Total Maximum Daily Load

Evaluation

for

Turkey Branch

in the

Suwannee River Basin

(Toxicity)

Submitted to:

The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
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1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories: supporting, partially supporting, or not supporting their designated uses depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* every two years.

Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) established for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions. This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.

The State of Georgia has placed an eight-mile segment of Turkey Branch, from its headwaters to the Willacoochee River on the 303(d) list based on test results on the effluent from the Fitzgerald WWTP, which predict that the effluent would be chronically toxic at critical low streamflow conditions. This segment of Turkey Branch is also listed due to exceedance of water quality standards for cadmium, copper, lead, zinc, mercury, fecal coliform and dissolved oxygen. Separate TMDLs have been developed for each of these additional parameters.

1.2 Watershed Description

The Turkey Branch watershed is located in the Suwannee River basin in south-central Georgia in Ben Hill County. The watershed is part of the Tifton upland of the Coastal Plain Physiographic Province. Turkey Branch originates approximately one mile north of the center of Fitzgerald, Georgia. Upstream of the Fitzgerald WWTP discharge point, the stream flows through areas that are predominantly urban or agricultural. Downstream of the Fitzgerald WWTP, the stream flows through a wetland area and transitions into Lake Beatrice, which drains into the Willacoochee River.

The Fitzgerald WWTP is the only major point source discharger in the Turkey Branch watershed. It treats both municipal and industrial wastewater using an activated sludge system with a design capacity of 6.0 million gallons per day (MGD). Two minor industrial facilities discharge to Turkey Branch just upstream of the Fitzgerald WWTP discharge point. The Custom Profiles, Inc. WTF discharges approximately 0.05 MGD of treated wastewater to Turkey Branch consisting of contact cooling and heating water as well as stormwater runoff. The Aeroquip Corporation WTF discharges approximately 0.08 MGD of treated wastewater to Turkey Branch consisting of contact cooling water and stormwater runoff. There are no known non-point source contributors to the predicted toxicity in Turkey Branch.

The 7-day, 10-year minimum (7Q10) statistical flow value associated with Turkey Branch is 0.0 cubic feet per second (cfs).

1.3 Water Quality Standard

The water use classification for Turkey Branch is fishing. The fishing classification, as stated in Georgia's Rules and Regulations for Water Quality Control Chapter 391-3-6-.03(6)(c), is established to protect the "Propagation of Fish, Shellfish, Game and Other Aquatic Life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality."

Protection against toxic releases is discussed in the CWA Section 101(a)(3), which states that "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." The State of Georgia has established narrative criteria for toxicity which applies to all waters of the State. Georgia Regulation 391-3-6-.03(5)(e) states that " all 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."

For an effluent dominated stream such as Turkey Branch, protection against chronic toxicity will inherently provide protection against acute toxicity. In accordance with EPA's Technical Support Document For Water Quality-Based Toxics Control, an instream chronic toxicity not exceeding 1.0 chronic toxic units (TU_c) is representative of no chronic toxic effects. Therefore, this TMDL is being developed such that the chronic toxicity of Turkey Branch does not exceed 1.0 TU_c under critical conditions.

2.0 WATER QUALITY ASSESSMENT

Whole effluent toxicity tests (WET) have been conducted on the Fitzgerald WWTP discharge. The results of the tests predict that the effluent would be toxic at critical low streamflow conditions.

3.0 SOURCE ASSESSMENT

WET tests on the Fitzgerald WWTP effluent predict toxicity in Turkey Branch at critical low streamflow conditions. As of the date of this report, toxicity tests have not been conducted on the effluent from either Aeroquip Corporation or Customs Profiles, Inc.

There are no known potential non-point source contributors to the predicted toxicity in Turkey Branch. Therefore, it is assumed that there are no toxicity contributions form nonpoint sources.

4.0 TMDL DEVELOPMENT APPROACH

For TMDL purposes, steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For effluent-dominated riverine systems where there are no known sources of nonpoint source pollution, critical environmental conditions correspond to drought upstream flows. The assumption behind steady-state modeling is that effluent concentrations that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur.

EPA's Technical Support Document for Water Quality-Based Toxics Controls (TSD) defines the No Observable Effects Concentration (NOEC) as the highest tested percent concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specific time of observation. The TSD defines the TU_c associated with an effluent discharge as being equal to 100 divided by the NOEC. For example, an effluent discharge with a NOEC of 50% reflects a TU_c of 2.) (i.e., 100/50 = 2.0). In addition, EPA's TSD suggests that the TU_c associated with a stream that exhibits no toxicity before it receives any wastewater is equal to zero (i.e., $TU_c = 0$). Therefore, a simple mass-balance equation reflecting critical flow conditions can be used for the TMDL development.

4.1 Critical Conditions

Since there are no known potential nonpoint source contribution to the predicted toxicity of Turkey Branch, the critical flow conditions for this TMDL are represented by scenarios where the ratio of effluent to stream flow is the greatest. For protection against chronic toxicity, the critical flow condition occurs when the stream is flowing at 7Q10 conditions (i.e., 0.0 cfs or 0.0 MGD).

5.0 ALLOCATION

5.1 Total Maximum Daily Load

A TMDL is the sum of the individual waste load allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background (40 CFR 130.2). The sum of these components may not result in an exceedence of water quality standards for that water body. To protect against exceedences, the TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. Conceptually, a TMDL can be expressed as follows:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while maintaining 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), "TMDLs can be expressed in terms of ... mass per time, toxicity, or other appropriate measure." In additions, NPDES permitting regulations in 40 CFR 122.45(f) state that "All 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 Turkey Branch, the Total Maximum Daily Load is expressed in terms of chronic toxicity units (TU_cs)

5.2 Waste Load Allocations

Under critical low flow conditions, the toxicity wasteload allocations (WLA) for Turkey Branch is expressed as follows:

$$\text{Toxicity from each point source} = 100 / NOEC = 100 / IWC = 100 / 100 = 1.0\ TU_c$$

5.3 Load Allocations

The toxicity contributions to Turkey Branch from nonpoint sources is assumed to be 0.0 TU_c. Since the wasteload allocations uses all of the assimilative capacity of Turkey Branch during critical conditions, the allocation to the nonpoint sources (i.e., the load allocations) is set to equal the existing toxicity contributions of 0.0 TU_c.

5.4 TMDL Results

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

$$\text{Instream Toxicity} = \frac{\text{upstream toxicity x upstream flow} + \Sigma\ (\text{effluent toxicity x effluent flow})}{\text{Upstream flow} + \Sigma\ \text{effluent flows}}$$

$$= \frac{0.0\ TUc \times 0.0\ MGD + (1.0\ TUc \times 6.0\ MGD + 1.0\ TUc \times 0.5\ MGD + 1.0\ TUc \times 0.08\ MGD)}{0.0\ MGD + (6.0\ MGD + 0.05\ MGD + 0.08\ MGD)}$$

$$= 1.0\ TUc$$

Table 1. TMDL Summary

Parameter	WLA	LA	MOS	TMDL
Chronic toxicity	Fitzgerald WWTP (1.0 TU_c) Custom Profiles Inc. (1.0 TU_c) Aeroquip Corporation (1.0 TU_c)	0.0 TU_c	Implicit	1.0 TU_c

5.5 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.

5.6 Margin of Safety

The MOS is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. The MOS was implicitly incorporated into the TMDL process by the use of critical low flow conditions.

6.0 POINT AND NONPOINT SOURCE APPROACHES

This TMDL has bee established to protect against chronic toxicity. Through its National Pollutant Discharge Elimination System (NPDES) permitting process, the EPD will determine whether these three permitted dischargers to Turkey Branch have a reasonable potential of discharging chronically toxic effluent. An allocation to an individual point source discharger does not automatically result in a permit limit or a monitoring requirement. Concerning the Fitzgerald WWTP, the EPD will evaluate the available chronic WET test data in light of Georgia's 1995 EPA-approved NPDES Reasonable Potential procedures to determine whether chronic WET monitoring requirements or limitations are necessary. Since there is no available chronic WET test data for either Custom Profile Inc or Aeroquip Corporation, the EPD will use its best professional judgement to determine whether a reasonable potential exists for these facilities to discharge chronically toxic effluent. f EPD determines that such a reasonable potential exists, effluent monitoring requirements will be established as appropriate.

As stated earlier in this report, it is assumed that nonpoint sources do not contribute to the toxicity of Turkey Branch. In the event that nonpoint sources were causing or contributing to the toxicity impairment of Turkey Branch, the allocations to the point sources would not be any different. That is , regardless or whether or not toxicity is associated with nonpoint sources, the toxicity associated with the point sources cannot exceed 1.0 TU_c.

7.0 PUBLIC PARTICIPATION

A thirty-day public notice will be provided for this TMDL. During this time the availability of the TMDL will be public noticed, a copy of the TMDL will be provided as requested, and the public will be invited to provide comments on the TMDL.

REFERENCES

GAEPD, NPDES Reasonable Potential Procedures. Atlanta, GA. January 1995.

GAEPD, *Rules and Regulations For Water Quality Control, Chapter 391-3-6, April 2000*, Georgia Department of Natural Resources, Environmental Protection Division.

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