Castor Creek (Subsegment 050303), Louisiana, Draft TMDL for Dissolved Lead

Prepared for:

Louisiana Department of Environmental Quality, Water Quality Assessment Division,
Total Maximum Daily Load Program

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EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* Part 130) require states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily loads (TMDLs) of pollutants for those waterbodies. A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding its water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources in order to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

This dissolved lead TMDL has been developed for Castor Creek, in the Mermentau River Basin in southwestern Louisiana. Castor Creek flows for 18 miles from the headwaters to the confluence with Bayou Nezpique.

For the purpose of TMDL development, the dissolved lead numerical criterion was calculated using the freshwater chronic value for aquatic life protection calculated on the basis of the average hardness values from 2007 at Station 490 (Castor Creek east of Oberlin, Louisiana). The dissolved lead numerical criterion for Castor Creek was determined to be 0.69 microgram per liter. For the purpose of this TMDL, dissolved lead was considered to be a conservative parameter. Using the 7Q10 flow at the end of subsegment 050303 and the calculated lead criterion, a TMDL of 0.000372 pound per day (lb/day) was calculated. The TMDL was then allocated to its WLA, MOS, and LA components.

1. Introduction

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Part 130) require states to develop total maximum daily loads (TMDLs) of pollutants for waterbodies that are not supporting their designated uses, even if pollutant sources have implemented technology-based controls. A TMDL establishes the maximum allowable load (mass per unit of time) of a pollutant that a waterbody is able to assimilate and still support its designated uses. The maximum allowable load is determined on the basis of the relationship between pollutant sources and in-stream water quality. A TMDL provides the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

This dissolved lead TMDL has been developed for Castor Creek, in the Mermentau River Basin in southwestern Louisiana. Castor Creek flows for 18 miles from the headwaters to the confluence with Bayou Nezpique (Figure 1-1).

LDEQ placed Castor Creek on the state's 303(d) list in 2000 and identified the creek as not supporting its designated use of primary contact recreation and fish and wildlife propagation because of pathogens and metals—cadmium, copper, lead, mercury. The suspected sources were natural and unknown (LDEQ 2001). LDEQ placed Castor Creek on the state's 303(d) list again in 2002 identifying it as not supporting its designated use of primary contact recreation because of total fecal coliform (LDEQ 2003). The 2004 and 2006 editions of the state's *Louisiana Water Quality Inventory: Integrated Report* (*Integrated Report*) list impairments to the creek's primary contact recreation because of total fecal coliform from unknown sources and wildlife other than waterfowl. The creek's fish and wildlife propagation designated use is also listed as impaired because of low dissolved oxygen from unknown sources (LDEQ 2005, 2007a). Also in the draft 2008 *Integrated Report* is an impairment of Castor Creek's fish and wildlife propagation designated use because of lead from unknown sources (LDEQ 2008).

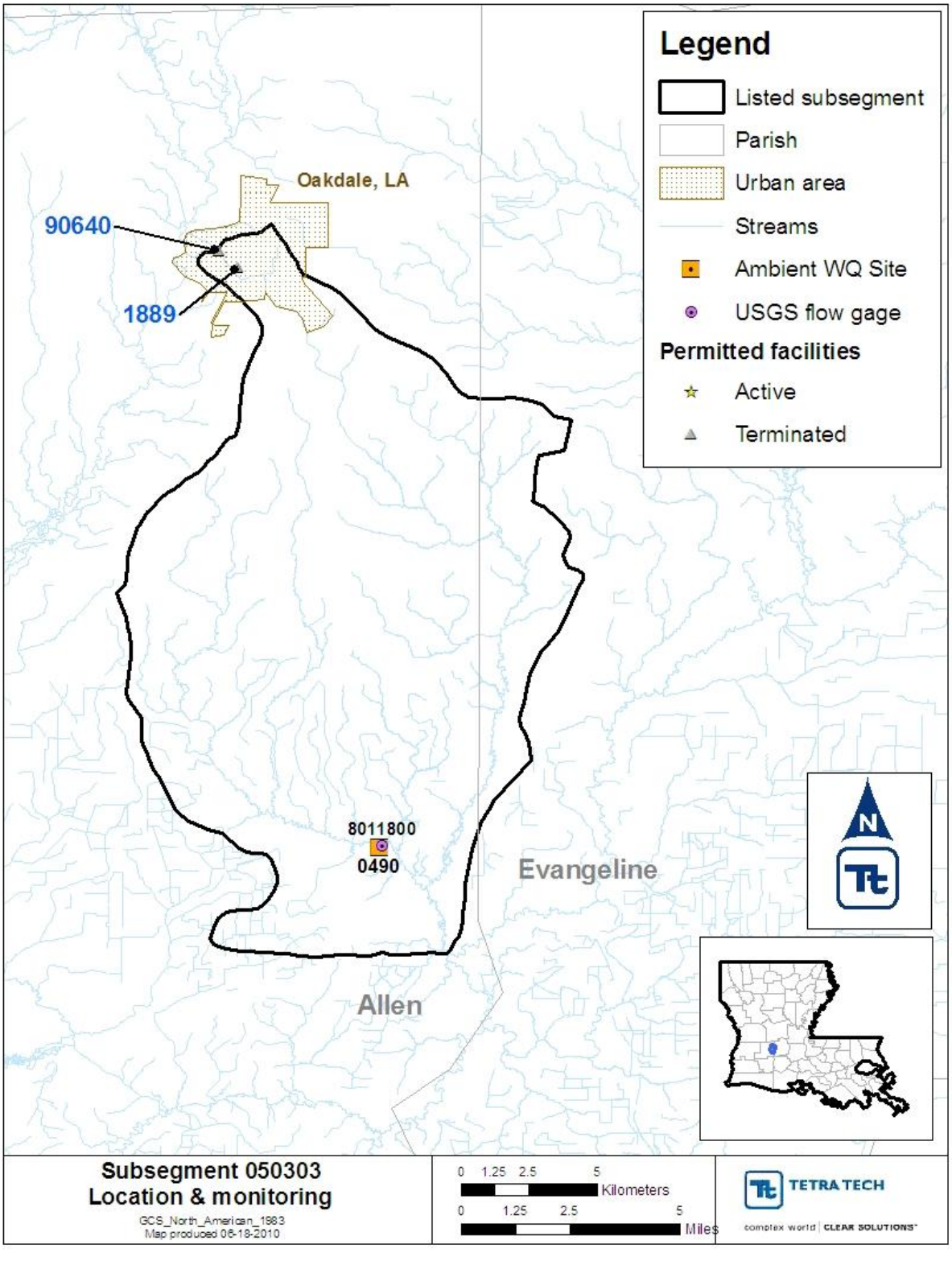

Figure 1-1. Subsegment 050303 (Castor Creek) location and monitoring.

2. Study Area Description

2.1 Mermentau River Basin—Castor Creek

This dissolved lead TMDL has been developed for Castor Creek, in the Mermentau River Basin in southwestern Louisiana. Castor Creek flows for 18 miles from the headwaters to the confluence with Bayou Nezpique (Figure 1-1). The Mermentau River Basin is bounded on the north and east by the Vermilion–Teche River Basin, on the west by the Calcasieu River Basin, and on the south by the Gulf of Mexico (LDEQ 1998). This is the prairie region of the state where rice and crawfish farms have been a dominant part of the landscape for many generations. The upper portion of the Mermentau Basin is forested, but the majority of the basin is in agricultural production except for the marshes that extend from the southern reaches of the basin to the Gulf of Mexico (LDEQ 2009a).

Land use data from the 2001 National Land Cover Database (NLCD) were used in Table 2-1 and Figure 2-1. NLCD 2001 is a land-cover database composed of land cover, impervious surface, and canopy density data. NLCD 2001 uses improved classification algorithms, which result in data with more precise rendering of spatial boundaries between the 16 classes than those obtained using NLCD 1992 (USEPA 2007).

Table 2-1. Subsegment 050303 land use (NLCD 2001)

Land use	Percent
Open water	0.01%
Developed	4.88%
Barren land	0.01%
Forest	33.23%
Grass/shrub	22.39%
Pasture/hay	6.34%
Cultivated crops	5.75%
Woody wetlands	26.50%
Emergent herbaceous wetlands	0.90%

Source: USEPA 2007

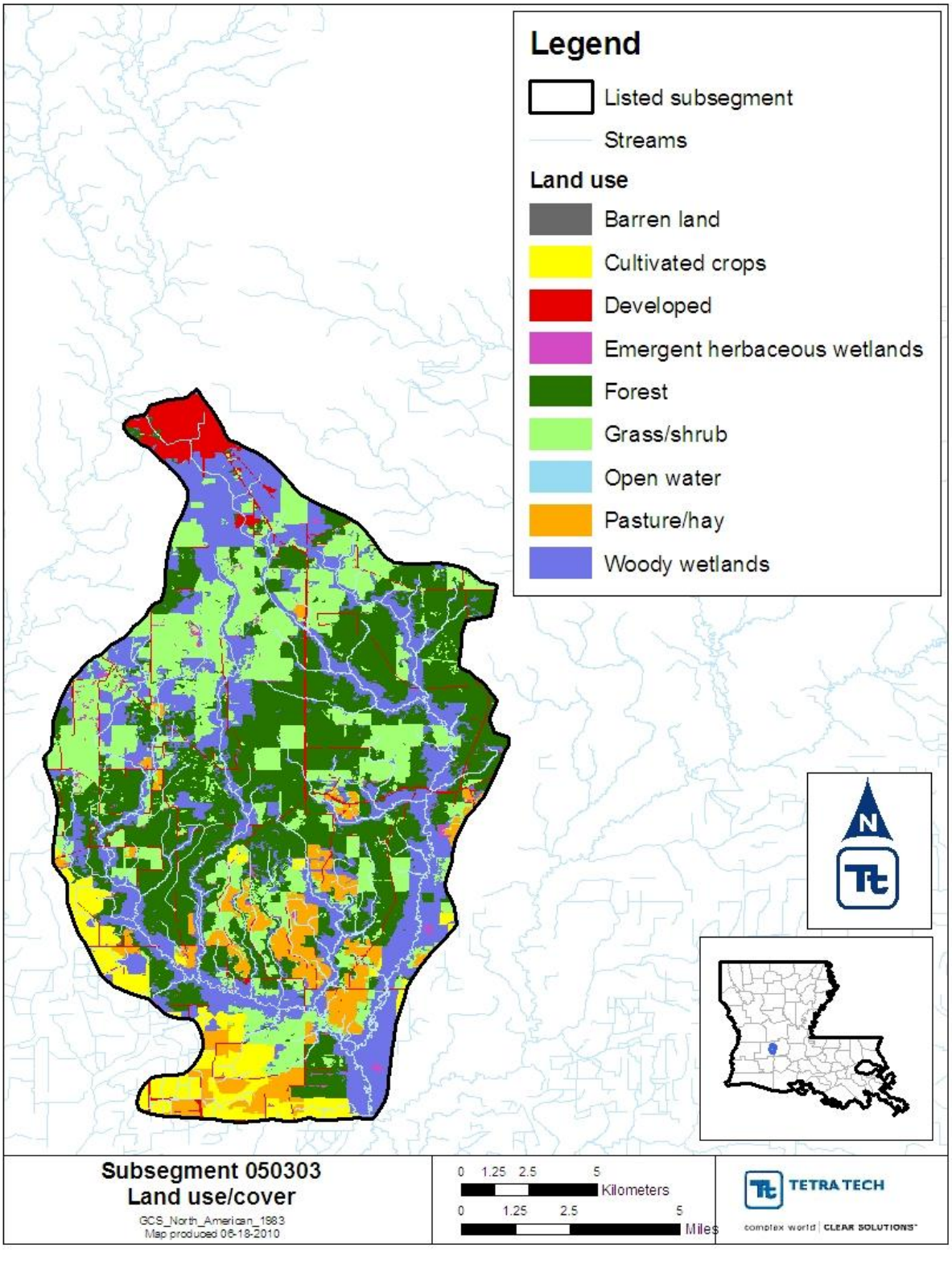

Figure 2-1. Land use in subsegment 050303 (Castor Creek).

2.2 Water Quality Data

One water quality station is on Castor Creek with lead data collected since 2005. Station 490 (Castor Creek east of Oberlin, Louisiana) has had four dissolved lead observations collected since 2005. Appendix A contains the raw water quality data. The lead data from station 490 containing current data were plotted over time for subsegment 050303 (Figure 2-2). No distinct seasonal trends or patterns can be seen in the water quality data.

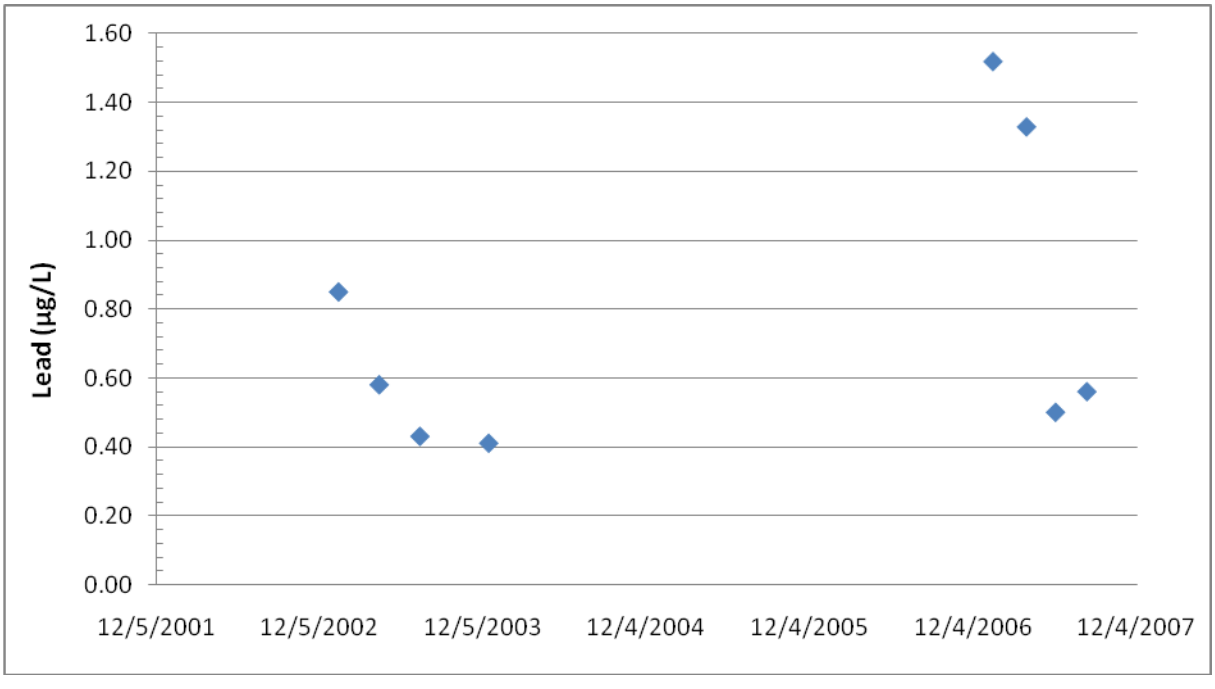

Figure 2-2. Lead data at station 490.

2.2 Water Quality Standards and Criteria

The designated uses for subsegment 050303 include primary and secondary contact recreation, and propagation of fish and wildlife. Primary contact recreation includes any recreational or other water contact activity involving prolonged or regular full-body contact with the water and in which the probability of ingesting appreciable amounts of water is considerable. Examples of that type of water use include swimming, water skiing, and diving (LDEQ 2007b). Secondary contact recreation includes any recreational or other water contact activity in which prolonged or regular full-body contact with the water is either incidental or accidental, and the probability of ingesting appreciable amounts of water is minimal. Examples of that type of water use include fishing, wading, and boating (LDEQ 2007b). 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.

The aquatic life criterion was used for this TMDL along with the 7Q10 flow for the waterbody. Metals criteria are based on hardness concentrations in ambient waters. The criterion was calculated from the freshwater chronic criteria equation (LDEQ 2009b):

$$\text{Criterion} = e^{((1.2730 \times (ln(\text{hardness}))) - 4.7050)} \times (1.46203 - (0.145712 \times ln(\text{hardness})))$$

Hardness concentrations from the past 5 years at station 490 were averaged and used in calculating the lead criteria. The average hardness concentration for the subsegment 050303 is 31.01 milligrams

per liter (mg/L). The applicable chronic lead criterion, therefore, is 0.69 µg/L. The criterion applies at all times. The available dissolved lead data and the sample exceedances are shown in Appendix A.

The Louisiana water quality standards also include an antidegradation policy (*Louisiana Administrative Code* Title 33, Part IX, Section 1109.A), which states that state waters exhibiting high water quality should be maintained at that high level of water quality. If that is not possible, water quality of a level that supports the designated uses of the waterbody should be maintained. The designated uses of a waterbody may be changed to allow a lower level of water quality only through a use attainability study. LDEQ has developed this TMDL to be consistent with the state's antidegradation policy (LDEQ 2000).

2.3 Flow

The USGS flow monitoring gage 0801180 (Castor Creek at Cottingin Castor Rd. near Oberlin, Louisiana) is on subsegment 050303 at station 490. The critical low flow (7Q10) is 0.0 cubic feet per second (cfs) (Ensminger and Wright 2003). Because the 7Q10 flow was 0 cfs, a default value of 0.1 cfs was used, per permitting guidelines.

2.4 Identification of Sources

Louisiana's draft 2008 *Integrated Report* lists Castor Creek as having an impairment to the designated use of fish and wildlife propagation because of lead from unknown sources (LDEQ 2008). LDEQ has established a group of reference streams throughout the state that exhibit near-pristine characteristics and have no man-made sources discharging or contributing runoff into them. Two of the reference streams in the Calcasieu Basin—Six Mile Creek and Beckwith Creek—were found as not supporting the lead criteria during the 2000 305(b) assessment. Therefore, LDEQ concluded that natural background loading is the dominant source of lead in other waterbodies in the state (LDEQ 2004).

Information on point source dischargers in the subsegment was obtained from LDEQ files. According to the LDEQ discharger database, no permitted point sources are discharging into subsegment 050303. Two permits were terminated in the watershed (Table 2-2).

Table 2-2 Summary of LPDES permits in subsegment 050303

AI #	Permit #	Outfall	Facility name	Exp. date	Facility type	Outfall type
1889	LAG470192	001	Oakdale Motors Inc	Terminated 10/05 tied into city water	Auto dealers and gasoline service stations	Washrack wastewater
		002				Wash water
		003				Wastewater
		004				Contaminated stormwater
		005				Sanitary wastewater
		006				Commingled washrack and sanitary wastewater
90640	LAR05N022		Ambar Lone Star Oakdale Facility	Terminated 9/03	Oil and Gas Extraction	

3. TMDL Load Calculations

A TMDL is the total amount of a pollutant that can be assimilated by the receiving waterbody while still achieving water quality standards. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis for establishing water quality-based controls.

A TMDL for a given pollutant and waterbody is composed of the sum of individual WLAs for point sources, LAs for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit MOS to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

TMDLs are typically expressed as a mass loading (e.g., pounds per day).

Both section 303(d) of the Clean Water Act and the regulations at 40 CFR 130.7 require that TMDLs include an MOS to account for uncertainty in available data or in the actual effect that controls will have on the loading reductions and receiving water quality. The MOS may be expressed explicitly as unallocated assimilative capacity or implicitly using conservative assumptions in establishing the TMDL. For a more detailed discussion of the MOS, see Section 3.4.

3.1 Load Determination for Castor Creek (050303)

The sampling events used as the basis for this TMDL were performed to meet the needs of the state to develop the *Integrated Report*, which includes the biennial section 305(b) report (*Water Quality Inventory*) and the section 303(d) list of impaired waters. The data are adequate for a conservative TMDL according to the assumption that no fate and transport mechanisms are present in the waterbodies. Data gathering did not include any flow measurements, any hardness measurements, nor any upstream sampling and measurements for background conditions. Without such data, fate and transport modeling and calculating reductions required from current loads are not possible.

Calculating the TMDL

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

$$TMDL \text{ (lb/day)} = (\textit{lead criterion} \text{ [mg/L]}) \times (\textit{critical flow} \text{ [mgd]}) \times 8.345$$

where 8.345 is a conversion factor. Only observed data from during 2005 and after were used in this TMDL.

Lead criterion = 0.69 µg/L = 0.00069 mg/L

Critical flow (7Q10) = 0.1 cfs = 0.0646 mgd

TMDL = (0.00069 mg/L) × (0.0646 mgd) × 8.345 = 0.00372 lb/day

3.2 Wasteload Allocation (WLA)

The WLA portion of the TMDL equation is the total loading of a pollutant that is assigned to point sources. Subsegment 050303 does not contain actively permitted facilities with lead limitations (excluding stormwater). Therefore, the WLA is zero.

3.3 Seasonal Variability

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

3.4 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration an MOS. The MOS is the portion of the pollutant loading reserved to account for any uncertainty in the data. There are two ways to incorporate the MOS. One is to implicitly incorporate it by using conservative model assumptions to develop allocations. The other is to explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations (USEPA 1991). For this TMDL, an explicit MOS of 20 percent was used. The MOS is 0.000074 lb/day.

3.5 Load Allocation (LA)

The LA is the portion of the TMDL assigned to natural background loadings and nonpoint sources urban runoff and other anthropogenic sources. The LA was calculated (see below) for this TMDL by subtracting the WLA and MOS from the total TMDL. LAs were not allocated to separate nonpoint sources because of the lack of available source characterization data. The LAs include natural background sources.

$$\sum LAs = TMDL - \sum WLAs - \text{MOS}$$

$$\sum \text{LAs} = 0.000372 - 0 - 0.000074$$

$$\sum \text{LAs} = 0.000298 \text{ lb/day}$$

4. Monitoring Plan

LDEQ uses funds provided under section 106 of the Clean Water Act and under the authority of the Louisiana Environmental Quality Act to run a program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations using appropriate sampling methods and procedures to ensure 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, develop a long-term database for water quality trend analysis, and monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the state's biennial *Water Quality Inventory* and the section 303(d) list of impaired waters. That information is also used to establish priorities for LDEQ's nonpoint source program.

LDEQ has implemented a watershed approach to surface water quality monitoring. Through that approach, the entire state is sampled on a 4-year cycle. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 4-year cycle. Sampling is conducted monthly to yield approximately 12 samples per site during each year the site is monitored. Sampling sites are where they are considered representative of the waterbody. Within each basin, all monitored subsegments will be sampled over the year or years specified under each cycle period. Castor Creek was monitored with the Mermentau River Basin in 2006, 2007, 2008, and 2009. Water quality assessments for the 305(b)/303(d) *Integrated Report* will be conducted for each basin following the last year of its monitoring period. Usually 125 waterbody subsegments are monitored each month under the program. Under the current monitoring schedule, approximately one-half of the state's waters are newly assessed for section 305(b) and section 303(d) listing purposes for each biennial cycle, with sampling occurring statewide each year. The 4-year cycle follows an initial 5-year rotation that covered all basins in the state according to the TMDL priorities. Monitoring allows LDEQ to determine whether any improvement has occurred in water quality after

the TMDLs have been implemented. When LDEQ evaluates monitoring results at the end of each year, it may add waterbodies to or remove them from the section 303(d) list of impaired waterbodies.

5. Public Participation

Federal regulations require LDEQ to notify the public and seek comments concerning the TMDLs it prepares. This TMDL was developed under contract to LDEQ, and LDEQ will hold a public review period seeking comments, information, and data from the public and any other interested party. The notice for the public review period will be published in local and state newspapers and on LDEQ's electronic notification system. The TMDL report will be available on LDEQ's TMDL Web site at www.deq.louisiana.gov/portal/default.aspx?tabid=1563. The public review period will last for 30 days. LDEQ will review all comments received, and this TMDL might be revised to reflect comments if appropriate.

6. References

Ensminger, P.A., and L.S. Wright. 2003, *Low-flow Characteristics of Louisiana Streams.* U.S. Geological Survey Water Resources Technical Report Number 70. Louisiana Department of Transportation and Development, Baton Rouge, LA.

LDEQ (Louisiana Department of Environmental Quality). 1998. *1998 Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/tabid/2201/Default.aspx>. Accessed June 21, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2000. *Environmental Regulatory Code,* Part IX. Water Quality Regulations. LAC33:IX.1109.A. Louisiana Department of Environmental Quality, Baton, Rouge, LA.

LDEQ (Louisiana Department of Environmental Quality). 2001. *2000 Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/tabid/2201/Default.aspx>. Accessed June 9, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2003. *2002 Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/tabid/2201/Default.aspx>. Accessed June 9, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2004. *Watershed Implementation Plan, Bayou Serpent, Subsegment 030701*. Nonpoint Source Unit. <http://nonpoint.deq.louisiana.gov/wqa/links/watershedplan/calcasieu/Bayou%20Serpent%20Implementation%20Plan.pdf>. Accessed April 14, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2005. *2004 Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/tabid/2201/Default.aspx>. Accessed June 9, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2007a. *2006 Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/tabid/2201/Default.aspx>. Accessed June 9, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2007b. *Environmental Regulatory Code*. Part IX, Water Quality Regulations. Chapter 11. Surface Water Quality Standards. Louisiana

Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/Portals/0/planning/regs/title33/33v09.pdf>. Accessed April 14, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2008. *2008 Draft Louisiana Water Quality Inventory: Integrated Report*. Louisiana Department of Environmental Quality, Baton Rouge, LA. <http://www.deq.louisiana.gov/portal/LinkClick.aspx?fileticket=I4PibcgdTUA%3d&tabid=2986>. Accessed June 14, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2009a. *Watershed Implementation Plan For Bayou Nezpique.* Nonpoint Source Unit. <http://nonpoint.deq.louisiana.gov/wqa/links/watershedplan/mermentau/Bayou%20Nezpique.pdf>. Accessed June 21, 2010.

LDEQ (Louisiana Department of Environmental Quality). 2009b. *Environmental Regulatory Code*. Part IX, Water Quality Regulations. Section 1113. Surface Water Quality Standards. Louisiana Department of Environmental Quality, Baton Rouge, LA.

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

USEPA (U.S. Environmental Protection Agency). 2007. Multi-Resolution Land Characteristics Consortium (MRLC). 2001 National Land Cover Database (NLCD 2001). <http://www.epa.gov/mrlc/nlcd-2001.html>. Accessed May 5, 2010.

Appendix A. Hardness and Lead Monitoring Data

Table A-1. Hardness data for station 490

Site	Collection date[a]	Result (mg/L)
Castor Creek east of Oberlin, Louisiana	5/24/94	19
Castor Creek east of Oberlin, Louisiana	10/13/98	12.7
Castor Creek east of Oberlin, Louisiana	10/28/98	24.2
Castor Creek east of Oberlin, Louisiana	11/9/98	22.3
Castor Creek east of Oberlin, Louisiana	11/23/98	12.4
Castor Creek east of Oberlin, Louisiana	12/15/98	9.6
Castor Creek east of Oberlin, Louisiana	1/14/03	13.7
Castor Creek east of Oberlin, Louisiana	2/11/03	10
Castor Creek east of Oberlin, Louisiana	4/15/03	14.8
Castor Creek east of Oberlin, Louisiana	4/15/03	15.5
Castor Creek east of Oberlin, Louisiana	5/13/03	51.8
Castor Creek east of Oberlin, Louisiana	6/10/03	47.1
Castor Creek east of Oberlin, Louisiana	7/15/03	28.3
Castor Creek east of Oberlin, Louisiana	8/12/03	20.4
Castor Creek east of Oberlin, Louisiana	9/16/03	18.6
Castor Creek east of Oberlin, Louisiana	10/14/03	23.1
Castor Creek east of Oberlin, Louisiana	11/18/03	36.7
Castor Creek east of Oberlin, Louisiana	12/9/03	14.1
Castor Creek east of Oberlin, Louisiana	1/17/07	14.7
Castor Creek east of Oberlin, Louisiana	2/13/07	12.7
Castor Creek east of Oberlin, Louisiana	3/14/07	44.2
Castor Creek east of Oberlin, Louisiana	4/2/07	16.9
Castor Creek east of Oberlin, Louisiana	4/25/07	43
Castor Creek east of Oberlin, Louisiana	5/16/07	44.5
Castor Creek east of Oberlin, Louisiana	6/6/07	37.5
Castor Creek east of Oberlin, Louisiana	6/27/07	37.4
Castor Creek east of Oberlin, Louisiana	7/25/07	23.5
Castor Creek east of Oberlin, Louisiana	8/15/07	48.2
Castor Creek east of Oberlin, Louisiana	9/11/07	28.1
Castor Creek east of Oberlin, Louisiana	10/2/07	21.4

a. Data from before 2005 were not included in TMDL analysis.

Table A-2. Hardness summary statistics

Statistic	Value
Minimum (mg/L)	12.7
Maximum (mg/L)	48.2
Average (mg/L)	31.01
Count	12

a. Data from before 2005 were not included in TMDL analysis.

Table A-3. Dissolved lead data for station 490

Site	Collection date	MDL (µg/L)	Type	Result (µg/L)[a]
Castor Creek east of Oberlin, Louisiana	5/24/94		Filtered	**1.1**
Castor Creek east of Oberlin, Louisiana	6/23/98		Filtered	**5**
Castor Creek east of Oberlin, Louisiana	7/28/98		Filtered	**5**
Castor Creek east of Oberlin, Louisiana	8/25/98		Filtered	**5**
Castor Creek east of Oberlin, Louisiana	9/22/98		Filtered	**5**
Castor Creek east of Oberlin, Louisiana	10/28/98		Filtered	**5**
Castor Creek east of Oberlin, Louisiana	11/23/98		Filtered	**5**

Site	Collection date	MDL (µg/L)	Type	Result (µg/L)[a]
Castor Creek east of Oberlin, Louisiana	1/14/03	0.01	Filtered	**0.85**
Castor Creek east of Oberlin, Louisiana	4/15/03	0.01	Filtered	0.58
Castor Creek east of Oberlin, Louisiana	7/15/03	0.01	Filtered	0.43
Castor Creek east of Oberlin, Louisiana	12/16/03	0.01	Filtered	0.41
Castor Creek east of Oberlin, Louisiana	1/17/07	0.04	Filtered	**1.52**
Castor Creek east of Oberlin, Louisiana	4/2/07	0.04	Filtered	**1.33**
Castor Creek east of Oberlin, Louisiana	6/6/07		Filtered	0.5
Castor Creek east of Oberlin, Louisiana	8/15/07		Filtered	0.56

a. Exceedances of the calculated standard are bold. Data from before 2005 were not included in TMDL analysis.

Table A-4. Lead summary statistics

Statistic	Value[a]
Minimum (µg/L)	0.5
Maximum (µg/L)	1.52
Average (µg/L)	0.978
Count	4
Percentage of data that violate the standard	50

a. Data from before 2005 were not included in TMDL analysis.