

## Determining the Significance of Degradation

Excerpts from Tetra Tech's June 22, 2007 *Technical Memorandum #2—Stormwater Nondegradation Analysis Project* prepared for the Minnesota Pollution Control Agency

### DETERMINING THE SIGNIFICANCE OF DEGRADATION

Dictionary definitions for degradation include (1) the act or process of degrading; (2) the state of being degraded, degeneration; and (3) a decline to a lower condition, quality, or level. However, the term *degradation* is not defined explicitly in federal or many state regulations. Federal antidegradation regulations at 40 CFR 131.12 refer to *lower water quality*, implying a departure from existing or current water quality; and describe the *tiered* water quality protection approach, which is based on protecting and maintaining existing uses ("existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected"). Existing uses are defined as "those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the water quality standards."

A lowering of water quality from existing conditions to a point falling below applicable water quality standards for any existing use is not allowed (Tier 1); activities that lower water quality in better-than-baseline waterbodies can be allowed under certain conditions (Tier 2); and activities that lower water quality in Tier 3 waters are banned unless the impacts are limited, short-term, and temporary under federal rules.

The term *existing water quality*, however, is not well defined in the regulations. Some states are designating existing water quality as the quality of water measured at a particular time in the recent past. Typically, existing water quality in these cases is linked to the time of the development or renewal of the general permit. Minnesota was unique in backdating *existing water quality* to 1988 for the purpose of stormwater antidegradation review. Other states provide a method for updating existing water quality for a particular waterbody at any time, if certain quality assurance/control procedures are followed.

While explicit federal definitions for degradation are absent, there are several references that provide important guidance on the determination of water quality degradation. EPA Region 9 has developed the following list of factors that may be considered when judging water quality impacts of proposed activities. These factors do not expressly define when a finding of degradation is warranted; however, they do provide a fairly comprehensive overview of categories of impacts to consider:

- Percent change in ambient concentrations predicted at the appropriate critical condition(s)
- Percent change in loadings (i.e., the new or expanded loadings compared to total existing loadings to the segment)
- Percent reduction in available assimilative capacity
- Nature, persistence, and potential effects of the parameter
- Potential for cumulative effects

Significant degradation is generally defined by states as degradation which requires a formal antidegradation review and justification under Tier 2. Some states define any degradation of water quality as significant. For example, the Oregon DEQ defines degradation as lowering of water quality. Any activity that proposes to discharge a new or increased load beyond that presently allowed in the

permit or any other activity that will lower water quality is subject to a Tier 2 review. The Oregon rules define lowering of water quality as “resulting in any measurable change in water quality away from conditions unimpacted by anthropogenic sources....”

States can subject *all* activities that result in *any* degradation of receiving waters to antidegradation reviews if they choose. However, doing so has been determined to be impractical. To focus scarce public agency resources on activities with the greatest potential for harm, EPA has endorsed and states have adopted the use of significance thresholds that are based on relative *impacts* proposed discharges will have on the receiving waterbody (i.e., not based on the *size* of the new or expanded discharge). EPA’s Region 5 antidegradation guidance, the Great Lakes antidegradation guidance, the Region 8 antidegradation guidance, the Region 4 antidegradation guidance, and the August 2005 memorandum to regional water management division directors on *Tier 2 Antidegradation Reviews and Significance Thresholds* from EPA OST Director Ephraim S. King all support exemptions from antidegradation reviews for new or expanded discharges that will consume less than 10 percent of the available assimilative capacity of the receiving water for specific non-bioaccumulative pollutants of concern in the discharge. This so-called *de minimis* exemption appears in West Virginia’s antidegradation rule and was upheld by a federal court in *Ohio Valley Environmental Coalition v. Horinko*, 2003. EPA Region 6 also supported Missouri’s 10 percent *de minimis* threshold for antidegradation reviews in comments on the *Missouri Water Quality Antidegradation Policy and Implementation Procedure* (2006).

EPA’s intent in including the *de minimis* test in its various guidance documents recognizes that certain activities, although they may result in some lowering of water quality, will not lower water quality to such an extent as to result in a *significant* lowering of water quality. The goal of allowing states to identify certain increases as *de minimis* is to provide a means of reducing the administrative burden on all parties associated with activities of little or no consequence to the environment. The provisions for identifying certain small increases in loading as *de minimis* and not subject to the requirements for antidegradation review is based in general on three principles, which are articulated in the Great Lakes antidegradation guidance (1) only non-bioaccumulative contaminants of concern will be released as a result of the proposed activity responsible for the anticipated lowering of water quality; (2) the proposed lowering of water quality uses less than 10 percent of the available assimilative capacity; and (3) for pollutants included in 40 CFR 132.2, Table 5, at least 10 percent of the total assimilative capacity remains unused following the lowering of water quality.

#### **U.S. Supreme Court Allows Increased Load if No Degradation is Detectable**

A notable ruling by the U.S. Supreme Court (*Arkansas v. Oklahoma*, Nos. 90-1262, 90-1266, February 26, 1992) supported increased pollutant loadings to a waterbody that was already impaired as long as there was no further detectable degradation of the receiving water. In this case, the owners of a new wastewater treatment plant in the state of Arkansas applied for a permit to discharge up to 6.1 million gallons of effluent per day into an unnamed stream that ultimately flowed into the Illinois River in Oklahoma. Oklahoma asserted the discharge into a tributary of the Illinois River would violate its water quality standards, which provide that no degradation of water quality will be allowed in the upper Illinois River. An administrative law judge found that there would be no detectable violation of Oklahoma’s water quality standards from the proposed plant and approved the permit. On appeal, the 10th Circuit Court of Appeals reversed the issuance of the permit, holding that the CWA prohibits granting an NPDES permit where applicable water quality standards have already been violated. The Supreme Court reversed the ruling, concluding that the 10th Circuit construed the CWA to prohibit any discharge of effluent that would reach waters already in violation of existing water quality standards, and that nothing in the act supported such a conclusion. The Supreme Court noted that the CWA vests in the EPA and the states broad authority to develop long-range, area-wide programs to alleviate and eliminate existing pollution.

EPA Region 4 also noted that some new or expanded activities might not pose significant risks to water quality and can proceed without an antidegradation review if certain conditions are met. In its proposed rulemaking for Kentucky in 2002, EPA Region 4 noted that

EPA's water quality standards regulation does not specify a threshold below which an antidegradation review would not be needed. However, EPA has long interpreted the antidegradation policy to allow a determination that certain proposed new discharges or increases in existing discharges may have an insignificant or de minimis impact on water quality and, therefore, may not require an antidegradation review... EPA has reflected this principle in the development of its own rulemakings.

In its *Antidegradation Guidance Tier 2 Procedure*, EPA Region 4 goes on to defend the practice of forgoing antidegradation reviews for relatively minor, or *insignificant*, activities, saying the approach

does not undercut the requirement that limitations protect existing uses, i.e., protect all applicable water quality standards. Rather, it limits the requirement to conduct an antidegradation review to situations when a source sought to increase existing permit limitations on the rate of mass loading, except as the increase is de minimis or there would be no change in ambient water quality, and thereby will limit the number of actions subject to a full antidegradation review. EPA believes this is an appropriate balance between the need to protect water quality for these substances and the burden, to both the regulated community and the regulatory agencies, of conducting an antidegradation review.

The de minimis concept used by EPA Region 8 in its 1993 *Antidegradation Implementation* manual suggests a level of 5 percent as a de minimis guideline, rather than criteria, subject to other qualifications. The memo by EPA OST Director Ephraim S. King cited above endorses the concept of de minimis exemptions from antidegradation reviews, but with this caveat:

Applying antidegradation review requirements only to those activities that may result in significant degradation of water quality is a useful approach....However, it is important states and tribes set their significance thresholds at a level that can be demonstrated to be consistent with the purpose of tier 2 antidegradation requirements.

The memo states that the most appropriate way to define significance is in terms of assimilative capacity, coupled with a cumulative cap. Such an approach strikes a *reasonable balance* between administrative and water quality interests and incorporates the concept that antidegradation should focus on the receiving waterbody, rather than just the proposed discharge

Evaluations of significance based solely on the magnitude of the proposed increase without reference to the amount of change in the ambient condition of the waterbody, need to be very carefully evaluated to determine how they translate to reduction in assimilative capacity in order to understand whether a significant decrease in assimilative capacity will occur.

The memo goes on to strongly recommend that new or revised antidegradation submissions from states or tribes define significance in terms of assimilative capacity, and recommends that for large waterbodies where assimilative capacity may be vast, significance should be defined using a combination of assimilative capacity and increase in pollutant loading. King also states that a cumulative cap should be established to limit the total assimilative capacity that can be used to prevent that capacity from being used up by repeated discharges and that are small enough to not require an antidegradation review. The memo suggests that the state or tribe establish a point at which all new or expanded discharges would be required to go through an antidegradation review based on a certain percentage of the capacity being used.

Many states have adopted similar de minimis thresholds that are based on assimilative capacity use. Ohio, New Mexico, Washington, Missouri, and West Virginia have set the threshold at 10 percent of the available assimilative capacity (i.e., use of less than 10 percent of the remaining assimilative capacity is

considered to be non-significant or de minimis, and hence not requiring an antidegradation review under Tier 2), while Wisconsin set the threshold at 33 percent.

#### **Minnesota Court Allows Agency Discretion in Pollutant Loading Decisions**

In *Cities of Annandale & Maple Lake NPDES/SDS Permit*, (A04-2033; 702 N.W.2d 768; Minn. App. 2005), the Minnesota Supreme Court ruled in May 2007 that the Minnesota Pollution Control Agency's (MPCA) interpretation of 40 CFR 122.4(i) as allowing offsets from another source in determining whether a new source will cause or contribute to the violation of water quality standards was reasonable, and that deference should be given to the MPCA's interpretation of its rules, and the agency's decision to provide permit coverage to the new wastewater treatment plant should be upheld.

The case stemmed from a requirement that under 40 CFR 122.4(i) (2004), an NPDES permit may not be issued for a new source when its discharge will cause or contribute to the impairment of waters with impaired status under the Clean Water Act. the MPCA had issued an NPDES permit for a wastewater treatment plant jointly proposed by the City of Annandale and the City of Maple Lake (the Cities). the MPCA found that the proposed plant—when operating at capacity—would increase phosphorus discharge to the North Fork of the Crow River by approximately 2,200 pounds per year over that which is discharged by the Cities' existing facilities, but the MPCA concluded that, under 40 CFR 122.4(i) (2006), this increase would not contribute to the violation of water quality standards in the Lake Pepin watershed. the MPCA reached this conclusion and issued a permit on the basis that the increased discharge would be offset by an approximate 53,500-pound annual reduction in phosphorus discharge due to an upgrade of a wastewater treatment plant in nearby Litchfield. An appeals court reversed the agency decision to permit the new facility, but the Supreme Court overruled based on the MPCA's finding that the increase in phosphorus discharge would be offset, resulting in an overall decrease in phosphorus loadings.

Some states have noted the distinction between nonsignificant and significant degrading activities using other benchmarks. In the *Proposed Water Quality Guidance for the Great Lakes System* EPA defined the term *significant lowering of water quality* and discussed the concept generally... EPA considered certain chemicals to be bioaccumulative chemicals of concern (BCCs) and distinguished those chemicals from other parameters affecting water quality. For BCCs, EPA also considered any increase in mass loading of such a pollutant to result in a significant lowering of water quality. But for other pollutants, EPA included other factors such as assimilative capacity (in addition to loading) in determining whether a proposed discharge would result in a significant lowering of water quality. The proposed Great Lakes rule also noted that the decision maker can make a case-by-case determination regarding the significant lowering of water quality because of other relevant considerations.

States use other criteria, such as ratio of stream flow to discharge flow (dilution ratio), and duration of discharge, to serve as additional nondegradation test criteria. Some states evaluate these criteria quantitatively (i.e., establishing that a dilution ratio of greater than 100:1 is sufficient to assimilate an effluent without impact), while others apply such factors in a more subjective manner, on a case by case basis, eventually arriving at a *finding* of degradation or nondegradation. EPA Region 8 *Antidegradation Implementation* manual supports this finding type process, but recommends that guidelines be established, and that all relevant information (e.g. dilution ratio, duration, degree of change in instream quality, nature of pollutants—conservative vs. non-conservative vs. persistent, percentage of assimilative capacity taken, degree of confidence in evaluation procedures) be considered. This type of evaluation is applied at the Tier 2 (i.e., high-quality waters) level as a tool to screen out minor discharges which would pass antidegradation reviews.

Nevada established a baseline against which to define degradation under its "requirement to maintain higher quality" water program. A requirement to maintain existing higher water quality (RMHQ) is established when the monitoring data show that existing water quality for individual parameters is significantly better than the standard necessary to protect the beneficial uses. If adequate monitoring

data exist, RMHQs are established at levels which reflect existing conditions. RMHQs are generally established at the 95th percentile of data, which is defined as the 95th ranked value of a sample population distributed into one hundred equal parts. At this time, RMHQs are only proposed or revised if there is greater than five years of data for single value RMHQs, or greater than 10 years of data for annual average RMHQs, with a minimum of two samples per year. In cases where two or more monitoring sites exist for one reach, only the data from the most downstream site is considered. Departures from RMHQs are considered to be degradation, and trigger the social and economic justification and alternatives analysis process in Tier 2 situations. According to the state, additional research is planned to better determine minimum sampling requirements for statistically valid RMHQ development. It is likely that more than two samples per year are needed to estimate the 95th percentile for most pollutants. To date, RMHQs have been set for routine parameters such as temperature, pH, phosphorus, nitrogen, chlorides, sulfates, total suspended solids, total dissolved solids, fecal coliform, and so on. No RMHQs have yet to be set for toxics such as arsenic, boron, cadmium, copper, lead, and the like.

Pennsylvania uses an evaluation procedure that is based on a more comprehensive approach to determine if a new or expanded discharge to Tier 2 or Tier 3 waters will cause degradation or demonstrates a high potential to cause degradation. The Pennsylvania DEP applies a two-part test that evaluates all facets of the discharge's potential effect on the receiving stream to make this determination. The first part of this test evaluates each pollutant of concern in the discharge using statistical and water quality modeling procedures for appropriate parameters. The second part of the test evaluates other considerations, such as the nature of the pollutants, treatment reliability, discharge duration, and physical/location concerns. Together, these two evaluations provide a comprehensive basis for a determination on whether or not the proposed discharge will maintain the quality of the receiving water.

For the purposes of conducting antidegradation reviews of stormwater discharges, the states generally define degradation as *no significant increase in loading* and appear to use a more qualitative evaluation or best professional judgment in conducting the antidegradation review for the general permit. According to the surveys, no states have conducted a quantitative analysis to determine whether stormwater discharges (MS4 discharges or otherwise) should be exempted from antidegradation review. Similarly, for those states that do not exempt stormwater from review, no states have conducted quantitative analyses to determine if MS4 stormwater discharges might result in significant degradation for which a Tier 2 review should be conducted. The Minnesota Pollution Control Agency is unique in requiring selected Phase II MS4s to conduct such a quantitative loading analysis.

As shown above, there are many different approaches to defining degradation and establishing thresholds for triggering a Tier 2 antidegradation review. Two factors which are key in predicting the effectiveness in these approaches are whether (1) the state expressly requires consideration of cumulative discharges into the stream segment when accounting for remaining assimilative capacity (e.g., the states of Missouri, Washington, West Virginia) and (2) the state expressly establishes a baseline water quality which becomes the yardstick for all antidegradation reviews in a given stream segment.

### CUMULATIVE WATER QUALITY IMPACTS

Degradation in water quality over time might be insignificant when considered incrementally, but more serious when cumulative impacts are reviewed. EPA Region 9's *Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12* (1987) notes that "repeated or multiple small changes in water quality (such as those resulting from actions which do not require detailed analyses) can result in significant water quality degradation." Conversely, improvements in water quality can result in upgrades for a waterbody's existing use and the corresponding minimum water quality criteria requirements that must be met. For example, EPA *Water Quality Standards Handbook: Second Edition* notes that if an analysis "indicates that the higher water quality does result in a better use, even if not up to the section 101(a)(2) goals, then the water quality standards must be upgraded to reflect the uses presently being attained."

The antidegradation policy thus establishes existing water quality as a benchmark that can improve at any time but can only decline under certain rare conditions (e.g., if the social and economic justifications for Tier 2 waters are met; if the degradation is deemed *not significant*, and so on). Even if existing water quality is permitted to decline, there appears to be strong support for retaining the *best* measurements of existing water quality as a permanent benchmark against which to assess long-term trends in water quality. EPA Region 9 antidegradation guidance clearly supports this concept:

To prevent such cumulative adverse impacts, a baseline of water quality must be established for each potentially affected water body, prior to allowing any action which would lower the quality of that water. This baseline should remain fixed unless some action improves water quality. At such time, the baseline should be adjusted accordingly.

Upgrades in both existing water quality and existing uses can result from analyses conducted by the state agency, the applicant, or even a volunteer monitoring group, in some cases. EPA Region 8 *Antidegradation Guidance* (1993) discusses a hypothetical case study in which a citizens group "has submitted information indicating that (a) segment supports a community of certain nongame fish species and a variety of pollution-sensitive macroinvertebrate species" in a segment with no aquatic life use designation. The guidance states that the water agency "would examine the information submitted by the citizens group, any other available information such as data that the applicant has been required to submit, and make a determination regarding the existing aquatic life use." If the aquatic life use is confirmed, the Agency

is required under antidegradation requirements to ensure that the (proposed) point source control requirements will fully protect the identified aquatic life use, regardless of whether that use has been designated. A change in the state water quality standards, to upgrade the designated use, is not required to protect the existing use. However, at the earliest opportunity the state would initiate a rulemaking to appropriately revise the designated use for the segment.

### OVERALLOCATION OF ASSIMILATIVE CAPACITY TO NPDES DISCHARGERS

One problem that is now being recognized in the antidegradation review process is that many states have written treatment plant discharge permits with far higher effluent limits than needed by the facility under current operating conditions. For example, a municipal or industrial treatment plant might have a permit limit of 1,000 pounds of pollutant x per month, or a concentration of 5 mg/L, when it actually averages 500 pounds discharged per month at 2 mg/L. The overallocation of available assimilative capacity through routine permitting on the basis of past practice (i.e., calculating loads on the basis of the total assimilative capacity of the receiving water, or on the ability of past technologies to remove pollutants from the effluent) can cause significant problems for antidegradation. If a significant number of facilities have *extra* capacity to discharge pollutants via their current permit limits, and they begin to

exercise their legal rights to do so, a receiving waterbody could degrade quickly without any antidegradation review or opportunity for public comment.

To deal with this challenge, some states now require an antidegradation review during the renewal of an NPDES discharge permit even when there is no expansion of the discharge, particularly when actual effluent quality has been consistently better than past permit limits. Some guidance (e.g., EPA Region 9, 1987) suggests antidegradation reviews for permit renewals, but if the activity is not expanding or adding additional pollutants existing water quality incorporates the effects of past discharges, and should not change if the discharge continues at past rates of effluent flow and quality (i.e., except for bioaccumulative pollutants, metals). EPA Regions 8 and 9 have issued guidance that states that reissuing a permit with previous limits when effluent quality has been significantly better might result in degradation and should be subjected to more stringent review (1993).

The Colorado WQCD addressed this issue in its 2001 *Antidegradation Significance Determination for New or Increased Water Quality Impacts Procedural Guidance*, noting that “[a]n antidegradation review and associated significance determination, is necessary only for regulated activities that will have a new or increased water quality impact. This includes new activities or facilities; expansion of existing activities or facilities resulting in an increased load over the current authorized load; or at the time of renewal, any increase in the authorized discharge levels (effluent limits) in a permit over the current authorized discharge levels.” This guidance also lays out a case for antidegradation reviews associated with permits that were developed before the antidegradation policy was in effect

Many, if not most, existing domestic and industrial permits were initially written before the first set of antidegradation requirements were established by the Commission in 1988. Significant public and private infrastructure investments and land-use commitments were made in accordance with the implicit waste load allocations authorized by those original permits. The permits included water quality-based effluent limits established using a mass balance equation designed to result in attainment of water quality standards. In some cases, and through such permitting practices, the entire assimilative capacity (for certain pollutants) of some high quality waterbodies was allocated long ago.

There are many cases where the discharge levels have not reached the allocated level and baseline water quality does not reflect the authorized pollutant levels. Because the critical effluent flow condition employed in the mass balance equation is the maximum hydraulic capacity of the wastewater treatment plant; some permitted discharges may have not yet fully utilized their permitted waste load allocation. Therefore, the baseline water quality for the pollutants of concern may, at present, be better than the level necessary to achieve water quality standards. Nonetheless, if the permitted discharges were to fully utilize the waste load allocations that are implicit in their permit effluent and flow limitations, presumably, the water quality standards for the pollutants of concern in the permits would just be met in the receiving waterbody at critical flow conditions. The historic waste load allocations authorized in permit limits conflict with the antidegradation concept of maintaining and protecting the baseline water quality condition.

It is the intent of this policy to reconcile past permitting decisions (that were based upon sound implementation of then-applicable regulatory requirements) with current antidegradation requirements. Of course, if errors in implementation of permitting requirements are discovered during the permit renewal process, they will be rectified as appropriate.

At the time of permit renewal for a discharge to reviewable waters, all of the relevant factors that are important in determining the appropriate effluent limitations will be evaluated. These factors include receiving waterbody quality, waterbody low-flow information, effluent quality and quantity, applicable water quality standards, relevant facility changes, situation of neighboring facilities, etc.

If the baseline water quality of the receiving waterbody is determined to be better than the water quality standards, but the assimilative capacity of the receiving waterbody for one or more pollutants had been previously allocated, the renewal permit(s) will be written in a manner consistent with past practices, provided that there is no increased load or concentration. In short, the purpose of the antidegradation review for those

pollutants of concern will be to assure the applicable standards and classified beneficial uses are protected. For all other pollutants that have not been fully allocated through past permitting practices, the antidegradation analysis and review will be performed as detailed in this guidance document.