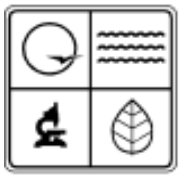

Missouri Department
of Natural Resources

Missouri Antidegradation Rule and Implementation Procedure

~~April 20, 2007~~
~~*Revised May 7, 2008*~~January 2012

Note: Bolded terms are defined in the *Glossary*.

Division of Environmental Quality

Water Protection Program

Antidegradation Rule and Implementation Procedure

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GLOSSARY

NOTES: This document occasionally refers to itself as "this document." The use of this phrase is meant to make reference to the entire document titled *Missouri Antidegradation Rule and Implementation Procedure*.

Definitions of terms used in this document that are also found in the definitions in Section (§) 644.016 of the Revised Statutes of the State of Missouri (RSMo) and 10 Code of State Regulations (CSR) 20-2 are the same unless otherwise noted below.

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Administrative Record of Decisions: The record of all information considered and decisions made during antidegradation reviews. This record shall be made available all interagency and public participation opportunities during an antidegradation review. This record shall also serve as a historical reference for subsequent antidegradation reviews involving the same water **segment**.

Alternatives Analysis: A structured evaluation of the reasonableness of **less-** and **non-degrading alternative**s to a new or expanded discharge likely to cause **significant degradation**.

Antidegradation: The implementation of a rule and procedure approved by the United States Environmental Protection Agency (EPA) and the Missouri **Clean Water Commission** that specifies how the Missouri Department of Natural Resources will determine, on a case-by-case basis, whether and to what extent, **existing water quality** may be degraded in a water of the state.

Assimilative Capacity: The amount of contaminant load that can be discharged to a specific water body without exceeding the **Water Quality Standards** (**WQS**) or the criteria associated with the **pollutant of concern** (**POC**). **Assimilative capacity** is used to define the ability of a water body to naturally attenuate a discharged substance without impairing **beneficial uses**. (Also see **FAC** and **SAC**.)

Beneficial Uses: All existing and **designated use**s on or in **waters of the state** as defined in the **Water Quality Standards** (**WQS**) at 10 CSR 20-7.031(1)(C).

Clean Water Act: The federal Water Pollution Control Act, 33 U.S.C. §§1251 et seq.

Clean Water Commission The water contaminant control agency formed in Missouri under §644.021 RSMo.

Critical Flow Conditions: The point in time in which the **beneficial uses** within a water of the state are most susceptible to the effects of pollution, which is generally but not necessarily when a stream is at or below its **7Q10** flow. A lake's critical condition shall be determined on a case-by-case basis but would normally be when the surface water is at or below its ordinary or base level.

Cumulative Degradation: The reduction of a **segment's assimilative capacity** from separate discharges approved by the **department** following the establishment of the water's **existing water quality**.

GLOSSARY (continued)

Degradation: An increase in the concentration of the **pollutants of concern** (**POC**s) within a surface water measured on a **pollutant-by-pollutant basis**.

Department: Missouri Department of Natural Resources.

Designated Use: A **beneficial use** designated to a water of the state as shown in Tables G and H of the **Water Quality Standards** (**WQS**).

Existing Source: Permitted discharge facilities that are in compliance with the terms and conditions of their permits at the time **existing water quality** (**EWQ**) is first determined for a segment.

Existing Use: Those **beneficial uses** actually attained in the water body on or after November 28, 1975, whether or not they are designated in the **Water Quality Standards**.

Existing Water Quality (EWQ): A characterization of level of the **pollutant of concern** (**POC**) in a water segment as it existed on August 30, 2008 (the effective date of the original Antidegradation Implementation Procedure). on the effective date of this document.[+] The **EWQ** shall be representative of the water quality at or immediately upstream from the point a new discharge would enter the water body, or below the point a discharge that existed on August 30, 2008 (the effective date of the original Antidegradation Implementation Procedure)before the effective date of this document enters the water body. This determination shall be made at the time the discharge is subject to an **antidegradation** review in accordance with the procedures in this document. Once established, **EWQ** is a fixed quantity/quality expressed as a concentration of a water quality parameter. *For waters receiving **pollutants** from an **existing source** (where full design capacity has not been reached), the **EWQ** shall include the levels of **pollutants** already permitted to be discharged at maximum design flow.*

EWQ: See **Existing Water Quality**.

FAC: See **Facility Assimilative Capacity**.

Facility Assimilative Capacity (FAC): The **assimilative capacity** applicable to an individual facility and determined through the establishment of the existing and probable **pollutant** concentrations at the point where the facility's effluent enters the **segment**. (Also see **SAC**.)

Less-Degrading Alternative: A reasonable discharging alternative identified through an **alternatives analysis** that results in less **degradation** then the alternative that protects **existing use**s and achieves the highest statutory and regulatory requirements, i.e., the more stringent of the water quality-based effluent limits for **existing use** protection or the technology-based effluent limits.

Minimal Degradation: The reduction of the **facility assimilative capacity** for any **pollutant** by less than 10 percent as a result of any single discharge or combination of dischargesand the reduction of the **segment assimilative capacity** for any **pollutant** by less than 20 percent as a result of all discharges combined after **existing water quality** was determined. Events or activities causing **minimal degradation** are not required to undergo a **Tier 2 review**.

Non-Degrading Alternative: A reasonable alternative to a proposed discharge that would not result in **degradation** of water quality as characterized by the **existing water quality** (**EWQ**) assessment.

[+] The effective date of this document (i.e., the *Missouri Antidegradation Rule and Implementation Procedure*) is the date this document was incorporated by reference into rules at 10 CSR 20-7.031(2)(D).

GLOSSARY (continued)

Outstanding National Resource Water (ONRW): Waters listed in Table D of the **WQS**. These waters have outstanding national recreational and ecological significance. These waters shall receive special protection against any **degradation** in quality. Congressionally designated rivers, including the Ozark National Scenic Riverways and the Wild and Scenic Rivers, are so designated.

Outstanding State Resource Water (OSRW): Waters listed in Table E of the **Water Quality Standards**. These waters are designated by the **Clean Water Commission** as high quality waters with significant aesthetic, recreational or scientific value.

Permit: Unless otherwise specified, this term includes all permits issued to satisfy §644.051 RSMo, and to administer the federal National Pollution Discharge System (NPDES). Also included are any state certifications granted under §401 of the federal **Clean Water Act**.

Pollutant: Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewer sludge, munitions, chemical waste, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, filter backwash or industrial, municipal or agricultural waste discharged into water.

Pollutant-by-Pollutant Basis: The review of the **pollutant**s in a water body by assessing the level of each **pollutant of concern**, as opposed to assessing the overall condition of a water body, for the purpose of determining the level of **antidegradation** review applicable to the water. (See **water body-by-water body approach**.)

Pollutant of Concern (POC): Discharged **pollutant**s, or **pollutant**s proposed for discharge that affect **beneficial use(s)** in **waters of the state**. **POC**s include **pollutant**s that create conditions unfavorable to **beneficial uses** in the water body receiving the discharge or proposed to receive the discharge. For example, where pH, temperature, and dissolved oxygen are in noncompliance with applicable numeric criteria.

POC: See **pollutant of concern**.

Preferred Alternative: A wastewater treatment or control alternative determined to be practicable, economically efficient and affordable through an **alternative analysis** in accordance with this document.

Quality Assurance Project Plan (QAPP): A QAPP or an equivalent plan that provides a blueprint for designing and evaluating data collection to ensure the data are of the quality needed to meet specified goals. The plan sets forth the specific quality control steps to be taken while collecting and analyzing information to ensure the data are credible.

Regulated Discharge: Any discharge that requires and is permissible by a **permit** or a water quality certification from the **department** pursuant to a state or federal law.

SAC: See **segment assimilative capacity**.

GLOSSARY (continued)

Segment: A segment is a section of water that is bound, at a minimum, by significant **existing source**s and confluences with other significant water bodies. The use of this term is intended to provide a framework for tracking changes in **assimilative capacity**. An evaluation of the **existing water quality** (**EWQ**) must be made for each segment to be significantly degraded by a new or expanded discharge. Because the **EWQ** will vary along the entire segment, the applicant may use statistical modeling to describe the variation in **degradation** for each segment spatially and/or during specific periods or seasons.

Segment Assimilative Capacity (SAC): The **assimilative capacity** of a water **segment** at the first point of applicable **Water Quality Standards** (**WQS**) below a discharge point. (Also see **FAC**.)

SEI: See **social and economic importance**.

7Q10: The lowest average flow that occurs for seven (7) consecutive days that has a probable recurrence interval of once in ten (10) years.

Significant Degradation: A reduction by 10 percent or more of the **facility assimilative capacity** for any **pollutant** as a result of any single discharge, or the reduction of the **segment assimilative capacity** for any **pollutant** by 10~~20~~ percent or more as a result of all discharges combined (See **cumulative degradation**) after **existing water quality** (**EWQ**) was determined. Events or activities causing significant degradation are required to undergo a **Tier 2 review**.

Social and Economic Importance (SEI): The social and economic benefits to the community that will occur from any activity involving a new or expanded discharge.

Temporary Degradation: **Degradation** that is non-permanent and the effects can be regarded as insignificant following a review of the a) length of time during which water quality will be lowered, b) percent change in ambient conditions, c) parameters affected, d) likelihood for long term water quality benefits to the **segment** (e.g., as may result from dredging of contaminated sediments), e) degree to which achieving the applicable **Water Quality Standards** (**WQS**) during the proposed activity may be at risk, and f) potential for any residual long-term influences on **existing use**s.

Tier 1 Review: Policies and procedures that apply to waters that qualify for Tier 1 protection in accordance with this document. Tier 1 protection requires a Tier 1 review designed to prohibit **degradation** that may cause or contribute to the impairment of a **beneficial use**, or violation of **water quality criteria** and prohibit further **degradation** of **existing water quality** (**EWQ**) where **pollutants of concern** (**POC**s) have resulted in the water being included on the 303(d) List. Tier 1 review applies as the minimum review level to all surface waters regardless of **EWQ** and applies on a **pollutant-by-pollutant basis**.

Tier 2 Review: Policies and procedures that apply to waters that qualify for Tier 2 protection in accordance with this document. Tier 2 protection requires a Tier 2 review designed to prohibit degrading the quality of a surface water unless a review of discharge necessity and social and economic considerations justifies the **degradation** of water quality. Tier 2 review applies to all waters where **existing water quality** is better than the applicable **Water Quality Standards** (**WQS**) as determined on a **pollutant-by-pollutant basis**.

GLOSSARY (continued)

Tier 3 Review: Policies and procedures that apply to waters given Tier 3 protection. Tier 3 protection requires a Tier 3 review designed to prohibit any **degradation** of water quality in **Outstanding National Resource Waters** (**ONRWs**) and **Outstanding State Resource Waters** (**OSRWs**) as identified in Tables D and E of the **Water Quality Standards** (**WQS**). **Temporary degradation** of a water under Tier 3 review may be allowed on a case-by-case basis by the **department** as explained in Section II.A.4 of this document. Tier 3 reviews are performed on a **water body-by-water body approach,** except for **temporary degradation**, which shall be performed on a **pollutant-by-pollutant basis**.

Water Body-by-Water Body Approach: The review of the **pollutants** in a water body by assessing the overall or combined levels of the **pollutants of concern** (**POCs**) as opposed to assessing the level of each **POC** in a water body for the purpose of determining the level of review applicable to the water. (See **pollutant-by-pollutant basis**.)

Waters of the State: Waters defined in §644.016(26) RSMo as: "[A]ll rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common and includes waters of the United States lying within the state." The term "water," or "waters," is often used in this document in place of "waters of the state."

Water Quality Criteria (WQC): Chemical, physical and biological properties of water that are necessary to protect beneficial water uses or the **Water Quality Standards** (**WQS**) that are expressed as the maximum allowable **pollutant** concentrations, or other conditions necessary for a water to fully support a **beneficial use**, i.e., 10 CSR 20-7.031(3) and (4).

Water Quality Standards (WQS): The provisions of 10 CSR 20-7.031 covering water classification, **beneficial uses**, general and specific **water quality criteria** (**WQC**), **antidegradation** and all other requirements establishing limits on the amount of pollution permissible in **waters of the state**.

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ANTIDEGRADATION RULE AND IMPLEMENTATION PROCEDURE

I. Missouri's Water Quality Antidegradation Rule

The following are the implementation procedures for Missouri's **antidegradation** rule found at Title 10 Code of State Regulations, Division 20, Chapter 7.031(2) (i.e., 10 CSR 20-7.031(2)) and federal **antidegradation** policy at Title 40 Code of Federal Regulations (CFR) Section (§)131.12. The Missouri Department of Natural Resources (**department**) is required by 40 CFR §131.12(a) to develop and adopt a statewide **antidegradation** policy and to identify procedures for implementing that policy. Implementation generally includes

- identifying the **antidegradation** review levels (i.e., the "tiers") that apply to a surface water;
- determining **existing water quality** (**EWQ**);
- assessing and determining appropriate extent of water quality **degradation**;
- identifying and assessing **less-degrading** or **non-degrading alternative**s;
- determining the importance of economic or social development to justify **degradation** of waters; and
- establishing intergovernmental coordination and public participation processes.

A. Summary of Applicable Laws and Regulations on **Antidegradation**

The Missouri Clean Water Law (Sections (§§) 644.006 - 644.150 of the Revised Statutes of the State of Missouri (RSMo)) establishes requirements for the protection and management of surface water and groundwater quality. The Missouri **Clean Water Commission**, through the assistance of the **department**, promulgates regulations on water quality. Missouri's **Water Quality Standards** (**WQS**)[2] are written into regulation at 10 CSR 20-7.031. The specific portion of the regulation prescribing the policy on **antidegradation** is 10 CSR 20-7.031(2).

The **antidegradation** rule is one of four required regulatory elements of the **WQS**. The other three elements include water classification, **beneficial uses**, and **water quality criteria** (narrative and numeric). All of these review elements must be administered as a whole.

Waters identified within Tables G and H of the **WQS** is regarded as "classified." All other **waters of the state** are "unclassified." All **waters of the state** are subject to the *Missouri Antidegradation Rule and Implementation Procedure* (this document).

[2] For purposes of this document, the terms "criteria" and "standards" have separate meanings (See the Glossary of this document). This document uses the phrase "**Water Quality Standards**," or **WQS**, when referring to the collective provisions of 10 CSR 20-7.031. The phrase "**water quality criteria**," or **WQC**, strictly refers to the provisions of 10 CSR 20-7.031(3) and (4) (i.e., the narrative and numeric limits placed on specific pollutants based on **designated use**). "**Beneficial uses**" is a term used in this document to mean both "**existing**" and "**designated**" **uses**. See Glossary of this document.

The **beneficial uses**[3] and the applicable **water quality criteria** (**WQC**) can be found in 10 CSR 20-7.031. All **waters of the state** are subject to general criteria contained in 10 CSR 20-7.031(3). All waters listed in Tables G and H have **beneficial uses** and are subject to the specific (i.e., numeric) **WQC** contained in 10 CSR 20-7.031(4).

Beneficial uses may vary in a water body and may change at various locations. Most waters have more than one beneficial use. Where more than one use exists (See definition of **existing use** in the Glossary of this document), or has been designated (See definition of **designated use** in the Glossary) for a water, the use with the most stringent water quality requirements must be maintained and protected. An **antidegradation** review shall be performed for the entire **segment** (or multiple **segment**s) of water expected to be **significantly degraded** by a new or expanded discharge. Depending on the **pollutant** load within the discharge and distance to, and **assimilative capacity** of, waters downgradient of the discharge point, the review may extend into more than one classified **segment**. The review must extend downgradient as far as **significant degradation** is expected regardless of the classification status of the receiving waters. If the expected, **degradation** is confined within a single **segment**, the review may be limited to only the portion of the **segment** to be affected.

Waters listed in Tables D and E of the **WQS** are waters of outstanding quality. These waters include the state's **Outstanding National Resource Water**s and the **Outstanding State Resource Water**s. The **degradation** of water quality of these surface waters is prohibited except from short-term effects of **temporary degradation**.

All **waters of the state** are protected under at least one of three tiers of the **antidegradation** rule. Section I.B of this document describes these tiers and explains how the protection levels are assigned to each water. How the tier protection level may be revised is explained in Section I.C of this document.

B. Assigning Tier Protection Levels

The following three levels (or tiers) protect water quality from **degradation** in all **waters of the state** on a **pollutant-by-pollutant basis**. The tiers are specified in rule at 10 CSR 20-7.031(2) as follows:

> (2) Antidegradation. The antidegradation policy shall provide three (3) levels of protection.
> (A) Tier One. Public health, existing instream water uses and a level of water quality necessary to protect existing uses shall be maintained and protected.
> (B) Tier Two. For all waters of the state, if existing water quality is better than applicable water quality criteria established in these rules, that existing quality shall be fully maintained and protected. Water quality may be lowered only if the state finds, after full satisfaction of the intergovernmental coordination and public participation requirements, that the lowered water quality is necessary to allow important economic and social development in the geographical area in which the waters are located. In allowing the lowering of water quality, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control before allowing any lowering of water quality. This provision allows a proposed new or modified point or nonpoint source of pollution to result in limited lowering of water quality provided that –

[3] "Beneficial uses" is a general term used in this document to mean both "existing" and "designated" uses. See the Glossary of this document.

1. The source does not violate any of the general criteria set forth in section (3) of this rule [not shown here], or any of the criteria for protection of beneficial uses set forth in section (4) of this rule [not shown here];
2. The source meets all applicable technological effluent limitations and minimum standards of design for point sources or minimum pollution control practices for nonpoint sources; and
3. The lowering of water quality, in the judgment of the department, is necessary for the accommodation of important economic and social development in the geographical vicinity of the discharge. In making a preliminary determination based on socioeconomic development considerations, the department may consider the potential for regional increases in utility rates, taxation levels or recoverable costs associated with the production of goods or services that may result from the imposition of a strict no-degradation policy. Consideration may also be given to the possible indirect effects of a policy on per capita income and the level of employment in the geographical vicinity of the proposed pollution source. Any preliminary decision by the department to allow a limited lowering of water quality will be stated as such in a public notice issued pursuant to 10 CSR 20-6.010. Pursuant to that provision, a public hearing will be held in the geographical vicinity of the proposed pollution source, if the department determines there is significant public interest in and need for a hearing.

(C) Tier Three. There shall be no lowering of water quality in outstanding national resource waters or outstanding state resource waters, as designated in Tables D and E [of the **Water Quality Standards**].

The protections created by those sections of the rule, in combination with the policies and procedures outlined in this document, can be comprehensively summarized as follows:

Tier 1 Protection:
Policies and procedures that prohibit **degradation** that may cause or contribute to the impairment of **a beneficial use** or violation of **WQC**; and prohibit further **degradation** of **existing water quality** (**EWQ**) where additional **pollutants of concern** (**POC**s) would result in the water being included on the 303(d) List. Tier 1 protection applies as the minimum protection level to all surface waters, regardless of the **EWQ**.

Tier 2 Protection:
Policies and procedures that prohibit the **degradation** of water quality of a surface water unless a review of reasonable alternatives and social and economic considerations justifies the **degradation** in accordance with the procedures presented in this document. Tier 2 protection applies on a **pollutant-by-pollutant basis** to all waters where **EWQ** is significantly better than the applicable **WQS**.

Tier 3 Protection:
Policies and procedures that prohibit any **degradation** of water quality of **Outstanding National Resource Water**s (**ONRW**s) and **Outstanding State Resource Water**s (**OSRW**s) as identified in Tables D and E of the **WQS**. **Temporary degradation** of water receiving Tier 3 protection may be allowed by the **department** on a case-by-case basis as explained in Section II.A of this document.

The level of protection identified above determines the type of **antidegradation** review required when new or expanded discharges are proposed such that Tier 1 protection requires a **Tier 1 review**, Tier 2 protection requires a **Tier 2 review** and Tier 3 protection requires a **Tier 3 review**. Because the **Tier 1 and 2 review**s are conducted

on a **pollutant-by-pollutant basis**, this document refers to these reviews as a review of a "**pollutant**" as opposed to a review of the overall quality of a "water body." (See the definitions of "**pollutant-by-pollutant basis**" and "**water body-by-water body approach**" in the Glossary of this document.)

Tier 1 reviews allow **pollutant**s to be discharged in accordance with the **WQS** without performing the **alternatives analysis**, reviewing the implementation of nonpoint source controls, or determining **social and economic importance** in accordance with Sections II.B, D and E of this document, respectively. Also, all other requirements for the development of appropriate **permit** effluent limits still apply (such as application of appropriate federal effluent limitation guidelines (ELGs) for certain industries and secondary treatment standards for domestic wastewater). For **pollutant**s receiving a **Tier 1 review**, the target water quality is determined by the **WQS** in combination with these other permitting requirements.

Because **Tier 1** and **2 review**s are conducted on a **pollutant-by-pollutant basis** as opposed to on a **water body-by-water body approach**, the allowance for **degradation** of water quality through a discharge of a **pollutant** depends on the existing level of that **pollutant** within the receiving water (i.e., the **EWQ**), and the probability of promptly restoring the quality where **pollutant**s levels are elevated. Waters already containing **POC**s "at or near" (See Section I.B.1 below) **WQS** will qualify for Tier 1 protection for those **POC**s. The water may receive the same **pollutants** if: 1) the discharge would not cause or contribute to a violation of the **WQS**; 2) all other conditions of the state permitting requirements are met (i.e., no-discharge options are explored and technology-based requirements (including ELGs) are met); and 3) the **permit** is issued reflecting the highest statutory and regulatory requirements. Section II.A of this document lists other examples of discharges not requiring a **Tier 2 review** based on the **minimal degradation** that results during those discharges.

In the absence of information on **EWQ**, waters shall automatically receive **Tier 2 review** prior to receiving any additional **POC**s that might result in degrading the water quality.

This procedure requires all waters to receive a **Tier 2 review** where a discharge will **significantly degrade** water quality. An exception is made for **ONRW**s and **OSRW**s that shall always be given Tier 3 protection (no **degradation** of water quality allowed).

1. Assigning **Tier 1 Review**

   Tier 1 review is assigned on a **pollutant-by-pollutant basis** by the **department** when the concentration of the **POC** is statistically similar to the applicable **WQC**. Additionally, 303(d) listed **segment**s are considered Tier 1 for **POC**s attributed to use impairment. Prior to allowing any new or expanded discharges of that **pollutant**, the **department** and applicant must conduct a **Tier 1 review** and demonstrate that the discharge would not violate the water quality criterion for that **pollutant**. *Only those **pollutants** that are documented as already being at, near or violating **WQS** qualify for a **Tier 1 review**.*

2. Assigning **Tier 2 Review**

   A **Tier 2 review** shall be conducted by default on all **waters of the state** before an application for a **permit** to discharge is filed, unless one of the following conditions apply:
   - the water is an **ONRW** or **OSRW** to which Tier 3 protection applies,
   - the discharge is considered insignificant in accordance with the criteria explained in Section II.A of this document, or
   - the **POC** is already at a level that qualifies the water for Tier 1 protection.

3. Assigning **Tier 3 Review**

   This review shall automatically apply to **ONRW**s and **OSRW**s listed in Tables D and E in the **WQS** at 10 CSR 20-7.031. All **ONRW**s and **OSRW**s are presumed to have no significant levels of **pollutant**s under normal circumstances. Any **degradation** of water quality is prohibited in these waters unless the discharge only results in **temporary degradation**.

C. Revising Tier Review Levels

The default tier review will change from Tier 3 to Tier 2 if the water is no longer designated in rule as an **ONRW** or **OSRW**. The **department** may also change a review level from Tier 2 to Tier 1 if a **pollutant** reaches the levels explained in Section I.B.1 of this document. The change in a review level of any **pollutant** will require an opportunity for public review as outlined in Section II.F of this document.

Any person may petition the **Clean Water Commission** to designate, through rulemaking, a water as an **OSRW**, and thus requiring **Tier 3 review**, if the water is documented to have the following conditions in accordance with 10 CSR 20-7.031(8):
- a high level of aesthetic or scientific value;
- undeveloped watershed; and
- located on or passes through lands which are state or federally owned, or which are leased or held in perpetual easement for conservation purposes by a state, federal or private conservation agency or organization.

Unique waters such as those that are highly aesthetic; provide critical needs for threatened, rare or endangered species; have archeological, cultural, scientific or exceptional recreational importance; or provide a special educational opportunity, should be given protection through the designation of a special use under 10 CSR 20-7.031(1)(C)14. When these special use designations are assigned, the **department** should recommend appropriate site-specific criteria to protect the unique quality of these waters. The tier review level assigned to these unique waters will follow the same procedures developed for all other waters.

II. Missouri's Antidegradation Implementation Procedure

This portion of the document outlines the procedure for determining whether or not **degradation** is allowed in **waters of the state** from **regulated discharge**s. The **antidegradation** review procedure is based on:

- the level of protection (i.e., Tier 1, 2 or 3) assigned to the **pollutants of concern** (**POC**s) within the water receiving the discharge,
- the type of receiving water,
- **existing water quality** (**EWQ**) of the receiving water,
- the necessity of **degradation**, and
- the **social and economic importance** (**SEI**) of the proposed discharge.

*All new or expanded **regulated discharge**s are subject to **antidegradation** review requirements.* These activities include those involving point source discharges regulated under Missouri's **permit** program (e.g., State Operating Permits) and discharges regulated under federal permits or licenses that are subject to state water quality certification under §401 of the federal Water Pollution Control Act (a.k.a. **Clean Water Act**).

Antidegradation reviews are required when proposed new or expanded discharges will significantly degrade water quality. In addition to reviewing the necessity for a discharge and the **social and economic importance** of the discharging activity, the **department** and applicants must ensure that proposed discharges fully protect **beneficial uses**, and achieve the highest statutory and regulatory requirements. The **department** must also assure that activities within the watershed are implementing cost-effective, reasonable best management practices to control nonpoint source pollution (See Section II.D of this document). Determinations issued under these provisions must be made in accordance with the public notification process described in Section II.F.1 of this document. A decision diagram of the **antidegradation** review process is provided as Appendix 1 of this document.

A. Determining the Significance and Appropriateness of **Degradation**

To determine the required scope of an antidegradation review, the **department** shall first determine whether or not the proposed new or expanded discharge will result in a **significant degradation** for a **POC**. **POC**s for **antidegradation** reviews include those **pollutants** reasonably expected to be present in the discharge and for which the **assimilative capacity** and permissible loads can be reasonably calculated. The **permit** applicant may avoid having to determine the **assimilative capacity** of the receiving water and, consequently, may proceed directly into defining the "necessity" (i.e., performing the **alternatives analysis**) of the discharge under Section II.B of this document by assuming (instead of demonstrating) that the proposed discharge will result in **significant degradation** for each of the **POC**s.

The activity shall be considered not to result in **significant degradation**, if:

- The proposed net increase in the discharge of a **POC** does not result in an increase in the ambient water quality concentration of the receiving water after

mixing. When an increased **pollutant** load has the potential to cause an increased accumulation of the **pollutant** within sediments or in fish tissue, the applicant may be required to assess the potential for such an accumulation of these **pollutant**s in determining the significance of **degradation**.

- The activity will result in only **temporary degradation** of water quality;
- An existing facility is applying for renewal with no new or expanded discharge;
- The reduction of the **facility assimilative capacity** (**FAC**) for an **pollutant** by less than 10 percent as a result of any single discharge and the reduction of the **segment assimilative capacity** (**SAC**) for any **pollutant** by less than 10~~20~~ percent as a result of all discharges combined after **EWQ** was determined;
- Combined sewer overflow (CSO) control projects resulting in a net decrease in the CSO-related **pollutant** loadings to surface waters shall be excluded from review requirements when these loadings are included in department-approved plans (e.g., Nine Minimum Controls, Long-Term Control Plan) in accordance with national guidance or policies. Treatment byproducts created by CSO discharges are also excluded from review requirements when the discharges are identified in a department-approved plan;
- The **department** concludes that the proposed activity will not cause **significant degradation** based upon the specifics of any watershed-based trading that has been agreed to by the project applicant. NOTE: Because Missouri does not currently have a watershed-based trading program in place, the applicant might experience some permitting delays in pursuing this exemption unless the **department** is given significant advanced notice of the applicant's proposal; or
- The activity is a thermal discharge that has been approved through a Clean Water Act 316(a) demonstration.

If a determination is made that **significant degradation** will occur, or it is assumed, the **department** will determine from information provided by the discharger whether or not the **degradation** is necessary to allow important economical and social development in the geographical areas in which the waters are located (See Sections II.B and II.E of this document).

1. Determining **Existing Water Quality**

   Determining **existing water quality** (**EWQ**) may be avoided if the discharger chooses to proceed on the assumption that all **POC**s will cause **significant degradation**. Dischargers wishing to make this assumption may skip to an **alternatives analysis** discussed in Section II.B of this document. Dischargers wishing to determine **EWQ** shall perform the following steps:

   a) Summary of Approach

      EWQ either:

      - provides confirmation that the water quality for a **POC** is below, at or near **WQS** and therefore justifies a **Tier 1 review**, or
      - serves as the yardstick by which available **assimilative capacity** is measured for the **POC**s to receive a **Tier 2 review**.

The **Water Quality Standards** (**WQS**), not **EWQ**, establishes the target for waters receiving **Tier 1 review**. However, no **degradation** of **EWQ** is allowed for any **pollutant** already causing water quality to not meet the applicable **WQS**. *For waters receiving **pollutant**s from permitted facilities that are in compliance with the terms and conditions of their **permit**s, the **EWQ** shall include the levels of **pollutant**s already permitted to be discharged to the waters at the time **EWQ** is first determined*. Also, **EWQ,** when determined for the same **segment** over multiple times, will track **cumulative degradation**.

The **department** intends to delineate water **segment**s in sufficient detail to allow for distinct **EWQ** assessments. **Segment**s should not overlap and should be bound, at a minimum, by significant **existing source**s and/or confluences with other water bodies. Where proposed new or expanded discharges may affect (degrade) multiple **segment**s, multiple **EWQ** evaluations may be needed. Finalization of a statewide water **segment** delineation and **EWQ** tracking system may require years to complete. The present uncertainty associated with **segment** delineation emphasizes the need for potential **EWQ** data generators to consult with the **department** prior to initiating data generation activities.

This section describes how **EWQ** is characterized through:

- Establishment of **EWQ** for waters using existing assessment data when available;
- Approaches which consider the size and potential impacts of the proposed discharge; and
- Cooperative action by both the **department** and the applicant to generate new **EWQ** information where little or no data exist.

In general, **EWQ** will be based upon existing assessments conducted under the current **department** monitoring and assessment programs. **EWQ** assessments will seek to gather information only on the **pollutants** reasonably expected to be in discharges.

The preferred approach for assessing **EWQ** is to use previously collected data where available. Where adequate data are not available, the second preferred approach is to collect water quality data. The third preferred approach for assessing **EWQ** is to use an appropriate water quality model. Sometimes more than one approach may be needed to characterize **EWQ** for all **POC**s.

The **department** can advise the applicant on what approaches may be most appropriate to establish the **EWQ**. If a data collection effort is chosen, the **department** can advise the applicant on what data are needed and can provide guidance on how to collect and report the needed information to the **department**. Statistical approaches to determine the appropriate level of tier review for each **POC** are discussed in Section II.A.1.d and Appendix 2 of this document.

b) Water Quality Assessment Procedures

EWQ must be established at **critical flow conditions**. **Critical flow conditions** are the point in time in which the **beneficial uses** within a water of the state are most susceptible to the effects of pollution, which is generally but not necessarily when a stream is at or near its **7Q10** flow. Therefore, stream water quality data used to establish **EWQ** should target critical conditions. If no measurable surface flow is present during critical conditions, then sampling should be collected at a representative pool. A lake's critical condition shall be determined on a case-by-case basis but would normally be when the surface water is at or below its ordinary or base level.

Although **EWQ** is established for **critical flow conditions**, the period of critical flow and maximum permitted **pollutant** loading often does not coincide with water quality sampling. Water quality models are useful for developing defensible **EWQ** values for **POC**s when water quality samples do not necessarily reflect the critical flow and loading conditions.

When data collection is involved, it is recommended that dischargers submit their monitoring and quality assurance/quality control (QA/QC) plans (e.g., a **Quality Assurance Project Plan** (**QAPP**) or similar quality assurance/quality control document) to the **department** well in advance (i.e., at least six months) of any planned activities or **permit** application submittals. This will facilitate and help streamline the permitting process. Environmental groups, trade organizations, the general public, the **department** and other governmental agencies may also elect to generate **EWQ** data with the prior approval of the **department** and under appropriate, documented QA/QC procedures (e.g., a **QAPP**). Multiple dischargers to a surface water may combine resources to generate **EWQ** data and may join with other watershed stakeholders in the effort. The technical complexity associated with this process precludes establishment of universally applicable procedures.

However, the objective of this effort – generating a reasonable, credible and scientifically defensible characterization of **EWQ** – provides a framework for conducting such activities when needed for **antidegradation** reviews.

Given the complexity of the issue, potential generators of **EWQ** data are expected to notify the **department** of their intent to generate data and to obtain agency concurrence on proposed sampling protocols, sampling locations, **POC**s, reporting format, etc., prior to initiating data collection efforts. The initial consultation with the **department** may also be used by regulated entities to evaluate the availability of existing data that may be used as a supplement to, or in lieu of, new **EWQ** data.

When regulated entities or third parties collect data, the **department** may conduct field or laboratory audits to verify that data generators are adhering to

established sampling protocols, and may split samples for independent analysis. Data generators that proceed without the **department** notification and concurrence, risk rejection of the data and significant delays in the permitting process. Potential generators of **EWQ** data are also encouraged to notify other regulated entities and stakeholders in the **segment** of their intent to generate **EWQ** data. Area-wide cooperation in the **EWQ** assessment process may allow for sharing of the cost of data generation and avoidance of conflict in subsequent permitting actions.

*Once **EWQ** is established for a surface water, it is the yardstick against which **degradation** is measured during all future **antidegradation** reviews on the **segment**.* If future monitoring data indicate that **EWQ** is improving due to upstream water pollution controls or water quality is changing due to natural conditions, the **department** may revise **EWQ** to reflect those water quality changes. **Antidegradation** rule generally does not allow a revision of the original **EWQ** measurement, that is, ***EWQ** is not a moving target, unless it moves in the direction that reflects improving water quality*. However, if it is shown that an error in determining **EWQ** or additional data collection significantly increases the certainty of the results, then **EWQ** should be reevaluated.

For proposals that entail a discharge into a water for which there is no **EWQ** data (i.e., where new data must be collected or a model performed for assessment of **EWQ**), the location of the **EWQ** assessment generally will be immediately upstream of the proposed new discharge location.

In some instances, particularly discharge expansions, it may be necessary to establish **EWQ** downstream of an **existing source**. In these instances, the water must be receiving a discharge at the time it is sampled. When such specific periods are analyzed, the resulting **EWQ** determination must clearly define the location and period for which the **EWQ** is representative, e.g., "x" distance below a mixing zone, at a specific flow rate (cubic feet per second, or "cfs") or flow level (e.g., 8.1 feet at a specific gauge). An alternative approach would be to measure **pollutant** concentration upstream of the **existing source** and model the **EWQ** in the downstream **segment** of interest based on **permit** conditions.

For lakes, **EWQ** will be assessed near tributary inlet mixing areas, in the main body of the lake or in other areas of the lake as appropriate. The **department** will make determinations regarding **EWQ** characterization and accommodation of variations caused by seasonal impacts, water level fluctuations or other factors.

Where there are adequate **EWQ** data from multiple sampling sites on a water, these stations can become the **EWQ** stations from which a composite **EWQ** characterization can be developed. Alternatively, the **department** may choose one existing monitoring site as the station from which to characterize **EWQ**. The **department** may request additional monitoring at the site if the

existing data are insufficient (e.g., where no information has been collected on **POC**s that would reasonably be expected in the proposed discharge).

It is important to note that when **EWQ pollutant** concentrations are presented as one numeric value applicable year-around, that it be representative of the concentration present during the **critical flow conditions**. Multiple values applicable to seasons, or other defined periods, may be used if supported by the data or modeling approach. Where uncertainty in the **EWQ** analysis is great, either a factor of safety may be incorporated into the calculation or applicants may be required to collect **EWQ** data after the **permit** is issued. Such data will serve to develop an **EWQ** profile during build-out of the activity's discharge capacity in order to verify the model results.

Before initiating **EWQ** sampling, the discharger should develop and submit a sampling plan to the **department** for review. The sampling plan should address the following elements:

- Project goals and objectives,
- Identification of target conditions (including a discussion of any weather, seasonal variations, stream flow, lake level or site access that may affect the project),
- Sampling and handling methods,
- Data quality objectives,
- List of chemical parameters to be analyzed,
- Sampling frequency,
- Sampling period, including time of day,
- Sampling locations and rationale for site selection,
- Evaluation criteria for data results, and
- A list of field equipment (including tolerance range and any other specifications related to accuracy and precision).

Analytical methods for samples collected must comply with the parameters below.

- A person conducting an analysis of a sample taken to determine compliance with a **WQS** shall use an Environmental Protection Agency (EPA)-approved analytical method or an alternative analytical method that is approved by the **department**.
- Samples, containers, preservation techniques, holding times and analysis shall be conducted in accordance with *Guidelines Establishing Test Procedures and Analysis of Pollutants* in 40 CFR Part 136. The use of other validated analytical methodologies may be authorized here if such use can be technically justified. Stream flow shall be measured possible each time **EWQ** sampling is performed.
- Acceptable methods for flow measurement include those described in the U.S Geological Survey manual, *Techniques of Water Resources*

Investigations of the United States Geologic Survey (Chapter A8, Book 3, "Discharge Measurements at Gauging Stations") and the **department**'s Environmental Services Program's Standard Operating Procedure MDNR-WQMS-113, Flow Measurements in Open Channels. Each time **EWQ** sampling is performed on lakes, lake levels shall be measured using procedures approved by the **department**.

As noted, the **department** may consider existing data for establishing the **EWQ** from a federal or state agency, the regulated entity, the public or any other source as long as the data:

- were collected in accordance with an appropriate quality assurance plan;
- were collected using specified assessment or sample collection and analysis protocols; and
- meet Missouri's credible data and data interpretation requirements specified by Missouri's 303(d) Listing Methodology Document (*Methodology for the Development of the 2006 Section 303(d) List in Missouri* or subsequent approved revisions).

c) **Pollutants of Concern**/Data Collection

Dischargers will be required to generate **EWQ** for all **POC**s associated with the proposed discharge unless the discharger wishes to assume that **significant degradation** will result. In addition to the **POC**s, regulated entities may also be requested to provide water quality data or representative values for parameters necessary to determine the appropriate value range of **WQC** (e.g., pH, temperature, hardness) or to assess synergistic effects of multiple **pollutant**s. If a dissolved metal is a **POC**, a regulated entity may also be requested to provide the information necessary to translate the total metal present in the discharge to an in-stream dissolved concentration. Again, the importance of consultation between **EWQ** data generators and the **department** staff prior to **EWQ** data generation cannot be overstated.

d) Interpreting Data on **Existing Water Quality**

The water quality information generated from observed data should be used to assign the correct tier review level and to develop the **EWQ** value for the **POC**. A **POC** will be considered a Tier 1 **pollutant** where the 90^{th} percentile of at least five samples is greater than or equal to 95 percent of applicable water quality standard. All consideration should be given to the distributional and statistical properties of the data to ensure that appropriate statistical tests are utilized. Appendix 2 is an example of a statistical test of an assumed lognormal distribution to determine the appropriate level of tier review for a **POC**.

Generators of **EWQ** data are expected to provide documentation of their adherence to approved or established protocols and assure that the submitted information is accurate and complete. Only credible data will be reviewed in order to determine the **EWQ** on a **pollutant-by-pollutant basis** for each **POC**.

Data generators should make every effort to use the most sensitive, practical analytical methods available. The use of less sensitive analytical methods may cause rejection of the data set. *The discharger must consider the current **EWQ** value contained in the **administrative record** from previous sampling events. Established **EWQ** for any particular **pollutant** must be used to judge the impact of all subsequent proposals for discharges involving that **pollutant**.* **EWQ** reassessments may be appropriate if the data used in the original determination are shown to be invalid or if the water quality of the **segment** is believed to be significantly improved over that which existed at the time of the original **EWQ** determination.

2. Relationship of **Antidegradation** to **Beneficial Uses** and Classifications

This **antidegradation** implementation procedure applies to all **waters of the state** regardless of use designations or water classification. Regardless of the level of review assigned, an **antidegradation** review must not result in the impairment of an existing or designated **beneficial use**.

3. Determining Event-Specific and **Cumulative Degradation**

Degradation of a water's **assimilative capacity** may be allowed if it is considered **minimal degradation** or if it is justified in accordance with an **antidegradation** review performed in accordance with this document. The **assimilative capacity** represents the amount of contamination load that can be discharged to a specific water body without exceeding the **WQS** applicable to the **POC**. **Degradation** is considered minimal if the new or proposed loading (i.e., event-specific) is less than 10 percent of the **facility assimilative capacity** (**FAC**) and the **cumulative degradation** is less than ~~20~~10 percent of the **segment assimilative capacity** (**SAC**).

The **FAC** for a new or expanded facility may be calculated as follows:

$$FAC = [(WQC \cdot (Qs+Qd)) - (Cs \cdot Qs)] \cdot CF$$

Where:

WQC = water quality criterion (represented as a concentration, e.g., mg/L)
Qs = stream flow (**7Q10** or other representative flow) in cubic feet per second (cfs)
Qd = average daily design flow of discharge in cfs
Cs = **pollutant** concentration in stream immediately below the point where the facility's effluent enters the **segment**
CF = conversion factor to convert a **pollutant** mass loading into the desired units. For example, a CF of 5.4 to derive a load in "lbs/day" is appropriate when the WQC is represented in mg/L and flow is represented in cfs [(mg/L) · (cfs) · 5.4) = (lbs/day)].

If the net increase in loading from the new or expanded facility is 10 percent or more of the **FAC**, then a **Tier 2 review** is required.

The **SAC** is calculated similar to the **FAC** but -

- Cs is established for the entire **segment**, and
- The applicable flow is equal to the flow at the most downstream extent of the water **segment** (i.e., sum of the stream critical flow and all upstream discharge flows).

If the cumulative net increase in loadings for a water **segment** is 10~~20~~ percent or more of the **SAC**, then a **Tier 2 review** is required. The cumulative loading used for comparison to the **SAC** is limited to loadings attributed to new or expanded discharges since establishment of **EWQ**. The **FAC** and **SAC** should always be calculated at appropriate **critical flow conditions** (e.g., **7Q10**).

Methods for calculating **FAC**, **SAC**, and **minimal degradation** for various scenarios are available in Appendix 3 of this document. The example calculations are based on conservative **pollutant**s. Consideration for assimilation of the pollutant within the water body should be given when calculating **minimal degradation** for non-conservative pollutants.

4. **Temporary Degradation**

Activities resulting only in **temporary degradation** will be given a **Tier 1 review**. The **department** will determine if **degradation** from a discharge qualifies as temporary following a review of information provided by the applicant. The information provided by the applicant must include a) length of time during which water quality will be lowered, b) percent change in ambient conditions, c) parameters affected, d) likelihood for long-term water quality benefits to the **segment** (e.g., as may result from dredging of contaminated sediments), e) degree to which achieving the applicable **WQS** during the proposed activity may be at risk, and f) potential for any residual long-term influences on **existing use**s.

B. Review for Alternatives to **Degradation**

An applicant proposing any new or expanded discharge that would significantly degrade water quality is required to prepare an evaluation of alternatives to the proposed discharge. The purpose of this evaluation is to determine whether or not the proposed discharge is "necessary," that is, no reasonable alternative(s) exist to prevent **significant degradation**. These alternatives are compared (in terms of practicability, economic efficiency and affordability) to the controls required to protect **existing use**s and to achieve the highest statutory and regulatory requirements (i.e., the more stringent between the water quality-based effluent limits to protect an **existing use** and the applicable technology-based effluent limits).

1. Identifying Non-Degrading and Less-Degrading Pollution Control Measures

   For any proposed discharge, there may be a number of pollution control measures that prevent or minimize water quality **degradation**. For discharges likely to cause **significant degradation**, applicants must provide an analysis of **non-degrading** and **less-degrading alternative**s to the minimum level pollution control. The minimum level of pollution control is the controls required to protect **existing use**s and to achieve the highest statutory and regulatory requirements, i.e., the more stringent of water quality-based effluent limits for **existing use** protection or technology-based effluent limits.

   The applicant should evaluate a range of **non-degrading** or **less-degrading** pollution control **alternatives** with the intent of identifying reliable, demonstrated processes or practices that can be reasonably expected to achieve greater pollution reduction. The following alternatives are examples that may be considered depending upon applicability:

   - Land application
   - Subsurface irrigation
   - Recycling or reuse (i.e., closed loop system)
   - Discharge to a regional wastewater collection and treatment system
   - Improved operation and maintenance of existing treatment system
   - Alternative discharge locations
   - Installation of biological/physical/chemical treatment processes that provide higher levels of treatment
   - Seasonal or controlled discharges to avoid critical water quality periods

   If experimental or unproven methods are proposed, the **department** may request information on previous applications of the method, effectiveness, transferability (if applicable), costs and other information as appropriate. Applications containing proposals for new or experimental methods will be required to append information regarding likely performance results. Such applications may be approved at the discretion of the **department** with the condition that if the proposed technology does not meet project **pollutant** control targets, the applicant must adopt conventional or other pollution control measures that meet state **antidegradation** requirements. The **department** may require that the applicant analyze additional alternatives if an appropriate range of alternatives were not evaluated. The **department** staff and the applicant should meet to discuss these and other issues early in the process. The applicant should also document any alternatives that were determined to be unreasonable and provide a basis for the conclusion.

2. Evaluating and Selecting Alternatives

   Following the evaluation of possible alternatives, the applicant must provide a basis for selecting the most reasonable alternative. A reasonable alternative is one that is practicable, economically efficient, and affordable.

a) Practicability

The practicability of alternatives is considered by evaluating the effectiveness, reliability, and potential impacts on the overall natural environment (i.e., land, air, and water) resulting from implementation of the alternatives. **Non-degrading** and **less-degrading alternative**s shall be considered effective unless an evaluation to the contrary is provided. The following are examples of the factors that may be evaluated during this process:

1) Effectiveness and Reliability
   - Certainty of achieving technology-based requirements and **water quality criteria** to protect **existing use**s
   - Technical feasibility of alternatives (e.g., no-discharge of large discharges within dense urban areas)
   - System or technology reliability, potential for upsets/accidents
   - Nature of **pollutant**s discharged
   - Discharge timing and duration
   - Need for low-flow augmentation
   - Dilution ratio for **pollutant**s discharged

2) Environmental Factors
   - Sensitivity of stream uses
   - Sensitivity of groundwater uses in the area
   - Effect on endangered species
   - Potential to generate secondary water quality impacts (storm water, hydrology)

Review of these factors might be on a qualitative or quantitative basis, as appropriate. Other secondary environmental impacts should also be considered, such as the potential impact of alternatives on odor, noise, energy consumption, air emissions, and solid waste generation. Other practicability factors that should be considered during the review include the technical, legal, and local considerations of the various alternatives examined. The schedule and the estimated time of completion of the project should also be provided for each alternative discussed.

b) Economic Efficiency

Alternatives that are deemed practicable must undergo a direct cost comparison. An analysis of pollution control costs, or economic efficiency, is appropriate when the applicant desires to optimize the balance between water quality benefits and project costs. General cost categories that should be considered include:

- Capital costs
- Annual operating costs (including cost escalation)
- Other costs (one-time costs, savings, opportunity cost, salvage value)

Opportunity costs may be considered in the estimate of overall cost, as appropriate. For example, lost opportunity costs for lots in a proposed subdivision that would be used for land application rather than housing, or losses related to process changes that results in missed production runs are legitimate and should be documented.

In order to develop a standardized framework for projecting, evaluating, and comparing costs associated with various pollution control alternatives, applicants should use a present worth framework for reporting cost information. However, applicants may propose alternate economic demonstrations if appropriate. Alternative direct cost comparisons may be presented if the present worth calculation is complicated by the amount of difference in the effective design lives of the alternatives examined. The following calculation may be used to determine present worth:

$$P = C + O + [A \cdot (P/A, d, n)] - S$$

Where:

P = Present worth
C = Capital cost
O = Other costs (expressed as present worth)
A = Average annual operating cost (alternatively a gradient factor may be applied to account for cost escalation)
d = Discount rate
n = Useful life
S = Salvage value of facilities and land (expressed as net worth)
(P/A, d, n) = Equal series present worth factor = $[(1 + d)^n - 1] / [1 + d)^n]$

The alternative that is most economically efficient is then compared to the base cost of pollution control. The base cost of pollution control is the cost of the controls required to protect **existing use**s and to achieve the highest statutory and regulatory requirements, i.e., the more stringent of water quality-based effluent limits for **existing use** protection or technology-based effluent limits.

As a *non-binding rule-of-thumb,* alternatives less than 120 percent of the base cost of pollution control measures are economically efficient. In general, this amount represents the point beyond which increasing costs yield less proportional increases in water quality. Unless evidence exists to the contrary, alternatives greater than 120 percent of the base costs are generally considered to not be economically efficient. Conditions that might warrant consideration of alternatives of greater cost (above 120 percent) are the practicability factors identified under Section II.B.2.a of this document.

Applicants performing the direct cost comparison approach should evaluate the economic efficiency of the treatment options for each of the primary

POCs related to the proposed discharge. For example, the primary **POC**s for domestic wastewater discharges include biochemical oxygen demand (influencing in-stream dissolved oxygen concentration), ammonia, bacteria, and potentially other **pollutants** for which a wasteload allocation can be reasonably determined. An applicant may need to evaluate the costs associated with one **POC** if additional treatment process alternatives do not effect treatment for other **POC**s. This quantitative water quality analysis is not needed when the receiving water quality is not a significant factor for a specific alternative (e.g., in-stream dissolved oxygen concentrations in relation to a no-discharge alternative). Since all alternatives analyses use qualitative and quantitative assessments of water quality benefits and treatment costs and feasibility, best professional judgment is of the utmost importance when evaluating alternatives.

c) Affordability

Following an analysis of economic efficiency, the affordability of the most practicable and efficient alternative may be assessed at the applicant's discretion. This assessment may be used to determine if the alternative is too expensive to reasonably implement. This approach results in the selection of the most practicable and efficient alternative, while maintaining affordability to the public or private entity. *Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis*.

The determination of affordability for public and private entities is an emerging issue nationally. As such, federal guidance has not yet been finalized. Therefore, the applicant may select the most appropriate analysis of affordability for the specific scenario. The U.S. Environmental Protection Agency's **water quality standards** handbook – "*Interim Economic Guidance for Water Quality Standards*," EPA-823-B-95-002 (1995) presents one set of public and private sector approaches which consider the absolute value of the alternative rather than through cost comparisons. This interim guidance is in no way binding and may be replaced or supplemented with other methods of analysis.

The applicant's analysis of affordability may also include a consideration of whether or not the alternative is equitable. For example, a project that will significantly impact the low-income members of the community may not be equitable, as opposed to the evaluation of impacts to median income households used in the EPA approach. Thresholds for equity may differ from community to community, therefore, an understanding of the social needs and conditions of the community are necessary to determine if an alternative is socially equitable. Additionally, the review should consider the overall needs in the community. For instance, the analysis of affordability may consider funds that are available to the community to pay for pollution control but that are already targeted for education, health care, and other needs of high priority in the affected community. Such analyses must consider the ability of the

community to obtain additional funding for expanding treatment in a manner equivalent to that presented in EPA guidance.

If the applicant determines that the most efficient alternative is affordable, then it is the **preferred alternative**. If the most efficient alternative is not affordable, then the affordability of the next most efficient alternative should be evaluated until an alternative is chosen that is practical, economically efficient and affordable.

Following the analysis of pollution control alternatives, the alternative that is the most practicable, economically efficient, and affordable should be considered the preferred pollution control alternative. If this alternative results in greater than **minimal degradation**, the applicant must then document the **social and economic importance** (**SEI**) of the discharge according to the guidelines in Section II.E. of this document.

C. Review for Conformance to Technology-Based Requirements

Prior to authorizing any proposed activity that would degrade a water, the **department** shall assure compliance with the state-required controls and federal effluent limitation guidelines on all point sources discharging to the water **segment** receiving the new or expanding discharge. Compliance shall be considered assured if all **permit**s are in effect and the discharges from permitted facilities are not in significant noncompliance and/or are implementing all required best management practices (BMPs). Appropriate enforcement action and/or compliance schedules on facilities that are out of compliance will satisfy the assurance requirement.

D. Review for Implementation of Controls for Nonpoint Pollution Sources

In March 1994, EPA transmitted guidance regarding nonpoint sources of pollution (NPS) and the **antidegradation** provisions of the **Water Quality Standards** (**WQS**), with clarifying remarks for **antidegradation** implementation. EPA's regulatory interpretation of 40 CFR Section 131.12(a)(2) is that federal **antidegradation** policy does not require the **department** to establish best management practices (BMPs) for nonpoint source pollution control where regulatory programs requiring BMPs do not exist. The **Clean Water Act** leaves it to the states to determine what, if any, controls on nonpoint sources are needed to provide for attainment of state **WQS**. States may adopt regulatory or voluntary programs to address nonpoint sources of pollution. Federal rules at 40 CFR Section 131.12(a)(2) do not require that states adopt or implement best management practices for nonpoint sources prior to allowing point source **degradation** of a water. However, where a state has adopted a regulatory program for nonpoint source pollution control, the state must assure that such controls are properly implemented before authorization is granted to allow **degradation** of water quality. EPA also interprets 40 CFR Section 131.12(a) to mean that **degradation** is unnecessary for accommodating important social and economic development if the **degradation** could be partially or completely prevented through implementation of existing state-required BMPs.

The State of Missouri documents its program for nonpoint source pollution control in its Continuing Planning Process. This document explains how the program functions - that is, how it is funded, how funds are allocated to specific projects and how the program oversees the project completion. This document is updated regularly to keep the program priority-based, cost-effective and open to the public.

Nonpoint source discharges are not exempt from **antidegradation** requirements. The **department** will take aggressive action to prevent **significant degradation** from nonpoint pollution sources and to restore waters that are impaired by nonpoint sources. However, nonpoint source discharges of **pollutant**s are not currently regulated, and there are no regulatory control documents that are subject to an **antidegradation** review. Consequently, activities resulting in a new or expanded amounts of **pollutants** entering waters from nonpoint sources are not subject to an **antidegradation** review prior to these activities commencing.

E. Determining **Social and Economic Importance** of the **Preferred Alternative**

1. Steps in Determining **Social and Economic Importance** (**SEI**)

If the **preferred alternative** identified in Section II.B. of this document will result in **significant degradation** to the receiving waters, then the applicant must demonstrate that the **preferred alternative** (or "project") will allow important economic and social development. **SEI** is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanded discharge. The applicant should use the following three steps to demonstrate the **SEI**:

- Identify the affected community
- Identify relevant factors that characterize the social and economic conditions of the affected community
- Describe the important social and economic development associated with the project

The affected community is defined in 10 CSR 20-7.031(2)(B) as the community "in the geographical area in which the waters are located." The affected community should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project.

In order to describe the economic and social development associated with the proposed project, the applicant will first need to determine the social and economic factors that best characterize the affected community. Examples of social and economic factors include:

- Measures of employment or income
- Increasing production
- Increasing or improving housing
- Increasing the community tax base

- Providing necessary public services (e.g., fire department, school, infrastructure)
- Correcting a public health, safety or environmental problem

The social and economic measures identified above do not constitute a comprehensive list. Each situation and community is different and will require an analysis of unique social and economic factors. The applicant is encouraged to consider analyzing additional factors that characterize the specific community under consideration.

Following the identification of appropriate social and economic measures, the applicant must describe the expected change in these factors that is associated with the project. The purpose of this step is to demonstrate whether or not important social and economic development will result from the project. The applicant should first describe the existing condition of the affected community. This base condition should then be compared to the predicted change (benefit) in social and economic condition after the discharge is allowed. The area's use or dependence upon the water resource affected by the proposed discharge should also be described in the analysis. In doing so, the applicant may evaluate any associated environmental related benefits or costs, such as:

- Promoting/impacting fishing, recreation and tourism industries
- Reserving **assimilative capacity** for future industry and development

Upon the consideration of all relevant factors, the project constitutes important social and economic development if the applicant demonstrates that the project will lead to beneficial changes in the factors presented (i.e., increased jobs, employment, housing or other appropriate factors). This determination will be made on a case-by-case basis using information provided with the application.

2. Preliminary Determination of **Social and Economic Importance**

When information available to the **department** is not sufficient to make a determination regarding the social and economic benefits or environmental impacts associated with the proposed activity, the **department** may request that the applicant submit additional information to support a preliminary determination. Once the **department** has reviewed the final information pertaining to the **SEI** of the proposed activity, the **department** shall make a preliminary determination regarding how the **SEI** was considered in light of the changes to water quality. If the applicant has demonstrated that the proposed activity is important and if the highest applicable and established statutory and regulatory requirements are achieved, the **department** will prepare draft determination for public review under Section II.F of this document. This preliminary determination also becomes part of the **Administrative Record of Decisions** described in Section VI of this document.

If the **department** determines, after appropriate discussions with the discharger, that either the **SEI** of the proposed project has not been demonstrated or that

alternatives to the proposed discharge have not been appropriately considered, the **department** shall post its **antidegradation** review findings and the preliminary decision to deny the proposed activity. This preliminary determination also becomes part of the **Administrative Record of Decisions**.

F. Public and Interagency Participation in **Antidegradation** Reviews

Public participation is a component of the **antidegradation** review process. Public notice of **antidegradation** review findings, solicitations of public comment and maintenance of **antidegradation** review documents as part of the public record help ensure that interested parties can be engaged and involved throughout the review process. In addition, intergovernmental coordination and review is required prior to any action that allows **degradation** of water quality in a surface water afforded a **Tier 2 review**.

This section outlines the public participation *and* the intergovernmental coordination and review requirements. The processes for both must follow existing state rules regarding public notice, response to comments and maintenance of records. **Antidegradation** reviews for permitted facilities will employ the public participation procedures that are available through the permitting process (e.g., draft permits, Fact Sheets, Water Quality Review Sheets, opportunities to comment, etc.). The Fact Sheet on a permitted action will include a discussion on the **antidegradation** review.

1. Public Notification Requirements

The **department** will provide public notice and opportunity for public comment on all **antidegradation** reviews. The **department** will combine these public participation opportunities with other procedures, such as the public notices related to permitting processes or intergovernmental coordination and review procedures.

Discharges that may result in **degradation** of waters can only be approved after the **department** allows for public comment on whether **degradation** should be allowed (under the general public hearing procedures prescribed at 10 CSR 20-6.010) and the **department** makes all of the following findings:

- The level of water quality necessary to protect applicable **beneficial uses** is fully maintained. Water quality shall not be degraded to a level that does not comply with the applicable **Water Quality Standards** (**WQS**).
- The highest statutory and regulatory requirements for new and existing point sources are achieved.
- All cost-effective and reasonable BMPs for nonpoint source pollution control are implemented.
- Allowing **degradation** of water quality is necessary and accommodates important economic or social development in the area where the surface water is located.

After an **antidegradation** review has been conducted for a discharge that may result in **significant degradation**, the public notice will include a notice of availability of

- the decision as to whether or not the proposed discharge meets **antidegradation** requirements;
- determination of projected impacts on **existing water quality** (**EWQ**);
- findings and determinations from the **alternatives analysis**, when required;
- the conclusions of any social and economic evaluation of the proposed activity, where necessary; and
- a description of the surface water that is subject to the **antidegradation** review.

Unless public participation on the **antidegradation** review is incorporated into a permitting process, a public notice will be provided through the appropriate legal advertisement in a qualified newspaper with the largest circulation for the county where the discharge will occur. The notice will identify the action being considered, list all **beneficial uses** identified of the surface water and call for comments from the public regarding the proposed discharge.

All **antidegradation** review findings shall be documented by the **department** and made part of the **Administrative Record of Decisions**. *Review documents, including **EWQ** assessments, determination on significance of **degradation**, alternatives analyses, demonstration of **social and economic importance** and any other decisions or findings, will be made available to the public.*

2. Opportunities for Public Participation

Public participation in Missouri's water quality **antidegradation** program is both broad and specific. Opportunities for broad participation include involvement in the department's triennial review of the **WQS** (i.e., use designations, **water quality criteria** determinations, **antidegradation** review requirements) and participation in rule development relative to permitting processes. In addition, any interested party may nominate a water body for review at the Tier 3 level by following the procedure for consideration outlined under Section I.C of this document. Finally, interested groups can conduct volunteer monitoring to support **EWQ** determinations.

Wherever possible, the **department** will seek to integrate public participation regarding **antidegradation** reviews with existing public participation procedures (e.g., permitting procedures). Public notice, opportunity for public comment and opportunity for a public hearing will be provided for all activities approved after a **Tier 1**, **2** or **3 antidegradation review**, as noted above. Public hearings and the collection of public comments on **antidegradation** reviews related to **permit** actions will be integrated into the existing hearing and comment provisions of **permit** processes.

When **antidegradation** reviews and notices of findings related to such reviews are incorporated into the **permit** process, any required notice of the **permit** hearing or solicitation of comments shall note that elements of the **antidegradation** review (e.g., decisions, analyses, studies, water quality impacts) are also under consideration. Public participation processes that may include opportunities for **antidegradation** review and public involvement include –

- The **permit** issuance process for individual or general permit templates, which must abide by the requirements of 10 CSR 20-6.
- Permitting, planning or funding actions, which require public notices, comment opportunities and meetings as part of the application process and planning requirements.
- Individual **Clean Water Act** §401 water quality certifications, which specify public participation requirements executed by the **department**.
- Provisions for public participation in **antidegradation** reviews and related matters as outlined in the **department**'s Continuing Planning Process.
- Rulemaking involving revisions to the **WQS** related to **antidegradation**.

3. Intergovernmental Coordination and Review

Intergovernmental coordination is required prior to approving a discharge that would degrade a surface water protected at the Tier 2 level. This requirement seeks to ensure that all relevant public entities at the local, state and federal levels are aware of any proposal to degrade water quality and are provided with an opportunity to review, seek additional information and comment on the proposal. The intergovernmental coordination and review process occurs prior to the issuance of any final determination on the **social and economic importance** of the proposed discharge and may occur in tandem with public notice procedures outlined in the previous section. The time period afforded to commenting agencies will be consistent with the requirements for submission of public comments.

Element 5 of the Continuing Planning Process (CPP) also outlines the intergovernmental coordination process on activities involving the protection of water quality. Element 5 may be reviewed by contacting the **department** and requesting a copy of the CPP document or accessing the **department**'s Web site.

Agencies will have access to summary information on the proposed activity, the receiving water **segment**, the **EWQ** of the receiving water **segment**, the **POC**s, the tier designation, estimated amount of **degradation** to the receiving waters, the treatment alternatives reviewed and the **social and economic importance** of the proposed activity.

Once the intergovernmental coordination and public notice requirements outlined above are satisfied, the **department** shall make a final determination concerning the proposed activity. All determinations, including determinations to prohibit the

activity, shall be documented and made a part of the **Administrative Record of Decisions**.

4. Appeals of **Antidegradation** Review Decisions

   If a preliminary decision on **antidegradation** is made in advance of a permitting decision, the discharger may appeal the preliminary decision to the **department** director, or authorized delegate, within 30 days of the preliminary decision is announced. After any modifications are made consistent with the **department** director's recommendations, the review shall be public noticed pursuant to the permitting procedures within 10 CSR 20-6.020. The **department**'s final decision on a **permit** may be appealed pursuant to §§621.250 and 644.051 RSMo (i.e., of the Missouri state statutes) and 10 CSR 20-6.020 (i.e., of the Missouri Code of State Regulations).

5. Confidentiality

   To the extent Missouri's statutes allow, any information submitted pursuant to the *Missouri Antidegradation Rule and Implementation Procedure* or other rules of the **Clean Water Commission** that contains confidential business information shall be kept confidential by the commission and employees and agents of the **department** if a timely request for confidentiality is made by the person submitting the information. Confidential business information includes secret processes, secret methods of manufacturing or production, trade secrets, sensitive financial information and other information possessed by a business, that under existing legal concepts, the business has a right to preserve as confidential, and to limit its use by not disclosing it to others.

III. Permit Considerations

The **department** will not require an **antidegradation** review for any proposed new or expanded discharge for which an entity submits an application for a construction or an operating permit prior to August 30, 2008, the original effective date of these procedures.

Antidegradation reviews will be initiated by requests for water quality-based effluent **permit** effluent limits for the individual permits. The **department** will assess **existing water quality** (**EWQ**) for the purpose of assisting in the development of permit effluent limits. In developing those limits, the **department** will use both internal and applicant-supplied data and evaluations, identify existing and **beneficial uses** of the receiving water and analyze the impacts of the discharge, as well as cumulative discharges, that might affect the **assimilative capacity** of the receiving surface water for relevant **pollutants of concern** (**POC**s).

Because the permit effluent limits have a significant impact on the treatment processes, technologies and procedures used by the applicant, it is important that the **department** be notified early as to the nature of the discharge, discharge location and effluent characteristics. Developing permit effluent limits requires collection of a considerable amount of information on the receiving water, the applicant's discharge and other activities

in the drainage area. Early notification will ensure that the information collection process begins well before the applicant needs a **permit** to conduct planning activities, design facilities or proceed with project construction. In cases where the applicant intends to collect water quality data in preparation for an **antidegradation** review, the **department** recommends that the applicant meet with the **department** in a pre-application conference at least one year prior to the expected date of **permit** issuance. Applicants seeking funding through state-managed grants or loans should consider visiting with the state at least two years in advance of **permit** issuance.

Much of the **antidegradation** review for a point source discharge regulated by a **permit** will occur during the permitting process. Proposed new or expanded discharges that may significantly degrade waters protected at the Tier 2 level must undergo a comprehensive **antidegradation** review to determine whether **less-degrading** or **non-degrading alternative**s exist and whether **significant degradation** is necessary to allow important social and economic development in the area of the point source discharge.

Early notification and consultation between the applicant and the **department** will help ensure that the permitting process proceeds efficiently. The following steps outline the general procedure for processing a **permit**:

- Applicant notifies the **department** of intent to apply for **permit** coverage;
- The **department** determines eligibility for general permit or site-specific permit coverage, and if not a general permit;
- Applicant and/or the **department** collects **EWQ** information for applicable **POC**s;
- The **department** develops draft permit effluent limits based on effluent guidelines, the applicable **Water Quality Standards** (**WQS**), **EWQ** and **antidegradation** requirements;
- Applicant applies for **permit** after consultation with the **department**;
- The **department** develops final permit effluent limits for **POC**s; and
- The **department** issues **permit** to applicant after the **antidegradation** review.

Regulated discharges that may temporarily degrade waters protected at the Tier 3 level must comply with the **antidegradation** requirements applicable to that review level (i.e., provide proof that the **degradation** is only temporary) before a **permit** will be granted. *Any discharge to an **Outstanding National Resource Water** or **Outstanding State Resource Water** will require a site-specific permit or individual §401 certification to ensure that impacts will be temporary and that the public can participate in the decision.*

A. General Permits

In order to implement the procedure for **antidegradation** without causing major disruption to workflow and permit timeliness, an **antidegradation** review will not be required for discharges covered under Missouri's general permits until the general permit templates are reissued to incorporate the procedure. General permits will be

addressed as they expire after the effective date of the *Missouri Antidegradation Rule and Implementation Procedure*. (The scheduled expiration dates of general permits issued by the **department** can be found on the **department**'s Web page.)

Incorporating the **antidegradation** requirements in this manner will incrementally address all general permits within five years from the effective date of this document. Incrementally addressing the renewals avoids an excessive workload both on the public (during the required public participation on the permit renewal process) and on the **department** (when evaluating the various discharge alternatives and the overall **social and economic importance** (**SEI**) of the discharges authorized by each general permit).

B. Site-Specific Permits

Following the effective date of this document, all applications for new or expanded site-specific permits, except for permits issued on non-discharging facilities, shall undergo an **antidegradation** review if **significant degradation** is likely in the receiving water or downstream waters. In these cases, site-specific permit effluent limits will be based upon applicable effluent guidelines, the characteristics of the discharge, cumulative effects and the **alternatives analysis**. In addition, the permit effluent limits must ensure that **beneficial uses** are maintained and protected in the receiving waters and downstream waters.

Applicants seeking site-specific permit coverage may be required to provide or collect **EWQ** information on any **POC**s reasonably expected to be in the discharge, if that information is not already available. Data collection requirements may depend on the nature of the proposed discharge and the **pollutant**s reasonably expected in the discharge.

C. §401 Certifications

Section 404 of the **Clean Water Act** regulates the placement of dredged or fill material into the "waters of the United States," including small streams and wetlands adjacent or connected to "waters of the United States." The U.S. Army Corps of Engineers (COE) administers the §404 permit program dealing with these activities (e.g., wetland fills, in-stream sand/gravel work, etc.) in cooperation with the EPA and in consultation with other public agencies.

In order to ensure that **antidegradation** and other water quality protection requirements are considered, reviewed and met in a comprehensive and efficient manner, these requirements will be addressed and implemented through the permitting and §401 water quality certification processes. Under this approach, applicants who fulfill the terms and conditions of applicable §404 permits, and the terms and conditions of the department's corresponding §401 water quality certification, will have fulfilled the **antidegradation** requirements. **Antidegradation** considerations will be incorporated into §404 permits and the corresponding §401 certifications at the time of permit issuance.

For minor activities covered under §404 general permits (e.g., road culvert installation, utility line activities, bank stabilization, etc.), **antidegradation** requirements will be deemed to be met if all appropriate and reasonable BMPs related to erosion and sediment control, project stabilization and prevention of water quality **degradation** (e.g., preserving vegetation, stream bank stability and basic drainage) are applied and maintained. Applicants desiring to fulfill **antidegradation** review requirements under this approach will be responsible for ensuring that permit requirements and relevant water quality certification conditions are met.

Missouri manages its §401 water quality certification program to ensure that the placement of dredged or fill material into surface waters do not create any unmitigated water quality impairments or **significant degradation** of surface waters. Under the BMP-based approach adopted by Missouri, regulated activities for which mitigation has been certified by the state pursuant to §401 of the **Clean Water Act** will not be required to undergo a separate **Tier 2 review** in accordance with this document.

The decision making process for §404 individual permits is contained in the §404(b)(1) guidelines (40 CFR Part 230) and contains all of the required elements for a **Tier 1** and **Tier 2 review**. Prior to issuing a permit under the §404(b)(1) guidelines, the COE must: 1) make a determination that the proposed discharges are unavoidable (i.e., necessary); 2) examine alternatives to the proposed activity and authorize only the least damaging practicable alternative; and 3) require mitigation for all impacts associated with the activity. A §404(b)(1) findings document is produced as a result of this procedure and is the basis for the permit decision. Public participation is also provided for in this process. Because the §404(b)(1) guidelines meet the requirements of a **Tier 1** and **Tier 2 review**, the **department** will not conduct a separate review for the proposed activity. **Tier 1** and **Tier 2 review** will be met through §401 certification of individual §404 permits and will rely upon the information contained in the §404(b)(1) findings document.

IV. Monitoring and Assessment Considerations

A. Data Collection and Evaluation

Data gathered during the **department**'s regular monitoring and assessment efforts shall be evaluated in accordance with the level of tier review designated to the waters. Data gathered on a water being given a **Tier 1 review** shall be assessed for compliance with the narrative and numeric **Water Quality Standards** (**WQS**) of 10 CSR 20-7.031. Waters receiving **Tier 3 review** shall be assessed against the **existing water quality** (**EWQ**) data or other appropriate reference stream data. Waters receiving **Tier 2 review** shall be assessed against **EWQ** data or other appropriate stream data unless **degradation** has been authorized since the **EWQ** data was collected. Assessments on waters that have undergone authorized **degradation** shall be assessed against the level of water quality that was predicted and documented in the **Administrative Record of Decisions** when the **degradation** was authorized. Such assessments shall be made on the same **pollutant-by-pollutant basis**, as authorized by the **antidegradation** review.

B. Applicability to §305(b) Report and §303(d) List

Section 305(b) of the **Clean Water Act** requires each state to prepare and submit to EPA a biennial report describing water quality of all surface waters in the state. Each state must monitor water quality and review available data to determine if the **WQS** are being met. From this review, waters that do not meet **WQS** are identified. These waters are known as impaired waters. Those impaired waters that are impaired by a discrete pollutant or chemical condition, do not yet have sufficient water quality protection measures in place, and do not yet have an approved TMDL are used to form the §303(d) list. Identification of a surface water as impaired may be based on a violation of a numeric or narrative **WQS**.

To coordinate **antidegradation** reviews with the §305(b) and §303(d) listing process, the **department** will implement the following procedures:

- Tier 1 Protection (applicable to all waters):

  No further **degradation** of **EWQ** for a **pollutant of concern** (**POC**) is allowed in a surface water where the **EWQ** for the **POC** does not meet the applicable **WQS**. Impaired waters are identified on Missouri's §303(d) List and targeted for future Total Maximum Daily Load (TMDL) development.

- Tier 2 Protection:

  If performed properly, **Tier 2 review**s will not result in **degradation** sufficient to cause beneficial use impairment. If a §305(b) water quality assessment shows that **significant degradation** of a surface water is occurring, and that the **WQS** might be violated over time, the **department** may conduct a special study of the extent and source(s) of **degradation** to determine the cause for the trend and identify appropriate **antidegradation** actions to reverse any preventable trends. The plan may include providing technical and other assistance to address probable sources of **degradation** and implement appropriate management practices. Other possible options include awarding priority points for grant or other funding programs targeted at water quality protection, amending **permit**s or water quality certification conditions and working with stakeholders to support actions needed to protect and restore water quality.

- Tier 3 Protection:

  No **degradation,** except for **temporary degradation,** is allowed in the unique waters afforded Tier 3 protection. If a §305(b) assessment shows that long-term **degradation** (i.e., not **temporary degradation**) of an **Outstanding National Resource Water** or **Outstanding State Resource Water** is occurring, the **department** may conduct a special study of the extent and source(s) of **degradation** to determine likely trends and explore possible **antidegradation** actions needed to reverse the trend, similar to what was described for ensuring Tier 2 protection.

V. Applicability to Total Maximum Daily Loads

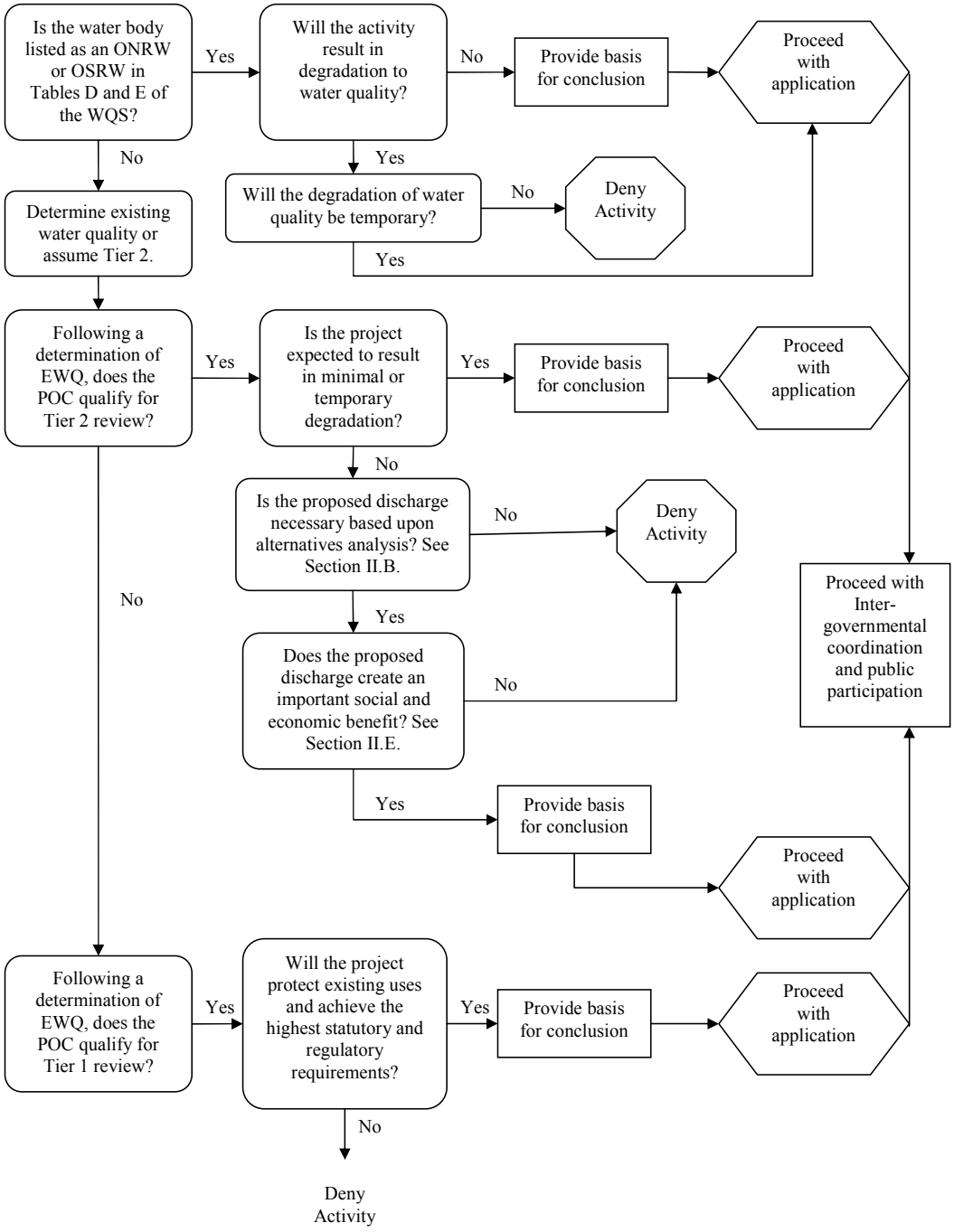
The **department** is required to develop Total Maximum Daily Loads (TMDLs) for the restoration of impaired waters. When developing these TMDLs, the **department** shall allocate pollution loads in accordance with the level of tier review designated to the **pollutant of concern** (**POC**). TMDLs developed for Tier 1 protection shall be designed to achieve compliance with the **water quality criteria** (**WQC**). TMDLs on waters receiving Tier 3 protection shall be designed to meet the water's **existing water quality** (**EWQ**) or other appropriate reference stream quality. TMDLs on **POC**s receiving **Tier 2 review** shall be designed to meet the water's **EWQ** data or other appropriate stream quality unless **degradation** has been authorized since the **EWQ** data were collected. TMDLs on waters that have undergone authorized **degradation** shall be developed for the level of water quality that was predicted and documented in the **Administrative Record of Decisions** when the **degradation** was authorized. Such TMDLs shall be made on the same **pollutant-by-pollutant basis**, as authorized by the **antidegradation** review.

VI. Administrative Record of Decisions

The **department** shall prepare a record of all information considered and decisions made during **antidegradation** reviews. The purpose of this record is to create a historical reference to the basis for decisions and a complete explanation of the conclusions reached. The following list describes the documents necessary to complete the **Administrative Record of Decisions** on each **antidegradation** review.

- Final written decision on acceptability of **degradation**
- **EWQ** data or model on evaluated **segment** (or reference to the data) and the final **EWQ** of the **segment** determined following the last data or model interpretation
- Calculations for determining **minimal degradation**, if applicable
- Any other worksheets and calculations used during the **antidegradation** review

Appendix 1. Antidegradation Decision Diagram



APPENDIX 2

Example Statistical Approach for Determining a Water's Eligibility for a Tier 1 Review

The following presents a method for determining whether or not a **pollutant** parameter or **pollutant of concern** (**POC**) is at, near, or violating the water quality standard in the water that would be receiving the discharge. The method below could be used regardless of data set size. This method may also be used in *Microsoft Excel*.

The following is the procedure to determine the 90th percentile of the observed data for a particular **POC**:

Step 1: Rank the list of values (concentrations) into ascending order and assign them values from 1 to N (N = total number of values)

Step 2: Use the following formula to calculate the corresponding ranking (which will be split into integer and decimal components).

$$R = 1 + \frac{P\,(N-1)}{100} = I + D$$

Where:

R = the rank of the data value (in this example, "3.7") that corresponds to the percentile to be determined
P = the percentile to be determined (in this example, "90", so written, "P90")
N = total number of data values from the receiving water (in this example, 4 values)
I = integer part of the ranking (in this example, "3")
D = decimal part of the ranking (in this example, "0.7")

Step 3: Use the following formula to interpolate between the necessary two values (in this example, "the two necessary values" are those representing the 3rd and 4th ranking):

$$P = Y_i + D\,(Y_{i+1} - Y_i)$$

EXAMPLE:

POC	=	Dissolved Aluminum (µg/L)
Sample Results	=	40 µg/L, 30 µg/L, 850 µg/L, 20 µg/L (four values)
Water Quality Standard	=	750 µg/L

Step 1: Rank the values in ascending order (e.g., 20, 30, 40, 850)

Step 2: Rank for 90th percentile = 1 + [90(N – 1)/100] = 1 + (90 · 3/100) = **3.7** (where "3" = the integer component, and "0.7" = the decimal component)

Since the rank, "3.7", is between 3 and 4, you must interpolate between the two values that represent the 3rd and 4th rankings. In this case, the value "40" was ranked 3rd ($\mathbf{Y_i}$), and "850" was ranked 4th ($\mathbf{Y_{i+1}}$). So use the formula in Step 3 to come up with a value between 40 and 850 (specifically, seven tenths of the way between 40 and 850).

Step 3: P90 = 40 + [0.7 · (850 – 40)] = **607 µg/L** Dissolved Aluminum

[For *Excel* users, there is no need to sort the data. Just use the formula: "=PERCENT(array,k)" where the array represents the list of values (20, 40, 30, 850) and k =0.90.]

If P90 ≥ 95% of the standard, then a Tier 1 review is appropriate.
If P90 < 95% of the standard, a Tier 1 review is not appropriate. A Tier 2 review is required.

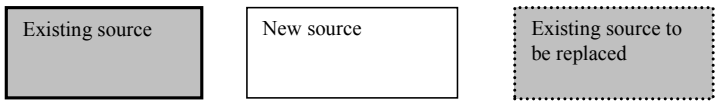
In this example, since the P90 (607 µg/L) is less than 95% of the 750 µg/L standard for dissolved aluminum (95% being 712.5 µg/L), the P90 is judged to be *significantly* less than the standard. Therefore, a significant available **assimilative capacity** exists for aluminum and the proposed discharge does not qualify for a **Tier 1 review**. Instead, a **Tier 2 review** is required to justify the amount of reduction, if any, in the available **assimilative capacity**.

APPENDIX 3

Examples of Calculations for Minimal Degradation

NOTE: For the following six examples, the variables/terms are defined as follows *(as is true in this entire document, bolded terms are defined in the Glossary)***:**

Symbols:



cfs = cubic feet per second

Cc = chronic criterion (Note: Although the provided examples use the "chronic" criterion, in some cases it may be more appropriate to use the "acute" criterion.)

Qs = stream flow (**7Q10** or other representative flow)

Qd_1 = average daily design flow of existing discharge in cubic feet per second (cfs)

Qd_2 = average daily design flow of new or expanded discharge (cfs)

Cs = **pollutant** concentration in stream immediately below the point where the facility's effluent enters the segment

CF = conversion factor used to convert a pollutant mass loading into the desired units. For example, using a CF of 5.4 to derive a load in "lbs/day" is appropriate when the **WQS** is represented in mg/L and flow is represented in cfs [(mg/L) · (cfs) · 5.4) = (lbs/day)]

Cd_1 = existing discharge concentration (mg/L)

Cd_2 = new or expanded discharge concentration (mg/L)

EWQ = **existing water quality**, a characterization of the current approved levels of **pollutant**s within a **segment** of water at the point of discharge (Also see the definition in the Glossary of this document.)

SAC = **Segment assimilative capacity** (lbs/day) – See Glossary.

FAC = **Facility assimilative capacity** (lbs/day) – See Glossary.

Steps for Calculating the Percent Reduction in **FAC** from a Proposed Discharge:

Step 1: Calculate the **FAC**

(1a) **FAC** for proposed new discharges = $[(\mathbf{WQC} \cdot (Qs+Qd_2)) - (Cs \cdot Qs)] \cdot CF$

(1b) **FAC** for existing (expanding) discharges = $[(\mathbf{WQC} \cdot (Qs+Qd_2)) - (Cs \cdot (Qs+Qd_1))] \cdot CF$

Step 2: Calculate the load of the new or expanded discharge and the current load of the existing discharge (if applicable)

(2a) Load of proposed new or expanded = $(Cd_2 \cdot Qd_2) \cdot CF$ = "New discharge load"

(2b) Load of existing discharge = $(Cd_1 \cdot Qd_1) \cdot CF$ = "Current discharge load"

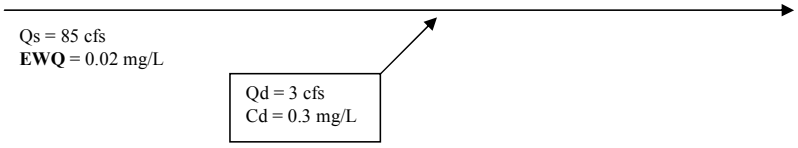
Step 3: Determine whether the new or expanded load is greater than 10 percent of the **FAC**

(3) Percent of **FAC** = [(New discharge load – Current discharge load)/**FAC**]·100

Example 1. Example calculation for determining minimal degradation from a new discharge

Scenario:

- A municipality plans to build a new wastewater treatment facility with a design flow of 3 cfs (Qd) and an effluent zinc concentration of 0.3 mg/L (Cd).
- The receiving stream has a **7Q10** (Qs) of 85 cfs.
- The **EWQ** for the **segment** is 0.02 mg/L of zinc.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.



FAC = [(Cc·(Qs+Qd)) – (EWQ·Qs)]·CF
= [(0.151 mg/L·(85 cfs + 3 cfs)) – (0.02 mg/L·85 cfs)]·5.4
= [(0.151·88) – (1.7)]·5.4
= 62.6 lbs/day

New discharge load = Qd·Cd·CF
= 3 cfs·0.3 mg/L·5.4
= 4.9 lbs/day

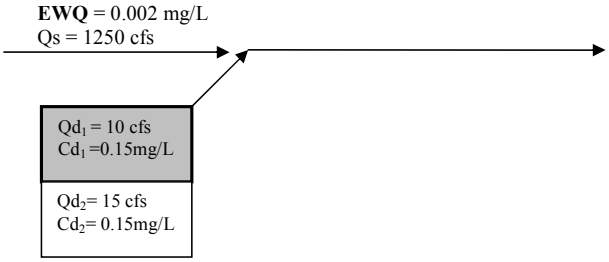
Percent of **FAC** = (New discharge load/FAC)·100
= (4.9/62.6)·100
= 7.8%

The discharge could be allowed without further **antidegradation** review since the **FAC** consumption is less than the 10% **minimal degradation** threshold. A higher total discharge could be allowed if an **antidegradation** review indicates the activity may proceed.

Example 2. Example calculation for determining minimal degradation from an expanding discharge

Scenario:

- A municipality plans to expand its current wastewater treatment facility (an **existing source**) from 10 cfs (Qd_1) to 15 cfs (Qd_2) and maintain its effluent copper concentration of 0.15 mg/L (Cd_1 and Cd_2).
- The receiving stream has a **7Q10** (Qs) of 1250 cfs.
- The **EWQ** upstream of plant is 0.002 mg/L of copper.
- The chronic criterion (Cc) of copper is 0.010 mg/L.



Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1250 cfs·5.4 = 13.5 lbs/day
Current discharge load =Current copper effluent concentration·Current discharge flow·CF
$= Cd_1 \cdot Qd_1 \cdot CF = 0.15 \text{ mg/L} \cdot 10 \text{ cfs} \cdot 5.4$
= 8.1 lbs/day
Total load = Stream load+Current discharge load = 13.5+8.1 = 21.6 lbs/day

To solve for Cs:

21.6 lbs/day = [Cs·(Qs+Qd_1)]·5.4 = [Cs·(1250 cfs+10 cfs)]·5.4 = [Cs·1260 cfs]·5.4
21.6/5.4 = [Cs·1260]·5.4/5.4
4 = Cs·1260
4/1260 = Cs
Cs = 0.0031746 mg/L

FAC = [(Cc·(Qs+Qd_2)) – (Cs·(Qs+Qd_1))]·CF
= [(0.01 mg/L·(1250 cfs+15 cfs)) – (0.0031746 mg/L·(1250 cfs+10 cfs))]·5.4
= 46.71 lbs/day

New discharge load = Qd_2·Cd·CF
= 15 cfs·0.15 mg/L·5.4
= 12.2 lbs/day

Net increase = New discharge load – Current discharge load
= 12.2 lbs/day – 8.1 lbs/day
= 4.1 lbs/day

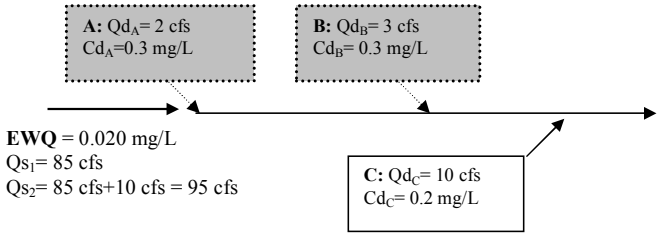
Percent of **FAC** = (Net increase/FAC)·100
= (4.1/46.71)·100
= 8.78%

The discharge could be allowed without further **antidegradation** review since the net percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold. A higher total discharge could be allowed if an **antidegradation** review indicates the activity may proceed.

Example 3. Example calculation for determining minimal degradation from a new discharge replacing two existing discharges *(Page 1 of 2)*

Scenario:

- A municipality plans to build a new wastewater treatment facility (Plant C) with a design flow of 10 cfs (Qd_C) and an effluent zinc concentration of 0.2 mg/L (Cd_C).
- The new wastewater treatment facility is to replace two current facilities (Plants A and B).
- Plant A (**existing source**) has a design flow of 2 cfs (Qd_A) and an effluent zinc concentration of 0.3 mg/L (Qd_A).
- Plant B (**existing source**) has a design flow of 3 cfs and an effluent zinc concentration of 0.3 mg/L (Cd_B).
- The receiving stream has a **7Q10** (Qs_1) of 85 cfs.
- The **EWQ** upstream of Plant A is 0.020 mg/L of zinc.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.



Note: Qs_1 is the flow upstream of the affected **segment** (i.e., upstream of Plant A) and Qs_2 is the flow downstream of Plant C after the consolidation.

Cs: Stream load = EWQ·Stream flow (i.e., Qs_1)·CF = 0.020 mg/L·85 cfs·5.4 = 9.2 lbs/day

Current discharge load = (Current zinc effluent concentration·Current discharge flow·CF) for Plants A and B combined.

$= [(Cd_A \cdot Qd_A \cdot CF)+(Cd_B \cdot Qd_B \cdot CF)]$

= [(0.3 mg/L·2 cfs·5.4)+ (0.3 mg/L·3 cfs·5.4)]

= [(3.24)+(4.86)]

= 8.1 lbs/day

Total load = Stream load+Current discharge load = 9.2+8.1 = 17.2 lbs/day

To solve for Cs:

$17.3 \text{ lbs/day} = [Cs \cdot (Qs_1+Qd_A+Qd_B)] \cdot CF = [Cs \cdot (85 \text{ cfs}+2 \text{ cfs}+3 \text{ cfs})] \cdot 5.4 = [Cs \cdot 90] \cdot 5.4$

$17.3/5.4 = [Cs \cdot 90] \cdot 5.4/5.4$

$3.2 = Cs \cdot 90$

$3.2/90 = Cs$

$Cs = 0.03556 \text{ mg/L}$

FAC $= [(Cc \cdot Qs_2) - (Cs \cdot (Qs_1+Qd_A+Qd_B))] \cdot CF$

$= [(0.151 \text{ mg/L} \cdot 95 \text{ cfs}) - (0.03556 \text{ mg/L} \cdot (85 \text{ cfs}+2 \text{ cfs}+3 \text{ cfs}))] \cdot 5.4$

$= [(14.345) - (0.03556 \cdot 3.2004)] \cdot 5.4 = [11.1446] \cdot 5.4$

= 60.181 lbs/day

New discharge load $= Qd_C \cdot Cd_C \cdot CF$

= 10 cfs·0.2 mg/L·5.4

= 10.8 lbs/day

Net increase = New discharge load – Current discharge load

= 10.8 lbs/day – 8.1 lbs/day

= 2.7 lbs/day

Example 3. Example calculation for determining minimal degradation from a new discharge replacing two existing discharges *(Page 2 of 2)*

Percent of **FAC** = (Net increase/FAC)·100
= (2.7/60.181)·100
= 4.5%

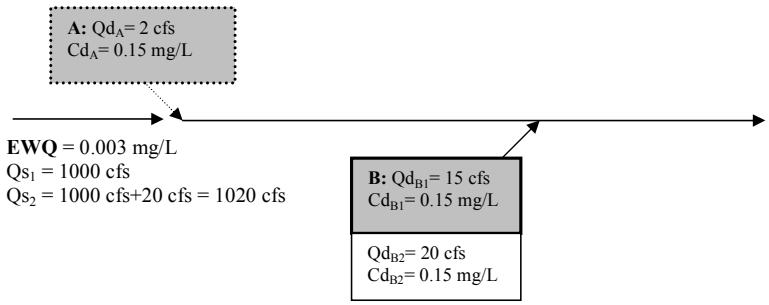
The discharge could be allowed without further **antidegradation** review since the net percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold. A higher total discharge could be allowed if an **antidegradation** review indicates the activity may proceed.

Example 4. Example calculation for determining minimal degradation from an expanding discharge replacing an existing discharge *(Page 1 of 2)*

Scenario:

A municipality plans to expand its current wastewater treatment facility (Plant B) (an **existing source**) from 15 cfs to 20 cfs while maintaining its effluent copper concentration at 0.15 mg/L.

- The expansion will replace Plant A (an **existing source**).
- Plant A has a design flow of 2 cfs (Qd_A) and an effluent copper concentration of 0.15 mg/L (Cd_A).
- Plant B has a design flow of 15 cfs (Qd_{B1}) and an effluent copper concentration of 0.15 mg/L (Cd_{B1}).
- The receiving stream has a **7Q10** (Qs_1) of 1000 cfs.
- The **EWQ** upstream of Plant A is 0.003 mg/L of copper.
- The chronic criterion (Cc) of copper is 0.010 mg/L.



Note: Qs_1 is the flow upstream of the affected **segment** (i.e., upstream of Plant A) and Qs_2 is the flow downstream of Plant B after the consolidation/expansion.

Cs: Stream load = EWQ·Stream flow (i.e., Qs_1)·CF = 0.003 mg/L·1000 cfs·5.4 = 16.2 lbs/day

Current discharge load = (Current copper effluent concentration·Current discharge flow·CF) for Plants A and B combined.

= [(Cd_A·Qd_A·CF)+(Cd_{B1}·Qd_{B1}·CF)]

= [(0.15 mg/L·2 cfs·5.4)+(0.15 mg/L·15 cfs·5.4)]

= [(1.62)+(12.15)]

= 13.8 lbs/day

Total load = Stream load+Current discharge load = 16.2+13.8 = 30 lbs/day

To solve for Cs:

30 lbs/day = [Cs·(Qs_1+Qd_A+Qd_{B1})]·CF = [Cs·(1000 cfs+2 cfs+15 cfs)]·5.4 =[Cs·1017]·5.4

30/5.4 = [Cs·1017]·5.4/5.4

5.556 = Cs·1017

5.556/1017 = Cs

Cs = 0.005463 mg/L

FAC = [(Cc·Qs_2) – (Cs·(Qs_1+Qd_A+Qd_{B1}))]·CF

= [(0.010 mg/L·1020 cfs) – (0.005463 mg/L·(1000+2+15 cfs))]·5.4

= [(10.2) – (0.005463 ·1017)]·5.4

= [10.2 – 5.555871]·5.4

= 25.1 lbs/day

New discharge load = Qd_{B2}·Cd_{B2}·CF

= 20 cfs·0.15 mg/L·5.4

= 16.2 lbs/day

Example 4. Example calculation for determining minimal degradation from an expanding discharge replacing an existing discharge *(Page 2 of 2)*

Net increase = New discharge load – Current discharge load
= 16.2 lbs/day – 13.8 lbs/day
= 2.4 lbs/day

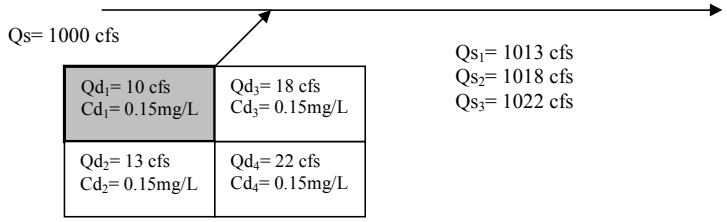
Percent of **FAC** = (Net increase/FAC)·100
= (2.4/25.1)·100
= 9.6%

The discharge could be allowed without further **antidegradation** review since the net percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold. A higher total discharge could be allowed if an **antidegradation** review indicates the activity may proceed.

Example 5. Example calculation for determining minimal degradation from an expanding discharge undergoing multiple expansions *(Page 1 of 3)*

Scenario: Over a period of many years a municipality plans three separate expansions of its wastewater treatment facility (WWTF).

- Each expansion increases the design flow by an additional cfs while maintaining its effluent copper concentration at 0.15 mg/L.
- The original design (Qd_1 = 10 cfs; Cd_1 = 0.15 mg/L of copper) is an **existing source**.
- The **EWQ** upstream of the WWTF is 0.002 mg/L of copper.
- The receiving stream has a **7Q10** (Qs) of 1000 cfs.
- The chronic criterion (Cc) of copper is 0.010 mg/L.



Note: Qs is the **7Q10** stream flow. Qs_1, Qs_2, and Qs_3 are the stream flows (i.e., **7Q10** plus facility flow) downstream of the WWTF after the first, second, and third expansions, respectively.

First Expansion:

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1000 cfs·5.4 = 10.8 lbs/day
Current discharge load = Current copper effluent conc.·Current discharge flow·CF
$= Cd_1 \cdot Qd_1 \cdot CF$ = 0.15 mg/L·10 cfs·5.4
= 8.1 lbs/day
Total load = Stream load+Current discharge load = 10.8+8.1 = 18.9 lbs/day

To solve for Cs:

18.9 lbs/day = [Cs·(Qs+Qd_1)]·CF = [Cs·(1000 cfs+10 cfs)]·5.4 = [Cs·1010 cfs]·5.4
18.9/5.4 = [Cs·1010]·5.4/5.4
3.5 = Cs·1010
3.5/1010 = Cs
Cs = 0.003465 mg/L

FAC = [(Cc·Qs_1) – (Cs·(Qs+Qd_1))]·CF
= [(0.010 mg/L·1013 cfs) – (0.003465 mg/L·(1000 cfs+10 cfs))]·5.4
= [(10.13) – (0.003465 mg/L·1010 cfs)]·5.4 = [(10.13) – (3.49965)]·5.4
= 35.804 lbs/day

New discharge load = $Qd_2 \cdot Cd_2 \cdot CF$
= 13 cfs·0.15 mg/L·5.4
= 10.5 lbs/day

Net increase = New discharge load – Current discharge load
= 10.5 lbs/day – 8.1 lbs/day
= 2.4 lbs/day

Percent of **FAC** = (Net increase/FAC)·100
= (2.4/35.804)·100
= 6.7%

The first expansion could be allowed without further **antidegradation** review since the net percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold.

Example 5. Example calculation for determining minimal degradation from an expanding discharge undergoing multiple expansions *(Page 2 of 3)*

Second Expansion:

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1000 cfs·5.4 = 10.8 lbs/day
Current discharge load = Current copper effluent conc.·Current discharge flow·CF
$= Cd_2 \cdot Qd_2 \cdot CF$ = 0.15 mg/L·13 cfs·5.4
= 10.5 lbs/day
Total load = Stream load+Current discharge load = 10.8+10.5 = 21.3 lbs/day

To solve for Cs:

21.3 lbs/day = $[Cs \cdot (Qs+Qd_2)] \cdot CF = [Cs \cdot (1000 \text{ cfs}+13 \text{ cfs})] \cdot 5.4 = [Cs \cdot 1013 \text{ cfs}] \cdot 5.4$
21.3 /5.4 = [Cs·1013]·5.4/5.4
3.9 = Cs·1013
3.9/1013 = Cs
Cs = 0.0038 mg/L

FAC = $[(Cc \cdot Qs_2) - (Cs \cdot (Qs+Qd_2))] \cdot CF$
= [(0.010 mg/L·1018 cfs) – (0.0038 mg/L·(1000 cfs+13 cfs))]·5.4
= [(10.18) – (0.0038·1013)]·5.4 = [(10.18) – (3.849)]·5.4 = [6.33]·5.4
= 34.18 lbs/day

New discharge load = $Qd_3 \cdot Cd_3 \cdot CF$
= 18 cfs·0.15 mg/L·5.4
= 14.6 lbs/day

Net increase = New discharge load – Current discharge load
= 14.6 lbs/day – 10.5 lbs/day
= 4.1 lbs/day

Percent of **FAC** = (Net increase/FAC)·100
= (4.1/34.18)·100
= 12.0%

The second expansion will consume more than 10% of the **FAC**, therefore, further antidegradation review is needed. ~~Even though exceeding 10% of the **FAC** requires the antidegradation review to continue, calculate the consumption of the **SAC** by the Second Addition in order to create an administrative record of the remaining **SAC** to use as reference when reviewing future expansions (See Third Expansion).~~

~~Cumulative net increase in discharge load = 1st Net increase+2nd Net increase~~
~~= 2.4 lbs/day+4.1 lbs/day~~
~~= 6.5 lbs/day~~

~~**SAC** = $[(Cc \cdot Qs_2) - (Cs \cdot (Qs+Qd_1))] \cdot CF$~~
~~= [(0.010 mg/L·1018 cfs) – (0.0038 mg/L·(1000 cfs+10 cfs))]·5.4~~
~~= [(10.18) – (3.8)]·5.4 = [6.38]·5.4~~
~~= 34.45 lbs/day~~

~~Cumulative Percent of **SAC** = (Cumulative net increase/SAC)·100~~
~~= (6.5/34.45)·100~~
~~= 18.9%~~

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Example 5. Example calculation for determining minimal degradation from an expanding discharge undergoing multiple expansions *(Page 3 of 3)*

Third Expansion:

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1000 cfs·5.4 = 10.8 lbs/day
Current discharge load = Current copper effluent conc.·Current discharge flow·CF
= $Cd_3 \cdot Qd_3 \cdot CF$ = 0.15 mg/L·18 cfs·5.4
= 14.6 lbs/day
Total load = Stream load+Current discharge load = 10.8+14.6 = 25.4 lbs/day
To solve for Cs:
25.4 lbs/day = [Cs·(Qs+Qd_3)]·CF = [Cs·(1000 cfs+18 cfs)]·5.4 = [Cs·1018 cfs]·5.4
25.4/5.4 = [Cs·1018]·5.4/5.4
4.704 = Cs·1018
4.704/1018 = Cs
Cs = 0.004621 mg/L

FAC = [(Ce·Qs_3) – (Cs·(Qs+Qd_3))]·CF
= [(0.010 mg/L·1022 cfs) – (0.004621 mg/L·(1000 cfs+18 cfs))]·5.4
= [(10.22) – (.004621 mg/L·1018 cfs)]5.4
= 29.786 lbs/day

New discharge load = $Qd_4 \cdot Cd_4 \cdot CF$
= 22 cfs·0.15 mg/L·5.4
= 17.8 lbs/day

Net increase = New discharge load – Current discharge load
= 17.8 lbs/day – 14.6 lbs/day
= 3.2 lbs/day

Percent of **FAC** = (Net increase/FAC)·100
= (3.2/29.786)·100
= 10.7%

Since the Third Expansion will consume more than 10% of the **FAC**, further **antidegradation** review is needed. Even though exceeding 10% of the **FAC** requires the antidegradation review to continue, you should calculate the consumption of the **SAC** by the Third Expansion in order to create an administrative record of the remaining **SAC** to use as reference when reviewing future expansions.

Cumulative net increase in discharge load = 1st Net increase+2nd Net increase+3nd Net increase
= 2.4 lbs/day+4.1 lbs/day+3.2 lbs/day
= 9.7 lbs/day

SAC = [(Ce·Qs_3) – (Cs·(Qs+Qd_2))]·CF
= [(0.010 mg/L·1022 cfs) – (0.004621 mg/L·(1000 cfs+13 cfs))]·5.4
= [(10.22) – (4.681)]·5.4
= 29.9 lbs/day

Cumulative Percent of **SAC** = (Cumulative net increase/SAC)·100
= (9.7/29.9)·100
= 32.4%

Since the Third Expansion exceeds 20% of the SAC, all future discharge expansions on the stream segment will require further antidegradation review.

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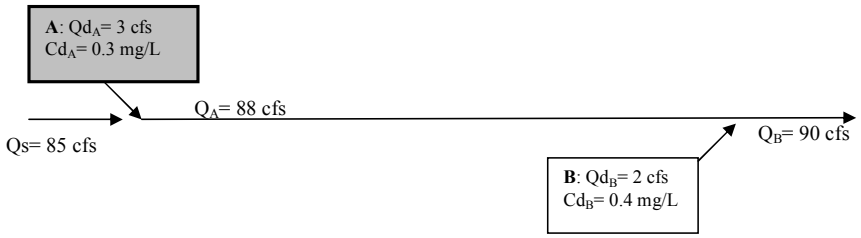
Example 6. Example calculation for determining minimal degradation from multiple new discharges *(Page 1 of 3)*

Scenario:

- Plant A (an **existing source**) discharges into a stream **segment** with a **7Q10** of 85 cfs (Qs).
- The **EWQ** upstream of Plant A is 0.03 mg/L of zinc.
- Plants B, C, and D are subsequently constructed on the same **segment** of river as the **existing source**.
- All four plants discharge zinc at concentrations shown below.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.

Plant B (1st Addition):



Note: Qs is the **7Q10** stream flow. Q_A and Q_B are the stream flows downstream of Plants A and B, respectively (i.e., **7Q10** plus facility flows).

The **EWQ** for plants B, C, and D would include the discharge from Plant A because it existed at the time the procedures become final. In other words, Plant A is "grandfathered" in and included in the determination of **EWQ** for Plant B, C, and D.

When Plant B is constructed this would be a "new" discharge to a segment that has an existing facility. The Cs would therefore be the same as the existing water quality that is downstream of Plant A.

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.03 mg/L·85 cfs·5.4 = 13.8 lbs/day
Current discharge load = Current zinc effluent conc.·Current discharge flow·CF
$= Cd_A \cdot Qd_A \cdot CF = 0.3$ mg/L·3 cfs·5.4
= 4.9 lbs/day
Total load = Stream load+Current discharge load = 13.8+4.9 = 18.7 lbs/day

To solve for Cs:
18.7 lbs/day = $(Cs \cdot Q_A) \cdot CF = (Cs \cdot 88$ cfs)·5.4
18.7/5.4 = (Cs·88)·5.4/5.4
3.46 = Cs·88
3.46/88 = Cs
Cs = 0.0393 mg/L

FAC = $[(Cc \cdot Q_B) - (Cs \cdot (Qs+Qd_A))] \cdot CF$
= [(0.151 mg/L·90 cfs) – (.0393 mg/L·(85 cfs+3 cfs))]·5.4
= [13.59 –3.4584]·5.4 = [10.1316]·5.4
= 54.711 lbs/day

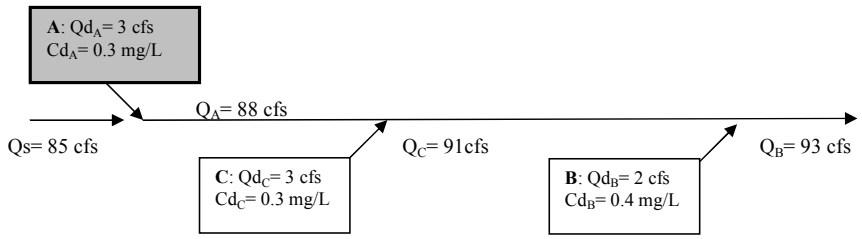
New discharge load = $Qd_B \cdot Cd_B \cdot CF$
= 2 cfs·0.4 mg/L·5.4
= 4.3 lbs/day

Percent of **FAC** = (New discharge load/FAC)·100
= (4.3/54.711)·100
= 7.86%

Plant B discharge could be allowed without further **antidegradation** review since the percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold.

Example 6. Example calculation for determining minimal degradation from multiple new discharges *(Page 2 of 3)*

Plant C (2nd Addition):



Note: Qs is the **7Q10** stream flow. Q_A, Q_B, and Q_C are the stream flows downstream of Plants A, B, and C, respectively (i.e., **7Q10** plus facility flows).

Cs = 0.0393 mg/L
Note: Cs remains the same as calculated for the 1st Addition because the 2nd Addition is downstream of Plant A (the original source) but upstream from Plant B (the 1st Addition).

FAC $= [(Cc \cdot Q_C) - (C_S \cdot (Qs+Qd_A))] \cdot CF$
$= [(0.151 \text{ mg/L} \cdot 91 \text{ cfs}) - (0.0393 \text{ mg/L} \cdot (85 \text{ cfs}+3 \text{ cfs}))] \cdot 5.4$
$= [(13.741) - (0.0393 \text{ mg/L} \cdot 88)] \cdot 5.4$
$= 55.526$ lbs/day

New discharge load $= Qd_C \cdot Cd_C \cdot CF$
$= 3 \text{ cfs} \cdot 0.3 \text{ mg/L} \cdot 5.4$
$= 4.9$ lbs/day

Percent of **FAC** $=$ (New discharge load/FAC)·100
$=$ (4.9/55.526)·100
$=$ 8.82%

Since Plant C will consume less than 10% of the **FAC**, an **antidegradation** review may not be needed. However, the cumulative increase needs to be compared to the cumulative ~~2~~10% threshold before a final determination may be made regarding the necessity of an **antidegradation** review.

SAC $= [(Cc \cdot Q_B) - (Cs \cdot Q_A)] \cdot CF$
$= [(0.151 \text{ mg/L} \cdot 93 \text{ cfs}) - (0.0393 \text{ mg/L} \cdot 88 \text{ cfs})] \cdot 5.4$
$= 57.204$ lbs/day

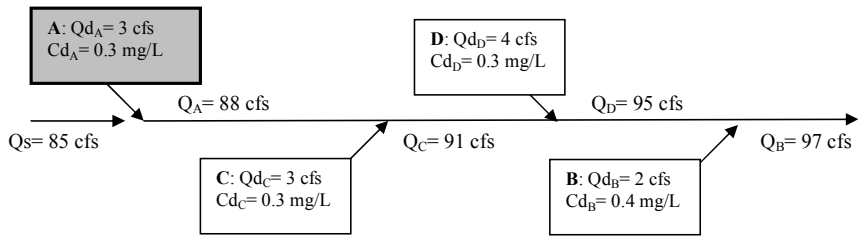
Cumulative net increase in load = Plant B New discharge load+Plant C New discharge load
$= 4.3$ lbs/day+4.9 lbs/day
$= 9.2$ lbs/day

Cumulative Percent of **SAC** $=$ (Cumulative net increase/SAC)·100
$= (9.2 \text{ lbs/day} / 57.204 \text{ lbs/day}) \cdot 100$
$= 16.1\%$

Plant C discharge ~~could be allowed without~~will require further **antidegradation** review ~~since~~ even though the percent consumption of the **FAC** is less than the 10% **minimal degradation** threshold ~~and~~because the cumulative percent consumption of the **SAC** is ~~less~~ more than the ~~20~~10% **cumulative degradation** threshold.

Example 6. Example calculation for determining minimal degradation from multiple new dischargs *(Page 3 of 3)*

Plant D (3rd Addition):



Note: Qs is the **7Q10** stream flow. Q_A, Q_B, Q_C and Q_D are the stream flows downstream of Plants A, B, C, and D respectively (i.e., **7Q10** plus facility flows).

Calculate the instream concentration (Cs) below Plant C and above Plant B, where Plant D is proposed. Then use this in the equation to determine FAC.

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.03 mg/L·85 cfs·5.4 = 13.8 lbs/day
Plant A Current discharge load = Current zinc effluent conc.·Current discharge flow·CF
= Cd_A·Qd_A·CF = 0.3 mg/L·3 cfs·5.4
= 4.9 lbs/day
Plant C Current discharge load = Current zinc effluent conc.·Current discharge flow·CF
= Cd_C·Qd_C·CF = 0.3 mg/L·3 cfs·5.4
= 4.9 lbs/day
Total load = Stream load+Current discharge load = 13.8+4.9+4.9= 23.6 lbs/day
To solve for Cs:
23.6lbs/day = (Cs·Q_C)·CF = (Cs·91 cfs)·5.4
23.6/5.4 = (Cs·91)·5.4/5.4
4.37 = Cs·91
4.37/91 = Cs
Cs = 0.0480 mg/L

FAC = $[(Cc·Q_B) - (C_s·(Qs+Qd_A+Qd_C))]·CF$
= [(0.151 mg/L·95 cfs) – (0.0480 mg/L·(85 cfs+3 cfs+3 cfs))]·5.4
= [(14.345) – (4.368)·5.4
= 53.8758 lbs/day

New discharge load = Qd_D·Cd_D·CF
= 4 cfs·0.3 mg/L·5.4
= 6.5 lbs/day

Percent of **FAC** = (New discharge load/FAC)·100
= (6.5/53.876)·100
= 12.1%

Since Plant D will consume more than 10% of the **FAC**, further **antidegradation** review is needed.
Even though exceeding 10% of the **FAC** requires the antidegradation review to continue, calculate the consumption of the **SAC** by the 3rd Addition in order to create an administrative record of the remaining **SAC** to use as reference when reviewing future expansions.

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