

Colorado Antidegradation Review Process

Issue: Determining Baseline Water Quality

WQCD Primer Question: What can be changed to clarify the process for determining “baseline” water quality from which to assess when a new or increased discharge would be “significant,” particularly where pre-2000 data do not exist?

Concerns:

The 2005 Basic Standards Triennial Review established September 30, 2000 as the date that will be used to determine baseline water quality. The current baseline approach relies upon a presumption that a robust suite of data is available for a water body immediately above or below the discharge point and/or the discharger, not only for the parameters with reasonable potential to exceed water quality standards, but also for the many parameters with concentrations so low that effluent limits have not been imposed.

The baseline is used in the antidegradation process to establish the limit called the Significant Concentration Threshold (SCT), which is 15 percent of increment between the baseline and the water quality standard. It is not adopted as a water quality standard but is used as such in the mass balance formula for deriving effluent limits. The SCT, through a mass balance analysis, becomes the Antidegradation Based Average Concentration (ADBAC) effluent limit. The ADBAC is then used to limit increases of all parameters in the effluent, unless a higher limit is set following public review of alternative measures to mitigate the increase.

If the baseline and SCT are established based upon insufficient or inadequate data, the risk is great that effluent quality will violate the ADBAC effluent limit, as described in the following examples.

- The Baseline data are not always available in the fully mixed condition below the point source and before dilution by a gaining stream or major tributary. That dilution makes for an artificially low baseline and resulting ADBAC effluent limit.
- If less sensitive test methods, particularly with detection levels near the water quality standards, are used to analyze samples, it can result in zero concentrations being detected, even though lower detection levels would result in a quantitative measurement of in-stream concentrations. If the Baseline is an average of many zeros (due to too high detection levels) along with some detected concentration values, the calculated baseline will be lower than the concentration that actually occurs. This artificially low baseline will result in an inappropriately low ADBAC.
- Baseline data collected prior to 2000 may include the years of 1998 and 1999, which were unusually wet years in some parts of the state (approximating 100-year frequency in duration of rainfall events if not quantity of such events). Use of these data causes a

significant dilution that is not representative of more average year conditions. That dilution results in a non-representative baseline and ADBACs.

Many parameters have no consistent database immediately upstream or downstream of the discharger. In this situation, there is need for such data to be collected during the next five years after permit renewal. These data should be collected as either representative of the year 2000 or more representative of a current baseline condition. It is not clear there is legal authority for collecting such data in 2009 as representative of September 2000.

Recommendations:

We recommend the following definition of “Baseline Water Quality” be added to Section 31.5 to include much of what is spread throughout the Guidance and assure consistency in implementation of the antidegradation rule.

Baseline is that low flow quality representative of a fully mixed condition immediately downstream of the discharge without new tributary dilution for the year 2000, or current quality. Such data may be from monitoring stations below the discharge point and upstream of the first major tributary, or monitoring stations immediately upstream of the discharge point combined with effluent quality for the same period of time. If data collected on or before or after 2000 are insufficient, not from lowest detectable testing methods, not otherwise representative of an average year baseline condition, then more recent data that can be collected as representative of 2000 or current conditions can be used. This would include current conditions collected over the next five years of a renewed permit, and adjusted if feasible to assure it is representative of 2000. However, if current effluent quality is better than past DMR data quality, it should not be used to calculate 2000 Baseline quality, unless it results in a greater increment and SCT, so that the discharger is rewarded for making improvements in its effluent quality.

Baseline can be determined from either: (1) the downstream monitoring station’s historical database before or near 2000, if that station is below the discharge point and upstream of the next major tributary and reasonably reflects the low flow seasons, or (2) calculated from a upstream monitoring station’s prior 5 years of data along with effluent DMR data for the last two years, or (3) measured now (for next five years presumably) at an appropriate downstream or upstream site or the effluent if representative of September 30, 2000.

For Implicit Limits, the Water Quality Based Effluent Limit (WQBELS) shall be determined using the same available data as those used for determining the explicit limits in the prior permit. In the absence of sufficient data, then the No Impact Limit will be determined from the highest measured effluent concentration in the last two years. That limit shall be a monitoring concentration which if exceeded triggers a determination of whether the SCT has been or will be

exceeded. If the SCT is predicted to be exceeded, the Division will determine whether conducting the antidegradation review should occur in the next permit renewal or plant expansion, considering the optimal opportunity for an alternatives analysis.

To be consistent with the intent of developing a baseline of a low flow quality representative of a fully mixed condition immediately downstream of the discharge without new tributary dilution, post-2000 data (upstream of the discharge, in the effluent, and immediately below the effluent mixing zone) should be collected and considered. This data would represent current conditions. The Guidance should indicate how current data can be adjusted to be representative of 2000. If the current quality of the effluent is better than past DMR data quality, that should not be used to represent 2000 quality, unless it results in a greater increment and SCT so that the discharger is rewarded for making improvements in its effluent quality. In other words, the closer the current baseline is to the water quality standard, the smaller the increment, making more significant any increase in allowable concentration. Thus, improvements to effluent quality since 2000 should be rewarded by using the larger increment.

The discharger should be given the opportunity in renewed permits to collect effluent and upstream data for the next five years with sufficiently low detection levels. These new data may have the greatest reliability in reflecting current conditions, which may be worse or better than the conditions that existed as of September 30, 2000. Due to the significant role the baseline value plays, reliable data must be collected. The current rule is problematic in that it requires certain effluent limits to be based upon data that were never required to be collected at sufficiently low concentrations, upstream and in the effluent. That is a denial of due process.

Additional supporting documentation and analysis follow.

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Supporting Documentation and Analysis

The following are essential elements from Colorado statute, regulation and guidance.

The WQCD's 2001 Antidegradation Significance Determination Guidance (Guidance) defines the Baseline Water Quality (BWQ) as:

Baseline water quality (BWQ): The ambient condition of the water quality, as of September 30, 2000. Baseline water quality defines the "baseline low-flow pollutant concentration," and in addition, for bioaccumulative toxic pollutants, the baseline load. Baseline water quality is the fully mixed condition below a discharge that was in place prior to September 30, 2000. The derivation and use of BWQ is discussed in detail in Section VI, F and Section VII, questions and answers 9 through 12. (emphasis added)

Under §31.8(3)(c)¹ of the Colorado Antidegradation Rule, the baseline water quality is limited to that portion of the water body segment impacted by the discharge from the discharge point to the first major tributary inflow. Therefore, the interpretation is that the fully mixed condition is limited to only that portion of the stream below the discharge point to the next major tributary.

Furthermore, in accordance with §31.8(3)(c)(ii)(B),² the baseline is determined when the first new or increased water quality impacts are proposed, and is based on the low-flow pollutant concentration.

From all this, the baseline is determined by the low-flow occurring in that portion of the segment impacted by the discharge, meaning from the discharge point to the first major tributary inflow, and shall be determined at the time of the first proposed new or increased water quality impacts to the reviewable waters after September 30, 2000.

¹ §31.8(3)(c): For the purposes of this subsection, the phrase "portion of the segment impacted by the discharge" means the portion of the stream from the discharge point to the first major tributary inflow, or as determined by the Division based on site-specific information at the time of the analysis.

² §31.8(3)(c)(ii)(B): The new activity or increased discharge from the source under review will consume, after mixing, less than 15 percent of the baseline available increment, provided that the cumulative increase in concentration from all sources shall not exceed 15 percent of the baseline available increment. The baseline available increment is the increment between low-flow pollutant concentrations and the relevant standards for critical constituents for that portion of the segment impacted by the discharge. The baseline low-flow pollutant concentration shall represent the water quality as of September 30, 2000, and shall be determined at the time of the first proposed new or increased water quality impacts to the reviewable waters after that date, provided,...(emphasis added)

The baseline for each parameter is most relevant as a comparison to the water quality standard to determine the incremental difference and whether there will be an increase in concentration greater than 15 % of that increment. The Significant Concentration Threshold is defined at VI.A. as “the baseline water quality plus 15 percent of the baseline available increment. The SCT is the level (in terms of concentration) that differentiates significant from insignificant degradation.”

The Water Quality Assessment (WQA) or Preliminary Effluent Limitations (PELs) document by the Division contains the antidegradation discussion. It starts with the determination of the baseline. The 85th percentile of data is chosen to represent the low-flow pollutant concentration. If sufficient representative low-flow data are available, the 50th percentile of this low flow data may be used to characterize the baseline condition. (Note that the permit is written to protect the biological low flow that is often characterized as the 30E3, or the 30 lowest days of flow in a three year period. Since data for each of those 30 days are not likely collected, the 85th percentile is an approximation of those low flows.)

The September 30, 2000 date for determining baseline water quality was adopted in the July 2005 rulemaking hearing, based on the assumption that human development over time would result in increasing water quality impacts and that that date would establish the minimum water quality used as a baseline against which to gauge future impacts. In establishing that date, the Commission did not consider the possibility that water quality might improve after September 30, 2000. (See June 2005 Basis and Purpose Statement at #31.44 E.)

If water quality improves after September 30, 2000, due to remediation of unpermitted releases of contaminants that impact the September 30, 2000 baseline, then the improved water quality shall be used. (Note there is some inconsistency in the language at §31.8(3)(c)(ii)(B) such that improvements due to permitted discharges may be able to stay with the September 30 baseline.)

There were no requirements to collect baseline data in the July 2005 decision even though that is when the baseline was limited to data for that “portion of the segment impacted by the discharge.” Rather, the Guidance’s “Questions and Answers” at Section VII, Question 10, at page 27, indicates that baseline is based upon:

data from a water quality station located below a fully mixed condition downstream of the segment portion in question. In general, ambient data should be no older than five years. Older data may be used on a case-by-case basis, if such data is representative of baseline conditions on September 30, 2000. In cases where significant changes have occurred in the watershed within the last five years, it may be appropriate to use a shorter period of record. If a larger data set is available, then the ideal period of record is from 1995-2000. (emphasis added)

This underlined provision is not consistent with the regulation at §31.8 (3)(c). The data cannot be from just any water quality station downstream. The regulation limits the data to that fully mixed condition upstream of the next major tributary. It is important to point out the criticality of that limitation. It means that the baseline reflects the discharger without the dilution of downstream

tributaries. That is the discharger's baseline. This helps prevent the SCT that becomes an effluent limit (ADBAC) from being lower than discharger's effluent quality. See page 9 of Guidance for definition of ADBAC. See Answer 11 below that the BWQ can be calculated from the discharger's effluent quality (DMR) and the upstream stream quality. This is the best calculation to avoid incidental dilution that requires improved effluent quality. This calculation is more consistent with regulation §31.8 (3)(c), which requires that the baseline reflect the existing low flow upstream of the next major tributary.

Guidance Questions 11 and 12 acknowledge the fact that pre-2000 data often do not exist, and provide alternate approaches for addressing the baseline.

Q11: How is the BWQ calculated if a discharge was in place prior to September 30, 2000, where representative downstream data isn't available?

A11: If representative downstream data is not available, use representative upstream station and discharge data to calculate instream water quality at a fully mixed condition below the discharge. The 85th percentile ambient upstream concentration and the receiving water chronic (30E3) low flow should be combined with the characteristic discharge condition defined as mean 30-day average effluent concentration and flow. The period of record for ambient data should generally be the previous five years...The period of record for discharge data, should generally be the previous two years (as reported on the discharge monitoring reports) prior to September 30, 2000. In cases where significant changes have occurred at the plant, it may be appropriate to use a different period of record.”

Q12: How is the BWQ determined if there is no data available for the waterbody or the discharge?

A12: Representative data from a comparable watershed may be used at the Division's discretion. If there is no representative data available, then provisions may be granted to obtain data to represent ambient water quality conditions as of September 30, 2000.

In calculating the BWQ, representative data from a comparable facility may be used at the Division's discretion. If there is no representative data available from a comparable facility, then provisions may be granted to obtain data to represent the average effluent contribution to water quality conditions as of September 30, 2000.

In essence, this answer says: “Over the next five years, go collect data, and adjust the data, if feasible, to be reflective of 2000.” This answer is the pragmatic solution to the absence of relevant data. Due to the common occurrence of lack of pre-2000 data, this approach is likely to

be frequently used to set a baseline that reflects water quality closest to the point of discharge. However, it is not clear how this approach should be implemented and whether is it consistent with the rule. For example, if upstream flows have increased since 2000, can 95th percentile rather than 85th percentile data be used?

Furthermore, none of the questions address the potential problem of artificially low baseline concentrations due to non-detect data, which are included in the calculation as a zero (0), causing averaged data results to be lower than would occur if more sensitive testing methods were used in the laboratory. None of the questions addresses the question of whether the data are representative of a true baseline condition in which abnormal weather and hydrologic conditions occur such as 500 year drought or 100 year rain fall events or rain fall duration events.