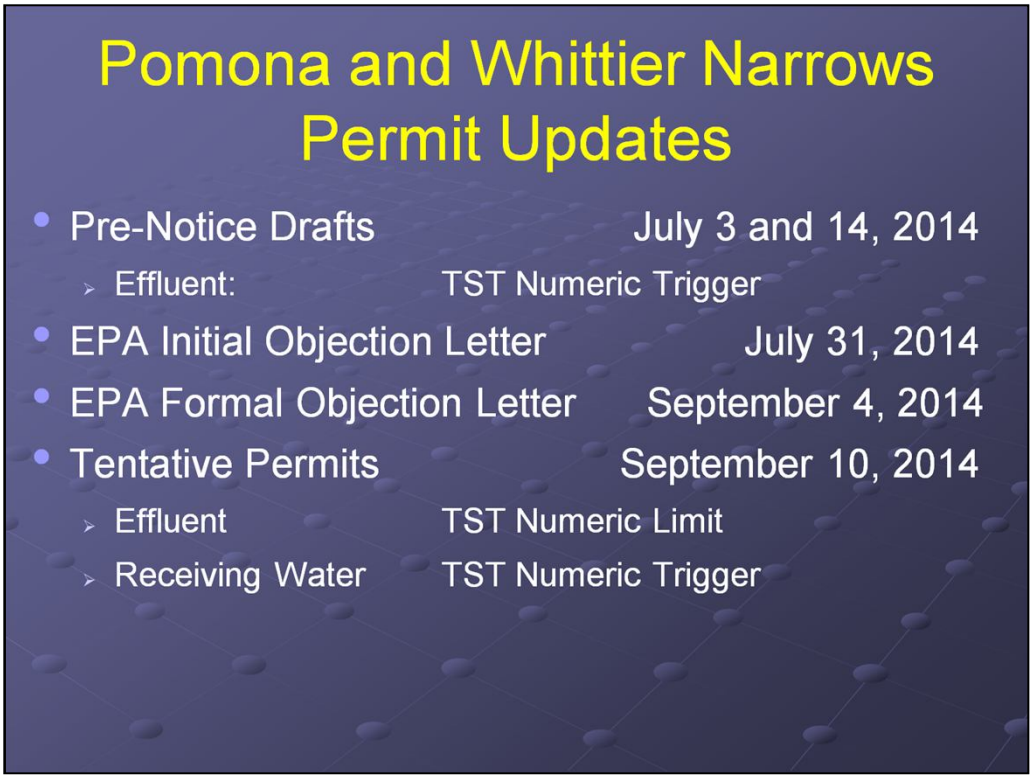
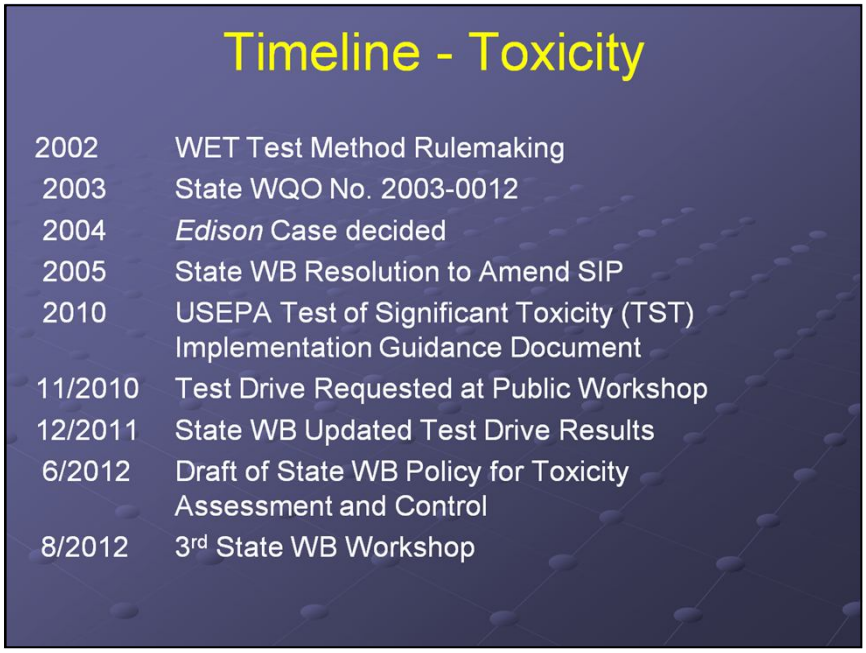
Written Testimony of Cris Morris,

Los Angeles Regional Water Quality Control Board



This slide illustrates the steps that took place leading up to adoption of the Pomona and Whittier Narrows NPDES permits in November. The Regional Water Board initially circulated pre-notice drafts of these permits to USEPA that included a narrative limit and "trigger" in July. USEPA issued a formal objection in September, requiring the permits to include numeric limits for chronic toxicity expressed as both a daily and a monthly limit. Subsequently, the Regional Water Board revised the permit to address USEPA's objections in order to retain jurisdiction over the permits, and proceeded with the permit process.

The Board adopted the permits on November 6, 2014. A petition for review was filed by the Los Angeles County Sanitation District, the California Association of Sanitation Agencies (CASA), the Southern California Alliance of POTWs (SCAP), and the Bay Area Clean Water Agencies.



This slide identifies the toxicity timeline as it relates to this permit.

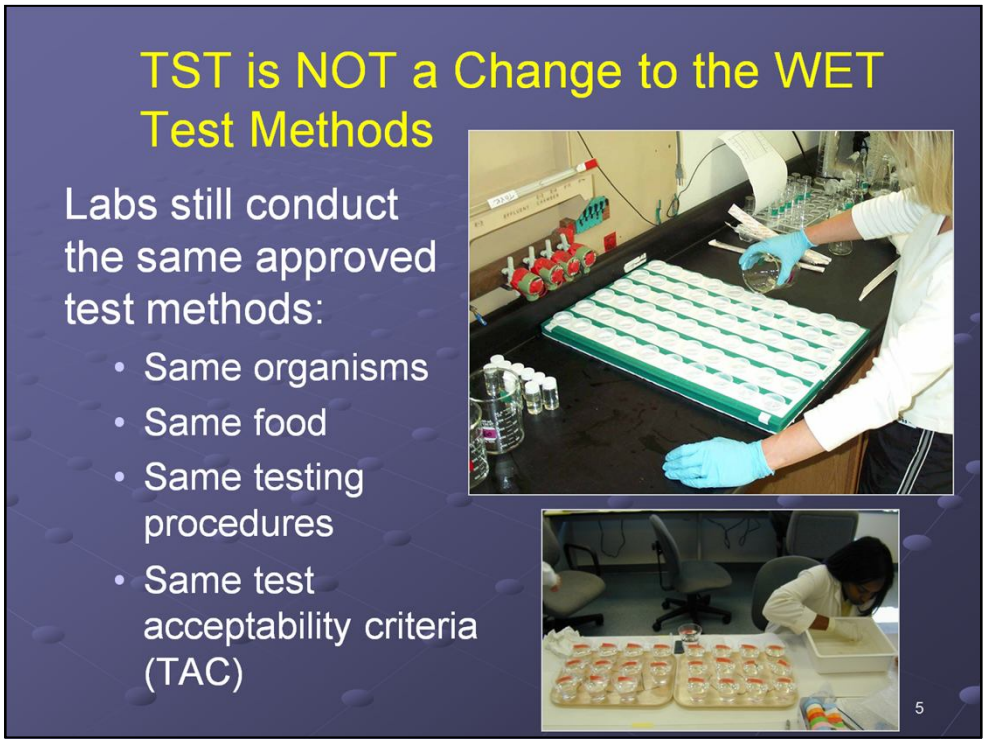
- In 2004, the *Edison* Case upheld the approval of the Whole Effluent Toxicity (WET) test methods by USEPA and found that the error rate was at or less than 5%.
- In 2005, the State Water Board adopted Resolution No. 2005-0019 again directing State Water Board staff to introduce an amendment to the State Implementation Plan (SIP) to revise toxicity control provisions by January 2006.
- In 2010, EPA issued a new guidance document for toxicity, called the Toxicity Training Tool.
- Later that year, in June 2010, EPA issued the TST Implementation Guidance Document
- In November 2010, the State Water Board held the first public workshop on the draft Toxicity Policy. In response to stakeholder concerns, State Board agreed to conduct a "test drive" with discharger effluent toxicity test data, comparing the results that would be obtained with the new TST approach to those obtained with the current No Observable Effect Concentration (NOEC) approach.
- In August 2011, the State Water Board released the second version of the draft Toxicity Policy for public comment. In December 2011, the State Water Board issued a report containing the results of the test drive. The new TST approach identified toxic and non-toxic effluents better than the current NOEC approach.
- In June 2012, the State Water Board released the third version of the draft Toxicity Policy for public comment. In August 2012, the State Water Board held its third public workshop regarding chronic toxicity. However the State Water Board has not released a response to comments document nor have they released a revised draft Toxicity Plan following that workshop.

Toxicity – Old vs. New Permit

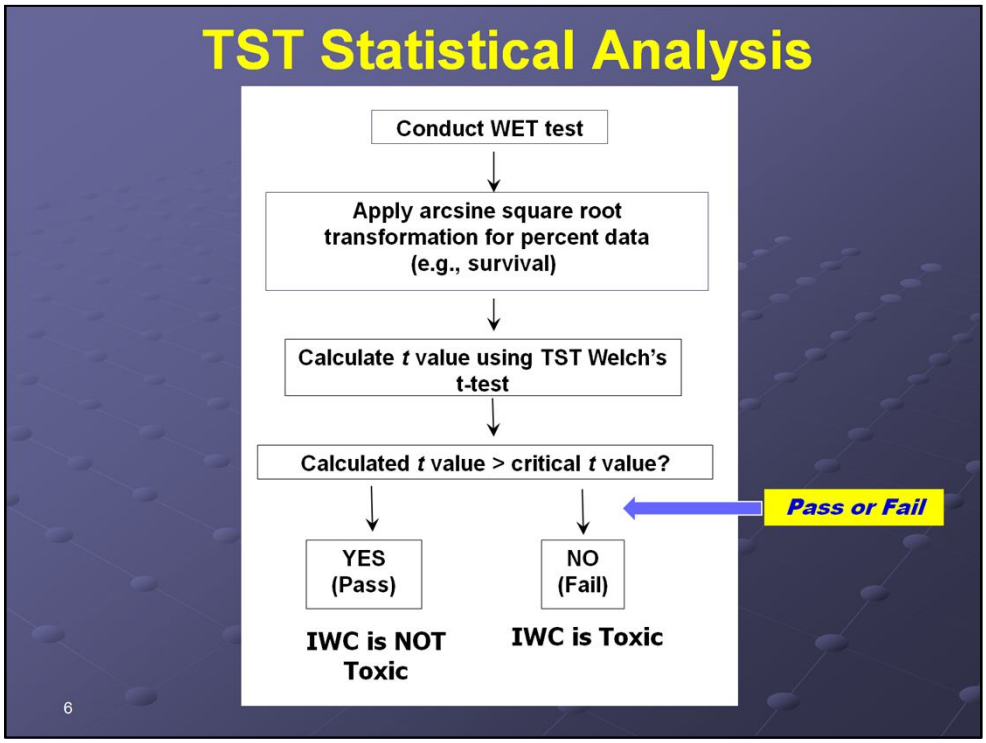
	Old Approach - 2009	New Approach - 2015
Test Objective	Estimate highest "safe" or "no-effect" (NOEC) concentration	Is the 100 % sample toxic or not?
Results reported (Units)	TUc = 100/NOEC	Pass or Fail, % Effect
Test Procedure/ Method	40 CFR 136 Same biological test method Multi-Concentration	40 CFR 136 Same biological test method Multi-Concentration
Statistical Analysis	More complex Hypothesis test approach	Less complex Hypothesis test approach
Regulatory Decision	Can be Difficult to Interpret, Less Effective	Simpler, Clearer & More Effective

This slide is an introductory slide to toxicity issues and compares the approach in the prior permits with the approach presented in this permit. First, the objective of the test is different. The old approach calculated the No Observable Effect Concentration, or NOEC, whereas the new approach just asks the question, is the 100% effluent sample toxic. The 100% effluent sample is referred to as the In-stream waste concentration, or IWC. Since our discharges our primarily into effluent-dominated water bodies, the IWC is the 100% effluent. That is not the case for other regions. The toxicity results for the NOEC approach are expressed as a chronic toxicity unit. The new toxicity approach reports the result to be either a pass or a fail. A pass is not toxic and a fail is. The percent effect is also calculated from the data. This percent effect is the value that denotes the difference in response between the 100% effluent concentration and the control.

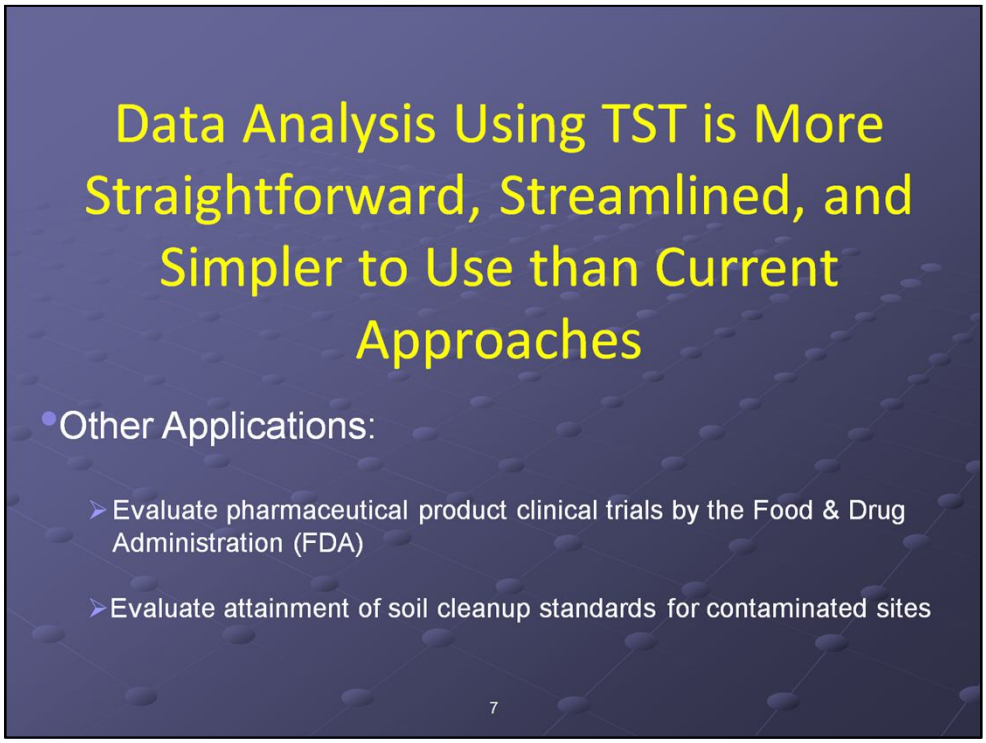
As you can see from this table, the same biological test method is used for the old and the new. The statistical analysis under the new approach is less complex and is simpler, clearer and more effective with respect to regulatory decisions.



As mentioned in the previous slide, the Test of Significant Toxicity is not a change to the WET test methods. The tests include the same organisms, the same food, the same testing procedures and the same test acceptability criteria, or TAC.



One of the advantages of this TST statistical approach is that it is simple. Unlike the NOEC/LOEC statistics, there are no decisions to make during the analysis. As a result, it is not necessary to go back and verify the assumptions like it is needed for the NOEC approach.



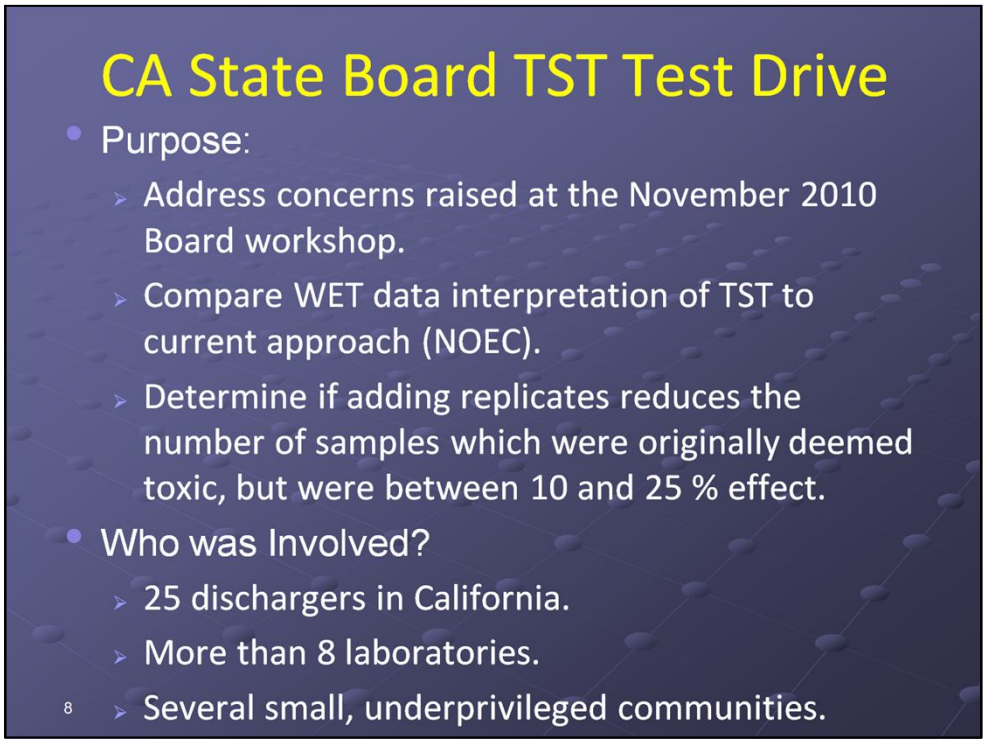
So, to summarize, the data analysis using TST is more straightforward, streamlined, and simpler to use than the NOEC approach for regulatory decision making.

This means that it is both simpler for the permittee to run the test and for our staff to analyze the results.

The statistical approach used with the TST (non-inferiority approach in hypothesis testing, also known as "bioequivalence" testing) has other applications besides WET toxicity testing.

The Food & Drug Administration (FDA) uses it to evaluate clinical trials of pharmaceutical products, and

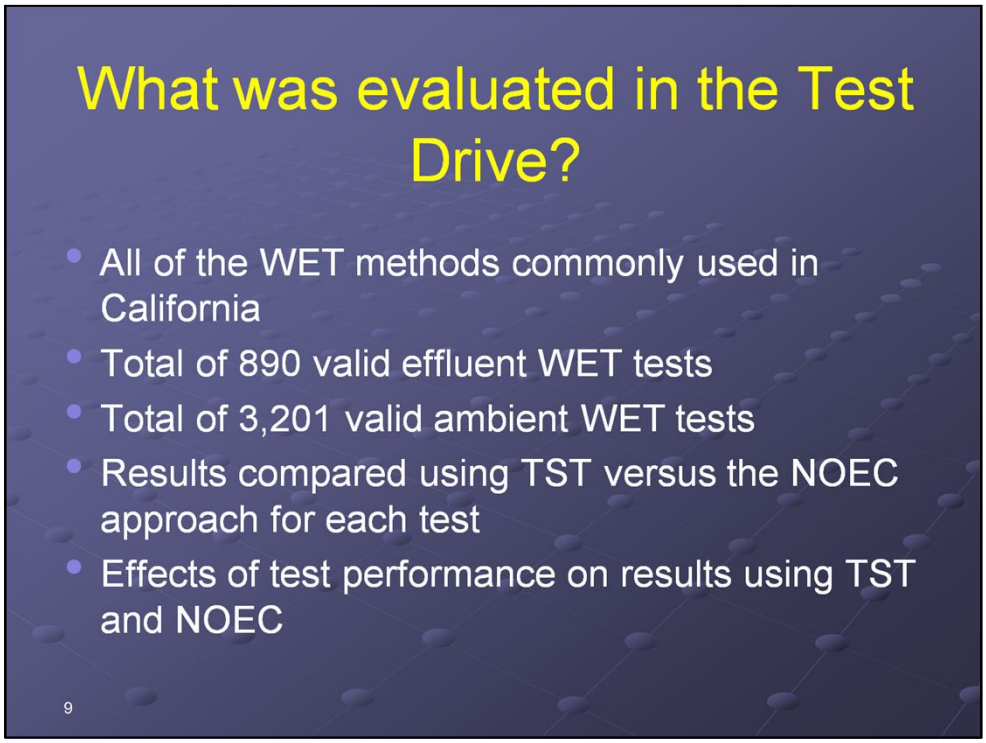
It is also used to evaluate the attainment of soil cleanup standards for contaminated sites.



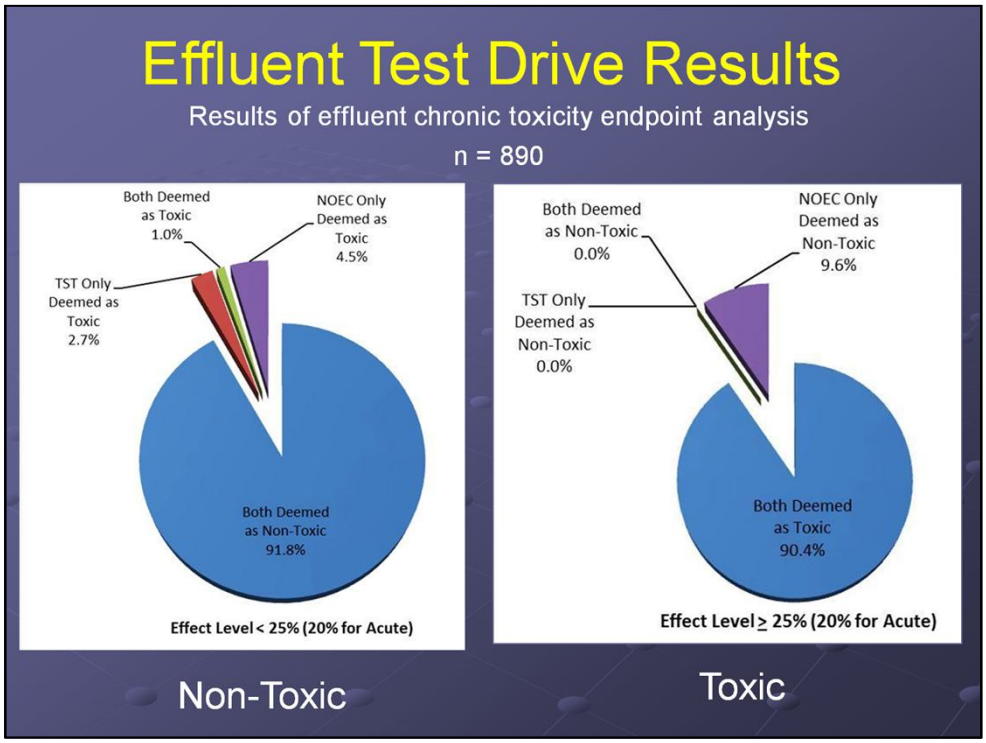
This slide addresses the CA State Board TST test drive that was a follow-up to the original test drive by USEPA.

State Board conducted a "test drive" to compare the performance of the NOEC approach to that of the new TST approach. The main objective was to compare the rates of toxic and non-toxic effluents identified by the two approaches. A secondary objective was to determine whether adding replicates to the test method would improve the TST approach by eliminating or reducing the low number of cases where samples were initially deemed to be toxic, but were between 10 and 25% effect.

Toxicity test data from over 25 dischargers were compiled and analyzed in the test drive, representing wastewater effluents from a variety of facilities throughout the state, including small facilities from underprivileged communities.



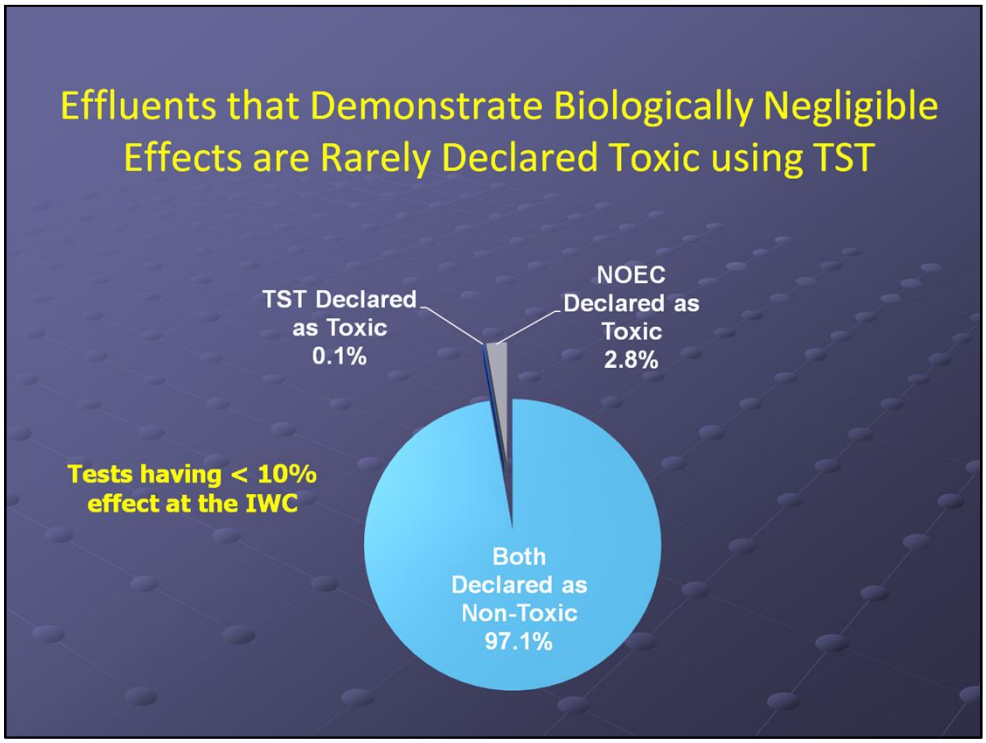
A total of 890 valid effluent toxicity tests were analyzed in this test drive. The test drive included both acute and chronic toxicity tests, both freshwater and marine toxicity tests, and covered the entire range of test organisms used for all of these tests. Each test was analyzed using both the new TST approach and the current NOEC approach and a determination was made as to whether the effluent sample would be deemed toxic or not using each approach. In addition, 3,201 chronic toxicity test results from ambient water samples were compiled from the Surface Water Ambient Monitoring Program (or SWAMP) and the California Environmental Data Exchange Network databases and analyzed in a similar manner.



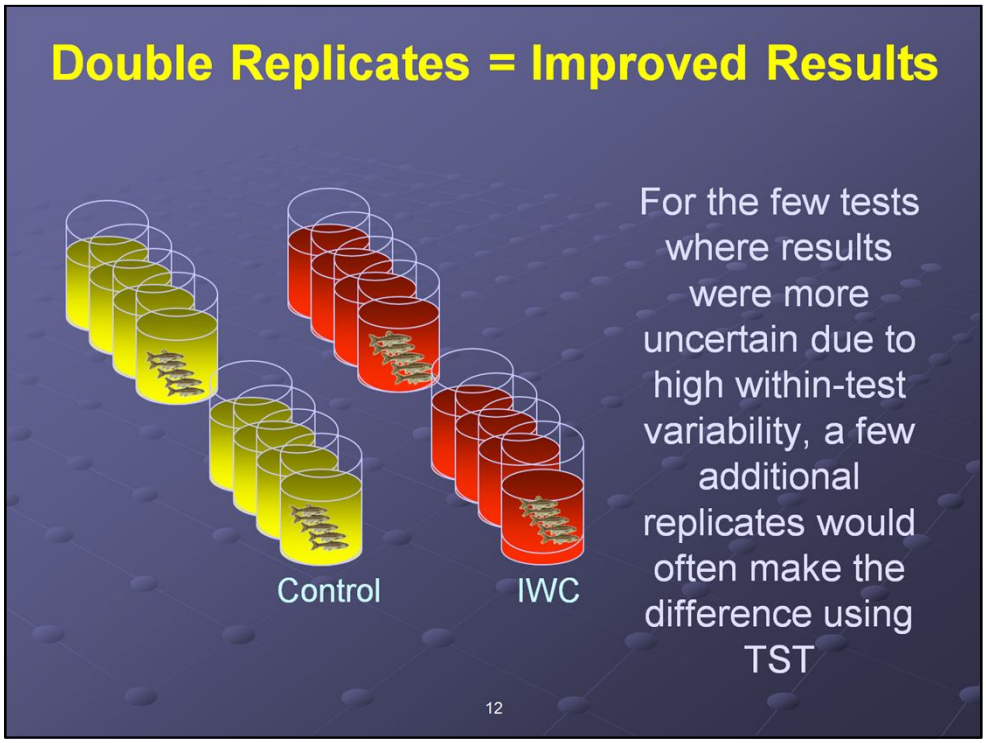
Here is a break-down of the study results. The State Water Board's Test Drive study looked at both scenarios, toxic and non-toxic. Based on 890 samples, the pie chart on the left depicts that the two approaches agreed on the "non-toxic" result 91.8% when the percent effect is less than the chronic threshold of 25% effect. For cases with a toxicity effect less than 25%, the TST identified 3.7% cases toxic and the NOEC identified 5.5% non-toxic cases as toxic. **This shows that the TST statistical approach deemed non-toxic tests as toxic less often than the NOEC approach.**

When the percent effect is ≥ 25%, both analytical methods deemed tests as toxic 90.4% of the time. However the TST analytical method deemed 0% of these tests as non-toxic whereas the NOEC analytical method deemed tests as non-toxic 9.6% of the time. **This shows that the TST statistical approach reduced the number of toxic samples characterized as non-toxic whereas the NOEC approach still deemed a toxic test as non-toxic almost 10% of the time. This percentage relates back to the toxic exceedances we have not been identifying for more than 10 years.**

In summary, most of the time the two tests agree. When they do differ, however, they both come up with the same result. When they don't, however, the TST is more accurate.



As shown by this slide, the results of the State Board Test Drive indicated that effluents that demonstrate biologically negligible effects are rarely declared toxic using TST. The threshold limit for "biologically negligible" is less than 10% effect. It is interesting to note that both methods agree for 97.1% of the samples when there is less than 10% effect. The TST declared 0.1% of these tests as toxic, and the NOEC approach declared 2.8 % of the samples as toxic.



With the new TST approach, if you double the minimum number of replicates you can improve the results, and further minimize the chances of calling a non-toxic sample toxic.

For fathead minnow and ceriodaphnia, the minimum number of replicates is 10. Some labs have already started running toxicity tests using more replicates, typically around 20, but also as high as 30 replicates.

Summary of State Board Test Drive

- TST and NOEC test results were very similar.
- Supports *Edison Electric* conclusion that EPA's reported method rate of identifying truly non-toxic samples toxic is correct and is not excessive.
- Samples having biologically negligible effects were declared non-toxic more often using TST than the current approach.
- Samples exhibiting significant toxicity effects at the IWC were declared toxic more often using TST than the current approach.
- For samples exhibiting toxic effects in the "gray area" (10-20% effect), addition of a few extra replicates to these tests would likely result in the sample being declared non-toxic.

So what did we learn from the test drive that the State Water Board performed?

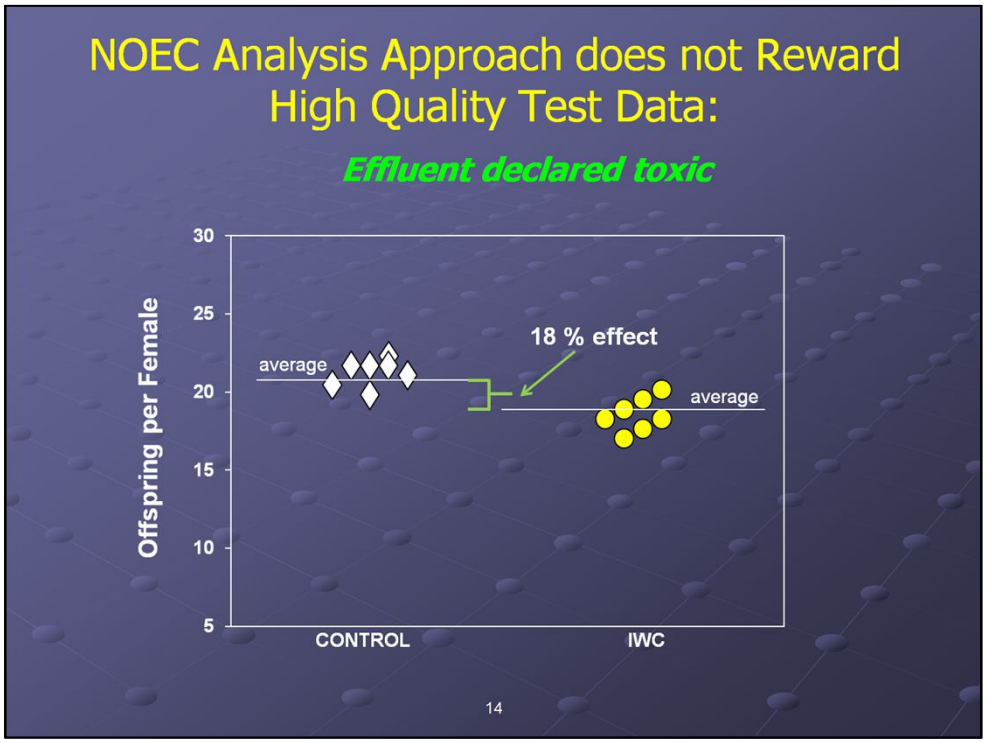
1. That the TST and NOEC test results were very similar,

2. That it supports the U.S. Court of Appeals *Edison Electric* conclusion that EPA's reported method rate of identifying truly non-toxic samples toxic is correct and is not excessive.

4. That the test drive showed that samples having biologically negligible effects were declared non-toxic more often using TST than the current approach.

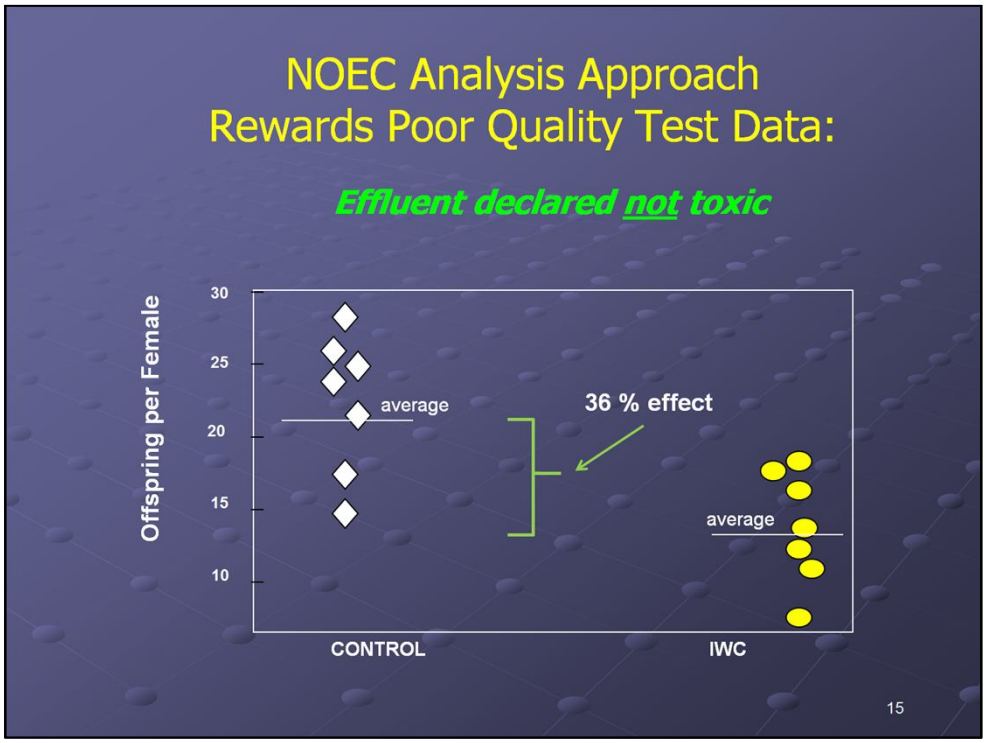
5. That samples exhibiting significant toxicity effects at the IWC were correctly declared toxic more often using TST than the current approach.

6. That by just adding a few extra replicates in the test you can improve the confidence in the results, such that for samples exhibiting toxic effects in the "gray area" or 10 to 20 % effect, the addition of a few extra replicates would likely result in the sample being declared non-toxic.



This is an example of a WET test that is declared toxic using the current approach because the particular test has good statistical power to detect a small difference that may not be biologically important. This slide shows that the difference between the control and IWC is 18%. So, this is an example of high quality test data, with only an 18% effect, being classified as toxic.

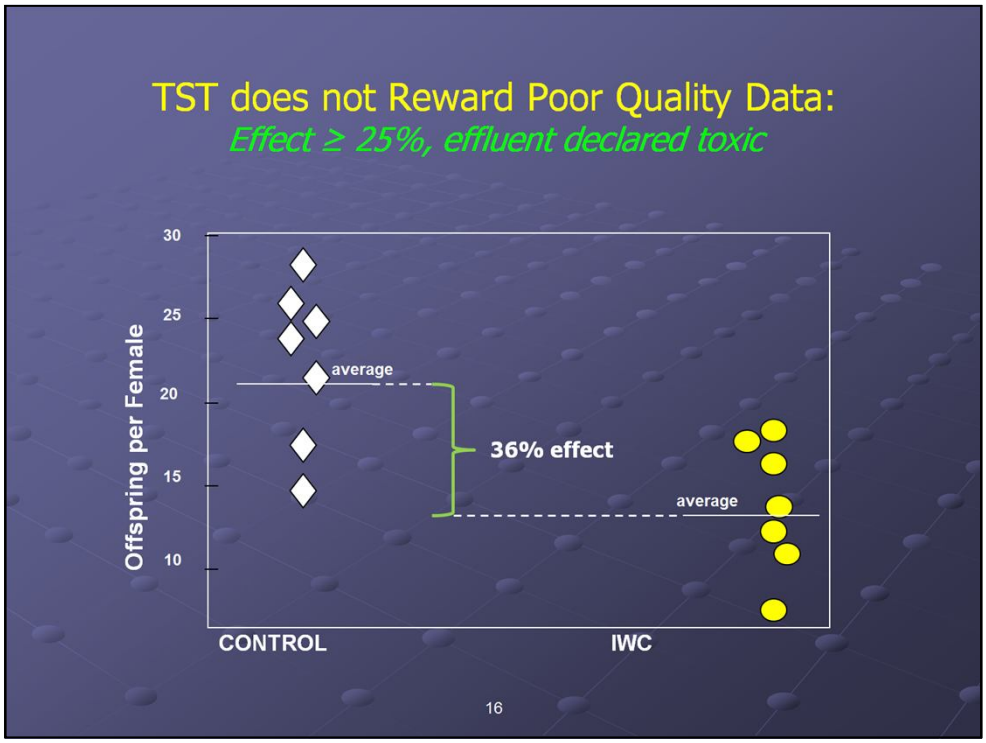
Using the current NOEC approach, this scenario is a concern of the permittee with labs that have really good performance because it is classifying the sample as toxic even though the percent effect is less than 25..



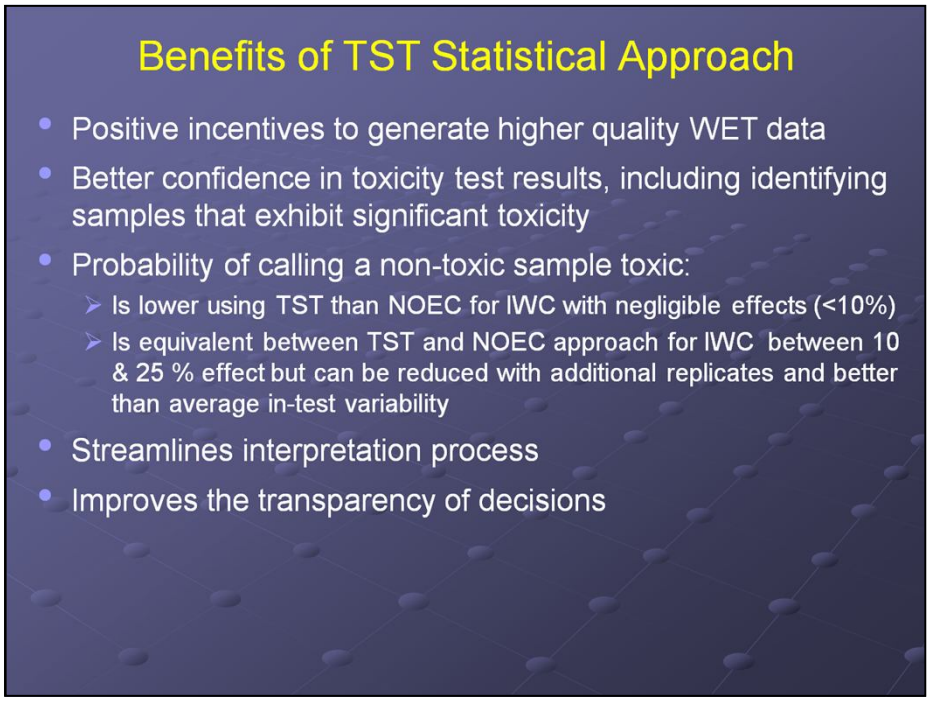
Here is an example of a WET test that is declared not toxic by the NOEC approach and lacks the ability to detect a truly toxic effect because of large within-test variability (or NOISE) (ie. the spread of data).

This is a concern of the permitting authority; missing a truly toxic event. This is caused by poor lab performance.

The percent efffect difference here is 36%, we desire to declare this difference to be TOXIC, but the current NOEC approach declares it to be non-toxic.



This example illustrates a test that has poorer quality data (more within-test variability), and it clearly has an effect of > 25% (the level that we desire to declare toxic). The difference is 36%. Under the NOEC approach this would have not been called toxic, when it clearly is toxic. The TST result for this test is toxic.

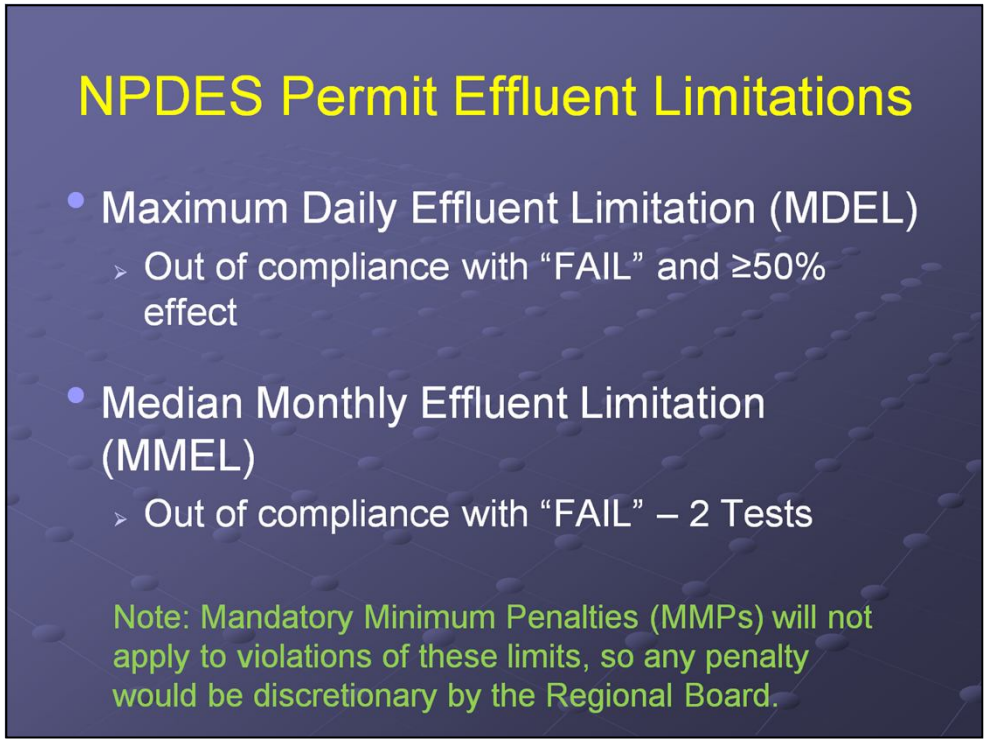


There are many benefits to using the TST statistical approach.

First, the TST statistical approach provides a positive incentive for the permittee to generate valid, high quality WET data by either increasing the number of test replicates for the instream waste concentration and the control within a test and/or achieving better precision within a test through improved WET test method performance (e.g., a high level of quality assurance and quality control).

There is also better confidence in the toxicity test results, especially in identifying toxic samples that exhibit significant toxicity. Another benefit of the TST statistical approach is that the probability of identifying a sample with negligible effects of less than 10% is less than for the NOEC test and that the probability of identifying a non-toxic sample toxic is reduced by running additional replicates and reducing the in-test variability.

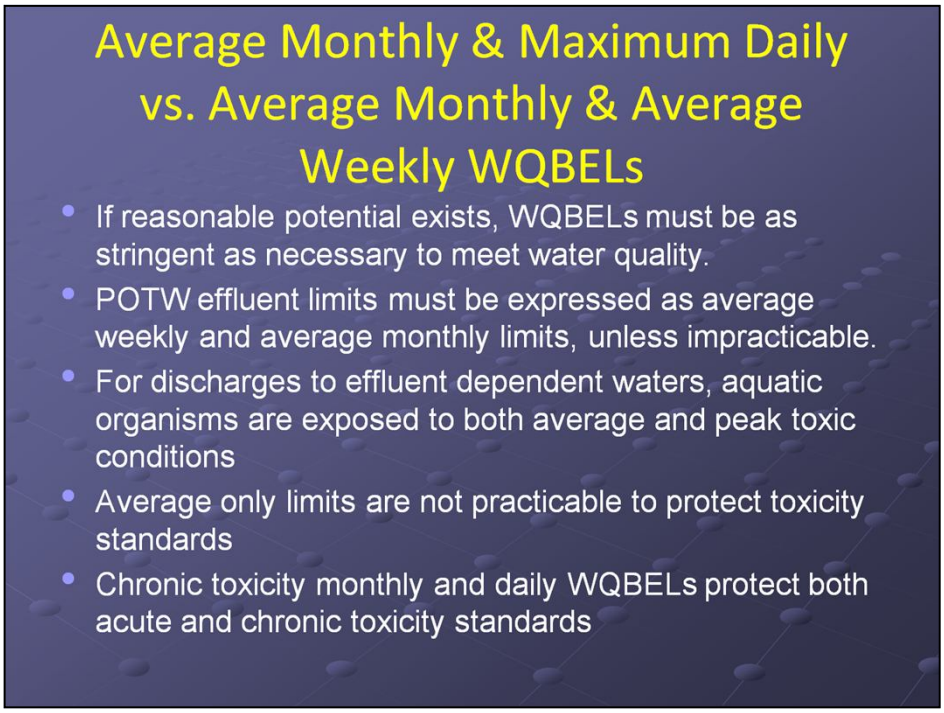
The TST statistical approach also has the benefit of not requiring any decisions to be made during the statistical analysis that may invalidate the results. As a result, the TST approach streamlines the interpretation process and improves the transparency of decisions. This transparency is demonstrated by data interpretation, compliance determination and laboratory performance review.



The permits contain two limits for toxicity, the Maximum Daily Effluent Limitation (MDEL) and the Median Monthly Effluent Limitation (MMEL). In the case of the daily max, the effluent is out of compliance if the TST result is "fail" and the percent effect is greater than 50%. The percent effect of 50 is double the otherwise applied regulatory threshold of 25% effect to reduce the possibility of a violation from an erroneous toxic classification from a single event.

The monthly median, on the other hand, is out of compliance when the result is a "FAIL." This limitation is based on up to three separate tests, run throughout a given month, and results in a lack of compliance when two tests result in a "FAIL."

Note that Mandatory Minimum Penalties (MMPs) will not apply to violations of these limits, so any penalty would be discretionary by the Regional Board.



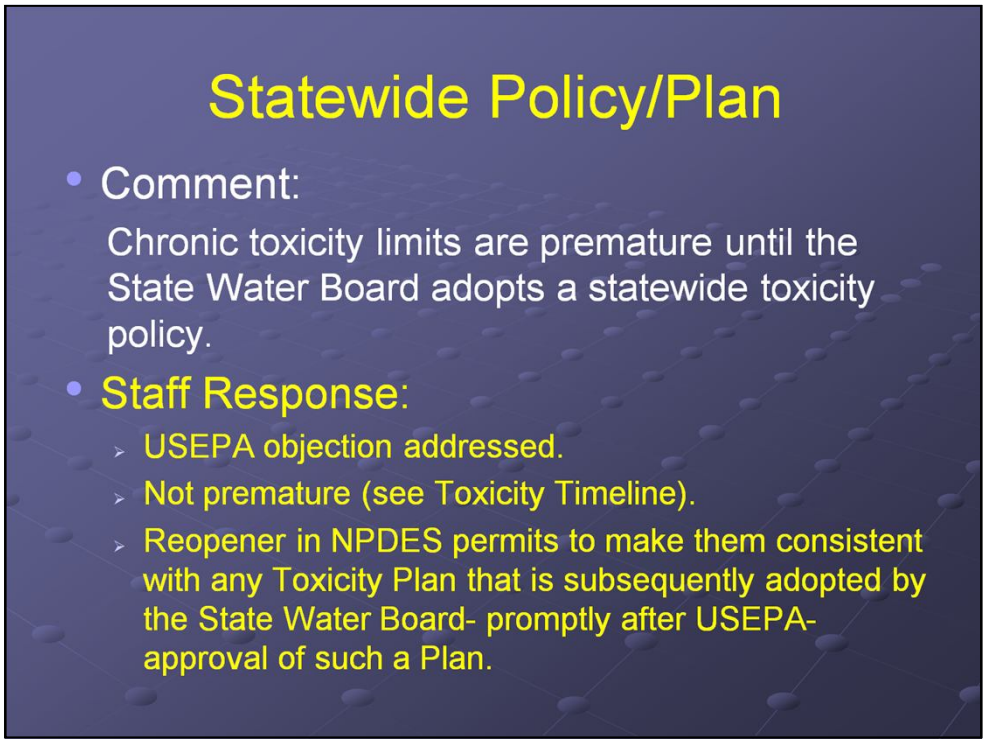
For pollutants with reasonable potential to exceed water quality standards, Water Quality Based Effluent Limits, or WQBELs, must be as stringent as necessary to meet those required standards. (Refer to CWA and 40 CFR 122.44(d)(1).)

POTW effluent limits must be expressed as average weekly and average monthly limits, unless impracticable. (40 CFR 122.45(d).)

Particularly with discharges to effluent dependent waters or without mixing zones, aquatic organisms in receiving waters are exposed to both average and peak toxicity levels from permitted discharges. As a result, using only average limits for toxicity is not practical to protect toxicity standards. Toxicity WQBELs for POTWs need to address this concern.

A typical chronic toxicity test can use up to three separate effluent samples to measure the toxicity of a discharge. Although some chronic toxicity tests can take up to 7-days to measure the biological endpoint (e.g., reduced growth, reproduction), the measured toxicity can be caused by any one or a combination of these effluent samples.

To address exposures to both average and peak toxicity levels and protect toxicity standards, both an average (median) monthly chronic toxicity WQBEL (based on up to three chronic toxicity tests per month) and a maximum daily chronic toxicity WQBEL (based on the maximum chronic toxicity test) are necessary to protect toxicity standards.

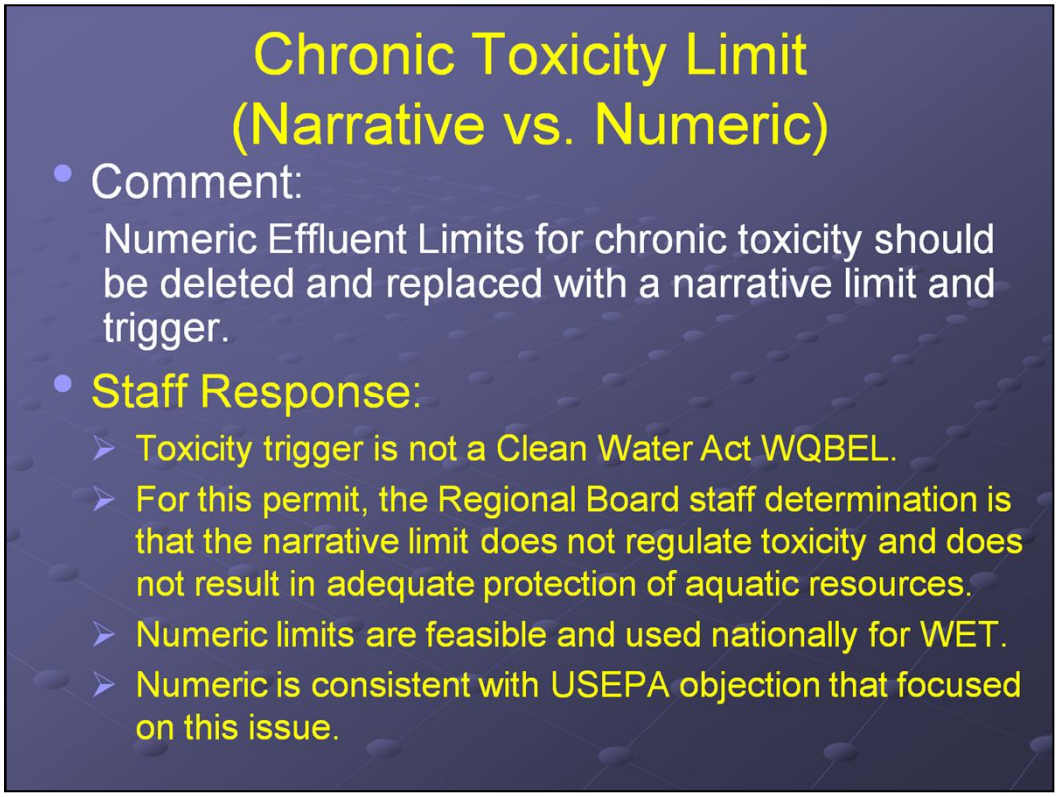


The staff response for this issue consists of three parts. First, the USEPA objection letter required the Regional Water Board to include numeric chronic toxicity effluent limitations.

Second, as shown in an earlier slide showing the Toxicity Timeline, the statewide toxicity policy is long overdue.

And finally, the permit contains a reopener such that the NPDES permits will be reopened to make them consistent with any Toxicity Plan that is subsequently adopted by the State Water Board- promptly after USEPA-approves the Plan.

As a result, there is no need to delay the permit renewal.



This permit includes a numeric chronic toxicity effluent limitation. The Regional Board staff has determined that the numeric limitation is necessary because the discharge had reasonable potential to cause or contribute to an exceedance of the water quality objective. The numeric limit is also protective of the aquatic life beneficial use and implements the narrative standard in the Basin Plan. The Clean Water Act and implementing federal regulations establish a presumption that numeric effluent limitations are required to make reasonable progress toward the goal of eliminating pollutants in the nations waters. Numeric effluent limits for chronic toxicity are feasible, as previously discussed, with the TST approach. It is appropriate for the effluent limitation to be numeric.

Numeric toxicity objectives are an efficient regulatory tool when expressed as effluent limits because the measurement of compliance is clearly defined. This facilitates and incentivizes follow-up by the Permittees and allows additional action by the Regional Board.

The Regional Water Board agrees that an important step to achieving compliance with a water quality-based Whole Effluent Toxicity (WET) requirement is a toxicity reduction evaluation to identify the constituents of concern. But a numeric effluent limit will prompt proactive efforts by dischargers to comply with the limitation and address toxicity in advance of violations that may impact aquatic life. This Order also requires the discharger to conduct the Toxicity Identification / Reduction Evaluation (TIE/TRE) process if the numeric effluent limit is exceeded.

This narrative prohibition for toxicity with a trigger is not a valid effluent limitation under the Clean Water Act.

The narrative limit has not resulted in adequate protection of the aquatic resources.

A numeric limitation, on the other hand, is feasible, used nationally and is consistent with USEPA direction provided in their objection letter and current guidance.

The State Water Board and Regional Water Boards (RB1, RB2, RB8, and RB9) have all used the TST approach in their NPDES permits. The Los Angeles Regional Water Board has also used this approach in several NPDES permits adopted for industrial facilities in this region.

The facilities in our region that also include the TST approach, are listed here.

The list of NPDES permits that have been adopted, or are in the process of being adopted, also include permits from the State Water Board, Regions 1, 8, and 9 as shown on this slide.

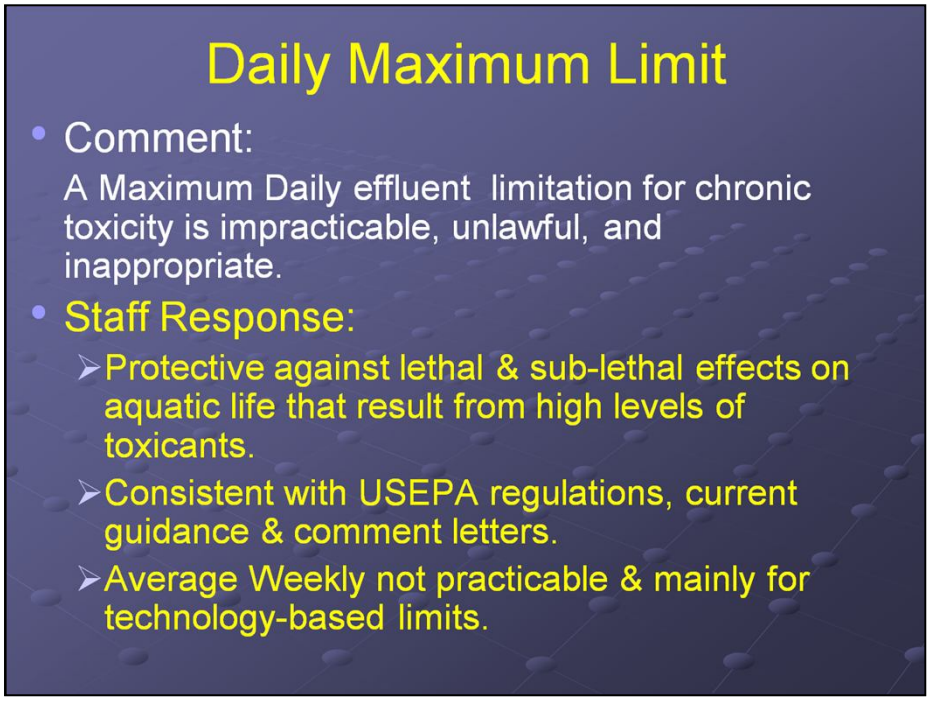
USEPA also adopted permits with chronic toxicity TST requirements, such as the Offshore Oil and Gas General Permit CAG280000.

Under USEPA Region 9's jurisdiction, Hawaii's U.S. Department of the Navy, Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility, Permit number HI0110230, also has chronic toxicity TST limits.

Summary of Toxicity Effluent Limits in Other 49 States

Number of States with chronic and acute toxicity WQBELs (based on 2012 WET limits data)		
Toxicity Effluent Limits	Number of States (not including California)	State
None.	1	Illinois
Acute toxicity. No chronic toxicity.	3	Nevada, Iowa, Delaware
Acute toxicity. Chronic toxicity (only lethal statistical endpoint).	2	Texas, Oklahoma
Acute toxicity. Chronic toxicity (both lethal and sub-lethal statistical endpoints).	43	--

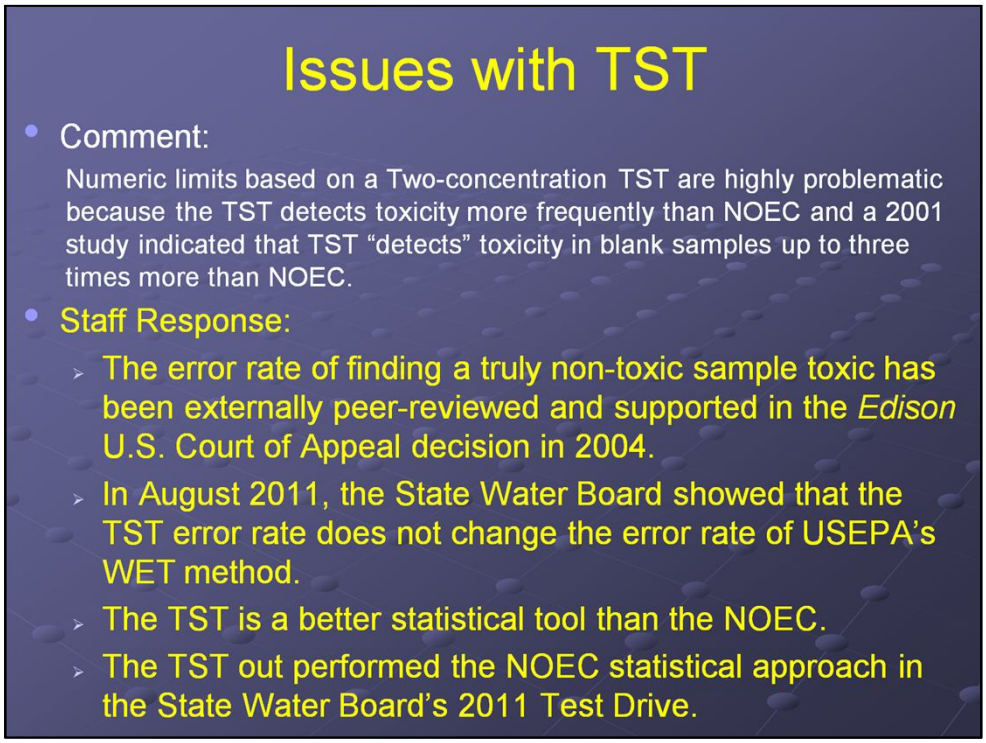
As shown in this slide, nationally, there are already 48 states besides California, using chronic and/or acute toxicity WQBELS.



The Maximum Daily limit is consistent with "*EPA Regions 8, 9 and 10 Toxicity Training Tool*," which provides interpretation on the permit limit expression for chronic toxicity.

The document acknowledges that NPDES regulations at 40 CFR 122.45(d) require that all permit limits be expressed, unless impracticable, as an average weekly limit and average monthly limit for POTWs. Following section 5.2.3 of the Technical Support Document, the use of an average weekly limit is not typically appropriate for WET. In lieu of an average weekly for POTWs, USEPA requires per their objection letter the establishment of a maximum daily limit for toxic pollutants, including WET. This is appropriate for multiple reasons. The basis for the average weekly requirement for POTWs derives from secondary treatment regulations and is not related to the requirement to assure achievement of water quality standards. In this case, use of an average weekly limit is impracticable to protect water quality standards. An average weekly requirement comprising up to seven daily samples could average out daily peak toxic concentrations for WET and therefore, the discharge's potential for causing acute and chronic effects would be missed.

The acute toxicity limitation in the prior order was not included in this Order because the chronic toxicity limitation is more stringent. The maximum daily effluent limit is intended to protect the aquatic life beneficial uses from survival and sublethal effects that may not be detected by an average weekly limitation. If the chronic toxicity maximum daily effluent limit is removed from the tentative, then a final effluent limitation for acute toxicity would need to be added to the Order to protect the water quality standard as well as corresponding effluent and receiving water monitoring for acute toxicity. Additionally, this approach would not protect against high magnitude sublethal effects in a chronic test; meaning it would not be protective of either acute or chronic effects.



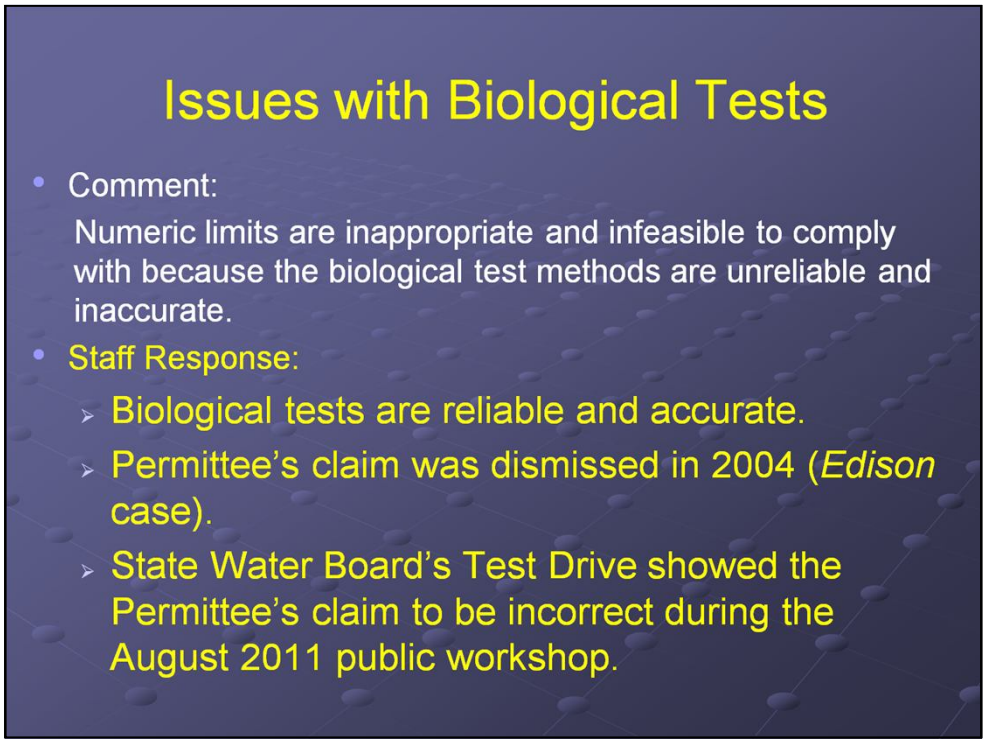
The Permittee and supporters believe that numeric limits based on TST are highly problematic because the TST statistical approach consistently "detects" toxicity more frequently than the NOEC methodology and that the TST "detects" toxicity in blank samples up to three times more than NOEC.

In August 2011, the State Water Board, in their response to comments, dismissed this claim as incorrect.

The TST is a better statistical tool than the NOEC in identifying toxics in what would have been mistakenly considered non-toxic samples. This was shown in the State Water Board's Test Drive in 2011.

The TST, with a greater statistical sensitivity, out-performed the NOEC statistical analysis. The TST allows permitting authorities to minimize the occurrence of declaring the sample nontoxic when it is actually exhibiting unacceptable toxicity, while also minimizing the occurrence of declaring the sample toxic when it is actually acceptable.

The NOEC system is more problematic than TST because it does not control declaring a sample non-toxic when it actually is toxic, as acknowledged by Section 1.2 of USEPA's *NPDES Test of Significant Toxicity Implementation Document-June 2010*.

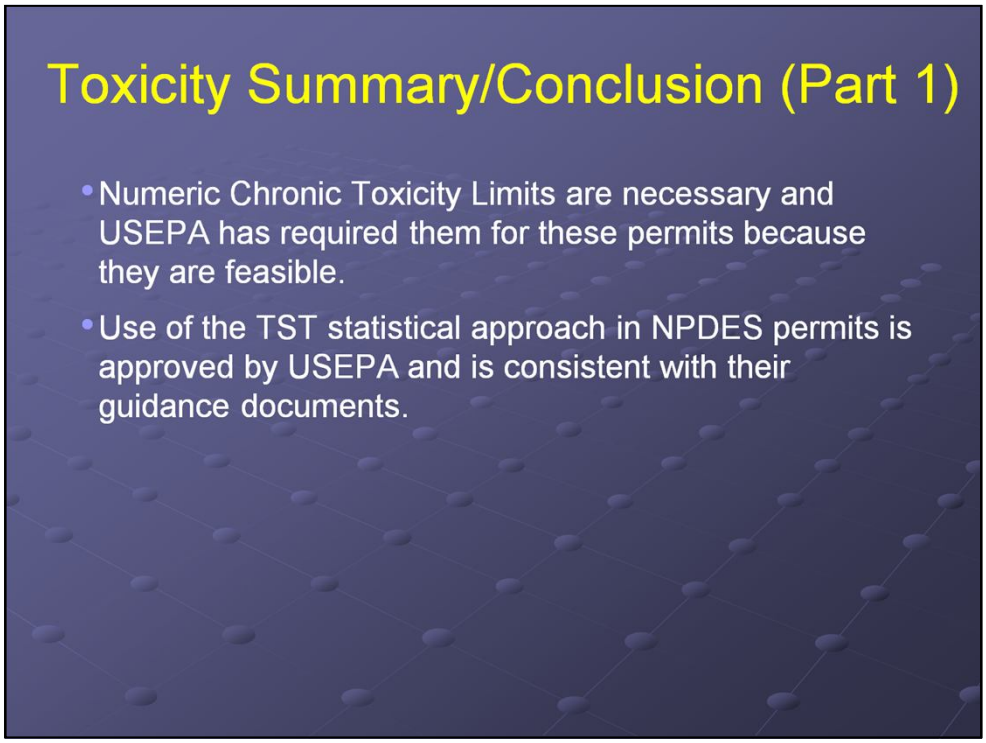


The Dischargers and supporters believe that Numeric limits are inappropriate and infeasible to comply with because the biological test methods are unreliable and inaccurate.

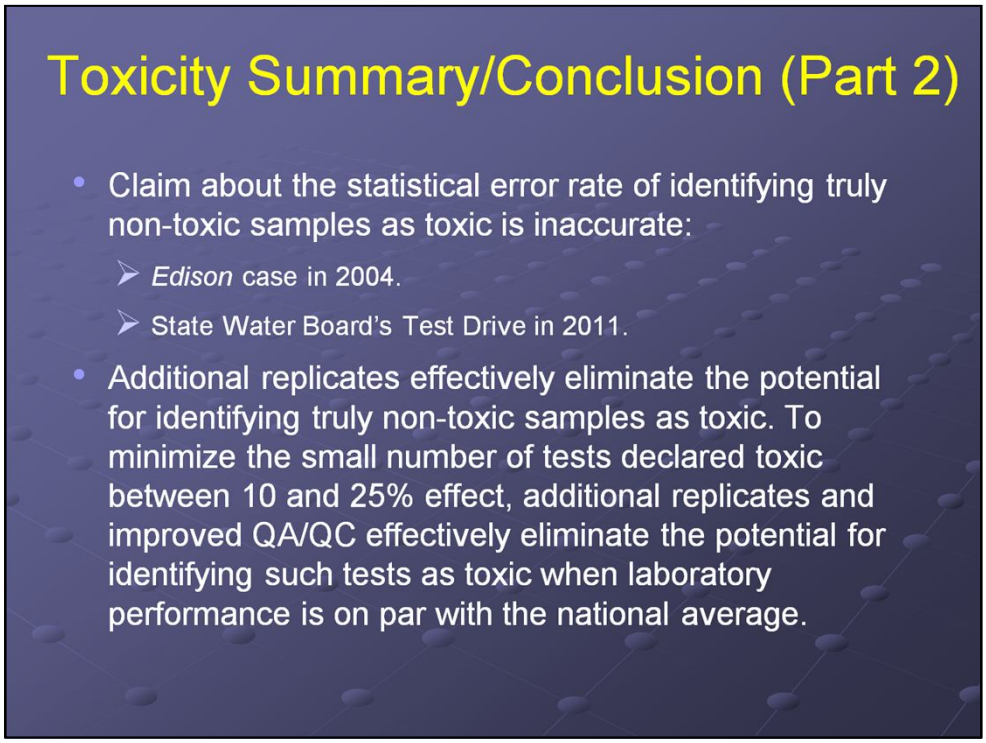
Staff disagrees. Biological tests are reliable and accurate.

Permitttee's claim was dismissed in 2004 with the *Edison* case.

State Water Board also showed the Permittee's claim to be incorrect during the August 2011 public workshop.

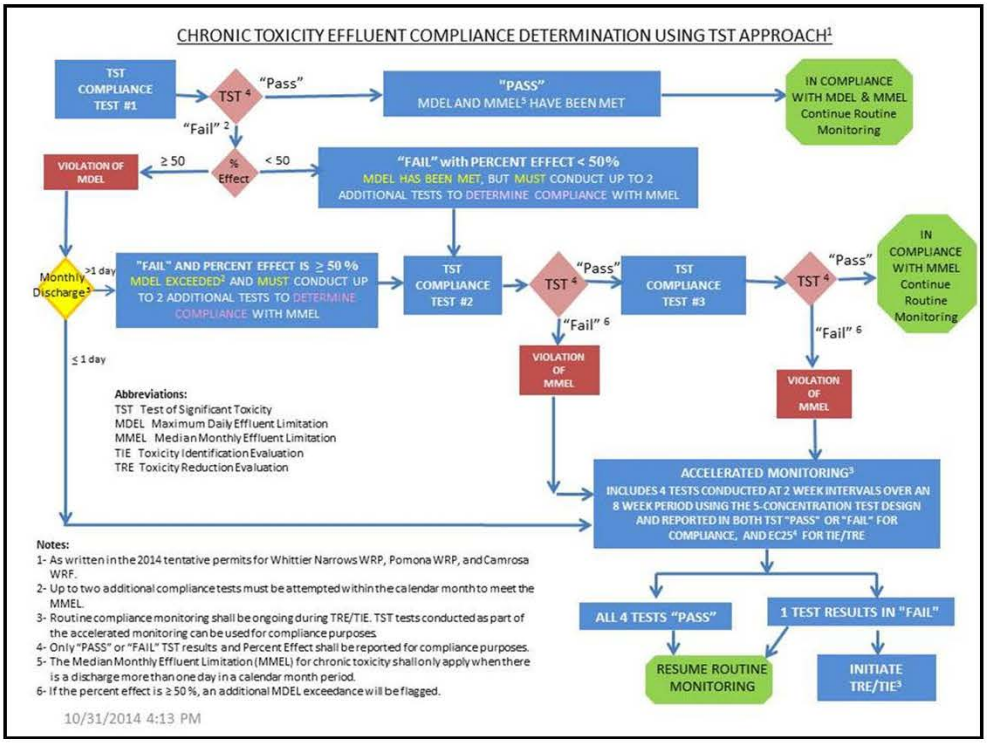


- Numeric Chronic Toxicity Limits are necessary to protect aquatic life beneficial uses. USEPA has required both monthly and daily toxicity limits for these permits because they are feasible.
- Use of the TST statistical approach in NPDES permits is endorsed by USEPA. Use of the TST in NPDES permits is also consistent with current USEPA guidance documents.



And now, Part 2.

- Based on the *Edison* case in 2004 and the State water Board's test drive in 2011, the Permittee's claim that the statistical error rate of identifying truly non-toxic samples as toxic, is inaccurate.
- In addition, eliminating the potential for identifying truly non-toxic samples as toxic can be effectively accomplished by performing additional replicates. To minimize the small number of tests declared toxic between 10 and 25 % effect, the additional replicates, AND improved QA/QC will eliminate the potential for identifying such tests as toxic when laboratory performance is on par with the national average.


CHRONIC TOXICITY EFFLUENT COMPLIANCE DETERMINATION USING TST APPROACH[1]
TST COMPLIANCE TEST #1
TST [4]
"Pass"
"PASS" MDEL AND MMEL[5] HAVE BEEN MET
IN COMPLIANCE WITH MDEL & MMEL Continue Routine Monitoring
"Fail" [2]
% Effect
≥ 50
VIOLATION OF MDEL
< 50
"FAIL" with PERCENT EFFECT < 50% MDEL HAS BEEN MET, BUT MUST CONDUCT UP TO 2 ADDITIONAL TESTS TO DETERMINE COMPLIANCE WITH MMEL
Monthly Discharge[3]
>1 day
"FAIL" AND PERCENT EFFECT IS ≥ 50 % MDEL EXCEEDED[3] AND MUST CONDUCT UP TO 2 ADDITIONAL TESTS TO DETERMINE COMPLIANCE WITH MMEL
TST COMPLIANCE TEST #2
TST [4]
"Pass"
TST COMPLIANCE TEST #3
TST [4]
"Pass"
IN COMPLIANCE WITH MMEL Continue Routine Monitoring
"Fail" [6]
VIOLATION OF MMEL
"Fail" [6]
VIOLATION OF MMEL
≤ 1 day
Abbreviations:
TST Test of Significant Toxicity
MDEL Maximum Daily Effluent Limitation
MMEL Median Monthly Effluent Limitation
TIE Toxicity Identification Evaluation
TRE Toxicity Reduction Evaluation
ACCELERATED MONITORING[3]
INCLUDES 4 TESTS CONDUCTED AT 2 WEEK INTERVALS OVER AN 8 WEEK PERIOD USING THE 5-CONCENTRATION TEST DESIGN AND REPORTED IN BOTH TST "PASS" OR "FAIL" FOR COMPLIANCE, AND EC25[6] FOR TIE/TRE
Notes:
1- As written in the 2014 tentative permits for Whittier Narrows WRP, Pomona WRP, and Camrosa WRF.
2- Up to two additional compliance tests must be attempted within the calendar month to meet the MMEL.
3- Routine compliance monitoring shall be ongoing during TRE/TIE. TST tests conducted as part of the accelerated monitoring can be used for compliance purposes.
4- Only "PASS" or "FAIL" TST results and Percent Effect shall be reported for compliance purposes.
5- The Median Monthly Effluent Limitation (MMEL) for chronic toxicity shall only apply when there is a discharge more than one day in a calendar month period.
6- If the percent effect is ≥ 50 %, an additional MDEL exceedance will be flagged.
ALL 4 TESTS "PASS"
1 TEST RESULTS IN "FAIL"
RESUME ROUTINE MONITORING
INITIATE TRE/TIE[3]
10/31/2014 4:13 PM

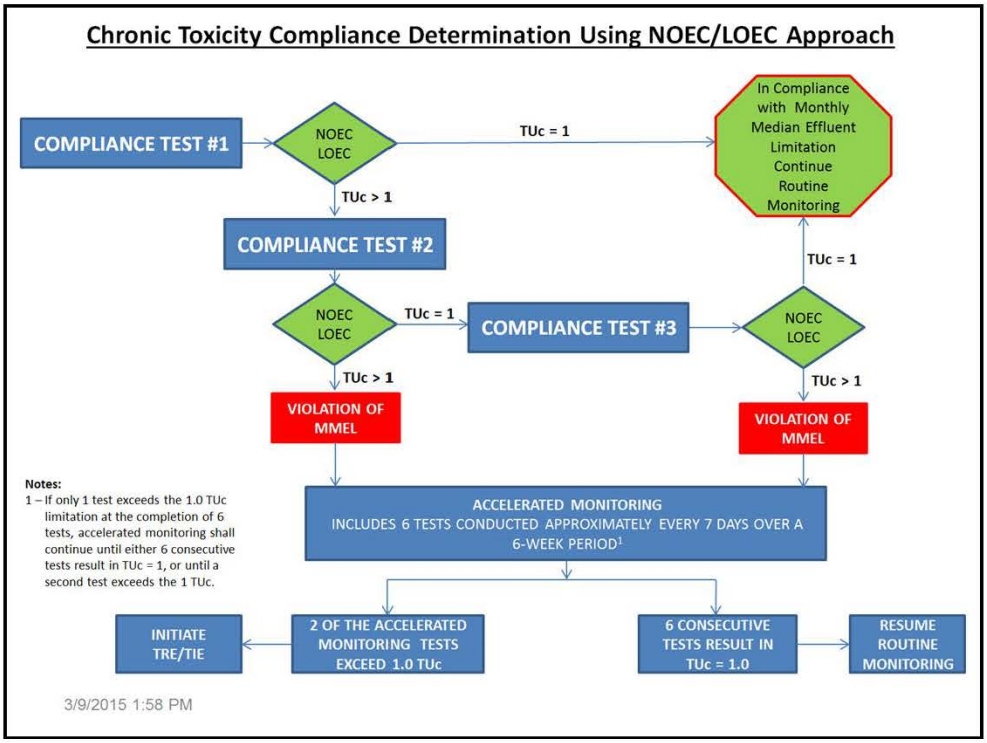

Chronic Toxicity Compliance Determination Using NOEC/LOEC Approach
COMPLIANCE TEST #1
NOEC LOEC
TUc = 1
In Compliance with Monthly Median Effluent Limitation Continue Routine Monitoring
TUc > 1
COMPLIANCE TEST #2
TUc = 1
NOEC LOEC
TUc = 1
COMPLIANCE TEST #3
NOEC LOEC
TUc > 1
TUc > 1
VIOLATION OF MMEL
VIOLATION OF MMEL
Notes:
1 – If only 1 test exceeds the 1.0 TUc limitation at the completion of 6 tests, accelerated monitoring shall continue until either 6 consecutive tests result in TUc = 1, or until a second test exceeds the 1 TUc.
ACCELERATED MONITORING
INCLUDES 6 TESTS CONDUCTED APPROXIMATELY EVERY 7 DAYS OVER A 6-WEEK PERIOD[1]
INITIATE TRE/TIE
2 OF THE ACCELERATED MONITORING TESTS EXCEED 1.0 TUc
6 CONSECUTIVE TESTS RESULT IN TUc = 1.0
RESUME ROUTINE MONITORING
3/9/2015 1:58 PM

Table E-1 from SB Test Drive Summary of all WET Method Tests

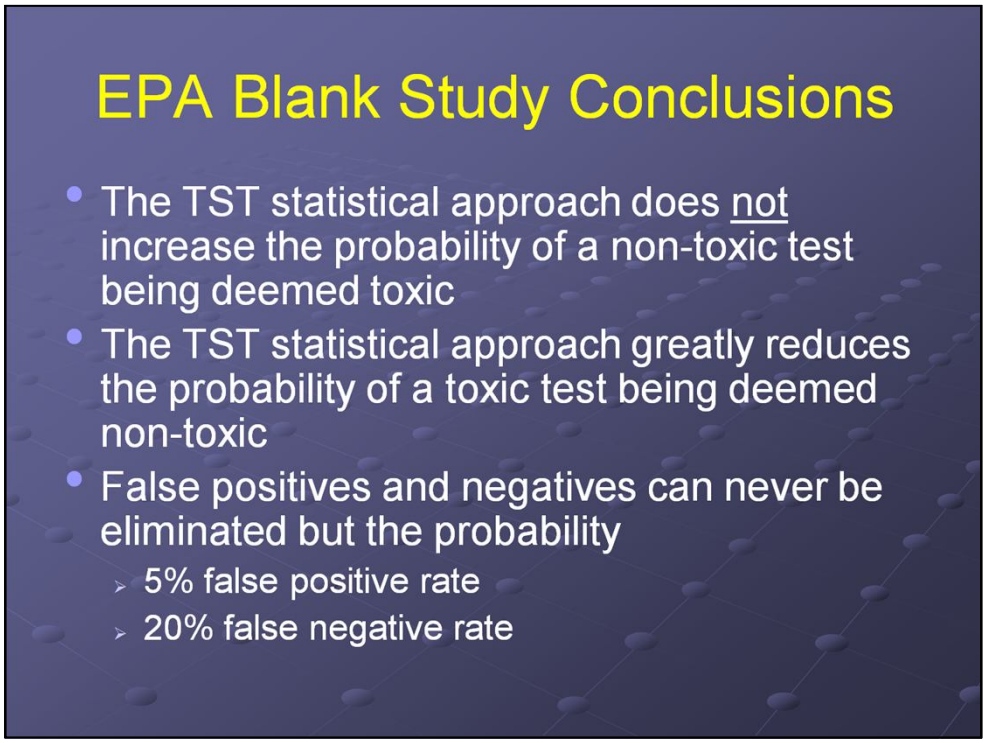
Method Type	Percent of Tests Declared Non-Toxic		Percent of Tests Declared Toxic [1]		Percent of Tests Declared Toxic with less than 25% (20% for Acute) Effect at IWC[2]		Percent of Tests Declared Toxic with less than or equal to 10% Effect at IWC[3]	
	TST	NOEC	TST	NOEC	TST	NOEC	TST	NOEC
Chronic Marine	89.3	83.5	10.7	16.5	2.2	9.8	0	5.6
Chronic Freshwater	73.8	77.3	26.2	22.7	7.0	4.4	0	1.7
Acute Marine	100	100	0	0	0	0	0	0
Acute Freshwater	96.4	98.8	3.6	1.2	1.8	0	0.6	0
All Methods	**85.1**	**84.6**	**14.9**	**15.4**	**3.7**	**5.5**	**0.1**	**2.8**

1. This includes tests which are truly toxic above the RMD of 20% for acute or 25% for chronic, as well as those tests with effects below the respective RMDs.
2. This includes only tests with effects less than the non-toxic RMD of 25% (chronic) or 20% (acute) effect at the IWC.
3. This includes only tests with effects less than the non-toxic RMD of 10% at the IWC.

Examples from chronic tests observed in the Test Drive

Test	Percent Effect	# Additional Reps Needed to Declare Test Not Toxic
Red Abalone	15.4%	1
Urchin fertilization	15.9%	2
Topsmelt	19.1%	2
Ceriodaphnia	20.6%	7
Fathead minnow	17.4 %	1

33



In conclusion, the TST statistical approach does not increase the probability of a non-toxic test being deemed toxic. In fact, the probability is at or below 5% and the number of non-toxic tests deemed toxic in the study was actually lower for the TST statistical approach than for the NOEC/LOEC method. The TST statistical approach also adds extra protection to the environment because it reduces the number of toxic tests being deemed non-toxic. Due to the nature of statistics, false positives and false negatives can never be eliminated however, the false positive rate has not changed with the TST statistical approach and the EPA has even allowed a false negative rate four times higher than the false positive rate.