TMDLS FOR CHLORIDE, SULFATE, TDS, AND TURBIDITY IN THE BAYOU BARTHOLOMEW WATERSHED, ARKANSAS

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards, and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be allocated to point sources and nonpoint sources discharging to the waterbody. This report presents TMDLs that have been developed for chloride, sulfate, and total dissolved solids (TDS) for four reaches of Bayou Bartholomew (reaches 08040205-013, 08040205-012U, 08040205-002, and 08040205-001) and for turbidity for Cutoff Creek (reach 08040205-007), which is a tributary of Bayou Bartholomew.

Bayou Bartholomew originates near Pine Bluff and flows generally southward through southeastern Arkansas and into northeastern Louisiana. The drainage area of Bayou Bartholomew at the Arkansas–Louisiana state line is almost 1,187 square miles, including 322 square miles in the Cutoff Creek watershed. The western side of the Bayou Bartholomew watershed (including Cutoff Creek) is in the Gulf Coastal ecoregion, which is mostly forested. The eastern side of the watershed (including most of the main stem of Bayou Bartholomew) is in the Delta ecoregion, which is mostly cropland and is flat. The Bayou Bartholomew watershed is in Planning Segment 2B.

These five stream reaches were included on the final 2004 Arkansas 303(d) list for not supporting their designated uses of agricultural and industrial water supply (the four reaches of Bayou Bartholomew) or aquatic life (Cutoff Creek). Based on the 2004 Integrated Report, the primary causes of these impairments are chloride only for two reaches of Bayou Bartholomew, chloride and TDS for the other two reaches of Bayou Bartholomew, and siltation/turbidity for Cutoff Creek. The primary sources of contamination cited in the 2004 Integrated Report are agriculture (irrigation water that has elevated concentrations of dissolved minerals) and unknown sources.

Arkansas Department of Environmental Quality (ADEQ) historical water quality data collected at five locations were analyzed for basic statistics, seasonal patterns, and relationships

between concentration and stream flow. The most noticeable pattern was that the highest concentrations of chloride, TDS, and sulfate tended to occur at low stream flows. Also, the highest concentrations of chloride and TDS tended to occur during August through November. These findings are consistent with the presumption that irrigation water is the primary source of elevated concentrations of dissolved minerals in Bayou Bartholomew. For the Cutoff Creek turbidity and total suspended solids (TSS) data, there were no consistent seasonal patterns or relationships between water quality and stream flow rate.

The turbidity TMDL was expressed using TSS as a surrogate for turbidity because turbidity cannot be expressed as a mass load. A regression between TSS and turbidity was developed using ADEQ water quality data for Cutoff Creek. This resulted in target TSS concentrations of 16 mg/L for base flow conditions and 32 mg/L for storm flow conditions.

The load duration curve method was used to develop all 13 TMDLs (four chloride, four sulfate, four TDS, and one turbidity). This method illustrates allowable loading at a wide range of stream flow conditions. The steps for applying this methodology for the TMDLs in this report were: 1) developing a flow duration curve; 2) converting the flow duration curve to load duration curves; 3) plotting observed loads with load duration curves; 4) calculating the TMDL, margin of safety (MOS), wasteload allocation, and load allocation; and 5) calculating percent reductions.

An explicit MOS equal to 10% of the TMDL was established for each of the chloride, sulfate, and TDS TMDLs. An implicit MOS was established for the turbidity TMDL through the use of conservative assumptions. The primary conservative assumption was calculating the turbidity TMDL assuming that TSS is a conservative parameter and does not settle out of the water column.

The wasteload allocation for point source contributions in the turbidity TMDL was set to zero because TSS in this TMDL was considered to represent inorganic suspended solids (i.e., soil and sediment particles from erosion or sediment resuspension). The suspended solids discharged by the two point source discharges in the Cutoff Creek watershed (Pine Haven Mobile Lodge and City of Monticello East Plant) are assumed to consist primarily of organic solids rather than inorganic solids. Discharges of organic suspended solids from point sources are

already addressed by ADEQ through their permitting of point sources to maintain water quality standards for dissolved oxygen.

The wasteload allocations for point sources in the chloride, sulfate, and TDS TMDLs were set to equal to estimates of existing loads with no reductions. All 12 point source facilities that were included in the chloride, sulfate, and TDS TMDLs were facilities that discharge treated domestic wastewater. These discharges were considered to have negligible effect on existing violations of water quality standards because they represent a very small percentage of the total loading. Some of the point sources do not discharge during critical low-flow periods.

A percent reduction was calculated for each TMDL by applying a uniform percent reduction factor to the actual loads until the number of loads exceeding the allowable loads was less than or equal to an acceptable number based on ADEQ's assessment methods and water quality standards. These calculations indicated that no reductions of sulfate are needed, which is consistent with the fact that the 303(d) list did not include any sulfate impairments for these reaches. The percent reductions needed for chloride and TDS are greatest in the upstream reaches. No reductions are needed for turbidity even though the 303(d) list includes a turbidity impairment for Cutoff Creek. The percent reduction calculations for turbidity yield a different conclusion than the 303(d) list because the TMDL represents a more rigorous analysis of data.

The draft version of this TMDL report was developed using criteria of 50 mg/L chloride, 20 mg/L sulfate, and 500 mg/L TDS from the latest version of the water quality standards that was adopted by the State of Arkansas. After the draft TMDL report was issued for public comment, USEPA Region 6 disapproved these criteria. This action has caused the previously approved criteria for Bayou Bartholomew (30 mg/L chloride, 30 mg/L sulfate, and 220 mg/L TDS) to remain effective for Clean Water Act purposes in place of the newer criteria adopted by the State of Arkansas. The TMDLs in this report have now been revised to use the criteria approved by USEPA (30 mg/L chloride, 30 mg/L sulfate, and 220 mg/L TDS). The results of the revised TMDL calculations and percent reduction calculations are summarized in Tables ES.1 – ES.4.

Table ES.1. Summary of chloride TMDLs.

Reach ID	Stream name	Loads (tons/day of chloride)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	38.4	4.3	42.7	57%
08040205-012U	Bayou Bartholomew	0.4	52.7	5.9	59.0	38%
08040205-002	Bayou Bartholomew	0	92.6	10.3	102.9	24%
08040205-001	Bayou Bartholomew	0.07	96.0	10.7	106.8	0%

Table ES.2. Summary of sulfate TMDLs.

Reach ID	Stream name	Loads (tons/day of sulfate)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	38.4	4.3	42.7	0%
08040205-012U	Bayou Bartholomew	0.3	52.8	5.9	59.0	0%
08040205-002	Bayou Bartholomew	0	92.6	10.3	102.9	0%
08040205-001	Bayou Bartholomew	0.05	96.1	10.7	106.8	0%

Table ES.3. Summary of TDS TMDLs.

Reach ID	Stream name	Loads (tons/day of TDS)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	281.5	31.3	312.8	39%
08040205-012U	Bayou Bartholomew	2.4	386.7	43.2	432.3	23%
08040205-002	Bayou Bartholomew	0	679.1	75.5	754.6	1%
08040205-001	Bayou Bartholomew	0.43	704.7	78.3	783.4	0%

Table ES.4. Summary of turbidity TMDL.

Reach ID	Stream name	Flow Category	Loads (tons/day of TSS)				Percent Reduction Needed
			WLA	LA	MOS	TMDL	
08040205-007	Cutoff Creek	Base flow	0	0.58	implicit	0.58	0%
		Storm flow	0	32.4	implicit	32.4	0%

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1.0 INTRODUCTION

This report presents total maximum daily loads (TMDLs) for chloride, sulfate, and total dissolved solids (TDS) for four reaches of Bayou Bartholomew (reaches 08040205-013, 08040205-012U, 08040205-002, and 08040205-001) and for turbidity for Cutoff Creek (reach 08040205-007), which is a tributary of Bayou Bartholomew. These stream reaches were included on the draft and final versions of the 2004 303(d) list for Arkansas as not supporting their designated uses of either aquatic life or agricultural and industrial water supply (Arkansas Department of Environmental Quality (ADEQ) 2005a; United States Environmental Protection Agency (USEPA) 2006). Suspected sources of contamination, suspected causes of impairment, and priority rankings from the 303(d) list are shown in Table 1.1. The TMDLs in this report were developed in accordance with Section 303(d) of the Federal Clean Water Act and USEPA regulations at Title 40 Code of Federal Regulations (CFR) Part 130.7.

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant. The TMDL is the sum of the wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern. The LA is the load allocated to nonpoint sources, including natural background. The MOS is a percentage of the TMDL that takes into account any lack of knowledge concerning the relationship between pollutant loadings and water quality.

Table 1.1. Information from the 2004 Integrated Report for TMDLs in this report.

Reach Number	Stream Name	Impaired Uses	Suspected Causes of Impairment	Suspected Sources of Impairment	Category	Priority
08040205-013	Bayou Bartholomew	Agricultural & Industrial Water Supply	Chloride, TDS*	Agriculture	5b	Low
08040205-012U	Bayou Bartholomew	Agricultural & Industrial Water Supply	Chloride, TDS*	Agriculture	5b	Low
08040205-002	Bayou Bartholomew	Agricultural & Industrial Water Supply	Chloride*	Unknown	5b	Low
08040205-001	Bayou Bartholomew	Agricultural & Industrial Water Supply	Chloride*	Unknown	5b	Low
08040205-007	Cutoff Creek	Aquatic Life	Siltation / Turbidity	Unknown	5d	Medium

*Note: Only parameters cited on the 303(d) list as causes of impairment are shown in this table. At USEPA's direction, TMDLs in this report were developed for additional related parameters that are not currently classified as impairments (sulfate for all four reaches of Bayou Bartholomew and TDS for reaches -002 and -001 of Bayou Bartholomew). Several reaches of Bayou Bartholomew were included on the 303(d) list as impaired for pathogens and/or dissolved oxygen, but those impairments are not listed here because they are not relevant to the TMDLs in this report.

2.0 BACKGROUND INFORMATION

2.1 General Information

The study area for this report consists of the watershed for the five stream reaches listed in Table 1.1. These reaches are located in southeastern Arkansas as shown on Figure A.1 in Appendix A. Bayou Bartholomew originates near Pine Bluff and flows generally southward through southeastern Arkansas and into northeastern Louisiana. The drainage area of Bayou Bartholomew is 1,187 square miles at the United States Geological Survey (USGS) flow gage located about 1 mile south of the Arkansas–Louisiana state line (USGS 2006a). Cutoff Creek drains 322 square miles of the Bayou Bartholomew watershed (USGS 1979). The western side of the Bayou Bartholomew watershed (including Cutoff Creek) is in the Gulf Coastal ecoregion, has a somewhat rolling topography, and is mostly forested. The eastern side of the watershed (including most of the main stem of Bayou Bartholomew) is in the Delta ecoregion, has a relatively flat topography, and is mostly cropland. The majority of soils in the Bayou Bartholomew watershed are classified as silt loam or sandy loam (United States Department of Agriculture (USDA) 1976; USDA 1979; USDA 1981). The Bayou Bartholomew watershed forms ADEQ Planning Segment 2B and covers parts of Jefferson, Cleveland, Drew, Chicot, Lincoln, Desha, and Ashley counties.

2.2 Land Use

Land use data for the study area were obtained from the GEOSTOR database, which is maintained by the Center for Advanced Spatial Technology (CAST) at the University of Arkansas in Fayetteville. These data were based on satellite imagery from 2004. The spatial distribution of these land uses is shown on Figure A.2 (located in Appendix A) and land use percentages are shown in Table 2.1. These data show that about 60% of the study area is forested, with most of the forest located in the western side of the watershed and most of the cropland located along the eastern side of the watershed.

Table 2.1. Land use percentages for the study area (CAST 2005).

Land Use Category	Percentage of Study Area
Urban	2.1%
Barren or Bare Soil	2.0%
Water	3.3%
Forest	60.9%
Soybeans	11.7%
Rice	3.5%
Cotton	5.8%
Other Crops	2.3%
Pasture / Forages	8.4%
TOTAL	100.0%

2.3 Stream Flow Data

The TMDLs in this report were developed using USGS stream flow data from two gaging stations. Selected information for these two gages is summarized in Table 2.2. The locations of the two gages are shown on Figure A.1 in Appendix A. USGS maintains two other flow gaging stations for Bayou Bartholomew in Arkansas; they are Bayou Bartholomew at Garrett Bridge (07364133) and Bayou Bartholomew near Portland (07364185). Data from those two gages were not used for TMDL development because the period of record for each gage was relatively short.

Table 2.2. Information for USGS stream flow gaging stations (USGS 2006a; USGS 2006b).

Gage number:	07364150	07364200
Gage name:	Bayou Bartholomew near McGehee	Bayou Bartholomew near Jones
Descriptive location:	US Hwy 278 west of McGehee, AR (same location as UWBYB02)	LA Hwy 834 northwest of Jones, LA (same location as OUA0013)
Period of record:	October 1945 – present	October 1957 – present
Drainage area:	576 square miles	1,187 square miles
Mean flow:	695 cfs	1,346 cfs

2.4 Water Quality Standards

Water quality standards for Arkansas waterbodies are listed in Regulation No. 2 (Arkansas Pollution Control and Ecology Commission (APCEC) 2007). Designated uses for the reaches of Bayou Bartholomew and Cutoff Creek that are addressed in this report are primary and secondary contact recreation; domestic, industrial, and agricultural water supply; and perennial fishery (perennial Delta fishery for Bayou Bartholomew and perennial Gulf Coastal fishery for Cutoff Creek).

Section 2.511 of Regulation No. 2 provides both a narrative criterion and numeric criteria for dissolved minerals. The general narrative criterion is: “Mineral quality shall not be altered by municipal, industrial, other waste discharges or instream activities so as to interfere with designated uses.” Numeric criteria that are listed specifically for Bayou Bartholomew in the latest version of Regulation No. 2 are 50 mg/L chloride, 20 mg/L sulfate, and 500 mg/L TDS. The draft version of the TMDLs were developed using these criteria, but USEPA Region 6 disapproved these criteria in early 2008 (USEPA 2008). This action caused the previously approved criteria for Bayou Bartholomew (30 mg/L chloride, 30 mg/L sulfate, and 220 mg/L TDS) to remain effective for Clean Water Act purposes in place of the newer criteria adopted by the State of Arkansas. The final TMDLs in this report are based on the criteria approved by USEPA (30 mg/L chloride, 30 mg/L sulfate, and 220 mg/L TDS).

Section 2.503 of Regulation No. 2 provides both a narrative criterion and numeric criteria that apply to siltation/turbidity. The general narrative criterion is: “There shall be no distinctly visible increase in turbidity of receiving waters attributable to municipal, industrial, agricultural, other waste discharges, or instream activities.” The numeric turbidity criteria for streams in the Gulf Coastal ecoregion (including Cutoff Creek) are 21 nephelometric turbidity units (NTU; “primary” value) and 32 NTU (“storm-flow” value). The regulation also states that “the non-point source runoff shall not result in the exceedance of the in stream storm-flow values in more than 20% of the ADEQ ambient monitoring network samples taken in not less than 24 monthly samples.”

As specified in USEPA's regulations at 40 CFR 130.7(b)(2), applicable water quality standards include antidegradation requirements. Arkansas' antidegradation policy is listed in

Sections 2.201 through 2.204 of Regulation No. 2. These sections impose the following requirements:

- Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected;
- Water quality that exceeds standards shall be maintained and protected unless allowing lower water quality is necessary to accommodate important economic or social development, although water quality must still be adequate to fully protect existing uses;
- For outstanding state or national resource waters, those uses and water quality for which the outstanding waterbody was designated shall be protected; and
- For potential water quality impairments associated with a thermal discharge, the antidegradation policy and implementing method shall be consistent with Section 316 of the Clean Water Act.

2.5 Nonpoint Sources

The 2004 Integrated Report specifies agriculture and unknown sources as the suspected sources of dissolved minerals in Bayou Bartholomew (ADEQ 2005b). Agricultural inputs of dissolved minerals are likely occurring due to elevated concentrations of dissolved minerals in irrigation water from the alluvial aquifer. Concentrations of chloride, sulfate, and TDS in the alluvial aquifer are highest between the Bayou Bartholomew watershed and the Mississippi River, but they are still somewhat elevated along the eastern edge of the Bayou Bartholomew watershed (USGS 1985). ADEQ conducted water quality sampling throughout the Bayou Bartholomew watershed during 1998 – 2000 and stated the following in their report:

> "Over 43% of the samples collected from these sites exceeded the chloride standards. Most of the elevated concentrations occurred during low-flow, indicating that the chlorides are most likely coming from irrigation return-flow water. In addition, all of these sites exceed the criteria for instream total dissolved solids concentrations" (ADEQ 2001, p. 48).

Nonpoint sources of turbidity in Cutoff Creek were not identified in the 2004 Integrated Report. Additional information is necessary to identify specific nonpoint sources affecting turbidity in Cutoff Creek.

2.6 Point Sources

Information for point source discharges in the study area was obtained by searching USEPA's Permit Compliance System (PCS 2007), reviewing ADEQ files (primarily permits and applications), and reviewing information found in published technical reports (ADEQ 2005b; FTN 2002b; ADEQ 2001). The search yielded 13 facilities with point source discharges. Selected information for these facilities is presented in Table 2.3. Locations of the facilities are shown on Figure A.1 in Appendix A. None of the point source discharges have permit limits for chloride, sulfate, or TDS. The monthly average permit limits for total suspended solids (TSS) for the two point source facilities that discharge in the Cutoff Creek watershed are 20 mg/L for Pine Haven Mobile Lodge and 90 mg/L for the City of Monticello East Plant.

Table 2.3. List of point source discharges in the study area.

Permit No.	Facility Name	Type of Discharge	Flowrate (MGD)	Receiving Waterbody
AR0041602	Suburbia SID #1	Domestic wastewater	0.012	Nevins Creek, Bayou Bartholomew (Upstream of Reach 013)
AR0039144	Pinewood Sewer Improvement	Domestic wastewater	0.05	Tributary, Nevins Creek, Bayou Bartholomew (Upstream of Reach 013)
AR0037885	Suburban SID No. Tantara #1 of Jefferson County	Domestic wastewater	0.025	Boggy Bayou, Bayou Bartholomew (Upstream of Reach 013)
AR0047872	Robert Floyd Sawmill Inc.	Wet log spray water	intermittent	Tributary, Cane Creek, Bayou Bartholomew (Upstream of Reach 013)
AR0046477	City of Star City	Domestic wastewater	0.375	Cane Creek, Bayou Bartholomew (Upstream of Reach 013)
AR0045888	Arkansas Department of Parks & Tourism (Cane Creek State Park)	Domestic wastewater	0.009	Cane Creek, Bayou Bartholomew (Upstream of Reach 013)
AR0047350	Pine Haven Mobile Lodge	Mobile home sites (domestic wastewater)	0.004	Tributary, Godfrey Creek, Cutoff Creek (Upstream of Reach 007)
AR0021831	City of Monticello, East Plant	Domestic wastewater	2.5	Tributary, Godfrey Creek, Cutoff Creek (Upstream of Reach 007)
AR0022071	City of McGehee	Domestic wastewater	0.6	Bayou Bartholomew (Reach 012U)
AR0022250	City of Dermott – South Pond	Domestic wastewater	1.2	16 inch pipe to Bayou Bartholomew (Reach 012U)
AR0034371	City of Portland	Domestic wastewater	0.1	Tributary, Bayou Bartholomew (Reach 001)
AR0037141	City of Parkdale	Domestic wastewater	0.05	Tributary, Bayou Bartholomew (Reach 001)
AR0022144	City of Wilmot	Domestic wastewater	0.165	Tributary, Bayou Bartholomew (Reach 001)

2.7 Previous Water Quality Studies

Following is a list of previous water quality studies that were identified for the Bayou Bartholomew watershed:

1. "Short and Long Term Strategies for Protecting and Enhancing Natural Resources in the Bayou Bartholomew Watershed" (Bayou Bartholomew Alliance (BBA) 1996), prepared by the BBA Technical Support Group. This document identifies environmental problems for Bayou Bartholomew and presents short-term and long-term action items to address the problems.

2. "Watershed Restoration Action Strategy for the Bayou Bartholomew Watershed" (Arkansas Natural Resources Commission (ANRC) 1999). This discusses existing conditions within the watershed, expected future uses and needs, and strategies for restoration actions within the watershed.

3. "Physical, Chemical and Biological Assessment of the Bayou Bartholomew Watershed" (ADEQ 2001). This report documents physical, water quality, and biological data collected by ADEQ in the Bayou Bartholomew watershed during 1998 – 2000. It also presents various watershed information as well as conclusions from the collection and analysis of the field data.

4. "Bayou Bartholomew Wetland Planning Area Report" (Layher and Phillips 2002). This report includes discussion of physical and biological watershed characteristics, historical land use and wetlands protection, characteristics of wetland ecosystems in the Bayou Bartholomew Wetland Planning Area, and the potential for wetlands losses and gain in the area.

5. "TMDLs for Segments Listed for Mercury in Fish Tissue for the Ouachita River Basin and Bayou Bartholomew, Arkansas" (FTN 2002a). This report provides analyses of fish tissue data and calculations of existing and allowable loads of mercury to two reaches of Bayou Bartholomew and one reach of Cutoff Creek plus other streams in the Ouachita River basin in Arkansas and Louisiana.

6. "TMDLs for Turbidity for Bayou Bartholomew, AR" (FTN 2002b). This report presents background information about the Bayou Bartholomew watershed, a summary of ADEQ water quality data, and calculations of existing and allowable loads of TSS.

7. "Bayou Bartholomew Watershed Nine Element Plan" (BBA 2005). This report provides a description of watershed characteristics, a summary of environmental problems that have been identified and actions that have been taken to address the problems, and a discussion of future actions that are needed.

8. "Bayou Bartholomew Watershed Initiative" (Winrock 2007). This project, which is still ongoing, is intended to improve water quality on Bayou Bartholomew through land and waterway restoration projects that produce environmental credits. Accomplishments to date include assessing carbon sequestration potential, producing various maps, completing a weir renovation project, and applying a watershed model.

3.0 EXISTING WATER QUALITY FOR DISSOLVED MINERALS

3.1 General Description of Data

Routine monitoring data for chloride, sulfate, and TDS have been collected by ADEQ at four sites along the reaches of Bayou Bartholomew that are being addressed in this report. Locations of the sampling sites are shown on Figure A.1 in Appendix A. These data are summarized in Table 3.1, including comparisons with the current criteria in the water quality standards. Appendix B includes tabular listings of the individual data (Tables B.1 – B.4) and time series plots of the data (Figures B.1 – B.12).

Table 3.1. Summary of ADEQ dissolved mineral data for Bayou Bartholomew.

	UWBYB03	**UWBYB02**	**OUA0154**	**OUA0013**
Site Description	Bayou Bartholomew at Garrett Bridge	Bayou Bartholomew near McGehee	Bayou Bartholomew near Portland	Bayou Bartholomew near Jones, LA
Reach Number*	08040205-013	08040205-012U	08040205-002	08040205-001
Period of Record	6/6/94 - 5/22/07	6/6/94 - 9/12/00	11/9/98 - 8/23/05	9/4/90 - 4/3/07
Chloride				
Number of Values	39	22	21	196
Minimum (mg/L)	2.4	1.9	1.7	1.7
Maximum (mg/L)	93.9	58.4	56.2	42.3
Median (mg/L)	14.5	13.0	14.6	8.9
Number of Values > 30 mg/L	8	4	5	13
Percent of Values > 30 mg/L	21%	18%	24%	7%
Sulfate				
Number of Values	39	22	21	201
Minimum (mg/L)	<0.04	2.6	3.2	<0.04
Maximum (mg/L)	21.9	15.9	15.2	30.5
Median (mg/L)	8.5	8.8	6.1	7.1
Number of Values > 30 mg/L	0	0	0	1
Percent of Values > 30 mg/L	0%	0%	0%	<1%
TDS				
Number of Values	40	22	21	200
Minimum (mg/L)	89	107	69	30
Maximum (mg/L)	388	314	278	277
Median (mg/L)	150	163	151	124
Number of Values > 220 mg/L	8	5	2	2
Percent of Values > 220 mg/L	20%	23%	10%	1%

*Note: These are reaches that ADEQ assesses using data from each station.

The data summarized in Table 3.1 represent a combination of data from the ADEQ web site and from ADEQ's report documenting their 1998 – 2000 study of the Bayou Bartholomew watershed (ADEQ 2001).

3.2 Seasonal Patterns

Seasonal plots of chloride, sulfate, and TDS concentrations in Bayou Bartholomew are shown on Figures C.1 – C.12 in Appendix C. The chloride concentrations (Figures C.1, C.4, C.7, and C.10) show the most noticeable seasonal patterns, with the highest concentrations occurring during August through November. This pattern is consistent with the conclusion that irrigation water is a cause of high dissolved minerals concentrations in Bayou Bartholomew (see Section 2.5). Most of the rice fields in this area tend to be drained during August, sometimes extending into early September. In most cases, dilution of this drainage water requires enough rain to produce runoff, which typically does not occur in large quantities during the dry months of September and October. Irrigation of soybeans and cotton extends later into the year (i.e., past August), but usually does not result in large amounts of runoff.

TDS concentrations (Figures C.3, C.6, C.9, and C.12) showed a similar but less pronounced seasonal pattern. It is likely that the seasonal increases in TDS during the fall are at least partly due to increases in chloride. The sulfate concentrations (Figures C.2, C.5, C.8, and C.11) showed no noticeable seasonal pattern.

3.3 Relationships Between Concentration and Flow

Concentrations of chloride, sulfate, and TDS were plotted versus stream flow to examine any correlation between concentration and flow (Figures D.1 – D.12, located in Appendix D). In all of these plots, the highest concentrations occurred at low flows. This relationship is consistent with previously stated conclusions about the impact of irrigation drainage because the irrigation water draining into streams will receive minimal dilution during times of low stream flow. This relationship is most pronounced for chloride.

4.0 EXISTING WATER QUALITY FOR TURBIDITY AND TSS

4.1 General Description of Data

Routine monitoring data for turbidity and TSS have been collected by ADEQ at one site along the reach of Cutoff Creek that is being addressed in this report. The location of this sampling site (UWCOC01) is shown on Figure A.1 in Appendix A. TSS data are discussed here because TSS is needed as a surrogate parameter for expressing the siltation/turbidity TMDL. Table 4.1 summarizes these turbidity and TSS data, which represent a combination of data from the ADEQ web site and from ADEQ's report documenting their 1998 – 2000 study of the Bayou Bartholomew watershed (ADEQ 2001). The individual data are listed in Table E.1 and shown graphically as time series plots on Figures E.1 – E.2 (located in Appendix E).

Table 4.1. Summary of ADEQ turbidity and TSS data for Cutoff Creek.

Site ID	Site Description	Period of Record	Parameter	Number of Values	Minimum	Median	Maximum
UWCOC01	Cutoff Creek northeast of Boydell	6/6/94 – 9/12/00	Turbidity	21	4.2 NTU	20 NTU	85 NTU
			TSS	21	1.0 mg/L	14 mg/L	34.5 mg/L

Table E.1 includes comparisons between the observed turbidity data and the numeric water quality criteria. These comparisons required the observed data to be separated into base flow data (to be compared with the "primary" criterion) and storm flow data (to be compared with the "storm-flow" criterion). It was assumed here that the lowest 40% of stream flow values represent flow conditions without significant influence from storm runoff and that stream flow values above the 40th percentile would have some influence from storm runoff. The turbidity data were considered to be base flow data when the flow on the sampling day at the USGS gage on Bayou Bartholomew near McGehee was 141 cubic ft per second (cfs) or less (the 40th percentile flow, or the flow that was exceeded 60% of the time). The turbidity data were considered to be storm flow data when the flow on the sampling day at the USGS gage on the Bayou Bartholomew near McGehee was 142 cfs or more. This analysis showed that the turbidity

values in Cutoff Creek exceeded the criteria 13% of the time for base flow conditions and 31% of the time for storm flow conditions.

4.2 Seasonal Patterns

Seasonal plots of turbidity and TSS data in Cutoff Creek are shown on Figures E.3 – E.4 in Appendix E. No seasonal patterns were apparent from visual analysis of the TSS and turbidity data, but this was partly due to the relatively small number of values. If additional data are collected, it is possible that a seasonal pattern could become evident.

4.3 Relationships of Turbidity and TSS versus Flow

Plots of turbidity and TSS versus stream flow were also developed to examine any correlation between these water quality parameters and stream flow rates (Figures E.5 – E.6 in Appendix E). A strong relationship is not evident due to the relatively small number of data, but the highest values occurred at somewhat lower flows. Additional information concerning conditions preceding and during the time of sampling would be needed to identify any relationship between turbidity or TSS and stream flow rates.

4.4 Relationships Between TSS and Turbidity

A plot of turbidity versus TSS for Cutoff Creek is shown on Figure E.7 in Appendix E. This plot shows some correlation, with higher turbidity values tending to correspond with higher TSS concentrations. Table 4.2 summarizes a linear regression that was performed on the logarithms of the turbidity and TSS values. The regression was performed using the logarithms of the data (rather than the raw data values) because turbidity and TSS data usually fit a lognormal distribution better than a normal distribution.

Table 4.2. Summary of turbidity and TSS regression for Cutoff Creek.

Sampling Site	Regression Equation	Number of Data	Coefficient of Determination ($R^{2)}$	Significance Level (P value)
UWCOC01	Turbidity = $4.814 \times TSS^{0.5847}$	21	0.53	1.75×10^{-4}

The regression was performed using all of the turbidity and TSS data from the UWCOC01 sampling site. Separate regressions for base flow conditions and storm flow conditions were not developed due to the small number of data points that were available.

The strength of the linear relationship is measured by the coefficient of determination (R^2) calculated during the regression analysis (Zar 1996). The R^2 value is the percentage of the total variation in the logarithm of turbidity that is explained or accounted for by the fitted regression (logarithm TSS). In the regression for Cutoff Creek, 53% of the variation in turbidity is accounted for by TSS, and the remaining 47% of variation in turbidity is unexplained. The unexplained portion is attributed to factors other than the measured value of TSS.

The Cutoff Creek regression shows that a majority of the variability of the turbidity measurement (NTU) is explained by the measured concentration of TSS. The perfect explanation of the measurement of turbidity to the measurement of TSS would require collecting and analyzing a large amount of data. A number of the items effecting this perfect explanation of the relationship would need to be known. A partial list of the items affecting the relationship follows:

- Velocity of the water at the time of sampling;
- Carbonaceous biochemical oxygen demand (CBOD) concentration;
- Ammonia concentration;
- Nitrate concentration;
- Phosphorus concentration;
- Algal mass in the water column;
- Bacteria mass in the water;
- Measured color of the water;
- Mass of the organic component of the TSS;
- Mass of the material passing through the filter during the TSS analysis;
- Grain size distribution of the inorganic portion of the TSS;
- Specific gravity of the different sizes of inorganic solids particles;
- Hydrograph for the stream;
- Position on the hydrograph (i.e., rising limb, falling limb) at the time of sampling;
- Number of overlapping rainfall events represented by this sample day;
- Magnitude of each of the rainfall events represented by this sample day; and
- Lags of the overlapping rainfall events represented by this sample day.

The collection of the above-listed data would not change the fact that inorganic particles represented in the TSS measurements is the major contributor to the turbidity reading and is the major constituent reduced when sediment best management practices (BMPs) are applied to nonpoint sources. The BMPs used on nonpoint sources for sediment also reduce the load of many of the unexplained contributors in the regression. The effort to have a perfect explanation of turbidity may not result in a better selection of BMPs. The regression presented above between TSS and turbidity is adequate for the preparation of this TMDL. A stakeholder group of knowledgeable persons from the watershed may need additional information to set a plan of action for this TMDL.

The correlation between turbidity and TSS for Cutoff Creek was considered to be acceptable; the R^2 value for this regression (0.53) is higher than or similar to R^2 values for turbidity and TSS from other approved TMDLs in Arkansas (FTN 2002b; FTN 2005; FTN 2006).

The statistical significance of the regression was evaluated by computing the "P value" for the slope of the regression line. The P value is essentially the probability that the slope of the regression line is really zero. A low P value indicates that a non-zero slope calculated from the regression analysis is statistically significant. The P value for the Cutoff Creek regression is small and is considered good.

5.0 TMDL DEVELOPMENT

5.1 Seasonality and Critical Conditions

USEPA regulations at 40 CFR 130.7 require the determination of TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. Also, both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to consider seasonal variations for meeting water quality standards. Therefore, the historical data and analyses discussed in Sections 3.0 and 4.0 were used to evaluate whether there were certain flow conditions or certain periods of the year that could be used to characterize critical conditions.

Concentrations of chloride and TDS were generally higher during August through November, but some of the concentrations during that time period were low. Sulfate concentrations did not show a seasonal pattern. It was considered unnecessary to develop dissolved mineral TMDLs for individual seasons because: 1) overall, the dissolved mineral concentrations tended to show more relationship with stream flow than with season, and 2) none of the point source discharges have seasonal permit limits for dissolved minerals. Critical flow conditions for dissolved minerals are addressed by the methodology used to develop these TMDLs (load duration curve).

The analysis of turbidity and TSS data showed no seasonal patterns or relationships between turbidity or TSS and stream flow. Based on these analyses, the turbidity TMDL in this report was not developed on a seasonal basis. The methodology used to develop the turbidity TMDL (load duration curve) addresses a wide range of flow conditions.

5.2 Water Quality Targets

The water quality targets for the dissolved minerals TMDLs were simply the criteria for Bayou Bartholomew that have been approved by USEPA as discussed in Section 2.4 (30 mg/L chloride, 30 mg/L sulfate, and 220 mg/L TDS). Chloride, sulfate, and TDS can easily be expressed as mass, so there was no need to use surrogate parameters.

Turbidity is an expression of the optical properties in a water sample that cause light to be scattered or absorbed and may be caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, and plankton and other microscopic organisms (Standard Methods 1999). Turbidity cannot be expressed as a load as preferred for TMDLs. To achieve a load-based value, turbidity is often correlated with a surrogate parameter such as TSS that may be expressed as a load. In general, activities that generate varying amounts of suspended sediment will proportionally change or affect turbidity (USEPA 1991). Research by Relyea et al. (2000) states, "increased turbidity by sediments can reduce stream primary production by reducing photosynthesis, physically abrading algae and other plants, and preventing attachment of autotrophs to substrate surfaces."

For the turbidity TMDL in this report, the relationship between turbidity and TSS presented in Table 4.2 was used to develop a target TSS concentration (i.e., numeric endpoint for the TMDL). The two target TSS concentrations developed for these TMDLs were 16 mg/L (using the regression and the primary turbidity criterion of 21 NTU) and 32 mg/L (using the regression and the storm flow turbidity criterion of 32 NTU). The discussion in Section 4.1 associating the primary turbidity criterion with the base flow portion of the duration curve is the basis for using the descriptor "base flow" in this document for the conditions when the primary turbidity criterion should apply.

5.3 Methodology for TMDL Calculations

The methodology used for all of the TMDLs in the report is the load duration curve. Because loading capacity varies as a function of the flow present in the stream, these TMDLs represent a continuum of desired loads over all flow conditions, rather than fixed at a single value. The basic elements of this procedure are documented on the Kansas Department of Health and Environment web site (KDHE 2007). This method was used to illustrate allowable loading at a wide range of flows. The steps for how this methodology is applied for the TMDLs in this report can be summarized as follows:

1. Develop a flow duration curve (Section 5.4);
2. Convert the flow duration curve to load duration curve (Section 5.5);

3. Plot observed loads with the load duration curves (Section 5.6);
4. Calculate the TMDL, MOS, WLA, and LA (Sections 5.7 - 5.10); and
5. Calculate percent reductions required to meet assessment criteria (Section 5.11).

5.4 Flow Duration Curves

A flow duration curve was developed for each of the two long-term flow gages on Bayou Bartholomew discussed in Section 2.3 (near McGehee, Arkansas, and near Jones, Louisiana). Daily stream flow measurements from each gage were sorted in increasing order and the percentile ranking of each flow was calculated.

The measured flows from the Bayou Bartholomew near McGehee gage (07364150) were used to develop load duration curves for reaches 08040205-013 and 08040205-012U of Bayou Bartholomew and reach 08040205-007 of Cutoff Creek. The measured flows from the Bayou Bartholomew near Jones gage (07364200) were used to develop load duration curves for reaches 08040205-002 and 08040205-001 of Bayou Bartholomew. Flows at the downstream end of each reach were estimated from the flows at the gages based on each ratio of drainage area for the reach and for the gage.

Each flow duration curve was then plotted as daily flow (cfs) versus percent exceedance (100% minus percentile ranking). These flow duration curves for the individual reaches are shown in the appendices of this report as follows:

Appendix F	(Figure F.1):	flow duration for reach 08040205-013
Appendix G	(Figure G.1):	flow duration for reach 08040205-012U
Appendix H	(Figure H.1):	flow duration for reach 08040205-002
Appendix I	(Figure I.1):	flow duration for reach 08040205-001
Appendix J	(Figure J.1):	flow duration for reach 08040205-007

5.5 Load Duration Curves

For each TMDL, the flow values from the flow duration curves were multiplied by the appropriate target concentration of chloride, sulfate, TDS, or TSS (from Section 5.2) to make an allowable load duration curve. Each load duration curve is a plot of tons per day of chloride,

sulfate, TDS, or TSS versus the percent exceedances from the flow duration curve. The load duration curves are presented in the following appendices:

Appendix F:	chloride, sulfate, and TDS curves for reach 08040205-013
Appendix G:	chloride, sulfate, and TDS curves for reach 08040205-012U
Appendix H:	chloride, sulfate, and TDS curves for reach 08040205-002
Appendix I:	chloride, sulfate, and TDS curves for reach 08040205-001
Appendix J:	TSS curve for reach 08040205-007

The calculations for these load duration curves are shown in Tables F.1, G.1, H.1, I.1, and J.1. The Arkansas water quality standards (APCEC 2007) do not specify a range of flows or flow exceedances for which each of the turbidity criteria (primary and storm flow) is applicable. As discussed in Section 4.1, it was assumed here that the lowest 40% of stream flow values represent flow conditions without significant influence from storm runoff and that stream flow values above the 40th percentile would have some influence from storm runoff. The TSS target corresponding to the primary turbidity criterion was applied to the lowest 40% of flows (from 100% exceedance of stream flow to 60% exceedance of stream flow). The TSS target corresponding to the storm flow turbidity criterion was applied from 60% exceedance of stream flow to 0% exceedance of stream flow. For dissolved minerals, the target for each pollutant was multiplied by the entire range of flows in the flow duration curve.

The load duration curve is beneficial when analyzing monitoring data with its corresponding flow information plotted as a load. This allows the monitoring data to be plotted in relation to its place in the flow continuum. Assumptions of the probable source or sources of the impairment can then be made from the plotted data.

The load duration curve shows the calculation of the TMDL at any flow rather than at a single critical flow. The official TMDL number is reported as a single number, but the curve is provided to demonstrate the value of the acceptable load at any flow. This will allow analysis of load cases in the future for different flow regimes.

5.6 Observed Loads

For each sampling site, observed loads were calculated by multiplying each observed concentration of chloride, sulfate, TDS, or TSS by the estimate flow at the downstream end of

the reach on the sampling day. These observed loads were then plotted versus the percent exceedances of the flow on the sampling day and placed on the plot with the corresponding load duration curve. These plots with the load duration curves and observed loads are shown in the appendices of this report as listed in Section 5.5.

These plots provide visual comparisons between observed and allowable loads under different flow conditions. Observed loads that are plotted above the load duration curve (identified as "TMDL" curve in the legend) represent conditions where observed loads exceed the loads corresponding to the numeric criterion or target concentration. Observed loads below the load duration curve represent conditions where observed loads were less than loads corresponding to the numeric criterion or target concentration (i.e., not violating water quality standards).

5.7 TMDL and MOS

Each TMDL was calculated as the area under the load duration curve. The area on these plots represents a load because the vertical axis is tons/day and the horizontal axis is unitless (percentage).

Both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to include an MOS to account for any lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS may be expressed explicitly as unallocated assimilative capacity or implicitly through conservative assumptions used in establishing the TMDL. For the dissolved mineral TMDLs, an explicit MOS was established as 10% of the TMDL. For the turbidity TMDL, an implicit MOS was established through the use of conservative assumptions. The primary conservative assumption was calculating the TMDL assuming that TSS is a conservative parameter and does not settle out of the water column.

5.8 WLAs for Dissolved Mineral TMDLs

A WLA for point source loads was calculated for each dissolved mineral TMDL as the design flow for each discharge multiplied by assumed effluent concentrations for chloride, sulfate, and TDS. All of the point source facilities within the study area discharge treated

domestic wastewater, except for the Robert Floyd Sawmill in Star City. This sawmill was not included in the dissolved mineral TMDLs because the water that it discharges is expected to have concentrations of dissolved minerals near background levels. No effluent concentrations of chloride, sulfate, or TDS were available for any of the point source discharges. The effluent concentrations for discharges in the study area were assumed to be similar to median values of effluent concentrations measured in 18 different domestic wastewater discharges across the state. These median values are 53 mg/L chloride, 41 mg/L sulfate, and 324 mg/L TDS (see Appendix K). The estimated loads for each point source facility and the total point source loads for each reach are calculated in Appendix K. The WLAs were set to the existing point source loads with no reductions because: 1) some of the TMDLs indicate no reductions are needed for either point sources or nonpoint sources, and 2) the point sources do not appear to be causing impairments because they represent a very small portion of the total loading and "none of the larger city systems produce enough flow during the summer months to have an actual discharge" (ADEQ 2001; p. 105).

Future growth for any existing or new point sources in the Bayou Bartholomew watershed is not limited by these TMDLs if the effluent concentrations of chloride, sulfate, and TDS are less than the instream criteria for Bayou Bartholomew in the Arkansas water quality standards. Additionally, some of these TMDLs indicate that existing loads are less than allowable loads, which means that some future growth can occur in those situations even if the effluent concentrations exceed instream criteria. If future growth of point source loading is needed in reaches where reductions are required (i.e., where existing loads exceed allowable loads), point source facilities may be able to increase their loading by discharging only during times when there is sufficient dilution in the receiving stream. These scenarios of future growth are consistent with the dissolved minerals TMDLs in this report.

5.9 WLA for Turbidity TMDL

The only point sources that were identified for the Cutoff Creek watershed were the Pine Haven Mobile Lodge and the City of Monticello East Plant, both of which discharge treated domestic wastewater. The WLA for the turbidity TMDL was set to zero because the surrogate

being used for turbidity (TSS) is considered to represent inorganic suspended solids (i.e., soil and sediment particles from erosion or sediment resuspension). The suspended solids discharged by the two point sources in the Cutoff Creek watershed are assumed to consist primarily of organic solids rather than inorganic solids. Discharges of organic suspended solids from point sources are already addressed by ADEQ through their permitting of point sources to maintain water quality standards for dissolved oxygen. The WLA to support this turbidity TMDL will not require any changes to the permits concerning inorganic suspended solids. Therefore, future growth for these permits or new permits would not be restricted by this turbidity TMDL.

5.10 Nonpoint Source Loads

The LA for nonpoint sources for each of the TMDLs was set equal to the TMDL minus the MOS and the WLA. The LAs are shown in Tables F.1, G.1, H.1, and I.1 (near the bottom of each table).

5.11 Percent Reductions

In addition to calculating allowable loads, estimates were made for percent reductions that are needed in order for each TMDL to be attained in the stream. Calculated loads identified as TMDLs are the approved descriptor of this document. The percent reductions are shown for informational purposes only. They may assist in the preparation of an implementation plan for this TMDL package.

For each of the dissolved mineral TMDLs, a uniform percent reduction factor was applied to the actual loads until the number of loads exceeding the allowable loads was less than or equal to an acceptable number. The allowable loads were defined as the loads represented by the line labeled “TMDL minus MOS” on each load duration plot. Each acceptable number of exceedances was set to 10% of the total number of observed loads for that parameter in accordance with the ADEQ assessment methodology (ADEQ 2005b). Whenever the percentage multiplied by the number of observed values yielded a fractional number (e.g., 25% × 38 = 9.5), the allowable number of exceedances was rounded up to the next whole number (e.g., 9.5 rounded up to 10) in accordance with the ADEQ assessment methodology (ADEQ 2005b). The

calculations for percent reductions for the dissolved mineral TMDLs are provided in the appendices of this report along with the corresponding calculations for the load duration curves (Appendices F – I as listed in Section 5.5). Results of the calculations for percent reductions and components of the dissolved mineral TMDLs are summarized in Tables 5.1 – 5.3.

The percent reduction was calculated for the turbidity TMDL in the same manner as for the dissolved mineral TMDLs, except that the allowable percentage of exceedances was different. For storm flow conditions, the acceptable number of exceedances was 20% of the number of storm flow data. This percentage (20%) was based on the Arkansas water quality standards, which state that "the non-point source runoff shall not result in the exceedance of the in stream storm-flow values in more than 20% of the ADEQ ambient monitoring network samples taken in not less than 24 monthly samples" (APCEC 2007). For base flow conditions, the acceptable number of exceedances was 25% of the number of base flow data. This percentage (25%) was based on the ADEQ assessment methodology for turbidity (ADEQ 2005b). The calculations for percent reductions for the turbidity TMDL are shown in Tables J.2 and J.3 in Appendix J. Results of the calculations for percent reduction and components of the turbidity TMDL are summarized in Table 5.4.

These calculations indicated that no reductions of sulfate are needed, which is consistent with the fact that the 303(d) list did not include any sulfate impairments for these reaches. The percent reductions needed for chloride and TDS are greatest in the upstream reaches. No reductions are needed for turbidity even though the 303(d) list includes a turbidity impairment for Cutoff Creek. The percent reduction calculations for turbidity yield a different conclusion than the 303(d) list because the TMDL represents a more rigorous analysis of data.

Table 5.1. Summary of chloride TMDLs.

Reach ID	Stream name	Loads (tons/day of chloride)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	38.4	4.3	42.7	57%
08040205-012U	Bayou Bartholomew	0.4	52.7	5.9	59.0	38%
08040205-002	Bayou Bartholomew	0	92.6	10.3	102.9	24%
08040205-001	Bayou Bartholomew	0.07	96.0	10.7	106.8	0%

Table 5.2. Summary of sulfate TMDLs.

Reach ID	Stream name	Loads (tons/day of sulfate)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	38.4	4.3	42.7	0%
08040205-012U	Bayou Bartholomew	0.3	52.8	5.9	59.0	0%
08040205-002	Bayou Bartholomew	0	92.6	10.3	102.9	0%
08040205-001	Bayou Bartholomew	0.05	96.1	10.7	106.8	0%

Table 5.3. Summary of TDS TMDLs.

Reach ID	Stream name	Loads (tons/day of TDS)				Percent Reduction Needed
		WLA	LA	MOS	TMDL	
08040205-013	Bayou Bartholomew	0	281.5	31.3	312.8	39%
08040205-012U	Bayou Bartholomew	2.4	386.7	43.2	432.3	23%
08040205-002	Bayou Bartholomew	0	679.1	75.5	754.6	1%
08040205-001	Bayou Bartholomew	0.43	704.7	78.3	783.4	0%

Table 5.4. Summary of turbidity TMDL.

Reach ID	Stream name	Flow Category	Loads (tons/day of TSS)				Percent reduction needed
			WLA	LA	MOS	TMDL	
08040205-007	Cutoff Creek	Base flow	0	0.58	implicit	0.58	0%
		Storm flow	0	32.4	implicit	32.4	0%

6.0 OTHER RELEVANT INFORMATION

In accordance with Section 106 of the Federal Clean Water Act and under its own authority, ADEQ has established a comprehensive program for monitoring the quality of the state's surface waters. ADEQ collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for long-term trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters, which are issued as a single document titled *Arkansas Integrated Water Quality Monitoring and Assessment Report.*

7.0 PUBLIC PARTICIPATION

Federal regulations require USEPA to notify the public and seek comment concerning TMDLs it prepares. Pursuant to a May 2000 consent decree, these TMDLs were prepared under contract to USEPA. After development of the draft version of these TMDLs, USEPA prepared a notice seeking comments, information, and data from the general public and affected public concerning these draft TMDLs. The notice for the public review period was published in the Federal Register on December 17, 2007, and the review period closed on January 16, 2008. No comments, data, or information were submitted for the TMDLs in this report during the public review period. USEPA has transmitted the final TMDLs to ADEQ for implementation and for incorporation into ADEQ's current water quality management plan.

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APPENDIX A

Maps

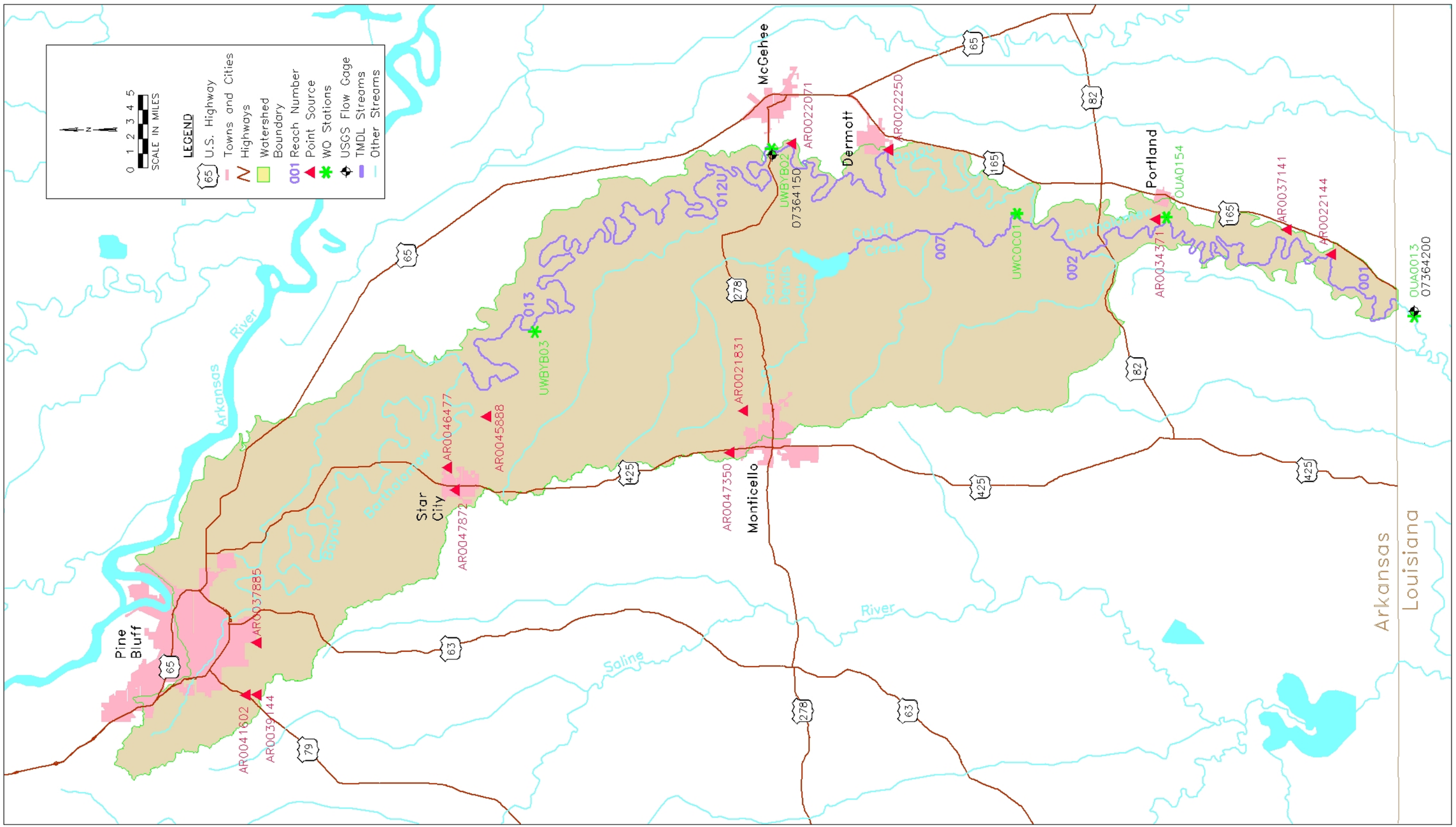


Figure A.1. Map of Bayou Bartholomew watershed.

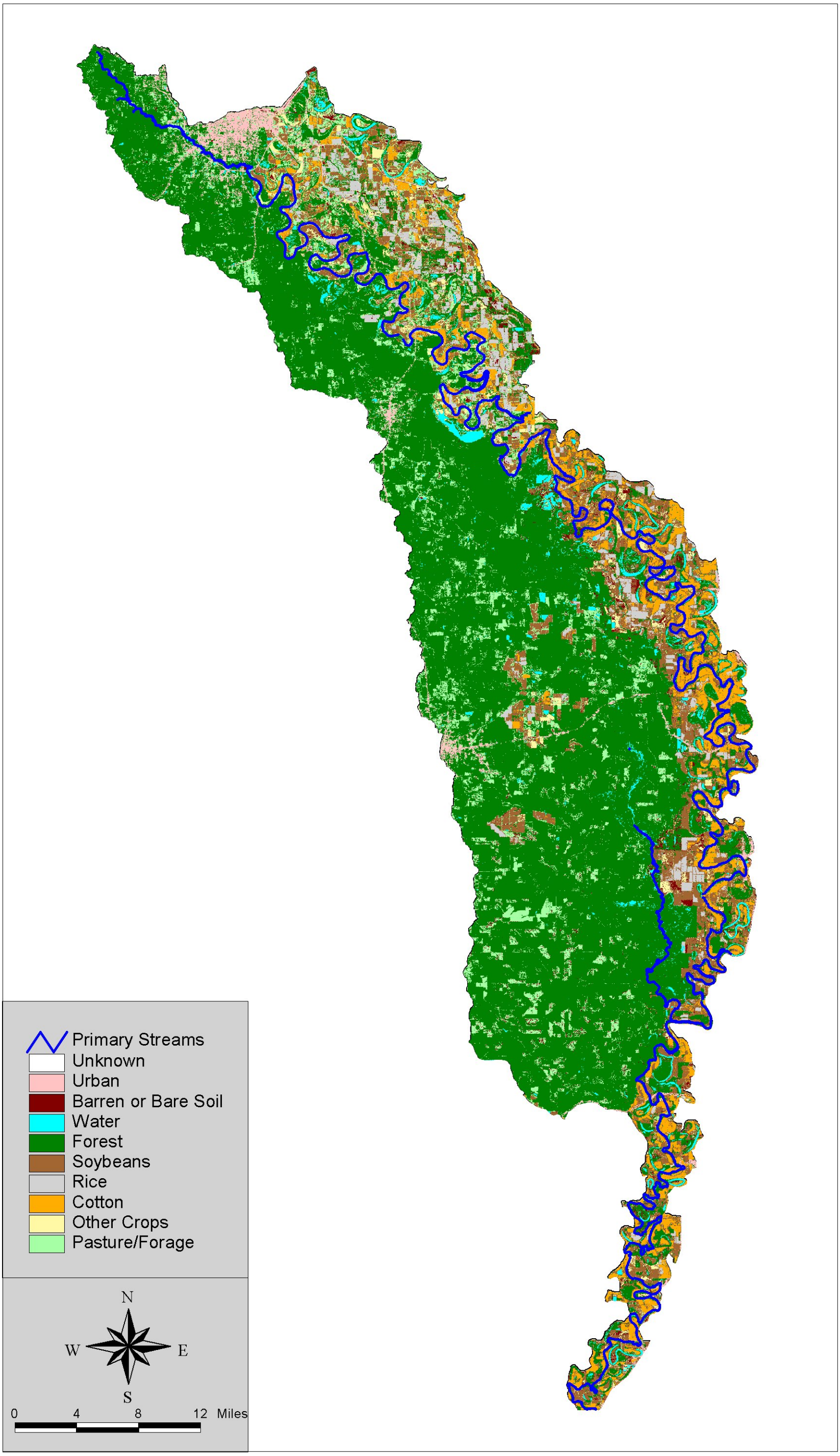


Figure A.2. Land use for Bayou Bartholomew watershed.

APPENDIX B

Tabular Listings and Time Series Plots of Dissolved Minerals

Table B.1. Historical water quality data for Bayou Bartholomew at Garrett Bridge (UWBYB03).

Date	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
6/6/1994	18.9	8.7	153
9/12/1994	14.9	9.8	127
1/17/1995	6.1	15.9	102
4/11/1995	4.9	10.0	115
7/18/1995	15.4	3.9	139
10/2/1995	93.9	21.9	386
2/26/1996	9.4	12.1	171
5/6/1996	10.9	12.9	136
9/30/1996	21.0	14.6	182
11/9/1998	15.3	8.5	219
1/12/1999	3.6	5.6	135
2/1/1999	2.4	3.0	136
3/9/1999	10.8	6.8	178
8/30/1999	64.3	13.2	378
9/27/1999	72.5	14.0	388
10/25/1999	62.0	12.2	321
1/4/2005			90
7/26/2005	22.7*	6.8*	175*
8/23/2005	66.8*	13.6*	354*
9/26/2005	17.0	7.7	131
10/25/2005	11.7	6.7	122
11/15/2005	8.4	6.6	99
12/13/2005	23.7	8.5	146
1/17/2006	13.8	< 0.04	189
1/31/2006	9.5	7.4	191
3/28/2006	3.0	6.9	103
4/25/2006	35.9	17.0	204
5/30/2006	4.7	4.3	121
6/20/2006	24.8	15.3	165
7/25/2006	41.3	12.5	272
8/22/2006	52.5	8.3	298
9/26/2006	14.5	10.6	124
10/24/2006	10.3	6.2	130
11/28/2006	27.7	12.3	186
12/19/2006	17.1	9.6	163
1/30/2007	2.7	5.2	89
2/27/2007	5.2	9.0	280
3/27/2007	4.4	7.6	101
4/24/2007	2.6	4.8	109
5/22/2007	3.1	4.8	103

* Averages of duplicates on same day

FILE: R:\PROJECTS\2110-624\TECH\WQDATA\UWBYB03 BAYOU BARTHOLOMEW.XLS

Table B.2. Historical water quality data for Bayou Bartholomew near McGehee, Arkansas (UWBYB02).

Date Collected	**Chloride** (mg/L)	**Sulfate** (mg/L)	**TDS** (mg/L)
6/6/1994	14.8	8.7	133
9/12/1994	10.5	7.8	116
1/17/1995	9.5	15.9	170
4/11/1995	4.7	11.1	121
7/18/1995	20.3	5.0	143
10/2/1995	53.1	14.4	253
2/26/1996	11.5	11.0	156
5/6/1996	7.7	11.8	147
9/30/1996	22.6	13.5	176
11/9/1998	23.8	14.5	264
1/12/1999	3.9	4.7	208
2/1/1999	1.9	2.6	107
3/9/1999	5.5	6.6	126
8/30/1999	49.5	10.0	285
9/27/1999	58.4	11.6	314
10/25/1999	16.6	7.1	152
1/18/2000	25.0	13.8	173
2/29/2000	14.4	8.9	201
3/21/2000	7.7	7.3	181
4/4/2000	2.3	3.7	146
6/5/2000	4.5	4.2	126
9/12/2000	43.5	8.8	256

FILE: R:\PROJECTS\2110-624\TECH\WQDATA\UWBYB02 BAYOU BARTHOLOMEW.XLS

Table B.3. Historical water quality data for Bayou Bartholomew near Portland, Arkansas (OUA0154)

Date Collected	**Chloride** (mg/L)	**Sulfate** (mg/L)	**TDS** (mg/L)
11/9/1998	36.3	7.6	
1/12/1999	4.0	5.9	108
2/1/1999	1.7	3.2	76
3/9/1999	4.1	4.4	110
8/30/1999	23.8	6.5	182
9/27/1999	49.3	9.6	254
10/25/1999	35.3	7.3	211
1/18/2000	22.3	15.2	173
2/29/2000	14.9	14.3	161
3/21/2000	7.8	6.1	137
4/4/2000	2.7	4.0	100
6/5/2000	4.7	5.0	151
9/12/2000	27.5	7.2	200
11/6/2000	56.2	13.5	278
1/22/2001	1.8	3.6	69
3/6/2001	1.8	3.6	89
5/14/2001	3.0	3.8	119
7/17/2001	14.6	6.4	161
9/10/2001	9.9	4.8	114
1/4/2005			72
7/26/2005	34.1	11.8	190
8/23/2005	19.8	5.3	161

FILE: R:\PROJECTS\2110-624\TECH\WQDATA\OUA0154 BAYOU BARTHOLOMEW.XLS

Table B.4. Historical water Quality data for Bayou Bartholomew near Jones, Louisiana (OUA0013).

Date Collected	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
9/4/1990	13.4	7.0	146
10/2/1990	18.4		150
10/30/1990	10.8	14.0	112
11/27/1990	9.1	11.0	110
1/2/1991	4.8	9.0	87
2/5/1991	3.9	12.0	81
3/12/1991	3.2	7.0	70
4/2/1991	3.8	7.0	93
6/4/1991		6.0	69
7/2/1991	7.6	8.0	115
8/6/1991	15.2	7.0	150
9/3/1991			139
10/1/1991			173
10/29/1991			178
11/25/1991	7.6	8.8	94
1/7/1992	3.8	10.6	80
2/4/1992	5.3	11.1	91
3/3/1992	3.2	10.3	79
4/7/1992	4.0	9.7	111
5/5/1992	6.1	8.4	98
6/2/1992	9.2	9.6	120
7/7/1992	6.3	7.6	93
8/4/1992	12.8	8.7	108
9/1/1992	11.8	7.5	127
9/29/1992	10.5	5.8	122
10/27/1992		6.9	142
12/1/1992	10.7	9.9	117
1/12/1993		11.4	119
2/9/1993	5.8	13.9	116
3/9/1993	4.0	7.8	89
4/13/1993	3.8	9.6	108
5/18/1993	3.6	9.3	92
6/21/1993	6.0	7.7	112
7/26/1993	10.0	7.9	116
8/24/1993	26.4	14.1	158
9/21/1993	15.3	8.6	157
10/26/1993	18.5	8.1	159
11/23/1993	8.0	11.0	104
12/20/1993		9.4	
1/18/1994		9.9	124
2/15/1994	4.1	8.8	113
3/15/1994	3.2	7.0	92
4/19/1994	6.5	10.3	
5/24/1994	8.0	8.9	107
6/28/1994	25.2	13.0	156
7/19/1994	24.9	8.0	157
8/16/1994	16.3	8.0	135
9/27/1994	23.5	10.8	168

Date Collected	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
10/25/1994	12.4	8.6	117
11/28/1994	11.7	12.3	123
12/19/1994	4.9	7.0	93
1/10/1995	7.5		
2/14/1995	4.9	10.1	106
3/28/1995	5.6	9.9	115
4/25/1995	4.3	6.4	115
5/23/1995	4.3	6.6	108
6/20/1995	11.5	9.9	121
7/17/1995	6.3	5.0	91
8/8/1995	13.1	7.5	138
9/19/1995	16.8	7.0	160
10/17/1995	18.5	7.2	176
11/13/1995		9.7	168
12/18/1995	15.3	11.8	140
1/30/1996	13.7	20.7	199
2/20/1996	10.4	13.6	155
3/12/1996	11.8	10.2	192
4/23/1996	4.3	13.9	184
5/21/1996	5.0	10.0	102
6/18/1996	11.1	11.9	135
7/16/1996	24.9	15.7	170
8/6/1996	10.5	10.1	104
9/10/1996	32.3	13.3	207
10/1/1996	5.2	11.0	75
11/19/1996	9.4	11.8	110
12/17/1996	8.5	15.0	112
1/28/1997	5.0	11.7	115
2/25/1997	3.5	8.8	101
3/11/1997	3.4	9.2	
4/15/1997	3.4	11.0	90
5/13/1997	4.5	9.3	91
6/10/1997		10.2	118
7/22/1997	11.3	10.2	120
8/26/1997	22.2	6.6	149
9/30/1997	27.9	7.1	176
10/28/1997	21.9	7.1	174
11/18/1997		7.4	181
12/16/1997	21.6	11.4	156
1/20/1998	4.1	4.8	112
2/17/1998	4.0	6.0	107
3/17/1998	2.2	5.0	82
4/14/1998	2.2	5.8	110
5/19/1998	20.5	11.4	136
6/9/1998	7.7	6.9	126
7/22/1998	16.5	4.5	127
8/11/1998	37.2	8.5	194
9/1/1998	37.5	8.0	209
9/29/1998	37.3	5.8	207
11/9/1998	35.6	6.5	

Date Collected	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
11/16/1998	31.5	7.4	194
12/22/1998	13.6	10.0	134
1/12/1999	3.7	5.2	85
1/26/1999	4.0	6.0	129
2/1/1999	2.4	3.7	92
2/23/1999	2.1	3.5	95
3/9/1999	2.9	4.5	95
3/23/1999	2.8	4.7	74
4/27/1999	2.3		90
5/25/1999	4.2	5.0	130
6/29/1999	9.5	6.0	119
7/27/1999	21.1	7.9	142
8/17/1999	23.8	8.7	170
8/30/1999	21.8	6.2	160
9/21/1999	34.1	7.6	194
9/27/1999	35.7	7.4	201
10/19/1999	39.3	7.3	214
10/25/1999	42.3	7.9	222
11/22/1999	32.3	6.3	196
12/20/1999	26.7	7.0	179
1/18/2000	21.1	15.1	165
1/25/2000	6.5	7.5	87
2/29/2000	17.2*	30.5*	175*
3/21/2000	10.6	6.8	197
3/27/2000	6.8	6.6	130
4/4/2000	3.9	4.9	135
4/24/2000	3.0	3.8	94
5/30/2000	6.6	5.4	124
6/5/2000	5.5	4.9	134
6/27/2000	5.9	4.8	144
7/25/2000	16.4	8.2	147
8/22/2000	23.6	6.6	180
9/12/2000	24.7	6.6	180
9/19/2000	25.7	7.2	183
10/17/2000	27.6	7.0	172
11/7/2000	35.5	8.4	196
12/19/2000	6.0	7.0	122
1/30/2001	2.0	4.4	78
2/27/2001	1.7	4.2	
3/26/2001	1.8	3.5	88
4/17/2001	2.8	4.7	92
5/22/2001	3.3	4.6	135
6/19/2001	11.3	8.2	135
7/24/2001	15.6	6.0	162
8/20/2001	29.2	7.1	196
9/17/2001	11.1	4.7	133
10/23/2001	5.9	5.5	85
11/19/2001	4.6	3.9	113
12/11/2001	3.3	3.3	79
1/14/2002	3.2	3.1	64

Date Collected	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
2/26/2002	2.6	4.4	99
3/26/2002	2.3	4.2	100
4/23/2002	2.2	3.3	93
5/28/2002	3.2	4.3	94
6/25/2002	12.7	8.6	
7/23/2002	22.1	8.3	149
8/20/2002	20.5	5.9	155
9/17/2002	31.2	8.7	190
10/15/2002	22.7	9.1	126
11/5/2002	12.3	6.4	124
12/3/2002	14.7	8.9	146
1/21/2003	3.1	5.3	93
2/25/2003	4.0	6.2	118
3/25/2003	2.2	5.2	101
4/15/2003	2.7	4.5	115
5/20/2003	4.2	5.0	30
6/17/2003	3.6	3.6	103
7/15/2003	3.0	3.3	84
8/12/2003	18.8	6.4	157
9/23/2003	18.0	5.5	137
10/14/2003	23.7	5.5	157
11/11/2003	21.0	6.0	142
12/16/2003	15.8	10.6	146
1/20/2004	15.1	9.9	277
2/17/2004	3.5	4.9	153
3/16/2004	2.4	4.1	100
4/13/2004	3.2	5.1	117
5/11/2004	3.7	5.2	130
5/15/2004	3.3	4.3	110
7/20/2004	3.0	2.7	76
8/17/2004	11.6	4.5	131
9/21/2004	16.9	6.0	142
10/19/2004	6.4	9.1	79
11/30/2004	2.8	3.3	92
12/14/2004	2.6	3.7	76
2/22/2005	3.1	5.6	106
3/28/2005	3.7	6.6	103
4/26/2005	3.1	5.2	105
5/24/2005	5.9	5.4	130
6/21/2005	11.8	8.3	140
7/25/2005	25.6	9.1	155
8/23/2005	21.8	5.8	177
9/27/2005	17.0	6.8	136
10/25/2005	17.3	8.7	153
11/29/2005	15.0	6.6	151
12/27/2005	15.7	6.7	146
1/17/2006	9.8	< 0.04	113
2/14/2006	5.7	5.4	114
4/18/2006	3.7	5.6	108
5/16/2006	12.0	7.8	125

Date Collected	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
7/25/2006	15.6	6.7	135
8/29/2006	21.7	10.6	148
9/26/2006 **			
10/24/2006	14.7	8.5	133
11/28/2006	13.6	6.4	121
12/5/2006	14.1	6.6	115
1/2/2007	8.7	6.4	125
2/6/2007	2.9	4.3	87
3/13/2007	6.1	8.7	125
4/3/2007	5.2	8.6	117

* Values for 2/29/2000 are averages of duplicates on the same day

** Sample results on 9/26/2006 (164 mg/L chloride, 54.4 mg/L sulfate, and 539 mg/L TDS) were excluded from statistics, plots, and TMDL development in this report because the results were considered unrealistic based on comparison with other data and best professional judgement.

FILE: R:\PROJECTS\2110-624\TECH\WQDATA\OUA0013 BAYOU BARTHOLOMEW.XLS

Figure B.1. Time Series Plot of Chloride in Bayou Bartholomew at Garrett Bridge (UWBYB03)

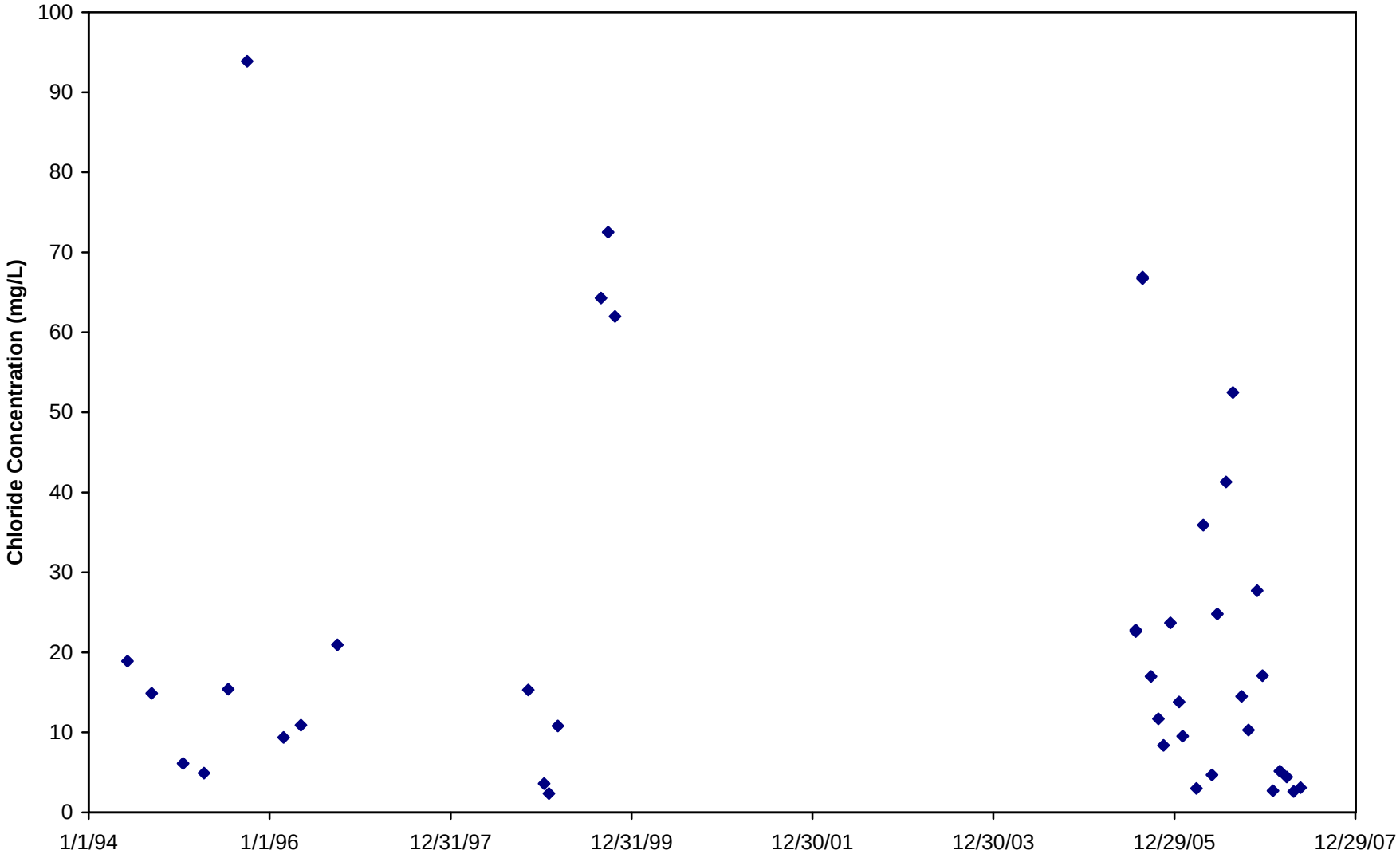


Figure B.2. Time Series Plot of Sulfate in Bayou Bartholomew at Garrett Bridge (UWBYB03)

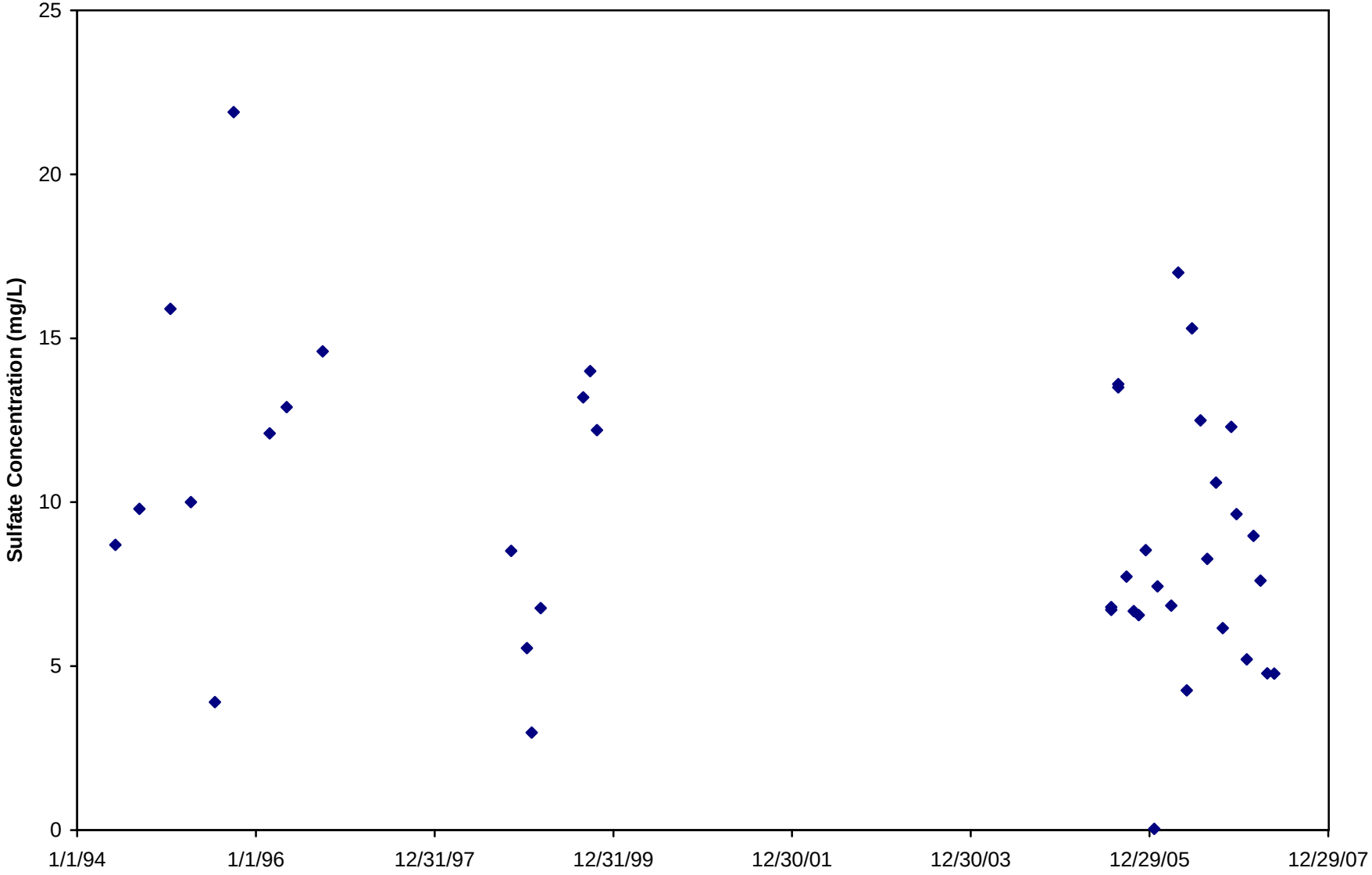


Figure B.3. Time Series Plot of TDS in Bayou Bartholomew at Garrett Bridge (UWBYB03)

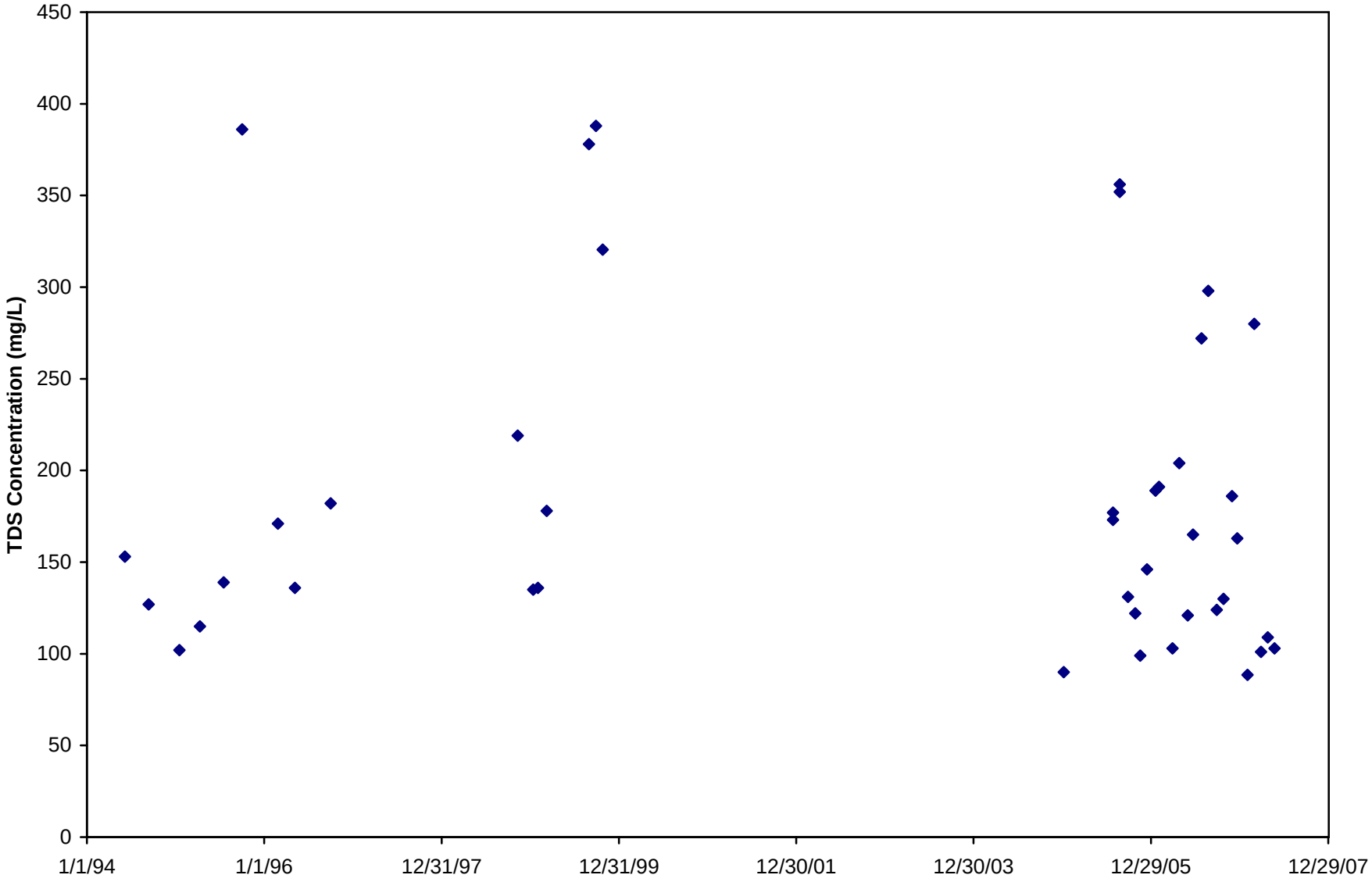


Figure B.4. Time Series Plot of Chloride in Bayou Bartholomew near McGehee (UWBYB02)

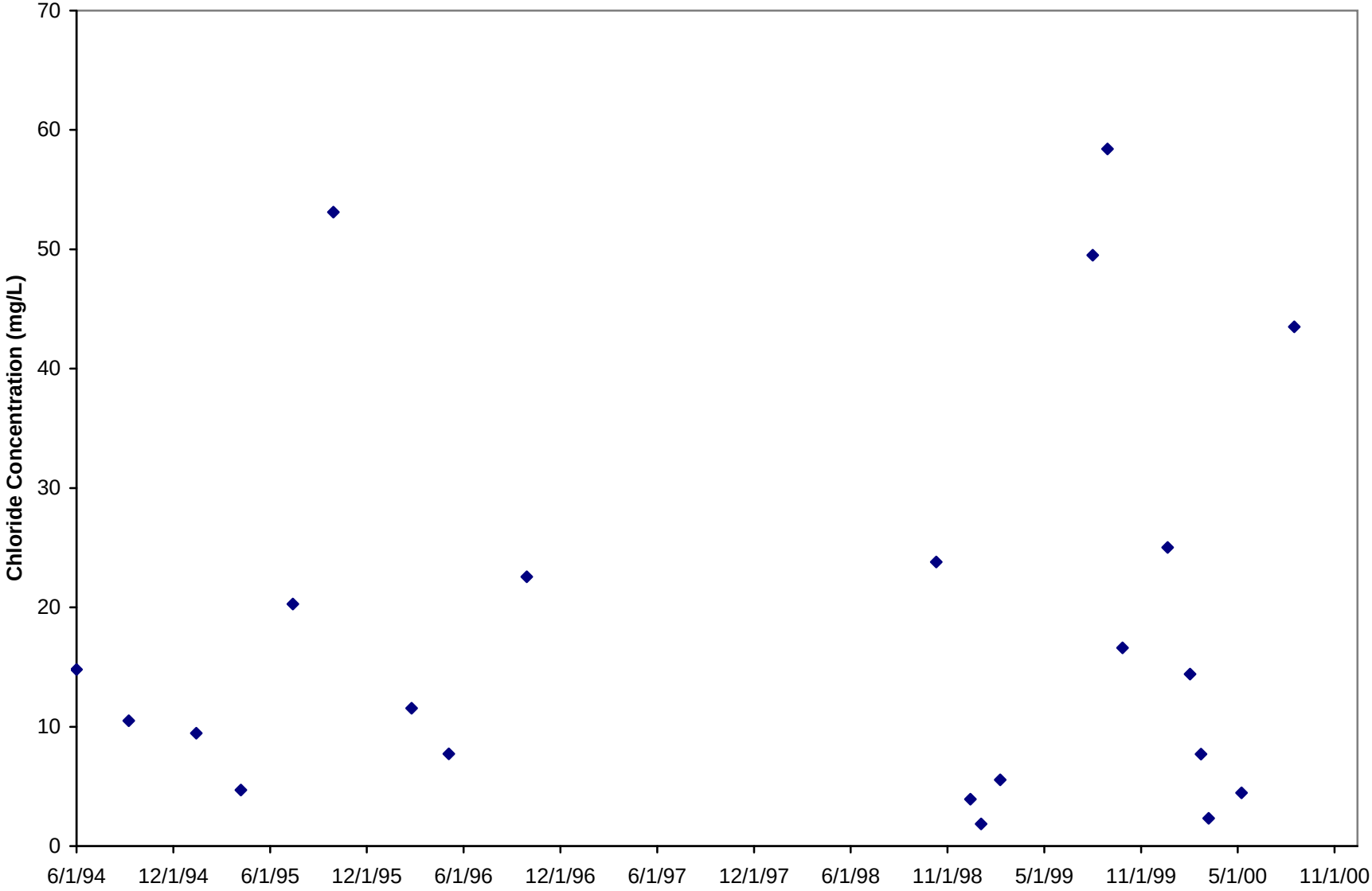


Figure B.5. Time Series Plot of Sulfate in Bayou Bartholomew near McGehee (UWBYB02)

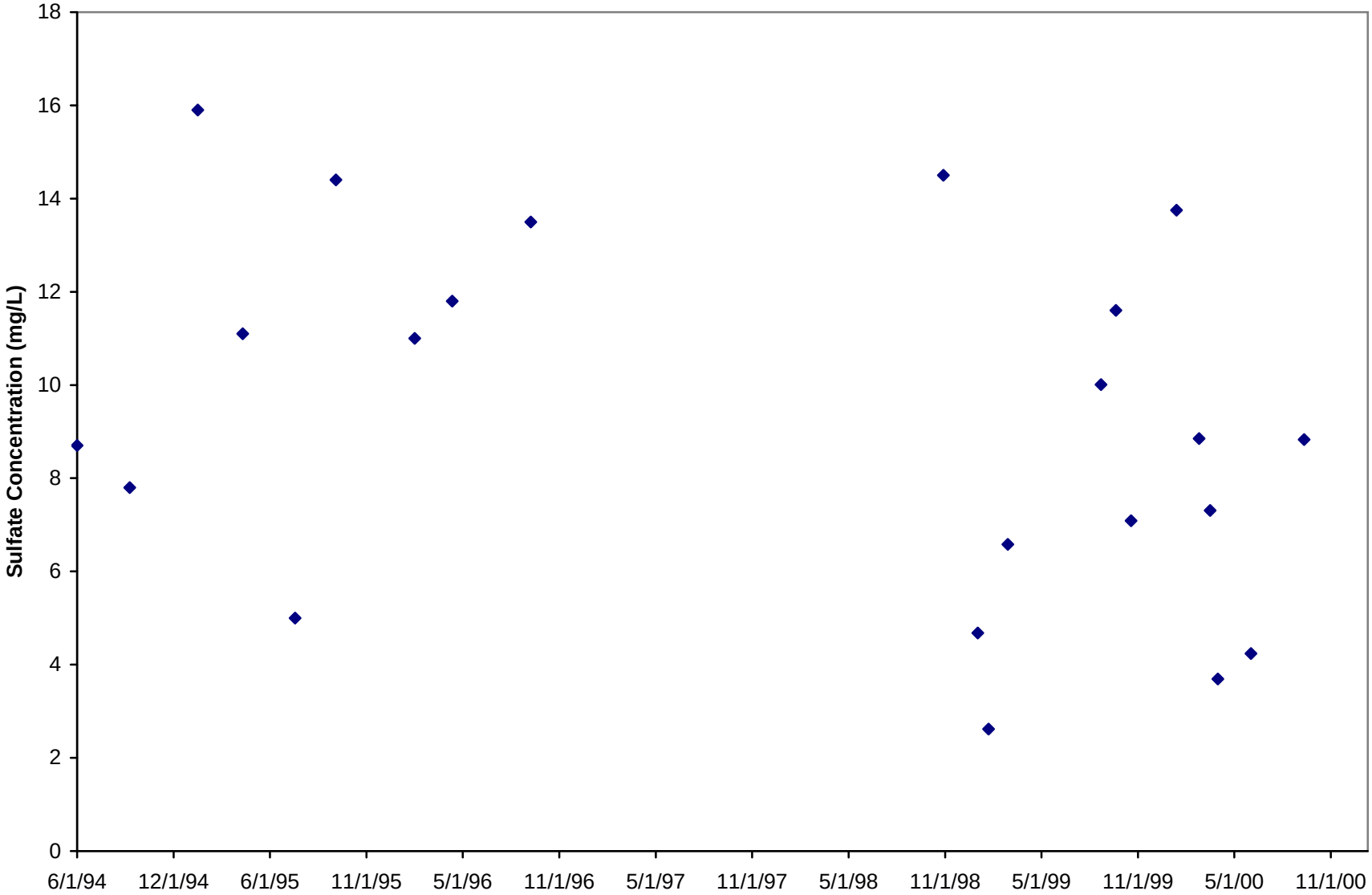


Figure B.6. Time Series Plot of TDS in Bayou Bartholomew near McGehee (UWBYB02)

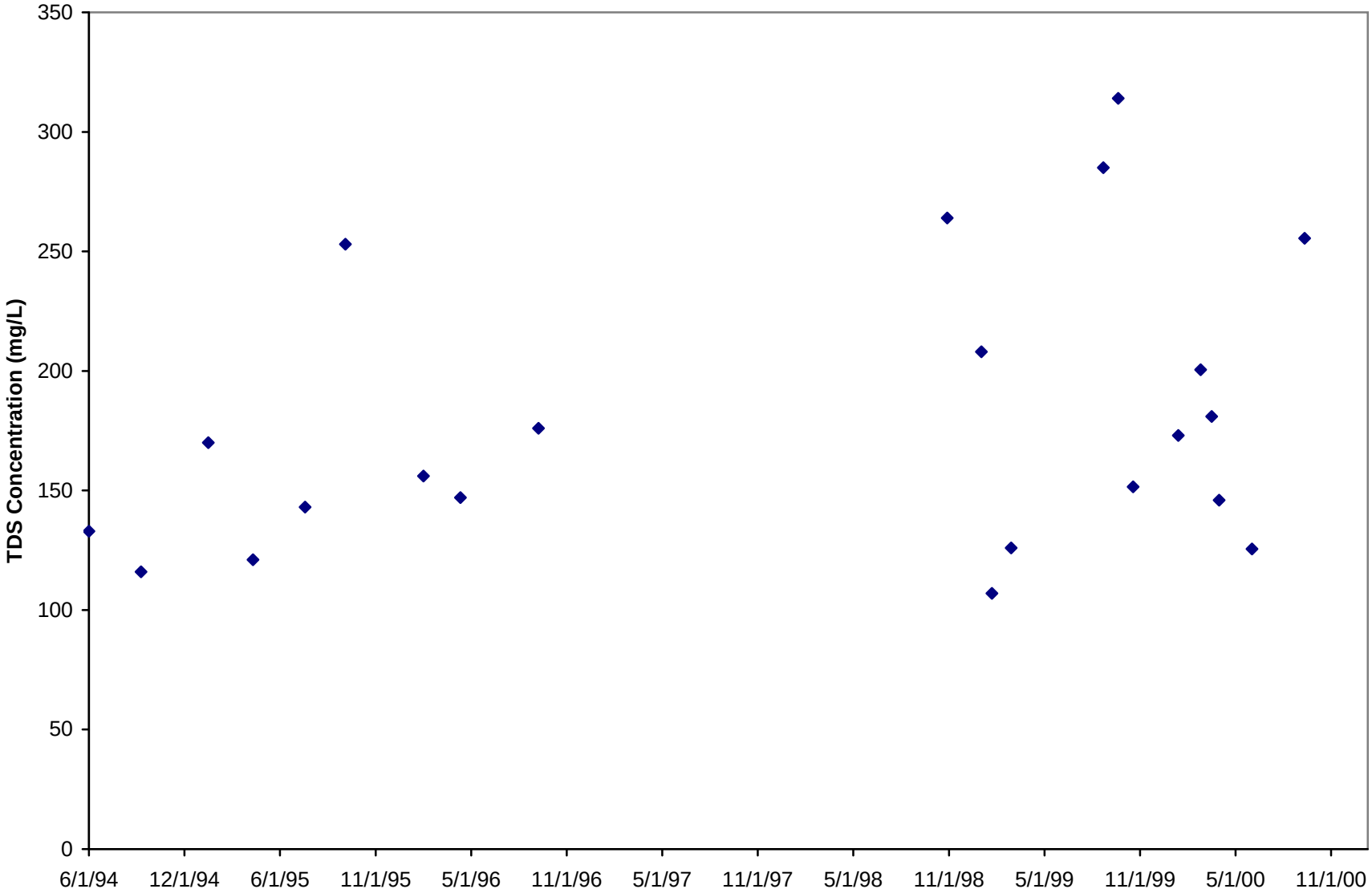


Figure B.7. Time Series Plot of Chloride in Bayou Bartholomew near Portland (OUA0154)

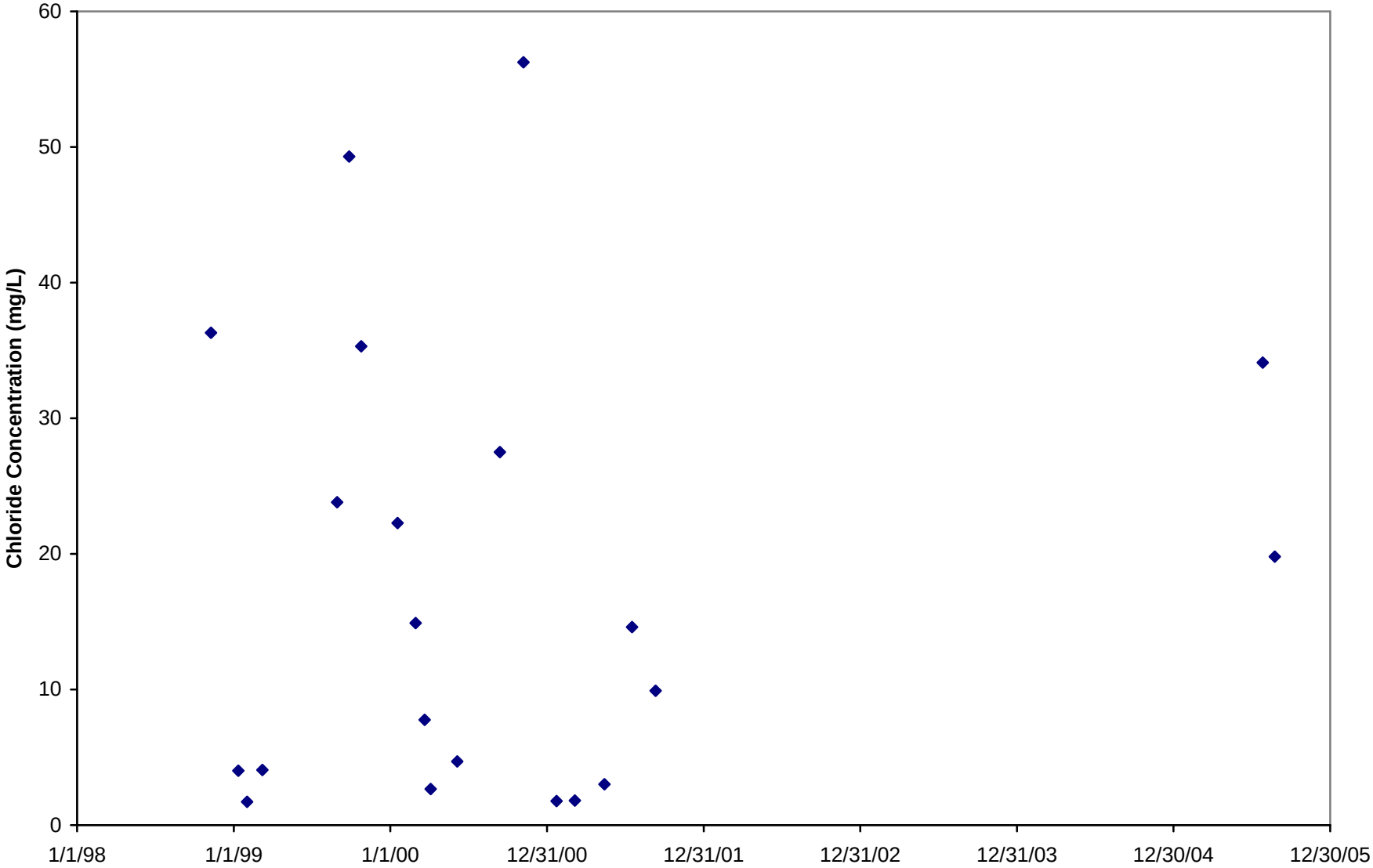


Figure B.8. Time Series Plot of Sulfate in Bayou Bartholomew near Portland (OUA0154)

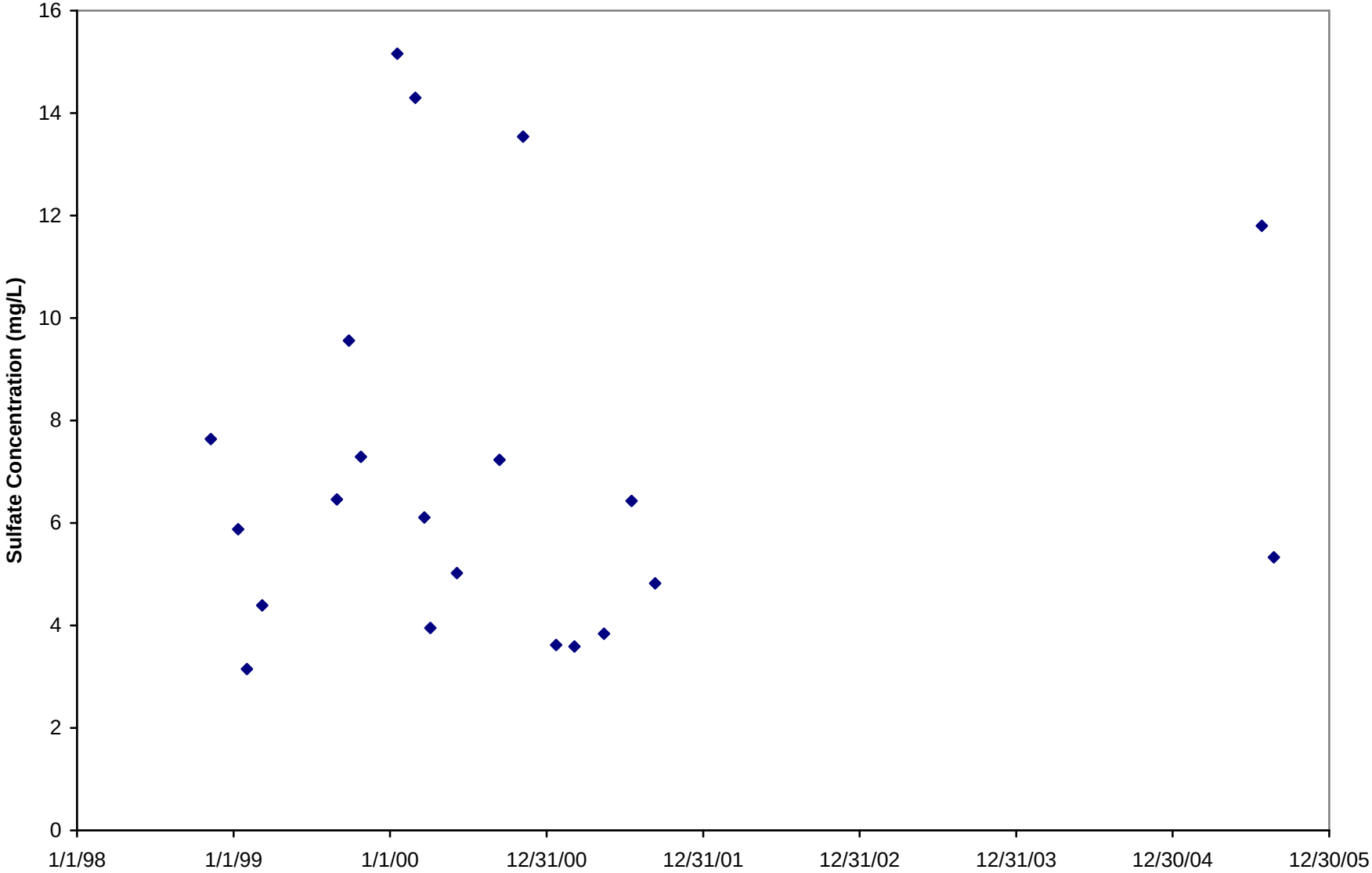


Figure B.9. Time Series Plot of TDS in Bayou Bartholomew near Portland (OUA0154)

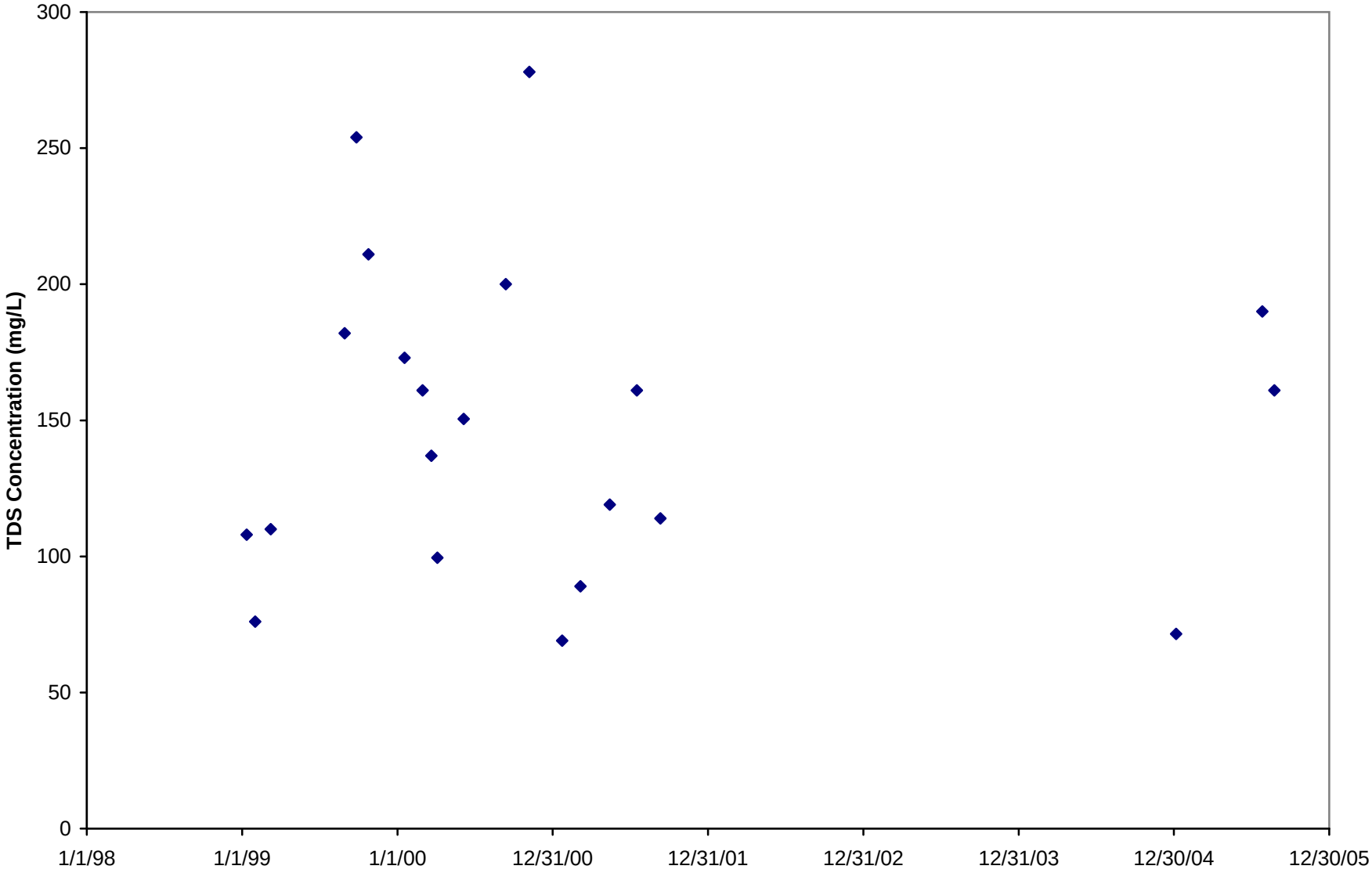


Figure B.10. Time Series Plot of Chloride in Bayou Bartholomew near Jones, LA (OUA0013)

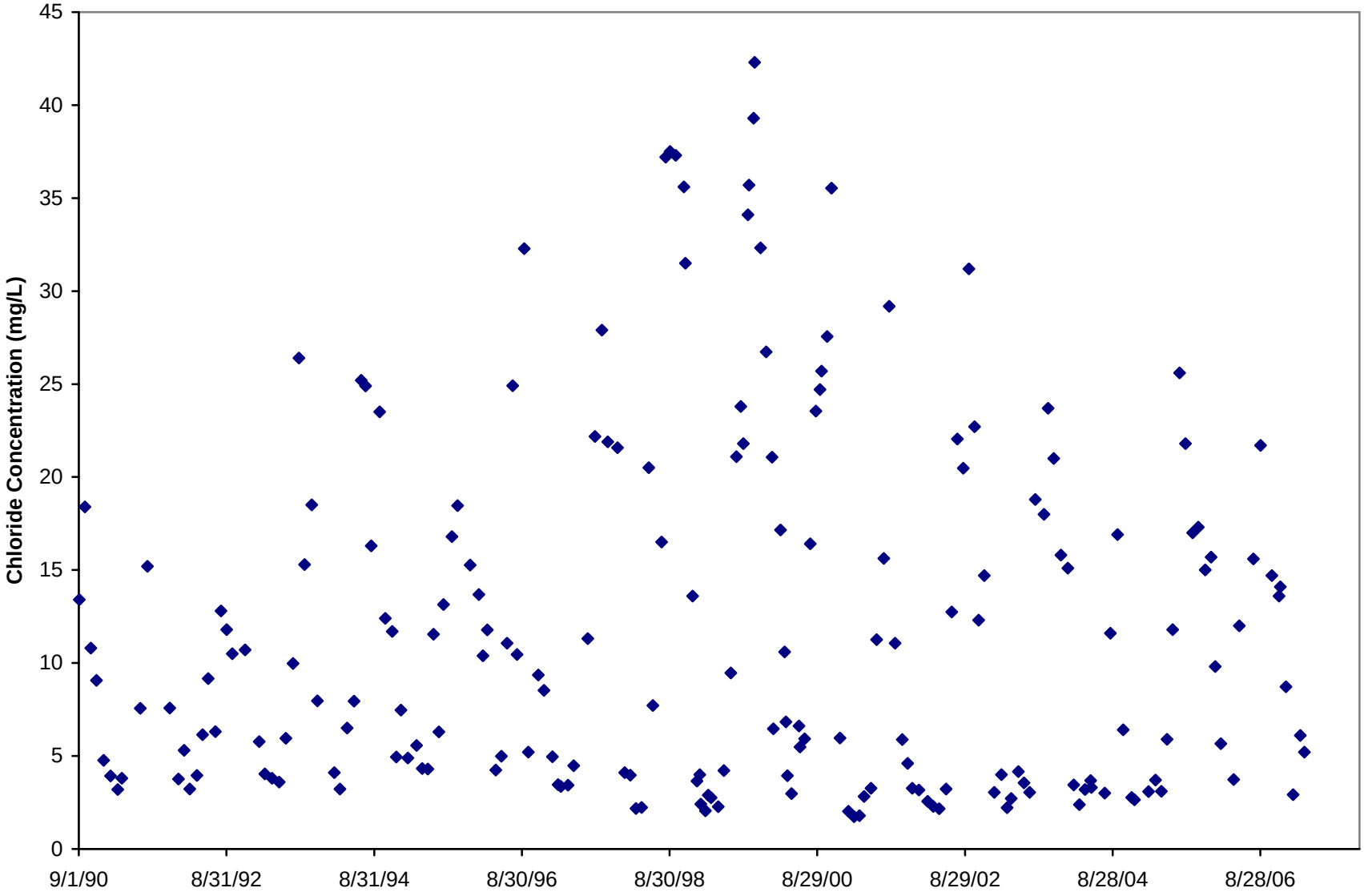


Figure B.11. Time Series Plot of Sulfate in Bayou Bartholomew near Jones, LA (OUA0013)

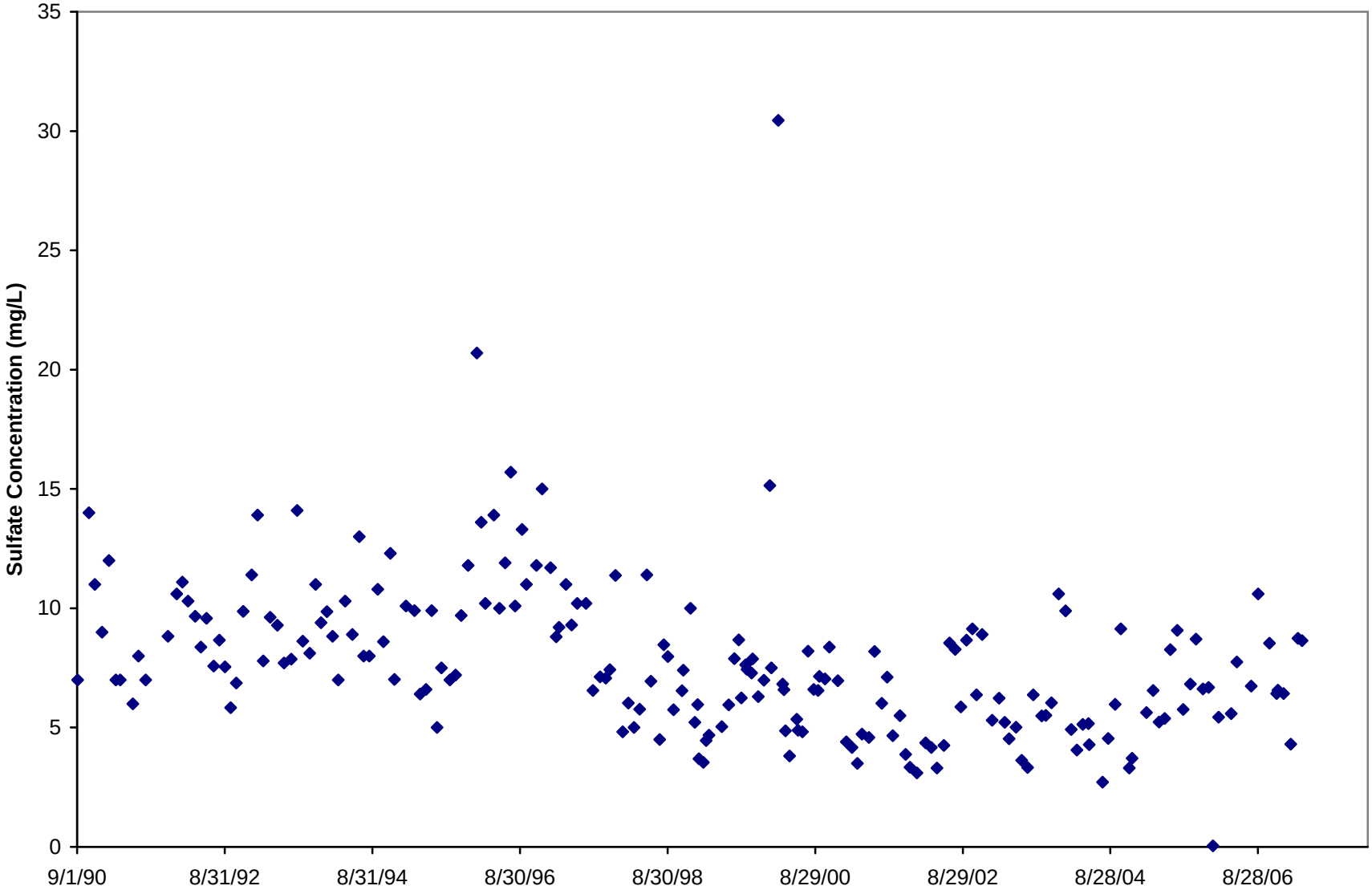
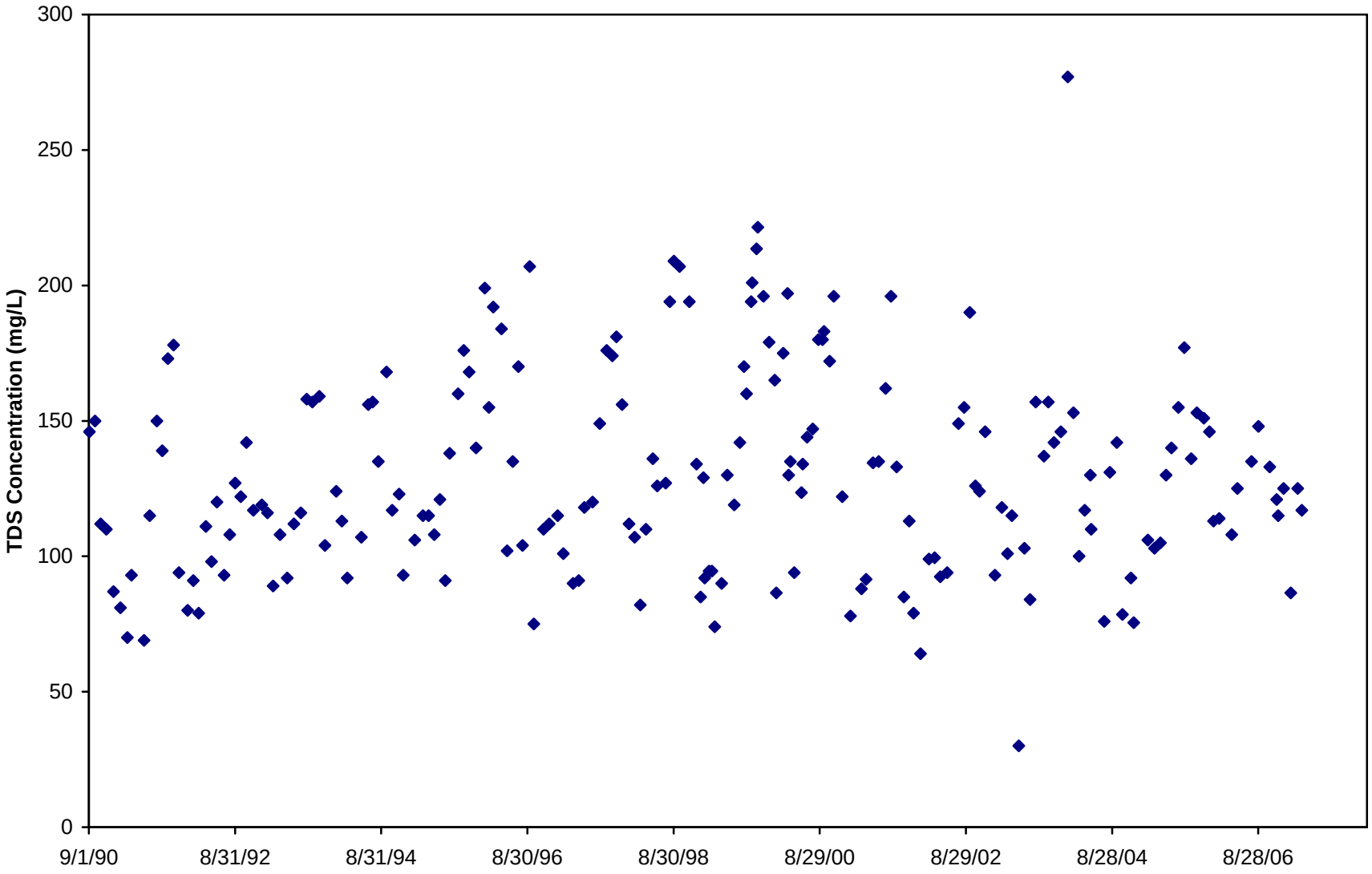


Figure B.12. Time Series Plot of TDS in Bayou Bartholomew near Jones, LA (OUA0013)



APPENDIX C

Seasonal Plots of Dissolved Minerals

Figure C.1. Seasonal Plot of Chloride in Bayou Bartholomew at Garrett Bridge (UWBYB03)

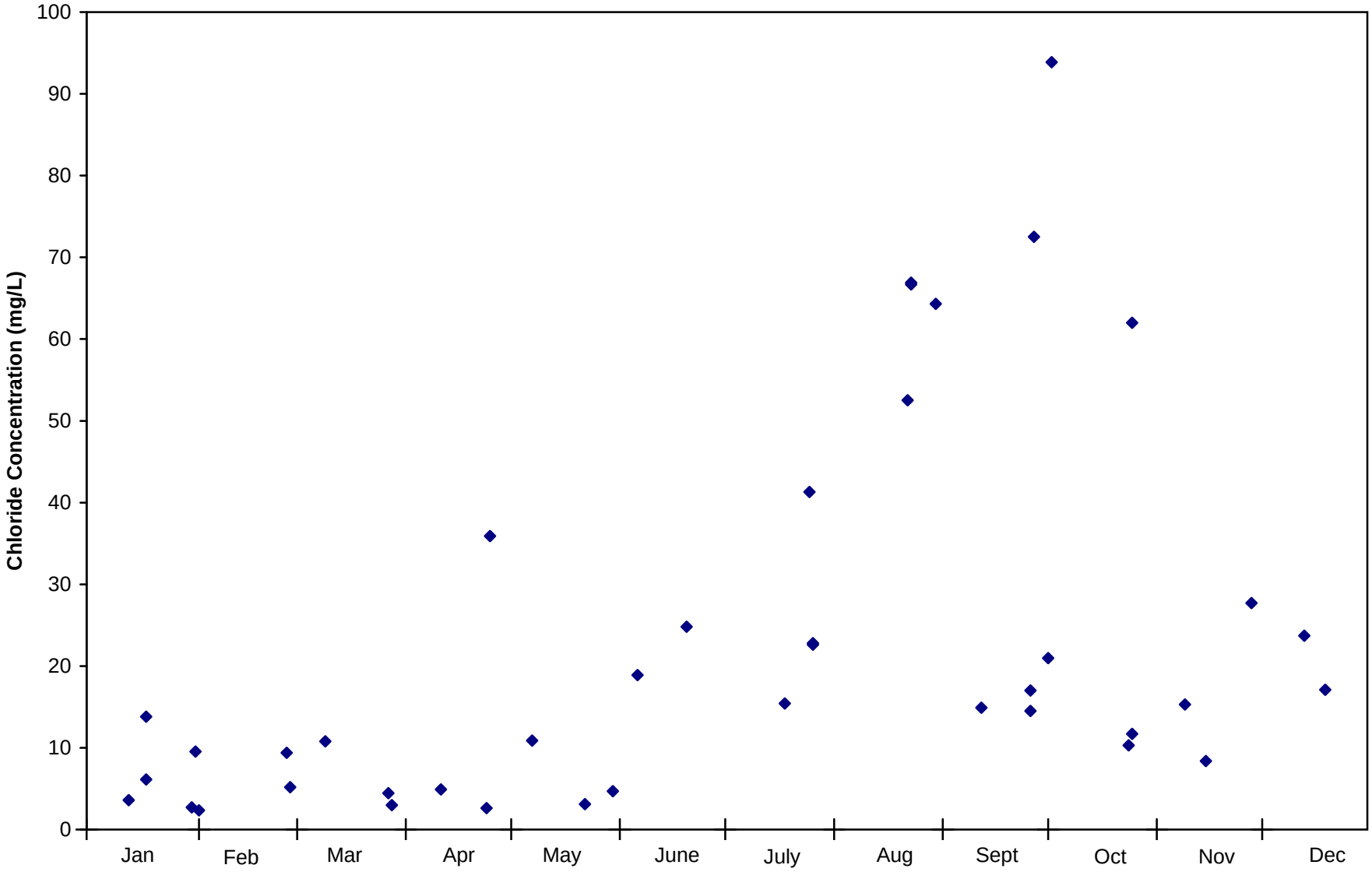


Figure C.2. Seasonal Plot of Sulfate in Bayou Bartholomew at Garrett Bridge (UWBYB03).

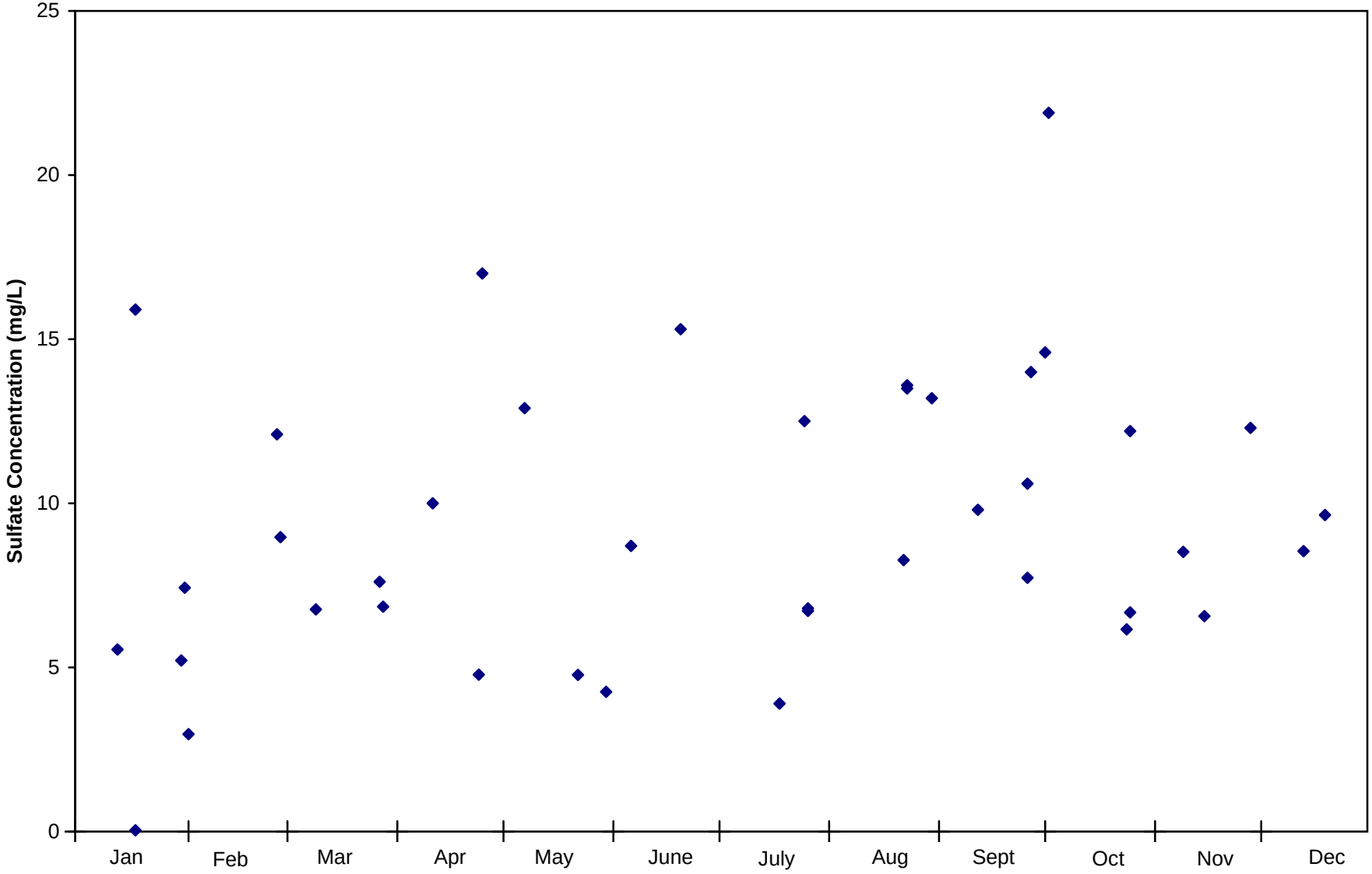


Figure C.3. Seasonal Plot of TDS in Bayou Bartholomew at Garrett Bridge (UWBYB03)

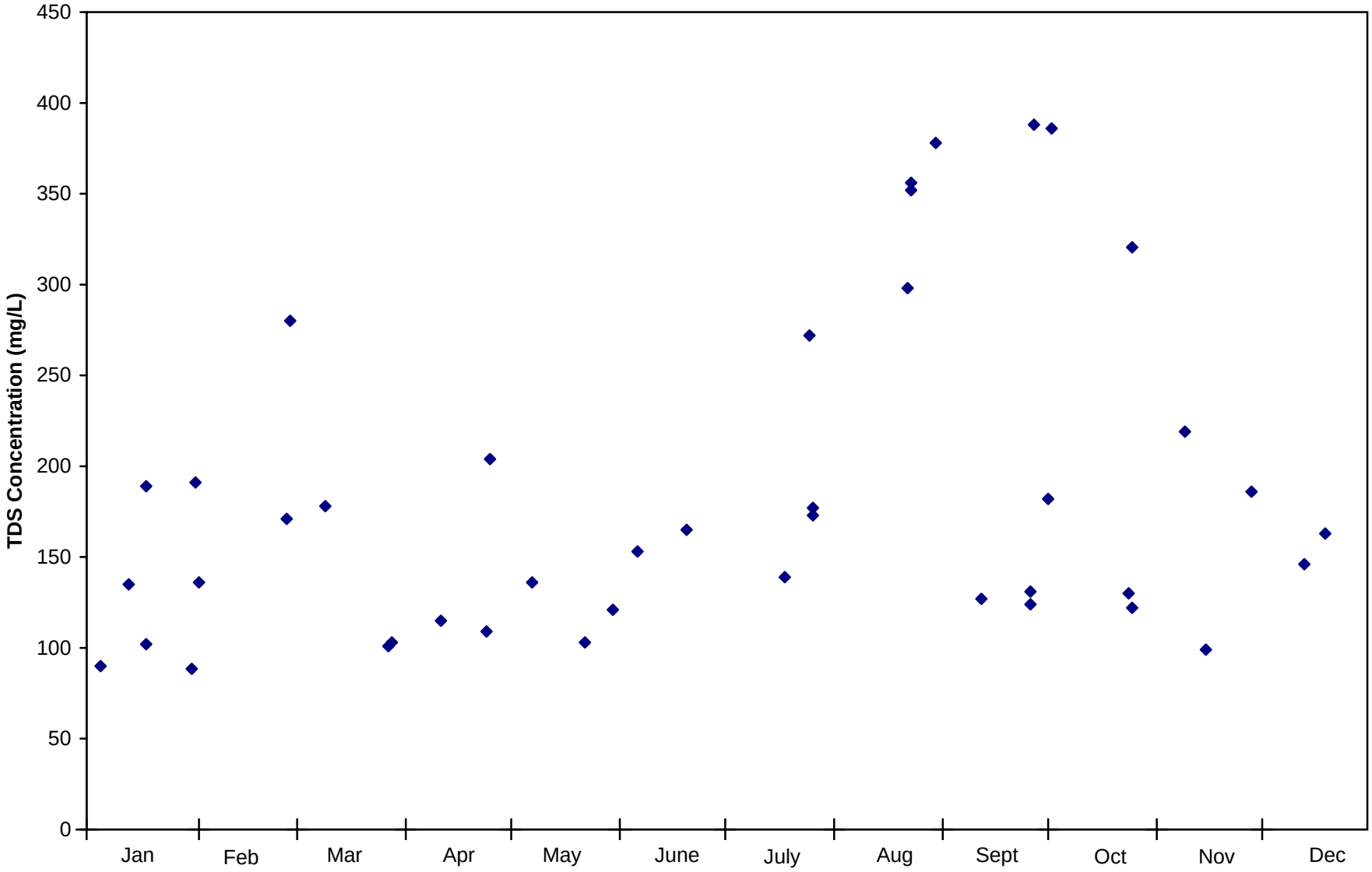


Figure C.4. Seasonal Plot of Chloride in Bayou Bartholomew near McGehee (UWBYB02)

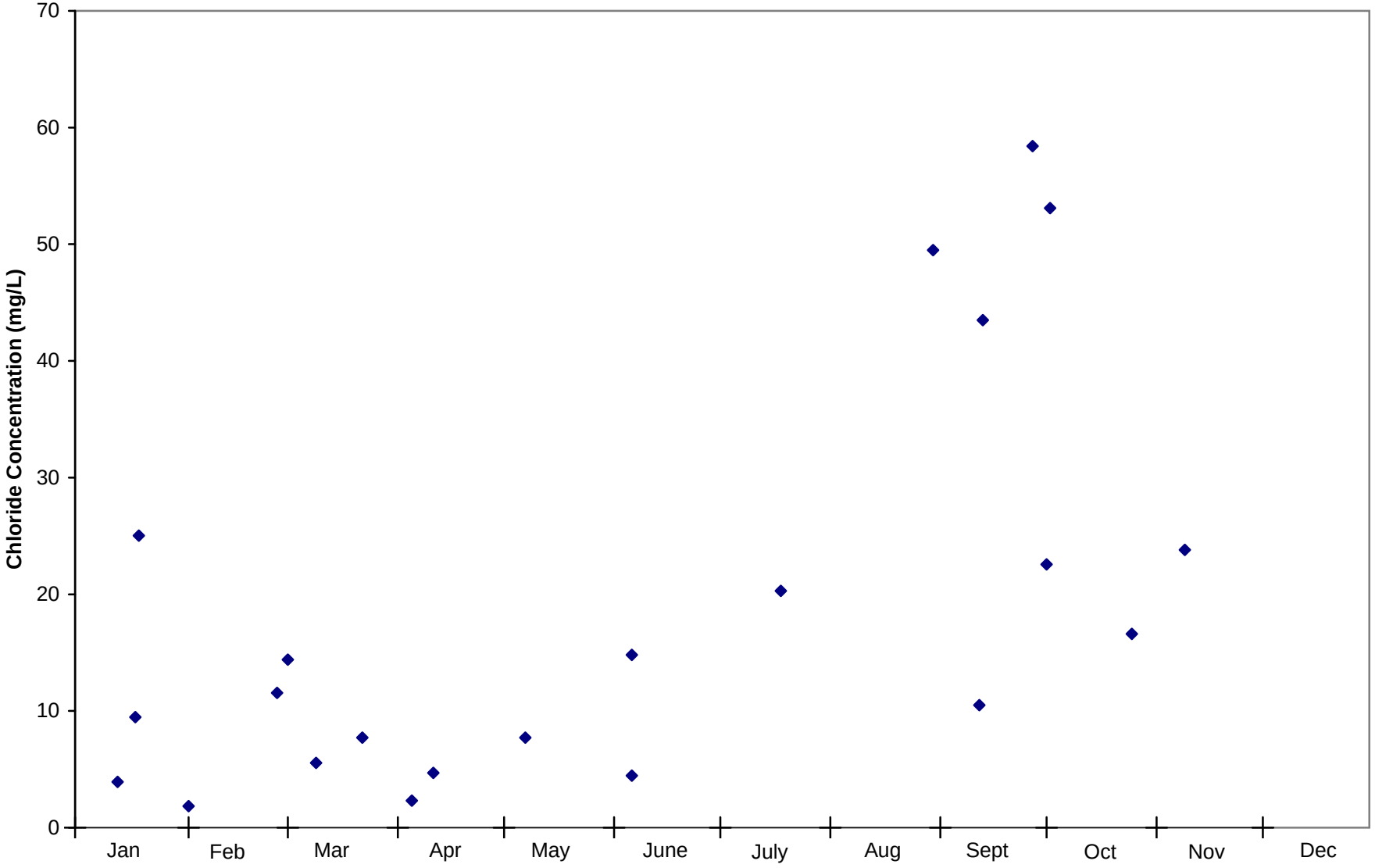


Figure C.5. Seasonal Plot of Sulfate in Bayou Bartholomew near McGehee (UWBYB02)

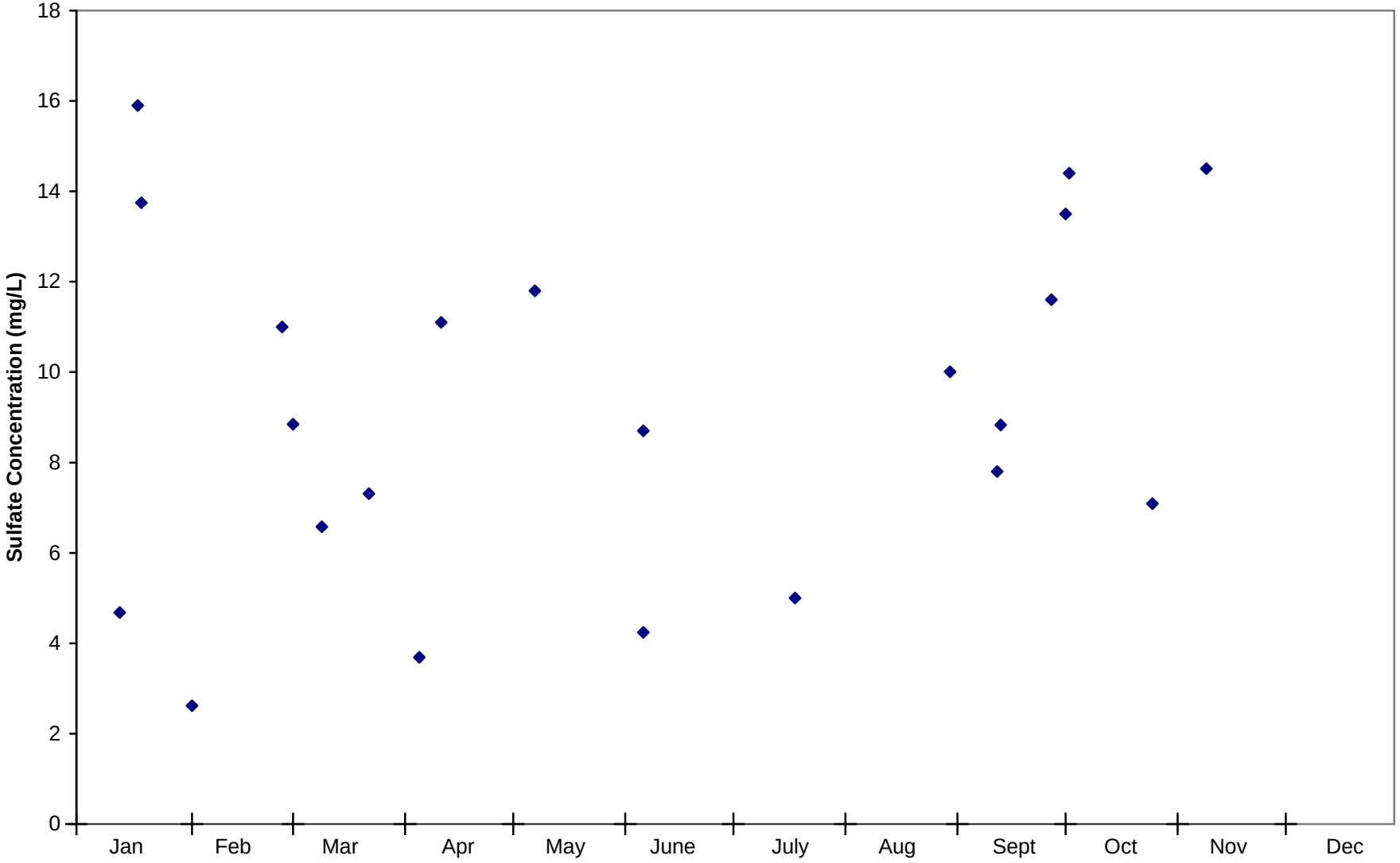


Figure C.6. Seasonal Plot of TDS in Bayou Bartholomew near McGehee (UWBYB02)

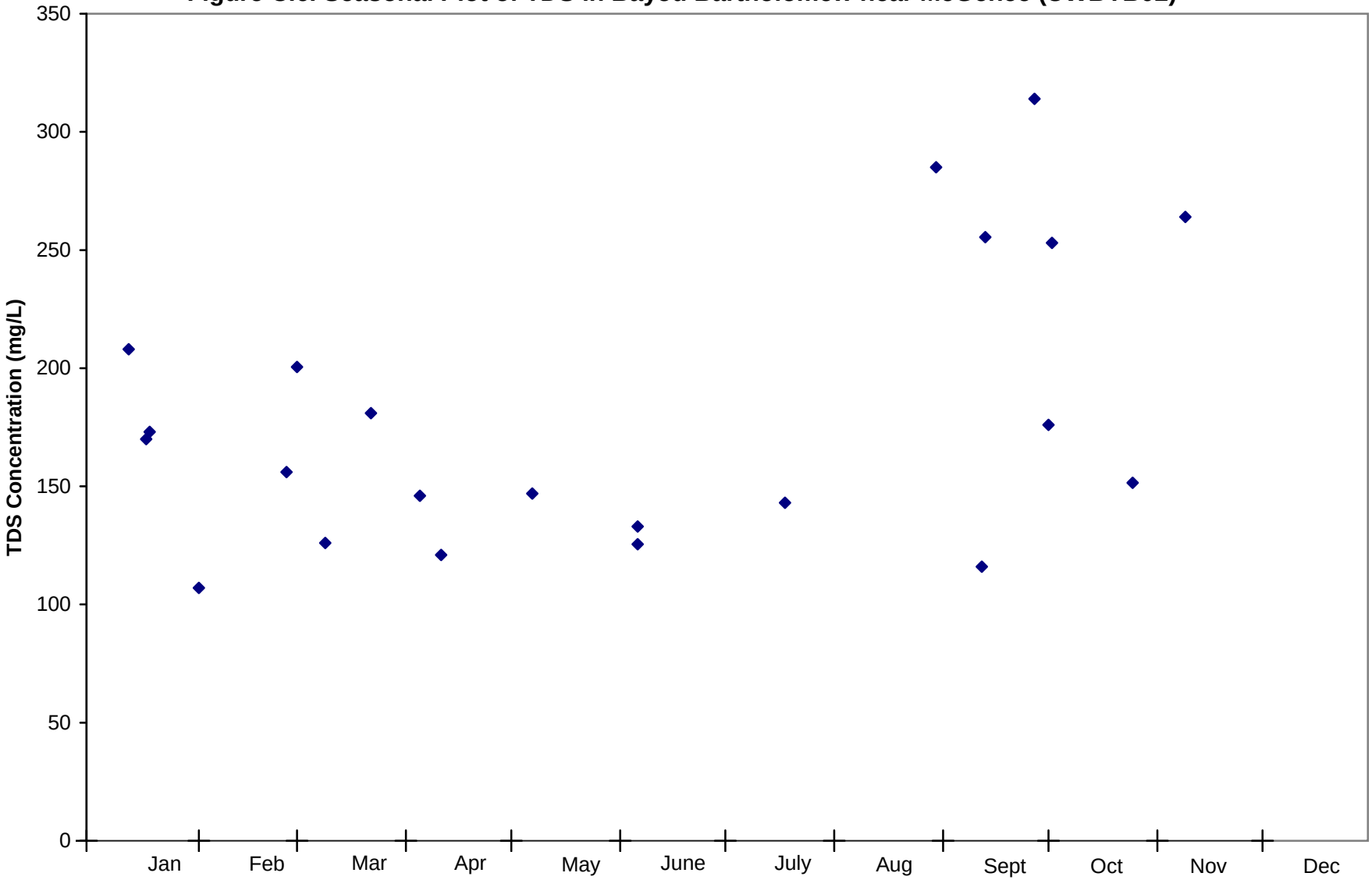


Figure C.7. Seasonal Plot of Chloride in Bayou Bartholomew near Portland (OUA0154)

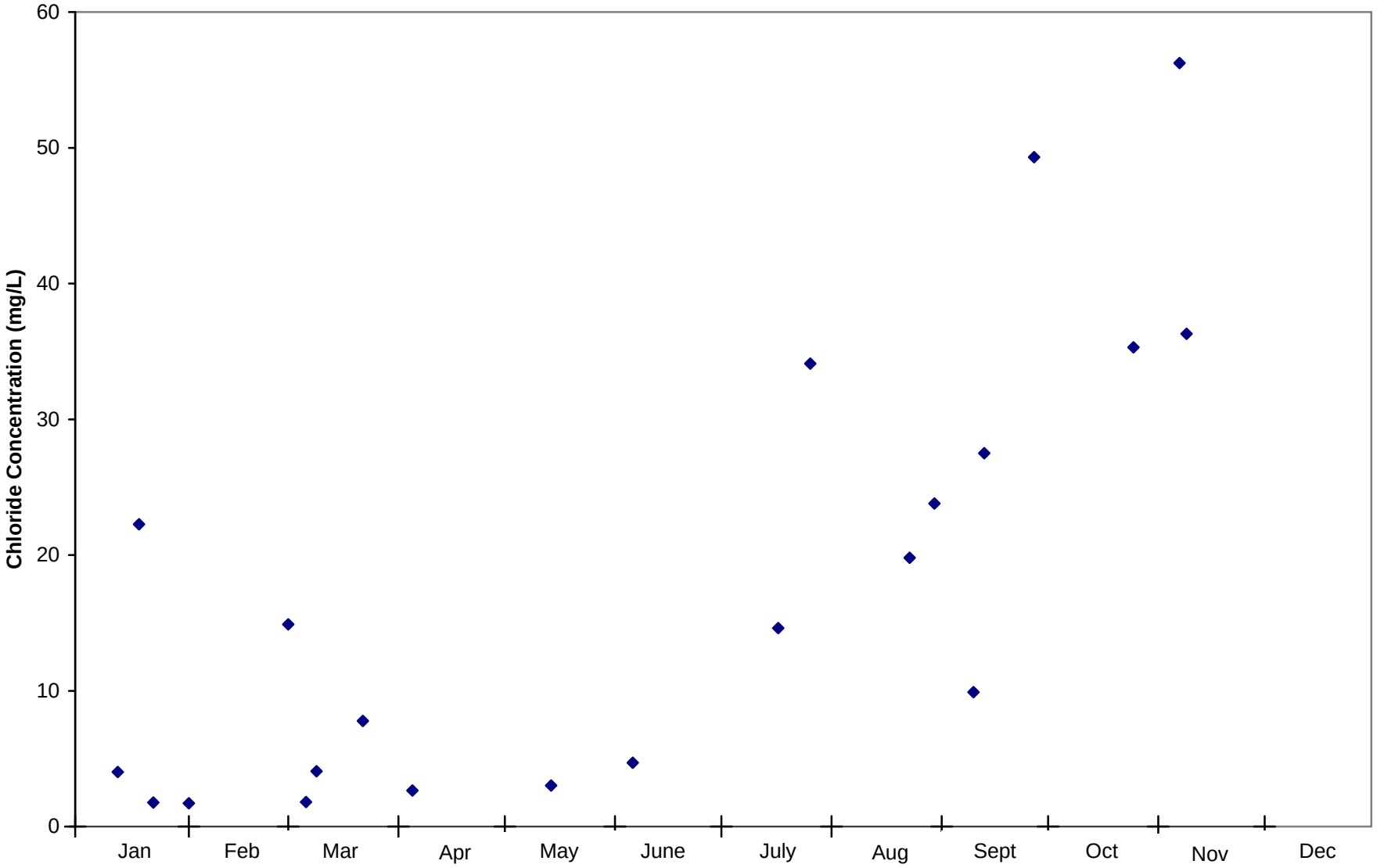


Figure C.8. Seasonal Plot of Sulfate in Bayou Bartholomew near Portland (OUA0154)

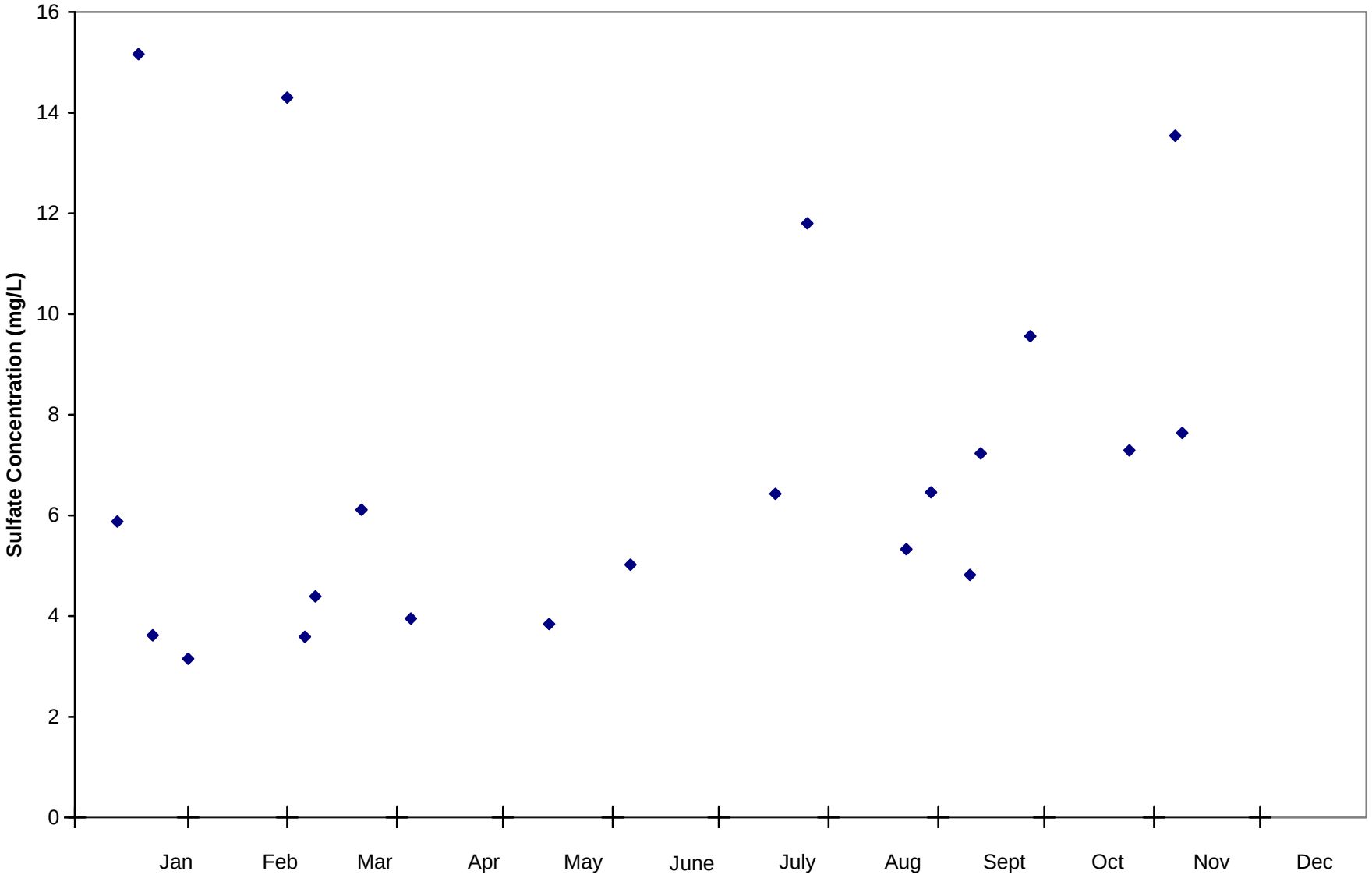


Figure C.9. Seasonal Plot of TDS in Bayou Bartholomew near Portland (OUA0154)

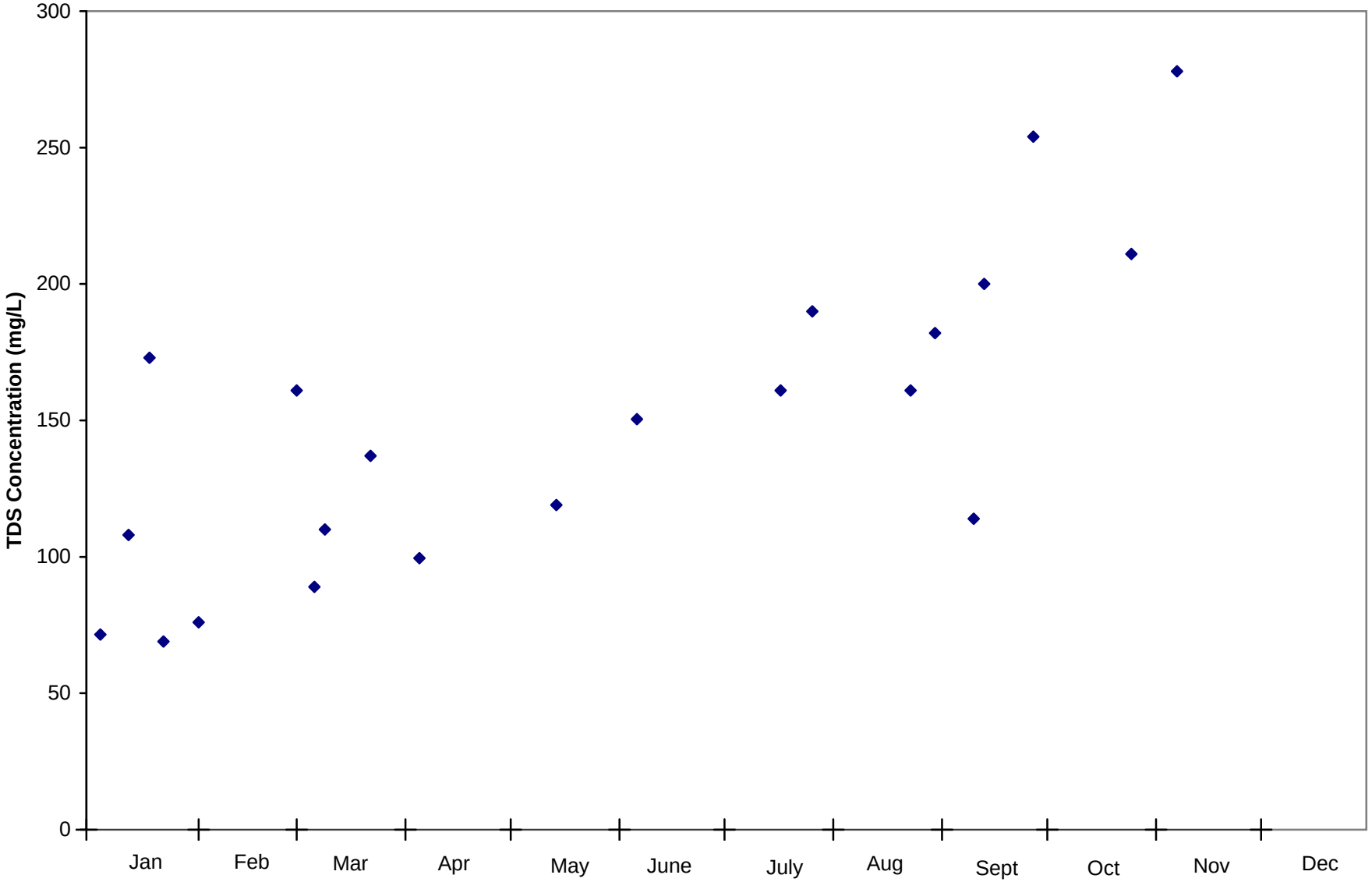


Figure C.10. Seasonal Plot of Chloride in Bayou Bartholomew near Jones, LA (OUA0013)

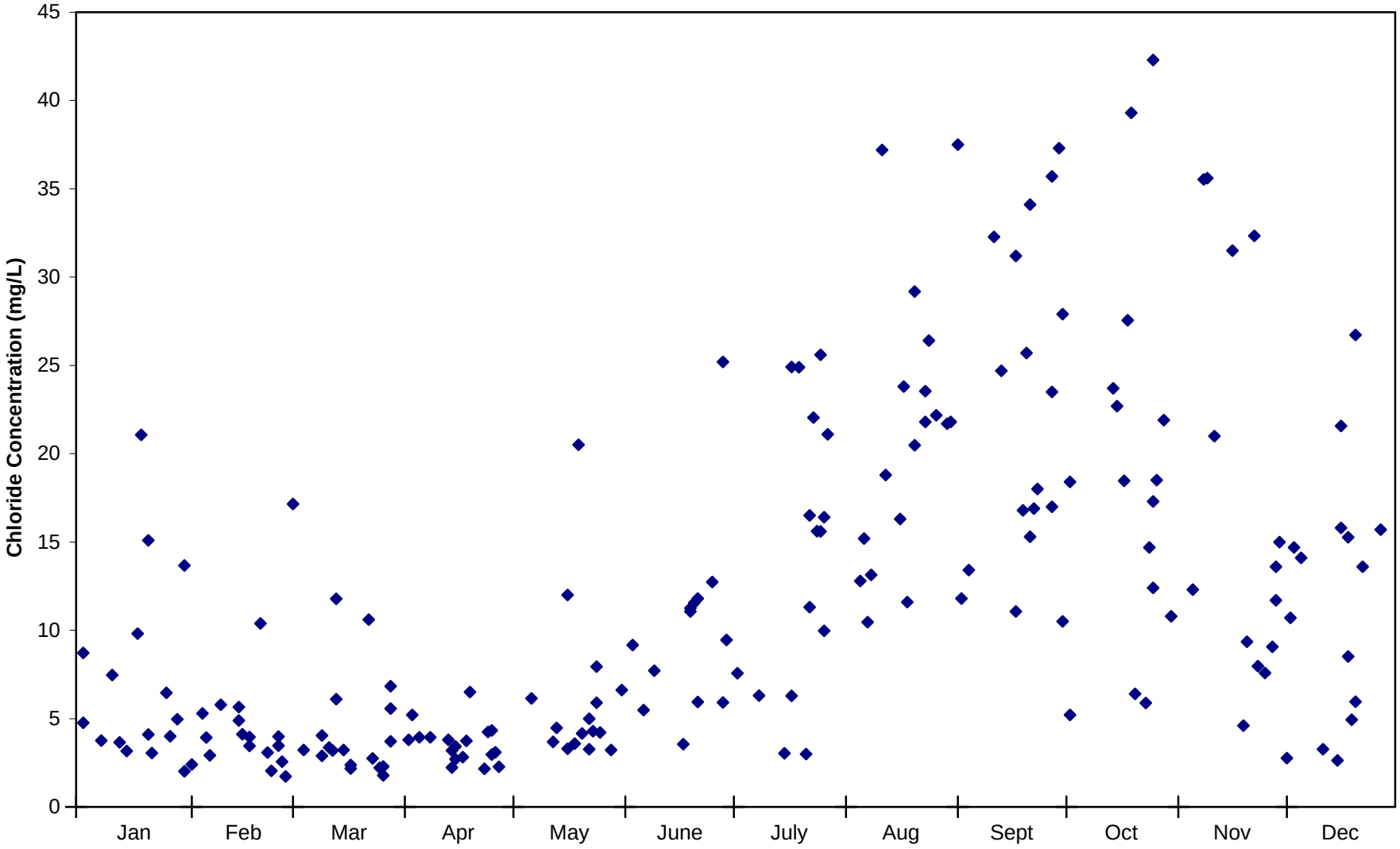


Figure C.11. Seasonal Plot of Sulfate in Bayou Bartholomew near Jones, LA (OUA0013)

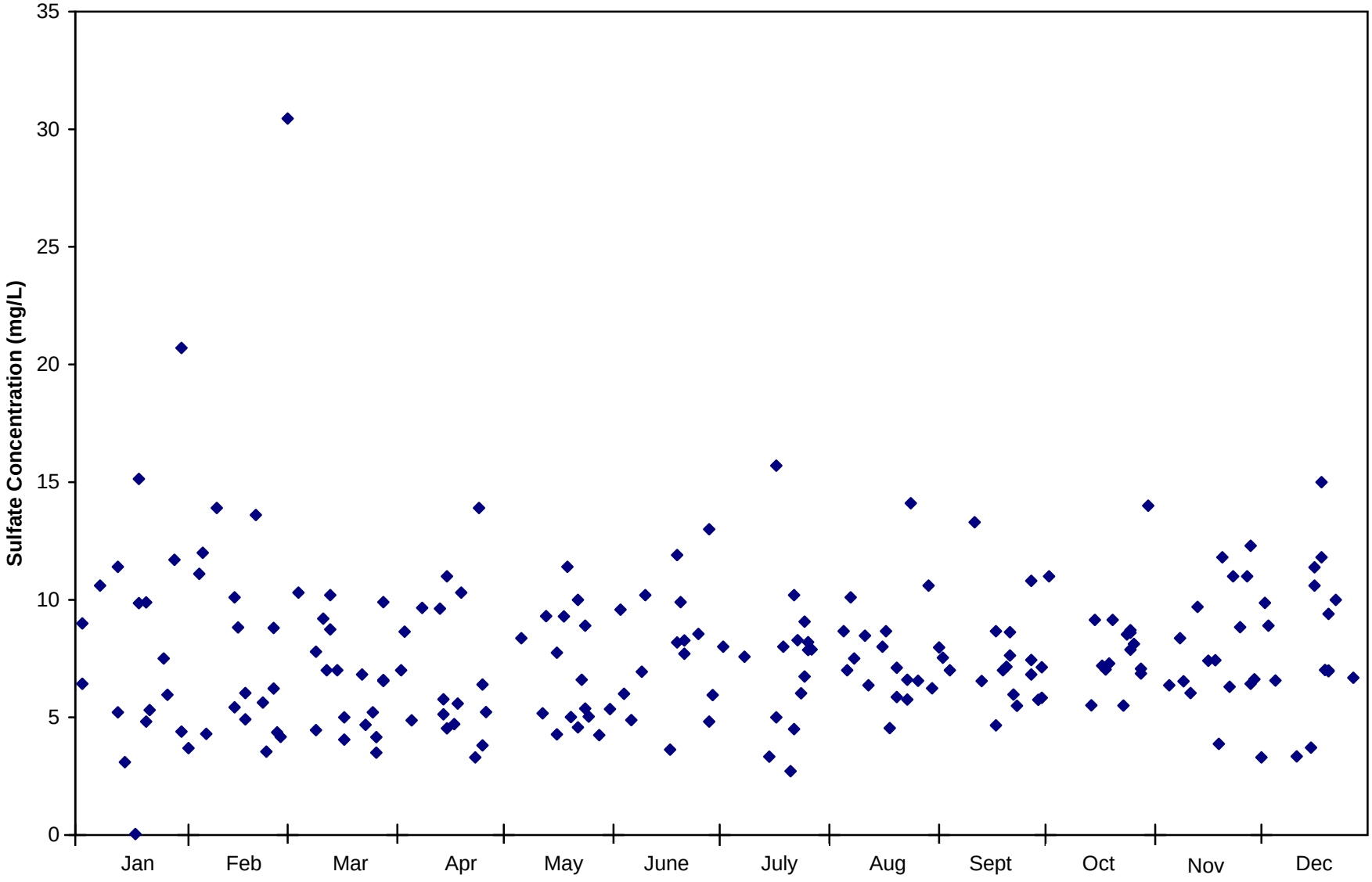
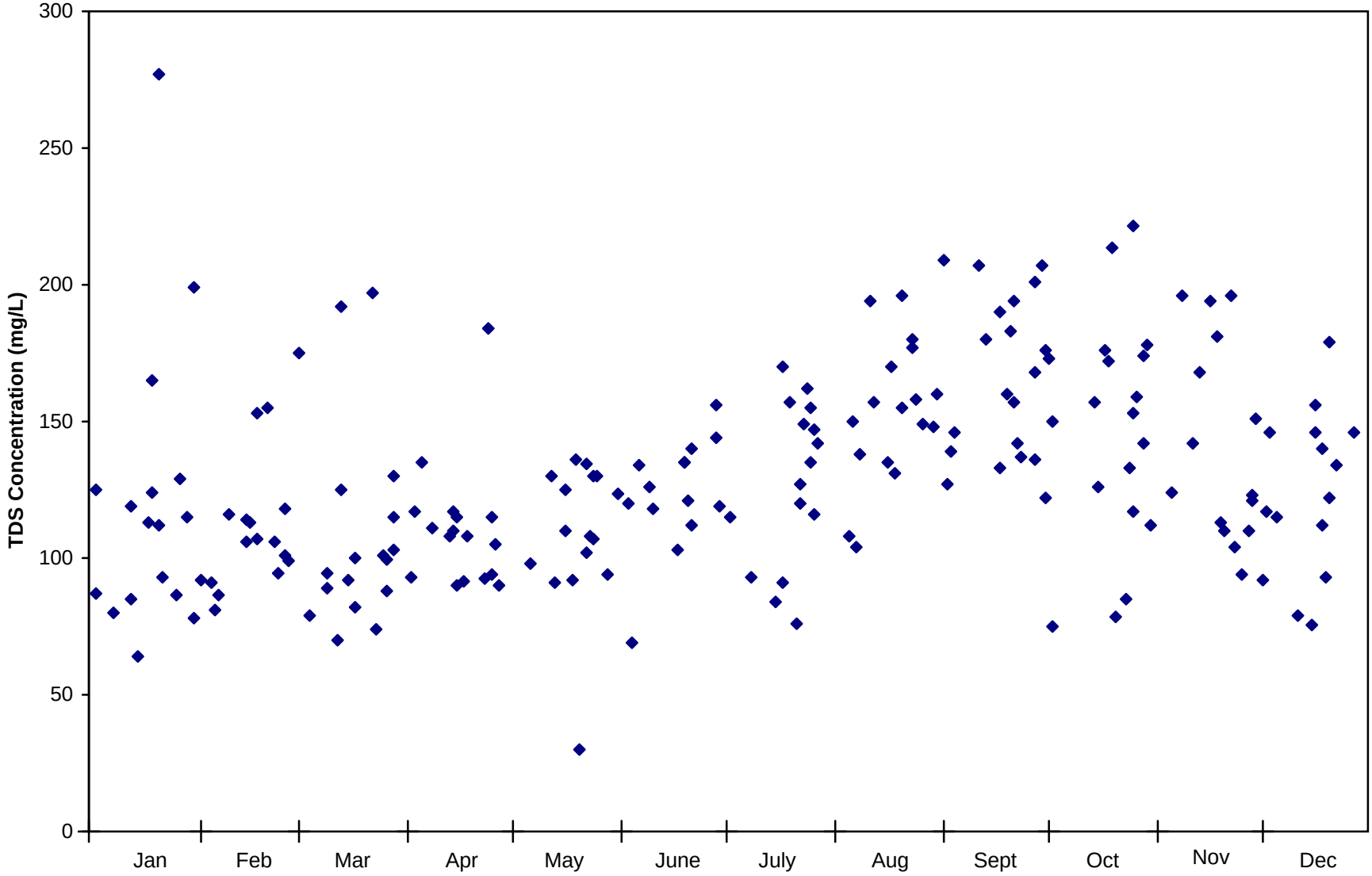


Figure C.12. Seasonal Plot of TDS in Bayou Bartholomew near Jones, LA (OUA0013)



APPENDIX D

Plots of Concentration vs. Flow for Dissolved Minerals

Figure D.1. Chloride Concentration versus Flow in Bayou Bartholomew at Garrett Bridge (UWBYB03)

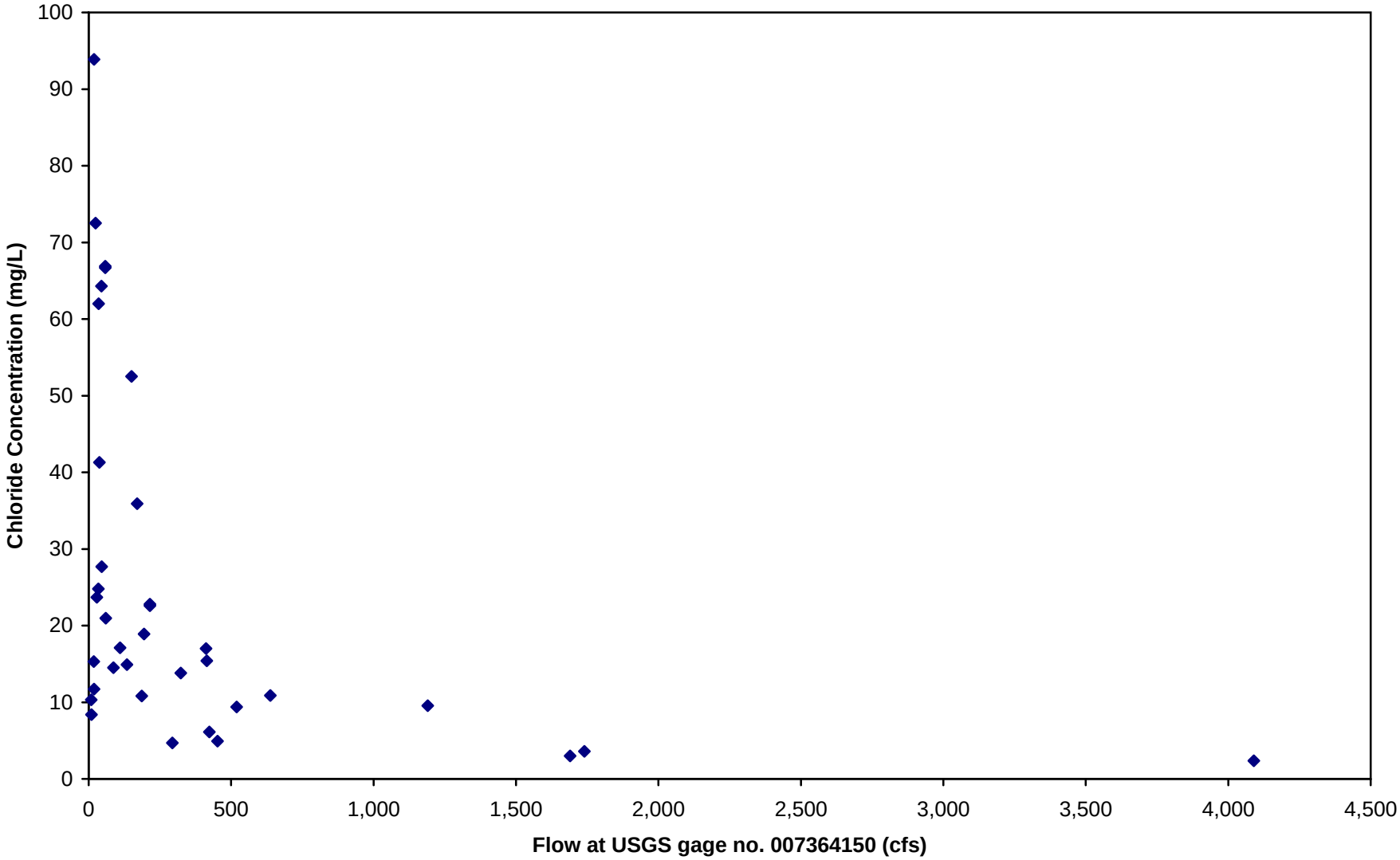


Figure D.2. Sulfate Concentration versus Flow in Bayou Bartholomew at Garrett Bridge (UWBYB03)

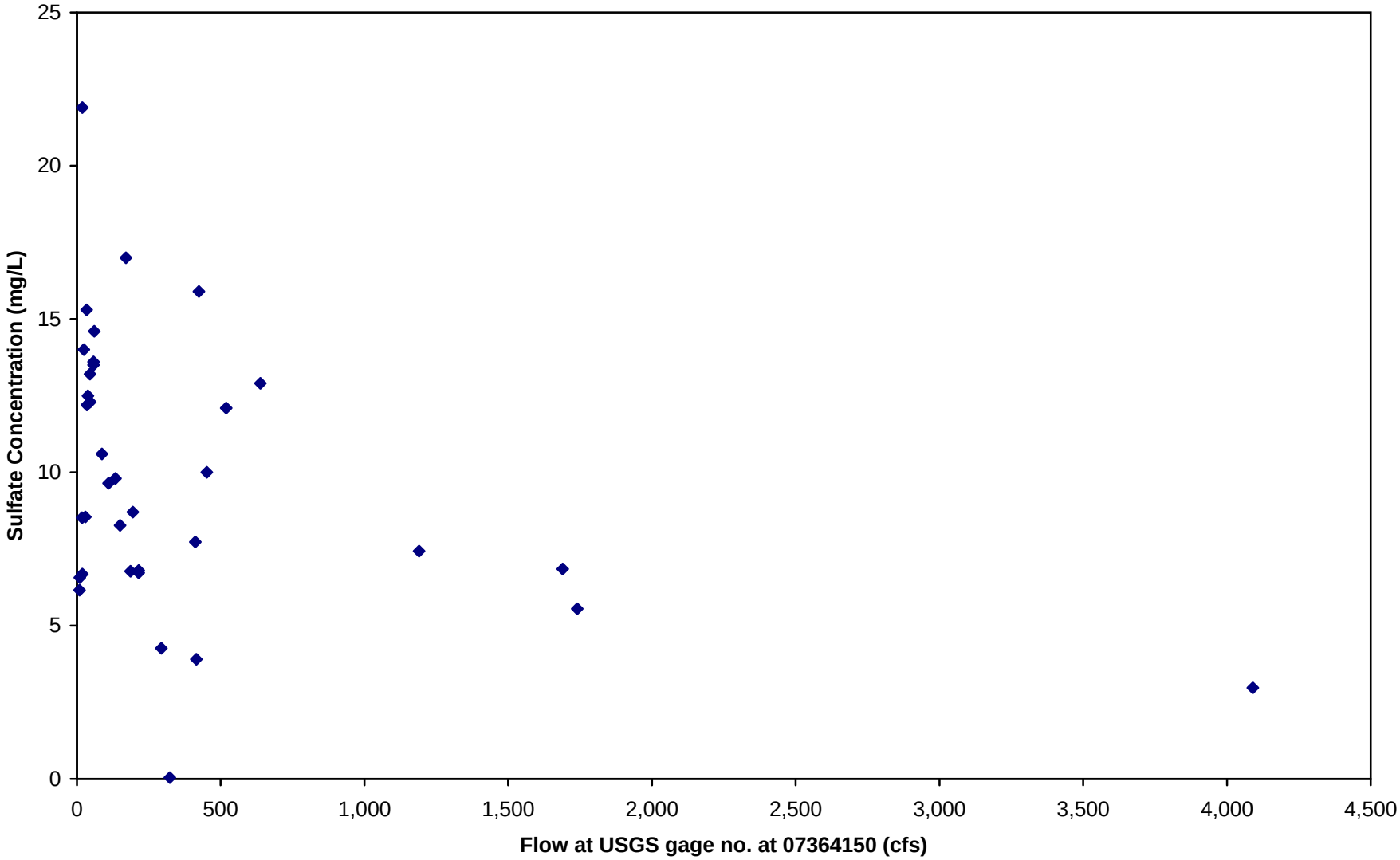


Figure D.3. TDS Concentration versus Flow in Bayou Bartholomew at Garrett Bridge (UWBYB03)

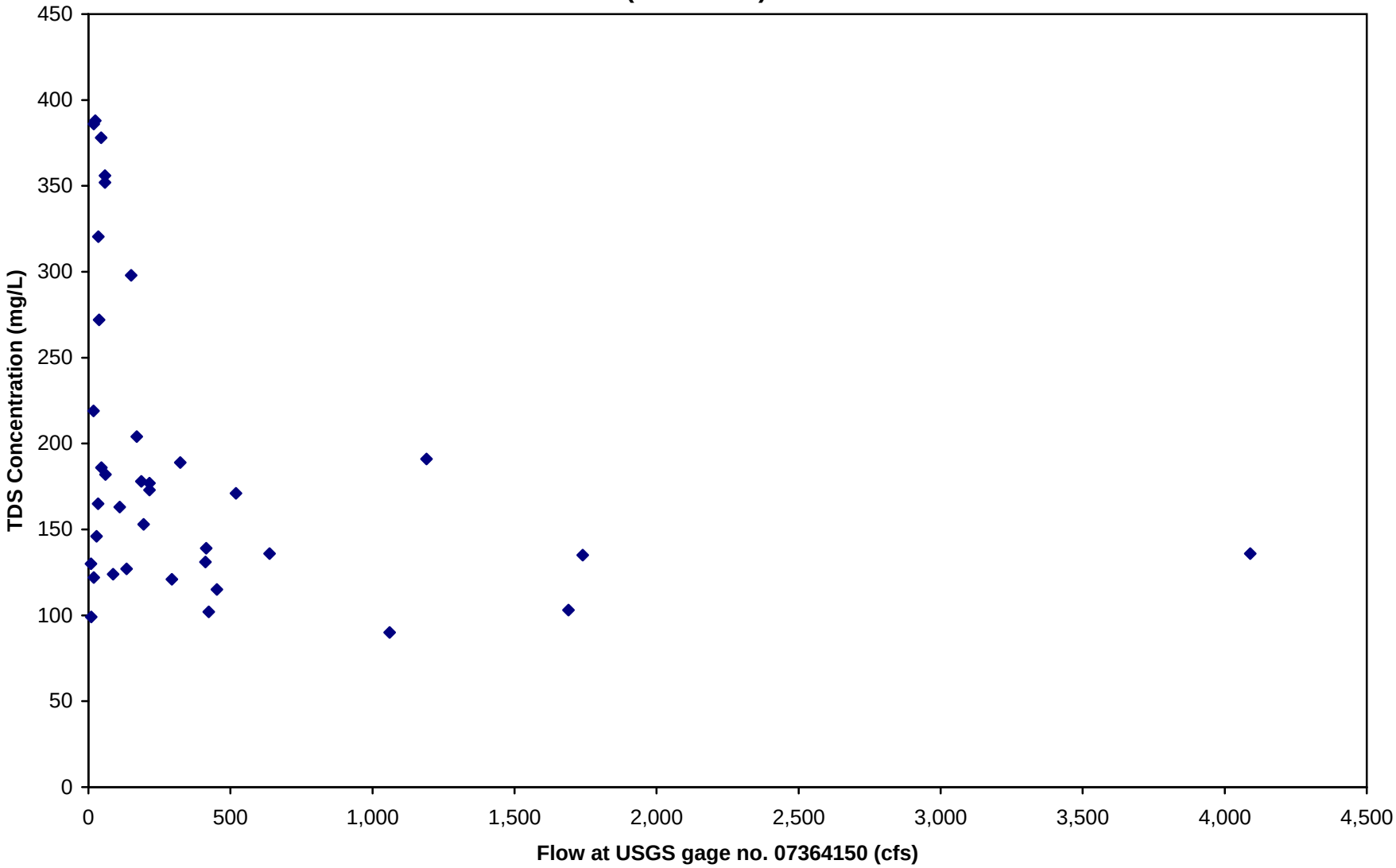


Figure D.4. Chloride Concentration vs. Flow in Bayou Bartholomew near McGehee (UWBYB02)

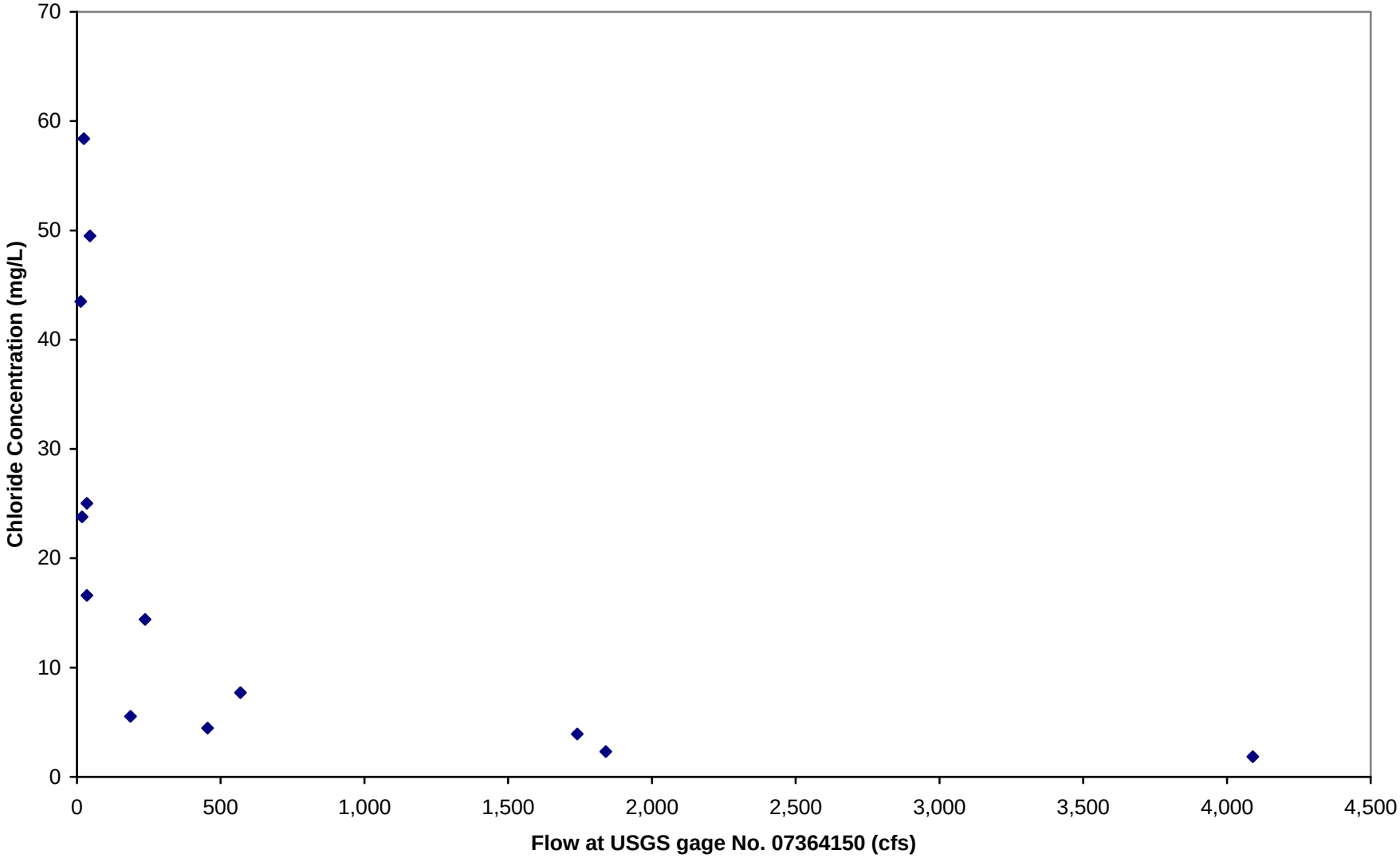


Figure D.5. Sulfate Concentration vs. Flow in Bayou Bartholomew near McGehee (UWBYB02)

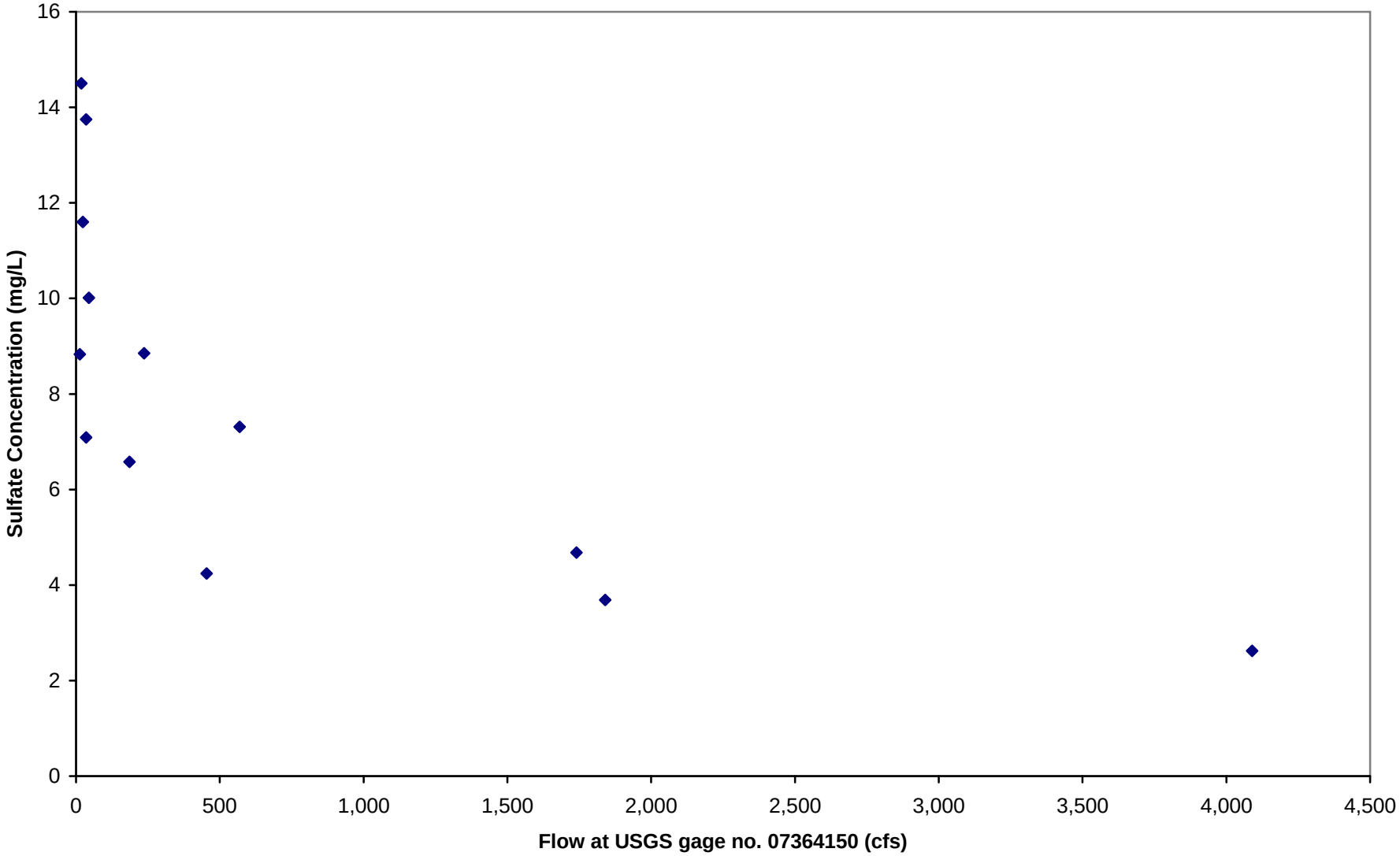


Figure D.6. TDS Concentration vs. Flow in Bayou Bartholomew near McGehee (UWBYB02)

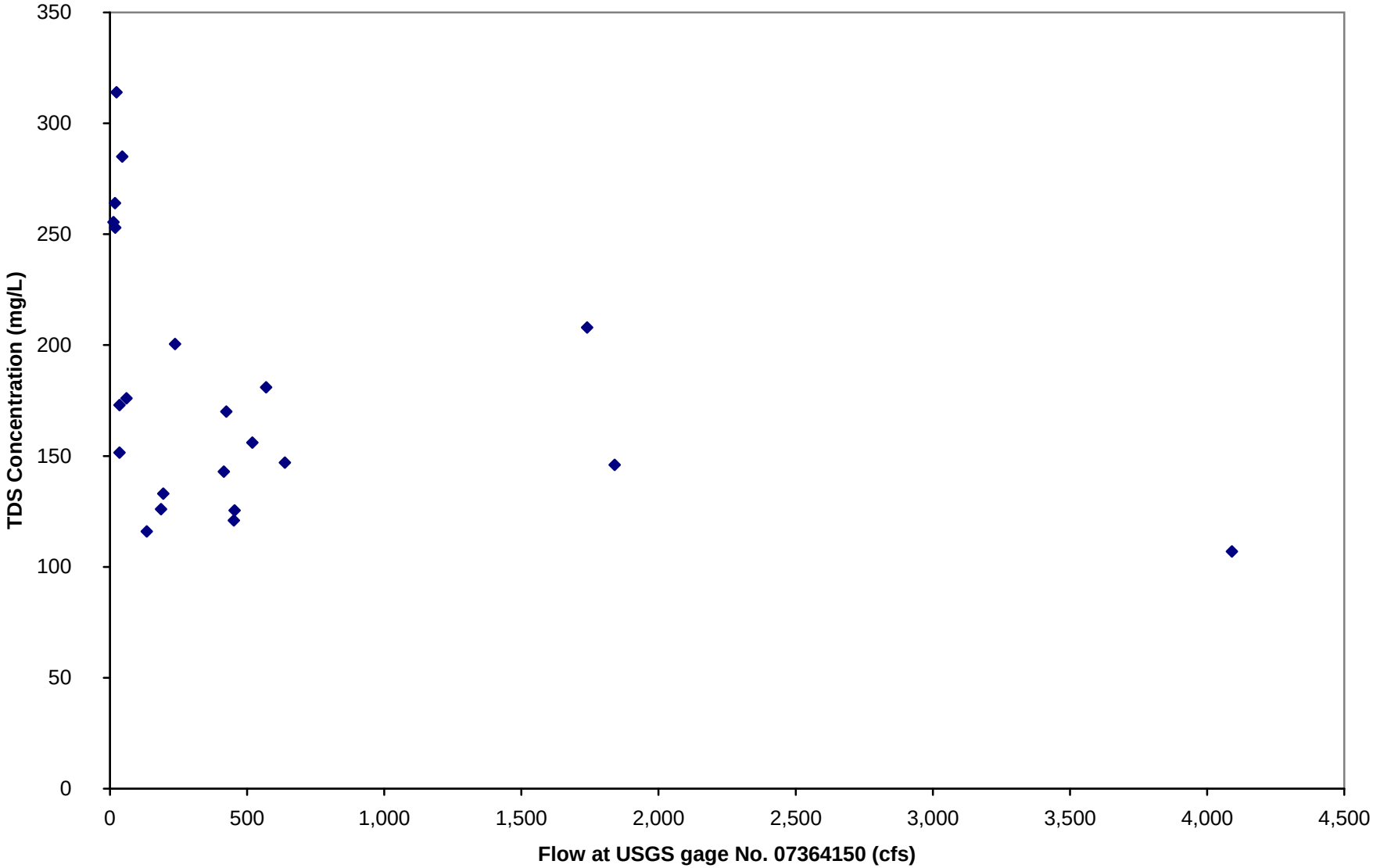


Figure D.7. Chloride Concentration versus Flow in Bayou Bartholomew near Portland (OUA0154)

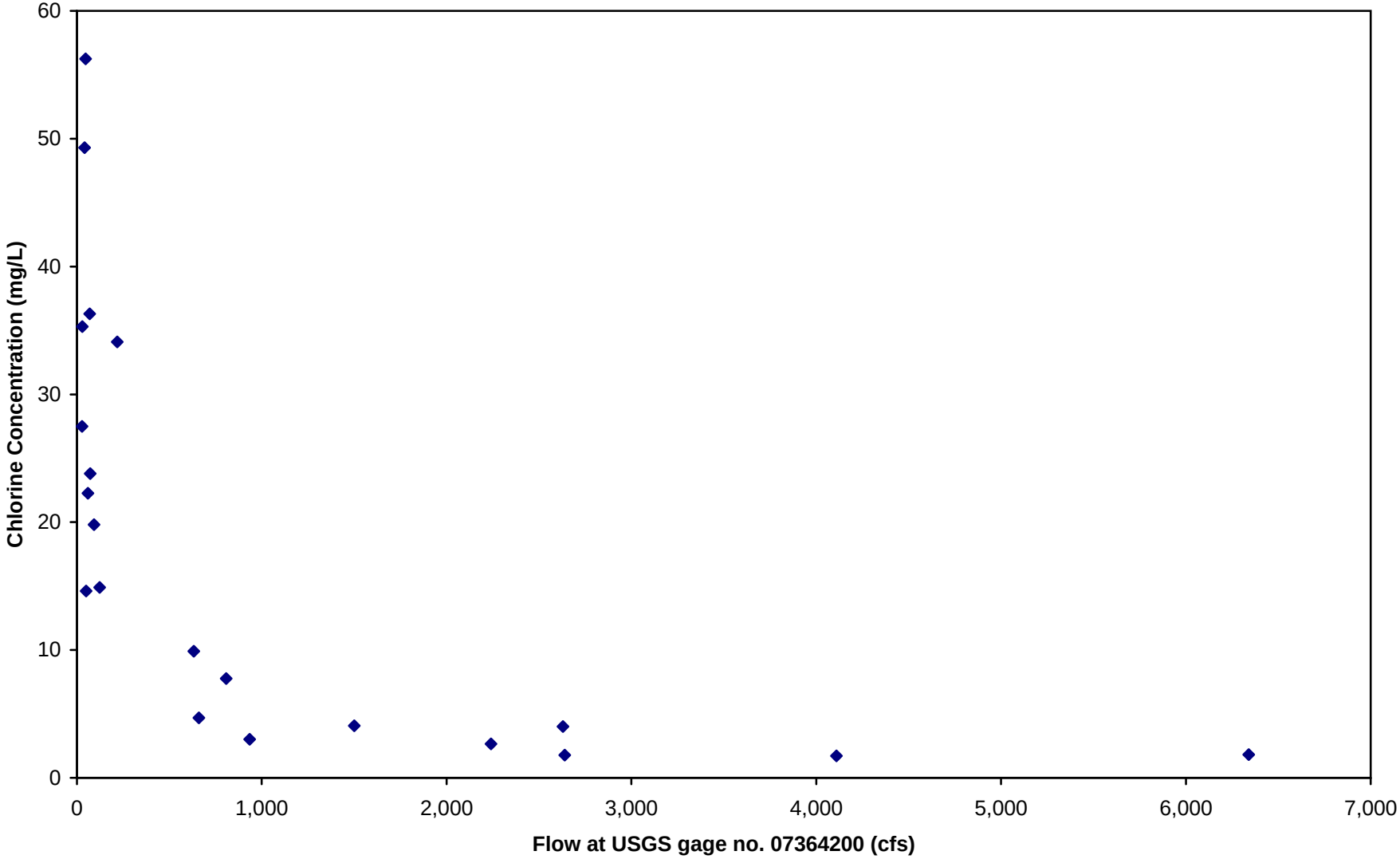


Figure D.8. Sulfate Concentration versus Flow in Bayou Bartholomew near Portland (OUA0154)

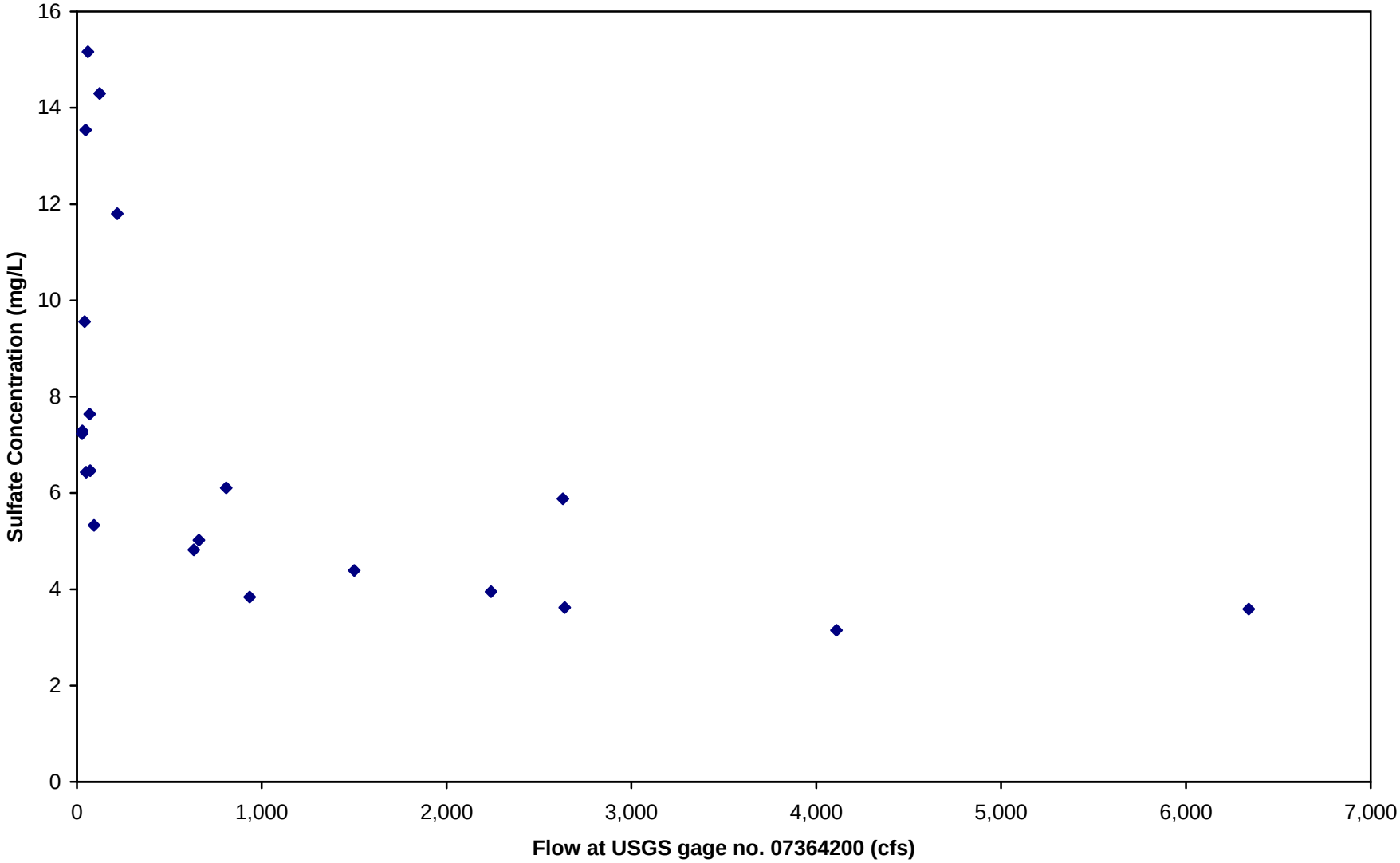


Figure D.9. TDS Concentration versus Flow in Bayou Bartholomew near Portland (OUA0154)

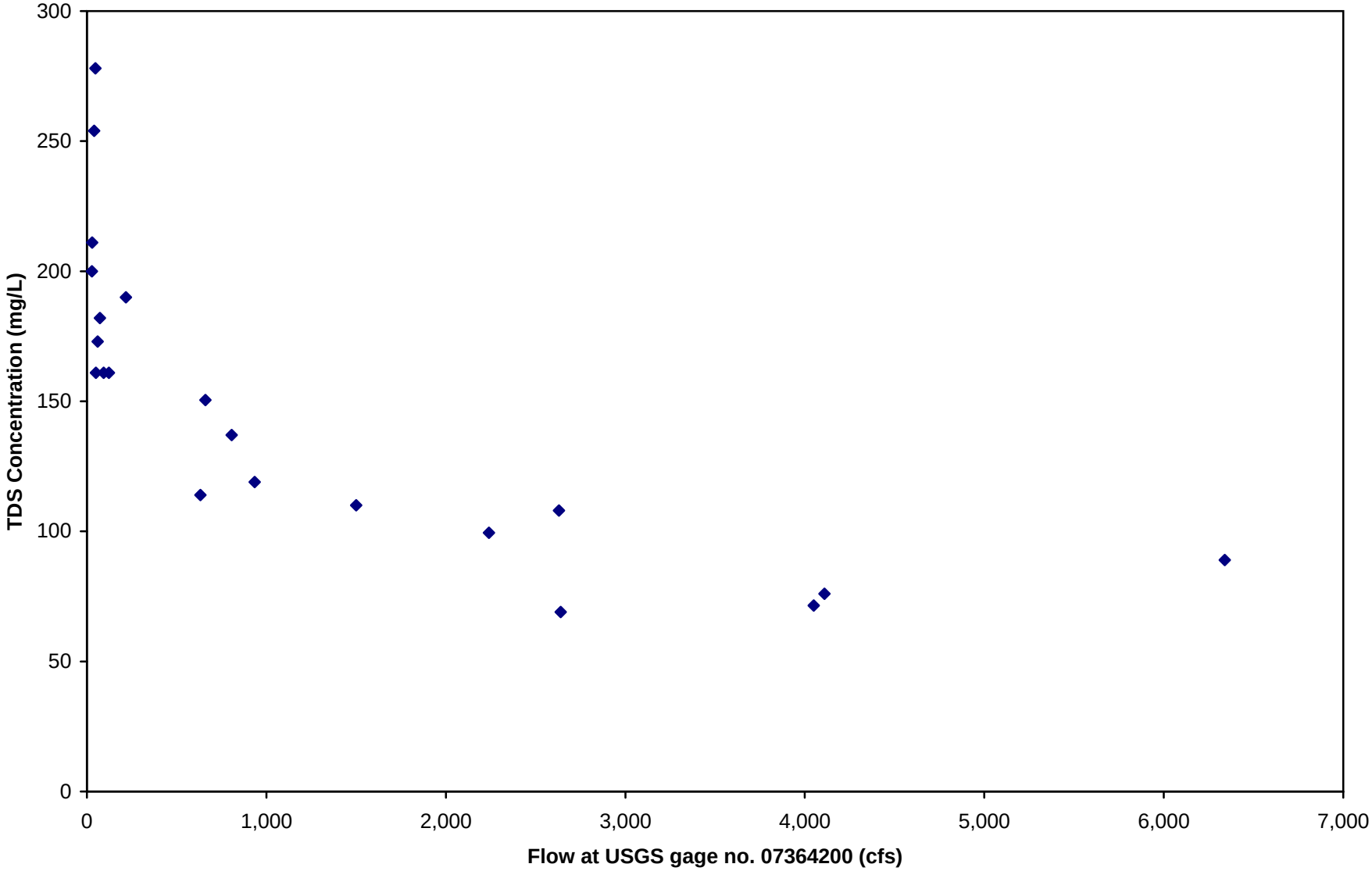
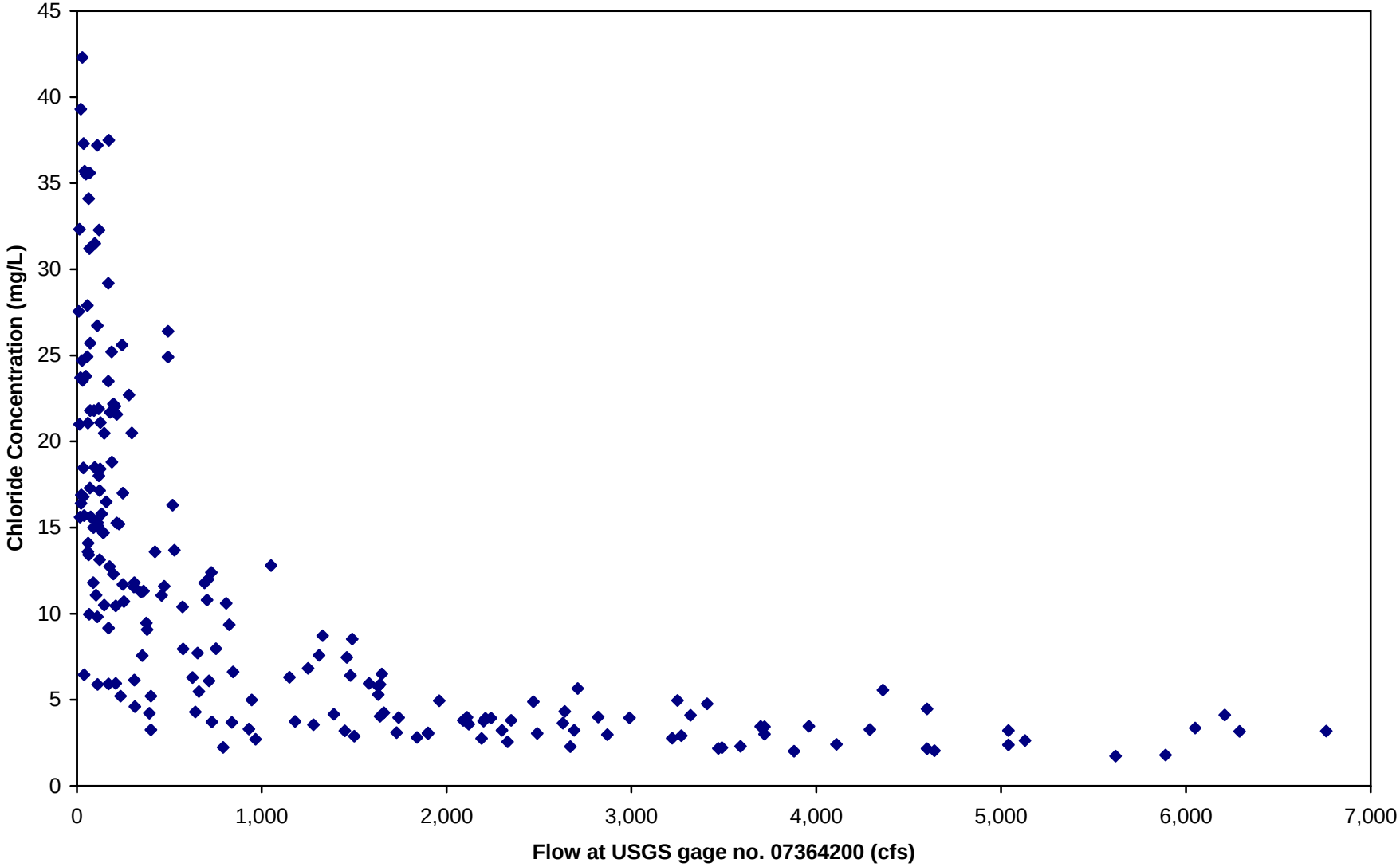


Figure D.10. Chloride Concentration versus Flow in Bayou Bartholomew near Jones, LA (OUA0013)



APPENDIX E

Tabular Listings and Plots of Turbidity and TSS Data

Table E.1 Observed Turbidity and TSS Data for Cutoff Creek at UWCOC01.

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Flow in Bayou Bartholomew near McGhee (cfs)	Estiamted flow in Cutoff Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
9/12/2000	32.0	33.5	13	7	98.0	Base flow	21	No	
11/9/1998	5.3	1.0	18	10	95.9	Base flow	21	Yes	
10/3/1995	6.8	7.0	18	10	95.9	Base flow	21	Yes	
9/27/1999	5.8	1.0	24	13	93.0	Base flow	21	Yes	
10/25/1999	4.2	1.5	35	20	88.0	Base flow	21	Yes	
1/18/2000	6.9	3.0	35	20	88.0	Base flow	21	Yes	
8/30/1999	11.0	6.0	45	25	83.8	Base flow	21	Yes	
9/12/1994	6.0	18.5	134	75	61.0	Base flow	21	Yes	
3/9/1999	23.0	15.0	186	104	54.8	Storm flow	32		Yes
6/6/1994	26.0	30.0	194	108	54.0	Storm flow	32		Yes
2/29/2000	27.0	16.5	237	132	50.6	Storm flow	32		Yes
7/18/1995	31.0	17.5	415	232	41.1	Storm flow	32		Yes
1/17/1995	85.0	14.0	424	237	40.7	Storm flow	32		No
4/11/1995	20.0	17.5	452	253	39.8	Storm flow	32		Yes
6/5/2000	61.0	34.0	454	254	39.8	Storm flow	32		No
5/7/1996	11.0	9.0	546	305	36.7	Storm flow	32		Yes
2/27/1996	20.0	19.5	563	315	36.2	Storm flow	32		Yes
3/21/2000	69.0	34.5	569	318	36.0	Storm flow	32		No
1/12/1999	43.0	7.5	1,740	973	12.4	Storm flow	32		No
4/4/2000	20.0	10.5	1,840	1,029	11.6	Storm flow	32		Yes
2/1/1999	19.0	3.5	4,090	2,286	1.3	Storm flow	32		Yes
							No. of Values =	8	13
							No of exceedances =	1	4
							% of Exceedances =	12.5%	30.8%

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Table E1 Summary of Historical Water Quality data for Cutoff Creek

Figure E.1. Time Series Plot of Turbidity in Cutoff Creek northeast of Boydell (UWCOC01)

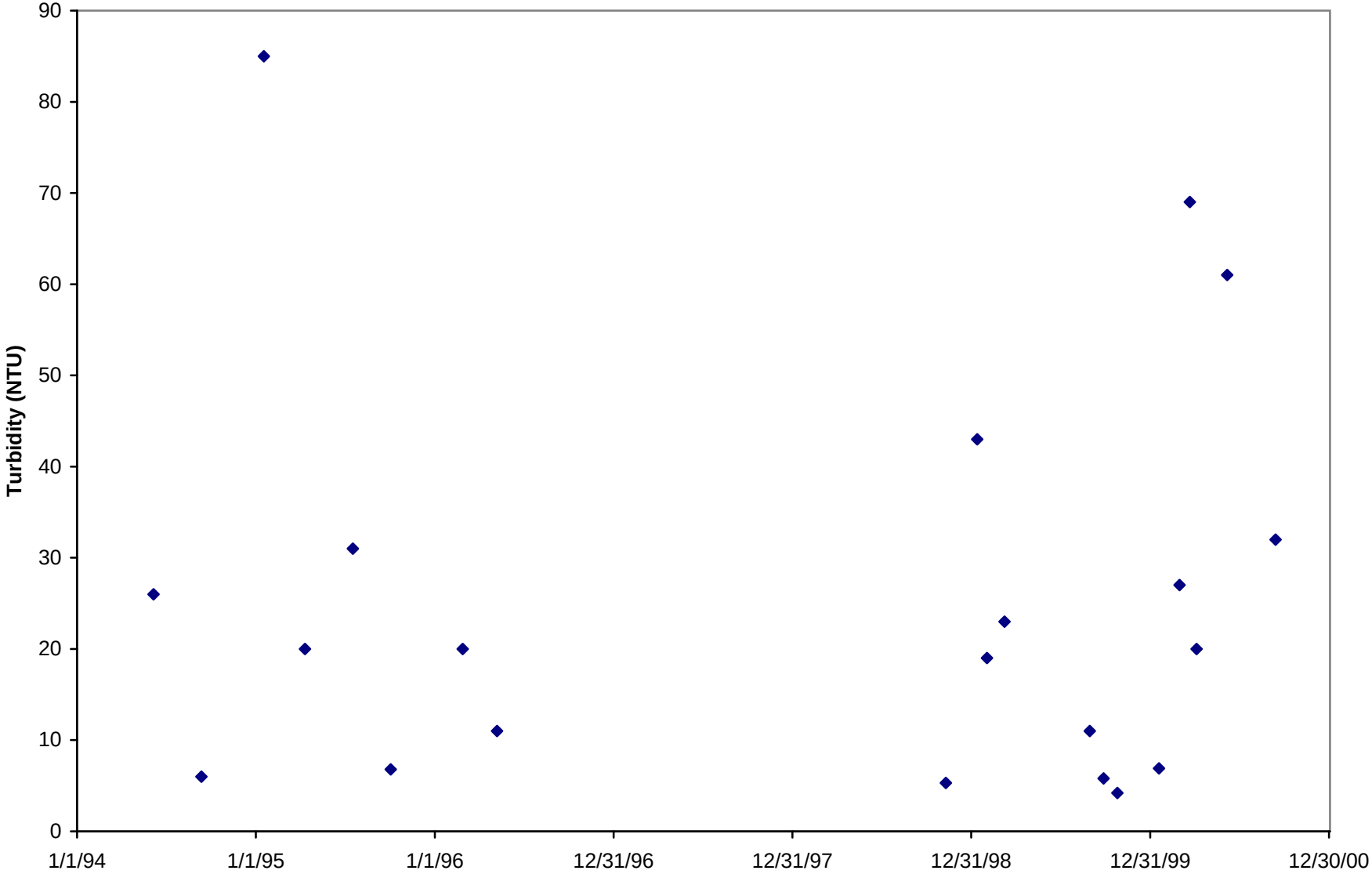


Figure E.2. Times Series Plot of TSS in Cutoff Creek northeast of Boydell (UWCOC01)

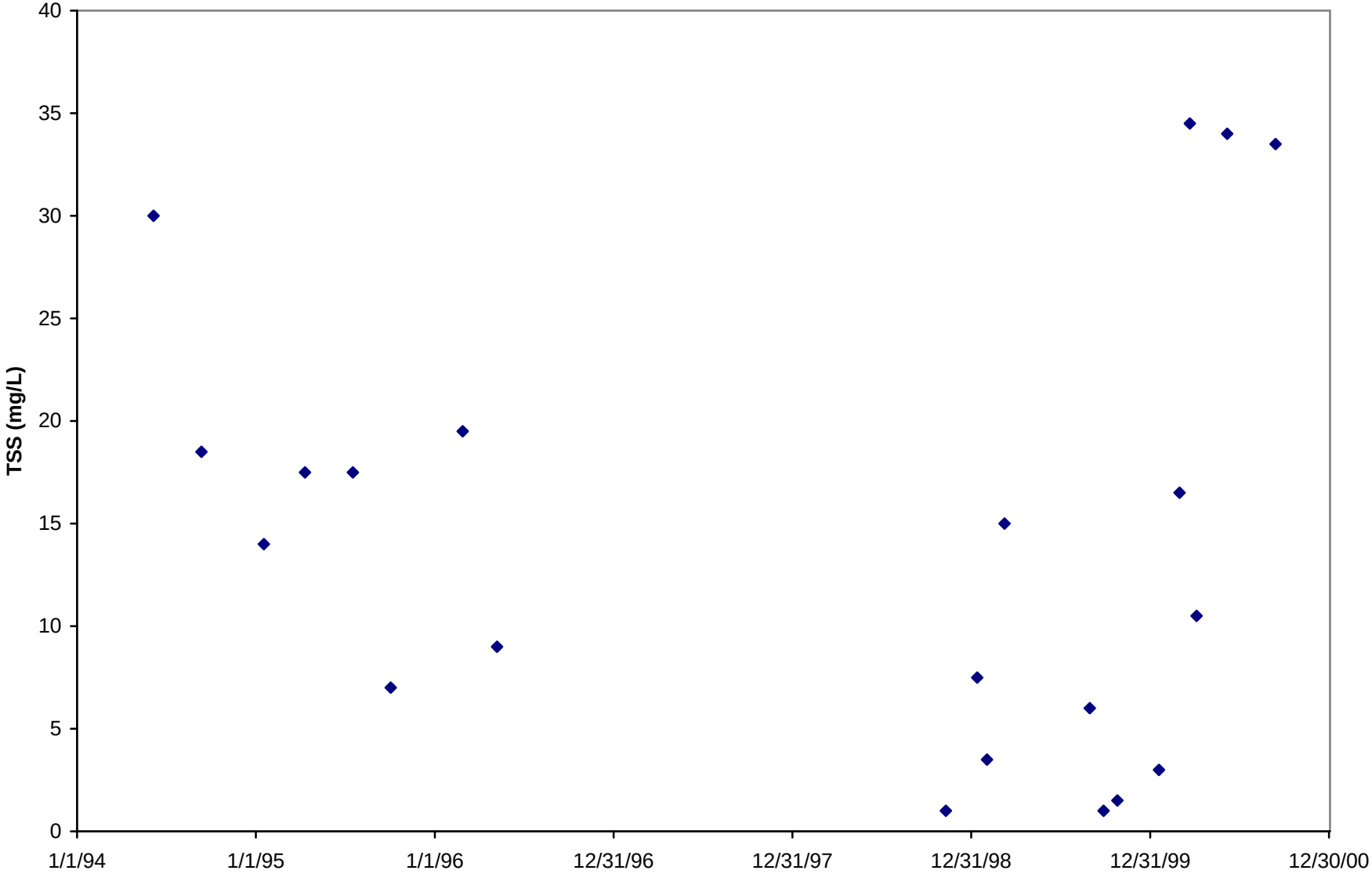


Figure E.3. Seasonal Plot of Turbidity in Cutoff Creek northeast of Boydell (UWCOC01)

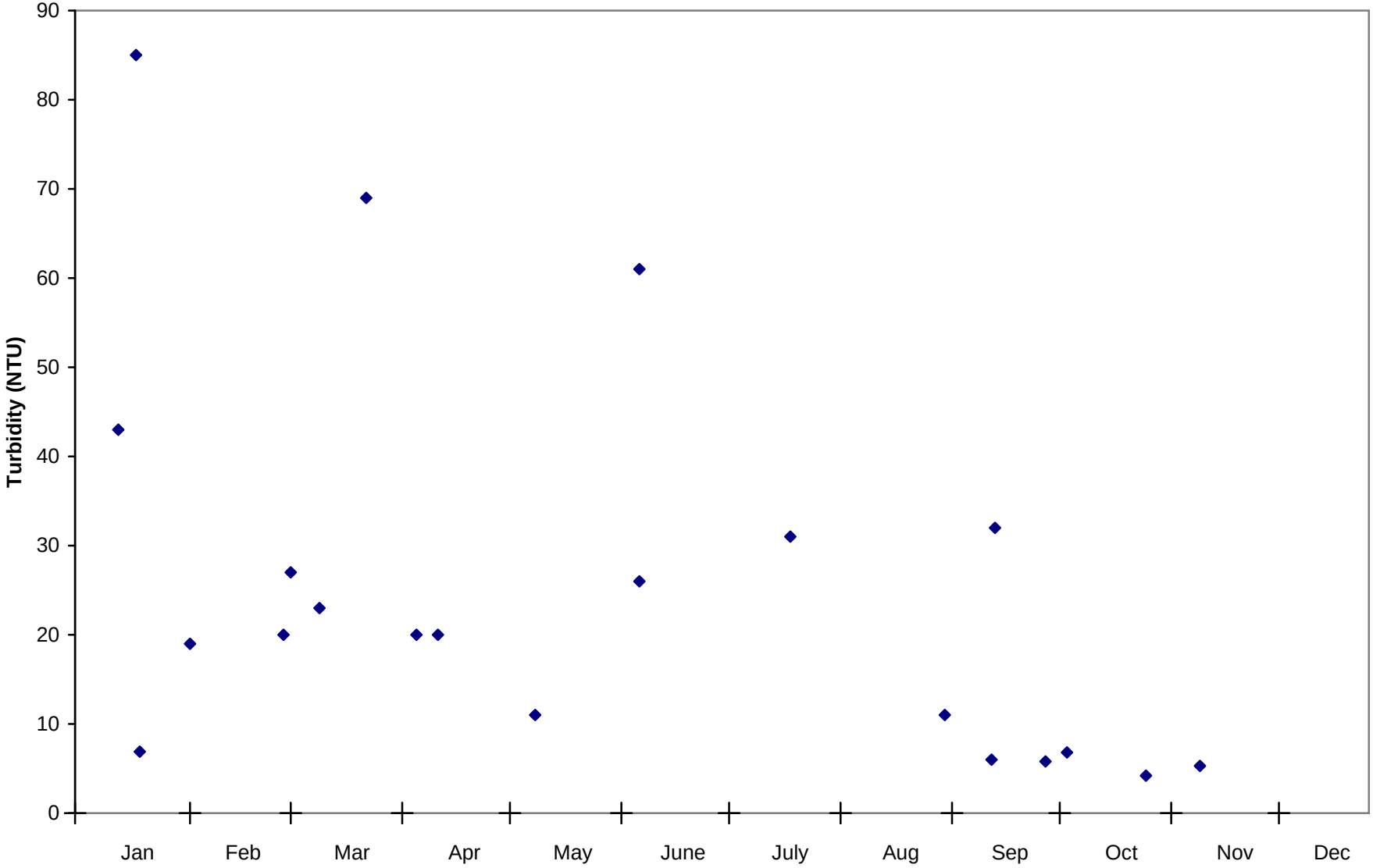


Figure E.4. Seasonal Plot of TSS in Cutoff Creek northeast of Boydell (UWCOC01)

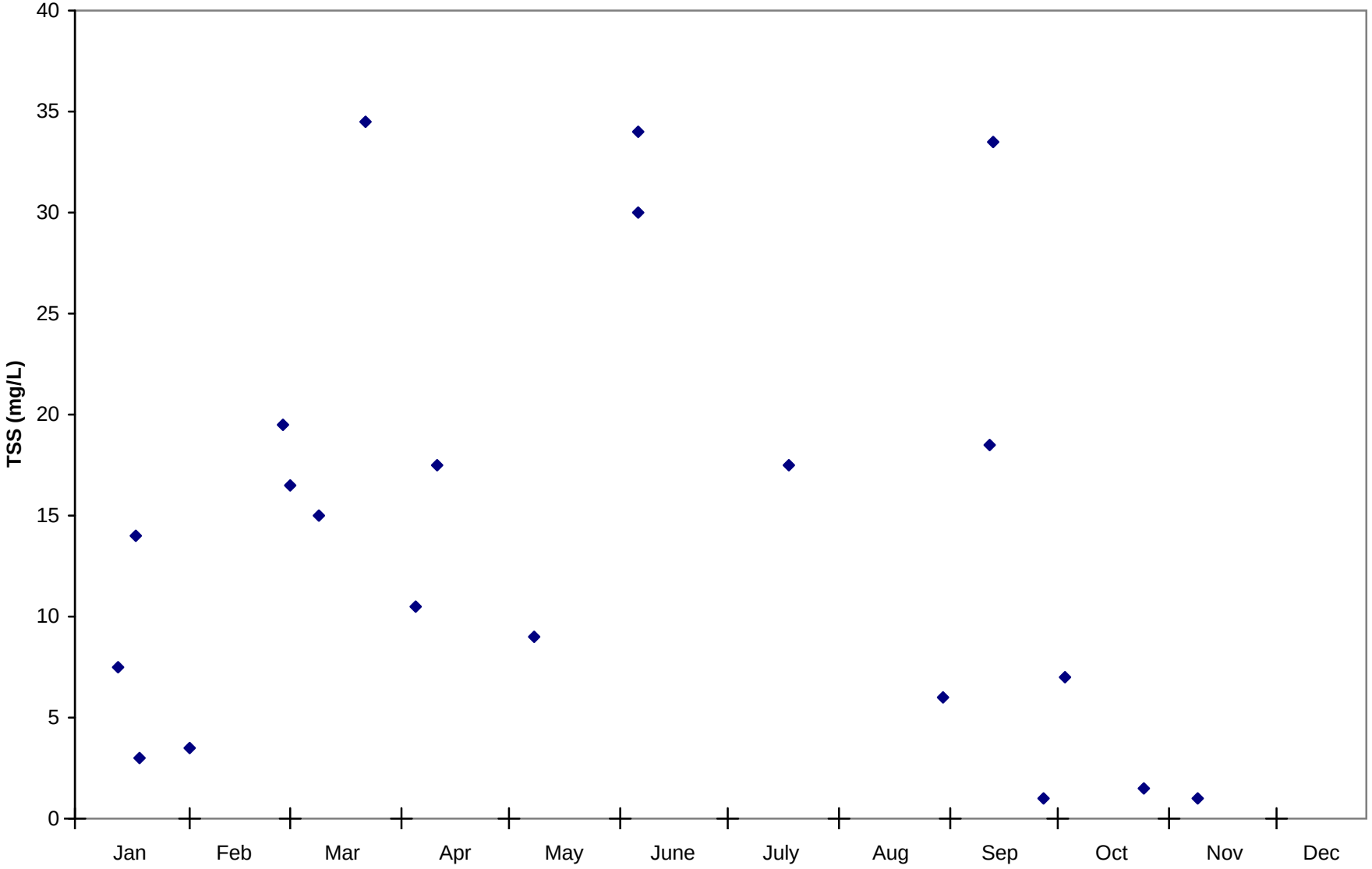


Figure E.5. Turbidity vs Flow for Cutoff Creek northeast of Boydell (UWCOC01)

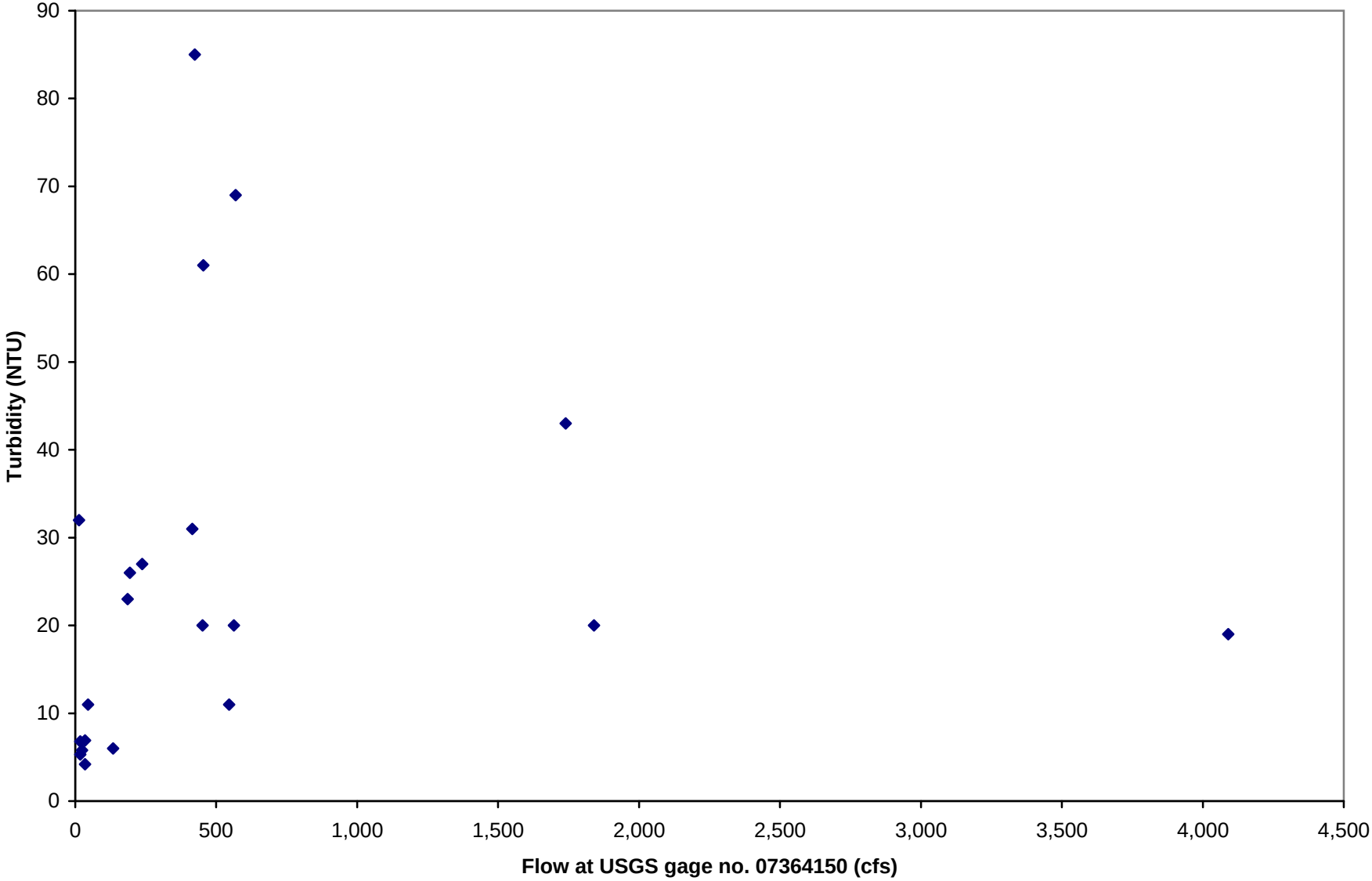


Figure E.6. TSS vs Flow for Cutoff Creek northeast of Boydell (UWCOC01)

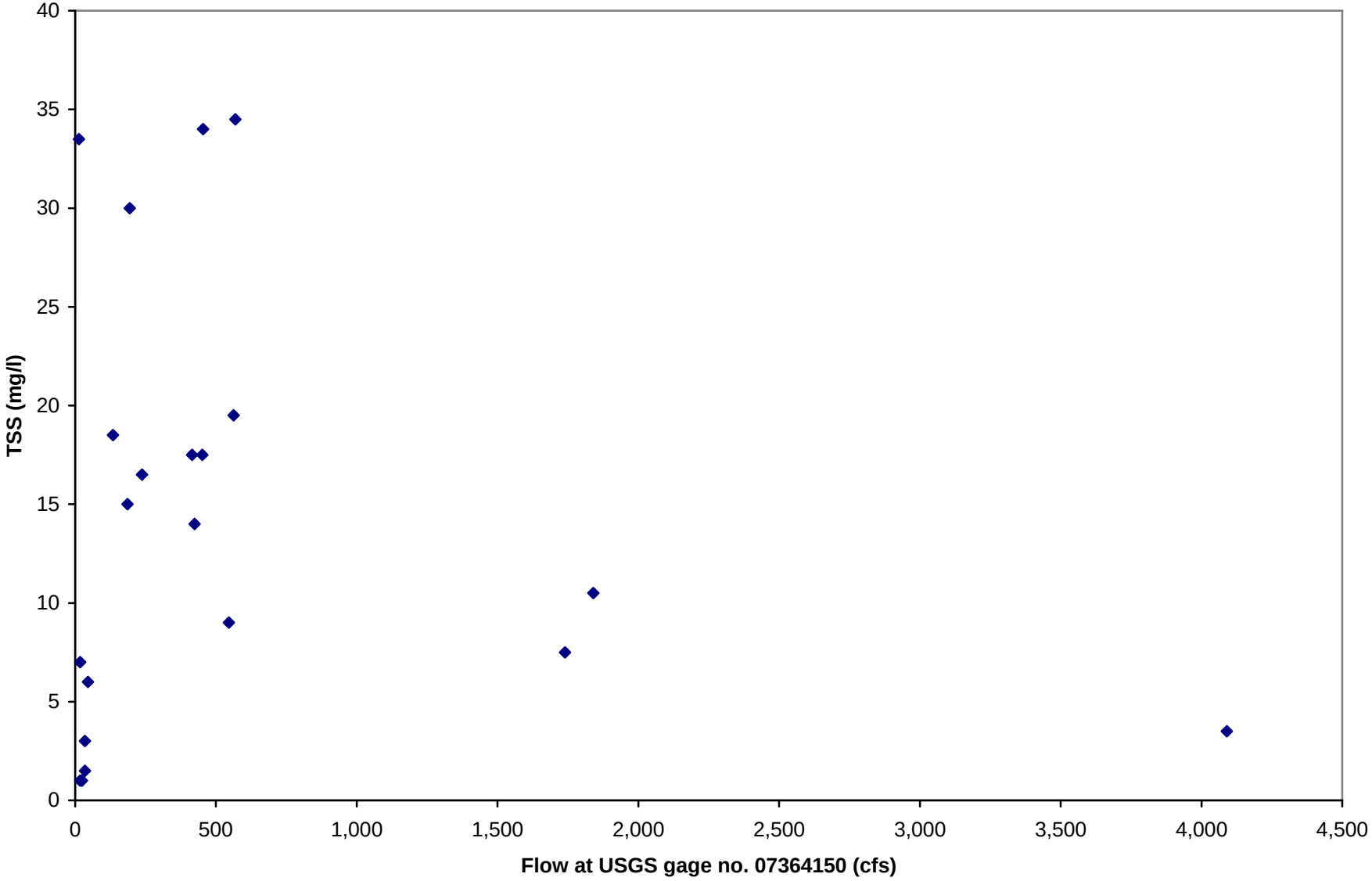
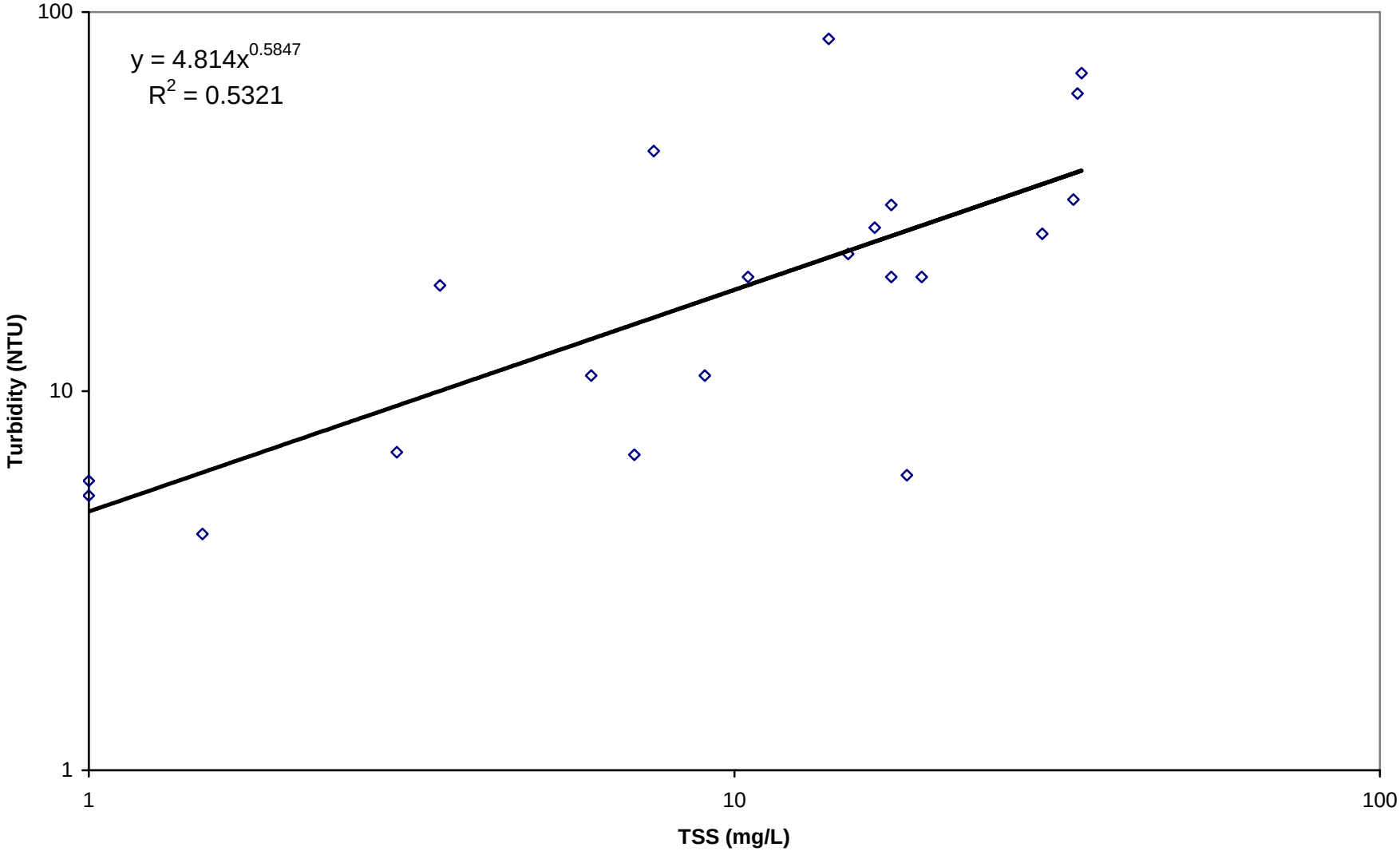


Figure E.7. Turbidity vs TSS for Cutoff Creek northeast of Boydell (UWCOC01)



APPENDIX F

Dissolved Mineral TMDL Calculations for Reach 08040205-013

TABLE F.1. ALLOWABLE LOADS OF CHLORIDE, SULFATE, AND TDS FOR BAYOU BARTHOLOMEW REACH 08040205-013

Drainage area at flow gage (B. Bartholomew near McGehee) = 576 square miles
Drainage area at downstream end of reach 08040205-013 = 436 square miles

				Chloride (criterion = 30 mg/L)			Sulfate (criterion = 30 mg/L)			TDS (criterion = 220 mg/L)		
Flow in Bayou Bartholomew at flow gage near McGehee (cfs)	Flow at downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow	Width on plot between data points (unitless)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)
0.2	0.15	99.980	0.0391	0.012	0.011	0.0000	0.012	0.011	0.0000	0.09	0.08	0.000
0.3	0.23	99.942	0.0324	0.018	0.017	0.0000	0.018	0.017	0.0000	0.13	0.12	0.000
0.4	0.30	99.915	0.0190	0.025	0.022	0.0000	0.025	0.022	0.0000	0.18	0.16	0.000
0.5	0.38	99.904	0.0089	0.031	0.028	0.0000	0.031	0.028	0.0000	0.22	0.20	0.000
0.6	0.45	99.897	0.0101	0.037	0.033	0.0000	0.037	0.033	0.0000	0.27	0.24	0.000
0.7	0.53	99.884	0.0145	0.043	0.039	0.0000	0.043	0.039	0.0000	0.31	0.28	0.000
0.8	0.61	99.868	0.0156	0.049	0.044	0.0000	0.049	0.044	0.0000	0.36	0.32	0.000
0.9	0.68	99.853	0.0145	0.055	0.050	0.0000	0.055	0.050	0.0000	0.40	0.36	0.000
1.0	0.76	99.839	0.0101	0.061	0.055	0.0000	0.061	0.055	0.0000	0.45	0.40	0.000
1.3	0.98	99.832	0.0067	0.080	0.072	0.0000	0.080	0.072	0.0000	0.58	0.53	0.000
The rows between 99.832 and 0.047 percent exceedance are hidden for the sake of brevity.												
6,670	5,053	0.047	0.0045	409	368	0.0183	409	368	0.0183	2,998	2,698	0.134
6,680	5,060	0.042	0.0056	409	368	0.0229	409	368	0.0229	3,002	2,702	0.168
6,700	5,075	0.036	0.0067	411	370	0.0275	411	370	0.0275	3,011	2,710	0.202
6,720	5,090	0.029	0.0056	412	371	0.0230	412	371	0.0230	3,020	2,718	0.169
6,730	5,098	0.025	0.0045	412	371	0.0184	412	371	0.0184	3,025	2,722	0.135
6,760	5,121	0.020	0.0045	414	373	0.0185	414	373	0.0185	3,038	2,734	0.136
6,800	5,151	0.016	0.0045	417	375	0.0186	417	375	0.0186	3,056	2,751	0.137
6,840	5,181	0.011	0.0045	419	377	0.0187	419	377	0.0187	3,074	2,767	0.137
6,850	5,189	0.007	0.0045	420	378	0.0188	420	378	0.0188	3,079	2,771	0.138
6,870	5,204	0.002	0.0045	421	379	0.0188	421	379	0.0188	3,088	2,779	0.138
				Total area under TMDL curve for chloride (tons/day) =		42.7	Total area under TMDL curve for sulfate (tons/day) =		42.7	Total area under TMDL curve for TDS (tons/day) =		312.8
Explicit MOS (tons/day) = TMDL × 10% =						4.3			4.3			31.3
WLA for point sources (tons/day) (from Appendix K) =						0			0			0
LA for nonpoint sources (tons/day) = TMDL - MOS - WLA =						38.4			38.4			281.5

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TABLE F.2. CHLORIDE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-013

Chloride criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 57%

Date	Observed chloride at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	18.9	194	147	54.0	7.49	3.22	11.89	10.70	Yes
9/12/1994	14.9	134	102	61.0	4.08	1.75	8.21	7.39	Yes
1/17/1995	6.1	424	321	40.7	5.31	2.28	25.99	23.39	Yes
4/11/1995	4.9	452	342	39.8	4.54	1.95	27.70	24.93	Yes
7/18/1995	15.4	415	314	41.1	13.06	5.62	25.43	22.89	Yes
10/2/1995	93.9	19	14	95.4	3.64	1.57	1.16	1.05	No
2/26/1996	9.4	519	393	37.6	9.95	4.28	31.81	28.63	Yes
5/6/1996	10.9	638	483	34.0	14.20	6.10	39.10	35.19	Yes
9/30/1996	21.0	60	45	78.0	2.57	1.10	3.68	3.31	Yes
11/9/1998	15.3	18	14	95.9	0.56	0.24	1.10	0.99	Yes
1/12/1999	3.6	1,740	1,318	12.4	12.80	5.50	106.64	95.98	Yes
2/1/1999	2.4	4,090	3,098	1.3	19.64	8.44	250.67	225.60	Yes
3/9/1999	10.8	186	141	54.8	4.10	1.76	11.40	10.26	Yes
8/30/1999	64.3	45	34	83.8	5.91	2.54	2.76	2.48	No
9/27/1999	72.5	24	18	93.0	3.55	1.53	1.47	1.32	No
10/25/1999	62.0	35	27	88.0	4.43	1.91	2.15	1.93	Yes
7/26/2005	22.7	215	163	52.4	9.97	4.29	13.18	11.86	Yes
8/23/2005	66.8	58	44	78.6	7.92	3.40	3.55	3.20	No
9/26/2005	17.0	412	312	41.1	14.31	6.15	25.25	22.73	Yes
10/25/2005	11.7	19	14	95.4	0.45	0.20	1.16	1.05	Yes
11/15/2005	8.4	10	7	98.7	0.17	0.07	0.61	0.55	Yes
12/13/2005	23.7	29	22	90.7	1.40	0.60	1.78	1.60	Yes
1/17/2006	13.8	323	245	45.5	9.11	3.92	19.80	17.82	Yes
1/31/2006	9.5	1,190	901	19.9	23.19	9.97	72.93	65.64	Yes
3/28/2006	3.0	1,690	1,280	13.0	10.36	4.45	103.58	93.22	Yes

Date	Observed chloride at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
4/25/2006	35.9	170	129	56.5	12.47	5.36	10.42	9.38	Yes
5/30/2006	4.7	294	223	47.1	2.81	1.21	18.02	16.22	Yes
6/20/2006	24.8	34	26	88.5	1.72	0.74	2.08	1.88	Yes
7/25/2006	41.3	38	29	86.8	3.21	1.38	2.33	2.10	Yes
8/22/2006	52.5	150	114	59.0	16.09	6.92	9.19	8.27	Yes
9/26/2006	14.5	87	66	70.1	2.58	1.11	5.33	4.80	Yes
10/24/2006	10.3	9	7	98.8	0.20	0.08	0.57	0.51	Yes
11/28/2006	27.7	46	35	83.4	2.60	1.12	2.82	2.54	Yes
12/19/2006	17.1	110	83	64.9	3.84	1.65	6.74	6.07	Yes

Note: Observed concentrations after Dec 2006 are not included here because flow data are not available after that time.

Total number of values of loads =	34
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	4
No. of exceedances before reductions of loads =	9
No. of exceedances after reductions of loads =	4

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Table F.2 Percent Reductions for Chloride

TABLE F.3. SULFATE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-013

Sulfate criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed sulfate at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	8.7	194	147	54.0	3.45	3.45	11.89	10.70	Yes
9/12/1994	9.8	134	102	61.0	2.68	2.68	8.21	7.39	Yes
1/17/1995	15.9	424	321	40.7	13.77	13.77	25.99	23.39	Yes
4/11/1995	10.0	452	342	39.8	9.23	9.23	27.70	24.93	Yes
7/18/1995	3.9	415	314	41.1	3.31	3.31	25.43	22.89	Yes
10/2/1995	21.9	19	14	95.4	0.85	0.85	1.16	1.05	Yes
2/26/1996	12.1	519	393	37.6	12.83	12.83	31.81	28.63	Yes
5/6/1996	12.9	638	483	34.0	16.81	16.81	39.10	35.19	Yes
9/30/1996	14.6	60	45	78.0	1.79	1.79	3.68	3.31	Yes
11/9/1998	8.5	18	14	95.9	0.31	0.31	1.10	0.99	Yes
1/12/1999	5.6	1,740	1,318	12.4	19.73	19.73	106.64	95.98	Yes
2/1/1999	3.0	4,090	3,098	1.3	24.82	24.82	250.67	225.60	Yes
3/9/1999	6.8	186	141	54.8	2.57	2.57	11.40	10.26	Yes
8/30/1999	13.2	45	34	83.8	1.21	1.21	2.76	2.48	Yes
9/27/1999	14.0	24	18	93.0	0.69	0.69	1.47	1.32	Yes
10/25/1999	12.2	35	27	88.0	0.87	0.87	2.15	1.93	Yes
7/26/2005	6.8	215	163	52.4	2.97	2.97	13.18	11.86	Yes
8/23/2005	13.6	58	44	78.6	1.61	1.61	3.55	3.20	Yes
9/26/2005	7.7	412	312	41.1	6.51	6.51	25.25	22.73	Yes
10/25/2005	6.7	19	14	95.4	0.26	0.26	1.16	1.05	Yes
11/15/2005	6.6	10	7	98.7	0.13	0.13	0.61	0.55	Yes
12/13/2005	8.5	29	22	90.7	0.51	0.51	1.78	1.60	Yes
1/17/2006	< 0.04	323	245	45.5	0.03	0.03	19.80	17.82	Yes
1/31/2006	7.4	1,190	901	19.9	18.06	18.06	72.93	65.64	Yes
3/28/2006	6.9	1,690	1,280	13.0	23.65	23.65	103.58	93.22	Yes

Date	Observed sulfate at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
4/25/2006	17.0	170	129	56.5	5.90	5.90	10.42	9.38	Yes
5/30/2006	4.3	294	223	47.1	2.56	2.56	18.02	16.22	Yes
6/20/2006	15.3	34	26	88.5	1.06	1.06	2.08	1.88	Yes
7/25/2006	12.5	38	29	86.8	0.97	0.97	2.33	2.10	Yes
8/22/2006	8.3	150	114	59.0	2.53	2.53	9.19	8.27	Yes
9/26/2006	10.6	87	66	70.1	1.88	1.88	5.33	4.80	Yes
10/24/2006	6.2	9	7	98.8	0.12	0.12	0.57	0.51	Yes
11/28/2006	12.3	46	35	83.4	1.16	1.16	2.82	2.54	Yes
12/19/2006	9.6	110	83	64.9	2.17	2.17	6.74	6.07	Yes

Note: Observed concentrations after Dec 2006 are not included here because flow data are not available after that time.

Total number of values of loads =	34
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	4
No. of exceedances before reductions of loads =	0
No. of exceedances after reductions of loads =	0

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Table F.3 Percent Reductions for Sulfate

TABLE F.4. TDS PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-013

TDS criterion in WQ standards = 220 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 39%

Date	Observed TDS at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	153	194	147	54.0	60.6	37.0	87.2	78.5	Yes
9/12/1994	127	134	102	61.0	34.8	21.2	60.2	54.2	Yes
1/17/1995	102	424	321	40.7	88.4	53.9	190.6	171.5	Yes
4/11/1995	115	452	342	39.8	106.2	64.8	203.1	182.8	Yes
7/18/1995	139	415	314	41.1	117.8	71.9	186.5	167.9	Yes
10/2/1995	386	19	14	95.4	15.0	9.1	8.5	7.7	No
2/26/1996	171	519	393	37.6	181.3	110.6	233.3	209.9	Yes
5/6/1996	136	638	483	34.0	177.3	108.1	286.7	258.1	Yes
9/30/1996	182	60	45	78.0	22.3	13.6	27.0	24.3	Yes
11/9/1998	219	18	14	95.9	8.1	4.9	8.1	7.3	Yes
1/12/1999	135	1,740	1,318	12.4	479.9	292.7	782.0	703.8	Yes
2/1/1999	136	4,090	3,098	1.3	1136.4	693.2	1838.2	1654.4	Yes
3/9/1999	178	186	141	54.8	67.6	41.3	83.6	75.2	Yes
8/30/1999	378	45	34	83.8	34.8	21.2	20.2	18.2	No
9/27/1999	388	24	18	93.0	19.0	11.6	10.8	9.7	No
10/25/1999	321	35	27	88.0	22.9	14.0	15.7	14.2	Yes
1/4/2005	90	1,060	803	22.6	194.9	118.9	476.4	428.8	Yes
7/26/2005	175	215	163	52.4	76.9	46.9	96.6	87.0	Yes
8/23/2005	354	58	44	78.6	41.9	25.6	26.1	23.5	No
9/26/2005	131	412	312	41.1	110.3	67.3	185.2	166.7	Yes
10/25/2005	122	19	14	95.4	4.7	2.9	8.5	7.7	Yes
11/15/2005	99	10	7	98.7	2.0	1.2	4.4	4.0	Yes
12/13/2005	146	29	22	90.7	8.6	5.3	13.0	11.7	Yes
1/17/2006	189	323	245	45.5	124.7	76.1	145.2	130.7	Yes
1/31/2006	191	1,190	901	19.9	464.3	283.2	534.8	481.4	Yes

Date	Observed TDS at UWBYB03 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-013 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
3/28/2006	103	1,690	1,280	13.0	355.6	216.9	759.6	683.6	Yes
4/25/2006	204	170	129	56.5	70.8	43.2	76.4	68.8	Yes
5/30/2006	121	294	223	47.1	72.7	44.3	132.1	118.9	Yes
6/20/2006	165	34	26	88.5	11.5	7.0	15.3	13.8	Yes
7/25/2006	272	38	29	86.8	21.1	12.9	17.1	15.4	Yes
8/22/2006	298	150	114	59.0	91.3	55.7	67.4	60.7	Yes
9/26/2006	124	87	66	70.1	22.0	13.4	39.1	35.2	Yes
10/24/2006	130	9	7	98.8	2.5	1.5	4.2	3.8	Yes
11/28/2006	186	46	35	83.4	17.5	10.7	20.7	18.6	Yes
12/19/2006	163	110	83	64.9	36.6	22.3	49.4	44.5	Yes

Note: Observed concentrations after Dec 2006 are not included here because flow data are not available after that time.

Total number of values of loads =	35
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	4
No. of exceedances before reductions of loads =	9
No. of exceedances after reductions of loads =	4

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Table F.4 Percent Reductions for TDS

Figure F.1. Flow duration curve for Bayou Bartholomew reach 08040205-013

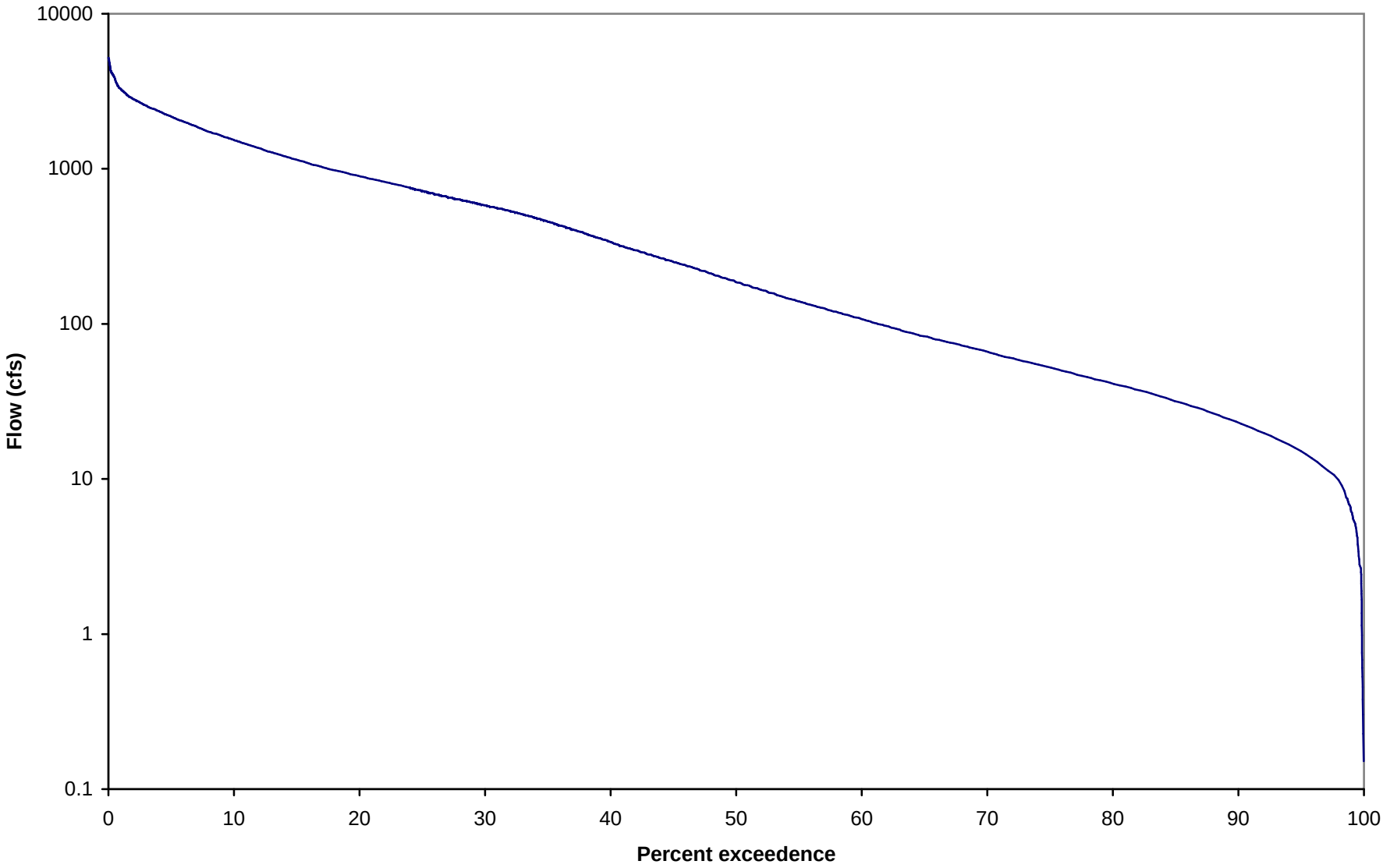


Figure F.2. Chloride Load Duration Curve for Bayou Bartholomew Reach 013

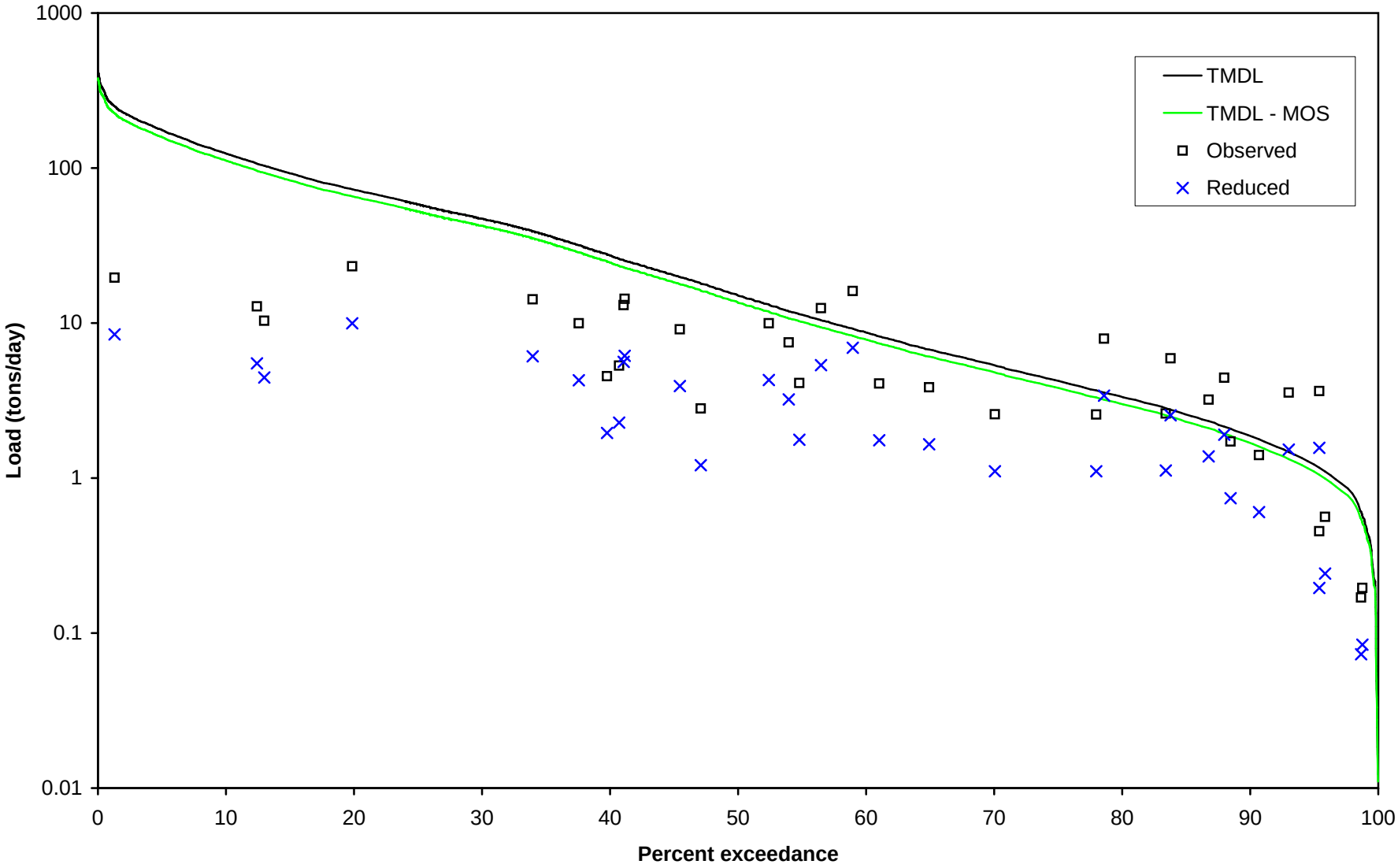


Figure F.3. Sulfate Load Duration Curve for Bayou Bartholomew Reach 013

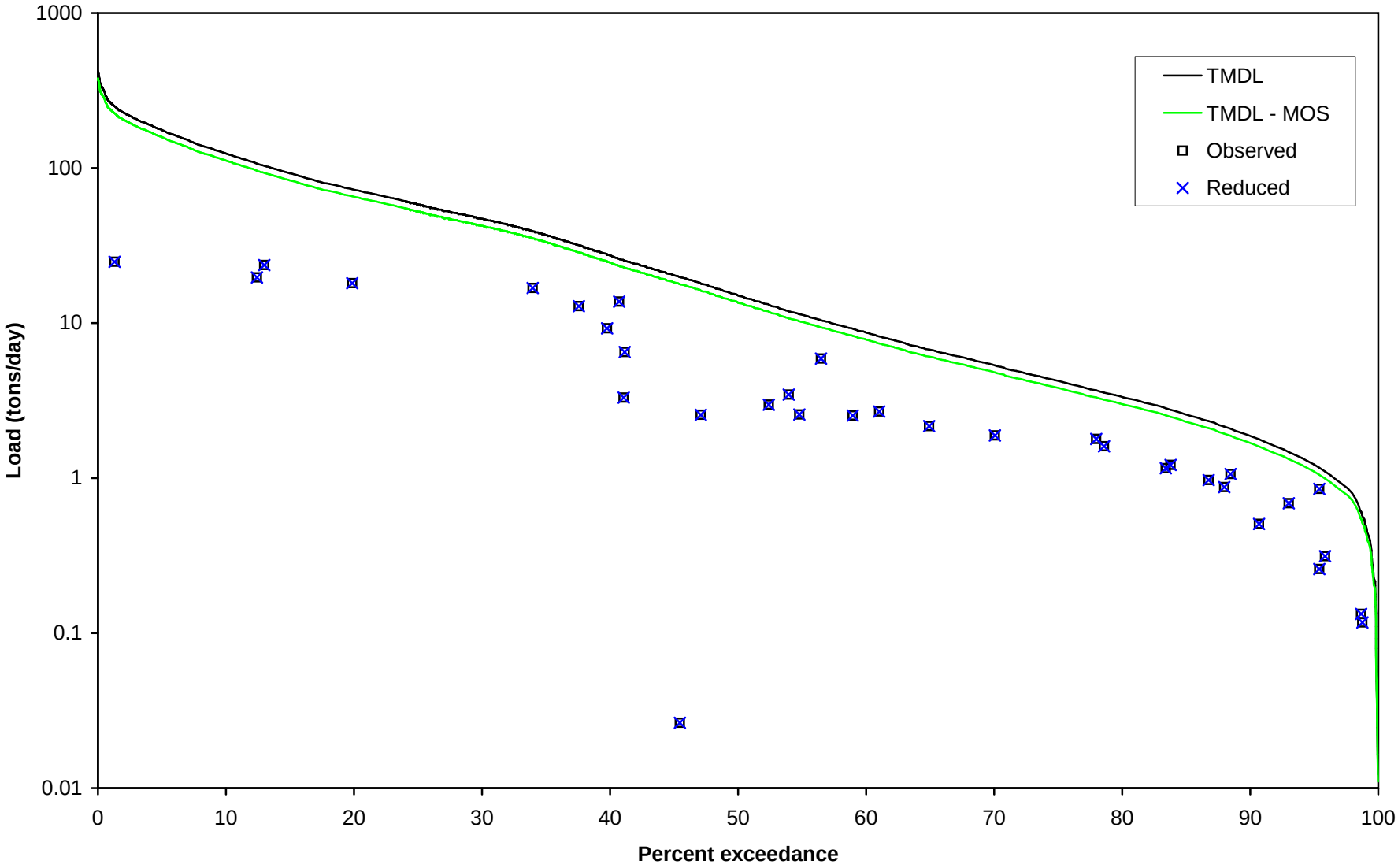
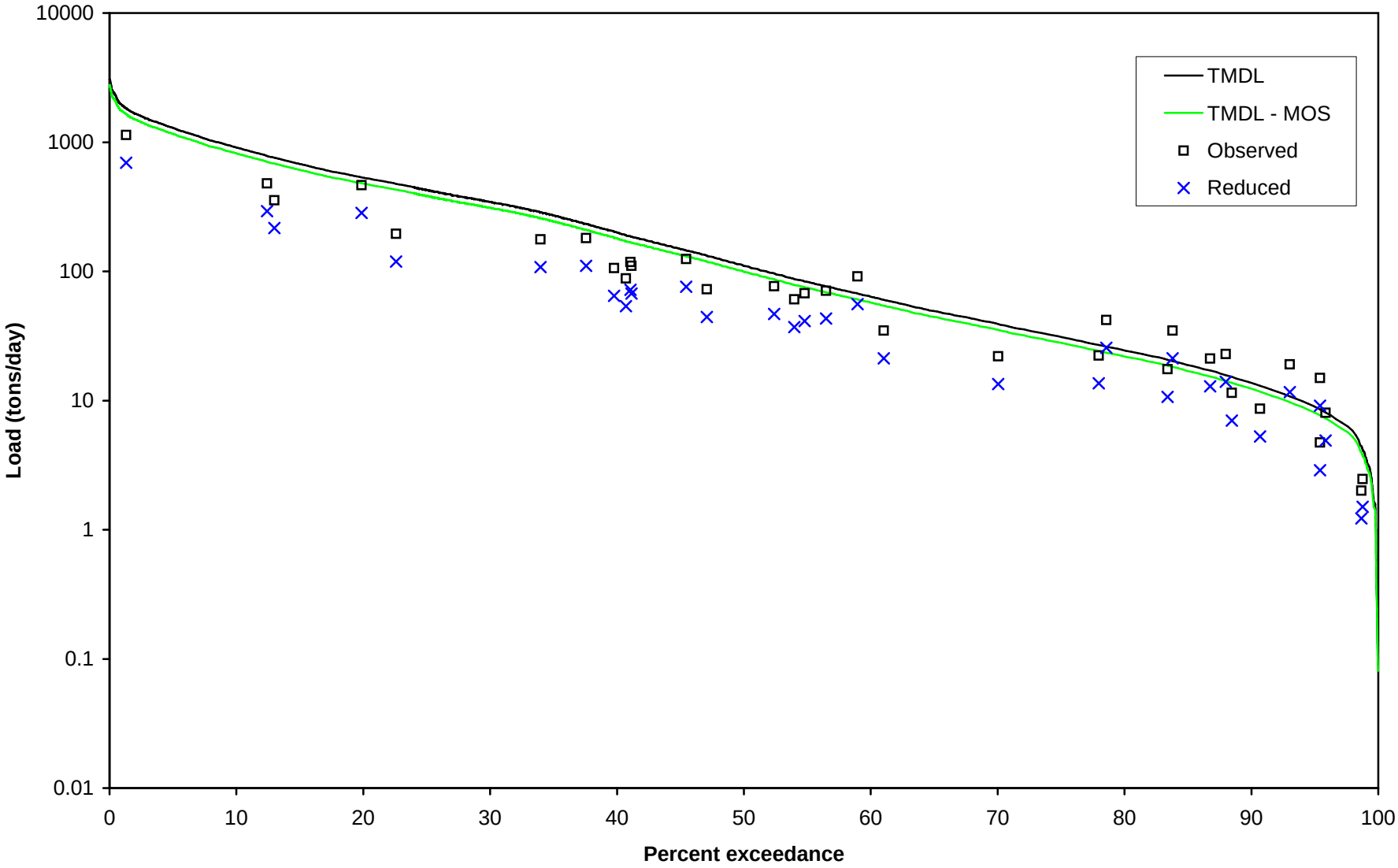


Figure F.4. TDS Load Duration Curve for Bayou Bartholomew Reach 013



APPENDIX G

Dissolved Mineral TMDL Calculations for Reach 08040205-012U

TABLE G.1. ALLOWABLE LOADS OF CHLORIDE, SULFATE, AND TDS FOR BAYOU BARTHOLOMEW REACH 08040205-012U

Drainage area at flow gage (B. Bartholomew near McGehee) = 576 square miles
Drainage area at downstream end of reach 08040205-012U = 603 square miles

				Chloride (criterion = 30 mg/L)			Sulfate (criterion = 30 mg/L)			TDS (criterion = 220 mg/L)		
Flow in Bayou Bartholomew at flow gage near McGehee (cfs)	Flow at downstream end of reach 08040205-012U (cfs)	Percent exceedance for flow	Width on plot between data points (unitless)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)
0.2	0.21	99.980	0.0391	0.017	0.015	0.0000	0.017	0.015	0.0000	0.12	0.11	0.000
0.3	0.31	99.942	0.0324	0.025	0.023	0.0000	0.025	0.023	0.0000	0.19	0.17	0.000
0.4	0.42	99.915	0.0190	0.034	0.030	0.0000	0.034	0.030	0.0000	0.25	0.22	0.000
0.5	0.52	99.904	0.0089	0.042	0.038	0.0000	0.042	0.038	0.0000	0.31	0.28	0.000
0.6	0.63	99.897	0.0101	0.051	0.046	0.0000	0.051	0.046	0.0000	0.37	0.34	0.000
0.7	0.73	99.884	0.0145	0.059	0.053	0.0000	0.059	0.053	0.0000	0.43	0.39	0.000
0.8	0.84	99.868	0.0156	0.068	0.061	0.0000	0.068	0.061	0.0000	0.50	0.45	0.000
0.9	0.94	99.853	0.0145	0.076	0.069	0.0000	0.076	0.069	0.0000	0.56	0.50	0.000
1.0	1.05	99.839	0.0101	0.085	0.076	0.0000	0.085	0.076	0.0000	0.62	0.56	0.000
1.3	1.36	99.832	0.0067	0.110	0.099	0.0000	0.110	0.099	0.0000	0.81	0.73	0.000
The rows between 99.832 and 0.047 percent exceedance are hidden for the sake of brevity.												
6,670	6,984	0.047	0.0045	565	509	0.0253	565	509	0.0253	4,144	3,729	0.185
6,680	6,994	0.042	0.0056	566	509	0.0316	566	509	0.0316	4,150	3,735	0.232
6,700	7,015	0.036	0.0067	568	511	0.0380	568	511	0.0380	4,162	3,746	0.279
6,720	7,036	0.029	0.0056	569	512	0.0318	569	512	0.0318	4,175	3,757	0.233
6,730	7,047	0.025	0.0045	570	513	0.0255	570	513	0.0255	4,181	3,763	0.187
6,760	7,078	0.020	0.0045	573	515	0.0256	573	515	0.0256	4,200	3,780	0.188
6,800	7,120	0.016	0.0045	576	518	0.0257	576	518	0.0257	4,224	3,802	0.189
6,840	7,162	0.011	0.0045	579	521	0.0259	579	521	0.0259	4,249	3,824	0.190
6,850	7,172	0.007	0.0045	580	522	0.0259	580	522	0.0259	4,255	3,830	0.190
6,870	7,193	0.002	0.0045	582	524	0.0260	582	524	0.0260	4,268	3,841	0.191
				Total area under TMDL curve for chloride (tons/day) =		59.0	Total area under TMDL curve for sulfate (tons/day) =		59.0	Total area under TMDL curve for TDS (tons/day) =		432.3
Explicit MOS (tons/day) = TMDL × 10% =						5.9			5.9			43.2
WLA for point sources (tons/day) (from Appendix K) =						0.4			0.3			2.4
LA for nonpoint sources (tons/day) = TMDL - MOS - WLA =						52.7			52.8			386.7

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TABLE G.2. CHLORIDE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-012U

Chloride criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 38%

Date	Observed chloride at UWBYB02 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-012U (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	14.8	194	203	54.0	8.11	5.03	16.43	14.79	Yes
9/12/1994	10.5	134	140	61.0	3.97	2.46	11.35	10.22	Yes
1/17/1995	9.5	424	444	40.7	11.33	7.02	35.92	32.33	Yes
4/11/1995	4.7	452	473	39.8	5.99	3.71	38.29	34.46	Yes
7/18/1995	20.3	415	435	41.1	23.78	14.74	35.16	31.64	Yes
10/2/1995	53.1	19	20	95.4	2.85	1.77	1.61	1.45	No
2/26/1996	11.5	519	543	37.6	16.92	10.49	43.97	39.57	Yes
5/6/1996	7.7	638	668	34.0	13.91	8.62	54.05	48.64	Yes
9/30/1996	22.6	60	63	78.0	3.82	2.37	5.08	4.57	Yes
11/9/1998	23.8	18	19	95.9	1.21	0.75	1.52	1.37	Yes
1/12/1999	3.9	1,740	1,822	12.4	19.31	11.97	147.40	132.66	Yes
2/1/1999	1.9	4,090	4,282	1.3	21.37	13.25	346.48	311.83	Yes
3/9/1999	5.5	186	195	54.8	2.91	1.80	15.76	14.18	Yes
8/30/1999	49.5	45	47	83.8	6.29	3.90	3.81	3.43	No
9/27/1999	58.4	24	25	93.0	3.96	2.45	2.03	1.83	No
10/25/1999	16.6	35	37	88.0	1.64	1.02	2.96	2.67	Yes
1/18/2000	25.0	35	37	88.0	2.47	1.53	2.96	2.67	Yes
2/29/2000	14.4	237	248	50.6	9.64	5.97	20.08	18.07	Yes
3/21/2000	7.7	569	596	36.0	12.39	7.68	48.20	43.38	Yes
4/4/2000	2.3	1,840	1,927	11.6	12.05	7.47	155.87	140.29	Yes
6/5/2000	4.5	454	475	39.8	5.72	3.54	38.46	34.61	Yes
9/12/2000	43.5	13	14	98.0	1.60	0.99	1.10	0.99	Yes

Total number of values of loads =	22
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	4
No. of exceedances after reductions of loads =	3

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TABLE G.3. SULFATE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-012U

Sulfate criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed sulfate at UWBYB02 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-012U (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	8.7	194	203	54.0	4.77	4.77	16.43	14.79	Yes
9/12/1994	7.8	134	140	61.0	2.95	2.95	11.35	10.22	Yes
1/17/1995	15.9	424	444	40.7	19.04	19.04	35.92	32.33	Yes
4/11/1995	11.1	452	473	39.8	14.17	14.17	38.29	34.46	Yes
7/18/1995	5.0	415	435	41.1	5.86	5.86	35.16	31.64	Yes
10/2/1995	14.4	19	20	95.4	0.77	0.77	1.61	1.45	Yes
2/26/1996	11.0	519	543	37.6	16.12	16.12	43.97	39.57	Yes
5/6/1996	11.8	638	668	34.0	21.26	21.26	54.05	48.64	Yes
9/30/1996	13.5	60	63	78.0	2.29	2.29	5.08	4.57	Yes
11/9/1998	14.5	18	19	95.9	0.74	0.74	1.52	1.37	Yes
1/12/1999	4.7	1,740	1,822	12.4	22.99	22.99	147.40	132.66	Yes
2/1/1999	2.6	4,090	4,282	1.3	30.26	30.26	346.48	311.83	Yes
3/9/1999	6.6	186	195	54.8	3.46	3.46	15.76	14.18	Yes
8/30/1999	10.0	45	47	83.8	1.27	1.27	3.81	3.43	Yes
9/27/1999	11.6	24	25	93.0	0.79	0.79	2.03	1.83	Yes
10/25/1999	7.1	35	37	88.0	0.70	0.70	2.96	2.67	Yes
1/18/2000	13.8	35	37	88.0	1.36	1.36	2.96	2.67	Yes
2/29/2000	8.9	237	248	50.6	5.92	5.92	20.08	18.07	Yes
3/21/2000	7.3	569	596	36.0	11.75	11.75	48.20	43.38	Yes
4/4/2000	3.7	1,840	1,927	11.6	19.17	19.17	155.87	140.29	Yes
6/5/2000	4.2	454	475	39.8	5.44	5.44	38.46	34.61	Yes
9/12/2000	8.8	13	14	98.0	0.32	0.32	1.10	0.99	Yes

Total number of values of loads =	22
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	0
No. of exceedances after reductions of loads =	0

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BAYOU BARTHOLOMEW 012U.XLS

TABLE G.4. TDS PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-012U

TDS criterion in WQ standards = 220 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 23%

Date	Observed TDS at UWBYB02 (mg/L)	Flow on Sampling Day: Flow gage near McGehee (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-012U (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/6/1994	133	194	203	54.0	72.9	56.1	120.5	108.5	Yes
9/12/1994	116	134	140	61.0	43.9	33.8	83.2	74.9	Yes
1/17/1995	170	424	444	40.7	203.5	156.7	263.4	237.1	Yes
4/11/1995	121	452	473	39.8	154.4	118.9	280.8	252.7	Yes
7/18/1995	143	415	435	41.1	167.6	129.0	257.8	232.0	Yes
10/2/1995	253	19	20	95.4	13.6	10.5	11.8	10.6	Yes
2/26/1996	156	519	543	37.6	228.6	176.0	322.4	290.2	Yes
5/6/1996	147	638	668	34.0	264.8	203.9	396.3	356.7	Yes
9/30/1996	176	60	63	78.0	29.8	23.0	37.3	33.5	Yes
11/9/1998	264	18	19	95.9	13.4	10.3	11.2	10.1	No
1/12/1999	208	1,740	1,822	12.4	1022.0	786.9	1080.9	972.8	Yes
2/1/1999	107	4,090	4,282	1.3	1235.8	951.5	2540.8	2286.7	Yes
3/9/1999	126	186	195	54.8	66.2	51.0	115.5	104.0	Yes
8/30/1999	285	45	47	83.8	36.2	27.9	28.0	25.2	No
9/27/1999	314	24	25	93.0	21.3	16.4	14.9	13.4	No
10/25/1999	152	35	37	88.0	15.0	11.5	21.7	19.6	Yes
1/18/2000	173	35	37	88.0	17.1	13.2	21.7	19.6	Yes
2/29/2000	201	237	248	50.6	134.2	103.3	147.2	132.5	Yes
3/21/2000	181	569	596	36.0	290.8	223.9	353.5	318.1	Yes
4/4/2000	146	1,840	1,927	11.6	758.6	584.1	1143.1	1028.8	Yes
6/5/2000	126	454	475	39.8	160.9	123.9	282.0	253.8	Yes
9/12/2000	256	13	14	98.0	9.4	7.2	8.1	7.3	Yes

Total number of values of loads = 22
Allowable % of exceedances of loads = 10%
Allowable no. of exceedances of loads = 3
No. of exceedances before reductions of loads = 7
No. of exceedances after reductions of loads = 3

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APPENDIX H

Dissolved Mineral TMDL Calculations for Reach 08040205-002

TABLE H.1. ALLOWABLE LOADS OF CHLORIDE, SULFATE, AND TDS FOR BAYOU BARTHOLOMEW REACH 08040205-002

Drainage area at flow gage (B. Bartholomew near Jones) = 1,187 square miles
Drainage area at downstream end of reach 08040205-002 = 1,141 square miles

				Chloride (criterion = 30 mg/L)			Sulfate (criterion = 30 mg/L)			TDS (criterion = 220 mg/L)		
Flow in Bayou Bartholomew at flow gage near Jones (cfs)	Flow at downstream end of reach 08040205-002 (cfs)	Percent exceedance for flow	Width on plot between data points (unitless)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)
0.1	0.11	99.997	0.0055	0.009	0.008	0.0000	0.009	0.008	0.0000	0.06	0.06	0.000
0.2	0.14	99.992	0.0055	0.012	0.010	0.0000	0.012	0.010	0.0000	0.09	0.08	0.000
0.4	0.41	99.986	0.0055	0.033	0.030	0.0000	0.033	0.030	0.0000	0.25	0.22	0.000
1.5	1.44	99.981	0.0055	0.117	0.105	0.0000	0.117	0.105	0.0000	0.86	0.77	0.000
1.6	1.54	99.975	0.0055	0.124	0.112	0.0000	0.124	0.112	0.0000	0.91	0.82	0.000
2.1	2.02	99.970	0.0055	0.163	0.147	0.0000	0.163	0.147	0.0000	1.20	1.08	0.000
2.3	2.21	99.964	0.0055	0.179	0.161	0.0000	0.179	0.161	0.0000	1.31	1.18	0.000
2.7	2.59	99.959	0.0055	0.210	0.189	0.0000	0.210	0.189	0.0000	1.54	1.39	0.000
3.0	2.88	99.953	0.0055	0.233	0.210	0.0000	0.233	0.210	0.0000	1.71	1.54	0.000
3.1	2.98	99.948	0.0055	0.241	0.217	0.0000	0.241	0.217	0.0000	1.77	1.59	0.000
The rows between 99.948 and 0.063 percent exceedance are hidden for the sake of brevity.												
7,020	6,746.22	0.063	0.0055	545.814	491.233	0.0300	545.814	491.233	0.0300	4,002.64	3,602.37	0.220
7,030	6,755.83	0.058	0.0055	546.592	491.932	0.0301	546.592	491.932	0.0301	4,008.34	3,607.50	0.221
7,060	6,784.66	0.052	0.0055	548.924	494.032	0.0302	548.924	494.032	0.0302	4,025.44	3,622.90	0.222
7,070	6,794.27	0.047	0.0055	549.702	494.732	0.0303	549.702	494.732	0.0303	4,031.15	3,628.03	0.222
7,090	6,813.49	0.041	0.0069	551.257	496.131	0.0379	551.257	496.131	0.0379	4,042.55	3,638.29	0.278
7,110	6,832.71	0.033	0.0096	552.812	497.531	0.0533	552.812	497.531	0.0533	4,053.95	3,648.56	0.391
7,120	6,842.32	0.022	0.0096	553.589	498.230	0.0533	553.589	498.230	0.0533	4,059.65	3,653.69	0.391
7,160	6,880.76	0.014	0.0069	556.699	501.029	0.0383	556.699	501.029	0.0383	4,082.46	3,674.22	0.281
7,190	6,909.59	0.008	0.0055	559.032	503.129	0.0308	559.032	503.129	0.0308	4,099.57	3,689.61	0.226
7,240	6,957.64	0.003	0.0055	562.919	506.627	0.0310	562.919	506.627	0.0310	4,128.08	3,715.27	0.227
				Total area under TMDL curve for chloride (tons/day) =		102.9	Total area under TMDL curve for sulfate (tons/day) =		102.9	Total area under TMDL curve for TDS (tons/day) =		754.6
Explicit MOS (tons/day) = TMDL × 10% =						10.3			10.3			75.5
WLA for point sources (tons/day) (from Appendix K) =						0			0.0			0
LA for nonpoint sources (tons/day) = TMDL - MOS - WLA =						92.6			92.6			679.1

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TABLE H.2. CHLORIDE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-002

Chloride criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 24%

Date	Observed chloride at OUA0154 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-002 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
11/9/1998	36.3	69	66.31	90.8	6.49	4.93	5.36	4.83	No
1/12/1999	4.0	2,630	2,527.43	18.7	27.33	20.77	204.49	184.04	Yes
2/1/1999	1.7	4,110	3,949.71	8.4	18.21	13.84	319.56	287.60	Yes
3/9/1999	4.1	1,500	1,441.50	32.3	15.82	12.03	116.63	104.96	Yes
8/30/1999	23.8	72	69.19	90.1	4.44	3.38	5.60	5.04	Yes
9/27/1999	49.3	41	39.40	96.3	5.24	3.98	3.19	2.87	No
10/25/1999	35.3	29	27.87	97.9	2.65	2.02	2.25	2.03	Yes
1/18/2000	22.3	60	57.66	93.0	3.46	2.63	4.67	4.20	Yes
2/29/2000	14.9	123	118.20	79.9	4.75	3.61	9.56	8.61	Yes
3/21/2000	7.8	807	775.53	43.4	16.25	12.35	62.75	56.47	Yes
4/4/2000	2.7	2,240	2,152.64	22.7	15.44	11.74	174.16	156.75	Yes
6/5/2000	4.7	660	634.26	46.5	8.04	6.11	51.32	46.18	Yes
9/12/2000	27.5	28	26.91	98.0	2.00	1.52	2.18	1.96	Yes
11/6/2000	56.2	47	45.17	95.6	6.85	5.21	3.65	3.29	No
1/22/2001	1.8	2,640	2,537.04	18.6	12.11	9.20	205.26	184.74	Yes
3/6/2001	1.8	6,340	6,092.74	1.0	29.74	22.60	492.94	443.65	Yes
5/14/2001	3.0	935	898.53	40.9	7.32	5.56	72.70	65.43	Yes
7/17/2001	14.6	50	48.05	95.0	1.89	1.44	3.89	3.50	Yes
9/10/2001	9.9	632	607.35	47.4	16.22	12.32	49.14	44.22	Yes
7/26/2005	34.1	218	209.50	67.2	19.27	14.64	16.95	15.25	Yes
8/23/2005	19.8	93	89.37	85.9	4.77	3.63	7.23	6.51	Yes

Total number of values of loads =	21
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	6
No. of exceedances after reductions of loads =	3

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TABLE H.3. SULFATE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-002

Sulfate criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed sulfate at OUA0154 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-002 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
11/9/1998	7.6	69	66.31	90.8	1.37	1.37	5.36	4.83	Yes
1/12/1999	5.9	2,630	2,527.43	18.7	40.08	40.08	204.49	184.04	Yes
2/1/1999	3.2	4,110	3,949.71	8.4	33.55	33.55	319.56	287.60	Yes
3/9/1999	4.4	1,500	1,441.50	32.3	17.07	17.07	116.63	104.96	Yes
8/30/1999	6.5	72	69.19	90.1	1.21	1.21	5.60	5.04	Yes
9/27/1999	9.6	41	39.40	96.3	1.02	1.02	3.19	2.87	Yes
10/25/1999	7.3	29	27.87	97.9	0.55	0.55	2.25	2.03	Yes
1/18/2000	15.2	60	57.66	93.0	2.36	2.36	4.67	4.20	Yes
2/29/2000	14.3	123	118.20	79.9	4.56	4.56	9.56	8.61	Yes
3/21/2000	6.1	807	775.53	43.4	12.78	12.78	62.75	56.47	Yes
4/4/2000	4.0	2,240	2,152.64	22.7	22.93	22.93	174.16	156.75	Yes
6/5/2000	5.0	660	634.26	46.5	8.59	8.59	51.32	46.18	Yes
9/12/2000	7.2	28	26.91	98.0	0.52	0.52	2.18	1.96	Yes
11/6/2000	13.5	47	45.17	95.6	1.65	1.65	3.65	3.29	Yes
1/22/2001	3.6	2,640	2,537.04	18.6	24.77	24.77	205.26	184.74	Yes
3/6/2001	3.6	6,340	6,092.74	1.0	58.99	58.99	492.94	443.65	Yes
5/14/2001	3.8	935	898.53	40.9	9.31	9.31	72.70	65.43	Yes
7/17/2001	6.4	50	48.05	95.0	0.83	0.83	3.89	3.50	Yes
9/10/2001	4.8	632	607.35	47.4	7.89	7.89	49.14	44.22	Yes
7/26/2005	11.8	218	209.50	67.2	6.67	6.67	16.95	15.25	Yes
8/23/2005	5.3	93	89.37	85.9	1.28	1.28	7.23	6.51	Yes

Total number of values of loads =	21
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	0
No. of exceedances after reductions of loads =	0

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TABLE H.4. TDS PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-002

TDS criterion in WQ standards = 220 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 1%

Date	Observed TDS at OUA00154 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-002 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
1/12/1999	108	2,630	2527.43	18.7	736.1	728.8	1499.6	1349.6	Yes
2/1/1999	76	4,110	3949.71	8.4	809.5	801.5	2343.4	2109.1	Yes
3/9/1999	110	1,500	1441.50	32.3	427.6	423.4	855.3	769.7	Yes
8/30/1999	182	72	69.19	90.1	34.0	33.6	41.1	36.9	Yes
9/27/1999	254	41	39.40	96.3	27.0	26.7	23.4	21.0	No
10/25/1999	211	29	27.87	97.9	15.9	15.7	16.5	14.9	No
1/18/2000	173	60	57.66	93.0	26.9	26.6	34.2	30.8	Yes
2/29/2000	161	123	118.20	79.9	51.3	50.8	70.1	63.1	Yes
3/21/2000	137	807	775.53	43.4	286.5	283.7	460.1	414.1	Yes
4/4/2000	100	2,240	2152.64	22.7	577.6	571.9	1277.2	1149.5	Yes
6/5/2000	151	660	634.26	46.5	257.4	254.9	376.3	338.7	Yes
9/12/2000	200	28	26.91	98.0	14.5	14.4	16.0	14.4	Yes
11/6/2000	278	47	45.17	95.6	33.9	33.5	26.8	24.1	No
1/22/2001	69	2,640	2537.04	18.6	472.1	467.4	1505.3	1354.7	Yes
3/6/2001	89	6,340	6092.74	1.0	1462.4	1447.8	3614.9	3253.4	Yes
5/14/2001	119	935	898.53	40.9	288.4	285.5	533.1	479.8	Yes
7/17/2001	161	50	48.05	95.0	20.9	20.7	28.5	25.7	Yes
9/10/2001	114	632	607.35	47.4	186.7	184.9	360.4	324.3	Yes
1/4/2005	72	4,050	3892.05	8.7	750.5	743.0	2309.2	2078.3	Yes
7/26/2005	190	218	209.50	67.2	107.3	106.3	124.3	111.9	Yes
8/23/2005	161	93	89.37	85.9	38.8	38.4	53.0	47.7	Yes

Total number of values of loads =	21
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	4
No. of exceedances after reductions of loads =	3

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Figure H.1. Flow duration curve for Bayou Bartholomew reach 08040205-002

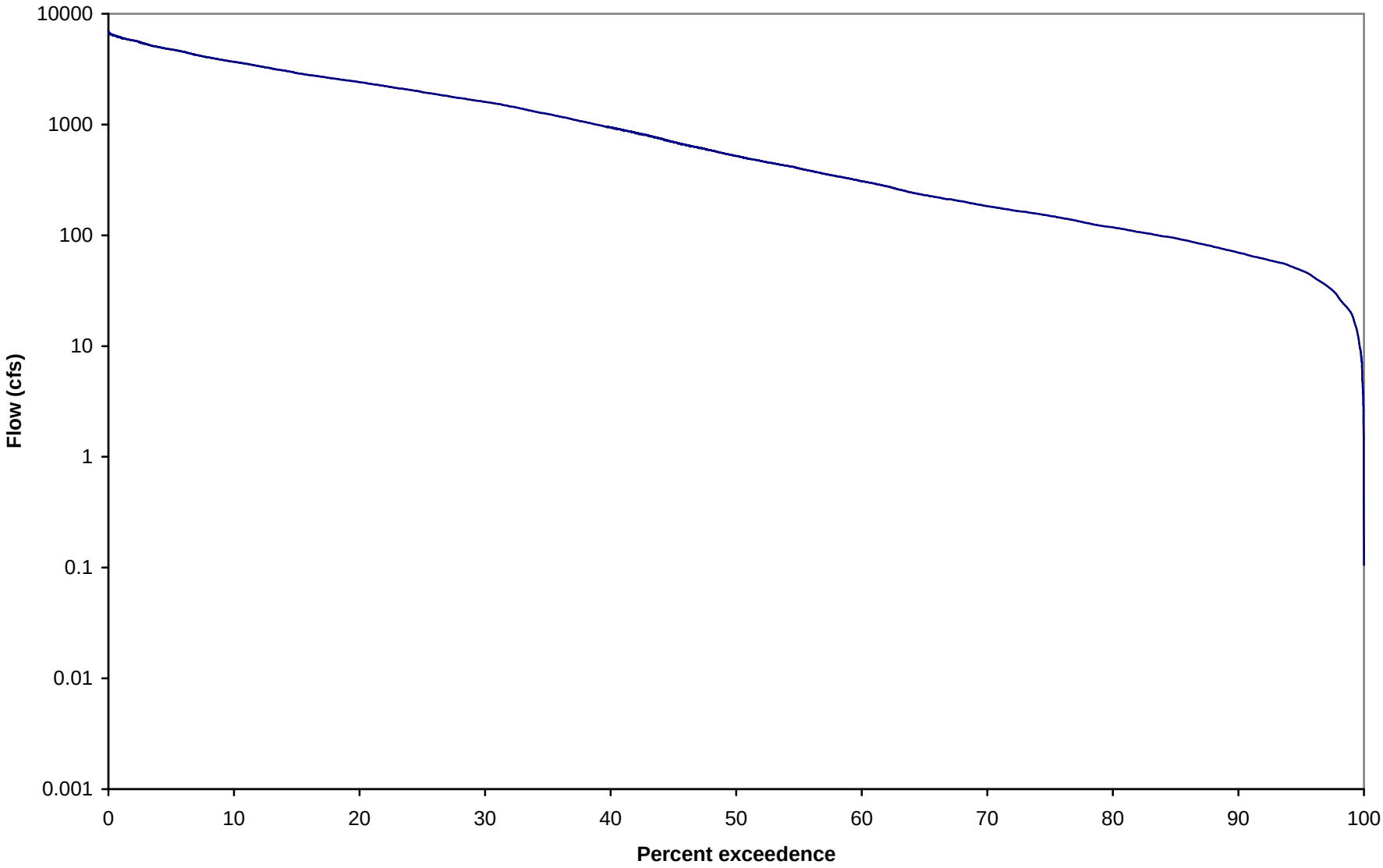


Figure H.2. Chloride Load Duration Curve for Bayou Bartholomew Reach 002

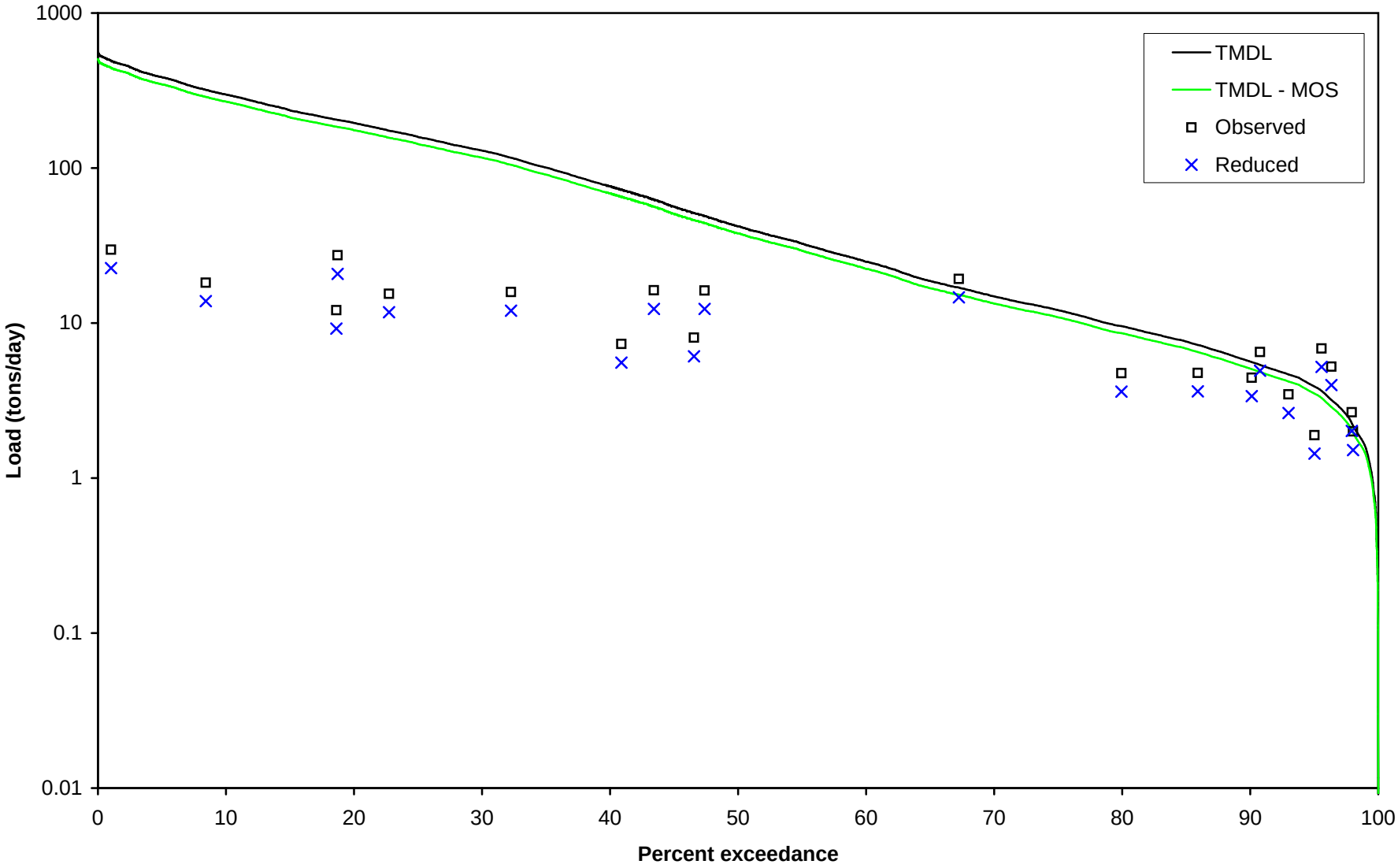


Figure H.3. Sulfate Load Duration Curve for Bayou Bartholomew Reach 002

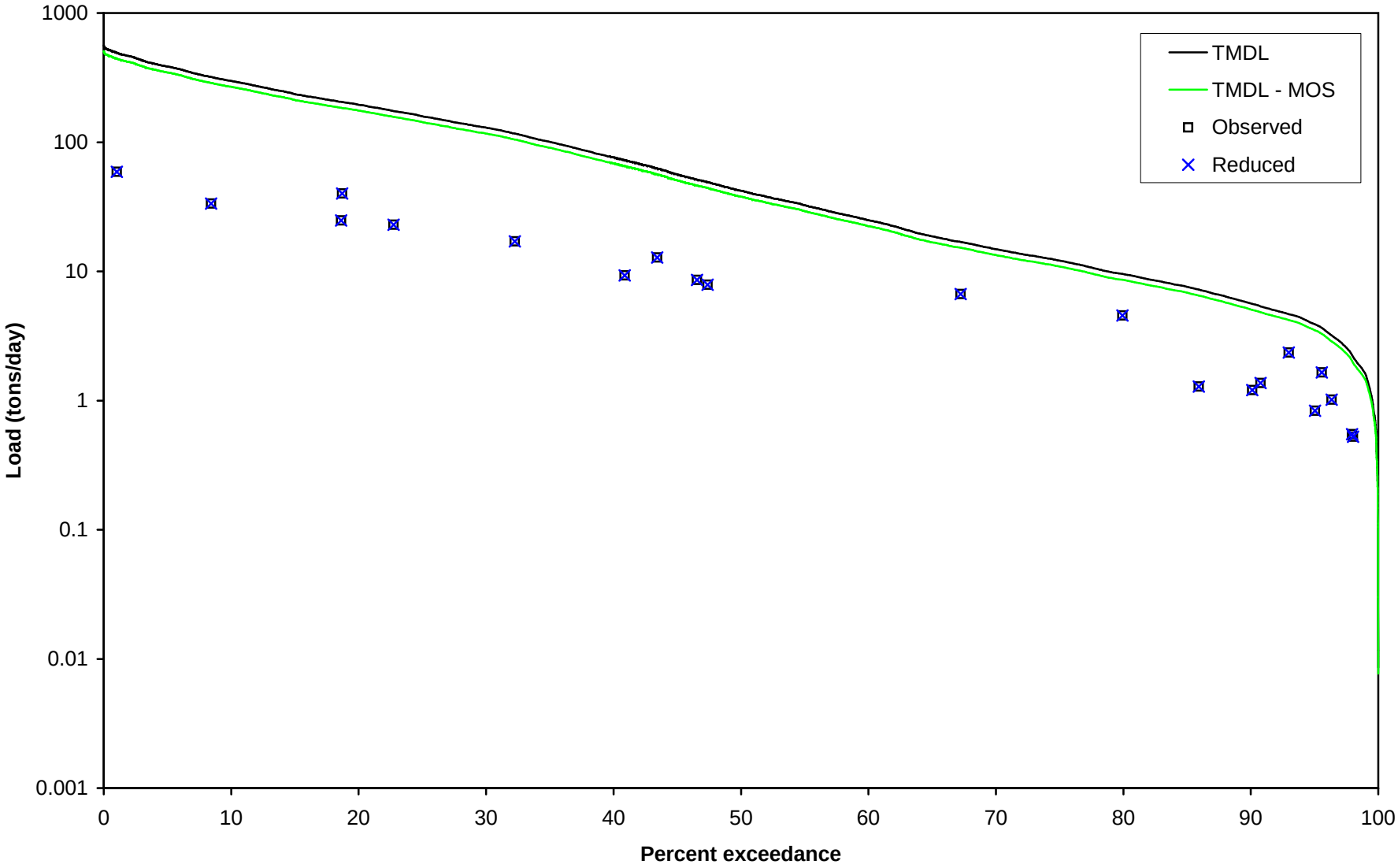
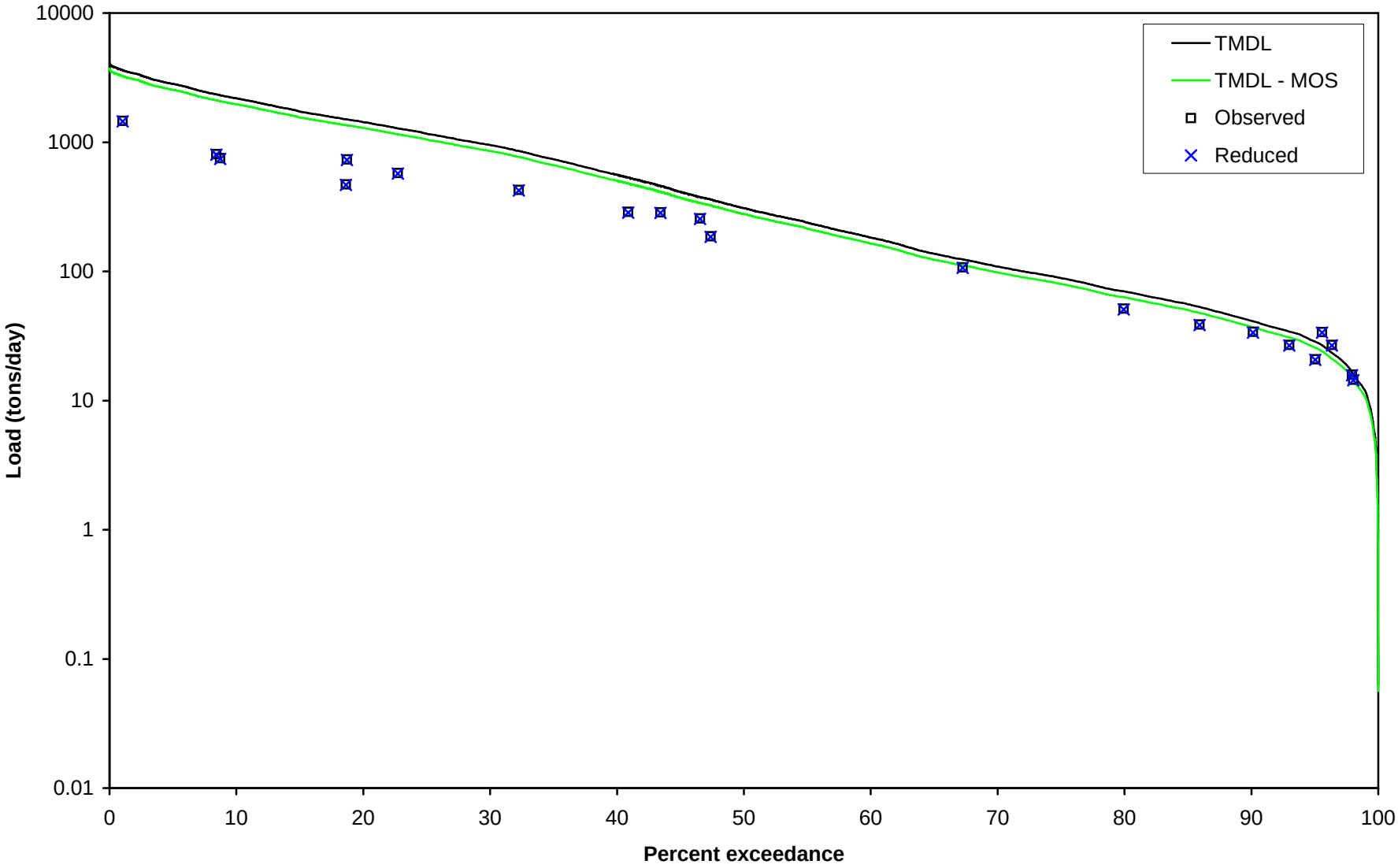


Figure H.4. TDS Load Duration Curve for Bayou Bartholomew Reach 002



APPENDIX I

Dissolved Mineral TMDL Calculations for Reach 08040205-001

TABLE I.1. ALLOWABLE LOADS OF CHLORIDE, SULFATE, AND TDS FOR BAYOU BARTHOLOMEW REACH 08040205-001

Drainage area at flow gage (B. Bartholomew near Jones) = 1,187 square miles
Drainage area at downstream end of reach 08040205-001 = 1,184 square miles

				Chloride (criterion = 30 mg/L)			Sulfate (criterion = 30 mg/L)			TDS (criterion = 220 mg/L)		
Flow in Bayou Bartholomew at flow gage near Jones (cfs)	Flow at downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow	Width on plot between data points (unitless)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)	Assimilative capacity, or TMDL (tons/day)	TMDL minus MOS (tons/day)	Area under TMDL curve (width times assimilative capacity) (tons/day)
0.1	0.11	99.997	0.0055	0.009	0.008	0.0000	0.009	0.008	0.0000	0.07	0.06	0.000
0.2	0.15	99.992	0.0055	0.012	0.011	0.0000	0.012	0.011	0.0000	0.09	0.08	0.000
0.4	0.43	99.986	0.0055	0.035	0.031	0.0000	0.035	0.031	0.0000	0.25	0.23	0.000
1.5	1.50	99.981	0.0055	0.121	0.109	0.0000	0.121	0.109	0.0000	0.89	0.80	0.000
1.6	1.60	99.975	0.0055	0.129	0.116	0.0000	0.129	0.116	0.0000	0.95	0.85	0.000
2.1	2.10	99.970	0.0055	0.170	0.153	0.0000	0.170	0.153	0.0000	1.24	1.12	0.000
2.3	2.29	99.964	0.0055	0.186	0.167	0.0000	0.186	0.167	0.0000	1.36	1.23	0.000
2.7	2.69	99.959	0.0055	0.218	0.196	0.0000	0.218	0.196	0.0000	1.60	1.44	0.000
3.0	2.99	99.953	0.0055	0.242	0.218	0.0000	0.242	0.218	0.0000	1.78	1.60	0.000
3.1	3.09	99.948	0.0055	0.250	0.225	0.0000	0.250	0.225	0.0000	1.84	1.65	0.000
The rows between 99.948 and 0.063 percent exceedance are hidden for the sake of brevity.												
7,020	7,003.79	0.063	0.0055	566.653	509.988	0.0312	566.653	509.988	0.0312	4,155.45	3,739.91	0.229
7,030	7,013.76	0.058	0.0055	567.460	510.714	0.0312	567.460	510.714	0.0312	4,161.37	3,745.24	0.229
7,060	7,043.69	0.052	0.0055	569.882	512.894	0.0314	569.882	512.894	0.0314	4,179.13	3,761.22	0.230
7,070	7,053.67	0.047	0.0055	570.689	513.620	0.0314	570.689	513.620	0.0314	4,185.05	3,766.55	0.230
7,090	7,073.62	0.041	0.0069	572.303	515.073	0.0394	572.303	515.073	0.0394	4,196.89	3,777.20	0.289
7,110	7,093.58	0.033	0.0096	573.918	516.526	0.0553	573.918	516.526	0.0553	4,208.73	3,787.86	0.405
7,120	7,103.55	0.022	0.0096	574.725	517.252	0.0554	574.725	517.252	0.0554	4,214.65	3,793.18	0.406
7,160	7,143.46	0.014	0.0069	577.954	520.158	0.0398	577.954	520.158	0.0398	4,238.33	3,814.49	0.292
7,190	7,173.39	0.008	0.0055	580.375	522.338	0.0320	580.375	522.338	0.0320	4,256.09	3,830.48	0.234
7,240	7,223.28	0.003	0.0055	584.411	525.970	0.0322	584.411	525.970	0.0322	4,285.68	3,857.11	0.236
				Total area under TMDL curve for chloride (tons/day) =		106.8	Total area under TMDL curve for sulfate (tons/day) =		106.8	Total area under TMDL curve for TDS (tons/day) =		783.4
Explicit MOS (tons/day) = TMDL × 10% =						10.7			10.7			78.3
WLA for point sources (tons/day) (from Appendix K) =						0.07			0.05			0.43
LA for nonpoint sources (tons/day) = TMDL - MOS - WLA =						96.0			96.1			704.7

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BAYOU BARTHOLOMEW 001.XLS

TABLE I.2. CHLORIDE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-001

Chloride criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
9/4/1990	13.4	64	63.85	91.9	2.31	2.31	5.17	4.65	Yes
10/2/1990	18.4	125	124.71	79.4	6.19	6.19	10.09	9.08	Yes
10/30/1990	10.8	704	702.37	45.4	20.46	20.46	56.83	51.14	Yes
11/27/1990	9.1	379	378.12	56.8	9.25	9.25	30.59	27.53	Yes
1/2/1991	4.8	3,410	3,402.12	12.5	43.77	43.77	275.25	247.73	Yes
2/5/1991	3.9	2,210	2,204.90	23.1	23.37	23.37	178.39	160.55	Yes
3/12/1991	3.2	6,760	6,744.39	0.3	58.02	58.02	545.67	491.10	Yes
4/2/1991	3.8	2,090	2,085.17	24.6	21.37	21.37	168.70	151.83	Yes
7/2/1991	7.6	354	353.18	58.1	7.21	7.21	28.57	25.72	Yes
8/6/1991	15.2	228	227.47	66.2	9.32	9.32	18.40	16.56	Yes
11/25/1991	7.6	1,310	1,306.97	34.7	26.72	26.72	105.74	95.17	Yes
1/7/1992	3.8	2,200	2,194.92	23.3	22.26	22.26	177.58	159.83	Yes
2/4/1992	5.3	1,630	1,626.24	30.5	23.24	23.24	131.57	118.42	Yes
3/3/1992	3.2	2,300	2,294.69	22.2	19.99	19.99	185.66	167.09	Yes
4/7/1992	4.0	2,990	2,983.09	15.3	31.78	31.78	241.35	217.22	Yes
5/5/1992	6.1	310	309.28	60.7	5.12	5.12	25.02	22.52	Yes
6/2/1992	9.2	171	170.61	72.7	4.21	4.21	13.80	12.42	Yes
7/7/1992	6.3	1,150	1,147.34	37.1	19.52	19.52	92.83	83.54	Yes
8/4/1992	12.8	1,050	1,047.57	38.7	36.16	36.16	84.76	76.28	Yes
9/1/1992	11.8	310	309.28	60.7	9.84	9.84	25.02	22.52	Yes
9/29/1992	10.5	148	147.66	76.1	4.18	4.18	11.95	10.75	Yes
12/1/1992	10.7	254	253.41	63.9	7.31	7.31	20.50	18.45	Yes
2/9/1993	5.8	1,630	1,626.24	30.5	25.35	25.35	131.57	118.42	Yes
3/9/1993	4.0	1,640	1,636.21	30.4	17.83	17.83	132.38	119.14	Yes
4/13/1993	3.8	2,350	2,344.57	21.7	24.03	24.03	189.69	170.72	Yes
5/18/1993	3.6	2,120	2,115.10	24.2	20.48	20.48	171.13	154.01	Yes
6/21/1993	6.0	210	209.51	68.0	3.36	3.36	16.95	15.26	Yes
7/26/1993	10.0	66	65.85	91.4	1.77	1.77	5.33	4.79	Yes
8/24/1993	26.4	493	491.86	51.8	35.02	35.02	39.79	35.82	Yes
9/21/1993	15.3	110	109.75	82.4	4.53	4.53	8.88	7.99	Yes

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
10/26/1993	18.5	97	96.78	85.1	4.83	4.83	7.83	7.05	Yes
11/23/1993	8.0	753	751.26	44.4	16.15	16.15	60.78	54.70	Yes
2/15/1994	4.1	6,210	6,195.66	1.3	68.67	68.67	501.27	451.14	Yes
3/15/1994	3.2	5,040	5,028.36	4.6	43.67	43.67	406.83	366.14	Yes
4/19/1994	6.5	1,650	1,646.19	30.3	28.86	28.86	133.19	119.87	Yes
5/24/1994	8.0	574	572.67	49.0	12.28	12.28	46.33	41.70	Yes
6/28/1994	25.2	188	187.57	70.4	12.75	12.75	15.18	13.66	Yes
7/19/1994	24.9	493	491.86	51.8	33.03	33.03	39.79	35.82	Yes
8/16/1994	16.3	518	516.80	50.8	22.72	22.72	41.81	37.63	Yes
9/27/1994	23.5	170	169.61	72.9	10.75	10.75	13.72	12.35	Yes
10/25/1994	12.4	727	725.32	45.0	24.26	24.26	58.68	52.81	Yes
11/28/1994	11.7	248	247.43	64.4	7.81	7.81	20.02	18.02	Yes
12/19/1994	4.9	1,960	1,955.47	26.0	26.05	26.05	158.21	142.39	Yes
1/10/1995	7.5	1,460	1,456.63	32.8	29.34	29.34	117.85	106.07	Yes
2/14/1995	4.9	2,470	2,464.30	20.5	32.49	32.49	199.38	179.44	Yes
3/28/1995	5.6	4,360	4,349.93	7.2	65.27	65.27	351.94	316.74	Yes
4/25/1995	4.3	2,640	2,633.90	18.6	30.75	30.75	213.10	191.79	Yes
5/23/1995	4.3	640	638.52	47.1	7.40	7.40	51.66	46.49	Yes
6/20/1995	11.5	308	307.29	60.8	9.57	9.57	24.86	22.38	Yes
7/17/1995	6.3	625	623.56	47.6	10.58	10.58	50.45	45.40	Yes
8/8/1995	13.1	123	122.72	79.9	4.35	4.35	9.93	8.94	Yes
9/19/1995	16.8	35	34.92	97.2	1.58	1.58	2.83	2.54	Yes
10/17/1995	18.5	35	34.92	97.2	1.74	1.74	2.83	2.54	Yes
12/18/1995	15.3	216	215.50	67.4	8.87	8.87	17.44	15.69	Yes
1/30/1996	13.7	527	525.78	50.5	19.39	19.39	42.54	38.29	Yes
2/20/1996	10.4	572	570.68	49.0	16.00	16.00	46.17	41.55	Yes
3/12/1996	11.8	690	688.41	45.8	21.88	21.88	55.70	50.13	Yes
4/23/1996	4.3	1,660	1,656.17	30.1	18.98	18.98	133.99	120.60	Yes
5/21/1996	5.0	946	943.82	40.7	12.71	12.71	76.36	68.72	Yes
6/18/1996	11.1	104	103.76	83.6	3.10	3.10	8.39	7.56	Yes
7/16/1996	24.9	55	54.87	94.1	3.69	3.69	4.44	4.00	Yes
8/6/1996	10.5	210	209.51	68.0	5.91	5.91	16.95	15.26	Yes
9/10/1996	32.3	120	119.72	80.5	10.42	10.42	9.69	8.72	No
10/1/1996	5.2	400	399.08	55.8	5.61	5.61	32.29	29.06	Yes
11/19/1996	9.4	824	822.10	43.1	20.75	20.75	66.51	59.86	Yes
12/17/1996	8.5	1,490	1,486.56	32.4	34.18	34.18	120.27	108.25	Yes
1/28/1997	5.0	3,250	3,242.49	13.6	43.36	43.36	262.34	236.11	Yes

Table I.2 Percent Reductions for Chloride

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
2/25/1997	3.5	3,960	3,950.85	9.2	36.91	36.91	319.65	287.69	Yes
3/11/1997	3.4	6,050	6,036.03	1.7	54.79	54.79	488.35	439.52	Yes
4/15/1997	3.4	3,720	3,711.41	10.7	34.34	34.34	300.28	270.25	Yes
5/13/1997	4.5	4,600	4,589.38	6.4	55.44	55.44	371.31	334.18	Yes
7/22/1997	11.3	360	359.17	57.7	10.95	10.95	29.06	26.15	Yes
8/26/1997	22.2	198	197.54	69.2	11.82	11.82	15.98	14.38	Yes
9/30/1997	27.9	56	55.87	94.0	4.20	4.20	4.52	4.07	No
10/28/1997	21.9	117	116.73	81.1	6.89	6.89	9.44	8.50	Yes
12/16/1997	21.6	215	214.50	67.5	12.48	12.48	17.35	15.62	Yes
1/20/1998	4.1	3,320	3,312.33	13.1	36.70	36.70	267.99	241.19	Yes
2/17/1998	4.0	1,740	1,735.98	28.9	18.55	18.55	140.45	126.41	Yes
3/17/1998	2.2	3,470	3,461.99	12.2	20.35	20.35	280.10	252.09	Yes
4/14/1998	2.2	791	789.17	43.7	4.75	4.75	63.85	57.46	Yes
5/19/1998	20.5	297	296.31	61.5	16.38	16.38	23.97	21.58	Yes
6/9/1998	7.7	653	651.49	46.7	13.56	13.56	52.71	47.44	Yes
7/22/1998	16.5	159	158.63	74.5	7.06	7.06	12.83	11.55	Yes
8/11/1998	37.2	110	109.75	82.4	11.01	11.01	8.88	7.99	No
9/1/1998	37.5	172	171.60	72.5	17.35	17.35	13.88	12.50	No
9/29/1998	37.3	36	35.92	97.1	3.61	3.61	2.91	2.62	No
11/9/1998	35.6	69	68.84	90.8	6.61	6.61	5.57	5.01	No
11/16/1998	31.5	96	95.78	85.3	8.14	8.14	7.75	6.97	No
12/22/1998	13.6	422	421.03	54.8	15.44	15.44	34.06	30.66	Yes
1/12/1999	3.7	2,630	2,623.93	18.7	25.83	25.83	212.29	191.06	Yes
1/26/1999	4.0	2,820	2,813.49	16.9	30.35	30.35	227.63	204.87	Yes
2/1/1999	2.4	4,110	4,100.51	8.4	26.65	26.65	331.76	298.58	Yes
2/23/1999	2.1	4,640	4,629.28	6.2	25.59	25.59	374.54	337.09	Yes
3/9/1999	2.9	1,500	1,496.54	32.3	11.66	11.66	121.08	108.97	Yes
3/23/1999	2.8	2,190	2,184.94	23.4	16.20	16.20	176.78	159.10	Yes
4/27/1999	2.3	2,670	2,663.83	18.3	16.38	16.38	215.52	193.97	Yes
5/25/1999	4.2	392	391.09	56.2	4.45	4.45	31.64	28.48	Yes
6/29/1999	9.5	375	374.13	56.9	9.55	9.55	30.27	27.24	Yes
7/27/1999	21.1	127	126.71	79.0	7.21	7.21	10.25	9.23	Yes
8/17/1999	23.8	48	47.89	95.4	3.07	3.07	3.87	3.49	Yes
8/30/1999	21.8	72	71.83	90.1	4.22	4.22	5.81	5.23	Yes
9/21/1999	34.1	63	62.85	92.2	5.78	5.78	5.09	4.58	No
9/27/1999	35.7	41	40.91	96.3	3.94	3.94	3.31	2.98	No
10/19/1999	39.3	21	20.95	98.9	2.22	2.22	1.70	1.53	No

Table I.2 Percent Reductions for Chloride

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
10/25/1999	42.3	29	28.93	97.9	3.30	3.30	2.34	2.11	No
11/22/1999	32.3	14	13.97	99.5	1.22	1.22	1.13	1.02	No
12/20/1999	26.7	111	110.74	82.1	7.98	7.98	8.96	8.06	Yes
1/18/2000	21.1	60	59.86	93.0	3.40	3.40	4.84	4.36	Yes
1/25/2000	6.5	38	37.91	96.8	0.66	0.66	3.07	2.76	Yes
2/29/2000	17.2	123	122.72	79.9	5.69	5.69	9.93	8.94	Yes
3/21/2000	10.6	807	805.14	43.4	23.02	23.02	65.14	58.63	Yes
3/27/2000	6.8	1,250	1,247.11	35.6	22.97	22.97	100.90	90.81	Yes
4/4/2000	3.9	2,240	2,234.83	22.7	23.75	23.75	180.81	162.73	Yes
4/24/2000	3.0	2,870	2,863.37	16.4	22.93	22.93	231.67	208.50	Yes
5/30/2000	6.6	845	843.05	42.7	15.05	15.05	68.21	61.39	Yes
6/5/2000	5.5	660	658.48	46.5	9.73	9.73	53.28	47.95	Yes
6/27/2000	5.9	171	170.61	72.7	2.72	2.72	13.80	12.42	Yes
7/25/2000	16.4	22	21.95	98.8	0.97	0.97	1.78	1.60	Yes
8/22/2000	23.6	31	30.93	97.8	1.96	1.96	2.50	2.25	Yes
9/12/2000	24.7	28	27.94	98.0	1.86	1.86	2.26	2.03	Yes
9/19/2000	25.7	72	71.83	90.1	4.98	4.98	5.81	5.23	Yes
10/17/2000	27.6	10	9.48	99.7	0.70	0.70	0.77	0.69	No
11/7/2000	35.5	48	47.89	95.4	4.59	4.59	3.87	3.49	No
12/19/2000	6.0	1,580	1,576.35	31.3	25.34	25.34	127.54	114.78	Yes
1/30/2001	2.0	3,880	3,871.04	9.7	21.09	21.09	313.19	281.87	Yes
2/27/2001	1.7	5,620	5,607.02	2.8	26.16	26.16	453.65	408.28	Yes
3/26/2001	1.8	5,890	5,876.40	2.2	28.37	28.37	475.44	427.90	Yes
4/17/2001	2.8	1,840	1,835.75	27.5	13.96	13.96	148.52	133.67	Yes
5/22/2001	3.3	400	399.08	55.8	3.51	3.51	32.29	29.06	Yes
6/19/2001	11.3	346	345.20	58.6	10.48	10.48	27.93	25.14	Yes
7/24/2001	15.6	75	74.83	89.5	3.15	3.15	6.05	5.45	Yes
8/20/2001	29.2	170	169.61	72.9	13.35	13.35	13.72	12.35	No
9/17/2001	11.1	458	456.94	53.2	13.63	13.63	36.97	33.27	Yes
10/23/2001	5.9	1,640	1,636.21	30.4	25.99	25.99	132.38	119.14	Yes
11/19/2001	4.6	313	312.28	60.5	3.87	3.87	25.27	22.74	Yes
12/11/2001	3.3	4,290	4,280.09	7.5	37.75	37.75	346.29	311.66	Yes
1/14/2002	3.2	6,290	6,275.47	1.1	53.65	53.65	507.73	456.95	Yes
2/26/2002	2.6	2,330	2,324.62	21.8	16.05	16.05	188.08	169.27	Yes
3/26/2002	2.3	3,590	3,581.71	11.5	22.12	22.12	289.78	260.81	Yes
4/23/2002	2.2	4,600	4,589.38	6.4	26.73	26.73	371.31	334.18	Yes
5/28/2002	3.2	2,690	2,683.79	18.1	23.38	23.38	217.14	195.42	Yes

Table I.2 Percent Reductions for Chloride

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/25/2002	12.7	177	176.59	71.8	6.07	6.07	14.29	12.86	Yes
7/23/2002	22.1	206	205.52	68.4	12.22	12.22	16.63	14.97	Yes
8/20/2002	20.5	148	147.66	76.1	8.16	8.16	11.95	10.75	Yes
9/17/2002	31.2	67	66.85	91.2	5.62	5.62	5.41	4.87	No
10/15/2002	22.7	282	281.35	62.3	17.22	17.22	22.76	20.49	Yes
11/5/2002	12.3	197	196.54	69.4	6.52	6.52	15.90	14.31	Yes
12/3/2002	14.7	143	142.67	76.8	5.66	5.66	11.54	10.39	Yes
1/21/2003	3.1	2,490	2,484.25	20.2	20.43	20.43	200.99	180.89	Yes
2/25/2003	4.0	2,110	2,105.13	24.4	22.65	22.65	170.32	153.29	Yes
3/25/2003	2.2	3,490	3,481.94	12.1	20.85	20.85	281.71	253.54	Yes
4/15/2003	2.7	966	963.77	40.3	7.04	7.04	77.98	70.18	Yes
5/20/2003	4.2	1,390	1,386.79	33.6	15.56	15.56	112.20	100.98	Yes
6/17/2003	3.6	1,280	1,277.04	35.2	12.23	12.23	103.32	92.99	Yes
7/15/2003	3.0	1,900	1,895.61	26.8	15.54	15.54	153.37	138.03	Yes
8/12/2003	18.8	189	188.56	70.2	9.56	9.56	15.26	13.73	Yes
9/23/2003	18.0	119	118.73	80.7	5.76	5.76	9.61	8.65	Yes
10/14/2003	23.7	20	19.95	99.0	1.28	1.28	1.61	1.45	Yes
11/11/2003	21.0	14	13.97	99.5	0.79	0.79	1.13	1.02	Yes
12/16/2003	15.8	134	133.69	78.0	5.70	5.70	10.82	9.73	Yes
1/20/2004	15.1	112	111.74	81.9	4.55	4.55	9.04	8.14	Yes
2/17/2004	3.5	3,700	3,691.45	10.8	34.35	34.35	298.66	268.80	Yes
3/16/2004	2.4	5,040	5,028.36	4.6	32.28	32.28	406.83	366.14	Yes
4/13/2004	3.2	1,450	1,446.65	32.9	12.48	12.48	117.04	105.34	Yes
5/11/2004	3.7	838	836.06	42.9	8.30	8.30	67.64	60.88	Yes
5/15/2004	3.3	931	928.85	41.0	8.27	8.27	75.15	67.64	Yes
7/20/2004	3.0	3,720	3,711.41	10.7	30.03	30.03	300.28	270.25	Yes
8/17/2004	11.6	472	470.91	52.6	14.73	14.73	38.10	34.29	Yes
9/21/2004	16.9	23	22.95	98.7	1.05	1.05	1.86	1.67	Yes
10/19/2004	6.4	1,480	1,476.58	32.5	25.53	25.53	119.47	107.52	Yes
11/30/2004	2.8	3,220	3,212.56	13.8	24.00	24.00	259.92	233.93	Yes
12/14/2004	2.6	5,130	5,118.15	4.3	36.44	36.44	414.09	372.68	Yes
2/22/2005	3.1	1,900	1,895.61	26.8	15.75	15.75	153.37	138.03	Yes
3/28/2005	3.7	730	728.31	44.8	7.29	7.29	58.93	53.03	Yes
4/26/2005	3.1	1,730	1,726.00	29.0	14.43	14.43	139.65	125.68	Yes
5/24/2005	5.9	112	111.74	81.9	1.78	1.78	9.04	8.14	Yes
6/21/2005	11.8	88	87.80	86.8	2.79	2.79	7.10	6.39	Yes
7/25/2005	25.6	244	243.44	64.7	16.81	16.81	19.70	17.73	Yes

Table I.2 Percent Reductions for Chloride

Date	Observed chloride at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual chloride load (tons/day)	Reduced chloride load (tons/day)	Allowable chloride load before MOS (tons/day)	Allowable chloride load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
8/23/2005	21.8	93	92.79	85.9	5.46	5.46	7.51	6.76	Yes
9/27/2005	17.0	249	248.42	64.3	11.39	11.39	20.10	18.09	Yes
10/25/2005	17.3	70	69.84	90.6	3.26	3.26	5.65	5.09	Yes
11/29/2005	15.0	90	89.79	86.5	3.63	3.63	7.26	6.54	Yes
12/27/2005	15.7	39	38.91	96.7	1.65	1.65	3.15	2.83	Yes
1/17/2006	9.8	110	109.75	82.4	2.90	2.90	8.88	7.99	Yes
2/14/2006	5.7	2,710	2,703.74	17.9	41.27	41.27	218.75	196.88	Yes
4/18/2006	3.7	1,180	1,177.27	36.7	11.87	11.87	95.25	85.72	Yes
5/16/2006	12.0	709	707.36	45.3	22.89	22.89	57.23	51.51	Yes
7/25/2006	15.6	16	15.96	99.3	0.67	0.67	1.29	1.16	Yes
8/29/2006	21.7	180	179.58	71.3	10.51	10.51	14.53	13.08	Yes
10/24/2006	14.7	142	141.67	77.0	5.62	5.62	11.46	10.32	Yes
11/28/2006	13.6	59	58.86	93.2	2.16	2.16	4.76	4.29	Yes
12/5/2006	14.1	61	60.86	92.7	2.31	2.31	4.92	4.43	Yes
1/2/2007	8.7	1,330	1,326.93	34.4	31.21	31.21	107.36	96.62	Yes
2/6/2007	2.9	3,270	3,262.45	13.4	25.69	25.69	263.95	237.56	Yes
3/13/2007	6.1	715	713.35	45.2	11.74	11.74	57.71	51.94	Yes
4/3/2007	5.2	236	235.45	65.4	3.31	3.31	19.05	17.14	Yes

Total number of values of loads =	196
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	20
No. of exceedances before reductions of loads =	16
No. of exceedances after reductions of loads =	16

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Table I.2 Percent Reductions for Chloride

TABLE I.3. SULFATE PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-001

Sulfate criterion in WQ standards = 30 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
9/4/1990	7.0	64	63.85	91.9	1.21	1.21	5.17	4.65	Yes
10/30/1990	14.0	704	702.37	45.4	26.52	26.52	56.83	51.14	Yes
11/27/1990	11.0	379	378.12	56.8	11.22	11.22	30.59	27.53	Yes
1/2/1991	9.0	3,410	3,402.12	12.5	82.58	82.58	275.25	247.73	Yes
2/5/1991	12.0	2,210	2,204.90	23.1	71.36	71.36	178.39	160.55	Yes
3/12/1991	7.0	6,760	6,744.39	0.3	127.32	127.32	545.67	491.10	Yes
4/2/1991	7.0	2,090	2,085.17	24.6	39.36	39.36	168.70	151.83	Yes
6/4/1991	6.0	4,540	4,529.51	6.6	73.29	73.29	366.47	329.82	Yes
7/2/1991	8.0	354	353.18	58.1	7.62	7.62	28.57	25.72	Yes
8/6/1991	7.0	228	227.47	66.2	4.29	4.29	18.40	16.56	Yes
11/25/1991	8.8	1,310	1,306.97	34.7	31.12	31.12	105.74	95.17	Yes
1/7/1992	10.6	2,200	2,194.92	23.3	62.75	62.75	177.58	159.83	Yes
2/4/1992	11.1	1,630	1,626.24	30.5	48.68	48.68	131.57	118.42	Yes
3/3/1992	10.3	2,300	2,294.69	22.2	63.74	63.74	185.66	167.09	Yes
4/7/1992	9.7	2,990	2,983.09	15.3	77.72	77.72	241.35	217.22	Yes
5/5/1992	8.4	310	309.28	60.7	6.98	6.98	25.02	22.52	Yes
6/2/1992	9.6	171	170.61	72.7	4.41	4.41	13.80	12.42	Yes
7/7/1992	7.6	1,150	1,147.34	37.1	23.45	23.45	92.83	83.54	Yes
8/4/1992	8.7	1,050	1,047.57	38.7	24.47	24.47	84.76	76.28	Yes
9/1/1992	7.5	310	309.28	60.7	6.29	6.29	25.02	22.52	Yes
9/29/1992	5.8	148	147.66	76.1	2.32	2.32	11.95	10.75	Yes
10/27/1992	6.9	94	93.78	85.7	1.74	1.74	7.59	6.83	Yes
12/1/1992	9.9	254	253.41	63.9	6.75	6.75	20.50	18.45	Yes
1/12/1993	11.4	995	992.70	39.7	30.52	30.52	80.32	72.28	Yes
2/9/1993	13.9	1,630	1,626.24	30.5	60.96	60.96	131.57	118.42	Yes
3/9/1993	7.8	1,640	1,636.21	30.4	34.37	34.37	132.38	119.14	Yes
4/13/1993	9.6	2,350	2,344.57	21.7	60.83	60.83	189.69	170.72	Yes
5/18/1993	9.3	2,120	2,115.10	24.2	52.99	52.99	171.13	154.01	Yes
6/21/1993	7.7	210	209.51	68.0	4.36	4.36	16.95	15.26	Yes
7/26/1993	7.9	66	65.85	91.4	1.40	1.40	5.33	4.79	Yes
8/24/1993	14.1	493	491.86	51.8	18.70	18.70	39.79	35.82	Yes
9/21/1993	8.6	110	109.75	82.4	2.55	2.55	8.88	7.99	Yes

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
10/26/1993	8.1	97	96.78	85.1	2.12	2.12	7.83	7.05	Yes
11/23/1993	11.0	753	751.26	44.4	22.29	22.29	60.78	54.70	Yes
12/20/1993	9.4	2,260	2,254.78	22.6	57.16	57.16	182.43	164.18	Yes
1/18/1994	9.9	988	985.72	39.9	26.21	26.21	79.75	71.78	Yes
2/15/1994	8.8	6,210	6,195.66	1.3	147.37	147.37	501.27	451.14	Yes
3/15/1994	7.0	5,040	5,028.36	4.6	94.93	94.93	406.83	366.14	Yes
4/19/1994	10.3	1,650	1,646.19	30.3	45.73	45.73	133.19	119.87	Yes
5/24/1994	8.9	574	572.67	49.0	13.75	13.75	46.33	41.70	Yes
6/28/1994	13.0	188	187.57	70.4	6.58	6.58	15.18	13.66	Yes
7/19/1994	8.0	493	491.86	51.8	10.61	10.61	39.79	35.82	Yes
8/16/1994	8.0	518	516.80	50.8	11.15	11.15	41.81	37.63	Yes
9/27/1994	10.8	170	169.61	72.9	4.94	4.94	13.72	12.35	Yes
10/25/1994	8.6	727	725.32	45.0	16.82	16.82	58.68	52.81	Yes
11/28/1994	12.3	248	247.43	64.4	8.21	8.21	20.02	18.02	Yes
12/19/1994	7.0	1,960	1,955.47	26.0	37.02	37.02	158.21	142.39	Yes
2/14/1995	10.1	2,470	2,464.30	20.5	67.12	67.12	199.38	179.44	Yes
3/28/1995	9.9	4,360	4,349.93	7.2	116.14	116.14	351.94	316.74	Yes
4/25/1995	6.4	2,640	2,633.90	18.6	45.46	45.46	213.10	191.79	Yes
5/23/1995	6.6	640	638.52	47.1	11.37	11.37	51.66	46.49	Yes
6/20/1995	9.9	308	307.29	60.8	8.20	8.20	24.86	22.38	Yes
7/17/1995	5.0	625	623.56	47.6	8.41	8.41	50.45	45.40	Yes
8/8/1995	7.5	123	122.72	79.9	2.48	2.48	9.93	8.94	Yes
9/19/1995	7.0	35	34.92	97.2	0.66	0.66	2.83	2.54	Yes
10/17/1995	7.2	35	34.92	97.2	0.68	0.68	2.83	2.54	Yes
11/13/1995	9.7	32	31.93	97.6	0.84	0.84	2.58	2.32	Yes
12/18/1995	11.8	216	215.50	67.4	6.86	6.86	17.44	15.69	Yes
1/30/1996	20.7	527	525.78	50.5	29.35	29.35	42.54	38.29	Yes
2/20/1996	13.6	572	570.68	49.0	20.93	20.93	46.17	41.55	Yes
3/12/1996	10.2	690	688.41	45.8	18.94	18.94	55.70	50.13	Yes
4/23/1996	13.9	1,660	1,656.17	30.1	62.08	62.08	133.99	120.60	Yes
5/21/1996	10.0	946	943.82	40.7	25.45	25.45	76.36	68.72	Yes
6/18/1996	11.9	104	103.76	83.6	3.33	3.33	8.39	7.56	Yes
7/16/1996	15.7	55	54.87	94.1	2.32	2.32	4.44	4.00	Yes
8/6/1996	10.1	210	209.51	68.0	5.71	5.71	16.95	15.26	Yes
9/10/1996	13.3	120	119.72	80.5	4.29	4.29	9.69	8.72	Yes
10/1/1996	11.0	400	399.08	55.8	11.84	11.84	32.29	29.06	Yes
11/19/1996	11.8	824	822.10	43.1	26.16	26.16	66.51	59.86	Yes
12/17/1996	15.0	1,490	1,486.56	32.4	60.14	60.14	120.27	108.25	Yes
1/28/1997	11.7	3,250	3,242.49	13.6	102.31	102.31	262.34	236.11	Yes

Table I.3 Percent Reductions for Sulfate

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
2/25/1997	8.8	3,960	3,950.85	9.2	93.76	93.76	319.65	287.69	Yes
3/11/1997	9.2	6,050	6,036.03	1.7	149.76	149.76	488.35	439.52	Yes
4/15/1997	11.0	3,720	3,711.41	10.7	110.10	110.10	300.28	270.25	Yes
5/13/1997	9.3	4,600	4,589.38	6.4	115.11	115.11	371.31	334.18	Yes
6/10/1997	10.2	1,650	1,646.19	30.3	45.28	45.28	133.19	119.87	Yes
7/22/1997	10.2	360	359.17	57.7	9.88	9.88	29.06	26.15	Yes
8/26/1997	6.6	198	197.54	69.2	3.49	3.49	15.98	14.38	Yes
9/30/1997	7.1	56	55.87	94.0	1.07	1.07	4.52	4.07	Yes
10/28/1997	7.1	117	116.73	81.1	2.23	2.23	9.44	8.50	Yes
11/18/1997	7.4	119	118.73	80.7	2.38	2.38	9.61	8.65	Yes
12/16/1997	11.4	215	214.50	67.5	6.58	6.58	17.35	15.62	Yes
1/20/1998	4.8	3,320	3,312.33	13.1	43.07	43.07	267.99	241.19	Yes
2/17/1998	6.0	1,740	1,735.98	28.9	28.24	28.24	140.45	126.41	Yes
3/17/1998	5.0	3,470	3,461.99	12.2	46.68	46.68	280.10	252.09	Yes
4/14/1998	5.8	791	789.17	43.7	12.28	12.28	63.85	57.46	Yes
5/19/1998	11.4	297	296.31	61.5	9.11	9.11	23.97	21.58	Yes
6/9/1998	6.9	653	651.49	46.7	12.19	12.19	52.71	47.44	Yes
7/22/1998	4.5	159	158.63	74.5	1.93	1.93	12.83	11.55	Yes
8/11/1998	8.5	110	109.75	82.4	2.51	2.51	8.88	7.99	Yes
9/1/1998	8.0	172	171.60	72.5	3.69	3.69	13.88	12.50	Yes
9/29/1998	5.8	36	35.92	97.1	0.56	0.56	2.91	2.62	Yes
11/9/1998	6.5	69	68.84	90.8	1.21	1.21	5.57	5.01	Yes
11/16/1998	7.4	96	95.78	85.3	1.91	1.91	7.75	6.97	Yes
12/22/1998	10.0	422	421.03	54.8	11.35	11.35	34.06	30.66	Yes
1/12/1999	5.2	2,630	2,623.93	18.7	36.94	36.94	212.29	191.06	Yes
1/26/1999	6.0	2,820	2,813.49	16.9	45.22	45.22	227.63	204.87	Yes
2/1/1999	3.7	4,110	4,100.51	8.4	40.81	40.81	331.76	298.58	Yes
2/23/1999	3.5	4,640	4,629.28	6.2	44.20	44.20	374.54	337.09	Yes
3/9/1999	4.5	1,500	1,496.54	32.3	18.00	18.00	121.08	108.97	Yes
3/23/1999	4.7	2,190	2,184.94	23.4	27.58	27.58	176.78	159.10	Yes
5/25/1999	5.0	392	391.09	56.2	5.32	5.32	31.64	28.48	Yes
6/29/1999	6.0	375	374.13	56.9	6.00	6.00	30.27	27.24	Yes
7/27/1999	7.9	127	126.71	79.0	2.70	2.70	10.25	9.23	Yes
8/17/1999	8.7	48	47.89	95.4	1.12	1.12	3.87	3.49	Yes
8/30/1999	6.2	72	71.83	90.1	1.21	1.21	5.81	5.23	Yes
9/21/1999	7.6	63	62.85	92.2	1.29	1.29	5.09	4.58	Yes
9/27/1999	7.4	41	40.91	96.3	0.82	0.82	3.31	2.98	Yes
10/19/1999	7.3	21	20.95	98.9	0.41	0.41	1.70	1.53	Yes
10/25/1999	7.9	29	28.93	97.9	0.61	0.61	2.34	2.11	Yes

Table I.3 Percent Reductions for Sulfate

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
11/22/1999	6.3	14	13.97	99.5	0.24	0.24	1.13	1.02	Yes
12/20/1999	7.0	111	110.74	82.1	2.09	2.09	8.96	8.06	Yes
1/18/2000	15.1	60	59.86	93.0	2.44	2.44	4.84	4.36	Yes
1/25/2000	7.5	38	37.91	96.8	0.77	0.77	3.07	2.76	Yes
2/29/2000	30.2	123	122.72	79.9	9.99	9.99	9.93	8.94	No
3/21/2000	6.8	807	805.14	43.4	14.81	14.81	65.14	58.63	Yes
3/27/2000	6.6	1,250	1,247.11	35.6	22.16	22.16	100.90	90.81	Yes
4/4/2000	4.9	2,240	2,234.83	22.7	29.35	29.35	180.81	162.73	Yes
4/24/2000	3.8	2,870	2,863.37	16.4	29.42	29.42	231.67	208.50	Yes
5/30/2000	5.4	845	843.05	42.7	12.16	12.16	68.21	61.39	Yes
6/5/2000	4.9	660	658.48	46.5	8.68	8.68	53.28	47.95	Yes
6/27/2000	4.8	171	170.61	72.7	2.22	2.22	13.80	12.42	Yes
7/25/2000	8.2	22	21.95	98.8	0.49	0.49	1.78	1.60	Yes
8/22/2000	6.6	31	30.93	97.8	0.55	0.55	2.50	2.25	Yes
9/12/2000	6.6	28	27.94	98.0	0.49	0.49	2.26	2.03	Yes
9/19/2000	7.2	72	71.83	90.1	1.39	1.39	5.81	5.23	Yes
10/17/2000	7.0	10	9.48	99.7	0.18	0.18	0.77	0.69	Yes
11/7/2000	8.4	48	47.89	95.4	1.08	1.08	3.87	3.49	Yes
12/19/2000	7.0	1,580	1,576.35	31.3	29.59	29.59	127.54	114.78	Yes
1/30/2001	4.4	3,880	3,871.04	9.7	45.93	45.93	313.19	281.87	Yes
2/27/2001	4.2	5,620	5,607.02	2.8	63.06	63.06	453.65	408.28	Yes
3/26/2001	3.5	5,890	5,876.40	2.2	55.47	55.47	475.44	427.90	Yes
4/17/2001	4.7	1,840	1,835.75	27.5	23.37	23.37	148.52	133.67	Yes
5/22/2001	4.6	400	399.08	55.8	4.93	4.93	32.29	29.06	Yes
6/19/2001	8.2	346	345.20	58.6	7.62	7.62	27.93	25.14	Yes
7/24/2001	6.0	75	74.83	89.5	1.21	1.21	6.05	5.45	Yes
8/20/2001	7.1	170	169.61	72.9	3.25	3.25	13.72	12.35	Yes
9/17/2001	4.7	458	456.94	53.2	5.74	5.74	36.97	33.27	Yes
10/23/2001	5.5	1,640	1,636.21	30.4	24.27	24.27	132.38	119.14	Yes
11/19/2001	3.9	313	312.28	60.5	3.26	3.26	25.27	22.74	Yes
12/11/2001	3.3	4,290	4,280.09	7.5	38.55	38.55	346.29	311.66	Yes
1/14/2002	3.1	6,290	6,275.47	1.1	52.47	52.47	507.73	456.95	Yes
2/26/2002	4.4	2,330	2,324.62	21.8	27.33	27.33	188.08	169.27	Yes
3/26/2002	4.2	3,590	3,581.71	11.5	40.18	40.18	289.78	260.81	Yes
4/23/2002	3.3	4,600	4,589.38	6.4	40.84	40.84	371.31	334.18	Yes
5/28/2002	4.3	2,690	2,683.79	18.1	30.76	30.76	217.14	195.42	Yes
6/25/2002	8.6	177	176.59	71.8	4.07	4.07	14.29	12.86	Yes
7/23/2002	8.3	206	205.52	68.4	4.59	4.59	16.63	14.97	Yes
8/20/2002	5.9	148	147.66	76.1	2.34	2.34	11.95	10.75	Yes

Table I.3 Percent Reductions for Sulfate

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
9/17/2002	8.7	67	66.85	91.2	1.56	1.56	5.41	4.87	Yes
10/15/2002	9.1	282	281.35	62.3	6.94	6.94	22.76	20.49	Yes
11/5/2002	6.4	197	196.54	69.4	3.38	3.38	15.90	14.31	Yes
12/3/2002	8.9	143	142.67	76.8	3.42	3.42	11.54	10.39	Yes
1/21/2003	5.3	2,490	2,484.25	20.2	35.58	35.58	200.99	180.89	Yes
2/25/2003	6.2	2,110	2,105.13	24.4	35.37	35.37	170.32	153.29	Yes
3/25/2003	5.2	3,490	3,481.94	12.1	49.02	49.02	281.71	253.54	Yes
4/15/2003	4.5	966	963.77	40.3	11.77	11.77	77.98	70.18	Yes
5/20/2003	5.0	1,390	1,386.79	33.6	18.74	18.74	112.20	100.98	Yes
6/17/2003	3.6	1,280	1,277.04	35.2	12.50	12.50	103.32	92.99	Yes
7/15/2003	3.3	1,900	1,895.61	26.8	17.02	17.02	153.37	138.03	Yes
8/12/2003	6.4	189	188.56	70.2	3.24	3.24	15.26	13.73	Yes
9/23/2003	5.5	119	118.73	80.7	1.76	1.76	9.61	8.65	Yes
10/14/2003	5.5	20	19.95	99.0	0.30	0.30	1.61	1.45	Yes
11/11/2003	6.0	14	13.97	99.5	0.23	0.23	1.13	1.02	Yes
12/16/2003	10.6	134	133.69	78.0	3.82	3.82	10.82	9.73	Yes
1/20/2004	9.9	112	111.74	81.9	2.98	2.98	9.04	8.14	Yes
2/17/2004	4.9	3,700	3,691.45	10.8	48.98	48.98	298.66	268.80	Yes
3/16/2004	4.1	5,040	5,028.36	4.6	55.06	55.06	406.83	366.14	Yes
4/13/2004	5.1	1,450	1,446.65	32.9	20.01	20.01	117.04	105.34	Yes
5/11/2004	5.2	838	836.06	42.9	11.66	11.66	67.64	60.88	Yes
5/15/2004	4.3	931	928.85	41.0	10.72	10.72	75.15	67.64	Yes
7/20/2004	2.7	3,720	3,711.41	10.7	27.13	27.13	300.28	270.25	Yes
8/17/2004	4.5	472	470.91	52.6	5.77	5.77	38.10	34.29	Yes
9/21/2004	6.0	23	22.95	98.7	0.37	0.37	1.86	1.67	Yes
10/19/2004	9.1	1,480	1,476.58	32.5	36.40	36.40	119.47	107.52	Yes
11/30/2004	3.3	3,220	3,212.56	13.8	28.59	28.59	259.92	233.93	Yes
12/14/2004	3.7	5,130	5,118.15	4.3	51.21	51.21	414.09	372.68	Yes
2/22/2005	5.6	1,900	1,895.61	26.8	28.78	28.78	153.37	138.03	Yes
3/28/2005	6.6	730	728.31	44.8	12.87	12.87	58.93	53.03	Yes
4/26/2005	5.2	1,730	1,726.00	29.0	24.34	24.34	139.65	125.68	Yes
5/24/2005	5.4	112	111.74	81.9	1.62	1.62	9.04	8.14	Yes
6/21/2005	8.3	88	87.80	86.8	1.96	1.96	7.10	6.39	Yes
7/25/2005	9.1	244	243.44	64.7	5.95	5.95	19.70	17.73	Yes
8/23/2005	5.8	93	92.79	85.9	1.44	1.44	7.51	6.76	Yes
9/27/2005	6.8	249	248.42	64.3	4.57	4.57	20.10	18.09	Yes
10/25/2005	8.7	70	69.84	90.6	1.64	1.64	5.65	5.09	Yes
11/29/2005	6.6	90	89.79	86.5	1.60	1.60	7.26	6.54	Yes
12/27/2005	6.7	39	38.91	96.7	0.70	0.70	3.15	2.83	Yes

Table I.3 Percent Reductions for Sulfate

Date	Observed sulfate at OUA0013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual sulfate load (tons/day)	Reduced sulfate load (tons/day)	Allowable sulfate load before MOS (tons/day)	Allowable sulfate load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
1/17/2006	0.0	110	109.75	82.4	0.01	0.01	8.88	7.99	Yes
2/14/2006	5.4	2,710	2,703.74	17.9	39.59	39.59	218.75	196.88	Yes
4/18/2006	5.6	1,180	1,177.27	36.7	17.75	17.75	95.25	85.72	Yes
5/16/2006	7.8	709	707.36	45.3	14.78	14.78	57.23	51.51	Yes
7/25/2006	6.7	16	15.96	99.3	0.29	0.29	1.29	1.16	Yes
8/29/2006	10.6	180	179.58	71.3	5.13	5.13	14.53	13.08	Yes
10/24/2006	8.5	142	141.67	77.0	3.26	3.26	11.46	10.32	Yes
11/28/2006	6.4	59	58.86	93.2	1.02	1.02	4.76	4.29	Yes
12/5/2006	6.6	61	60.86	92.7	1.08	1.08	4.92	4.43	Yes
1/2/2007	6.4	1,330	1,326.93	34.4	23.01	23.01	107.36	96.62	Yes
2/6/2007	4.3	3,270	3,262.45	13.4	37.83	37.83	263.95	237.56	Yes
3/13/2007	8.7	715	713.35	45.2	16.81	16.81	57.71	51.94	Yes
4/3/2007	8.6	236	235.45	65.4	5.49	5.49	19.05	17.14	Yes

Total number of values of loads =	201
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	21
No. of exceedances before reductions of loads =	1
No. of exceedances after reductions of loads =	1

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Table I.3 Percent Reductions for Sulfate

TABLE I.4. TDS PERCENT REDUCTION CALCULATIONS FOR BAYOU BARTHOLOMEW REACH 08040205-001

TDS criterion in WQ standards = 220 mg/L
Explicit MOS (percent of TMDL) = 10%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Percent reduction needed = 0%

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
9/4/1990	146	64	63.85	91.9	25.1	25.1	37.9	34.1	Yes
10/2/1990	150	125	124.71	79.4	50.4	50.4	74.0	66.6	Yes
10/30/1990	112	704	702.37	45.4	212.2	212.2	416.7	375.1	Yes
11/27/1990	110	379	378.12	56.8	112.2	112.2	224.3	201.9	Yes
1/2/1991	87	3,410	3402.12	12.5	798.2	798.2	2018.5	1816.7	Yes
2/5/1991	81	2,210	2204.90	23.1	481.7	481.7	1308.2	1177.4	Yes
3/12/1991	70	6,760	6744.39	0.3	1273.2	1273.2	4001.5	3601.4	Yes
4/2/1991	93	2,090	2085.17	24.6	523.0	523.0	1237.2	1113.4	Yes
6/4/1991	69	4,540	4529.51	6.6	842.9	842.9	2687.4	2418.7	Yes
7/2/1991	115	354	353.18	58.1	109.5	109.5	209.5	188.6	Yes
8/6/1991	150	228	227.47	66.2	92.0	92.0	135.0	121.5	Yes
9/3/1991	139	350	349.19	58.3	130.9	130.9	207.2	186.5	Yes
10/1/1991	173	137	136.68	77.6	63.8	63.8	81.1	73.0	Yes
10/29/1991	178	120	119.72	80.5	57.5	57.5	71.0	63.9	Yes
11/25/1991	94	1,310	1306.97	34.7	331.3	331.3	775.4	697.9	Yes
1/7/1992	80	2,200	2194.92	23.3	473.6	473.6	1302.3	1172.1	Yes
2/4/1992	91	1,630	1626.24	30.5	399.1	399.1	964.9	868.4	Yes
3/3/1992	79	2,300	2294.69	22.2	488.9	488.9	1361.5	1225.3	Yes
4/7/1992	111	2,990	2983.09	15.3	893.0	893.0	1769.9	1592.9	Yes
5/5/1992	98	310	309.28	60.7	81.7	81.7	183.5	165.2	Yes
6/2/1992	120	171	170.61	72.7	55.2	55.2	101.2	91.1	Yes
7/7/1992	93	1,150	1147.34	37.1	287.8	287.8	680.7	612.7	Yes
8/4/1992	108	1,050	1047.57	38.7	305.1	305.1	621.5	559.4	Yes
9/1/1992	127	310	309.28	60.7	105.9	105.9	183.5	165.2	Yes
9/29/1992	122	148	147.66	76.1	48.6	48.6	87.6	78.8	Yes
10/27/1992	142	94	93.78	85.7	35.9	35.9	55.6	50.1	Yes
12/1/1992	117	254	253.41	63.9	80.0	80.0	150.4	135.3	Yes
1/12/1993	119	995	992.70	39.7	318.6	318.6	589.0	530.1	Yes
2/9/1993	116	1,630	1626.24	30.5	508.7	508.7	964.9	868.4	Yes
3/9/1993	89	1,640	1636.21	30.4	392.7	392.7	970.8	873.7	Yes
4/13/1993	108	2,350	2344.57	21.7	682.9	682.9	1391.1	1252.0	Yes
5/18/1993	92	2,120	2115.10	24.2	524.8	524.8	1254.9	1129.4	Yes

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
6/21/1993	112	210	209.51	68.0	63.3	63.3	124.3	111.9	Yes
7/26/1993	116	66	65.85	91.4	20.6	20.6	39.1	35.2	Yes
8/24/1993	158	493	491.86	51.8	209.6	209.6	291.8	262.6	Yes
9/21/1993	157	110	109.75	82.4	46.5	46.5	65.1	58.6	Yes
10/26/1993	159	97	96.78	85.1	41.5	41.5	57.4	51.7	Yes
11/23/1993	104	753	751.26	44.4	210.7	210.7	445.7	401.2	Yes
1/18/1994	124	988	985.72	39.9	329.6	329.6	584.8	526.4	Yes
2/15/1994	113	6,210	6195.66	1.3	1888.1	1888.1	3676.0	3308.4	Yes
3/15/1994	92	5,040	5028.36	4.6	1247.6	1247.6	2983.4	2685.1	Yes
5/24/1994	107	574	572.67	49.0	165.3	165.3	339.8	305.8	Yes
6/28/1994	156	188	187.57	70.4	78.9	78.9	111.3	100.2	Yes
7/19/1994	157	493	491.86	51.8	208.3	208.3	291.8	262.6	Yes
8/16/1994	135	518	516.80	50.8	188.2	188.2	306.6	276.0	Yes
9/27/1994	168	170	169.61	72.9	76.8	76.8	100.6	90.6	Yes
10/25/1994	117	727	725.32	45.0	228.9	228.9	430.3	387.3	Yes
11/28/1994	123	248	247.43	64.4	82.1	82.1	146.8	132.1	Yes
12/19/1994	93	1,960	1955.47	26.0	490.5	490.5	1160.2	1044.2	Yes
2/14/1995	106	2,470	2464.30	20.5	704.5	704.5	1462.1	1315.9	Yes
3/28/1995	115	4,360	4349.93	7.2	1349.1	1349.1	2580.9	2322.8	Yes
4/25/1995	115	2,640	2633.90	18.6	816.9	816.9	1562.7	1406.5	Yes
5/23/1995	108	640	638.52	47.1	186.0	186.0	378.8	341.0	Yes
6/20/1995	121	308	307.29	60.8	100.3	100.3	182.3	164.1	Yes
7/17/1995	91	625	623.56	47.6	153.0	153.0	370.0	333.0	Yes
8/8/1995	138	123	122.72	79.9	45.7	45.7	72.8	65.5	Yes
9/19/1995	160	35	34.92	97.2	15.1	15.1	20.7	18.6	Yes
10/17/1995	176	35	34.92	97.2	16.6	16.6	20.7	18.6	Yes
11/13/1995	168	32	31.93	97.6	14.5	14.5	18.9	17.0	Yes
12/18/1995	140	216	215.50	67.4	81.4	81.4	127.9	115.1	Yes
1/30/1996	199	527	525.78	50.5	282.2	282.2	312.0	280.8	No
2/20/1996	155	572	570.68	49.0	238.6	238.6	338.6	304.7	Yes
3/12/1996	192	690	688.41	45.8	356.5	356.5	408.4	367.6	Yes
4/23/1996	184	1,660	1656.17	30.1	821.8	821.8	982.6	884.4	Yes
5/21/1996	102	946	943.82	40.7	259.6	259.6	560.0	504.0	Yes
6/18/1996	135	104	103.76	83.6	37.8	37.8	61.6	55.4	Yes
7/16/1996	170	55	54.87	94.1	25.2	25.2	32.6	29.3	Yes
8/6/1996	104	210	209.51	68.0	58.8	58.8	124.3	111.9	Yes
9/10/1996	207	120	119.72	80.5	66.8	66.8	71.0	63.9	No
10/1/1996	75	400	399.08	55.8	80.7	80.7	236.8	213.1	Yes
11/19/1996	110	824	822.10	43.1	243.9	243.9	487.8	439.0	Yes

Table I.4 Percent Reductions for TDS

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
12/17/1996	112	1,490	1486.56	32.4	449.0	449.0	882.0	793.8	Yes
1/28/1997	115	3,250	3242.49	13.6	1005.6	1005.6	1923.8	1731.4	Yes
2/25/1997	101	3,960	3950.85	9.2	1076.2	1076.2	2344.1	2109.7	Yes
4/15/1997	90	3,720	3711.41	10.7	900.8	900.8	2202.0	1981.8	Yes
5/13/1997	91	4,600	4589.38	6.4	1126.3	1126.3	2722.9	2450.7	Yes
6/10/1997	118	1,650	1646.19	30.3	523.9	523.9	976.7	879.0	Yes
7/22/1997	120	360	359.17	57.7	116.2	116.2	213.1	191.8	Yes
8/26/1997	149	198	197.54	69.2	79.4	79.4	117.2	105.5	Yes
9/30/1997	176	56	55.87	94.0	26.5	26.5	33.1	29.8	Yes
10/28/1997	174	117	116.73	81.1	54.8	54.8	69.3	62.3	Yes
11/18/1997	181	119	118.73	80.7	58.0	58.0	70.4	63.4	Yes
12/16/1997	156	215	214.50	67.5	90.2	90.2	127.3	114.5	Yes
1/20/1998	112	3,320	3312.33	13.1	1000.5	1000.5	1965.3	1768.7	Yes
2/17/1998	107	1,740	1735.98	28.9	500.9	500.9	1030.0	927.0	Yes
3/17/1998	82	3,470	3461.99	12.2	765.6	765.6	2054.0	1848.6	Yes
4/14/1998	110	791	789.17	43.7	234.1	234.1	468.2	421.4	Yes
5/19/1998	136	297	296.31	61.5	108.7	108.7	175.8	158.2	Yes
6/9/1998	126	653	651.49	46.7	221.4	221.4	386.5	347.9	Yes
7/22/1998	127	159	158.63	74.5	54.3	54.3	94.1	84.7	Yes
8/11/1998	194	110	109.75	82.4	57.4	57.4	65.1	58.6	Yes
9/1/1998	209	172	171.60	72.5	96.7	96.7	101.8	91.6	No
9/29/1998	207	36	35.92	97.1	20.1	20.1	21.3	19.2	No
11/16/1998	194	96	95.78	85.3	50.1	50.1	56.8	51.1	Yes
12/22/1998	134	422	421.03	54.8	152.2	152.2	249.8	224.8	Yes
1/12/1999	85	2,630	2623.93	18.7	601.5	601.5	1556.8	1401.1	Yes
1/26/1999	129	2,820	2813.49	16.9	978.8	978.8	1669.3	1502.4	Yes
2/1/1999	92	4,110	4100.51	8.4	1017.4	1017.4	2432.9	2189.6	Yes
2/23/1999	95	4,640	4629.28	6.2	1179.8	1179.8	2746.6	2472.0	Yes
3/9/1999	95	1,500	1496.54	32.3	381.4	381.4	887.9	799.1	Yes
3/23/1999	74	2,190	2184.94	23.4	436.0	436.0	1296.4	1166.7	Yes
4/27/1999	90	2,670	2663.83	18.3	646.6	646.6	1580.5	1422.4	Yes
5/25/1999	130	392	391.09	56.2	137.1	137.1	232.0	208.8	Yes
6/29/1999	119	375	374.13	56.9	120.1	120.1	222.0	199.8	Yes
7/27/1999	142	127	126.71	79.0	48.5	48.5	75.2	67.7	Yes
8/17/1999	170	48	47.89	95.4	22.0	22.0	28.4	25.6	Yes
8/30/1999	160	72	71.83	90.1	31.0	31.0	42.6	38.4	Yes
9/21/1999	194	63	62.85	92.2	32.9	32.9	37.3	33.6	Yes
9/27/1999	201	41	40.91	96.3	22.2	22.2	24.3	21.8	No
10/19/1999	214	21	20.95	98.9	12.1	12.1	12.4	11.2	No

Table I.4 Percent Reductions for TDS

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
10/25/1999	222	29	28.93	97.9	17.3	17.3	17.2	15.4	No
11/22/1999	196	14	13.97	99.5	7.4	7.4	8.3	7.5	Yes
12/20/1999	179	111	110.74	82.1	53.5	53.5	65.7	59.1	Yes
1/18/2000	165	60	59.86	93.0	26.6	26.6	35.5	32.0	Yes
1/25/2000	87	38	37.91	96.8	8.8	8.8	22.5	20.2	Yes
2/29/2000	175	123	122.72	79.9	57.9	57.9	72.8	65.5	Yes
3/21/2000	197	807	805.14	43.4	427.8	427.8	477.7	429.9	Yes
3/27/2000	130	1,250	1247.11	35.6	437.2	437.2	739.9	665.9	Yes
4/4/2000	135	2,240	2234.83	22.7	813.7	813.7	1326.0	1193.4	Yes
4/24/2000	94	2,870	2863.37	16.4	725.9	725.9	1698.9	1529.0	Yes
5/30/2000	124	845	843.05	42.7	280.8	280.8	500.2	450.2	Yes
6/5/2000	134	660	658.48	46.5	238.0	238.0	390.7	351.6	Yes
6/27/2000	144	171	170.61	72.7	66.3	66.3	101.2	91.1	Yes
7/25/2000	147	22	21.95	98.8	8.7	8.7	13.0	11.7	Yes
8/22/2000	180	31	30.93	97.8	15.0	15.0	18.4	16.5	Yes
9/12/2000	180	28	27.94	98.0	13.6	13.6	16.6	14.9	Yes
9/19/2000	183	72	71.83	90.1	35.5	35.5	42.6	38.4	Yes
10/17/2000	172	10	9.48	99.7	4.4	4.4	5.6	5.1	Yes
11/7/2000	196	48	47.89	95.4	25.3	25.3	28.4	25.6	Yes
12/19/2000	122	1,580	1576.35	31.3	518.7	518.7	935.3	841.7	Yes
1/30/2001	78	3,880	3871.04	9.7	814.3	814.3	2296.7	2067.1	Yes
3/26/2001	88	5,890	5876.40	2.2	1394.6	1394.6	3486.6	3137.9	Yes
4/17/2001	92	1,840	1835.75	27.5	453.0	453.0	1089.2	980.3	Yes
5/22/2001	135	400	399.08	55.8	144.8	144.8	236.8	213.1	Yes
6/19/2001	135	346	345.20	58.6	125.7	125.7	204.8	184.3	Yes
7/24/2001	162	75	74.83	89.5	32.7	32.7	44.4	40.0	Yes
8/20/2001	196	170	169.61	72.9	89.7	89.7	100.6	90.6	Yes
9/17/2001	133	458	456.94	53.2	163.9	163.9	271.1	244.0	Yes
10/23/2001	85	1,640	1636.21	30.4	375.1	375.1	970.8	873.7	Yes
11/19/2001	113	313	312.28	60.5	95.2	95.2	185.3	166.8	Yes
12/11/2001	79	4,290	4280.09	7.5	911.9	911.9	2539.4	2285.5	Yes
1/14/2002	64	6,290	6275.47	1.1	1083.2	1083.2	3723.3	3351.0	Yes
2/26/2002	99	2,330	2324.62	21.8	620.7	620.7	1379.2	1241.3	Yes
3/26/2002	100	3,590	3581.71	11.5	961.1	961.1	2125.1	1912.6	Yes
4/23/2002	93	4,600	4589.38	6.4	1144.9	1144.9	2722.9	2450.7	Yes
5/28/2002	94	2,690	2683.79	18.1	680.4	680.4	1592.3	1433.1	Yes
7/23/2002	149	206	205.52	68.4	82.6	82.6	121.9	109.7	Yes
8/20/2002	155	148	147.66	76.1	61.7	61.7	87.6	78.8	Yes
9/17/2002	190	67	66.85	91.2	34.3	34.3	39.7	35.7	Yes

Table I.4 Percent Reductions for TDS

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
10/15/2002	126	282	281.35	62.3	95.6	95.6	166.9	150.2	Yes
11/5/2002	124	197	196.54	69.4	65.7	65.7	116.6	105.0	Yes
12/3/2002	146	143	142.67	76.8	56.2	56.2	84.6	76.2	Yes
1/21/2003	93	2,490	2484.25	20.2	623.1	623.1	1473.9	1326.5	Yes
2/25/2003	118	2,110	2105.13	24.4	669.9	669.9	1249.0	1124.1	Yes
3/25/2003	101	3,490	3481.94	12.1	948.4	948.4	2065.9	1859.3	Yes
4/15/2003	115	966	963.77	40.3	298.9	298.9	571.8	514.6	Yes
5/20/2003	30	1,390	1386.79	33.6	112.2	112.2	822.8	740.5	Yes
6/17/2003	103	1,280	1277.04	35.2	354.7	354.7	757.7	681.9	Yes
7/15/2003	84	1,900	1895.61	26.8	429.4	429.4	1124.7	1012.2	Yes
8/12/2003	157	189	188.56	70.2	79.8	79.8	111.9	100.7	Yes
9/23/2003	137	119	118.73	80.7	43.9	43.9	70.4	63.4	Yes
10/14/2003	157	20	19.95	99.0	8.4	8.4	11.8	10.7	Yes
11/11/2003	142	14	13.97	99.5	5.3	5.3	8.3	7.5	Yes
12/16/2003	146	134	133.69	78.0	52.6	52.6	79.3	71.4	Yes
1/20/2004	277	112	111.74	81.9	83.5	83.5	66.3	59.7	No
2/17/2004	153	3,700	3691.45	10.8	1523.2	1523.2	2190.2	1971.2	Yes
3/16/2004	100	5,040	5028.36	4.6	1356.1	1356.1	2983.4	2685.1	Yes
4/13/2004	117	1,450	1446.65	32.9	456.5	456.5	858.3	772.5	Yes
5/11/2004	130	838	836.06	42.9	293.1	293.1	496.1	446.4	Yes
5/15/2004	110	931	928.85	41.0	275.6	275.6	551.1	496.0	Yes
7/20/2004	76	3,720	3711.41	10.7	760.7	760.7	2202.0	1981.8	Yes
8/17/2004	131	472	470.91	52.6	166.4	166.4	279.4	251.5	Yes
9/21/2004	142	23	22.95	98.7	8.8	8.8	13.6	12.3	Yes
10/19/2004	79	1,480	1476.58	32.5	312.6	312.6	876.1	788.5	Yes
11/30/2004	92	3,220	3212.56	13.8	797.1	797.1	1906.1	1715.5	Yes
12/14/2004	76	5,130	5118.15	4.3	1042.1	1042.1	3036.7	2733.0	Yes
2/22/2005	106	1,900	1895.61	26.8	541.9	541.9	1124.7	1012.2	Yes
3/28/2005	103	730	728.31	44.8	202.3	202.3	432.1	388.9	Yes
4/26/2005	105	1,730	1726.00	29.0	488.8	488.8	1024.1	921.7	Yes
5/24/2005	130	112	111.74	81.9	39.2	39.2	66.3	59.7	Yes
6/21/2005	140	88	87.80	86.8	33.1	33.1	52.1	46.9	Yes
7/25/2005	155	244	243.44	64.7	101.8	101.8	144.4	130.0	Yes
8/23/2005	177	93	92.79	85.9	44.3	44.3	55.1	49.5	Yes
9/27/2005	136	249	248.42	64.3	91.1	91.1	147.4	132.7	Yes
10/25/2005	153	70	69.84	90.6	28.8	28.8	41.4	37.3	Yes
11/29/2005	151	90	89.79	86.5	36.6	36.6	53.3	47.9	Yes
12/27/2005	146	39	38.91	96.7	15.3	15.3	23.1	20.8	Yes
1/17/2006	113	110	109.75	82.4	33.4	33.4	65.1	58.6	Yes

Table I.4 Percent Reductions for TDS

Date	Observed TDS at OUA00013 (mg/L)	Flow on Sampling Day: Flow gage near Jones (cfs)	Flow on Sampling Day: Downstream end of reach 08040205-001 (cfs)	Percent exceedance for flow on sampling day	Actual TDS load (tons/day)	Reduced TDS load (tons/day)	Allowable TDS load before MOS (tons/day)	Allowable TDS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
2/14/2006	114	2,710	2703.74	17.9	831.3	831.3	1604.2	1443.8	Yes
4/18/2006	108	1,180	1177.27	36.7	342.9	342.9	698.5	628.6	Yes
5/16/2006	125	709	707.36	45.3	238.5	238.5	419.7	377.7	Yes
7/25/2006	135	16	15.96	99.3	5.8	5.8	9.5	8.5	Yes
8/29/2006	148	180	179.58	71.3	71.7	71.7	106.6	95.9	Yes
10/24/2006	133	142	141.67	77.0	50.8	50.8	84.1	75.7	Yes
11/28/2006	121	59	58.86	93.2	19.2	19.2	34.9	31.4	Yes
12/5/2006	115	61	60.86	92.7	18.9	18.9	36.1	32.5	Yes
1/2/2007	125	1,330	1326.93	34.4	447.3	447.3	787.3	708.6	Yes
2/6/2007	87	3,270	3262.45	13.4	761.1	761.1	1935.7	1742.1	Yes
3/13/2007	125	715	713.35	45.2	240.5	240.5	423.2	380.9	Yes
4/3/2007	117	236	235.45	65.4	74.3	74.3	139.7	125.7	Yes

Total number of values of loads =	200
Allowable % of exceedances of loads =	10%
Allowable no. of exceedances of loads =	20
No. of exceedances before reductions of loads =	8
No. of exceedances after reductions of loads =	8

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Table I.4 Percent Reductions for TDS

Figure I.1. Flow duration curve for Bayou Bartholomew reach 08040205-001

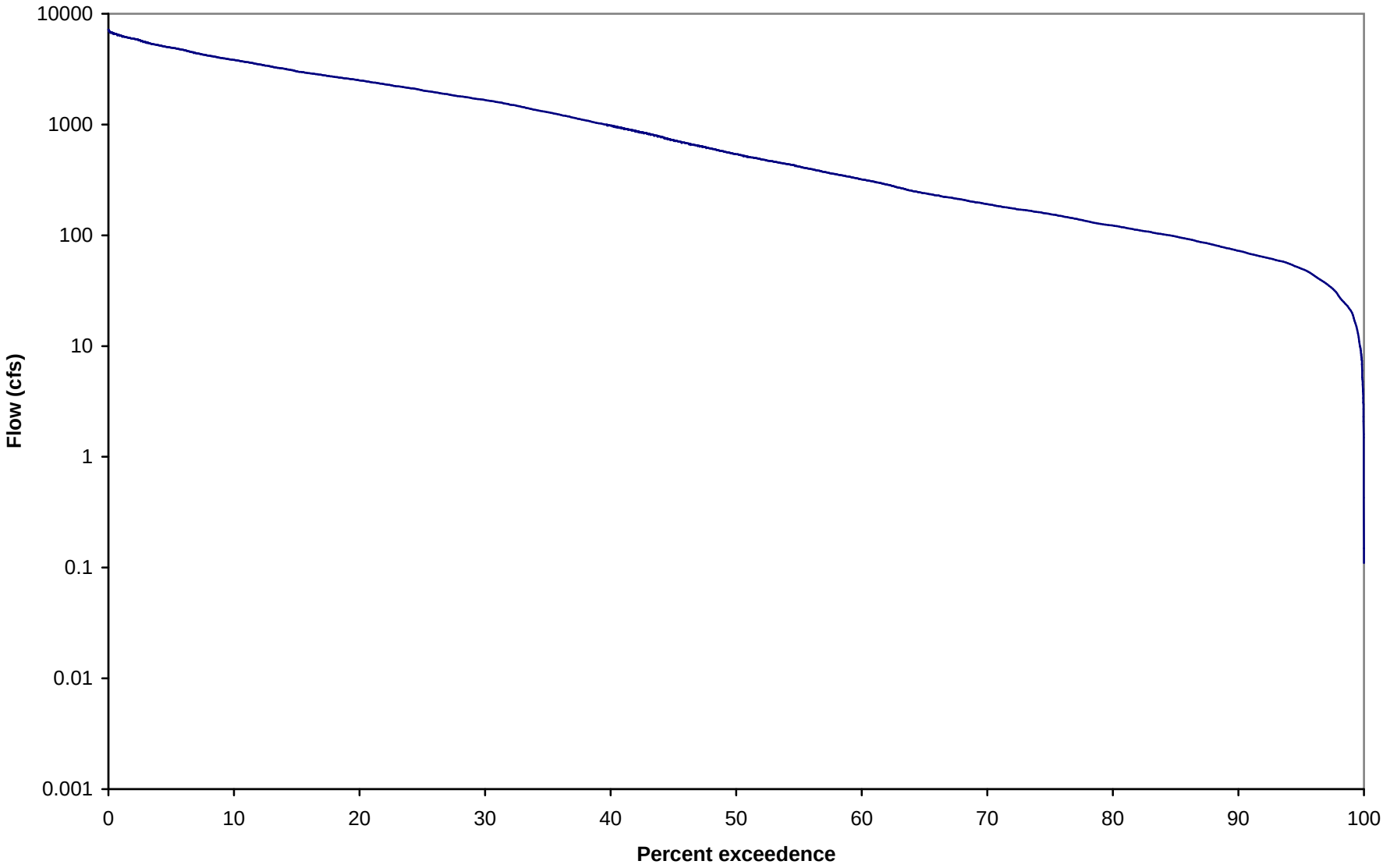


Figure I.2. Chloride Load Duration Curve for Bayou Bartholomew Reach 001

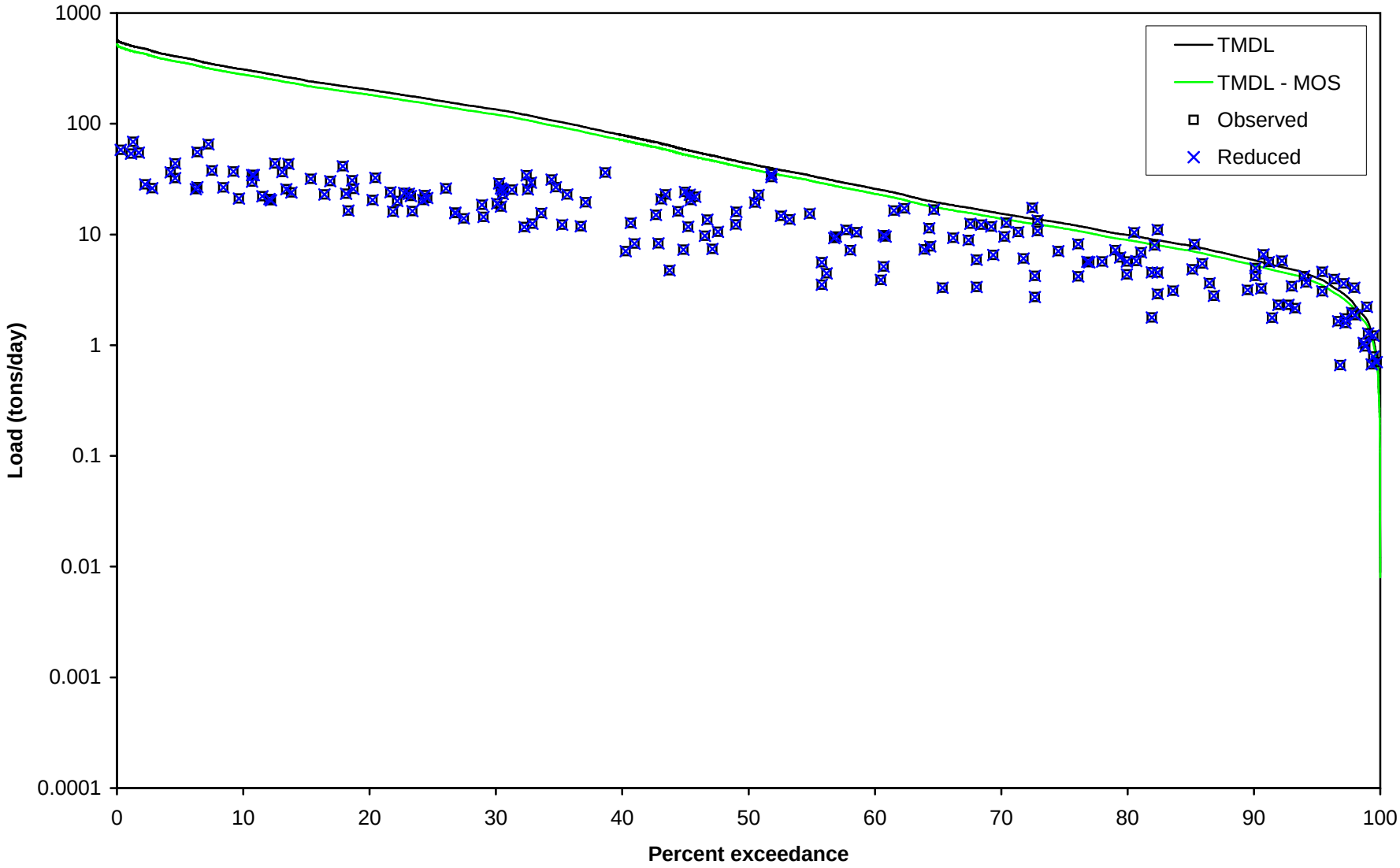


Figure I.3. Sulfate Load Duration Curve for Bayou Bartholomew Reach 001

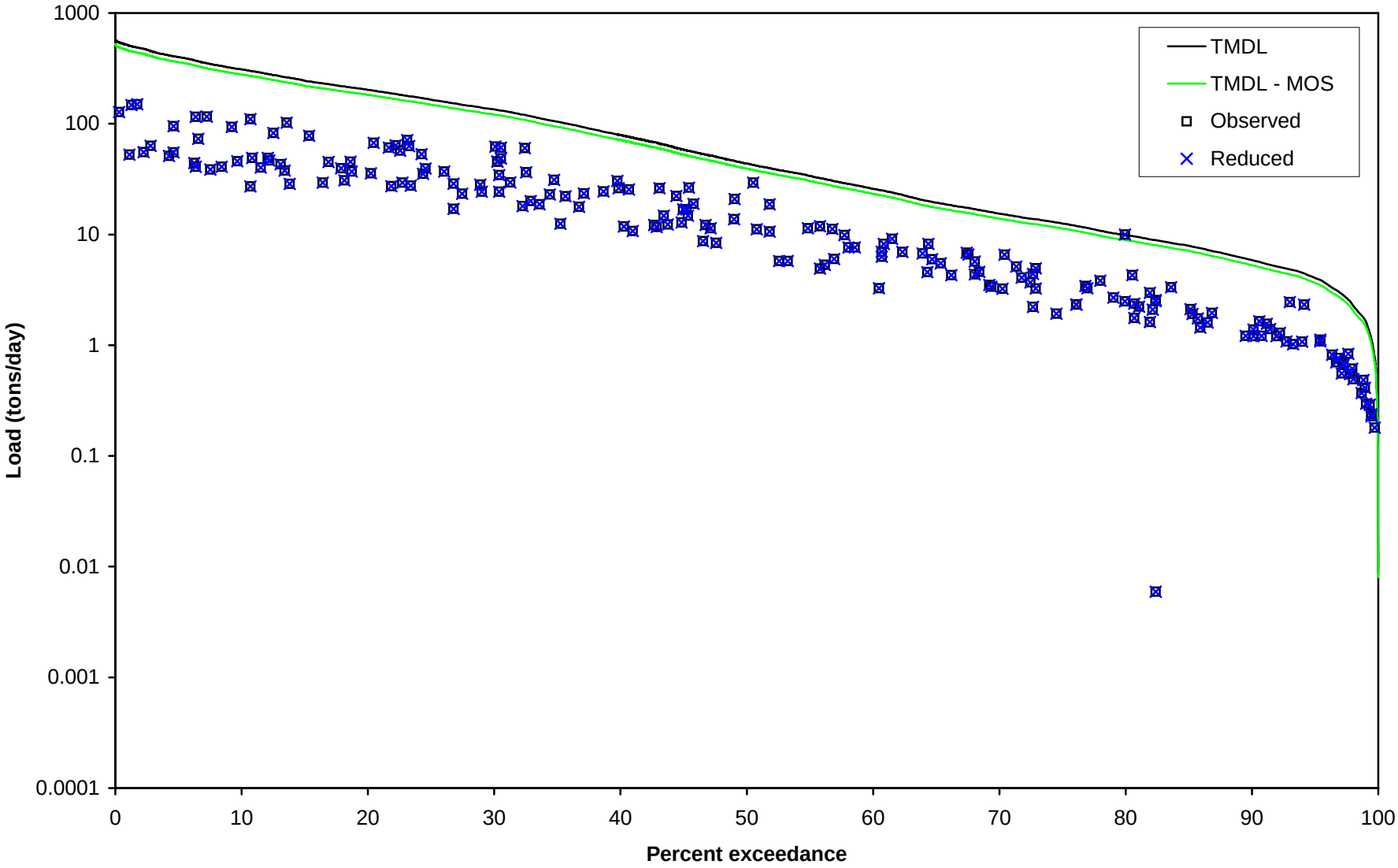
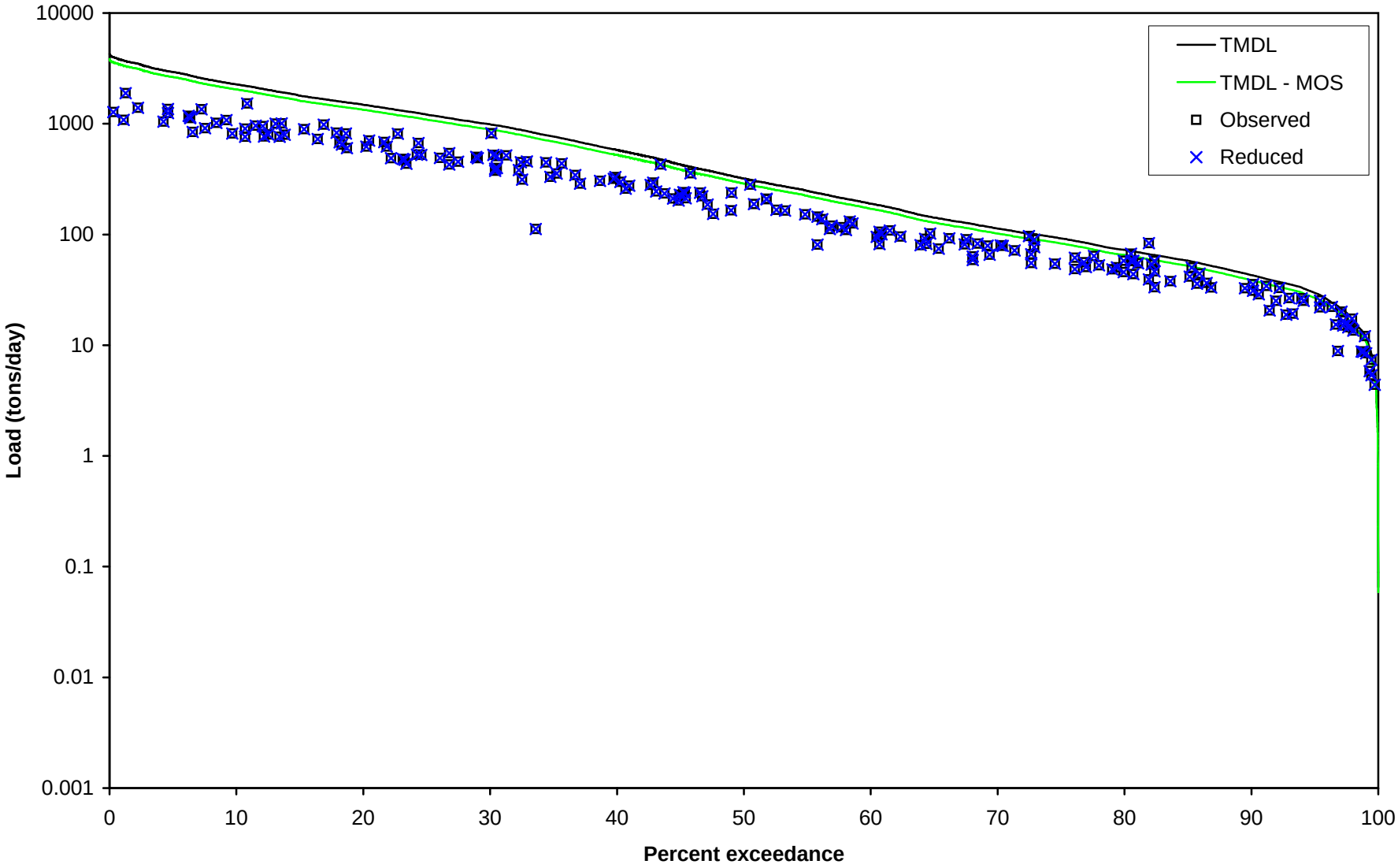


Figure I.4. TDS Load Duration Curve for Bayou Bartholomew Reach 001



APPENDIX J

Turbidity TMDL Calculations for Reach 08040205-007

TABLE J.1. ALLOWABLE TSS LOAD CALCULATIONS FOR CUTOFF CREEK 08040205-007

Drainage area (mi^2) of flow gage = 576
Drainage area (mi^2) of Cutoff Creek = 322

Flow at gage 07364150 (cfs)	Flow in Cutoff Creek (cfs)	Percent of days flow exceeded	Width between points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	TMDL minus MOS TSS load (tons/day)	Area under TSS TMDL curve (tons/day)
0.2	0.1	99.98	0.0391	Base flow	21	16	4.82E-03	4.82E-03	1.89E-06
0.3	0.2	99.94	0.0324	Base flow	21	16	7.24E-03	7.24E-03	2.34E-06
0.4	0.2	99.92	0.0190	Base flow	21	16	9.65E-03	9.65E-03	1.83E-06
The rows between 99.92 and 60.33 percent exceedances are not shown for the sake of brevity.									
139.0	77.7	60.33	0.1240	Base flow	21	16	3.35E+00	3.35E+00	4.16E-03
140.0	78.3	60.26	0.1151	Base flow	21	16	3.38E+00	3.38E+00	3.89E-03
141.0	78.8	60.10	0.1531	Base flow	21	16	3.40E+00	3.40E+00	5.21E-03
								Total =	5.83E-01
142.0	79.4	59.95	0.1095	Storm flow	32	32	6.85E+00	6.85E+00	7.50E-03
143.0	79.9	59.89	0.0916	Storm flow	32	32	6.90E+00	6.90E+00	6.32E-03
144.0	80.5	59.77	0.1732	Storm flow	32	32	6.95E+00	6.95E+00	1.20E-02
The rows between 59.77 and 0.01 percent exceedances are not shown for the sake of brevity.									
6,840.0	3,823.8	0.01	0.0045	Storm flow	32	32	3.30E+02	3.30E+02	1.47E-02
6,850.0	3,829.3	0.01	0.0045	Storm flow	32	32	3.30E+02	3.30E+02	1.48E-02
6,870.0	3,840.5	0.002	0.0034	Storm flow	32	32	3.31E+02	3.31E+02	1.11E-02
								Total =	3.24E+01

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TABLE J.2. STORM FLOW PERCENT REDUCTION FOR TSS IN CUTOFF CREEK 08040205-007

TSS Target =	32.0 mg/L
Explicit MOS (% of TMDL) =	0%
TSS Target reduced by MOS =	32.0 mg/L
Percent reduction =	0%

Error check for reduction is / is not needed:	ok
Error check for less or more reduction needed:	ok

Date	Observed TSS at UWCOC01 (mg/L)	Estimated flow in Cutoff Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
3/9/1999	15.0	104	54.78	4.206	4.206	8.973	Yes
6/6/1994	30.0	108	53.96	8.774	8.774	9.359	Yes
2/29/2000	16.5	132	50.56	5.896	5.896	11.434	Yes
7/18/1995	17.5	232	41.06	10.949	10.949	20.021	Yes
1/17/1995	14.0	237	40.70	8.949	8.949	20.456	Yes
4/11/1995	17.5	253	39.77	11.925	11.925	21.806	Yes
6/5/2000	34.0	254	39.75	23.272	23.272	21.903	No
5/7/1996	9.0	305	36.75	7.409	7.409	26.341	Yes
2/27/1996	19.5	315	36.23	16.552	16.552	27.162	Yes
3/21/2000	34.5	318	35.97	29.596	29.596	27.451	No
1/12/1999	7.5	973	12.42	19.675	19.675	83.945	Yes
4/4/2000	10.5	1,029	11.59	29.128	29.128	88.770	Yes
2/1/1999	3.5	2,286	1.30	21.582	21.582	197.319	Yes

Total number of values of loads =	13
Allowable % of exceedances of loads =	20%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	2
No. of exceedances after reductions of loads =	2

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TABLE J.3. BASE FLOW PERCENT REDUCTION FOR TSS IN CUTOFF CREEK 08040205-007

TSS Target =	16.0 mg/L	Error check for reduction is / is not needed:	ok
Explicit MOS (% of TMDL) =	0%	Error check for less or more reduction needed:	ok
TSS Target reduced by MOS =	16.0 mg/L		
Percent reduction =	0%		

Date	Observed TSS at UWCOC01 (mg/L)	Estimated flow in Cutoff Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load with MOS incorporated (tons/day)	Reduced load less than or equal to allowable load?
9/12/2000	33.5	7	97.97	0.657	0.657	0.314	No
11/9/1998	1.0	10	95.85	0.027	0.027	0.434	Yes
10/3/1995	7.0	10	95.85	0.190	0.190	0.434	Yes
9/27/1999	1.0	13	93.02	0.036	0.036	0.579	Yes
10/25/1999	1.5	20	87.97	0.079	0.079	0.844	Yes
1/18/2000	3.0	20	87.97	0.158	0.158	0.844	Yes
8/30/1999	6.0	25	83.78	0.407	0.407	1.085	Yes
9/12/1994	18.5	75	61.02	3.737	3.737	3.232	No

Total number of values of loads =	8
Allowable % of exceedances of loads =	25%
Allowable no. of exceedances of loads =	2
No. of exceedances before reductions of loads =	2
No. of exceedances after reductions of loads =	2

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Figure J.1. Flow duration curve for for Cutoff Creek 08040205-007

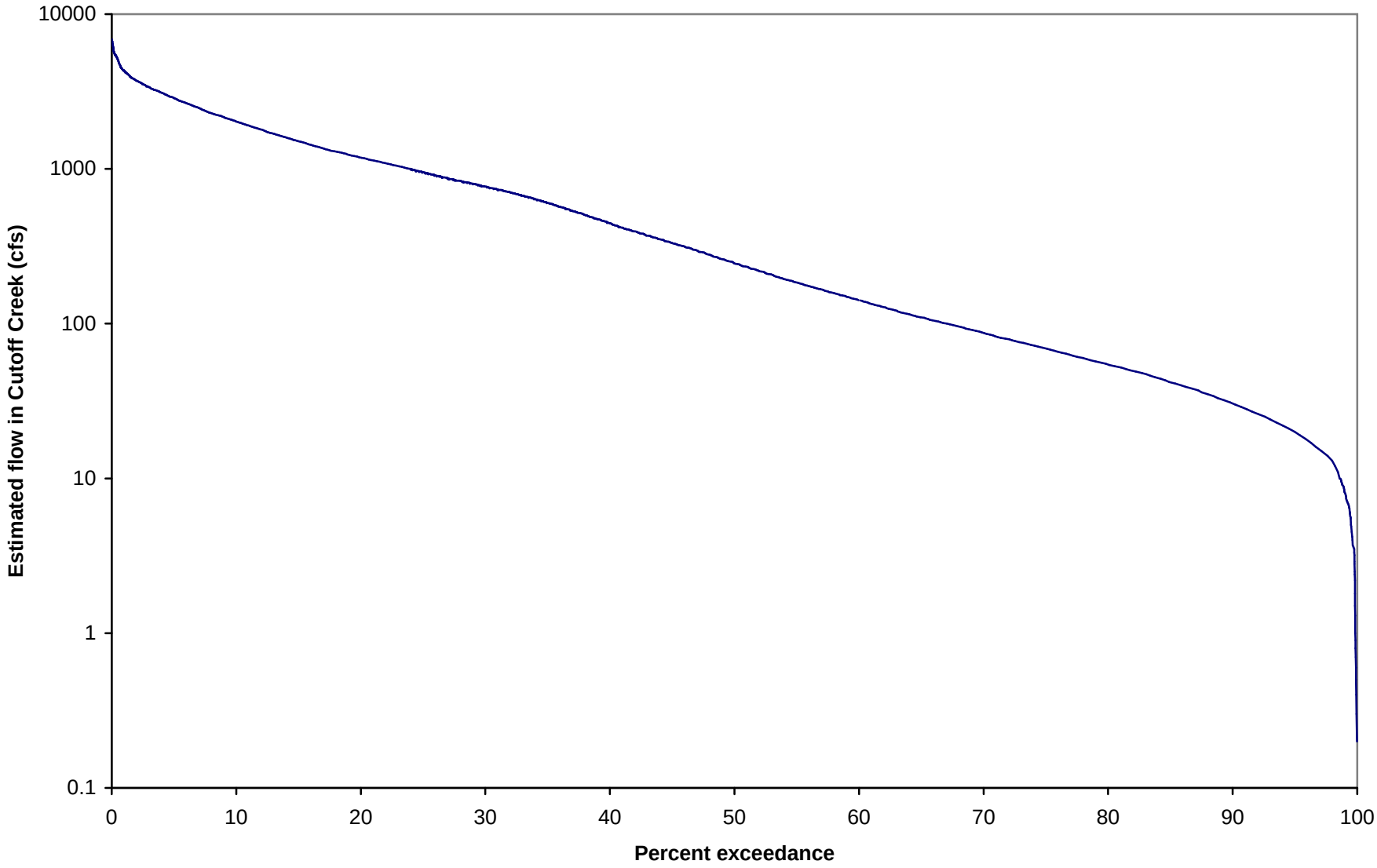


Figure J.2. Storm flow load duration curve for Cutoff Creek (08040205-007)

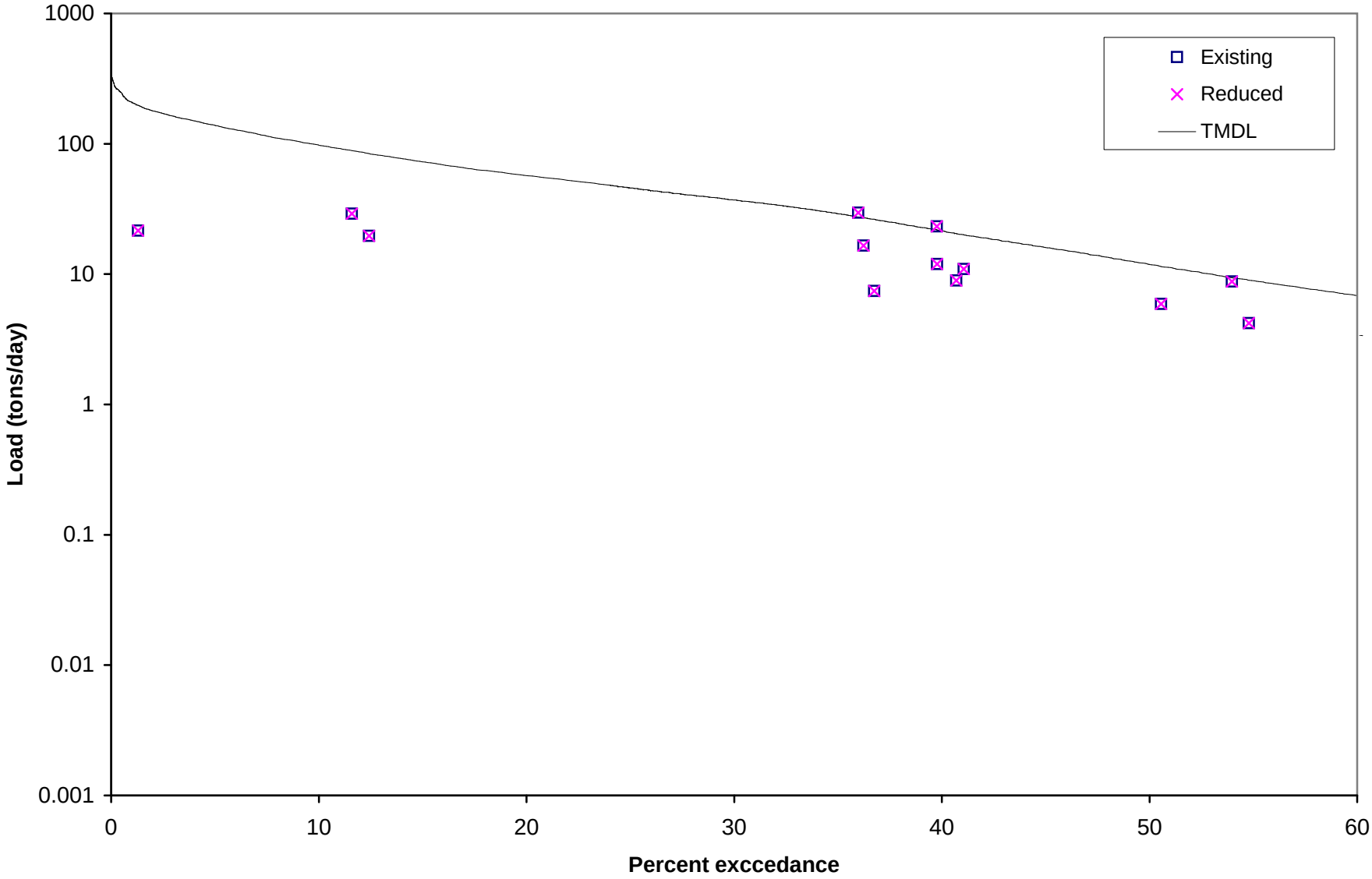
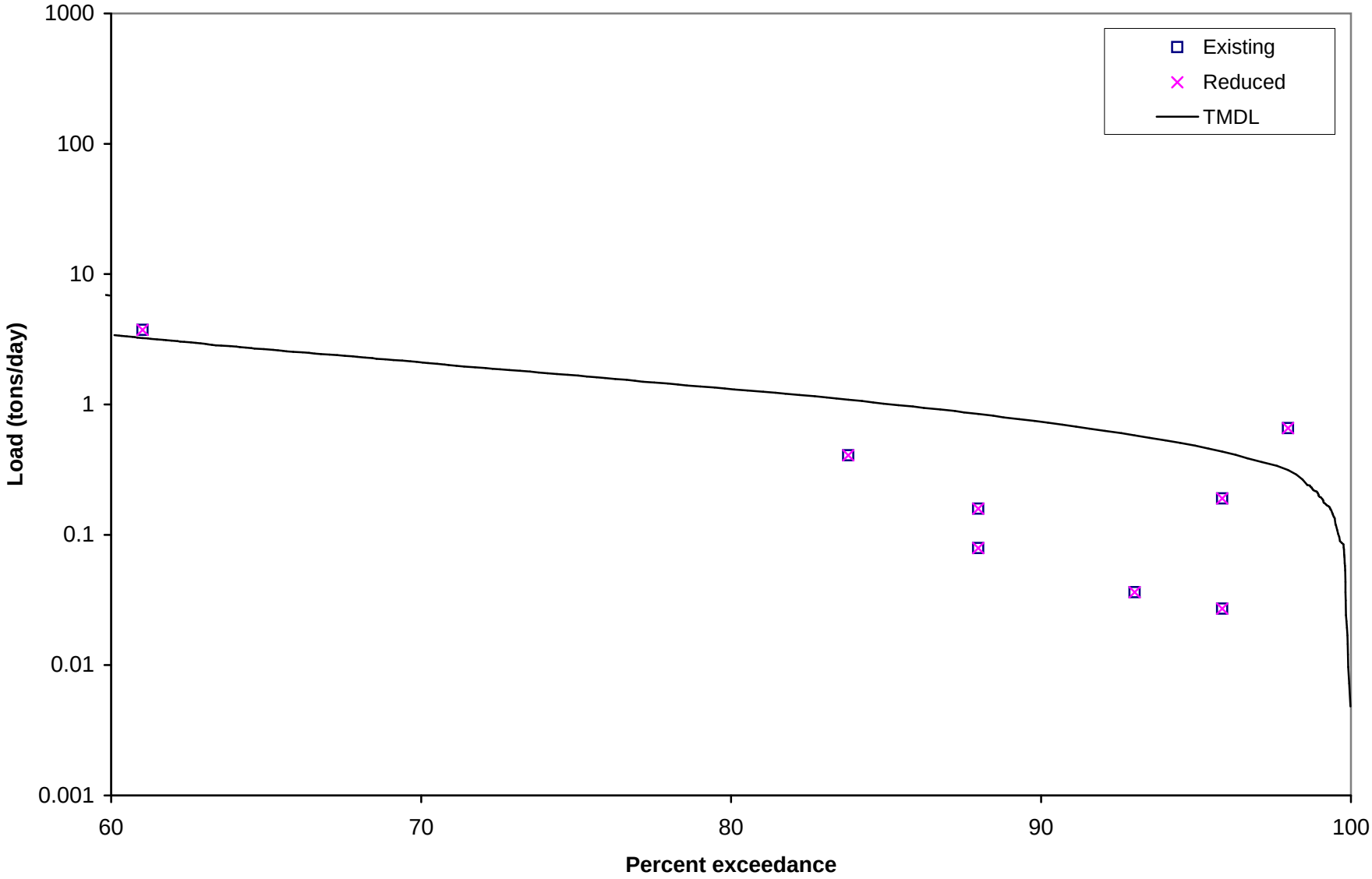


Figure J.3. Base flow load duration curve for Cutoff Creek (08040205-007)



APPENDIX K

Wasteload Allocations for Dissolved Mineral TMDLs

EFFLUENT CONCENTRATIONS OF DISSOLVED MINERALS IN ARKANSAS

From ADEQ field surveys (referenced by report number), EPA STORET database, ambient water quality data on ADEQ web site, and NPDES applications

Municipal discharger	Sampling Date	Station ID	Individual conc's (mg/L)			Average conc's (mg/L)			Median conc's (mg/L)			ADEQ report number or other source
			Chloride	Sulfate	TDS	Chloride	Sulfate	TDS	Chloride	Sulfate	TDS	
City of Siloam Springs	7/27/1993	SAG08E	104.0	28.7	422							WQ95-12-2
	9/13/1993	SAG08E	90.1	34.8	402							WQ95-12-2
	10/18/1993	SAG08E	67.7	35.7	337							WQ95-12-2
	11/16/1993	SAG08E	47.4	22.4	270							WQ95-12-2
	1/24/1934	SAG08E	90.6	26.5	392							WQ95-12-2
	4/11/1994	SAG08E	10.8	18.8	265							WQ95-12-2
	6/28/1994	SAG08E	121.0	21.2	468							WQ95-12-2
Average =						75.9	26.9	365				
Median =									90.1	26.5	392	
City of Bentonville	8/14/1996	TBC02E	74.2	73.9	454	74.2	73.9	454	74.2	73.9	454	WQ97-05-2
Village Wastewater North	8/14/1996	LSC06E	36.2	41.4	245	36.2	41.4	245	36.2	41.4	245	WQ97-05-2
City of Fordyce	7/30/1996	JUG03E	49.8	26.8	368	49.8	26.8	368	49.8	26.8	368	WQ97-06-2
City of Nashville	9/03/1997	RED0051	51.3	134.0	409							WQ00-05-1
	9/22/1998	RED0051	39.6	114.0	332							ADEQ web site
	8/01/2000	RED0051	38.1	--	--							STORET
	1/08/2001	RED0051	12.2	--	--							STORET
	3/12/2001	RED0051	2.8	--	--							STORET
	6/18/2001	RED0051	19.2	--	--							STORET
	9/04/2001	RED0051	20.9	--	--							STORET
Average =						26.3	124.0	371				
Median =									20.9	124.0	371	
City of Waldron	8/31/1994	POTEW	43.0	35.0	312							WQ94-11-1
	9/07/1994	POTEW	37.0	34.0	262							WQ94-11-1
Average =						40.0	34.5	287				
Median =									40.0	34.5	287	
City of Mena	7/29/1992	Station 1	39.2	50.3	195	39.2	50.3	195	39.2	50.3	195	WQ94-01-1
City of Berryville	8/28/1991	Station 5	167.0	--	217	167.0	--	217	167.0	--	217	WQ92-06-1
City of Huntsville	7/21/1992	Station E	140.0	27.7	589							WQ93-03-1
	7/22/1992	Station E	136.0	28.7	648							WQ93-03-1
	9/15/1992	Station E	126.0	33.6	545							WQ93-03-1
Average =						134.0	30.0	594				
Median =									136.0	28.7	589	
City of Mountain Home	9/01/1993	HIC02E	78.3	24.8	405	78.3	24.8	405	78.3	24.8	405	WQ95-02-1
City of Conway	7/09/1996	SDC01E	59.8	211.0	503	59.8	211.0	503	59.8	211.0	503	WQ97-05-1
City of Russellville	7/01/1996	WIG01E	52.7	41.3	324	52.7	41.3	324	52.7	41.3	324	WQ97-06-1

Municipal discharger	Sampling Date	Station ID	Individual conc's (mg/L)			Average conc's (mg/L)			Median conc's (mg/L)			ADEQ report number or other source
			Chloride	Sulfate	TDS	Chloride	Sulfate	TDS	Chloride	Sulfate	TDS	
City of Prairie Grove	4/11/1995	MFI01E	23.2	--	--							STORET
	5/09/1995	MFI01E	14.2	--	--							STORET
	5/22/1995	MFI01E	47.4	38.9	--							STORET
	6/27/1995	MFI01E	43.5	36.2	--							STORET
	7/10/1995	MFI01E	51.9	38.8	--							STORET
	8/01/1995	MFI01E	47.9	39.9	--							STORET
	9/18/1995	MFI01E	47.1	--	--							STORET
	9/25/1995	MFI01E	51.1	35.6	--							STORET
	10/24/1995	MFI01E	52.2	39.7	--							STORET
	11/13/1995	MFI01E	47.2	38.0	--							STORET
	11/14/1995	MFI01E	45.5	43.3	--							STORET
	1/09/1996	MFI01E	49.4	49.8	--							STORET
	1/15/1996	MFI01E	54.9	51.0	--							STORET
	1/23/1996	MFI01E	43.1	43.9	--							STORET
	2/27/1996	MFI01E	48.9	52.8	--							STORET
	3/19/1996	MFI01E	43.7	51.7	--							STORET
	4/15/1996	MFI01E	41.6	52.0	--							STORET
	5/14/1996	MFI01E	36.4	44.1	--							STORET
	6/01/1996	MFI01E	41.7	43.3	--							STORET
Average =						43.7	43.7	--				
Median =									47.1	43.3	--	
City of Arkadelphia	2006?	--	--	--	278	--	--	278	--	--	278	NPDES applic.
City of McGehee	2005?	--	--	--	219	--	--	219	--	--	219	NPDES applic.
City of Mitchellville	2006?	--	--	--	180	--	--	180	--	--	180	NPDES applic.
City of Calion	2006?	--	--	--	513	--	--	513	--	--	513	NPDES applic.
City of Norphlet	2004?	--	--	--	191	--	--	191	--	--	191	NPDES applic.
Overall averages =						67.5	60.7	336				
Overall medians =									52.7	41.4	324	

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DISSOLVED MINERAL WLA CALCULATIONS FOR BAYOU BARTHOLOMEW

Assumed effluent conc's for domestic wastewater (statewide medians): Chloride = 53 mg/L
Sulfate = 41 mg/L
TDS = 324 mg/L

Permit Number	Name	Flowrate (MGD)	Reach	Individual Loads (lbs/day)		
				Chloride	Sulfate	TDS
AR0041602	Suburbia SID #1	0.012	Upstream of Reach 013 - not included in TMDL			
AR0039144	Pinewood Sewer Improvement	0.05	Upstream of Reach 013 - not included in TMDL			
AR0037885	Suburban SID No. Tantara #1 of Jefferson Co.	0.025	Upstream of Reach 013 - not included in TMDL			
AR0047872	Robert Floyd Sawmill	Intermittent	Upstream of Reach 013 - not included in TMDL			
AR0046477	City of Star City	0.375	Upstream of Reach 013 - not included in TMDL			
AR0045888	Ar. Dept. of Parks & Tourism	0.009	Upstream of Reach 013 - not included in TMDL			
AR0022071	City of McGehee	0.6	012U	265.4	205.3	1,622.5
AR0022250	City of Dermontt - South Pond	1.2	012U	530.8	410.6	3,244.9
AR0047350	Pine Haven Mobile Lodge	0.004	Upstream of Reach 007 - not included in TMDL			
AR0021831	City of Monticello, East Plant	2.5	Upstream of Reach 007 - not included in TMDL			
AR0034371	City of Portland	0.1	001	44.2	34.2	270.4
AR0037141	City of Parkdale	0.05	001	22.1	17.1	135.2
AR0022144	City of Wilmot	0.165	001	73.0	56.5	446.2

TOTAL LOADS FOR EACH REACH IN LBS/DAY -->

Reach	Cumulative Loads (lbs/day)		
	Chloride	Sulfate	TDS
Reach 012U	796.2	615.9	4,867.4
Reach 001	139.3	107.8	851.8

TOTAL LOADS FOR EACH REACH IN TONS/DAY -->

Total for each reach	Cumulative Loads (tons/day)		
	Chloride	Sulfate	TDS
Reach 012U	0.40	0.31	2.43
Reach 001	0.07	0.05	0.43

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