BECKWITH CREEK TMDL FOR DISSOLVED LEAD

SUBSEGMENT 030803

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Office of Environmental Assessment
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TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody.

Beckwith Creek is in the Calcasieu River Basin in southwest Louisiana and originates near De Ridder, Louisiana in Beauregard Parish. The Creek was not listed on any 303(d) list for lead but was determined to be not meeting its criterion for lead during the 2000 305(b) Assessment. The Creek was tested using the "Clean Technique" procedures using samples collected in 2000 and 2001. Between the months of September 2000 and March 2001, five samples were taken. The sample results showed that lead exceeded the subsegment's water quality criterion for aquatic life. Thus a TMDL has been developed for dissolved lead in Beckwith Creek.

For the purpose of TMDL development, the dissolved lead numerical criterion was calculated based on the freshwater chronic value for aquatic life protection using the average hardness value from 1999. The hardness data is from Station 0843 located on Beckwith Creek and is shown in Appendix A. The dissolved lead numerical criterion was determined to be 0.292 μg/L. For the purpose of this TMDL, dissolved lead was considered to be a conservative parameter. Using the 7Q10 flow at the lower reach of subsegment 030803 and the calculated lead criterion, a TMDL of 0.00095 lb/day was calculated. The TMDL was then allocated to its wasteload allocation, margin of safety, and load allocation components. Since there are no known point sources discharging lead in this watershed, the wasteload allocation is zero.

1. Introduction

Beckwith Creek was not listed on any 303(d) list for lead; however, it was found to be not meeting its criterion for lead during the 2000 305(b) Assessment. Since this was discovered while TMDLs were being prepared for the Calcasieu and Ouachita Basins, this waterbody was added to the schedule for TMDL development.

Five samples from September 2000 to March 2001 were tested for lead using the "Clean Technique" procedures. The sample results showed an exceedance of dissolved lead thus requiring a TMDL for this parameter. A TMDL for dissolved lead was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL can also establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is allocated to point sources, and the load allocation is allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2. Study Area Description

2.1 Calcasieu River Basin

Beckwith Creek is in subsegment 030803 of the Calcasieu River Basin. It originates in Beauregard Parish near De Ridder in southwest Louisiana. A map of the Calcasieu River Basin and subsegment 030803 is shown in Appendix C (LDEQ, 1999). The Calcasieu River Basin lies in southwestern Louisiana and is bordered by the Mermentau River to the east and the Sabine River to the west. The lands within the Calcasieu River Basin are primarily forested and agricultural, although the basin also contains significant amounts of wetlands and the city of Lake Charles. The 1993 Nonpoint Source (NPS) Assessment Report estimated that approximately 51% of the basin is forested, 26% was in agriculture, 12% was in wetlands and 3% was in urban. The remainder of the basin is in water and other types of land use (LDEQ, 1999).

2.2 Water Quality Standards (LDEQ, 2000)

The designated uses for subsegment 030803 include primary and secondary contact recreation, propagation of fish and wildlife, and agriculture. The criteria for protection of aquatic life are based on acute and chronic concentrations in fresh and marine waters and are developed primarily for attainment of the fish and wildlife propagation use.

Criteria for human health are derived for waterbodies used as drinking water supplies and those not used as drinking water supplies. Criteria applied to waterbodies designated as drinking water supplies are developed to protect that water supply for human consumption, including protection against taste and odor effects, to protect it for primary and secondary contact recreation, and to

prevent contamination of fish and aquatic life consumed by humans. Criteria for waterbodies not designated as drinking water supplies are developed to protect them for primary and secondary contact recreation and to prevent contamination of fish and aquatic life consumed by humans. The lead criterion for surface waterbodies designated as drinking water supply is 50 µg/L.

Metals criteria are based on dissolved metals concentrations in ambient waters. Hardness values are averaged and used in the calculation of the lead criteria. The lead criterion used in this TMDL was calculated using hardness data from 1999. The calculated criterion and the sample exceedances are shown in Appendix B.

2.3 Identification of Sources

According to the LDEQ discharger database, there are no point sources that discharge lead into Beckwith Creek. LDEQ has established a group of reference streams located throughout the state which exhibit near-pristine characteristics and have no man-made sources discharging or contributing runoff into them. Beckwith Creek is one of these reference streams. Therefore, LDEQ concludes that natural background loading is the most likely source of lead in Beckwith Creek. Since the lead criterion is hardness-dependent and Beckwith Creek had very low hardness, the standard is very low and is easily exceeded at the low detection capabilities of modern laboratory instruments.

3. TMDL Load Calculations

3.1 Load Determination

The aquatic life criterion was used for this TMDL along with the 7Q10 flow for the waterbody. The criterion was calculated from the freshwater chronic criteria equation (Environmental Regulatory Code, Part IX. Water Quality Regulations 2000, pages 139 and 141):

Chronic Dissolved Lead Criterion= $e^{(1.2730[\ln(\text{hardness})]-4.7050)}$ X 1.46203-[(ln hardness)(0.145712)]

The average hardness value used in this equation was determined from the 1999 hardness data at Water Quality Station 0843 located on Beckwith Creek. The data is shown in Appendix A.

Dissolved lead was treated as a conservative parameter. The following equation was used to calculate the dissolved lead TMDL. The TMDL calculations are shown below.

Dissolved Lead TMDL, lb/day = (Lead Criterion, mg/L) x (Critical Flow, mgd) x 8.345

where 8.345 is a conversion factor from mg/L to lb/day.

The sampling events used as the basis for this TMDL were performed to meet the needs of the 2000 305(b) Assessment. The data is adequate for a conservative TMDL based on the assumption that no fate and transport mechanisms were present in the waterbody. Data gathering did not include any flow measurements, any hardness measurements nor any upstream sampling and measurements for

background conditions. In the absence of such data, fate and transport modeling and calculation of reductions required from current loads are not possible.

LDEQ has developed this TMDL to be consistent with the State antidegradation policy (LAC 33:IX.1109.A).

Calculation of the Total Maximum Daily Load (TMDL) for Lead in Beckwith Creek (Subsegment 030803)

Determination of the TMDL:

Average Hardness at LDEQ WQ ambient site #0843 = 14.5 mg/L

Critical flow (7Q10) for the total subsegment (Note 1) = 0.6 cfs = 0.4 mgd

The dissolved Lead criterion = Freshwater Chronic criterion = $e^{(1.2730[\ln(\text{avg. hardness})] - 4.7050)}$ X 1.46203-[(ln avg hardness)(0.145712)]

The dissolved Lead criterion = 0.292 ug/L = 0.000292 mg/L

TMDL for dissolved Lead = (Lead criterion, mg/L) x (Critical Flow, mgd) x 8.345 = lb/day

TMDL for dissolved Lead =	0.00095 lb/day

Determination of the various loads contributing to the TMDL:

TMDL = Load Allocation (LA) + Waste Load Allocation (WLA) + Margin of Safety (MOS)

WLA calculation:

Waste Load portion of the TMDL =	0.000 lb/day

Margin of Safety = 20% x TMDL =	0.00019 lb/day

LA = TMDL - WLA - MOS =	0.00076 lb/day

Note 1 - The 7Q10 at the bottom of the subsegment was calculated using USGS Station 08016400 and applying drainage area ratios to obtain a 7Q10 of 0.6 cfs. The 7Q10s can be found in "Low-Flow on Streams in Louisiana" by Fred N. Lee, March 2000.

USGS Station 08016400 is located on Beckwith Creek near DeQuincy, Louisiana.

3.2 Load Allocation (LA)

The load allocation is the TMDL minus the WLA and MOS. The load allocation includes natural background sources.

3.3 Wasteload Allocation (WLA)

The WLA is zero since there are no known point sources discharging lead to Beckwith Creek.

3.4 Seasonal Variability

Because ambient monitoring data indicate there is little variability of trace metals levels throughout the year, LDEQ has not defined a critical season.

3.5 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. For this TMDL an explicit MOS of 20% was used.

4. Monitoring Plan

In accordance with Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a comprehensive program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any

improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Calcasieu River Basin will be sampled again in 2004.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1999, compliance inspections were as follows:

Calcasieu Basin: 33 major NPDES facilities, 260 minor facilities.

Ouachita Basin: 348 facilities (total) inspected.

REFERENCES

Lee, Fred N., *Low-Flow On Streams in Louisiana*. March 2000. Prepared for Louisiana Department of Environmental Quality, Office of Water Resources, Engineering Section 2.

Louisiana Department of Environmental Quality. 1999. Nonpoint Source Management Plan, Baton Rouge, Louisiana, http://nonpoint.deq.state.la.us/99manplan/99calcasieu.pdf

Louisiana Department of Environmental Quality. 2000. *Environmental Regulatory Code, Part IX. Water Quality Regulations*.

Appendix A – Hardness Data

Beckwith Creek, Subsegment 030803, Water Quality Station 0843

DATE	TIME	DEPTH meters	HARD-NESS mg/l
12/8/1999	920	1	17.7
11/3/1999	950	1	17.8
10/6/1999	950	1	17
9/8/1999	950	1	19.7
8/4/1999	920	1	18.9
7/7/1999	855	1	16.7
6/2/1999	955	1	16.7
5/5/1999	1000	1	
4/7/1999	955	1	4.5
3/3/1999	920	1	14.4
2/3/1999	843	1	8
1/6/1999	925	1	8.1
		average=	14.5

Appendix B – Lead Data and Exceedances

Beckwith Creek, Site 0843, 030803
Clean Techniques Metals(dissolved ug/L)

Date Collected	Pb	Monthly Hardness (mg/L)	Pb Calculated Criteria	Pb Exc?	Lead Calculated Criteria X CF	Pb Exc?	Freshwater Lead CF	Marine Lead CF
9/26/2000	0.679	14.50	0.2723	YES	0.2920	YES	1.072	0.951
11/1/2000	0.053	14.50	0.2723	no	0.2920	no	1.072	0.951
12/7/2000	0.338	14.50	0.2723	YES	0.2920	YES	1.072	0.951
2/6/2001	0.489	14.50	0.2723	YES	0.2920	YES	1.072	0.951
3/13/2001	0.398	14.50	0.2723	YES	0.2920	YES	1.072	0.951

Appendix C – Basin Map & 2000 305(b) Assessment