Maryland
Department of
the Environment

Procedures for Review of Chemical Additives for Sediment Control

DRAFT for REVIEW DURING INFORMAL COMMENTS (July 2019)

Last Updated: April 30, 2019

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I. Introduction

This document has been created by Maryland Department of the Environment (hereafter "the Department") to provide information to those who wish to use chemical additives for control of sediments in the State of Maryland. An additive review is necessary for substances that may enter surface water without receiving treatment or for substances that are used in a treatment process, but are not expected to be removed by wastewater treatment and may contribute to effluent toxicity. While this document specifically applies to chemical additives for sediment control, you must consult the Department prior to discharging any chemical additive which fits the definition above.

This document specifies all information which must be provided in order for the Department to complete an evaluation of aquatic toxicity on a given chemical additive. Products for which an additive review has been previously conducted and/or for which the same application, product formulation, and usage conditions apply do not need to be re-evaluated unless or until application, product formulation, or usage practices change. The Department maintains a list of additives which have already been deemed allowable on an aquatic toxicity basis on its website at https://mdewwp.page.link/MDFlocs.

Please note that a completed review for aquatic toxicity alone DOES NOT authorize the use of a chemical additive for sediment control. In order to apply for use of such additives, you must obtain the appropriate NPDES discharge permit for your activity. Available NPDES permits can be found on the Department's website at https://mdewwp.page.link/WaterPermits. You must follow guidelines outlined in your NPDES permit language (where applicable) as well as the *Standards for Use of Chemical Additives for Sediment Control* document (https://mdewwp.page.link/ChemAddStandards) to gain approval for use of additives as part of the permit registration process.

The approach described in this guidance is intended for both water-applied and land-applied products. This guidance document describes the procedures for deriving secondary acute and secondary chronic values for an additive, which are the concentrations in surface water that protect aquatic life from adverse short-term and long-term effects. Because the procedures for determining secondary values are the same regardless of the purpose of the additive, this document applies to both water-applied and land-applied additives. The secondary value is converted to an allowable usage rate using the appropriate procedures for the given application.

The federal Clean Water Act (CWA) requires states to inhibitors, industrial process polymers, pH develop water quality criteria for substances that control, scale control, settling flocculent logs, soil stabilizers, erosion control products, and may adversely impact the environment. Many stormwater and process water additives have not undergone rigorous toxicological testing required to develop water quality criteria for the protection of aquatic life (i.e., Acute Toxicity Criterion and Chronic Toxicity Criterion). Instead, secondary acute and chronic values may be derived. A Secondary value is defined as a temporary value that represents the concentration of a substance which ensures adequate protection of sensitive species of aquatic life. Secondary values are based on the available data and account for the uncertainty of the data by using a safety factor. These secondary values are then used to determine allowable usage rate (i.e., permit limit, application rates).

II. Restrictions and Limitations

In order to be eligible for use, the following characteristics must be true of the additive and/or the associated project:

1) All those seeking to use chemical additives for sediment control must obtain the proper discharge permit for the ongoing type of activity. No additive usage for sediment control is authorized unless it is done so as part of a permit registration. Please consult the applicable permit as well as *Standards for Use of Chemical Additives for Sediment Control* document (https://mdewwp.page.link/ChemAddStandards) for more information on how to gain approval.

2) All additives must be certified under ANSI/NSF Standard 60 for drinking water to be considered by the Department for approval.

3) The Department only authorizes additives which are intended for use in flocculation/coagulation of suspended materials in stormwater or groundwater.

While this document specifically addresses the procedure for determining if an additive is allowable (and at which application rates) based on aquatic toxicity, it does not represent the only requirements for authorization to use said additive. If an additive and/or project is not able to meet the requirements of this section as well as the requirements of the applicable discharge permit, there is no need to submit a request for additive review for toxicity using the procedure outlined in this document.

III. How to Request an Additive Review for Toxicity

This section identifies all of the information which must be provided in order to request an additive review for toxicity and provided some guidance for obtaining such information. The Department has provided an Additive Review Request Worksheet (see Appendix C of this document) for assistance in collecting the appropriate materials. Once all of the required information has been collected, submit it to the Department as an attachment to the Notice of Intent or application for your NPDES permit.

Information Required for Submission

- **General Product Information**
  - Permittee/Applicant contact information
  - Product trade name and manufacturer (if available)
  - Product chemical name (if available)
  - Product active ingredient(s) including CAS# of product components (if available - CAS# may not be available if additives are not OSHA regulated).
- **Product Dosage/Application Information**
  - Proposed application of dosage rate
  - Maximum discharge concentration (i.e., discharge concentration the represents worst case scenario —maximum additive dosage, minimum discharge flow, no degradation of additive).
- **Official Aquatic Life Toxicity (Bioassay) Test Results**

- Acute and Chronic Test Types describes the toxicity test species, test types and results acceptable for use in performing an additive review (see Table III-1).
- Test Parameter Summary describes the toxicity test parameters used to determine if the toxicity test results are acceptable for use in performing an additive review and the reasons why each parameter is needed (see Table III-2)
- The toxicity information submitted must address the *commercial product formulation* in order to be applicable. The whole product is all active ingredients and any and all carriers, buffering agents, binding agents, and additional materials. Toxicity data for only the active ingredient(s) are not acceptable because they are not representative of what is actually being used.
- In some instances, SDSs provide a "no effects level" or 0% mortality value. If the discharger is using an additive at a substantially lower concentration than the no effect level, it is not necessary to calculate a SAV or SCV, or include limitations for this additive in the NPDES permit. If this is the case, It is important to verify that proper test methods were used to calculate a no effect level for an additive (see Appendix A).

- **Official Aquatic Test Parameters**
  - Test duration and endpoint
  - Test method
  - Exposure format
  - Control response
  - Additional parameters, if needed (see Appendix A)
  - The parameters listed above are necessary for completing the additive review, safety data sheets (SDS) do not always contain the toxicity data needed to calculate secondary values and rarely contain the information necessary to determine if the available data is acceptable to use in calculating a secondary value. In these instances, the permittee/applicant must obtain additional toxicity test information from the chemical distributor and/or manufacturer (see Appendix A).

Table III-1: Acceptable Acute and Chronic Test Types and Results for Common Test Species

Test Format	Test Species	Acute		Chronic	
		Test Type	Test Result	Test Type	Test Result
Water Column Tests	*Ceriodaphnia dubia* (Water flea)	48-hour	LC_{50} or LC_{50}	Life-cycle	LOAEL or NOAEL
	Ceriodaphnia reticulate (Water flea)				
	Ceriodephnia serrulatus (Water flea)				
	Daphnia magna (Water flea)				
	Daphnia pulex (Water flea)				
	Simocephalus serrulatus (Water flea)				
	Simocephalus vetulus (Water flea)				

Water Column Tests (cont.)	*Pimephales promelas* (Fathead minnow)	96-hour	LC_{50}	Early life stage or Partial Life-cycle or Life-cycle	LOAEL or NOAEL
	Lepomis macrochirus (Bluegill)				
	Oncorhynchus mykiss (Rainbow trout)				
	Salvelinus fontinalis (Brook trout)				
Whole Sediment Tests*	*Ceriodaphnia dubia* (Water flea)	48-hour	NOAEL	N/A	N/A
	Daphnia magna (Water flea)				
	Hyalella azteca (Amphipod)	N/A	N/A	10-day	NOAEL

*Certain additives, typically certain erosion control products, may not be soluble in water. For these types of additives, sediment testing should be conducted in place of water column testing (see Appendix B for more information).

Definitions and Acronyms

Early life stage - used as predictors of life-cycle and partial life-cycle tests with the same species.

EC_{50} - estimated concentration of product that would cause 50% effect (e.g., mortality, immobilization) to the test population following the given time period

LC_{50} - the estimated concentration of product that would cause 50% mortality to the test population following the given time period

Life-cycle - exposures of each of two or more groups of individuals of a species to a different concentration of the test material throughout a life cycle

LOAEL - lowest observable adverse effect level

NOAEL - no observable adverse effect level

Partial Life-cycle - exposures of each of two or more groups of individuals of a species of fish to a different concentration of the test material through most portions of a life cycle-allowed with fish species that require more than a year to reach sexual maturity, so that all major life stages can be exposed to the test material in less than 15 months

Table III-2: Test Parameter Descriptions and Reasons for Use in Determining if Toxicity Test Results are Acceptable for Use in Performing an Additive Review

Test Parameter	Reason Why Test Parameter is Important
REQUIRED TEST PARAMETERS	
Test Method	Indicates which protocols were followed during the test
Exposure Format	Indicates the manner in which the organisms were exposed to the substance of concern
Toxicity Endpoint	The method for calculating secondary values is based on using these toxicity endpoints
Control Response	If a large number of control organisms die, the calculated secondary value may be artificially lower because some other factors may be affecting the health of the organisms

ADDITIONAL TEST PARAMETERS	
Dilution Water	The proper dilution water is necessary for organisms to function properly and minimizes concerns of contamination
Number of Test Concentrations	A large number of test concentrations provides consistency and helps reduce potential for an "all-or-nothing" response (ie, either all organisms alive or all dead)
Dilution Series	A stepwise dilution series also provides consistency and helps reduce potential for an "all-or-nothing" response
Temperature	Higher or lower temperatures than those of the organism's optimal range can affect how the substance of concern is metabolized and, thus, impact toxicity
Test Duration	The shorter an organism is exposed to a toxic substance, the higher the concentration needed to cause the effect. Therefore, improper test duration can result in inaccurate secondary values
Age of Organisms (prior to test)	Organisms must all be undergoing the same developmental processes during the test for the results to be valid
Number of Organisms per Test Chamber	The more organisms used, the better the accuracy of the results
Number of Chambers per Concentration	
Number of organisms per Concentration	

NOTE: The Department may require whole effluent toxicity (WET) tests in order to determine the potential for impacts to the receiving stream fish and aquatic life community from point source discharges. See Section V of this document for more details. The Department will notify you if such testing is required.

IV. Determining an Allowable Additive Usage Rate

This section outlines the process to be followed by MDE staff to assist with the timely and thorough evaluation of information related to additives. The additive review process consists of four general steps:

Step 1) Additive review request

Step 2) Secondary acute value (SAV) calculation

Step 3) Secondary chronic value (SCV) calculation

Step 4) Allowable usage rate determination

Each of these steps is described in more detail below. Figure 1 is a detailed flowchart of the additive review process. An excel template, the Secondary Value Calculator, is available to assist with calculating secondary acute and secondary chronic values for additives. Instructions for using the Secondary Value Calculator can be found in Appendix A.

Step 1 Additive Review Request Submitted	1A. The permittee/applicant submits a request for the approval of additives to MDE as part of their NPDES permit Notice of Intent or application package.
	1B. The assigned MDE staff member compiles all information provided by requestor and determines if the information package is complete. A complete request package should include general product information, product dosage/application information, and official aquatic life toxicity test results and parameters for the whole product (see Section III for more details).
	1C. Once the package is complete, the request package is forwarded to the assigned MDE staff member responsible for calculating the secondary value.
Step 2 Secondary Acute Value Calculated	2A. The MDE staff member enters the permittee/applicant and product information into the "Secondary Value Report" in the Secondary Value Calculator-
	2B. The MDE staff member enters all acute toxicity test results for the substance into the Secondary Value Calculator.
	2C. The MDE staff member determines if the toxicity test results are acceptable to use for the additive review (See Tables III-1 and III-2 in Section III for more details).
	2D. The Secondary Value Calculator automatically calculates the species mean acute value (SMAV) and genus mean acute value (GMAV).
	2E. The Secondary Value Calculator automatically calculates the SAV(s) for the appropriate designated use classification(s) and these values are included in the Secondary Value Report.
Step 3 Secondary Chronic Value Calculated	3A. The MDE staff member enters all chronic toxicity test results for the substance into the Secondary Value Calculator. Note: The calculator yields Secondary Chronic Values (SCVs) even if there no chronic toxicity test results are available.
	3B. The MDE staff member determines if the toxicity test results are acceptable to use for the additive review (see Step 2B for more details).
	3C. The Secondary Value Calculator automatically calculates the toxicity test acute-chronic ratio o (TACR).
	3D. The Secondary Value Calculator automatically calculates the species mean acute-chronic ratio (SMACR). Note: if no test results are available for a required taxa category, a default SMACR of 18 is used.
	3E. The Secondary Value Calculator automatically calculates the secondary acute-chronic ratio (SACR).
	3F. The Secondary Value Calculator automatically calculates the SCV(s) for the appropriate designated use classification(s) and these values are included in the "Secondary Value Report'.
Step 4 Approved Usage Rate Determined	4A. Once the Secondary Value Calculator is completed, the applicable secondary acute and chronic values are automatically populated into the "Secondary Value Report"
	4B. The MDE staff member calculating the secondary value makes a final decision whether to approve or disapprove the use of the product as requested and sends a copy of the Secondary Value Report to MDE staff member who received the request and the Water Evaluation Toxicologist.
	4C. The MDE staff member who received the request determines the approved usage concentration (i .e., the level of the additive acceptable for use) and calculates a final acceptable application rate for the product. The staff then issues or modifies the NPDES permit as necessary.
	4D. MDE maintains all additive review files and related toxicological information and updates the relevant information in the additives database and online listing.

Figure IV-1: Steps Involved in Performing an Additive Review

Step 1: Additive Review Request

A. The permittee/applicant submits a request for the approval of an additive (i.e., the complete production formulation) to the MDE staff responsible for their NPDES permitting or runoff management decisions.

B. The assigned staff member receiving information in Step 1 compiles all information and determines if the information package is complete. A complete request package should include general product information, product dosage/application information, official aquatic toxicity test (bioassay) results and parameters.

- The Additive Review Request Worksheet (Appendix C) can be used by the permittee/applicant to obtain the proper information for the additive review from the product manufacturer/supplier.
- Figure IV-2 provides details on the specific information needed from each of these categories.
- Table III-1 describes the toxicity test species, test types and results acceptable for use in performing an additive review.
- Table III-2 describes the toxicity test parameters used to determine if the toxicity test results are acceptable for use in performing an additive review and the reasons why each parameter is needed.

In some instances, SDS provide a "no effects level" or 0% mortality value. If the applicant is using an additive at a substantially lower concentration than the no effect level, it is not necessary to calculate a SAV or SCV and limitations for this additive are not needed in the NPDES permit for wastewater dischargers. It is important to verify that proper test methods were used to calculate a no effect level for an additive (see Appendix A).

Certain additives, typically certain erosion control products, may not be soluble in water (e.g. wood chips). Because these products contain materials that are not soluble in water, the primary ecological concern is not for organisms that live in the water column (i.e., fish) but for organisms that live in or near the sediment (e.g., amphipods, crustaceans). Therefore, for these types of additives, the traditional, water column toxicological testing methods are not appropriate. Instead, toxicity testing methods that use sediment-dwelling species should be used (see Appendix B for more information).

C. Once the request package is complete, it is forwarded to the MDE staff member responsible for calculating the allowable usage rate.

Step 2: Secondary Acute Value (SAV) Calculation

A. The MDE staff member enters the permittee/applicant information and available product information into the "Secondary Value Report' in the *Secondary Value Calculator*.

B. The MDE staff member enters all acute toxicity test results for the substance into the *Secondary Value Calculator*.

If there is not at least one acceptable test result for a water flea species (i.e, Ceriodaphnia spp., Daphnia spp., or Simocephalus spp.), a secondary acute value (SAV) cannot be calculated. If this is the case, contact the Department's Biomonitoring Coordinator (INSERT CONTACT INFO) for assistance.

C. The MDE staff member determines if the toxicity test results are acceptable to use for the additive review (see Tables III-1 and III-2).

D. The *Secondary Value Calculator* automatically calculates the Species Mean Acute Value (SMAV) by taking the geometric mean of all available toxicity test results for a given species and the Genus Mean Acute Value (GMAV) by taking the geometric mean of all SMAVs for a given genus.

E. The *Secondary Value Calculator* automatically calculates the Secondary Acute Values (SAVs) for the appropriate designated use classification(s). The SAV equals the lowest Genus Mean Acute Value (GMAV) divided by the Secondary Acute Factor (SAF); the SAF is automatically selected based on how many different organism classes are represented.

Table IV-1: Applicable Secondary Acute Factor (SAF)

Number of Organism Classes Represented	Secondary Acute Factor (SAF)
1	21.9
2	13
3	8
4	7
5	6.1
6	5.2
7	4.3

Step 3: Secondary Chronic Value (SCV) calculation

A. The MDE staff member enters all chronic toxicity test results for the substance into the *Secondary Value Calculator*. Note: The calculator yields Secondary Chronic Values (SCVs) even if no chronic toxicity test results are available.

B. The MDE staff member determines if the toxicity test results are acceptable to use for the additive review (see Step 2B for more details).

C. The *Secondary Value Calculator* automatically calculates the Toxicity Test Acute-Chronic Ratio (TACR). The TACR is the Species Mean Acute Value (SMAV) divided by Species Mean Chronic Value (SMCV) for each species.

D. The *Secondary Value Calculator* automatically calculates the Species Mean Acute-Chronic Ratio (SMACR). The SMACR is the geometric mean of all available TACRs for a given species. Note: A

SMACR is required for the following organism categories: fish, invertebrate, sensitive freshwater species. If no TACRs are available for a category, a default SMACR of 18 is used.

E. The *Secondary Value Calculator* automatically calculates the Secondary Acute-Chronic ratio (SACR). The SACR is the geometric mean of the Species Mean Acute Chronic Ratios (SMACRs) for at least one species (or default value) in each organism category.

F. The *Secondary Value Calculator* automatically calculates the Secondary Chronic Values (SCVs) for the appropriate designated use classification(s). The SCV equals the Secondary Acute Value (SAV) divided by the Secondary Acute-Chronic Ratio (SACR).

Step 4: Allowable Usage Rate Determination

A. Once the *Secondary Value Calculator* is completed, the applicable secondary acute and chronic values are automatically populated into the "Secondary Value Report."

B. The MDE staff member calculating the secondary value makes a final decision whether to approve or disapprove the use of the product as requested and either includes the decision as part of the permit registration letter or writes an additional letter notifying the permittee/applicant of the decision.

C. The MDE staff member who received the request determines the allowable usage concentration (i.e., the level of the additive acceptable for use), considering the following:

- The effluent concentration of the additive at the outfall if there are other streams which provide dilution before discharge.
- No degradation of the additive is typically assumed.
- If there is an applicable water quality standard or water quality-based effluent limitation which must be applied for the additive. If so, Table IV-2 identifies how to determine proper additive requirements for the discharge permit.

Table IV-2: Proposed Decision Matrix for Additive Decisions

Estimated Effluent Concentration	Potential Outcome
Significantly less than the lowest calculated WQS or WQBEL (typically < 1/5th of the limit)	Additive may be approved for use at the proposed application rate. No WQBEL is required.
Less than the lowest calculated WQBEL but greater than 1/5 th of the limit	Additive may be approved for use at the proposed application rate, but staff should use best professional judgment to determine if a WQBEL or use restriction should be included in the permit to insure that additive use does not increase.
Greater than the lowest calculated WQBEL	The additive is not approved for use at the proposed application rate.

- Staff should clearly document decisions about additive approvals (or denials) and/or the need for WQBELs in permit fact sheets accompanying reissued permits or in written

correspondence to the permittee as needed, if changes in additive use are being evaluated during the permit term.

- If it is necessary to determine the application rate in lbs/acre·ft:
    - For application directly to water, multiply the allowable usage rate concentration (mg/L) by (1.35 lbs/acre·ft)/(mg/L).
    - For application to land (if allowable), multiply the allowable usage rate concentration (mg/L) by (lbs/acre·ft)/(1.4 mg/L).
    - The final application rate is compared to the proposed application rate to determine if the product can be used as requested.

D. Once a final decision is made on whether to approve or disapprove the use of the product as requested, the MDE staff provides a copy of the decision and documentation to the permitting staff responsible for issuing the permit or permit registration. That staff incorporates the findings into the final permit or permit registration letter. At this time, MDE staff shall also update the online list of approved chemical additives, if necessary.

V. Determining the Need for WET Testing

For wastewater dischargers, whole effluent toxicity (WET) tests may be needed to determine the potential for impacts to the receiving stream fish and aquatic life community from point source discharges. These tests may be needed in addition to or in lieu of secondary values. This guidance document is intended to apply to situations when secondary values for additives may be needed to protect against effluent toxicity. WET testing should be considered when any of the following conditions apply:

- When the toxicity data needed to calculate secondary values are not made available to MDE.
- When historical or projected use of an additive suggests that the effective dose may exceed 1/5th of the calculated secondary value.
- When a discharge contains multiple additives that are likely to be discharged simultaneously.

If MDE staff are unsure about the applicability of WET testing for a given situation, they should contact the Biomonitoring Coordinator.

The amount of WET monitoring that is needed in a given situation will be site-specific and will depend on the number of additives used simultaneously and the discharge conditions involved. WET testing should be conducted on an effluent that is likely to contain an additive, residual of an additive, or any mixture of multiple additives and residuals.

It is recommended that testing be required once annually for the first two years if the proposal is to use a single additive or mixture that is expected to be mostly used simultaneously. If the proposal is for The use of an additive mixture which are not likely to be discharged simultaneously, it is recommended that the frequency be increased to once every three (3) months for the first nine (9) months. monitoring frequencies recommended in Table V-I are an attempt to cover some of the possible discharge scenarios that may call for WET testing.

Note: These recommendations represent the minimum frequencies recommended to evaluate the reasonable potential for additive-related impacts to receiving stream fish and aquatic life communities. These frequencies should be increased if there are case-specific reasons that warrant a further evaluation of the reasonable potential.

Best professional judgment should be used to determine if any unusual circumstances exist that may warrant additional testing. Examples of discharge/additive-specific circumstances that may require additional testing include known effects of water chemistry (temperature, pH, etc.) on the toxicity of an additive, changes in the receiving stream species composition on a seasonal basis.

VI. Glossary of Terms

Additive: substance, typically a commercial product, that has the potential to be directly discharged to a surface water and may cause toxicity to fish and aquatic organisms,

Acute Toxicity Criterion: maximum daily concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the acute toxicity of that substance and will adequately protect the designated fish and aquatic life use of the surface water if not exceeded more than once every 3 years,

Biocide: a chemical substance (e.g., pesticide, herbicide, fungicide) or microorganism which is used to deter or kill living organisms through chemical or biological means.

CAS number: unique numerical identifier assigned by Chemical Abstracts Service (CAS) to every chemical substance described in the open scientific literature.

Chronic Toxicity Criterion: the maximum 4-day concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the chronic toxicity of that substance and will adequately protect the designated fish and aquatic use of the surface water if not exceeded more than once every 3 years.

Clarifying Agent: chemicals that are used to remove suspended particles from liquids by inducing flocculation.

Department: the Maryland Department of the Environment. Unless stated otherwise, all submissions to the Department shall be directed to the attention of the Wastewater Permits Program

Effective Concentration 50% (EC_{50}): concentration of a toxic substance which causes an adverse effect including mortality in 50% of the exposed organisms in a given time period.

Flocculent Log: a block made of polymers and/or other additives used reduce and prevent fine and colloidal particles from entering stormwater.

Frac Sand: quartz sand used in hydraulic fracturing (i.e., fracking) to produce oil, natural gas, or other petroleum-based materials.

Genus Mean Acute Value (GMAV): the geometric mean of the all species mean acute values (SMAVs) for a given genus.

Lethal Concentration 50% (LC_{50}): concentration of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

Lowest Observable Adverse Effect Level (LOAEL): the lowest tested concentration that caused an adverse effect in comparison with a control when all higher test concentrations caused the same effect.

No Observable Adverse Effect Level (NOAEL): highest tested concentration that did not cause an adverse effect in comparison with a control when no lower test concentration caused an adverse effect.

NPDES: National Pollutant Discharge Elimination System

Permit Registration: Used to describe an approval to discharge under a general permit, as opposed to obtaining an individual permit

Polymer: natural or synthetic materials that have a chain of carbon molecules that are identical, repeating units.

Safety Data Sheet (SDS): a document that outlines chemical information and procedures for handling and working with the chemical; typically include physical and chemical property information, potential hazard information, emergency procedures, and manufacturer contact information. SDS have previously been referred to as Material Safety Data Sheets (MSDS).

Secondary Acute Factor (SAF): safety factor based on how many different organism classes are represented in the available data.

Secondary Acute Value (SAV): temporary value that represents the concentration of a substance which ensures adequate protection of a sensitive species of aquatic life to adverse effects from acute exposure to that substance; equal to the lowest genus mean acute value divided by the appropriate secondary acute factor for a given fish and aquatic life designated use subclassification.

Secondary Acute-Chronic Ratio (SACR): The geometric mean of at least one Species Mean Acute-Chronic Ratio (SMACR) for each of the following categories. Used when a final acutechronic ratio FACR cannot be calculated because all of the required data is not available.

Secondary Chronic Value (SCV): temporary value that represents the concentration of a substance which ensures adequate protection of a sensitive species of aquatic life to adverse effects from acute exposure to that substance; equal to the appropriate secondary acute value (SAV) divided by the secondary acute-chronic ratio (SACR) for a given fish and aquatic life designated use subclassification.

Species Mean Acute Value (SMAV): the geometric mean of all acceptable acute toxicity values for a given species.

Species Mean Acute-Chronic Ratio (SMACR): the geometric mean of all available TACRs for a given species. A SMACR is required for the following organism categories: fish, invertebrate, sensitive freshwater species.

Species Mean Chronic Value (SMCV): the geometric mean of all acceptable chronic toxicity values for a given species.

Toxicity Test Acute-Chronic Ratio (TACR): the Species Mean Acute Value (SMAV) divided by Species Mean Chronic Value (SMCV) for toxicity test available for each species.

Water Quality-based Effluent Limits (WQBEL): effluent limitations established by the department to meet applicable water quality standards.

Whole Effluent Toxicity (WET): toxicological testing conducted on point-source end-of-pipe effluent to measure, predict, and control the discharge of materials that may be harmful to aquatic life.

VII. References

This document has been adapted from a procedure developed by the Wisconsin Department of Natural Resources for use in the State of Wisconsin. Their document can be accessed online at https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=117491352.

Weber, C., et al. 2002. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition*. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/4-90/027F. <http://water.epa.gov/scitech/methods[cwa/wet/disk2>.

Weber, C. , et al. 2002. *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, 4th Edition*. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. EPA-821-R-02-013. <http://water.epa.gov/scitech/metho s c a/wet/disk>.

Appendix A

Tutorial for Using the Secondary Value Calculator

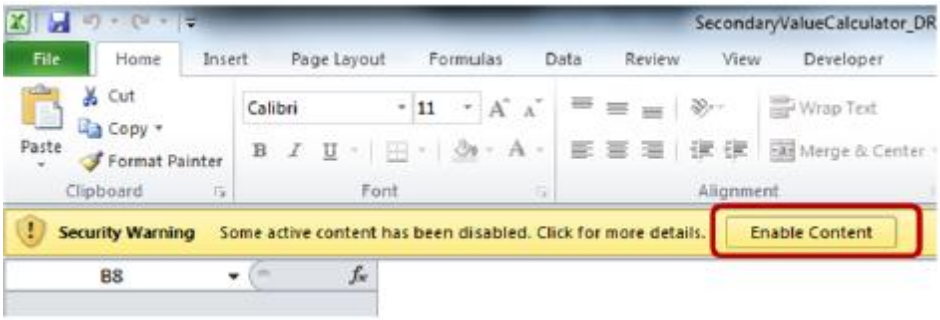
GENERAL TIPS

- Save Before Changing- Save the additive review spreadsheet under a new name before making edits to the spreadsheet.
- Locked Cells- This spreadsheet has locked cells to avoid editing the wrong features, unlocked cells to be edited by the MDE staff are highlighted in blue.
- Copy and Paste- To copy and paste text into highlighted cells double click the appropriate cell first, so the text cursor appears in the cell. You cannot simply click the cell and paste text without being in the "text" mode.
- Watch for "red flags"- Red flags are comment features in excel, and provide additional information for the person filling out the spreadsheet.
- Deleting Selection - To delete dropdown information, click the incorrect cell and press the backspace or delete key.

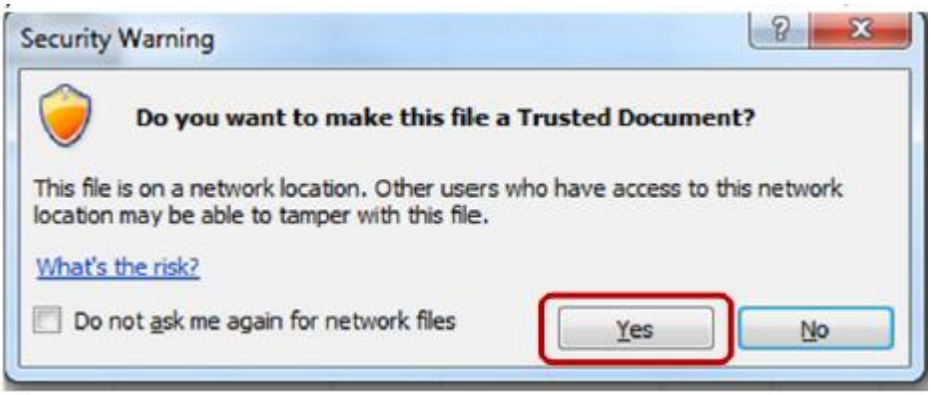
SECONDARY VALUES REPORT

This is the first sheet that should come up when you open the spreadsheet.

STEP 1: In the “Macros has been disabled” box, select “Enable Content.”



STEP 2: In the "Do you want to make this file a Trusted Document?" box, select "Yes.”

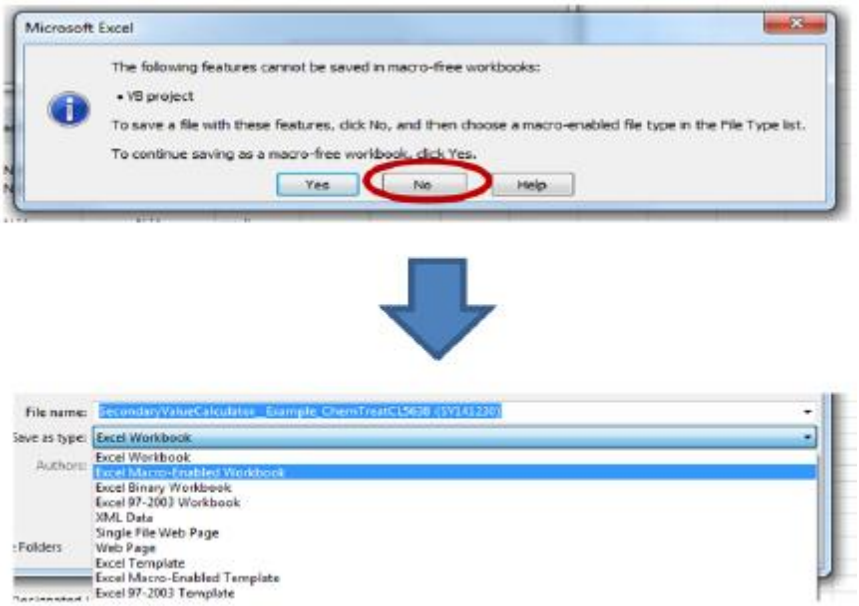


STEP 3: Save the document in the appropriate subfolder in the IDP Folder on the M Drive under a new name using the format: (Date DDMonthYR) (Product Name) (Permit Number)

- Example File Name: 18Mar19 Chemical XYZ 17HT1234

Tip: *If storage of additional files (product information, SDS, etc.) is needed, create a new folder within the subfolder and use the same file name format for the folder name. Store all data including the spreadsheet within the newly created folder.*

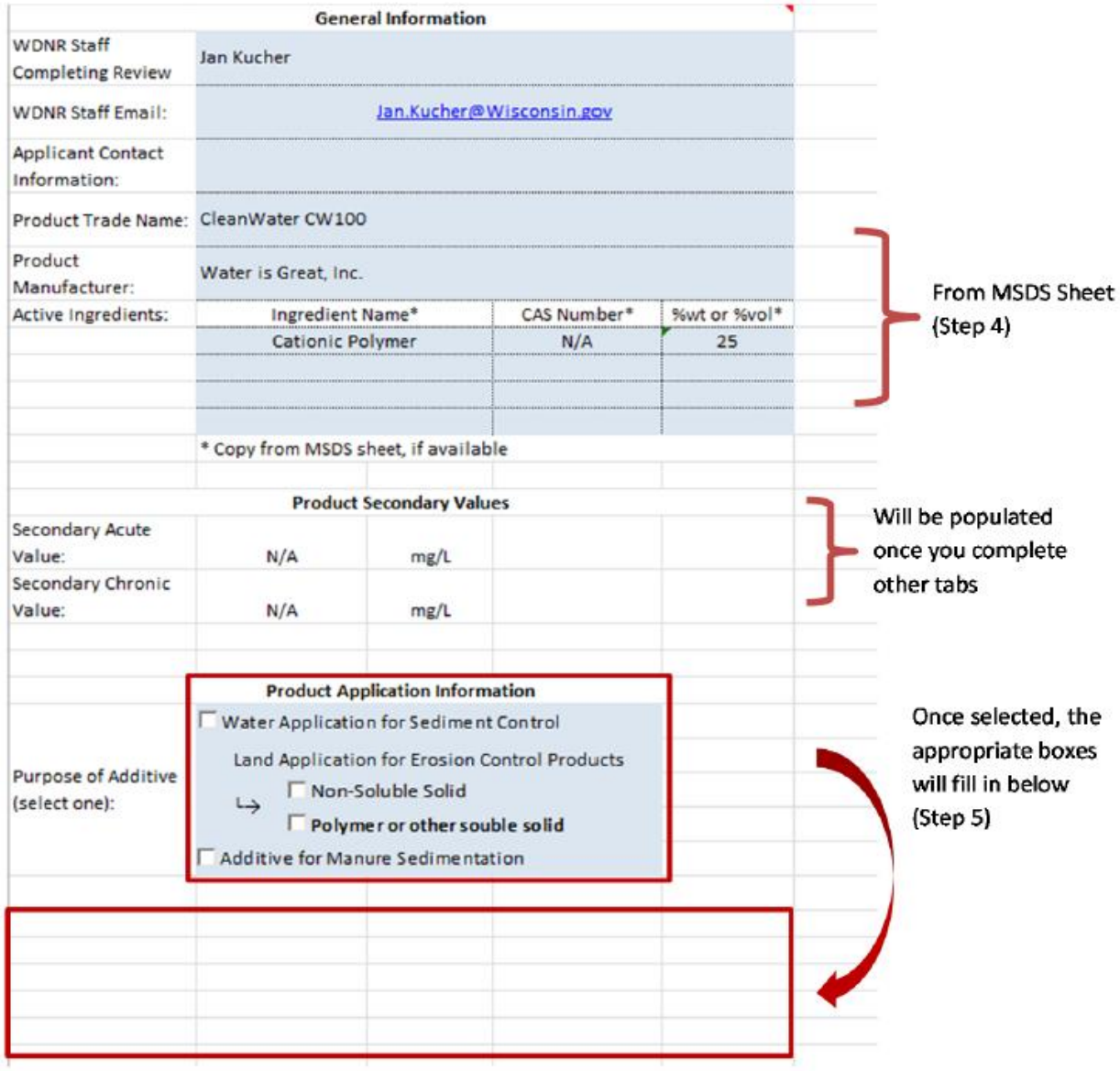
Tip: *If you get an error when trying to save (see image of the box below), click "No" and select "Excel Macro-Enabled Workbook" under "Save as Type."*



STEP 4: In the "General Information" section, fill in all highlighted cells for which you have data. You will likely need to refer to previous permit documents, TEMPO data, and SDS's to complete this tab.

STEP 5: For "Purpose of Additive," select the appropriate box. Once selected, additional rows will appear

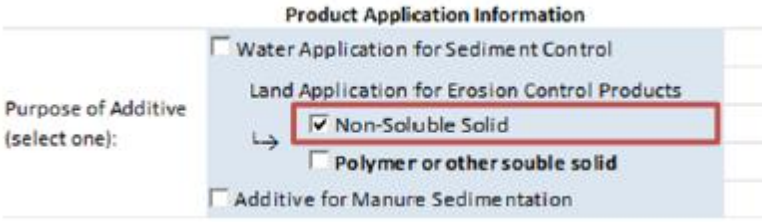
Note: The applicable secondary acute and chronic value rows (Rows 15 and 16) will automatically fill-in with the correct data once you fill out the rest of the spreadsheet.



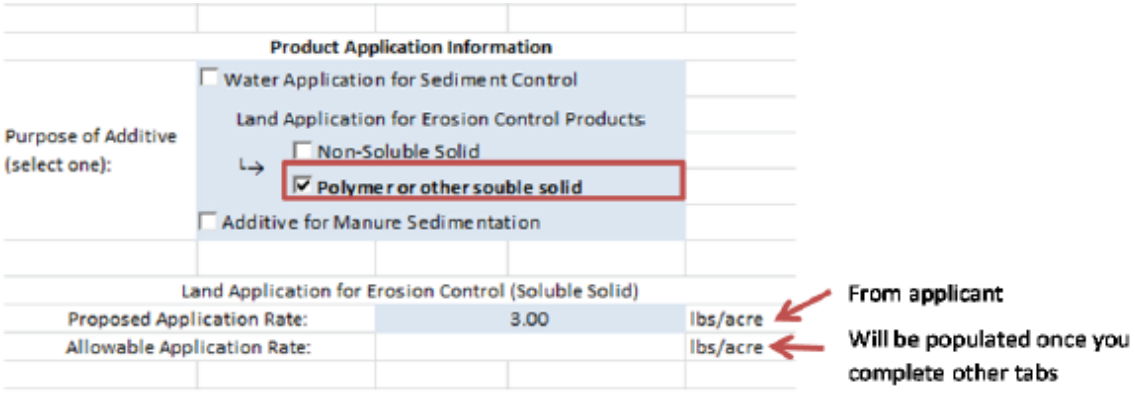
STEP 6: In the "Product Application" section, fill in all highlighted cells.

- For **Water Application for Sediment Control**, enter the proposed application rate.

- For **Land Application for Erosion Control Products – Non-Soluble Solid**, a different process is used (see Appendix B).



- For **Land Application for Erosion Control Products – Polymer or other soluble solid**, enter the proposed application rate.



- At this time, MDE is not including reviews of **Manure Additive for Nutrient Management** as part of this process.

DON'T FORGET TO SAVE

A (ACUTE)

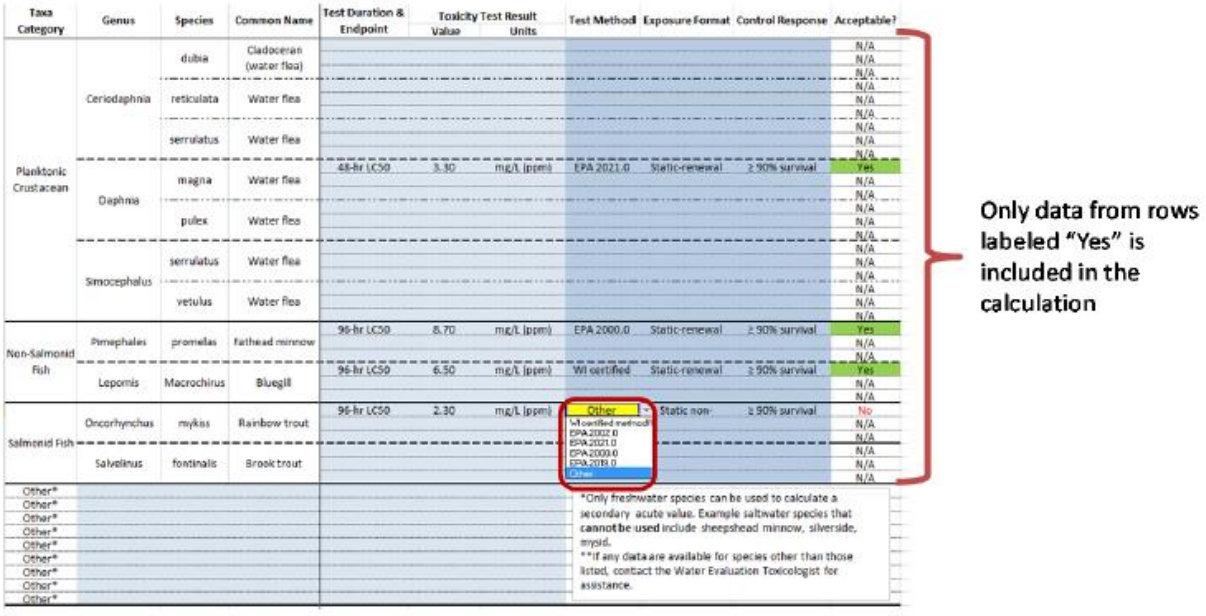
STEP 7: Use the dropdown menus to fill in the toxicity information provided from the SDS(s) and/or lab sheet(s). This should also include test method data provided by the lab.

Tip: *Test method data may be available via lab reports or through lab correspondence. Work with the permittee to ascertain these data.*

Tip: *Contact the Water Evaluation Toxicologist if toxicity data are provided for species other than those listed in A (Acute) tab.*

Tip: *Only 48-hour and 96-hour toxicity endpoints should be used in this tab.*

STEP 8: Review the spreadsheet, in particular the "Acceptable?" column (Column L), to determine if data can be used to calculate secondary values. Column L will automatically be labeled "Yes" if data are acceptable. In some cases, data is not flagged as acceptable because “Other" was selected as the "Test Method" (Column H). If this is the case, go to Step 9 in B (Acute-Optional) tab to determine if this data can be used in the calculation.



If Test Method is “Other”, go to Tab B (Acute-Optional).

B (ACUTE-OPTIONAL)

Note: This tab is used for data for which "Other" was selected as the "Test Method" (see Step 8).

STEP 9: (optional) Use the dropdown menus to select the test parameters used to generate the toxicity endpoint. All fields must be filled in before the data can be considered acceptable. Contact the Biomonitoring Coordinator with questions. Once completed, go to C (Acute) tab.

Toxicity Test Parameters	Water flea (Ceriodaphnia spp.)	Water flea (Daphnia spp.)	Water flea (Simocephalus spp.)	Fathead Minnow (Pimephales promelas)	Bluegill (Lepomis macrochirus)	Rainbow Trout (Oncorhynchus mykiss)
Temperature:		25±1 °C				
Dilution water:		20±1 °C / 25±1 °C / Other				
Number of test concentrations:		≥ 5 + control				
Dilution series setup:		≥0.5 dilution series				
Age of test organisms:		< 24 h				
Number of organisms/test chamber:		≥ 5				
Number of replicate chambers per concentration:		≥ 4				
Number of organisms per concentration:		≥ 20				
Data acceptable?	No	Yes	No	No	No	No

DON'T FORGET TO SAVE

C (ACUTE)

STEP 10: No action is necessary in this tab. MDE staff may wish to review to verify findings. All information is automatically entered into tab and a SAV is calculated. The final SAVs are highlighted in orange.

Taxa Category	Genus	Species	Common Name	Test Result mg/L	SMAV mg/L	GMAV mg/L	Designated Use Classification CW	WW	LFF	LAL
Planktonic Crustacean	Ceriodaphnia	dubia	Water flea		N/A	N/A	X	X	X	X
		reticulata	Water flea		N/A					
		serrulatus	Water flea		N/A					
	Daphnia	magna	Water flea	3.30	3.30	3.30	X	X	X	X
		pulex	Water flea		N/A					
	Simocephalus	serrulatus	Water flea		N/A	N/A	X	X	X	
		vetulus	Water flea		N/A					
Non-Salmonid Fish	Pimephales	promelas	Fathead minnow	8.70	8.70	8.70	X	X	X	
	Lepomis	Macrochirus	Bluegill	6.50	6.50	6.50	X	X	X	
Salmonid Fish	Oncorhynchus	mykiss	Rainbow trout	2.30	2.30	2.30	X			
	Salvelinus	fontinalis	Brook trout		N/A	N/A	X			
					SAF:		8			
					Lowest GMAV:		2.30	3.30	3.30	3.30
					Calculated SAV:		0.29	0.41	0.41	0.41
					Selected SAV:		0.288	0.413	0.413	0.413 mg/L
							287.5	412.5	412.5	412.5 µg/L

D (CHRONIC)

STEP 11: Determine whether chronic data have been submitted to MDE for review. If chronic data have been submitted, proceed to Step 12. If no chronic data is submitted, go to Step 16 ("Secondary Values Report" Tab). A secondary chronic value will be calculated using default parameters.

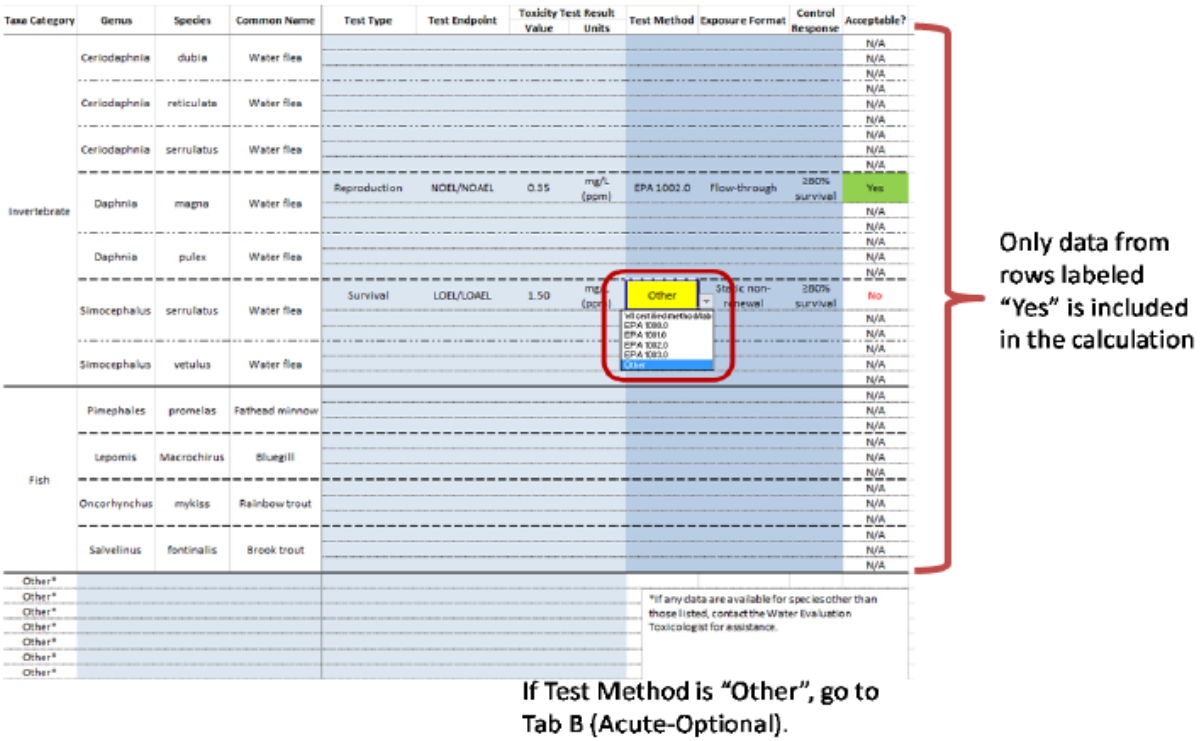
STEP 12: Use the dropdown menus to fill in the toxicity information provided from the SDS(s) and/or lab sheet(s). This should also include test method data provided by the lab.

Tip: Test method data may be available via lab reports or through lab correspondence. Work with the permittee to ascertain these data.

Tip: Contact the Water Evaluation Toxicologist if toxicity data are provided for species other than those listed in D (Chronic) tab.

Tip: Only long-term toxicity endpoints (e.g., NOAEL, LOAEL) should be used in this tab.

STEP 13: Review the spreadsheet, in particular the "Acceptable?" column (Column M), to determine if data can be used to calculate secondary values. Column M will automatically be labeled "Yes" if data are acceptable. In some cases, data is not flagged as acceptable because 'Other" was selected as the "Test Method" (Column I). If this is the case, go to Step 14 in E (Chronic-Optional) tab to determine if this data can be used in the calculation.



DON'T FORGET TO SAVE

E (CHRONIC-OPTIONAL)

Note: This tab is used for data for which "Other" was selected as the "Test Method" (see Step 13).

STEP 14: (optional) Use dropdown menus to select the test parameters used to generate the toxicity endpoint. All fields must be filled in before the data will be considered acceptable. Contact the Biomonitoring Coordinator with questions. Once completed, go to F (Chronic) tab.

Toxicity Test Parameters	Water flea (Ceriodaphnia spp.)	Water flea (Daphnia spp.)	Water flea (Simocephalus spp.)	Fathead Minnow (Pimephales promelas)
Test duration:	≤ 8 days			
Temperature:	20±1 °C			
Dilution water:	Synthetic water			
Number of test concentrations:	≥ 5 + control			
Dilution series setup:	≥0.5 dilution series			
Age of test organisms:	< 24 h			
Number of organisms/te chamber:	< 24 h / Other			
Number of replicate chambers per concentration:	≥ 10			
Number of organisms per concentration:	≥ 10			
Data acceptable?	**Yes**	**No**	**No**	**No**

F (CHRONIC)

STEP 15: No action is necessary in this tab. MDE staff may wish to review to verify findings. All information is automatically entered into tab and a SCV is calculated.

Taxa Category	Genus	Species	Common Name	SMAV mg/L	Chronic TEST Value mg/L	SMCV	SMACR	Designated Use Classification CW	WW	LFF	LAL	
Invertebrate	Ceriodaphnia	dubia	Water flea					X	X	X	X	
	Ceriodaphnia	reticulata	Water flea					X	X	X	X	
	Ceriodaphnia	serrulatus	Water flea					X	X	X	X	
	Daphnia	magna	Water flea	3	FALSE			X	X	X	X	
	Daphnia	pulex	Water flea					X	X	X	X	
	Simocephalus	serrulatus	Water flea		2.500	2.50		X	X	X	X	
	Simocephalus	vetulus	Water flea					X	X	X	X	
					Invertebrate SMACR:		18.00	(default)				
Fish	Pimephales	promelas	Fathead minnow	8.7				X	X	X		
	Lepomis	Macrochirus	Bluegill	6.5				X	X			
	Oncorhynchus	mykiss	Rainbow trout	2.3				X				
	Salvelinus	fontinalis	Brook trout					X				
					Fish SMACR:		18.00	(default)				
					Sensitive Freshwater Species SMACR:		9.43					
					SACR:			13.027	14.510	14.510	13.027	
					Selected SAV:			0.288	0.413	0.413	0.413	
					Calculated SCV:			0.022	0.028	0.028	0.032	
					Selected SCV:			0.02	0.03	0.03	0.03	mg/L

DON'T FORGET TO SAVE

SECONDARY VALUES REPORT

STEP 16: Return to "Secondary Values Report" Tab. The appropriate final secondary acute and chronic values are highlighted in orange.

Product Secondary Values			
Secondary Acute Value:	0.288	mg/L	← Used to calculate allowable application rate
Secondary Chronic Value:	0.02	mg/L	

STEP 17: The SAV is used to calculate an application rate using the appropriate conversion factors. Compare the allowable application rate to the proposed application rate to determine if the product can be used as proposed.

- For **Water Application for Sediment Control**, enter the proposed application rate.

Water Application for Sediment Control			Compare the proposed application rate to the allowable application rate
Proposed Application Rate:	3.00	lbs/acre-ft	
Allowable Application Rate:	**0.388**	**lbs/acre-ft**	

- For **Land Application for Erosion Control Products – Polymer or other soluble solid**, enter the proposed application rate.

Land Application for Erosion Control (Soluble Solid)			Compare the proposed application rate to the allowable application rate
Proposed Application Rate:	3.00	lbs/acre	
Allowable Application Rate:	**0.200**	**lbs/acre**	

Appendix B

Additive Review for Non-Soluble Additives

1. Introduction

Some additives, typically erosion control products, are composed of solid materials that are not soluble in water. Examples may include, but are not limited to, bonded fiber matrices (e.g. wood chips), certain flocculating agents, and certain soil stabilizers. Because these products contain materials that are not soluble in water, the primary ecological concern is not for organisms that live in the water column (i.e., fish) but for organisms that live in or near the sediment (e.g., amphipods, crustaceans). Therefore, the traditional, water-column toxicological testing methods are not appropriate for these types of additives. Instead, toxicity testing methods with sediment-dwelling species should be used.

2. Acceptable Toxicity Tests

Table B-1 lists the recommended test organisms, test type, test result, endpoint type, and test method for "non-soluble solid" additives.

Table B-1: Acceptable Whole Sediment Testing Methods for Common Test Species

Test Organism	Test Type	Test Result	Endpoint Type	Test Method
Ceriodaphnia dubia (Water flea)	48-hour	NOAEL	Survival	ASTM E1706-05 Section 13 Procedure 1
Daphnia magna (Water flea)				
Hyalella azteca (Amphipod)	10-day	NOAEL	Survival and/or Growth	ASTM E1706-05 Annex A2 Section 2.5.2.1
NOAEL – no observable adverse effect level				

In these tests, the erosion control product is used in place of the "whole sediment", since this is a close surrogate of how the product would exist in an aquatic environment.

> <u>Note</u>: *Toxicity tests are to be conducted on the "commercial product formulation", which is all active ingredients and any and all carriers, buffering agents, binding agents, non-soluble solids, and additional materials (i.e. the entire product as used). Toxicological information related to "active ingredient" alone is not sufficient.*

For these products, a secondary value is not derived. Instead, the highest test concentration that causes no mortality (i.e., the no observable adverse effect level-NOAEL) is used as the acceptable maximum application concentration.

> <u>Note</u>: *To determine the highest concentration that causes no mortality, several concentrations may need to be tested. It is recommended to start with the maximum proposed application concentration and use a 0.5 dilution factor to select other concentrations if necessary.*

MDE Staff then determines the allowable application rate in lbs/acre·ft (as necessary):

- For application directly to water, multiply the allowable usage rate concentration (mg/L) by (1.35 lbs/acre·ft)/(mg/L).

- For application to land (if allowable), multiply the allowable usage rate concentration (mg/L) by (lbs/acre·ft)/(1.4 mg/L).
- The final application rate is compared to the proposed application rate to determine if the product can be used as requested.

3. Specific Toxicity Test Process

At least two toxicity tests should be run-each with appropriate controls. Therefore, a sufficient amount of land applied erosion control product should be prepared to be used in:

- At least one 10-day acute *Hyalella azteca* whole sediment test, and/or
- At least one 2-day acute overlying water test with *Ceriodaphnia dubia*, and/or
- At least one 2-day acute overlying water test with *Daphnia magna*.

Additional considerations:

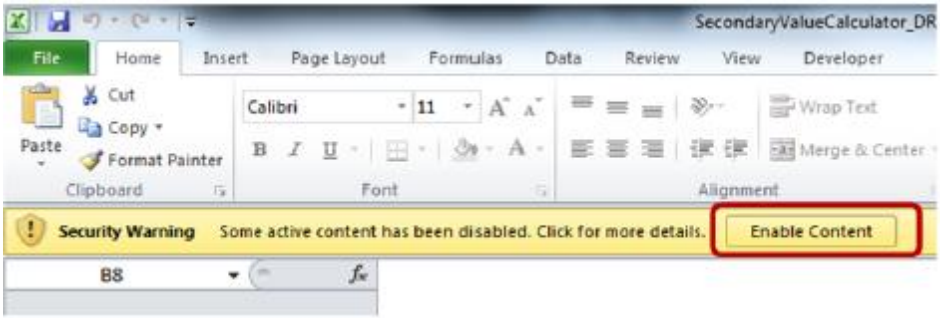
- Replace any reference to "sediment" in any of the methods above with the erosion control product.
- For the water flea tests, slight modifications of the methods can be used to get the erosion control product into the test chamber (e.g. chamber size, use of syringe to dispense product, etc.). However, the 1:4 sediment to water ratio should be maintained. If a modification is used, what was changed and how should be noted and included into the toxicity test results submitted to MDE
- Immobility of test organisms in the test treatments due to the physical nature of the product (such as in viscous polymer) shall be considered as equivalent to death for the purpose of these tests.

4. Instructions for Using the Secondary Value Calculator for Non-Soluble Additives

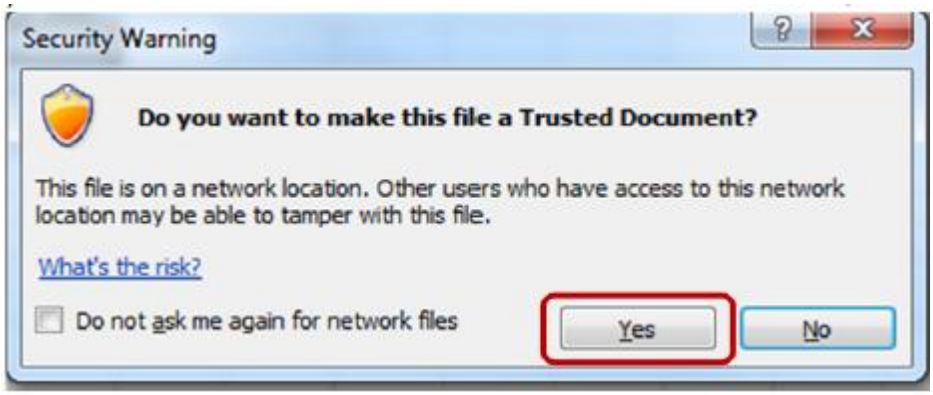
SECONDARY VALUES REPORT

This is the first sheet that should come up when you open the spreadsheet.

STEP 1: In the “Macros has been disabled” box, select “Enable Content.”



STEP 2: In the "Do you want to make this file a Trusted Document?" box, select "Yes."

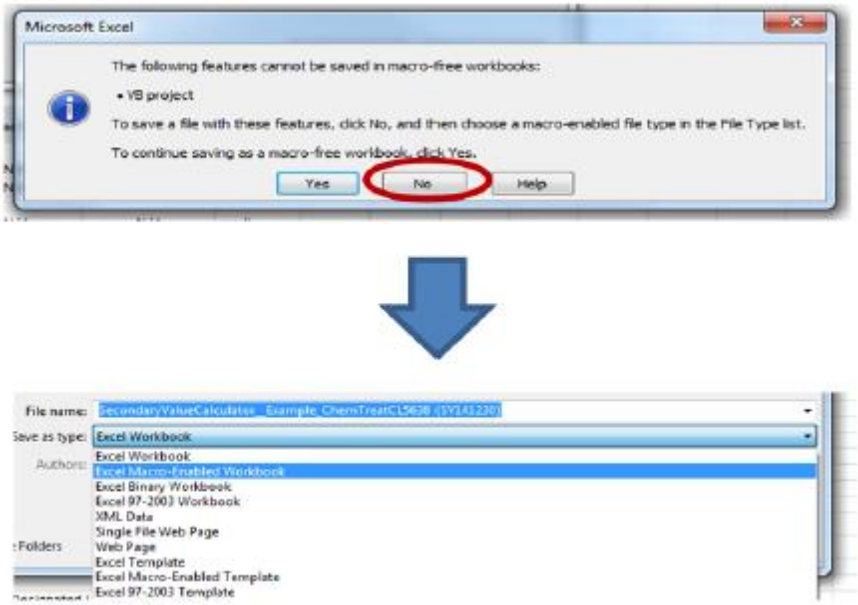


STEP 3: Save the document in the appropriate subfolder in the IDP Folder on the M Drive under a new name using the format: (Date DDMonthYR) (Product Name) (Permit Number)

- Example File Name: 18Mar19 Chemical XYZ 17HT1234

Tip: *If storage of additional files (product information, SDS, etc.) is needed, create a new folder within the subfolder and use the same file name format for the folder name. Store all data including the spreadsheet within the newly created folder.*

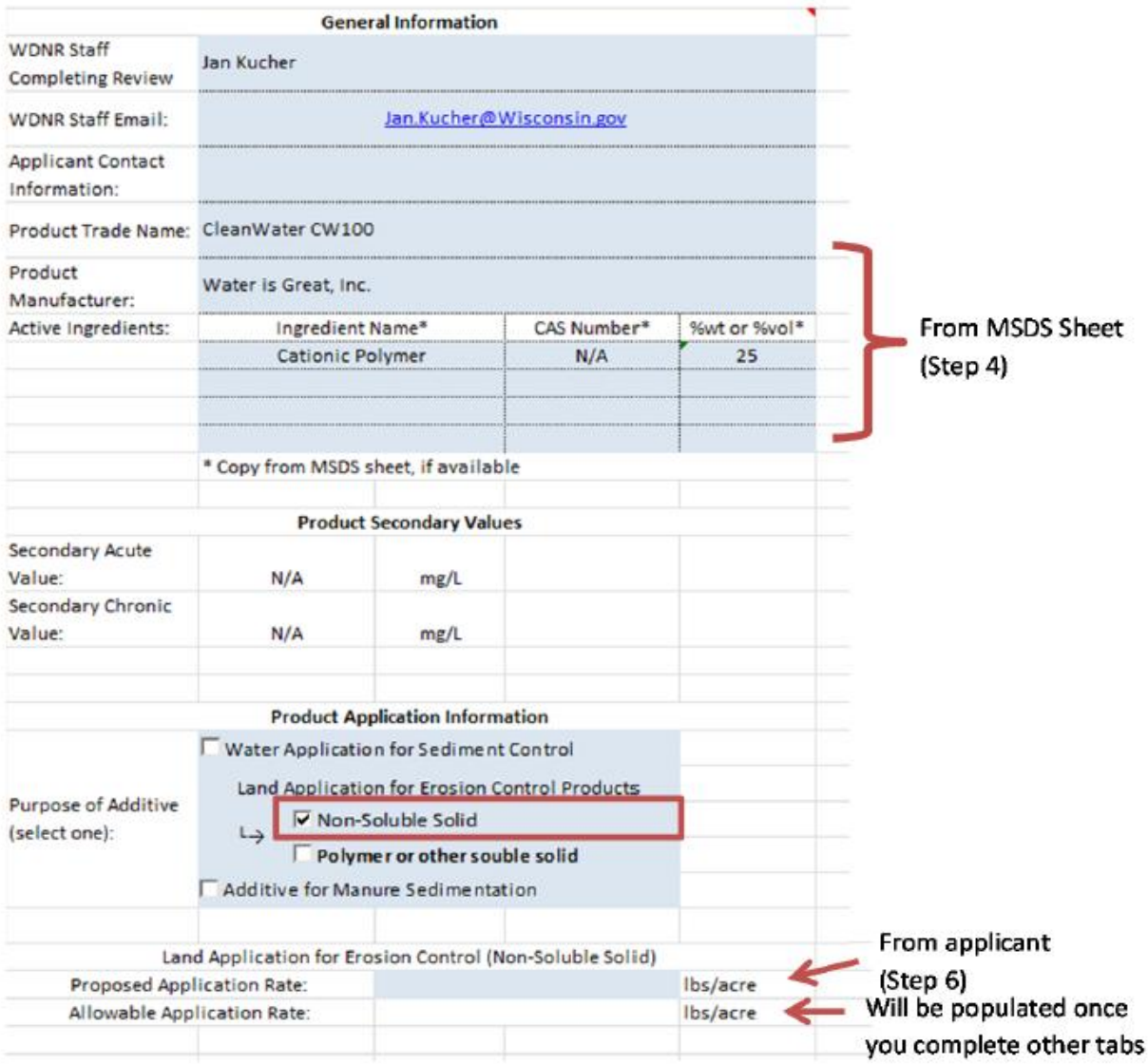
Tip: *If you get an error when trying to save (see image of the box below), click "No" and select "Excel Macro-Enabled Workbook" under "Save as Type."*



STEP 4: In the "General Information" section, fill in all highlighted cells for which you have data. You will likely need to refer to previous permit documents, TEMPO data, and SDS's to complete this tab.

STEP 5: For "Purpose of Additive," select the "Non-Soluble Solid" box.

STEP 6: In the "Product Application section, enter the proposed application rate.



General Information			
WDNR Staff Completing Review	Jan Kucher		
WDNR Staff Email:	Jan.Kucher@Wisconsin.gov		
Applicant Contact Information:			
Product Trade Name:	CleanWater CW100		
Product Manufacturer:	Water is Great, Inc.		
Active Ingredients:	Ingredient Name*	CAS Number*	%wt or %vol*
	Cationic Polymer	N/A	25
	* Copy from MSDS sheet, if available		

From MSDS Sheet (Step 4)

Product Secondary Values		
Secondary Acute Value:	N/A	mg/L
Secondary Chronic Value:	N/A	mg/L

Product Application Information

Purpose of Additive (select one):

- ☐ Water Application for Sediment Control
- Land Application for Erosion Control Products
  - ↳ ☑ Non-Soluble Solid
  - ☐ Polymer or other souble solid
- ☐ Additive for Manure Sedimentation

Land Application for Erosion Control (Non-Soluble Solid)		
Proposed Application Rate:		lbs/acre
Allowable Application Rate:		lbs/acre

From applicant (Step 6)

Will be populated once you complete other tabs

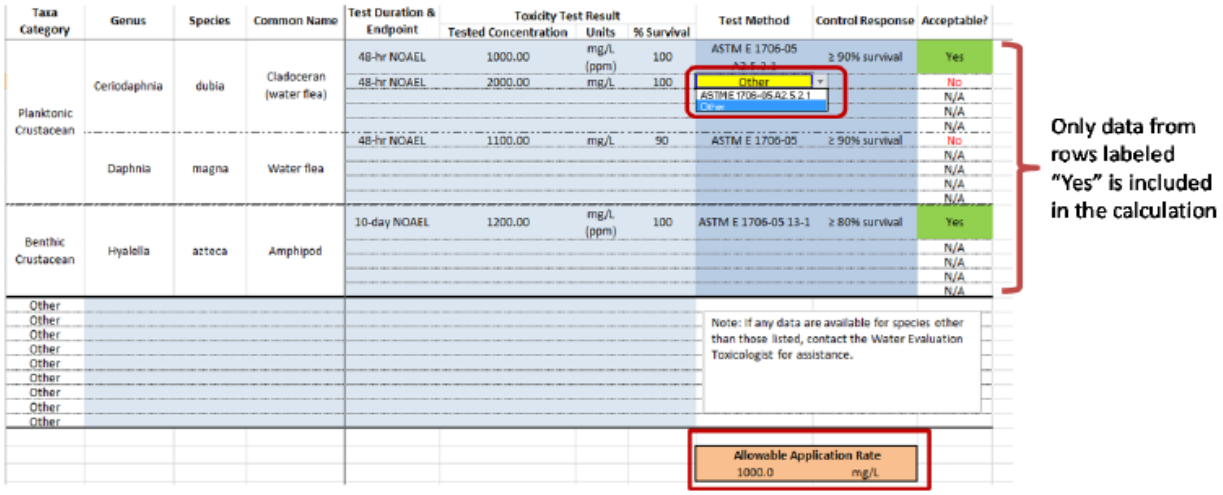
NON-SOLUBLE ADDITIVES

STEP 7: Use the dropdown menus to fill in the toxicity information provided from the SDS(s) and/or lab sheet(s). This should also include test method data provided by the lab. Tip: Test method data may be available via lab reports or through lab correspondence. Work with the applicant to ascertain these data.

Note: Only the species and toxicity endpoints listed in this tab may be used to review non-soluble solid additives.

STEP 8: Review the spreadsheet, in particular the "Acceptable?" column (Column L), to determine if data can be used to calculate secondary values. Column L will automatically be labeled "Yes" if data are acceptable. In some cases, data is not flagged as acceptable because ,'Other" was selected as the "Test Method" (Column l). If this is the case, contact the Biomonitoring Coordinator for assistance.

STEP 9: Once the acceptable information has been entered, the spreadsheet will automatically calculate the allowable application rate.



If Test Method is "Other", contact the Water Evaluation Toxicologist for assistance.

SECONDARY VALUES REPORT

STEP 10: Compare the allowable application rate to the proposed application rate to determine if the product can be used as proposed.

Product Application Information		
Purpose of Additive:	☐ Water Application for Sediment Control	
	Land Application for Erosion Control Products	
	↳ ☑ Non-Soluble Solid	
	↳ ☐ **Polymer or other souble solid**	
	☐ Manure Additive for Nutrient Management	

Land Application for Erosion Control (Non-Soluble Solid)		
Proposed Application Rate:	3.00	lbs/acre
Allowable Application Rate:	**1000**	**lbs/acre**

Compare the proposed application rate with the allowable application rate

DON'T FORGET TO SAVE

5. References

ASTM E 1706-05, "Standard Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates", in Annual Book of ASTM Standards 2005, Section 11 Water and Environmental Technology, vol. 11.05, Biological Effects and Environmental Fate; Biotechnology; Pesticides. ASTM International, West Conshohocken, PA, pp. 1151-1268.

Appendix C

Additive Review Request Worksheet

Additive Review Worksheet

This worksheet supplements the *Procedures for Review of Chemical Additives for Sediment Control* document by summarizing the information to be submitted to MDE for review and approval decisions relating to water and land-applied treatment additives. This information is required because additives are approved on a case-by-case basis.

The fields highlighted in blue are required for all additive reviews.

Parts D and E need to be completed **for each species** for which a toxicity test is conducted.

The fields highlighted in green are required for toxicity tests conducted when "Other" is selected for Test Method in Part D-1.

Note: Toxicity test results must address the ***commercial product formulation***. The commercial product formulation is all active ingredients and any and all carriers, buffering agents, binding agents, and additional materials – the entire product as used. Information related to active ingredient alone is not sufficient**.**

Notes:

1. For an additive review to be performed, at least one toxicity test for a water flea species is required.
2. Provide a letter from the manufacturer to confirm that the additive contains less than 0.05% by weight of acrylamide (NSF/ANSI Standard 60, and 40 CFR 141.111).
3. Include the Safety Data Sheet.

A. General Production Information

Date of Request:	
Applicant Contact Information:	
Product Trade Name:	
Product Manufacturer:	

Active Ingredients:

Ingredient Name*	CAS Number**	%wt or % vol

* Must be provided unless noted to be proprietary information
** If available

Is this product replacing another additive (if yes, include product name)?	☐Yes	☐No
	Current Product Name:	

B. Dosage or Application Information

Purpose of additive:			
Proposed application rate (expressed in lb/acre for land and lbs/acre-ft for water applications):		lb/acre lb/acre-ft	Runoff management applicants
Proposed dosage rate:		lbs/day mg/L	Wastewater permittees
Estimated maximum discharge concentration:		lbs/day mg/L	

C. Toxicity Test Results

Test Species	Toxicity Value Type	Toxicity Value	Toxicity Value Units
Select from list	Select from list		Select from list
Select from list	Select from list		Select from list
Select from list	Select from list		Select from list
Select from list	Select from list		Select from list

D. Toxicity Test Parameters (Species: Select from list**)**

1. Parameters needed for **ALL** reviews

Test method:	☐ WI certified WET testing lab/method ☐ EPA method (Method: Select from list) ☐ Other (additional information needed; see part D2)
Test type:	☐ Static non-renewal ☐ Static-renewal ☐ Flow-through
Control response:	☐ ≥ 90% survival ☐Other (Note: if this is selected, this data cannot be used)

2. Parameters needed when using "**other**" test methods

Dilution water:	☐Moderately hard synthetic water ☐Synthetic water ☐Receiving water ☐Ground water ☐Other (Specify:)
Number of test concentrations:	enter text here
Dilution series:	☐ ≥ 0.5 ☐ Other (Specify:)
Water chemistry analyses (check all that apply):	☐ pH ☐ Conductivity ☐ Hardness ☐ Alkalinity
Temperature:	Choose an item. (If other, specify:)
Number of organisms per test chamber:	
Number of replicate chambers per concentration:	
Number of organisms per concentration:	
Method for calculating the response endpoint:	

If additional species have been tested, copy the above table (Part D) and paste on a separate page.