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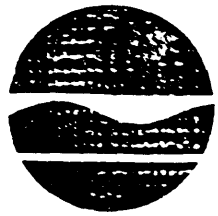

John P. Cahill
Commissioner

Memo

NOTICE

This document has been developed to provide Department staff with guidance on how to ensure compliance with statutory and regulatory requirements, including case law interpretations, and to provide consistent treatment of similar situations. This document may also be used by the public to gain technical guidance and insight regarding how the department staff may analyze an issue and factors in their consideration of particular facts and circumstances. This guidance document is not a fixed rule under the State Administrative Procedure Act section 102(2)(a)(I). Furthermore, nothing set forth herein prevents staff from varying from this guidance as the specific facts and circumstances may dictate, provided staff's actions comply with applicable statutory and regulatory requirements. This document does not create any enforceable rights for the benefit of any party.

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To: Regional Water Engineers, Bureau Directors, Section Chiefs

Subject: Division of Water Technical and Operational Guidance Series (1.3.1)

TOTAL MAXIMUM DAILY LOADS AND WATER QUALITY-BASED EFFLUENT LIMITS

(Originators: Albert W. Bromberg and Quality Allocation & Plans Section staff)

NOTE: AMENDMENTS TO THIS TOGS WHICH SHOULD ALSO BE CONSULTED are TOGS 1.3.1.A, B, C, D and E. Also, see the Attachment A listing of additional TOGS.

PURPOSE

The purpose of this guidance is to describe the analysis used to determine if a waterbody will meet water quality standards. The analysis is called the total maximum daily load (TMDL)

implementation of administrative permitting procedures. A "next phase" TMDL analysis should be conducted when significant changes occur. Examples of "significant" changes are changes in water quality standards, upgrades in receiving water classification, updated source loading data, updated ambient monitoring data, better modeling techniques, etc.

s) Chronic and Acute Mixing Zones

The presence of a mixing zone in a receiving water is accepted as a normal and expected consequence of a wastewater discharge. A mixing zone is that portion of the receiving water body which either surrounds or is immediately downstream of a point source discharge and where the concentration of the discharged material is progressively diluted by the receiving water until, at some distance from the discharge point, the applicable water quality criteria are satisfied. Thus, by definition, mixing zones are areas where water quality standards for individual pollutants are expected to be exceeded, potentially impairing habitat usability for fish and benthic communities. Toxic conditions would not occur outside the mixing zone. Mixing zone assessments should be conducted and are intended to assure that safe fish passage is maintained and that the overall biological integrity of the receiving water is protected.

The first step in a mixing zone assessment involves the gathering of site-specific information (e.g. - outfall location and configuration, receiving water depth and velocity, etc.) so that the size and shape of the mixing zone, along with the relative quickness and completeness of the mixing, can be appraised.

If mixing is determined to occur relatively quickly, the chronic and acute mixing zone principles described below should be applied.

1. Streams and Rivers

a. Chronic Mixing Zones

100% of the critical low flow (7Q10 or 30Q10) should be applied to chronic aquatic, wildlife and human protection criteria.

Wildlife and human protection criteria are developed based on lifetime exposure; therefore, the establishment of a zone of passage is not pertinent. If water supply intakes or sensitive wildlife areas are present in the vicinity of a wastewater discharge, additional precautions should be taken.

Allowing full mixing when using chronic aquatic criteria is expected to have only minimal impacts, and then only when the flow of the receiving

stream approaches the 7Q10 flow. The duration of the minimal impacts should only last as long as the low flow condition persists.

b. Acute Mixing Zones

50% of critical low flow (7Q10) should be utilized for acute aquatic protection criteria. This will provide for an adequate zone of passage.

2. Overlapping Mixing Zones

If mixing zones from two or more proximate sources interact or overlap, the combined effect should be evaluated using the principles of the mixing zone assessment.

3. Large Flow Rivers

For large rivers, such as the Niagara and the St. Lawrence, application of a percentage of critical flow is not appropriate. For these rivers, a 100:1 and 50:1 dilution ratio for chronic and acute aquatic criteria, respectively, should be used as the limiting conditions for mixing zone assessments.

Outfall or stream conditions may be such that rapid and complete mixing is not possible. If mixing is determined to be incomplete, additional analyses should be undertaken. Using plume modeling techniques to calculate mixing zones, the following guidelines should be applied using best professional judgement.

- If no dilution is available (intermittent flow stream), standards should become end of pipe limits.

- If mixing is incomplete, mixing zone dimensions should have the following limitations:

  - streams and rivers
    chronic criteria - mixing length to be no more than 20 times the stream width.
    acute criteria - 50% of the cross-sectional area at the mixing length which is no more than 20 times the stream width.

  - inland lakes, reservoirs, estuaries and estuarine embayments
    chronic and acute criteria - 10:1 dilution or 10% of the volume, area or cross-section or site specific diffusion study or dispersion model analysis when available.

- Lakes Erie and Ontario
  chronic and acute criteria - 10:1 dilution

The analysis described above constitutes a mixing zone demonstration under procedure 3.F of the Great Lakes Guidance. Rapid mixing of a discharge with the receiving water is encouraged. The permittee is given the opportunity to submit outfall structure proposals to enhance mixing. If the outfall alterations result in rapid and complete mixing, the principles of paragraph 1. and 2. may be applied. The discharger may conduct additional analyses to develop an independent mixing zone demonstration.

t) When developing TMDLs for pollutants which are not conservative, the application of steady state or time variable dynamic modeling may be necessary for the establishment of WLAs and WQBELs.

GUIDANCE FOR OXYGEN DEMANDING SUBSTANCES

In terms of dissolved oxygen, the waste assimilative capacity of a waterbody reach or segment is determined by the use of mathematical water quality models. The models applied may range from simple, single system, steady state, mass balance desk-top computations to complex, time variable, non-conservative, multi-system, computer generated solutions.

Whenever possible, these models are calibrated and verified using physical and chemical stream survey data. The following factors should be considered, where appropriate, in model development:

water body advection	sediment oxygen demand and rate
water body diffusion	reaeration
carbonaceous oxygen demand and rate	photosynthetic oxygen production
nitrogenous oxygen demand and rate	aquatic plant respiration

The following principles apply to waste assimilative capacity determinations:

1) Unless source-specific data are available, non-point source loads are considered to be part of the background organic load

2) Analyses are conducted using the critical stream flow, i.e. the minimum average 7 consecutive day flow at a recurrence interval of 10 years (MA7CD10).

3) In regulated streams (controlled flow), 30% of the waste assimilative capacity is withheld as a safety/reliability factor. Flow regulation produces an artificial flow regime which prolongs periods of low flow for much longer periods than would occur naturally (i.e. the MA7CD10).

ANALYSIS OF THE GLWQI RELATIVE TO THE MIXING ZONE DEMONSTRATION AND THE PROPOSED MIXING ZONE ASSESSMENT

The default mixing zone conditions of Procedure 3. of the GLI should be satisfied by the source specific mixing zone assessment contained in this guidance. The NYSDEC mixing zone assessment uses existing data and accepted analytical techniques to demonstrate that assumptions concerning pollutant dispersion, stream design flow for stream-specific and pollutant-specific conditions, zones of passage, and endangered and/or threatened species are consistent with the requirements described in Procedure 3.D, E and F of the GLI. The NYSDEC should implement procedure 3 through TOGS 1.3.1. A mixing zone assessment as described in TOGS 1.3.1. and the proposed amendments herein satisfies the mixing zone demonstration requirements of procedure 3.F.

Many of the requirements of procedure 3 are already included in TOGS 1.3.1. These include:

- From Procedure 3.D. - Open Waters of the Great Lakes
  - Use of 10:1 dilution in lakes.
  - Assessment of mixing zones for nonpoint sources on a case by case basis.
  - Overlap or interaction of mixing zones.
  - Protection of endangered or threatened species.
- From Procedure 3.E. - Tributaries
  - Stream design flows.
  - Application of dynamic modeling.
  - Establishment of the loading capacity of the water body.
  - Pollutants are assumed to be conservative.
  - Overlap or interaction of mixing zones.
  - Maintenance of an acute zone of passage.
  - Assessment of dilution under all expected effluent flows.
  - Protection of endangered or threatened species.
- From Procedure 3.F. - Mixing Zone Demonstration
  - Description of dilution at the boundaries of the mixing zone (size, shape and location of mixing area).
  - Definition of the edge of discharge-induced mixing in the open waters of the Great Lakes.
  - Provision of a zone of passage.
  - Protection of endangered or threatened species.

- Drinking water intake location relative to mixing zones.
- Protection of designated uses (identified in the surface water classification).
- Identification of background water quality concentrations.
- Freedom from floatables, settleables and color/odor/taste (provided for in the surface water classifications/standards).
- Interaction and overlap of mixing zones.
- Pollutant degradation does not occur in the mixing zone.

TOGS 1.3.1. satisfies the remaining elements of Procedures 3.D, E and F in the following ways;

- Acute Aquatic Life Criteria Design Flow: TOGS 1.3.1. uses 50% of the 7Q10 in lieu of the 1Q10. NYSDEC considers this flow, in conjunction with other elements of the TMDL analysis, to be equivalent to the 1Q10 flow.

- Substrate character and geomorphology in the mixing zone; organism attraction to the mixing zone; the promotion of undesirable or nuisance species; species naturally occurring in the mixing zone habitat: These conditions should be assessed using information available from fishery surveys, macroinvertebrate surveys, and chemical/physical monitoring programs conducted by the Department, the permittee, or other private/public entities.

Reference for Mixing Zone Analysis

Mixing Zones and Dilution Policy, USEPA Region VIII, Denver, Colorado, December 1994