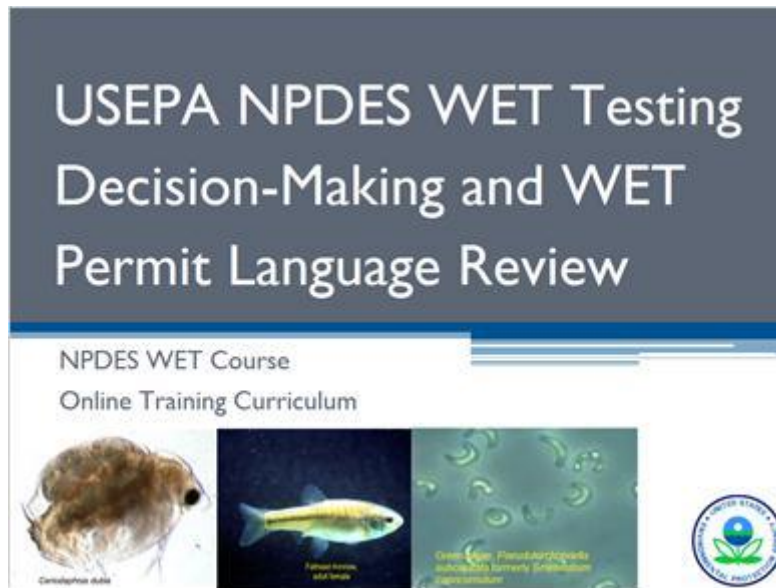


Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

Welcome to this presentation on the United States Environmental Protection Agency's, hereafter USEPA, National Pollutant Discharge Elimination System or NPDES Whole Effluent Toxicity Testing Decision-Making and WET Permit Language Review. This presentation is part of a Web-based training series on Whole Effluent Toxicity sponsored by the USEPA Office of Wastewater Management's Water Permits Division.

You can review this stand-alone presentation, or, if you have not already done so, you might also be interested in viewing the other presentations in the series, which cover the use of Whole Effluent Toxicity in the USEPA's NPDES permits program.

Before we get started with this presentation, I'll make some introductions and cover two important housekeeping items.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

Presenters

- *Laura Phillips*
EPA HQ WET Coordinator
U.S. Environmental Protection Agency
Washington, DC
- *Marcus Bowersox*
Aquatic Toxicologist
Tetra Tech, Incorporated
Owings Mills, MD

Reference: USEPA WET Test Methods

2

Notes:

First, the introductions.

Your speakers for this presentation are, me, Laura Phillips, USEPA's National WET Coordinator with the Water Permits Division within the Office of Wastewater Management at the USEPA HQ in Washington D.C., and Marcus Bowersox, USEPA HQ Contractor and an aquatic toxicologist with Tetra Tech, Incorporated in Owings Mills, Maryland. Second, now for those housekeeping items.

You should be aware that all the materials used in this presentation have been reviewed by USEPA staff for technical and programmatic accuracy; however, the views of the speakers are their own and do not necessarily reflect those of USEPA. The NPDES permits program, which includes the use of Whole Effluent Toxicity testing, is governed by the existing requirements of the Clean Water Act and USEPA's NPDES permit implementation regulations. These statutory and regulatory provisions contain legally binding requirements. However, the information in this presentation is not binding. Furthermore, it supplements, and does not modify, existing USEPA policy and guidance on Whole Effluent Toxicity under the NPDES permits program. USEPA may revise and/or update this presentation in future.

Also, this module was developed based on the live USEPA HQ NPDES WET course that the Water Permits Division of the Office of Wastewater

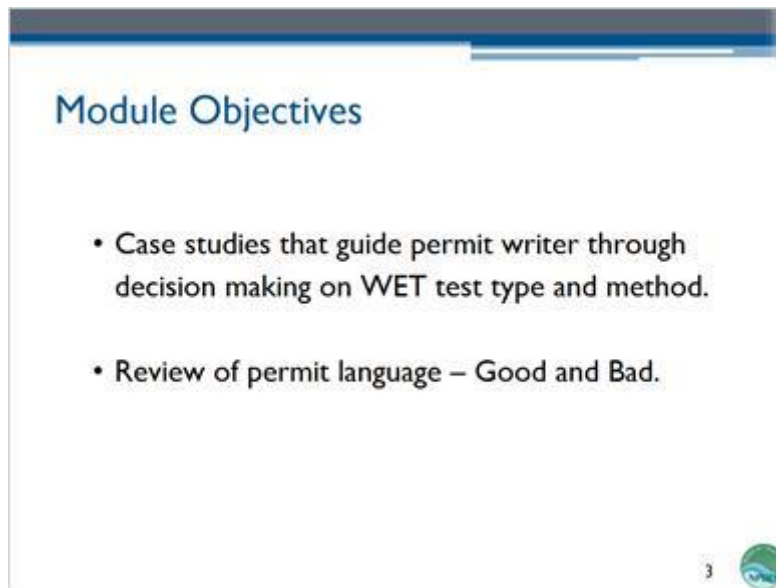
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

Management has been teaching to USEPA Regions and states for several years. This course, where possible, has been developed with the both the non-scientist and scientist in mind, and while not necessary, it is recommended that a basic knowledge of biological principles and Whole Effluent Toxicity will be helpful to the viewer. Prior to this course, a review of the USEPA's Permit Writer's online course, which is also available at USEPA's NPDES website, is recommended.

When appropriate a blue button will appear on a slide. By clicking this button, additional slides will present information regarding either freshwater or marine USEPA WET test methods. When these additional slides are finished, you will be automatically returned to the module slide where you left off. The blue button on this slide provides the references for USEPA's WET test methods that will be presented throughout this module.

So now Marcus will guide you through the NPDES WET Testing Decision-Making and WET Permit Language Review.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review




Notes:

Thanks, Laura. The purpose of this module is to demonstrate the USEPA's decision-making process when implementing WET into NPDES permits. This module will present multiple case studies that describe some of the decisions that must be made when reasonable potential has been demonstrated, and a WET limit is necessary in an NPDES permit. We will guide you through the decision-making process used to determine whether acute or chronic WET testing is necessary, whether freshwater or marine WET testing is required, and what USEPA approved WET test method species should be required. This module will also review permit language from actual NPDES permits on how WET should be incorporated into the permit and some of the common mistakes made in writing WET permit language. Now, let's begin with our first case study.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

Discharge Scenario #1

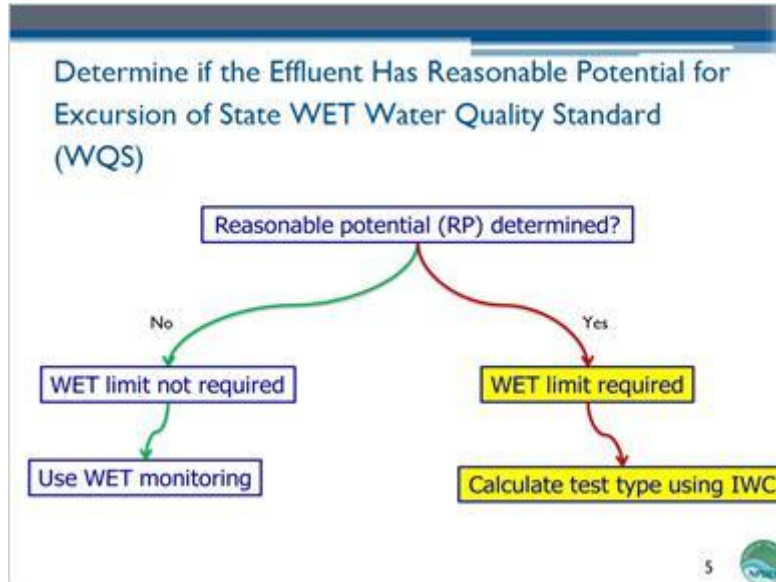
- WWTP discharge to Beaver Creek
- History of toxic results of WET tests
 - Demonstrated Reasonable Potential
- In-Stream Waste Concentration (IWC) = 74%

4 

Notes:

In this first case study, we present a wastewater treatment plant that is discharging to Beaver Creek, a freshwater stream. The state allows for a mixing zone as part of the state's water quality standards and/or NPDES permit regulations. Upon a review of the history of toxicity results from previous WET tests, we know that this effluent discharge has had at least one toxic event in the past five years, thus reasonable potential has been demonstrated. Based on the design flow of the facility discharge and the creek flow under low-flow conditions, the In-Stream Waste Concentration, or the percentage of downstream flow that is attributable to the effluent, is 74%. Thus, this receiving water is effluent dominated because more than 50% of the downstream flow under dry conditions is from effluent. Now let's take a look at the first decision that needs to be made: does the facility need a NPDES WET permit limit?

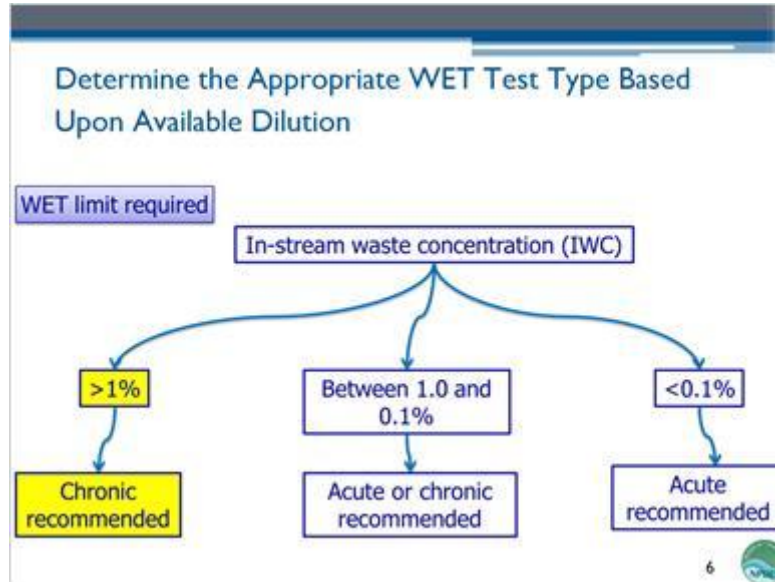
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As we noted on the previous slide, this wastewater treatment facility has had at least one WET test that was declared toxic in the past five years, thus the evaluation of reasonable potential is clear in this case. Since there has been a demonstrated non-compliant event, the facility has caused an excursion of the state's WET water quality standards, thus this facility is required to have a WET permit limit. Now that it has been determined that the facility needs a WET permit limit, which type of WET testing should be required in the NPDES permit, acute or chronic? Let's move on to the next slide to see how this is determined.

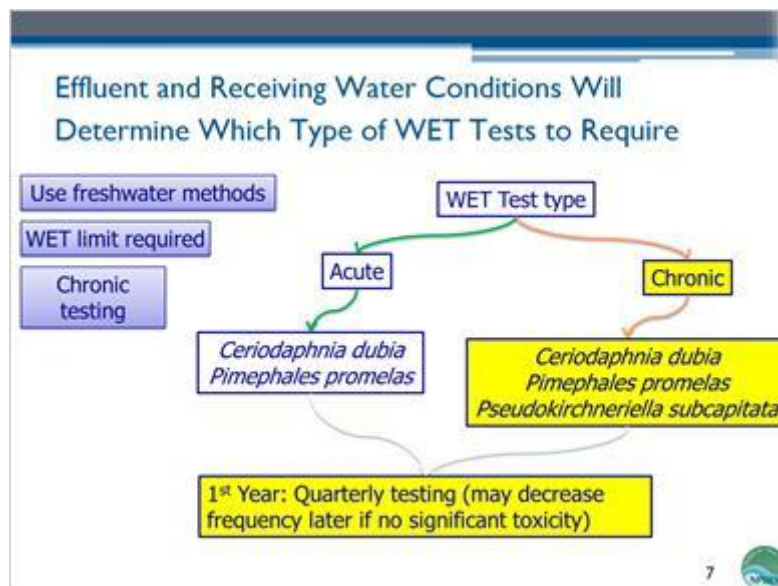
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

The decision regarding whether acute or chronic WET testing should be required in the NPDES permit is based on the available effluent dilution in the receiving water. What we see illustrated in this diagram is the decision-making process of evaluating the available dilution and what type of WET testing is required based on the In-stream Waste Concentration, or IWC. If the effluent concentration in the receiving water is less than one tenth of 1% or 0.1% at the edge of the mixing zone, then the effluent should be evaluated using acute toxicity tests. Those effluents that have an IWC between 0.1% and 1.0% after a complete mix with the receiving stream on the edge of the mixing zone, may be evaluated using USEPA acute or chronic WET testing, depending on other factors regarding the effluent, such as the potential contaminants that may be discharged or the types of aquatic species inhabiting the receiving water body downstream of the effluent discharge. Those facilities, such as the facility in this example, that discharge into a receiving water with minimal available dilution of the effluent (IWC is greater than 1% and remember the IWC for this facility is 74%) should conduct USEPA chronic WET testing. Due to the fact that the IWC is relatively high in this case, chronic WET testing will be more protective of the potential exposure experienced by aquatic life in the receiving water. Now that it has been established that chronic WET testing is required, which USEPA approved WET test species should be required?

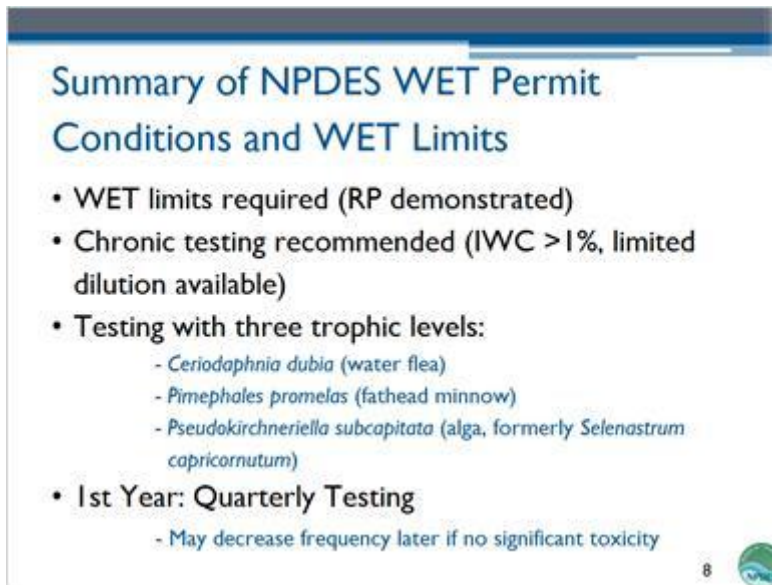
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

Let's take a moment to recap what we have learned over the past couple of slides about this permitted effluent discharge. The wastewater treatment facility discharges to Beaver Creek, a freshwater receiving water. The state allows for a mixing zone under its state law. The IWC, based on the facility design flow and the low-flow stream conditions, is 74% effluent; therefore, the stream is effluent dominated under low flow or dry conditions. The facility has had at least one excursion of the state's WET water quality standards in the last five years, so a WET permit limit is necessary. Based on the IWC, we have established that USEPA chronic WET testing is necessary. USEPA promulgated freshwater chronic WET test methods are available for *Ceriodaphnia dubia* (water flea), *Pimephales promelas* (fathead minnow), and *Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum* which is a green algae). So as we illustrate in this slide, USEPA chronic freshwater WET testing should be evaluated, at least initially, using these three taxonomically diverse USEPA approved WET test species. Based on the USEPA's 1991 Technical Support Document for Water Quality-based Toxics Control, commonly referred to as the TSD, quarterly testing for the first year of the NPDES permit is recommended, but a decrease in monitoring frequency may be warranted if no significant toxicity is observed after several valid WET tests. So now, let's wrap up this case study with a review of the USEPA NPDES decision-making process.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



The slide is titled "Summary of NPDES WET Permit Conditions and WET Limits". It contains a bulleted list of requirements and recommendations. The first bullet point states "WET limits required (RP demonstrated)". The second bullet point states "Chronic testing recommended (IWC > 1%, limited dilution available)". The third bullet point is "Testing with three trophic levels:", followed by three sub-bullets: "- Ceriodaphnia dubia (water flea)", "- Pimephales promelas (fathead minnow)", and "- Pseudokirchneriella subcapitata (alga, formerly Selenastrum capricornutum)". The fourth bullet point is "1st Year: Quarterly Testing", followed by a sub-bullet: "- May decrease frequency later if no significant toxicity". In the bottom right corner of the slide, there is a small number "8" and a circular logo with a globe.

- WET limits required (RP demonstrated)
- Chronic testing recommended (IWC > 1%, limited dilution available)
- Testing with three trophic levels:
 - *Ceriodaphnia dubia* (water flea)
 - *Pimephales promelas* (fathead minnow)
 - *Pseudokirchneriella subcapitata* (alga, formerly *Selenastrum capricornutum*)
- 1st Year: Quarterly Testing
 - May decrease frequency later if no significant toxicity


Notes:

This first case study presented us with a wastewater discharge to Beaver Creek that had a high IWC of 74%, had documented excursions of the state WET water quality standards, and the state allows for a mixing zone under state law. Based on the recommended decision-making process, it was determined that the NPDES permit for this facility will need to contain a WET permit limit. The relatively high IWC under low flow conditions requires that a chronic WET permit limit be established, and thus USEPA chronic WET testing be used to evaluate permit compliance. USEPA recommends that three taxonomically diverse USEPA approved WET test species be used to evaluate chronic toxicity and that USEPA WET testing be conducted at least quarterly for the first year of the NPDES permit. The next case study will present a different scenario but will use the same decision-making process presented in this first case study.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

Discharge Scenario #2

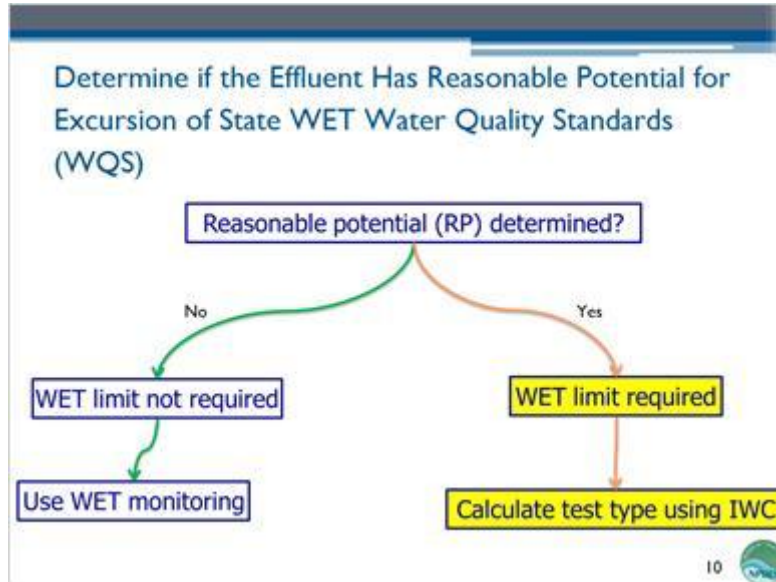
- Industrial discharge to Johnson River
- History of toxic results of WET tests
 - Demonstrated Reasonable Potential based on a State's zone of initial dilution (ZID)
- High dilution rates at edge of mixing zone (IWC < 0.1%)

9 

Notes:

In case study number 2, the effluent discharge is an industrial facility that discharges to Johnson River, a freshwater river. The state allows for a mixing zone under its state water quality standards and/or the state's NPDES permitting regulations. Upon reviewing the WET tests submitted with the NPDES permit renewal application, it was noted that at least one WET test was deemed toxic, resulting in an excursion of the state's WET water quality standards. Johnson River is a very large river and the effluent discharge flow from the facility is very little in comparison with the river flow. Thus, there is a high rate of dilution at the edge of the mixing zone under low flow conditions and the IWC is less than 0.1%.

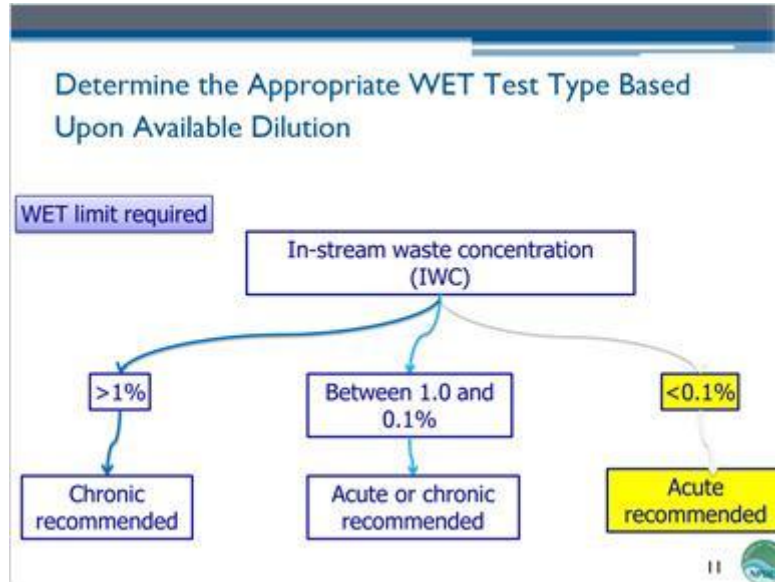
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As we noted on the previous slide, this industrial facility has had at least one WET test declared toxic in the past five years, thus the evaluation of reasonable potential is clear in this case. Similar to the first case example, there has been a demonstrated non-compliant event, which means the facility has caused an excursion of state WET water quality standards, and therefore this facility is required to have a NPDES WET permit limit. Now that it has been determined that the facility needs a NPDES WET permit limit, which type of USEPA WET testing should be required in the NPDES permit, acute or chronic?

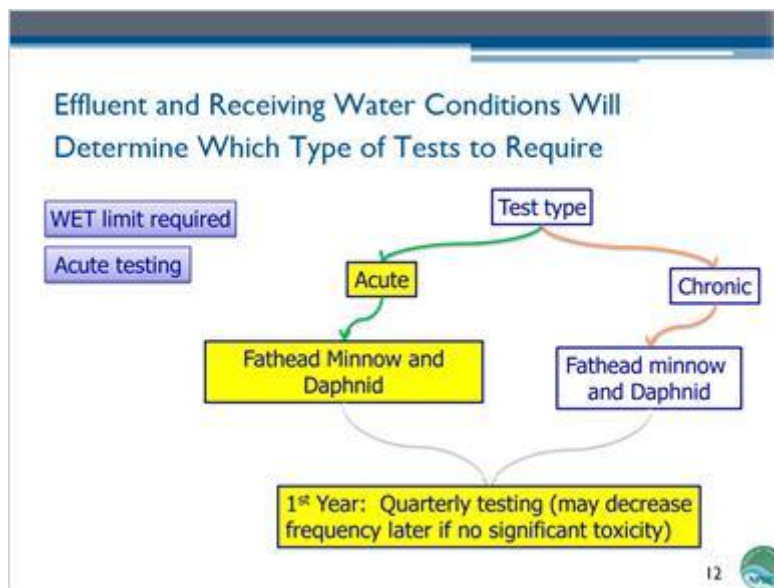
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As was demonstrated in the first case study, the decision on what type of USEPA WET testing, acute or chronic, is based on the available dilution in the receiving water. For effluent discharges, like the one at this facility that discharge into a receiving water with a high amount of dilution (remember the IWC for this facility is <0.1%) acute WET testing is appropriate. Given the fact that the IWC is relatively low in this case, acute WET testing should be protective of the potential exposure experienced by aquatic life in the receiving water near the point of the discharge. So unlike the first case study, this facility is going to have to conduct acute WET testing, but which USEPA approved WET test species should be required?

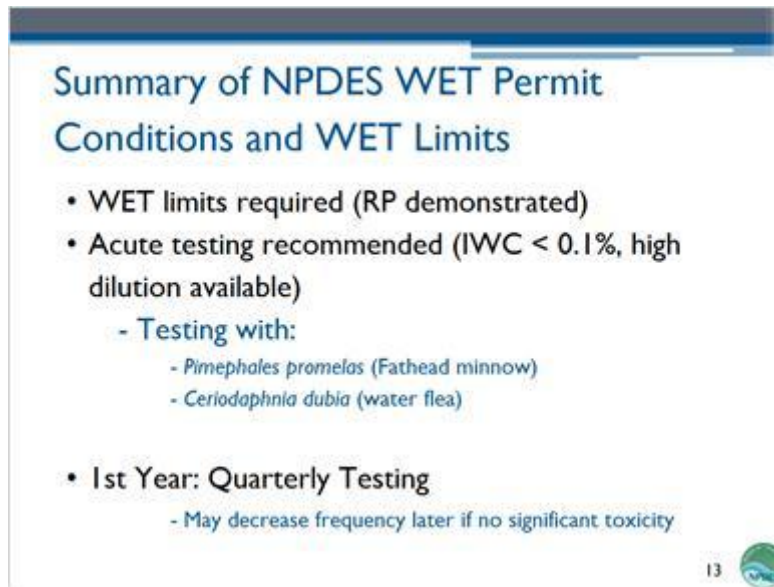
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

So recapping the second case study, the industrial facility discharges to Johnson River, a freshwater receiving water, and the state allows for a mixing zone under its state laws. The IWC, based on the facility design effluent flow and low-flow river conditions, is <math><0.1\%</math> effluent, therefore the effluent makes up very little of the downstream receiving water. The facility has had at least one excursion of the state's WET water quality standards in the last five years, so a NPDES WET permit limit is necessary. Based on the IWC, we have established that USEPA acute WET testing is necessary. So as we illustrate in this slide, acute freshwater WET testing should be evaluated using a minimum of two taxonomically diverse USEPA approved WET testing species. If the designated use in the state's water quality standards for this receiving waterbody is warm water aquatic life, then USEPA approved WET testing species such as a daphnid (water flea) and fathead minnow would be appropriate. If the waterbody's designated use is for cold water aquatic life, it would be more appropriate to conduct acute WET tests with one of the USEPA approved salmonid WET test species (for example, rainbow trout) rather than the fathead minnow, in addition to testing one of the daphnid WET test species. USEPA's TSD recommends at least quarterly testing for the first year of the NPDES permit, but a decrease in monitoring frequency may be warranted if no significant toxicity is observed over several valid WET tests. So, now let's wrap up this case study with a review of the USEPA NPDES decision-making process.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



The slide is titled "Summary of NPDES WET Permit Conditions and WET Limits". It contains a bulleted list of requirements and testing protocols. The first bullet point states "WET limits required (RP demonstrated)". The second bullet point states "Acute testing recommended (IWC < 0.1%, high dilution available)", with a sub-bullet "Testing with:" followed by two species: "Pimephales promelas (Fathead minnow)" and "Ceriodaphnia dubia (water flea)". The third bullet point states "1st Year: Quarterly Testing", with a sub-bullet "May decrease frequency later if no significant toxicity". The slide number "13" and a small circular logo are in the bottom right corner.

- WET limits required (RP demonstrated)
- Acute testing recommended (IWC < 0.1%, high dilution available)
 - Testing with:
 - *Pimephales promelas* (Fathead minnow)
 - *Ceriodaphnia dubia* (water flea)
- 1st Year: Quarterly Testing
 - May decrease frequency later if no significant toxicity

Notes:

This case study presented us with an industrial discharge to Johnson River that had high in-stream dilution under low flow river conditions and an IWC of less than 0.1%, and the state allows for mixing zones under its state laws. The NPDES permit renewal application submitted indicated there was at least one excursion of the state WET water quality standards in the past five years. Based on the recommended decision-making process, it was determined that the permit for this facility needs to contain a NPDES WET permit limit and that the available dilution supports the decision to require USEPA acute WET tests. USEPA requires that a minimum of two taxonomically diverse USEPA approved WET test species be used to evaluate acute toxicity and that WET testing be conducted at a monitoring frequency of at least quarterly for the first year of the NPDES permit. The types of WET test species required in acute WET testing should be appropriate for the type of aquatic species that inhabit the receiving waterbody; that is, cold water versus warm water aquatic species.

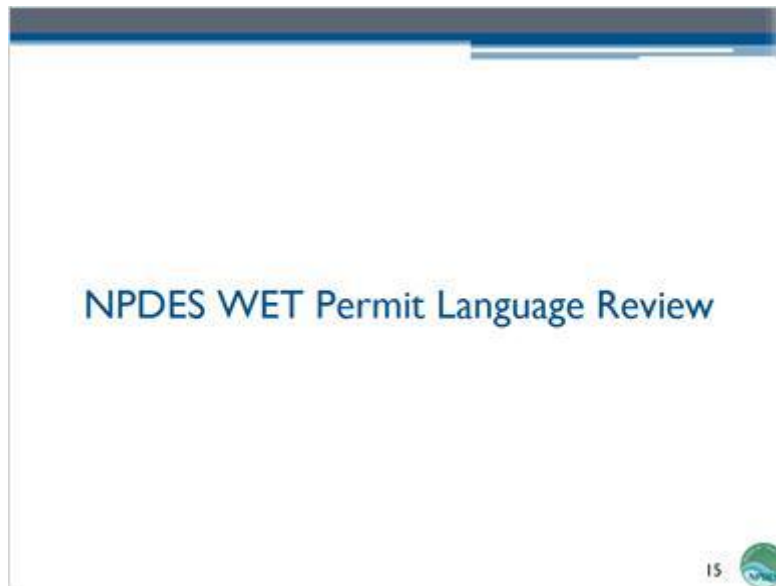
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

Two additional effluent discharge scenarios are available to those that may be interested in effluent discharges to marine receiving waters on the East Coast and West Coast. The buttons on this slide will direct you to additional slides that evaluate these case studies.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

That concludes our case studies on the decision-making process for NPDES implementation of WET based on a reasonable potential demonstration. Now, let's take a look at some NPDES permit language examples that demonstrate how to and how not to properly implement WET into NPDES permits.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

e. Test Methods

1) Acute Toxicity Testing

A) The acute toxicity tests shall be conducted in accordance with the EPA publication, EPA-821-R-02-012 *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (Fifth Edition), October 2002, or the most recent edition of this publication, if such edition is available.

B) The tests shall provide a measure of the acute toxicity as determined by the wastewater concentration, which cause 50 percent mortality of the organisms over a 48 hour period. Test results shall be expressed in terms of *Lethal Concentration (LC)* and reported as 48 hour LC50.

Reference to the EPA WET Test Methods (40 CFR Part 136)

No Recommended Dilution Series

16

Notes:

This first example is from a NPDES permit which, similar to our second case study, requires USEPA acute WET testing. Highlighted is the reference in the permit to the use of USEPA's promulgated 2002 WET testing methods, which are required to be in the permits either as a specific citation as shown here or incorporated by reference. We will illustrate incorporation by reference in one of the next examples. Also highlighted here is the lack of a recommended WET test dilution series. The permit should contain either a specific reference to a recommended dilution series or how the dilution series should be constructed. In any case, one of the effluent WET test concentrations should be the IWC. For example, the NPDES permit could list the actual WET test dilutions based on the IWC, of say 42%, so it could recommend a control, plus 10.5%, 21%, 42%, 84%, and 100% effluent. Or similar to how this dilution series was constructed, the permit could specify that the dilution series should bracket the IWC of 42% by including a control, plus the following 5 effluent test concentrations: IWC/4, IWC/2, IWC, IWCx2 (if less than 50%) and 100% effluent.


Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

EPA also requires that 60% of surviving organisms have three broods

Table 2.0: CONTROL PERFORMANCE

TEST ORGANISM	MINIMUM SURVIVAL	MINIMUM WEIGHT GAIN	MINIMUM FECUNDITY/ REPRODUCTION
<i>Pimephales promelas</i>	80%	0.25 mg avg	N/A
<i>Ceriodaphnia dubia</i>	80%	N/A	Average of ≥ 15 young per surviving female
<i>Selenastrum capricornutum</i>	Density $\geq 2 \times 10^5$ cells/ml	N/A	Variability in controls not to exceed 20%.

EPA requires density of $\geq 1 \times 10^6$ cells/ml

17 

Notes:

In our second NPDES permit language example, we see a permit that includes the required USEPA WET test method's Test Acceptability Criteria, hereafter TACs, for the required chronic freshwater tests including *Pimephales promelas*, or fathead minnows, *Ceriodaphnia dubia*, a water flea, and *Selenastrum capricornutum*, a green alga. Unfortunately, this permit did not include the correct TACs for two of the three WET test species. The chronic sub-lethal TACs for *Ceriodaphnia dubia*, along with the noted USEPA WET test methods' requirement of an average of greater than or equal to 15 young per surviving female WET test organism, also require that 60% of the surviving WET test organisms have at least three broods of young. The TAC listed for the green algae WET test is quite a bit lower than what is required by the USEPA WET test methods. The TAC listed indicates that the controls must have a cell density greater than or equal to 200,000 cells per milliliter, but the actual USEPA required WET test method's TAC is five times higher, at 1,000,000 cells per milliliter.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

The image shows a screenshot of NPDES permit language with three callout boxes. A green box labeled 'State required dilution series' points to the text 'control, 12, 25, 50, 75 and 100% effluent' in section 6.4. A red box labeled 'EPA recommends 24-hour composite samples' points to the text 'grab samples' in section 6.5. A green box labeled 'References allowable holding time' points to the text '36 hours' in section 6.5. The page number '18' and a logo are visible in the bottom right corner.

6.4 The static renewal chronic serial dilution tests of the effluent shall consist of a control, 12, 25, 50, 75 and 100% effluent. The Receiving Water Concentration (RWC) is equal to 98% wastewater for the purpose of evaluating compliance with water quality standards.

6.5 The wastewater samples shall be grab samples. The test solutions shall be renewed daily from each grab sample. Toxicity testing shall begin within 36 hours of sample collection. Receiving water collected from station SW004 shall be used for dilution and controls.

6.6 Circumstances not covered in this section, or that require deviation from the requirements of this section, shall first be approved by the [REDACTED]

State required dilution series

EPA recommends 24-hour composite samples

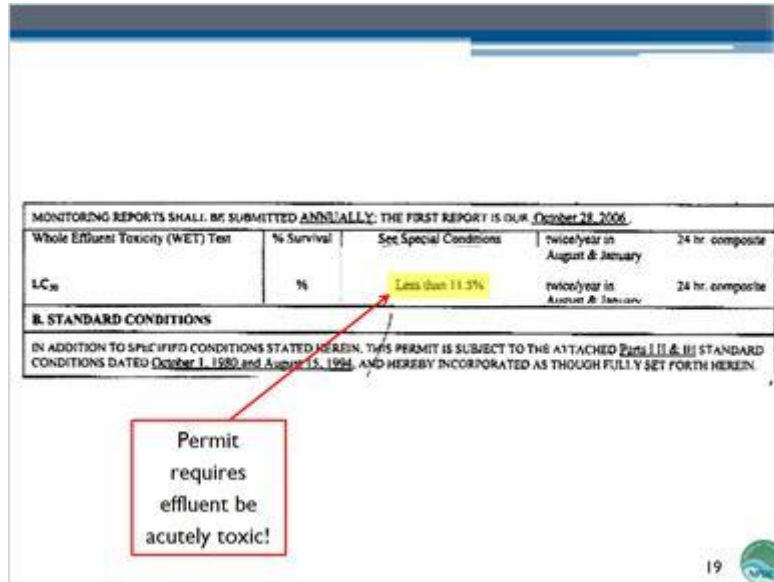
References allowable holding time

18

Notes:

This section of NPDES permit language includes specific references to the USEPA WET test methods' required WET test dilution series and references the maximum allowable 36-hour holding time of the effluent sample for its first use. The NPDES permit language indicates that the effluent samples will be grab samples, but USEPA recommends the use of 24-hour composite samples for WET chronic toxicity testing unless specific facility discharge information indicates that grab samples yield better representation of the effluent exposure in the receiving waterbody.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



The image shows a screenshot of an NPDES permit table. The table has four columns: 'Whole Effluent Toxicity (WET) Test', '% Survival', 'See Special Conditions', and '24 hr composite'. The first row is for 'Whole Effluent Toxicity (WET) Test' with '% Survival' and 'See Special Conditions' in the second and third columns, and 'twice/year in August & January' and '24 hr composite' in the fourth and fifth columns. The second row is for 'LC₅₀' with '%' in the second column, 'Less than 11.5%' in the third column, 'twice/year in August & January' in the fourth column, and '24 hr composite' in the fifth column. The cell containing 'Less than 11.5%' is highlighted in yellow. A red box with the text 'Permit requires effluent be acutely toxic!' is positioned below the table, with a red arrow pointing from the box to the highlighted cell. Below the table, there is a section titled 'B. STANDARD CONDITIONS' and a paragraph of text. The page number '19' and a logo are in the bottom right corner.

Whole Effluent Toxicity (WET) Test	% Survival	See Special Conditions	24 hr composite	
			twice/year in August & January	24 hr composite
LC ₅₀	%	Less than 11.5%	twice/year in August & January	24 hr composite

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED Parts I, II & III STANDARD CONDITIONS DATED October 1, 1980 and August 15, 1994, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

Permit requires effluent be acutely toxic!

19

Notes:

This example of NPDES permit language incorporates an acute WET permit limit using an LC₅₀ measured as percent effluent but indicates that the endpoint must be less than 11.5%. Remember, the lower the LC₅₀, the more toxic the effluent sample. So, this requirement is essentially requiring that the effluent is acutely toxic! In this case, the NPDES WET permit limit should indicate that the LC₅₀ must be greater than 11.5% effluent.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review


Permit recommends out of date methods!
(Although current methods are incorporated by reference).

Ceriodaphnia dubia chronic static renewal survival and reproduction test, Method 1002.0, EPA/600/4-89/001 or the most recent update thereof. This test should be terminated when 60% of the surviving organisms in the control produce three broods. If these criteria are not met at the end of 8 days, the test must be repeated.

Pimephales promelas (Fathead minnow) chronic static renewal 7-day larval survival and growth test, Method 1000.0, EPA/600/4-91/002, or the most recent update thereof. A minimum of five (5) replicates with eight (8) organisms per replicate must be used in the control and in each effluent dilution of this test.

7. The NOEC (No Observed Effect Concentration) is defined as the greatest effluent dilution which does not result in lethality that is statistically different from the control (0% effluent) at the 95% confidence level.

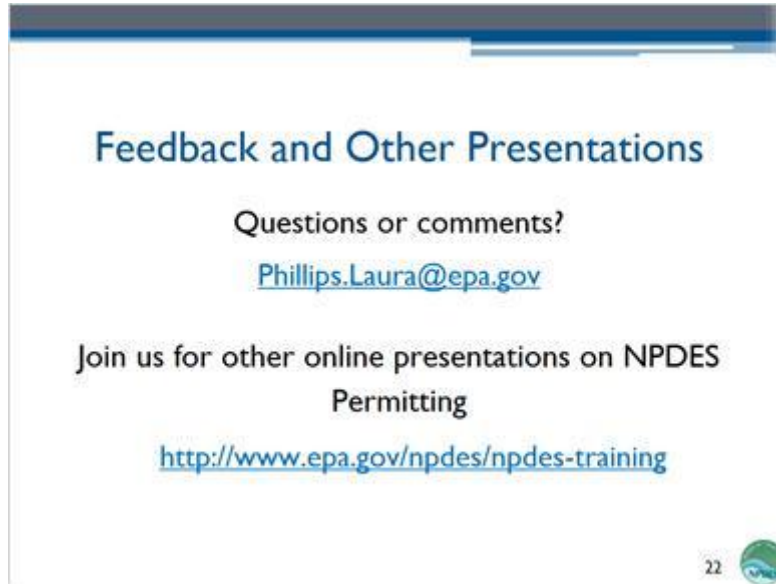
Chronic toxicity is not just lethality! Sub-lethal endpoints are required!

20 

Notes:

The last example of NPDES permit language indicates a specific reference to out of date USEPA WET test methods, in this case the 1989 USEPA WET test methods guidance, but it does incorporate the 2002 USEPA promulgated WET test methods by stating: "...or the most recent update thereof". Thus, although the NPDES permit specifically cites older USEPA WET test methods, the permittee is still required to use the most recent update to those USEPA WET test methods, in this case the USEPA 2002 promulgated WET test methods. This is considered one way to incorporate by reference the most recent USEPA WET test methods. The last point to make on this final permit language example is that the permit specifies that the No Observed Effect Concentration, or NOEC, is applicable only to the lethality endpoint. As noted, chronic toxicity is not just measured using lethality but also using sub-lethal endpoints. In this example, NOECs for reproduction and growth must be included as part of the NPDES permit so that both the permittee and its WET testing laboratory are aware of what is being required under the permit.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

Thank you for joining us for this USEPA HQ's NPDES WET training presentation. We hope that you have enjoyed it!


If you have questions or comments on this or any part of the USEPA HQ's NPDES WET online training curriculum, click on the email address given on this slide to send a message to Laura Phillips, USEPA HQ National WET Coordinator.

Remember, you will find all of the USEPA's NPDES WET online training presentations, under the training section of the USEPA's NPDES website found on the Office of Wastewater Management's NPDES website. See you next time.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review

Discharge Scenario #3

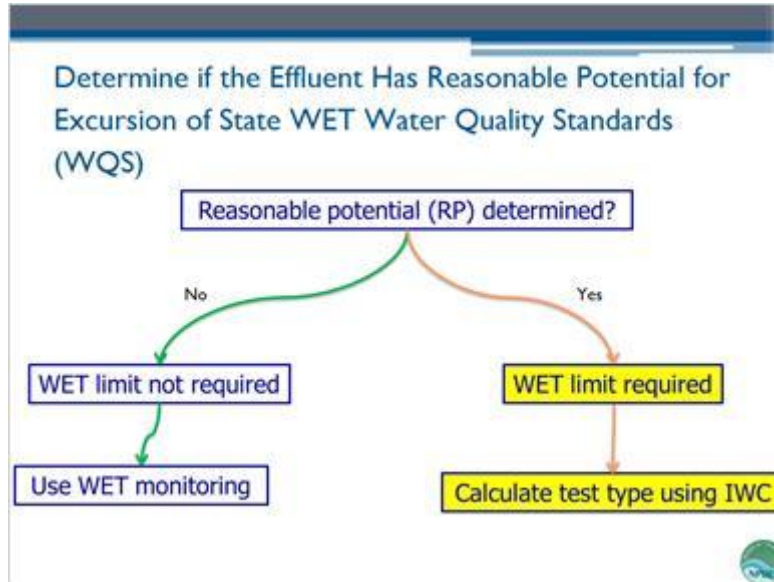
- Industrial discharge to Atlantic Ocean - 1 kilometer offshore
- History of toxic results of WET tests
 - Demonstrated Reasonable Potential based on a State's zone of initial dilution (ZID)
- High dilution rates at edge of mixing zone (IWC < 0.1%)



Notes:

In case study number 3, the effluent discharge is an industrial facility that discharges to the Atlantic Ocean. The state allows for a mixing zone in its state water quality standards and/or its NPDES permitting regulations. Upon reviewing the valid WET tests submitted with the NPDES permit renewal application, it was noted that at least one test was declared toxic resulting in an excursion of the state's WET water quality standards. The Atlantic Ocean provides a high rate of dilution at the edge of the mixing zone, and the IWC is less than 0.1%.

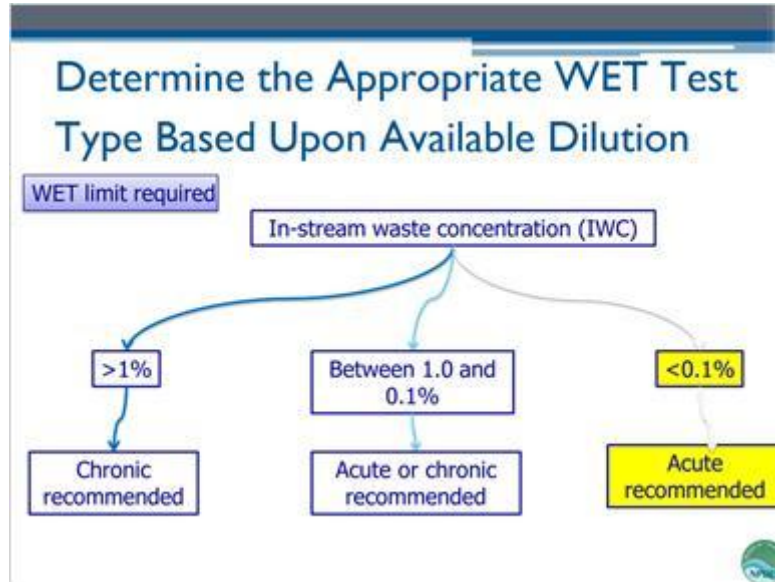
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As we noted on the previous slide, this industrial facility has had at least one toxic sample in the past five years, thus there has been a demonstrated non-compliant event, the facility has caused an excursion of state water quality standards. Therefore, this facility is required to have a NPDES WET permit limit. Now that it has been determined that the facility needs a NPDES WET permit limit, which type of USEPA WET testing should be required in the permit, acute or chronic?

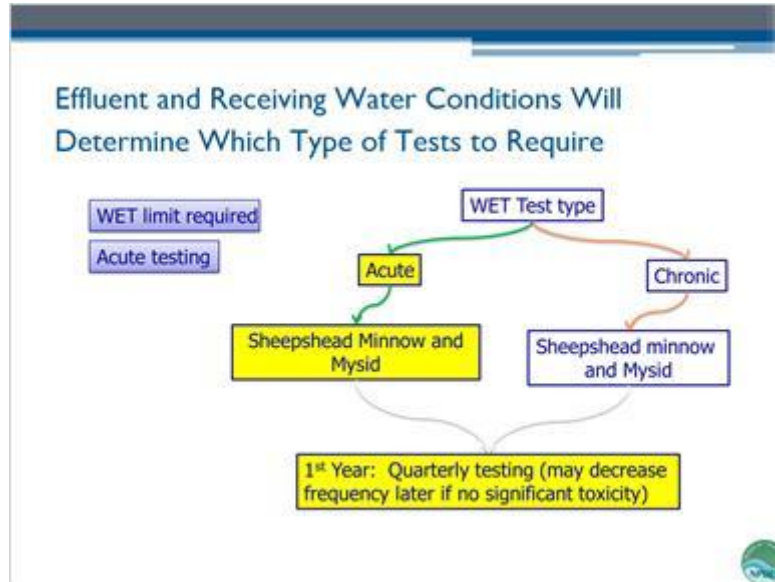
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As was demonstrated in the first two case studies, the decision on what type of WET testing, acute or chronic, is based on the available dilution in the receiving water. Facilities, such as this one, that discharge into a receiving water that offers a high amount of dilution (remember the IWC for this facility is less than 0.1%), should conduct USEPA acute WET testing. Due to the fact that the IWC is so low in this case, acute WET testing should be protective of the potential exposure experienced by aquatic life in the receiving water near the point of discharge. So unlike the first case study, this facility is going to have to conduct acute testing, but which USEPA approved WET test species should be required?

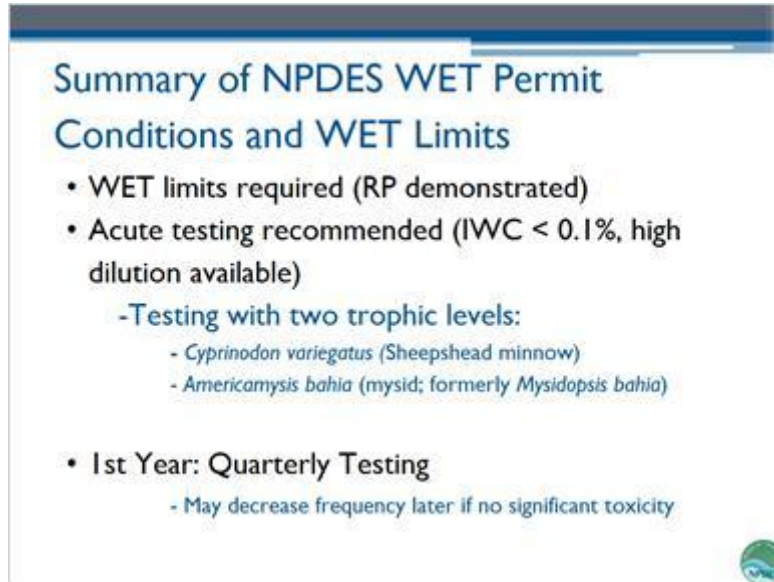
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

So recapping this case study, the industrial facility discharges to the Atlantic Ocean, thus it discharges to a marine receiving water. The state allows for a mixing zone under its state laws. The IWC, based on the facility's design flow under low-flow conditions, is less than 0.1% effluent, therefore the effluent discharge makes up very little of the receiving water. The facility has had at least one excursion of the state's WET water quality standards in the last five years, so a NPDES WET permit limit is necessary. Based on the IWC, we have established that USEPA acute WET testing is necessary. So as we illustrate in this slide, acute marine WET testing requires evaluation using a minimum of two taxonomically diverse USEPA approved WET test species including a vertebrate and an invertebrate. In this case, a mysid shrimp and sheepshead minnows are appropriate WET test species. Based on USEPA's TSD, quarterly testing for the first year of the NPDES permit is recommended, but a decrease in monitoring frequency may be warranted if no significant toxicity is observed. So, now let's wrap up this case study with a review of the USEPA NPDES decision-making process.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



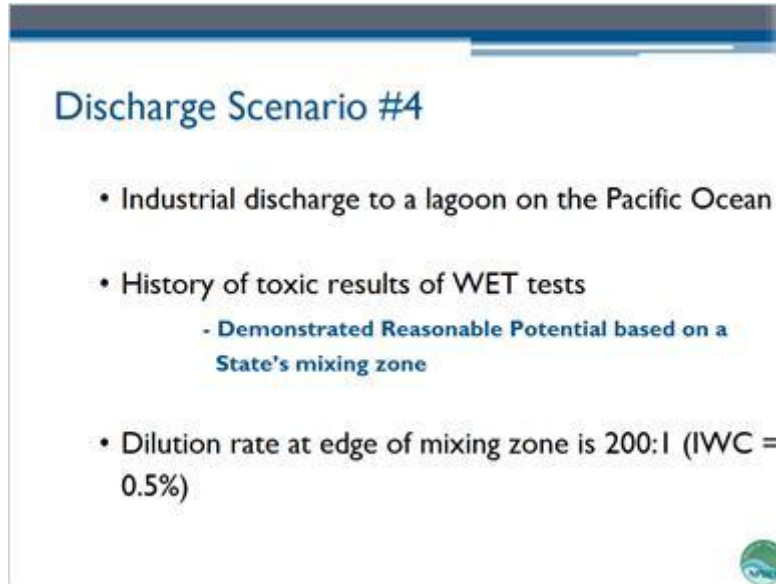
The slide is titled "Summary of NPDES WET Permit Conditions and WET Limits". It contains a bulleted list of requirements and testing protocols. The first bullet point states "WET limits required (RP demonstrated)". The second bullet point states "Acute testing recommended (IWC < 0.1%, high dilution available)", followed by a sub-bullet "-Testing with two trophic levels:" which lists two species: "*Cyprinodon variegatus* (Sheepshead minnow)" and "*Americamysis bahia* (mysid; formerly *Mysidopsis bahia*)". The third main bullet point is "1st Year: Quarterly Testing", with a sub-bullet "- May decrease frequency later if no significant toxicity". A small circular logo is visible in the bottom right corner of the slide.

- WET limits required (RP demonstrated)
- Acute testing recommended (IWC < 0.1%, high dilution available)
 - Testing with two trophic levels:
 - *Cyprinodon variegatus* (Sheepshead minnow)
 - *Americamysis bahia* (mysid; formerly *Mysidopsis bahia*)
- 1st Year: Quarterly Testing
 - May decrease frequency later if no significant toxicity

Notes:

This case study presented us with an industrial discharge to the Atlantic Ocean that had a high in-stream dilution available, an IWC of less than 0.1%, and the state allows for a mixing zone under its state laws. The NPDES permit renewal application submitted indicated that at least one excursion of the state's WET water quality standards had occurred in the past five years. Based on USEPA's decision-making process, it was determined that the NPDES permit for this facility will need to contain a NPDES WET permit limit, and the available effluent dilution supports the decision to require acute WET tests. USEPA requires that a minimum of two taxonomically diverse USEPA approved WET test species be used to evaluate acute toxicity and that USEPA WET testing be conducted at a monitoring frequency of at least quarterly for the first year of the NPDES permit.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



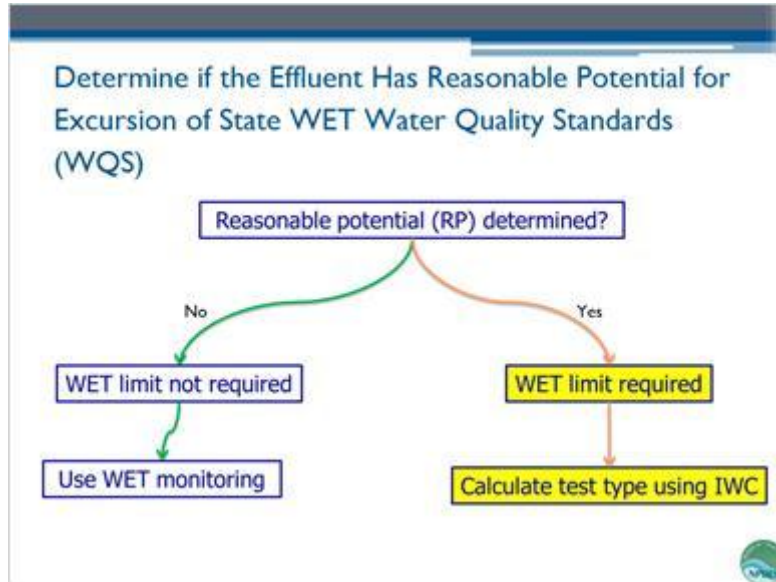
Discharge Scenario #4

- Industrial discharge to a lagoon on the Pacific Ocean
- History of toxic results of WET tests
 - Demonstrated Reasonable Potential based on a State's mixing zone
- Dilution rate at edge of mixing zone is 200:1 (IWC = 0.5%)

Notes:

In this case study the discharge is an industrial facility that discharges to a lagoon on the Pacific Ocean. The state allows for mixing zones under its water quality standards and/or NPDES permitting regulations. Upon reviewing the valid WET tests submitted with the NPDES permit renewal application, it was noted that at least one WET test was declared toxic, resulting in an excursion of the state's WET water quality standards. The lagoon on the Pacific Ocean provides a rate of dilution at the edge of the mixing zone of 200 parts receiving water to 1 part effluent, and the IWC is 0.5%.

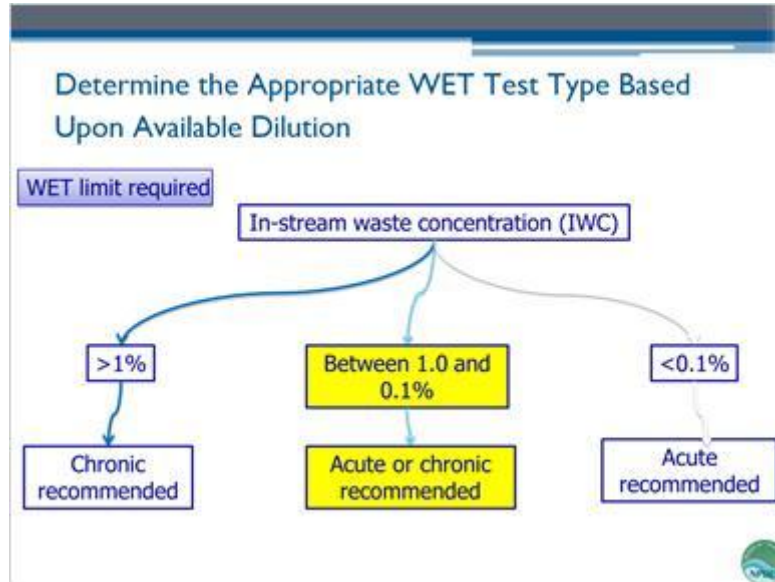
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

As we noted on the previous slide, this industrial facility has had at least one toxic sample in the past five years, thus there has been a demonstrated non-compliant event, the facility has caused an excursion of the state's water quality standards, and therefore, this facility is required to have a NPDES WET permit limit. Now that it has been determined that the facility needs a NPDES WET permit limit, which type of USEPA WET testing should be required in the NPDES permit, acute or chronic?

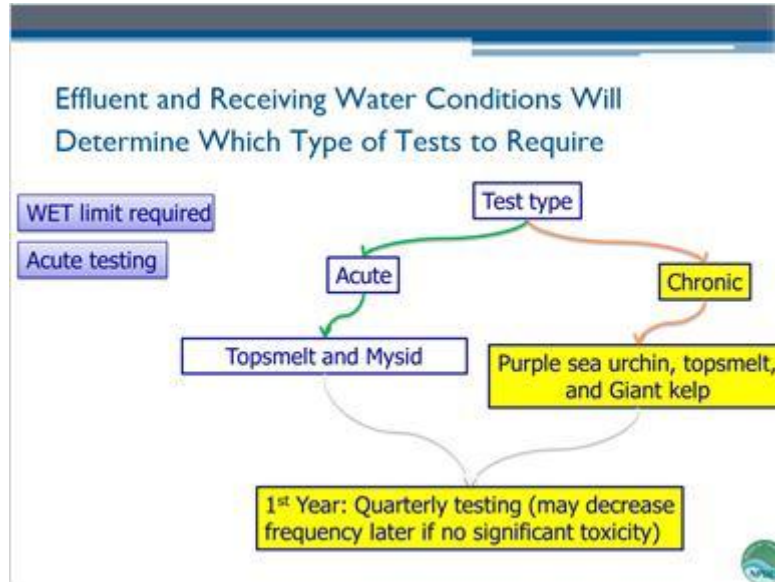
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

The decision on what type of WET testing, acute or chronic, is based on the available dilution in the receiving water, as well as the sensitivity of the receiving water body, in terms of the level of protection required by the permitting authority. For facilities, like the one in this example, that discharge into a receiving water that offers a high amount of dilution, remember, the IWC for this facility is 0.5%, acute or chronic WET testing may be appropriate. In general, when the IWC is low as in this case, acute WET testing may be protective of the potential exposure experienced by aquatic life in the receiving water near the point of discharge. However, in certain cases, even though available effluent dilution is high the receiving waterbody may have special protection provisions because of the unique habitats and/or species inhabiting the site (for example many lagoons off the California, Oregon, and Washington coasts have these species-based protective requirements). In these cases, the permitting authority may elect to require USEPA chronic WET testing to ensure that sensitive marine life is protected. For this example, we will assume that the receiving waterbody requires special protection and therefore, USEPA chronic WET testing is necessary, but which USEPA WET test species should be required?

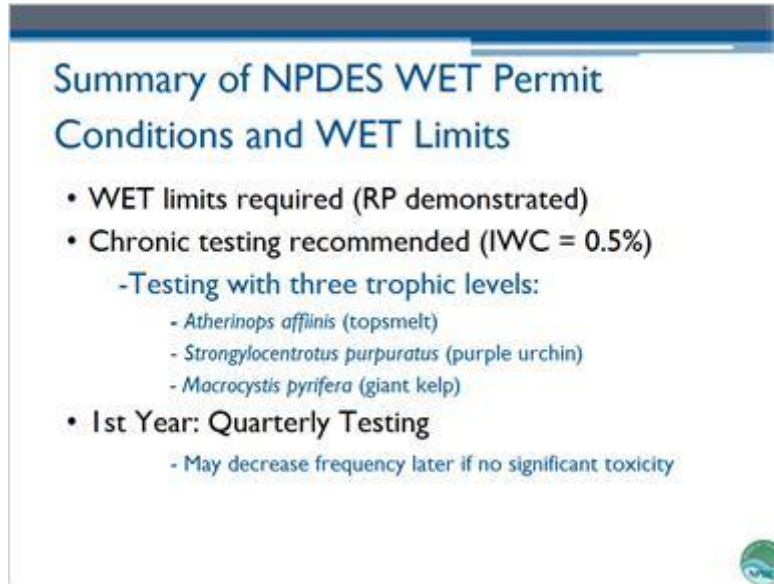
Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



Notes:

So recapping this case study, the industrial facility discharges to a lagoon of the Pacific Ocean, thus it discharges to a marine receiving water, and the state allows for a mixing zone under its state laws. The IWC, which is based on the facility's design flow and the low-flow conditions in the receiving water, is 0.5% effluent, therefore the effluent makes up very little of the receiving water. The facility has had at least one excursion of the state's WET water quality standard in the last five years, so a NPDES WET permit limit is necessary. Based on the IWC, and the fact that the effluent discharge site requires special protection for species in the receiving stream, we have established that USEPA chronic WET testing is necessary. USEPA's West Coast chronic WET test methods are available for multiple invertebrates (for example mysid shrimp, sea urchins, Pacific oyster, red abalone), fish (only the topsmelt), and a plant (only the Giant kelp). So as we illustrate in this slide, USEPA chronic West Coast WET testing should be evaluated, at least initially, using these three taxonomically diverse USEPA WET test species. Based on USEPA's TSD, quarterly testing for the first year of the NPDES permit is recommended but a decrease in monitoring frequency may be warranted if no significant toxicity is observed after several valid WET tests. So, now let's wrap up this case study with a review of the USEPA NPDES decision-making process.

Module 7: USEPA NPDES WET Testing Decision-Making and WET Permit Language Review



The slide is titled "Summary of NPDES WET Permit Conditions and WET Limits". It contains a bulleted list of requirements and recommendations. The first bullet point is "WET limits required (RP demonstrated)". The second bullet point is "Chronic testing recommended (IWC = 0.5%)", which includes a sub-bullet "Testing with three trophic levels:" followed by three species: *Atherinops affinis* (topsmelt), *Strongylocentrotus purpuratus* (purple urchin), and *Macrocystis pyrifera* (giant kelp). The third bullet point is "1st Year: Quarterly Testing", with a sub-bullet "May decrease frequency later if no significant toxicity". A small circular logo is in the bottom right corner of the slide.

- WET limits required (RP demonstrated)
- Chronic testing recommended (IWC = 0.5%)
 - Testing with three trophic levels:
 - *Atherinops affinis* (topsmelt)
 - *Strongylocentrotus purpuratus* (purple urchin)
 - *Macrocystis pyrifera* (giant kelp)
- 1st Year: Quarterly Testing
 - May decrease frequency later if no significant toxicity

Notes:

This case study presented us with an industrial discharge to a lagoon of the Pacific Ocean that had a high in-stream dilution available, an IWC of 0.5%, and a mixing zone allowed under the state's laws. The NPDES permit renewal application submitted indicated that at least one excursion of the state's WET water quality standards had occurred in the past five years. Based on our decision-making process, it was determined that this NPDES permit for this facility will need to contain a NPDES WET permit limit, and the available dilution and the sensitive receiving waterbody supported the decision to require USEPA chronic WET tests. USEPA requires that a minimum of three taxonomically diverse USEPA WET test species be used to evaluate chronic toxicity and that USEPA WET testing be conducted at a monitoring frequency of at least quarterly for the first year of the NPDES permit.