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FY 89 205 (j) (1)
Grant No: C6-220000-29
IAG No: 24032-91-01
Red Chute WLA 91.07/Rogers
Originated: August 17, 1991

WASTELOAD ALLOCATION FOR RED CHUTE BAYOU NEAR BOSSIER CITY, LOUISIANA

Prepared for:
Louisiana Department of Environmental Quality

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CLIWS-WLA 91.07
August 25, 1991

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PREFACE

This report presents a wastewater treatment plant wasteload allocation which has been developed for Red Chute Bayou near Bossier City, Louisiana. This wasteload allocation was funded by the State of Louisiana and the U.S. Environmental Protection Agency. This report presents data, statistics and calculations which were developed by personnel of the Water Pollution Control Division of the Louisiana Department of Environmental Quality (LDEQ), and by staff members of the USL Center for Louisiana Inland Water Studies under Interagency Agreement Number 24032-91-01 (Task 1, Subtask 1) with the Louisiana Department of Environmental Quality. Funding to LDEQ was provided through grant number C6-220000-29 from Region VI of the USEPA.

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1 EXECUTIVE SUMMARY

Wasteload allocation modeling has been conducted for several facilities which discharge into Red Chute Bayou. These facilities include Dogwood Subdivision North (GP7899), Bossier City (LA0065978, WP1222), Dogwood Subdivision South (GP 7969), East Highland Mobile Home Park (LA0032981, WP3512) and Espanita Forest Subdivision (GP7902). The study area is located within water quality segment 100402, a subsegment of the Red River Water Quality Management Basin. This wasteload allocation analysis was conducted following the procedures defined in the "Draft Memorandum of Understanding" (MOU) between the USEPA Region VI and the Louisiana Department of Environmental Quality (LDEQ).

The LIMNOSS model, a version of the USEPA AUTOQUAL model, was used to determine the wasteload allocation for Red Chute Bayou. Interim effluent limits were proposed using model coefficients determined through literature values and limited model calibration. The model calculations indicate that the previously mentioned wastewater treatment facilities cannot meet the current DO standard for Red Chute Bayou of 5.0 mg/l during the summer months (May-October) because of nonpoint source contributions. Therefore, it is recommended that a phased TMDL process be followed, and that initial limits of 10/5/6 (CBOD5/NH3-N/effluent DO) be established for the summer season

until the causes of the nonpoint source loadings can be determined and controlled. The DO standard can be met during the winter season (November-April) with treatment limits of 10/10/6 (CBOD5/NH3-N/effluent DO).

2 INTRODUCTION

A wasteload allocation conducted by Limno-Tech Inc. (LTI) in 1984 was not approved by EPA Region VI. An addendum to the Limno-Tech wasteload allocation completed in 1986 recommended that flow-based limits be assigned to the Red Chute Bayou dischargers pending an agreement between Bossier City and International Paper Company involving higher flow releases from Lake Earling, Arkansas. An agreement was never reached; consequently, this wasteload allocation was initiated to determine appropriate permit limits for Bossier City and other Red Chute Bayou dischargers. Specific emphasis has therefore been given to the impact of various treatment levels on the water quality in Red Chute Bayou.

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2.1 Segment Description

Red Chute Bayou is located in Water Quality Management Section 100402 of the Red River Basin in northwestern Louisiana (Figure 1). The area of this drainage basin is approximately 660 square miles. Red Chute Bayou flows for approximately 40 miles in a southerly direction to the confluence with the Flat River. The flow rate in Red Chute is affected primarily by the release of water from Lake Earling in Arkansas. This discharge from Lake Earling is controlled by International Paper Company. The actual survey area is located in a nine river mile reach in the immediate vicinity of Bossier City. Land resources in the area of Red Chute Bayou consist of Southern Costal Plain which is characterized by a gently to strongly sloping dissected costal plain underlain by unconsolidated sands, silts and clays. Elevations range from 100 to 400 feet. Almost two-thirds of the area is forest land, and almost one-quarter of the area is agricultural land. Lumber and pulpwood are the major forest products, while cotton, rice, melons and corn are the cash crops. Cotton is the dominant cash crop; and it is believed that this crop provides the largest contribution to the nonpoint source loads in Red Chute Bayou. The major source of pesticides from agricultural runoff occurs during the winter months due to the of water from Lake Erling in Arkansas. This discharge from Lake Erling is controlled by International Paper Company. The actual survey area is located in a nine river mile reach in the immediate vicinity of Bossier City. Land resources in the area of Red Chute Bayou consist of Southern Costal Plain which is characterized by a gently to strongly sloping dissected costal plain underlain by unconsolidated sands, silts and clays. Elevations range from 100 to 400 feet. Almost two-thirds of the area is forest land, and almost one-quarter of the area is agricultural land. Lumber and pulpwood are the major forest products, while cotton, rice, melons and corn are the cash crops. Cotton is the dominant cash crop; and it is beleived that this crop provides the largest contribution to the nonpoint source loads in Red Chute Bayou. Pesticides are the major source of agricultural runoff which occurs primarily durng the winter months due to the lack of a cover crop to hold the top layer of soil. Table 1 lists the landuses that comprise Red River Basin Segment 1004.

TABLE 1

Land uses in Segment 1004, Red River Basin.
Total Segment Area:421,466 Acres.

LAND USE	ACRES	%
Urban	16,501	3.9
Extractive	1,629	0.4
Agricultural	94,826	22.5
Forest Land	272,778	64.5
Water	5,947	1.4
Wetland	30,319	7.2
Barren Land	466	0.1

(Volume 6, Nonpoint Source Pollution, State of Louisiana Water Quality Management Plan,1990)

Soils within the Coastal Plain are Ruston, Orangeburg, Bowie and Beauregard soils. Ruston and Orangeburg are gently to strongly sloping while Bowie and Beauregard soils are nearly level to gently sloping. Climate in the basin is characterized by mild winters and hot summers. Precipitation over the entire basin is usually abundant with a normal annual precipitation of about 50 inches.

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Inventories, State of Louisiana Water Quality Management Plan, 1987).

The study area begins just upstream of the Dogwood Subdivision Bridge and ends at the Louisiana Downs Racetrack Bridge just upstream of Interstate 20 (Figure 2). Red Chute Bayou may also receive some nonpoint source loadings from the stables located in the vicinity of the racetrack.

2.2 Discharger Description And Inventory

The wastewater treatment facilities included in this wasteload allocation analysis are listed in Table 2. Rivermiles of the outfall locations are measured upstream from latitude 32° 30' north (Figure 2).

TABLE 2 - Red Chute Bayou Dischargers Included in this Analysis

DISCHARGER	PERMIT	RIVERMILE	DESIGN-FLOW (MGD)	DESIGN-FLOW (CFS)	TREATMENT TYPE
Dogwood North	GP7899	7.800	0.175	0.271	2-cell oxidation pond
Bossier City	LA0065978 WP1222	5.910	2.000	3.100	2-cell oxidation pond
Dogwood South	GP7969	5.796	0.299	0.463	2-cell oxidation pond
East Highland	LA0032981 WP3512	4.300	0.030	0.047	1-cell oxidation pond
Espanita Forest	GP7902	4.200	0.059	0.092	1-cell oxidation pond

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3 WATER QUALITY ASSESSMENT

An assessment of historical water quality data in relation to designated uses and criteria may often indicate the presence or absence of water quality problems due to industrial or municipal wasteloads, as well as provide a qualitative evaluation of the appropriateness of the designated uses and stream water quality standards. Historical water quality data for Red Chute Bayou east of Shreveport is presented in Appendix B.

3.1 Water Quality Standards

Water quality standards for ambient surface waters of streams in Louisiana have been designated by LDEQ (LDEQ, 1989). One purpose of these standards is for utilization in development of enforceable effluent limitations for point source wastewater discharge permits.

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3.1.1 Designated Uses

The water uses for Red Chute Bayou are primary contact recreation (Classification A), secondary contact recreation (Classification B), and propagation of fish and wildlife (Classification C). Waterbody segment 100402 is only partially meeting these designated uses. The suspected source is agriculture and the suspected causes are pesticides, nutrients, and solids. (Volume 6, Nonpoint Source Pollution, State of Louisiana Water Quality Management Plan, 1990). Red Chute Bayou is not classified as a scenic stream.

3.1.2 Criteria

Water quality criteria for Red Chute Bayou include both specific numerical and general criteria. General criteria include prevention of objectionable color, taste and odor, solids, toxics, oil and grease, foam, and prevention of aesthetic degradation. The standard of interest in this wasteload allocation is the 5.0 mg/l average dissolved oxygen standard. Minor excursions of this standard due to natural diurnal photosynthetic activity are permissible. The 5.0 mg/l dissolved oxygen standard was used in this study as the target concentration for determination of effluent limits and assimilative capacity. Numerical criteria are listed in Table 3.

TABLE 3

Current Numerical and Bacterial Criteria for Stream Segment 100402

PARAMETER	NUMERICAL STANDARD
Cl	250
SO_4	75
DO	5.0
pH range	6.0-8.5
BAC	1 (Primary Contact Recreation)
Temp.	32
TDS	800

(Louisiana Water Quality Standards, 1989).

4 COMPUTER SIMULATIONS

Computer simulations were performed for model calibration, wasteload allocation, and model sensitivity. This section describes the model development, calibration, and sensitivity analyses performed in this study.

4.1 Model Description And Justification

The purpose of the modeling study described here was to develop a predictive model for DO, to study the relative importance of various pollutant sources, to clarify the importance of the transport and transformation processes within the stream system, and to provide a water quality planning and management tool. This report describes the development of a model of Red Chute Bayou, calibration of the model to field data, and the application of this calibrated model for testing the response of water quality in the stream to hypothetical conditions of waste load and temperature.

An existing water quality modeling program, LIMNOSS, was utilized in this project. This program provides the user with a standardized calculation of transformation and advective and dispersive transport within the system, as well as a variety of printed reports. Model development utilizing such a program requires only the construction of an input data set describing the system's geometric structure, location and load from point dischargers, parameters determining rates of transformations, and inflows from tributaries and non-point sources, and flows and loads entering at the headwaters.

LIMNOSS is a steady-state, one-dimensional water quality model that was developed by Limno-Tech Inc., and is a modification of the USEPA AUTOQUAL water quality model. The program can be installed on any computer of sufficient size having a compatible language implementation of FORTRAN. The modelsimulationsreportedhere wereperformedontheLDEQ VAXcomputers.

LIMNOSS simulates an unbranched stream segment. Tributary inflows must therefore be treated as sources of flow and material in a manner identical to point sources. Simulation of a branched stream system can be performed by transferring the flow and concentrations from tributary models to the receiving stream.

On the LDEQ VAX, this process has been somewhat simplified through automated generation of linkage files and use of a pre-processor to provide for "include files" and comments within the input datasets. Include file names are preceded by a "%" character in column one of the dataset, and comments are preceded by a "!" character in column one. Comments within the input datasets provide self documentation of many of the model input parameters. Use of include files eliminates redundancy of parameter value specifications for multiple model scenarios. Minimization of data redundancy is a general goal in database design and is associated with improved quality assurance and quality control within the database.

LIMNOSS projects water quality through the application of a mass balance principle to the various water quality constituents which are included in the model. In this model, these include DO, ultimate carbonaceous BOD (UCBOD), and ultimate nitrogenous BOD (UNBOD). The interrelationships between these variables is programmed into the model implementation, leaving the program user with the responsibility to specify rates, coefficients, geometry, loads, and flows.

In model calibration, model parameters are selected so that model output matches water quality data observed in the stream under investigation. In this study, the September 1990 water quality survey performed by LDEQ (report number DEQ-WPCD-90.06) was applied for model calibration. Parameter values selected were within generally accepted limits (Bowie, et al., 1985).

4.2 Model Input Data And Coefficients

Model input data and calculated coefficients from the calibration simulation and TMDL projections are presented in Table 4.

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Table 4
Selected Input Parameters and Variables in the Calibrated Model

PARAMETER	UNITS	CALIB	SUMMER	WINTER
Rivermiles	MILES	0.000-9.000	-9.000-9.000	-9.000-9.000
FLOW-HEADW.	CFS	2.140	3.449	3.449
OUTFLOW	CFS	5.200	10.100	10.100
NONP.FLOW	CFS/MI	0.630	0.630	0.630
NONP.CBOD	LB/MI/DAY	4.000-6.000	4.000-6.000	4.000-6.000
NONP.NBOD	LB/MI/DAY	5.000-15.00	5.000-15.00	4.000-6.000
NONP.DO	LB/MI/DAY	3.700	3.700	3.700
VELOCITY	FT/SEC	0.053-0.089	0.075-0.127	0.075-0.127
DEPTH	FT	0.714-1.930	0.714-1.930	0.714-1.930
WIDTH	FT	30.00-53.00	30.00-53.00	30.00-53.00
TEMP.	DEG C	28.700	29.250	19.140
KL	FT/DAY	1.900	1.900	1.900
CBOD DECAY	1/DAY	0.100	0.100	0.100
NBOD DECAY	1/DAY	0.080	0.080	0.080
SOD	G/SQM/DAY	1.000-2.500	1.000	1.000
PHOTO	G/SQM/DAY	0.000	0.000	0.000
CBOD SED.	1/DAY	0.250	0.250	0.250
NBOD SED.	1/DAY	0.005	0.005	0.005
DISPERSION	SQFT/SEC	0.000	0.000	0.000

4.2.1 Stream Geometry

Ranges of stream geometry input for this modeling analysis are listed in Table 4 in terms of width and depth. Stream geography, station locations, and discharger locations are illustrated in the large-scale study area map (Figure 2). Mile markers are used to specify inputs used in the modeling analysis. In this study, rivermiles are measured upstream from Red Chute Bayou at latitude 32° 30' north. This modeling study begins at rivermile -9.0 because it was discovered that the study area would need to be extended downstream to show recovery of instream dissolved oxygen concentrations.

4.2.2 Pollutant Loads

Pollutant loads for model calibration were selected based on measurements made during the intensive survey. Pollutant loads used in the wasteload allocation process were determined from the design flows of the wastewater treatment facilities. Design flow were increased by a factor to provide a 20% safety factor for safety and growth, in accordance with the MOU.

4.2.3 Dispersion

Because of the high stream velocities observed in Red Chute Bayou near Bossier City, dispersion was determined not to be an important factor in this wasteload allocation analysis. Therefore, dispersion was not included in the model input data set.

4.2.4 Temperature

In the model calibration, temperature was set at average observed values and assumed to be constant. Critical temperatures used in seasonal wasteload allocation projections are discussed in a later section.

4.2.5 Reaeration Rate

Reaeration rates for Red Chute Bayou were calculated using the Isaacs and Gaudy formula for all model elements. This formula is expressed as K_2=8.62U/H**1.5 where K_2 is the reaeration coefficient, U is the velocity in feet per second, and H is the depth in feet. The reaeration coefficient measured during the intensive survey of September 1990 was 1.09 (day^{-1}, @ 20° C, base e). The reaeration calculated by LIMNOSS using the Isaacs and Gaudy formula was between 0.760 and 2.035 (day^{-1}, @ 20° C, base e).

4.2.6 BOD Decay And Settling Rates

CBOD and NBOD decay rates were determined through calibration and were consistent with "bottle" decay rates. Values, adjusted for a temperature of 20° C, are shown in Table 4. The CBOD settling rate was determined to be 0.025/day through calibration. Settling of NBOD was used to represent uptake of ammonia by plants, resulting in a fraction of the ammonia not entering into nitrification. The value of this parameter was set at 0.005/day through model calibration.

4.2.7 Plant Photosynthesis And Respiration

Net algal production and respiration were assumed to be zero in this modeling analysis since little or no algae was observed in Red Chute Bayou during the September 1990 intensive survey.

4.2.8 Sediment Oxygen Demand

Values for sediment oxygen demand (SOD) were selected based on literature values and were adjusted during the calibration process. The SOD values used in this modeling analysis are presented in Table 4.

4.2.9 Nonpoint Pollution And Incremental Flow

The model allows the specification of loads which are not associated with point source dischargers. These loads are referred to as nonpoint load, and are specified as a total load per stream mile. Nonpoint source inputs for CBOD and NBOD were included in this modeling analysis because it is believed that nonpoint source impacts on Red Chute Bayou near Bossier City are significant.

4.3 Model Calibration

The model was calibrated using data from the September 1990 Red Chute Bayou intensive water quality survey (report number DEQ-WPCD-90.06). Transformation rates and quantities of some inputs and demands were initially set at values estimated from past modeling experience and literature values. These parameters were then adjusted, within reasonable limits, to obtain an acceptable fit to the observed values from the survey data.

4.3.1 Calibration Results

Figures 3, 4, and 5 illustrate the results of model calibration for Red Chute Bayou near Bossier City. Concentrations of DO, CBOD, and NBOD respectively, are plotted against rivermile. Observed values are plotted as discrete points, while simulated values are plotted as a solid line. The vector diagram in Figure 6 exhibits the rivermile locations of each of the dischargers included in the modeling analysis.

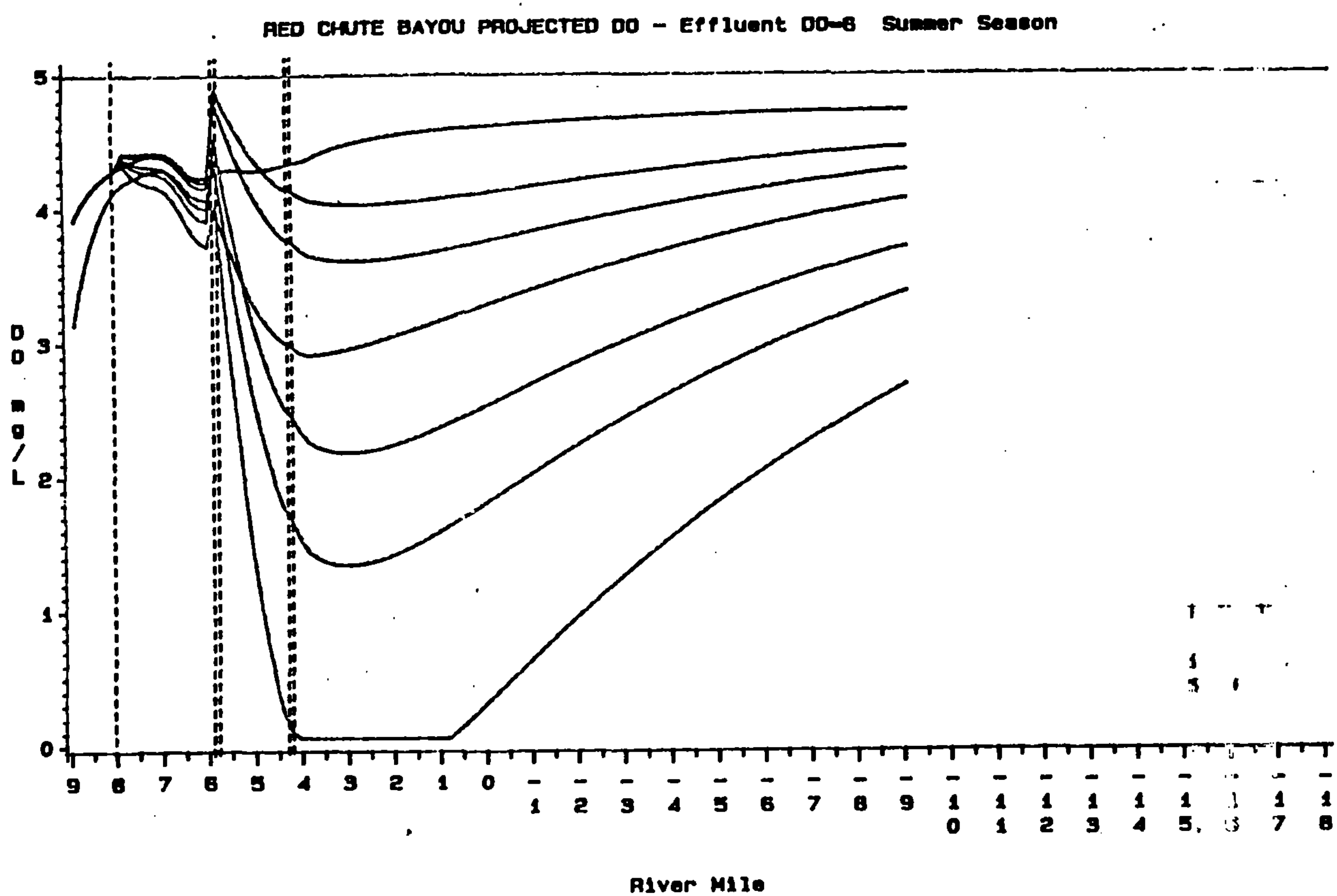

Figure 11 - Projected DO: Effluent DO = 6, Summer Season

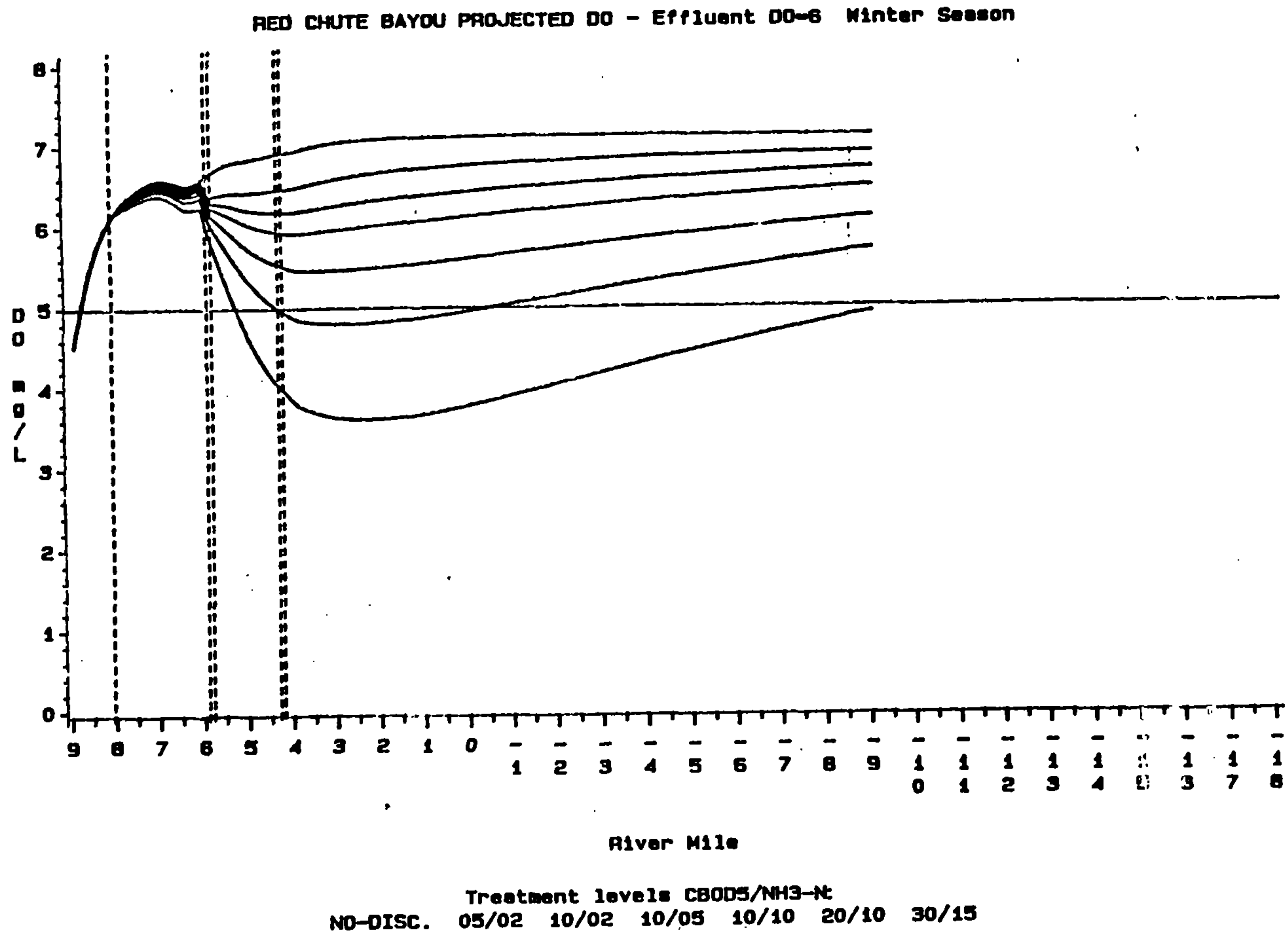

Figure 12 - Projected DO: Effluent DO = 6, Winter Season

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TABLE 9. Minimum DO at Various Treatment Levels. Summer Critical Conditions

CBOD5	NH3-N	EFFLUENT DO	MINIMUM DO
30	15	2	0.000
20	10	2	0.887
10	10	2	1.705
10	5	2	2.571
10	2	2	3.069
5	2	2	3.323
30	15	5	0.000
20	10	5	1.217
10	10	5	2.055
10	5	5	2.948
10	2	5	3.481
5	2	5	3.892
30	15	6	0.000
20	10	6	1.290
10	10	6	2.130
10	5	6	3.024
10	2	6	3.560
5	2	6	3.980
No Disch.			4.176

TABLE 10. Minimum DO at Various Treatment Levels. Winter Conditions

CBOD5	NH3-N	EFFLUENT DO	MINIMUM DO
30	15	6	3.521
20	10	6	4.712
10	10	6	5.372
10	5	6	5.830
10	2	6	6.099
5	2	6	6.278
No Disch.			6.416

Proposed effluent limitations are detailed in the Executive Summary of this report.

5.4 Water Quality Based Effluent Limits

Table 11 presents the wasteload allocations (WLA's) and allocable TMDL's (total maximum daily loads) for the Red Chute Bayou dischargers which would result from the proposed 10/5/6 (CBOD5/NH3-N/effluent DO) summer effluent limitations. Table 12 displays WLA's and the allocable TMDL's for the 10/10/6 (CBOD5/NH3-N/effluent DO) winter limits. According to the latest proposed DEQ-EPA Region VI MOU (CLIWS-WQR 91.10, in preparation), the wasteload allocation can be defined as the portion of a receiving stream's loading capacity that is allocated to one of its existing or future man-induced point sources of pollution. Every water body for which one or more WLA's are developed will also have a designated WLA or "margin of safety", typically 20%, for growth and potential model error. The sum of the wasteload allocation(s) and this reserve capacity is called the "allocable TMDL". Thus, the individual wasteload allocation(s) is/are 80% of the allocable TMDL (i.e. 0.8 = 1/1.25). This provides a 20% factor to allow for both growth and a safety factor. This is more completely defined in the following section.

As previously mentioned, nonpoint source loadings to Red Chute Bayou are significant. The load allocation (LA) is the portion of the receiving stream's load capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. For calibrated modeling studies, the LA may often be estimated from the headwater loads, incremental flow loads, and nonpoint loads required for calibration. The nonpoint source contributions for NBOD, CBOD and DO are 244, 78, and 10 (lbs/day) respectively. Headwater loads are listed in Table 13. The TMDL which includes both the allocable TMDL and the LA for the summer and winter seasons is presented in Table 14.

TABLE 11.
Red Chute Bayou Summer WLA
and Allocable TMDL
at Proposed Advanced Limits

DISCHARGER	DESIGN-FLOW (CFS)	DESIGN-FLOW (MGD)	CBOD5 CONC. (mg/L) = 10: WLA (LB/DY)	CBOD5 CONC. (mg/L) = 10: ALLOCABLE TMDL (LB/DY)	NH3-N CONC. (mg/l) = 5: WLA (LB/DY)	NH3-N CONC. (mg/l) = 5: ALLOCABLE TMDL (LB/DY)
Dogwood A	0.271	0.175	14.60	18.24	7.30	9.12
Bossier City	3.100	2.000	166.80	208.50	83.40	104.25
Dogwood B	0.463	0.299	24.94	31.17	12.47	15.59
E. Highland	0.047	0.030	2.50	3.13	1.25	1.56
Espanita For.	0.092	0.059	4.92	6.15	2.46	3.08
GRAND TOTALS	3.973	2.563	213.76	267.19	106.88	133.60

TABLE 12
Red Chute Bayou Winter WLA
and Allocable TMDL
at Proposed Advanced Limits

DISCHARGER	DESIGN-FLOW (CFS)	(MGD)	CBOD5 CONC. (mg/L) = 10 WLA (LB/DY)	ALLOCABLE TMDL (LB/DY)	NH3-N CONC. (mg/l) = 10 WLA (LB/DY)	ALLOCABLE TMDL (LB/DY)
Dogwood A	0.271	0.175	14.60	18.24	14.60	18.24
Bossier City	3.100	2.000	166.80	208.50	166.80	208.50
Dogwood B	0.463	0.299	24.94	31.17	24.94	31.17
E. Highland	0.047	0.030	2.50	3.13	2.50	3.13
Espanita For.	0.092	0.059	4.92	6.15	4.92	6.15
GRAND TOTALS	3.973	2.563	213.76	267.19	213.76	267.19

Table 13
Headwater Load Contributions

Headwater flow = 3.449 cfs or 2.23 MGD

	(mg/L)	(lbs/day)
CBOD	4.55	84.44
NBOD	8.77	162.75
DO	3.7	68.66

Table 14
Red Chute Bayou Summer & Winter TMDL's

	TMDL (lbs/day) Summer	Winter
CBOD	429.63	429.63
NBOD	540.35	673.94
DO	719.92	719.92

5.5 Reserve Capacity

Following Louisiana Department of Environmental Quality procedures for wasteload allocation determinations, a 20 percent reserve capacity in TMDL is included in this study. This was accomplished by multiplying effluent concentrations by a factor of 1.25 in each simulation used for the wasteload allocation projections. This reserve capacity provides a safety factor for possible error, and an unallocated reserve for future growth.

5.6 Residual And Downstream Effects

No significant impact on water quality downstream of the model study area is likely to occur as a result of the Bossier City STP and other point source dischargers included in this analysis. However, water quality downstream of these dischargers may be affected by nonpoint source loadings in the study area.

5.7 Model Sensitivity

All modeling studies necessarily involve uncertainty and some degree of approximation. It is therefore of value to consider the sensitivity of the model output to changes in model coefficients, and in the hypothesized relationships among model variables.

The development of this model required the selection of various model coefficients which cannot be identified with complete certainty. It is therefore of interest to determine the sensitivity of the model projections to changes in these parameters. Interpretation of parametric sensitivity results should include a consideration of parametric uncertainty. Stream width and depth, for example, are often known with more accuracy than are estimates of reaeration coefficients, sediment oxygen demand, or dispersion.

Model simulations for sensitivity determinations were performed as variations from the proposed hot weather season effluent limitations scenario. Minimum DO was determined after variations of ±30 percent for model parameters. Results of this analysis are presented in Table 15. This table presents the minimum DO values at ±30% variation for the corresponding parameters. The most significant sensitivity was found for the DO saturation, temperature, and reaeration coefficients. The parameters in Table 15 are listed in order from most sensitive to least sensitive.

Grant No: C6-220000-29
IAG No: 24032-91-01
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the period of record are displayed in Figure 8. Annual and monthly temperature statistics are shown in Tables 5 and 6 respectively. Seasonal temperature statistics are exhibited in Tables 7 and 8.

Table 5 - Annual Temperature Statistics

Red Chute Bayou East of Shreveport

YR	NTEMP	TEMPAVG	TEMPMIN	TEMPQ1	TEMPMED	TEMPQ3	TEMPMAX
78	10	20.6000	5.00	15.750	21.250	28.250	29.50
79	12	16.6250	1.50	9.500	19.250	23.500	26.00
80	11	16.2273	4.00	9.500	16.000	22.500	28.50
81	12	17.7083	6.00	10.625	19.250	25.125	28.00
82	12	17.0000	2.00	6.875	19.000	27.375	28.50
83	12	17.8167	5.00	10.800	17.500	25.975	28.50
84	12	19.0917	5.50	13.400	19.650	26.750	30.10
85	12	19.3750	4.70	13.950	20.900	26.425	28.40
86	12	19.6083	9.20	14.350	20.400	24.575	27.70
87	12	19.7333	6.40	12.825	19.150	27.450	29.40
88	12	18.3083	6.30	8.925	18.650	26.475	31.40
89	12	17.8333	8.70	11.600	17.850	25.025	25.80
90	6	21.9000	14.80	16.450	21.900	27.300	29.10
91	2	15.7250	10.87	10.870	15.725	20.580	20.58

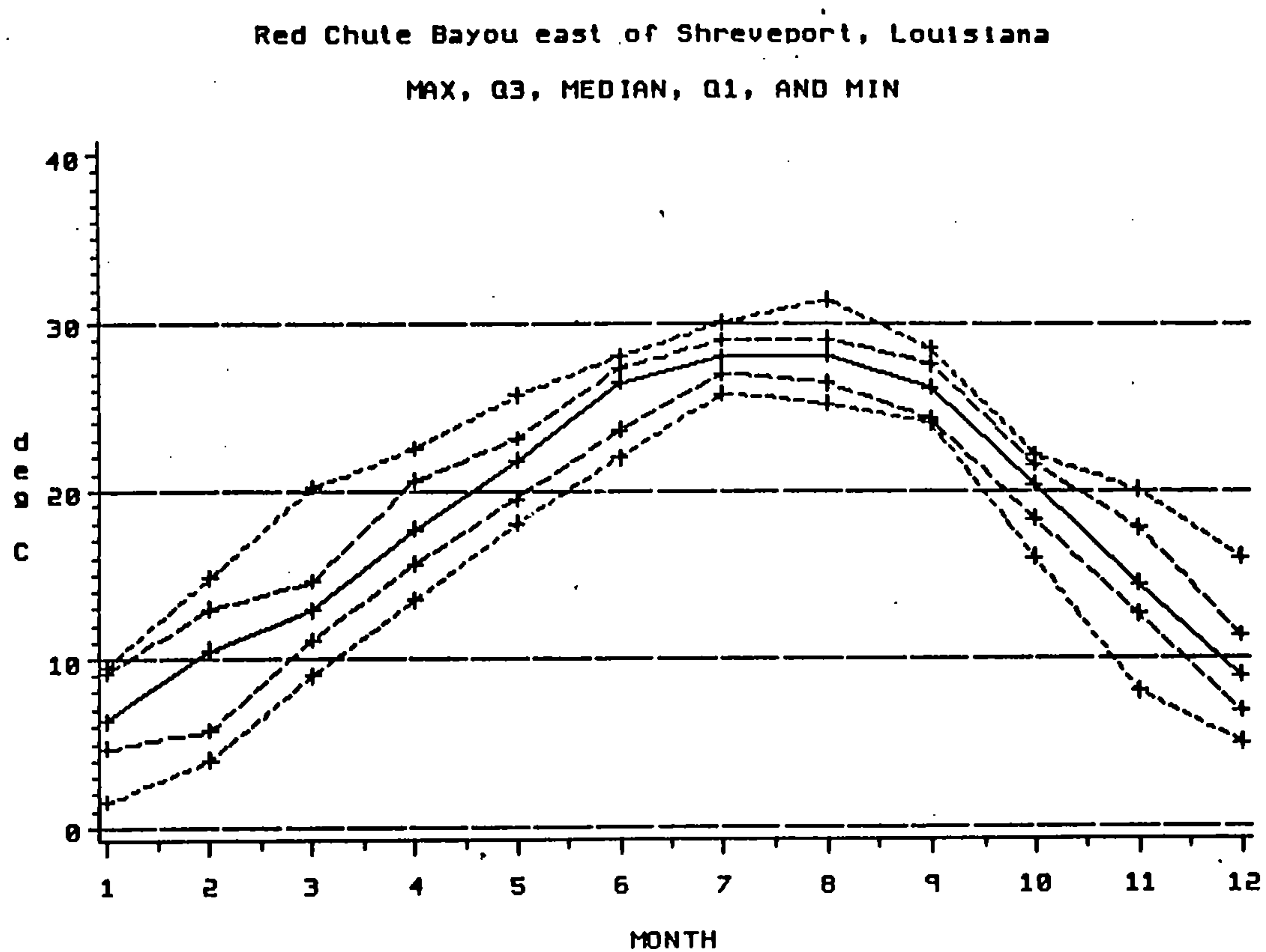

Figure 8 - Historical Water Temperature Monthly Percentiles

Table 6 - Monthly Temperature Statistics

Red Chute Bayou East of Shreveport

MON	NTEMP	TEMPAVG	TEMPMAX	TEMPMIN	TEMPQ1	TEMPMED	TEMPQ3
1	11	6.3273	9.5	1.5	4.700	6.30	9.200
2	13	9.3208	14.8	4.0	5.750	10.50	12.950
3	12	13.3667	20.2	9.0	11.125	12.90	14.600
4	14	18.1129	22.5	13.5	15.625	17.70	20.625
5	13	21.5769	25.7	18.0	19.500	21.80	23.100
6	13	25.5615	28.0	22.0	23.600	26.50	27.350
7	11	28.0182	30.1	25.8	27.000	28.00	29.000
8	13	27.8692	31.4	25.2	26.450	28.10	29.100
9	12	26.0250	28.5	24.0	24.225	26.10	27.550
10	13	19.7231	22.1	16.0	18.300	20.30	21.550
11	12	14.5250	20.0	8.0	12.625	14.45	17.750
12	12	9.4583	16.0	5.0	6.850	8.95	11.325

Critical temperature within seasons was defined to be the 95 percentile value for that season. The critical hot weather season was defined to be from April through October, and the cool weather season was November through March. As shown in Tables 7 and 8, the cool weather critical temperature was 19.14° C, and the hot weather critical temperature was 29.25° C.

FY 89 205 (J) (1)
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Table 7 - Seasonal Temperature Statistics

SEASON=COLD

UNIVARIATE
VARIABLE=TEMP

MOMENTS

N	60	SUM WGTS	60
MEAN	10.6495	SUM	638.97
STD DEV	4.38181	VARIANCE	19.2003
SKEWNESS	0.150158	KURTOSIS	-0.432253
USS	7937.53	CSS	1132.82
CV	41.1457	STD MEAN	0.565689
T:MEAN=0	18.8257	PROB>|T|	0.0001
SGN RANK	915	PROB>|S|	0.0001
NUM ^= 0	60		

QUANTILES(DEF=4)				EXTREMES LOWEST	EXTREMES HIGHEST
100% MAX	20.2	99%	20.2	1.5	17.4
75% Q3	13.775	95%	19.14	2	18
50% MED	10.785	90%	16.9	4	19.2
25% Q1	6.825	10%	5	4.5	20
0% MIN	1.5	5%	4.025	4.7	20.2
		1%	1.5		

RANGE	18.7
Q3-Q1	6.95
MODE	6.5

Table 8 - Seasonal Temperature Statistics
SEASON=HOT

UNIVARIATE
VARIABLE=TEMP

MOMENTS

N	89	SUM WGTS	89
MEAN	23.6582	SUM	2105.58
STD DEV	4.25772	VARIANCE	18.1282
SKEWNESS	-0.409929	KURTOSIS	-0.771761
USS	51409.5	CSS	1595.28
CV	17.9968	STD MEAN	0.451317
T:MEAN=0	52.4203	PROB>:T:	0.0001
SGN RANK	2002.5	PROB>:S:	0.0001
NUM ^= 0	89		

QUANTILES(DEF=4)				EXTREMES LOWEST	EXTREMES HIGHEST
100% MAX	31.4	99%	31.4	13.5	29.1
75% Q3	27.35	95%	29.25	14.3	29.4
50% MED	24.2	90%	28.5	14.5	29.5
25% Q1	20.5	10%	17.6	16	30.1
0% MIN	13.5	5%	16	16	31.4
		1%	13.5		
RANGE	17.9				
Q3-Q1	6.85				
MODE	28.5				

5.1.2 Critical Flow

Critical flow is defined to be the 7Q10 flow; that is, the annual minimum seven day average flow with a recurrence probability of once in ten years. The USGS maintains a gaging station on Red Chute Bayou near Sligo. The critical flow (7Q10) value used for the Total Maximum Daily Load (TMDL) was 3.449 cfs based upon the measurements at this location.

5.2 No-Load Scenario

Dissolved oxygen values, with all dischargers removed under summer critical conditions in Red Chute Bayou at effluent DO loadings of 2.0, 5.0 and 6.0 mg/l, are illustrated in Figures 9, 10 and 11 respectively. DO values resulting from the winter season no-load scenario are presented in Figure 12. The minimum DO value for the summer season no-load scenario was 4.176 and the winter season no-load scenario DO value was 6.416.

5.3 Effluent Limits

The dashed horizontal line in these graphs represents the target DO concentration of 5.0 mg/l. Tables 9 and 10 list the minimum DO values for various treatment levels during summer and winter conditions. In these tables, treatment levels are specified in terms of the 5-day CBOD concentration in mg/L, the effluent NH3-N concentration in mg/L, and the effluent DO in mg/L. An effluent mass ratio of 4.3 between NBOD and NH3-N is assumed.

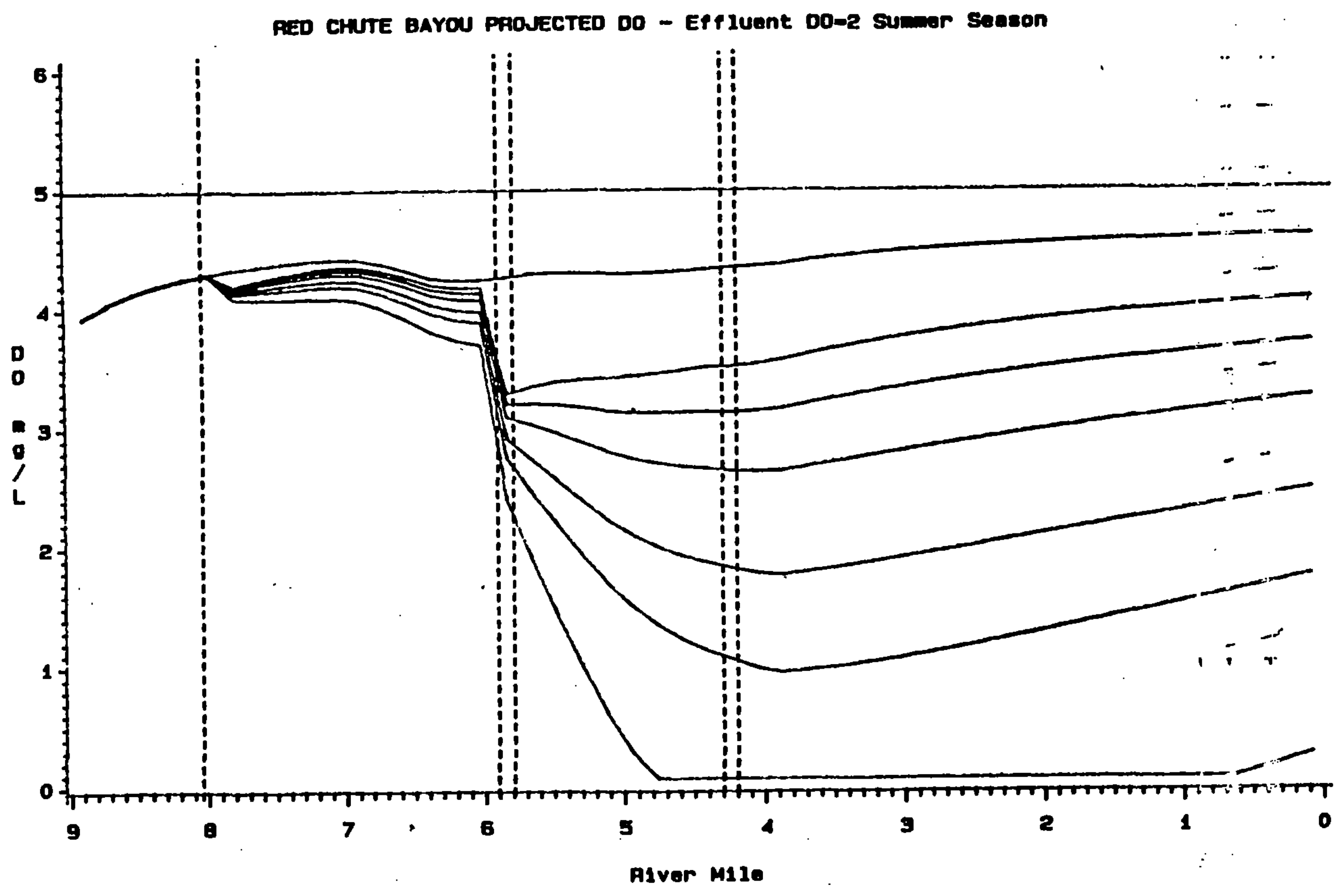

Figure 9 - Projected DO: Effluent DO = 2, Summer Season

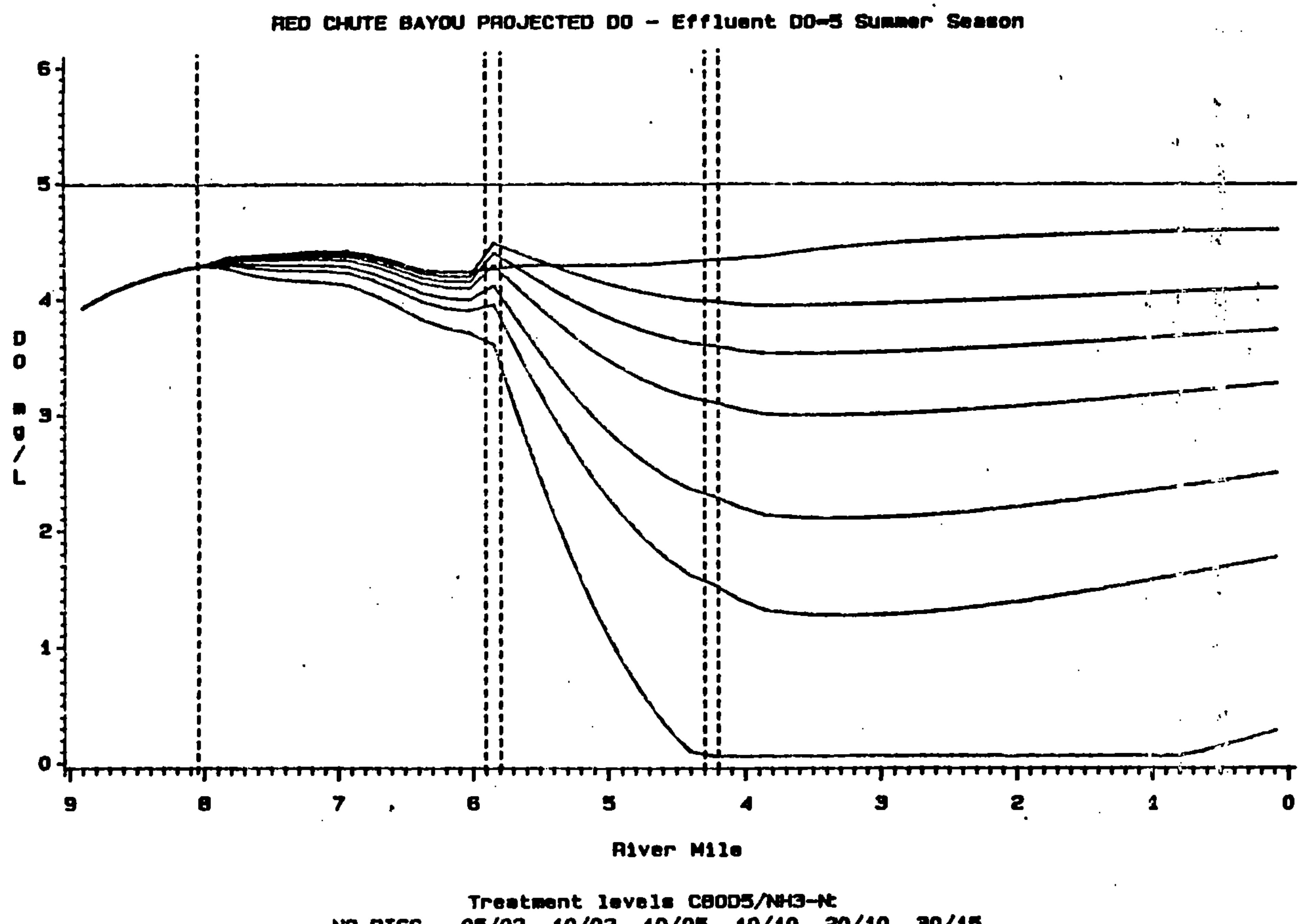

Figure 10 - Projected DO: Effluent DO = 5, Summer Season

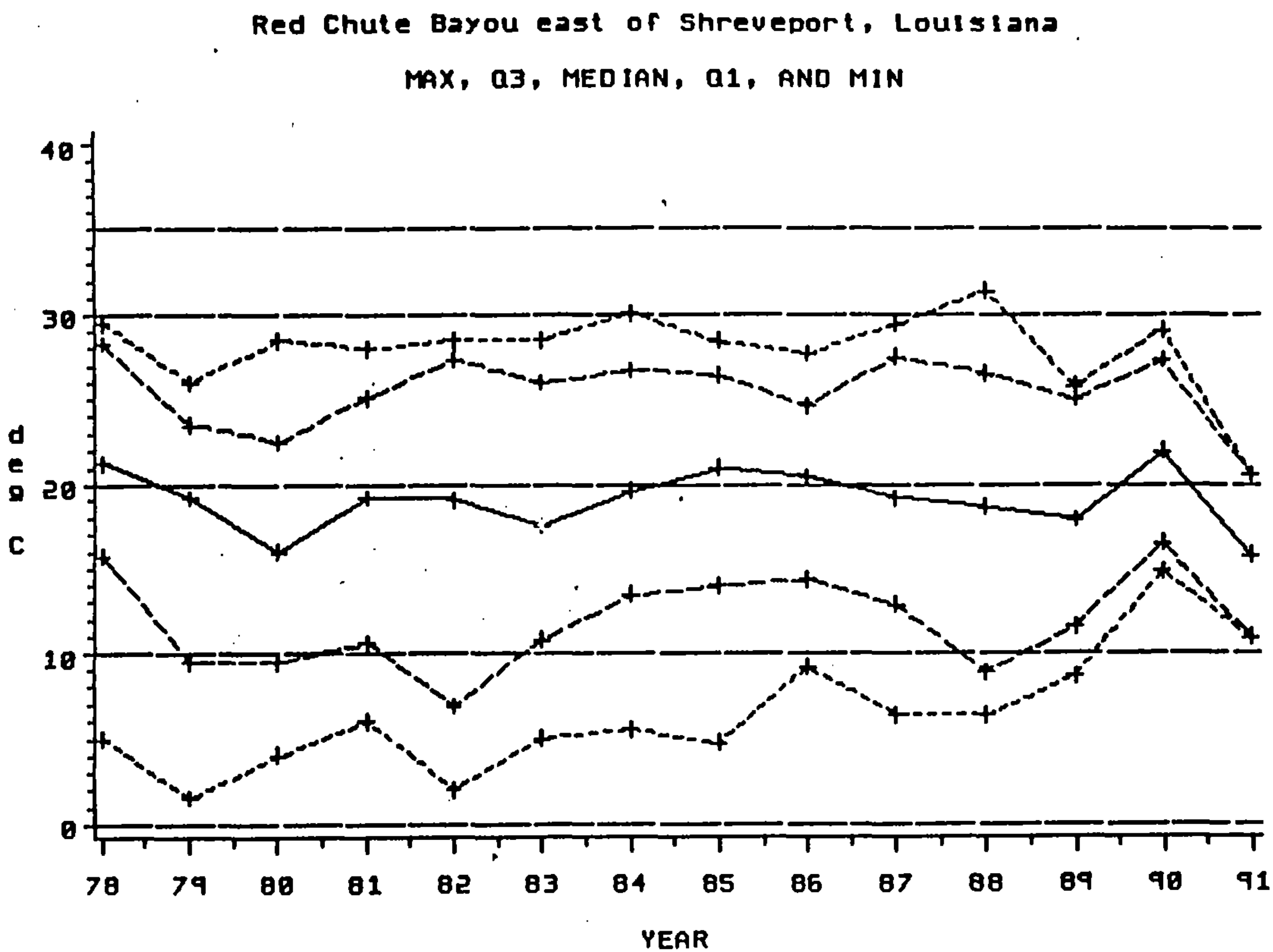

Figure 7 - Historical Water Temperature Annual Percentiles.

5 WASTELOAD ALLOCATION DETERMINATION

The process for identifying water bodies which require total maximum daily load (TMDL) development and wasteload allocations is described in the EPA document "Guidance for State Water Monitoring and Wasteload Allocation Programs" (USEPA, 1985).

5.1 Critical Stream Conditions

Critical conditions were determined to provide a worst case scenario for water quality projections. These conditions usually include low stream flows and high water temperatures.

5.1.1 Critical Seasonal Temperature

Critical temperature for the cool weather and critical hot weather seasons for Red Chute Bayou was determined through analysis of data acquired at the DEQ Statewide Water Quality Monitoring Network station on Red Chute Bayou located at the Highway 80 bridge 8.7 miles east of Shreveport (Station Number B103555010). Figure 7 illustrates the historical water temperature annual percentiles. Monthly percentile values over

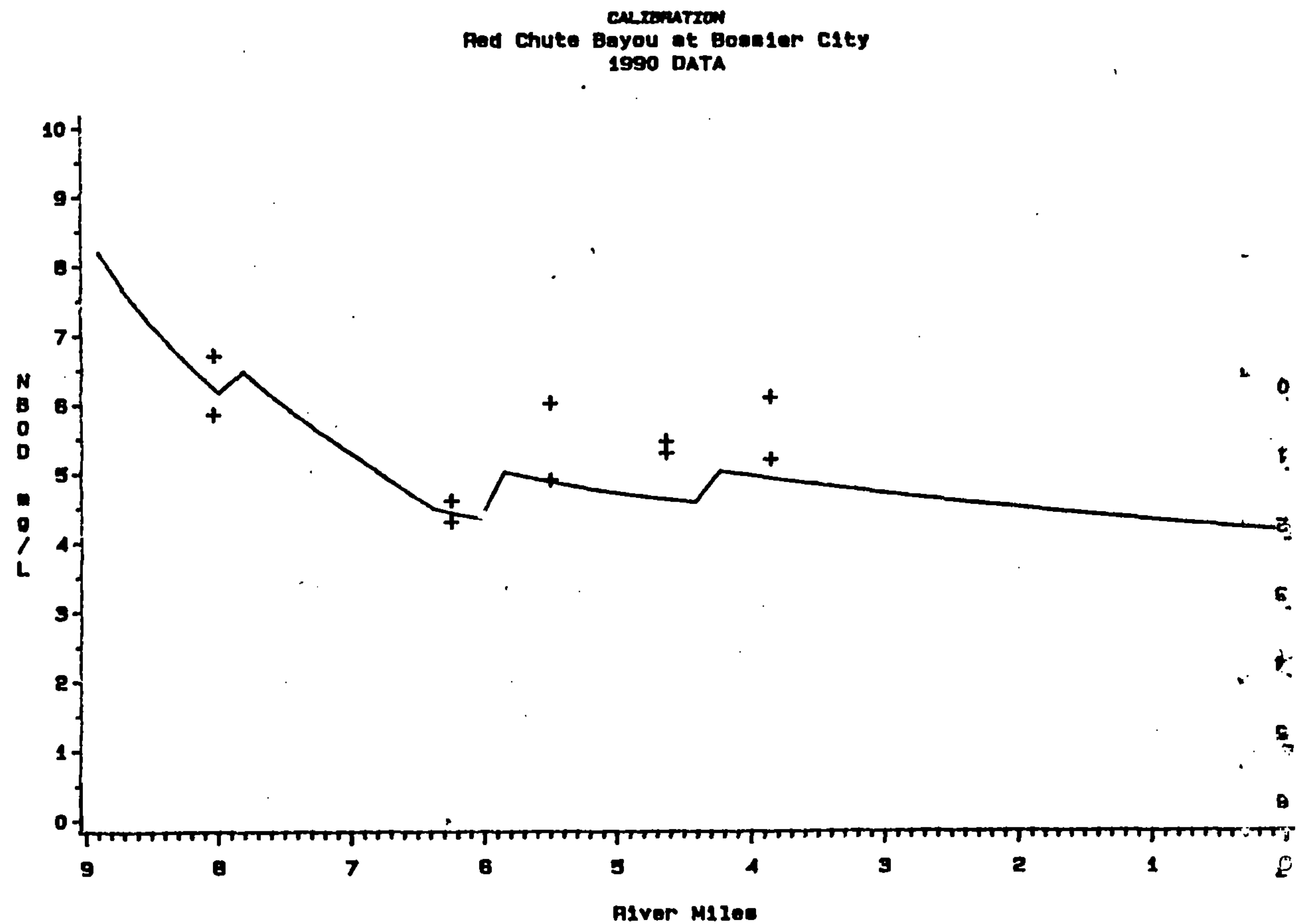

Figure 5 - Calibration: NBOD Plotted Against Rivermile

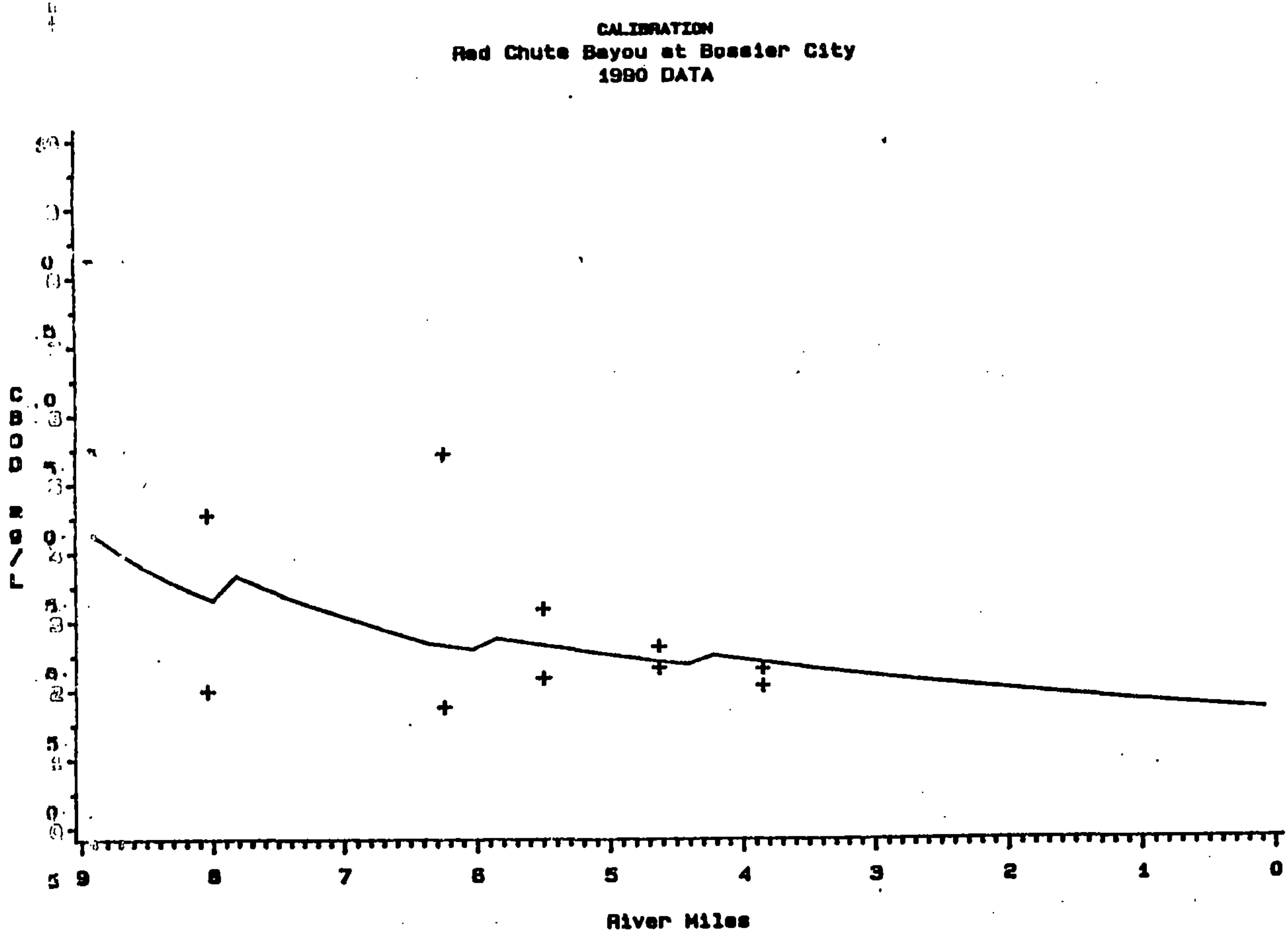

Figure 4 - Calibration:CBOD Plotted Against Rivermile

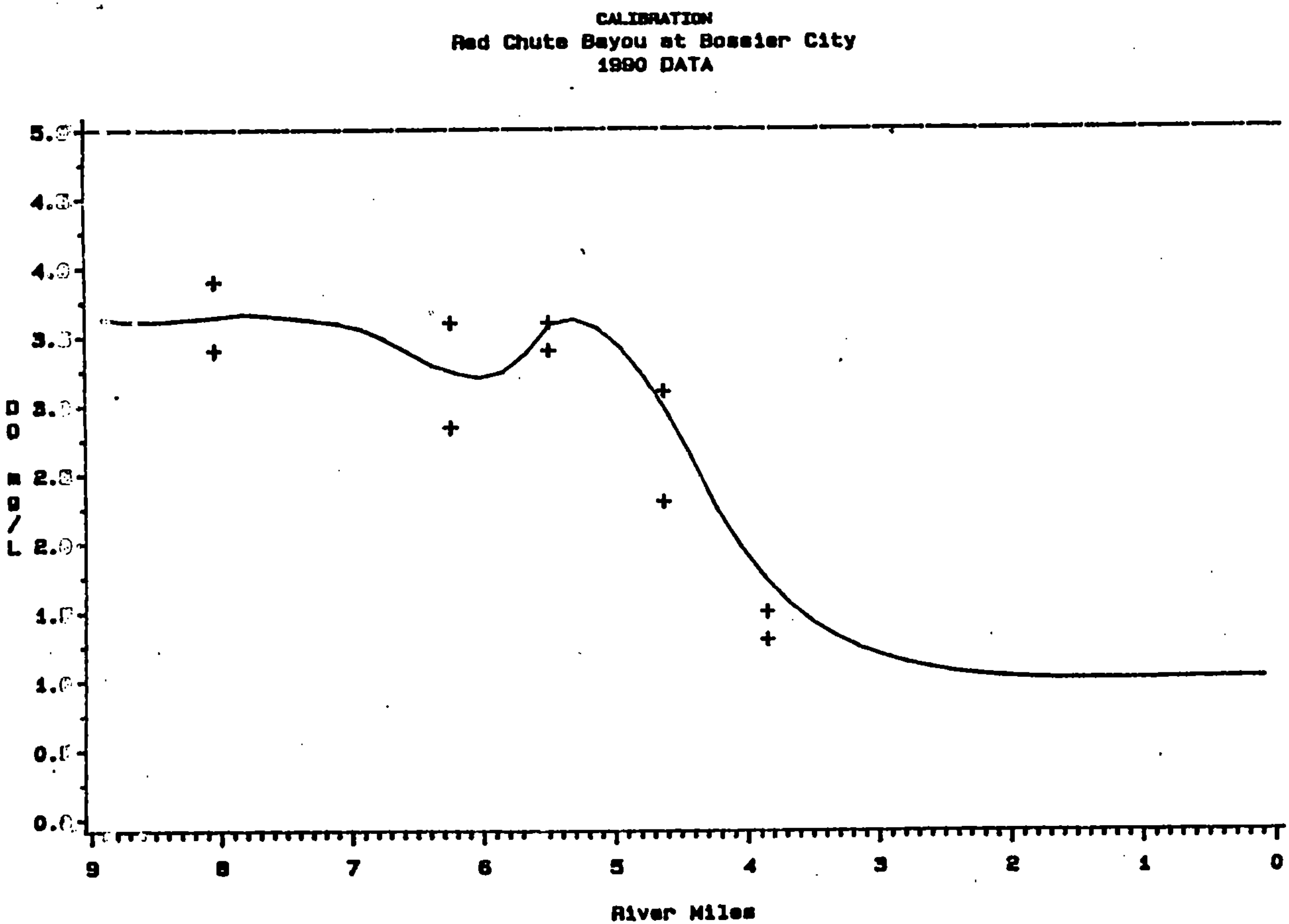

Figure 3 - Calibration: DO Plotted Against Rivermile

TABLE 15. Sensitivity to Variations in Calibration Parameters *

	PERCENT -30%	+30%
REAER COEFF	3.949	1.313
SED O2 DEMAND	3.715	2.319
DEPTH	3.556	2.547
NBOD LOAD	3.356	2.691
CBOD LOAD	3.305	2.743
NBOD DECAY	3.319	2.765
CBOD DECAY	3.276	2.797
DO LOAD	2.856	3.116
NONPOINT FLOW	2.921	3.116
NONPOINT NBOD	3.048	3.000
WIDTH	2.983	3.008
NONPOINT CBOD	3.035	3.014
CBOD SETTLING	3.015	3.033
NBOD SETTLING	3.022	3.027
NONPOINT DO	3.023	3.026

* Temperature was varied by ± 2° C.
Minimum DO's @ T+2° C = 2.507 and T-2° C = 3.179

5.8 Conclusions

This calibrated modeling analysis indicated that the 5.0 mg/l dissolved oxygen standard for Red Chute Bayou cannot be maintained during the summer season with any level of advanced treatment. It is believed that nonpoint source impacts resulting from agricultural activities upstream of the study area are significant. This area is a candidate for funding of a nonpoint source study to begin in the fall of 1991. It is recommended that a phased TMDL process be implemented with interim effluent limits of 10/10/6 (CBOD5/NH3-N/effluent DO) during the winter (November-April) season and 10/5/6

(CBOD5/NH3-N/effluent DO) during the summer (May-October) for all dischargers included in this analysis until the causes of nonpoint source pollution are determined and Best Management Practices (BMP's) are implemented. Subsequently, another wasteload allocation can be conducted to determine final effluent limits for the Red Chute Bayou wastewater treatment facilities.

Other recommendations include that a Use Attainability Analysis (UAA) be considered on Red Chute Bayou for the purpose of reclassifying the stream as a man-made watercourse which may be justified since flow in the stream is controlled at all times.

It is also recommended that an intensive survey and subsequent wasteload allocation be conducted for nearby Bayou Fifi in order to determine appropriate permit limits for several existing point source dischargers.

6 REFERENCES

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US Environmental Protection Agency, 1985. Guidance for State Water Monitoring and Wasteload Allocation Programs. Office of Water Regulations and Standards, October, 1985.

APPENDIX A - MODEL INPUTS AND OUTPUTS

```
! Stream geometry used in all models
!
!   start RM   end RM   fall RM     #-SECS
   -9.000      9.000    0.000       100
!
!            #      SENS
!              RM          VALUE
DATA
WIDTH        7      1.000
! DOWNSTREAM OF STATION 10-RC-09 (RACETRACK BRIDGE)
   1          3.70     53.000
! UPSTREAM OF STATION 10-RC-09 (RACETRACK BRIDGE)
   2          3.95     46.000
! UPSTREAM OF STATION 10-RC-07 (HIGHLAND STP)
   3          4.40     46.000
! DOWNSTREAM OF STATION 10-RC-05
   4          5.20     41.000
! DOWNSTREAM OF STATION 10-RC-04 (BOSSIER CITY STP)
   5          5.65     52.000
! STATION 10-RC-03
   6          6.25     30.000
! UPSTREAM OF STATION 10-RC-03
   7          7.00     52.000
DEPTH        7      1.000
! DOWNSTREAM OF STATION 10-RC-09 (RACETRACK BRIDGE)
   1          3.70        1.510
! UPSTREAM OF STATION 10-RC-09 (RACETRACK BRIDGE)
   2          3.95        1.740
! UPSTREAM OF STATION 10-RC-07 (HIGHLAND STP)
   3          4.40        1.720
! DOWNSTREAM OF STATION 10-RC-05
   4          5.20        1.930
! DOWNSTREAM OF STATION 10-RC-04 (BOSSIER CITY STP)
   5          5.65        1.520
! STATION 10-RC-03
   6          6.25        1.920
! UPSTREAM OF STATION 10-RC-03
   7          7.00        0.714
```

```
! Decay rates and non-point source
COXY            1       1.000
    1            0.000        0.100
! MEDIAN BOTTLE RATE FOR CBOD
CSED            1       1.000
    1            0.000        0.025
NOXY            1       1.000
    1            0.000        0.080
! MEDIAN BOTTLE RATE FOR NBOD
NSED            1       1.000
    1            0.000        0.005
NONPFLOW        3       1.000
    1            8.050        0.630
    2            6.250        0.630
    3            6.200        0.000
NONPNBOD        5       1.000
    1            8.050        8.000
    2            6.250        5.000
    3            6.200        8.000
    4            4.500       15.000
    5            4.300       15.000
NONPCBOD        3       1.000
    1            8.050        6.000
    2            6.250        6.000
    3            6.200        4.000
NONPDO          3       1.000
    1            8.050        3.700
    2            6.250        3.700
    3            6.200        0.000
D-REAER         5       1.000
! MINI-KL 1.9 SO COMPUTED VALUE MATCHES MEASURED VALUE
MINI-KL          1.9
DISP            1             1.000
                 0.000        0.000
```

Temperature and production for calibration

```
TEMP            1     1.000
    1            0.000    28.700
PHOTO           1     1.000
    1            0.000     0.000
RESP            1     1.000
    1            0.000     0.000
SATDO           1     1.000
    1            0.000     7.786
EVAP            1     1.000
    1            0.000     0.000
```

```
! SOD for calibration
SEDI            4      1.000
    1           7.800        1.400
    2           5.910        1.600
    3           5.500        1.000
    4           4.300        2.500
```

```
: Temperature for summer critical season
TEMP           1      1.000
    1           0.000     29.250
PHOTO          1      1.000
    1           0.000      0.000
RECP           1      1.000
    1           0.000      0.000
SATDO          1      1.000
    1           0.000      7.658
EVAP           1      1.000
    1           0.000      0.000
```

SOD for TMDL

SEDI		1	1.000	
	1		0.000	1.000

```
! TMDL Flows and Loads 10/05 (CBOD5/NH3)
SENS            1.000
! Headwater flow
                9.000       3.449
! Tributary flow (Dogwood A North STP)
! Design flow = 0.271 cfs
! Including 20% reserve capacity 0.271/0.8=0.339 cfs
                7.800       0.339
! Tributary flow (Bossier City STP)
! Desgin flow = 3.100 cfs
! Including 20% reserve capacity 3.100/0.8=3.875 cfs
                5.910       3.875
! Tributary flow (Dogwood B South STP)
! Design flow = 0.463 cfs
! Including 20% reserve capacity 0.463/0.8=0.579 cfs
                5.796       0.579
! Tributary flow (East Highland MHP STP)
! Design flow = 0.047 cfs
! Including 20% reserve capacity 0.047/0.8=0.059 cfs
                4.300       0.059
! Tributary flow (Espanita Subd. STP)
! Design flow = 0.092 cfs
! Including 20% reserve capacity 0.092/0.8=0.115 cfs
                4.200       0.115
STOP
NBOD
SENS            1.000       1.000
                9.000       3.449       6.770
                7.800       0.339      21.500
                5.910       3.875      21.500
                5.796       0.579      21.500
                4.300       0.059      21.500
                4.200       0.115      21.500
STOP
CBOD
SENS            1.000       1.000
                9.000       3.449       4.550
                7.800       0.339      23.000
                5.910       3.875      23.000
                5.796       0.579      23.000
                4.300       0.059      23.000
                4.200       0.115      23.000
STOP
```

DO
SENS

	1.000	1.000	
	9.000	3.449	3.700
	7.800	0.339	6.000
	5.910	3.875	6.000
	5.796	0.579	6.000
	4.300	0.059	6.000
	4.200	0.115	6.000

```
LaDEQ 1.03**************************************************************************************************
****************************************************************************************************
  LLL              III    MMM        MMM    NNN      NNN    00000000000      SSSSSSSSSSSSS     SSSSSSSSSSSSS
  LLL              III    MMMM      MMMM    NNNN     NNN   0000000000000    SSSSSSSSSSSSSS    SSSSSSSSSSSSSS
  LLL              III    MMMMM    MMMMM    NNNNN    NNN  000000000000000  SS                SS
  LLL              III    MMMMMM  MMMMMM    NNNNNN   NNN  000         000   SSSSSSSSSSSSS     SSSSSSSSSSSSS
  LLL              III    MMM MMM MMM MMM   NNN NNN  NNN  000         000    SSSSSSSSSSSSS     SSSSSSSSSSSSS
  LLL              III    MMM  MMMMM  MMM   NNN  NNN NNN  000         000             SSSS              SSSS
  LLL              III    MMM   MMM   MMM   NNN   NNNNNN  000         000             SSSS              SSSS
  LLLLLLLLLLLLLLL  III    MMM    M    MMM   NNN    NNNNN  000000000000000  SSSSSSSSSSSSSS    SSSSSSSSSSSSSS
  LLLLLLLLLLLLLLL  III    MMM         MMM   NNN     NNNN   0000000000000   SSSSSSSSSSSSS     SSSSSSSSSSSSS
  LLLLLLLLLLLLLLL  III    MMM         MMM   NNN      NNN    00000000000    SSSSSSSSSSSS      SSSSSSSSSSSS
****************************************************************************************************
****************************************************************************************************
```

22-JUN-94
10:39:09

```
********************     STEADY STATE WATER QUALITY MODEL
********************
********************     RUN TITLE.....Red Chute Bayou TMDL   10/05 treatment  6 effluent DO
********************
********************
********************     BASIC NETWORK DATA
********************     RIVER MILE AT DOWNSTREAM END...     -9.00
********************     RIVER MILE AT UPSTREAM END.....      9.00
********************     RIVER MILE OF FALL LINE........      0.00
********************     NUMBER OF SECTIONS.............       100
```

E S T U A R Y / S T R E A M   I N P U T   D A T A

JUNCT'N WIDTHS (FT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	53.000	27	-4.41	53.000	52	0.09	53.000	77	4.59	44.813
2	-8.91	53.000	28	-4.23	53.000	53	0.27	53.000	78	4.77	43.688
3	-8.73	53.000	29	-4.05	53.000	54	0.45	53.000	79	4.95	42.563
4	-8.55	53.000	30	-3.87	53.000	55	0.63	53.000	80	5.13	41.438
5	-8.37	53.000	31	-3.69	53.000	56	0.81	53.000	81	5.31	43.689
6	-8.19	53.000	32	-3.51	53.000	57	0.99	53.000	82	5.49	48.089
7	-8.01	53.000	33	-3.33	53.000	58	1.17	53.000	83	5.67	51.267
8	-7.83	53.000	34	-3.15	53.000	59	1.35	53.000	84	5.85	44.667
9	-7.65	53.000	35	-2.97	53.000	60	1.53	53.000	85	6.03	38.067
10	-7.47	53.000	36	-2.79	53.000	61	1.71	53.000	86	6.21	31.467
11	-7.29	53.000	37	-2.61	53.000	62	1.89	53.000	87	6.39	34.107
12	-7.11	53.000	38	-2.43	53.000	63	2.07	53.000	88	6.57	39.387
13	-6.93	53.000	39	-2.25	53.000	64	2.25	53.000	89	6.75	44.667
14	-6.75	53.000	40	-2.07	53.000	65	2.43	53.000	90	6.93	49.947
15	-6.57	53.000	41	-1.89	53.000	66	2.61	53.000	91	7.11	52.000
16	-6.39	53.000	42	-1.71	53.000	67	2.79	53.000	92	7.29	52.000
17	-6.21	53.000	43	-1.53	53.000	68	2.97	53.000	93	7.47	52.000
18	-6.03	53.000	44	-1.35	53.000	69	3.15	53.000	94	7.65	52.000
19	-5.85	53.000	45	-1.17	53.000	70	3.33	53.000	95	7.83	52.000
20	-5.67	53.000	46	-0.99	53.000	71	3.51	53.000	96	8.01	52.000
21	-5.49	53.000	47	-0.81	53.000	72	3.69	53.000	97	8.19	52.000
22	-5.31	53.000	48	-0.63	53.000	73	3.87	48.240	98	8.37	52.000
23	-5.13	53.000	49	-0.45	53.000	74	4.05	46.000	99	8.55	52.000
24	-4.95	53.000	50	-0.27	53.000	75	4.23	46.000	100	8.73	52.000
25	-4.77	53.000	51	-0.09	53.000	76	4.41	45.938	101	8.91	52.000
26	-4.59	53.000									

JUNCTION SURFACE AREAS (SQFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	5.037E+04	27	-4.41	5.037E+04	52	0.09	5.037E+04	77	4.59	4.259E+04
2	-8.91	5.037E+04	28	-4.23	5.037E+04	53	0.27	5.037E+04	78	4.77	4.152E+04
3	-8.73	5.037E+04	29	-4.05	5.037E+04	54	0.45	5.037E+04	79	4.95	4.045E+04
4	-8.55	5.037E+04	30	-3.87	5.037E+04	55	0.63	5.037E+04	80	5.13	3.938E+04
5	-8.37	5.037E+04	31	-3.69	5.037E+04	56	0.81	5.037E+04	81	5.31	4.152E+04
6	-8.19	5.037E+04	32	-3.51	5.037E+04	57	0.99	5.037E+04	82	5.49	4.570E+04
7	-8.01	5.037E+04	33	-3.33	5.037E+04	58	1.17	5.037E+04	83	5.67	4.872E+04
8	-7.83	5.037E+04	34	-3.15	5.037E+04	59	1.35	5.037E+04	84	5.85	4.245E+04
9	-7.65	5.037E+04	35	-2.97	5.037E+04	60	1.53	5.037E+04	85	6.03	3.618E+04
10	-7.47	5.037E+04	36	-2.79	5.037E+04	61	1.71	5.037E+04	86	6.21	2.991E+04
11	-7.29	5.037E+04	37	-2.61	5.037E+04	62	1.89	5.037E+04	87	6.39	3.241E+04
12	-7.11	5.037E+04	38	-2.43	5.037E+04	63	2.07	5.037E+04	88	6.57	3.743E+04
13	-6.93	5.037E+04	39	-2.25	5.037E+04	64	2.25	5.037E+04	89	6.75	4.245E+04
14	-6.75	5.037E+04	40	-2.07	5.037E+04	65	2.43	5.037E+04	90	6.93	4.747E+04

15	-6.57	5.037E+04	41	-1.89	5.037E+04	66	2.61	5.037E+04	91	7.11	4.942E+04
16	-6.39	5.037E+04	42	-1.71	5.037E+04	67	2.79	5.037E+04	92	7.29	4.942E+04
17	-6.21	5.037E+04	43	-1.53	5.037E+04	68	2.97	5.037E+04	93	7.47	4.942E+04
18	-6.03	5.037E+04	44	-1.35	5.037E+04	69	3.15	5.037E+04	94	7.65	4.942E+04
19	-5.85	5.037E+04	45	-1.17	5.037E+04	70	3.33	5.037E+04	95	7.83	4.942E+04
20	-5.67	5.037E+04	46	-0.99	5.037E+04	71	3.51	5.037E+04	96	8.01	4.942E+04
21	-5.49	5.037E+04	47	-0.81	5.037E+04	72	3.69	5.037E+04	97	8.19	4.942E+04
22	-5.31	5.037E+04	48	-0.63	5.037E+04	73	3.87	4.585E+04	98	8.37	4.942E+04
23	-5.13	5.037E+04	49	-0.45	5.037E+04	74	4.05	4.372E+04	99	8.55	4.942E+04
24	-4.95	5.037E+04	50	-0.27	5.037E+04	75	4.23	4.372E+04	100	8.73	4.942E+04
25	-4.77	5.037E+04	51	-0.09	5.037E+04	76	4.41	4.366E+04	101	8.91	4.942E+04
26	-4.59	5.037E+04									

******************** A3 COEFFICIENT FOR FLOW EQUATION -REPRESENTS DEPTH OF FLOW IF A1 AND/OR A2 ARE ********************
******************** NOT SPECIFIED (OR ARE ZERO) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	1.510	27	-4.41	1.510	52	0.09	1.510	77	4.59	1.770
2	-8.91	1.510	28	-4.23	1.510	53	0.27	1.510	78	4.77	1.817
3	-8.73	1.510	29	-4.05	1.510	54	0.45	1.510	79	4.95	1.864
4	-8.55	1.510	30	-3.87	1.510	55	0.63	1.510	80	5.13	1.912
5	-8.37	1.510	31	-3.69	1.510	56	0.81	1.510	81	5.31	1.830
6	-8.19	1.510	32	-3.51	1.510	57	0.99	1.510	82	5.49	1.666
7	-8.01	1.510	33	-3.33	1.510	58	1.17	1.510	83	5.67	1.533
8	-7.83	1.510	34	-3.15	1.510	59	1.35	1.510	84	5.85	1.653
9	-7.65	1.510	35	-2.97	1.510	60	1.53	1.510	85	6.03	1.773
10	-7.47	1.510	36	-2.79	1.510	61	1.71	1.510	86	6.21	1.893
11	-7.29	1.510	37	-2.61	1.510	62	1.89	1.510	87	6.39	1.695
12	-7.11	1.510	38	-2.43	1.510	63	2.07	1.510	88	6.57	1.405
13	-6.93	1.510	39	-2.25	1.510	64	2.25	1.510	89	6.75	1.116
14	-6.75	1.510	40	-2.07	1.510	65	2.43	1.510	90	6.93	0.827
15	-6.57	1.510	41	-1.89	1.510	66	2.61	1.510	91	7.11	0.714
16	-6.39	1.510	42	-1.71	1.510	67	2.79	1.510	92	7.29	0.714
17	-6.21	1.510	43	-1.53	1.510	68	2.97	1.510	93	7.47	0.714
18	-6.03	1.510	44	-1.35	1.510	69	3.15	1.510	94	7.65	0.714
19	-5.85	1.510	45	-1.17	1.510	70	3.33	1.510	95	7.83	0.714
20	-5.67	1.510	46	-0.99	1.510	71	3.51	1.510	96	8.01	0.714
21	-5.49	1.510	47	-0.81	1.510	72	3.69	1.510	97	8.19	0.714
22	-5.31	1.510	48	-0.63	1.510	73	3.87	1.666	98	8.37	0.714
23	-5.13	1.510	49	-0.45	1.510	74	4.05	1.736	99	8.55	0.714
24	-4.95	1.510	50	-0.27	1.510	75	4.23	1.728	100	8.73	0.714
25	-4.77	1.510	51	-0.09	1.510	76	4.41	1.723	101	8.91	0.714
26	-4.59	1.510									

******************** JUNCTION WATER TEMPERATURES (DEG-C) ********************
ALL VALUES = 29.250

******************** INPUTED OXYGEN SATURATION CONCENTRATIONS (PPM) ********************
ALL VALUES = 7.658

******************** NET EVAPORATION - RAINFALL (IN/MO) ********************
ALL VALUES = 0.000E+00

******************** OXYGEN UPTAKE OF SEDIMENTS (GM 02/SQM/DAY) ********************
ALL VALUES = 1.806

******************** CBOD DEOXYGENATION RATES CORRECTED TO STREAM TEMPS - (1/DAY) **********

ALL VALUES = 0.153

** CBOD SEDIMENTATION RATES - (1/DAY) **

ALL VALUES = 0.025

******************** NBOD DEOXYGENATION RATES CORRECTED TO STREAM TEMPS - (1/DAY) **********

ALL VALUES = 0.175

** NBOD SEDIMENTATION RATES - (1/DAY),5X**

ALL VALUES = 5.000E-03

******************** NONPOINT SOURCE FLOW (CFS/MILE OF STREAM) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	0.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.126
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.630
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.630
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.630
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.630
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.630
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.630
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.630
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.630
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	0.630
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.630
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.630
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.630
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.630
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.000	100	8.73	0.630
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	0.630
26	-4.59	0.000									

******************** NBOD NONPOINT SOURCE CONTRIBUTION (LBSNBOD/DAY/MILE OF STREAM) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	15.000	27	-4.41	15.000	52	0.09	15.000	77	4.59	14.629
2	-8.91	15.000	28	-4.23	15.000	53	0.27	15.000	78	4.77	13.888
3	-8.73	15.000	29	-4.05	15.000	54	0.45	15.000	79	4.95	13.147
4	-8.55	15.000	30	-3.87	15.000	55	0.63	15.000	80	5.13	12.406
5	-8.37	15.000	31	-3.69	15.000	56	0.81	15.000	81	5.31	11.665
6	-8.19	15.000	32	-3.51	15.000	57	0.99	15.000	82	5.49	10.924
7	-8.01	15.000	33	-3.33	15.000	58	1.17	15.000	83	5.67	10.182
8	-7.83	15.000	34	-3.15	15.000	59	1.35	15.000	84	5.85	9.441
9	-7.65	15.000	35	-2.97	15.000	60	1.53	15.000	85	6.03	8.700
10	-7.47	15.000	36	-2.79	15.000	61	1.71	15.000	86	6.21	7.400

11	-7.29	15.000	37	-2.61	15.000	62	1.89	15.000	87	6.39	5.233
12	-7.11	15.000	38	-2.43	15.000	63	2.07	15.000	88	6.57	5.533
13	-6.93	15.000	39	-2.25	15.000	64	2.25	15.000	89	6.75	5.833
14	-6.75	15.000	40	-2.07	15.000	65	2.43	15.000	90	6.93	6.133
15	-6.57	15.000	41	-1.89	15.000	66	2.61	15.000	91	7.11	6.433
16	-6.39	15.000	42	-1.71	15.000	67	2.79	15.000	92	7.29	6.733
17	-6.21	15.000	43	-1.53	15.000	68	2.97	15.000	93	7.47	7.033
18	-6.03	15.000	44	-1.35	15.000	69	3.15	15.000	94	7.65	7.333
19	-5.85	15.000	45	-1.17	15.000	70	3.33	15.000	95	7.83	7.633
20	-5.67	15.000	46	-0.99	15.000	71	3.51	15.000	96	8.01	7.933
21	-5.49	15.000	47	-0.81	15.000	72	3.69	15.000	97	8.19	8.000
22	-5.31	15.000	48	-0.63	15.000	73	3.87	15.000	98	8.37	8.000
23	-5.13	15.000	49	-0.45	15.000	74	4.05	15.000	99	8.55	8.000
24	-4.95	15.000	50	-0.27	15.000	75	4.23	15.000	100	8.73	8.000
25	-4.77	15.000	51	-0.09	15.000	76	4.41	15.000	101	8.91	8.000
26	-4.59	15.000									

******************** CBOD NONPOINT SOURCE CONTRIBUTION (LBSCBOD/DAY/MILE OF STREAM) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	4.000	27	-4.41	4.000	52	0.09	4.000	77	4.59	4.000
2	-8.91	4.000	28	-4.23	4.000	53	0.27	4.000	78	4.77	4.000
3	-8.73	4.000	29	-4.05	4.000	54	0.45	4.000	79	4.95	4.000
4	-8.55	4.000	30	-3.87	4.000	55	0.63	4.000	80	5.13	4.000
5	-8.37	4.000	31	-3.69	4.000	56	0.81	4.000	81	5.31	4.000
6	-8.19	4.000	32	-3.51	4.000	57	0.99	4.000	82	5.49	4.000
7	-8.01	4.000	33	-3.33	4.000	58	1.17	4.000	83	5.67	4.000
8	-7.83	4.000	34	-3.15	4.000	59	1.35	4.000	84	5.85	4.000
9	-7.65	4.000	35	-2.97	4.000	60	1.53	4.000	85	6.03	4.000
10	-7.47	4.000	36	-2.79	4.000	61	1.71	4.000	86	6.21	4.400
11	-7.29	4.000	37	-2.61	4.000	62	1.89	4.000	87	6.39	6.000
12	-7.11	4.000	38	-2.43	4.000	63	2.07	4.000	88	6.57	6.000
13	-6.93	4.000	39	-2.25	4.000	64	2.25	4.000	89	6.75	6.000
14	-6.75	4.000	40	-2.07	4.000	65	2.43	4.000	90	6.93	6.000
15	-6.57	4.000	41	-1.89	4.000	66	2.61	4.000	91	7.11	6.000
16	-6.39	4.000	42	-1.71	4.000	67	2.79	4.000	92	7.29	6.000
17	-6.21	4.000	43	-1.53	4.000	68	2.97	4.000	93	7.47	6.000
18	-6.03	4.000	44	-1.35	4.000	69	3.15	4.000	94	7.65	6.000
19	-5.85	4.000	45	-1.17	4.000	70	3.33	4.000	95	7.83	6.000
20	-5.67	4.000	46	-0.99	4.000	71	3.51	4.000	96	8.01	6.000
21	-5.49	4.000	47	-0.81	4.000	72	3.69	4.000	97	8.19	6.000
22	-5.31	4.000	48	-0.63	4.000	73	3.87	4.000	98	8.37	6.000
23	-5.13	4.000	49	-0.45	4.000	74	4.05	4.000	99	8.55	6.000
24	-4.95	4.000	50	-0.27	4.000	75	4.23	4.000	100	8.73	6.000
25	-4.77	4.000	51	-0.09	4.000	76	4.41	4.000	101	8.91	6.000
26	-4.59	4.000									

******************** O2 NONPOINT SOURCE CONTRIBUTIONS (LBS O2/DAY/MILE OF STREAM) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000

6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	0.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.740
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	3.700
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	3.700
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	3.700
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	3.700
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	3.700
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	3.700
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	3.700
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	3.700
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	3.700
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	3.700
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	3.700
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	3.700
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	3.700
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.000	100	8.73	3.700
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	3.700
26	-4.59	0.000									

******************** DISPERSION COEFFICIENTS (SQFT/SEC) ********************

ALL VALUES = 0.000E+00

********** AVERAGE DAILY PHOTOSYNTHESIS-RESPIRATION RATE (GM O2/SQM/DAY) CORRECTED TO STREAM TEMPERATURES *****

ALL VALUES = 0.000E+00

DEPTH OR VELOCITY DEPENDENT VARIABLES

CROSSECTIONAL AREAS OF JUNCT*NS (SQFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	80.030	27	-4.41	80.030	52	0.09	80.030	77	4.59	79.313
2	-8.91	80.030	28	-4.23	80.030	53	0.27	80.030	78	4.77	79.386
3	-8.73	80.030	29	-4.05	80.030	54	0.45	80.030	79	4.95	79.352
4	-8.55	80.030	30	-3.87	80.030	55	0.63	80.030	80	5.13	79.213
5	-8.37	80.030	31	-3.69	80.030	56	0.81	80.030	81	5.31	79.941
6	-8.19	80.030	32	-3.51	80.030	57	0.99	80.030	82	5.49	80.105
7	-8.01	80.030	33	-3.33	80.030	58	1.17	80.030	83	5.67	78.609
8	-7.83	80.030	34	-3.15	80.030	59	1.35	80.030	84	5.85	73.849
9	-7.65	80.030	35	-2.97	80.030	60	1.53	80.030	85	6.03	67.505
10	-7.47	80.030	36	-2.79	80.030	61	1.71	80.030	86	6.21	59.577
11	-7.29	80.030	37	-2.61	80.030	62	1.89	80.030	87	6.39	57.807
12	-7.11	80.030	38	-2.43	80.030	63	2.07	80.030	88	6.57	55.356
13	-6.93	80.030	39	-2.25	80.030	64	2.25	80.030	89	6.75	49.848
14	-6.75	80.030	40	-2.07	80.030	65	2.43	80.030	90	6.93	41.284
15	-6.57	80.030	41	-1.89	80.030	66	2.61	80.030	91	7.11	37.128
16	-6.39	80.030	42	-1.71	80.030	67	2.79	80.030	92	7.29	37.128
17	-6.21	80.030	43	-1.53	80.030	68	2.97	80.030	93	7.47	37.128
18	-6.03	80.030	44	-1.35	80.030	69	3.15	80.030	94	7.65	37.128
19	-5.85	80.030	45	-1.17	80.030	70	3.33	80.030	95	7.83	37.128
20	-5.67	80.030	46	-0.99	80.030	71	3.51	80.030	96	8.01	37.128
21	-5.49	80.030	47	-0.81	80.030	72	3.69	80.030	97	8.19	37.128
22	-5.31	80.030	48	-0.63	80.030	73	3.87	80.387	98	8.37	37.128
23	-5.13	80.030	49	-0.45	80.030	74	4.05	79.836	99	8.55	37.128
24	-4.95	80.030	50	-0.27	80.030	75	4.23	79.468	100	8.73	37.128
25	-4.77	80.030	51	-0.09	80.030	76	4.41	79.133	101	8.91	37.128
26	-4.59	80.030									

JUNCT*N DEPTHS (FT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	1.510	27	-4.41	1.510	52	0.09	1.510	77	4.59	1.770
2	-8.91	1.510	28	-4.23	1.510	53	0.27	1.510	78	4.77	1.817
3	-8.73	1.510	29	-4.05	1.510	54	0.45	1.510	79	4.95	1.864
4	-8.55	1.510	30	-3.87	1.510	55	0.63	1.510	80	5.13	1.912
5	-8.37	1.510	31	-3.69	1.510	56	0.81	1.510	81	5.31	1.830
6	-8.19	1.510	32	-3.51	1.510	57	0.99	1.510	82	5.49	1.666
7	-8.01	1.510	33	-3.33	1.510	58	1.17	1.510	83	5.67	1.533
8	-7.83	1.510	34	-3.15	1.510	59	1.35	1.510	84	5.85	1.653
9	-7.65	1.510	35	-2.97	1.510	60	1.53	1.510	85	6.03	1.773
10	-7.47	1.510	36	-2.79	1.510	61	1.71	1.510	86	6.21	1.893
11	-7.29	1.510	37	-2.61	1.510	62	1.89	1.510	87	6.39	1.695
12	-7.11	1.510	38	-2.43	1.510	63	2.07	1.510	88	6.57	1.405
13	-6.93	1.510	39	-2.25	1.510	64	2.25	1.510	89	6.75	1.116
14	-6.75	1.510	40	-2.07	1.510	65	2.43	1.510	90	6.93	0.827
15	-6.57	1.510	41	-1.89	1.510	66	2.61	1.510	91	7.11	0.714
16	-6.39	1.510	42	-1.71	1.510	67	2.79	1.510	92	7.29	0.714

17	-6.21	1.510	43	-1.53	1.510	68	2.97	1.510	93	7.47	0.714
18	-6.03	1.510	44	-1.35	1.510	69	3.15	1.510	94	7.65	0.714
19	-5.85	1.510	45	-1.17	1.510	70	3.33	1.510	95	7.83	0.714
20	-5.67	1.510	46	-0.99	1.510	71	3.51	1.510	96	8.01	0.714
21	-5.49	1.510	47	-0.81	1.510	72	3.69	1.510	97	8.19	0.714
22	-5.31	1.510	48	-0.63	1.510	73	3.87	1.666	98	8.37	0.714
23	-5.13	1.510	49	-0.45	1.510	74	4.05	1.736	99	8.55	0.714
24	-4.95	1.510	50	-0.27	1.510	75	4.23	1.728	100	8.73	0.714
25	-4.77	1.510	51	-0.09	1.510	76	4.41	1.723	101	8.91	0.714
26	-4.59	1.510									

******************** JUNCT*N VELOCITIES (FT/SEC) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.127	27	-4.41	0.127	52	0.09	0.127	77	4.59	0.126
2	-8.91	0.127	28	-4.23	0.127	53	0.27	0.127	78	4.77	0.126
3	-8.73	0.127	29	-4.05	0.127	54	0.45	0.127	79	4.95	0.126
4	-8.55	0.127	30	-3.87	0.127	55	0.63	0.127	80	5.13	0.126
5	-8.37	0.127	31	-3.69	0.127	56	0.81	0.127	81	5.31	0.125
6	-8.19	0.127	32	-3.51	0.127	57	0.99	0.127	82	5.49	0.124
7	-8.01	0.127	33	-3.33	0.127	58	1.17	0.127	83	5.67	0.127
8	-7.83	0.127	34	-3.15	0.127	59	1.35	0.127	84	5.85	0.075
9	-7.65	0.127	35	-2.97	0.127	60	1.53	0.127	85	6.03	0.082
10	-7.47	0.127	36	-2.79	0.127	61	1.71	0.127	86	6.21	0.092
11	-7.29	0.127	37	-2.61	0.127	62	1.89	0.127	87	6.39	0.093
12	-7.11	0.127	38	-2.43	0.127	63	2.07	0.127	88	6.57	0.095
13	-6.93	0.127	39	-2.25	0.127	64	2.25	0.127	89	6.75	0.103
14	-6.75	0.127	40	-2.07	0.127	65	2.43	0.127	90	6.93	0.122
15	-6.57	0.127	41	-1.89	0.127	66	2.61	0.127	91	7.11	0.133
16	-6.39	0.127	42	-1.71	0.127	67	2.79	0.127	92	7.29	0.130
17	-6.21	0.127	43	-1.53	0.127	68	2.97	0.127	93	7.47	0.126
18	-6.03	0.127	44	-1.35	0.127	69	3.15	0.127	94	7.65	0.123
19	-5.85	0.127	45	-1.17	0.127	70	3.33	0.127	95	7.83	0.111
20	-5.67	0.127	46	-0.99	0.127	71	3.51	0.127	96	8.01	0.108
21	-5.49	0.127	47	-0.81	0.127	72	3.69	0.127	97	8.19	0.105
22	-5.31	0.127	48	-0.63	0.127	73	3.87	0.126	98	8.37	0.102
23	-5.13	0.127	49	-0.45	0.127	74	4.05	0.127	99	8.55	0.099
24	-4.95	0.127	50	-0.27	0.127	75	4.23	0.125	100	8.73	0.096
25	-4.77	0.127	51	-0.09	0.127	76	4.41	0.126	101	8.91	0.093
26	-4.59	0.127									

******************** JUNCTION VOLUMES (CUFT) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	7.606E+04	27	-4.41	7.606E+04	52	0.09	7.606E+04	77	4.59	7.538E+04
2	-8.91	7.606E+04	28	-4.23	7.606E+04	53	0.27	7.606E+04	78	4.77	7.545E+04
3	-8.73	7.606E+04	29	-4.05	7.606E+04	54	0.45	7.606E+04	79	4.95	7.542E+04
4	-8.55	7.606E+04	30	-3.87	7.606E+04	55	0.63	7.606E+04	80	5.13	7.528E+04
5	-8.37	7.606E+04	31	-3.69	7.606E+04	56	0.81	7.606E+04	81	5.31	7.598E+04
6	-8.19	7.606E+04	32	-3.51	7.606E+04	57	0.99	7.606E+04	82	5.49	7.613E+04
7	-8.01	7.606E+04	33	-3.33	7.606E+04	58	1.17	7.606E+04	83	5.67	7.471E+04
8	-7.83	7.606E+04	34	-3.15	7.606E+04	59	1.35	7.606E+04	84	5.85	7.019E+04
9	-7.65	7.606E+04	35	-2.97	7.606E+04	60	1.53	7.606E+04	85	6.03	6.416E+04
10	-7.47	7.606E+04	36	-2.79	7.606E+04	61	1.71	7.606E+04	86	6.21	5.662E+04
11	-7.29	7.606E+04	37	-2.61	7.606E+04	62	1.89	7.606E+04	87	6.39	5.494E+04

12	-7.11	7.606E+04	38	-2.43	7.606E+04	63	2.07	7.606E+04	88	6.57	5.261E+04
13	-6.93	7.606E+04	39	-2.25	7.606E+04	64	2.25	7.606E+04	89	6.75	4.738E+04
14	-6.75	7.606E+04	40	-2.07	7.606E+04	65	2.43	7.606E+04	90	6.93	3.924E+04
15	-6.57	7.606E+04	41	-1.89	7.606E+04	66	2.61	7.606E+04	91	7.11	3.529E+04
16	-6.39	7.606E+04	42	-1.71	7.606E+04	67	2.79	7.606E+04	92	7.29	3.529E+04
17	-6.21	7.606E+04	43	-1.53	7.606E+04	68	2.97	7.606E+04	93	7.47	3.529E+04
18	-6.03	7.606E+04	44	-1.35	7.606E+04	69	3.15	7.606E+04	94	7.65	3.529E+04
19	-5.85	7.606E+04	45	-1.17	7.606E+04	70	3.33	7.606E+04	95	7.83	3.529E+04
20	-5.67	7.606E+04	46	-0.99	7.606E+04	71	3.51	7.606E+04	96	8.01	3.529E+04
21	-5.49	7.606E+04	47	-0.81	7.606E+04	72	3.69	7.606E+04	97	8.19	3.529E+04
22	-5.31	7.606E+04	48	-0.63	7.606E+04	73	3.87	7.640E+04	98	8.37	3.529E+04
23	-5.13	7.606E+04	49	-0.45	7.606E+04	74	4.05	7.588E+04	99	8.55	3.529E+04
24	-4.95	7.606E+04	50	-0.27	7.606E+04	75	4.23	7.553E+04	100	8.73	3.529E+04
25	-4.77	7.606E+04	51	-0.09	7.606E+04	76	4.41	7.521E+04	101	8.91	3.529E+04
26	-4.59	7.606E+04									

******************** ISAACS AND GAUDY CORRELATION ********************

WIND INDUCED REAERATION WAS USED FOR THE FOLLOW SEGMENTS

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  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25  26  27  28  29  30
 31  32  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54  55  56  57  58  59  60
 61  62  63  64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90
 91  92  93  94  95  96  97  98  99 100 101
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******************** COMPUTED REAERATION RATES (1/DAY) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	1.567	27	-4.41	1.567	52	0.09	1.567	77	4.59	1.337
2	-8.91	1.567	28	-4.23	1.567	53	0.27	1.567	78	4.77	1.302
3	-8.73	1.567	29	-4.05	1.567	54	0.45	1.567	79	4.95	1.269
4	-8.55	1.567	30	-3.87	1.567	55	0.63	1.567	80	5.13	1.238
5	-8.37	1.567	31	-3.69	1.567	56	0.81	1.567	81	5.31	1.293
6	-8.19	1.567	32	-3.51	1.567	57	0.99	1.567	82	5.49	1.420
7	-8.01	1.567	33	-3.33	1.567	58	1.17	1.567	83	5.67	1.543
8	-7.83	1.567	34	-3.15	1.567	59	1.35	1.567	84	5.85	1.431
9	-7.65	1.567	35	-2.97	1.567	60	1.53	1.567	85	6.03	1.334
10	-7.47	1.567	36	-2.79	1.567	61	1.71	1.567	86	6.21	1.250
11	-7.29	1.567	37	-2.61	1.567	62	1.89	1.567	87	6.39	1.396
12	-7.11	1.567	38	-2.43	1.567	63	2.07	1.567	88	6.57	1.684
13	-6.93	1.567	39	-2.25	1.567	64	2.25	1.567	89	6.75	2.120
14	-6.75	1.567	40	-2.07	1.567	65	2.43	1.567	90	6.93	2.863
15	-6.57	1.567	41	-1.89	1.567	66	2.61	1.567	91	7.11	3.314
16	-6.39	1.567	42	-1.71	1.567	67	2.79	1.567	92	7.29	3.314
17	-6.21	1.567	43	-1.53	1.567	68	2.97	1.567	93	7.47	3.314
18	-6.03	1.567	44	-1.35	1.567	69	3.15	1.567	94	7.65	3.314
19	-5.85	1.567	45	-1.17	1.567	70	3.33	1.567	95	7.83	3.314
20	-5.67	1.567	46	-0.99	1.567	71	3.51	1.567	96	8.01	3.314
21	-5.49	1.567	47	-0.81	1.567	72	3.69	1.567	97	8.19	3.314
22	-5.31	1.567	48	-0.63	1.567	73	3.87	1.420	98	8.37	3.314
23	-5.13	1.567	49	-0.45	1.567	74	4.05	1.363	99	8.55	3.314
24	-4.95	1.567	50	-0.27	1.567	75	4.23	1.370	100	8.73	3.314
25	-4.77	1.567	51	-0.09	1.567	76	4.41	1.374	101	8.91	3.314
26	-4.59	1.567									

STEADY STATE FLOW CONDITIONS

TOTAL INFLOWS = 10.1 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 10.1 CFS

POINT SOURCE INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	4.454
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.000
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.000
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.000
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.000
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.000
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.000
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.000
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.000
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.000
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	0.339
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.000
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.000
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.000
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.000
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.174	100	8.73	0.000
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	3.449
26	-4.59	0.000									

NONPOINT SOURCE INFLOWS (CFS) (EXCLUDING RAINFALL)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	0.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.023
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.113
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.113

13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.113
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.113
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.113
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.113
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.113
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.113
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	0.113
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.113
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.113
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.113
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.113
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.000	100	8.73	0.113
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	0.113
26	-4.59	0.000									

******************** POINT DIVERSIONS (CFS) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	10.140	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	0.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.000
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.000
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.000
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.000
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.000
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.000
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.000
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.000
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.000
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	0.000
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.000
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.000
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.000
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.000
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.000	100	8.73	0.000
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	0.000
26	-4.59	0.000									

******************** NONPOINT DIVERSIONS OR LOSSES (CFS) (EXCLUDING EVAPORATION) ********************

ALL VALUES = 0.000E+00

******************** JUNCT*N FLOWS (CFS) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	-10.140	27	-4.41	-10.140	52	0.09	-10.140	77	4.59	-9.966
2	-8.91	-10.140	28	-4.23	-10.140	53	0.27	-10.140	78	4.77	-9.966
3	-8.73	-10.140	29	-4.05	-10.140	54	0.45	-10.140	79	4.95	-9.966
4	-8.55	-10.140	30	-3.87	-10.140	55	0.63	-10.140	80	5.13	-9.966

5	-8.37	-10.140	31	-3.69	-10.140	56	0.81	-10.140	81	5.31	-9.966
6	-8.19	-10.140	32	-3.51	-10.140	57	0.99	-10.140	82	5.49	-9.966
7	-8.01	-10.140	33	-3.33	-10.140	58	1.17	-10.140	83	5.67	-9.966
8	-7.83	-10.140	34	-3.15	-10.140	59	1.35	-10.140	84	5.85	-5.512
9	-7.65	-10.140	35	-2.97	-10.140	60	1.53	-10.140	85	6.03	-5.512
10	-7.47	-10.140	36	-2.79	-10.140	61	1.71	-10.140	86	6.21	-5.489
11	-7.29	-10.140	37	-2.61	-10.140	62	1.89	-10.140	87	6.39	-5.376
12	-7.11	-10.140	38	-2.43	-10.140	63	2.07	-10.140	88	6.57	-5.262
13	-6.93	-10.140	39	-2.25	-10.140	64	2.25	-10.140	89	6.75	-5.149
14	-6.75	-10.140	40	-2.07	-10.140	65	2.43	-10.140	90	6.93	-5.035
15	-6.57	-10.140	41	-1.89	-10.140	66	2.61	-10.140	91	7.11	-4.922
16	-6.39	-10.140	42	-1.71	-10.140	67	2.79	-10.140	92	7.29	-4.809
17	-6.21	-10.140	43	-1.53	-10.140	68	2.97	-10.140	93	7.47	-4.695
18	-6.03	-10.140	44	-1.35	-10.140	69	3.15	-10.140	94	7.65	-4.582
19	-5.85	-10.140	45	-1.17	-10.140	70	3.33	-10.140	95	7.83	-4.129
20	-5.67	-10.140	46	-0.99	-10.140	71	3.51	-10.140	96	8.01	-4.016
21	-5.49	-10.140	47	-0.81	-10.140	72	3.69	-10.140	97	8.19	-3.903
22	-5.31	-10.140	48	-0.63	-10.140	73	3.87	-10.140	98	8.37	-3.789
23	-5.13	-10.140	49	-0.45	-10.140	74	4.05	-10.140	99	8.55	-3.676
24	-4.95	-10.140	50	-0.27	-10.140	75	4.23	-9.966	100	8.73	-3.562
25	-4.77	-10.140	51	-0.09	-10.140	76	4.41	-9.966	101	8.91	-3.449
26	-4.59	-10.140									

******************** RESIDENCE TIME (DAYS) ********************

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	9.147	27	-4.41	6.890	52	0.09	4.719	77	4.59	2.547
2	-8.91	9.060	28	-4.23	6.803	53	0.27	4.632	78	4.77	2.459
3	-8.73	8.973	29	-4.05	6.716	54	0.45	4.545	79	4.95	2.372
4	-8.55	8.887	30	-3.87	6.629	55	0.63	4.459	80	5.13	2.284
5	-8.37	8.800	31	-3.69	6.542	56	0.81	4.372	81	5.31	2.197
6	-8.19	8.713	32	-3.51	6.456	57	0.99	4.285	82	5.49	2.109
7	-8.01	8.626	33	-3.33	6.369	58	1.17	4.198	83	5.67	2.020
8	-7.83	8.539	34	-3.15	6.282	59	1.35	4.111	84	5.85	1.933
9	-7.65	8.452	35	-2.97	6.195	60	1.53	4.025	85	6.03	1.786
10	-7.47	8.366	36	-2.79	6.108	61	1.71	3.938	86	6.21	1.651
11	-7.29	8.279	37	-2.61	6.021	62	1.89	3.851	87	6.39	1.532
12	-7.11	8.192	38	-2.43	5.935	63	2.07	3.764	88	6.57	1.414
13	-6.93	8.105	39	-2.25	5.848	64	2.25	3.677	89	6.75	1.298
14	-6.75	8.018	40	-2.07	5.761	65	2.43	3.590	90	6.93	1.191
15	-6.57	7.931	41	-1.89	5.674	66	2.61	3.504	91	7.11	1.101
16	-6.39	7.845	42	-1.71	5.587	67	2.79	3.417	92	7.29	1.018
17	-6.21	7.758	43	-1.53	5.501	68	2.97	3.330	93	7.47	0.933
18	-6.03	7.671	44	-1.35	5.414	69	3.15	3.243	94	7.65	0.846
19	-5.85	7.584	45	-1.17	5.327	70	3.33	3.156	95	7.83	0.757
20	-5.67	7.497	46	-0.99	5.240	71	3.51	3.070	96	8.01	0.658
21	-5.49	7.411	47	-0.81	5.153	72	3.69	2.983	97	8.19	0.557
22	-5.31	7.324	48	-0.63	5.066	73	3.87	2.896	98	8.37	0.452
23	-5.13	7.237	49	-0.45	4.980	74	4.05	2.809	99	8.55	0.344
24	-4.95	7.150	50	-0.27	4.893	75	4.23	2.722	100	8.73	0.233
25	-4.77	7.063	51	-0.09	4.806	76	4.41	2.634	101	8.91	0.118
26	-4.59	6.976									

STEADY STATE NBOD INPUT CONDITIONS

POINT SOURCE INFLOW CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	21.500
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.000
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.000
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.000
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.000
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.000
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.000
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.000
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.000
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.000
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	21.500
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.000
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.000
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.000
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.000
24	-4.95	0.000	50	-0.27	0.000	75	4.23	21.500	100	8.73	0.000
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	8.770
26	-4.59	0.000									

NONPOINT SOURCE LOADS (LBS/DAY)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	2.700	27	-4.41	2.700	52	0.09	2.700	77	4.59	2.633
2	-8.91	2.700	28	-4.23	2.700	53	0.27	2.700	78	4.77	2.500
3	-8.73	2.700	29	-4.05	2.700	54	0.45	2.700	79	4.95	2.366
4	-8.55	2.700	30	-3.87	2.700	55	0.63	2.700	80	5.13	2.233
5	-8.37	2.700	31	-3.69	2.700	56	0.81	2.700	81	5.31	2.100
6	-8.19	2.700	32	-3.51	2.700	57	0.99	2.700	82	5.49	1.966
7	-8.01	2.700	33	-3.33	2.700	58	1.17	2.700	83	5.67	1.833
8	-7.83	2.700	34	-3.15	2.700	59	1.35	2.700	84	5.85	1.699
9	-7.65	2.700	35	-2.97	2.700	60	1.53	2.700	85	6.03	1.566
10	-7.47	2.700	36	-2.79	2.700	61	1.71	2.700	86	6.21	1.332
11	-7.29	2.700	37	-2.61	2.700	62	1.89	2.700	87	6.39	0.942
12	-7.11	2.700	38	-2.43	2.700	63	2.07	2.700	88	6.57	0.996

13	-6.93	2.700	39	-2.25	2.700	64	2.25	2.700	89	6.75	1.050
14	-6.75	2.700	40	-2.07	2.700	65	2.43	2.700	90	6.93	1.104
15	-6.57	2.700	41	-1.89	2.700	66	2.61	2.700	91	7.11	1.158
16	-6.39	2.700	42	-1.71	2.700	67	2.79	2.700	92	7.29	1.212
17	-6.21	2.700	43	-1.53	2.700	68	2.97	2.700	93	7.47	1.266
18	-6.03	2.700	44	-1.35	2.700	69	3.15	2.700	94	7.65	1.320
19	-5.85	2.700	45	-1.17	2.700	70	3.33	2.700	95	7.83	1.374
20	-5.67	2.700	46	-0.99	2.700	71	3.51	2.700	96	8.01	1.428
21	-5.49	2.700	47	-0.81	2.700	72	3.69	2.700	97	8.19	1.440
22	-5.31	2.700	48	-0.63	2.700	73	3.87	2.700	98	8.37	1.440
23	-5.13	2.700	49	-0.45	2.700	74	4.05	2.700	99	8.55	1.440
24	-4.95	2.700	50	-0.27	2.700	75	4.23	2.700	100	8.73	1.440
25	-4.77	2.700	51	-0.09	2.700	76	4.41	2.700	101	8.91	1.440
26	-4.59	2.700									

Red Chute Bayou TMDL 10/05 treatment 6 effluent DO

STEADY STATE NBOD CONCENTRATIONS (PPM)

OUTFLOW AT DOWNSTREAM END = 10.1 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	5.823	27	-4.41	7.138	52	0.09	9.012	77	4.59	11.596
2	-8.91	5.864	28	-4.23	7.200	53	0.27	9.103	78	4.77	11.730
3	-8.73	5.906	29	-4.05	7.262	54	0.45	9.196	79	4.95	11.868
4	-8.55	5.949	30	-3.87	7.326	55	0.63	9.290	80	5.13	12.010
5	-8.37	5.992	31	-3.69	7.391	56	0.81	9.385	81	5.31	12.157
6	-8.19	6.036	32	-3.51	7.457	57	0.99	9.482	82	5.49	12.311
7	-8.01	6.081	33	-3.33	7.524	58	1.17	9.581	83	5.67	12.470
8	-7.83	6.127	34	-3.15	7.592	59	1.35	9.681	84	5.85	12.630
9	-7.65	6.173	35	-2.97	7.661	60	1.53	9.782	85	6.03	5.739
10	-7.47	6.220	36	-2.79	7.731	61	1.71	9.885	86	6.21	5.825
11	-7.29	6.267	37	-2.61	7.802	62	1.89	9.990	87	6.39	5.929
12	-7.11	6.316	38	-2.43	7.874	63	2.07	10.096	88	6.57	6.147
13	-6.93	6.365	39	-2.25	7.948	64	2.25	10.204	89	6.75	6.372
14	-6.75	6.414	40	-2.07	8.022	65	2.43	10.314	90	6.93	6.597
15	-6.57	6.465	41	-1.89	8.098	66	2.61	10.426	91	7.11	6.811
16	-6.39	6.516	42	-1.71	8.175	67	2.79	10.539	92	7.29	7.026
17	-6.21	6.569	43	-1.53	8.253	68	2.97	10.654	93	7.47	7.252
18	-6.03	6.622	44	-1.35	8.332	69	3.15	10.770	94	7.65	7.491
19	-5.85	6.676	45	-1.17	8.412	70	3.33	10.889	95	7.83	7.743
20	-5.67	6.730	46	-0.99	8.494	71	3.51	11.009	96	8.01	6.902
21	-5.49	6.786	47	-0.81	8.577	72	3.69	11.131	97	8.19	7.157
22	-5.31	6.842	48	-0.63	8.662	73	3.87	11.256	98	8.37	7.431
23	-5.13	6.899	49	-0.45	8.747	74	4.05	11.382	99	8.55	7.726
24	-4.95	6.958	50	-0.27	8.834	75	4.23	11.510	100	8.73	8.046
25	-4.77	7.017	51	-0.09	8.923	76	4.41	11.467	101	8.91	8.393
26	-4.59	7.077									

STEADY STATE CBOD INPUT CONDITIONS

POINT SOURCE INFLOW CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	23.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.000
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.000
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.000
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.000
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.000
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.000
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.000
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.000
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.000
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	23.000
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.000
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.000
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.000
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.000
24	-4.95	0.000	50	-0.27	0.000	75	4.23	23.000	100	8.73	0.000
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	4.550
26	-4.59	0.000									

NONPOINT SOURCE LOADS (LBS/DAY)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.720	27	-4.41	0.720	52	0.09	0.720	77	4.59	0.720
2	-8.91	0.720	28	-4.23	0.720	53	0.27	0.720	78	4.77	0.720
3	-8.73	0.720	29	-4.05	0.720	54	0.45	0.720	79	4.95	0.720
4	-8.55	0.720	30	-3.87	0.720	55	0.63	0.720	80	5.13	0.720
5	-8.37	0.720	31	-3.69	0.720	56	0.81	0.720	81	5.31	0.720
6	-8.19	0.720	32	-3.51	0.720	57	0.99	0.720	82	5.49	0.720
7	-8.01	0.720	33	-3.33	0.720	58	1.17	0.720	83	5.67	0.720
8	-7.83	0.720	34	-3.15	0.720	59	1.35	0.720	84	5.85	0.720
9	-7.65	0.720	35	-2.97	0.720	60	1.53	0.720	85	6.03	0.720
10	-7.47	0.720	36	-2.79	0.720	61	1.71	0.720	86	6.21	0.792
11	-7.29	0.720	37	-2.61	0.720	62	1.89	0.720	87	6.39	1.080
12	-7.11	0.720	38	-2.43	0.720	63	2.07	0.720	88	6.57	1.080

13	-6.93	0.720	39	-2.25	0.720	64	2.25	0.720	89	6.75	1.080
14	-6.75	0.720	40	-2.07	0.720	65	2.43	0.720	90	6.93	1.080
15	-6.57	0.720	41	-1.89	0.720	66	2.61	0.720	91	7.11	1.080
16	-6.39	0.720	42	-1.71	0.720	67	2.79	0.720	92	7.29	1.080
17	-6.21	0.720	43	-1.53	0.720	68	2.97	0.720	93	7.47	1.080
18	-6.03	0.720	44	-1.35	0.720	69	3.15	0.720	94	7.65	1.080
19	-5.85	0.720	45	-1.17	0.720	70	3.33	0.720	95	7.83	1.080
20	-5.67	0.720	46	-0.99	0.720	71	3.51	0.720	96	8.01	1.080
21	-5.49	0.720	47	-0.81	0.720	72	3.69	0.720	97	8.19	1.080
22	-5.31	0.720	48	-0.63	0.720	73	3.87	0.720	98	8.37	1.080
23	-5.13	0.720	49	-0.45	0.720	74	4.05	0.720	99	8.55	1.080
24	-4.95	0.720	50	-0.27	0.720	75	4.23	0.720	100	8.73	1.080
25	-4.77	0.720	51	-0.09	0.720	76	4.41	0.720	101	8.91	1.080
26	-4.59	0.720									

Red Chute Bayou TMDL 10/05 treatment 6 effluent DO

STEADY STATE CBOD CONCENTRATIONS (PPM)

OUTFLOW AT DOWNSTREAM END = 10.1 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	4.094	27	-4.41	5.681	52	0.09	7.936	77	4.59	11.034
2	-8.91	4.144	28	-4.23	5.756	53	0.27	8.046	78	4.77	11.192
3	-8.73	4.195	29	-4.05	5.831	54	0.45	8.157	79	4.95	11.353
4	-8.55	4.246	30	-3.87	5.908	55	0.63	8.270	80	5.13	11.517
5	-8.37	4.299	31	-3.69	5.986	56	0.81	8.384	81	5.31	11.683
6	-8.19	4.352	32	-3.51	6.066	57	0.99	8.501	82	5.49	11.853
7	-8.01	4.406	33	-3.33	6.146	58	1.17	8.619	83	5.67	12.026
8	-7.83	4.461	34	-3.15	6.228	59	1.35	8.739	84	5.85	12.198
9	-7.65	4.517	35	-2.97	6.311	60	1.53	8.861	85	6.03	3.765
10	-7.47	4.573	36	-2.79	6.396	61	1.71	8.985	86	6.21	3.831
11	-7.29	4.631	37	-2.61	6.481	62	1.89	9.110	87	6.39	3.901
12	-7.11	4.689	38	-2.43	6.568	63	2.07	9.238	88	6.57	4.029
13	-6.93	4.748	39	-2.25	6.656	64	2.25	9.367	89	6.75	4.160
14	-6.75	4.809	40	-2.07	6.746	65	2.43	9.499	90	6.93	4.292
15	-6.57	4.870	41	-1.89	6.837	66	2.61	9.632	91	7.11	4.418
16	-6.39	4.932	42	-1.71	6.930	67	2.79	9.768	92	7.29	4.544
17	-6.21	4.995	43	-1.53	7.023	68	2.97	9.906	93	7.47	4.678
18	-6.03	5.059	44	-1.35	7.119	69	3.15	10.046	94	7.65	4.821
19	-5.85	5.124	45	-1.17	7.216	70	3.33	10.188	95	7.83	4.973
20	-5.67	5.190	46	-0.99	7.314	71	3.51	10.332	96	8.01	3.669
21	-5.49	5.257	47	-0.81	7.414	72	3.69	10.478	97	8.19	3.789
22	-5.31	5.325	48	-0.63	7.515	73	3.87	10.627	98	8.37	3.918
23	-5.13	5.394	49	-0.45	7.618	74	4.05	10.779	99	8.55	4.058
24	-4.95	5.464	50	-0.27	7.723	75	4.23	10.932	100	8.73	4.209
25	-4.77	5.535	51	-0.09	7.829	76	4.41	10.878	101	8.91	4.372
26	-4.59	5.608									

STEADY STATE DO INPUT CONDITIONS

POINT SOURCE INFLOW CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	6.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.000
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.000
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.000
13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.000
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.000
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.000
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.000
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.000
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.000
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	6.000
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.000
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.000
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.000
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.000
24	-4.95	0.000	50	-0.27	0.000	75	4.23	6.000	100	8.73	0.000
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	3.700
26	-4.59	0.000									

NONPOINT SOURCE LOADS (LBS/DAY)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	0.000	27	-4.41	0.000	52	0.09	0.000	77	4.59	0.000
2	-8.91	0.000	28	-4.23	0.000	53	0.27	0.000	78	4.77	0.000
3	-8.73	0.000	29	-4.05	0.000	54	0.45	0.000	79	4.95	0.000
4	-8.55	0.000	30	-3.87	0.000	55	0.63	0.000	80	5.13	0.000
5	-8.37	0.000	31	-3.69	0.000	56	0.81	0.000	81	5.31	0.000
6	-8.19	0.000	32	-3.51	0.000	57	0.99	0.000	82	5.49	0.000
7	-8.01	0.000	33	-3.33	0.000	58	1.17	0.000	83	5.67	0.000
8	-7.83	0.000	34	-3.15	0.000	59	1.35	0.000	84	5.85	0.000
9	-7.65	0.000	35	-2.97	0.000	60	1.53	0.000	85	6.03	0.000
10	-7.47	0.000	36	-2.79	0.000	61	1.71	0.000	86	6.21	0.133
11	-7.29	0.000	37	-2.61	0.000	62	1.89	0.000	87	6.39	0.666
12	-7.11	0.000	38	-2.43	0.000	63	2.07	0.000	88	6.57	0.666

13	-6.93	0.000	39	-2.25	0.000	64	2.25	0.000	89	6.75	0.666
14	-6.75	0.000	40	-2.07	0.000	65	2.43	0.000	90	6.93	0.666
15	-6.57	0.000	41	-1.89	0.000	66	2.61	0.000	91	7.11	0.666
16	-6.39	0.000	42	-1.71	0.000	67	2.79	0.000	92	7.29	0.666
17	-6.21	0.000	43	-1.53	0.000	68	2.97	0.000	93	7.47	0.666
18	-6.03	0.000	44	-1.35	0.000	69	3.15	0.000	94	7.65	0.666
19	-5.85	0.000	45	-1.17	0.000	70	3.33	0.000	95	7.83	0.666
20	-5.67	0.000	46	-0.99	0.000	71	3.51	0.000	96	8.01	0.666
21	-5.49	0.000	47	-0.81	0.000	72	3.69	0.000	97	8.19	0.666
22	-5.31	0.000	48	-0.63	0.000	73	3.87	0.000	98	8.37	0.666
23	-5.13	0.000	49	-0.45	0.000	74	4.05	0.000	99	8.55	0.666
24	-4.95	0.000	50	-0.27	0.000	75	4.23	0.000	100	8.73	0.666
25	-4.77	0.000	51	-0.09	0.000	76	4.41	0.000	101	8.91	0.666
26	-4.59	0.000									

Red Chute Bayou TMDL 10/05 treatment 6 effluent DO

STEADY STATE DO CONCENTRATIONS (PPM)

OUTFLOW AT DOWNSTREAM END = 10.1 CFS

CONCENTRATIONS (PPM)

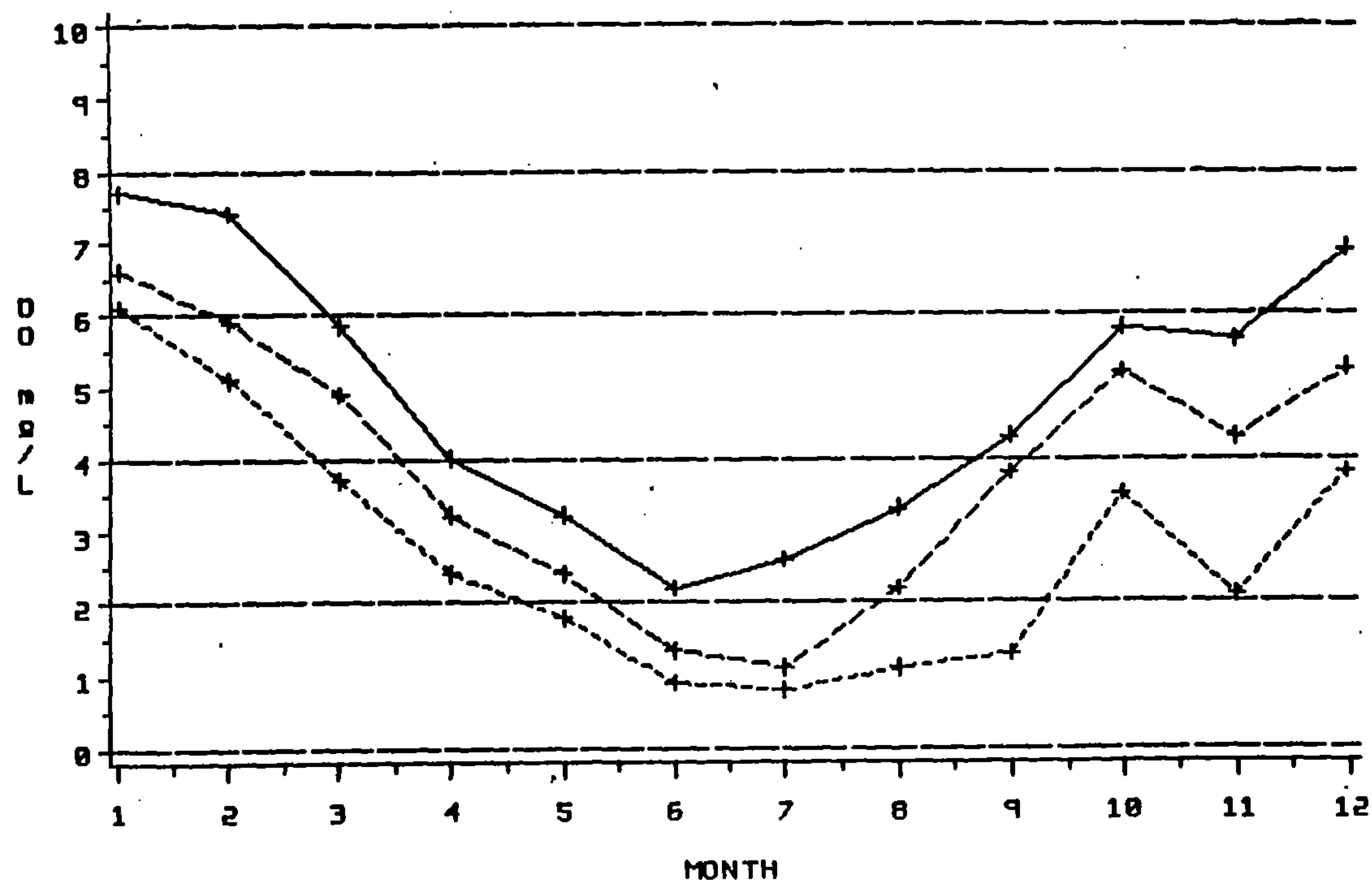
JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	-9.09	4.027	27	-4.41	3.688	52	0.09	3.234	77	4.59	3.359
2	-8.91	4.016	28	-4.23	3.672	53	0.27	3.215	78	4.77	3.474
3	-8.73	4.005	29	-4.05	3.656	54	0.45	3.196	79	4.95	3.612
4	-8.55	3.994	30	-3.87	3.640	55	0.63	3.177	80	5.13	3.774
5	-8.37	3.983	31	-3.69	3.623	56	0.81	3.159	81	5.31	3.962
6	-8.19	3.971	32	-3.51	3.606	57	0.99	3.141	82	5.49	4.171
7	-8.01	3.960	33	-3.33	3.589	58	1.17	3.124	83	5.67	4.398
8	-7.83	3.948	34	-3.15	3.572	59	1.35	3.108	84	5.85	4.645
9	-7.65	3.936	35	-2.97	3.555	60	1.53	3.092	85	6.03	4.042
10	-7.47	3.924	36	-2.79	3.537	61	1.71	3.078	86	6.21	4.055
11	-7.29	3.912	37	-2.61	3.520	62	1.89	3.064	87	6.39	4.094
12	-7.11	3.899	38	-2.43	3.501	63	2.07	3.052	88	6.57	4.176
13	-6.93	3.887	39	-2.25	3.483	64	2.25	3.042	89	6.75	4.248
14	-6.75	3.874	40	-2.07	3.465	65	2.43	3.034	90	6.93	4.299
15	-6.57	3.861	41	-1.89	3.446	66	2.61	3.028	91	7.11	4.313
16	-6.39	3.847	42	-1.71	3.427	67	2.79	3.025	92	7.29	4.311
17	-6.21	3.834	43	-1.53	3.408	68	2.97	3.024	93	7.47	4.313
18	-6.03	3.820	44	-1.35	3.389	69	3.15	3.028	94	7.65	4.321
19	-5.85	3.806	45	-1.17	3.370	70	3.33	3.035	95	7.83	4.338
20	-5.67	3.792	46	-0.99	3.351	71	3.51	3.047	96	8.01	4.232
21	-5.49	3.778	47	-0.81	3.331	72	3.69	3.064	97	8.19	4.190
22	-5.31	3.764	48	-0.63	3.312	73	3.87	3.088	98	8.37	4.137
23	-5.13	3.749	49	-0.45	3.292	74	4.05	3.145	99	8.55	4.070
24	-4.95	3.734	50	-0.27	3.273	75	4.23	3.223	100	8.73	3.981
25	-4.77	3.719	51	-0.09	3.253	76	4.41	3.265	101	8.91	3.863
26	-4.59	3.703(									

FY 89 205 (J) (1)
Grant No: C6-220000-29
IAG No: 24032-91-01
Red Chute WLA 91.07/Rogers
Originated: August 17, 1991

APPENDIX B - HISTORICAL WATER QUALITY DATA

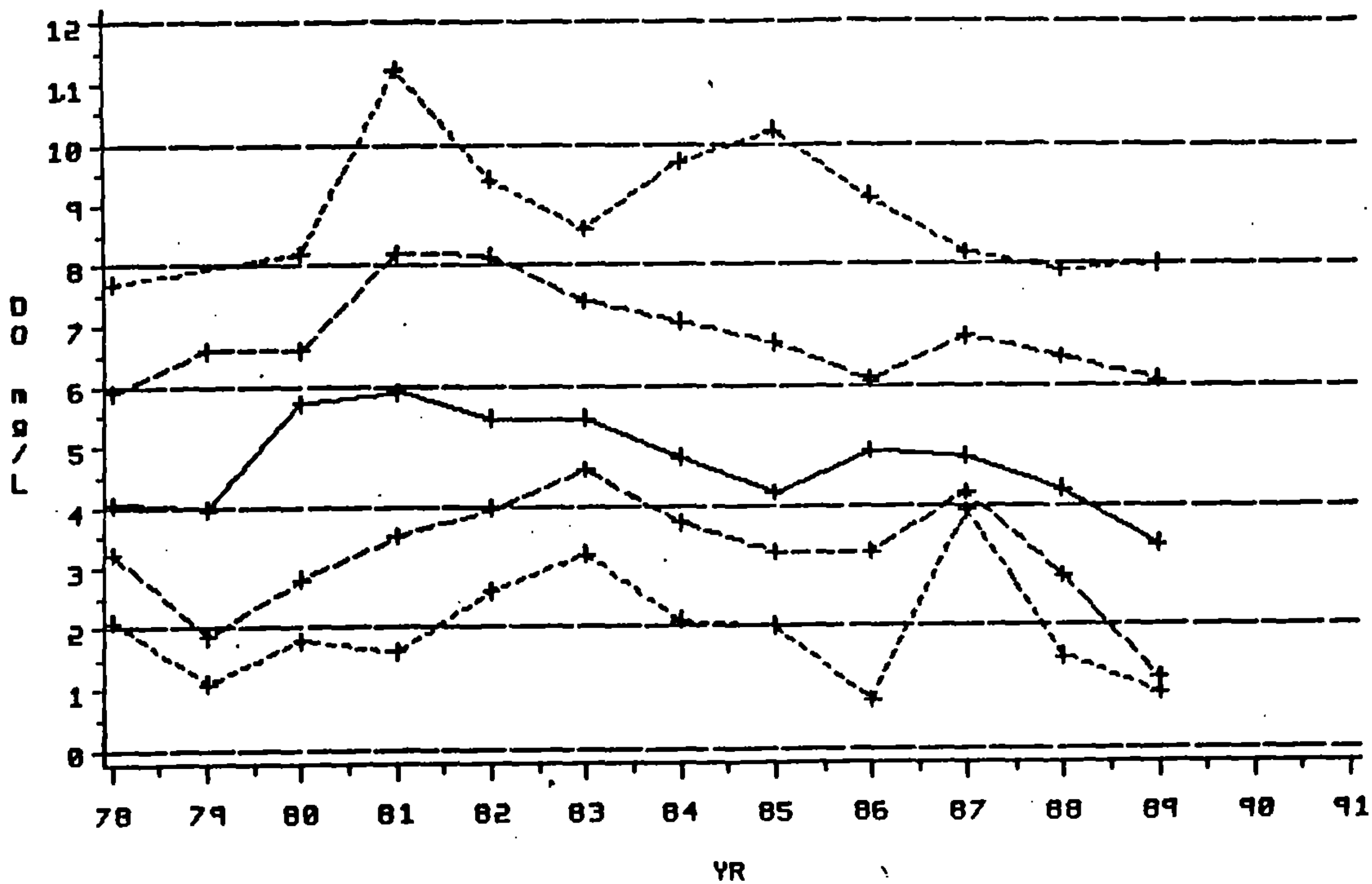
Red Chute Bayou east of Shreveport, Louisiana

MEDIAN, Q1, AND MIN



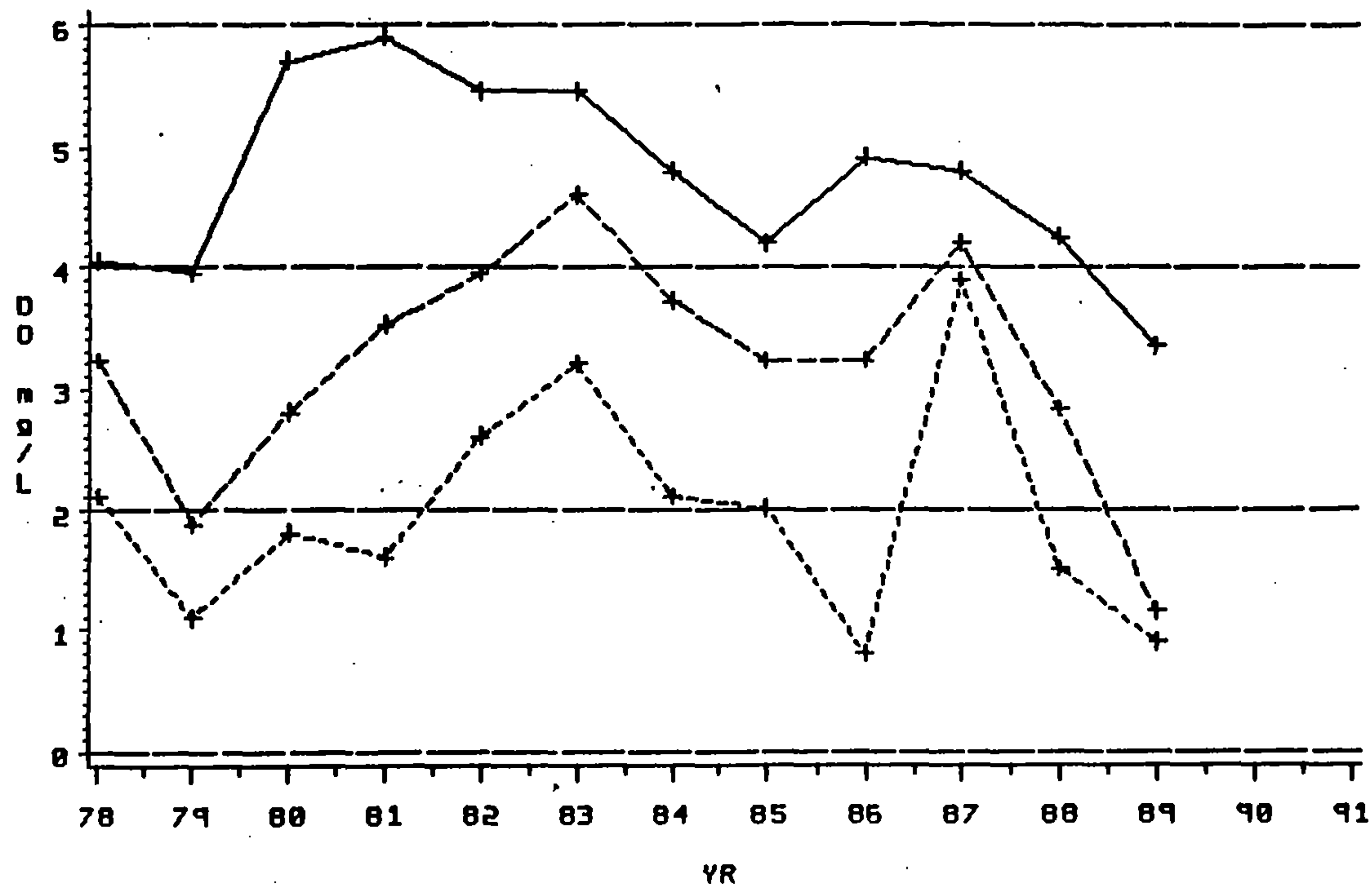
Red Chute Bayou east of Shreveport, Louisiana

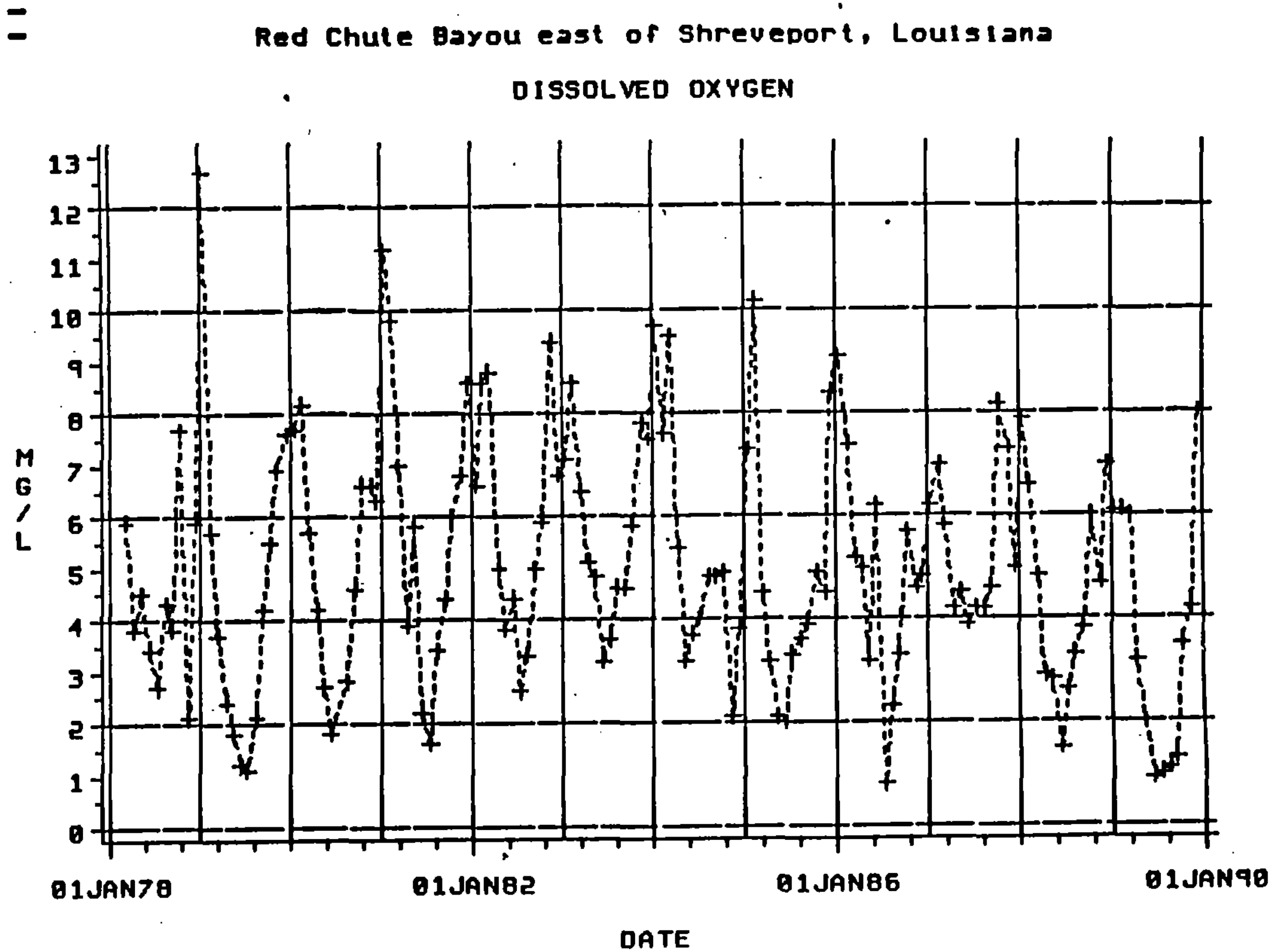
MAX, Q3, MEDIAN, Q1, AND MIN



Red Chute Bayou east of Shreveport, Louisiana

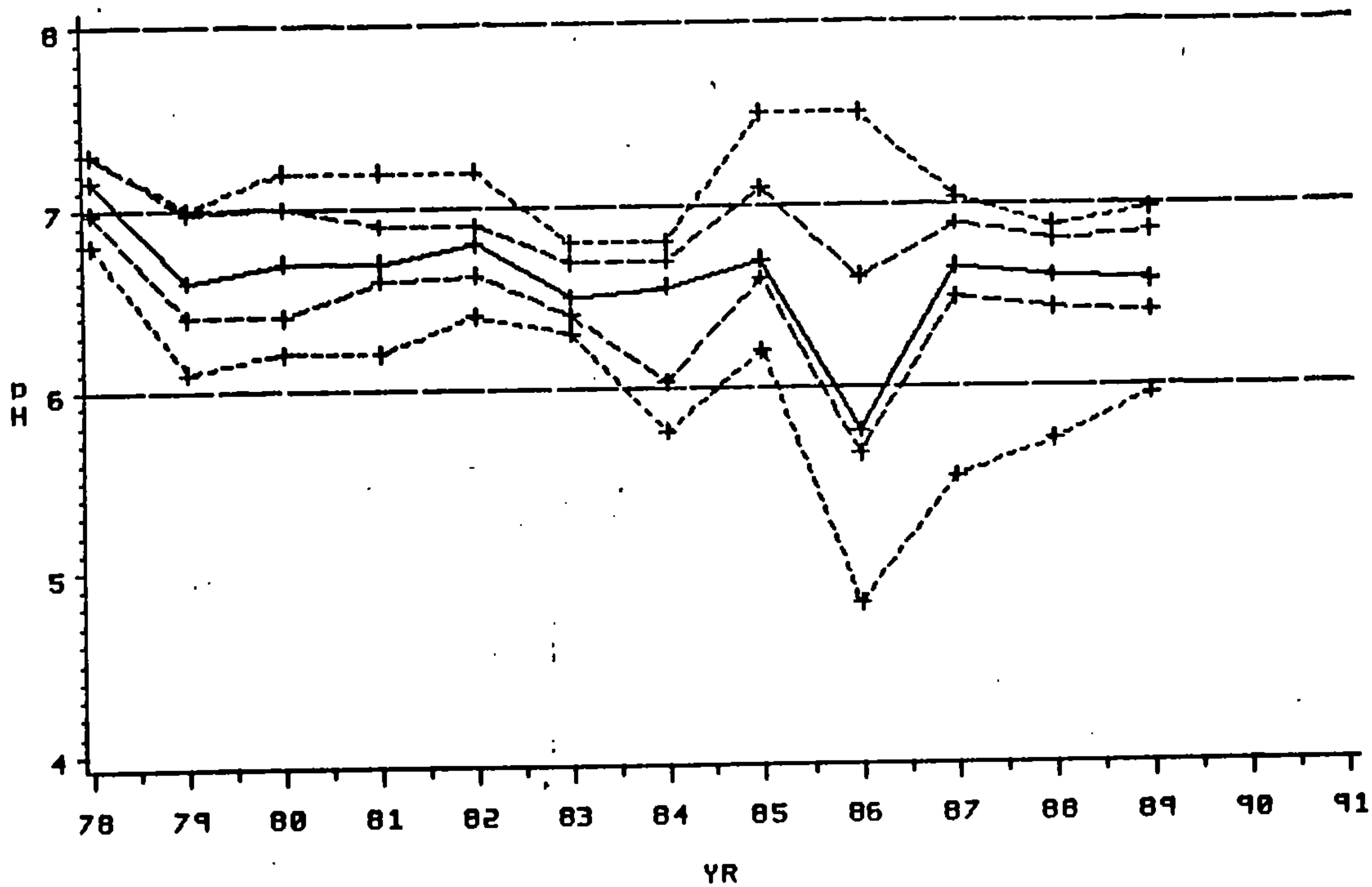
MEDIAN, Q1, AND MIN




Red Chute Bayou east of Shreveport, Louisiana
DISSOLVED OXYGEN
M G / L
13
12
11
10
9
8
7
6
5
4
3
2
1
0
01JAN78
01JAN82
01JAN86
01JAN90
DATE

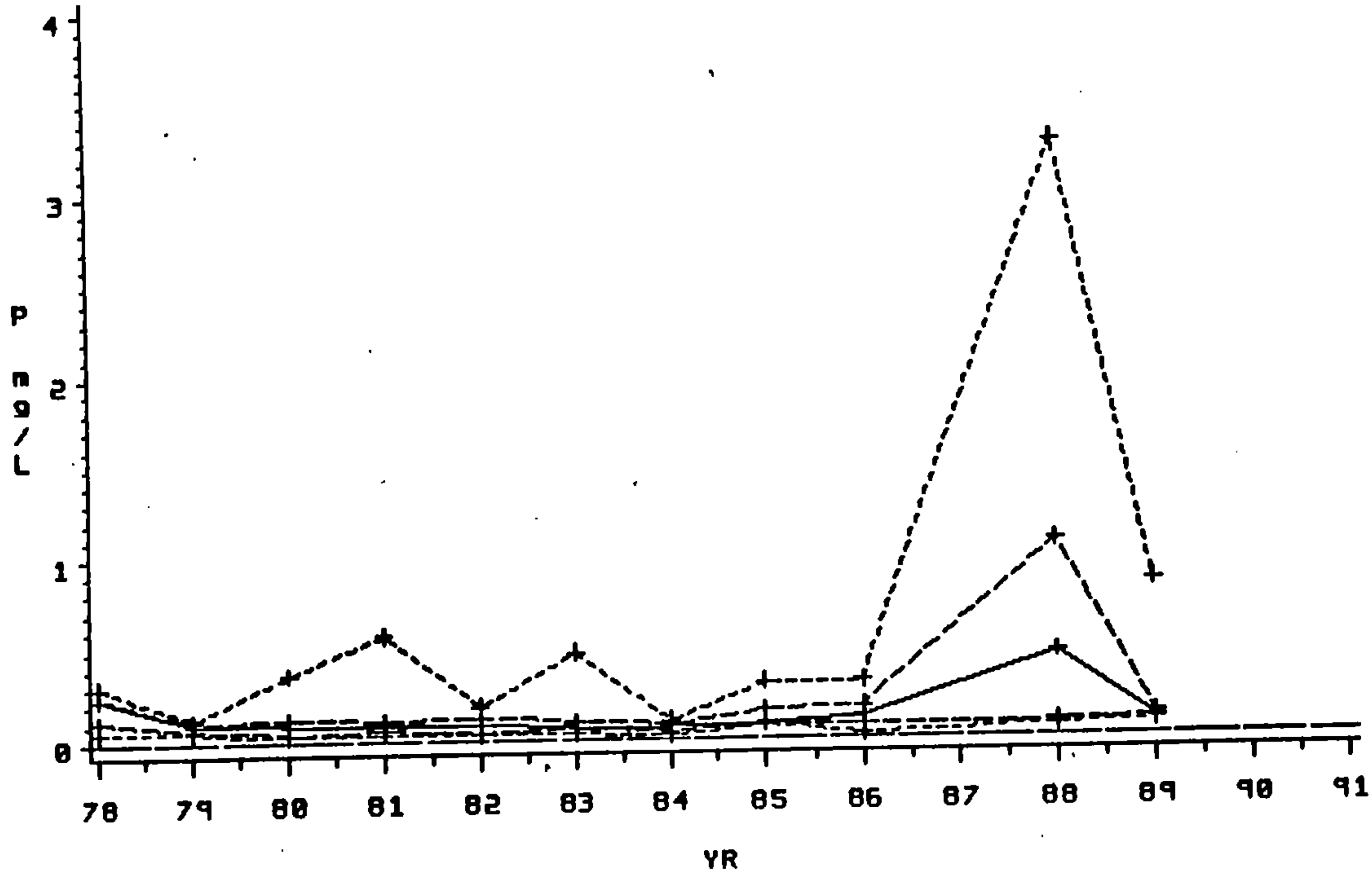
Red Chute Bayou east of Shreveport, Louisiana

MAX, Q3, MEDIAN, Q1, AND MIN



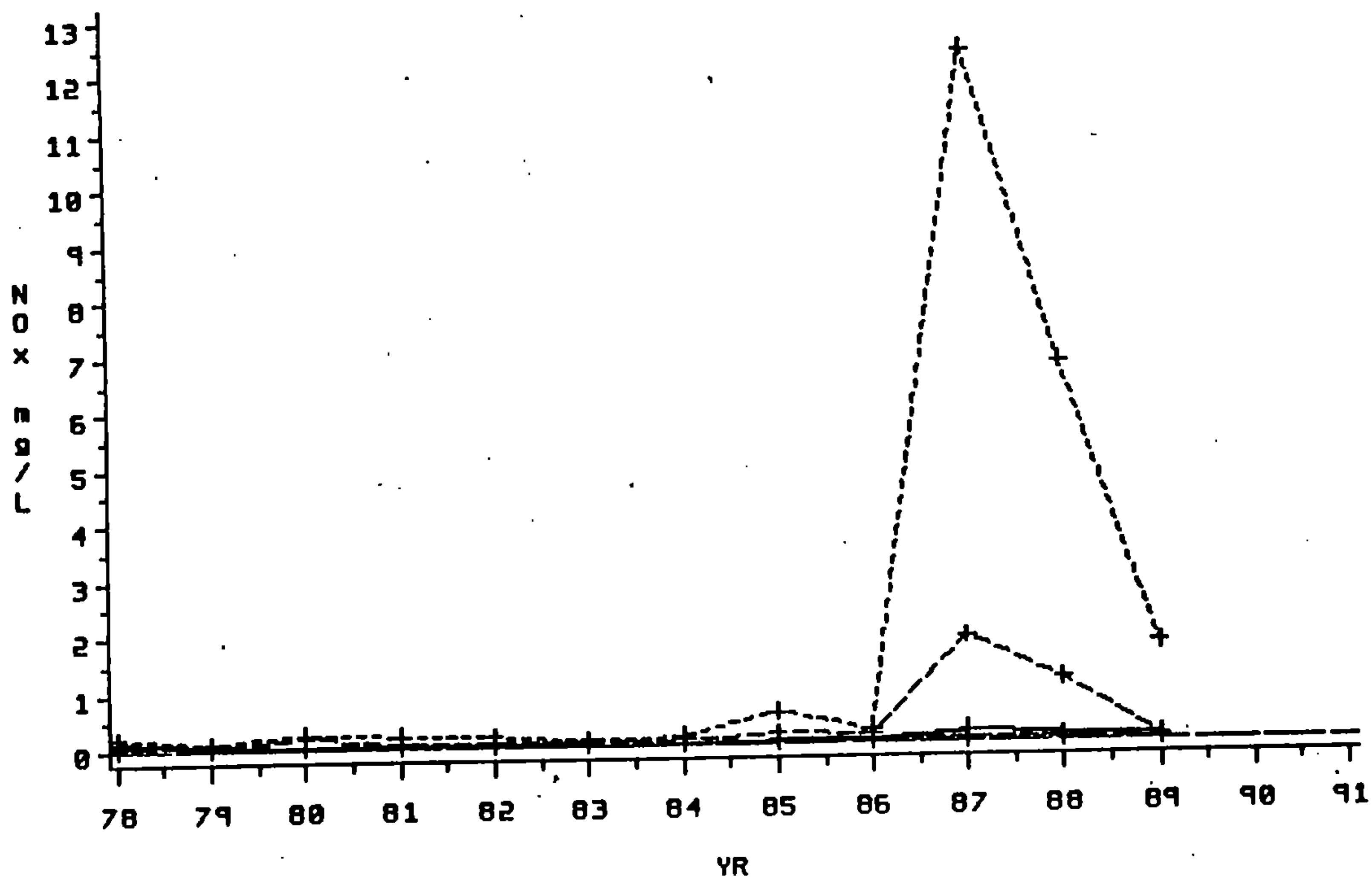
Red Chute Bayou east of Shreveport, Louisiana

MAX, Q3, MEDIAN, Q1, AND MIN



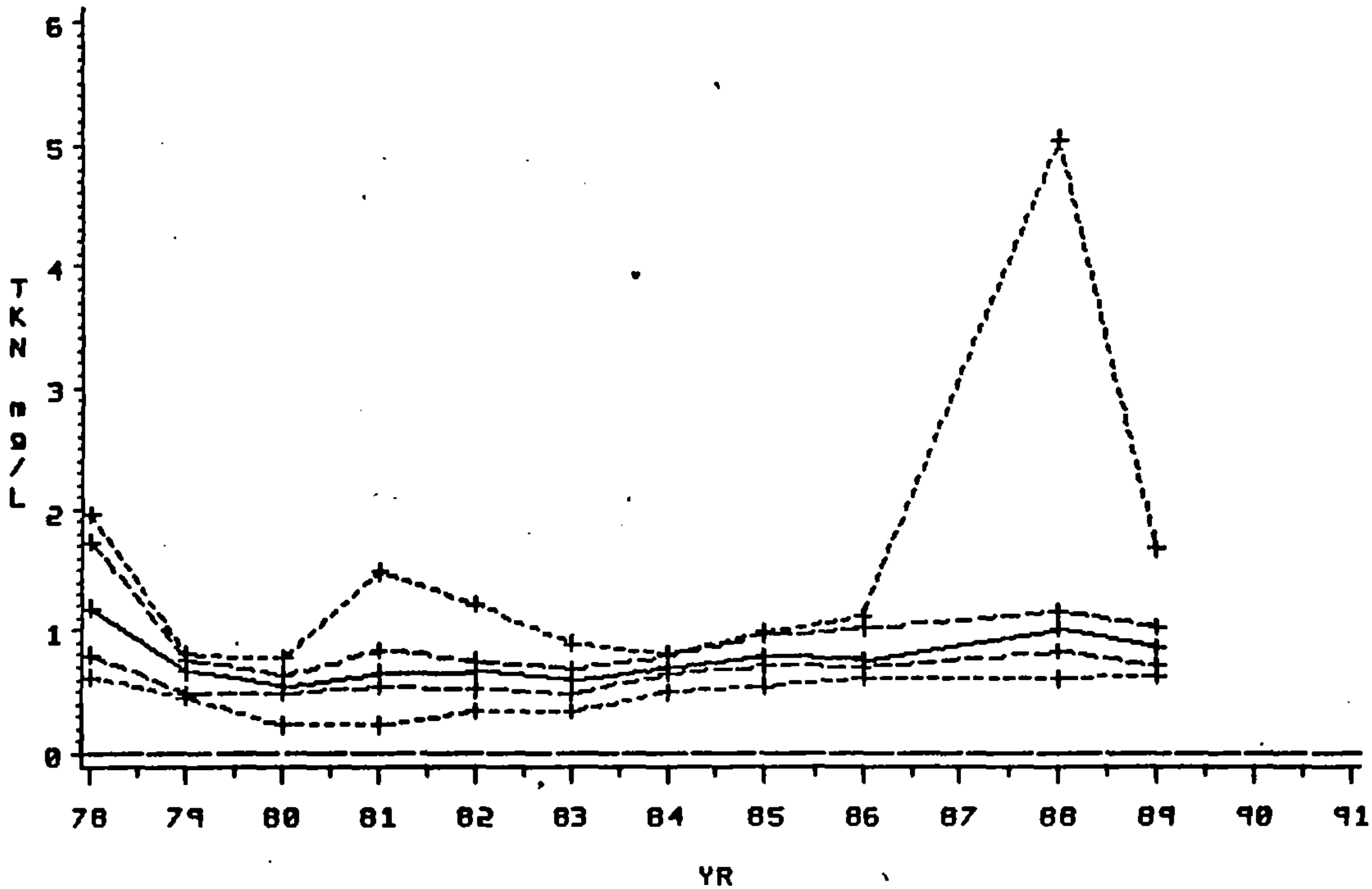
Red Chute Bayou east of Shreveport, Louisiana

MAX, Q3, MEDIAN, Q1, AND MIN



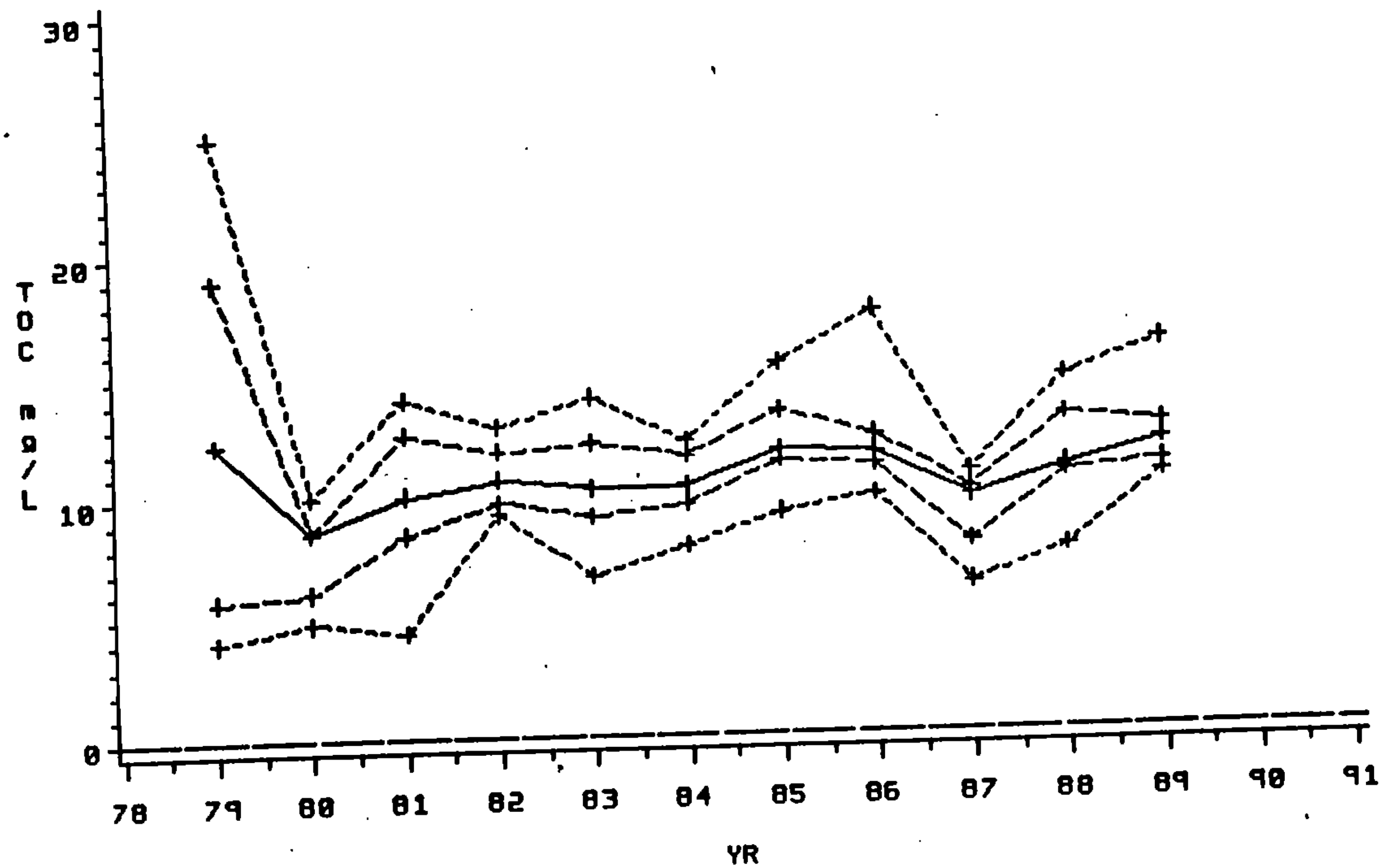
Red Chute Bayou east of Shreveport, Louisiana

MAX, Q3, MEDIAN, Q1, AND MIN



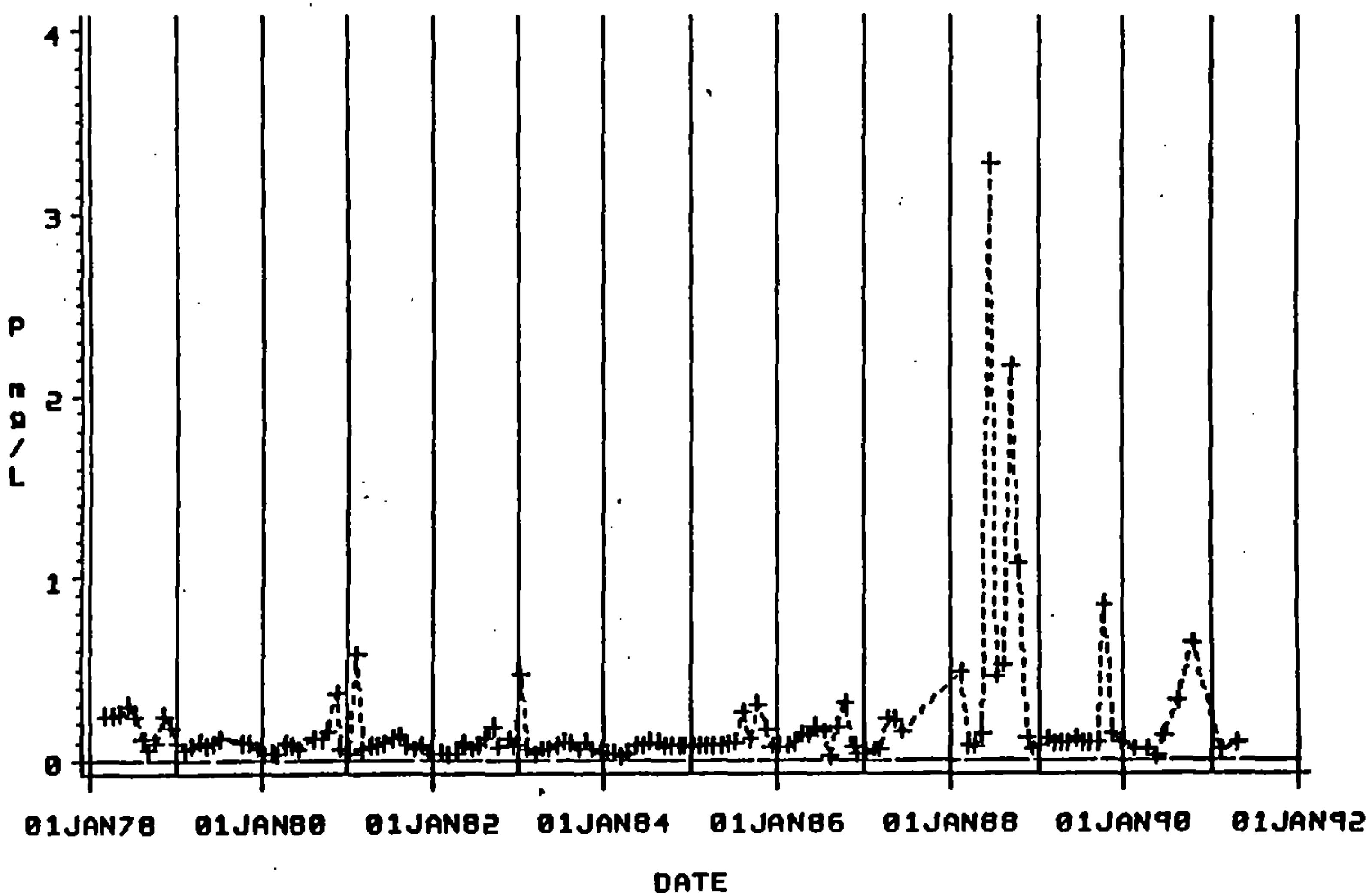
Red Chute Bayou east of Shreveport, Louisiana

MAX, Q3, MEDIAN, Q1, AND MIN



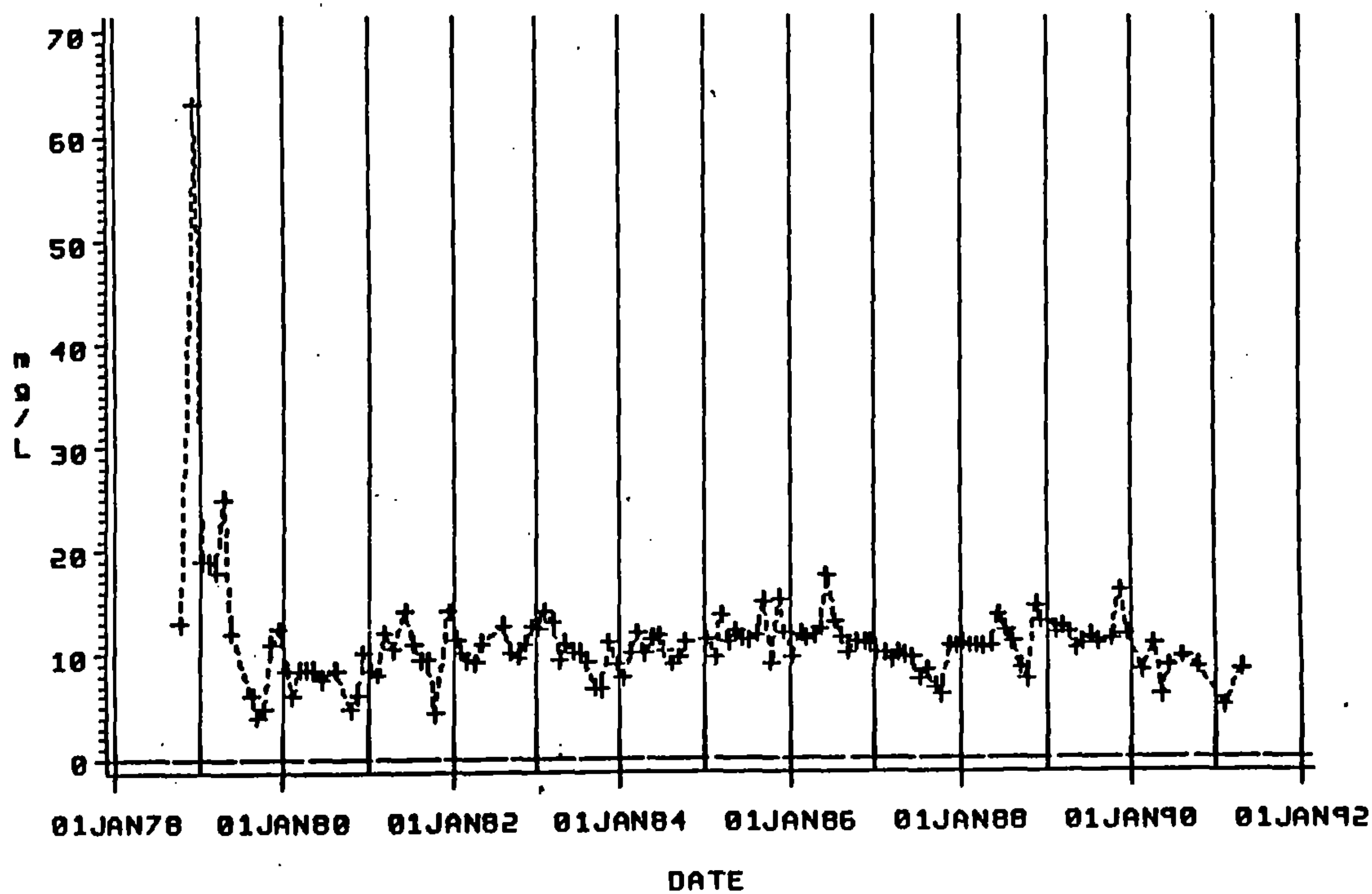
Red Chute Bayou east of Shreveport, Louisiana

Phosphorus



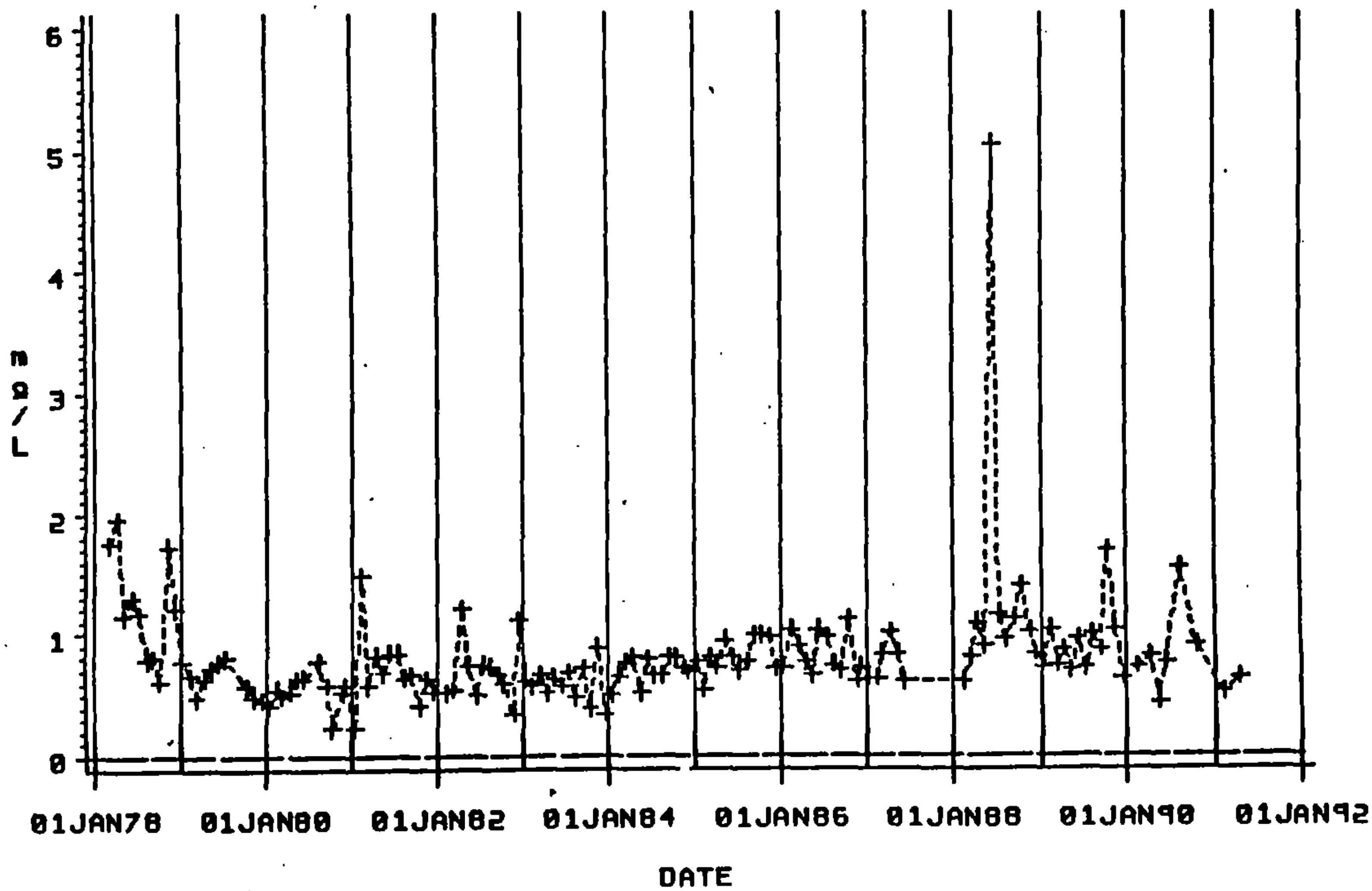
Red Chute Bayou east of Shreveport, Louisiana

Total Organic Carbon



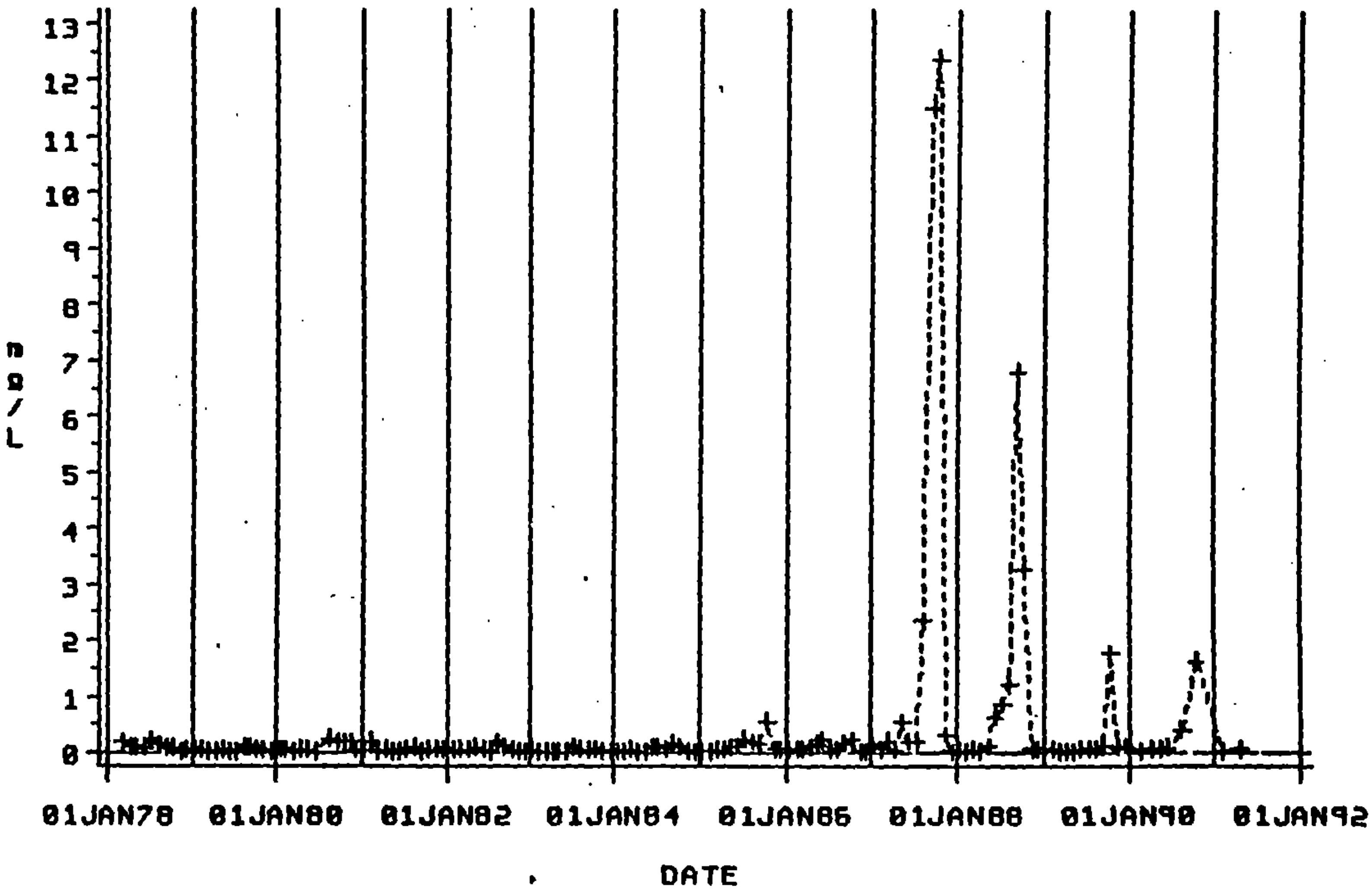
Red Chute Bayou east of Shreveport, Louisiana

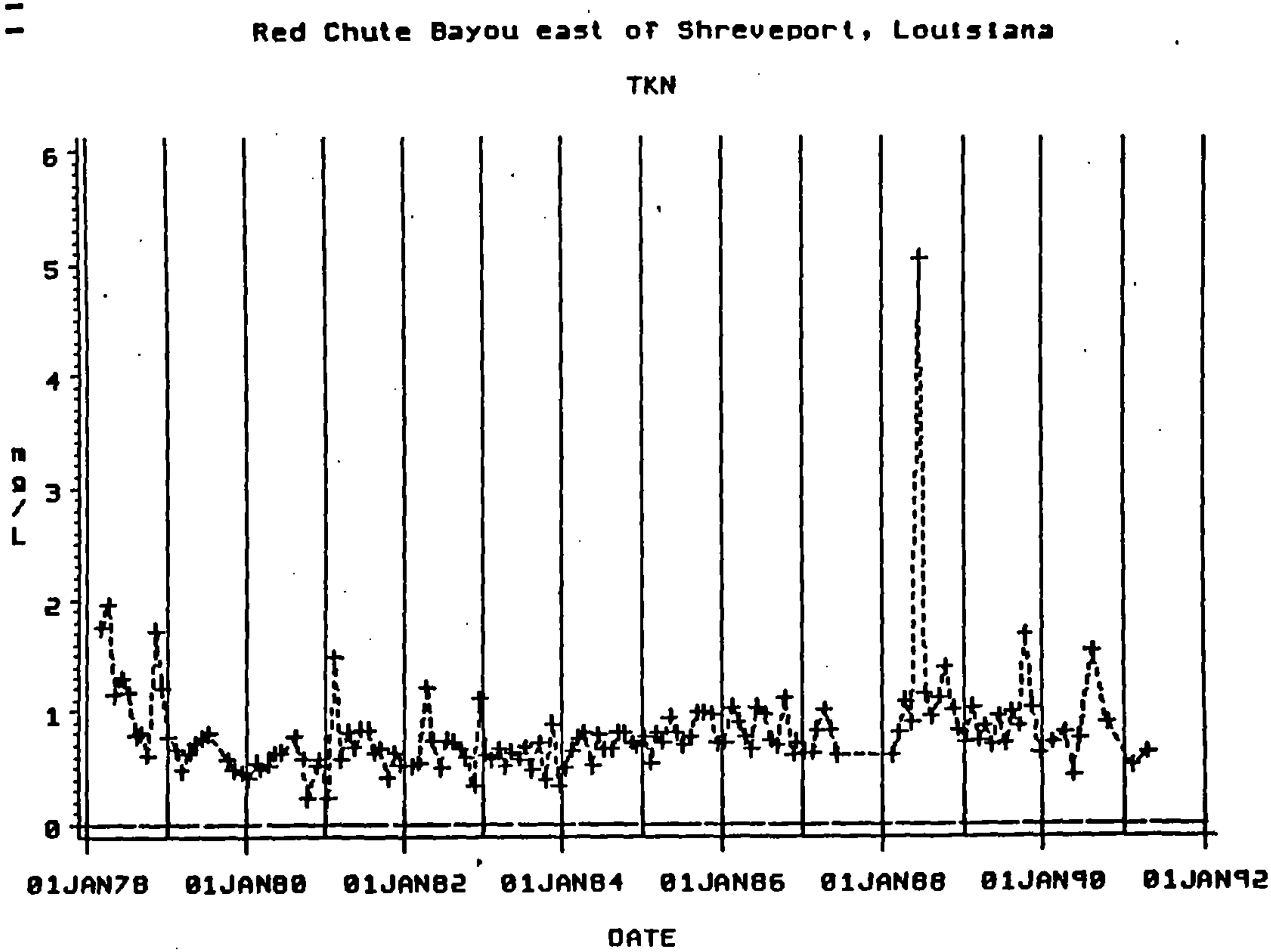
TKN



Red Chute Bayou east of Shreveport, Louisiana

NO2+NO3

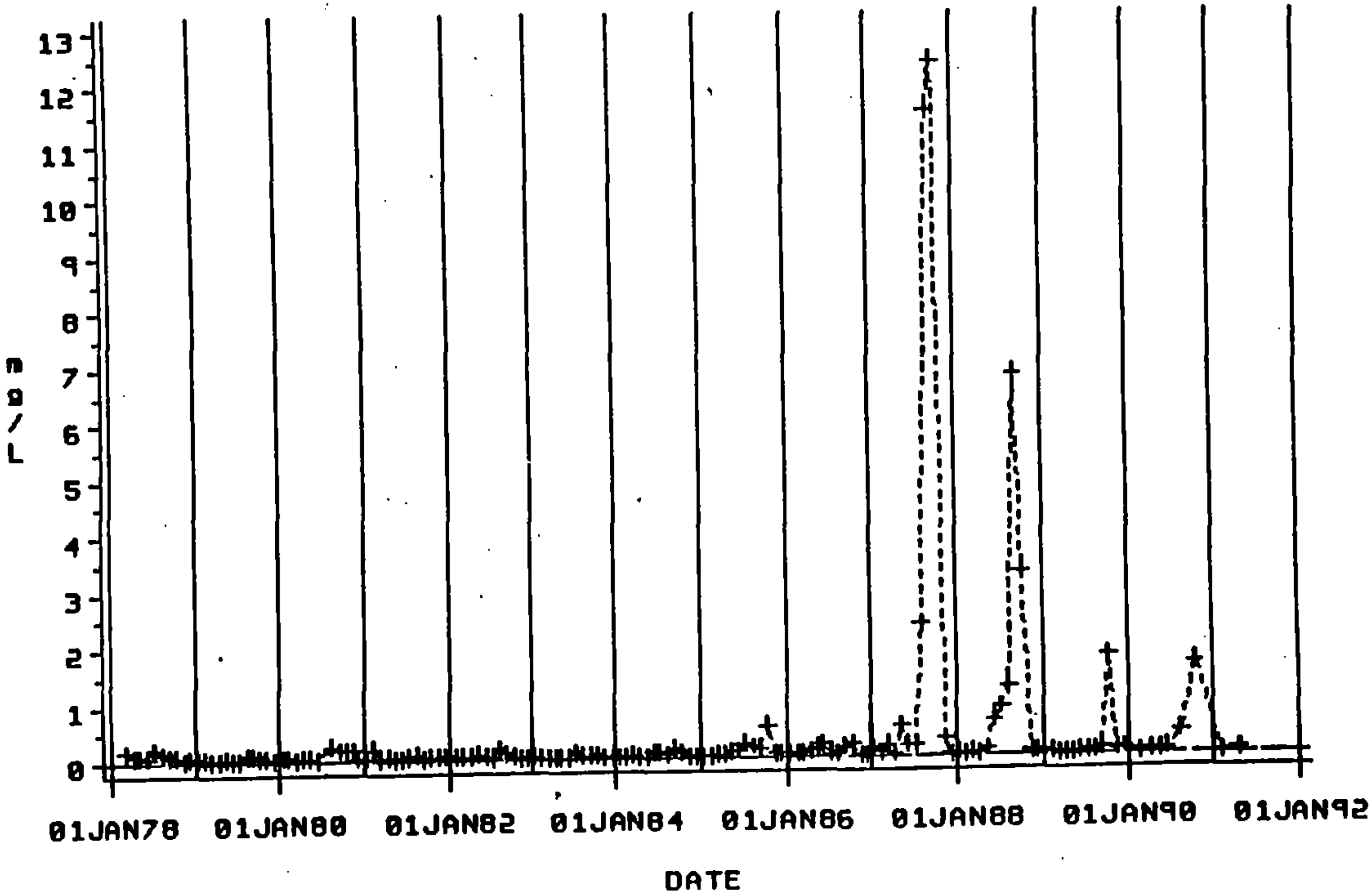




Red Chute Bayou east of Shreveport, Louisiana
TKN
mg/L
0
1
2
3
4
5
6
01JAN78
01JAN80
01JAN82
01JAN84
01JAN86
01JAN88
01JAN90
01JAN92
DATE

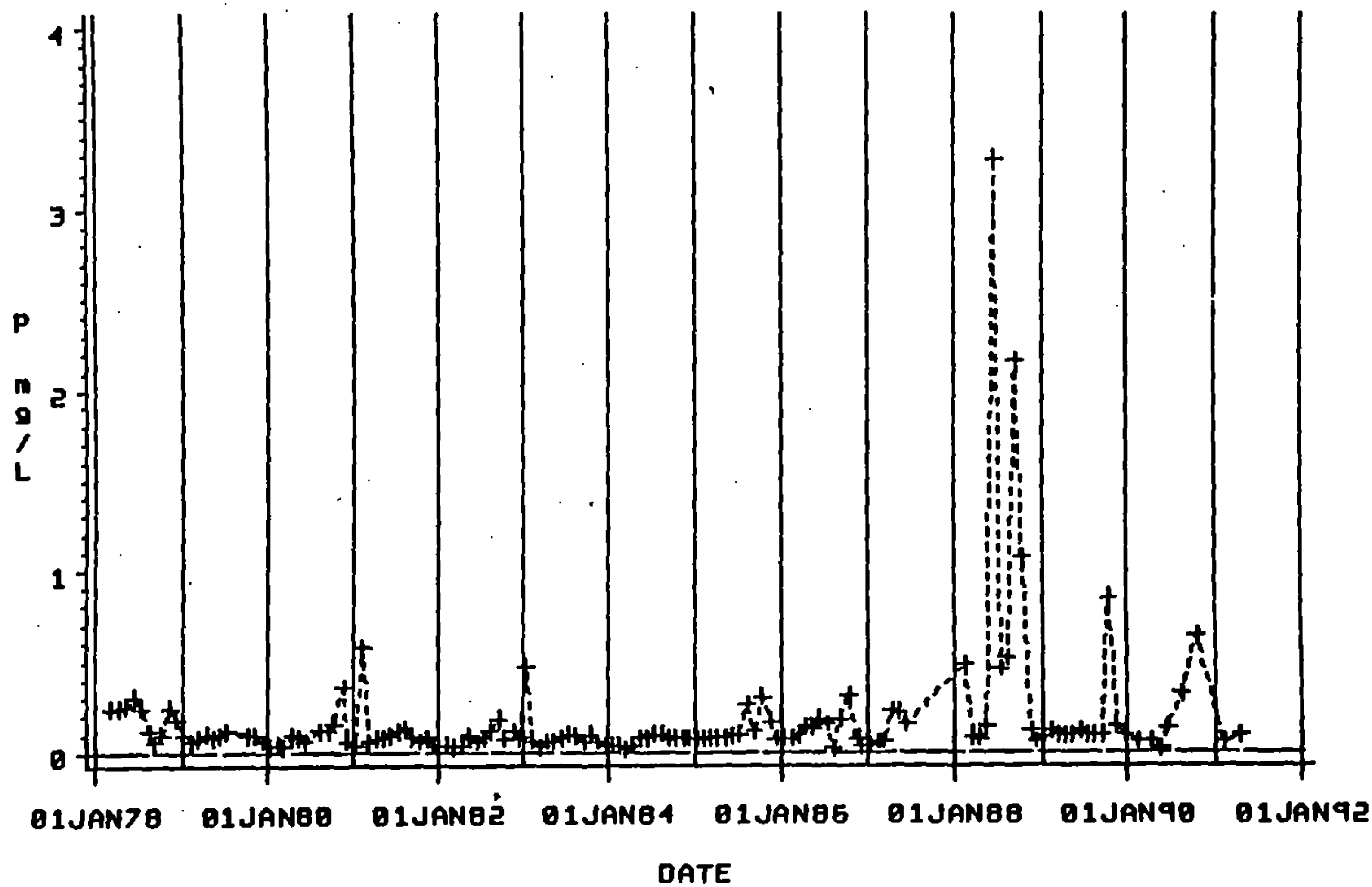
Red Chute Bayou east of Shreveport, Louisiana

NO2+NO3



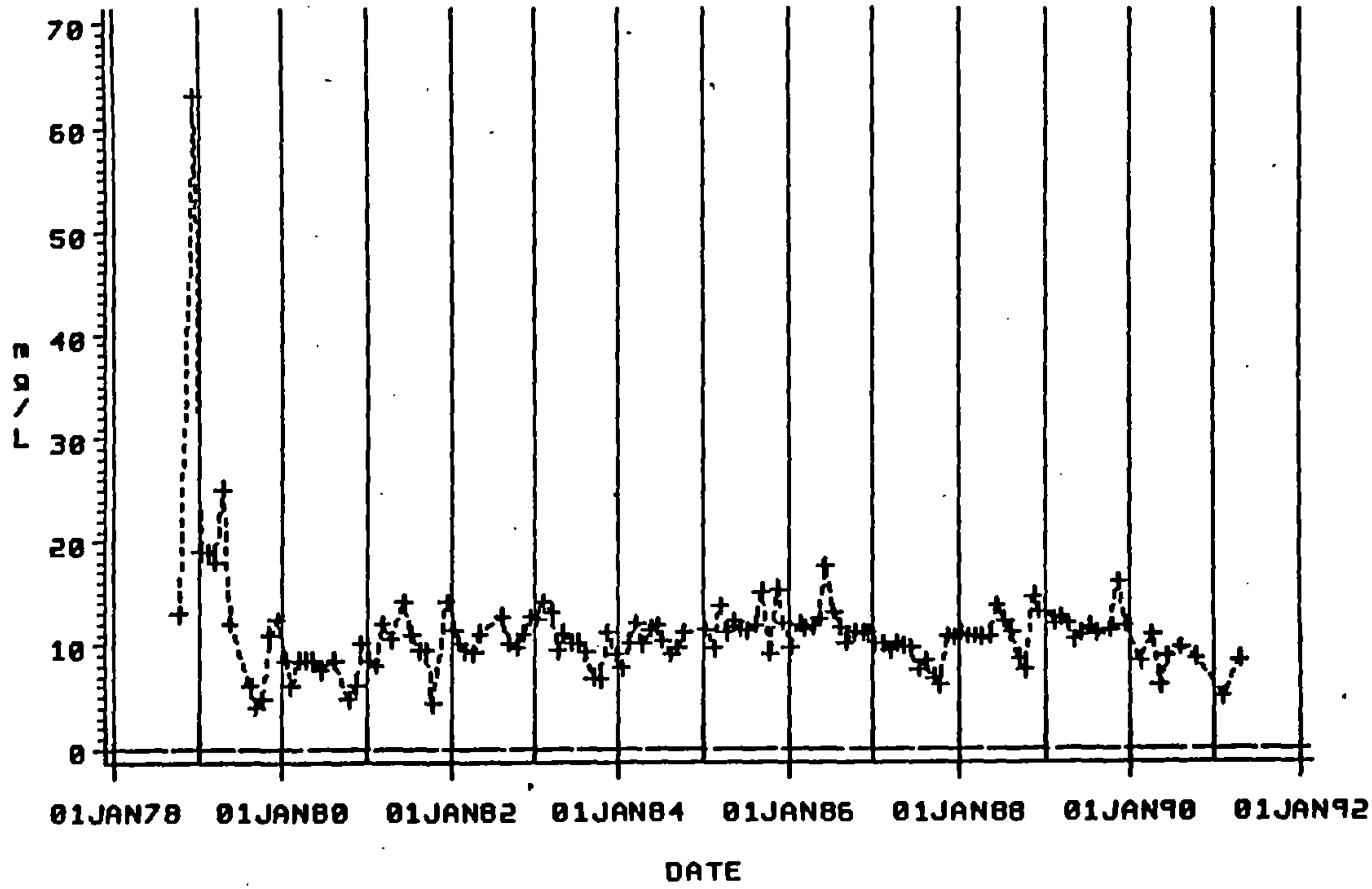
Red Chute Bayou east of Shreveport, Louisiana

Phosphorus



Red Chute Bayou east of Shreveport, Louisiana

Total Organic Carbon



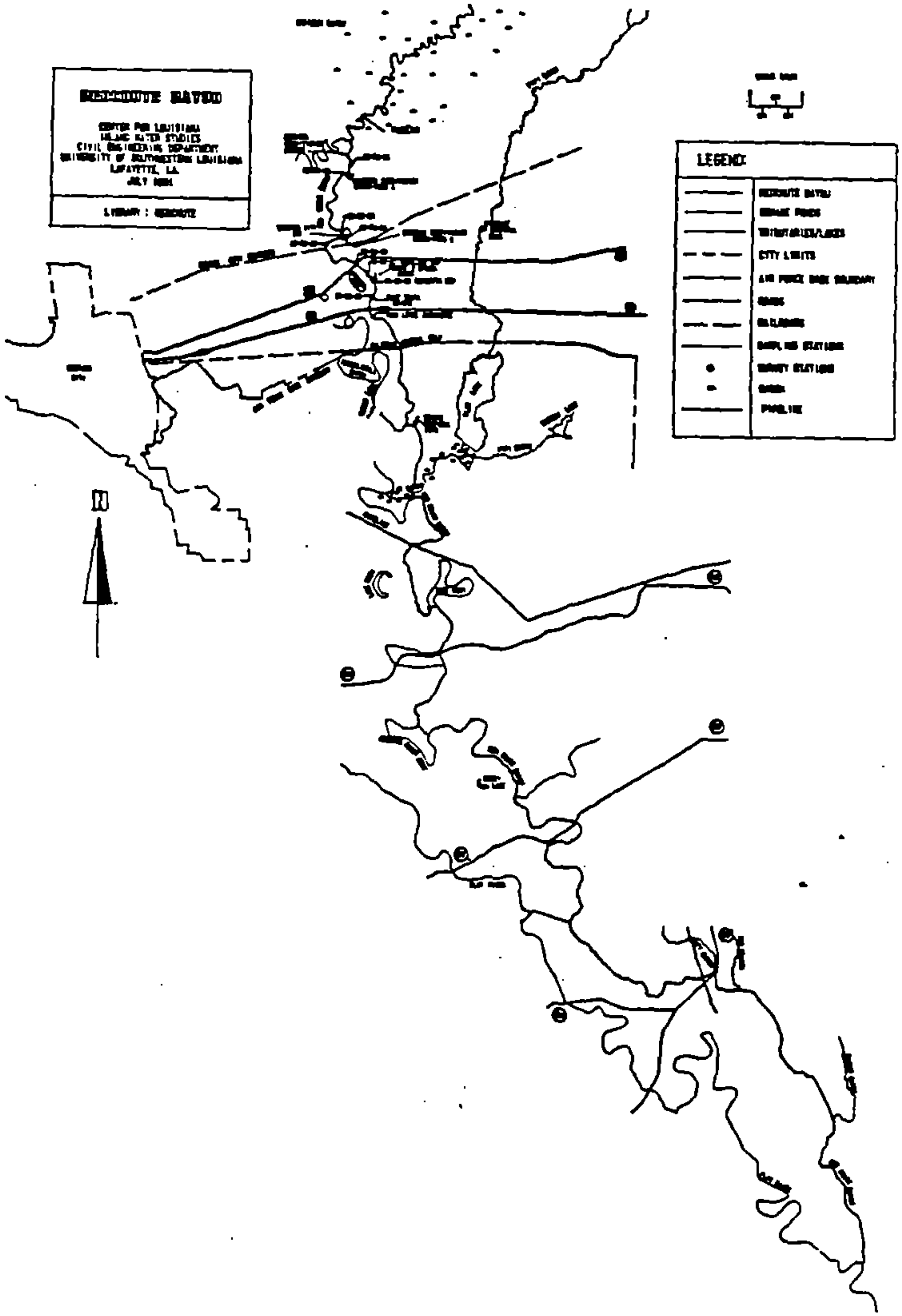


Figure 1 - Study Area Map of Red Chute Bayou

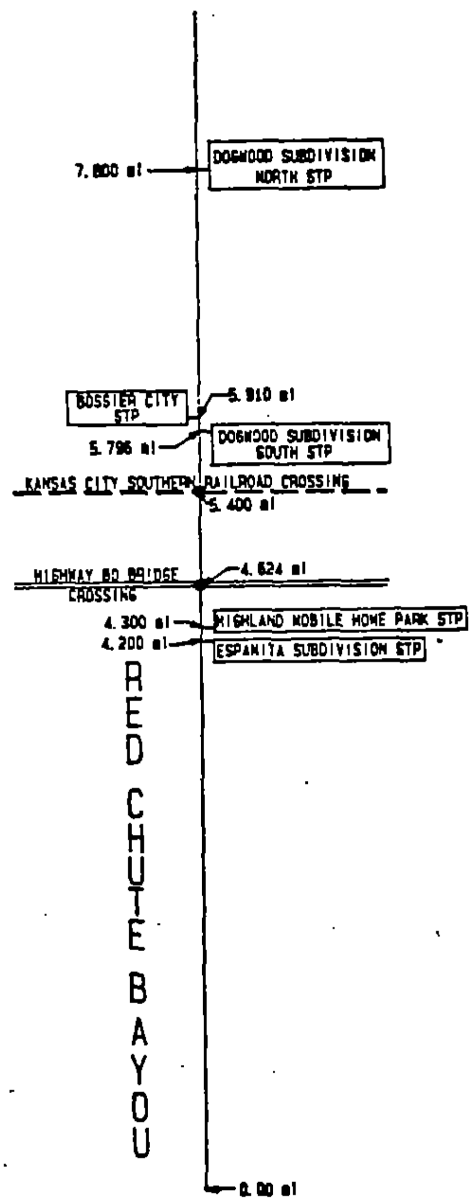


Figure 6 - Vector Diagram Red Chute Bayou near Bossier City