TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For LEAD in the

Savannah River Between Butler & McBean Creek

&

Butler Creek

(HUC 03060106)

Richmond County, Savannah River Basin, Georgia

APPROVAL PAGE

for FECAL COLIFORM TMDL in

Savannah River, GA

Georgia=s final 1998 303(d) list identified the Savannah River between Butler and McBean Creek and Butler Creek near Augusta, GA as not supporting its designated use, with the pollutant of concern being lead. 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 allocation of lead load to Butler Creek and Savannah River between Butler and McBean Creek is given below.

$TMDL_{\text{Butler to McBean}}$ = Upstream Savannah (7.36 kg/day Lead) + Butler Creek (0.20 kg/day Lead)

TMDL = 7.56 kg/day Lead

Because no permitted point sources of lead have been identified in this segment of the Savannah River, as NPDES permits are up for renewal, investigations into their effluents for lead should be undertaken.

Since an unknown nonpoint source or sources of lead are causing the water quality impairment and because no permitted point sources of lead have been identified in this segment, the nonpoint source of lead needs to be identified and controlled. Until this occurs there is no available load to allocate to other sources. Further investigations and lead sampling need to be conducted to identify the other loads and to implement methods to reduce these loads.

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 Regulation (40 CFR), Part 130] require each State to identify those waters within its boundaries not meeting water quality standards applicable to the water's designated uses. 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 consideration given to 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 23 miles of the Savannah River between the confluence of Butler and McBean Creek as not supporting its designated use as a fishing water, with the pollutant of concern being lead. Butler Creek was also identified for not meeting its use designation as a fishing stream due to lead.

This TMDL is being established pursuant to the 1998 Georgia 303(d) list and the Consent Decree in the Georgia TMDL lawsuit that requires TMDLs to be developed for all waters on the current 303 (d) list according to certain conditions prescribed in the Consent Decree. Because no permitted lead loads were identified in and around the listed segments, a TMDL will be developed to set the loading values. The cause of the impairment is an unknown loading source and further investigations need to be conducted to identify the source or sources and implement appropriate controls to reduce the lead load to meet this TMDL. Until

this occurs no additional load of lead to the system should be allocated.

Target Identification

The target level for the development of this lead TMDL is the numeric criterion established 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)(ii)(5)(a) establishes the freshwater criteria for lead expressed in terms of the dissolved fraction in the water column. Criteria were promulgated such that instream concentrations should not exceed the chronic criterion under 7-day, 10-year minimum flow (7Q10) conditions. The numeric criterion for lead in freshwater, assuming a hardness of less than 100 mg/l, is 1.07 ug/l.

Background

The segments that are impaired are located directly downstream of the City of Augusta, Georgia between the confluences of Butler Creek and McBean Creek. The Savannah River segment is a 23-mile segment of the Savannah River that is on the State of Georgia's §303 (d) list for violating the total lead standard for the State of Georgia. Currently, there are no known point or nonpoint sources of lead either in or upstream of this listed segment. It is assumed that there is a legacy load of lead either in contaminated sediments or nonpoint source runoff. Further fieldwork will need to be accomplished to better characterize the source. Butler Creek is a tributary to the Savannah River and is primarily responsible for the transport of the Augusta-Richmond County Commission Wastewater Treatment Plant (NPDES GA0020087) effluent to the Savannah River. The Augusta-Richmond County Commission Wastewater Treatment Plant is not permitted for lead, but a permit review does not indicate whether it is monitored and reported.

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. Lead will be considered a conservative substance in the TMDL calculation. The influence on the instream lead concentration will be river flow. For the Savannah River segment, the critical flow has been determined to be considered 2810 cubic feet second (cfs). This flow represents the minimum daily average flow on record for the Savannah River, which is required by Georgia State law for regulated waters. The Butler Creek TMDL will use the 7Q10 flow for Butler Creek (7.3 cfs) plus the Augusta-Richmond WWTP monthly average flow (46.1 million gallons per day (MGD)).

Low-flow characteristics of the Savannah River (Butler Creek to McBean Creek) were determined by using the USGS Gage #02197000 (Augusta below New Savannah Bluff Lock and Dam). The Savannah River is regulated by a series of impoundments affecting flows in the Greater Augusta Area. Thurmond Dam is the major control structure used to control flows in the River through the Augusta metropolitan area. Thurmond Reservoir encompasses approximately 70,000 acres, is located 22 miles above Augusta on the Savannah River, and represents the first Corps of Engineers flood control project built in the Savannah River Basin (full pool 1955). New Savannah Bluff Lock and Dam, used for flood control and sparingly for navigation below Augusta represents the final control structure before the Savannah River enters Savannah Harbor.

USGS flow gage #02197000 is located directly below the New Savannah Bluff Lock and Dam and above the confluence of Butler Creek and the Savannah River. According to USGS daily flow records obtained from the USGS NWIS retrieval web-site, the minimum daily average flow of record for 1955-1998 occurred on 12/7/1981 as 2810 cfs. In addition the, 7Q10 flow for this period is approximated as 4007

cfs.

The 7Q10 flow was obtained from BASINS, accessing the Reach File 1 meta information for Butler Creek.

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 there are no known permitted point sources of lead and the cause of the lead impairment is not identified for this waterbody, this TMDL will be expressed as a loading capacity. If in the future, a point or nonpoint source load of lead 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 from the previous 20 years.

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:

Load = Concentration (Water Quality Standard) * Flow

The Total Maximum Daily load for the Savannah River segment between Butler Creek and McBean Creek and Butler Creek are given in Table 1**.**

Table 1

TMDL for Lead

Flow	TMDL
Upstream Segment Boundary Flowing into listed segment	7.36 kg/day
Butler Creek	0.20 kg/day

For the Savannah River between Butler and McBean, the target TMDL for Lead is 7.56 kg/day.

Seasonal Variation

The low flow condition represents the most critical design condition and will provide year round protection. For example, in the Savannah River, the long term mean flow of 9717 cfs the maximum instream concentration is projected to be 0.44 ug/l, which is 34% of the water quality standard. There are no seasonal variations that impact the concentration of lead in the Savannah River and Butler Creek due biological activities.

Allocation of Responsibility and Recommendations

The allocation of lead load to Butler Creek and Savannah River between Butler and McBean Creek is given below.

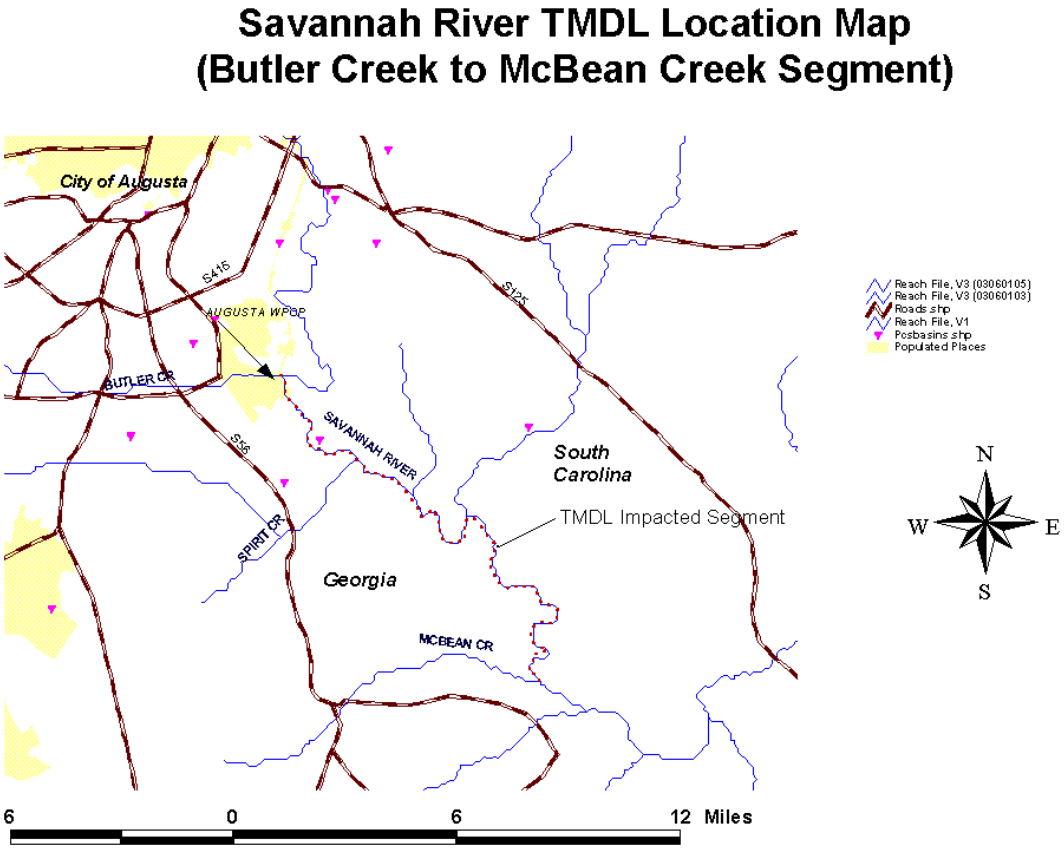
$TMDL_{\text{Butler to McBean}}$ = Upstream Savannah (7.36 kg/day Lead) + Butler Creek (0.20 kg/day Lead)

TMDL = 7.56 kg/day Lead

Because no permitted point sources of lead have been identified in this segment of the Savannah River, as NPDES permits are up for renewal, investigations into their effluents for lead should be undertaken.

Since an unknown nonpoint source or sources of lead are causing the water quality impairment and because no permitted point sources of lead have been identified in this segment, the nonpoint source of lead needs to be identified and controlled. Until this occurs there is no available load to allocate to other sources. Further investigations and lead sampling need to be conducted to identify the other loads and to implement methods to reduce these loads.

Appendix A -- Site 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
Pounds (lbs)	Kilograms (Kg)	0.4536
Tons (Short)	Kilograms (Kg)	907.1848
Tons (Long)	Kilograms (Kg)	1016.00

Administrative Record

1. Augusta, Georgia Municipal Separate Storm Sewer System Suburban Stormwater District NPDES Stormwater Permit No. GAS000201. 1998-99 Annual Report.
2. Compilation of Georgia's Current Modeling Guidelines for the Development of Wasteload Allocations and NPDES Permit Limitations. January 1991
3. Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards
4. STORET Water Quality Data
5. Georgia Environmental Protection Division Stream Monitoring Data
6. USGS Water Quality and Stream Flow Data
7. On Disk: Excel Spreadsheet to calculate TMDL

Response to Public Comment on the Proposed TMDL

COMMENTS:

In the Target Identification section of the TMDL, both acute and chronic criteria are mentioned, but it appears that only the chronic is given. It needs to be explained how both are addressed.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

The chronic value was selected because it represents the most stringent limit.

COMMENTS:

In the Target Identification section of the TMDL, the hardness value of 100 mg/l needs to be justified and then shown how the criteria are determined for this.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

The hardness value is assumed to be less than 100 mg/l.

COMMENTS:

In the Background section of the TMDL, the local wastewater plant is not permitted for lead, but should be considered a possible source. This needs to be addressed and perhaps permit modified.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

Permit limits and permit monitoring and reporting data were analyzed and lead was not found in the limits or effluent.

COMMENTS:

In the TMDL section of the TMDL, no new sources should be allowed until the load is reduced, since the waterbody is already overloaded with lead. This is perhaps different from the statement regarding future loads in this section.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

Loading of lead to the waterbody should not exceed the established loading capacity. The TMDL further states that the source of the exceedences has not been identified. Additional sampling should occur in the future.

COMMENTS:

In the Margin of Safety section of this TMDL, this method of applying margin of safety is questionable and needs to be resolved. Since the standard is based on flow used, then at times when such flows occur, there is no margin of safety. Thus, the commenter urges the use of an explicit of margin of safety as a stated load.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

Comment noted, however, the use of the critical low flow will remain in this TMDL.

COMMENTS:

In the Target Calculation section of the TMDL, it appears that it is assumed that there is zero load allocation for lead, but this is not addressed or justified.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

The TMDL is expressed as a loading capacity that incorporates both WLA and LA.

COMMENTS:

In the TMDL Calculation section of the TMDL, the TMDLs are given in kg/day. It is preferred that is be given in lb/day or both ways (with conversion shown); and at least one standard way for similar TMDLs.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

A units conversion table is provided in Appendix B to the final TMDL.

COMMENTS:

In the Allocation of Responsibility and Allocation section of the TMDL, it is state that, when permits are up for renewal, lead investigations will be done. It would seem that such should and could be done now rather than waiting, and possibly allowing additional pollution.

Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 10, 1999

RESPONSE:

Comment noted, facilities are required to monitor for lead during the Priority Pollutant scan process as described in their permits.

COMMENT:

EPA erred by basing the TMDL on the critical flow that is defined as low flow.

Eric E. Huber, EarthJustice Legal Defense Fund, 400 Magazine Street, Suite 401, New Orleans, Louisiana 70130-2453, November 8, 1999

RESPONSE:

The Savannah River has a regulated streamflow, due to locks and dams. Georgia water quality standards require the use of this flow for critical condition calculations. Typically, the Savannah River flow is much higher.

COMMENT:

The critical conditions used to develop a TMDL should match those used to derive the underlying water quality standard. Chronic water quality standards for protection of aquatic life are based on 96-hour toxicity tests, and are not to be exceeded more than once every three years. To match the TMDL to the underlying water quality standard, the exposure duration (i.e., design flow) should be 96 hours (four days) and the recurrence interval should be 1 in 3 years.

Therefore, the most appropriate critical low flow condition would be the 4Q3. Values of 4Q3 are as easily derived as 7Q10 values and should be used for developing TMDLs where low flow is the critical condition.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Comment noted.

COMMENT:

The commenters request that the TMDL be withdrawn. Where applicable, recalculation should be done using defensible assumptions using all the available site-specific data.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia TMDL Lawsuit Consent Decree. GA EPD presented new data that indicates that this segment is no longer impaired.

COMMENT:

The source of the lead needs to be determined and the TMDL revised accordingly. When was the Augusta WTP last tested for lead ? What are the test results for that in Augusta's storm water ?

Eric E. Huber, EarthJustice Legal Defense Fund, 400 Magazine Street, Suite 401, New Orleans, Louisiana 70130-2453, November 8, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia TMDL Lawsuit Consent Decree. GA EPD presented new data that indicates that this segment is no longer impaired.

EPA did a data query for all potential sources of lead to the listed segment. No sources were found.

COMMENT:

The TMDL allocates zero loads to point sources despite the presence of a wastewater treatment plant (WWTP). The commenters believe, at a minimum, that the allocation should be based on the detection limit for the lead analyses conducted, upon which the assumption that there is no lead in the discharge is based. The allocation would then be the detection limit times the maximum permitted discharge rate of the WWTP. It is inappropriate to set all wasteload allocations for point sources at zero simply because loads have not been detected or simply because nonpoint sources are unidentified.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

No allocation was made, as there are no direct dischargers to this segment.

COMMENT:

Many of the assumptions used by EPA in developing this TMDL are extremely conservative, inconsistently applied, and irrational. Little or no attempt has been made to quantify the effects of the multiplicity of conservative assumptions upon the resulting TMDL. The conservative assumptions build in unknown, and conceivably very large, implicit margins of safety, and the commenters believe that TMDLs should be calculated as accurately as possible taking into account explicit margins of safety. The margin of safety should be quantified to the extent possible and communicated in the TMDL. Until this done, neither EPA nor the regulated community will know if established TMDLs represent an appropriate balance between environmental protection and the ability to use the resource.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia TMDL Lawsuit Consent Decree. GA EPD presented new data that indicates that this segment is no longer impaired.

COMMENT:

According to EPA's own guidance, an acceptable margin of safety in aquatic ecosystems allows for the criterion to be exceeded once every three years. The TMDL should not be formulated, by applying large factors of safety, so that the criterion is never to be exceeded. This assumption ignores the margin of safety that EPA has built into the water quality criteria and makes the TMDL overly-conservative.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Comment noted.

COMMENT:

The use of default translators, where 95% of all samples actually show lower dissolved metals concentrations than predicted using the standard translator, can result in errors of an order of magnitude or more in the TMDL. Site-specific translators should be used whenever possible. Effluent data for total suspended solids can be used to more accurately determine the translator.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia TMDL Lawsuit Consent Decree. GA EPD presented new data that indicates that this segment is no longer impaired.

COMMENT:

EPA has used a low hardness value in conjunction with low flow, making the assumption that the two are independent variables. The relationship between hardness and stream flow should be considered and a hardness value typical of low flow should be used in the TMDL determination. Hardness can easily vary by a factor of two between wet- and dry-weather flows.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Comment noted.

COMMENT:

The critical conditions used to develop a TMDL should match those used to derive the underlying water quality standard. Chronic water quality standards for protection of aquatic life are based on 96-hour toxicity tests, and are not to be exceeded more than once every three years. To match the

TMDL to the underlying water quality standard, the exposure duration (i.e., design flow) should be 96 hours (four days) and the recurrence interval should be 1 in 3 years.

Therefore, the most appropriate critical low flow condition would be the 4Q3. Values of 4Q3 are as easily derived as 7Q10 values and should be used for developing TMDLs where low flow is the critical condition.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Comment noted.

COMMENT:

The selection of a drought stream flow rate as the critical condition is unsupported and quite possibly flawed. If the source of impairment is contaminated run-off, use of a low flow condition is inappropriate because the source loading would be minimal during this condition. Lead concentration and concurrent stream flow rate data should be reviewed to determine mass loading rates under dry and wet weather conditions. A "one-size-fits-all" approach should not be applied.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia consent decree. GA EPD presented new data that no longer supported this segment as impaired.

COMMENT:

EPA must show that a lead problem actually exists in this waterbody based on dissolved lead exceedances of the current water quality criterion for lead. If there is no lead problem in the upper Savannah River, then EPA should not be establishing a lead TMDL.

J. David Dean, Technical Director, Water Quality, Ogden Environmental and Energy Services, and Ian Lundberg, P.E., Principal, Resolve Environmental Engineering, 1395 South Marietta Parkway, Building 300, Suite 210, Marietta, Georgia 30061, November 12, 1999

RESPONSE:

Commented noted. This TMDL does not have any implications associated with the calculations, but was done as requirement of the Georgia TMDL Lawsuit Consent Decree. GA EPD presented new data that indicates that this segment is no longer impaired.

References:

Better Assessment Science Integrating Point and Nonpoint Sources, BASINS, Version 2, User's Manual. EPA-823-B-98-006

Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards

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

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