Detailed Description of Basin Plan Issue

Historical Context of Nutrient Objectives in the San Diego Region

Subsequent to the enactment of the Clean Water Act in the early 1970's, the San Diego RWQCB began work on draft versions of the *San Diego Comprehensive Water Quality Control Plan Report* (Basin Plan). Initial draft versions of the Basin Plan did not specify numeric concentration standards, goals, or objectives for total phosphorus. After review of the original draft Basin Plan, however, the U.S. Environmental Protection Agency (EPA) required RWQCB to incorporate some form of numerical phosphorus limit. (The need for a numerical limit was, in part, driven by the need to protect coastal lagoons that can be significantly affected by nutrients). In response to the EPA directive, RWQCB agreed to incorporate a numerical limit for phosphorus into the Basin Plan, but to incorporate the limit in such a way as to encourage additional study to develop site-appropriate limits. Compromise language within the original 1975 Basin Plan agreed to by EPA and the RWQCB utilized a narrative water quality objective for biostimulatory substances (nitrogen and phosphorus) that incorporated a numerical phosphorus "goal" of 0.1 mg/l into the narrative objective, as follows:

> *Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those of which stimulate algae and emergent plant growth. Threshold total phosphorous (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water. A desired goal in order to prevent plant nuisances in streams and other flowing waters appears to be 0.1 mg/l total P. There values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1, on a weight-to-weight basis shall be used.*

The RWQCB has since combined the 0.1 mg/L total P water quality goal and the 10:1, N:P ratio to extrapolate a total nitrogen objective of 1.0 mg/L N. This water quality objective for nitrogen is an important benchmark for assessing impairments and has been used by the RWQCB as a numeric target in draft versions of the Rainbow Creek TMDL.

To insure protection of coastal lagoons, the numeric water quality goals established in the compromise biostimulatory substances objective were primarily based on:

1. Draft EPA water quality criteria for the protection of estuarine waters. (These criteria were subsequently published by EPA in 1976 in a document entitled Quality Criteria for Water.)
2. The results of a literature search conducted by a RWQCB contractor on nutrient biostimulation (which focused primarily on biostimulatory effects in waters outside California).

The numerical water quality targets established within the narrative biostimulatory substances objective represented desired water quality goals. The numerical water quality targets within the biostimulatory substances narrative objective did not take into account the facts that:

1. Only limited surface water quality data were available at the time the numerical goals for total phosphorus were developed, and historic surface water quality frequently exceeded the numeric total phosphorus goals throughout the San Diego Region during much of the year,
2. Research and data on which the selected numeric goals were developed may not be applicable to San Diego County water bodies,
3. Numeric water quality goals were developed for total phosphorus, but only certain forms of phosphorus are available for uptake by algae and aquatic vegetation, and
4. Different biostimulatory concentration goals may be appropriate for different water bodies

The compromise biostimulatory substances narrative objective (with numerical phosphorus goals) was adopted by RWQCB in 1975. After the adoption of the 1975 Basin Plan, EPA promulgated the Basin Plan surface water quality objectives as federal water quality standards. This action significantly restricted the flexibility of the RWQCB in assigning appropriate effluent permit standards for discharges to surface waters. The action also brought into play federal anti-degradation and anti-backsliding regulations, which made it difficult to implement the original Basin Plan vision of updating the assigned water quality objectives.

Total Phosphorus and Basin Plan Numerical Goals

Numerous researchers have addressed the pitfalls of using numerical total phosphorus criterion to assess the potential for water quality degradation and beneficial use impairment. Phosphorus in freshwater and marine systems exists in either a particulate or dissolved phase. The particulate phase includes living and dead plankton, precipitates of phosphorus, phosphorus adsorbed to particulates, and amorphous phosphorus (North Carolina State Water Quality Group, 2002).

There appears to be some disagreement over the best form of phosphorus to measure in flowing and standing water bodies (total vs. orthophosphate or P in algal mats when present). A draft report prepared by Tetra Tech for the US Environmental Protection Agency (2002) indicates that particulate phosphorus is not immediately available for biotic uptake but represents a potential supply of phosphorus for plant and/or algal growth. However, it was well established many years ago that most of the particulate phosphorus in agricultural and urban stormwater runoff is not available to support algal growth (Lee, et al., 2002). Lee (2002) reported that only about 20% of the particulate P in land runoff from urban and agricultural areas can typically be converted to algal-available P and that algal-available P can be estimated as soluble orthophosphate plus 20% of the particulate fraction. Therefore, utilizing a combination of phosphorus measures and other related parameters including dissolved oxygen and algal abundance in a ***weight-of evidence*** analysis would seem to be a reasonable approach.

The Basin Plan does not attempt to establish separate storm and non-storm nutrient criteria. However; turbid samples collected during storm conditions are likely to contain significantly higher particulate phosphorus concentrations than non-storm samples. Establishing storm and non-storm objectives could be a useful tool to evaluate seasonal differences in water quality and would contribute to an overall weight-of-evidence approach to assessing the nutrient status of a water body.

In summary, the nutrient status of flowing and standing water systems is more accurately assessed using a combination of chemical and physical parameters and observations. Simply using average total phosphorus values and the 10:1 N:P ratio may represent an oversimplification

of a complex situation. Ideally, the chemical parameters should include orthophosphate (dissolved, bioavailable), total phosphorus, nitrate, ammonia, and total nitrogen. Other relevant parameters include algal/ aquatic plant abundance measures and at least one or more of the following: dissolved oxygen concentration, the occurrence of fish kills or other aquatic life stress, and odors. At a minimum, the RWQCB should strongly consider establishing objectives for dissolved phosphorus in addition to total P and total N.

Other Factors

We support the USEPA (2000) strategy for developing nutrient criteria that recommends developing separate numeric water quality objectives for nutrients in 1) flowing waters, 2) lakes and reservoirs, 3) estuaries, and 4) wetlands. We strongly support using local data sets rather than regional data sets for the development of nutrient criteria.

Develop nutrient criteria *ranges* for nitrogen and phosphorus for the four water body types listed above. Criteria ranges will allow managers and regulators an appropriate level of flexibility to design effective nutrient management plans targeting local problems.

Nutrient levels in imported water must be considered when developing the surface water nutrient objectives. Average nitrate concentrations in the region's imported water supply were 0.9 mg/L-N during FY 2001-2002 (San Diego County Water Authority, 2002). This level is comparable to the 1.0 mg/L N 'objective' that is derived from the 0.1 mg/L total P 'goal' and the 10:1 N:P ratio. The RWQCB should pursue the development of nutrient water quality objectives that acknowledge this scenario. Nitrate concentrations in imported water may strongly influence, if not control, the background concentration of nitrogen in the San Diego Region.

The process of nutrient criteria development will be strengthened if the Regional Board elicits the support and input of local stakeholders whenever and wherever possible. This may include data sharing between stakeholders and the Regional Board, document review by stakeholders, and the establishment of a Technical Committee to discuss the issue with local entities.

REFERENCES

Lee, G.F., 2002. Evaluating Nitrogen and Phosphorus Control in Nutrient TMDLs. *Stormwater*, Vol. 3, No. 1. Jan/ Feb 2002.

Lee, G.F. and Jones-Lee, A., unpublished. Assessing the Water Quality Impacts of Phosphorus in Runoff From Agricultural Lands, to be published by the American Chemical Society, Spring 2002.

North Carolina State Water Quality Group, 2002. Watersheds: A Decision Support System for Non Point Source Pollution Control. Website: http://h2osparc.wq.ncsu.edu/info/phos.html.

San Diego Regional 303(d) Workgroup, 2002. An Analysis of Proposed 303(d) Listings for Total Phosphorus in San Diego County Watersheds.

San Diego County Water Authority Annual Report, 2001. Data is average for the 2000-2001 fiscal year (July 2000 through June 2001).

United States Environmental Protection Agency (USEPA) and California State Water Resource Control Board (SWRCB), 2002. The Development of Nutrient Criteria for Ecoregions Within California, Arizona, and Nevada (Draft). Prepared by Tetra Tech, Inc. EPA Contract No. 68-C-99-249.

United States Environmental Protection Agency, 1998, National Strategy for the Development of Nutrient Criteria, U.S. Protection Agency, Washington. DC. EPA-R-98-002.

United States Environmental Protection Agency, 2000a. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs, U.S. Protection Agency, Washington, DC. EPA-822-B00-001.

United States Environmental Protection Agency, 2000a. Nutrient Criteria Technical Guidance Manual: Rivers and Streams, U.S. Protection Agency, Washington, DC. EPA-822-B00-002.

United States Environmental Protection Agency, 2000, Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion III , EPA 822-B-00-016.

California Regional Water Quality Control Board, San Diego Region (RWQCB). Water Quality Control Plan for the San Diego Basin (9). 1994.