Addendum to TMDL(s)

In the TMDL report “TMDLs for Turbidity for Seven Stream Reaches in Arkansas” (2008), a turbidity TMDL was developed for Prairie Creek assessment unit (AU) -048. Since the development of the TMDL, AU -048 has been split into multiple AUs: -048, -848, and -948. These three AUs comprise the same total length of the original TMDL from the mouth of Prairie Creek upstream to the confluence of Ward Creek (-748).

TMDLS FOR TURBIDITY FOR SEVEN STREAM REACHES IN ARKANSAS

MARCH 27, 2008

Revised July 9, 2025

TMDLS FOR TURBIDITY FOR SEVEN STREAM REACHES IN 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 (TMDLs) for those waterbodies. A 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 siltation/turbidity for seven reaches along four streams in Arkansas. General information for these streams is presented in Table ES.1.

Table ES.1. General information for stream reaches addressed in this report.

Reach Numbers	Stream Name	Ecoregion	ADEQ Planning Segment	Drainage Area at Mouth (square miles)	Predominant Land Use
08040204-005	Big Creek	Gulf Coastal	2C	155.9	Forest
08040201-001U, -001L	Moro Creek	Gulf Coastal	2D	548.1	Forest
08040101-048	Prairie Creek	Ouachita Mountains	2F	23.5	Forest
08020203-003, -005, -007	Blackfish Bayou	Delta	5A	534.8	Cropland

These seven stream reaches were included on the final 2004 Arkansas 303(d) list for not supporting their designated use of aquatic life due to siltation/turbidity. The primary sources of siltation/turbidity cited in the 2004 Integrated Report for Arkansas were “unknown” for Big Creek, Moro Creek, and Prairie Creek, and agriculture for Blackfish Bayou.

Arkansas Department of Environmental Quality (ADEQ) historical water quality data were obtained for four routine monitoring stations along the streams in Table ES.1. These data were analyzed for basic statistics, seasonal patterns, relationships between concentration and flow, and relationships between total suspended solids (TSS) and turbidity. The analysis did not reveal any noticeable seasonal patterns, and the only noticeable relationship between concentration and flow was a relationship of increasing turbidity and TSS with increasing flow

for Blackfish Bayou. The regression between turbidity and TSS for each monitoring station yielded correlation coefficients (R^2) ranging from 0.39 to 0.88.

The TMDLs in this report were expressed using TSS as a surrogate for turbidity because turbidity cannot be expressed as a mass load. The regressions between TSS and turbidity were used to develop target TSS concentrations corresponding to the numeric turbidity criteria for base flow conditions and storm flow conditions in the Arkansas water quality standards.

The TMDLs in this report were developed using the load duration curve methodology. 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 flow duration curves,
2. Converting the flow duration curves to load duration curves,
3. Plotting observed loads with load duration curves,
4. Calculating the TMDL components, and
5. Calculating percent reductions.

An implicit margin of safety (MOS) was established for each TMDL through the use of conservative assumptions. The primary conservative assumption was calculating the TMDLs assuming that TSS is a conservative parameter and does not settle out of the water column.

A wasteload allocation (WLA) was specified for Blackfish Bayou reach 08020203-005 to account for loading from runoff from the area covered by the Municipal Separate Storm Sewer System (MS4) permit for the cities of West Memphis, Marion, and Sunset. This WLA was estimated as the TMDL for Blackfish Bayou reach 08020203-005 multiplied by 8.7%, which is the percentage of the watershed that is inside the city limits for West Memphis, Marion, and Sunset.

The WLAs for point source contributions in all the other TMDLs were set to not applicable (NA) ~~zero~~ because TSS in these TMDLs was considered to represent inorganic suspended solids (i.e., soil and sediment particles from erosion or sediment resuspension). The suspended solids discharged by the point sources discharging to these streams were 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.

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 criteria and water quality standards. The percent reduction values are presented for informational purposes only.

The results of the TMDL calculations and percent reductions are summarized in Table ES.2.

Table ES 2. Summary of TMDLs for siltation/turbidity.

Reach Number	Stream Name	Flow Category	Loads (tons/day of TSS)				Percent Reduction
			WLA	LA	MOS	TMD	
08020203-007	Blackfish Bayou	Base flow	~~0~~NA	3.17	implicit	3.17	15% for base flow, 0% for storm flow
		Storm flow	~~0~~NA	167	implicit	167	
08020203-005	Blackfish Bayou	Base flow	0.66	6.96	implicit	7.62	
		Storm flow	35	366	implicit	401	
08020203-003	Blackfish Bayou	Base flow	~~0~~NA	8.57	implicit	8.57	
		Storm flow	~~0~~NA	451	implicit	451	
08040101-048	Prairie Creek	Base flow	~~0~~NA	0.030	implicit	0.030	73%
		Storm flow	~~0~~NA	1.40	implicit	1.40	0%
08040201-001U	Moro Creek	Base flow	~~0~~NA	0.0156	implicit	0.0156	0% for base flow, 0% for storm flow
		Storm flow	~~0~~NA	19.6	implicit	19.6	
08040201-001L	Moro Creek	Base flow	~~0~~NA	0.0531	implicit	0.0531	
		Storm flow	~~0~~NA	79.8	implicit	79.8	
08040204-005	Big Creek	Base flow	~~0~~NA	0.0128	implicit	0.0128	50%
		Storm flow	~~0~~NA	18.6	implicit	18.6	0%

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1.0 INTRODUCTION

This report presents total maximum daily loads (TMDLs) for siltation/turbidity for seven reaches along four streams in Arkansas. These stream reaches were included on the draft and final versions of the 2004 303(d) list for Arkansas as not supporting their designated use of aquatic life (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 2004 Integrated Report for Arkansas (ADEQ 2005b) 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's 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 and to establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL is the sum of the wasteload allocation (WLA), the 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.

Reach Number	Stream Name	Impaired Uses	Suspected Causes of Impairment	Suspected Sources of Impairment	Category	Priority
08040204-005	Big Creek	Aquatic Life	Siltation/turbidity	Unknown	5d	Med.
08040201-001U	Moro Creek	Aquatic Life	Siltation/turbidity	Unknown	5a	Low
08040201-001L	Moro Creek	Aquatic Life	Siltation/turbidity	Unknown	5a	Low
08040101-048	Prairie Creek	Aquatic Life	Siltation/turbidity	Unknown	5d	Med.
08020203-003	Blackfish Bayou	Aquatic Life	Siltation/turbidity	Agriculture	5b	Low
08020203-005	Blackfish Bayou	Aquatic Life	Siltation/turbidity	Agriculture	5b	Low
08020203-007	Blackfish Bayou	Aquatic Life	Siltation/turbidity	Agriculture	5b	Low

2.0 BACKGROUND INFORMATION

2.1 General Information

General information for the study areas associated with the stream reaches addressed in this report is summarized in Table 2.1. The streams addressed in this report are located in different ecoregions and different ADEQ Planning Segments. Maps of the study areas for this report are included in Appendix A (Figures A.1 through A.3).

Table 2.1. General information for streams addressed in this report.

Stream Name	Ecoregion	ADEQ Planning Segment	Region of State	Counties	Reach Number	Reach Length (miles)	Drainage Area (mi^2)
Big Creek	Gulf Coastal	2C	South (near Rison)	Jefferson, Cleveland	08040204-005	28.9	155.9
Moro Creek	Gulf Coastal	2D	South (near Fordyce)	Dallas, Cleveland, Calhoun	08040201-001U	57.9	452.8
					08040201-001L	12.0	548.1
Prairie Creek	Ouachita Mountains	2F	West (near Mena)	Polk	08040101-048	10.0	23.5
Blackfish Bayou	Delta	5A	East (near West Memphis)	Crittenden, Cross, Lee, St. Francis	08020203-007	2.4	197.9
					08020203-005	2.6	475.8
					08020203-003	16.1	534.8

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 Figures A.4 through A.6 (located in Appendix A) and land use percentages are shown in Table 2.2. These data indicate that forest is the predominant land use in the Moro Creek, Big Creek, and Prairie Creek study areas, while cropland is the predominant land use in the Blackfish Bayou study area.

Table 2.2. Land use percentages for the study areas (CAST 2005).

Land Use Category	Big Creek	Moro Creek	Prairie Creek	Blackfish Bayou
Urban	0.4%	0.8%	12.6%	4.5%
Barren or Bare Soil	0.2%	0.1%	1.1%	2.1%
Water	0.5%	0.4%	0.8%	1.6%
Forest	92.3%	91.7%	56.8%	17.5%
Soybeans	0.0%	0.0%	0.0%	49.6%
Rice	0.0%	0.0%	0.0%	10.3%
Cotton	0.0%	0.0%	0.0.%	8.2%
Other Crops	0.0%	0.0%	0.0%	4.3%
Pasture / Forages	6.6%	7.0%	28.7%	1.9%
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**

2.3 Stream Flow

Daily stream flow data were estimated for the downstream end of each of the seven reaches addressed in this report. Flow data were needed to develop plots of water quality vs. flow and to develop TMDLs using the load duration method. Table 2.3 presents information for the United States Geological Survey (USGS) flow gages used in this report.

Flows for the Moro Creek and Big Creek reaches were estimated using measured flows from the USGS flow gage on Moro Creek near Fordyce multiplied times the ratio of drainage areas for the reach of interest and the USGS gage. Flows that were missing at the Fordyce gage on ADEQ sampling days were estimated using measured flows from the USGS flow gage on Smackover Creek near Smackover multiplied times the ratio of drainage areas for the reach of interest and the USGS gage.

Stream flows for Prairie Creek were estimated by calculating flows per unit area for the USGS gages on the Ouachita River near Mount Ida and Mountain Fork at Smithville, averaging them, then multiplying them by the Prairie Creek drainage area, and then adding the average effluent flow from the City of Mena wastewater treatment plant (WWTP) for that month. The effluent flows were added because they can represent a significant portion of the total flow in Prairie Creek during times when there is little or no upstream runoff.

Stream flows for Blackfish Bayou were estimated using measured flows from the USGS flow gage on the L'Anguille River near Colt multiplied times the ratio of drainage areas for the reach of interest and the USGS gage.

Table 2.3. Information for USGS stream flow gaging stations.

Gage Number	Gage Name	Descriptive location	Period of record	Draiange area (mi^2)	Mean flow (cfs)
07362500	Moro Creek near Fordyce, AR	AR Hwy 8 east of Fordyce, AR	10/1951 – 9/1983, 10/2001 – present	240	246
07362100	Smckover Creek near Smackover, AR	AR Hwy 7 northwest of Smackover, AR	10/1961 - present	385	437
07356000	Ouachita River near Mount Ida, AR	Hwy 270 north of Mount Ida, AR	10/1941 – present	414	719
07338750	Miuntain Fork at Smithville, OK	OK Hwy 4 east of Smithville, OK	10/1991 – present	320	548
07047942	L'Anguille River near Colt, AR	AR Hwy 306 west of Colt, AR	10/1970 – present	535	704

2.4 Water Quality Standards

Water quality standards for Arkansas waterbodies are listed in Arkansas Pollution Control and Ecology Commission (APCEC) Regulation No. 2 (APCEC 2007). Designated uses for the stream reaches that are addressed in this report include primary and secondary contact recreation; domestic, industrial and agricultural water supply; and perennial fishery. A short section of Moro Creek downstream of Fordyce is also designated as an Extraordinary Resource Water. Blackfish Bayou is also designated as a Channel-altered Delta Ecoregion Stream.

Section 2.503 of Regulation No. 2 also 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 the stream reaches addressed in this TMDL are listed in Table 2.4. Regulation No. 2 also states that "the non-point source runoff shall not result in the exceedance of the instream storm-flow values in more than 20% of the ADEQ ambient monitoring network samples taken in not less than 24 monthly samples."

Table 2.4. Numeric turbidity criteria for streams addressed in this report.

Stream	Primary Turbidity Criteria (NTU)	Storm-Flow Turbidity Criteria (NTU)
Big Creek	21	32
Moro Creek	21	32
Prairie Creek	10	18
Blackfish Bayou	75	250

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

1. Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
2. 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.
3. For outstanding state or national resource waters, those uses and water quality for which the outstanding waterbody was designated shall be protected.
4. 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 Point Sources

Information for point source discharges in the study areas was obtained by searching the Permit Compliance System (PCS) on the USEPA website (PCS 2007), reviewing ADEQ files, and reviewing information in the 2004 Integrated Report (ADEQ 2005b). The search yielded a total of 14 facilities for all seven reaches. Search results, including flow rate and pertinent permit limits, are summarized in Tables B.1 through B.4 (located in Appendix B). Locations of the permitted facilities are shown on Figures A.1 through A.3 in Appendix A.

Storm runoff from areas within the city limits for West Memphis, Marion, and Sunset is classified as a point source because these cities have a Municipal Separate Storm Sewer System (MS4) permit. These three cities are contiguous and form one urban area that covers 8.7% of the

total drainage area for Blackfish Bayou reach 08020203-005. This MS4 permit does not set numeric limits for the quality of storm runoff from the urban area, but it does require these cities to identify and implement best management practices (BMPs) to minimize pollutants in storm runoff.

2.6 Nonpoint Sources

The 2004 Integrated Report specified "unknown" as the suspected source for the siltation/turbidity impairments in Big Creek, Moro Creek, and Prairie Creek. The 2004 Integrated Report specified agriculture as the suspected source for the siltation/turbidity impairment in Blackfish Bayou. Streams in the St. Francis River basin (including Blackfish Bayou) were characterized as follows:

> "The assessment concludes that essentially all of the streams within these segments have high turbidity and silt loads carried into the streams from row crop agriculture activities. This condition was encouraged by the drainage of lowland areas and by ditching and the channelization of streams to facilitate the runoff. The continuation of such activities and the continuous maintenance dredging of the ditches and streams aggravates and further deteriorates the conditions" (ADEQ 2005b).

3.0 EXISTING WATER QUALITY DATA FOR TURBIDITY AND TSS

3.1 General Description of Data

Routine monitoring data for turbidity and total suspended solids (TSS) data have been collected by ADEQ at four water quality stations located along the stream reaches that are being addressed in this report. Locations of these sampling sites are shown on Figures A.1 through A.3 in Appendix A. Table 3.1 shows summaries of the turbidity and TSS data. The TSS data are included in this summary because TSS is needed as a surrogate parameter for expressing the turbidity TMDLs. These data were downloaded from the ADEQ web site (ADEQ 2007). The individual values are listed in Tables C.1 through C.4 in Appendix C. Time series plots of the turbidity and TSS data are shown on Figures C.1 through C.8 in Appendix C.

Table 3.1. Turbidity and TSS data for streams addressed in this report.

	OUA0043	OUA0028	OUA0040	FRA0027
Station Description	Big Creek near Pansy	Moro Creek east of Hampton	Prairie Creek below Mena	Blackfish Bayou near Wildwood
Period of Record	9/4/90 – 4/3/07	10/16/90 – 4/3/07	9/11/90 – 4/18/07	11/6/00 – 9/11/01
Turbidity Statistics				
Number of Values	158	159	193	6
Minimum (NTU)	5.1	2.0	0.8	25
Maximum (NTU)	252	361	215	470
Median (NTU)	20	17	11	77
TSS Statistics				
Number of Values	154	152	192	6
Minimum (mg/L)	0.5	1.0	<1	31
Maximum (mg/L)	414	116	360	373
Median (mg/L)	9.4	7.5	7.0	110.5

Tables C.1 through C.4 include 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" criteria) and storm flow data (to be compared with the "storm-flow" criteria). 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 40^{th} 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 was less than the 40th percentile flow (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 was more than the 40th percentile.

3.2 Seasonal Patterns

Plots of turbidity and TSS versus day of year were developed to determine if any seasonal patterns were evident for these data (shown on Figures C.9 through C.16 in Appendix C). No seasonal patterns were apparent in any of the data. Insufficient data were available to evaluate seasonal patterns for Blackfish Bayou.

3.3 Relationships with Flow

Plots of turbidity and TSS versus stream flow were developed to determine if any relationships between water quality and stream flow were evident for these data (Figures C.17 through C.24 in Appendix C). No relationships were apparent in any of the data, except for Blackfish Bayou, where higher turbidity and TSS values tended to occur during higher flows.

3.4 Relationships Between Turbidity and TSS

Plots of TSS versus turbidity for each station (Figures C.25 through C.28) showed a noticeable correlation, with higher turbidity values tending to correspond with higher TSS concentrations. Linear regressions were performed on the natural logarithms of turbidity and TSS for each of the water quality stations. The results of these regressions are summarized in Table 3.2. The regressions were performed using the natural logarithms of the data (rather than the raw data values) because turbidity and TSS usually fit a lognormal distribution better than a normal distribution.

Table 3.2. Summary of results of turbidity and TSS regressions.

Sampling Station	Regression Equation	Number of Data	R^2	Significance Level (P value)
OUA0043	ln(Turbidity) = 0.39 * ln(TSS) + 2.15	154	0.52	1.01E-25
OUA0028	ln(Turbidity) = 0.48 * ln(TSS) + 1.84	148	0.39	2.32E-17
OUA0040	ln(Turbidity) = 0.68 * ln(TSS) + 1.15	185	0.58	1.17E-36
FRA0027	ln(Turbidity) = 1.18 * ln(TSS) – 0.98	6	0.88	0.005

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 turbidity that is explained or accounted for by the fitted regression (TSS). For example, 88% of the variation in turbidity at station FRA0027 is accounted for by TSS and the remaining 12% of variation in turbidity is unexplained. The unexplained portion is attributed to factors other than TSS. The correlations between TSS and turbidity were somewhat variable, with R^2 values ranging from 0.39 to 0.88.

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 items affecting the relationship follows:

1. Velocity of the water at the time of sampling;
2. Carbonaceous biochemical oxygen demand (CBOD) concentration;
3. Ammonia concentration;
4. Nitrate concentration;
5. Phosphorus concentration;
6. Algal mass in the water column;
7. Bacteria mass in the water;
8. Measured color of the water;
9. Mass of the organic component of the TSS;
10. Mass of the material passing through the filter during the TSS analysis;
11. Grain size distribution of the inorganic portion of the TSS;
12. Specific gravity of the different sizes of inorganic solids particles;
13. Hydrograph for the stream;
14. Position on the hydrograph (i.e., rising limb, falling limb) at the time of sampling;
15. Number of overlapping rainfall events represented by this sample day;
16. Magnitude of each of the rainfall events represented by this sample day; and
17. 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 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 regressions presented above between TSS and turbidity are adequate for the preparation of these TMDLs. Stakeholder groups of knowledgeable persons from these watersheds may need additional information to set plans of action for these TMDLs.

The statistical significance for each regression was evaluated by computing the "P value" for the slope for each regression. 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 values for these regressions were all less than 0.01, which is considered good.

4.0 TMDL DEVELOPMENT

4.1 Seasonality and Critical Conditions

USEPA's 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. The historical data and analyses presented in Section 3.0 did not reveal any noticeable seasonal patterns, and the only noticeable relationship between concentration and flow was a relationship of increasing turbidity and TSS with increasing flow for Blackfish Bayou. Based on these analyses, the TMDLs in this report were not developed on a seasonal basis. The methodology used to develop these TMDLs (load duration curve) addresses a wide range of flow conditions.

4.2 Water Quality Targets

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."

The relationships between turbidity and TSS presented in Table 3.2 were used to develop target TSS concentrations (i.e., numeric endpoints for the TMDLs). The target TSS concentrations developed for these TMDLs are shown in Table 4.1. The discussion in Section 3.1 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.

Table 4.1. TSS target concentrations.

Stream Name	Water Quality Station	Flow Category	Turbidity Criterion	Target TSS
Big Creek	OUA0043	Base flow	21 NTU	10 mg/L
		Storm flow	32 NTU	28 mg/L
Moro Creek	OUA0028	Base flow	21 NTU	12 mg/L
		Storm flow	32 NTU	29 mg/L
Prairie Creek	OUA0040	Base flow	10 NTU	5 mg/L
		Storm flow	18 NTU	13 mg/L
Blackfish Bayou	FRA0027	Base flow	75 NTU	90 mg/L
		Storm flow	250 NTU	251 mg/L

4.3 Methodology for TMDL Calculations

The methodology used for the TMDLs was 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 (KDHE) web site (KDHE 2007). This method was used to illustrate allowable loading at a wide range of flows. The steps for how this methodology was applied for the TMDLs in this report can be summarized as follows:

1. Develop a flow duration curve (Section 4.4);
2. Convert the flow duration curve to load duration curves (Section 4.5);
3. Calculate TMDL components (Sections 4.6 – 4.8);
4. Plot observed loads with load duration curves (Section 4.9); and
5. Calculate percent reductions required to meet assessment criteria (Section 4.10).

4.4 Flow Duration Curves

A flow duration curve was developed for each stream reach using daily stream flows that were estimated as described in Section 2.3. Daily stream flows were sorted in increasing order and the percentile ranking of each flow was calculated. Each flow duration curve was 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 D (Figure D.1): flow duration for reach 08020203-007
Appendix E (Figure E.1): flow duration for reach 08020203-005
Appendix F (Figure F.1): flow duration for reach 08020203-003
Appendix G (Figure G.1): flow duration for reach 08040101-048
Appendix H (Figure H.1): flow duration for reach 08040201-001U
Appendix I (Figure I.1): flow duration for reach 08040201-001L
Appendix J (Figure J.1): flow duration for reach 08040204-005

4.5 Load Duration Curves

The flow values from each flow duration curve were multiplied by the appropriate target TSS concentration (from Table 4.1) to calculate allowable load duration curves. Each load duration curve is a plot of tons per day of TSS versus the percent exceedances from the flow duration curve. The load duration curves are presented in the following appendices:

Appendix D (Figures D.2 and D.3): load durations for reach 08020203-007
Appendix E (Figures E.2 and E.3): load durations for reach 08020203-005
Appendix F (Figures F.2 and F.3): load durations for reach 08020203-003
Appendix G (Figures G.2 and G.3): load durations for reach 08040101-048
Appendix H (Figures H.2 and H.3): load durations for reach 08040201-001U
Appendix I (Figures I.2 and I.3): load durations for reach 08040201-001L
Appendix J (Figures J.2 and J.3): load durations for reach 08040204-005

The calculations for these load duration curves are shown in Tables D.1, E.1, 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 3.1, 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 40^{th} percentile would have some influence from storm runoff. The TSS targets corresponding to the primary turbidity criteria were applied to the lowest 40% of flows (from 100% exceedance of stream flow to 60% exceedance of stream flow). The TSS targets corresponding to the storm flow turbidity criteria were applied from 60% exceedance of stream flow to 0% exceedance of stream flow.

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 often be made from the plotted data.

The load duration curve shows the calculation of the TMDL at all flows, rather than at a single critical flow. The official TMDL 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.

4.6 TMDL and MOS

Each TMDL was calculated by integrating the area under the load duration curve. Each storm flow TMDL was the area under the curve between the 0% and 60% exceedances. Each base flow TMDL was the area under the curve between the 60% and 100% exceedances. The area on these plots represents a load because the vertical axis is tons/day and the horizontal axis is unitless (percentage). The TMDL calculations are shown in Tables D.1, E.1, F.1, G.1, H.1, I.1, and J.1.

Both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to include a 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. An implicit MOS was established for each of these TMDLs by assuming that TSS is a conservative material (i.e., will not settle out of the water column).

4.7 Point Source Loads

A WLA was specified for Blackfish Bayou reach 08020203-005 to account for loading from runoff from the area covered by the MS4 permit for the cities of West Memphis, Marion, and Sunset. This WLA was estimated as the TMDL for Blackfish Bayou reach 08020203-005 multiplied by 8.7%, which is the percentage of the watershed that is inside the city limits for West Memphis, Marion, and Sunset.

The WLAs for point source loads in all the other TMDLs were set to NA ~~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 point sources discharging to these streams 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 WLAs to support these turbidity TMDLs will not require any changes to the permits concerning inorganic suspended solids. Future growth for these permits or new permits would not be restricted by these turbidity TMDLs.

4.8 Nonpoint Source Loads

Each LA for nonpoint sources was set equal to the TMDL minus the MOS and the WLA.

4.9 Observed Loads

Observed loads were calculated for the four sampling stations by multiplying each observed TSS concentration by the estimated flow for that 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 same plot as the load duration curve. Observed loads were calculated and plotted only for reaches where ADEQ sampling stations were located. Observed loads are shown on Figures D.2, D.3, G.2, G.3, H.2, H.3, J.2, and J.3.

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

4.10 Percent Reductions

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 plot of observed loads (Figures D.2, D.3, G.2, G.3, H.2, H.3, J.2, and J.3), a uniform percent reduction factor was applied to the actual loads until the number of loads above the load duration curve was less than or equal to an acceptable number. The acceptable number of exceedances for storm flow conditions was 20% of the number of storm flow loads because the Arkansas water quality standards 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). The acceptable number of exceedances for base flow conditions was 25% of the number of base flow loads because this is the percentage used by ADEQ for assessment concerning turbidity under base flow conditions (ADEQ 2005b). Whenever the percentage multiplied by the number of observed loads 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 are provided in the appendices of this report along with the corresponding calculations for the load duration curves (Appendices D through J as listed in Section 4.5). Results of the calculations for percent reductions and components of the TMDLs are summarized in Table 4.2.

Table 4.2. Summary of TMDLs for siltation/turbidity.

Reach Number	Stream Name	Flow Category	Loads (tons/day of TSS)				Percent Reduction
			WLA	LA	MOS	TMDL	
08020203-007	Blackfish Bayou	Base flow	~~0~~NA	3.17	implicit	3.17	15% for base flow, 0% for storm flow
		Storm flow	~~0~~NA	167	implicit	167	
08020203-005	Blackfish Bayou	Base flow	0.66	6.96	implicit	7.62	
		Storm flow	35	366	implicit	401	
08020203-003	Blackfish Bayou	Base flow	~~0~~NA	8.57	implicit	8.57	
		Storm flow	~~0~~NA	451	implicit	451	
08040101-048	Prairie Creek	Base flow	~~0~~NA	0.030	implicit	0.030	73%
		Storm flow	~~0~~NA	1.40	implicit	1.40	0%
08040201-001U	Moro Creek	Base flow	~~0~~NA	0.0156	implicit	0.0156	0% for base flow, 0% for storm flow
		Storm flow	~~0~~NA	19.6	implicit	19.6	
08040201-001L	Moro Creek	Base flow	~~0~~NA	0.0531	implicit	0.0531	
		Storm flow	~~0~~NA	79.8	implicit	79.8	
08040204-005	Big Creek	Base flow	~~0~~NA	0.0128	implicit	0.0128	50%
		Storm flow	~~0~~NA	18.6	implicit	18.6	0%

5.0 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*.

6.0 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.

7.0 REFERENCES

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APPENDIX A

Maps

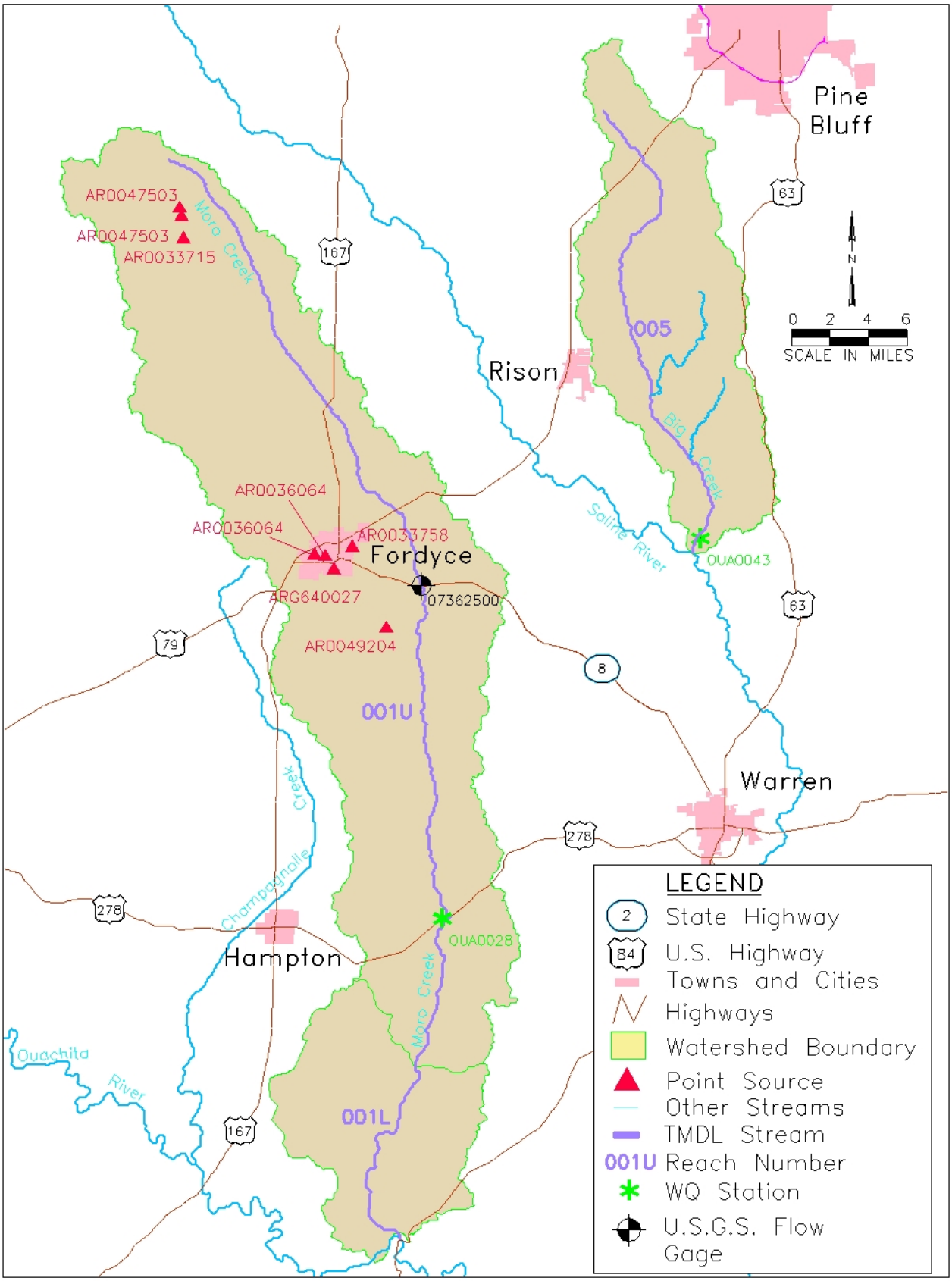

Figure A.1. Moro Creek and Big Creek study areas.

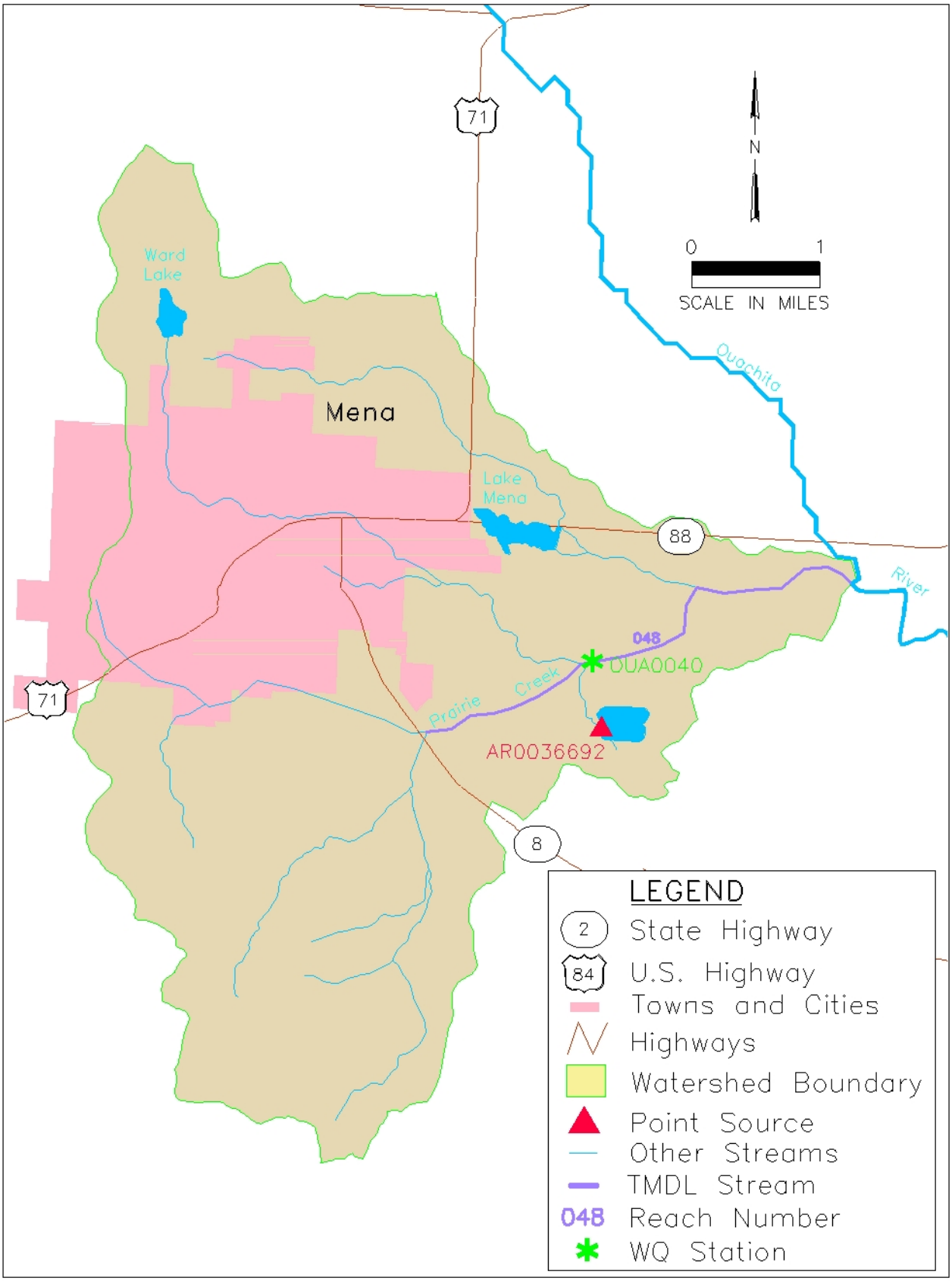

Figure A.2. Prairie Creek study area.

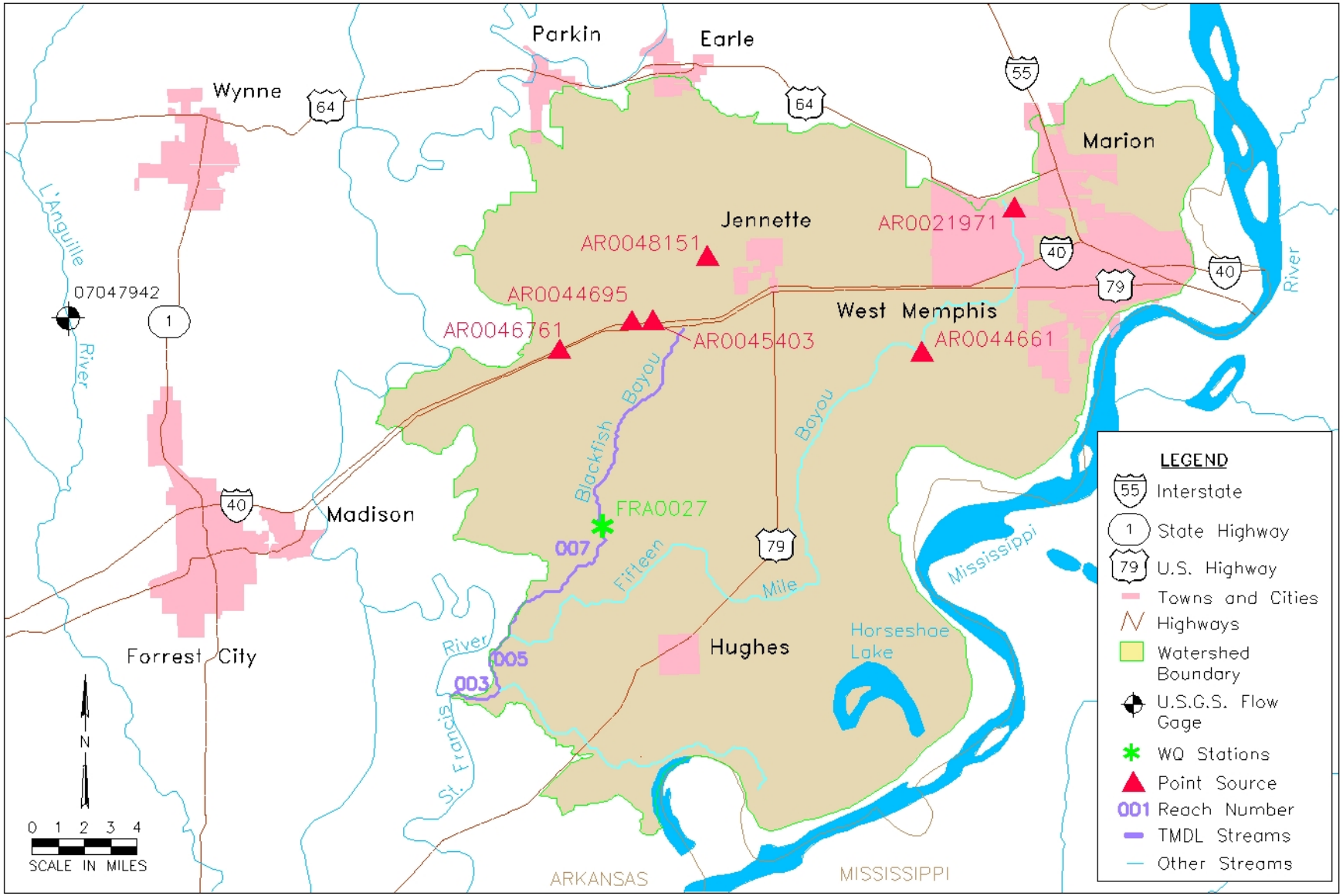

Figure A.3. Blackfish Bayou study area.

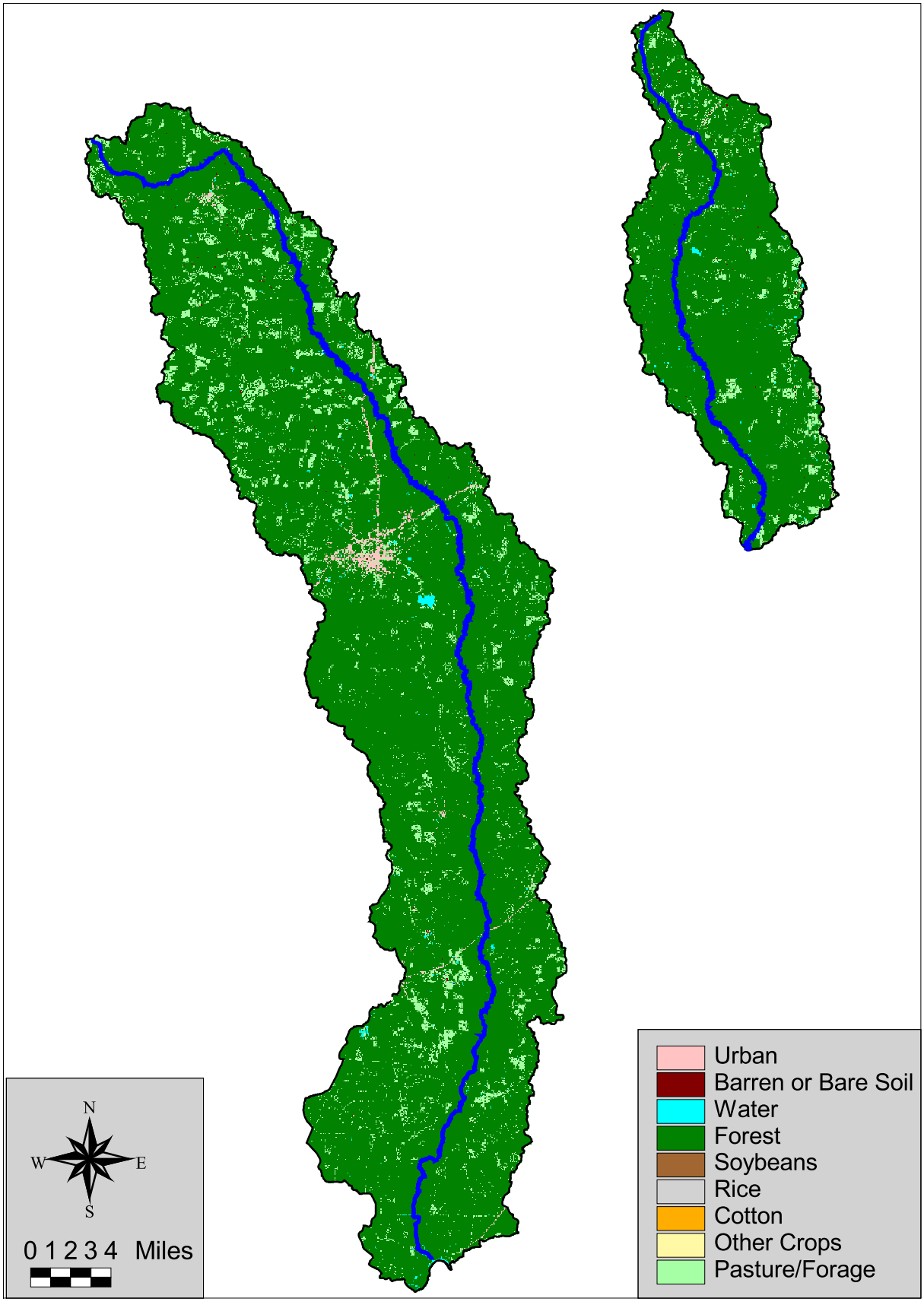

Figure A.4. Land use for Moro Creek and Big Creek.

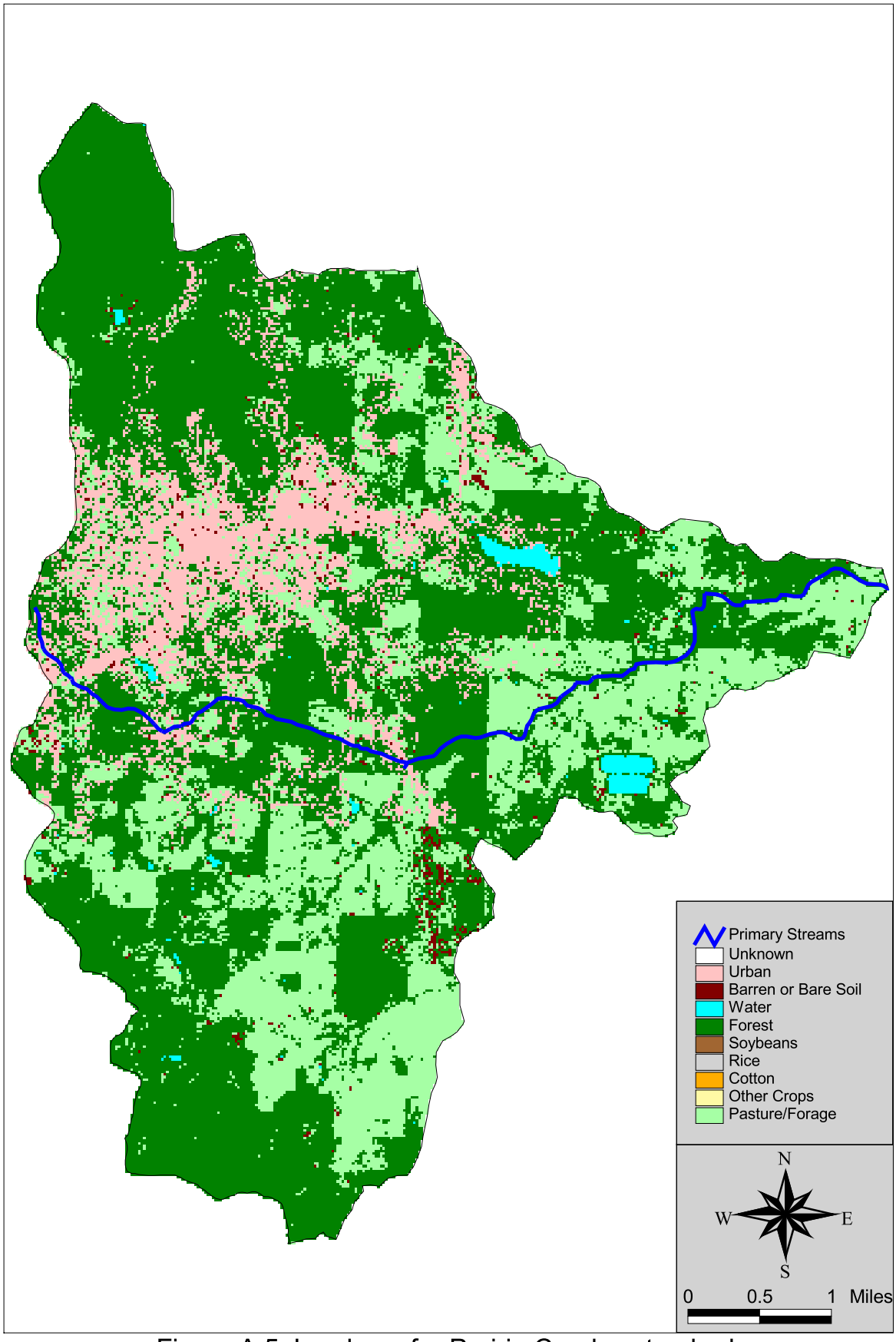

Figure A.5. Land use for Prairie Creek watershed.

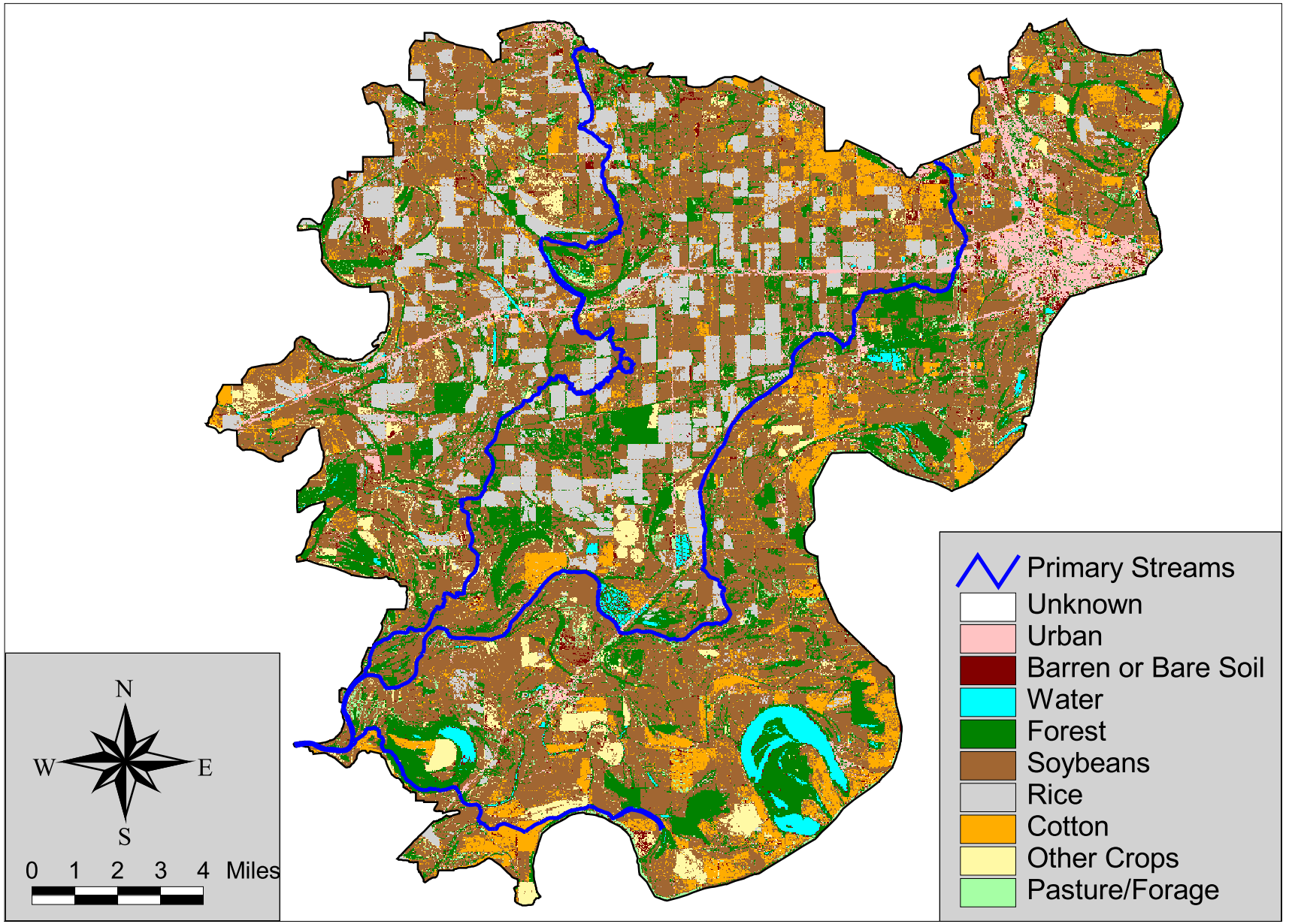

Figure A.6. Land use for Blackfish Bayou watershed.

APPENDIX B

Permitted Point Source Discharges

Table B.1. List of Point Sources Discharging into Blackfish Bayou.

NPDES	Type of Facility	Facility Name	Flowrate (MGD)	Outfal Number	Receiving Waters	Average Limit Concentration (mg/L)	Maximum Limit Concentration (mg/L)	Parameter
AR0021971	SEWERAGE SYSTEMS	CITY OF MARION	1.6	001	15-MILE BAYOU, BLACK FISH BAYOU, ST FRANCIS RIVER	20	30	TOTAL SUSPENDED SOLIDS
AR0044661	SEWERAGE SYSTEMS	CITY OF EDMONDSON	0.063	001	15-MILE BAYOU, BLACK FISH BAYOU, ST FRANCIS RIVER	90	135	TOTAL SUSPENDED SOLIDS
AR0044695	HOTELS AND MOTELS	SUPER 8 MOTEL, FORMERLY: BEST WESTERN LAKESIDE	0.012	001	SHELL LAKE, BLACKFISH BAYOU, ST FRANCIS RIVER	15	23	TOTAL SUSPENDED SOLIDS
AR0045403	GASOLINE SERVICE STATIONS	WEST MEMPHIS TRAVEL CENTER,FORMERLY: TRAVELCENTERS OF AMERICA	0.03	001	BLACKFISH BAYOU, ST FRANCIS RIVER	20	30	TOTAL SUSPENDED SOLIDS
AR0046761	GASOLINE SERVICE STATIONS	MAPCO EXPRESS INC #3155	0.021	001	UNNAMED TRIBUTARY, BLAKFISH BAYOU, ST FRANCIS RIVER	20	30	TOTAL SUSPENDED SOLIDS
				002	UNNAMED TRIBUTARY, BLAKFISH BAYOU, ST FRANCIS RIVER	35	53	TOTAL SUSPENDED SOLIDS
AR0048151	SEWERAGE SYSTEMS	TOWN OF JENNETTE	0.043	001	BLACKFISH BAYOU, ST FRANCIS RIVER	90	135	TOTAL SUSPENDED SOLIDS

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Table B.2. List of Point Sources Discharging into Prairie Creek.

NPDES	Type of Facility	Facility Name	Flowrate (MGD)	Outfal Number	Receiving Waters	Average Limit Concentration (mg/L)	Maximum Limit Concentration (mg/L)	Parameter
AR0036692	SEWERAGE SYSTEMS	CITY OF MENA	3.1	001	TRIBUTARY, PRAIRIE CREEK, QUACHITA RIVER	15	22.5	TOTAL SUSPENDED SOLIDS

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Table B.3. List of Point Sources Discharging into Moro Creek.

NPDES	Type of Facility	Facility Name	Flowrate (MGD)	Outfal Number	Receiving Waters	Average Limit Concentration (mg/L)	Maximum Limit Concentration (mg/L)	Parameter
AR0033715	SEWERAGE SYSTEMS	CARTHAGE CITY OF	0.09	001	TRIBUTARY, MORO CREEK, OUACHITA RIVER	20 (summer), 30 (winter)	30 (summer), 45 (winter)	TOTAL SUSPENDED SOLIDS
AR0033758	SEWERAGE SYSTEMS	FORDYCE CITY OF	0.84	001	JUG CREEK, MORO CREEK, OUACHITA RIVER	15 (summer), 20 (winter)	23 (summer), 30 (winter)	TOTAL SUSPENDED SOLIDS
AR0036064	SOFTWOOD VENEER AND PLYWOOD	GEORGIA PACIFIC WOOD PRODUCTS	0.357	001	DITCH, JUG CREEK, MORO CREEK	30	45	TOTAL SUSPENDED SOLIDS
				002		35	53	TOTAL SUSPENDED
AR0047503	SAWMILLS & PLANING MILLS GEN	IDAHO TIMBER CORP OF CARTHAGE	0.01	001	TRIBUTARY, MORO CREEK, SALINE RIVER	35	53	TOTAL SUSPENDED SOLIDS
				002		35	53	TOTAL SUSPENDED SOLIDS
AR0049204	RECONSTITUTED WOOD PRODUCTS	GEORGIA PACIFIC-FORDYCE OSB FA	0.006	001	TRIBUTARY, MORO CREEK, OUACHITA RIVER	20	30	TOTAL SUSPENDED SOLIDS
ARG640027	WATER SUPPLY	FORDYCE WATER SYSTEM	0.093	001	ACRUMAN DITCH, MORO CREEK, OUACHITA	20	30	TOTAL SUSPENDED SOLIDS

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Table B.4. List of Point Sources Discharging into Big Creek.

NPDES	Type of Facility	Facility Name	Flowrate (MGD)	Outfal Number	Receiving Waters	Average Limit Concentration (mg/L)	Maximum Limit Concentration (mg/L)	Parameter
ARG640110	WATER SUPPLY	WOODLAWN WATER TREATMENT PLANT	0.0493	001	BIG CREEK	20	30	TOTAL SUSPENDED SOLIDS

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APPENDIX C

Water Quality Data and Plots

Table C.1. Observed Turbidity and TSS Data for Big Creek at OUA0043.

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Big Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
9/26/2006	39.6	10.2	0.001	92.3	Base flow	21	No	
11/28/2006	7.7	7.5	0.001	92.3	Base flow	21	Yes	
10/10/1995	21.0	19.5	0.6	77.6	Base flow	21	Yes	
6/14/2005	35.1	10.2	0.7	76.5	Base flow	21	No	
11/7/1995	32.0	25.0	0.8	76.0	Base flow	21	No	
8/22/1995	17.0	19.0	1.1	73.7	Base flow	21	Yes	
9/11/1995	24.0	20.5	1.1	73.7	Base flow	21	No	
9/21/1993	24.0	10.0	1.8	69.9	Base flow	21	No	
8/24/1993	12.0	10.0	2.1	68.7	Base flow	21	Yes	
9/4/1990	52.0	48.0	2.9	66.3	Base flow	21	No	
5/17/2005	27.9	6.8	3.0	66.0	Base flow	21	No	
10/15/1991	57.0	31.0	3.1	65.7	Base flow	21	No	
10/20/1992	29.0	20.0	3.1	65.7	Base flow	21	No	
8/31/2004	12.1	5.2	3.2	65.5	Base flow	21	Yes	
7/26/1993	20.0	15.0	3.5	64.8	Base flow	21	Yes	
1/17/2006	51.3	18.7	3.9	64.1	Base flow	21	No	
7/25/1995	17.0	5.5	4.0	63.9	Base flow	21	Yes	
6/27/1995	25.0	10.5	4.9	62.3	Base flow	21	No	
10/2/1990	89.0	55.0	5.3	61.7	Base flow	21	No	
12/19/2006	14.7	2.5	6.2	60.7	Base flow	21	Yes	
8/6/1991	58.0	49.0	6.5	60.3	Base flow	21	No	
8/25/1992	18.0	18.0	6.9	59.7	Storm flow	32		Yes
10/12/1993	48.0	12.0	6.9	59.7	Storm flow	32		No
8/5/1997	21.0	9.0	6.9	59.7	Storm flow	32		Yes
9/3/1991	58.0	70.0	7.7	58.9	Storm flow	32		No
12/12/1995	60.0	47.5	7.7	58.9	Storm flow	32		No
8/27/1996	15.0	9.5	8.5	58.0	Storm flow	32		Yes
1/16/1996	19.0	5.5	9.3	57.2	Storm flow	32		Yes
12/9/2003	17.5	17.0	10	56.2	Storm flow	32		Yes
10/15/1996	13.0	10.5	11	55.9	Storm flow	32		Yes
9/22/1992	33.0	26.0	11	55.9	Storm flow	32		No
10/30/1990	9.0	6.0	11	55.0	Storm flow	32		Yes
8/30/1994	22.0	11.5	11	55.0	Storm flow	32		Yes
6/8/1999	25.5	5.5	11	55.0	Storm flow	32		Yes
8/10/2004	27.4	4.0	12	54.5	Storm flow	32		Yes
7/17/2001	23.0	9.2	12	54.1	Storm flow	32		Yes
9/24/1996	26.0	10.0	13	53.3	Storm flow	32		Yes
4/25/2006	17.5	7.2	14	53.0	Storm flow	32		Yes
12/20/1999	34.0	7.0	14	52.6	Storm flow	32		No
11/17/1992	43.0	19.0	15	52.6	Storm flow	32		No
7/28/1992	18.0	19.0	15	52.1	Storm flow	32		Yes
10/29/1991	45.0	26.0	16	51.7	Storm flow	32		No
11/6/2001	8.7	0.5	16	51.2	Storm flow	32		Yes
6/14/1993	32.0	9.0	16	50.8	Storm flow	32		Yes
7/5/1994	28.0	7.5	18	49.3	Storm flow	32		Yes

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Big Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
5/5/1998	23.0	8.5	18	49.3	Storm flow	32		Yes
3/27/2007	16.5	6.8	19	49.0	Storm flow	32		Yes
7/8/1997	26.0	8.0	20	48.8	Storm flow	32		Yes
6/20/2006	21.9	7.8	21	47.9	Storm flow	32		Yes
6/11/1996	32.0	10.5	21	47.7	Storm flow	32		Yes
10/11/1994	28.0	24.0	22	47.7	Storm flow	32		Yes
2/20/1996	41.0	56.5	23	47.3	Storm flow	32		No
5/25/2004	32.2	7.3	23	47.1	Storm flow	32		No
8/2/1994	29.0	4.5	24	46.8	Storm flow	32		Yes
1/20/2004	35.2	20.8	24	46.6	Storm flow	32		No
5/30/1995	19.0	3.5	25	46.4	Storm flow	32		Yes
4/15/2003	13.3	6.8	27	45.4	Storm flow	32		Yes
6/27/2000	35.0	5.5	28	44.9	Storm flow	32		No
7/9/1991	36.0	23.0	29	44.9	Storm flow	32		No
7/9/1996	20.0	12.5	29	44.9	Storm flow	32		Yes
12/10/2002	12.1	5.5	29	44.8	Storm flow	32		Yes
11/12/2002	14.1	4.0	30	44.4	Storm flow	32		Yes
1/31/2006	31.6	6.0	32	43.9	Storm flow	32		Yes
12/6/1994	5.1	0.5	34	43.3	Storm flow	32		Yes
5/20/1997	27.0	11.5	37	42.6	Storm flow	32		Yes
5/18/1999	34.0		39	42.1	Storm flow	32		No
1/28/2003	12.2	2.0	39	41.9	Storm flow	32		Yes
4/24/2007	18.6	5.2	41	41.3	Storm flow	32		Yes
9/4/2001	23.0	5.8	42	41.1	Storm flow	32		Yes
11/27/1990	6.6	10.0	44	40.5	Storm flow	32		Yes
5/5/1992	8.9	8.0	45	40.5	Storm flow	32		Yes
5/30/2006	18.5	4.0	46	40.1	Storm flow	32		Yes
5/30/2000	28.0	30.0	46	40.0	Storm flow	32		Yes
12/14/1992	17.0	10.0	47	39.9	Storm flow	32		Yes
6/19/2001	18.0	5.0	47	39.9	Storm flow	32		Yes
3/8/1999	11.0	4.3	49	39.3	Storm flow	32		Yes
7/13/1999	28.0	22.5	49	39.3	Storm flow	32		Yes
12/5/2000	13.0	1.5	49	39.3	Storm flow	32		Yes
5/18/1993	17.0	10.0	50	39.0	Storm flow	32		Yes
3/14/2000	6.0	3.0	51	38.9	Storm flow	32		Yes
1/7/1992	9.2	5.0	52	38.8	Storm flow	32		Yes
4/21/1992	17.0	14.0	58	37.5	Storm flow	32		Yes
11/25/1991	18.0	8.0	64	36.2	Storm flow	32		Yes
12/21/1993	13.0	1.5	65	36.2	Storm flow	32		Yes
6/9/1992	24.0	14.0	65	36.0	Storm flow	32		Yes
4/30/1996	18.0	11.5	68	35.6	Storm flow	32		Yes
6/18/1991	32.0	14.0	69	35.4	Storm flow	32		Yes
11/8/1994	19.0	11.5	73	35.0	Storm flow	32		Yes
1/19/1999	7.9	0.5	78	34.4	Storm flow	32		Yes
1/2/2002	11.0	1.3	80	34.0	Storm flow	32		Yes
4/11/2000	12.0	4.0	81	33.9	Storm flow	32		Yes
1/11/1994	10.0	3.5	83	33.5	Storm flow	32		Yes

Table C1 Summary of Historical Water Quality data for Big Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Big Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
2/27/2007	34.6	19.0	88	32.9	Storm flow	32		No
11/16/1993	20.0	14.0	92	32.5	Storm flow	32		Yes
6/10/1997	21.0	5.5	92	32.5	Storm flow	32		Yes
12/10/1996	13.0	3.5	97	31.8	Storm flow	32		Yes
4/22/1997	26.0	21.0	100	31.4	Storm flow	32		Yes
7/27/2004	46.6	34.8	105	30.9	Storm flow	32		No
4/12/1994	12.0	7.5	107	30.8	Storm flow	32		Yes
4/24/2001	17.0	12.8	107	30.8	Storm flow	32		Yes
2/21/1995	7.2	1.5	110	30.4	Storm flow	32		Yes
11/19/1996	15.0	2.5	111	30.4	Storm flow	32		Yes
3/12/1991	9.3	11.0	116	29.8	Storm flow	32		Yes
4/13/1999	12.0	7.0	120	29.4	Storm flow	32		Yes
3/31/1998	16.0	12.0	122	29.2	Storm flow	32		Yes
3/18/2003	17.5	10.0	122	29.1	Storm flow	32		Yes
5/22/2001	23.0	9.0	124	29.0	Storm flow	32		Yes
1/30/2007	23.0	3.5	125	28.8	Storm flow	32		Yes
3/5/2002	12.0	3.8	127	28.7	Storm flow	32		Yes
3/16/1993	11.0	9.0	144	27.4	Storm flow	32		Yes
12/9/1997	17.0	5.0	150	26.8	Storm flow	32		Yes
4/19/2005	23.9	8.2	151	26.7	Storm flow	32		Yes
2/12/1991	16.0	10.0	154	26.6	Storm flow	32		Yes
3/21/1995	17.0	9.5	155	26.4	Storm flow	32		Yes
4/16/1996	14.0		159	26.2	Storm flow	32		Yes
2/15/2005	20.0	8.8	174	25.1	Storm flow	32		Yes
5/14/1991	8.0	49.0	176	25.0	Storm flow	32		Yes
2/9/1999	10.0	3.5	184	24.5	Storm flow	32		Yes
2/16/1993	24.0	26.0	203	23.3	Storm flow	32		Yes
2/4/1997	17.0		209	23.0	Storm flow	32		Yes
1/6/1998	26.0		212	22.9	Storm flow	32		Yes
4/20/1993	22.0	17.0	213	22.8	Storm flow	32		Yes
1/7/1997	17.0	7.0	222	22.4	Storm flow	32		Yes
3/17/1992	19.0	12.0	223	22.4	Storm flow	32		Yes
12/21/1998	18.0	1.0	238	21.8	Storm flow	32		Yes
3/26/1996	27.0	25.0	256	21.1	Storm flow	32		Yes
2/3/1998	16.0	3.5	258	21.0	Storm flow	32		Yes
5/17/1994	22.0	21.5	277	20.4	Storm flow	32		Yes
5/20/2003	36.6	38.8	304	19.3	Storm flow	32		No
4/11/1995	82.0	224.0	316	18.9	Storm flow	32		No
3/28/2006	27.1	3.8	340	18.2	Storm flow	32		Yes
3/1/1994	13.0	5.0	354	17.6	Storm flow	32		Yes
3/22/2005	252.0	414.0	364	17.4	Storm flow	32		No
11/9/2004	20.8	7.8	378	16.9	Storm flow	32		Yes
12/14/2004	18.4	4.5	412	16.2	Storm flow	32		Yes
2/12/2002	15.0	4.0	415	16.1	Storm flow	32		Yes
12/11/2001	20.0	9.0	428	15.7	Storm flow	32		Yes
1/30/2001	30.0	19.8	433	15.6	Storm flow	32		Yes
4/2/1991	25.0	24.0	454	15.2	Storm flow	32		Yes

Table C1 Summary of Historical Water Quality data for Big Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Big Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
10/12/2004	42.9	25.5	500	14.2	Storm flow	32		No
1/19/1993	22.0	18.0	518	13.7	Storm flow	32		Yes
1/2/1991	23.0	12.0	527	13.6	Storm flow	32		Yes
2/22/1994	56.0	139.0	531	13.5	Storm flow	32		No
2/18/1992	19.0	16.0	535	13.4	Storm flow	32		Yes
3/3/1998	18.0	7.0	547	13.2	Storm flow	32		Yes
3/18/1997	17.0	11.0	559	12.9	Storm flow	32		Yes
2/10/2004	32.4	7.0	621	11.6	Storm flow	32		No
3/20/2001	7.5	4.0	636	11.4	Storm flow	32		Yes
5/7/2002	15.0	12.5	766	9.2	Storm flow	32		Yes
6/24/2003	18.1	9.3	847	8.2	Storm flow	32		Yes
6/4/2002	27.0	14.5	859	8.0	Storm flow	32		Yes
6/21/1993	20.0	14.0	867	7.9	Storm flow	32		Yes
3/9/2004	23.8	8.5	1,080	5.9	Storm flow	32		Yes
2/20/2001	8.4	2.8	1,268	4.7	Storm flow	32		Yes
7/6/2004	7.3	0.5	1,420	4.0	Storm flow	32		Yes
4/13/2004	28.7	22.0	2,170	2.0	Storm flow	32		Yes
4/2/2002	16.0	4.5	3,520	0.7	Storm flow	32		Yes
2/18/2003	24.9	3.0	3,550	0.7	Storm flow	32		Yes
						No. of Values =	21	137
						No of exceedances =	13	21
						% of Exceedances =	61.9%	15.3%

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Table C1 Summary of Historical Water Quality data for Big Creek

Table C.2. Observed Turbidity and TSS Data for Moro Creek at OUA0028.

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Moro Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
10/25/2005	12	6.8	0	92.3	Base flow	21	Yes	
11/29/2005	12.8	5	0	92.3	Base flow	21	Yes	
12/27/2005	18.8	17.8	0	92.3	Base flow	21	Yes	
9/26/2006	10.1	6.2	0	92.3	Base flow	21	Yes	
5/24/2005	43.8	7.5	1	74.6	Base flow	21	No	
1/17/2006	9.18	6.5	4	64.2	Base flow	21	Yes	
7/21/1998	12	8.5	4	63.6	Base flow	21	Yes	
8/8/1995	15	15	5	62.8	Base flow	21	Yes	
9/21/1993	33	116	5	61.8	Base flow	21	No	
8/24/1993	7	6	6	61.0	Base flow	21	Yes	
7/23/2002	22	11.3	6	60.9	Base flow	21	No	
8/20/2002	17	5.8	7	59.4	Storm flow	32		Yes
9/30/1997	8.1	8.5	8	58.9	Storm flow	32		Yes
7/15/2003	32.1	11	8	58.9	Storm flow	32		No
8/17/2004	38.6	5.8	9	57.8	Storm flow	32		No
10/27/1992	23	25	9	57.4	Storm flow	32		Yes
8/12/2003	27.5	9.5	9	57.3	Storm flow	32		Yes
7/27/1999	16	7	10	56.9	Storm flow	32		Yes
7/26/1993	8.5	8	10	56.0	Storm flow	32		Yes
9/26/1994	30	25.5	10	56.0	Storm flow	32		Yes
9/1/1992	12	4	14	52.7	Storm flow	32		Yes
12/16/2003	17.9	7.5	15	52.3	Storm flow	32		Yes
9/29/1992	12	10	15	51.8	Storm flow	32		Yes
8/16/1994	17	6	15	51.8	Storm flow	32		Yes
5/19/1998	24	5	15	51.8	Storm flow	32		Yes
9/18/2001	22	13	15	51.8	Storm flow	32		Yes
4/18/2006	7.48	5.8	16	51.4	Storm flow	32		Yes
11/19/2001	12	3.5	17	50.6	Storm flow	32		Yes
5/21/1996	14	7	18	50.3	Storm flow	32		Yes
12/3/2002	10.3	2	18	49.9	Storm flow	32		Yes
7/17/1995	20		19	49.4	Storm flow	32		Yes
6/25/2002	28		20	48.6	Storm flow	32		Yes
10/19/2004	29.4	16.5	20	48.6	Storm flow	32		Yes
9/27/2005	13.4	6	21	48.1	Storm flow	32		Yes
9/3/1991	5	7	22	47.4	Storm flow	32		Yes
6/20/1995	32	17	22	47.4	Storm flow	32		Yes
9/29/1998	14	11	24	47.0	Storm flow	32		Yes
1/20/2004	20.5	3.5	24	46.8	Storm flow	32		Yes
3/13/2007	8.67	3.5	24	46.8	Storm flow	32		Yes
7/22/1997	20	9	26	46.0	Storm flow	32		Yes
4/15/2003	21.6	11	27	45.5	Storm flow	32		Yes
4/26/2005	44.1	13.7	27	45.5	Storm flow	32		No
7/20/2004	50	13.8	29	44.9	Storm flow	32		No
6/28/1994	22	8.5	29	44.8	Storm flow	32		Yes
9/10/1996	7.1	5	29	44.8	Storm flow	32		Yes

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Moro Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
11/6/1990	7.4	6	32	44.2	Storm flow	32		Yes
1/25/2000	7.6	2	33	43.9	Storm flow	32		Yes
5/11/2004	46.4	28.8	34	43.5	Storm flow	32		No
10/16/1990	17	12	39	42.2	Storm flow	32		Yes
8/26/1997	14	8	41	41.3	Storm flow	32		Yes
12/20/1999	8.6	3.5	41	41.3	Storm flow	32		Yes
1/30/1996	6.1		44	40.9	Storm flow	32		Yes
11/5/2002	46.5	14.2	44	40.7	Storm flow	32		No
7/2/1991		11	45	40.6	Storm flow	32		Yes
10/26/1993	9	5	46	40.3	Storm flow	32		Yes
1/21/2003	13.6	7.5	48	39.8	Storm flow	32		Yes
7/7/1992	19	8	49	39.5	Storm flow	32		Yes
5/28/2002	34	22.5	50	39.3	Storm flow	32		No
2/14/2006	18.4	8.2	50	39.3	Storm flow	32		Yes
3/12/1996	12	3	53	38.8	Storm flow	32		Yes
4/23/2002	30	25.3	54	38.5	Storm flow	32		Yes
2/6/2007	12.8	5.8	55	38.2	Storm flow	32		Yes
5/24/1994	24	12.5	55	38.1	Storm flow	32		Yes
10/28/1997	35	10	57	37.8	Storm flow	32		No
5/25/1999	25	9.5	60	37.1	Storm flow	32		Yes
2/20/1996	5.6	2.5	66	36.2	Storm flow	32		Yes
5/23/1995	28	9	67	36.0	Storm flow	32		Yes
7/19/1994	11	12.5	68	35.8	Storm flow	32		Yes
8/4/1992	14	12	72	35.3	Storm flow	32		Yes
12/1/1992	5.6	2	74	34.9	Storm flow	32		Yes
6/18/1996	32	9.5	80	34.2	Storm flow	32		Yes
1/14/2002	15	5.2	81	34.0	Storm flow	32		Yes
6/27/2000	31	16	82	33.8	Storm flow	32		Yes
11/18/1997	9.4	2.5	93	32.6	Storm flow	32		Yes
10/23/2001	12	6	99	31.9	Storm flow	32		Yes
12/18/1995	26	16.5	102	31.4	Storm flow	32		Yes
12/16/1997	13	8	104	31.3	Storm flow	32		Yes
11/28/1994	17	13.5	112	30.5	Storm flow	32		Yes
11/23/1993	10	4	113	30.4	Storm flow	32		Yes
6/9/1998	16	7.5	119	29.7	Storm flow	32		Yes
5/16/2006	23.8	12	119	29.7	Storm flow	32		Yes
6/4/1991	26	18	120	29.6	Storm flow	32		Yes
4/14/1998	17	9	125	29.1	Storm flow	32		Yes
5/5/1992	12	7	129	28.7	Storm flow	32		Yes
5/30/2000	17	11	134	28.3	Storm flow	32		Yes
6/19/2001	22	6	136	28.1	Storm flow	32		Yes
5/13/1997	42	62	140	27.8	Storm flow	32		No
5/18/1993	19	12	146	27.4	Storm flow	32		Yes
2/22/2005	38.6	15.7	150	27.1	Storm flow	32		No
1/7/1992	9.6	4	151	27.0	Storm flow	32		Yes
3/16/2004	28.4	5	151	26.9	Storm flow	32		Yes
4/19/1994	12		156	26.5	Storm flow	32		Yes

Table C2 Summary of Historical Water Quality data for Moro Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Moro Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
2/9/1993	11	4	165	26.0	Storm flow	32		Yes
12/20/1993	12	3	180	24.9	Storm flow	32		Yes
1/2/2007	21.5	4.2	190	24.3	Storm flow	32		Yes
4/24/2000	8.4	7	192	24.2	Storm flow	32		Yes
11/16/1998	7.5	3	193	24.1	Storm flow	32		Yes
2/23/1999	13	1	209	23.2	Storm flow	32		Yes
3/9/1993	19	8	213	23.1	Storm flow	32		Yes
4/7/1992	19	10	215	22.9	Storm flow	32		Yes
4/27/1999	19	8	234	22.1	Storm flow	32		Yes
3/28/1995	13	7.5	242	21.8	Storm flow	32		Yes
6/10/1997	41	22	267	20.9	Storm flow	32		No
2/4/1992	17	6	268	20.8	Storm flow	32		Yes
5/20/2003	28.2	13.2	304	19.5	Storm flow	32		Yes
11/19/1996	11	4	321	18.9	Storm flow	32		Yes
3/25/2003	22.8	8.5	330	18.6	Storm flow	32		Yes
3/12/1991	17	8	338	18.4	Storm flow	32		Yes
2/14/1995	9.4	3	348	18.1	Storm flow	32		Yes
5/22/2001	17	14.75	360	17.7	Storm flow	32		Yes
3/23/1999	14	4.5	364	17.6	Storm flow	32		Yes
3/28/2005	35.2	13.2	366	17.5	Storm flow	32		No
4/15/1997	18	8	372	17.2	Storm flow	32		Yes
2/29/2000	16		378	17.2	Storm flow	32		Yes
5/15/2004	41.9	21.5	381	17.0	Storm flow	32		No
10/1/1996	26	8	391	16.8	Storm flow	32		Yes
10/25/1994	15	7	399	16.7	Storm flow	32		Yes
12/14/2004	28.7	8.5	412	16.4	Storm flow	32		Yes
12/11/2001	11	8.5	428	15.9	Storm flow	32		Yes
6/2/1992	20	14	439	15.7	Storm flow	32		Yes
3/27/2000	13	3.5	487	14.5	Storm flow	32		Yes
12/22/1998		3.5	545	13.4	Storm flow	32		Yes
3/15/1994	16	5	598	12.2	Storm flow	32		Yes
2/26/2002	27	11.5	611	11.9	Storm flow	32		Yes
6/29/1999	29	9	639	11.5	Storm flow	32		Yes
2/5/1991	8.9	5.5	722	10.1	Storm flow	32		Yes
1/12/1993	13	6	766	9.4	Storm flow	32		Yes
1/20/1998	16		790	9.0	Storm flow	32		Yes
1/26/1999	18	3	799	8.9	Storm flow	32		Yes
8/6/1996	17	7.5	807	8.9	Storm flow	32		Yes
1/18/1994	19	9	835	8.5	Storm flow	32		Yes
1/10/1995	12		903	7.6	Storm flow	32		Yes
3/3/1992	14	9	906	7.6	Storm flow	32		Yes
12/17/1996	17	6	907	7.6	Storm flow	32		Yes
3/26/2001	12	10.8	912	7.5	Storm flow	32		Yes
7/16/1996	11	7.5	934	7.2	Storm flow	32		Yes
3/11/1997	13		948	7.1	Storm flow	32		Yes
4/23/1996	7.6	4	999	6.5	Storm flow	32		Yes
3/26/2002	16	4.25	1,100	5.8	Storm flow	32		Yes

Table C2 Summary of Historical Water Quality data for Moro Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Moro Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
4/13/1993	12	5	1,149	5.5	Storm flow	32		Yes
2/17/2004	29.5	6	1,190	5.1	Storm flow	32		Yes
1/30/2001	11	4	1,259	4.8	Storm flow	32		Yes
12/19/2000	14	3.2	1,282	4.6	Storm flow	32		Yes
4/2/1991	21	12	1,317	4.5	Storm flow	32		Yes
1/22/1991	7.8	4	1,423	4.0	Storm flow	32		Yes
11/30/2004	19.8	3.8	1,520	3.7	Storm flow	32		Yes
2/25/1997	16	4.5	1,612	3.4	Storm flow	32		Yes
2/27/2001	7.6	3.75	1,729	3.1	Storm flow	32		Yes
2/15/1994	6.8		1,988	2.4	Storm flow	32		Yes
3/17/1998	20	5.5	1,988	2.4	Storm flow	32		Yes
2/17/1998	21	4	2,000	2.4	Storm flow	32		Yes
1/28/1997	18	11.5	2,106	2.2	Storm flow	32		Yes
4/25/1995	17	7.5	2,129	2.1	Storm flow	32		Yes
4/13/2004	30.1	14.8	2,170	2.0	Storm flow	32		Yes
6/21/1993	28	13	2,517	1.6	Storm flow	32		Yes
4/3/2007	9.23	3	2,640	1.5	Storm flow	32		Yes
4/17/2001	13	8.5	2,847	1.3	Storm flow	32		Yes
2/25/2003	19.8	3	3,220	0.9	Storm flow	32		Yes
12/19/1994	16	5	3,235	0.9	Storm flow	32		Yes
5/7/1991	8.2	8	3,576	0.7	Storm flow	32		Yes
6/17/2003	19.5	8.8	5,820	0.2	Storm flow	32		Yes
						No. of Values =	11	150
						No of exceedances =	3	13
						% of Exceedances =	27.3%	8.7%

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Table C2 Summary of Historical Water Quality data for Moro Creek

Table C.3. Observed Turbidity and TSS Data for Prairie Creek at OUA0040.

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
8/29/2000		10.5	2.0	99.5	Base flow	10		
9/14/2005	49.3	18.0	2.1	98.9	Base flow	10	No	
9/5/1995	13.0	8.0	2.2	98.1	Base flow	10	No	
8/24/2005	13.6	8.2	2.3	97.3	Base flow	10	No	
7/26/2006	5.1	3.2	2.3	97.3	Base flow	10	Yes	
8/8/2001	33.0	39.7	2.4	96.5	Base flow	10	No	
9/1/1999	20.0	22.5	2.5	95.5	Base flow	10	No	
8/30/2006	50.0	28.0	2.5	95.5	Base flow	10	No	
7/11/2001	24.0	27.0	2.5	95.5	Base flow	10	No	
9/4/2002	10.2	14.3	2.5	95.5	Base flow	10	No	
9/5/2001	18.0	23.8	2.5	95.5	Base flow	10	No	
9/29/1999	12.0	12.0	2.6	94.6	Base flow	10	No	
9/8/2004	7.2	7.0	2.6	94.6	Base flow	10	Yes	
8/14/2002	18.0	12.3	2.7	93.7	Base flow	10	No	
8/25/1997	5.4	4.0	2.8	92.8	Base flow	10	Yes	
7/20/2005	11.5	4.2	2.9	92.0	Base flow	10	No	
8/15/1995	6.5	6.0	3.0	91.1	Base flow	10	Yes	
8/11/2004	31.7	23.0	3.0	91.1	Base flow	10	No	
10/26/2005	42.8	33.3	3.0	91.1	Base flow	10	No	
9/15/1997	13.0	12.5	3.2	89.4	Base flow	10	No	
10/31/1995	1.9	2.0	3.2	89.4	Base flow	10	Yes	
9/27/1994	6.2	7.0	3.3	88.4	Base flow	10	Yes	
7/26/2000	2.6	4.5	3.3	88.4	Base flow	10	Yes	
7/13/1998	3.4		3.5	86.9	Base flow	10	Yes	
10/25/2000	5.5	6.5	3.5	86.9	Base flow	10	Yes	
9/24/2003	13.1	8.5	3.7	85.6	Base flow	10	No	
10/19/1999	4.3	4.0	3.7	85.6	Base flow	10	Yes	
8/10/1998	0.8		3.8	84.9	Base flow	10	Yes	
10/2/2002	18.0	13.5	3.9	84.4	Base flow	10	No	
6/28/2005	16.6	5.5	4.0	83.9	Base flow	10	No	
8/12/2003	8.4	9.8	4.0	83.9	Base flow	10	Yes	
7/12/1993	9.6	14.0	4.2	82.8	Base flow	10	Yes	
10/3/1995	40.0	9.5	4.3	82.4	Base flow	10	No	
10/9/2001	13.0	10.5	4.3	82.4	Base flow	10	No	
11/28/1995	4.9	2.5	4.4	81.8	Base flow	10	Yes	
8/27/1996	12.0	6.0	4.4	81.8	Base flow	10	No	
10/8/1991	8.8	9.0	4.5	81.1	Base flow	10	Yes	
10/15/2003	20.5	15.0	4.5	81.1	Base flow	10	No	
10/15/2003	3.8	2.2	4.5	81.1	Base flow	10	Yes	
7/14/1997	8.4	6.5	4.5	81.1	Base flow	10	Yes	
7/28/1999	19.0	27.0	4.6	80.7	Base flow	10	No	
7/10/2002	5.9	8.8	5.0	78.6	Base flow	10	Yes	
9/14/1993	215.0	360.0	5.1	78.1	Base flow	10	No	
12/14/2005	21.4	21.0	5.3	77.3	Base flow	10	No	
7/14/1992	7.4	5.0	5.3	77.3	Base flow	10	Yes	

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
8/13/1991	7.6	6.0	5.6	76.2	Base flow	10	Yes	
6/25/1996	74.0	49.5	5.6	76.2	Base flow	10	No	
9/27/2006	25.9	17.0	5.6	76.2	Base flow	10	No	
1/18/2006	13.5	6.0	5.8	75.6	Base flow	10	No	
9/11/1990	140.0	83.0	6.0	75.0	Base flow	10	No	
6/7/2006	17.3	4.0	6.0	75.0	Base flow	10	No	
9/27/2000	17.0	12.5	6.0	75.0	Base flow	10	No	
5/24/2005	15.5	9.2	6.1	74.6	Base flow	10	No	
7/2/1991		12.0	6.4	73.6	Base flow	10		
8/10/1993	34.0	26.0	6.7	72.7	Base flow	10	No	
6/13/2001	17.0	24.0	6.8	72.4	Base flow	10	No	
7/16/2003	10.5	7.5	7.2	71.2	Base flow	10	No	
3/8/2006	3.9	2.2	7.2	71.2	Base flow	10	Yes	
11/23/1999	65.0	63.5	7.2	71.2	Base flow	10	No	
8/23/1994	10.0	10.0	7.3	70.9	Base flow	10	Yes	
10/25/2006	16.9	13.2	7.5	70.3	Base flow	10	No	
11/7/2001	8.3	13.3	7.6	70.1	Base flow	10	Yes	
6/21/1994	3.8	4.0	7.8	69.6	Base flow	10	Yes	
7/11/1995	5.1	3.5	7.8	69.6	Base flow	10	Yes	
7/21/2004	18.4	6.5	7.9	69.4	Base flow	10	No	
9/17/1996	32.0	24.5	8.5	68.1	Base flow	10	No	
6/16/1997	6.2	10.5	8.5	68.1	Base flow	10	Yes	
11/13/2003	33.5	23.6	8.5	68.1	Base flow	10	No	
8/11/1992	5.4	6.0	8.6	67.9	Base flow	10	Yes	
10/25/1994	17.0	3.5	9.0	66.8	Base flow	10	No	
10/6/1992	7.5	6.0	9.2	66.4	Base flow	10	Yes	
10/21/1997	1.5		9.4	65.9	Base flow	10	Yes	
4/23/2003	4.2	4.2	9.6	65.6	Base flow	10	Yes	
10/12/1993	19.0	13.0	10.1	64.3	Base flow	10	No	
6/20/1995	3.1	1.0	10.1	64.3	Base flow	10	Yes	
3/20/2007	14.2	11.8	10.5	63.5	Base flow	10	No	
7/30/1996	2.4	2.5	10.9	62.7	Base flow	10	Yes	
1/26/2000	6.0	7.0	10.9	62.7	Base flow	10	Yes	
6/11/1991	8.7	11.0	11.2	62.0	Base flow	10	Yes	
2/6/1996	10.0	12.5	11.4	61.6	Base flow	10	Yes	
11/17/1992	9.0	6.0	11.4	61.6	Base flow	10	Yes	
9/8/1992	19.0	12.0	11.7	60.9	Base flow	10	No	
11/6/1990	6.2	4.0	12.0	60.3	Base flow	10	Yes	
5/8/2001	8.1	11.0	12.2	59.9	Storm flow	18		Yes
4/26/1994	4.4	8.0	12.5	59.4	Storm flow	18		Yes
6/12/2002	5.8	4.0	12.7	59.1	Storm flow	18		Yes
5/12/1997	7.9	8.5	13.1	58.3	Storm flow	18		Yes
5/28/2003	6.1	3.5	13.2	58.1	Storm flow	18		Yes
1/22/2003	7.3		13.4	57.7	Storm flow	18		Yes
5/19/2004	12.6	2.8	13.8	56.8	Storm flow	18		Yes
12/10/2003	31.0	8.8	13.9	56.6	Storm flow	18		No
6/9/1998	2.6	3.5	14.1	56.3	Storm flow	18		Yes

Table C3 Summary of Historical Water Quality data for Prairie Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
6/28/1993	6.8	8.0	14.8	55.0	Storm flow	18		Yes
4/12/2006	6.3	3.8	14.9	54.8	Storm flow	18		Yes
4/20/2004	8.6	4.0	14.9	54.8	Storm flow	18		Yes
3/12/1996	6.3	3.0	15.4	53.7	Storm flow	18		Yes
5/5/1992	7.4	12.0	15.4	53.7	Storm flow	18		Yes
3/2/1999	3.3	2.0	15.6	53.3	Storm flow	18		Yes
11/2/1993	7.0	4.0	15.9	52.9	Storm flow	18		Yes
12/18/2006	6.8	2.0	16.1	52.4	Storm flow	18		Yes
5/8/2002	7.0	7.0	16.8	50.9	Storm flow	18		Yes
11/3/1998	2.8	2.0	18.3	48.4	Storm flow	18		Yes
11/17/2004	16.0	2.8	18.5	48.0	Storm flow	18		Yes
1/19/1999	3.2	1.0	18.6	47.8	Storm flow	18		Yes
6/25/2003	15.0	8.0	18.7	47.7	Storm flow	18		Yes
3/17/2004	16.1	2.5	19.1	47.3	Storm flow	18		Yes
1/3/2002	9.5	2.0	19.5	46.5	Storm flow	18		Yes
5/26/1999	8.6	8.5	19.6	46.4	Storm flow	18		Yes
2/4/1992	7.2	8.0	20.7	44.7	Storm flow	18		Yes
4/7/1992	22.0	8.0	21.1	44.4	Storm flow	18		No
2/28/2007	7.3	3.0	21.2	44.2	Storm flow	18		Yes
2/22/2005	8.0	3.5	21.2	44.2	Storm flow	18		Yes
4/27/2005	21.6	6.0	21.2	44.2	Storm flow	18		No
3/19/1991	8.6	6.0	21.5	43.7	Storm flow	18		Yes
2/6/1995	11.0	4.5	21.8	43.3	Storm flow	18		Yes
2/2/1993	11.0	7.0	21.8	43.3	Storm flow	18		Yes
3/22/1994	6.8	8.5	23.3	41.3	Storm flow	18		Yes
12/21/1999	8.6	4.0	23.3	41.3	Storm flow	18		Yes
10/13/2004	54.4	31.7	23.9	40.6	Storm flow	18		No
12/1/1992	13.0	6.0	25.6	38.8	Storm flow	18		Yes
5/16/1995	8.6	5.0	26.7	37.5	Storm flow	18		Yes
11/12/1997	7.1	4.5	26.8	37.4	Storm flow	18		Yes
3/30/1993	9.0	8.0	27.8	36.7	Storm flow	18		Yes
12/5/2001	12.0	7.5	28.4	35.9	Storm flow	18		Yes
6/2/1992	165.0	279.0	28.6	35.6	Storm flow	18		No
5/17/1994	16.0	37.0	28.9	35.2	Storm flow	18		Yes
4/18/2007	14.2	7.0	29.0	35.1	Storm flow	18		Yes
12/14/2004	9.1	1.8	29.1	35.0	Storm flow	18		Yes
10/13/1998	8.4	7.0	29.3	34.8	Storm flow	18		Yes
2/12/1991	7.6	6.0	29.5	34.6	Storm flow	18		Yes
2/3/1998	4.1	2.5	29.9	34.3	Storm flow	18		Yes
3/3/1992	7.4	6.0	30.1	34.0	Storm flow	18		Yes
4/25/2000	14.0	7.5	30.3	33.8	Storm flow	18		Yes
4/9/1991	32.0	21.0	30.9	33.2	Storm flow	18		No
12/1/1998	12.0	1.5	31.5	32.7	Storm flow	18		Yes
1/21/1997	3.8		31.6	32.6	Storm flow	18		Yes
2/16/1999	4.5	2.5	33.7	30.9	Storm flow	18		Yes
5/26/1998	1.5	1.0	34.4	30.3	Storm flow	18		Yes
1/21/1992	2.7		34.8	30.0	Storm flow	18		Yes

Table C3 Summary of Historical Water Quality data for Prairie Creek

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
5/31/2000	15.0	11.5	35.0	29.8	Storm flow	18		Yes
3/11/1997	9.5		38.1	27.5	Storm flow	18		Yes
11/21/1994	24.0	4.5	38.3	27.3	Storm flow	18		No
1/2/1996	37.0	6.0	39.5	26.6	Storm flow	18		No
3/6/2002	11.0	4.2	40.0	26.2	Storm flow	18		Yes
12/20/2000	7.4	2.5	40.3	26.0	Storm flow	18		Yes
12/2/1997	5.8	3.5	44.0	23.8	Storm flow	18		Yes
4/18/2001	8.6	11.5	44.6	23.3	Storm flow	18		Yes
3/14/1995	30.0	10.5	45.1	23.0	Storm flow	18		No
11/6/2002	34.0	10.2	47.5	21.9	Storm flow	18		No
11/5/1991	14.0	6.0	47.7	21.8	Storm flow	18		Yes
2/18/2004	14.9	3.8	47.8	21.7	Storm flow	18		Yes
9/15/1998	8.1	8.5	50.3	20.5	Storm flow	18		Yes
4/16/1996	9.2	5.0	51.3	20.1	Storm flow	18		Yes
2/19/2003	15.0	1.5	51.9	19.9	Storm flow	18		Yes
3/1/2000	11.0	7.0	53.3	19.3	Storm flow	18		Yes
11/15/2000	11.0	10.0	54.9	18.6	Storm flow	18		Yes
12/10/1996	8.4	3.0	55.3	18.5	Storm flow	18		Yes
3/30/2005	14.5	3.2	59.2	17.1	Storm flow	18		Yes
4/3/2002	8.8	3.0	59.6	17.0	Storm flow	18		Yes
1/25/1994	19.0	6.0	61.8	16.2	Storm flow	18		No
4/8/1997	11.0	4.0	63.6	15.7	Storm flow	18		Yes
1/17/2001	37.0	23.0	64.1	15.5	Storm flow	18		No
2/5/2002	11.0	3.5	68.1	14.3	Storm flow	18		Yes
1/13/1998	10.0	4.0	68.8	14.1	Storm flow	18		Yes
4/28/1998	11.0	3.5	70.4	13.7	Storm flow	18		Yes
7/19/1994	9.2	6.5	70.7	13.7	Storm flow	18		Yes
12/20/1994	52.0	24.5	71.0	13.6	Storm flow	18		No
1/17/1995	13.0	2.5	71.7	13.5	Storm flow	18		Yes
2/4/1997	26.0	11.0	74.6	12.8	Storm flow	18		No
1/23/2007	12.2	6.0	75.1	12.7	Storm flow	18		Yes
3/27/2000	35.0	9.5	76.1	12.4	Storm flow	18		No
12/4/1990	21.0	8.0	78.4	12.0	Storm flow	18		No
5/3/1993	12.0	6.0	85.9	10.9	Storm flow	18		Yes
11/19/1996	10.0	1.0	89.6	10.2	Storm flow	18		Yes
12/4/2002	68.0	26.0	89.6	10.2	Storm flow	18		No
3/14/2001	7.4	5.2	90.3	10.2	Storm flow	18		Yes
12/7/1993	8.6	6.0	96.2	9.1	Storm flow	18		Yes
5/3/2006	16.9	4.0	98.1	8.8	Storm flow	18		Yes
4/4/1995	27.0	9.0	100.5	8.6	Storm flow	18		No
6/20/2000	12.0		105.0	8.0	Storm flow	18		Yes
11/15/2006	78.6	20.2	124.4	6.3	Storm flow	18		No
4/28/1999	18.0	6.5	141.8	5.3	Storm flow	18		Yes
3/19/2003	57.8	19.5	144.5	5.1	Storm flow	18		No
4/30/1991	8.4	7.0	161.4	4.4	Storm flow	18		Yes
3/2/1993	21.0	11.0	165.2	4.3	Storm flow	18		No
12/3/1991	14.0	7.0	181.7	3.7	Storm flow	18		Yes

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
10/29/1996	22.0	6.0	194.8	3.4	Storm flow	18		No
6/30/1999	25.0	9.0	206.8	3.1	Storm flow	18		No
1/15/1991	51.0	42.0	209.2	3.0	Storm flow	18		No
2/22/1994	41.0	22.0	243.4	2.4	Storm flow	18		No
6/23/2004	31.1	14.0	250.4	2.4	Storm flow	18		No
2/14/2001	19.0	24.3	312.6	1.7	Storm flow	18		No
3/17/1998	24.0	26.5	322.0	1.6	Storm flow	18		No
10/9/1990	24.0	13.0	468.9	0.9	Storm flow	18		No
1/5/1993	24.0	10.0	489.3	0.8	Storm flow	18		No
						No. of Values =	81	112
						No of exceedances =	44	30
						% of Exceedances =	54.3%	26.8%

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Table C3 Summary of Historical Water Quality data for Prairie Creek

Table C.4. Observed Turbidity and TSS Data for Blackfish Bayou at FRA0027.

Date	Observed turbidity (NTU)	Observed TSS (mg/L)	Estimated flow in Blackfish Bayou (cfs)	Percent of days flow exceeded	Applicable category	Applicable water quality criterion (NTU)	Turbidity meeting Base flow criterion?	Turbidity meeting Storm flow criterion?
11/6/2000	100	132	5	94.8	Base flow	75	No	
7/9/2001	49	105	7	93.3	Base flow	75	Yes	
5/15/2001	54	65.75	10	90.1	Base flow	75	Yes	
9/11/2001	25	31	56	69.0	Base flow	75	Yes	
1/23/2001	150	116	219	35.6	Storm flow	250		Yes
3/6/2001	470	373	747	8.3	Storm flow	250		No
						No. of Values =	4	2
						No of exceedances =	1	1
						% of Exceedances =	25.0%	50.0%

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Figure C.1. Time Series Plot of Turbidity for Big Creek near Pansy (OUA0043)

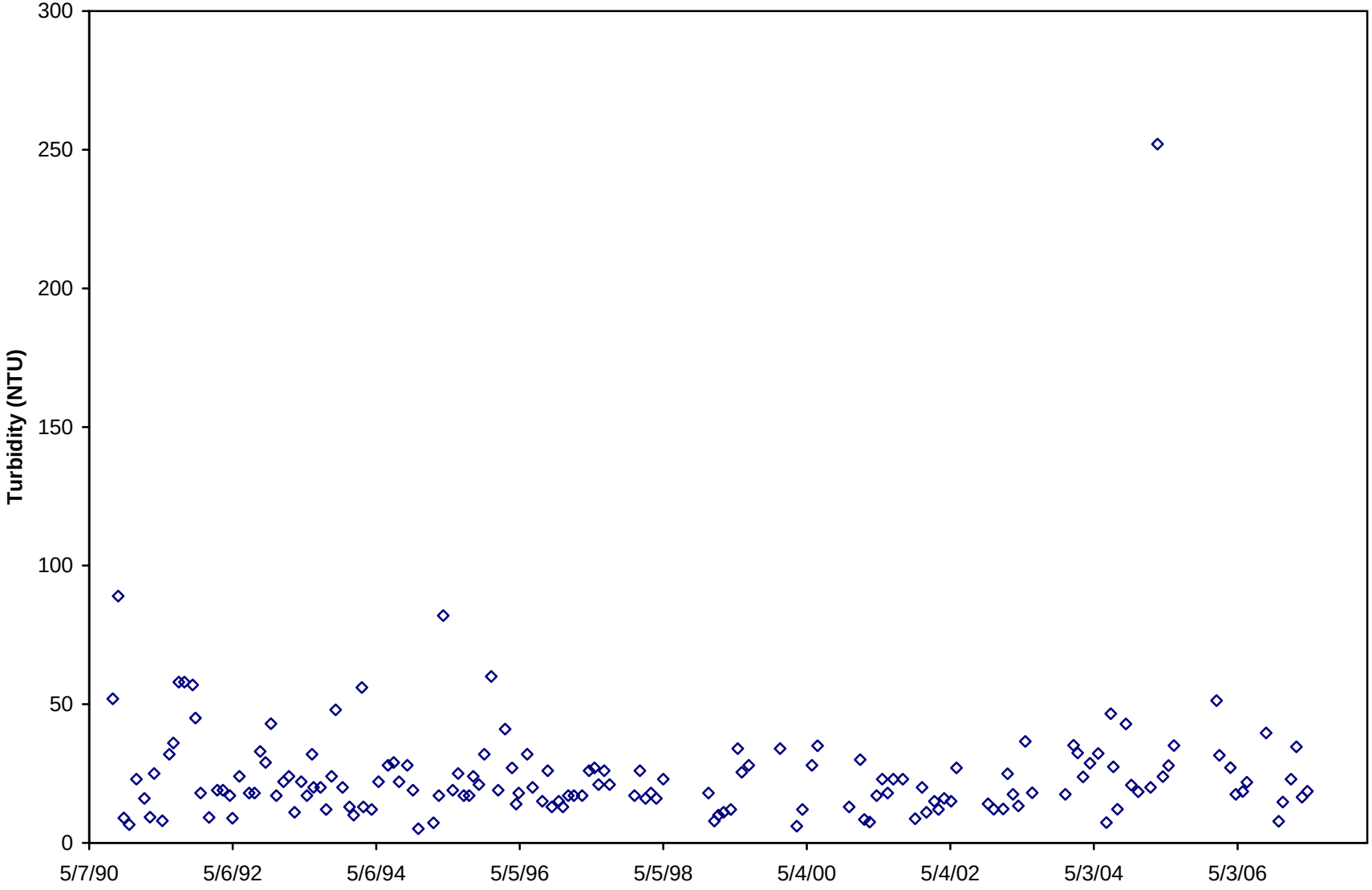


Figure C.2. Time Series Plot of Turbidity in Moro Creek (OUA0028)

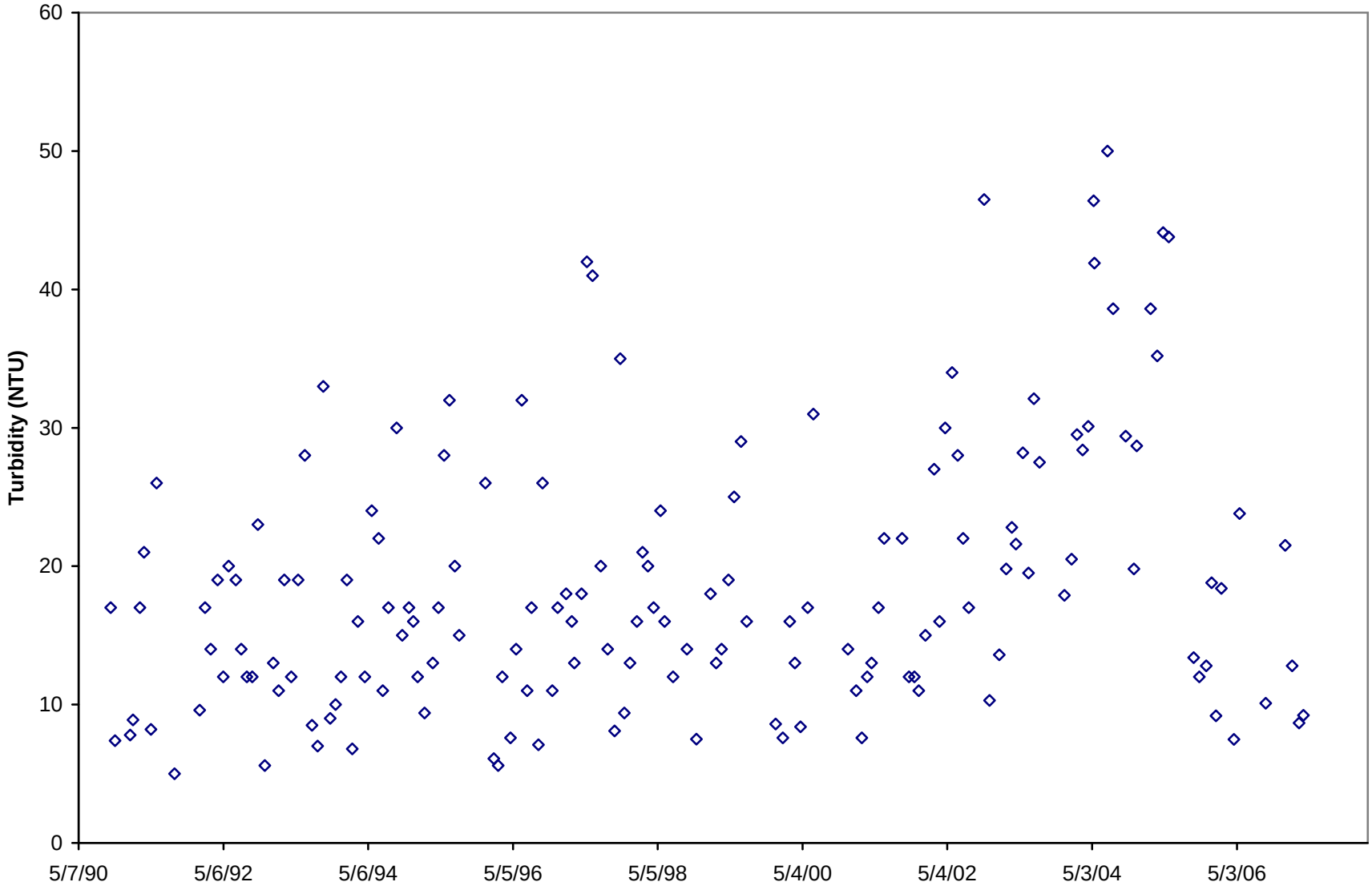


Figure C.3. Time Series Plot of Turbidity in Prairie Creek (OUA0040)

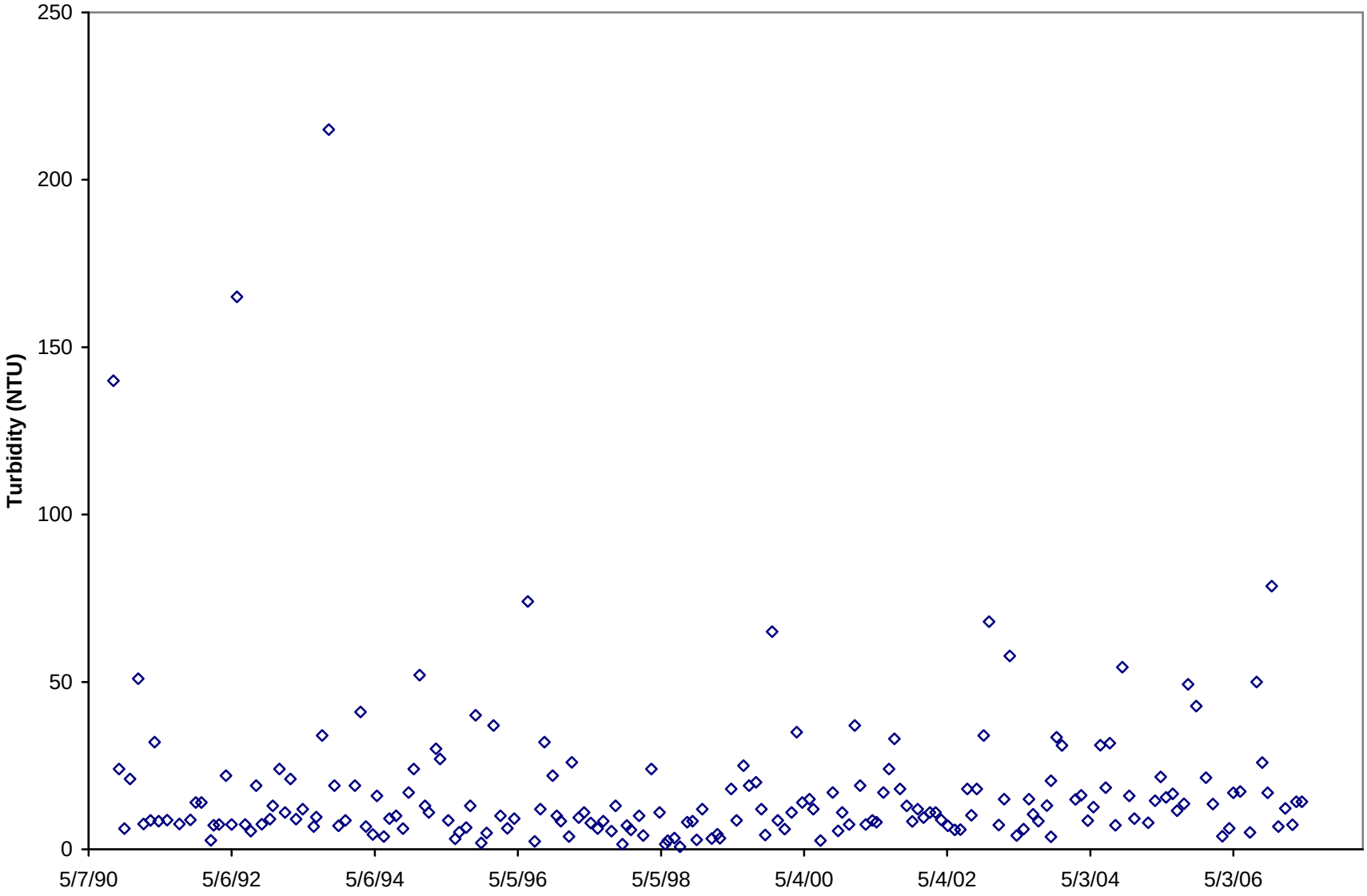


Figure C.4. Time Series Plot of Turbidity for Blackfish Bayou (FRA0027)

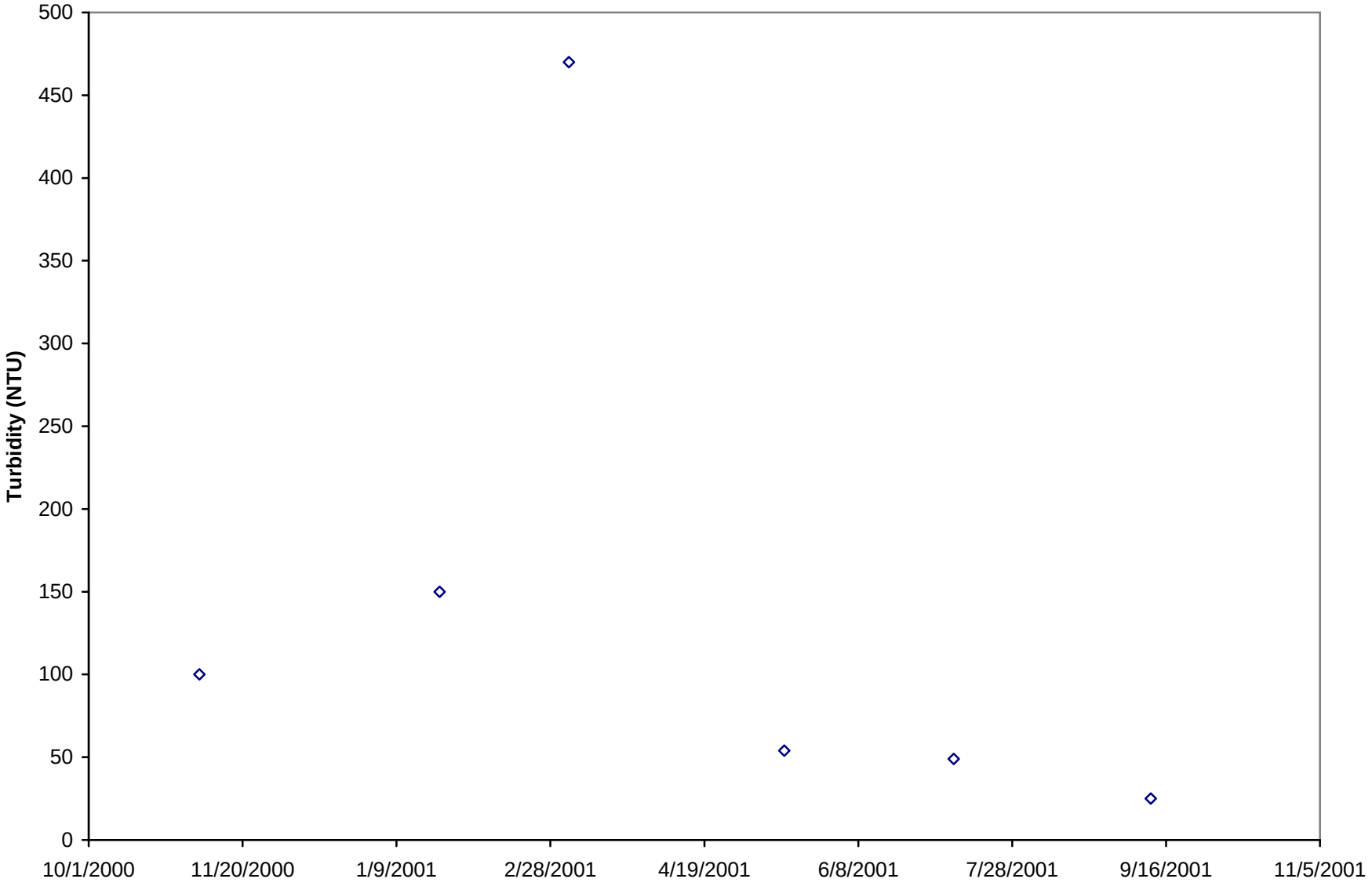


Figure C.5. Time Series Pot of TSS for Big Creek near Pansy (OUA0043)

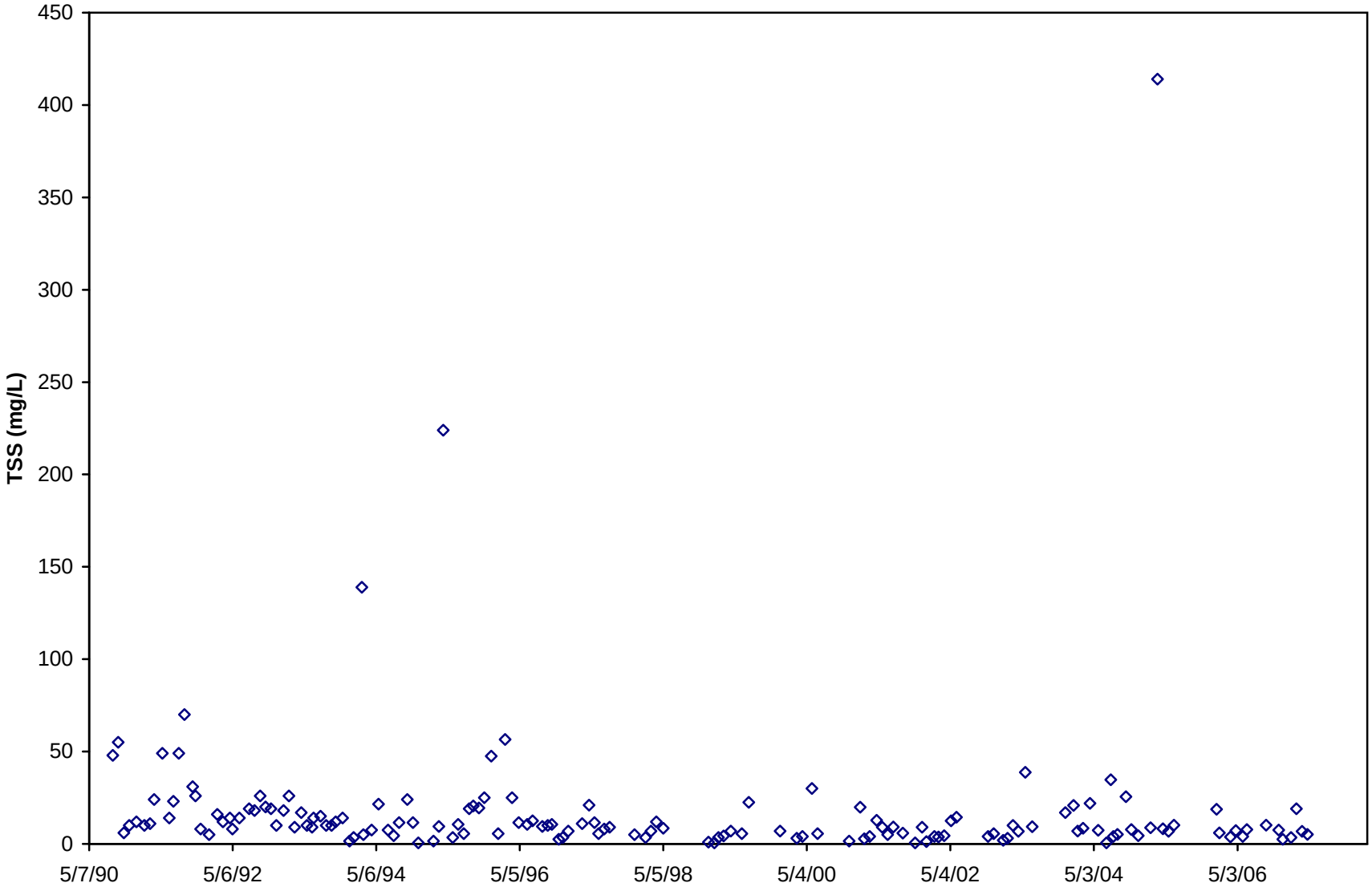


Figure C.6. Time Series Plot of TSS in Moro Creek (OUA0028)

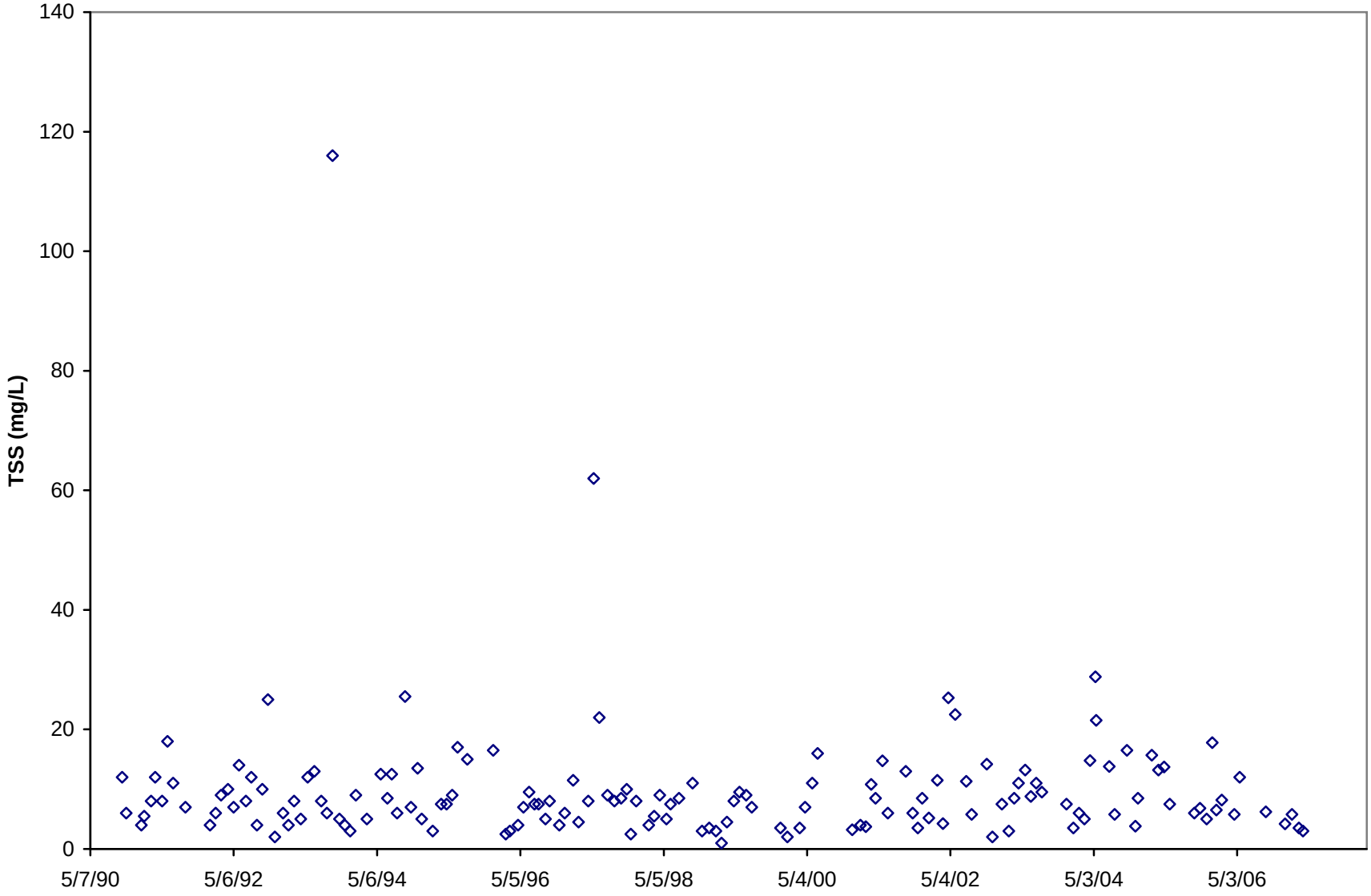


Figure C.7. Time Series Plot of TSS in Prairie Creek (OUA0040)

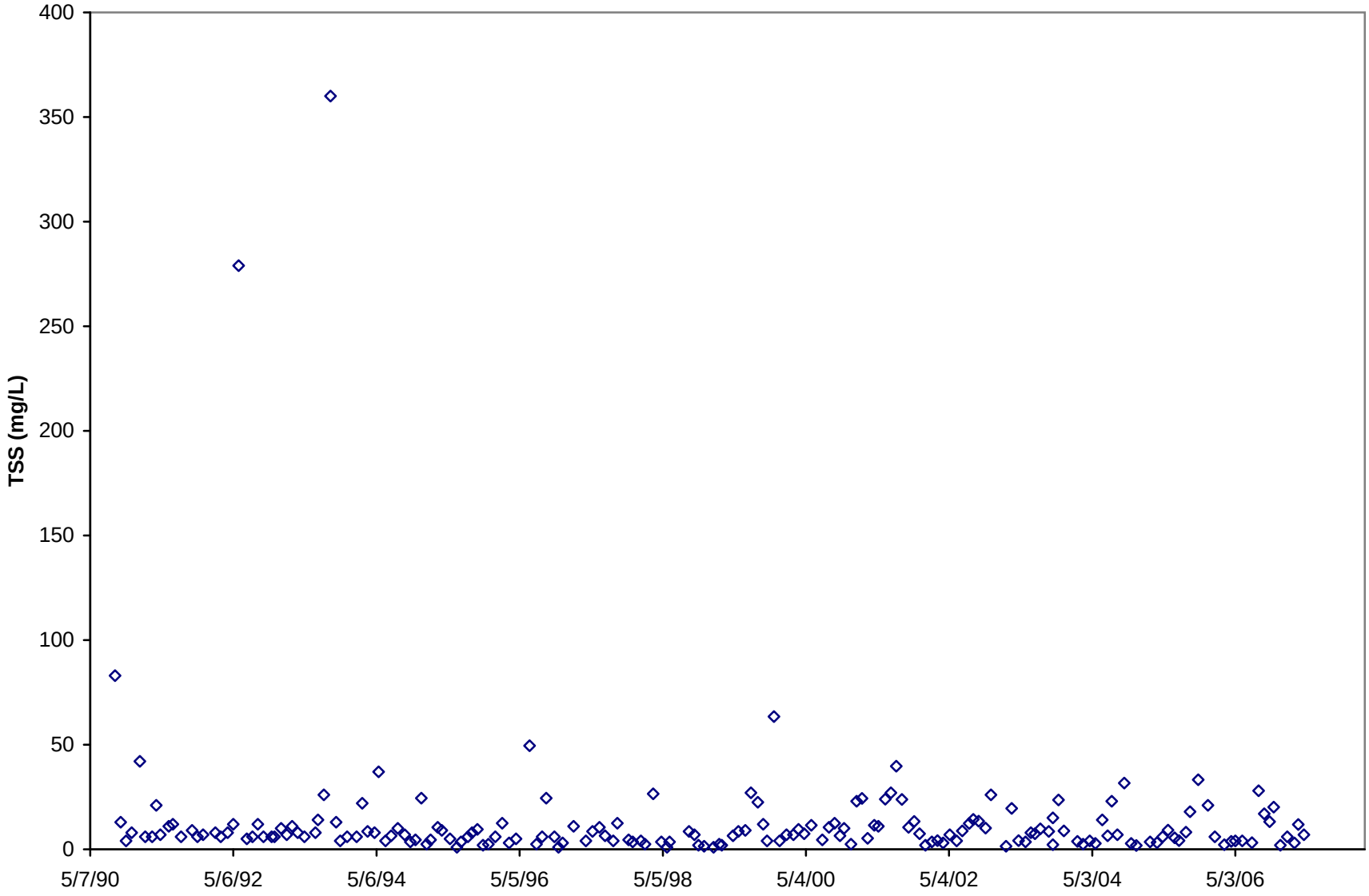


Figure C.8. Time Series Plot of TSS for Blackfish Bayou (FRA0027)

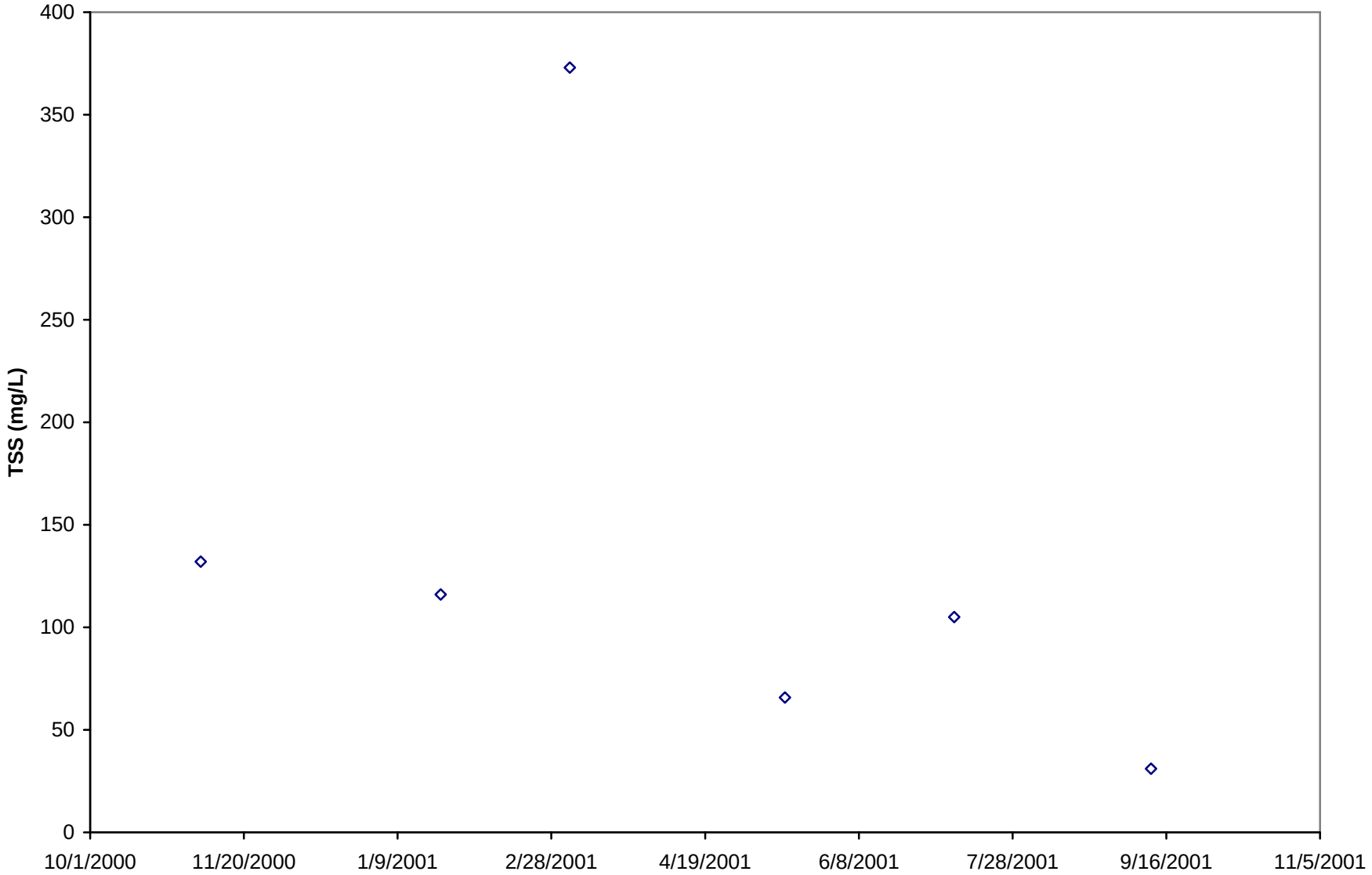


Figure C.9. Seasonal Plot of Turbidity for Big Creek near Pansy (OUA0043)

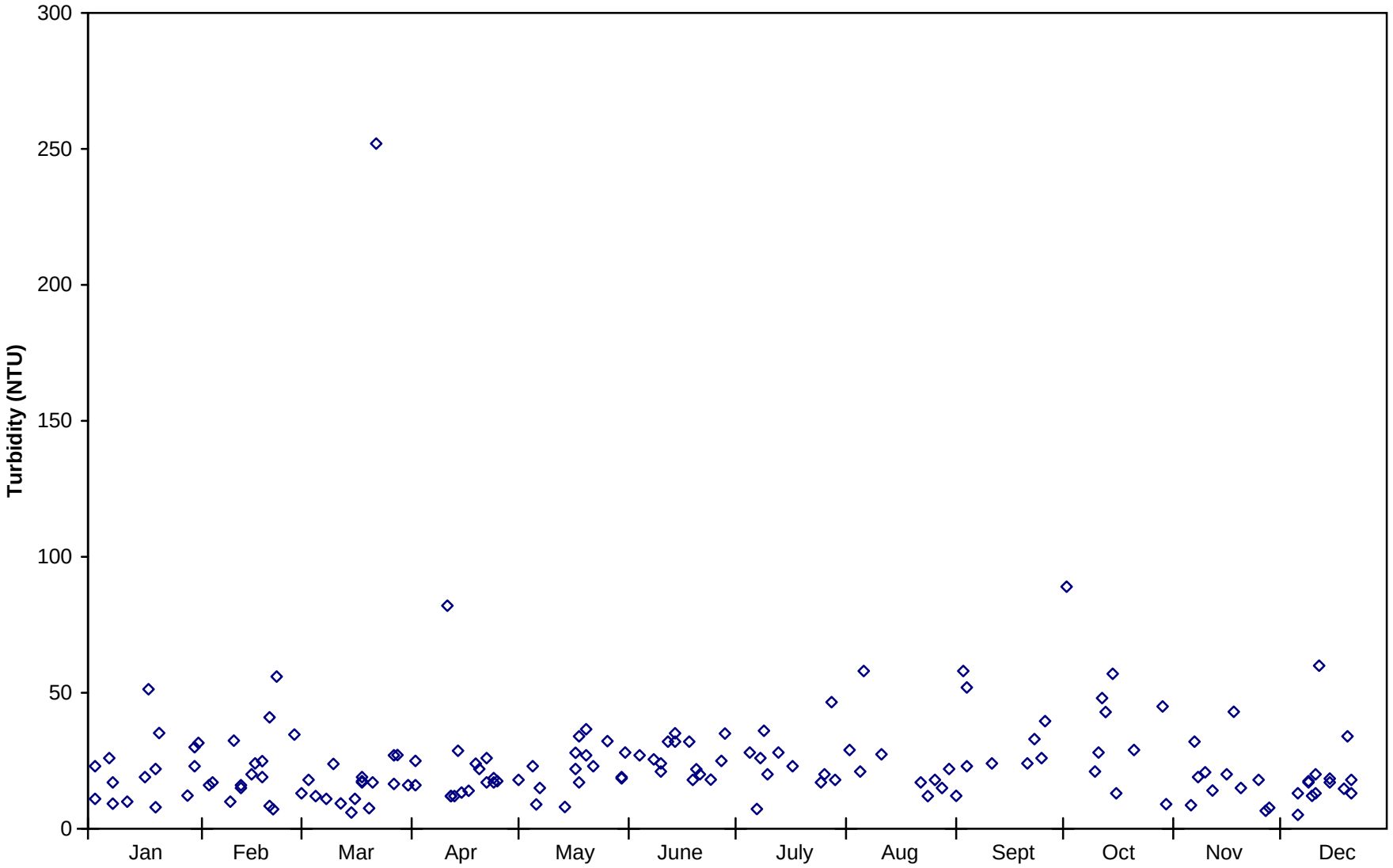


Figure C.10. Seasonal Plot of Turbidity in Moro Creek (OUA0028)

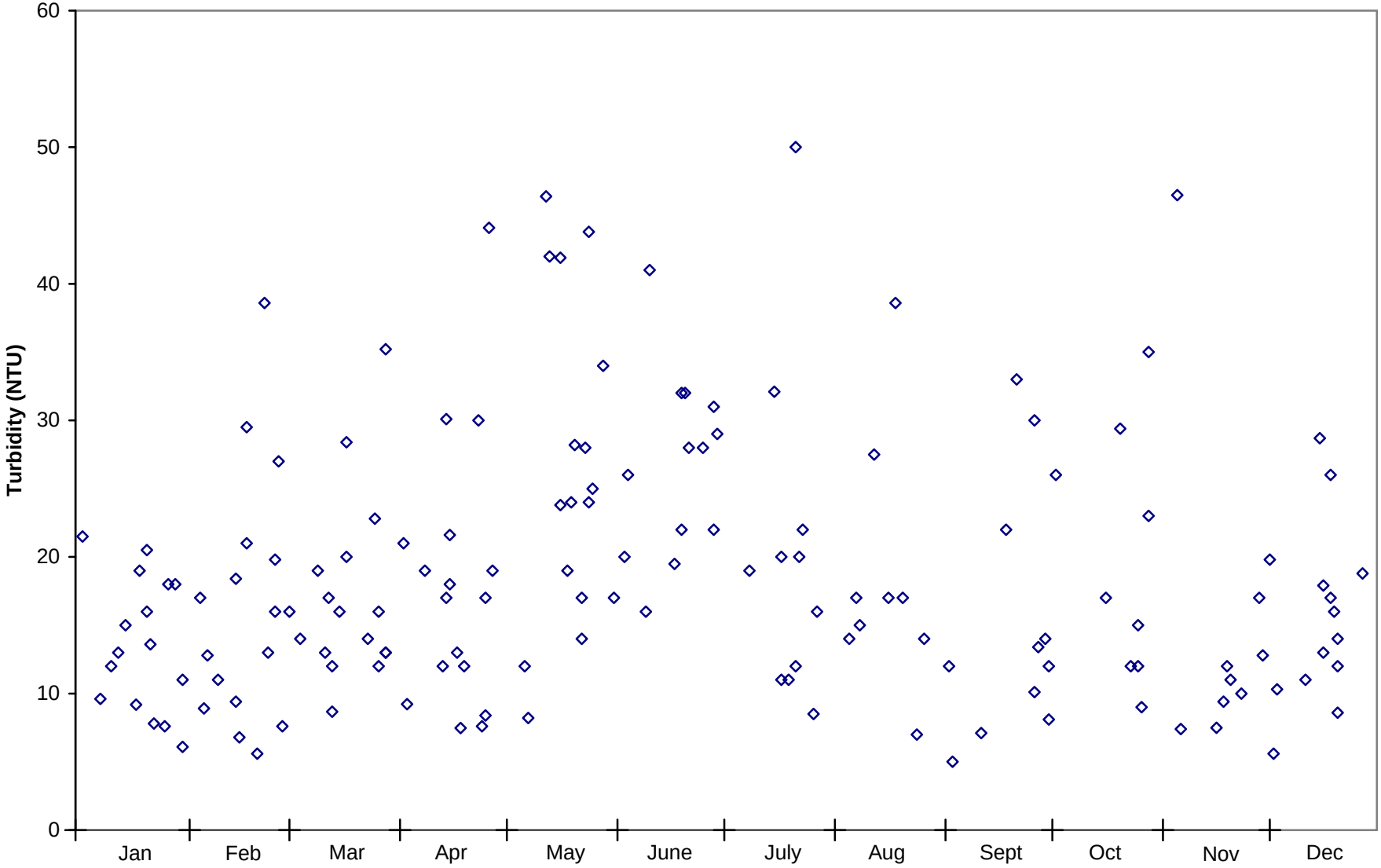


Figure C.11. Seasonal Plot of Turbidity for Prairie Creek (OUA0040)

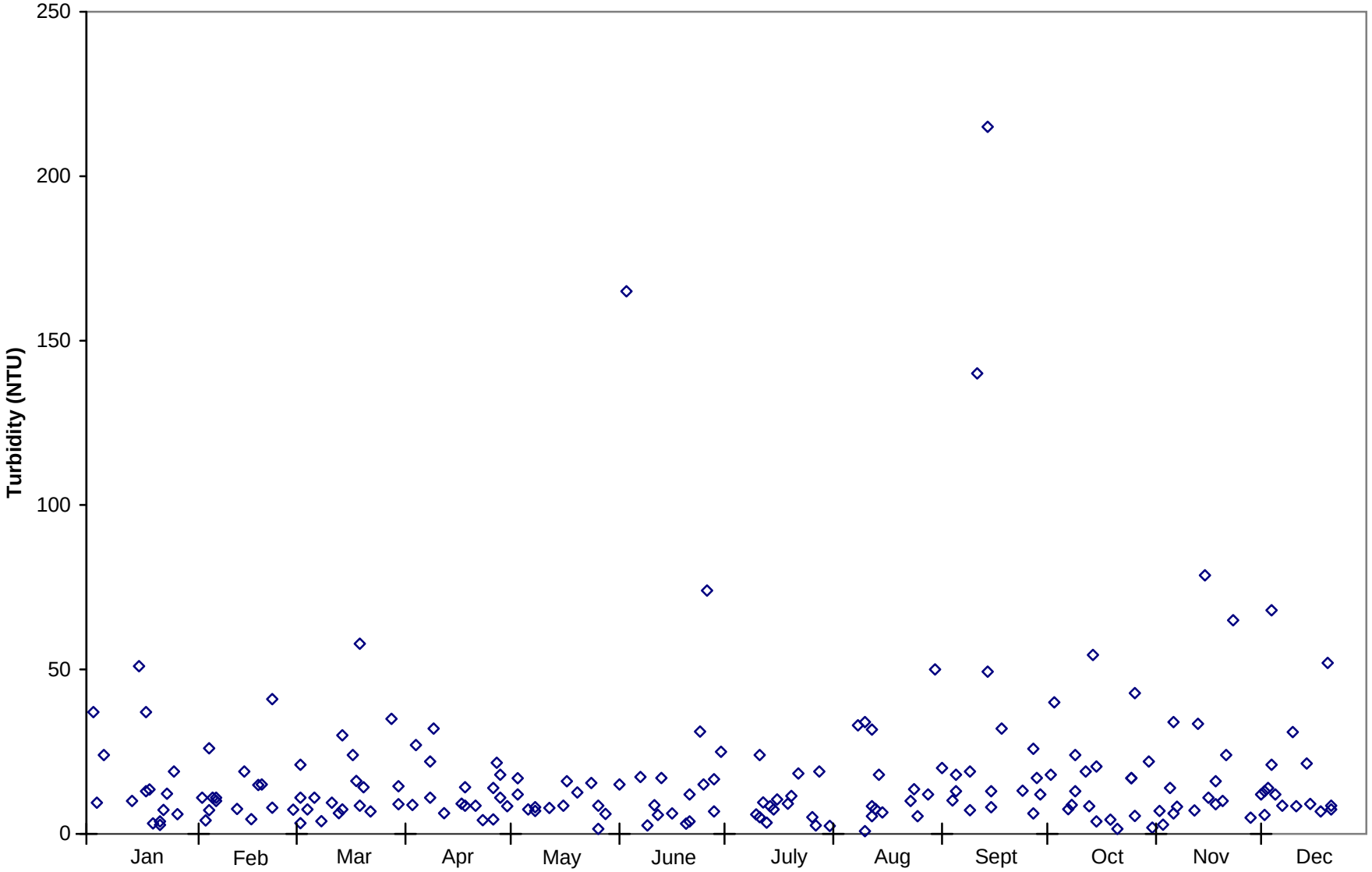


Figure C.12. Seasonal Plot of Turbidity for Blackfish Bayou (FRA0027)

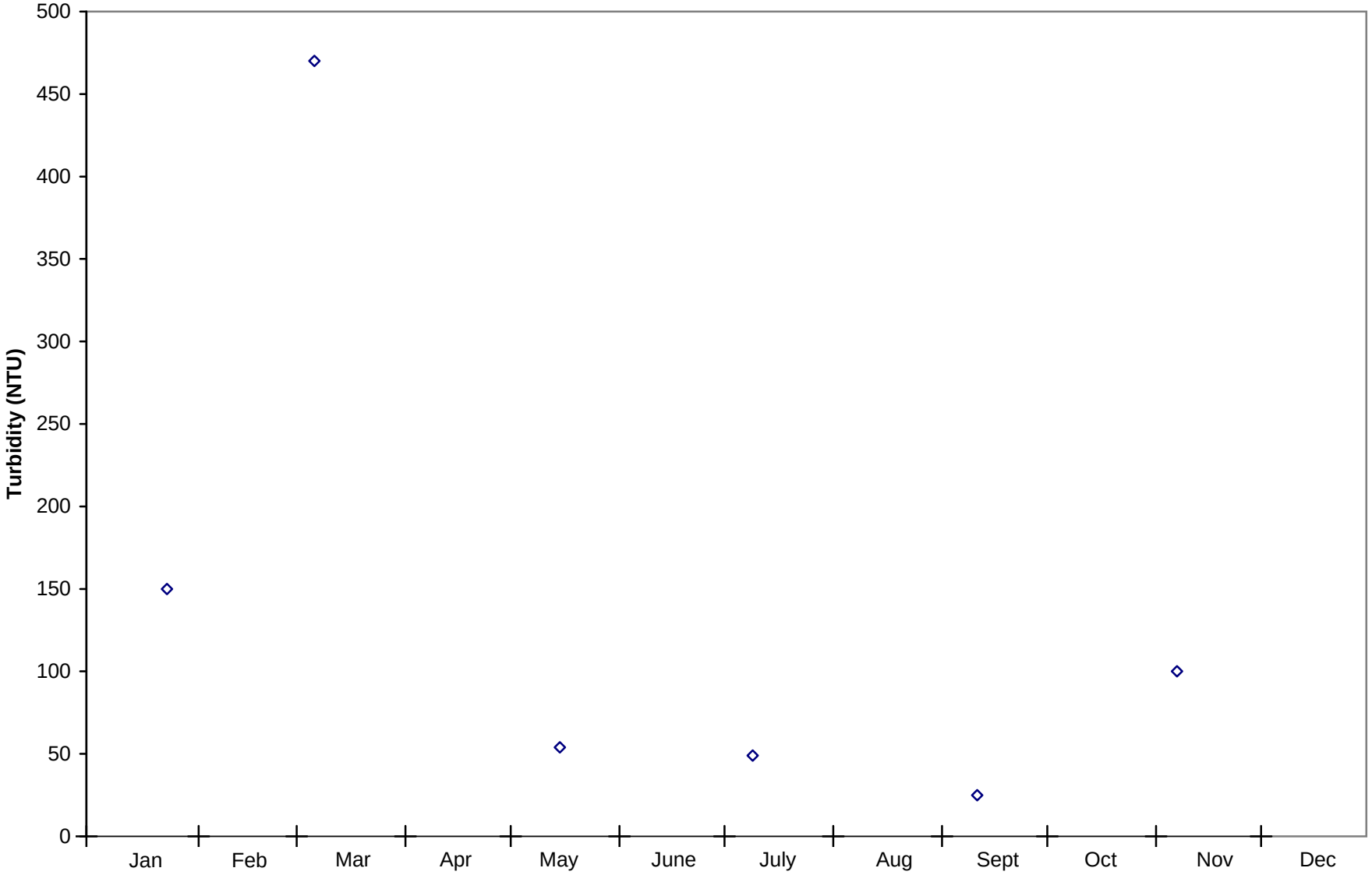


Figure C.13. Seasonal Plot of TSS for Big Creek near Pansy (OUA0043)

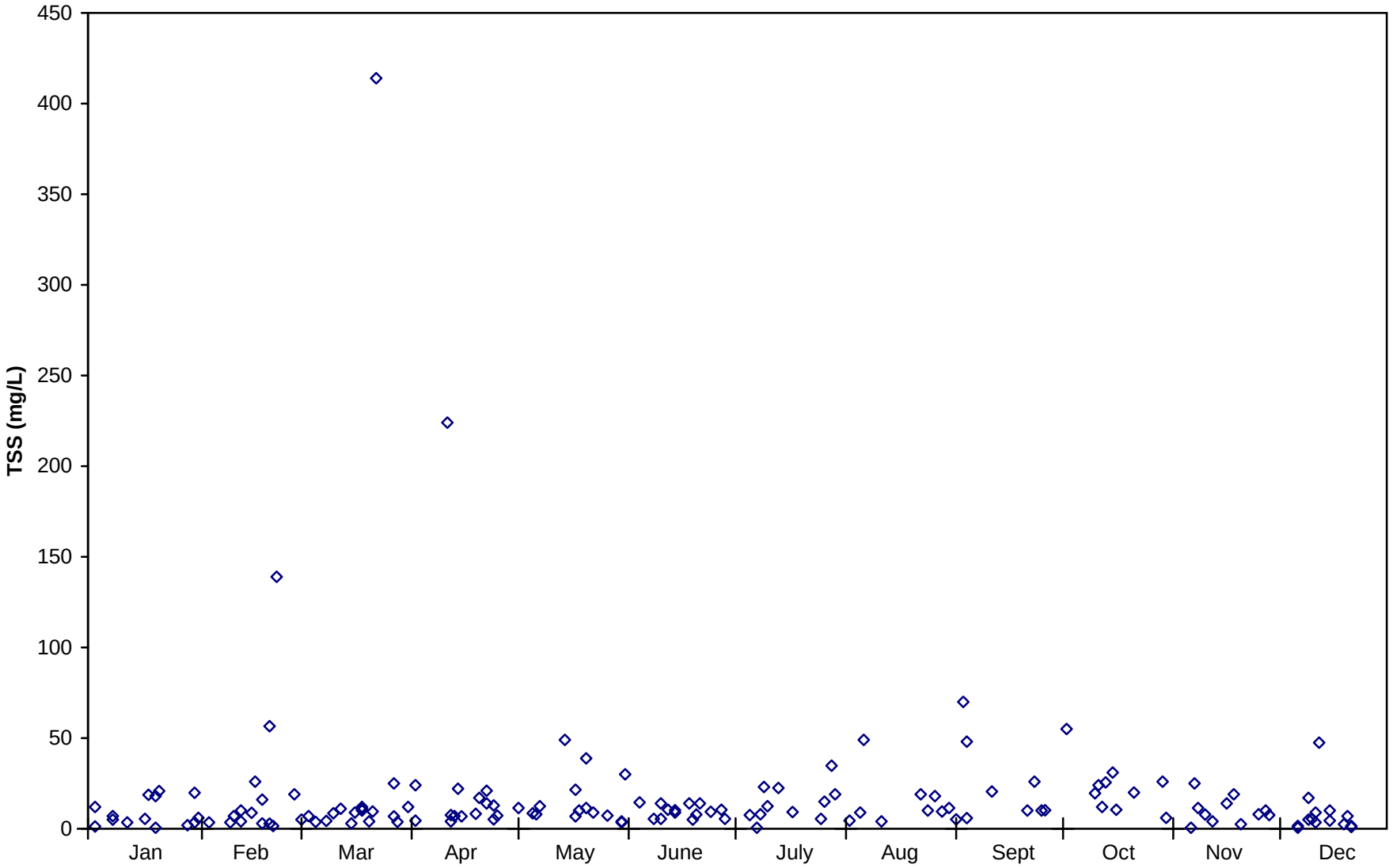


Figure C.14. Seasonal Plot of TSS in Moro Creek (OUA0028)

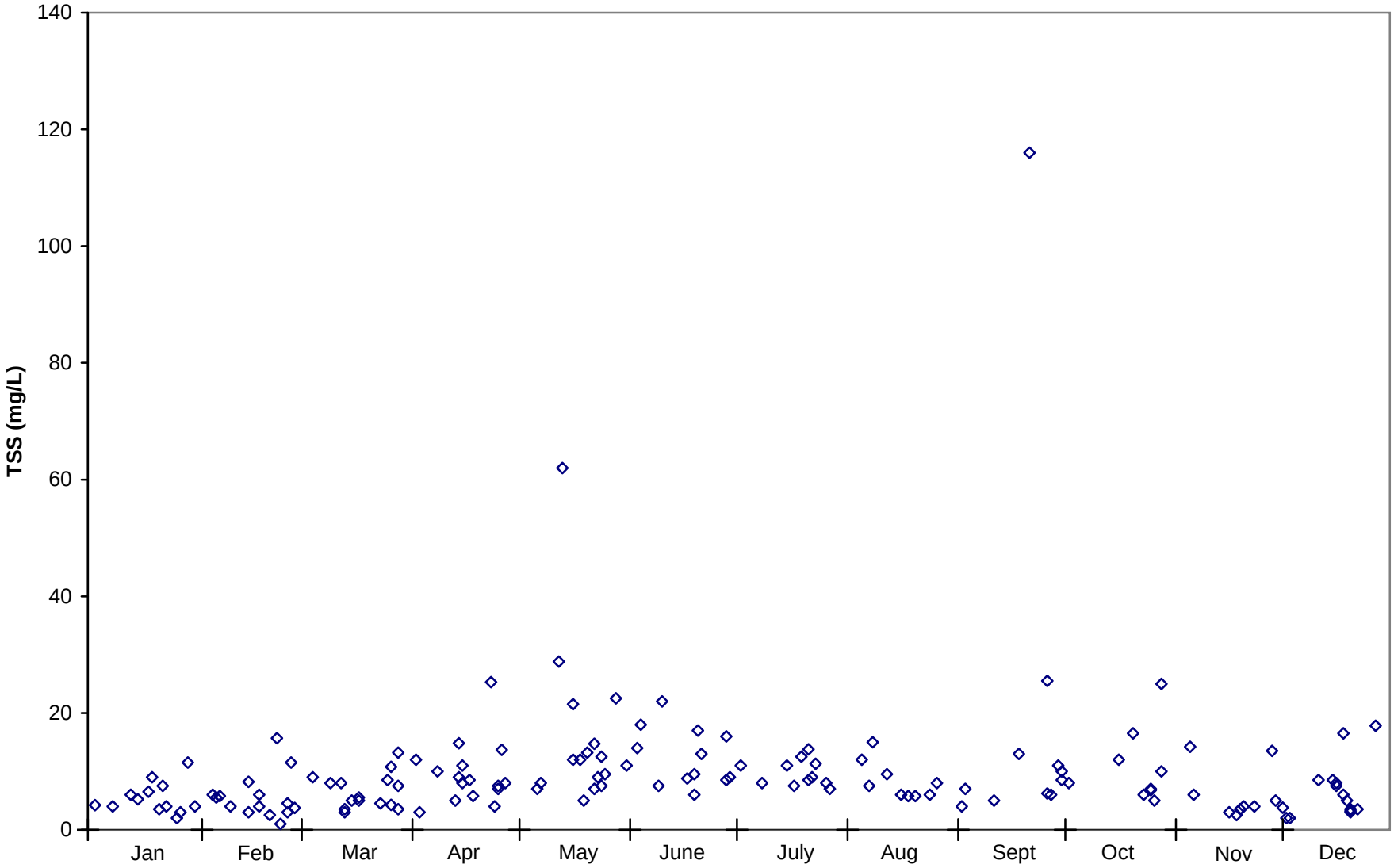


Figure C.15. Seasonal Plot of TSS for Prairie Creek (OUA0040)

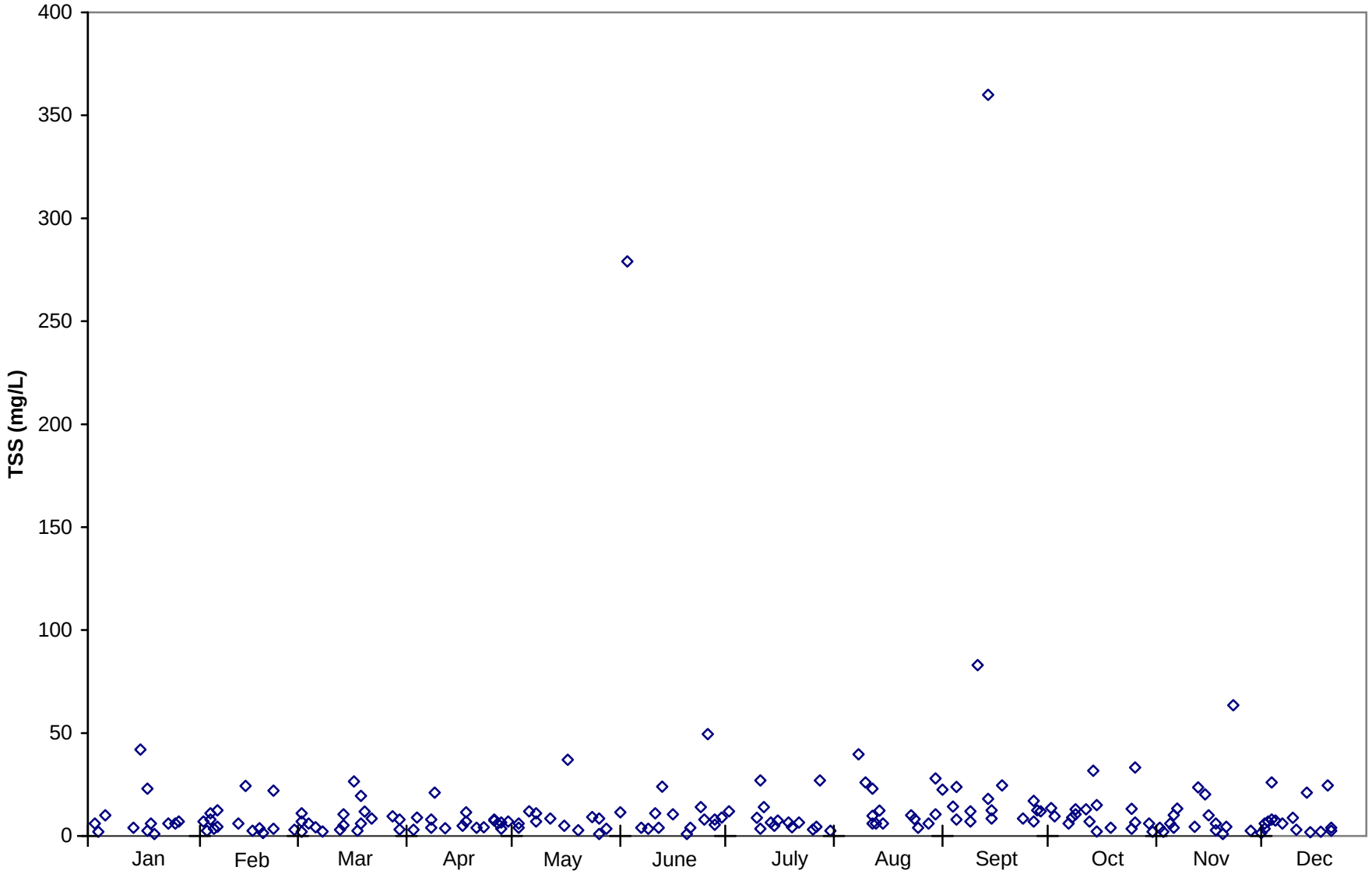


Figure C.16. Seasonal Plot of TSS for Blackfish Bayou (FRA0027)

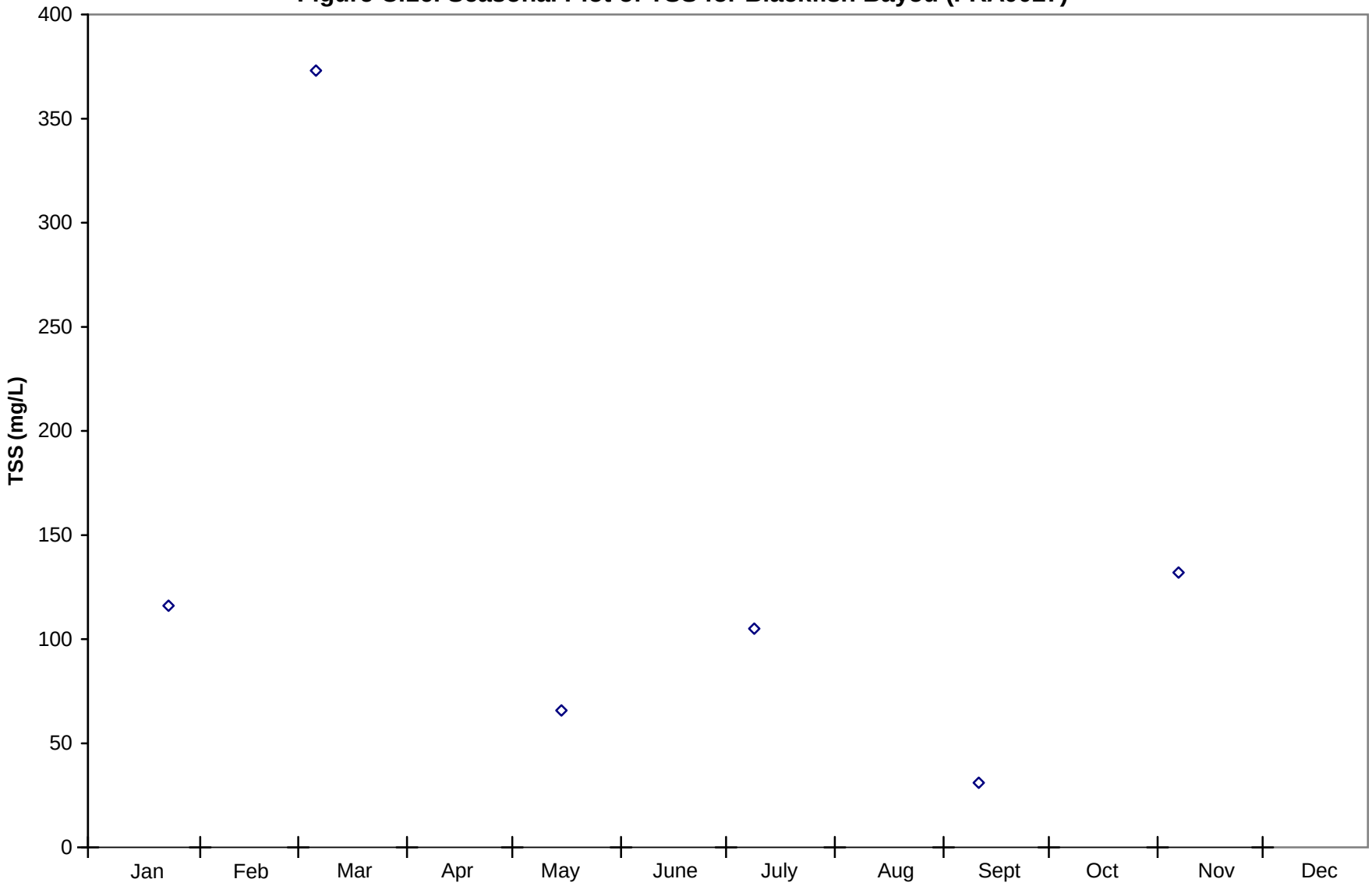


Figure C.17 Turbidity vs flow for Big Creek near Pansy (OUA0043)

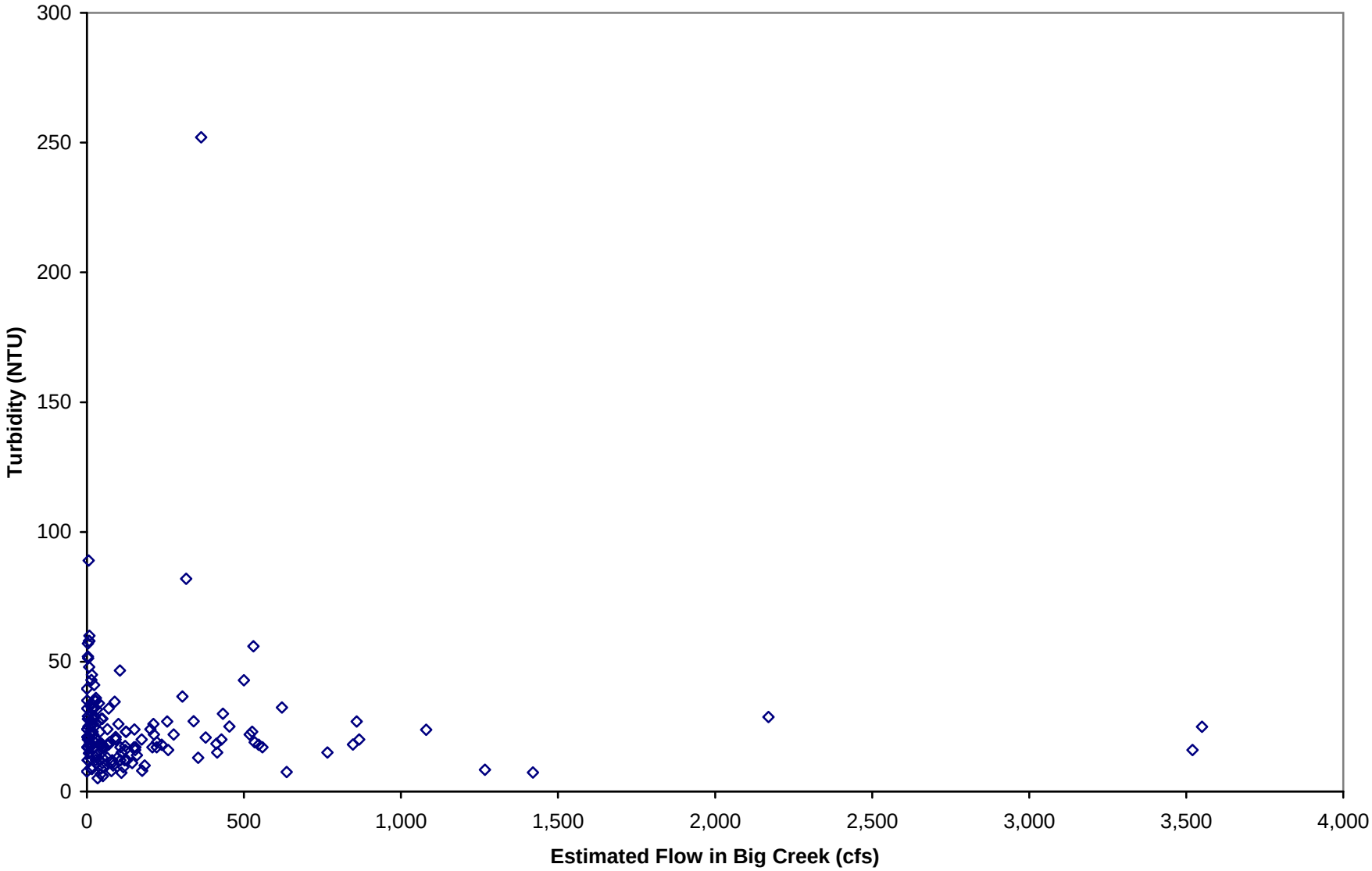


Figure C.18. Turbidity vs Flow for Moro Creek (OUA0028)

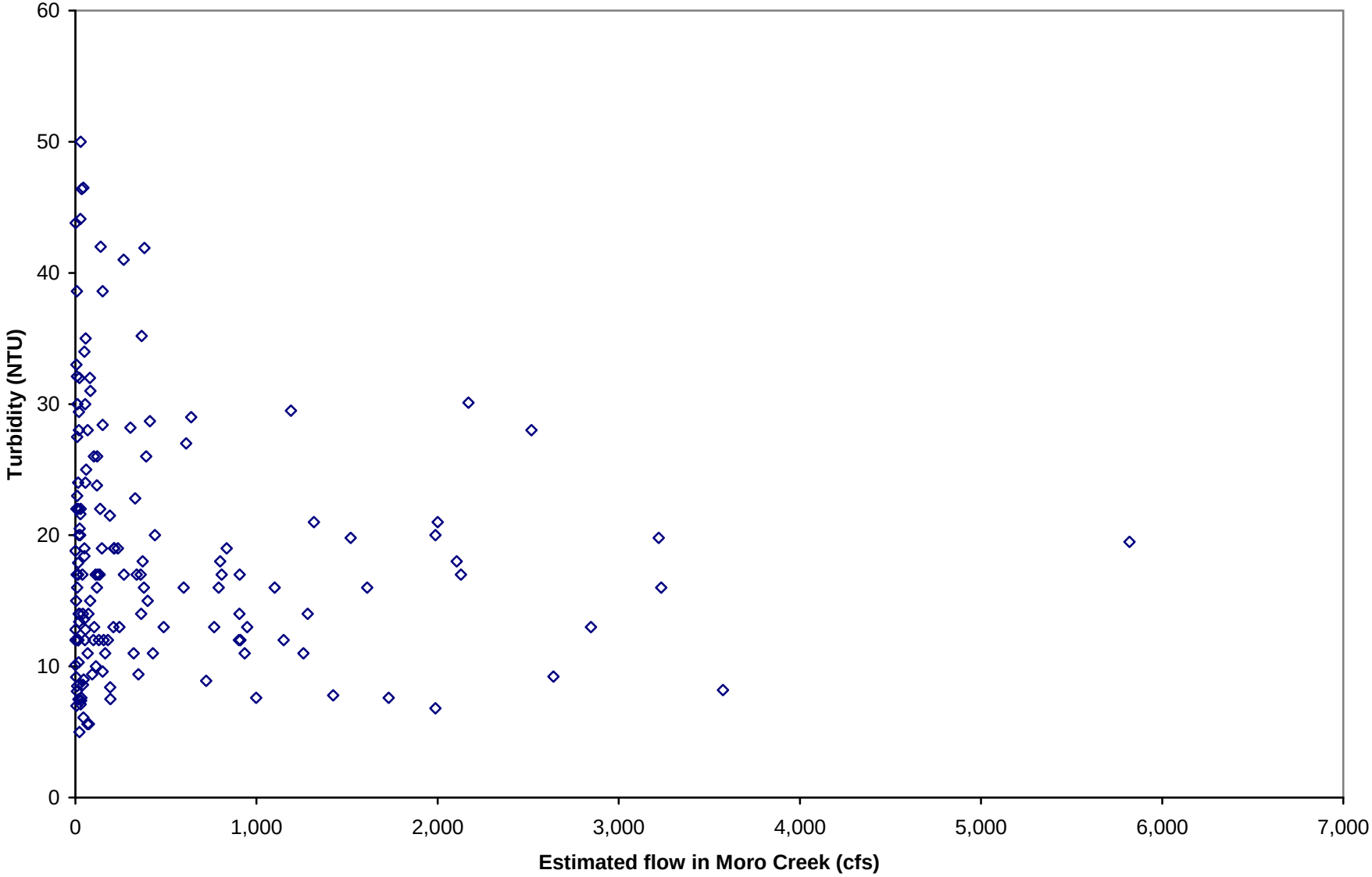


Figure C.19. Turbidity vs Flow in Prairie Creek (OUA0040)

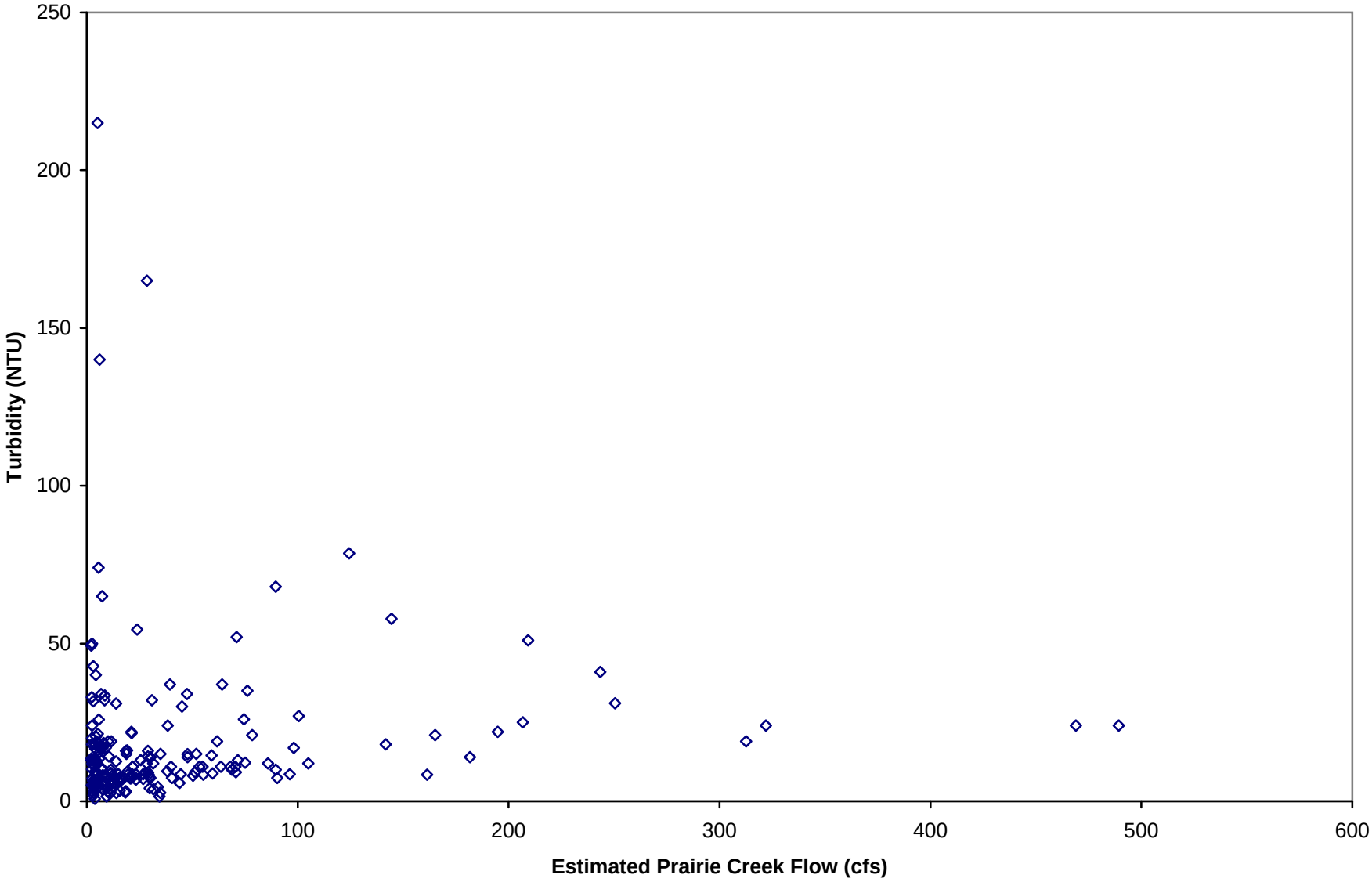


Figure C.20. Turbidity vs Flow for Blackfish Bayou (FRA0027)

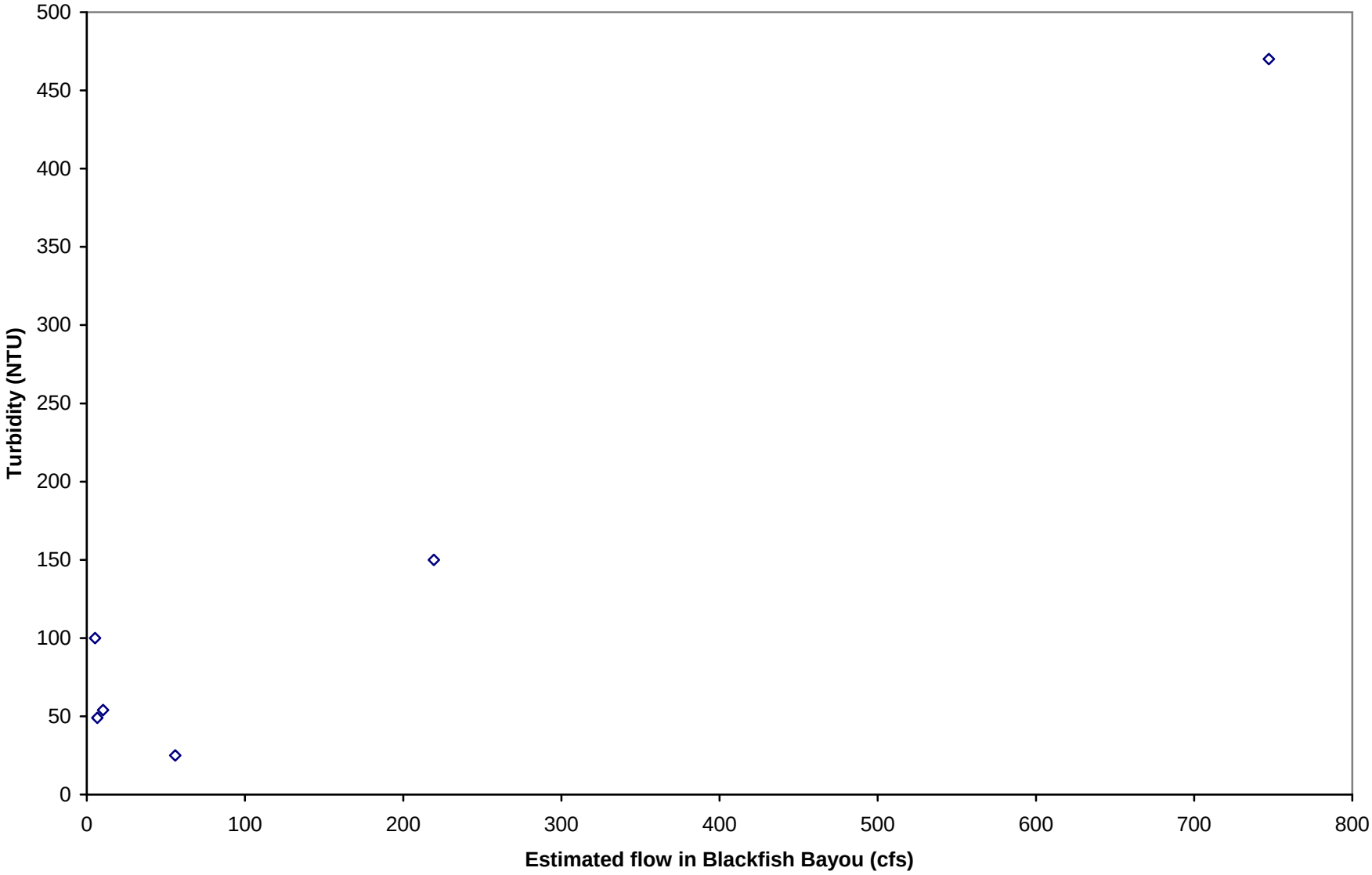


Figure C.21. TSS vs flow for Big Creek near Pansy (OUA0043)

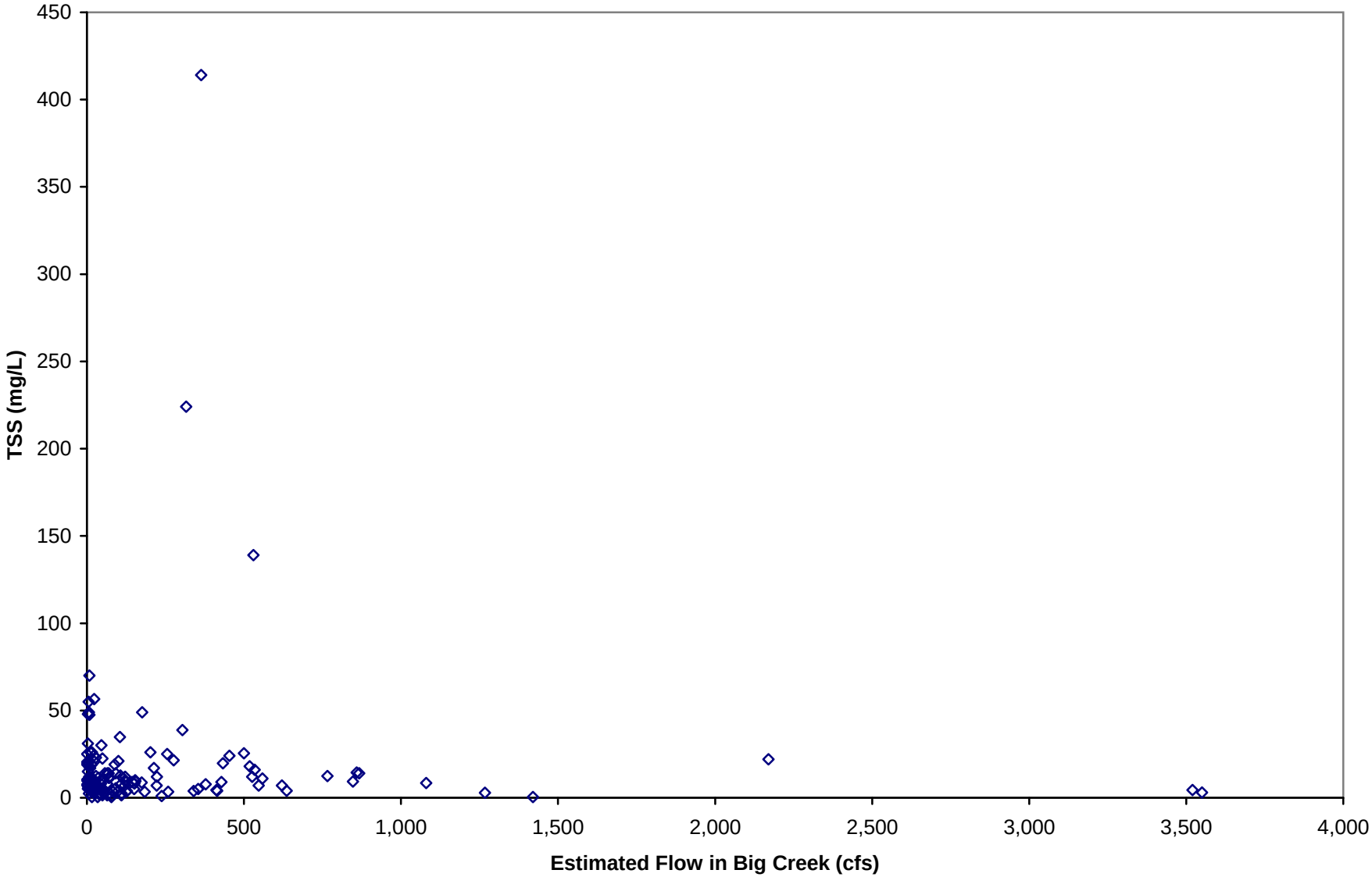


Figure C.22. TSS vs Flow for Moro Creek (OUA0028)

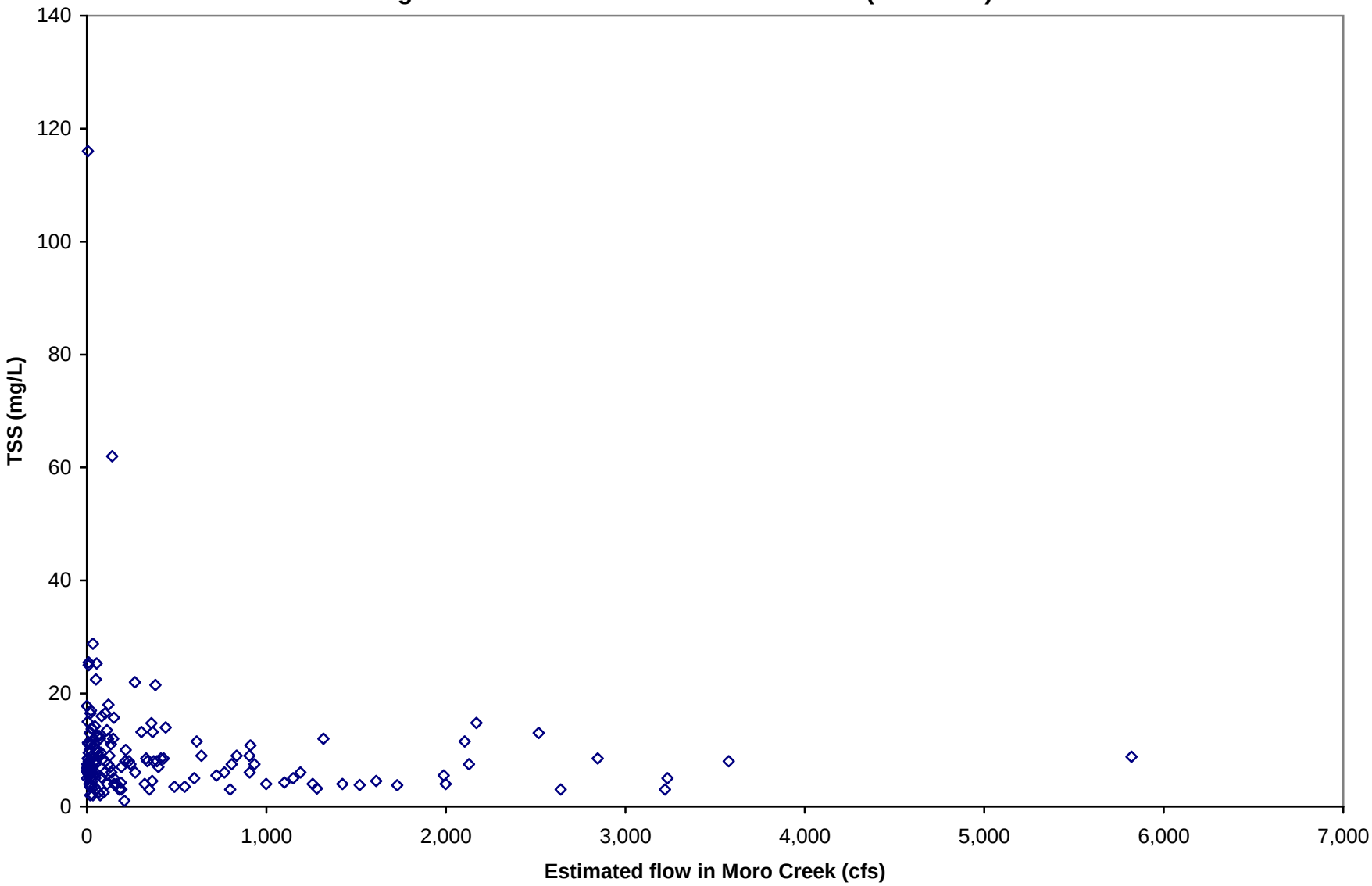


Figure C.23. TSS vs Flow in Prairie Creek (OUA0040)

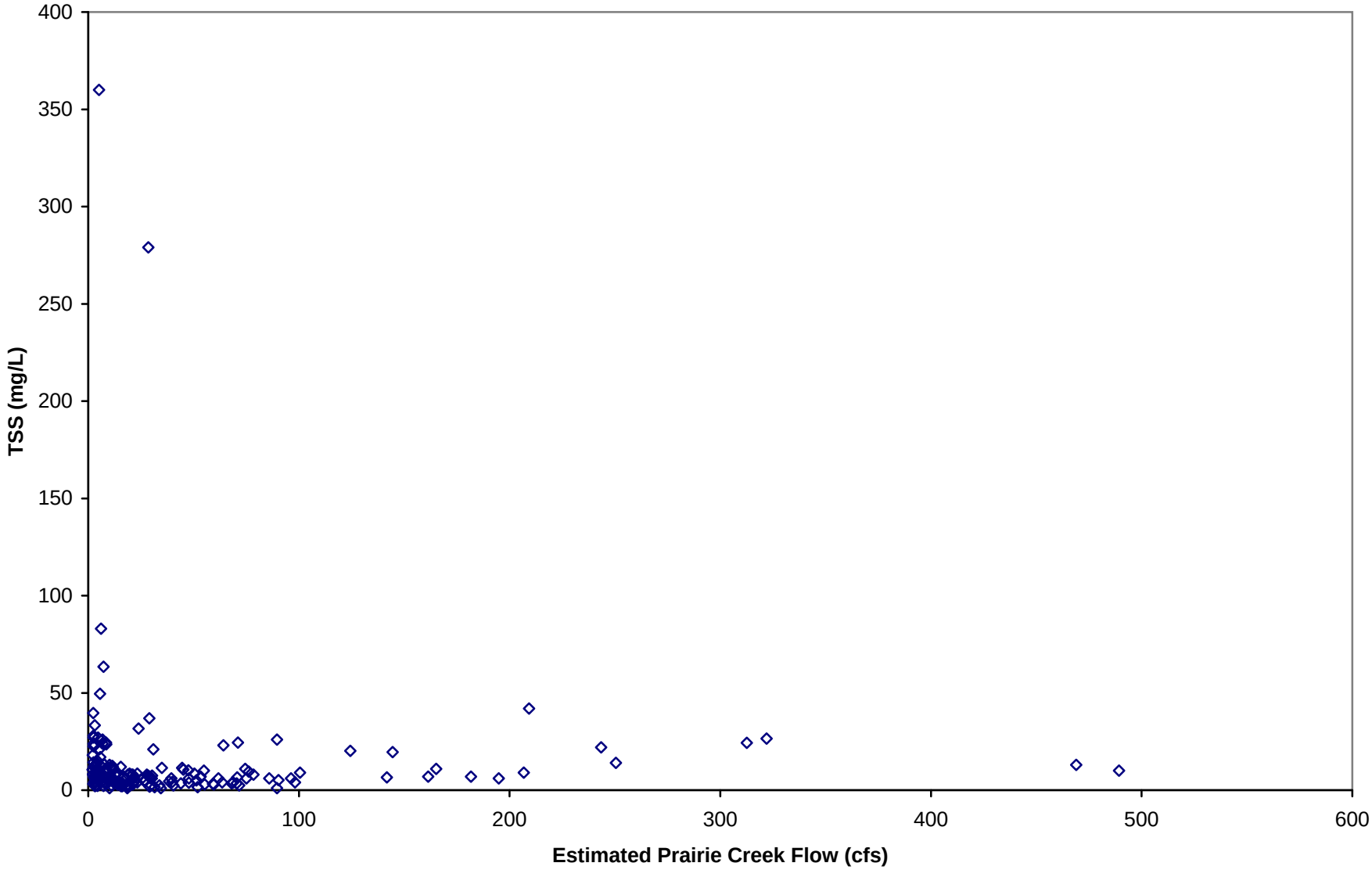
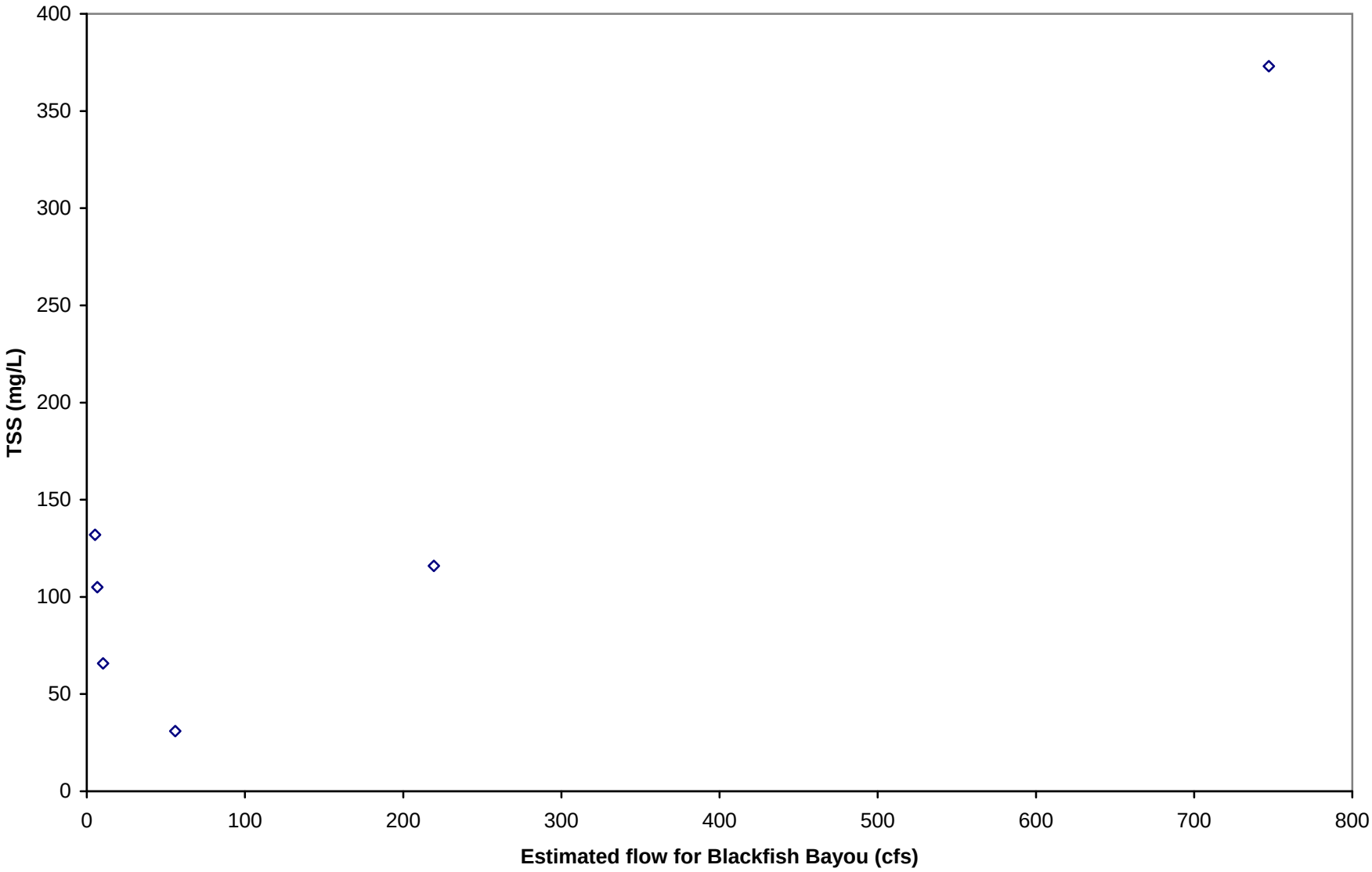


Figure C.24. TSS versus Flow for Blackfish Bayou (FRA0027)



APPENDIX D

TMDL for Blackfish Bayou 08020203-007

Figure D.1. Flow duration curve for Blackfish Bayou (08020203-007)

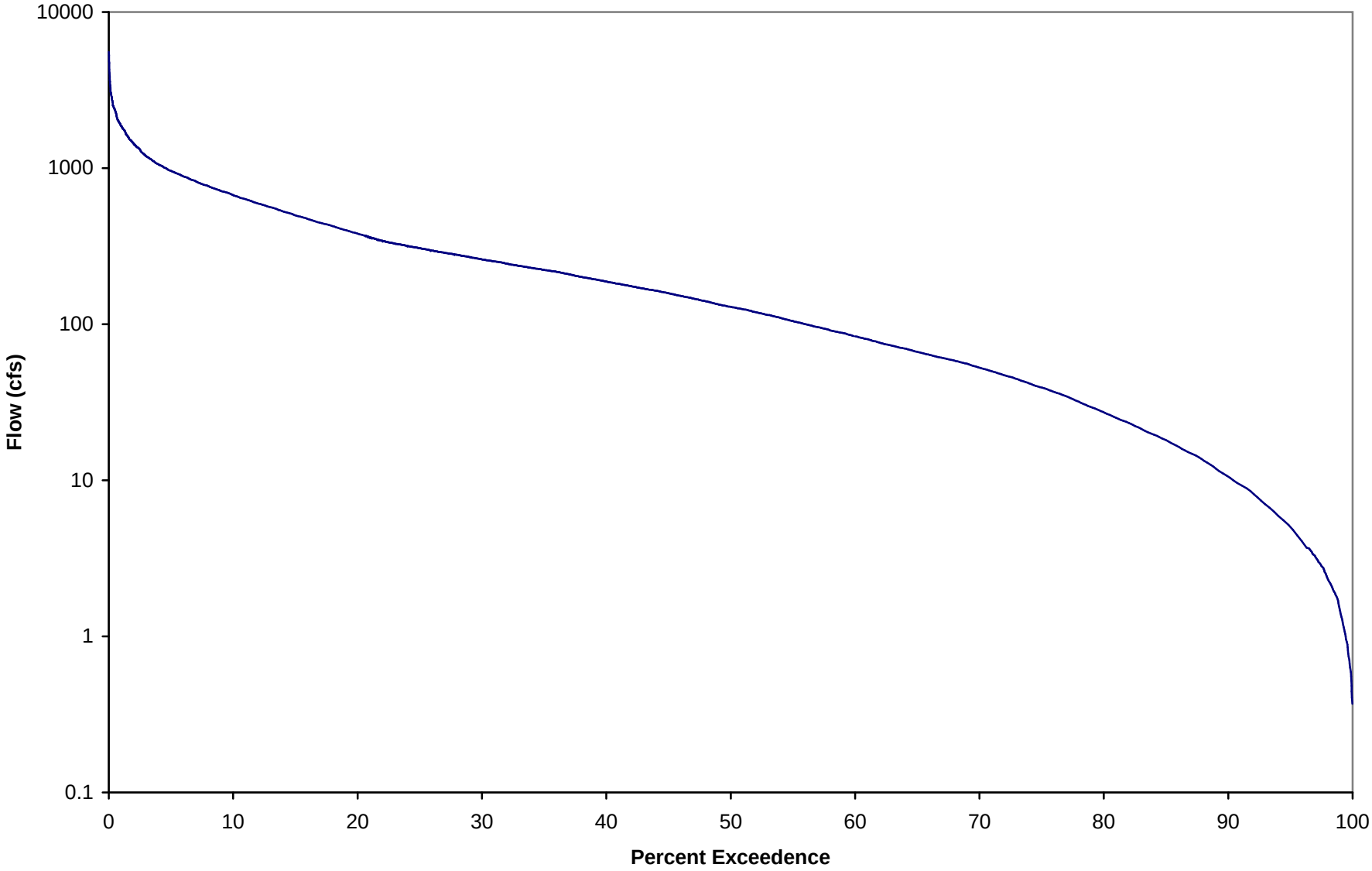


Figure D.2. Storm flow load duration curve for Blackfish Bayou (08020203-007)

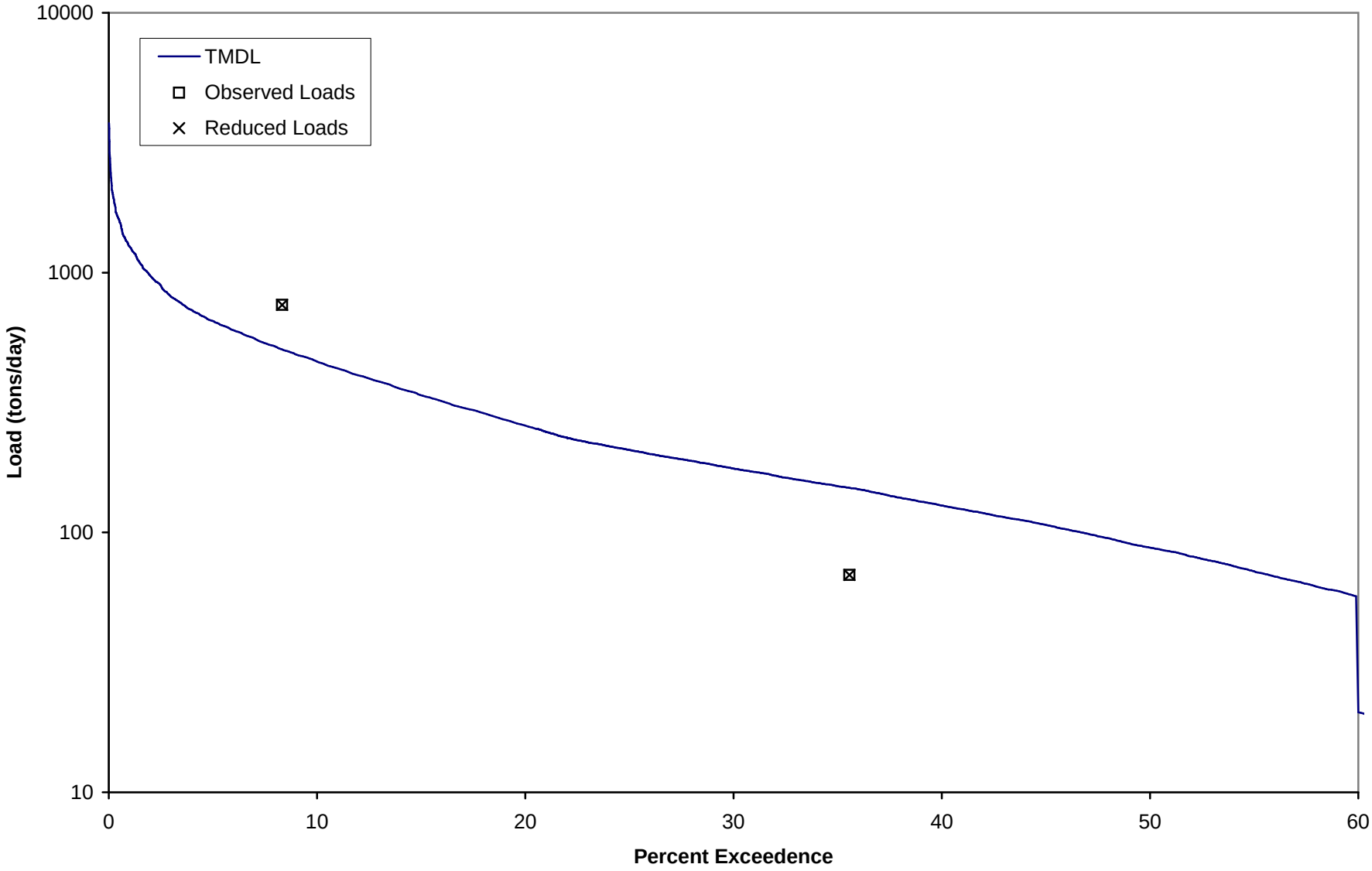


Figure D.3. Base flow load duration curve for Blackfish Bayou (08020203-007)

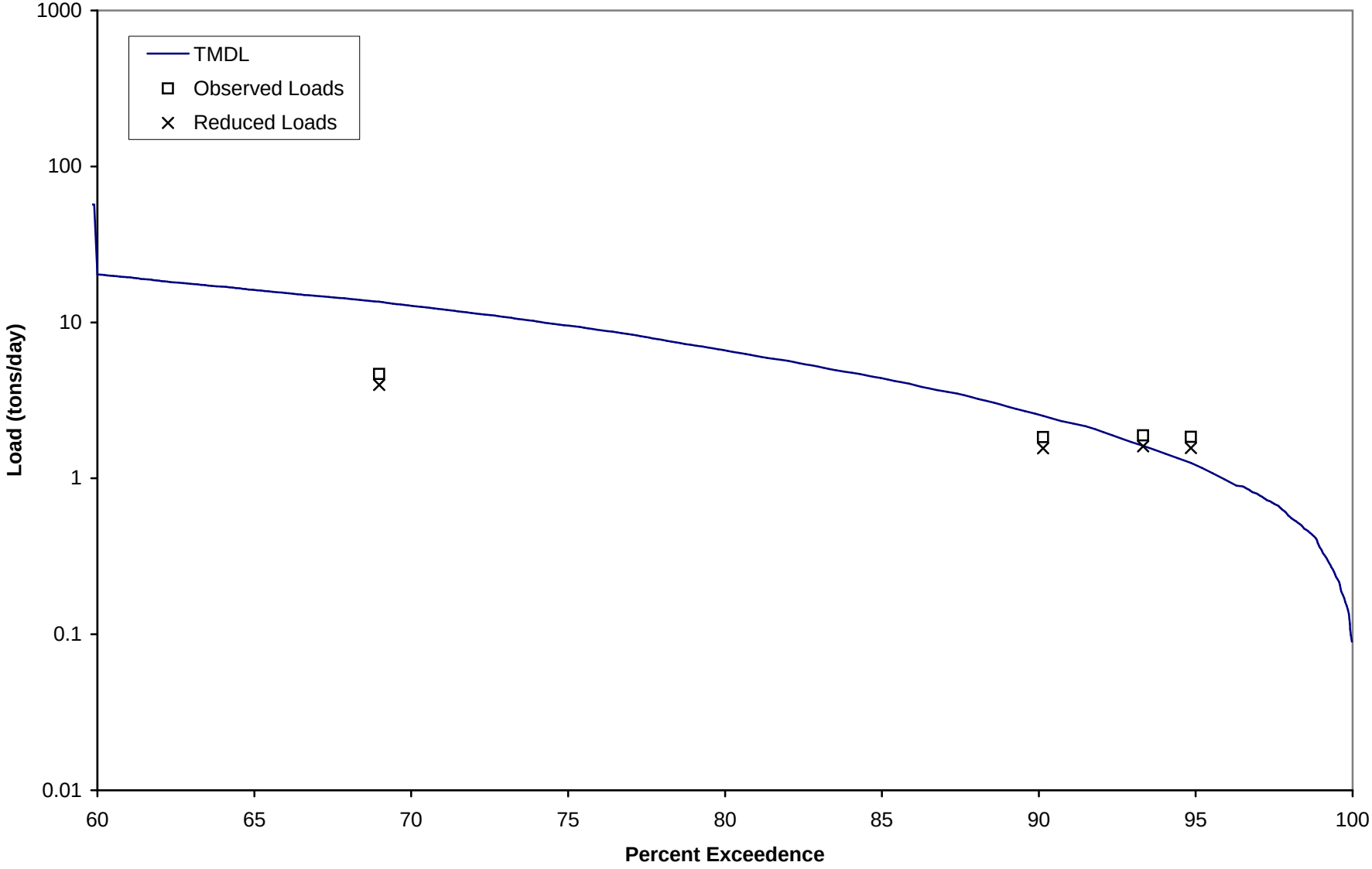


TABLE D.1. ALLOWABLE LOAD FOR BLACKFISH BAYOU (08020203-007)

L'Anguille River flow (cfs)	Estimated flow at DS end of 08020203-007 (cfs)	Percent exceed-ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
1.0	0.37	99.977	0.0396197	Base flow	75	90	8.98E-02	3.56E-05
1.1	0.41	99.943	0.0264131	Base flow	75	90	9.88E-02	2.61E-05
1.2	0.44	99.925	0.0150932	Base flow	75	90	1.08E-01	1.63E-05
The rows between 99.925 and 60.222 percent exceedances are not shown for the sake of brevity.								
224.0	82.86	60.222	0.0962192	Base flow	75	90	2.01E+01	1.94E-02
225.0	83.23	60.120	0.1094257	Base flow	75	90	2.02E+01	2.21E-02
226.0	83.60	60.003	0.113199	Base flow	75	90	2.03E+01	2.30E-02
							Total =	3.17E+00
227.0	83.97	59.894	0.1037658	Storm flow	250	251	5.68E+01	5.90E-02
228.0	84.34	59.795	0.0830126	Storm flow	250	251	5.71E+01	4.74E-02
229.0	84.71	59.728	0.0735794	Storm flow	250	251	5.73E+01	4.22E-02
The rows between 59.728 and 0.026 percent exceedances are not shown for the sake of brevity.								
13,000.0	4,808.88	0.026	0.0075466	Storm flow	250	251	3.26E+03	2.46E-01
14,300.0	5,289.77	0.019	0.0094333	Storm flow	250	251	3.58E+03	3.38E-01
15,000.0	5,548.71	0.008	0.0132066	Storm flow	250	251	3.76E+03	4.96E-01
							Total =	1.67E+02

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TABLE D.2. STORM FLOW PERCENT REDUCTION FOR TSS IN BLACKFISH BAYOU (08020203-007)

TSS Target =	251 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 =	251 mg/L		
Percent reduction =	0%		

Date	Observed TSS at FRA0027 (mg/L)	Estimated flow in Blackfish Bayou (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
1/23/2001	116	219	35.56	68.624	68.624	148.488	Yes
3/6/2001	373	747	8.32	751.664	751.664	505.811	No

Total number of values of loads =	2
Allowable % of exceedances of loads =	20%
Allowable no. of exceedances of loads =	1
No. of exceedances before reductions of loads =	1
No. of exceedances after reductions of loads =	1

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BLACKFISH BAYOU 007.XLS

TABLE D.3. BASE FLOW PERCENT REDUCTION FOR TSS IN BLACKFISH BAYOU (08020203-007)

TSS Target =	90 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 =	90 mg/L		
Percent reduction =	15%		

Date	Observed TSS at FRA0027 (mg/L)	Estimated flow in Blackfish Bayou (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
11/6/2000	132	5	94.85	1.844	1.567	1.257	No
7/9/2001	105	7	93.32	1.885	1.603	1.616	Yes
5/15/2001	65.75	10	90.14	1.837	1.561	2.514	Yes
9/11/2001	31	56	68.98	4.670	3.969	13.558	Yes

Total number of values of loads =	4
Allowable % of exceedances of loads =	25%
Allowable no. of exceedances of loads =	1
No. of exceedances before reductions of loads =	2
No. of exceedances after reductions of loads =	1

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BLACKFISH BAYOU 007.XLS

APPENDIX E

TMDL for Blackfish Bayou 08020203-005

Figure E.1. Flow duration curve for Blackfish Bayou (08020203-005)

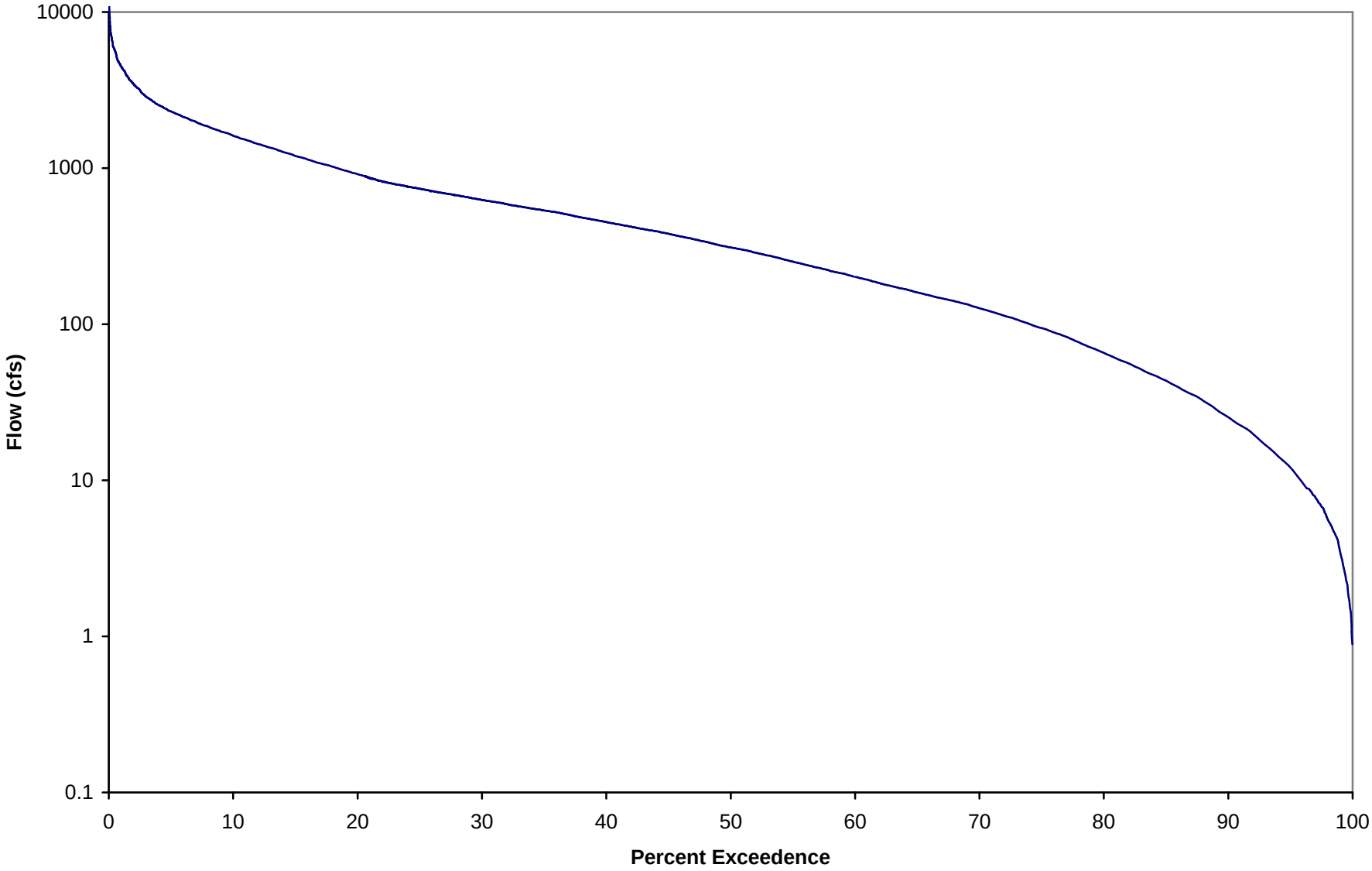

Figure E.2. Storm flow load duration curve for Blackfish Bayou (08020203-005)

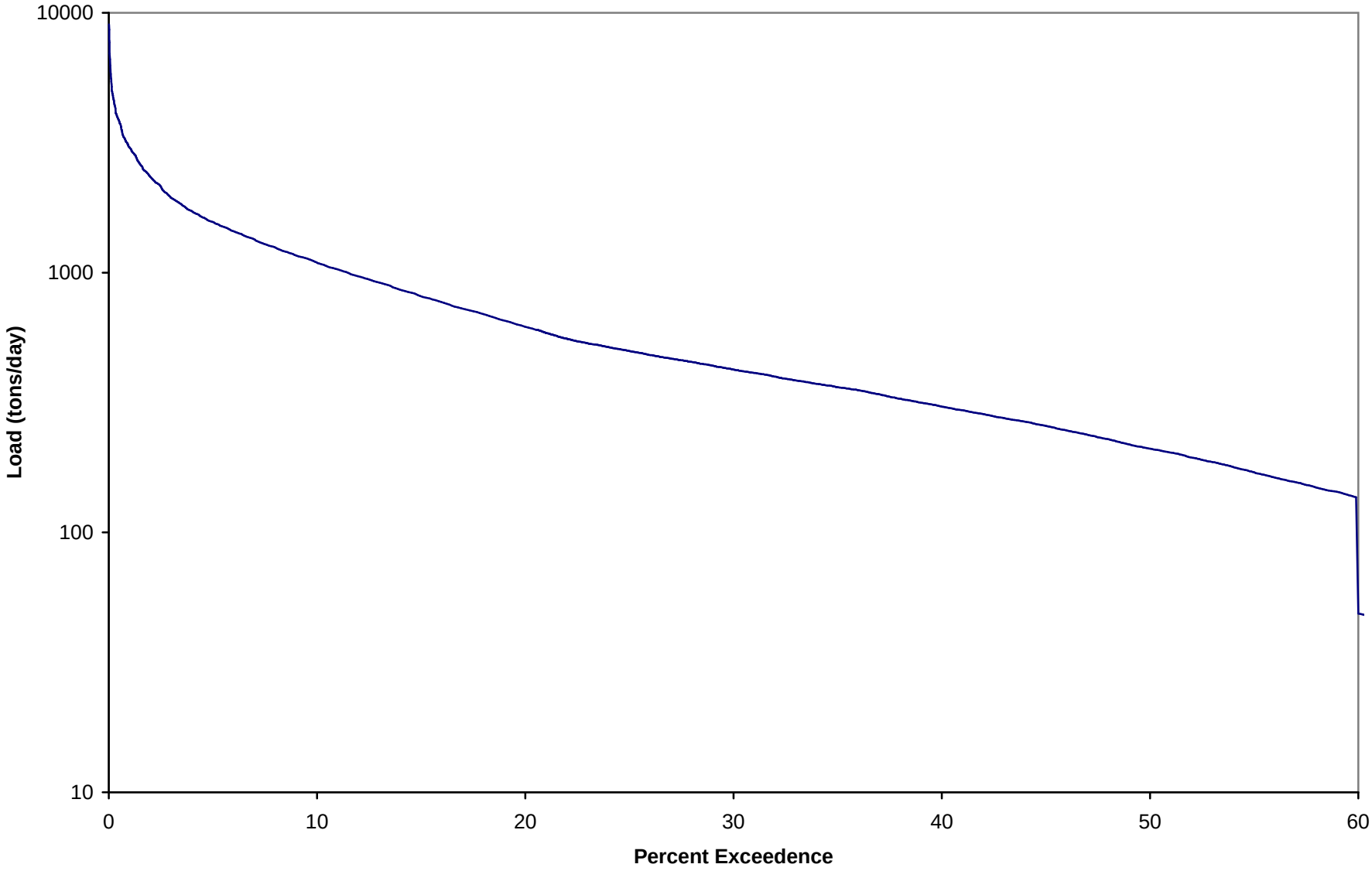

Figure E.3. Base flow load duration curve for Blackfish Bayou (08020203-005)

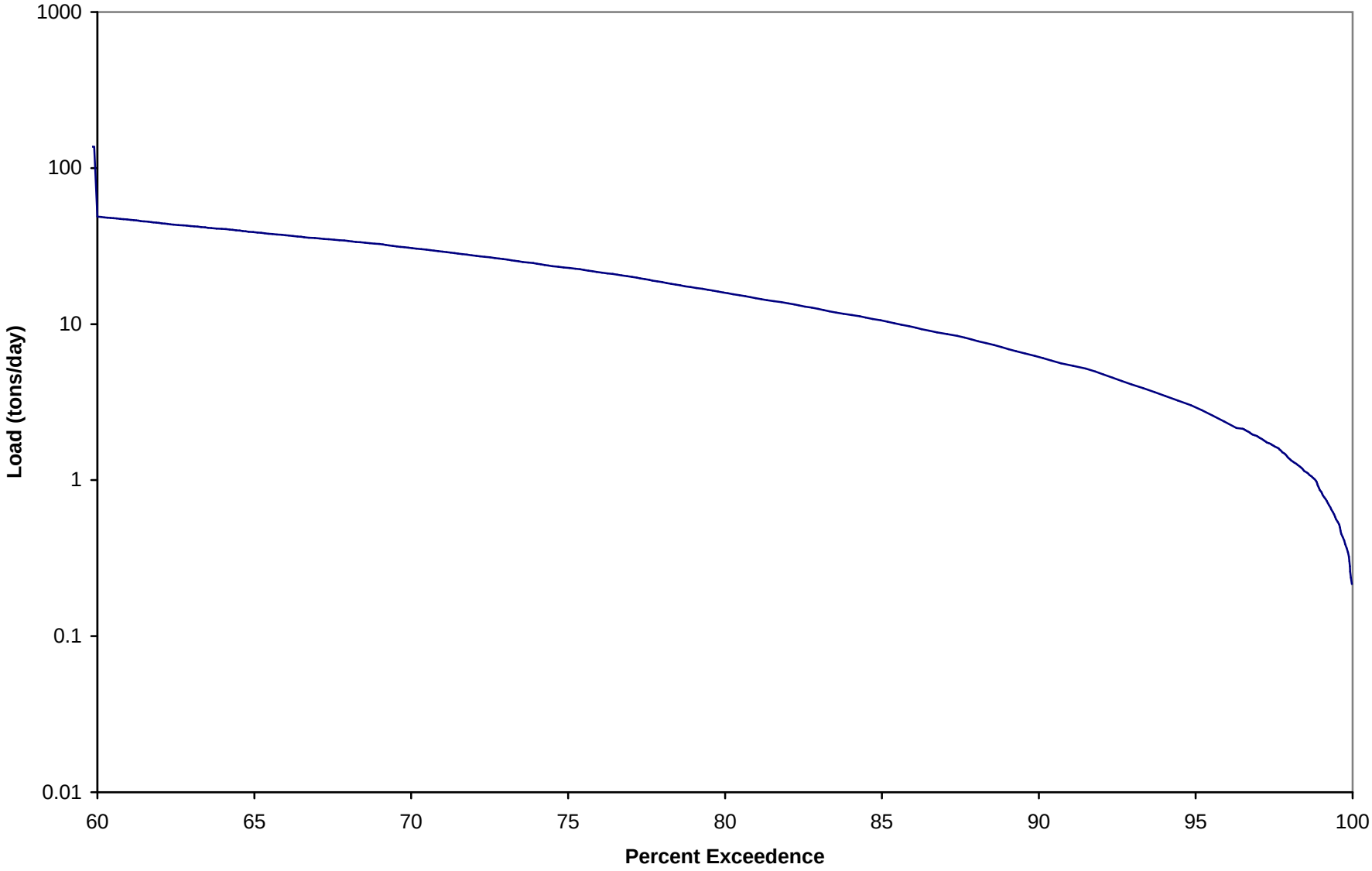

TABLE E.1. ALLOWABLE LOAD FOR BLACKFISH BAYOU (08020203-005)

L'Anguille River flow (cfs)	Estimated flow at DS end of 08020203-005 (cfs)	Percent exceed-ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
1.0	0.89	99.977	0.0396197	Base flow	75	90	2.16E-01	8.55E-05
1.1	0.98	99.943	0.0264131	Base flow	75	90	2.37E-01	6.27E-05
1.2	1.07	99.925	0.0150932	Base flow	75	90	2.59E-01	3.91E-05
The rows between 99.925 and 60.222 percent exceedances are not shown for the sake of brevity.								
224.0	199.21	60.222	0.0962192	Base flow	75	90	4.84E+01	4.65E-02
225.0	200.09	60.120	0.1094257	Base flow	75	90	4.86E+01	5.31E-02
226.0	200.98	60.003	0.113199	Base flow	75	90	4.88E+01	5.52E-02
							Total =	7.62E+00
227.0	201.87	59.894	0.1037658	Storm flow	250	251	1.37E+02	1.42E-01
228.0	202.76	59.795	0.0830126	Storm flow	250	251	1.37E+02	1.14E-01
229.0	203.65	59.728	0.0735794	Storm flow	250	251	1.38E+02	1.01E-01
The rows between 59.728 and 0.026 percent exceedances are not shown for the sake of brevity.								
13,000.0	11,561.03	0.026	0.0075466	Storm flow	250	251	7.83E+03	5.91E-01
14,300.0	12,717.13	0.019	0.0094333	Storm flow	250	251	8.61E+03	8.12E-01
15,000.0	13,339.65	0.008	0.0132066	Storm flow	250	251	9.03E+03	1.19E+00
							Total =	4.01E+02

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BLACKFISH BAYOU 005.XLS

APPENDIX F

TMDL for Blackfish Bayou 08020203-003

Figure F.1. Flow duration curve for Blackfish Bayou (08020203-003)

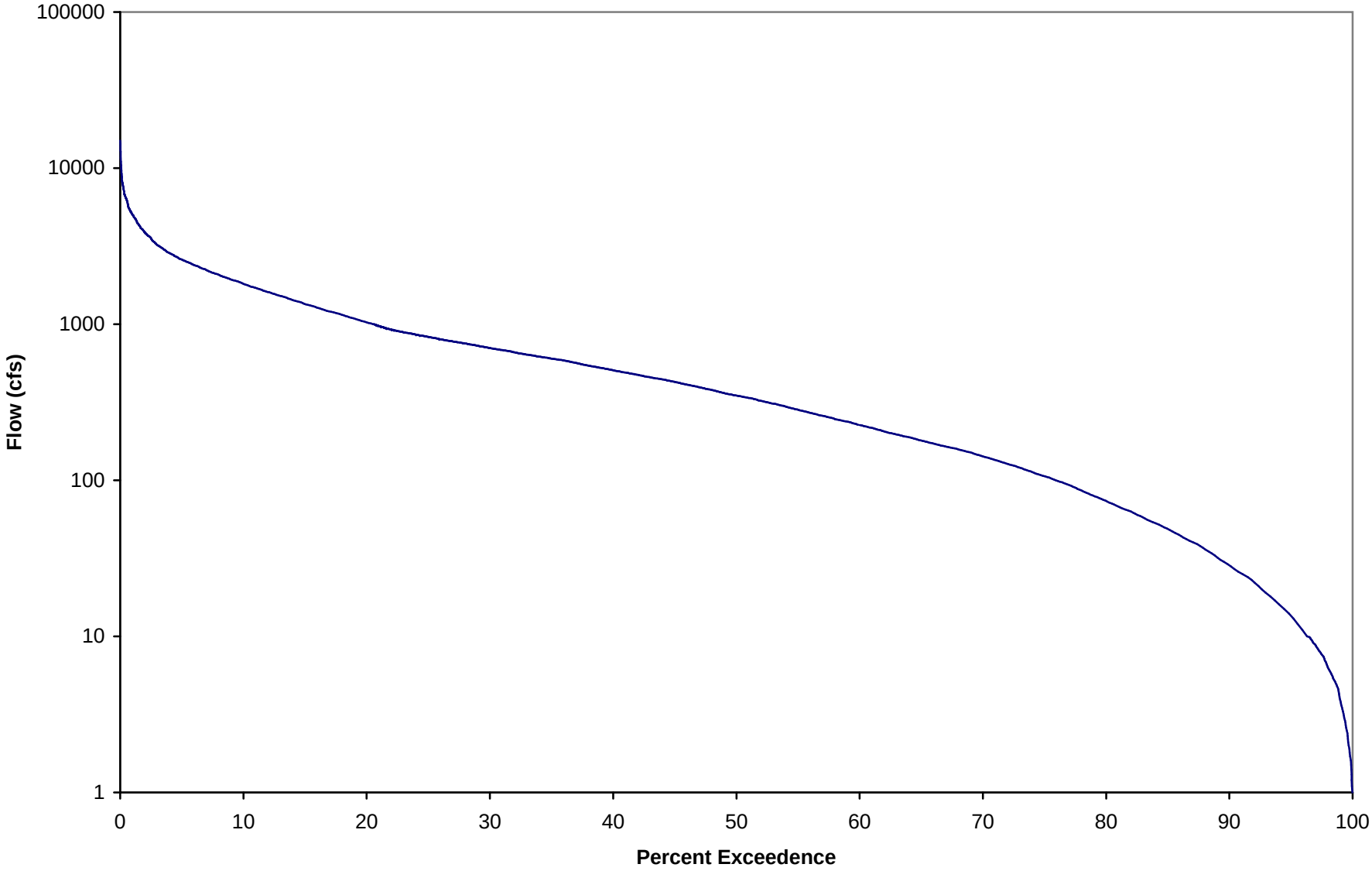

Figure F.2. Storm flow load duration curve for Blackfish Bayou (08020203-003)

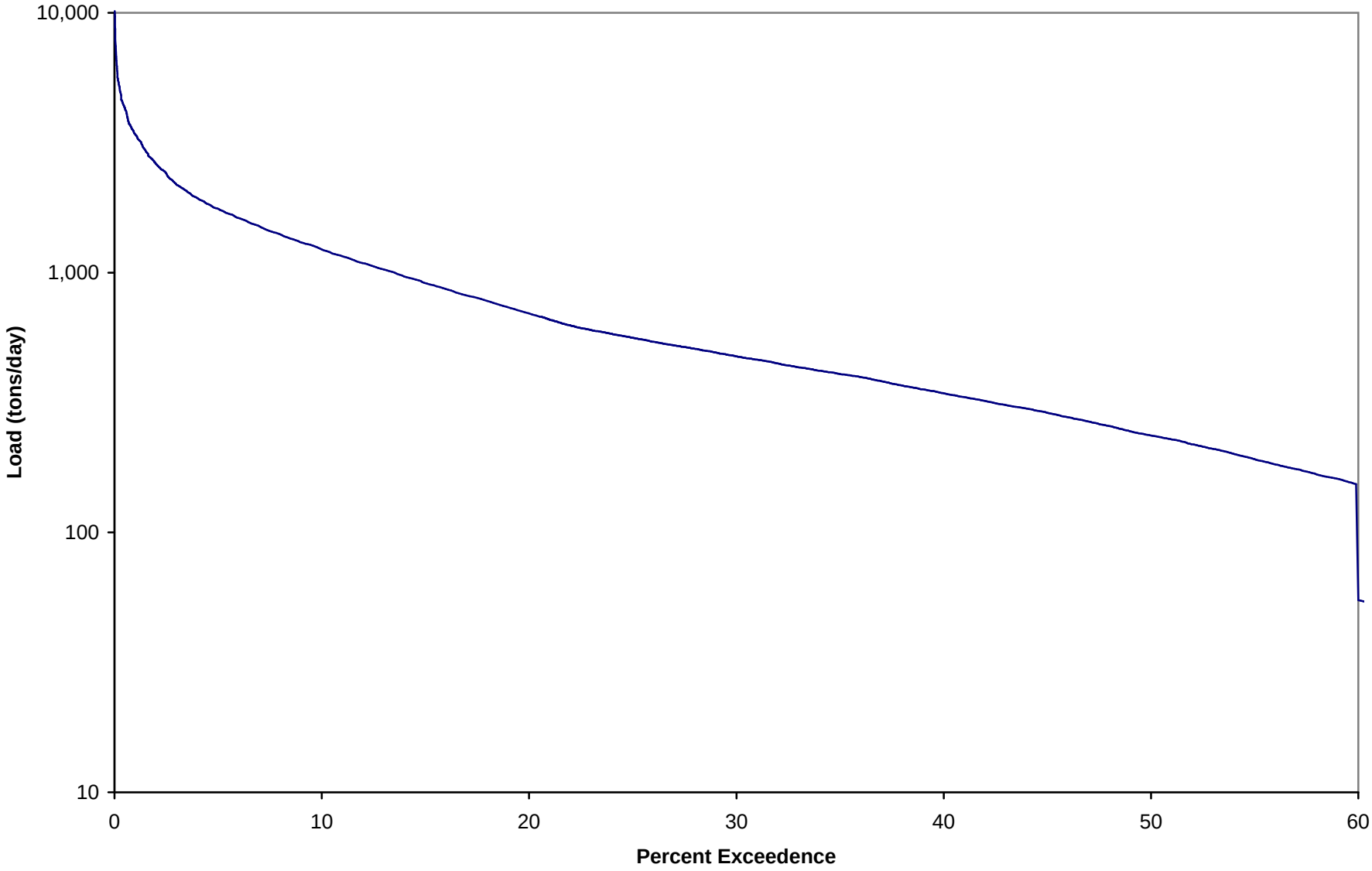

Figure F.3. Base flow load duration curve for Blackfish Bayou (08020203-003)

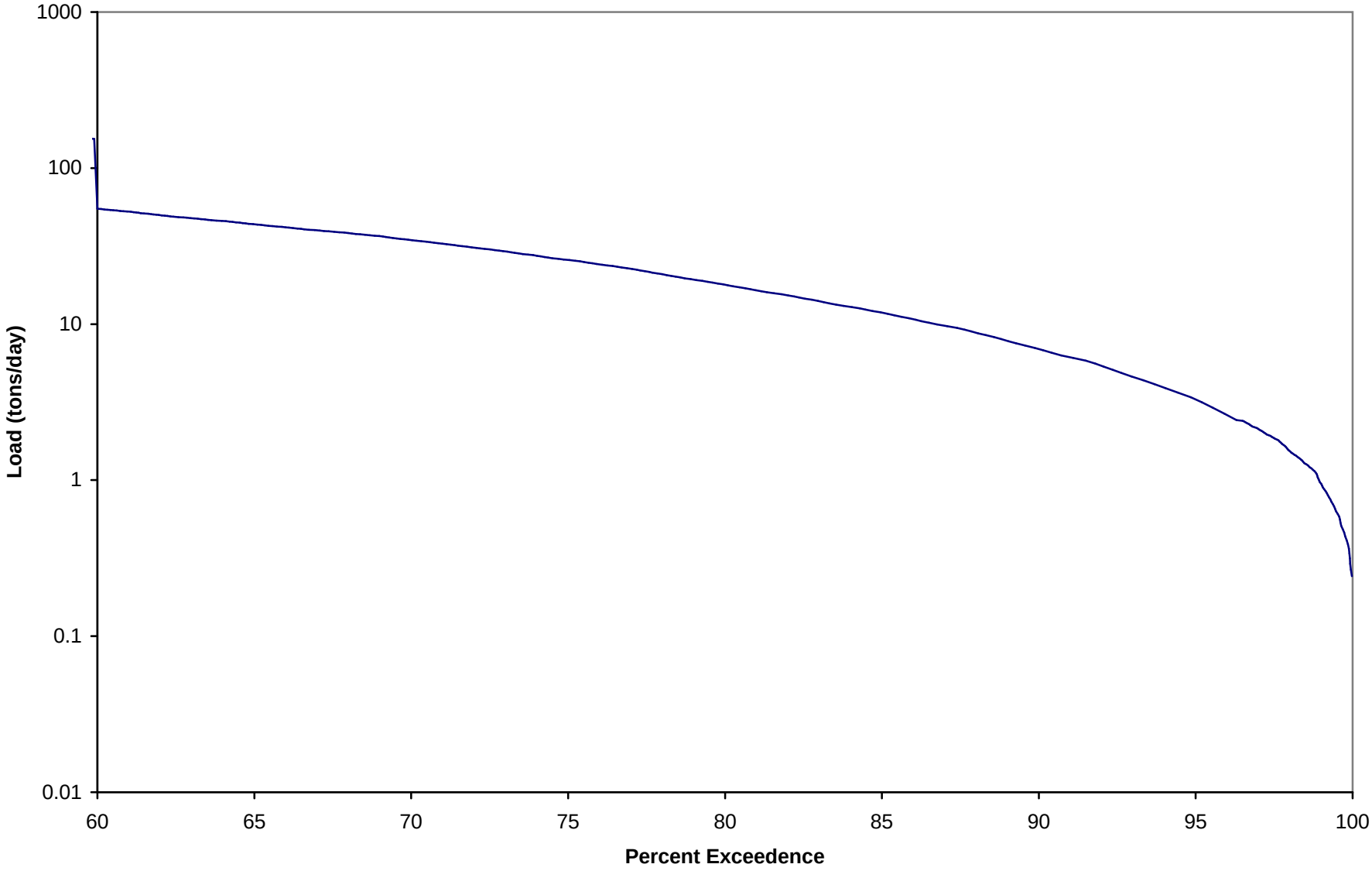

TABLE F.1. ALLOWABLE LOAD FOR BLACKFISH BAYOU (08020203-003)

L'Anguille River flow (cfs)	Estimated flow at DS end of 08020203-003 (cfs)	Percent exceed-ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
1.0	1.00	99.977	0.0396197	Base flow	75	90	2.43E-01	9.61E-05
1.1	1.10	99.943	0.0264131	Base flow	75	90	2.67E-01	7.05E-05
1.2	1.20	99.925	0.0150932	Base flow	75	90	2.91E-01	4.39E-05
The rows between 99.925 and 60.222 percent exceedances are not shown for the sake of brevity.								
224.0	223.94	60.222	0.0962192	Base flow	75	90	5.44E+01	5.23E-02
225.0	224.94	60.120	0.1094257	Base flow	75	90	5.46E+01	5.97E-02
226.0	225.94	60.003	0.113199	Base flow	75	90	5.48E+01	6.21E-02
							Total =	8.57E+00
227.0	226.94	59.894	0.1037658	Storm flow	250	251	1.54E+02	1.59E-01
228.0	227.94	59.795	0.0830126	Storm flow	250	251	1.54E+02	1.28E-01
229.0	228.94	59.728	0.0735794	Storm flow	250	251	1.55E+02	1.14E-01
The rows between 59.728 and 0.026 percent exceedances are not shown for the sake of brevity.								
13,000.0	12,996.39	0.026	0.0075466	Storm flow	250	251	8.80E+03	6.64E-01
14,300.0	14,296.02	0.019	0.0094333	Storm flow	250	251	9.68E+03	9.13E-01
15,000.0	14,995.83	0.008	0.0132066	Storm flow	250	251	1.02E+04	1.34E+00
							Total =	4.51E+02

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL BLACKFISH BAYOU 003.XLS

APPENDIX G

TMDL for Prairie Creek 08040101-048

Figure G.1. Flow duration curve for Prairie Creek

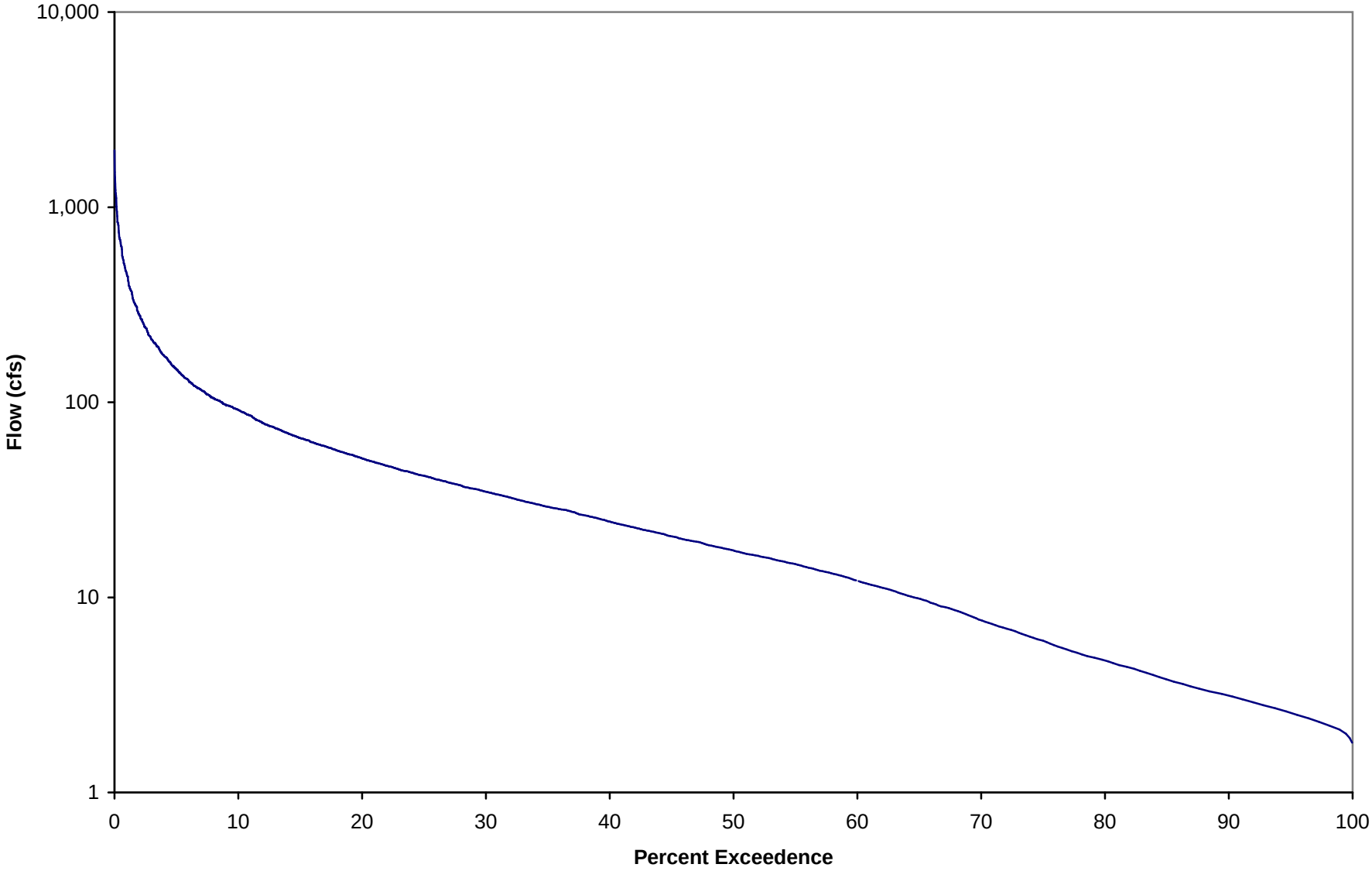

Figure G.2. Storm flow load duration curve for Prairie Creek

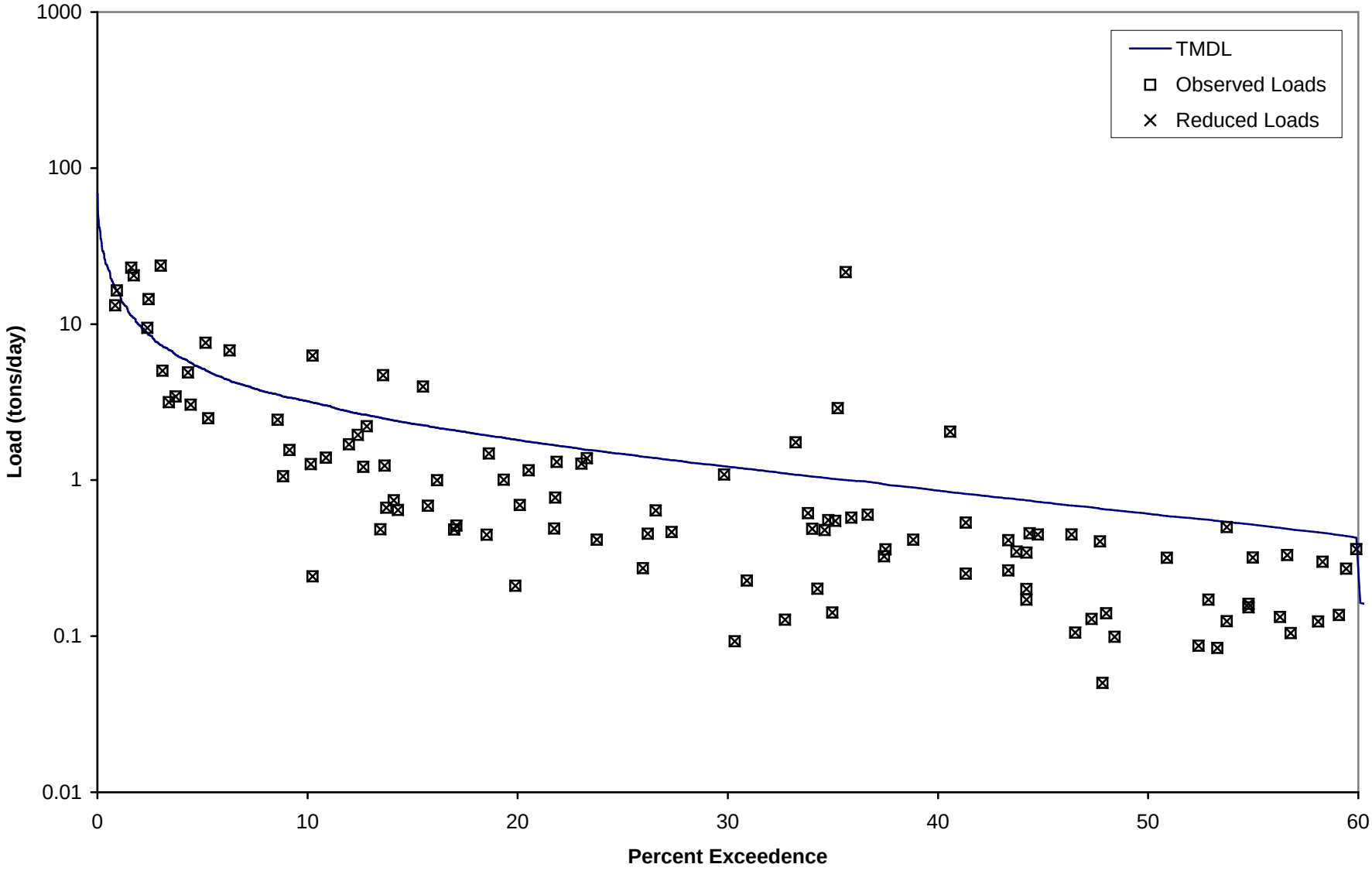

Figure G.3. Base flow load duration curve for Prairie Creek

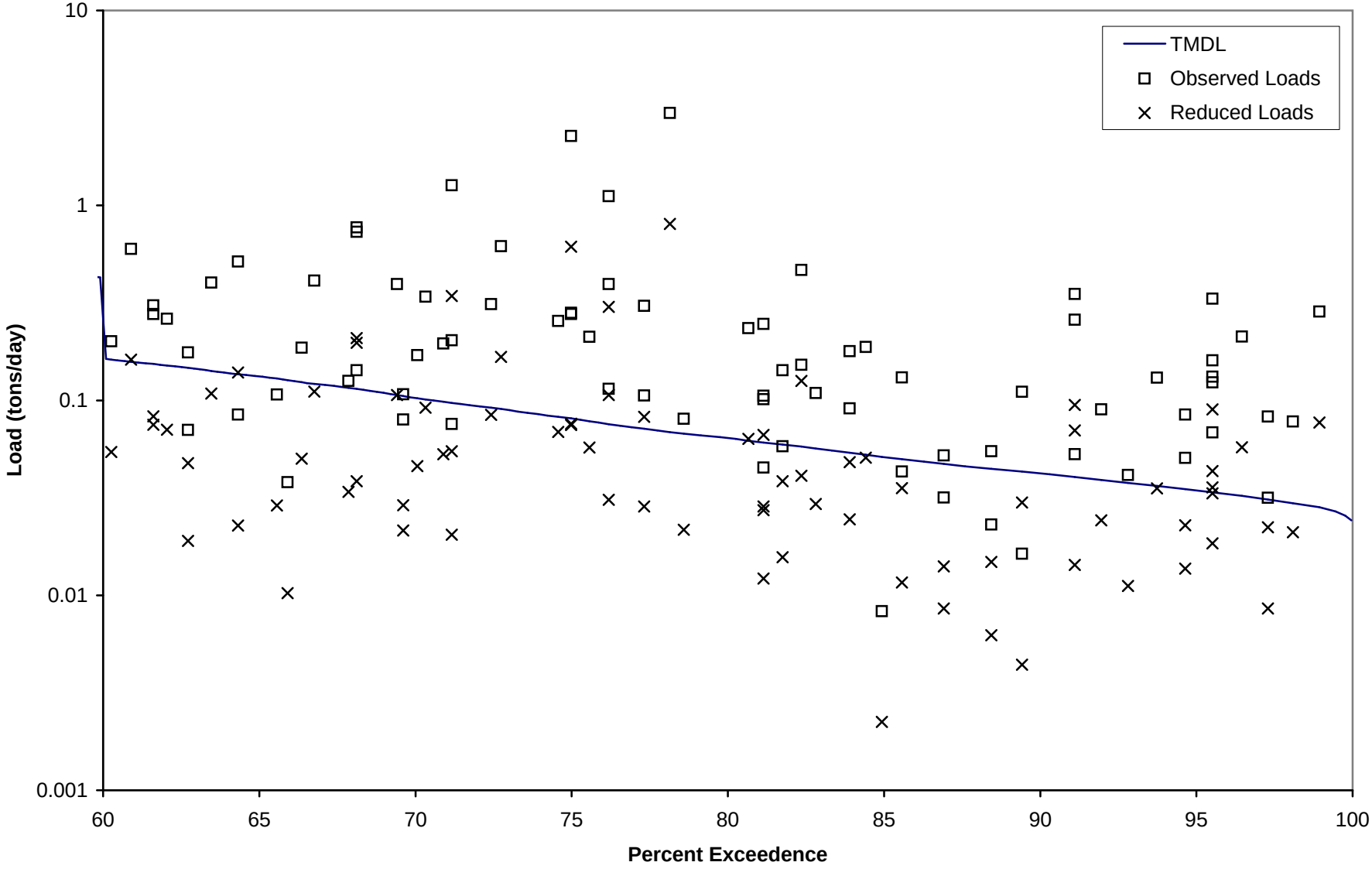

TABLE G.1. ALLOWABLE LOAD FOR PRAIRIE CREEK (08040101-048)

Est Flow in Prairie Creek (cfs)	Percent exceed-ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
1.8	99.960	0.141	Base flow	10	5	2.43E-02	3.42E-05
1.9	99.758	0.254	Base flow	10	5	2.56E-02	6.50E-05
2.0	99.452	0.411	Base flow	10	5	2.70E-02	1.11E-04
The rows between 99.452 and 60.461 percent exceedances are not shown for the sake of brevity.							
11.9	60.461	0.217	Base flow	10	5	1.60E-01	3.49E-04
12.0	60.259	0.181	Base flow	10	5	1.62E-01	2.93E-04
12.1	60.098	0.177	Base flow	10	5	1.63E-01	2.89E-04
							3.00E-02
12.2	59.905	0.185	Storm flow	18	13	4.28E-01	7.92E-04
12.3	59.728	0.161	Storm flow	18	13	4.31E-01	6.95E-04
12.4	59.583	0.153	Storm flow	18	13	4.35E-01	6.65E-04
The rows between 59.583 and 0.040 percent exceedances are not shown for the sake of brevity.							
1,422.5	0.040	0.016	Storm flow	18	13	4.99E+01	8.03E-03
1,512.4	0.024	0.016	Storm flow	18	13	5.30E+01	8.54E-03
1,957.8	0.008	0.016	Storm flow	18	13	6.86E+01	1.11E-02
							1.40E+00

FILE: R:\PROJECTS\2110-624\TECH\TMDL\TMDL PRIAIRE CREEK.XLS

TABLE G.2. STORM FLOW PERCENT REDUCTION FOR TSS IN PRAIRIE CREEK (08040101-048)

TSS Target =	13 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 =	13 mg/L		
Percent reduction =	0%		

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
5/8/2001	11	12	59.90	0.361	0.361	0.427	Yes
4/26/1994	8	13	59.42	0.270	0.270	0.440	Yes
6/12/2002	4	13	59.08	0.137	0.137	0.444	Yes
5/12/1997	9	13	58.30	0.300	0.300	0.459	Yes
5/28/2003	4	13	58.09	0.124	0.124	0.462	Yes
5/19/2004	3	14	56.78	0.105	0.105	0.485	Yes
12/10/2003	9	14	56.62	0.331	0.331	0.488	Yes
6/9/1998	4	14	56.27	0.133	0.133	0.493	Yes
6/28/1993	8	15	54.98	0.319	0.319	0.518	Yes
4/12/2006	4	15	54.78	0.153	0.153	0.522	Yes
4/20/2004	4	15	54.78	0.161	0.161	0.524	Yes
3/12/1996	3	15	53.74	0.125	0.125	0.540	Yes
5/5/1992	12	15	53.74	0.499	0.499	0.541	Yes
3/2/1999	2	16	53.29	0.084	0.084	0.545	Yes
11/2/1993	4	16	52.87	0.171	0.171	0.557	Yes
12/18/2006	2	16	52.40	0.087	0.087	0.565	Yes
5/8/2002	7	17	50.89	0.318	0.318	0.591	Yes
11/3/1998	2	18	48.41	0.099	0.099	0.643	Yes
11/17/2004	3	19	48.00	0.140	0.140	0.650	Yes
1/19/1999	1	19	47.83	0.050	0.050	0.651	Yes
6/25/2003	8	19	47.71	0.404	0.404	0.657	Yes
3/17/2004	3	19	47.31	0.129	0.129	0.670	Yes
1/3/2002	2	20	46.54	0.105	0.105	0.685	Yes
5/26/1999	9	20	46.35	0.448	0.448	0.686	Yes
2/4/1992	8	21	44.75	0.447	0.447	0.727	Yes

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
4/7/1992	8	21	44.36	0.456	0.456	0.741	Yes
2/28/2007	3	21	44.21	0.171	0.171	0.743	Yes
2/22/2005	4	21	44.21	0.200	0.200	0.744	Yes
4/27/2005	6	21	44.21	0.344	0.344	0.744	Yes
3/19/1991	6	22	43.74	0.348	0.348	0.755	Yes
2/6/1995	5	22	43.35	0.264	0.264	0.763	Yes
2/2/1993	7	22	43.35	0.412	0.412	0.765	Yes
3/22/1994	9	23	41.33	0.534	0.534	0.817	Yes
12/21/1999	4	23	41.33	0.251	0.251	0.817	Yes
10/13/2004	32	24	40.59	2.043	2.043	0.838	No
12/1/1992	6	26	38.82	0.414	0.414	0.898	Yes
5/16/1995	5	27	37.50	0.360	0.360	0.935	Yes
11/12/1997	5	27	37.44	0.325	0.325	0.939	Yes
3/30/1993	8	28	36.66	0.600	0.600	0.976	Yes
12/5/2001	8	28	35.88	0.575	0.575	0.996	Yes
6/2/1992	279	29	35.61	21.489	21.489	1.001	No
5/17/1994	37	29	35.23	2.888	2.888	1.015	No
4/18/2007	7	29	35.11	0.548	0.548	1.017	Yes
12/14/2004	2	29	34.97	0.141	0.141	1.022	Yes
10/13/1998	7	29	34.79	0.554	0.554	1.029	Yes
2/12/1991	6	30	34.61	0.478	0.478	1.036	Yes
2/3/1998	3	30	34.26	0.201	0.201	1.047	Yes
3/3/1992	6	30	34.02	0.487	0.487	1.056	Yes
4/25/2000	8	30	33.81	0.613	0.613	1.062	Yes
4/9/1991	21	31	33.23	1.749	1.749	1.083	No
12/1/1998	2	32	32.72	0.128	0.128	1.106	Yes
2/16/1999	3	34	30.91	0.227	0.227	1.182	Yes
5/26/1998	1	34	30.33	0.093	0.093	1.207	Yes
5/31/2000	12	35	29.82	1.085	1.085	1.226	Yes
11/21/1994	5	38	27.32	0.465	0.465	1.344	Yes
1/2/1996	6	39	26.57	0.639	0.639	1.384	Yes
3/6/2002	4	40	26.20	0.453	0.453	1.401	Yes

Table G.2. Storm Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
12/20/2000	3	40	25.95	0.272	0.272	1.415	Yes
12/2/1997	4	44	23.77	0.415	0.415	1.543	Yes
4/18/2001	12	45	23.30	1.383	1.383	1.563	Yes
3/14/1995	11	45	23.04	1.277	1.277	1.581	Yes
11/6/2002	10	48	21.86	1.308	1.308	1.667	Yes
11/5/1991	6	48	21.78	0.772	0.772	1.673	Yes
2/18/2004	4	48	21.73	0.490	0.490	1.676	Yes
9/15/1998	9	50	20.53	1.154	1.154	1.765	Yes
4/16/1996	5	51	20.11	0.692	0.692	1.799	Yes
2/19/2003	2	52	19.89	0.210	0.210	1.821	Yes
3/1/2000	7	53	19.33	1.006	1.006	1.869	Yes
11/15/2000	10	55	18.63	1.481	1.481	1.926	Yes
12/10/1996	3	55	18.52	0.447	0.447	1.938	Yes
3/30/2005	3	59	17.09	0.511	0.511	2.074	Yes
4/3/2002	3	60	16.98	0.482	0.482	2.090	Yes
1/25/1994	6	62	16.16	1.000	1.000	2.166	Yes
4/8/1997	4	64	15.73	0.686	0.686	2.228	Yes
1/17/2001	23	64	15.49	3.979	3.979	2.249	No
2/5/2002	4	68	14.30	0.643	0.643	2.388	Yes
1/13/1998	4	69	14.11	0.743	0.743	2.414	Yes
4/28/1998	4	70	13.75	0.665	0.665	2.470	Yes
7/19/1994	7	71	13.67	1.239	1.239	2.479	Yes
12/20/1994	25	71	13.59	4.694	4.694	2.491	No
1/17/1995	3	72	13.46	0.483	0.483	2.514	Yes
2/4/1997	11	75	12.82	2.212	2.212	2.614	Yes
1/23/2007	6	75	12.66	1.214	1.214	2.631	Yes
3/27/2000	10	76	12.39	1.950	1.950	2.669	Yes
12/4/1990	8	78	11.97	1.692	1.692	2.750	Yes
5/3/1993	6	86	10.88	1.391	1.391	3.013	Yes
11/19/1996	1	90	10.24	0.242	0.242	3.141	Yes
12/4/2002	26	90	10.24	6.282	6.282	3.141	No
3/14/2001	5	90	10.15	1.266	1.266	3.165	Yes

Table G.2. Storm Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
12/7/1993	6	96	9.15	1.557	1.557	3.373	Yes
5/3/2006	4	98	8.84	1.059	1.059	3.440	Yes
4/4/1995	9	100	8.58	2.438	2.438	3.522	Yes
11/15/2006	20	124	6.29	6.774	6.774	4.360	No
4/28/1999	7	142	5.27	2.486	2.486	4.971	Yes
3/19/2003	20	144	5.15	7.597	7.597	5.065	No
4/30/1991	7	161	4.44	3.047	3.047	5.658	Yes
3/2/1993	11	165	4.31	4.899	4.899	5.790	Yes
12/3/1991	7	182	3.73	3.430	3.430	6.371	Yes
10/29/1996	6	195	3.41	3.152	3.152	6.829	Yes
6/30/1999	9	207	3.10	5.019	5.019	7.249	Yes
1/15/1991	42	209	3.01	23.699	23.699	7.335	No
2/22/1994	22	243	2.44	14.443	14.443	8.534	No
6/23/2004	14	250	2.38	9.454	9.454	8.779	No
2/14/2001	24	313	1.73	20.489	20.489	10.961	No
3/17/1998	27	322	1.62	23.013	23.013	11.289	No
10/9/1990	13	469	0.93	16.440	16.440	16.440	Yes
1/5/1993	10	489	0.85	13.195	13.195	17.153	Yes

Total number of values of loads =	107
Allowable % of exceedances of loads =	20%
Allowable no. of exceedances of loads =	22
No. of exceedances before reductions of loads =	14
No. of exceedances after reductions of loads =	14

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Table G.2. Storm Flow
Percent Reductions for Prairie Creek

TABLE G.3. BASE FLOW PERCENT REDUCTION FOR TSS IN PRAIRIE CREEK (08040101-048)

TSS Target =	5 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 =	5 mg/L		
Percent reduction =	73%		

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
9/14/2005	49	2.15	98.94	0.285	0.077	0.029	No
9/5/1995	13	2.22	98.09	0.078	0.021	0.030	Yes
8/24/2005	14	2.25	97.29	0.083	0.022	0.030	Yes
7/26/2006	5	2.33	97.29	0.032	0.009	0.031	Yes
8/8/2001	33	2.39	96.46	0.213	0.057	0.032	No
9/1/1999	20	2.45	95.51	0.132	0.036	0.033	No
8/30/2006	50	2.47	95.51	0.333	0.090	0.033	No
7/11/2001	24	2.48	95.51	0.161	0.043	0.033	No
9/4/2002	10	2.49	95.51	0.068	0.018	0.034	Yes
9/5/2001	18	2.55	95.51	0.124	0.033	0.034	Yes
9/29/1999	12	2.61	94.64	0.085	0.023	0.035	Yes
9/8/2004	7	2.62	94.64	0.051	0.014	0.035	Yes
8/14/2002	18	2.70	93.73	0.131	0.035	0.036	Yes
8/25/1997	5	2.84	92.81	0.041	0.011	0.038	Yes
7/20/2005	12	2.89	91.96	0.090	0.024	0.039	Yes
8/15/1995	7	3.02	91.11	0.053	0.014	0.041	Yes
8/11/2004	32	3.03	91.11	0.259	0.070	0.041	No
10/26/2005	43	3.04	91.11	0.351	0.095	0.041	No
9/15/1997	13	3.16	89.42	0.111	0.030	0.043	Yes
10/31/1995	2	3.19	89.42	0.016	0.004	0.043	Yes
9/27/1994	6	3.28	88.44	0.055	0.015	0.044	Yes
7/26/2000	3	3.29	88.44	0.023	0.006	0.044	Yes
7/13/1998	3	3.46	86.91	0.032	0.009	0.047	Yes
10/25/2000	6	3.52	86.91	0.052	0.014	0.047	Yes
9/24/2003	13	3.71	85.57	0.131	0.035	0.050	Yes

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
10/19/1999	4	3.72	85.57	0.043	0.012	0.050	Yes
8/10/1998	1	3.84	84.93	0.008	0.002	0.052	Yes
10/2/2002	18	3.87	84.42	0.188	0.051	0.052	Yes
6/28/2005	17	3.99	83.90	0.179	0.048	0.054	Yes
8/12/2003	8	4.02	83.90	0.091	0.025	0.054	Yes
7/12/1993	10	4.21	82.82	0.109	0.029	0.057	Yes
10/3/1995	40	4.32	82.36	0.466	0.126	0.058	No
10/9/2001	13	4.34	82.36	0.152	0.041	0.058	Yes
11/28/1995	5	4.40	81.75	0.058	0.016	0.059	Yes
8/27/1996	12	4.41	81.75	0.143	0.039	0.059	Yes
10/8/1991	9	4.45	81.14	0.106	0.029	0.060	Yes
10/15/2003	21	4.45	81.14	0.246	0.066	0.060	No
10/15/2003	4	4.45	81.14	0.045	0.012	0.060	Yes
7/14/1997	8	4.47	81.14	0.101	0.027	0.060	Yes
7/28/1999	19	4.58	80.66	0.235	0.063	0.062	No
7/10/2002	6	5.05	78.59	0.080	0.022	0.068	Yes
9/14/1993	215	5.14	78.14	2.979	0.804	0.069	No
12/14/2005	21	5.28	77.32	0.305	0.082	0.071	No
7/14/1992	7	5.31	77.32	0.106	0.029	0.072	Yes
8/13/1991	8	5.59	76.19	0.114	0.031	0.075	Yes
6/25/1996	74	5.59	76.19	1.116	0.301	0.075	No
9/27/2006	26	5.65	76.19	0.394	0.106	0.076	No
1/18/2006	14	5.82	75.57	0.212	0.057	0.079	Yes
9/11/1990	140	6.02	74.98	2.272	0.613	0.081	No
6/7/2006	17	6.03	74.98	0.281	0.076	0.081	Yes
9/27/2000	17	6.05	74.98	0.277	0.075	0.082	Yes
5/24/2005	16	6.10	74.57	0.255	0.069	0.082	Yes
8/10/1993	34	6.74	72.74	0.618	0.167	0.091	No
6/13/2001	17	6.80	72.42	0.312	0.084	0.092	Yes
7/16/2003	11	7.17	71.16	0.203	0.055	0.097	Yes
3/8/2006	4	7.24	71.16	0.076	0.020	0.098	Yes
11/23/1999	65	7.24	71.16	1.270	0.343	0.098	No

Table G.3. Base Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0040 (mg/L)	Estimated flow in Prairie Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
8/23/1994	10	7.26	70.89	0.196	0.053	0.098	Yes
10/25/2006	17	7.46	70.32	0.340	0.092	0.101	Yes
11/7/2001	8	7.61	70.06	0.170	0.046	0.103	Yes
6/21/1994	4	7.78	69.61	0.080	0.022	0.105	Yes
7/11/1995	5	7.80	69.61	0.107	0.029	0.105	Yes
7/21/2004	18	7.95	69.41	0.394	0.106	0.107	Yes
9/17/1996	32	8.47	68.12	0.731	0.197	0.114	No
6/16/1997	6	8.53	68.12	0.143	0.038	0.115	Yes
11/13/2003	34	8.55	68.12	0.772	0.209	0.115	No
8/11/1992	5	8.64	67.85	0.126	0.034	0.116	Yes
10/25/1994	17	8.97	66.76	0.411	0.111	0.121	Yes
10/6/1992	8	9.20	66.36	0.186	0.050	0.124	Yes
10/21/1997	2	9.39	65.90	0.038	0.010	0.127	Yes
4/23/2003	4	9.57	65.57	0.107	0.029	0.129	Yes
10/12/1993	19	10.05	64.32	0.515	0.139	0.136	No
6/20/1995	3	10.10	64.32	0.084	0.023	0.136	Yes
3/20/2007	14	10.48	63.46	0.401	0.108	0.141	Yes
7/30/1996	2	10.88	62.72	0.070	0.019	0.147	Yes
1/26/2000	6	10.90	62.72	0.176	0.048	0.147	Yes
6/11/1991	9	11.17	62.05	0.262	0.071	0.151	Yes
2/6/1996	10	11.38	61.61	0.307	0.083	0.153	Yes
11/17/1992	9	11.43	61.61	0.277	0.075	0.154	Yes
9/8/1992	19	11.68	60.90	0.599	0.162	0.158	No
11/6/1990	6	12.03	60.26	0.201	0.054	0.162	Yes

Total number of values of loads =	81
Allowable % of exceedances of loads =	25%
Allowable no. of exceedances of loads =	21
No. of exceedances before reductions of loads =	68
No. of exceedances after reductions of loads =	21

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Table G.3. Base Flow
Percent Reductions for Prairie Creek

APPENDIX H

TMDL for Moro Creek 08040201-001U

Figure H.1. Flow duration curve for Moro Creek (08040201-001U)

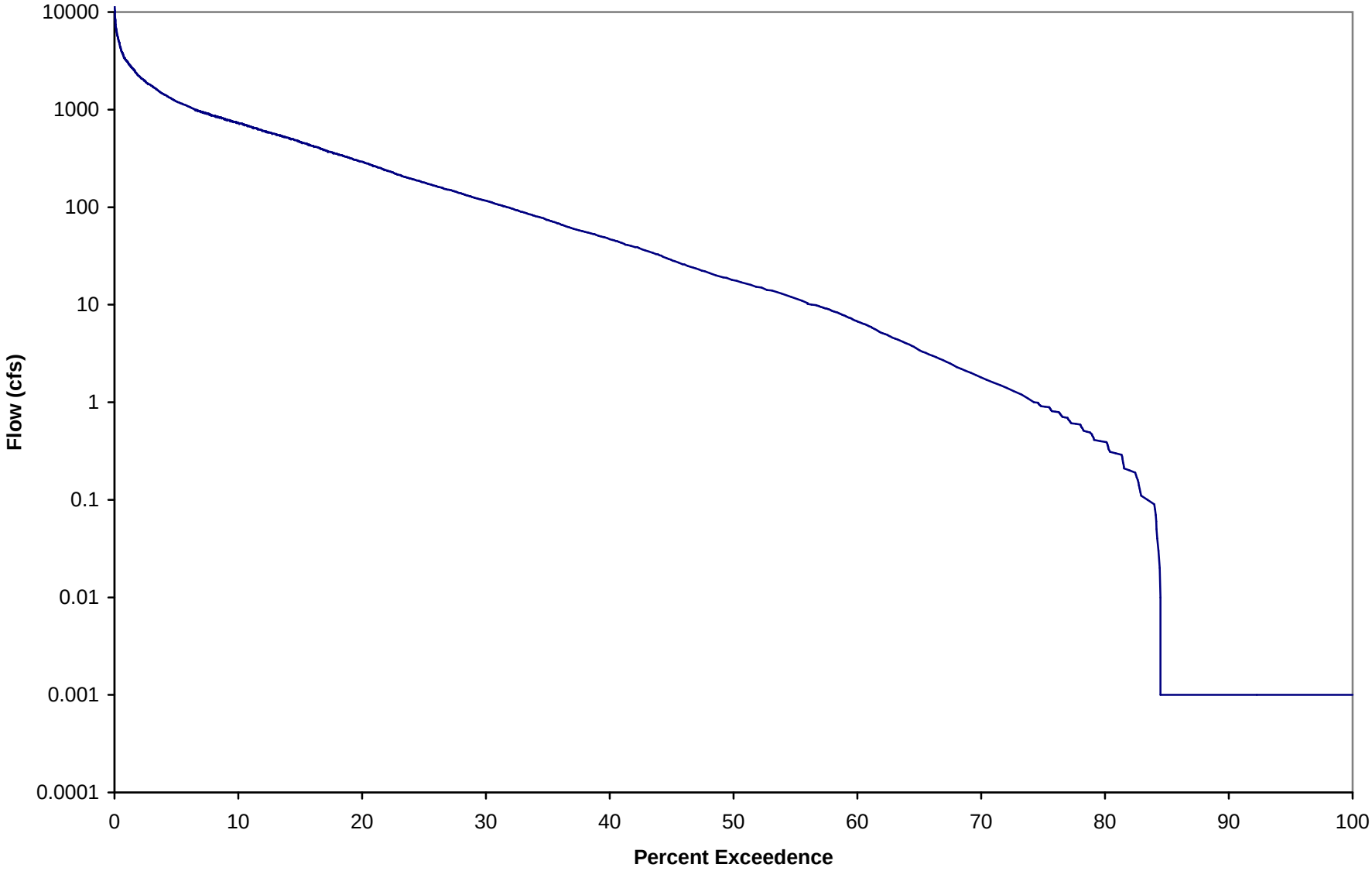

Figure H.2. Storm flow load duration curve for Moro Creek (08040201-001U)

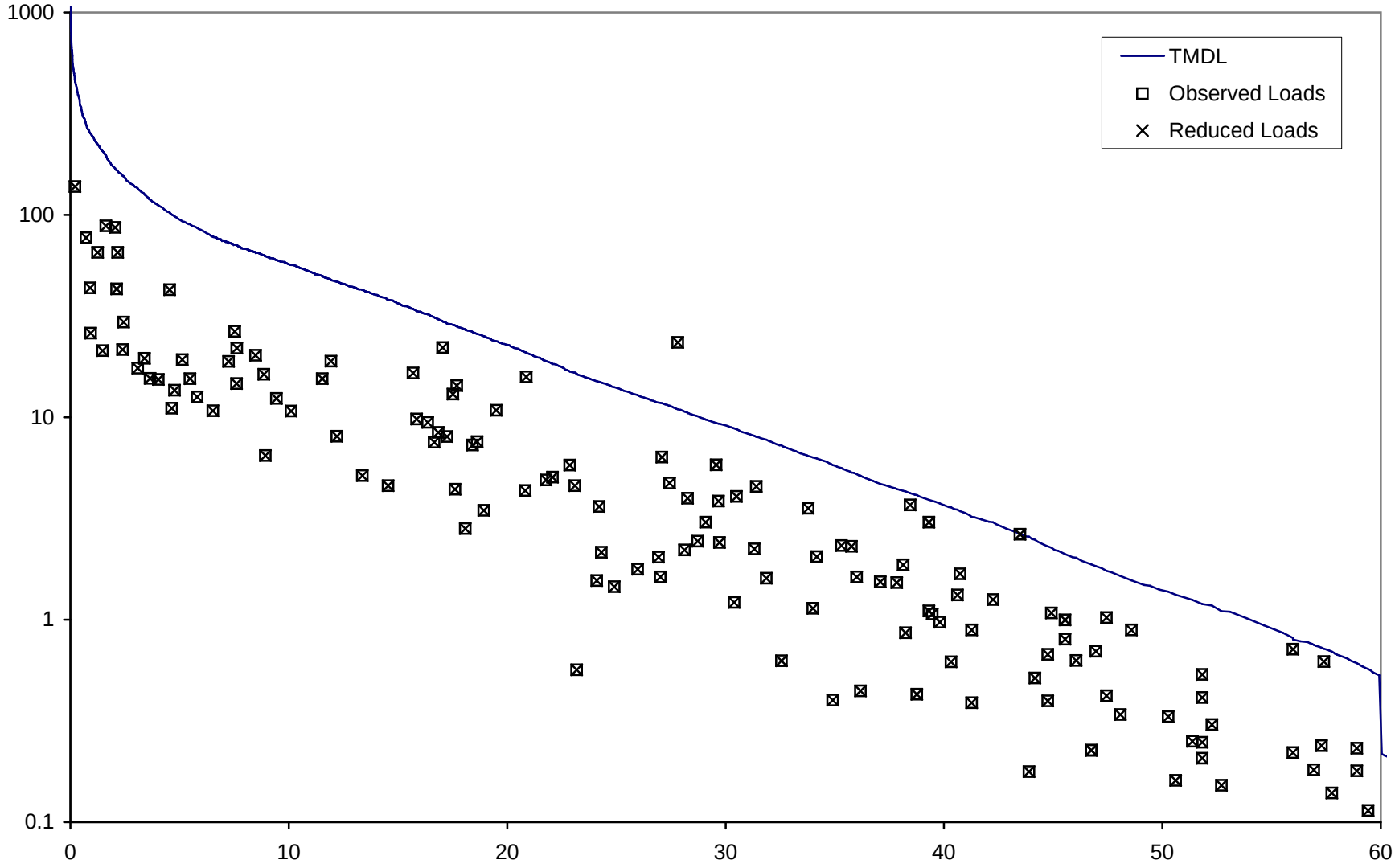

Figure H.3. Base flow load duration curve for Moro Creek (08040201-001U)

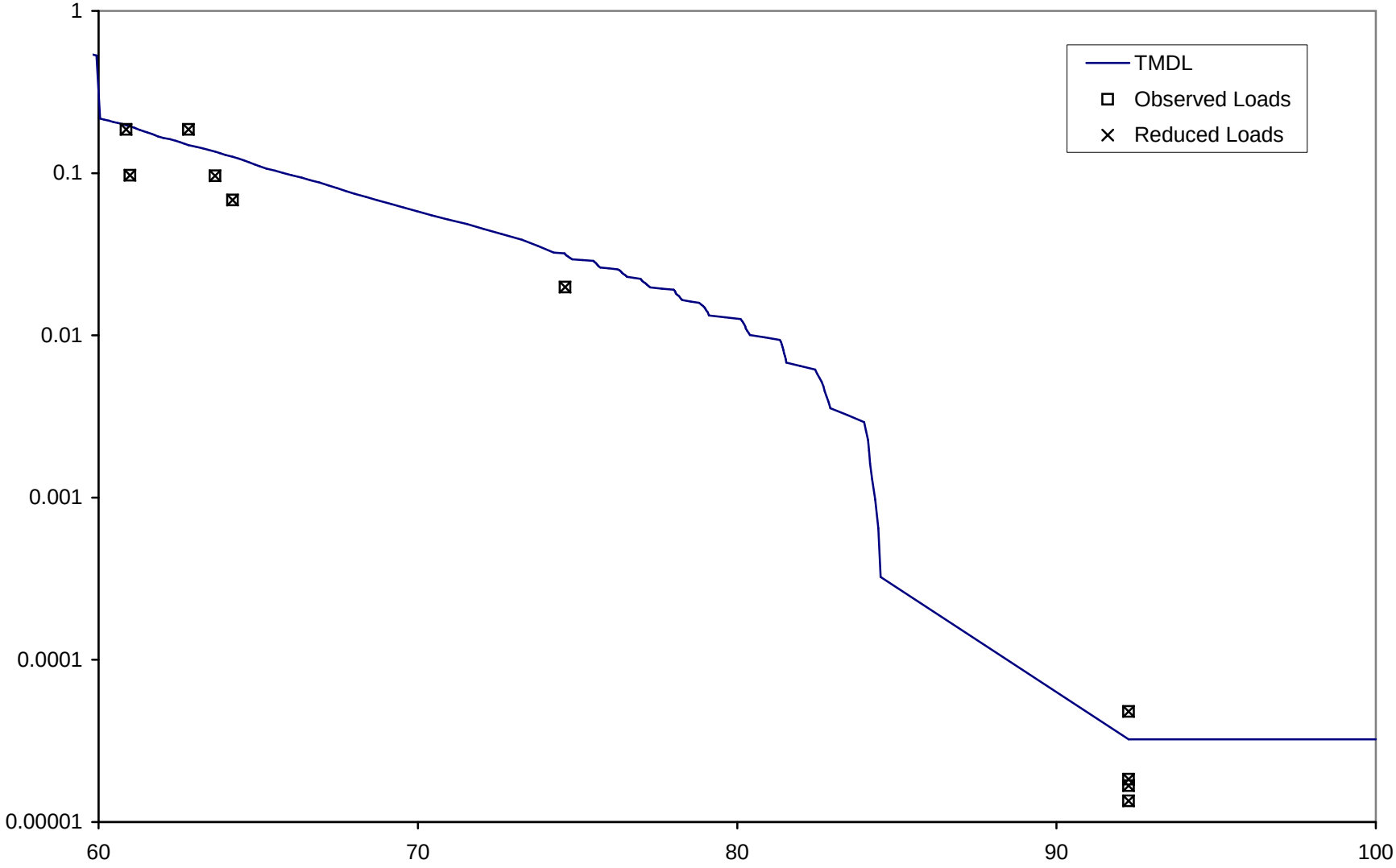

TABLE H.1. ALLOWABLE LOAD FOR MORO CREEK (08040201-001U)

Flow in Moro Creek (cfs)	Percent exceed- ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
0.001	92.257	11.627	Base flow	21	12	3.24E-05	3.76E-06
0.01	84.490	2.625	Base flow	21	12	3.24E-04	8.49E-06
0.02	84.419	0.085	Base flow	21	12	6.47E-04	5.51E-07
The rows between 84.419 and 60.321 percent exceedances are not shown for the sake of brevity.							
6.5	60.321	0.144	Base flow	21	12	2.10E-01	3.02E-04
6.6	60.176	0.138	Base flow	21	12	2.14E-01	2.95E-04
6.7	60.045	0.121	Base flow	21	12	2.17E-01	2.61E-04
						TOTAL =	1.56E-02
6.8	59.935	0.124	Storm flow	32	29	5.32E-01	6.60E-04
6.9	59.796	0.131	Storm flow	32	29	5.40E-01	7.08E-04
7	59.672	0.103	Storm flow	32	29	5.47E-01	5.63E-04
The rows between 59.672 and 0.018 percent exceedances are not shown for the sake of brevity.							
15500	0.018	0.007	Storm flow	32	29	1.21E+03	8.60E-02
16200	0.011	0.007	Storm flow	32	29	1.27E+03	8.99E-02
23600	0.004	0.007	Storm flow	32	29	1.85E+03	1.31E-01
						TOTAL =	1.96E+01

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TABLE H.2. STORM FLOW PERCENT REDUCTION FOR TSS IN MORO CREEK (08040201-001U)

TSS Target =	29 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 =	29 mg/L		
Percent reduction =	0%		

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
8/20/2002	5.8	7	59.42	0.114	0.114	0.571	Yes
9/30/1997	8.5	8	58.90	0.179	0.179	0.610	Yes
7/15/2003	11	8	58.90	0.231	0.231	0.610	Yes
8/17/2004	5.8	9	57.76	0.139	0.139	0.696	Yes
10/27/1992	25	9	57.40	0.620	0.620	0.720	Yes
8/12/2003	9.5	9	57.29	0.238	0.238	0.727	Yes
7/27/1999	7	10	56.94	0.181	0.181	0.751	Yes
7/26/1993	8	10	55.99	0.220	0.220	0.798	Yes
9/26/1994	25.5	10	55.98	0.715	0.715	0.813	Yes
9/1/1992	4	14	52.71	0.152	0.152	1.103	Yes
12/16/2003	7.5	15	52.27	0.303	0.303	1.173	Yes
9/29/1992	10	15	51.82	0.413	0.413	1.197	Yes
8/16/1994	6	15	51.82	0.248	0.248	1.197	Yes
5/19/1998	5	15	51.82	0.206	0.206	1.197	Yes
9/18/2001	13	15	51.82	0.536	0.536	1.197	Yes
4/18/2006	5.8	16	51.38	0.250	0.250	1.251	Yes
11/19/2001	3.5	17	50.61	0.160	0.160	1.330	Yes
5/21/1996	7	18	50.27	0.332	0.332	1.376	Yes
12/3/2002	2	18	49.85	0.097	0.097	1.408	Yes
10/19/2004	16.5	20	48.59	0.890	0.890	1.564	Yes
9/27/2005	6	21	48.07	0.340	0.340	1.642	Yes
9/3/1991	7	22	47.44	0.421	0.421	1.744	Yes
6/20/1995	17	22	47.44	1.022	1.022	1.744	Yes
9/29/1998	11	24	46.96	0.697	0.697	1.838	Yes
1/20/2004	3.5	24	46.75	0.227	0.227	1.877	Yes

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
3/13/2007	3.5	24	46.75	0.227	0.227	1.877	Yes
7/22/1997	9	26	46.05	0.629	0.629	2.026	Yes
4/15/2003	11	27	45.54	0.801	0.801	2.112	Yes
4/26/2005	13.7	27	45.54	0.998	0.998	2.112	Yes
7/20/2004	13.8	29	44.92	1.079	1.079	2.268	Yes
6/28/1994	8.5	29	44.75	0.674	0.674	2.299	Yes
9/10/1996	5	29	44.75	0.396	0.396	2.299	Yes
11/6/1990	6	32	44.16	0.515	0.515	2.487	Yes
1/25/2000	2	33	43.89	0.177	0.177	2.573	Yes
5/11/2004	28.8	34	43.49	2.641	2.641	2.659	Yes
10/16/1990	12	39	42.25	1.256	1.256	3.035	Yes
8/26/1997	8	41	41.26	0.889	0.889	3.222	Yes
12/20/1999	3.5	41	41.26	0.389	0.389	3.222	Yes
11/5/2002	14.2	44	40.74	1.685	1.685	3.441	Yes
7/2/1991	11	45	40.62	1.326	1.326	3.496	Yes
10/26/1993	5	46	40.33	0.619	0.619	3.590	Yes
1/21/2003	7.5	48	39.81	0.971	0.971	3.754	Yes
7/7/1992	8	49	39.47	1.066	1.066	3.864	Yes
5/28/2002	22.5	50	39.31	3.034	3.034	3.910	Yes
2/14/2006	8.2	50	39.31	1.106	1.106	3.910	Yes
3/12/1996	3	53	38.76	0.428	0.428	4.137	Yes
4/23/2002	25.3	54	38.46	3.684	3.684	4.223	Yes
2/6/2007	5.8	55	38.24	0.860	0.860	4.302	Yes
5/24/1994	12.5	55	38.13	1.864	1.864	4.325	Yes
10/28/1997	10	57	37.84	1.524	1.524	4.419	Yes
5/25/1999	9.5	60	37.09	1.537	1.537	4.693	Yes
2/20/1996	2.5	66	36.17	0.444	0.444	5.154	Yes
5/23/1995	9	67	36.00	1.626	1.626	5.240	Yes
7/19/1994	12.5	68	35.77	2.299	2.299	5.334	Yes
8/4/1992	12	72	35.31	2.324	2.324	5.615	Yes
12/1/1992	2	74	34.90	0.400	0.400	5.795	Yes
6/18/1996	9.5	80	34.18	2.050	2.050	6.257	Yes

Table H2 Storm Flow
Percent Reductions for Moro Creek

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
1/14/2002	5.2	81	34.00	1.136	1.136	6.335	Yes
6/27/2000	16	82	33.79	3.551	3.551	6.437	Yes
11/18/1997	2.5	93	32.56	0.626	0.626	7.266	Yes
10/23/2001	6	99	31.86	1.602	1.602	7.743	Yes
12/18/1995	16.5	102	31.41	4.552	4.552	8.001	Yes
12/16/1997	8	104	31.32	2.233	2.233	8.095	Yes
11/28/1994	13.5	112	30.51	4.067	4.067	8.736	Yes
11/23/1993	4	113	30.40	1.218	1.218	8.830	Yes
6/9/1998	7.5	119	29.72	2.403	2.403	9.291	Yes
5/16/2006	12	119	29.67	3.851	3.851	9.307	Yes
6/4/1991	18	120	29.57	5.825	5.825	9.385	Yes
4/14/1998	9	125	29.09	3.027	3.027	9.753	Yes
5/5/1992	7	129	28.73	2.443	2.443	10.120	Yes
5/30/2000	11	134	28.26	3.978	3.978	10.488	Yes
6/19/2001	6	136	28.12	2.207	2.207	10.668	Yes
5/13/1997	62	140	27.82	23.409	23.409	10.949	No
5/18/1993	12	146	27.44	4.722	4.722	11.411	Yes
2/22/2005	15.7	150	27.09	6.351	6.351	11.731	Yes
1/7/1992	4	151	27.01	1.625	1.625	11.778	Yes
3/16/2004	5	151	26.93	2.036	2.036	11.810	Yes
2/9/1993	4	165	25.98	1.777	1.777	12.881	Yes
12/20/1993	3	180	24.90	1.456	1.456	14.078	Yes
1/2/2007	4.2	190	24.32	2.152	2.152	14.860	Yes
4/24/2000	7	192	24.21	3.619	3.619	14.993	Yes
11/16/1998	3	193	24.10	1.561	1.561	15.087	Yes
2/23/1999	1	209	23.19	0.565	0.565	16.377	Yes
3/9/1993	8	213	23.11	4.593	4.593	16.651	Yes
4/7/1992	10	215	22.87	5.806	5.806	16.839	Yes
4/27/1999	8	234	22.08	5.051	5.051	18.309	Yes
3/28/1995	7.5	242	21.79	4.901	4.901	18.950	Yes
6/10/1997	22	267	20.87	15.842	15.842	20.882	Yes
2/4/1992	6	268	20.82	4.340	4.340	20.976	Yes

Table H2 Storm Flow
Percent Reductions for Moro Creek

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
5/20/2003	13.2	304	19.49	10.822	10.822	23.776	Yes
11/19/1996	4	321	18.94	3.464	3.464	25.113	Yes
3/25/2003	8.5	330	18.62	7.565	7.565	25.809	Yes
3/12/1991	8	338	18.41	7.284	7.284	26.404	Yes
2/14/1995	3	348	18.08	2.817	2.817	27.233	Yes
5/22/2001	14.75	360	17.70	14.317	14.317	28.148	Yes
3/23/1999	4.5	364	17.61	4.411	4.411	28.429	Yes
3/28/2005	13.2	366	17.52	13.029	13.029	28.625	Yes
4/15/1997	8	372	17.25	8.019	8.019	29.071	Yes
5/15/2004	21.5	381	17.05	22.092	22.092	29.798	Yes
10/1/1996	8	391	16.84	8.425	8.425	30.541	Yes
10/25/1994	7	399	16.65	7.527	7.527	31.182	Yes
12/14/2004	8.5	412	16.36	9.445	9.445	32.222	Yes
12/11/2001	8.5	428	15.86	9.811	9.811	33.474	Yes
6/2/1992	14	439	15.69	16.564	16.564	34.311	Yes
3/27/2000	3.5	487	14.55	4.597	4.597	38.088	Yes
12/22/1998	3.5	545	13.37	5.141	5.141	42.593	Yes
3/15/1994	5	598	12.20	8.057	8.057	46.730	Yes
2/26/2002	11.5	611	11.93	18.950	18.950	47.786	Yes
6/29/1999	9	639	11.54	15.503	15.503	49.953	Yes
2/5/1991	5.5	722	10.10	10.712	10.712	56.483	Yes
1/12/1993	6	766	9.43	12.390	12.390	59.885	Yes
1/26/1999	3	799	8.93	6.462	6.462	62.466	Yes
8/6/1996	7.5	807	8.86	16.321	16.321	63.107	Yes
1/18/1994	9	835	8.48	20.270	20.270	65.313	Yes
3/3/1992	9	906	7.62	21.983	21.983	70.835	Yes
12/17/1996	6	907	7.61	14.675	14.675	70.928	Yes
3/26/2001	10.8	912	7.52	26.552	26.552	71.296	Yes
7/16/1996	7.5	934	7.25	18.890	18.890	73.040	Yes
4/23/1996	4	999	6.53	10.772	10.772	78.100	Yes
3/26/2002	4.25	1,100	5.80	12.608	12.608	86.031	Yes
4/13/1993	5	1,149	5.48	15.496	15.496	89.879	Yes

Table H2 Storm Flow
Percent Reductions for Moro Creek

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
2/17/2004	6	1,190	5.13	19.256	19.256	93.070	Yes
1/30/2001	4	1,259	4.77	13.577	13.577	98.435	Yes
12/19/2000	3.2	1,282	4.64	11.065	11.065	100.273	Yes
4/2/1991	12	1,317	4.54	42.635	42.635	103.034	Yes
1/22/1991	4	1,423	4.03	15.354	15.354	111.316	Yes
11/30/2004	3.8	1,520	3.66	15.577	15.577	118.879	Yes
2/25/1997	4.5	1,612	3.39	19.557	19.557	126.035	Yes
2/27/2001	3.75	1,729	3.08	17.487	17.487	135.233	Yes
3/17/1998	5.5	1,988	2.43	29.486	29.486	155.473	Yes
2/17/1998	4	2,000	2.39	21.571	21.571	156.388	Yes
1/28/1997	11.5	2,106	2.17	65.300	65.300	164.671	Yes
4/25/1995	7.5	2,129	2.12	43.063	43.063	166.509	Yes
4/13/2004	14.8	2,170	2.05	86.613	86.613	169.715	Yes
6/21/1993	13	2,517	1.63	88.252	88.252	196.870	Yes
4/3/2007	3	2,640	1.47	21.359	21.359	206.474	Yes
4/17/2001	8.5	2,847	1.25	65.252	65.252	222.624	Yes
2/25/2003	3	3,220	0.93	26.052	26.052	251.835	Yes
12/19/1994	5	3,235	0.91	43.618	43.618	252.985	Yes
5/7/1991	8	3,576	0.71	77.148	77.148	279.663	Yes
6/17/2003	8.8	5,820	0.22	138.124	138.124	455.181	Yes

Total number of values of loads =	141
Allowable % of exceedances of loads =	20%
Allowable no. of exceedances of loads =	29
No. of exceedances before reductions of loads =	1
No. of exceedances after reductions of loads =	1

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Table H2 Storm Flow
Percent Reductions for Moro Creek

TABLE H.3. BASE FLOW PERCENT REDUCTION FOR TSS IN MORO CREEK (08040201-001U)

TSS Target =	12 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 =	12 mg/L		
Percent reduction =	0%		

Date	Observed TSS at OUA0028 (mg/L)	Estimated flow in Moro Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
10/25/2005	6.8	1.000E-03	92.26	1.834E-05	1.834E-05	3.236E-05	Yes
11/29/2005	5	1.000E-03	92.26	1.348E-05	1.348E-05	3.236E-05	Yes
12/27/2005	17.8	1.000E-03	92.26	4.800E-05	4.800E-05	3.236E-05	No
9/26/2006	6.2	1.000E-03	92.26	1.672E-05	1.672E-05	3.236E-05	Yes
5/24/2005	7.5	1.0	74.61	0.020	0.020	0.032	Yes
1/17/2006	6.5	3.9	64.19	0.068	0.068	0.126	Yes
7/21/1998	8.5	4.2	63.65	0.096	0.096	0.136	Yes
8/8/1995	15	4.6	62.82	0.186	0.186	0.149	No
9/21/1993	116	5.3	61.76	1.658	1.658	0.172	No
8/24/1993	6	6.0	60.99	0.097	0.097	0.194	Yes
7/23/2002	11.3	6.1	60.87	0.186	0.186	0.197	Yes

Total number of values of loads =	11
Allowable % of exceedances of loads =	25%
Allowable no. of exceedances of loads =	3
No. of exceedances before reductions of loads =	3
No. of exceedances after reductions of loads =	3

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APPENDIX I

TMDL for Moro Creek 08040201-001L

Figure I.1. Flow duration curve for Moro Creek (08040201-001L)

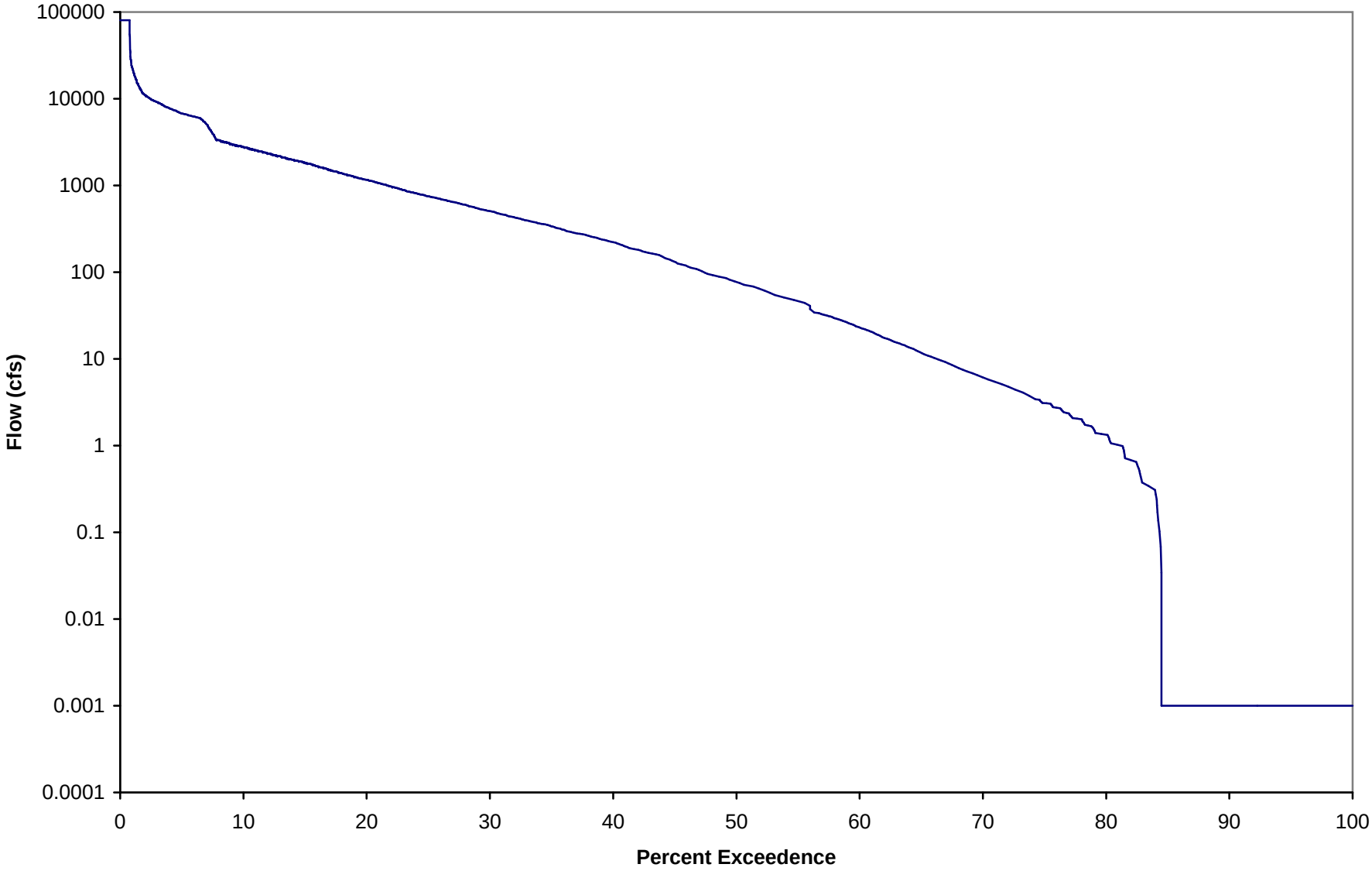

Figure I.2. Storm flow load duration curve for Moro Creek (08040201-001L)

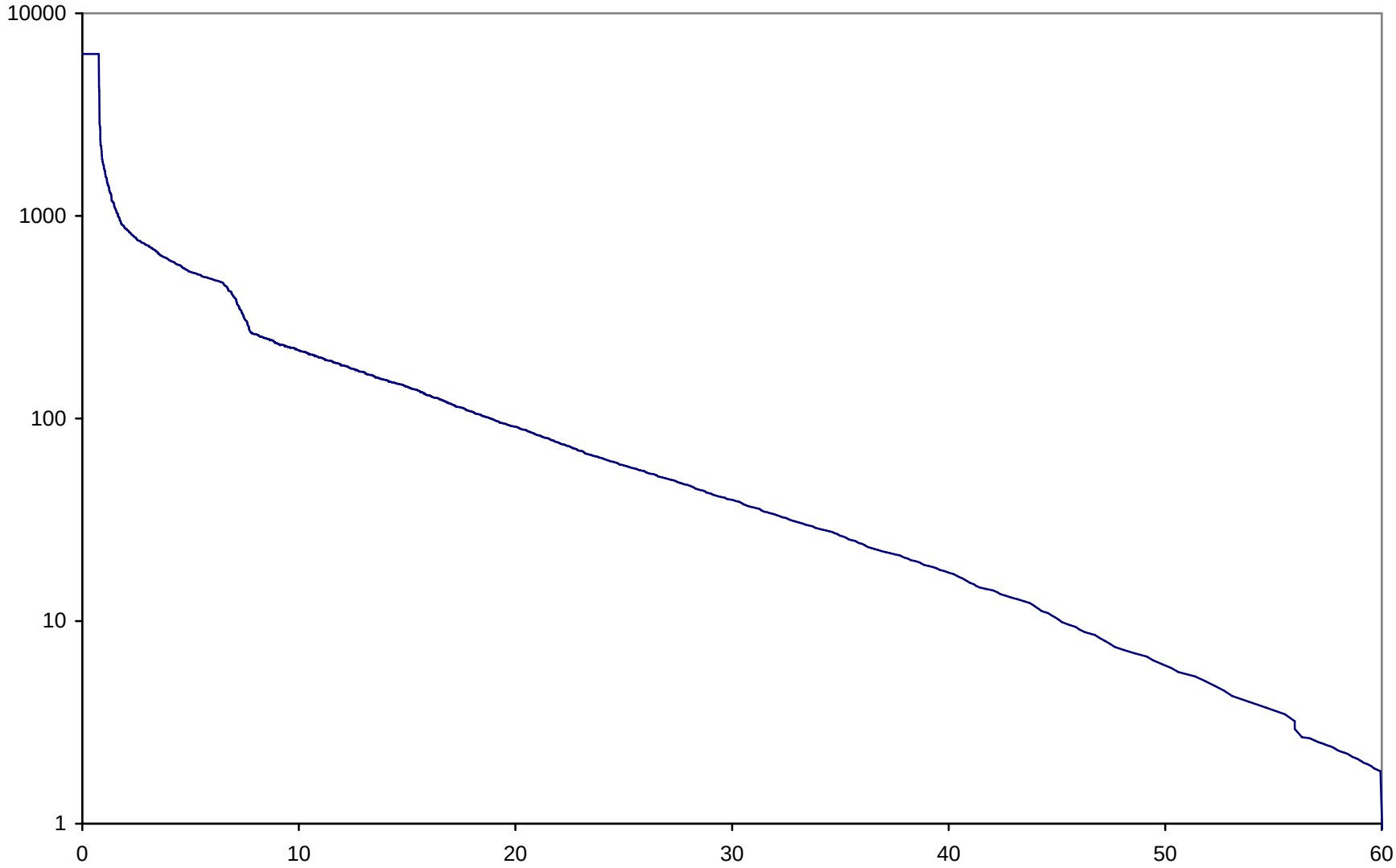

Figure I.3. Base flow load duration curve for Moro Creek (08040201-001L)

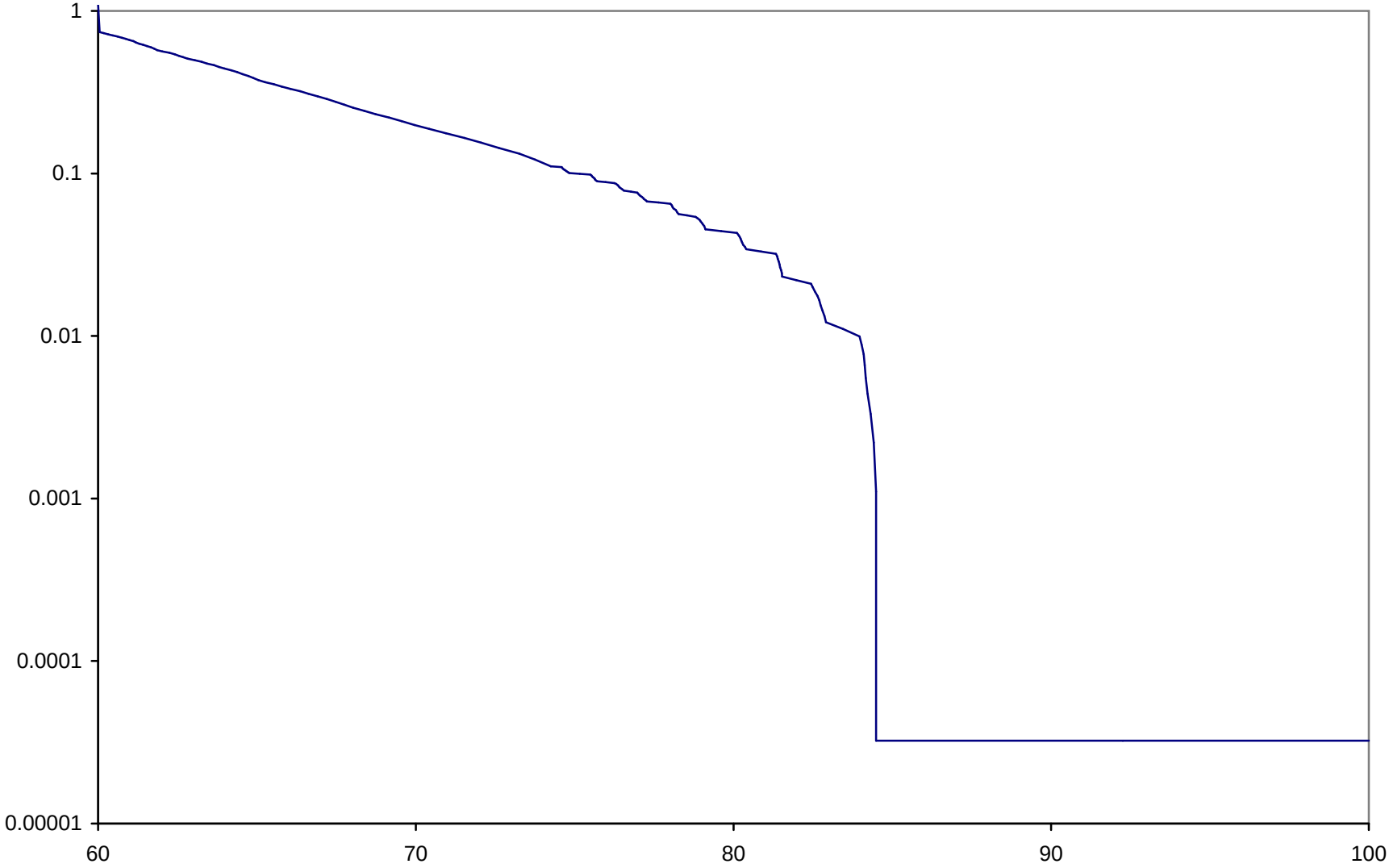

TABLE I.1. ALLOWABLE LOAD FOR MORO CREEK (080400204-001L)

Flow in Moro Creek (cfs)	Percent exceed- ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
0.001	92.257	11.627	Base flow	21	12	3.24E-05	3.76E-06
0.0	84.490	2.625	Base flow	21	12	1.10E-03	2.90E-05
0.1	84.419	0.085	Base flow	21	12	2.21E-03	1.88E-06
The rows between 84.319 and 60.321 percent exceedances are not shown for the sake of brevity.							
22.2	60.321	0.144	Base flow	21	12	7.18E-01	1.03E-03
22.5	60.176	0.138	Base flow	21	12	7.29E-01	1.01E-03
22.9	60.045	0.121	Base flow	21	12	7.40E-01	8.92E-04
						Total =	5.31E-02
23.2	59.935	0.124	Storm flow	32	29	1.81E+00	2.25E-03
23.5	59.796	0.131	Storm flow	32	29	1.84E+00	2.42E-03
23.9	59.672	0.103	Storm flow	32	29	1.87E+00	1.92E-03
The rows between 59.672 and 0.784 percent exceedances are not shown for the sake of brevity.							
52,893.9	0.784	0.016	Storm flow	32	29	4.14E+03	6.60E-01
55,282.7	0.770	0.011	Storm flow	32	29	4.32E+03	4.60E-01
80,535.2	0.763	0.004	Storm flow	32	29	6.30E+03	2.23E-01
						Total =	7.98E+01

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APPENDIX J

TMDL for Big Creek 08040204-005

Figure J.1. Flow duration curve for Big Creek

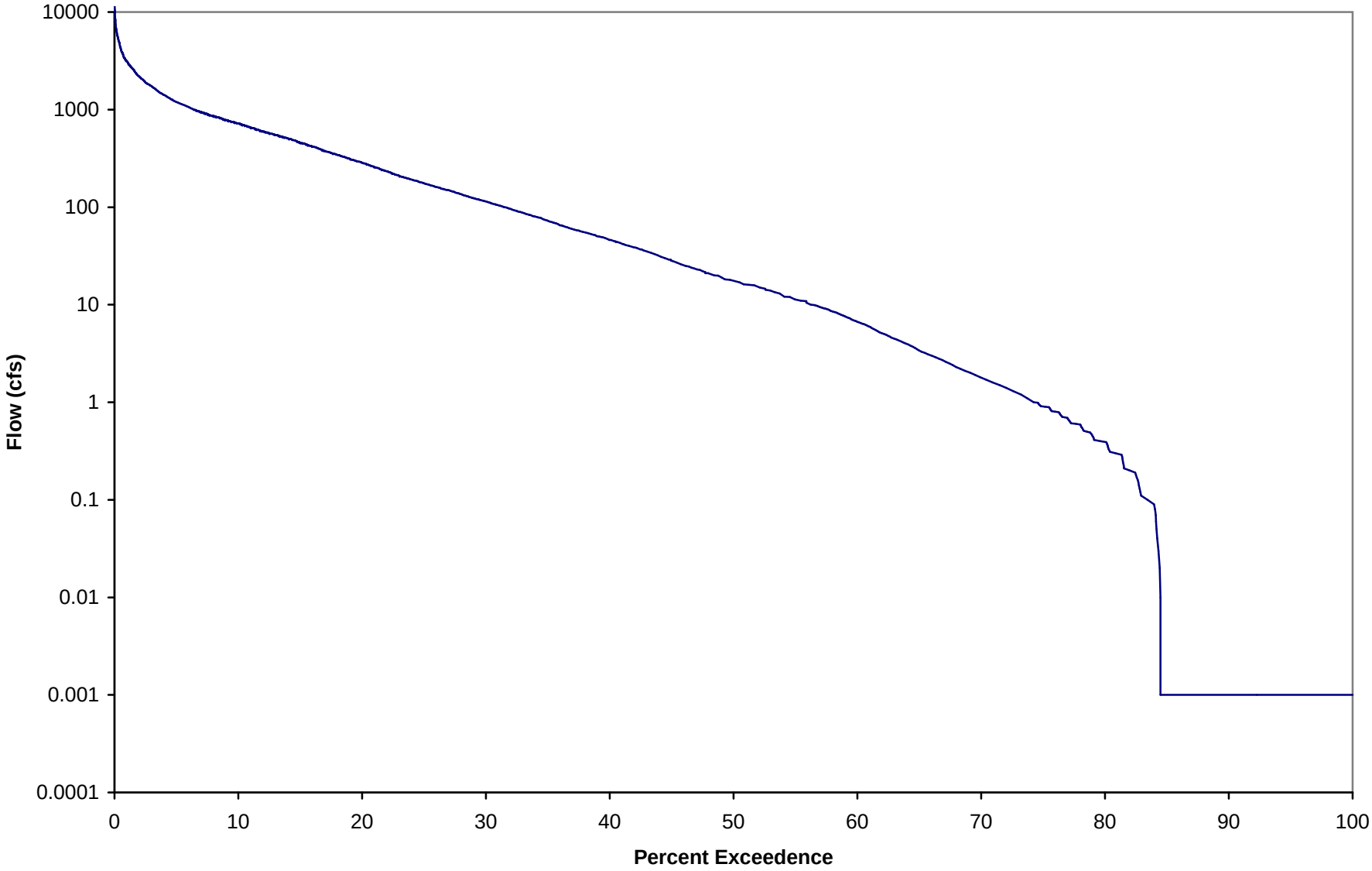

Figure J.2. Storm flow load duration curve for Big Creek

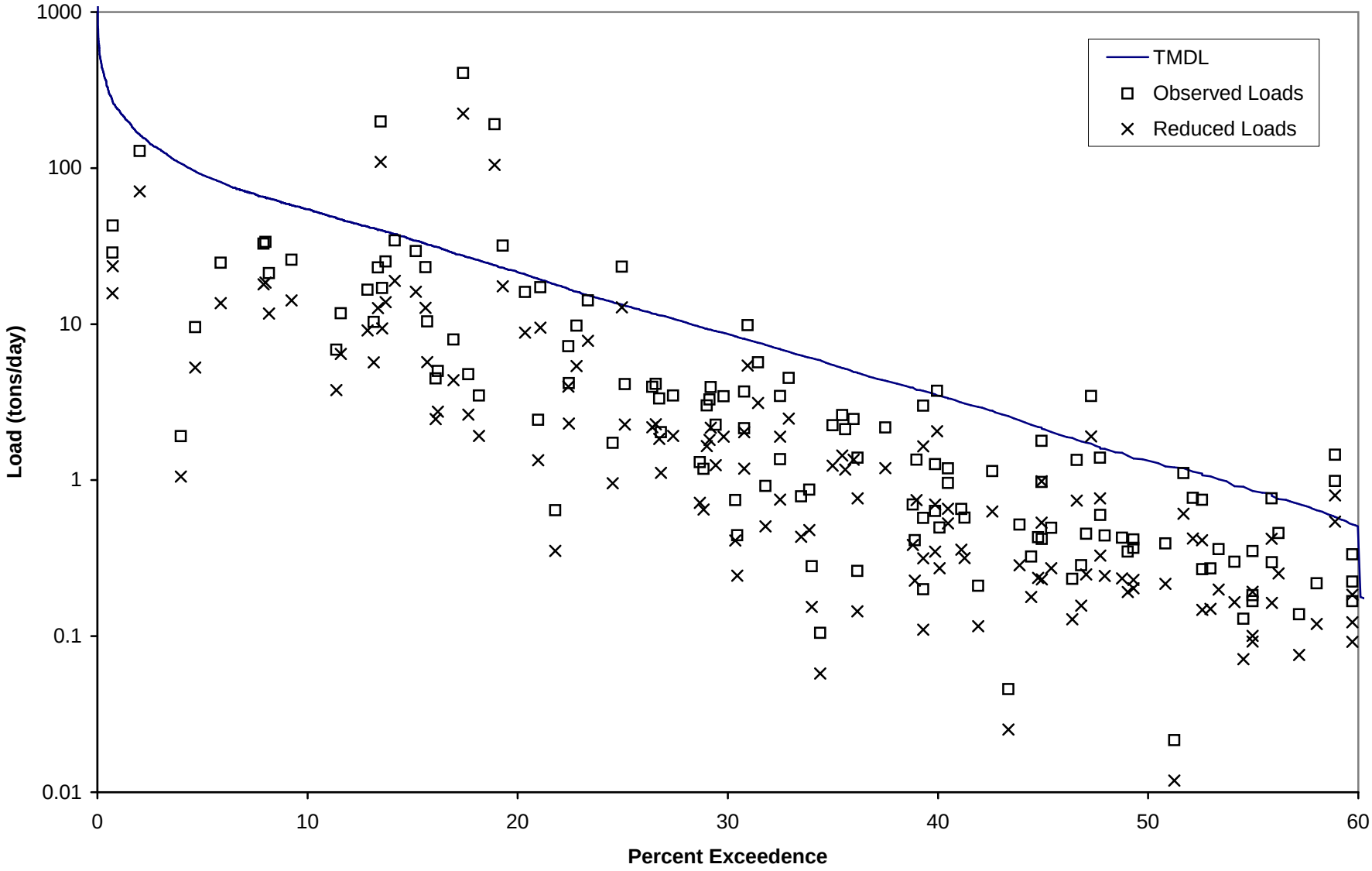

Figure J.3. Base flow load duration curve for Big Creek

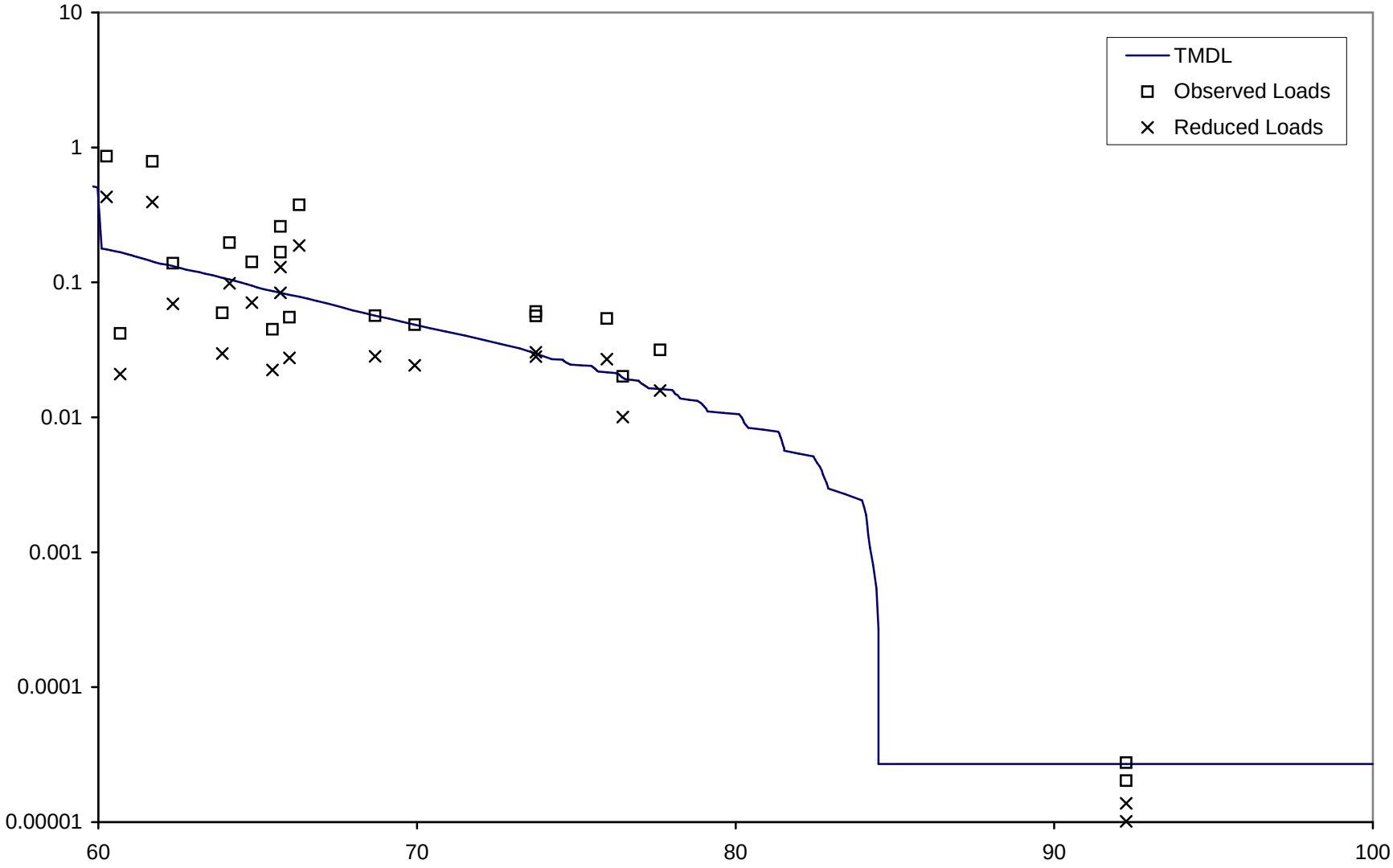

TABLE J.1. ALLOWABLE LOAD FOR BIG CREEK (08040205-005)

Est Flow in Big Creek (cfs)	Percent exceed-ance	Width on plot between data points (unitless)	Flow category	Turbidity criterion (NTU)	Target TSS (mg/L)	TSS TMDL (tons/day)	Area under TSS TMDL curve (tons/day)
0.001	92.26	9.051	Base flow	21	10	2.70E-05	2.44E-06
0.01	84.49	2.625	Base flow	21	10	2.70E-04	7.08E-06
0.02	84.42	0.085	Base flow	21	10	5.39E-04	4.59E-07
The rows between 84.416 and 60.400 percent exceedances are not shown for the sake of brevity.							
6.4	60.40	0.145	Base flow	21	10	1.73E-01	2.51E-04
6.5	60.26	0.147	Base flow	21	10	1.75E-01	2.58E-04
6.6	60.11	0.140	Base flow	21	10	1.78E-01	2.49E-04
						Total =	1.28E-02
6.7	59.98	0.121	Storm flow	32	28	5.06E-01	6.10E-04
6.8	59.87	0.129	Storm flow	32	28	5.13E-01	6.65E-04
6.9	59.72	0.142	Storm flow	32	28	5.21E-01	7.39E-04
The rows between 59.716 and 0.018 percent exceedances are not shown for the sake of brevity.							
15500	0.02	0.007	Storm flow	32	28	1.17E+03	8.30E-02
16200	0.01	0.007	Storm flow	32	28	1.22E+03	8.68E-02
23600	0.00	0.004	Storm flow	32	28	1.78E+03	6.32E-02
						Total =	1.86E+01

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TABLE J.2. STORM FLOW PERCENT REDUCTION FOR TSS IN BIG CREEK (08040204-005)

TSS Target =	28 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 =	28 mg/L		
Percent reduction =	0%		

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
8/25/1992	18	7	59.72	0.335	0.335	0.521	Yes
10/12/1993	12	7	59.72	0.223	0.223	0.521	Yes
8/5/1997	9	7	59.72	0.167	0.167	0.521	Yes
9/3/1991	70	8	58.89	1.454	1.454	0.581	No
12/12/1995	48	8	58.89	0.986	0.986	0.581	No
8/27/1996	10	9	58.02	0.218	0.218	0.642	Yes
1/16/1996	6	9	57.18	0.138	0.138	0.702	Yes
12/9/2003	17	10	56.21	0.458	0.458	0.755	Yes
10/15/1996	11	11	55.89	0.297	0.297	0.793	Yes
9/22/1992	26	11	55.88	0.764	0.764	0.823	Yes
10/30/1990	6	11	54.97	0.183	0.183	0.853	Yes
8/30/1994	12	11	54.97	0.350	0.350	0.853	Yes
6/8/1999	6	11	54.97	0.168	0.168	0.853	Yes
8/10/2004	4	12	54.53	0.129	0.129	0.906	Yes
7/17/2001	9	12	54.11	0.300	0.300	0.914	Yes
9/24/1996	10	13	53.35	0.361	0.361	1.012	Yes
4/25/2006	7	14	52.96	0.272	0.272	1.057	Yes
12/20/1999	7	14	52.58	0.268	0.268	1.072	Yes
11/17/1992	19	15	52.57	0.748	0.748	1.102	Yes
7/28/1992	19	15	52.12	0.769	0.769	1.133	Yes
10/29/1991	26	16	51.68	1.108	1.108	1.193	Yes
11/6/2001	1	16	51.25	0.022	0.022	1.208	Yes
6/14/1993	9	16	50.82	0.393	0.393	1.223	Yes
7/5/1994	8	18	49.30	0.368	0.368	1.374	Yes
5/5/1998	9	18	49.30	0.417	0.417	1.374	Yes

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
3/27/2007	7	19	49.03	0.348	0.348	1.435	Yes
7/8/1997	8	20	48.76	0.427	0.427	1.495	Yes
6/20/2006	8	21	47.93	0.442	0.442	1.586	Yes
6/11/1996	11	21	47.72	0.597	0.597	1.593	Yes
10/11/1994	24	22	47.72	1.392	1.392	1.624	Yes
2/20/1996	57	23	47.29	3.459	3.459	1.714	No
5/25/2004	7	23	47.05	0.453	0.453	1.737	Yes
8/2/1994	5	24	46.81	0.285	0.285	1.775	Yes
1/20/2004	21	24	46.60	1.346	1.346	1.812	Yes
5/30/1995	4	25	46.39	0.233	0.233	1.865	Yes
4/15/2003	7	27	45.39	0.495	0.495	2.039	Yes
6/27/2000	6	28	44.94	0.420	0.420	2.137	Yes
7/9/1991	23	29	44.93	1.786	1.786	2.175	Yes
7/9/1996	13	29	44.93	0.971	0.971	2.175	Yes
12/10/2002	6	29	44.76	0.430	0.430	2.190	Yes
11/12/2002	4	30	44.44	0.324	0.324	2.265	Yes
1/31/2006	6	32	43.88	0.518	0.518	2.416	Yes
12/6/1994	1	34	43.35	0.046	0.046	2.567	Yes
5/20/1997	12	37	42.59	1.144	1.144	2.786	Yes
1/28/2003	2	39	41.91	0.210	0.210	2.945	Yes
4/24/2007	5	41	41.26	0.575	0.575	3.096	Yes
9/4/2001	6	42	41.12	0.652	0.652	3.149	Yes
11/27/1990	10	44	40.48	1.189	1.189	3.330	Yes
5/5/1992	8	45	40.47	0.960	0.960	3.360	Yes
5/30/2006	4	46	40.08	0.496	0.496	3.474	Yes
5/30/2000	30	46	39.96	3.738	3.738	3.489	No
12/14/1992	10	47	39.86	1.268	1.268	3.549	Yes
6/19/2001	5	47	39.86	0.634	0.634	3.549	Yes
3/8/1999	4	49	39.30	0.573	0.573	3.730	Yes
7/13/1999	23	49	39.30	2.998	2.998	3.730	Yes
12/5/2000	2	49	39.30	0.200	0.200	3.730	Yes
5/18/1993	10	50	38.98	1.354	1.354	3.791	Yes

Table J2 Storm Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
3/14/2000	3	51	38.89	0.413	0.413	3.851	Yes
1/7/1992	5	52	38.80	0.698	0.698	3.912	Yes
4/21/1992	14	58	37.50	2.171	2.171	4.342	Yes
11/25/1991	8	64	36.17	1.389	1.389	4.863	Yes
12/21/1993	2	65	36.17	0.262	0.262	4.893	Yes
6/9/1992	14	65	35.99	2.462	2.462	4.923	Yes
4/30/1996	12	68	35.59	2.121	2.121	5.165	Yes
6/18/1991	14	69	35.45	2.613	2.613	5.225	Yes
11/8/1994	12	73	34.98	2.249	2.249	5.475	Yes
1/19/1999	1	78	34.40	0.105	0.105	5.875	Yes
1/2/2002	1	80	34.00	0.280	0.280	6.041	Yes
4/11/2000	4	81	33.88	0.869	0.869	6.086	Yes
1/11/1994	4	83	33.49	0.787	0.787	6.298	Yes
2/27/2007	19	88	32.90	4.509	4.509	6.645	Yes
11/16/1993	14	92	32.49	3.455	3.455	6.909	Yes
6/10/1997	6	92	32.48	1.363	1.363	6.940	Yes
12/10/1996	4	97	31.79	0.917	0.917	7.340	Yes
4/22/1997	21	100	31.44	5.686	5.686	7.581	Yes
7/27/2004	35	105	30.95	9.854	9.854	7.929	No
4/12/1994	8	107	30.78	2.154	2.154	8.042	Yes
4/24/2001	13	107	30.77	3.690	3.690	8.072	Yes
2/21/1995	2	110	30.45	0.444	0.444	8.284	Yes
11/19/1996	3	111	30.35	0.746	0.746	8.352	Yes
3/12/1991	11	116	29.79	3.447	3.447	8.775	Yes
4/13/1999	7	120	29.42	2.263	2.263	9.054	Yes
3/31/1998	12	122	29.18	3.945	3.945	9.205	Yes
3/18/2003	10	122	29.13	3.290	3.290	9.213	Yes
5/22/2001	9	124	28.99	3.007	3.007	9.356	Yes
1/30/2007	4	125	28.85	1.180	1.180	9.439	Yes
3/5/2002	4	127	28.66	1.302	1.302	9.590	Yes
3/16/1993	9	144	27.40	3.490	3.490	10.859	Yes
12/9/1997	5	150	26.82	2.025	2.025	11.342	Yes

Table J2 Storm Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
4/19/2005	8	151	26.74	3.339	3.339	11.402	Yes
2/12/1991	10	154	26.57	4.140	4.140	11.591	Yes
3/21/1995	10	155	26.40	3.963	3.963	11.682	Yes
2/15/2005	9	174	25.10	4.129	4.129	13.139	Yes
5/14/1991	49	176	24.96	23.284	23.284	13.305	No
2/9/1999	4	184	24.52	1.736	1.736	13.887	Yes
2/16/1993	26	203	23.34	14.199	14.199	15.291	Yes
4/20/1993	17	213	22.81	9.784	9.784	16.114	Yes
1/7/1997	7	222	22.43	4.189	4.189	16.756	Yes
3/17/1992	12	223	22.41	7.220	7.220	16.847	Yes
12/21/1998	1	238	21.79	0.641	0.641	17.949	Yes
3/26/1996	25	256	21.07	17.226	17.226	19.294	Yes
2/3/1998	4	258	20.98	2.439	2.439	19.513	Yes
5/17/1994	22	277	20.35	16.038	16.038	20.887	Yes
5/20/2003	39	304	19.28	31.810	31.810	22.956	No
4/11/1995	224	316	18.90	190.836	190.836	23.855	No
3/28/2006	4	340	18.16	3.484	3.484	25.674	Yes
3/1/1994	5	354	17.65	4.778	4.778	26.754	Yes
3/22/2005	414	364	17.40	406.410	406.410	27.487	No
11/9/2004	8	378	16.95	7.952	7.952	28.544	Yes
12/14/2004	5	412	16.20	5.000	5.000	31.111	Yes
2/12/2002	4	415	16.09	4.477	4.477	31.338	Yes
12/11/2001	9	428	15.70	10.388	10.388	32.320	Yes
1/30/2001	20	433	15.61	23.138	23.138	32.720	Yes
4/2/1991	24	454	15.16	29.359	29.359	34.253	Yes
10/12/2004	26	500	14.15	34.385	34.385	37.756	Yes
1/19/1993	18	518	13.72	25.165	25.165	39.146	Yes
1/2/1991	12	527	13.55	17.039	17.039	39.758	Yes
2/22/1994	139	531	13.48	198.867	198.867	40.060	No
2/18/1992	16	535	13.36	23.064	23.064	40.362	Yes
3/3/1998	7	547	13.15	10.321	10.321	41.283	Yes
3/18/1997	11	559	12.86	16.577	16.577	42.197	Yes

Table J2 Storm Flow
Percent Reductions for Prairie Creek

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?
2/10/2004	7	621	11.59	11.723	11.723	46.894	Yes
3/20/2001	4	636	11.37	6.859	6.859	48.011	Yes
5/7/2002	13	766	9.24	25.823	25.823	57.843	Yes
6/24/2003	9	847	8.17	21.244	21.244	63.959	Yes
6/4/2002	15	859	8.01	33.591	33.591	64.866	Yes
6/21/1993	14	867	7.91	32.720	32.720	65.439	Yes
3/9/2004	9	1,080	5.86	24.757	24.757	81.554	Yes
2/20/2001	3	1,268	4.65	9.571	9.571	95.713	Yes
7/6/2004	1	1,420	3.97	1.915	1.915	107.228	Yes
4/13/2004	22	2,170	2.02	128.749	128.749	163.863	Yes
4/2/2002	5	3,520	0.73	42.719	42.719	265.805	Yes
2/18/2003	3	3,550	0.72	28.722	28.722	268.071	Yes

Total number of values of loads =	133
Allowable % of exceedances of loads =	20%
Allowable no. of exceedances of loads =	27
No. of exceedances before reductions of loads =	6
No. of exceedances after reductions of loads =	10

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Table J2 Storm Flow
Percent Reductions for Prairie Creek

TABLE J.3. BASE FLOW PERCENT REDUCTION FOR TSS IN BIG CREEK (08040204-005)

TSS Target =	10 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 =	10 mg/L		
Percent reduction =	50%		

Date	Observed TSS at OUA0043 (mg/L)	Estimated flow in Big Creek (cfs)	Percent exceedance for flow on sampling day	Current TSS load (tons/day)	Reduced TSS load (tons/day)	Allowable TSS load (tons/day)	Reduced load less than or equal to allowable load?	Is load reduced by 49% still at or below allowable load?
9/26/2006	10	0.00	92.26	2.75E-05	1.38E-05	2.70E-05	Yes	Yes
11/28/2006	8	0.00	92.26	2.02E-05	1.01E-05	2.70E-05	Yes	Yes
10/10/1995	20	0.60	77.63	0.032	0.016	0.016	Yes	Yes
6/14/2005	10	0.73	76.46	0.020	0.010	0.020	Yes	Yes
11/7/1995	25	0.80	75.96	0.054	0.027	0.022	No	No
8/22/1995	19	1.10	73.73	0.056	0.028	0.030	Yes	Yes
9/11/1995	21	1.10	73.73	0.061	0.030	0.030	No	No
9/21/1993	10	1.80	69.93	0.049	0.024	0.049	Yes	Yes
8/24/1993	10	2.10	68.69	0.057	0.028	0.057	Yes	Yes
9/4/1990	48	2.90	66.31	0.375	0.188	0.078	No	No
5/17/2005	7	3.00	66.00	0.055	0.028	0.081	Yes	Yes
10/15/1991	31	3.10	65.71	0.259	0.130	0.084	No	No
10/20/1992	20	3.10	65.71	0.167	0.084	0.084	Yes	No
8/31/2004	5	3.20	65.46	0.045	0.022	0.086	Yes	Yes
7/26/1993	15	3.50	64.82	0.142	0.071	0.094	Yes	Yes
1/17/2006	19	3.90	64.12	0.197	0.098	0.105	Yes	Yes
7/25/1995	6	4.00	63.89	0.059	0.030	0.108	Yes	Yes
6/27/1995	11	4.90	62.34	0.139	0.069	0.132	Yes	Yes
10/2/1990	55	5.30	61.69	0.786	0.393	0.143	No	No
12/19/2006	3	6.20	60.68	0.042	0.021	0.167	Yes	Yes
8/6/1991	49	6.50	60.26	0.859	0.429	0.175	No	No

Total number of values of loads =	21
Allowable % of exceedances of loads =	25%
Allowable no. of exceedances of loads =	6
No. of exceedances before reductions of loads =	14
No. of exceedances after reductions of loads =	6

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