TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For TOXICITY in

WHITES CREEK

(HUC 3060108)

McDuffie County, Savannah River Basin, Georgia

EPA United States Environmental Protection Agency

Region 4 serving the southeast

APPROVAL PAGE

for TOXICITY in

Whites Creek, GA

Georgia=s final 1998 303(d) list identified Whites Creek near Thomson, GA as not supporting its designated use, with the pollutant of concern being toxicity. This total maximum daily load (TMDL) is being established pursuant to the 1998 Georgia 303(d) list and the Consent Decree in the Georgia TMDL Lawsuit.

The load allocation for Whites Creek is based on the low flow value and the background concentration of toxicity in the stream. Low flow in Whites Creek is assumed to be 0.00028 cubic meters per second. The background toxicity in Whites Creek is assumed to be 0.0 chronic toxic units. The resulting load allocation for Whites Creek is 1.003 chronic toxic units.

The Total Maximum Daily Load for Whites Creek for toxicity is given below:

Parameter	**TMDL**	**WLA**	**LA**	**MOS**
Chronic toxicity	1.003 TU_c	1.003 TU_c	0.0 TU_c	Implicit

The toxicity TMDL for Whites Creek is 1.003 chronic toxic units. This accounts for a maximum load from the City of Thomson Water Pollution Control Plant and natural background conditions.

APPROVED BY:

_____ _____

Robert F. McGhee, Director Date

Water Management Division

EPA-Region 4

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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 Regulations (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 two miles of Whites Creek, downstream of the Thomson Water Pollution Control Plant (WPCP), as not supporting its designated use as a fishing water. Toxicity was identified as the criterion violated while the potential cause of impairment was identified as the municipal facility (NPDES Permit # GA 0020974). The object of this document is to establish the toxicity TMDL for Whites Creek (HUC 3060108), McDuffie County, Savannah River Basin, Georgia (GA).

Target Identification

Protection against toxic releases is called for under the CWA Section 101(a)(3), which states that Ait is the

national policy that the discharge of toxic pollutants in toxic amounts be prohibited.@ In addition, Clean Water Act Section 303(c) requires States to develop water quality standards to protect the public health or welfare, enhance the quality of water, and serve the purposes of the CWA. In turn, water quality standards are composed of the designated use of the receiving water, water quality criteria (numeric or narrative) to protect the designated use, and an antidegradation statement.

Georgia=s narrative criterion for toxicity is established for all waters and is deemed to be necessary and applicable to all waters of the State. Georgia=s Water Quality Standard for toxicity is expressed in Georgia=s Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised July 6, 1999. Georgia Regulation 391-3-6-.03(5)(e) states that AAll waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.@

The use of toxicity testing and whole effluent toxicity limits for establishing a toxicity TMDL is based upon Georgia=s narrative water quality criterion. Whites Creek has been identified as not supporting its designated use due to chronic toxicity. For an effluent dominated stream such as Whites Creek, protection against chronic toxicity will inherently provide protection against acute toxicity. For protection against chronic effects, the ambient toxicity should not exceed 1.0 chronic toxic units (TU_c) to the most sensitive of at least three different test species. Therefore, this TMDL is being established such that the chronic toxicity of Whites Creek does not exceed 1.0 TU_c under critical conditions.

Background

Whites Creek originates within the southern portion of the city limits of the City of Thomson. The creek originates in an urban setting but much of its watershed lies in rural areas amidst pasture lands and forested areas. Whites Creek flows for approximately 7 miles through central and southern McDuffie County before it empties into Brier Creek, and eventually, the Savannah River.

The Thomson WPCP is the only point source discharger of wastewater in the Whites Creek watershed. It

treats wastewater using an activated sludge system with a design capacity of 2.5 million gallons per day (MGD) discharge of treated wastewater. The Thomson discharge is on Whites Creek located approximately 5 river miles upstream from the confluence of Whites Creek and Brier Creek.

Whole Effluent Toxicity (WET) testing conducted on the Thomson WPCP effluent from 1996 to July 1999 indicates intermittent acute and chronic toxicity, and the cause of the toxicity has not been identified. The City is currently experimenting to determine if artificial wetlands would be able to remove the toxicity. The City is under a State of Georgia consent order (Consent Order No. EPD-WQ-3271-1) to attain compliance with its WET limit by 5/17/99, and thus is paying a stipulated penalty of $1000 per month for failure to meet the limit (No Observed Effect Concentration (NOEC) greater than or equal to the Instream Wastewater Concentration (IWC) of 100%).

Numeric Targets and Sources - Model Development

A steady-state water quality model provides predictions for only a single set of environmental conditions. For NPDES permitting purposes, steady-state models are applied for "critical" environmental conditions that represent conditions when the assimilative capacity of a waterbody is very low. 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 Whites Creek will be used to determine the TMDL. For the Whites Creek segment, the critical flow will be considered 0.00028 cms (0.0065 MGD). This flow represents the Seven Day Low Flow that occurs once every Ten Years (7Q10) on record for Whites Creek at the point of discharge, which is required by Georgia State law for regulated waters. This value was taken from Georgia EPD's "Wasteload Allocation Form" used during the permitting process.

Total Maximum Daily Load (TMDL)

A TMDL is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels for a given watershed. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relation between pollutant loads and the quality of the receiving water body. Conceptually, this definition is denoted by the equation:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). In accordance with 40 CFR Part 130.2(i), ATMDLs can be expressed in terms of ... mass per time, toxicity, or other appropriate measure(s).@ In addition, NPDES permitting regulations in 40 CFR 122.45(f) state that AAll pollutants limited in permits shall have limitations...expressed in terms of mass except...pollutants which cannot appropriately be expressed by mass.@ For the toxicity TMDL for Whites Creek, the Total Maximum Daily Load is expressed in terms of chronic toxicity units (TU_cs).

Wasteload Allocation:

Under critical low flow conditions, the toxicity wasteload allocation (WLA) for Whites Creek is expressed as follows:

$$\text{Toxicity from point sources} = 100 / NOEC = 100 / IWC = 100 / 99.7 = 1.003\ TU_c$$

Load Allocation:

As GAEPD documented in its 1998 §303(d) list, the only potential cause of toxicity impairment to the listed segment of Whites Creek is the effluent from the City of Thomson WPCP. Therefore, the existing toxicity contribution to Whites Creek from nonpoint sources is assumed to be 0.0 TU_c. Since the wasteload allocation uses all of the assimilative capacity of Whites Creek during critical conditions, the allocation to the nonpoint sources (i.e., the load allocation) is set to equal the existing toxicity contribution of 0.0 TU_c.

Margin of Safety:

In accordance with Section 303(d)(1)(c) of the CWA, the margin of safety (MOS) shall account for any lack of knowledge concerning the relationship between effluent limitations and water quality. There are two basic methods for incorporating the MOS:

1. Implicitly incorporating the MOS using conservative 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 in the TMDL process by the use of critical low flow conditions.

Seasonal Variation:

The low flow critical conditions incorporated in this TMDL represent the most critical design condition and will provide year-round protection of water quality.

This TMDL can be shown to be protective of an instream chronic toxicity of 1.0 TU_c for Whites Creek as follows:

$$\text{instream toxicity} = \frac{\text{upstream toxicity } \mathbf{x} \text{ upstream flow } + \text{ effluent toxicity } \mathbf{x} \text{ effluent flow}}{\text{upstream flow } + \text{ effluent flow}}$$

$$= \frac{0.0\ TU_c \times 0.00028\ cms\ +\ 1.003\ TU_c \times 0.1095\ cms}{0.00028\ cms\ +\ 0.1095\ cms}$$

$$= 1.0\ TU_c$$

TMDL SUMMARY

The toxicity concentrations for the 2 mile listed segment of Whites Creek required to meet Georgia's standards and thus represent a TMDL are summarized below:

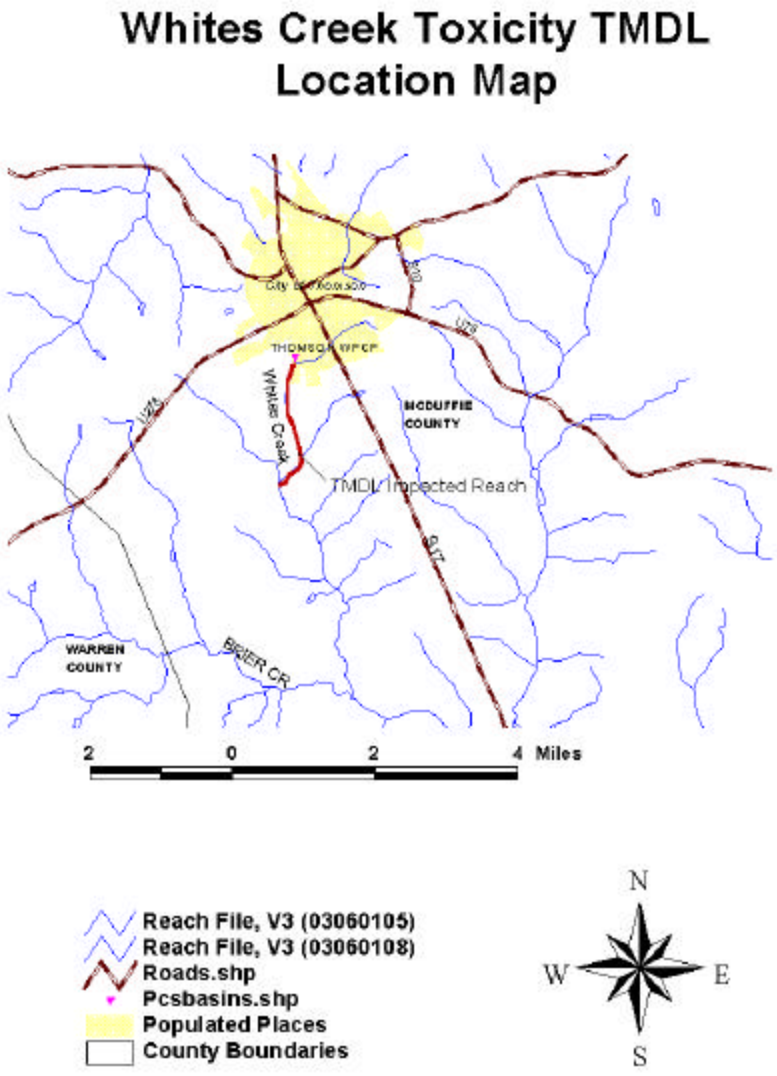
Parameter	TMDL	WLA	LA	MOS
Chronic toxicity	1.003 TU_c	1.003 TU_c	0.0 TU_c	Implicit

Table 1: TMDL Allocation for toxicity in Whites Creek

Allocation of Responsibility and Recommendations:

The allocation for toxicity to this segment of Whites Creek is given in Table 1. For a potential future point or nonpoint source of toxicity introduced into 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 TMDL.

Appendix A: Site Location Map



Appendix B – Units Conversion Table

From	To	Multiply by:
Million Gallons per Day (MGD)	Cubic Meters per Second (cms)	0.04381
Cubic Feet per Second (cfs)	Cubic Meters per Second (cms)	0.02832

Administrative Record Index

1. City of Thomson, Georgia, Water Pollution Control Plant NPDES Permit No. GA0020974.

2. Compilation of Georgia's Current Modeling Guidelines for the Development of Wasteload Allocations and NPDES Permit Limitations. January 1991

3. Georgia Department of Natural Resources, Environmental Protection Division, Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards

4. Georgia Department of Natural Resources, Environmental Protection Division, "Wasteload Allocation Form" used for permitting GA0020974, City of Thomson WPCP.

5. "Thomson WPCP Acute and Chronic Toxicity Test Evaluations" spreadsheet provided by Georgia EPD Municipal Permitting Section.

6. Stored on TMDL Shared drive m:/apps32/tmdl/whites.doc TMDL Report

Response to Public Comment on the Proposed TMDL:

COMMENT

The Thomson WPCP permit should be revised, if necessary, to meet the wasteload allocation of the TMDL.

The Thomson facility has a history of noncompliance. Given this history, is it adequate if the permit limits are the TMDL limits? Is there any showing that the permit limits are protective of water quality?

Mr. Eric E. Huber, EarthJustice Legal Defense Fund, 400 Magazine Street, Suite 401, New Orleans, Louisiana 70130-2453, December 7, 1999

RESPONSE

Through its oversight authority of the State's NPDES permitting program, EPA Region 4 will use its best efforts to ensure that the NPDES permit issued for the Thomson WPCP is consistent with the toxicity TMDL for Whites Creek and the State's NPDES Reasonable Potential Procedures.

COMMENT

The draft TMDL uses 7Q10 as the basis for toxicity calculations. However, it is unclear, from the Georgia toxicity criteria, if the chronic and acute criteria are to be based on this flow. The use of this flow for an implicit margin of safety is questioned, especially where the low flow is zero. While both acute and chronic criterion are given, the TMDL calculations are only done for chronic. If this also assures compliance with acute, it needs to be justified.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The 7Q10 flow used in this TMDL is equal to 0.00028 cubic meters per second (0.01 cfs). As a result, there is virtually no dilution of the effluent during chronic toxicity testing. Based on best professional judgement, EPA is comfortable that the use of the 7Q10 flow of 0.01 cfs in this toxicity TMDL sufficiently accounts for the lack of knowledge concerning the relationship between effluent limitations and water quality.

The final TMDL report includes a statement that clarifies that protection of chronic toxicity in this TMDL inherently results in protection of acute toxicity.

COMMENT

It is preferable that the TMDL identify the cause of the toxicity and set the load based on the acceptable amount of the identified parameter of concern.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The pollutant or pollutants causing the toxicity have not, as yet, been identified. EPA is working with the State and the discharger to determine the cause or causes of the toxicity.

COMMENT

There is no mention of the pollutant causing the toxicity in the draft TMDL. The ' 303(d) list indicates that chlorine is the problem. This should be included in the TMDL as per the commenter=s comments for Crawford Creek.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The pollutant or pollutants causing the toxicity have not, as yet, been identified. Dechlorinated samples have also failed toxicity tests. EPA is working with the State and the discharger to determine the cause or causes of the toxicity.

COMMENT

On page 3, it is stated that there have been problems with both acute and chronic toxicity. Both need to addressed for all parameters where there are multiple criteria.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The final TMDL report includes a statement that clarifies that protection of chronic toxicity in this TMDL inherently results in protection of acute toxicity.

COMMENT

Please provide information explaining if the mentioned Consent Order has been complied with or if any penalties have been paid.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The City of Thomson continues to pay $1000 per month in fines for failure to comply with effluent toxicity criteria. Please contact EPD's Water Protection Branch for additional and updated information regarding the status of compliance to Consent Order number EPD-WQ-3512 issued by EPD.

COMMENT

On page 3, it is stated that the in-stream wastewater concentration is 100%, thereby suggesting a background or low flow of zero. A different value is given for the 7Q10 used in the TMDL calculation. This needs to be explained or corrected. On page 4, the 7Q10 is stated as being for Crawford Creek and this may be the source of the error as Crawford Creek does not appear to be related to this issue. Crawford Creek is again mentioned in page 8 in the Seasonal Variation section and this too may be a mistake.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The State NPDES permitting program provides a Wasteload Allocation Form cited in the References attached to this TMDL report. This form suggests that wasteload allocation for Whites Creek is based on 7Q10 critical flow of 0.01 cfs at the outfall location. Language in the NPDES permit regarding the WET test limits suggests 7Q10 of 0.0 cfs. EPA will make every effort through its oversight of the State TMDL program to revise the permit to reflect the appropriate critical flow. The difference between these flows is negligible considering that the critical instream wastewater concentration changes by only 0.3 %.

The references to Crawford Creek are typo errors. All references to Crawford Creek should be replaced with Whites Creek.

References:

USEPA. 1991a. *Guidance for Water Quality –based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.

Georgia Department of Natural Resources, Environmental Protection Division. 1998. *Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards*, July 1999.

Sierra Club v. EPA & Hankinson. 1998. USDC-ND-GA Atlanta Div. #1: 94-CV-2501-MHS.