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Flexibilities for States Applying EPA's Ammonia Criteria Recommendations

Background

The U.S. Environmental Protection Agency (EPA) is updating its 1999 Clean Water Act (CWA) § 304(a) national ambient water quality criteria recommendations for ammonia to account for the sensitivity of freshwater mussels and snails to ammonia toxicity. The updated criteria recommendations reflect new science on juvenile mussels and gill-bearing, non-pulmonate snails. Through extensive peer review processes, reviewers agreed on the quality and acceptability of the new data EPA included in the quantitative derivations of the updated recommendations. The criteria recommendations for ammonia apply to all freshwaters for the protection of the aquatic community, including both freshwater mussels and snails.

Freshwater mussels are highly sensitive to ammonia toxicity and represent the most sensitive species in the dataset for the criteria recommendations. New science has demonstrated that freshwater snails are also sensitive to ammonia toxicity. Both mussels and snails are important to the environment because they serve as food sources for other organisms in the food web and provide vital services in improving and maintaining water quality. Specifically, mussels are filter feeders and can filter nutrients, toxics, and other pollutants out of the water, thereby helping to control the levels of these pollutants and reduce exposure to humans and other aquatic organisms. Snails feed on organic debris including algae, which helps to reduce the effects of eutrophication and keeps bottom substrates clean for other benthic organisms.

Flexibilities for Applying EPA's Ammonia Criteria Recommendations

This section describes some of the flexibilities that states[1] may want to consider in adoption and application of EPA's ammonia criteria recommendations. These flexibilities include the Recalculation Procedure for site-specific criteria derivation, variances, revisions to designated uses, dilution allowances, and compliance schedules.

1. Recalculation Procedure for Site-specific Criteria Derivation

The water quality standards (WQS) regulation at 40 CFR § 131.11(b)(1)(ii) provides states with the opportunity to adopt water quality criteria that are "…modified to reflect site-specific conditions." As with any criteria, site-specific criteria must be based on a sound scientific rationale in order to protect the designated use and are subject to review and approval or disapproval by EPA.

[1] Throughout this document, the term "states" refers to authorized tribes and U.S. territories in addition to states.

The Recalculation Procedure for site-specific criteria derivation is intended to allow site-specific criteria that differ from national criteria recommendations (i.e., concentrations that are higher or lower than national recommendations) where there are demonstrated differences in sensitivity between the aquatic species that occur at the site and those that were used to derive the national criteria recommendations. The national dataset may contain aquatic species that are sensitive to a particular pollutant, but these or comparably sensitive species might not occur at the site (e.g., freshwater mussels are included in the national ammonia dataset but may not be present at a particular site). On the other hand, a species that is critical at the site might be sensitive to the pollutant and require site-specific criteria that are lower than the national recommended criteria.

In the case of ammonia, where a state can demonstrate that mussels are not present on a site-specific basis, the Recalculation Procedure may be used to remove the mussel species from the national criteria dataset to better represent the species present at the site.

For example, many of the commonly occurring freshwater bivalves (e.g., pea clam) are more closely related to the non-unionid fingernail clam *Musculium* (which is the fourth most sensitive genus in the national dataset for the chronic criterion) than to the unionid mussels *Lampsilis* and *Villosa* (which are the two most sensitive genera in the national dataset for the chronic criterion). At sites where all bivalves present are more closely related to *Musculium* than to *Lampsilis* and *Villosa* (i.e., where unionid mussels are not present at the site), the Recalculation Procedure may be used to remove *Lampsilis* and *Villosa* from the dataset because they would not be representative of the species present at the site.[2] The retention of *Musculium* in the dataset would represent the other non-unionid bivalves present at the site, so the non-unionid bivalves would still be protected if *Lampsilis* and *Villosa* were removed from the dataset. However, at sites where both unionid and non-unionid bivalves are present, all three bivalves in the national dataset (i.e., *Lampsilis*, *Villosa*, and *Musculium*) would be retained because they would represent the species present at the site. The Recalculation Procedure describes how to compare the taxonomy of species present at the site with the taxonomy of species in the national dataset.

The number of tested genera (N) in the criteria calculations must be updated where genera such as *Lampsilis* and *Villosa* are removed from the dataset. For example, if only the two unionid mussels are removed from the dataset for the national chronic ammonia criterion, N would be reduced from 16 genera in the national dataset to 14 genera in the site-specific dataset.

Freshwater snails are another sensitive species used in the criteria derivation. However, they are ubiquitous in the environment and, therefore, not likely to be deleted from the dataset in a criteria recalculation.

As with any criteria, states choosing to utilize the Recalculation Procedure should ensure that their site-specific criteria "…provide for the attainment and maintenance of the water quality standards of downstream waters." 40 CFR § 131.10(b). In addition, states should consider how they will demonstrate that mussels are not present at the site before selecting this approach. For

[2] With removal of *Lampsilis* and *Villosa* from the national dataset, the Recalculation Procedure would result in criteria (and associated water quality-based effluent limits (WQBELs) based on such criteria) with higher concentrations than EPA's recommendations but that are still protective of the designated use.

additional information on the Recalculation Procedure, see EPA's *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria* at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/index.cfm. For additional information on site-specific water quality criteria, see EPA's *Water Quality Standards Handbook* at http://www.epa.gov/wqshandbook.

2. Variances

The WQS regulation at 40 CFR § 131.13 authorizes states, at their discretion, to "…include in their [s]tate standards, policies generally affecting their application and implementation, such as mixing zones, low flows and *variances* [emphasis added]. Such policies are subject to EPA review and approval."

A variance may be described as a time-limited designated use and criteria that target a specific pollutant(s), source(s), waterbody(ies) and/or waterbody segment(s). As first articulated in 1977, a state may adopt a variance and applicable criteria where the state can satisfy the same substantive and procedural requirements as a designated use removal.[3] Therefore a variance must be supported by one of the factors at § 131.10(g) demonstrating that the current designated use and criteria are unattainable at the present time. In addition, because a variance is a revision to WQS, it requires review and approval or disapproval by EPA. Variances are different from revisions to designated uses (described below) in that variances are time-limited and intended to be a mechanism to provide time for states, dischargers, and other stakeholders to implement adaptive management approaches that are aimed at improving water quality and ultimately attaining the designated use.

A discharger may be interested in a variance where 1) the National Pollutant Discharge Elimination System (NPDES) permitting authority has determined that there is reasonable potential for the discharger to cause or contribute to an excursion above a newly adopted ammonia criterion and 2) the state and discharger can show, based on §131.10(g), that the designated use and criteria for the particular waterbody or segment are unattainable immediately or within a limited period of time because the discharger cannot meet its new ammonia WQBELs. In such a case, the state may adopt a discharger-specific variance as long as the variance is consistent with the CWA and implementing regulations. The practical effect of such a variance is that the discharger's NPDES permit may be written to comply with a less stringent designated use and criteria.

In the case of ammonia, the variance demonstration would likely be based on § 131.10(g)(6), which allows a use to be removed where water quality-based controls "…would result in substantial and widespread economic and social impact." If a state successfully demonstrates that § 131.10(g)(6) precludes attainment of the use and ammonia criteria immediately or within a limited period of time, the state may establish interim ammonia criteria that would allow the

[3] US EPA. March 29, 1977. *Office of General Counsel on Matters of Law Pursuant to 40 CFR Section 125.36(m). No. 58.* U.S. Environmental Protection Agency. Washington, D.C. Available at: http://water.epa.gov/scitech/swguidance/standards/upload/2008_08_04_standards_section40cfr3.pdf; and EPA's *Water Quality Standards Handbook*. Available at: http://www.epa.gov/wqshandbook.

discharger's new WQBELs to be adjusted for ammonia only. See EPA's *Interim Economic Guidance for Water Quality Standards: Workbook* (March 1995, EPA-823-B-95-002, http://water.epa.gov/scitech/swguidance/standards/economics/index.cfm) for guidance on the types of information that a state should consider and include in its record to support a variance based on § 131.10(g)(6).

Typically, a state adopts a variance for an individual discharger for a specific pollutant in a specific waterbody. However, where multiple dischargers have similar attainment challenges, a state may streamline its variance process by adopting a multiple discharger variance. Such a variance would apply to several dischargers and may be supported by a single technical rationale justifying the need for a variance. EPA has previously published information on individual and multiple discharger variances in *Water Quality Guidance for the Great Lakes System* (60 FR 56 (March 23, 1995) p. 15366, 40 CFR § 132). For additional information on variances, also see *Discharger-Specific Variances on a Broader Scale: Developing Credible Rationales for Variances that Apply to Multiple Dischargers* (March 2013, EPA-820-F-13-012, http://water.epa.gov/scitech/swguidance/standards/library/) and EPA's *Water Quality Standards Handbook* at http://www.epa.gov/wqshandbook.

3. Revisions to Designated Uses

The WQS regulation at 40 CFR § 131.10(g) provides that "[s]tates may remove a designated use… or establish sub-categories of a use if the [s]tate can demonstrate that attaining the designated use is not feasible…" because of at least one of the six specified factors. The state would make such a demonstration through a use attainability analysis (UAA). A UAA is defined under § 131.3(g) as "…a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in § 131.10(g)." A UAA must be conducted where the state designates or has designated uses that do not include a CWA § 101(a)(2) use, where the state wants to remove a designated use that is also a § 101(a)(2) use (e.g., aquatic life use), or where the state wants to adopt subcategories of a § 101(a)(2) use that require less stringent criteria. 40 CFR § 131.10(j).

In the case of ammonia, a UAA would likely be based on the factor described in § 131.10(g)(6), which allows a use to be removed where water quality based controls "…would result in substantial and widespread economic and social impact." For guidance on the types of information that a state should consider and include in its record to support a use revision based on § 131.10(g)(6), see EPA's *Interim Economic Guidance for Water Quality Standards: Workbook* (March 1995, EPA-823-B-95-002, http://water.epa.gov/scitech/swguidance/standards/economics/index.cfm).

While the WQS regulation allows states to remove uses that are not feasible to attain, it does not allow states to remove uses that are feasible to attain. Therefore, states must retain/adopt such feasible uses (i.e., the highest attainable use) in their state WQS. 40 CFR 131.10(g) and (h). States have the flexibility to determine how to articulate attainable uses in their WQS. For example, to the extent allowed by state law, the state could refine its designated use from "aquatic life" to "ammonia-limited aquatic life" where ammonia is the parameter preventing

attainment of the full aquatic life use. In this situation, the state could then revise its ammonia criteria to protect the ammonia-limited aquatic life use while retaining the other pollutant criteria designed to protect the full aquatic life use.[4]

For additional information on use changes and UAAs, see EPA's *Water Quality Standards Handbook* at http://www.epa.gov/wqshandbook. Additional information is also available at http://water.epa.gov/scitech/swguidance/standards/uses/uaa/.

4. Dilution Allowances

The NPDES permitting regulation at 40 CFR § 122.44(d)(1)(ii) states that "[w]hen determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criterion within a [s]tate water quality standard, the permitting authority shall use procedures which account for…where appropriate, the *dilution* [emphasis added] of the effluent in the receiving water."

Many state WQS have general provisions allowing some consideration of dilution when determining the need for and calculating WQBELs. A dilution allowance is typically expressed as the flow of a river or stream, or a portion thereof, that is allowed to mix with and dilute effluent before water quality criteria must be met. Under incomplete mixing situations, the dilution allowance is typically expressed as a dilution factor determined from a regulatory mixing zone. State WQS and implementation policies often describe the conditions under which dilution is allowed and might also indicate specific locations or conditions (e.g., breeding grounds for aquatic species or bathing beaches) or specific water quality criteria (e.g., pathogens, bioaccumulative pollutants, or carcinogenic pollutants) for which consideration of a dilution allowance is not allowed or is otherwise considered inappropriate. For additional information on dilution, see sections 6.2.2 and 6.2.5 of EPA's *NPDES Permit Writers' Manual* (September 2010, EPA-833-K-10-001, http://www.epa.gov/npdes/pwmanual), sections 2.2.2, 4.4, and 4.5 of *Technical Support Document for Water Quality-based Toxics Control* (March 1991, EPA/505/2-90-001, http://www.epa.gov/npdes/pubs/owm0264.pdf) , and *Water Quality Standards Handbook* at http://www.epa.gov/wqshandbook.

The amount of dilution a particular discharger has available for calculating WQBELs depends on the applicable water quality criteria as well as the instream ambient concentration of ammonia. Taking into consideration flow conditions and ambient ammonia concentrations throughout the watershed may be useful to identify and address all sources of ammonia to a waterbody. For more information on this watershed approach, see EPA's watershed approach resources at http://water.epa.gov/type/watersheds/approach.cfm.

[4] See 40 CFR § 131.20(a) for review and revision requirements when new information indicates that the previously unattainable uses specified in § 101(a)(2) of the CWA are now attainable.

5. Compliance Schedules

Permit compliance schedules, along with variances, are the most common regulatory tools used by states to provide dischargers with time to meet regulatory requirements. Which tool is appropriate depends upon the circumstances. Variances can be appropriate to address situations where it is known that the designated use and criteria are unattainable immediately or within a limited period of time, but feasible progress could be made toward attaining the designated use and criteria. In contrast, a permit compliance schedule may be appropriate when 1) the designated use is attainable, 2) the discharger's WQBELs are achievable, and 3) the discharger needs time to modify or upgrade treatment facilities in order to meet its WQBELs such that a schedule and resulting milestones will lead to compliance with the WQBELs (which are based on the currently applicable WQS) "as soon as possible." See § 502(17) of the CWA for a definition of "schedules of compliance" and 40 CFR § 122.47.

Compliance schedules in NPDES permits can be used to meet WQBELs based on WQS adopted after July 1, 1977, if the state has clearly indicated in its WQS or implementing regulations that it intends to allow the use of permit compliance schedules for the pollutant of concern. A compliance schedule may be included in a permit with WQBELs for ammonia where (1) the discharger requires time to install treatment technology or implement other controls necessary to meet the new WQBELs and (2) the permitting authority (which is the state in most cases) determines that a compliance schedule is "appropriate" in light of all the circumstances and that the discharger can ultimately meet its new ammonia WQBELs by an "as soon as possible" date certain in the future. To ensure that the compliance schedule is enforceable by the permitting authority, the schedule must consist of a sequence of interim requirements, actions, or operations leading to compliance with the CWA and its implementing regulations. 40 CFR § 122.2. If the schedule is longer than one year, the schedule must include annual interim requirements and dates for their achievement. 40 CFR § 122.47(a)(3). Additionally, the permit must include a final WQBEL and a date for its achievement. The decision to include a compliance schedule as well as all of the dates and interim requirements must be supported by the administrative record. The permit fact sheet should include a justification explaining why the compliance schedule was determined to be "appropriate" and why the chosen time frame was deemed "as soon as possible." For additional information on compliance schedules, see section 9.1.3 of EPA's *NPDES Permit Writers' Manual* (September 2010, EPA-833-K-10-001, http://www.epa.gov/npdes/pwmanual) and *Compliance Schedules for Water Quality-based Effluent Limitations in NPDES Permits* (May 2007, http://www.epa.gov/npdes/pubs/memo_complianceschedules_may07.pdf).

Flexibility Framework for States Applying EPA's Ammonia Criteria Recommendations

The above flexibilities are available to assist states in considering the adoption and application of EPA's ammonia criteria recommendations. In a given situation, a state may want to employ multiple flexibilities depending on the particular circumstances. For example, a state may decide that only a variance is appropriate in one situation while the Recalculation Procedure, a dilution

allowance, and a compliance schedule are appropriate in a different situation. Figures 1 and 2 display the components of the Framework for States Applying EPA's Ammonia Criteria Recommendations (Framework) and help to guide states in determining which flexibility or combination of flexibilities is available in a particular situation. Figure 1 focuses on the WQS adoption process, and Figure 2 focuses on WQS application.

Utilizing Flexibilities in the Water Quality Standards Adoption Process

The first section of the Framework displays the process by which states may evaluate the ammonia criteria recommendations and under what circumstances a state may want to utilize the Recalculation Procedure, variances, or revisions to designated uses:

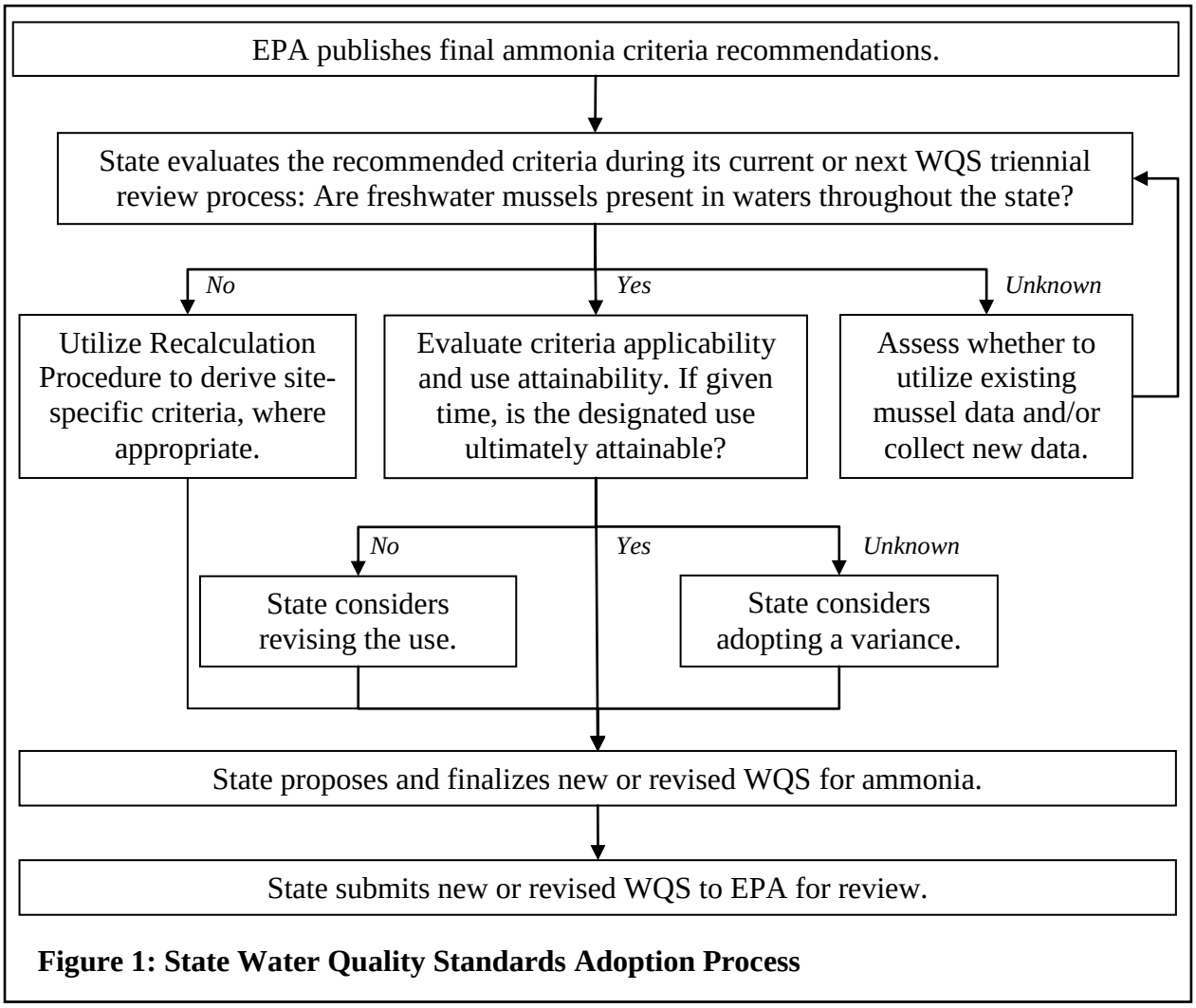

Figure 1: State Water Quality Standards Adoption Process

CWA § 303(c)(1) and EPA's WQS regulations at 40 CFR § 131.20(a) provide that states review their WQS every three years and modify and adopt standards, as appropriate. With the publication of EPA's final ammonia criteria recommendations, states should consider the availability of these new data and criteria recommendations during their current or next WQS triennial review.[5] States should consider adopting the recommendations to protect the aquatic life uses in their waters.

One main consideration in adoption of ammonia criteria is the presence of mussels throughout state waters. If mussels are present throughout the state, states may want to consider whether aquatic life designated uses can be attained in their waterbodies as part of the state WQS adoption process. That way, if a variance or revision to a designated use is warranted, the state can include those actions as part of the WQS revisions to better facilitate application of the criteria. If the state concludes that the designated use is unattainable, the state should then consider whether the use is unattainable within a limited period of time or if the use is ultimately unattainable in the long term. Where the use is unattainable within a limited period of time or where attainability is unknown, the state may want to consider adopting a variance. Where the use is ultimately unattainable, the state may want to consider revising the designated use and criteria necessary to protect the revised use.

Where mussels are not present throughout the state, states may want to consider utilizing the Recalculation Procedure on a site-specific or watershed basis where the state can demonstrate that freshwater mussels are not present at a particular site or in a particular watershed. Before choosing this approach, the state should consider how it will demonstrate that mussels are not present at the site. If the state is unsure whether mussels are present at a particular site or in a particular watershed, the state should assess whether to utilize existing mussel distribution data and/or collect new data to determine whether mussels are present and adopt criteria that are protective of the use. As with any criteria, states choosing to utilize the Recalculation Procedure should ensure that their site-specific criteria "…provide for the attainment and maintenance of the water quality standards of downstream waters." 40 CFR § 131.10(b).

Utilizing Flexibilities in Water Quality Standards Application

The second section of the Framework outlines the process by which the ammonia criteria, as adopted into state WQS, may be applied in the NPDES permitting, monitoring, assessment, listing, and Total Maximum Daily Load (TMDL) programs:

[5] In addition to ammonia criteria, if a state is also considering adoption of criteria for total nitrogen (TN), it is important to note that the two parameters and their treatment processes are linked. A full biological nutrient removal (BNR) process of nitrification and denitrification will provide treatment for both parameters, as ammonia is one component of TN (TN is the sum of nitrate, nitrite, *ammonia*, and organic nitrogen). BNR systems that are designed to remove TN can be used to remove some ammonia, but ammonia treatment alone is not sufficient to remove TN. Where the state plans to adopt criteria for both ammonia and TN, dischargers within the state may be required to meet WQBELs for both parameters and may see long-term cost savings by planning treatment upgrades for both parameters up front.

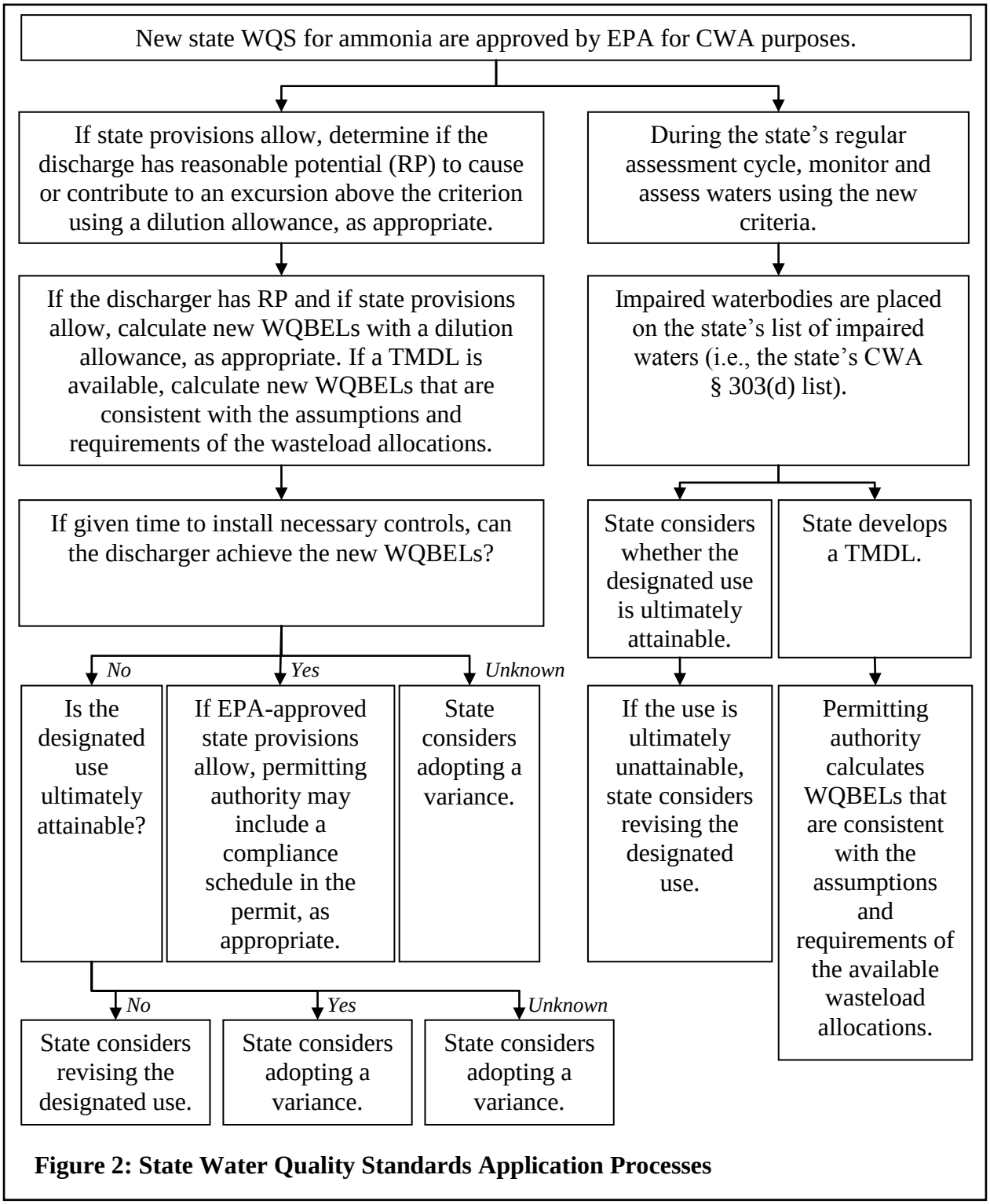

Figure 2: State Water Quality Standards Application Processes

Water Quality Standards Application in NPDES Programs

Once a state's new ammonia criteria have been submitted to and approved by EPA, the permitting authority (which is the state in most cases) can begin to apply the new criteria in its NPDES permits. Permitting authorities typically revise permits based on new criteria at the time of permit reissuance.[6] The permitting authority should determine whether the state WQS allow for consideration of dilution and, if so, whether dilution is available in the discharger's receiving water. If the state allows for dilution and dilution is available in the receiving water for a specific discharger, the permitting authority may determine the need for ammonia WQBELs (i.e., a "reasonable potential" or RP analysis) and calculate WQBELs, if necessary, using a dilution allowance.[7] However, if the state does not allow for consideration of dilution and/or dilution is not available in the discharger's receiving water, the permitting authority should determine RP and calculate WQBELs, if necessary, without consideration of a dilution allowance (i.e., at the end-of-pipe). If a state does not currently have a provision allowing for dilution, the state may want to consider adopting such a provision.

The permitting authority should also determine whether the state WQS allow for the use of compliance schedules in NPDES permits. The permitting authority may consider including a compliance schedule in the discharger's permit if 1) the state has an EPA-approved authorizing provision for compliance schedules in its WQS or implementing regulations and 2) the discharger can meet its new WQBELs for ammonia but requires time to install treatment technology or implement other controls necessary to meet its new WQBELs.[8] However, the permitting authority may not include a compliance schedule in the permit if the state does not have an EPA-approved authorizing provision for compliance schedules in its WQS or implementing regulations or where the discharger is already capable of meeting its new ammonia WQBELs without additional time to install treatment technology or implement other controls. The state may want to consider adopting a provision to authorize the use of compliance schedules if the state does not currently have such a provision. Any such provision must be submitted to EPA for review and approval or disapproval under § 303(c) of the CWA.

As previously explained in the WQS adoption process, where the state concludes that the designated use is unattainable within a limited period of time or attainability is unknown, the state may consider adopting a variance. Where the current designated use is ultimately unattainable, the state may want to consider revising the designated use and associated criteria necessary to protect the new designated use.

[6] The maximum permit term for an NPDES permit is five years.

[7] The NPDES permitting regulation at 40 CFR § 122.44(d)(1)(i) requires that permit limits control pollutants that "…are or may be discharged at a level which will cause, have the *reasonable potential* [emphasis added] to cause, or contribute to an excursion above any [s]tate water quality standard…"

[8] Where a state adopts ammonia criteria into its WQS and a reasonable potential analysis shows that WQBELs are necessary for a particular discharger, treatment technology upgrades would reduce the ammonia levels in the effluent and, combined with a permit compliance schedule where appropriate, would assist the discharger in achieving new ammonia WQBELs. The treatment technology to remove ammonia may be a combination of biological, physical, or chemical processes. The biological process of nitrification present in BNR technology is a primary method used to remove ammonia to certain levels by converting it to nitrate.

On a parallel track, once a state's new ammonia criteria have been submitted to and approved by EPA, the state can begin to monitor and assess waters using its new criteria during its regular assessment cycle. If a waterbody is determined to be impaired and placed on the state's list of impaired waters (i.e., the state's CWA § 303(d) list), the state must develop a TMDL for that waterbody. The permitting authority can then calculate new ammonia WQBELs that are consistent with the assumptions and requirements of the wasteload allocations established in the TMDL. Concurrent with the TMDL development process, the state may also want to assess whether the designated use is ultimately attainable, as the TMDL development process may inform a UAA. If the use is ultimately unattainable, the state may want to consider revising the designated use and associated criteria necessary to protect the new designated use.

Summary

EPA is updating its 1999 CWA § 304(a) national ambient water quality criteria recommendations for ammonia to account for the sensitivity of freshwater mussels and snails to ammonia toxicity. In applying these updated ammonia criteria recommendations, a number of flexibilities are available for state consideration including the Recalculation Procedure for site-specific criteria derivation, WQS variances, revisions to designated uses, dilution allowances, and compliance schedules. Flexibilities may be utilized alone or in combination with one another depending on the specific situation. EPA has developed the Flexibility Framework for States Applying EPA's Ammonia Criteria Recommendations to help guide states in determining which flexibility or combination of flexibilities is available to the state in a particular situation as the state considers the new information provided by EPA's updated criteria recommendations. Flexibilities are available throughout the WQS adoption and application processes.