

TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For Zinc

In the

SAVANNAH RIVER (between Brier Creek and Ebenezer Creek)

In the Savannah River Basin

(HUC 3060109)

Screven and Effingham Counties, Georgia

Introduction

Section 303(d) of the Clean Water Act (CWA) as Amended by the Water Quality Act of 1987, Public Law 100-4, and the United States Environmental Protection Agency's (USEPA/EPA) Water Quality Planning and Management Regulations [Title 40 of the Code of Federal Regulation (40 CFR), Part 130] require each State to identify those waters within its boundaries not meeting water quality standards applicable to the waters designated uses. The identified waters are prioritized based on the severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants violating or causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a water body, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

Problem Definition

Georgia's final 1998 Section 303(d) list identified the Savannah River, between Brier Creek and Ebenezer Creek, as partially supporting its designated use for the pollutant zinc. The only known source of zinc loading is the Sylvania WPCP which discharges to Buck Creek, a tributary to the Savannah River. There are no other known sources within the watershed which contribute to the zinc loading to this segment of the Savannah River. This TMDL will be used to set the Total Maximum Daily Load for zinc.

The TMDL is being proposed pursuant to EPA commitments in the October 1997 Consent Decree in the Georgia TMDL lawsuit. These conditions include a requirement that TMDLs be proposed by August 30, 1999, for each water on the 1998 303(d) list that is impacted by a National Pollutant Discharge Elimination System (NPDES) point source or point sources, and is located in the Savannah/Ogeechee Basins. The TMDL will be calculated under low flow summer time conditions, which represents lowest level of available dilution, and critical condition.

Target Identification

The target level for the development of this zinc TMDL is the numeric criterion established in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised November 23, 1998. Georgia Regulation 391-3-6-.03(5)(e)(ii)(5)(a) establishes the freshwater criterion for zinc expressed in terms of the dissolved fraction in the water column. Criteria were promulgated such that instream concentrations should not exceed the acute criterion indicated under 1-day, 10-year minimum flow (1Q10) or higher stream flow conditions and should not exceed the chronic criterion under 7-day, 10-year minimum flow (7Q10) conditions. The numeric chronic criterion for zinc in freshwater, assuming a hardness of less than 25 mg/l as CaCO₃, is 32 µg/L.

Background

The segment of the Savannah that is impaired is 53 miles long and begins downstream of the confluence of the Savannah River with Brier Creek and ends at the confluence of the Savannah River with Ebenezer Creek. The 7Q10 for the Savannah River, just below its confluence with Brier Creek, is 5915 cfs. Recent data collected by the Georgia EPD indicate that zinc concentrations in this segment are not currently violating water quality standards.

A zinc TMDL for Buck Creek has concurrently been developed with this TMDL resulting in a total maximum daily load of 0.58 kg/day. The TMDL for the Savannah River, between Brier Creek and Ebenezer Creek, will incorporate the Buck Creek TMDL in the TMDL calculation.

Numeric Targets and Sources - Model Development

The steady-state model provides predictions for only a single set of environmental conditions. For permitting purposes, steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For discharges to riverine systems, critical environmental conditions correspond to drought upstream flows. The assumption behind steady-state modeling is that permit limits that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur.

Critical Condition Determination

The most critical condition for this segment of the Savannah River will be used to determine the TMDL. Zinc will be considered a conservative substance in the TMDL calculation. The critical low flow is 5915 cfs.

Total Maximum Daily Load (TMDL)

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards. Since zinc water standards violations are no a problem and the cause of the zinc impairment is not identified for this waterbody, the TMDL will be expressed as a loading capacity. In addition, this TMDL will incorporate the zinc TMDL that has concurrently been developed for Buck Creek (a tributary to the Savannah River just downstream of Brier Creek). If in the future, a point or nonpoint source load of zinc is introduced in the system, the total of the WLA (wasteload allocations for point source loadings) and LA (load allocation for nonpoint source loadings) shall not exceed this loading capacity.

Margin of Safety

The margin of safety (MOS) is part of the TMDL development process. There are two basic methods for incorporating the MOS (USEPA, 1991a):

1. Implicitly incorporating the MOS using conservative model assumptions to develop allocations, or
2. Explicitly specifying a portion of the total TMDL as the MOS; using the remainder for allocations.

The MOS is incorporated implicitly into this modeling process by selecting the critical low flow.

TMDL Calculation

The TMDL calculation will utilize the conservation of mass principle, where the load can be calculated by using the following relationship:

$$\text{Concentration} = \text{Load} / \text{Flow}$$

Rearranging this equation the maximum load can be calculated as follows:

$$\text{Load} = \text{Concentration (Water Quality Standard)} * \text{Flow}$$

Table 1 TMDL Calculation and Waste Load Allocation

Pollutant	TMDL (kg/day)	WLA (kg/day)	LA (kg/day)	MOS
Zinc	463.17	0.58	462.59	Implicit

Seasonal Variation

The low flow condition represents the most critical design condition and will provide year round protection.

Allocation of Responsibility and Recommendations

The wasteload allocation has already been determined during the development of the zinc TMDL for Buck Creek. Since impairment in this segment by zinc has been ruled out by recent sampling data, the TMDL does not assign responsibility for load reduction.

References:

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