

CALCASIEU RIVER TMDL FOR DISSOLVED LEAD  
SUBSEGMENTS 030101, 030102, & 030103

Louisiana Department of Environmental Quality  
Office of Environmental Assessment  
Environmental Technology Division  
Engineering Group 2

November 30, 2001

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	3
1. Introduction.....	4
2. Study Area Description .....	4
2.1 Calcasieu River Basin .....	4
2.2 Water Quality Standards (LDEQ, 2000) .....	4
2.3 Identification of Sources .....	5
3. TMDL Load Calculations .....	5
3.1 Load Determination .....	5
3.2 Load Allocation (LA).....	8
3.3 Wasteload Allocation (WLA) .....	8
3.4 Seasonal Variability .....	8
3.5 Margin of Safety (MOS) .....	8
4. Monitoring Plan .....	8
REFERENCES .....	10
Appendix A – Hardness Data.....	11
Appendix B – Lead Data and Exceedances .....	13
Appendix C – Basin Map & 2000 305(b) Assessment .....	15

## 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.

Subsegments 030101, 030102, and 030103 of the Calcasieu River are located in southwest Louisiana. Subsegment 030101 is located in Vernon Parish and is the headwaters of the Calcasieu River. Subsegment 030103 was listed for lead on the 1999 Court Ordered 303(d) List as well as the 2000 305(b) Assessment (Appendix C). The River 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 water quality criterion for aquatic life in Subsegment 030103. Thus a TMDL has been developed for dissolved lead in the Calcasieu River. The TMDL will apply to Subsegment 030103 as well as Subsegments 030101 and 030102 since they are upstream of the subsegment that violated the lead criterion.

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 January-May 1998 and January-December 1999. The hardness data is from Station 0095 located on the Calcasieu River and is shown in Appendix A. The dissolved lead numerical criterion was determined to be 0.217 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 030103 and the calculated lead criterion, a TMDL of 0.287 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 these subsegments, the wasteload allocation is zero.

## 1. Introduction

Subsegments 030101, 030102, and 030103 of the Calcasieu River are located in southwest Louisiana. Subsegment 030101 is located in Vernon Parish and is the headwaters of the Calcasieu River. Subsegment 030103 was listed for lead on the 1999 Court Ordered 303(d) List as well as the 2000 305(b) Assessment (Appendix C). The River 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 water quality criterion in Subsegment 030103. Thus a TMDL has been developed for dissolved lead in the Calcasieu River. The TMDL will apply to Subsegment 030103 as well as Subsegments 030101 and 030102 since they are upstream of the subsegment that violated the lead criterion.

The 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

A map of the Calcasieu River Basin and the subsegments 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 Subsegments 030101 and 030102 are primary and secondary contact recreation, propagation of fish and wildlife, and agriculture with the addition of outstanding natural resource water for Subsegment 030102. The designated uses for subsegment 030103 include primary and secondary contact recreation, propagation of fish and wildlife, agriculture, and outstanding natural resource water (scenic) from the junction with Whiskey Chitto Creek to the confluence with Marsh Bayou. 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 January-May 1998 and January-December 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 the subsegments in question. 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. Two of these reference streams located in the Calcasieu Basin, Six Mile Creek and Beckwith Creek, were found to be not supporting the lead criteria during the 2000 303(b) Assessment. Therefore, LDEQ concludes that natural background loading is the most likely source of lead in Subsegments 030101, 030102, and 030103. Since the lead criterion is hardness-dependent and the Calcasieu River 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):

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

The average hardness value used in this equation was determined from the January-May 1998 and January-December 1999 hardness data at Water Quality Station 0095 located on the Calcasieu River. 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.

$$\text{Dissolved Lead TMDL, lb/day} = (\text{Lead Criterion, mg/L}) \times (\text{Critical Flow, mgd}) \times 8.345$$

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 the Calcasieu River (Subsegments 030101, 030102 & 030103)

### *Determination of the TMDL:*

Average Hardness at LDEQ WQ ambient site #0095 = 11.2 mg/L

Critical flow (7Q10) at bottom of subsegment 030103 (Note 1) = 245.0 cfs = 158.3 mgd

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

The dissolved Lead criterion = 0.217 ug/L = 0.000217 mg/L

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

TMDL for dissolved Lead =	0.287 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 =

0.057 lb/day

LA = TMDL - WLA - MOS =

0.229 lb/day

Note 1 - This flow was calculated using the 7Q10 from USGS Station 08015500 and applying drainage area ratios to obtain the 7Q10 at the bottom of the subsegment. The 7Q10 can be found in "Low-Flow on Streams in Louisiana" by Fred N. Lee, March 2000.

USGS Station 08015500 is located on the Calcasieu River near Kinder, 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 the subsegments.

### 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 the use of an implicit or explicit 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

### Calcasieu River, Subsegment 030103, Water Quality Station 0095

DATE	TIME	DEPTH meters	HARD- NESS mg/l
-----	----	-----	-----
12/22/1999	945	1	12
11/17/1999	935	1	12.7
10/20/1999	925	1	13.6
9/22/1999	935	1	13
8/18/1999	945	1	13.7
7/21/1999	910	1	11.6
6/16/1999	920	1	12.6
5/19/1999	945	1	12.4
4/21/1999	925	1	12.4
3/17/1999	910	1	8.9
2/18/1999	950	1	10.5
1/20/1999	910	1	7.7
5/12/1998	810	1	16.3
4/14/1998	820	1	11.9
3/10/1998	805	1	5.1
2/10/1998	802	1	10
1/13/1998	813	1	5.5
		avg=	11.17

## Appendix B – Lead Data and Exceedances

**Calcasieu River, Site 0095, 030103**  
**Clean Techniques Metals (dissolved ug/L)**

Date Collected	Pb (mg/L)	Monthly Hardness (mg/L)	Pb Calculated Criteria	Pb Exc?	Lead Calculated Criteria X CF	Pb Exc?	Freshwater Lead CF	Marine Lead CF
9/28/2000	0.174	11.17	0.1954	no	0.2169	no	1.110	0.951
11/1/2000	0.087	11.17	0.1954	no	0.2169	no	1.110	0.951
12/7/2000	0.228	11.17	0.1954	YES	0.2169	YES	1.110	0.951
2/7/2001	0.231	11.17	0.1954	YES	0.2169	YES	1.110	0.951
3/13/2001	0.423	11.17	0.1954	YES	0.2169	YES	1.110	0.951

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