA, *Chronic Toxicity for Marine and Estuarine Organisms*, EPA-821-R-02-014, p. 5.

Moreover, the IWC represents a "worst-case" parameter because it is typically calculated by the ratio of effluent design flow (often maximum design flow) to a statistical low-flow parameter for the receiving stream (*e.g.*, the 7Q10 flow). This "fixed" value has less environmental relevance compared to a five serial dilution series used in the promulgated WET test methods. Assessing "pass/fail" toxicity using the IWC as the sole "response" concentration is an over-simplistic, environmentally unrealistic approach.

Therefore, the TST Method fails to fully consider important information from tests that EPA requires and is necessary to appropriately interpret WET test results.

V. The TST Method does not produce a valid dose response curve.

The purpose of requiring and analyzing at least five effluent concentrations and a control, as described in Section IV, is to ensure enough data to generate a dose-response curve. According

to EPA, "[t]he concept of a concentration-response, or more classically, a dose-response relationship is 'the most fundamental and pervasive one in toxicology,'" and the concept "assumes that there is a causal relationship between the dose of a toxicant (or concentration for toxicants in solution) and a measured response." EPA, *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 C.F.R. Part 136)*, EPA 821-B-00-004, p. 4-1 (July 2000). The dose-response relationship is important to "determining whether an effluent possesses toxicity and in identifying anomalous test results." *Id.* at 4-3. In fact, the lead EPA scientist responsible for standardizing the WET test methods stated:

> A predictable dose-response curve is one of the mandatory requirements for a valid toxicity test. We would never accept analytical results from an instrument producing an abnormal standard curve. The predictable dose-response curve, that is increasing toxicity with increasing concentration, is the analogue of the analytical standard curve and is of equal importance in toxicity testing.

Dr. Donald Mount, National Effluent Toxicity Assessment Center, EPA Environmental Research Laboratory - Duluth, MN, *NETA Communique* (Jan. 1990).

Multi-concentration testing and evaluation of dose-response results are essential for NPDES permittees because they identify outliers (including the tested IWC concentration), determine "how toxic" the sample is, and provide the toxicologist with dose-response clues (*e.g.*, potency) as to the possible cause of toxicity. WET permits commonly require repeat testing within two weeks of a "failed test," so the toxicologist can provide valuable information to the permittee in the interim that might require operational changes that would eliminate further failed tests.

In addition, although probably not an issue under the proposed ISWEBE Plan, multi-concentration testing and evaluation of dose-response results are essential for NPDES permittees with water quality-based effluent limits (WQBELs) and permit conditions for WET expressed as

toxic units (TUs).[4] *See* EPA, *EPA Regions 8, 9, 10 Toxicity Training Tool*, § 2.1, p. 25 (Jan. 2010) (recommending "WET data be expressed using toxic units"). For example, when no mixing zone or dilution allowance is authorized or when a NPDES discharge is to a zero flow stream, EPA Regions 9 and 10 recommend that permitting authorities establish a monthly median limit (MML) of 1.0 TUc for chronic WET. *Id.*, § 2.6.2, p. 36. The "pass/fail" nature of the TST Method, however, cannot provide the information necessary to assess compliance with TU limits since the NOEC, EC25, and/or LC50 values cannot be determined from the results of the control and IWC concentration.

Despite the reasons for requiring multiple effluent concentrations and the strong scientific support for the use of dose-response information to make informed regulatory decisions, the TST Method does not consider the dose-response relationship. *See* Attach. 1, William L. Goodfellow, Jr., *et al.*, *Toxicity Assessments for NPDES Compliance: Traditional TSD Methods versus the TST Approach*, Presentation at the SETAC North America 38th Annual Meeting, p. 7 (Nov. 14, 2017). The TST Method's analysis of one control and one effluent sample at the IWC does not allow for enough data points to create a robust dose-response relationship—a fundamental concept in ecotoxicolgy. *See id*. Because the TST Method does not consider the dose-response relationship, it will be more difficult to identify outliers, determine the toxicity of a sample, make a toxicologist's task of determining the potential cause of toxicity more difficult, and make compliance with permit conditions more difficult. Thus, the State Water Board should abandon the TST Method in its proposed ISWEBE Plan.

[4] TUs are measures of acute or chronic toxicity in an effluent. EPA, *EPA Regions 8, 9, 10 Toxicity Training Tool*, p. 15 (Jan. 2010). "The larger the TU, the greater the toxicity." *Id.* Toxic Unit – Chronic (TUc) is "100 times the reciprocal of the effluent concentration that causes no observable effect on test organisms in a chronic toxicity test" or 100/NOEC or 100/EC25. *Id.* Toxic Unit – Acute (TUa) is "100 times the reciprocal of the effluent concentration that causes 50 percent of the organisms to die in an acute toxicity test" or 100/LC50. *Id.*

VI. The TST Method presumes samples are toxic unless proven otherwise, ignoring inherent variability.

Several factors can affect test success and precision, such as the experience and skill of the lab analyst; test organism age, condition, and sensitivity; dilution water quality; and temperature control. EPA, *Acute Toxicity Manual*, EPA-821-R-02-012, § 4.13, p. 10. And the results will depend on the species used and the strain or source of the test organisms. *Id.* Even though the currently promulgated WET test methods make every effort to minimize or control variability, there will always be inherent variability that cannot be eliminated. *See* EPA, *Method Variability in WET Applications Under the NPDES Program*, EPA 833-R-00-003, App. D, p. D-1 (June 30, 2000) (stating "[v]ariability is inherent in any analytical procedure") .

According to EPA's promulgated statistical methods using the hypothesis testing approach (*i.e.* NOEC/IC25) the null hypothesis (*i.e.*, default assumption) is that an effluent sample is non-toxic until proven otherwise. This null hypothesis is important because of the inherent biological variability discussed above. It allows uncertainty in test results to be resolved in favor of the NPDES permittee as a way to deal with inherent variability.

The TST Method, however, reverses this null hypothesis. The TST Method's default assumption is that effluent samples are toxic. In other words, the TST Method assumes that aquatic organisms exposed to the sample will exhibit unacceptably low levels of survival, growth, or reproduction unless the test provides otherwise. The TST Method's null hypothesis effectively construes statistical uncertainty as evidence that unacceptable levels of toxicity exist. And it reverses the presumption of innocence by placing on the NPDES permittee the burden of proof that a sample is *not* toxic. Given the inherent variability in the WET analytical procedures, the TST Method's null hypothesis penalizes NPDES permittees when the test results are false positives due to factors that are out of their control.

VII. The TST Method is inconsistent with the objectives EPA agreed to when it adopted WET test methods after years of litigation.

Shortly after EPA first promulgated the WET test methods on October 16, 1995, several parties challenged the rulemaking. *See* 67 Fed. Reg. 69,952, 69,954 (Nov. 19, 2002). And, "to resolve the litigation, EPA entered into settlement agreements with various parties" in which it agreed to do several things. *Id.* In a July 24, 1998 Settlement Agreement, EPA agreed to undertake three rulemakings, prepare three guidance documents, and provide additional information through guidance or letters. *See Edison Electric Institute. v. USEPA*, Settlement Agreement, July 24, 1998. EPA agreed to revise the WET test method manuals to "incorporate … requirements for the demonstration of a valid concentration-response relationship as a prerequisite for the determination of a valid test result." 1998 Settlement Agreement, Specific Provision 6(B), p. 7. In effect, a valid concentration-response, or dose-response, relationship would assist in reducing the rate of false positive test results.

As discussed in Section V, the TST Method does not allow permitting authorities to verify a valid dose-response relationship. And because EPA agreed to incorporate a valid dose-response relationship as a "prerequisite for the determination of a valid test result," the TST Method violates the goal EPA agreed to in Specific Provision 6(B) of the 1998 Settlement Agreement.

In addition to the agreement regarding the dose-response relationship requirement, EPA agreed to issue guidance to permitting authorities discussing procedures for taking into account analytical variability. *Id.*, Specific Provision 1, p. 4. Consistent with this agreement, EPA established bounds for acceptable variability using data from its interlaboratory variability study that were incorporated into the WET test method manuals.

For example, EPA states that, "when NPDES permits require sublethal hypothesis testing endpoints" from certain Methods, "within-test variability must be reviewed and variability criteria

must be applied" as described in the method manual. EPA, *Chronic Toxicity for Freshwater Organisms*, EPA-821-R-02-013, § 10.2.8.2, p. 51. To measure test variability for certain sublethal hypothesis testing endpoints, EPA requires the permitting authority to calculate the percent minimum significant difference (PMSD) achieved in the test. *Id.*, § 10.2.8.1. EPA then establishes upper and lower PMSD bounds for several test methods ranging from 9 to 47 percent. *Id.*, Table 6, p. 52. These established bounds for acceptable variability are relatively large.

The TST Method does not perform as well as the statistical methods recommended by EPA in the WET test method manuals when there is considerable variability. In fact, "[t]ests declared toxic using the TST had a significantly larger effect and higher within-test coefficient of variation in both the control and the IWC than those tests declared toxic using the NOEC …. Thus, TST is more likely to declare tests as toxic if the effect size is large and/or within-test variability is large…." Jerry M. Diamond, *et al*., *Evaluation of the Test of Significant Toxicity for Determining the Toxicity of Effluents and Ambient Water Samples*, *Environmental Toxicology and Chemistry*, Vol. 32, No. 5, 1101, 1102 (2013).

EPA agreed to establish procedures to characterize variability in the 1998 Settlement Agreement. The TST method is not likely to perform well within the bounds set by EPA in those mandatory procedures. Adoption of the TST method would be contrary to EPA's objectives in the 1998 Settlement Agreement.

VIII. The TST Method will likely increase costs associated with WET testing and data analysis, not reduce them.

The State Water Board states that "the TST reduces the need for multiple test concentrations which, in turn reduces laboratory costs for dischargers …." California State Water Resources Control Board, *Policy for Toxicity Assessment and Control Draft Staff Report and Environmental Checklist*, p. 40 (June 2012).

To the contrary, the EPA-promulgated WET test methods require a minimum of five effluent concentrations and a control sample. The minimum number of test concentrations cannot be reduced unless EPA changes the WET test methods in a newly promulgated rule.

In addition, depending on the species being analyzed, NPDES permittees will need to significantly increase the number of test organisms to bring the TST method's false failure rate down to design levels. The increase in the number of test organisms will increase costs.

Moreover, the TST method will most likely force NPDES permittees to incur additional costs associated with the procurement of additional software, training of laboratory staff, and implementation of the changes (*i.e.* SOP revisions and reporting).

Thus, for the reasons discussed above, any alleged cost savings will likely be lost.

IX. Conclusion

The TST Method is not as scientifically sound as the statistical methods incorporated into official rulemakings by EPA after years of study and stakeholder negotiations. The TST method's flaws will likely increase false positive rates and increase unwarranted liability for NPDES permittees. Thus, for the reasons discussed above, UWAG urges the State Water Board to abandon the TST method as the sole method for analyzing WET in its proposed ISWEBE Plan.

Exponent®

Toxicity Assessments for NPDES Compliance: Traditional TSD Methods versus the TST Approach

William L. Goodfellow, Jr.
Susan C. Paulsen
Katie C. Marjanovic

SETAC North America 38th Annual Meeting
November 14, 2017

NPDES Permitting

Using the Technical Support Document (TSD) Strategy

- Employs physical, chemical and ecotoxicological methods
  - Determine the likelihood of an effluent discharge as having an adverse impact to receiving water

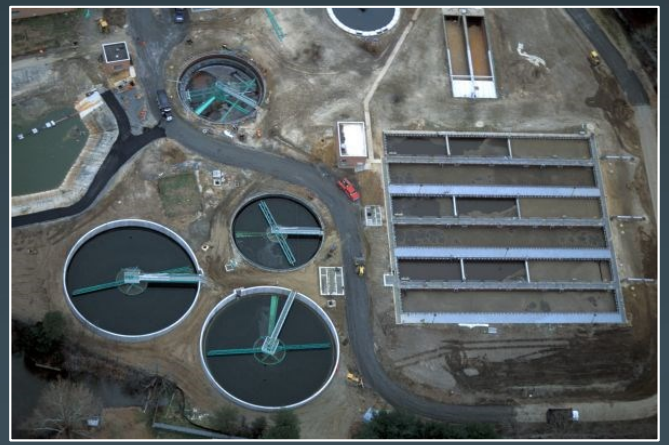
Traditionally in the TSD

- Physical controls
  - Flows, pH, solids, etc.
- Chemical specific controls
  - Water quality standards

- Acute and Chronic toxicity testing used to assess Whole Effluent Toxicity (WET)
  - Fish
    - Fathead minnows, inland silversides, etc.
  - Invertebrates
    - Water fleas, opossum shrimp, etc.
  - Plants
    - Green algae

WET Testing Methods

- Acute Toxicity Testing
  - Using 100% effluent treatment for effluent dominated systems, plus a laboratory/receiving water control
    - Typically a pass/fail process (hypothesis testing statistics)
  - Using multiple concentration series exposures
    - Often 5 or more concentrations, plus a laboratory/receiving water control
    - Typically expressed as a 48-hour LC50/EC50 for water fleas or 96-hour LC50/EC50 for all other species
- Chronic Toxicity Testing
  - Using multiple concentrations series exposures, plus a laboratory/receiving water control
    - Hypothesis testing (NOEC) or regression analysis (IC25)

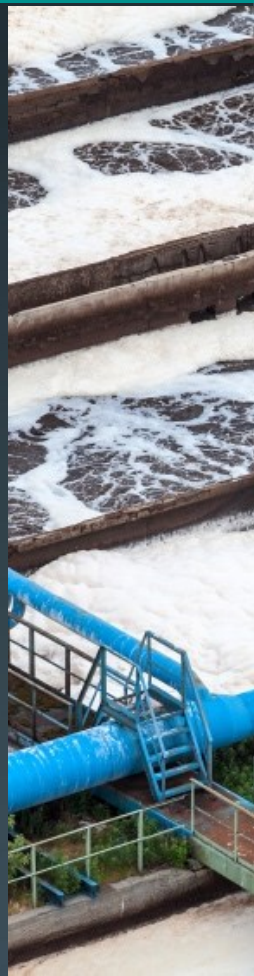


Test for Significant Toxicity (TST)

- Technical guidance manuals released by EPA in 2010
  - Employs a two treatment test
    - Effluent concentration at the instream waste concentration
    - Laboratory/receiving water control
  - TST does not change the laboratory testing procedures
  - Evaluates the “mean effect”
    - Difference between the mean response of the controls and the mean response of the effluent sample divided by the mean response of the controls

Test for Significant Toxicity (TST)

- TST assumes that effluent samples are toxic unless they are proven non-toxic
- Also two regulatory decisions made
  - < 10% mean effect is a negligible effect, and fail the TST no more than 5% of the time
  - < 20% mean effect as an acceptable level for acute testing
    - Or > 20% mean effect is acutely toxic
  - < 25% mean effect as an acceptable level for chronic testing
    - Or > 25 % mean effect is chronically toxic
- Also the false positive rate was limited to 5% (< 10% negligible effect)



Concerns with the TST Approach

- TST approach only evaluates the control and the IWC
- Does not take into consideration the dose response relationship
  - Fundamental concept in ecotoxicology
  - Does not provide the investigator the ability to address anomalous test results that would be discernable with dose response information
- EPA asserted with the development of the TST, there could be a significant cost savings
  - However, dischargers may have to increase the number of organisms tested to ensure the false failure rate of the TST is met and any cost savings is lost
  - Dose response information is critical for Toxicity Identification Evaluation performance

TST vs TSD Traditional Methods

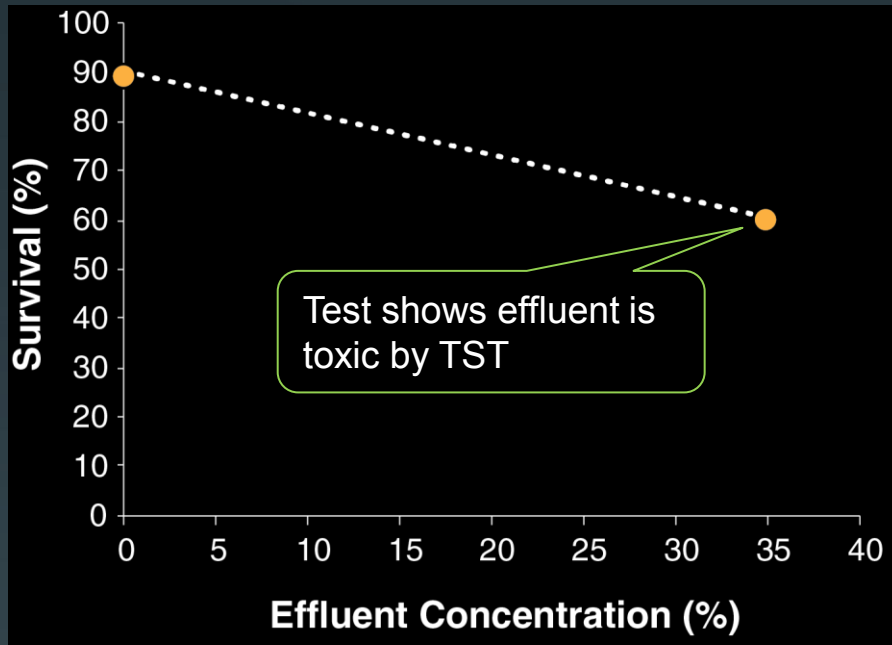
Advantages

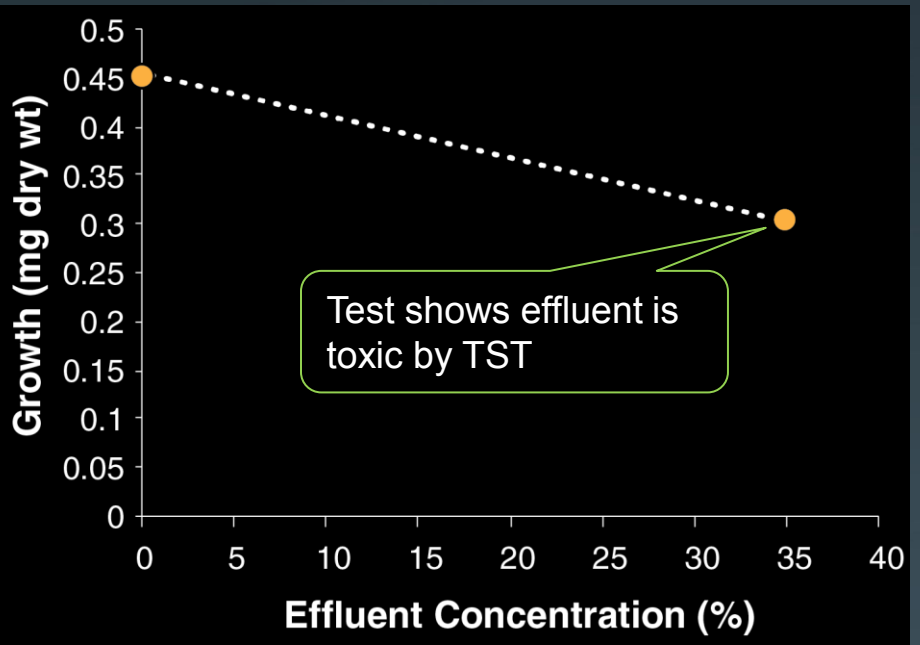
- Requires the assessment of the IWC
- Testing of two treatments requires less resources
  - Effluent
  - Organisms
  - Less technician time to evaluate test
- Rigorous assessment
  - Especially in comparison to previous screening tools

Disadvantages

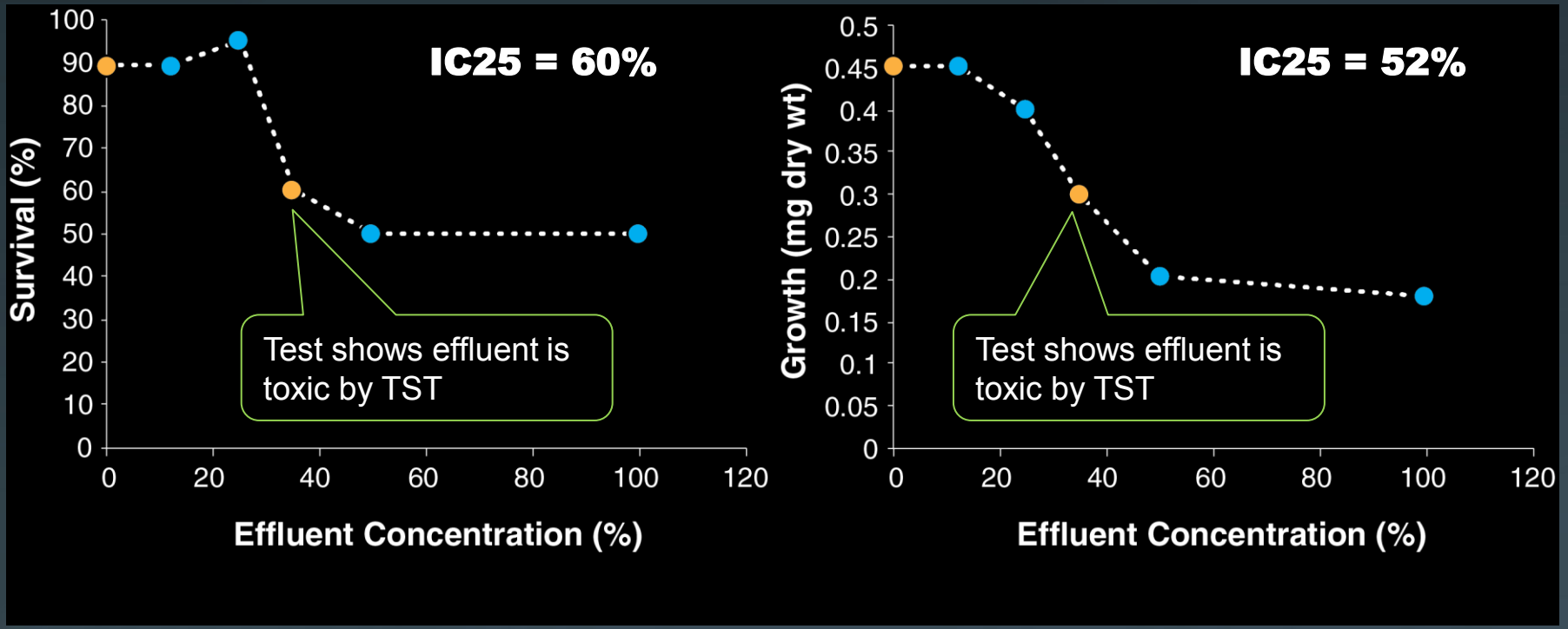
- Does not use dose response information
- Effluent is considered toxic until proven non-toxic
- May not be as resource conservative if additional organisms or replicates used
- If effluent is toxic, does not provide additional information for how toxic or thresholds

Chronic Toxicity Test with Two Treatments

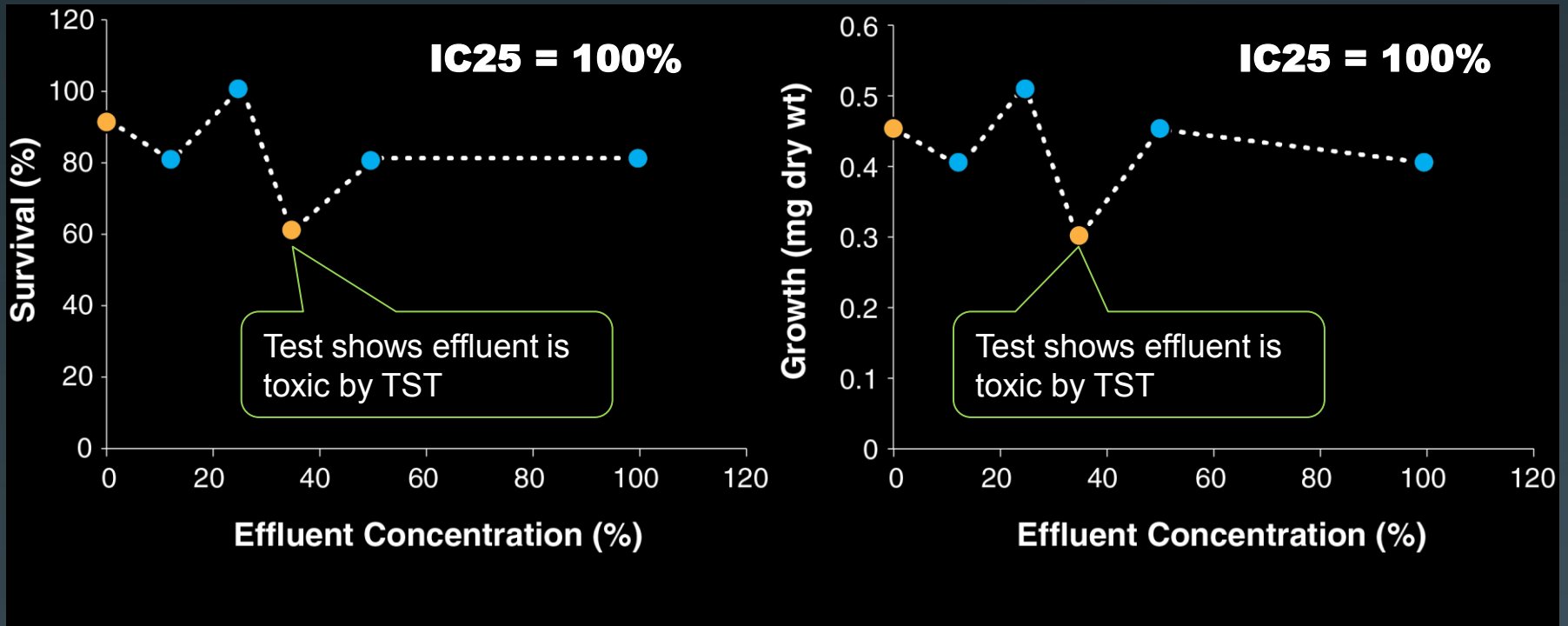




Chronic Toxicity Test with Multiple Treatments



Chronic Toxicity Test with Multiple Treatments



Conclusions

- Either, the traditional TSD method or TST method can be used as part of NPDES testing following EPA guidance manual
  - Often left up to the individual states or EPA regions
- However, given that the effluent is considered toxic until proven non-toxic, it is recommended that additional test organisms and/or replicates be employed
- It is also recommended that additional serial dilution concentrations be evaluated to provide dose response information
- With these additional recommendations, the cost savings may not be realized

Conclusions

- WWTPs are designed to be effective at treating the wastewater
  - Should we have a test for compliance that already has as the hypothesis that the effluent is toxic until we assess the alterative hypothesis that it is not toxic?
- Given the issues with regards to compliance
  - Is there anything to be gained with regards to WET testing by the permittee in using the TST method?
  - Maybe some cost savings, if you are not toxic
  - From my perspective, it is chancing a lot at risk for little gain by the permittee

Thank you