

# SUMMARY OF MODELING FOR THE IBERIA PARISH SEWERAGE DISTRICT NO. 1 POTW

## WATER QUALITY ASSESSMENT DIVISION

OCTOBER 13, 2004

### Introduction and Executive Summary

LDEQ has reviewed previously completed Wasteload Allocations and TMDLs to evaluate alternatives for treatment levels and receiving streams for the Iberia Parish Sewerage District No. 1 POTW. This facility currently discharges approximately 2.5 mgd to Tete Bayou, Subsegment 060701, south of New Iberia. The plant is located between Tete Bayou and Bayou Teche, Subsegment 060401, about 0.3 miles from Tete Bayou and 0.6 miles from Bayou Teche. Both Tete Bayou and Bayou Teche have dissolved oxygen criteria of 5.0 mg/l. The plant has been given an allocation of 5 mg/l BOD<sub>5</sub>, 2 mg/l NH<sub>3</sub>-N, and 6 mg/l dissolved oxygen by an April 2002, EPA Region VI TMDL. LDEQ has investigated the possibility of a discharge to Bayou Teche or perhaps splitting the plant discharge between Tete Bayou and Bayou Teche. Digital and land use maps of Tete Bayou may be found in Figures 1 and 2.

The summer season projection of the January 2000 Bayou Teche TMDL has been rerun to calculate an allocation for the discharge of the treatment plant to Bayou Teche, and a Tete Bayou model has been calibrated to 1983 and 1993 survey data to provide an allocation to that waterbody.

The Tete Bayou model projects a minimum dissolved oxygen of about 1.2 in the vicinity of river mile 6, recovering to about 2.4 just above Lake Fausse Pointe, with all man-made loading, including the Sewerage District No. 1 POTW, removed. It is clear that there is no assimilative capacity for the Sewerage District No. 1 POTW in Tete Bayou. The best option is a 100% discharge to Bayou Teche. With a reduced explicit margin of safety for point sources, the Bayou Teche TMDL model shows that Bayou Teche can assimilate the load from the Sewerage District No. 1 POTW at an effluent limitation (wasteload allocation) of 10 mg/l CBOD<sub>5</sub>, 5 mg/l NH<sub>3</sub>-N, 2 mg/l DO.

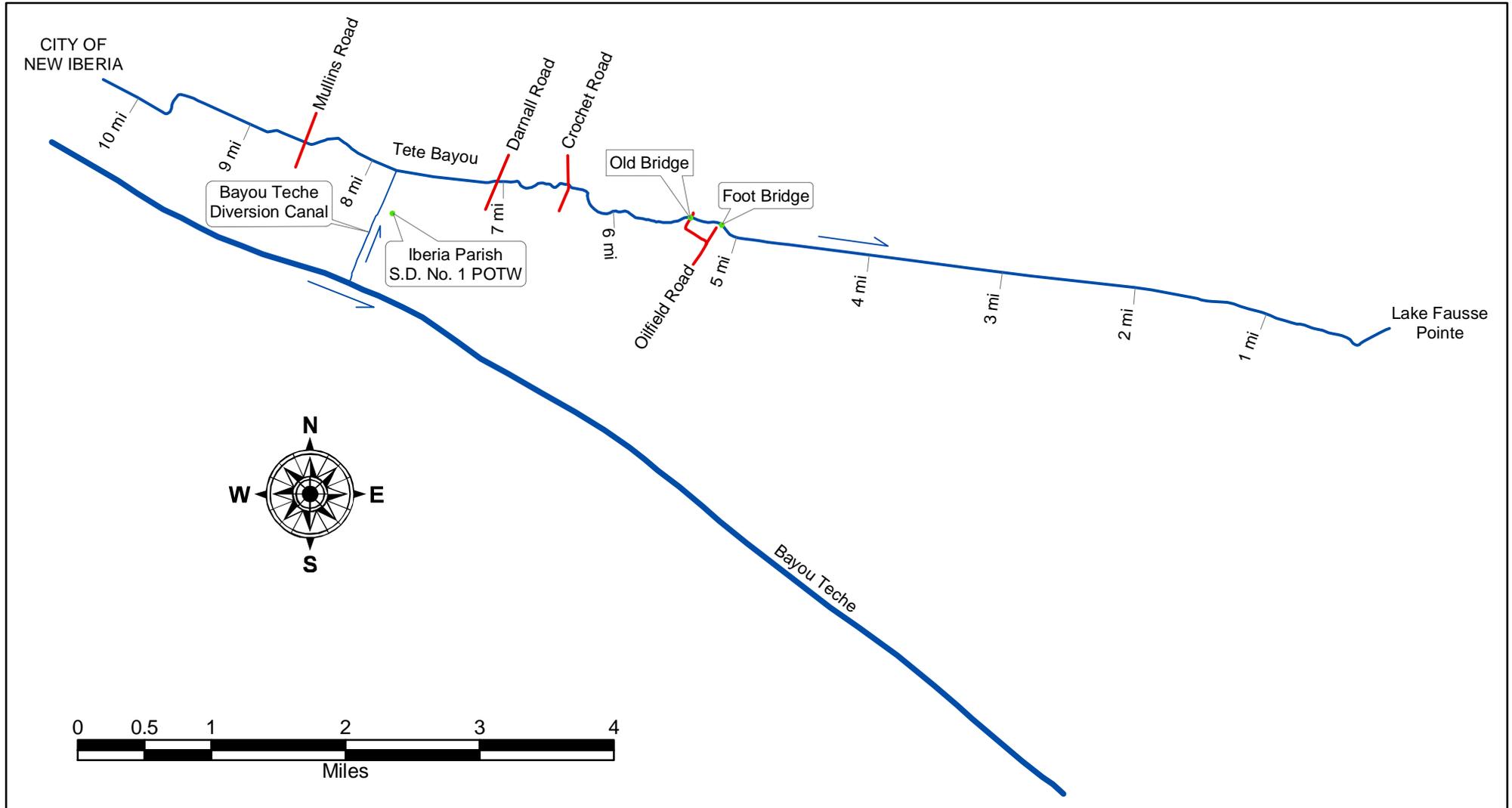
# FIGURE 1

# TETE BAYOU - SUBSEGMENT 060701

Map date: 10/13/2004  
Map number: 200403207  
Map sources (cont): DOQQ raster maps  
Map projection: UTM Zone 15  
Map datum: NAD83  
LDEQ/OEA/WQAD/ENG



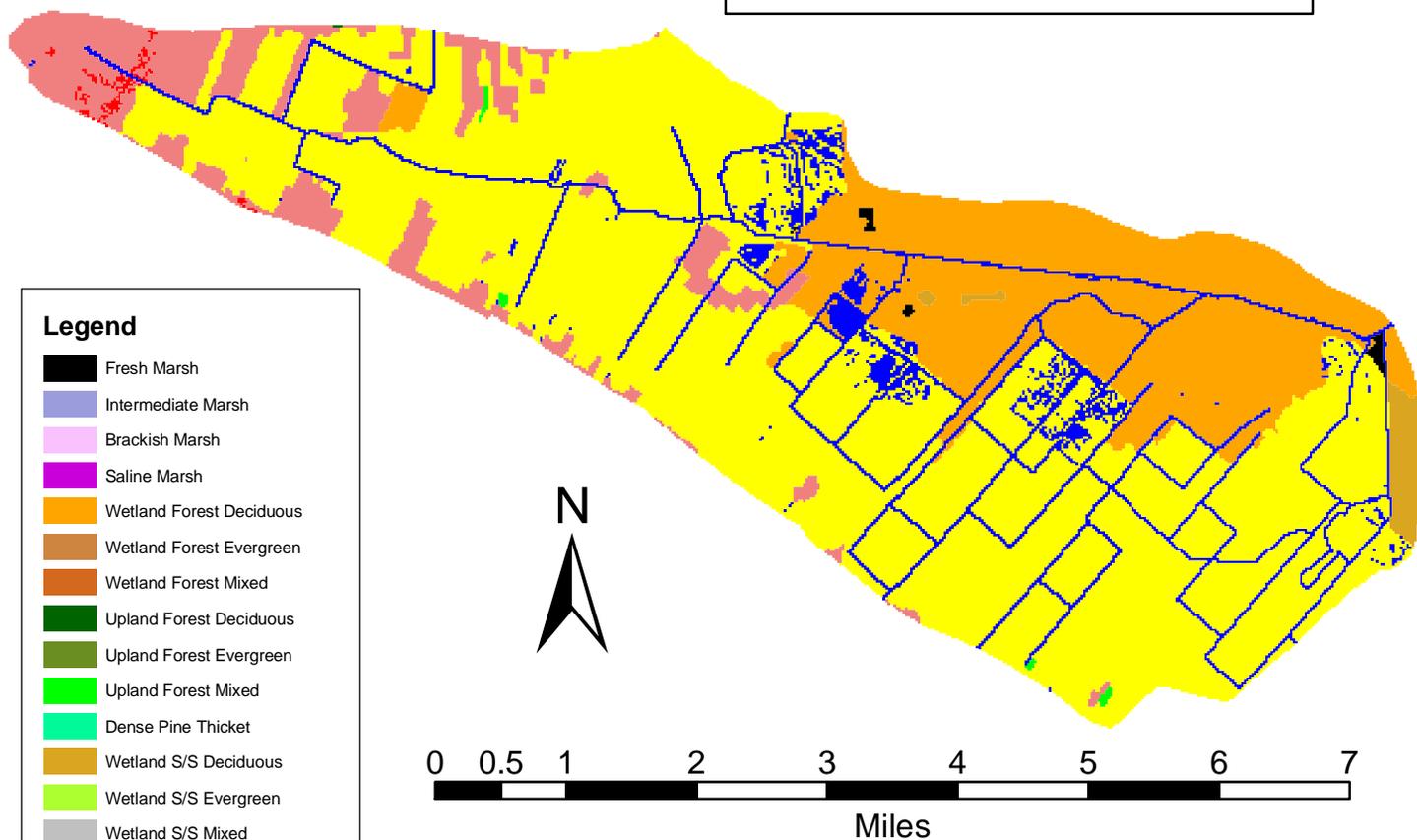
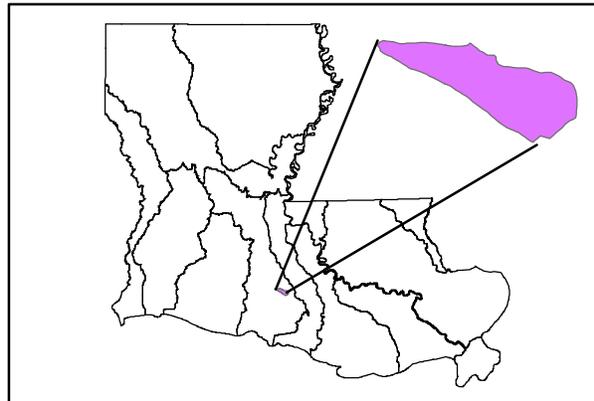
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# FIGURE 2 - LAND USE:

## LDEQ Basin Subsegment 060701 - Tete Bayou

Map Date: August 23, 2004  
 Map Number: 200403147  
 Map Sources: LDEQ Basin-Subsegment data  
 USGS Louisiana GAP Data  
 Map Projection: UTM Zone 15; NAD 27



**Legend**

- Fresh Marsh
- Intermediate Marsh
- Brackish Marsh
- Saline Marsh
- Wetland Forest Deciduous
- Wetland Forest Evergreen
- Wetland Forest Mixed
- Upland Forest Deciduous
- Upland Forest Evergreen
- Upland Forest Mixed
- Dense Pine Thicket
- Wetland S/S Deciduous
- Wetland S/S Evergreen
- Wetland S/S Mixed
- Upland S/S Deciduous
- Upland S/S Evergreen
- Upland S/S Mixed
- Agriculture/Cropland/Grassland
- Vegetated Urban
- Non-Vegetated Urban
- Wetland Barren
- Upland Barren
- Water



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## 1 Bayou Teche Surveys and Modeling

### 1.1 Surveys and Prior Models

Surveys of Bayou Teche, Subsegments 060301, 060401, and 060501, were conducted on April 25 and November 28 of 1978 by the Louisiana Department of Natural Resources (LDNR). A wasteload allocation report was developed for Bayou Teche in 1984 by Limno-Tech of Ann-Arbor Michigan. The Limno-Tech model was recalibrated and reprojected in 1999 by LDEQ, and a TMDL report issued in January 2000.

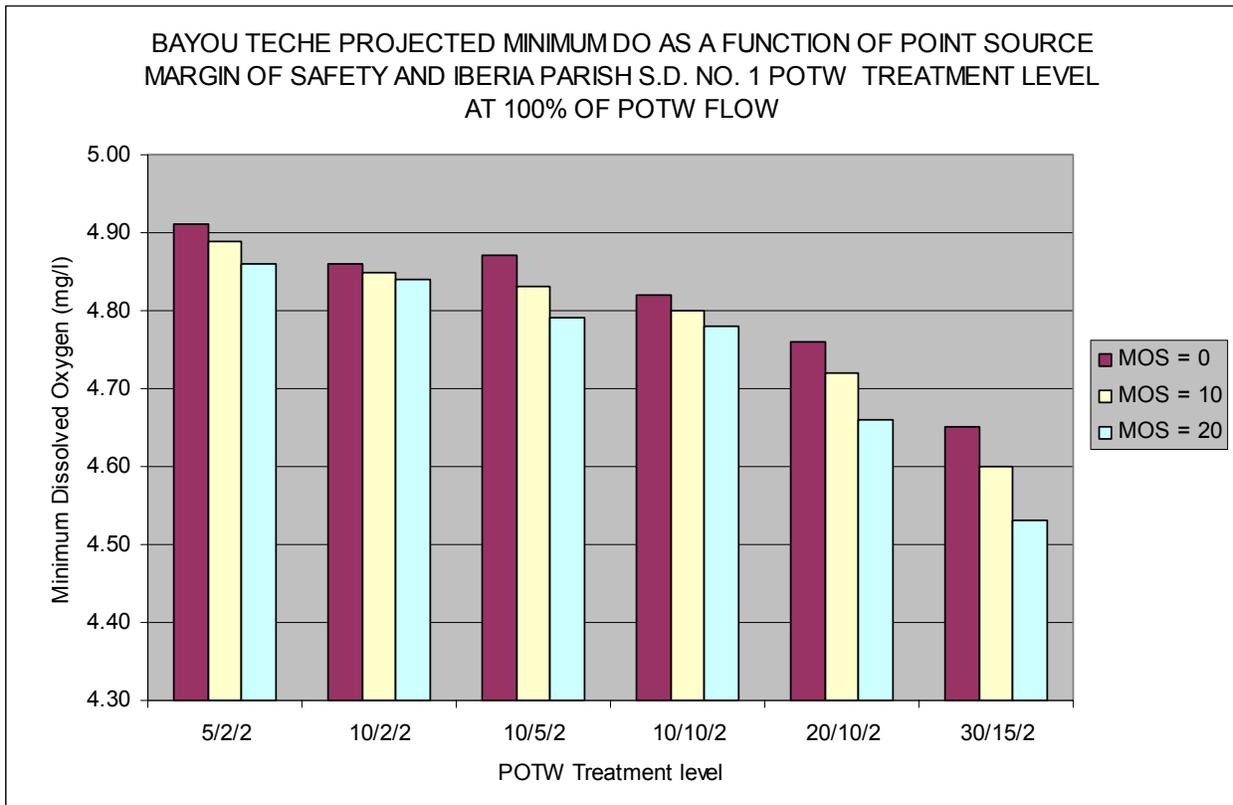
### 1.2 2004 Reprojection of the Calibrated Bayou Teche Model

The Bayou Teche TMDL projected a summer season minimum dissolved oxygen of 4.93 mg/l with a margin of safety (MOS) of 20% and without the addition of the Sewerage District No. 1 POTW. With the addition of the discharge from the Sewerage District No. 1 POTW, additional projections were made with margins of safety of 0, 10, and 20 %, with the results summarized in Figure 3.

The projection runs indicate that if a 20 % point source margin of safety is maintained, the Sewerage District No. 1 POTW can be assimilated at a treatment level of 10 mg/l CBOD5, 2 mg/l NH3-N, 2 mg/l DO (10/2/2). At a margin of safety of 10%, a treatment level of 10/10/2 will allow a minimum DO of 4.8. A wasteload allocation of 10/5/2 at a MOS of 10% would be more reasonable.

Figure 4 depicts the impact on Bayou Teche, at a MOS of 10%, of splitting the POTW discharge between Tete Bayou and Bayou Teche. Splitting the flow 80/20 between Bayou Teche and Tete Bayou makes 10/10/2 a reasonable allocation for Bayou Teche. Putting 20% of the POTW discharge into Tete Bayou is questionable, however, as shown by the Tete Bayou summary. Figure 5 is the Bayou Teche dissolved oxygen projection at a Iberia Parish Sewerage District No. 1 POTW treatment level of 10/5/2 and a MOS of 10%. As shown by the chart, the minimum DO is projected to be just over 4.8 mg/l.

**Figure 3**



**Figure 4**

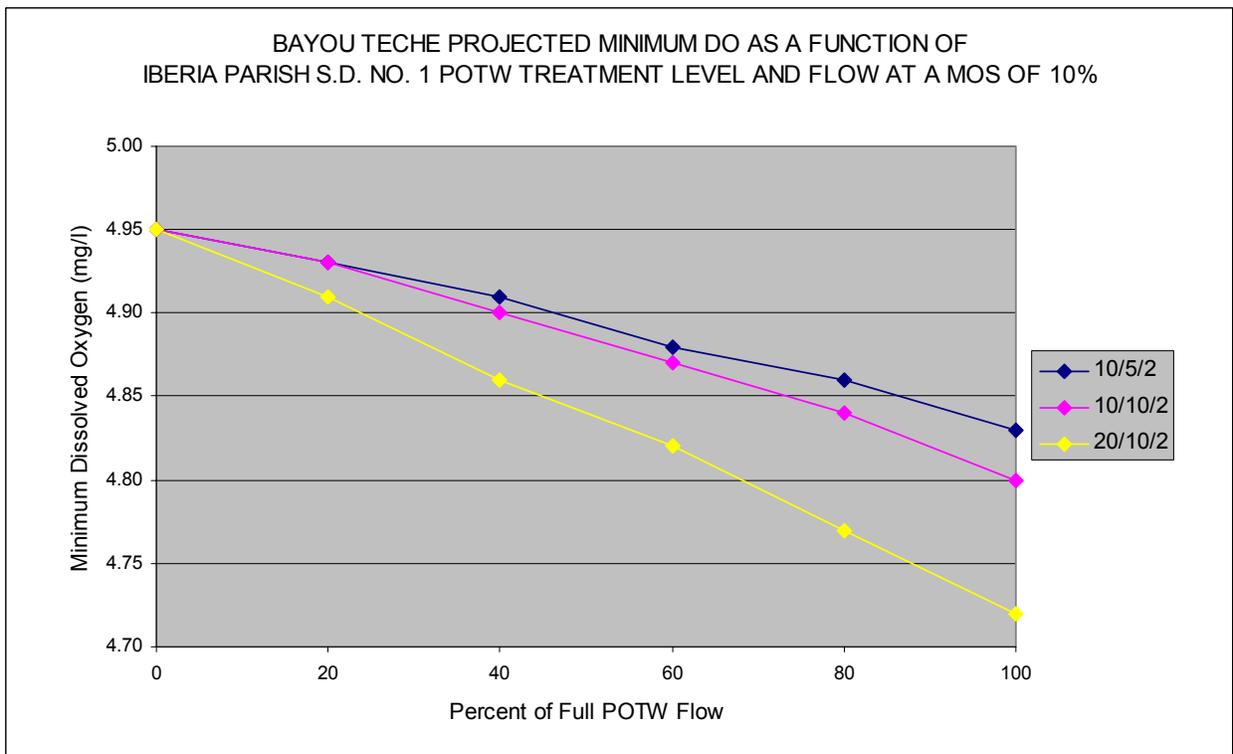
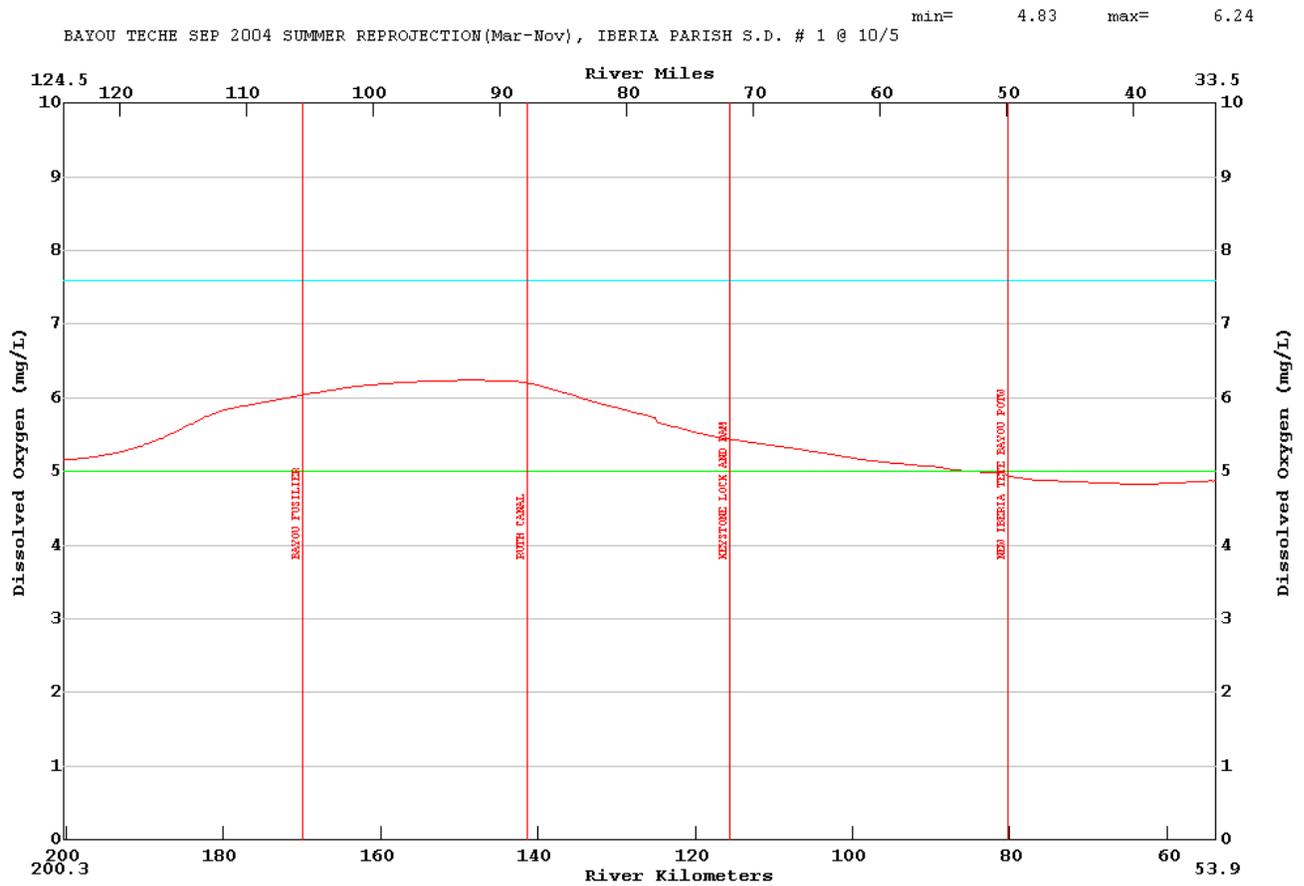


Figure 5



## 2 Tete Bayou Surveys and Modeling

### 2.1 Surveys and Prior Models

There have been three intensive surveys of Tete Bayou, Subsegment 060701, the first on July 21-22, 1981, the second on August 16-17, 1983, and the third on August 15-20, 1993. The Iberia Parish Sewerage District No. 1 POTW was built subsequent to the 1983 survey and prior to the 1993 survey. A wasteload allocation performed for the Sewerage District No. 1 POTW in 1984 by Limno-Tech of Ann-Arbor Michigan resulted in an allocation of 5/2/5. A TMDL performed in 2002 by FTN Associates for EPA resulted in an allocation of 5/2/6. The 2002 TMDL projected that reductions of 75 to 99 percent of natural and man-made nonpoint load combined, in addition to the above POTW limitations, would be required to meet the dissolved oxygen criteria of 5.0 mg/l.

As shown by the map in Figure 1, a canal diverts a small amount of Bayou Teche flow to Tete Bayou just above the Sewerage District No. 1 POTW. No diversion flow was found during the 1981 survey, but diversion flows of about 6 and 4 cfs were measured during the 1983 and 1993 surveys. Limno-Tech apparently did not recognize that the diversion existed and calibrated with a headwater flow of 0.09 cfs against the 1981 data, and verified with a headwater flow of 0.15 cfs against the 1983 data. The headwater flow for the projection was the POTW flow of 1.7 cfs (1.10 mgd). Distributed nonpoint

inflow was added to the calibration and the verification to achieve a flow at the downstream end of Tete Bayou of 25.5 cfs against the 1981 data and 34.2 cfs against the 1983 data. Flows downstream of the Darnall Road bridge were measured only during the 1983 survey, and were highly erratic, probably a consequence of tidal variation. There is no data that justifies the distributed nonpoint inflow that LimnoTech used. No nonpoint flow was added to the projection. The FTN model was calibrated against the 1993 survey data, and included a headwater flow of 3.97 cfs as measured in 1993 with no distributed nonpoint inflow. The projection included only a default minimum 0.1 cfs headwater flow. The projection included only a default minimum 0.1 cfs headwater flow.

## 2.2 LDEQ Calibration

Based on a 5 day time-of-travel from the Keystone gage to the diversion, the Bayou Teche flow on the day of the measurement of diversion flow in 1993 was 273 cfs compared to a critical flow below Ruth Canal of 302 cfs. We believe that the measured flow in the diversion can therefore be regarded as a critical flow, and be used in the projections. The DEQ model of Tete Bayou was calibrated against the 1983 and 1993 survey data, the two surveys in which there was significant headwater flow from the Bayou Teche diversion. The dissolved oxygen calibration graphs are depicted in Figures 6 and 7.

Figure 6

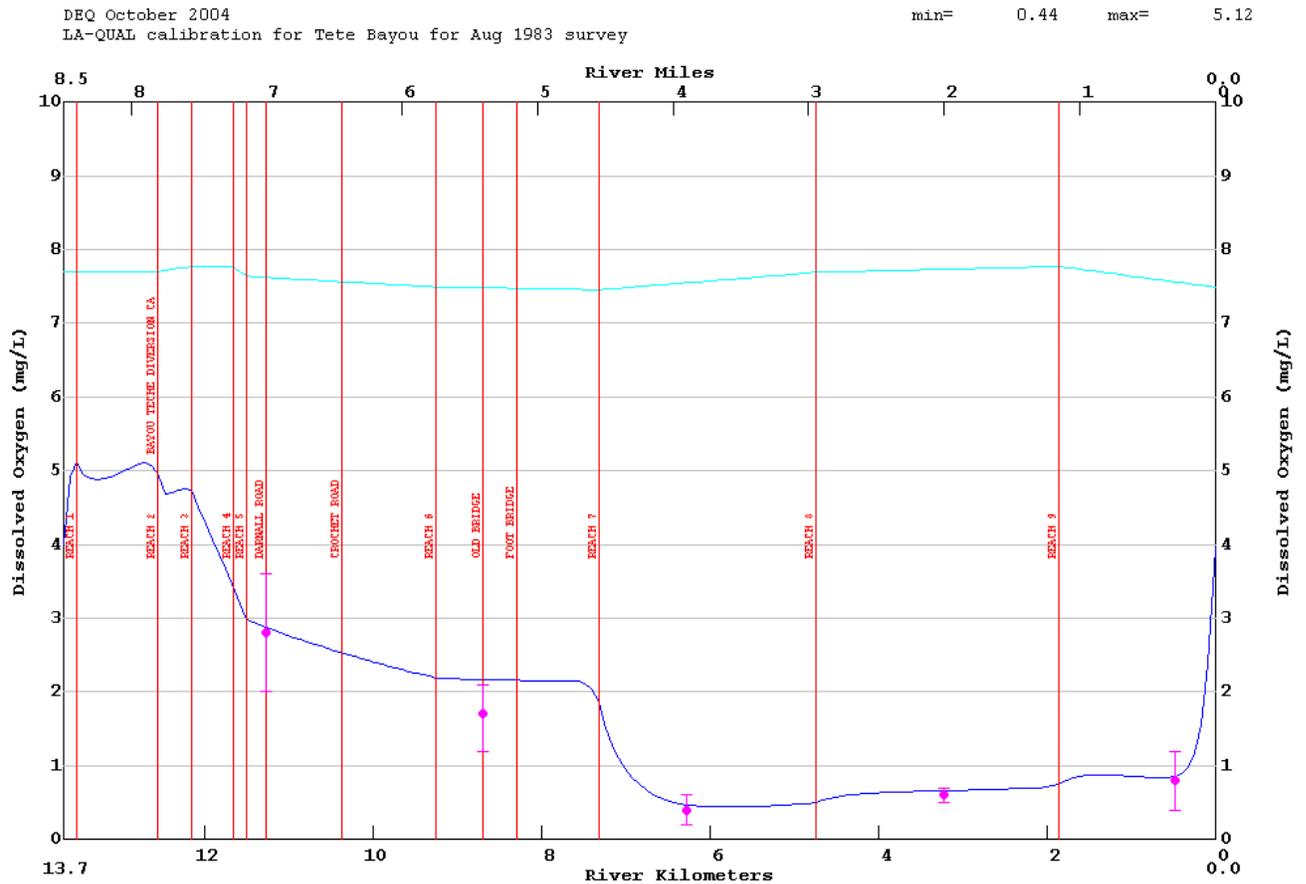
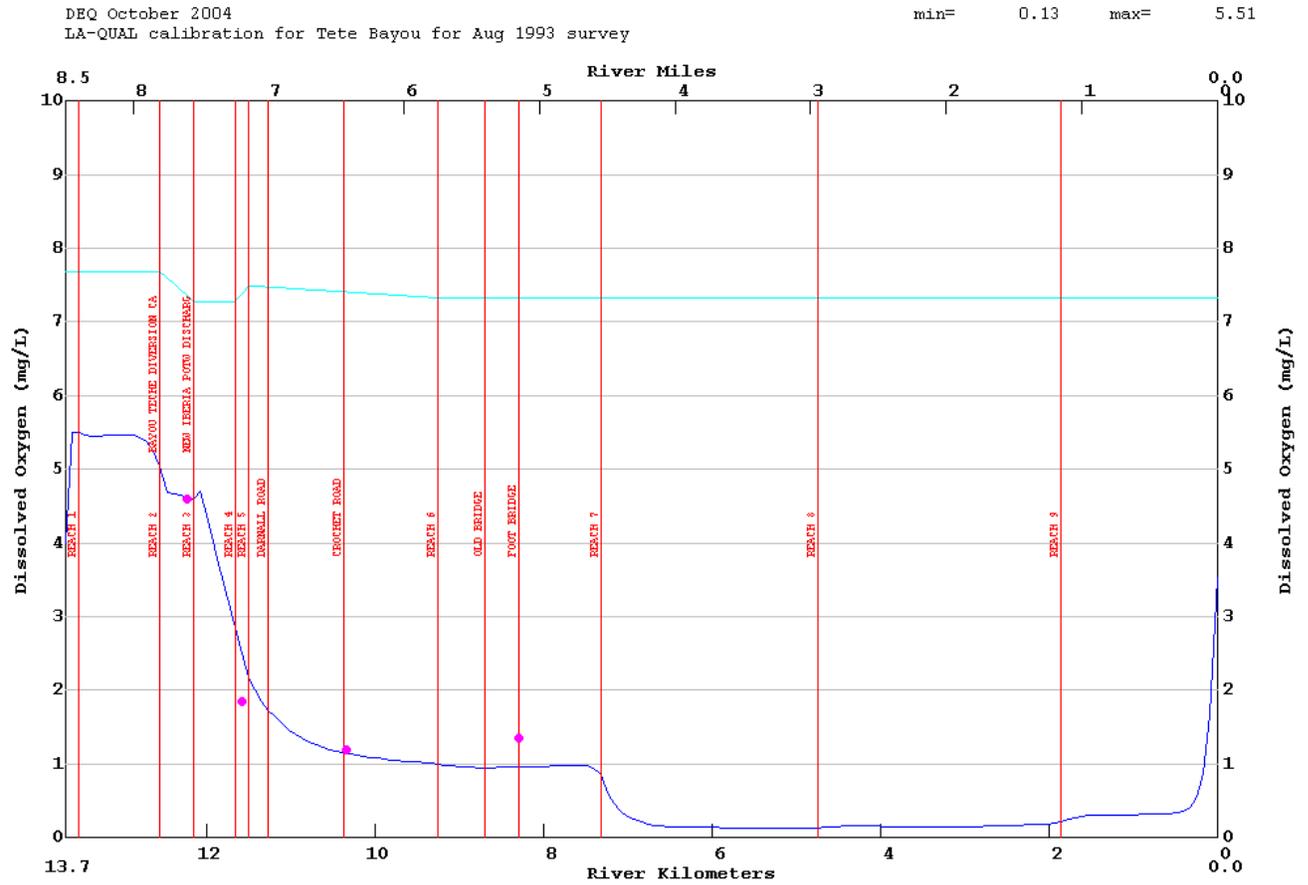


Figure 7



### 2.3 LDEQ Projection

All projection runs were made with zero man-made nonpoint loading. A total benthic load of 2.0 gm/m<sup>2</sup>/day (185.8 mg/ft<sup>2</sup>/day) was used to represent natural background loading. Man-made nonpoint loading is principally from agricultural uses with some urban run-off from the City of New Iberia, as shown by the land use map of Figure 2. A Bayou Teche diversion BOD concentration of 11.0 mg/l was used. This is the diversion concentration that was measured in 1993 and is very close to the 1978 Bayou Teche calibration at the diversion canal. The critical temperature is the 90 percentile temperature in Lake Fausse Pointe, there being insufficient historic ambient data for Tete Bayou. The Bayou Teche diversion BOD was not reduced for the projections, and headwater and diversion dissolved oxygen was set at 5.0. The DO plot for a run with zero man-made point and nonpoint source loading is shown in Figure 10. Figures 8 and 9 depict the results of the projection runs.

Figure 8

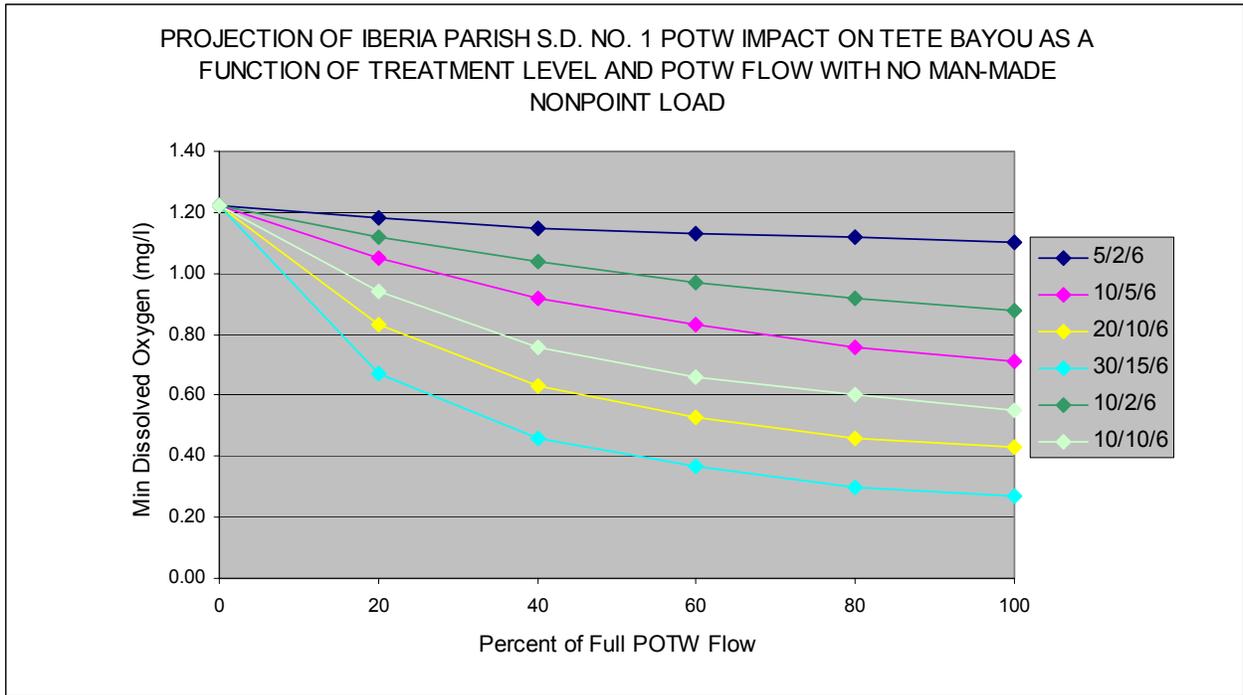


Figure 9

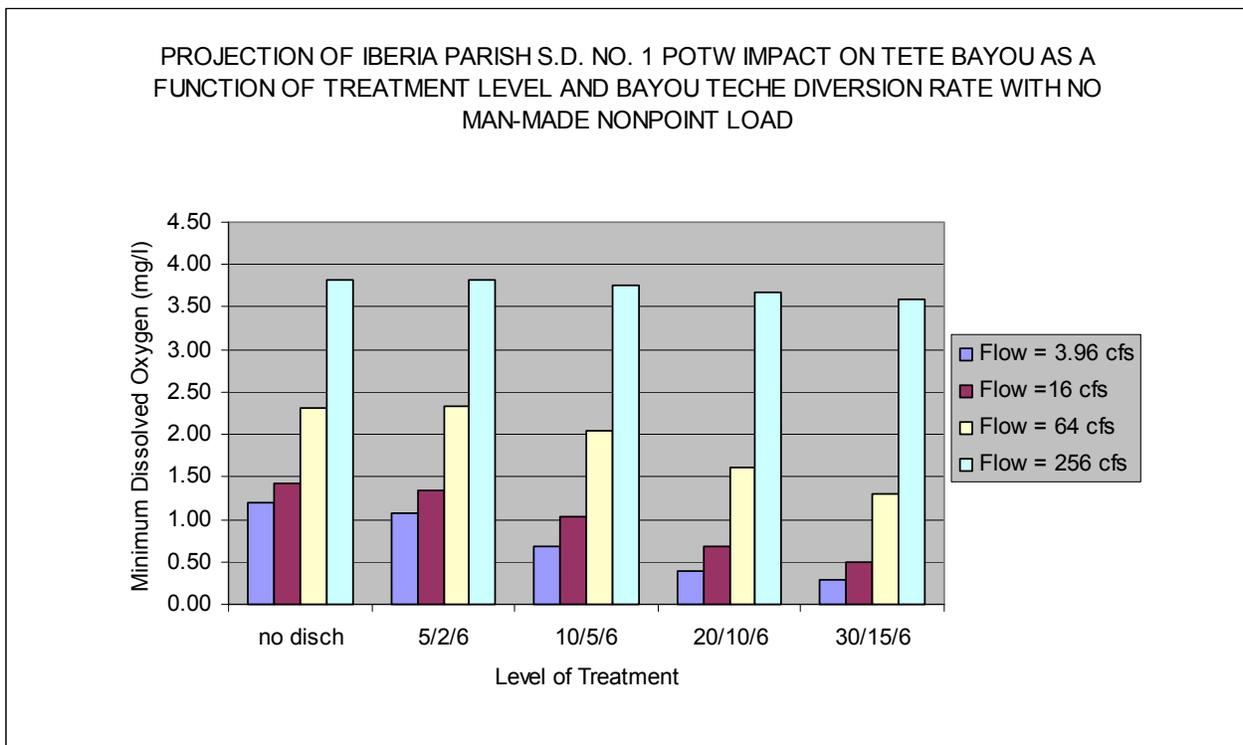
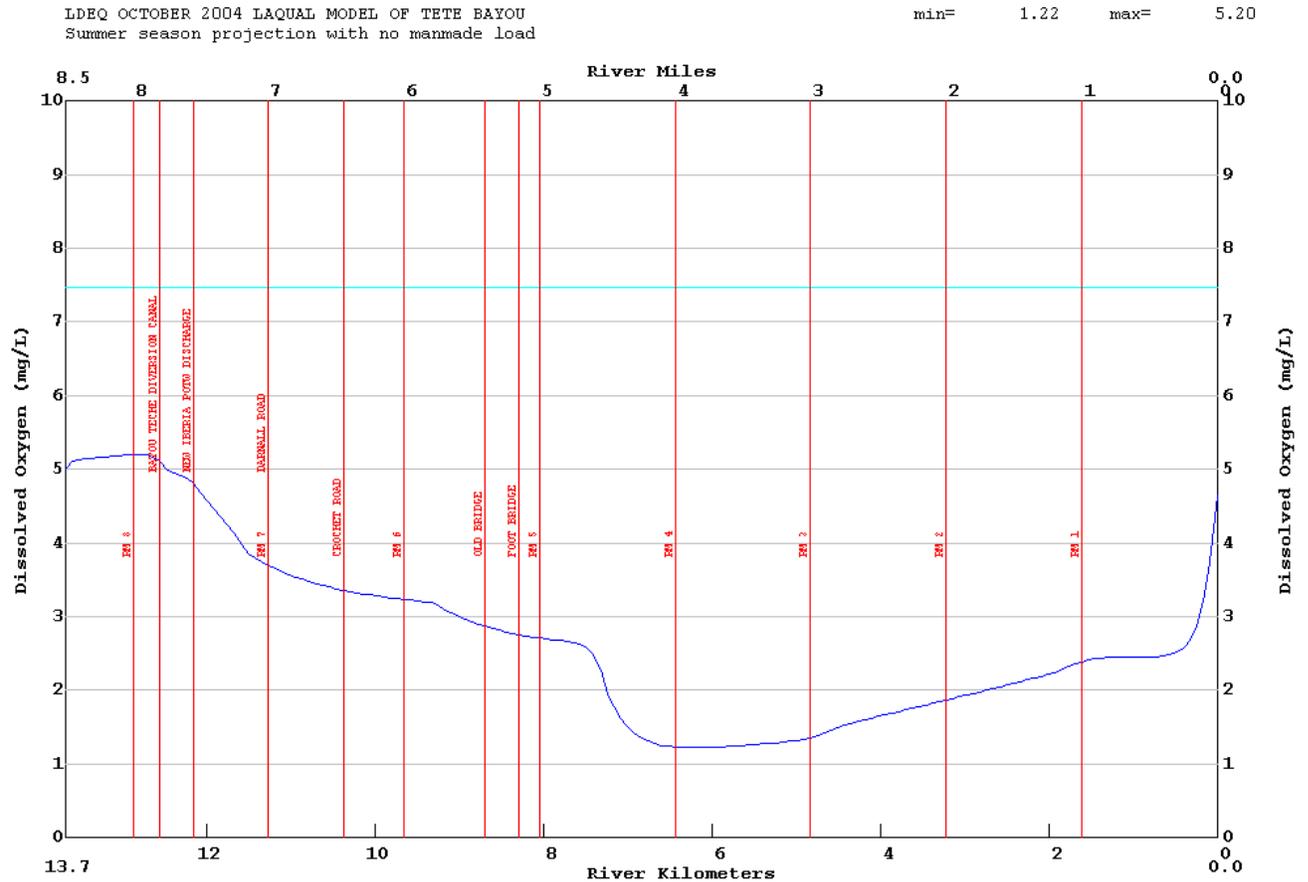


Figure 10



As can be seen from Figure 10, the no man-made load model projects a DO of about 1.2 in the vicinity of river mile 6, and recovers to about 2.4 just above Lake Fausse Pointe. The causes are the unusually high depth measured at RM 3.9 during the 1983 survey, headwater loading from Bayou Teche, and low velocities. Since the depth is the result of a single measurement, additional cross-sections might make a difference. However, dissolved oxygen concentrations will probably be less than 2 and certainly less than 3 mg/l in lower Tete Bayou, regardless of any reductions in loading that might be made.

Figure 9 depicts the result of increased diversion flow. There is insufficient hydrologic data to calculate the amount of flow that the channel will accommodate, so the flow figures are arbitrary. It seems unlikely that the Tete Bayou channel can accommodate sufficient flow to allow a criteria of 5 mg/l to be met. Increased flow does, however, decrease the impact of the Iberia Parish Sewerage District No. 1 POTW discharge.

Figure 8 depicts the result of splitting the POTW flow between Bayou Teche and Tete Bayou. Even an 80/20 split does not look promising. The best option appears to be a 100% discharge to Bayou Teche, and enlarging the diversion canal to increase flow down Tete Bayou. Although the Sewerage District No. 1 POTW would not be discharging to Tete Bayou, water quality in the bayou is so poor that the diversion from Bayou Teche is needed to prevent nuisance conditions from developing.

### 3 Conclusions

The Tete Bayou model projects a minimum dissolved oxygen of about 1.2 in the vicinity of river mile 6, recovering to about 2.4 just above Lake Fausse Pointe, with all man-made loading, including the Sewerage District No. 1 POTW, removed. It is clear that there is no assimilative capacity for the Sewerage District No. 1 POTW in Tete Bayou. The best option is a 100% discharge to Bayou Teche. With a reduced explicit margin of safety for point sources, the Bayou Teche TMDL model shows that Bayou Teche can assimilate the load from the Sewerage District No. 1 POTW at an effluent limitation (wasteload allocation) of 10 mg/l CBOD<sub>5</sub>, 5 mg/l NH<sub>3</sub>-N, 2 mg/l DO.