Tyger River Basin (Hydrological Unit Code: 03050107); Stations: B-005, B-008, B-012, B-014, B-018A, B-019, B-020, B-021, B-051, B-067A, B-067B, B-164, B-199, B-219, B-235, B-263, B-286, B-287, B-315, B-317, B-321, B-332, B-336, BF-007, BF-008 Fecal Coliform Bacteria

May 21, 2004

Abstract

The Tyger River Basin (8-digit HUC 03050107) is located in parts of Greenville, Newberry, Spartanburg, and Union counties in the Broad River Basin (Figure 1-1). Twenty-five water quality monitoring stations in the watershed have been placed on the South Carolina §303(d) list of impaired waters for violations of the fecal coliform bacteria standard, as shown in Table 1-1. The 820 square mile basin is composed of mostly forested land (70%) with some cropland (11%) and pastureland (10%). Unincorporated Spartanburg and Greenville counties and several towns and cities in the watershed have or will have Municipal Separate Storm Sewer (MS4) permits. There are also 21 active continuous point sources discharging fecal coliform bacteria in the Tyger River basin of South Carolina.

The load-duration curve methodology was used to establish allowable fecal coliform loads in the watershed. The existing load was determined using measured data from the impaired water quality monitoring stations. Loads were established from measured concentrations and a power trend line was fit to samples violating the instantaneous standard. The existing load and allowable total maximum daily load for impaired stations is presented in Table I. To achieve the TMDL target, reductions of fecal coliform loads will be necessary (Table I).

Table I Total Maximum Daily Loads for Impaired Water Quality Stations in the Tyger River Basin (03050107)

Station ID	Existing Waste Load	TMDL WLA		Existing Load	TMDL LA	MOS	TMDL[3]	Percent Reduction[4]
	Continuous (counts/day)	Continuous[1] (counts/day)	MS4[2]	(counts/day)	(counts/day)	(counts/day)	(counts/day)	
B-005	7.16E+10	7.16E+10	83%	5.47E+12	8.05E+11	4.87E+10	9.25E+11	83%
B-008	1.78E+11	1.78E+11	NA	7.86E+12	3.17E+12	1.86E+11	3.53E+12	55%
B-012	7.42E+10	7.42E+10	40%	1.23E+12	6.21E+11	3.86E+10	7.33E+11	40%
B-014	7.42E+10	7.42E+10	63%	2.24E+12	7.11E+11	4.36E+10	8.29E+11	63%
B-018A	9.09E+10	9.09E+10	NA	6.98E+12	1.55E+12	9.10E+10	1.73E+12	75%
B-019	NA	NA	NA	2.32E+11	3.96E+10	2.20E+09	4.18E+10	82%
B-020	NA	NA	73%	5.09E+12	1.82E+11	1.01E+10	1.92E+11	73%
B-021	1.54E+11	1.54E+11	73%	1.93E+12	3.36E+11	2.72E+10	5.17E+11	73%
B-051	4.38E+11	4.38E+11	NA	1.53E+13	6.40E+12	3.80E+11	7.22E+12	53%
B-067A	NA	NA	NA	3.00E+11	6.16E+10	3.42E+09	6.50E+10	78%
B-067B	NA	NA	NA	2.14E+11	5.34E+10	2.97E+09	5.64E+10	74%
B-164	NA	NA	83%	1.41E+12	2.30E+11	1.28E+10	2.42E+11	83%
B-199	3.79E+09	3.79E+09	NA	7.35E+10	3.39E+10	2.09E+09	3.97E+10	46%
B-219	7.57E+08	7.57E+08	46%	6.49E+11	3.29E+11	1.83E+10	3.48E+11	46%
B-235	NA	NA	64%	1.32E+11	4.56E+10	2.53E+09	4.81E+10	64%
B-263	3.48E+09	3.48E+09	13%	8.78E+11	7.21E+11	4.03E+10	7.65E+11	13%
B-286	NA	NA	NA	8.66E+10	3.33E+10	1.85E+09	3.52E+10	59%
B-287	5.30E+09	5.30E+09	NA	5.64E+10	3.94E+10	2.48E+09	4.72E+10	16%
B-315	NA	NA	52%	3.96E+11	1.79E+11	9.94E+09	1.89E+11	52%
B-317	NA	NA	NA	1.21E+11	7.90E+10	4.39E+09	8.33E+10	31%
B-321	NA	NA	73%	2.21E+10	5.66E+09	3.15E+08	5.98E+09	73%
B-332	8.74E+10	8.74E+10	NA	2.14E+12	1.28E+12	7.58E+10	1.44E+12	33%
B-336	5.30E+09	5.30E+09	NA	1.78E+11	1.16E+11	6.75E+09	1.28E+11	28%
BF-007	1.54E+11	1.54E+11	NA	5.91E+11	1.11E+11	1.47E+10	2.79E+11	53%
BF-008	2.49E+11	2.49E+11	NA	1.16E+12	2.12E+11	2.56E+10	4.87E+11	58%

Table Notes:

1. Total monthly wasteload (#/30 days) cannot exceed loads listed in Table 3-3.
2. MS4 expressed as percent reduction equal to LA reduction.
3. TMDLs expressed as monthly load (#/30 days) by station are listed in Table B-1.
4. Percent reduction applies to LA and MS4 components when an MS4 is in the watershed.

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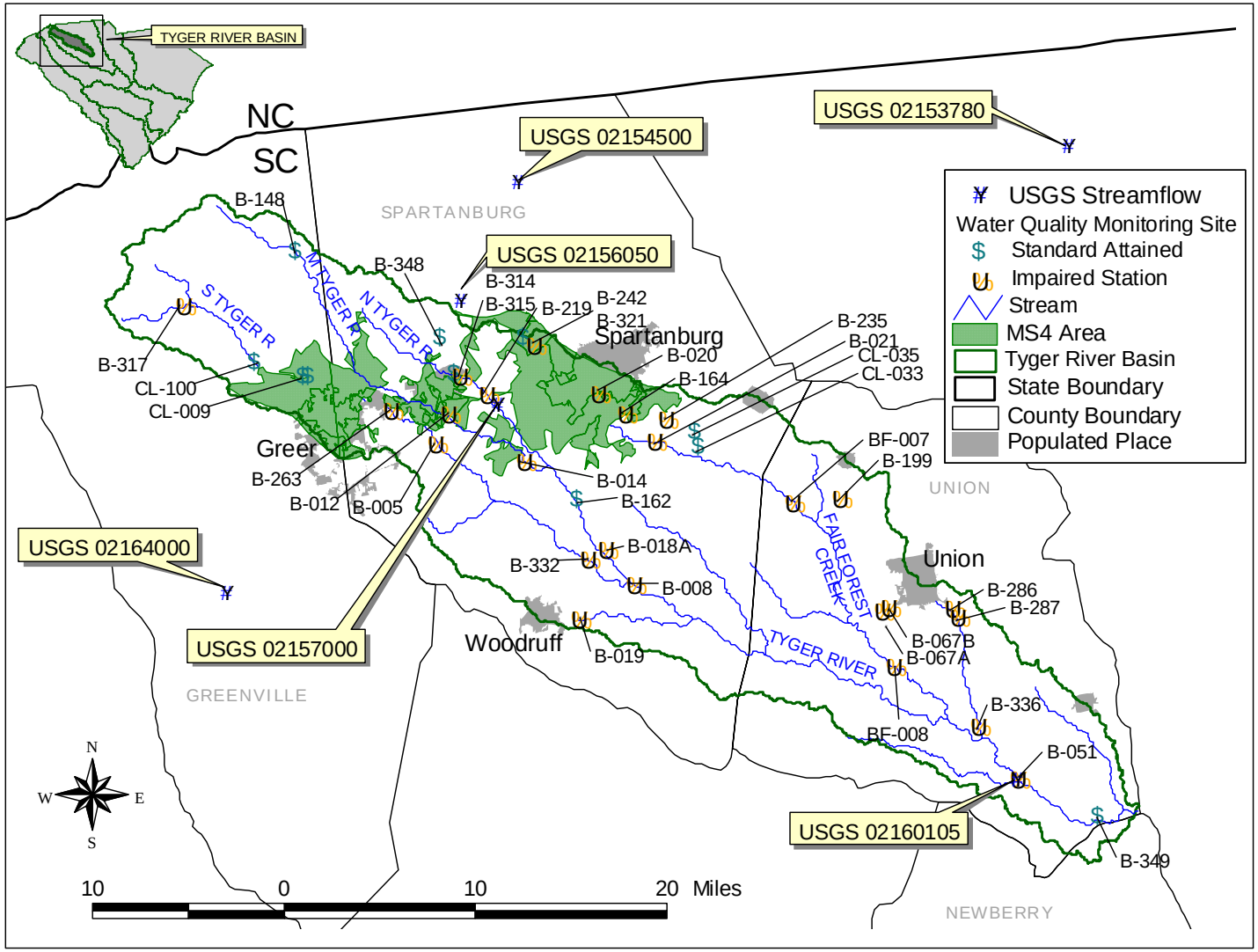

Figure 1-1 Tyger River Basin (03050107)

1.0 INTRODUCTION

1.1 Background

Levels of fecal coliform bacteria can be elevated in waterbodies as the result of both point and nonpoint sources of pollution. Section §303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for waterbodies that are not meeting designated uses under technology-based pollution controls. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and instream water quality conditions so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of water resources (USEPA, 1991).

The State of South Carolina has placed 25 monitoring stations in the Tyger River basin (8-digit HUC 03050107) on South Carolina's 2002 Section §303(d) list for impairment due to fecal coliform bacteria. These stations are identified in Table 1-1.

Table 1-1 Water Quality Monitoring Stations Impaired by Fecal Coliform in the Tyger River Watershed (03050107)

Waterbody Name	Waterbody ID	Waterbody Location
S Tyger Rvr	B-005	SOUTH TYGER RIVER AT S-42-63
Tyger Rvr	B-008	TYGER RIVER AT S-42-50 E. WOODRUFF
Middle Tyger Rvr	B-012	MIDDLE TYGER RIVER AT S-42-63
Middle Tyger Rvr	B-014	MIDDLE TYGER RIVER AT S-42-64
N Tyger Rvr	B-018A	NORTH TYGER RIVER AT S-42-231, 11 MI S OF SPARTANBURG
Jimmies Ck	B-019	JIMMIES CREEK AT S-42-201 2 MI E OF WOODRUFF
Fairforest Ck	B-020	FAIRFOREST CREEK AT US 221 S OF SPARTANBURG
Fairforest Ck	B-021	FAIRFOREST CREEK AT SC 56
Tyger Rvr	B-051	TYGER RIVER AT SC 72 5.5 MI SW OF CARLISLE
Toschs Ck	B-067A	TOSCHS CREEK AT US 176 2 MI SW OF UNION
Toschs Ck	B-067B	TOSCHS CREEK AT RD TO WWTP OFF HWY S-44-92 SW OF UNION
Fairforest Ck	B-164	FAIRFOREST CREEK AT S-42-651 3.5 MI SSE OF SPARTANBURG
Mitchell Ck	B-199	MITCHELL CREEK AT CO RD 233 2.3 MI SSW OF JONESVILLE
N Tyger Rvr	B-219	NORTH TYGER RIVER AT US 29 7.2 MI W OF SPARTANBURG
Kelsey Ck	B-235	KELSEY CREEK AT S-42-321
S Tyger Rvr	B-263	SOUTH TYGER RIVER AT SC 290 3.7 MI E OF GREER
Tinker Ck	B-286	TINKER CREEK AT RD TO STP 1.3 MI SSE OF UNION
Tinker Ck	B-287	TINKER CREEK AT UN# CO RD 1.7 MI SSE OF UNION
Tributary to N Tyger	B-315	TRIB TO NORTH TYGER RIVER AT UN# RD BL JACKSON #2 EFF
Mush Ck	B-317	MUSH CREEK AT SC 253 BL TIGERVILLE
Trib to Fairforest	B-321	TRIB TO FAIRFOREST CREEK 200 FT BL S-42-65
S Tyger Rvr	B-332	SOUTH TYGER RIVER AT S-42-86, 5 MI NE OF WOODRUFF
Tinker Ck	B-336	TINKER CREEK AT S-44-278, 9 MI SSE OF UNION
Fairforest Ck	BF-007	FAIRFOREST CREEK ON CO RD 12 SW OF JONESVILLE
Fairforest Ck	BF-008	FAIRFOREST CREEK AT S-44-16 SW OF UNION

1.2 Watershed Description

The Tyger River basin (8-digit HUC 03050107) (Figure 1-1) is located in the Piedmont region of South Carolina. It drains 820 square miles, encompassing portions of Greenville, Newberry, Spartanburg, and Union counties. The North, Middle, and South Tyger River segments drain the upstream region (11-digit HUCs 03050107-010, -020, -030, and –040). The North and Middle branches converge nine miles to the east-southeast of Duncan, and continue on to confluence with the South Tyger River ten miles downstream. Six miles south of Union, the main stem of the Tyger River flows to its confluence with Fairforest Creek, (11-digit HUC 03050107-060) draining the Spartanburg region. The Tyger River ultimately drains into the Lower Broad River (03050106) near Shelton, South Carolina.

Based on 1996 USGS Multi-Resolution Land Characteristic (MRLC) land use data, 70 percent of the watershed is forested. The remaining 30 percent is composed of cropland (11%), pastureland (10%), urban area (6%), and a small mix of water and barren land uses (3%). Table 1-2 presents the percentage of total watershed area for each aggregated land use. The percentage of land use area in each monitoring station drainage area is presented in Appendix A (Table A-1) and the actual areas in square miles are presented

in Table A-2. Figure 1-2 illustrates land use activities in the basin. Much of the forested land is abandoned agricultural land comprised of scrubby hardwoods or pine tree farms. The majority of urban land is located in the upper to middle portion of the basin along the southwestern ridgeline near Greer and along the northeastern ridgeline near Spartanburg.

Table 1-2 MRLC Aggregated Land Use for the Tyger River Basin (03050107)

Aggregated Land Use	Percent of Total Area	Total Area (miles^2)
Urban	6.4%	52.5
Barren	2.1%	17.5
Row Crops	10.8%	88.7
Pasture	9.6%	78.8
Forest	70.3%	576
Water	0.7%	6.0

1.3 Water Quality Standard

The impaired stream segments of the Tyger River basin are designated as Class Freshwater. Waters of this class are described as:

"Freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department. Suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. Suitable also for industrial and agricultural uses." (R.61-68)

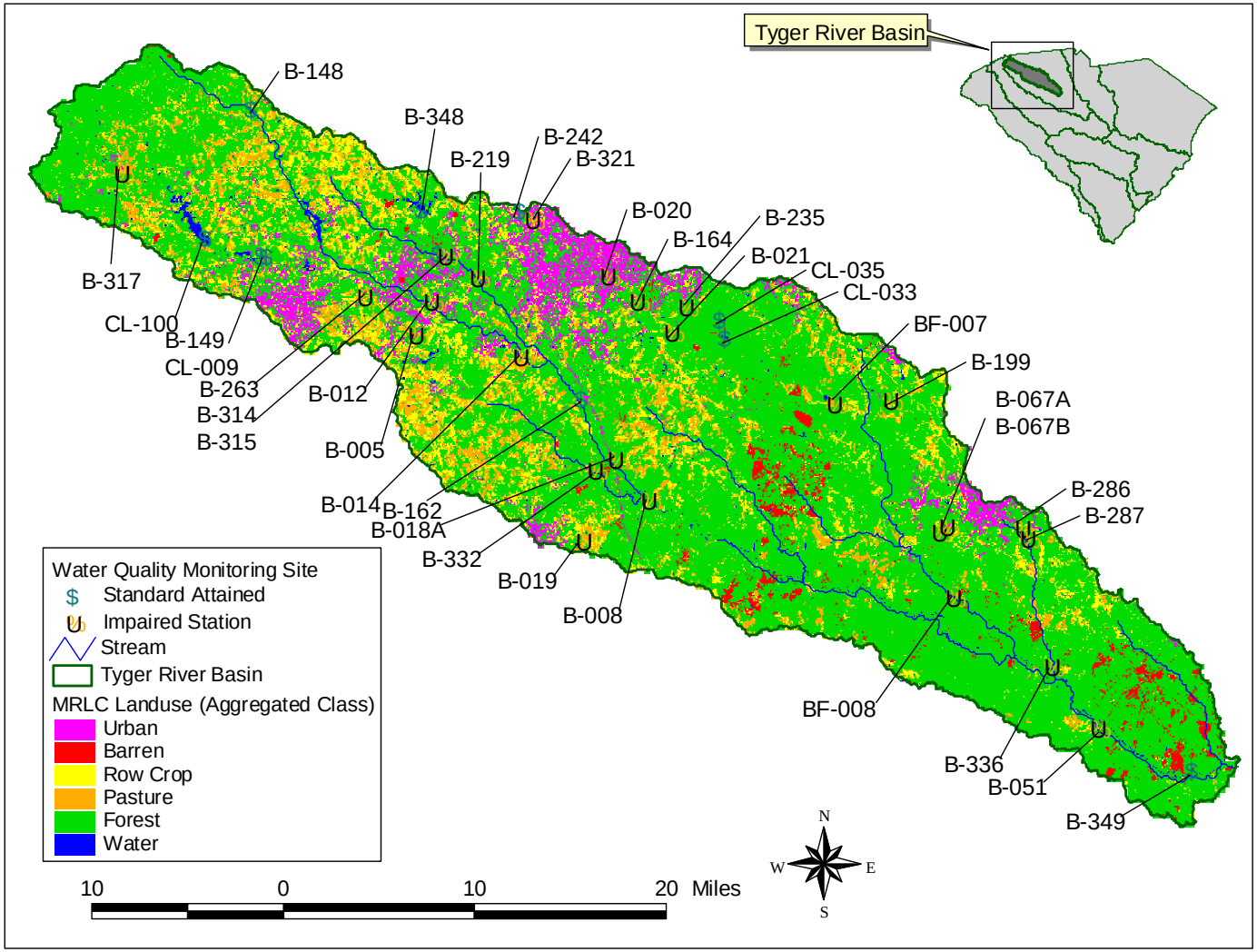

Figure 1-2 Tyger River Basin Land Use

South Carolina's standard for fecal coliform bacteria in freshwater is:

> "Not to exceed a geometric mean of 200/100 mL, based on five consecutive samples during any 30 day period; nor shall more than 10 percent of the total samples during any 30 day period exceed 400/100 mL." (R.61-68).

2.0 WATER QUALITY ASSESSMENT

Fecal coliform bacteria data collected in the Tyger River basin from 1990 through 2001 were assessed to determine impairment of standards for recreational use. The State of South Carolina monitors fecal coliform bacteria at 36 stations in the watershed. Figure 1-1 shows the location of water quality monitoring stations in the watershed.

Twenty-five water quality monitoring stations in the basin have been identified on the State of South Carolina's Section §303(d) list for 2002 as impaired (Table 1-1). Table 2-1 presents the statistical information supporting the listing of impaired water quality monitoring sites in the watershed. Waters in which no more than 10 percent of the samples collected over a five year period are greater than 400 fecal coliform counts per 100 mL are considered to comply with the South Carolina water quality standard for fecal

Table 2-1 Statistical Assessment of Observed Fecal Coliform Bacteria Collected from 1996 through 2000

Station	Total Number of Samples	Total Number of Samples >400 #/100 mL	Percent of Samples >400 #/100 mL
B-005	29	10	34%
B-008	59	18	31%
B-012	29	14	48%
B-014	12	2	17%
B-018A	36	17	47%
B-019	30	22	73%
B-020	29	29	100%
B-021	60	32	53%
B-051	58	22	38%
B-067A	27	11	41%
B-067B	27	16	59%
B-164	29	15	52%
B-199	26	21	81%
B-219	35	6	17%
B-235	30	11	37%
B-263	29	4	14%
B-286	26	11	42%
B-287	26	13	50%
B-315	16	13	81%
B-317	58	17	29%
B-321	57	25	44%
B-332	12	3	25%
B-336	13	9	69%
BF-007	25	7	28%
BF-008	32	11	34%

coliform bacteria. Waters with more than 10 percent of samples greater than 400 counts per 100 mL are considered impaired and were listed for fecal coliform bacteria on the State of South Carolina's Section §303(d) list. The fecal coliform bacteria data collected at impaired water quality monitoring stations is presented in Appendix A (Table A-3).

The timeframe, both annually and seasonally, of water quality monitoring at each station varies greatly. The statistical assessment presented in Table 2-1 was based on data collected over the five-year period from 1996 through 2000.

After determining compliance with water quality standards, observed violations were assessed to determine conditions critical to impairment. Data were compared with estimated streamflows to establish a relationship between instream concentrations and hydrologic conditions. Due to limited streamflow data in the watershed, observed data were plotted with the load-duration curves generated based on area-weighted flows. The development of load-duration curves is discussed further in Section 4.0 of this report. Load-duration curves plotted for each station in Figures B-1 through B-25, and in Figure 2-1 (for B-051) are equal to the TMDL target based on the criteria for instantaneous events. The observed fecal coliform bacteria data were also converted from counts per 100 mL to loads in counts per day to assess hydrologic conditions when the standard is not attained.

The percent of flow exceeded in Figure 2-1 and Figures B-1 through B-25 represent flow conditions at each monitoring station. Hydrologic conditions for very dry events, likely to be exceeded in 99.99 percent of measured events, are represented as 99.99 percent. Extremely wet events that occur rarely are represented as 0.01 percent. Data collected at all impaired stations in the basin have violations during all flow conditions. Violations during various flow events suggest both overland, instream, and continuous sources, such as groundwater, of fecal coliform bacteria.

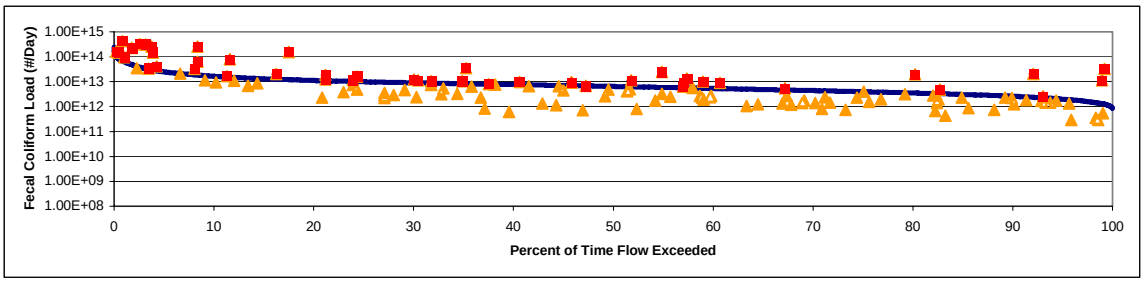

Figure 2-1 Fecal Coliform Bacteria Load-Duration Curve for Station B-051 Illustrating Observed Fecal Coliform Bacteria Loads Over Various Hydrologic Conditions

Though monitoring station B-332 (Appendix B, Figure B-12) has violations at both high and low flow conditions, the limited number of violating samples illustrates more significant violations during extreme low flow conditions. These violations are reflective of direct inputs to the system from wildlife and/or cattle in the stream or failing septic

systems. This station is greatly contrasted by B-020 (Appendix B, Figure B-17), located in the MS4 area of Spartanburg. Every sample collected between 1996 and 2000 is in violation of the water quality instantaneous criteria.

3.0 SOURCE ASSESSMENT AND LOAD ALLOCATION

Fecal coliform bacteria enter surface waters of the Tyger River basin from both point and nonpoint sources. Point sources are facilities that discharge at a specific location through pipes, outfalls, and/or conveyance channels. All point sources must have a National Pollutant Discharge Elimination System (NPDES) permit and are often municipal wastewater treatment plants or industrial waste treatment facilities. Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters. Some nonpoint sources are related to land use activities that accumulate fecal coliform bacteria on the land surface (i.e. pastureland) and runoff during storm events.

3.1 Point Sources

3.1.1 Continuous Point Sources

Facilities with continuous discharges of fecal coliform bacteria are listed in Table 3-1 and illustrated in Figure 3-1. In South Carolina, NPDES permittees that discharge sanitary wastewater must meet the State criteria for fecal coliform bacteria at the point of discharge (i.e. a daily maximum concentration of 400 counts per 100 mL, and a 30-day geometric mean of 200 counts per 100 mL).

The TMDLs presented in this report were developed using permitted flows (or design flows when there is no limit permitted flow) and permitted concentrations for fecal coliform bacteria. Limited information was available to determine the survival rate of fecal coliform bacteria discharging from permitted facilities to establish the impact downstream. Therefore, for the purpose of fecal coliform bacteria TMDL development in the Tyger River basin, wasteloads for continuous discharges are cumulative for a given drainage area. Estimated existing loads and the permitted geometric mean concentration of 200 counts per 100 mL and instantaneous concentration of 400 counts per 100 mL are listed in Table 3-3.

The collection systems associated with municipal wastewater treatment facilities are also potential sources of fecal coliform bacteria. Sewage collection systems typically are placed adjacent to waterways. At these locations, there is a potential for collection system leaks which could result in elevated instream concentrations of fecal coliform bacteria. Sanitary sewer overflows (SSOs) are also a potential source, particularly after periods of intense rainfall. This source is associated with infrequent events, limited in duration and likely to have an insignificant long-term impact instream. Identified collection system and/or SSO problems are addressed by SCDHEC through compliance and enforcement mechanisms. Fairforest Creek in Spartanburg has reported very high

fecal coliform concentrations (Appendix A Table A-3), which suggests leaking sanitary sewers or sewer overflows.

Table 3-1 Permitted Facilities Discharging Fecal Coliform Bacteria into Waterbodies of the Tyger River Basin

Facility Name	NPDES No.	Flow Limits * (MGD)	Receiving Stream
PM UTILITIES INC/LOOKUP LODGE	SC0026379	0.030	Burbank Creek
LAUREL VALLEY/N GVILLE COLLEGE	SC0026565	0.200	Meadow Creek
WESTSIDE PROP/MIDWAY PARK WWTP	SC0030571	0.015	Frey Creek
JACKSON MILLS/WELLFORD PLANT	SC0001716	0.050	Unnamed Tributary
TOWN OF LYMAN	SC0021300	4.500	Middle Tyger River
GREER/MAPLE CREEK PLANT	SC0046345	4.500	South Tyger River
SPARTAN MILLS/STARTEX MILL	SC0002453	0.400	Middle Tyger River
SSSD/FAIRFOREST PLANT	SC0020435	10.000	Fairforest Creek
MILLIKEN/ARMITAGE PLANT	SC0023451	0.010	Williams Creek
SSSD/MARILYNDALE SD	SC0030121	0.042	Reedy Creek
SSSD/CAROLINA COUNTRY CLUB	SC0039560	0.100	Fairforest Creek
SSSD/N TYGER RIVER WWTP	SC0043532	1.000	North Tyger River
EASTMAN CHEMICAL COMPANY	SC0002321	0.036	North Tyger River
TOWN OF JONESVILLE	SC0024988	0.250	Mill Creek
SPARTANBURG BOYS HOME INC	SC0024449	0.004	Mineral Springs
MIDLAND CAPITAL LLC	SC0036145	0.032	South Tyger River
SC DEPT CORR/TYGER R CORRECTIONS	SC0036773	0.350	Tyger River
UNION/BELTLINE PLANT	SC0021202	0.350	Tinker Creek
UNITED UTILS/FAIRWOODS SD	SC0035041	0.065	Fairforest Creek
UNION/TOSCH'S CREEK WWTP	SC0047244	6.000	Fairforest Creek
SSSD/S. TYGER RV REGIONAL WWTP	SC0047732	1.000	South Tyger River

- Note: Flow limits are either permit limits or design limits.

Table 3-2 Impaired Water Quality Monitoring Stations Draining NPDES Facilities in the Tyger River Basin

B-051	**B-008**	**B-332**	**B-005**	**B-199**
SC0020435	SC0002453	SC0047732	SC0026379	SC0024988
SC0002453	SC0021300	SC0036145	SC0026565	
SC0021300	SC0001716	SC0023451	SC0046345	**B-219**
SC0026379	SC0002321	SC0046345		SC0001716
SC0026565	SC0023451	SC0026565	**B-021**	
SC0039560	SC0030571	SC0026379	SC0020435	**B-287**
SC0030121	SC0036145		SC0039560	SC0021202
SC0001716	SC0043532	**B-018A**	SC0030121	
SC0046345	SC0047732	SC0001716		**B-336**
SC0002321	SC0026379	SC0002321	**B-263**	SC0021202
SC0021202	SC0026565	SC0030571	SC0026565	
SC0023451	SC0046345	SC0043532	SC0026379	
SC0024449		SC0002453		
SC0024988	**BF-008**	SC0021300	**B-014**	
SC0030571	SC0047244		SC0002453	
SC0036145	SC0035041	**BF-007**	SC0021300	
SC0043532	SC0020435	SC0024449		
SC0047732	SC0039560	SC0039560	**B-012**	
SC0035041	SC0024988	SC0030121	SC0021300	
SC0047244	SC0024449	SC0020435	SC0002453	
SC0036773	SC0030121			

Table 3-3 Estimated Existing Fecal Coliform Bacteria Loads for Facilities in the Tyger River Basin

NPDES Facility	Flow (MGD)	Existing Loading (counts/days)	Existing Loading (counts/30days)
SC0026379	0.030	4.54E+08	6.81E+09
SC0026565	0.200	3.03E+09	4.54E+10
SC0030571	0.015	2.27E+08	3.41E+09
SC0001716	0.050	7.57E+08	1.14E+10
SC0021300	4.500	6.81E+10	1.02E+12
SC0046345	4.500	6.81E+10	1.02E+12
SC0002453	0.400	6.06E+09	9.08E+10
SC0020435	10.000	1.51E+11	2.27E+12
SC0023451	0.010	1.51E+08	2.27E+09
SC0030121	0.042	6.28E+08	9.43E+09
SC0039560	0.100	1.51E+09	2.27E+10
SC0043532	1.000	1.51E+10	2.27E+11
SC0002321	0.036	5.45E+08	8.18E+09
SC0024988	0.250	3.79E+09	5.68E+10
SC0024449	0.004	5.30E+07	7.95E+08
SC0036145	0.032	4.85E+08	7.27E+09
SC0036773	0.350	5.30E+09	7.95E+10
SC0021202	0.350	5.30E+09	7.95E+10
SC0035041	0.065	9.84E+08	1.48E+10
SC0047244	6.000	9.08E+10	1.36E+12
SC0047732	1.000	1.51E+10	2.27E+11

3.1.2 Municipal Separate Storm System (NPDES)

Several towns and the surrounding areas of unincorporated Spartanburg and Greenville Counties in the watershed have or will have NPDES MS4 (Municipal Separate Storm Sewer System) permits (Figure 1-1). These permitted sewer systems will be treated as point sources in the TMDL calculations below. However for modeling purposes all urban areas will be evaluated together as urban nonpoint sources.

In 1990, EPA developed rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) storm water program, designed to prevent harmful pollutants from being washed by storm water runoff into Municipal Separate Storm Sewer Systems (MS4s) (or from being dumped directly into the MS4) and then discharged into local waterbodies (SCDHEC, 2002). Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or

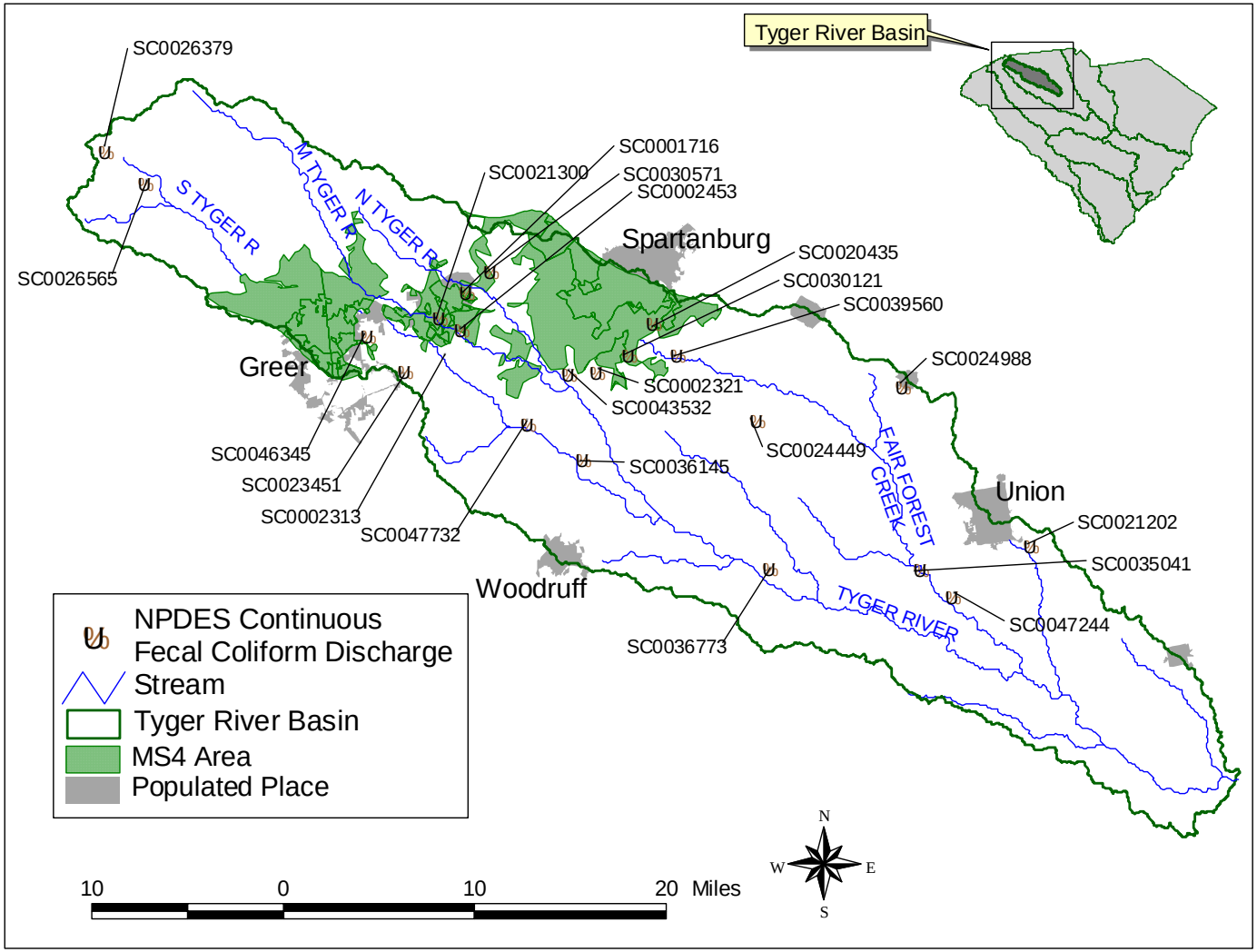

Figure 3-1 Active Fecal Coliform Bacteria Discharging NPDES Facilities

greater) to implement a storm water management program as a means to control polluted discharges from MS4s. Approved storm water management programs for medium and large MS4s are required to address a variety of water quality related issues including roadway runoff management, municipal owned operations, and hazardous waste treatment.

Phase II of the rule extends coverage of the NPDES storm water program to certain small MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES Storm Water Program. Phase II requires operators of regulated small MS4s to obtain NPDES permits and develop a storm water management program. Programs are to be designed to reduce discharges of pollutants to the "maximum extent practicable", protect water quality, and satisfy appropriate water quality requirements of the Clean Water Act.

3.2 Nonpoint Sources

The land use distribution of the Tyger River basin provides insight into determining nonpoint sources of fecal coliform bacteria (Figure 1-2). In the watershed, 70 percent of the land area is classified forested, 10 percent is pastureland, and 6 percent of the area is urban. Key nonpoint sources identified in the watershed include livestock, manure application, failing septic systems, illicit discharges (including leaking and overflowing sewers), over land contributions from impervious surfaces, and natural sources.

3.2.1 Wildlife

Fecal coliform bacteria are found in forested areas, pastureland, and cropland due to the presence of wild animal sources such as deer, raccoons, wild turkeys and waterfowl. The Department of Natural Resources in South Carolina estimates the deer habitat in the basin at a density from 15 to 45 deer per square mile (SC Deer Density 2000 map). Deer habitat was assumed to include forests, cropland, and pastures. Wildlife waste is transported over land surfaces during rainfall events or may be directly deposited by animals into streams. The high percentage of permeable surfaces in forested areas increases the infiltration rate over the watershed area. This process ultimately reduces the runoff reaching streams by overland flow and reduces the significance of fecal coliform contributions transported over land.

3.2.2 Agricultural Activities and Grazing Animals

Agricultural land can be a source of fecal coliform bacteria. Runoff from grazing pastures, improper land application of animal wastes, livestock operations, and livestock with access to waterbodies are all agricultural sources of fecal coliform bacteria. Agricultural best management practices (BMPs) such as buffer strips, alternative watering sources, limiting livestock access to streams, and the proper land application of animal wastes reduce fecal coliform bacteria loading to waterbodies.

The number of animals in the watershed (Table 3-4), was estimated by area-weighting the 1997 USDA census data over the watershed area aggregated to pastureland for Greenville, Newberry, Spartanburg, and Union counties. Census data show that grazing cattle are of more relevance in the Tyger River basin than confined animal operations. Livestock, except for dairy cattle, are not usually confined and are typically grazing in the pastures where deposited manure is a source of nonpoint pollution. The time that cattle spend in streams is assumed to be 0.15 percent of their total gazing time. Hogs are anticipated to be generally confined, where as sheep are expected to spend all of their time grazing. Horses and ponies are expected to spend the majority of spring, summer, and fall months grazing in pastureland where manure is a source of nonpoint pollution.

Table 3-4 1997 USDA Agricultural Census Data Animal Estimates

Animal	1997 Census Estimate
Beef Cow	8777
Dairy Cow	856
Hog	307
Sheep	28
Horses and Ponies	1051

3.2.3 Failing Septic Systems and Illicit Discharges

Failing septic systems and illegal discharges represent a nonpoint source that can contribute fecal coliform to receiving waterbodies through surface, subsurface malfunctions or direct discharges. Based on 1990 census information, population change from 1990 and 2000, and assuming an average of 2.5 people per household (U.S. Census, 2000), greater than 140,000 people in the Tyger River basin use septic systems. Though the precise failure rate is unknown, Schueler (1999) suggests an average septic failure rate of 20 percent. Many of these areas are also on sewer systems that may leak and/or overflow during rain events contributing significant loads of fecal coliform bacteria directly to streams.

3.2.4 Urban Runoff

Runoff from urban areas not permitted under the MS4 program are a significant source of fecal coliform bacteria in the Tyger River basin. Water quality data collected from streams draining many of the unpermitted communities show existing loads of fecal coliform bacteria at levels greater than 50 percent of the State's instantaneous standards. Best management practices (BMPs) such as buffer strips and the proper disposal of domestic animal wastes reduce fecal coliform bacteria loading to waterbodies.

4.0 TECHNICAL APPROACH – LOAD-DURATION METHOD

Load-duration curves were developed for water quality stations in the Tyger River basin to establish allowable fecal coliform bacteria loads under various hydrologic conditions. The load-duration methodology uses the cumulative frequency distribution of streamflow and pollutant concentration (fecal coliform bacteria) data to estimate the allowable loads for a waterbody. Allowable load-duration curves were established in the basin using the instantaneous concentration of fecal coliform bacteria, minus a five percent margin of safety (MOS), and streamflow measured at various USGS stations in the Tyger River basin and surrounding watersheds, as shown in Figure 1-1 and listed in Table 4-1.

Table 4-1 USGS Stations Used to Establish Area-Weighted Flows

Site Number	Site Name	From	To	Drainage Area (mile2)
02153780	CLARKS FORK CREEK NR SMYRNA, SC	10/01/80	09/30/01	24.1
02156050	LAWSONS FORK CREEK AT DEWEY PLANT NR INMAN, SC	10/01/79	09/30/01	6.46
02157000	N TYGER RIVER NEAR FAIRMONT, SC	10/01/50	09/30/88	44.4
02160105	TYGER RIVER NEAR DELTA, SC	10/1/1973	9/30/2001	755
02164000	REEDY RIVER NEAR GREENVILLE, SC	11/21/41	09/30/01	48.6

Streamflow data was not available at each impaired water quality monitoring station to develop load-duration curves. Therefore, flows were determined by area-weighted data collected at USGS stations listed in Table 4-1. Data collected at these stations through 2001 were used to develop loading curves. For USGS station 02157000, the North Tyger River near Fairmont, where data were not collected through 2001, the program MOVE.1 was used to interpolate streamflow by comparing overlapping records with USGS station 02160105, Tyger River near Delta. Statistical analysis from matched stations and technical clarification of the MOVE.1 methods can be found in Appendix D.

Watershed characteristics (including the distribution of land use activities, ecoregions, and topography) for the USGS stations and impaired water quality monitoring sites were compared to associate stations to develop load-duration curves. Table 4-2 lists the impaired water quality monitoring stations and associated streamflow stations used to develop area-weighted flow relationships. The location of both USGS and water quality monitoring stations are identified in Figure 1-1.

The best available streamflow data were used when establishing area-weighted flows. To compare USGS stations with extensive datasets and similar watershed characteristics to impaired water quality stations, USGS stations outside the Tyger River basin were selected. Specifically, USGS 02153780 and 02156050 in the Upper Broad River basin and USGS 02164000 of the Saluda River basin were selected as appropriate streamflow stations. The gages were deemed appropriate based on their watershed area, land use distribution and extensive datasets. The Figure 4-1 illustrates the water yield for

impaired stations associated with USGS station 02160105, located on Tyger River near Delta, South Carolina.

After calculating streamflow for each impaired monitoring station the data were ranked to determine the percent of time streamflow was exceeded. The streamflow was then multiplied by a concentration of 380 counts/100 mL (based on the instantaneous concentration and a five percent MOS) to generate a load-duration curve for each impaired station, shown in Figures B-26 through B-30 of Appendix B. The result of the load-duration curve is the TMDL target.

To define the TMDL for each station, an average of the load-duration curve was calculated. The average was calculated using loads at five percent intervals from the 10th percentile of flow exceeded to the 90th percentile of flow exceeded. Loads occurring at less than the 10th percentile of flow exceeded are extreme high flow events and the data collected at greater than the 90th percentile of flow exceeded are extreme low flow events and therefore were not considered in developing theses TMDLs. Loads established at intervals and the mean load for each station can be found in Appendix B, Table B-1.

Table 4-2 USGS Stations and Associated Water Quality Stations

USGS Gage	Waterbody ID	Waterbody Name
02153780	B-336	Tinker Ck
	BF-008	Fairforest Ck
	BF-007	Fairforest Ck
	B-317	Mush Ck
02156050	B-199	Mitchell Ck
02157000	B-315	Tributary to N Tyger
	B-219	N Tyger Rvr
	B-018A	N Tyger Rvr
	B-332	S Tyger Rvr
	B-008	Tyger Rvr
	B-014	Middle Tyger Rvr
	B-012	Middle Tyger Rvr
02160105	B-005	S Tyger Rvr
	B-263	S Tyger Rvr
	B-051	Tyger Rvr
02164000	B-321	Tributary to Fairforest
	B-020	Fairforest Ck
	B-164	Fairforest Ck
	B-019	Jimmies Ck
	B-021	Fairforest Ck
	B-067B	Toschs Ck
	B-067A	Toschs Ck
	B-235	Kelsey Ck
	B-286	Tinker Ck
	B-287	Tinker Ck

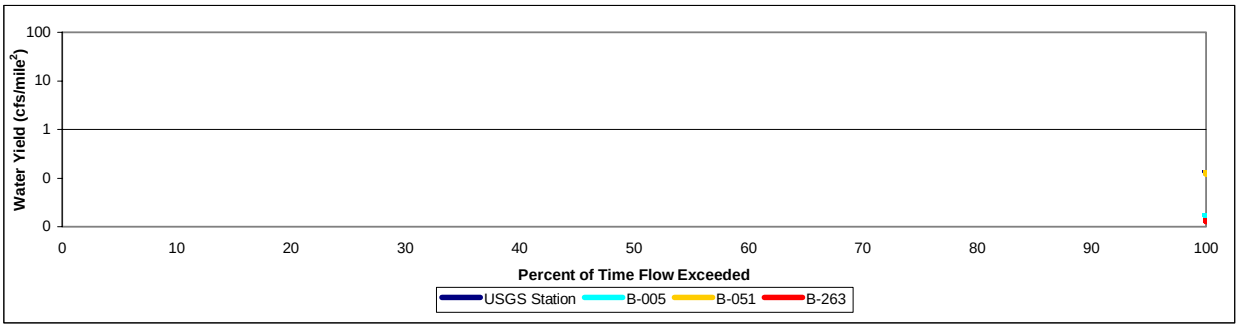

Figure 4-1 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02160105

5.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOAD

A total maximum daily load (TMDL) for a given pollutant and waterbody is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is represented by the equation:

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

The TMDL is the total amount of a pollutant that can be assimilated by the receiving waterbody while still achieving water quality standards. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis to establish water quality-based controls. For some pollutants, TMDLs are expressed on a mass-loading basis (e.g., pounds per day). For bacteria, however, TMDLs can be expressed in terms of organism counts (or resulting concentration), in accordance with 40 CFR 130.2(l).

5.1 Critical Conditions

Critical conditions for fecal coliform bacteria in the Tyger River basin occur at various flow regimes. The load-duration curve methodology used to establish TMDLs in the watershed considers various hydrologic conditions critical in maintaining water quality standards.

5.2 Existing Load

The existing load for each impaired station was established using observed fecal coliform bacteria data and area-weighted streamflow. The measured data occurring at less than the

10th percentile of flow exceeded is an extreme high flow event and the data collected at greater than the 90th percentile of flow exceeded is an extreme low flow event and therefore not considered as critical conditions for these TMDLs.

The data violating the instantaneous concentration were isolated and a best-fit trendline was fit to violating data. The power trendline was determined using a best-fit relationship that was most representative of the violating data. The equation representing the trendline was then used to calculate the average violating load that occurred between the 10th and 90th percentiles, at every fifth percentile. This average load is equal to the existing instream fecal coliform bacteria load at the associated station. The existing nonpoint source load is equal to the existing instream load minus the wasteload from point sources.

Figure 5-1 presents the power best-fit trendline for station B-051, the impaired station on the Tyger River at SC 72 southwest of Carlisle. Interval loads calculated for existing instream conditions are presented in Table B-2. Power trendlines are presented in Figures B-1 through B-25 of Appendix B. Existing nonpoint loads calculated for each station are listed in Table 5-1.

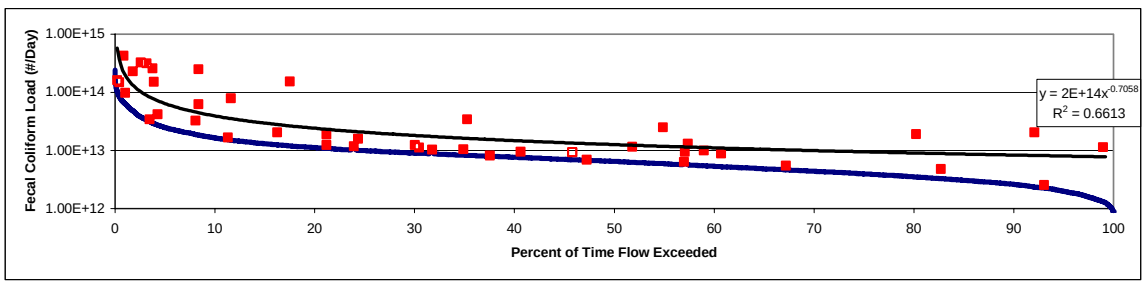

Figure 5-1 Power Trendline Generated from Violating Fecal Coliform Bacteria at B-051

Table 5-1 Existing Loads for Impaired Water Quality Stations in the Tyger River Basin (03050107)

Station ID	Existing Load (counts/day)
B-005	5.47E+12
B-008	7.86E+12
B-012	1.23E+12
B-014	2.24E+12
B-018A	6.98E+12
B-019	2.32E+11
B-020	5.09E+12
B-021	1.93E+12
B-051	1.53E+13
B-067A	3.00E+11
B-067B	2.14E+11
B-164	1.41E+12
B-199	7.35E+10

Station ID	Existing Load (counts/day)
B-219	6.49E+11
B-235	1.32E+11
B-263	8.78E+11
B-286	8.66E+10
B-287	5.64E+10
B-315	3.96E+11
B-317	1.21E+11
B-321	2.21E+10
B-332	2.14E+12
B-336	1.78E+11
BF-007	5.91E+11
BF-008	1.16E+12

5.3 Existing Wasteload

The existing wasteload was calculated for each NPDES permitted continuous discharge. The facilities were assumed to discharge at permitted flows (design flows when a flow limit was not designated in the permit) and permitted limits of fecal coliform bacteria equal to the State criteria for both instantaneous and geometric mean loads. In South Carolina, NPDES permittees that discharge sanitary wastewater must meet the State's criteria for fecal coliform bacteria at the point of discharge (i.e. a daily maximum concentration of 400 counts per 100 mL, and a 30-day geometric mean of 200 counts per 100 mL). Under these permitted concentrations facilities should not be in exceedance of the fecal coliform bacteria water quality criteria, and therefore, not considered to be a major contributing source. If facilities are discharging at greater than permitted concentrations this is an illicit discharge and regulated through the NPDES program. Allowable TMDL wasteloads for impaired stations, as shown in Table 5-2, are equal to loads calculated for facilities in the basin.

5.4 Margin of Safety

There are two methods for incorporating a margin of safety (MOS) in the analysis: a) by implicitly incorporating the MOS using conservative assumptions to develop allocations; or b) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations. For the Tyger River basin TMDLs, both methods were applied to incorporate a MOS. An implicit MOS was incorporated through the use of conservative assumptions in developing the TMDL, such as the use of the design or permitted flow for NPDES facilities and the use of a trendline to establish a total instream load. A five percent explicit MOS was reserved from the water quality criteria in developing the load-duration curves. Specifically, the water quality target was set at 190 counts per 100 mL for the geometric mean 30-day period and 380 counts per 100 mL for the instantaneous criterion, which is five percent lower than the water quality criteria of 200 and 400 counts per 100 mL, respectively.

5.5 Total Maximum Daily Load

The TMDL represents the maximum fecal coliform bacteria load the stream may carry and still meet water quality standards. The TMDL is presented in fecal coliform counts to be protective of both the instantaneous, per day, and geometric mean, per 30-day, criteria. Table 5-3 defines the fecal coliform bacteria total maximum daily load for protection of water quality standards for impaired stations in the Tyger River Basin.

There are seven municipalities in the watershed that have or will have NPDES MS4 permits. Greenville County became covered under NPDES Phase I in August of 2000. The towns and Spartanburg County will eventually be covered under one or more NPDES phase II stormwater permits. The reduction percentages in this TMDL apply also to the fecal coliform waste load attributable to those areas of the watershed which are covered or will be covered under NPDES MS4 (Municipal Separate Storm Sewer

System) permits. Compliance by these municipalities with the terms of their individual MS4 permits will fulfill any obligations they have towards implementing this TMDL.
The MS4 WLAs and LAs for Fairforest Creek at B-020 and B-164, which are expressed as percent reductions, were reduced from 96 % and 83 % respectively, to 73 % because of the evidence of leaking sewers or sewer overflows into the creek. The station upstream of these locations, B-321 and the station downstream, B-021, which have not shown the extremely high fecal coliform concentrations, require reductions in load of 73 %. Therefore it is reasonable to assign the two intermediate locations of Fairforest Creek the same reductions for the MS4 contributions and nonpoint sources.

Table 5-2 Wasteloads from NPDES Continuous Discharges to Impaired Water Quality Stations in the Tyger River Basin (03050107)

Station ID	Existing Waste Load Continuous (counts/day)
B-005	7.16E+10
B-008	1.78E+11
B-012	7.42E+10
B-014	7.42E+10
B-018A	9.09E+10
B-019	NA
B-020	NA
B-021	1.54E+11
B-051	4.38E+11
B-067A	NA
B-067B	NA
B-164	NA
B-199	3.79E+09
B-219	7.57E+08
B-235	NA
B-263	3.48E+09
B-286	NA
B-287	5.30E+09
B-315	NA
B-317	NA
B-321	NA
B-332	8.74E+10
B-336	5.30E+09
BF-007	1.54E+11
BF-008	2.49E+11

Table 5-3 Total Maximum Daily Loads for Impaired Water Quality Stations in the Tyger River Basin (03050107)

Station ID	Existing Waste Load	TMDL WLA		Existing Load	TMDL LA	MOS	TMDL[3]	Percent Reduction[4]
	Continuous (counts/day)	Continuous[1] (counts/day)	MS4[2]	(counts/day)	(counts/day)	(counts/day)	(counts/day)	
B-005	7.16E+10	7.16E+10	83%	5.47E+12	8.05E+11	4.87E+10	9.25E+11	83%
B-008	1.78E+11	1.78E+11	NA	7.86E+12	3.17E+12	1.86E+11	3.53E+12	55%
B-012	7.42E+10	7.42E+10	40%	1.23E+12	6.21E+11	3.86E+10	7.33E+11	40%
B-014	7.42E+10	7.42E+10	63%	2.24E+12	7.11E+11	4.36E+10	8.29E+11	63%
B-018A	9.09E+10	9.09E+10	NA	6.98E+12	1.55E+12	9.10E+10	1.73E+12	75%
B-019	NA	NA	NA	2.32E+11	3.96E+10	2.20E+09	4.18E+10	82%
B-020	NA	NA	73%	5.09E+12	1.82E+11	1.01E+10	1.92E+11	73%
B-021	1.54E+11	1.54E+11	73%	1.93E+12	3.36E+11	2.72E+10	5.17E+11	73%
B-051	4.38E+11	4.38E+11	NA	1.53E+13	6.40E+12	3.80E+11	7.22E+12	53%
B-067A	NA	NA	NA	3.00E+11	6.16E+10	3.42E+09	6.50E+10	78%
B-067B	NA	NA	NA	2.14E+11	5.34E+10	2.97E+09	5.64E+10	74%
B-164	NA	NA	73%	1.41E+12	2.30E+11	1.28E+10	2.42E+11	73%
B-199	3.79E+09	3.79E+09	NA	7.35E+10	3.39E+10	2.09E+09	3.97E+10	46%
B-219	7.57E+08	7.57E+08	46%	6.49E+11	3.29E+11	1.83E+10	3.48E+11	46%
B-235	NA	NA	64%	1.32E+11	4.56E+10	2.53E+09	4.81E+10	64%
B-263	3.48E+09	3.48E+09	13%	8.78E+11	7.21E+11	4.03E+10	7.65E+11	13%
B-286	NA	NA	NA	8.66E+10	3.33E+10	1.85E+09	3.52E+10	59%
B-287	5.30E+09	5.30E+09	NA	5.64E+10	3.94E+10	2.48E+09	4.72E+10	16%
B-315	NA	NA	52%	3.96E+11	1.79E+11	9.94E+09	1.89E+11	52%
B-317	NA	NA	NA	1.21E+11	7.90E+10	4.39E+09	8.33E+10	31%
B-321	NA	NA	73%	2.21E+10	5.66E+09	3.15E+08	5.98E+09	73%
B-332	8.74E+10	8.74E+10	NA	2.14E+12	1.28E+12	7.58E+10	1.44E+12	33%
B-336	5.30E+09	5.30E+09	NA	1.78E+11	1.16E+11	6.75E+09	1.28E+11	28%
BF-007	1.54E+11	1.54E+11	NA	5.91E+11	1.11E+11	1.47E+10	2.79E+11	53%
BF-008	2.49E+11	2.49E+11	NA	1.16E+12	2.12E+11	2.56E+10	4.87E+11	58%

Table Notes:

1. Total monthly wasteload (#/30 days) cannot exceed loads listed in Table 3-3.
2. MS4 expressed as percent reduction equal to LA reduction.
3. TMDLs expressed as monthly load (#/30 days) by station are listed in Table B-1.
4. Percent reduction applies to LA and MS4 components when an MS4 is in the watershed.

6.0 IMPLEMENTATION

As discussed in the *Implementation Plan for Achieving Total Maximum Daily Load Reductions From Nonpoint Sources for the State of South Carolina* (SCDHEC,1998), South Carolina has several tools available for implementing this nonpoint source TMDL. Specifically, SCDHEC's animal agriculture permitting program addresses animal operations and land application of animal wastes. In addition, SCDHEC will work with the existing agencies in the area to provide nonpoint source education in the Tyger River watershed. Local sources of nonpoint source education and assistance include Clemson Extension Service, the Natural Resource Conservation Service (NRCS), the Greenville,

Spartanburg, Newberry, and Union Counties Soil and Water Conservation Services, and the South Carolina Department of Natural Resources. Clemson Extension Service offers a 'Farm-A-Syst' package to farmers. Farm-A-Syst allows the farmer to evaluate practices on their property and determine the nonpoint source impact they may be having. It recommends best management practices (BMPs) to correct nonpoint source problems on the farm. NRCS can provide cost share money to land owners installing BMPs.

SCDHEC is empowered under the State Pollution Control Act to perform investigations of and pursue enforcement for activities and conditions which threaten the quality of waters of the state.

The iterative BMP approach as defined in the general storm water NPDES MS4 permit is expected to provide significant implementation of this TMDL. Discovery and removal of illicit storm drain cross connection is one important element of the storm water NPDES permit. Public nonpoint source pollution education is another.

Also, other interested parties (universities, local watershed groups, etc.) may apply for section 319 grants to install BMPs that will reduce fecal coliform loading to the Tyger River and its tributaries. TMDL implementation projects are given highest priority for 319 funding.

In addition to the resources cited above for the implementation of this TMDL in the Tyger River watershed, Clemson Extension has developed a Home-A-Syst handbook that can help urban or rural homeowners reduce sources of NPS pollution on their property. This document guides homeowners through a self-assessment, including information on proper maintenance practices for septic tanks. SCDHEC also employs a nonpoint source educator who can assist with distribution of these tools as well as provide additional BMP information.

Using existing authorities and mechanisms, these measures will be implemented in the Tyger River watershed in order to bring about the necessary reductions in fecal coliform bacteria loading to the Tyger River and its impaired tributaries. DHEC will continue to monitor, according to the basin monitoring schedule, the effectiveness of implementation measures and evaluate stream water quality as the implementation strategy progresses.

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APPENDIX A Data

Table A-1 Percent of Watershed Area Aggregated by Land Use Class for Areas Draining to Streamflow and Water Quality Monitoring Stations in the Tyger River Basin

Monitoring Station ID	Water	Urban	Row Crop	Pasture	Forest	Barren
USGS 02157000	1.5%	5.9%	21.3%	13.4%	56.8%	1.1%
USGS 02153780	0.4%	0.8%	4.1%	5.6%	89.2%	0.0%
USGS 02156050	0.4%	19.6%	26.3%	14.6%	39.0%	0.1%
USGS 02164000	0.3%	52.5%	3.1%	6.3%	37.4%	0.4%
B-005	1.9%	9.6%	11.3%	13.2%	63.9%	0.1%
B-008	1.1%	6.9%	15.4%	14.7%	61.5%	0.3%
B-012	1.1%	4.1%	16.7%	15.4%	62.4%	0.3%
B-014	1.0%	5.7%	16.4%	14.6%	62.0%	0.3%
B-018A	0.9%	7.7%	16.3%	13.8%	60.8%	0.5%
B-019	0.1%	28.9%	16.1%	12.4%	42.5%	0.0%
B-020	0.1%	60.5%	4.6%	4.3%	30.4%	0.1%
B-021	0.4%	35.9%	8.6%	7.5%	47.2%	0.4%
B-051/USGS 02160105	0.7%	6.7%	11.4%	10.2%	69.5%	1.6%
B-067A	0.2%	34.5%	11.0%	2.0%	51.4%	0.8%
B-067B	0.3%	39.4%	9.0%	2.1%	48.4%	0.9%
B-164	0.1%	58.4%	4.4%	4.5%	32.3%	0.2%
B-199	1.4%	9.7%	17.5%	10.8%	60.1%	0.3%
B-219	1.9%	5.1%	22.8%	15.0%	54.0%	1.2%
B-235	0.1%	35.1%	5.4%	7.4%	51.9%	0.1%
B-263	2.2%	6.8%	10.1%	11.3%	69.4%	0.2%
B-286	0.0%	34.6%	5.0%	1.8%	58.4%	0.1%
B-287	0.0%	26.7%	6.6%	1.7%	64.8%	0.2%
B-315	0.4%	4.8%	27.6%	16.1%	49.9%	1.2%
B-317	0.4%	1.3%	5.2%	7.4%	85.7%	0.0%
B-321	0.5%	57.1%	7.2%	9.1%	25.6%	0.6%
B-332	1.5%	7.2%	14.4%	15.5%	61.3%	0.1%
B-336	0.2%	0.6%	14.2%	6.6%	76.1%	2.2%
BF-007	0.5%	2.0%	5.5%	6.3%	84.0%	1.7%
BF-008	0.2%	1.9%	10.0%	6.9%	78.0%	3.0%

Table A-2 Watershed Area in Square Miles Aggregated by Land Use Class for Areas Draining to Streamflow and Water Quality Monitoring Stations in the Tyger River Basin

Monitoring Station ID	Water	Urban	Row Crop	Pasture	Forest	Barren	Total
	(miles^2)						
USGS 02157000	0.7	2.6	9.4	5.9	25	0.5	44
USGS 02153780	0.1	0.2	1.0	1.4	22	0.0	24
USGS 02156050	0.0	1.3	1.7	1.0	2.6	0.0	6.6
USGS 02164000	0.1	25	1.5	3.1	18	0.2	48
B-005	1.8	9.3	11	13	62	0.1	97
B-008	3.8	24	53	51	213	1.2	347
B-012	0.8	2.9	12	11	45	0.2	72
B-014	0.8	4.6	13	12	50	0.2	81
B-018A	1.6	13	28	23	103	0.8	170
B-019	0.0	1.1	0.6	0.5	1.6	0.0	3.7
B-020	0.0	10	0.8	0.7	5.1	0.0	17
B-021	0.2	16	3.9	3.4	21	0.2	45
B-051/USGS 02160105	5.6	50	86	77	525	12	755
B-067A	0.0	2.0	0.6	0.1	2.9	0.0	5.7
B-067B	0.0	1.9	0.4	0.1	2.4	0.0	4.9
B-164	0.0	12	0.9	0.9	6.9	0.0	21
B-199	0.1	0.4	0.7	0.4	2.3	0.0	3.8
B-219	0.6	1.7	7.8	5.1	18	0.4	34
B-235	0.0	1.5	0.2	0.3	2.2	0.0	4.2
B-263	1.8	5.4	8.1	9.1	56	0.1	80
B-286	0.0	1.1	0.2	0.1	1.8	0.0	3.1
B-287	0.0	1.1	0.3	0.1	2.7	0.0	4.1
B-315	0.1	0.9	5.1	3.0	9.2	0.2	19
B-317	0.1	0.2	0.8	1.2	13	0.0	16
B-321	0.0	0.3	0.0	0.0	0.1	0.0	0.5
B-332	2.1	10	20	22	87	0.2	141
B-336	0.1	0.2	3.4	1.6	18	0.5	24
BF-007	0.3	1.1	2.9	3.3	44	0.9	53
BF-008	0.2	1.8	9.2	6.3	72	2.7	92

Table A-3 Fecal Coliform Data Collected between 1990 and 2001 at Water Quality Monitoring Stations in the Tyger River Watershed

B-005	Value
5/29/90	7300
6/14/90	240
7/12/90	270
8/24/90	5000
9/26/90	440
10/11/90	810
5/21/91	2000
6/14/91	160
7/23/91	150
8/15/91	1100
9/13/91	130
10/10/91	130
5/18/93	200
6/8/93	190
7/21/93	300
8/5/93	120
9/7/93	81
10/4/93	180
5/5/94	280
6/23/94	250
7/12/94	1100
8/16/94	1300
9/22/94	320
10/13/94	2900
5/4/95	150
6/9/95	240
7/13/95	260
8/24/95	860
9/29/95	220
10/16/95	390
5/25/96	110
6/11/96	800
7/12/96	1600
8/9/96	2700
9/13/96	580
10/11/96	140

B-005	Value
5/15/97	270
6/20/97	400
7/18/97	450
8/15/97	480
9/5/97	150
10/3/97	100
5/15/98	220
6/11/98	1400
7/16/98	190
8/18/98	430
10/7/98	900
5/15/98	220
5/3/99	140
6/8/99	180
7/20/99	200
8/31/99	190
9/22/99	3200
10/25/99	40
5/16/00	30
6/20/00	250
7/26/00	180
8/22/00	140
9/12/00	240
10/3/00	230
1/17/01	60
2/7/01	240
3/8/01	63
6/25/01	460
7/13/01	160
8/21/01	94
9/11/01	120
9/21/01	220
10/12/01	260
11/6/01	160
12/13/01	290

Table A-3 (Continued)

B-008	Value
1/3/90	200
2/8/90	780
3/1/90	200
4/5/90	2610
5/30/90	710
6/19/90	250
7/25/90	560
8/28/90	180
9/19/90	250
10/5/90	580
11/2/90	2440
12/4/90	1400
1/4/91	380
2/7/91	880
3/8/91	110
4/11/91	480
5/23/91	580
6/24/91	3400
7/25/91	180
8/14/91	790
9/23/91	640
10/1/91	330
11/8/91	520
12/2/91	410
1/8/92	290
2/7/92	80
3/4/92	360
4/8/92	270
5/12/92	120
6/5/92	2600
7/9/92	110
8/3/92	120
9/1/92	200
10/1/92	360
11/24/92	940
12/10/92	2200
1/8/93	8000
2/4/93	130
3/2/93	130
4/8/93	200
5/11/93	260
6/15/93	360
7/13/93	200
8/2/93	220

B-008	Value
9/23/93	240
10/4/93	220
11/4/93	150
12/8/93	220
1/13/94	780
2/2/94	180
3/8/94	94
4/14/94	400
5/16/94	300
6/10/94	540
7/14/94	460
8/19/94	680
10/15/94	480
10/26/94	40
11/16/94	40
12/6/94	1700
1/5/95	510
2/2/95	140
3/8/95	460
4/24/95	260
5/8/95	150
6/8/95	390
7/17/95	1300
8/8/95	370
9/13/95	840
10/9/95	300
11/8/95	2300
12/7/95	540
1/18/96	220
2/7/96	120
3/14/96	160
4/12/96	120
5/28/96	1700
6/26/96	200
7/30/96	310
8/20/96	480
9/17/96	1200
10/23/96	140
11/22/96	1200
12/5/96	360
1/17/97	580
2/6/97	160
3/5/97	460
4/1/97	180

B-008	Value
5/29/97	280
6/13/97	1200
7/29/97	790
8/13/97	300
9/24/97	1700
10/7/97	160
11/24/97	260
12/12/97	170
1/9/98	2000
3/6/98	220
4/21/98	680
6/25/98	190
7/21/98	1200
8/6/98	180
9/9/98	800
10/7/98	800
11/12/98	400
12/16/98	1200
1/7/99	250
2/11/99	220
3/18/99	100
4/22/99	77
5/4/99	86
6/7/99	150
7/19/99	280
8/24/99	1600
9/27/99	550
10/4/99	220
11/10/99	200
12/1/99	240
1/12/00	290
2/9/00	55
3/9/00	140
4/25/00	*Present >QL
5/16/00	93
6/20/00	230
7/26/00	160
8/22/00	180
9/12/00	300
10/3/00	380
11/16/00	260
12/12/00	160

Table A-3 (Continued)

B-012	Value
5/29/90	1400
6/14/90	4400
7/12/90	13000
8/24/90	2200
9/26/90	6400
10/11/90	5700
5/21/91	960
6/14/91	300
7/23/91	180
8/15/91	410
9/13/91	700
10/10/91	260
5/18/93	370
6/8/93	310
7/21/93	140
8/5/93	110
9/7/93	200
10/4/93	200
5/5/94	920
6/23/94	230
7/12/94	6100
8/16/94	5200
9/22/94	290
10/13/94	620
5/4/95	250
6/9/95	70
7/13/95	800
9/29/95	460
10/16/95	300

B-012	Value
5/25/96	190
6/11/96	920
7/12/96	240
8/9/96	110
9/13/96	600
10/11/96	220
5/15/97	300
6/20/97	1200
7/18/97	2700
8/15/97	120
9/5/97	270
10/3/97	200
5/15/98	240
6/11/98	240
7/16/98	210
8/18/98	350
10/7/98	460
5/3/99	160
6/8/99	230
7/20/99	450
8/31/99	1200
9/22/99	930
10/25/99	90
5/16/00	620
6/20/00	620
7/26/00	570
8/22/00	610
9/12/00	4600
10/3/00	600

Table A-3 (Continued)

B-014	Value
11/16/1994	90
12/6/1994	3000
1/5/1995	1700
2/2/1995	1300
3/8/1995	570
4/24/1995	2000
5/4/1995	200
6/9/1995	160
7/13/1995	490
8/24/1995	500
9/29/1995	740
10/16/1995	350
11/12/1998	160
12/16/1998	1100
1/7/1999	100
2/11/1999	55
3/18/1999	55
4/22/1999	64
5/27/1999	45
6/30/1999	120
7/27/1999	40
8/26/1999	310
9/29/1999	570
10/26/1999	120
1/17/2001	90
2/7/2001	160
3/8/2001	40
7/13/2001	290
8/21/2001	410
9/11/2001	160
9/21/2001	570
10/12/2001	250
11/6/2001	73
12/13/2001	280

Table A-3 (Continued)

B-018A	Value
11/16/94	70
12/6/94	2600
1/5/95	240
2/2/95	400
3/8/95	930
4/24/95	1300
5/31/95	1500
6/9/95	350
7/13/95	520
8/24/95	620
9/29/95	420
10/16/95	900
5/28/96	3100
6/26/96	270
7/30/96	600
8/20/96	680
9/17/96	6000
10/23/96	140
5/29/97	420
6/13/97	17000
7/29/97	2800
8/13/97	350
9/24/97	1400
10/7/97	230
5/5/98	340
6/25/98	320
7/21/98	6000
8/6/98	640
9/9/98	1100

B-018A	Value
10/7/98	4000
11/12/98	460
12/16/98	6000
1/7/99	280
2/11/99	150
3/18/99	140
4/22/99	110
5/4/99	280
6/7/99	190
7/19/99	280
8/24/99	980
9/27/99	370
10/4/99	3900
5/16/00	220
6/20/00	220
7/26/00	300
8/22/00	200
9/12/00	320
10/3/00	820
2/7/01	210
3/8/01	490
7/12/01	260
8/16/01	550
9/11/01	210
9/21/01	460
10/10/01	620
11/5/01	120
12/13/01	800

Table A-3 (Continued)

B-019	Value
5/30/90	320
6/19/90	310
7/25/90	580
8/28/90	170
9/19/90	160
10/5/90	180
5/23/91	200
6/24/91	330
7/25/91	1500
8/14/91	6900
9/23/91	780
10/1/91	460
5/11/93	150
6/15/93	220
7/13/93	240
8/2/93	700
9/23/93	180
10/4/93	300
5/16/94	250
6/10/94	9300
7/14/94	310
8/19/94	540
10/15/94	350
5/8/95	6000
6/8/95	560
7/17/95	4500
8/8/95	9400
9/13/95	340
10/9/95	480
5/28/96	3100

B-019	Value
6/26/96	9000
7/30/96	5100
8/20/96	540
9/17/96	4500
10/23/96	80
5/29/97	330
6/13/97	14000
7/29/97	880
8/13/97	690
9/23/97	2000
10/7/97	230
5/5/98	330
6/25/98	400
7/21/98	380
8/6/98	520
9/9/98	1600
10/7/98	3600
5/4/99	660
6/7/99	2700
7/19/99	140000
8/24/99	6100
9/27/99	73000
10/4/99	58000
5/16/00	800
6/20/00	180
7/26/00	760
8/22/00	490
9/12/00	440
10/3/00	290

Table A-3 (Continued)

B-020	Value
5/10/90	17000
6/6/90	11000
7/25/90	950000
8/9/90	23000
9/6/90	2500
10/4/90	7600
5/3/91	1300
6/3/91	2900
7/19/91	1500
8/9/91	2400
9/12/91	4200
10/2/91	2500
5/19/93	12000
6/9/93	5300
7/22/93	12000
8/6/93	9000
9/8/93	2600
10/8/93	1900
5/12/94	4500
6/15/94	99000
7/28/94	100000
8/25/94	62000
9/8/94	20000
10/11/94	9600
5/10/95	160000
6/22/95	13000
7/24/95	4E+06
8/1/95	11000
9/5/95	6900

B-020	Value
10/5/95	47000
5/24/96	17000
6/14/96	2100
7/19/96	5400
8/22/96	2800
9/26/96	3800
10/29/96	1300
5/1/97	1800
6/5/97	1000
7/29/97	2100
8/20/97	16000
9/9/97	3200
10/6/97	2000
6/18/98	1400
7/17/98	19000
8/6/98	4600
9/8/98	5800
10/6/98	2700
5/27/99	2500
6/30/99	6000
7/27/99	2200
8/26/99	14000
9/29/99	9100
10/26/99	2700
5/15/00	2800
6/19/00	>600
7/25/00	>600
8/21/00	>600
9/11/00	3400
10/16/00	86000

Table A-3 (Continued)

B-021	Value
1/3/90	50
2/8/90	22
3/1/90	37000
4/5/90	280
5/10/90	20000
6/6/90	220
7/25/90	17000
8/9/90	830
9/6/90	310
10/4/90	2300
11/2/90	90
12/4/90	60
1/4/91	260
2/7/91	120
3/8/91	1600
4/11/91	180
5/3/91	140
6/3/91	420
7/19/91	400
8/9/91	600
9/12/91	260
10/2/91	350
11/8/91	180
12/2/91	300
1/8/92	30
2/7/92	55
3/4/92	110
4/8/92	15
5/12/92	590
6/5/92	780
7/9/92	700
8/3/92	580
9/1/92	960
10/1/92	420
11/24/92	520
12/10/92	3200
1/8/93	4800
2/4/93	5
3/2/93	70
4/8/93	4000
5/19/93	980
6/9/93	700
7/22/93	10000

B-021	Value
8/6/93	1000
9/8/93	540
10/8/93	1100
11/4/93	480
12/8/93	100
1/13/94	520
2/2/94	57
3/8/94	49
4/14/94	1200
5/12/94	420
6/15/94	2100
7/28/94	19000
8/25/94	2800
9/8/94	20000
10/11/94	2200
11/16/94	35
12/6/94	760
1/5/95	66
2/2/95	700
3/8/95	380
4/24/95	4000
5/10/95	4000
6/22/95	120000
7/24/95	200000
8/1/95	63000
9/5/95	600
10/5/95	37000
11/8/95	6300
12/7/95	2700
1/18/96	140
2/7/96	50
3/14/96	170
4/12/96	160
5/24/96	460
6/14/96	840
7/19/96	1500
8/22/96	780
9/26/96	570
10/29/96	240
11/22/96	1100
12/5/96	160
1/9/97	15000
2/6/97	100
3/5/97	180
4/1/97	100

B-021	Value
5/1/97	290
6/5/97	560
7/29/97	1200
8/20/97	580
9/9/97	580
10/6/97	380
11/20/97	120
1/8/98	1200
1/8/98	1200
2/13/98	44
3/6/98	740
4/21/98	780
5/6/98	240
6/18/98	280
7/17/98	860
8/6/98	460
9/8/98	1200
10/6/98	1200
11/12/98	270
1/7/99	160
2/11/99	140
3/18/99	60
4/22/99	230
5/27/99	520
6/30/99	960
7/27/99	380
8/26/99	1800
9/29/99	37000
10/26/99	160
11/10/99	340
12/1/99	280
1/12/00	290
2/9/00	*Present <QL
3/9/00	110
4/25/00	2000
5/15/00	510
6/19/00	*Present >QL
7/25/00	*Present >QL
8/21/00	640
9/11/00	1100
10/16/00	3600
11/16/00	500
12/12/00	160

Table A-3 (Continued)

B-051	Value
1/29/90	280
2/28/90	80
3/28/90	140
4/5/90	120
5/24/90	380
6/26/90	100
7/23/90	560
8/9/90	280
9/13/90	1600
10/15/90	680
11/27/90	120
12/10/90	160
1/2/91	370
2/4/91	140
3/4/91	2400
4/1/91	1800
5/24/91	220
6/20/91	480
7/22/91	170
8/12/91	3300
9/16/91	320
10/14/91	230
11/25/91	130
12/16/91	210
1/9/92	220
2/25/92	660
3/12/92	660
4/2/92	60
5/12/92	190
6/4/92	150
7/23/92	320
8/11/92	250
9/8/92	700
10/28/92	120
11/5/92	2000
12/1/92	190
1/26/93	380
2/18/93	250
3/24/93	1980
4/29/93	110
5/13/93	140
6/2/93	390

B-051	Value
7/8/93	50
8/5/93	180
9/28/93	430
10/27/93	3300
11/2/93	330
12/16/93	1600
1/27/94	110
2/2/94	40
3/17/94	40
4/21/94	70
5/26/94	110
6/15/94	190
7/27/94	440
8/4/94	240
9/28/94	300
10/4/94	880
11/17/94	110
12/1/94	440
1/12/95	180
2/9/95	30
3/9/95	1300
4/27/95	150
5/23/95	450
6/15/95	700
7/11/95	200
8/17/95	250
9/6/95	280
10/24/95	210
11/2/95	600
12/7/95	360
1/30/96	330
2/27/96	150
3/6/96	5200
4/11/96	100
5/8/96	480
6/4/96	160
8/29/96	300
10/1/96	3300
11/12/96	390
12/4/96	580
1/14/97	280
2/27/97	90
3/20/97	620
4/8/97	320
5/20/97	190

B-051	Value
6/3/97	480
7/15/97	250
8/26/97	280
9/2/97	320
10/7/97	330
11/20/97	95
12/11/97	510
1/8/98	4900
2/5/98	590
3/11/98	590
4/1/98	520
5/5/98	250
7/30/98	220
8/20/98	450
9/22/98	340
10/20/98	380
11/10/98	150
12/2/98	70
1/26/99	420
2/3/99	3600
3/23/99	240
4/6/99	110
5/19/99	70
6/17/99	160
7/14/99	430
8/10/99	3300
9/7/99	*Present >QL
11/3/99	640
11/13/99	2100
12/8/99	640
1/20/00	130
2/24/00	50
3/23/00	410
4/24/00	80
5/9/00	100
6/15/00	60
7/13/00	270
8/7/00	280
9/20/00	160
10/25/00	80
11/2/00	95
12/28/00	75

Table A-3 (Continued)

B-067A	Value
5/24/90	2600
6/26/90	780
7/23/90	20000
8/9/90	2000
9/13/90	20000
10/15/90	18000
5/24/91	260
6/20/91	730
7/22/91	300
8/12/91	10000
9/16/91	260
10/14/91	310
5/12/92	290
6/4/92	1700
7/23/92	410
8/11/92	380
9/8/92	190
10/28/92	720
5/13/93	290
6/2/93	130
7/8/93	360
8/5/93	230
9/28/93	160
10/27/93	210
5/26/94	260
6/15/94	6600
7/27/94	230
8/4/94	3300
9/28/94	360
10/4/94	1100
5/23/95	460

B-067A	Value
7/11/95	210
8/17/95	280
9/6/95	590
10/18/95	240
5/8/96	330
6/4/96	190
8/29/96	260
10/1/96	500
5/20/97	180
6/3/97	110
7/15/97	260
8/26/97	160
9/2/97	330
10/7/97	400
5/5/98	250
7/30/98	660
8/20/98	210
9/23/98	820
10/20/98	110
5/19/99	1000
6/17/99	840
7/14/99	900
8/10/99	1200
9/7/99	320
10/12/99	900
5/9/00	300
6/15/00	260
7/13/00	980
8/7/00	740
9/19/00	680
10/23/00	220

Table A-3 (Continued)

B-067B	Value
5/24/90	36000
6/26/90	800
7/23/90	200000
8/9/90	2000
9/13/90	20000
10/15/90	5200
5/23/91	370
6/20/91	660
7/22/91	420
8/12/91	10000
9/16/91	460
10/14/91	380
5/12/92	310
6/4/92	2600
7/23/92	760
8/11/92	210
9/8/92	360
10/28/92	540
5/13/93	350
6/2/93	590
7/8/93	550
8/5/93	510
9/28/93	400
10/27/93	980
5/26/94	170
6/15/94	620
7/27/94	650
8/4/94	3300
9/28/94	3000
10/4/94	3000
5/23/95	2400
6/15/95	1000

B-067B	Value
7/11/95	190
8/17/95	280
9/6/95	780
10/18/95	500
5/8/96	300
6/4/96	260
8/29/96	350
10/1/96	2200
5/20/97	2310
6/3/97	160
7/15/97	290
8/26/97	210
9/2/97	500
10/7/97	440
5/5/98	480
7/30/98	250
8/20/98	1200
9/23/98	530
10/20/98	60
5/19/99	990
6/17/99	320
7/14/99	1200
8/10/99	4000
9/7/99	1300
10/12/99	990
5/9/00	150
6/15/00	500
7/13/00	1100
8/7/00	760
9/19/00	600
10/23/00	120

Table A-3 (Continued)

B-164	Value
5/10/90	14000
6/6/90	12
7/25/90	4000
8/9/90	270
9/6/90	92
10/4/90	410
5/3/91	140
6/3/91	3100
7/19/91	40
8/9/91	110
9/12/91	50
10/2/91	88
5/19/93	3900
6/9/93	540
7/22/93	1200
8/6/93	400
9/8/93	390
10/8/93	410
5/12/94	160
6/15/94	8600
7/28/94	40000
8/25/94	3700
9/8/94	5300
10/11/94	1800
5/10/95	9000
6/22/95	15000
7/24/95	5600
8/1/95	13000
9/5/95	310

B-164	Value
10/5/95	6000
5/24/96	630
7/19/96	1200
8/22/96	320
9/26/96	280
10/29/96	190
5/1/97	400
6/5/97	230
7/29/97	5000
8/20/97	200
9/9/97	180
10/6/97	180
5/6/98	90
6/18/98	450
7/17/98	1200
8/6/98	590
9/8/98	1300
10/6/98	430
5/27/99	530
6/30/99	580
7/27/99	310
8/26/99	8700
9/29/99	3200
10/26/99	*Present <QL
5/15/00	980
6/19/00	*Present >QL
7/25/00	*Present >QL
8/21/00	3300
9/11/00	750
10/16/00	240

Table A-3 (Continued)

B-199	Value
5/23/90	470
6/26/90	3000
7/19/90	1600
8/14/90	360
9/17/90	130
10/17/90	130
5/23/91	130
6/27/91	550
7/22/91	130
8/29/91	380
9/16/91	260
10/14/91	200
5/7/92	450
6/4/92	2600
7/30/92	470
8/19/92	130
9/8/92	3000
10/22/92	110
5/13/93	1100
6/8/93	560
7/7/93	320
8/5/93	1100
9/7/93	2000
10/19/93	360
5/19/94	420
6/16/94	640
7/6/94	2200
8/10/94	150
9/13/94	360
10/11/94	340
5/16/95	360

B-199	Value
6/21/95	220
7/25/95	1200
8/22/95	370
9/5/95	330
10/24/95	300
5/23/96	540
7/1/96	5000
10/7/96	390
5/21/97	570
6/2/97	570
7/17/97	560
8/27/97	390
9/10/97	1900
10/23/97	550
5/20/98	1000
7/29/98	1100
8/24/98	390
9/28/98	570
10/14/98	240
5/18/99	1100
6/23/99	890
7/13/99	350
8/7/99	3300
9/8/99	720
10/13/99	3800
5/31/00	540
6/21/00	2200
7/13/00	1000
8/24/00	1300
9/13/00	820
10/18/00	460

Table A-3 (Continued)

B-219	Value
5/29/90	4200
6/14/90	360
7/12/90	400
8/24/90	1400
9/26/90	330
10/11/90	660
5/21/91	300
6/14/91	160
7/23/91	220
8/15/91	880
9/13/91	210
10/10/91	600
5/18/93	220
6/8/93	310
7/21/93	400
8/5/93	840
9/7/93	280
10/4/93	510
5/5/94	430
6/23/94	540
7/12/94	1500
8/16/94	15000
9/22/94	380
10/13/94	3100
11/17/94	220
12/15/94	220
1/26/95	85
2/15/95	320
3/16/95	120
4/20/95	480
5/4/95	350
6/9/95	600
7/13/95	420
8/24/95	460
9/29/95	460
10/16/95	840
5/25/96	500
6/11/96	400
7/12/96	190
8/9/96	280
9/13/96	740

B-219	Value
10/11/96	220
5/15/97	100
6/20/97	240
7/18/97	390
8/15/97	290
9/5/97	110
10/3/97	120
5/15/98	30
6/11/98	920
7/16/98	260
8/18/98	2200
10/7/98	760
11/17/98	300
12/10/98	50
1/6/99	760
2/4/99	180
3/25/99	5
4/21/99	25
5/3/99	210
6/8/99	10
7/20/99	10
8/31/99	5
9/22/99	20
10/25/99	20
5/16/00	10
6/20/00	70
7/26/00	100
8/22/00	20
9/12/00	20
10/3/00	26
1/17/01	*Present <QL
2/7/01	3
3/8/01	20
6/25/01	18
7/13/01	24
8/21/01	3
9/11/01	1
9/21/01	23
10/12/01	5
11/6/01	1
12/13/01	45

Table A-3 (Continued)

B-235	Value
5/10/90	3500
6/6/90	360
7/25/90	16000
8/9/90	250
9/6/90	360
10/4/90	2100
5/3/91	1500
6/3/91	120
7/19/91	240
8/9/91	280
9/12/91	240
10/2/91	300
5/19/93	7300
6/9/93	760
7/22/93	210
8/6/93	360
9/8/93	300
10/8/93	100
5/12/94	400
6/15/94	240
7/28/94	540
8/25/94	800
9/8/94	220
10/11/94	500
5/10/95	2000
6/22/95	3000
7/24/95	360
8/1/95	3900
9/5/95	280
10/5/95	9400

B-235	Value
5/24/96	290
6/14/96	820
7/19/96	210
8/22/96	180
9/26/96	400
10/29/96	540
5/1/97	310
6/5/97	400
7/31/97	1200
8/20/97	530
9/9/97	200
10/6/97	600
5/6/98	110
6/18/98	220
7/17/98	400
8/6/98	230
9/8/98	210
10/6/98	460
5/27/99	180
6/30/99	390
7/27/99	220
8/26/99	660
9/29/99	500
10/26/99	150
5/15/00	76
6/19/00	580
7/25/00	1800
8/21/00	600
9/11/00	240
10/16/00	240

Table A-3 (Continued)

B-263	Value
5/29/90	850
6/14/90	190
7/12/90	320
8/24/90	420
9/26/90	160
10/11/90	740
5/21/91	640
6/14/91	560
7/23/91	120
8/15/91	270
9/13/91	35
10/10/91	150
5/18/93	140
6/8/93	110
7/21/93	170
8/5/93	240
9/7/93	170
10/4/93	540
5/5/94	260
6/23/94	740
7/12/94	300
8/16/94	940
9/22/94	130
10/13/94	2600
5/4/95	82
6/9/95	140
7/13/95	920
8/24/95	500
9/29/95	86
10/16/95	330

B-263	Value
5/25/96	170
6/11/96	120
7/12/96	190
8/9/96	370
9/13/96	330
10/11/96	98
5/15/97	100
6/20/97	120
7/18/97	370
8/15/97	170
9/5/97	100
10/3/97	45
5/15/98	260
6/11/98	260
7/16/98	52
8/18/98	68
10/7/98	450
5/3/99	30
6/8/99	250
7/20/99	820
8/31/99	55
9/22/99	2100
10/25/99	10
5/16/00	540
6/20/00	75
7/26/00	80
8/22/00	90
9/12/00	90
10/3/00	70

Table A-3 (Continued)

B-286	Value
5/23/90	320
6/26/90	390
7/19/90	1100
8/14/90	2200
9/17/90	400
10/17/90	240
5/24/91	460
6/27/91	400
7/22/91	280
8/29/91	980
9/16/91	1100
10/14/91	60
5/7/92	3100
6/4/92	1200
7/30/92	440
8/19/92	320
9/8/92	380
10/22/92	80
5/13/93	460
6/8/93	250
7/7/93	410
8/5/93	350
9/7/93	440
10/19/93	800
5/19/94	440
6/16/94	760
7/6/94	710
8/10/94	240
9/13/94	210
10/11/94	290
5/16/95	460

B-286	Value
6/21/95	510
7/25/95	620
8/22/95	1200
9/5/95	250
10/24/95	220
5/23/96	130
7/1/96	280
10/7/96	200
5/21/97	310
6/2/97	4100
7/17/97	470
8/27/97	500
9/10/97	1200
10/23/97	80
5/20/98	300
7/29/98	260
8/24/98	820
9/28/98	150
10/14/98	1000
5/18/99	190
6/23/99	120
7/14/99	290
8/7/99	3300
9/8/99	1100
10/12/99	360
5/31/00	120
6/21/00	200
7/13/00	400
8/24/00	500
9/13/00	21000
10/18/00	480

Table A-3 (Continued)

B-287	Value
5/23/90	460
6/26/90	970
7/19/90	1200
8/14/90	290
9/17/90	480
10/17/90	380
5/24/91	360
6/27/91	530
7/22/91	310
8/29/91	400
9/16/91	360
10/14/91	190
5/7/92	800
6/4/92	940
7/30/92	780
8/19/92	1800
9/8/92	230
10/22/92	220
5/13/93	305
6/8/93	530
7/7/93	150
8/5/93	2600
9/7/93	710
10/19/93	390
5/19/94	480
6/16/94	860
7/6/94	540
9/13/94	200
10/11/94	430
5/16/95	380
6/21/95	1200

B-287	Value
7/25/95	900
8/22/95	1400
9/5/95	370
10/24/95	310
5/23/96	160
7/1/96	1300
10/7/96	290
5/21/97	280
6/2/97	520
7/17/97	440
8/27/97	550
9/10/97	1000
10/23/97	100
5/20/98	370
7/29/98	860
8/24/98	380
9/28/98	180
10/14/98	6600
6/23/99	410
5/18/99	400
10/12/99	790
9/8/99	540
8/9/99	1600
7/14/99	370
10/18/00	200
9/13/00	790
8/24/00	230
7/13/00	380
6/21/00	520
5/31/00	240

Table A-3 (Continued)

B-315	Value
5/29/90	580
6/14/90	840
7/12/90	450
8/24/90	2500
9/26/90	460
10/11/90	920
5/21/91	90
6/14/91	240
7/23/91	460
8/15/91	1100
9/13/91	660
10/10/91	50
5/18/93	390
6/8/93	490
7/21/93	240
8/5/93	50
9/7/93	1000
10/4/93	800
5/5/94	1800
5/13/94	230
6/23/94	280
7/12/94	1500
8/16/94	1700
9/22/94	100

B-315	Value
10/13/94	140
5/4/95	110
6/9/95	800
7/13/95	820
8/24/95	410
9/29/95	140
10/16/95	170
5/24/96	860
6/11/96	410
7/12/96	760
8/9/96	680
9/13/96	2400
10/11/96	480
5/15/97	1400
6/20/97	230
7/18/97	1800
8/15/97	320
9/5/97	420
5/15/98	340
6/11/98	960
7/16/98	500
8/18/98	920
10/7/98	1200
5/15/98	340

Table A-3 (Continued)

B-317	Value
1/4/90	140
2/1/90	45
3/8/90	76
4/11/90	1000
5/31/90	660
6/6/90	340
7/19/90	2200
8/16/90	610
9/17/90	530
10/3/90	250
11/2/90	105
12/7/90	90
1/2/91	86
2/1/91	46
3/1/91	54
4/4/91	250
5/10/91	120
6/7/91	130
7/25/91	1700
8/9/91	260
9/13/91	290
10/23/91	140
11/14/91	120
12/5/91	500
1/2/92	210
2/14/92	150
3/2/92	90
4/6/92	120
5/15/92	260
6/17/92	300
7/17/92	390
9/3/92	360
10/5/92	1100
11/5/92	750
12/14/92	100
1/21/93	1700
2/19/93	90
3/18/93	45
4/22/93	69
5/24/93	130
6/18/93	510
7/16/93	360
8/13/93	1600
9/17/93	310

B-317	Value
10/21/93	480
11/18/93	160
12/16/93	400
1/20/94	37
2/25/94	380
3/18/94	140
4/14/94	420
5/19/94	160
6/10/94	4700
7/15/94	240
8/26/94	190
9/23/94	460
10/31/94	77
11/22/94	40
12/16/94	120
1/19/95	200
2/27/95	35
3/24/95	420
4/14/95	210
5/18/95	1100
6/15/95	320
7/20/95	1700
8/10/95	240
9/21/95	280
10/18/95	280
11/21/95	35
12/14/95	71
1/25/96	100
2/15/96	40
3/22/96	68
4/25/96	110
5/23/96	560
6/27/96	320
7/25/96	500
8/22/96	860
9/26/96	420
10/24/96	130
11/21/96	83
12/12/96	30
1/2/97	80
2/27/97	140
3/27/97	220
4/17/97	210

B-317	Value
5/22/97	69
6/30/97	230
7/17/97	260
8/21/97	1700
9/11/97	1700
10/16/97	330
11/20/97	30
12/11/97	45
1/7/98	450
3/26/98	77
4/23/98	610
5/28/98	170
7/30/98	600
8/19/98	390
9/21/98	320
10/29/98	440
11/19/98	280
12/9/98	460
1/14/99	130
2/11/99	200
3/4/99	320
4/29/99	100
5/13/99	260
6/10/99	300
7/13/99	420
8/19/99	1400
9/30/99	320
10/14/99	260
11/18/99	130
12/9/99	120
1/13/00	180
2/17/00	190
3/16/00	270
4/13/00	1300
5/11/00	1200
6/8/00	260
7/13/00	830
8/10/00	470
9/14/00	280
10/19/00	250
11/2/00	240
12/7/00	160

Table A-3 (Continued)

B-321	Value
1/3/90	15
2/8/90	54
3/1/90	36
4/5/90	22
5/29/90	7800
6/14/90	9900
7/12/90	38000
8/24/90	2000
9/26/90	1100
10/11/90	43000
11/2/90	300
12/4/90	210
1/4/91	310
2/7/91	160
3/8/91	910
4/11/91	350
5/21/91	380
6/14/91	1400
7/23/91	480
8/15/91	2100
9/13/91	9900
10/10/91	3400
11/8/91	480
12/2/91	250
1/8/92	60
2/7/92	90
3/4/92	300
4/8/92	110
5/12/92	510
6/5/92	1300
7/9/92	210
8/3/92	3700
9/1/92	8700
10/1/92	220
11/24/92	1800
12/10/92	2000
1/8/93	560
2/4/93	10
3/2/93	30
4/8/93	25
5/18/93	84
6/8/93	530

B-321	Value
7/21/93	3600
8/5/93	530
9/7/93	2900
10/4/93	430
11/4/93	97
12/8/93	50
1/13/94	60
2/2/94	35
3/8/94	5
4/14/94	120
5/5/94	440
6/23/94	930
7/12/94	9600
8/16/94	8500
9/22/94	210
10/13/94	3500
11/17/94	220
12/15/94	71
1/26/95	55
2/15/95	1800
3/16/95	97
4/20/95	1000
5/4/95	360
6/9/95	1600
7/13/95	900
8/24/95	8100
9/29/95	260
10/16/95	550
11/8/95	190
12/7/95	560
1/18/96	180
2/7/96	5
3/14/96	15
4/12/96	64
5/24/96	1400
6/11/96	420
7/12/96	300
8/9/96	830
9/13/96	1300
10/11/96	430
11/22/96	100
12/5/96	68
1/9/97	3200
2/6/97	73
3/5/97	35
4/1/97	100

B-321	Value
5/15/97	370
6/19/97	270
7/25/97	1100
8/22/97	6000
9/12/97	330
10/22/97	60000
11/20/97	20
1/8/98	760
2/13/98	260
3/6/98	77
4/3/98	600
5/5/98	1
6/26/98	200
8/19/98	1500
9/16/98	1700
10/20/98	200
11/17/98	180
12/10/98	800
2/13/98	260
1/6/99	250
2/4/99	140
3/25/99	140
4/21/99	200
5/5/99	60
6/10/99	700
7/15/99	880
8/5/99	240
9/14/99	1200
10/20/99	7300
11/10/99	290
12/1/99	50
1/12/00	140
2/9/00	30
3/9/00	50
4/25/00	330
5/15/00	*Present >QL
7/25/00	*Present >QL
8/21/00	*Present >QL
9/11/00	2100
10/16/00	7100
11/16/00	3300
12/12/00	1900

Table A-3 (Continued)

B-332	Value
11/16/1994	25
12/6/1994	380
1/5/1995	340
2/2/1995	140
3/8/1995	64
4/24/1995	300
5/31/1995	200
6/9/1995	250
7/13/1995	240
8/24/1995	210
9/29/1995	190
10/16/1995	490
11/12/1998	400
12/16/1998	1100
1/7/1999	97
2/11/1999	140
3/18/1999	62
4/22/1999	160
5/4/1999	110
6/7/1999	130
7/19/1999	220
8/24/1999	490
9/27/1999	340
10/4/1999	5000
2/7/2001	100
3/8/2001	32
7/12/2001	200
8/16/2001	350
9/21/2001	210
9/21/2001	430
10/10/2001	87
11/5/2001	100
12/13/2001	370

B-336	Value
11/17/1994	240
12/1/1994	490
1/12/1995	220
2/9/1995	120
3/9/1995	140
4/27/1995	520
5/23/1995	990
6/15/1995	520
7/11/1995	1000
8/17/1995	420
9/6/1995	550
10/24/1995	600
5/5/1998	480
11/4/1998	310
12/10/1998	140
1/18/1999	770
2/2/1999	820
3/13/1999	150
4/7/1999	180
5/19/1999	800
6/17/1999	410
7/14/1999	470
8/10/1999	3300
9/7/1999	840
11/13/1999	1100

Table A-3 (Continued)

BF-007	Value
5/23/90	280
6/26/90	800
7/19/90	1700
8/14/90	50
9/17/90	55
10/17/90	120
5/24/91	180
6/27/91	85
7/22/91	120
8/29/91	1900
9/16/91	180
10/14/91	200
5/7/92	560
6/4/92	880
7/30/92	210
8/19/92	210
9/8/92	160
10/22/92	70
5/13/93	290
6/8/93	180
7/7/93	150
8/5/93	240
9/7/93	10
10/19/93	290
5/19/94	90
6/16/94	360
7/6/94	2500
8/10/94	60
9/13/94	310
10/11/94	570
5/16/95	1400
6/21/95	2200
7/25/95	80
8/22/95	360
9/5/95	250
10/24/95	330

BF-007	Value
5/23/96	240
7/1/96	230
10/7/96	280
6/2/97	60
7/17/97	6600
8/27/97	250
9/10/97	2200
10/23/97	220
5/20/98	260
7/29/98	410
8/24/98	330
9/28/98	310
10/14/98	330
5/18/99	180
6/23/99	220
7/13/99	2500
8/7/99	3300
9/8/99	380
10/13/99	3400
5/31/00	400
6/21/00	140
7/13/00	13000
8/24/00	210
9/13/00	220
10/18/00	130
1/9/01	450
2/7/01	100
3/21/01	4800
4/2/01	270
5/7/01	100
6/19/01	200
7/30/01	150
8/8/01	100
9/10/01	230
10/9/01	140
11/14/01	120
12/4/01	55

Table A-3 (Continued)

BF-008	Value
5/24/90	200
6/26/90	150
7/23/90	580
8/9/90	480
9/13/90	5000
10/15/90	1200
5/23/91	140
6/20/91	800
7/22/91	300
8/12/91	6600
9/16/91	180
10/14/91	110
5/12/92	280
6/4/92	270
7/23/92	760
8/11/92	170
9/8/92	300
10/28/92	330
5/13/93	100
6/2/93	280
7/8/93	310
8/5/93	390
9/28/93	360
10/27/93	420
5/26/94	280
6/15/94	1300
7/27/94	210
8/4/94	330
9/28/94	270
10/4/94	1900
11/17/94	150
12/1/94	230
1/12/95	140
2/9/95	40
3/9/95	2400
4/27/95	140
5/23/95	210
6/15/95	290
7/11/95	270
8/17/95	420
9/6/95	460
10/24/95	270
5/8/96	270

BF-008	Value
6/4/96	350
8/29/96	230
10/1/96	3300
5/20/97	260
6/3/97	340
7/15/97	300
8/26/97	410
9/2/97	230
10/7/97	2400
5/5/98	240
7/30/98	250
8/20/98	400
9/22/98	400
10/20/98	300
11/4/98	760
12/10/98	180
1/18/99	1500
2/2/99	3500
3/23/99	380
5/19/99	200
6/17/99	330
7/15/99	410
8/10/99	3300
9/7/99	540
10/12/99	3800
5/9/00	240
6/15/00	200
7/13/00	800
8/7/00	340
9/19/00	330
10/25/00	70
1/9/01	300
2/7/01	65
3/21/01	2000
4/4/01	10
5/7/01	95
6/19/01	88
7/30/01	340
8/8/01	290
9/10/01	200
10/9/01	410
11/14/01	95
12/4/01	82

APPENDIX B Calculations

Table B-1 TMDL Target Loads

Station	B-317
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	8.33E+10
Allowable Load (#/day)	8.33E+10
Geometric Mean Load (#/30days)	1.25E+12

Percent Exceedance (%)	Load(#/Day)
10	2.06E+11
15	1.70E+11
20	1.45E+11
25	1.21E+11
30	1.09E+11
35	9.69E+10
40	9.08E+10
45	7.87E+10
50	7.27E+10
55	6.05E+10
60	5.57E+10
65	4.96E+10
70	4.42E+10
75	3.81E+10
80	3.21E+10
85	2.60E+10
90	2.06E+10

Station	B-336
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	1.28E+11
Allowable Load (#/day)	1.28E+11
Geometric Mean Load (#/30days)	1.92E+12

Percent Exceedance (%)	Load(#/Day)
10	3.17E+11
15	2.61E+11
20	2.23E+11
25	1.86E+11
30	1.68E+11
35	1.49E+11
40	1.40E+11
45	1.21E+11
50	1.12E+11
55	9.31E+10
60	8.57E+10
65	7.64E+10
70	6.80E+10
75	5.87E+10
80	4.94E+10
85	4.00E+10
90	3.17E+10

Station	BF-007
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	2.79E+11
Allowable Load (#/day)	2.79E+11
Geometric Mean Load (#/30days)	4.18E+12

Percent Exceedance (%)	Load(#/Day)
10	6.89E+11
15	5.68E+11
20	4.86E+11
25	4.05E+11
30	3.65E+11
35	3.24E+11
40	3.04E+11
45	2.63E+11
50	2.43E+11
55	2.03E+11
60	1.86E+11
65	1.66E+11
70	1.48E+11
75	1.28E+11
80	1.07E+11
85	8.72E+10
90	6.89E+10

Table B-1 (Continued)

Station	BF-008
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	4.87E+11
Allowable Load (#/day)	4.87E+11
Geometric Mean Load (#/30days)	7.31E+12

Percent Exceedance (%)	Load(#/Day)
10	1.20E+12
15	9.91E+11
20	8.49E+11
25	7.08E+11
30	6.37E+11
35	5.66E+11
40	5.31E+11
45	4.60E+11
50	4.25E+11
55	3.54E+11
60	3.26E+11
65	2.90E+11
70	2.58E+11
75	2.23E+11
80	1.88E+11
85	1.52E+11
90	1.20E+11

Station	B-199
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	3.97E+10
Allowable Load (#/day)	3.97E+10
Geometric Mean Load (#/30days)	5.96E+11

Percent Exceedance (%)	Load(#/Day)
10	7.66E+10
15	6.57E+10
20	5.47E+10
25	5.14E+10
30	4.81E+10
35	4.54E+10
40	4.21E+10
45	3.99E+10
50	3.78E+10
55	3.50E+10
60	3.28E+10
65	3.06E+10
70	2.79E+10
75	2.52E+10
80	2.30E+10
85	2.08E+10
90	1.86E+10

Station	B-008
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	3.53E+12
Allowable Load (#/day)	3.53E+12
Geometric Mean Load (#/30days)	5.30E+13

Percent Exceedance (%)	Load(#/Day)
10	7.26E+12
15	5.99E+12
20	5.23E+12
25	4.72E+12
30	4.36E+12
35	4.07E+12
40	3.78E+12
45	3.49E+12
50	3.25E+12
55	2.98E+12
60	2.76E+12
65	2.55E+12
70	2.33E+12
75	2.18E+12
80	1.96E+12
85	1.74E+12
90	1.45E+12

Table B-1 (Continued)

Station	B-012
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	7.33E+11
Allowable Load (#/day)	7.33E+11
Geometric Mean Load (#/30days)	1.10E+13

Percent Exceedance (%)	Load(#/Day)
10	1.51E+12
15	1.24E+12
20	1.08E+12
25	9.79E+11
30	9.04E+11
35	8.44E+11
40	7.83E+11
45	7.23E+11
50	6.75E+11
55	6.18E+11
60	5.73E+11
65	5.29E+11
70	4.84E+11
75	4.52E+11
80	4.07E+11
85	3.62E+11
90	3.01E+11

Station	B-014
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	8.29E+11
Allowable Load (#/day)	8.29E+11
Geometric Mean Load (#/30days)	1.24E+13

Percent Exceedance (%)	Load(#/Day)
10	1.70E+12
15	1.40E+12
20	1.23E+12
25	1.11E+12
30	1.02E+12
35	9.53E+11
40	8.85E+11
45	8.17E+11
50	7.63E+11
55	6.98E+11
60	6.47E+11
65	5.98E+11
70	5.47E+11
75	5.11E+11
80	4.60E+11
85	4.09E+11
90	3.40E+11

Station	B-018A
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	1.73E+12
Allowable Load (#/day)	1.73E+12
Geometric Mean Load (#/30days)	2.59E+13

Percent Exceedance (%)	Load(#/Day)
10	3.55E+12
15	2.93E+12
20	2.56E+12
25	2.31E+12
30	2.13E+12
35	1.99E+12
40	1.85E+12
45	1.70E+12
50	1.59E+12
55	1.46E+12
60	1.35E+12
65	1.25E+12
70	1.14E+12
75	1.07E+12
80	9.59E+11
85	8.52E+11
90	7.10E+11

Table B-1 (Continued)

Station	B-219
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	3.48E+11
Allowable Load (#/day)	3.48E+11
Geometric Mean Load (#/30days)	5.22E+12

Percent Exceedance (%)	Load(#/Day)
10	7.14E+11
15	5.89E+11
20	5.14E+11
25	4.64E+11
30	4.29E+11
35	4.00E+11
40	3.71E+11
45	3.43E+11
50	3.20E+11
55	2.93E+11
60	2.71E+11
65	2.51E+11
70	2.29E+11
75	2.14E+11
80	1.93E+11
85	1.71E+11
90	1.43E+11

Station	B-315
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	1.89E+11
Allowable Load (#/day)	1.89E+11
Geometric Mean Load (#/30days)	2.83E+12

Percent Exceedance (%)	Load(#/Day)
10	3.88E+11
15	3.20E+11
20	2.79E+11
25	2.52E+11
30	2.33E+11
35	2.17E+11
40	2.02E+11
45	1.86E+11
50	1.74E+11
55	1.59E+11
60	1.47E+11
65	1.36E+11
70	1.25E+11
75	1.16E+11
80	1.05E+11
85	9.31E+10
90	7.76E+10

Station	B-332
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	1.44E+12
Allowable Load (#/day)	1.44E+12
Geometric Mean Load (#/30days)	2.16E+13

Percent Exceedance (%)	Load(#/Day)
10	2.96E+12
15	2.44E+12
20	2.13E+12
25	1.92E+12
30	1.78E+12
35	1.66E+12
40	1.54E+12
45	1.42E+12
50	1.33E+12
55	1.21E+12
60	1.12E+12
65	1.04E+12
70	9.51E+11
75	8.88E+11
80	7.99E+11
85	7.11E+11
90	5.92E+11

Table B-1 (Continued)

Station	B-005
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	9.25E+11
Allowable Load (#/day)	9.25E+11
Geometric Mean Load (#/30days)	1.39E+13

Percent Exceedance (%)	Load(#/Day)
10	2.11E+12
15	1.67E+12
20	1.43E+12
25	1.27E+12
30	1.16E+12
35	1.06E+12
40	9.82E+11
45	9.00E+11
50	8.32E+11
55	7.57E+11
60	6.86E+11
65	6.20E+11
70	5.62E+11
75	5.08E+11
80	4.52E+11
85	3.93E+11
90	3.35E+11

Station	B-051
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	7.22E+12
Allowable Load (#/day)	7.22E+12
Geometric Mean Load (#/30days)	1.08E+14

Percent Exceedance (%)	Load(#/Day)
10	1.65E+13
15	1.30E+13
20	1.12E+13
25	9.95E+12
30	9.03E+12
35	8.26E+12
40	7.66E+12
45	7.02E+12
50	6.49E+12
55	5.90E+12
60	5.35E+12
65	4.83E+12
70	4.39E+12
75	3.96E+12
80	3.52E+12
85	3.07E+12
90	2.61E+12

Station	B-263
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	7.65E+11
Allowable Load (#/day)	7.65E+11
Geometric Mean Load (#/30days)	1.15E+13

Percent Exceedance (%)	Load(#/Day)
10	1.74E+12
15	1.38E+12
20	1.18E+12
25	1.05E+12
30	9.57E+11
35	8.76E+11
40	8.12E+11
45	7.44E+11
50	6.88E+11
55	6.26E+11
60	5.68E+11
65	5.13E+11
70	4.65E+11
75	4.20E+11
80	3.74E+11
85	3.25E+11
90	2.77E+11

Table B-1 (Continued)

Station	B-019
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	4.18E+10
Allowable Load (#/day)	4.18E+10
Geometric Mean Load (#/30days)	6.28E+11

Percent Exceedance (%)	Load(#/Day)
10	9.69E+10
15	7.51E+10
20	6.46E+10
25	5.62E+10
30	5.06E+10
35	4.63E+10
40	4.28E+10
45	3.93E+10
50	3.65E+10
55	3.37E+10
60	3.09E+10
65	2.88E+10
70	2.67E+10
75	2.46E+10
80	2.18E+10
85	1.97E+10
90	1.69E+10

Station	B-020
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	1.92E+11
Allowable Load (#/day)	1.92E+11
Geometric Mean Load (#/30days)	2.88E+12

Percent Exceedance (%)	Load(#/Day)
10	4.44E+11
15	3.44E+11
20	2.96E+11
25	2.57E+11
30	2.32E+11
35	2.12E+11
40	1.96E+11
45	1.80E+11
50	1.67E+11
55	1.54E+11
60	1.42E+11
65	1.32E+11
70	1.22E+11
75	1.13E+11
80	9.97E+10
85	9.01E+10
90	7.72E+10

Station	B-021
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	5.17E+11
Allowable Load (#/day)	5.17E+11
Geometric Mean Load (#/30days)	7.76E+12

Percent Exceedance (%)	Load(#/Day)
10	1.20E+12
15	9.29E+11
20	7.99E+11
25	6.94E+11
30	6.25E+11
35	5.73E+11
40	5.29E+11
45	4.86E+11
50	4.51E+11
55	4.17E+11
60	3.82E+11
65	3.56E+11
70	3.30E+11
75	3.04E+11
80	2.69E+11
85	2.43E+11
90	2.08E+11

Table B-1 (Continued)

Station	B-067A
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	6.50E+10
Allowable Load (#/day)	6.50E+10
Geometric Mean Load (#/30days)	9.75E+11

Percent Exceedance (%)	Load(#/Day)
10	1.51E+11
15	1.17E+11
20	1.00E+11
25	8.73E+10
30	7.85E+10
35	7.20E+10
40	6.65E+10
45	6.11E+10
50	5.67E+10
55	5.24E+10
60	4.80E+10
65	4.47E+10
70	4.15E+10
75	3.82E+10
80	3.38E+10
85	3.05E+10
90	2.62E+10

Station	B-067B
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	5.64E+10
Allowable Load (#/day)	5.64E+10
Geometric Mean Load (#/30days)	8.46E+11

Percent Exceedance (%)	Load(#/Day)
10	1.31E+11
15	1.01E+11
20	8.71E+10
25	7.57E+10
30	6.82E+10
35	6.25E+10
40	5.77E+10
45	5.30E+10
50	4.92E+10
55	4.54E+10
60	4.17E+10
65	3.88E+10
70	3.60E+10
75	3.31E+10
80	2.93E+10
85	2.65E+10
90	2.27E+10

Station	B-164
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	2.42E+11
Allowable Load (#/day)	2.42E+11
Geometric Mean Load (#/30days)	3.63E+12

Percent Exceedance (%)	Load(#/Day)
10	5.61E+11
15	4.35E+11
20	3.74E+11
25	3.25E+11
30	2.93E+11
35	2.68E+11
40	2.48E+11
45	2.28E+11
50	2.11E+11
55	1.95E+11
60	1.79E+11
65	1.67E+11
70	1.54E+11
75	1.42E+11
80	1.26E+11
85	1.14E+11
90	9.76E+10

Table B-1 (Continued)

Station	B-235
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	4.81E+10
Allowable Load (#/day)	4.81E+10
Geometric Mean Load (#/30days)	7.21E+11

Percent Exceedance (%)	Load(#/Day)
10	1.11E+11
15	8.63E+10
20	7.42E+10
25	6.46E+10
30	5.81E+10
35	5.33E+10
40	4.92E+10
45	4.52E+10
50	4.20E+10
55	3.87E+10
60	3.55E+10
65	3.31E+10
70	3.07E+10
75	2.82E+10
80	2.50E+10
85	2.26E+10
90	1.94E+10

Station	B-286
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	3.52E+10
Allowable Load (#/day)	3.52E+10
Geometric Mean Load (#/30days)	5.27E+11

Percent Exceedance (%)	Load(#/Day)
10	8.14E+10
15	6.31E+10
20	5.43E+10
25	4.72E+10
30	4.25E+10
35	3.89E+10
40	3.60E+10
45	3.30E+10
50	3.07E+10
55	2.83E+10
60	2.60E+10
65	2.42E+10
70	2.24E+10
75	2.07E+10
80	1.83E+10
85	1.65E+10
90	1.42E+10

Station	B-287
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190
Mean	4.72E+10
Allowable Load (#/day)	4.72E+10
Geometric Mean Load (#/30days)	7.07E+11

Percent Exceedance (%)	Load(#/Day)
10	1.09E+11
15	8.47E+10
20	7.28E+10
25	6.33E+10
30	5.70E+10
35	5.22E+10
40	4.83E+10
45	4.43E+10
50	4.12E+10
55	3.80E+10
60	3.48E+10
65	3.25E+10
70	3.01E+10
75	2.77E+10
80	2.45E+10
85	2.22E+10
90	1.90E+10

Table B-1 (Continued)

Station	B-321
Instantaneous Conc. (#/100 ml)	380
Geo. Mean Conc. (#/100 ml)	190

Mean	5.98E+09
Allowable Load (#/day)	5.98E+09
Geometric Mean Load (#/30days)	8.97E+10

Percent Exceedance (%)	Load(#/Day)
10	1.38E+10
15	1.07E+10
20	9.23E+09
25	8.02E+09
30	7.22E+09
35	6.62E+09
40	6.12E+09
45	5.62E+09
50	5.22E+09
55	4.81E+09
60	4.41E+09
65	4.11E+09
70	3.81E+09
75	3.51E+09
80	3.11E+09
85	2.81E+09
90	2.41E+09

Table B-2 Existing Loads

Station	B-317
Trend Line:	Power
Equation: y=4E+12*x^(-0.9903)	

Existing Load (#/Day):	1.21E+11
Average (#/Day):	1.21E+11

Percent Exceedance(%)	Load(#/Day)
10	4.09E+11
15	2.74E+11
20	2.06E+11
25	1.65E+11
30	1.38E+11
35	1.18E+11
40	1.04E+11
45	9.22E+10
50	8.31E+10
55	7.56E+10
60	6.94E+10
65	6.41E+10
70	5.95E+10
75	5.56E+10
80	5.22E+10
85	4.91E+10
90	4.64E+10

Station	B-336
Trend Line:	Power
Equation: y=7E+12*x^(-1.0355)	

Existing Load (#/Day):	1.83E+11
Average (#/Day):	1.83E+11

Percent Exceedance(%)	Load(#/Day)
10	6.45E+11
15	4.24E+11
20	3.15E+11
25	2.50E+11
30	2.07E+11
35	1.76E+11
40	1.54E+11
45	1.36E+11
50	1.22E+11
55	1.10E+11
60	1.01E+11
65	9.29E+10
70	8.60E+10
75	8.01E+10
80	7.49E+10
85	7.03E+10
90	6.63E+10

Station	BF-007
Trend Line:	Power
Equation: y=2E+13*x^(-0.9281)	

Existing Load (#/Day):	7.45E+11
Average (#/Day):	7.45E+11

Percent Exceedance(%)	Load(#/Day)
10	2.36E+12
15	1.62E+12
20	1.24E+12
25	1.01E+12
30	8.51E+11
35	7.38E+11
40	6.52E+11
45	5.84E+11
50	5.30E+11
55	4.85E+11
60	4.47E+11
65	4.15E+11
70	3.88E+11
75	3.64E+11
80	3.43E+11
85	3.24E+11
90	3.07E+11

Table B-2 (Continued)

Station	BF-008
Trend Line:	Power
Equation: y=2E+14*x^(-1.4497)	

Existing Load (#/Day):	1.41E+12
Average (#/Day):	1.41E+12

Percent Exceedance(%)	Load(#/Day)
10	7.10E+12
15	3.95E+12
20	2.60E+12
25	1.88E+12
30	1.44E+12
35	1.16E+12
40	9.52E+11
45	8.02E+11
50	6.89E+11
55	6.00E+11
60	5.29E+11
65	4.71E+11
70	4.23E+11
75	3.83E+11
80	3.48E+11
85	3.19E+11
90	2.94E+11

Station	B-199
Trend Line:	Power
Equation: y=1E+12*x^(-0.7119)	

Existing Load (#/Day):	7.73E+10
Average (#/Day):	7.73E+10

Percent Exceedance(%)	Load(#/Day)
10	1.94E+11
15	1.45E+11
20	1.19E+11
25	1.01E+11
30	8.88E+10
35	7.96E+10
40	7.24E+10
45	6.65E+10
50	6.17E+10
55	5.77E+10
60	5.42E+10
65	5.12E+10
70	4.86E+10
75	4.63E+10
80	4.42E+10
85	4.23E+10
90	4.06E+10

Station	B-008
Trend Line:	Power
Equation: y=1E+14*x^(-0.7011)	

Existing Load (#/Day):	8.04E+12
Average (#/Day):	8.04E+12

Percent Exceedance(%)	Load(#/Day)
10	1.99E+13
15	1.50E+13
20	1.23E+13
25	1.05E+13
30	9.24E+12
35	8.29E+12
40	7.55E+12
45	6.95E+12
50	6.46E+12
55	6.04E+12
60	5.69E+12
65	5.38E+12
70	5.10E+12
75	4.86E+12
80	4.65E+12
85	4.45E+12
90	4.28E+12

Table B-2 (Continued)

Station	B-012
Trend Line:	Power
Equation: y=1E+13*x^(-0.5619)	

Existing Load (#/Day):	1.30E+12
Average (#/Day):	1.30E+12

Percent Exceedance(%)	Load(#/Day)
10	2.74E+12
15	2.18E+12
20	1.86E+12
25	1.64E+12
30	1.48E+12
35	1.36E+12
40	1.26E+12
45	1.18E+12
50	1.11E+12
55	1.05E+12
60	1.00E+12
65	9.58E+11
70	9.19E+11
75	8.84E+11
80	8.52E+11
85	8.24E+11
90	7.98E+11

Station	B-014
Trend Line:	Power
Equation: y=3E+14*x^(-1-4205)	

Existing Load (#/Day):	2.31E+12
Average (#/Day):	2.31E+12

Percent Exceedance(%)	Load(#/Day)
10	1.14E+13
15	6.40E+12
20	4.26E+12
25	3.10E+12
30	2.39E+12
35	1.92E+12
40	1.59E+12
45	1.35E+12
50	1.16E+12
55	1.01E+12
60	8.94E+11
65	7.98E+11
70	7.18E+11
75	6.51E+11
80	5.94E+11
85	5.45E+11
90	5.02E+11

Station	B-018A
Trend Line:	Power
Equation: y=4E+14*x^(-1.1562)	

Existing Load (#/Day):	7.07E+12
Average (#/Day):	7.07E+12

Percent Exceedance(%)	Load(#/Day)
10	2.79E+13
15	1.75E+13
20	1.25E+13
25	9.68E+12
30	7.84E+12
35	6.56E+12
40	5.62E+12
45	4.90E+12
50	4.34E+12
55	3.89E+12
60	3.52E+12
65	3.21E+12
70	2.94E+12
75	2.72E+12
80	2.52E+12
85	2.35E+12
90	2.20E+12

Table B-2 (Continued)

Station	B-219
Trend Line:	Power
Equation: y=2E+13*x^(-0.9691)	

Existing Load (#/Day):	6.50E+11
Average (#/Day):	6.50E+11

Percent Exceedance(%)	Load(#/Day)
10	2.15E+12
15	1.45E+12
20	1.10E+12
25	8.84E+11
30	7.41E+11
35	6.38E+11
40	5.60E+11
45	5.00E+11
50	4.51E+11
55	4.12E+11
60	3.78E+11
65	3.50E+11
70	3.26E+11
75	3.05E+11
80	2.86E+11
85	2.70E+11
90	2.55E+11

Station	B-315
Trend Line:	Power
Equation: y=7E+12*x^(-0.8033)	

Existing Load (#/Day):	3.96E+11
Average (#/Day):	3.96E+11

Percent Exceedance(%)	Load(#/Day)
10	1.10E+12
15	7.95E+11
20	6.31E+11
25	5.27E+11
30	4.56E+11
35	4.02E+11
40	3.62E+11
45	3.29E+11
50	3.02E+11
55	2.80E+11
60	2.61E+11
65	2.45E+11
70	2.31E+11
75	2.18E+11
80	2.07E+11
85	1.97E+11
90	1.88E+11

Station	B-332
Trend Line:	Power
Equation: y=3E+13*x^(-0.7236)	

Existing Load (#/Day):	2.23E+12
Average (#/Day):	2.23E+12

Percent Exceedance(%)	Load(#/Day)
10	5.67E+12
15	4.23E+12
20	3.43E+12
25	2.92E+12
30	2.56E+12
35	2.29E+12
40	2.08E+12
45	1.91E+12
50	1.77E+12
55	1.65E+12
60	1.55E+12
65	1.46E+12
70	1.39E+12
75	1.32E+12
80	1.26E+12
85	1.21E+12
90	1.16E+12

Table B-2 (Continued)

Station	B-005
Trend Line:	Power
Equation: y=3E+13*x^(-0.6598)	

Existing Load (#/Day):	2.77E+12
Average (#/Day):	2.77E+12

Percent Exceedance(%)	Load(#/Day)
10	6.57E+12
15	5.03E+12
20	4.16E+12
25	3.59E+12
30	3.18E+12
35	2.87E+12
40	2.63E+12
45	2.43E+12
50	2.27E+12
55	2.13E+12
60	2.01E+12
65	1.91E+12
70	1.82E+12
75	1.74E+12
80	1.67E+12
85	1.60E+12
90	1.54E+12

Station	B-051
Trend Line:	Power
Equation: y=2E+14*x^(-0.7058)	

Existing Load (#/Day):	1.58E+13
Average (#/Day):	1.58E+13

Percent Exceedance(%)	Load(#/Day)
10	3.94E+13
15	2.96E+13
20	2.41E+13
25	2.06E+13
30	1.81E+13
35	1.63E+13
40	1.48E+13
45	1.36E+13
50	1.26E+13
55	1.18E+13
60	1.11E+13
65	1.05E+13
70	9.97E+12
75	9.50E+12
80	9.07E+12
85	8.69E+12
90	8.35E+12

Station	B-263
Trend Line:	Power
Equation: y=1E+13*x^(-0.6737)	

Existing Load (#/Day):	8.81E+11
Average (#/Day):	8.81E+11

Percent Exceedance(%)	Load(#/Day)
10	2.12E+12
15	1.61E+12
20	1.33E+12
25	1.14E+12
30	1.01E+12
35	9.12E+11
40	8.33E+11
45	7.70E+11
50	7.17E+11
55	6.72E+11
60	6.34E+11
65	6.01E+11
70	5.71E+11
75	5.45E+11
80	5.22E+11
85	5.01E+11
90	4.82E+11

Table B-2 (Continued)

Station	B-019
Trend Line:	Power
Equation: y=2E+13*x^(-1.289)	

Existing Load (#/Day):	2.32E+11
Average (#/Day):	2.32E+11

Percent Exceedance(%)	Load(#/Day)
10	1.03E+12
15	6.10E+11
20	4.21E+11
25	3.16E+11
30	2.49E+11
35	2.05E+11
40	1.72E+11
45	1.48E+11
50	1.29E+11
55	1.14E+11
60	1.02E+11
65	9.21E+10
70	8.37E+10
75	7.66E+10
80	7.05E+10
85	6.52E+10
90	6.05E+10

Station	B-020
Trend Line:	Power
Equation: y=4E+14*x^(-1.2597)	

Existing Load (#/Day):	5.09E+12
Average (#/Day):	5.09E+12

Percent Exceedance(%)	Load(#/Day)
10	2.20E+13
15	1.32E+13
20	9.19E+12
25	6.94E+12
30	5.51E+12
35	4.54E+12
40	3.84E+12
45	3.31E+12
50	2.90E+12
55	2.57E+12
60	2.30E+12
65	2.08E+12
70	1.90E+12
75	1.74E+12
80	1.60E+12
85	1.48E+12
90	1.38E+12

Station	B-021
Trend Line:	Power
Equation: y=6E+13*x^(-0.9484)	

Existing Load (#/Day):	2.09E+12
Average (#/Day):	2.09E+12

Percent Exceedance(%)	Load(#/Day)
10	6.76E+12
15	4.60E+12
20	3.50E+12
25	2.83E+12
30	2.38E+12
35	2.06E+12
40	1.81E+12
45	1.62E+12
50	1.47E+12
55	1.34E+12
60	1.24E+12
65	1.14E+12
70	1.07E+12
75	1.00E+12
80	9.40E+11
85	8.88E+11
90	8.41E+11

Table B-2 (Continued)

Station	B-067A
Trend Line:	Power
Equation: y=2E+13*x^(-1.2079)	

Existing Load (#/Day):	3.00E+11
Average (#/Day):	3.00E+11

Percent Exceedance(%)	Load(#/Day)
10	1.24E+12
15	7.59E+11
20	5.36E+11
25	4.10E+11
30	3.29E+11
35	2.73E+11
40	2.32E+11
45	2.01E+11
50	1.77E+11
55	1.58E+11
60	1.42E+11
65	1.29E+11
70	1.18E+11
75	1.09E+11
80	1.01E+11
85	9.34E+10
90	8.72E+10

Station	B-067B
Trend Line:	Power
Equation: y=8E+12*x^(-1.0277)	

Existing Load (#/Day):	2.14E+11
Average (#/Day):	2.14E+11

Percent Exceedance(%)	Load(#/Day)
10	7.51E+11
15	4.95E+11
20	3.68E+11
25	2.93E+11
30	2.43E+11
35	2.07E+11
40	1.81E+11
45	1.60E+11
50	1.44E+11
55	1.30E+11
60	1.19E+11
65	1.10E+11
70	1.02E+11
75	9.46E+10
80	8.86E+10
85	8.32E+10
90	7.85E+10

Station	B-164
Trend Line:	Power
Equation: y=1E+14*x^(-1.2274)	

Existing Load (#/Day):	1.41E+12
Average (#/Day):	1.41E+12

Percent Exceedance(%)	Load(#/Day)
10	5.92E+12
15	3.60E+12
20	2.53E+12
25	1.92E+12
30	1.54E+12
35	1.27E+12
40	1.08E+12
45	9.35E+11
50	8.22E+11
55	7.31E+11
60	6.57E+11
65	5.95E+11
70	5.44E+11
75	5.00E+11
80	4.61E+11
85	4.28E+11
90	3.99E+11

Table B-2 (Continued)

Station	B-235
Trend Line:	Power
Equation: y=5E+12*x^(-1.0315)	

Existing Load (#/Day):	1.32E+11
Average (#/Day):	1.32E+11

Percent Exceedance(%)	Load(#/Day)
10	4.65E+11
15	3.06E+11
20	2.27E+11
25	1.81E+11
30	1.50E+11
35	1.28E+11
40	1.11E+11
45	9.86E+10
50	8.84E+10
55	8.01E+10
60	7.32E+10
65	6.74E+10
70	6.25E+10
75	5.82E+10
80	5.44E+10
85	5.11E+10
90	4.82E+10

Station	B-286
Trend Line:	Power
Equation: y=8E+12*x^(-1.311)	

Existing Load (#/Day):	8.66E+10
Average (#/Day):	8.66E+10

Percent Exceedance(%)	Load(#/Day)
10	3.91E+11
15	2.30E+11
20	1.58E+11
25	1.18E+11
30	9.26E+10
35	7.57E+10
40	6.35E+10
45	5.44E+10
50	4.74E+10
55	4.18E+10
60	3.73E+10
65	3.36E+10
70	3.05E+10
75	2.79E+10
80	2.56E+10
85	2.36E+10
90	2.19E+10

Station	B-287
Trend Line:	Power
Equation: y=1E+12*x^(-0.7777)	

Existing Load (#/Day):	6.17E+10
Average (#/Day):	6.17E+10

Percent Exceedance(%)	Load(#/Day)
10	1.67E+11
15	1.22E+11
20	9.73E+10
25	8.18E+10
30	7.10E+10
35	6.30E+10
40	5.68E+10
45	5.18E+10
50	4.77E+10
55	4.43E+10
60	4.14E+10
65	3.89E+10
70	3.67E+10
75	3.48E+10
80	3.31E+10
85	3.16E+10
90	3.02E+10

Table B-2 (Continued)

Station	**B-321**
Trend Line:	**Power**
Equation: y=2E+11*x^(-0.6078)	

Existing Load (#/Day):	**2.21E+10**
Average (#/Day):	**2.21E+10**

Percent Exceedance(%)	**Load(#/Day)**
10	4.93E+10
15	3.86E+10
20	3.24E+10
25	2.83E+10
30	2.53E+10
35	2.30E+10
40	2.12E+10
45	1.98E+10
50	1.86E+10
55	1.75E+10
60	1.66E+10
65	1.58E+10
70	1.51E+10
75	1.45E+10
80	1.39E+10
85	1.34E+10
90	1.30E+10

Figure B-1 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-317

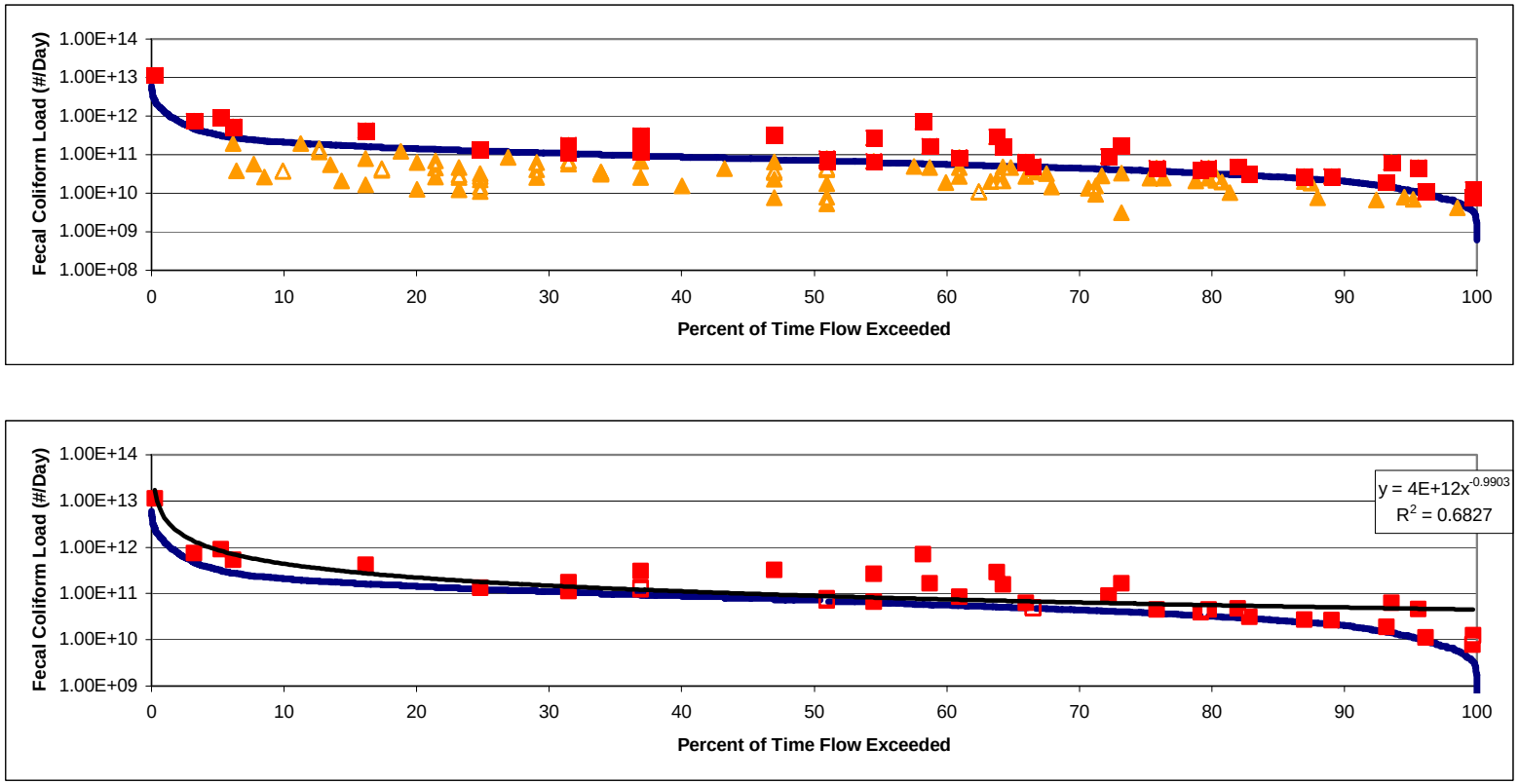


Figure B-2 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-336

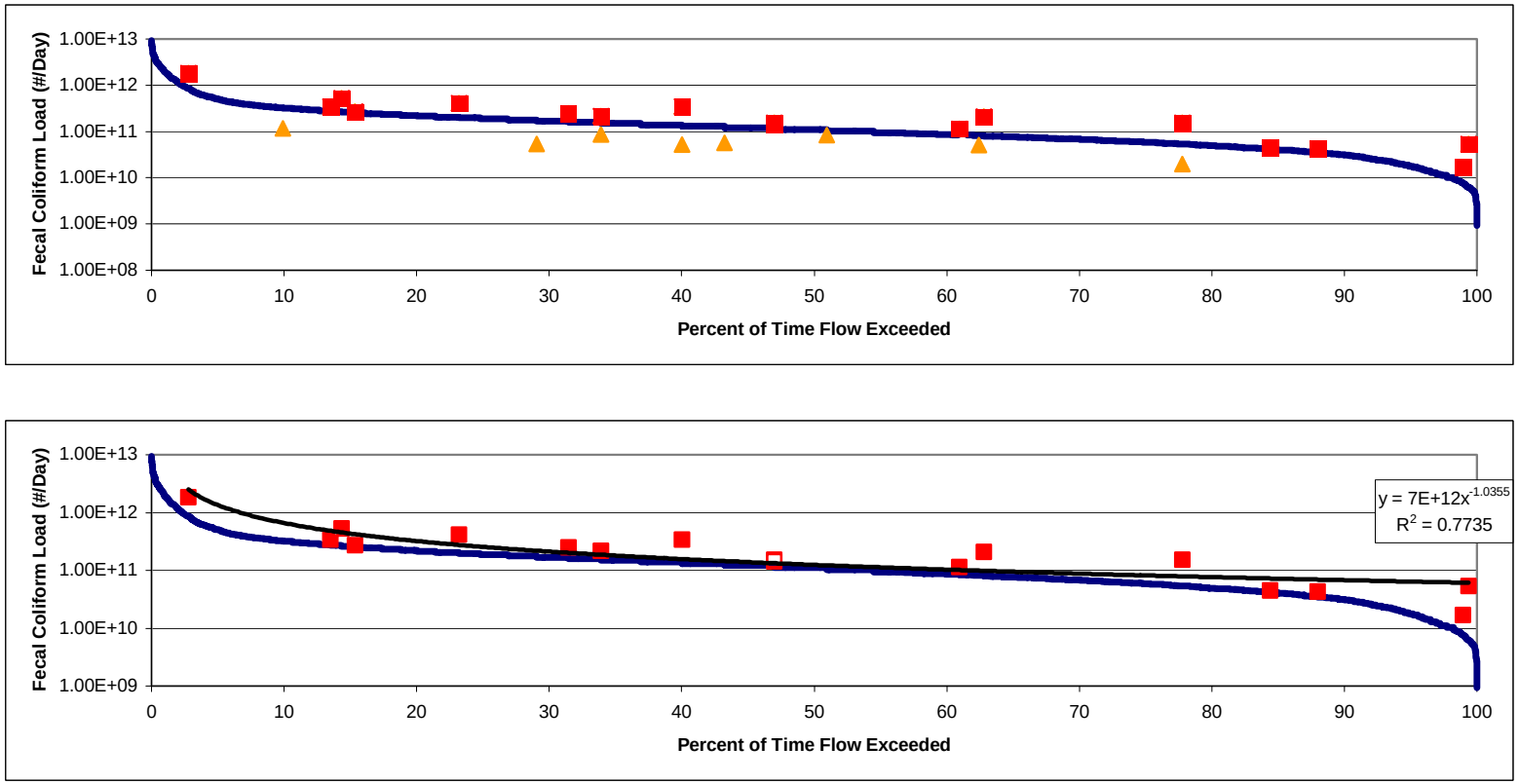


Figure B-3 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at BF-007

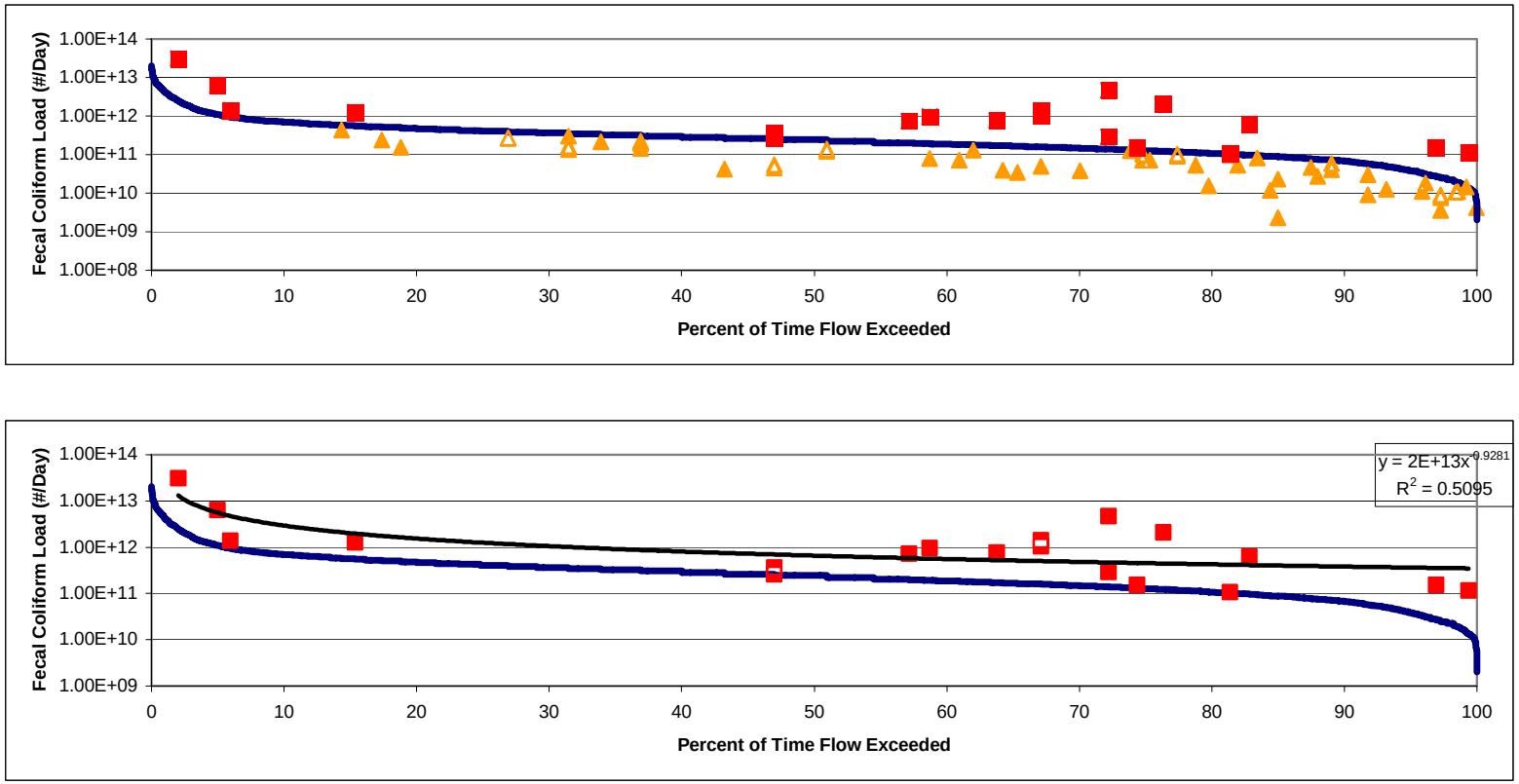
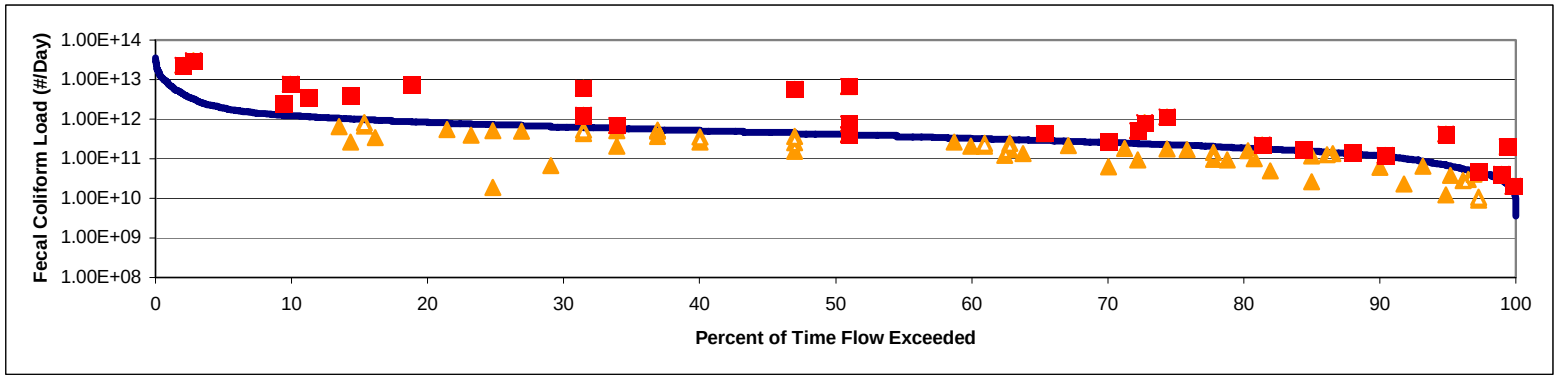


Figure B-4 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at BF-008



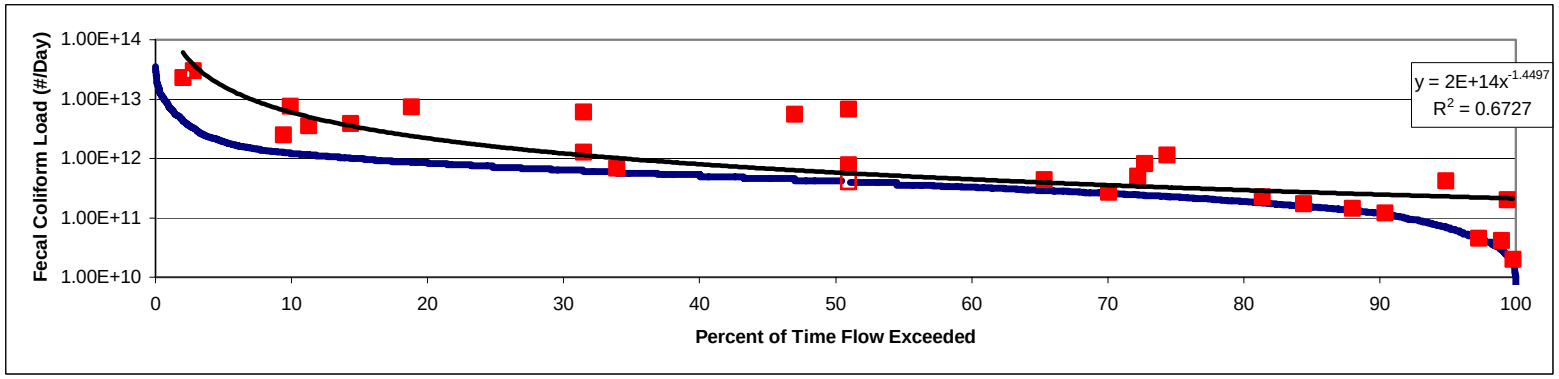


Figure B-5 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-199

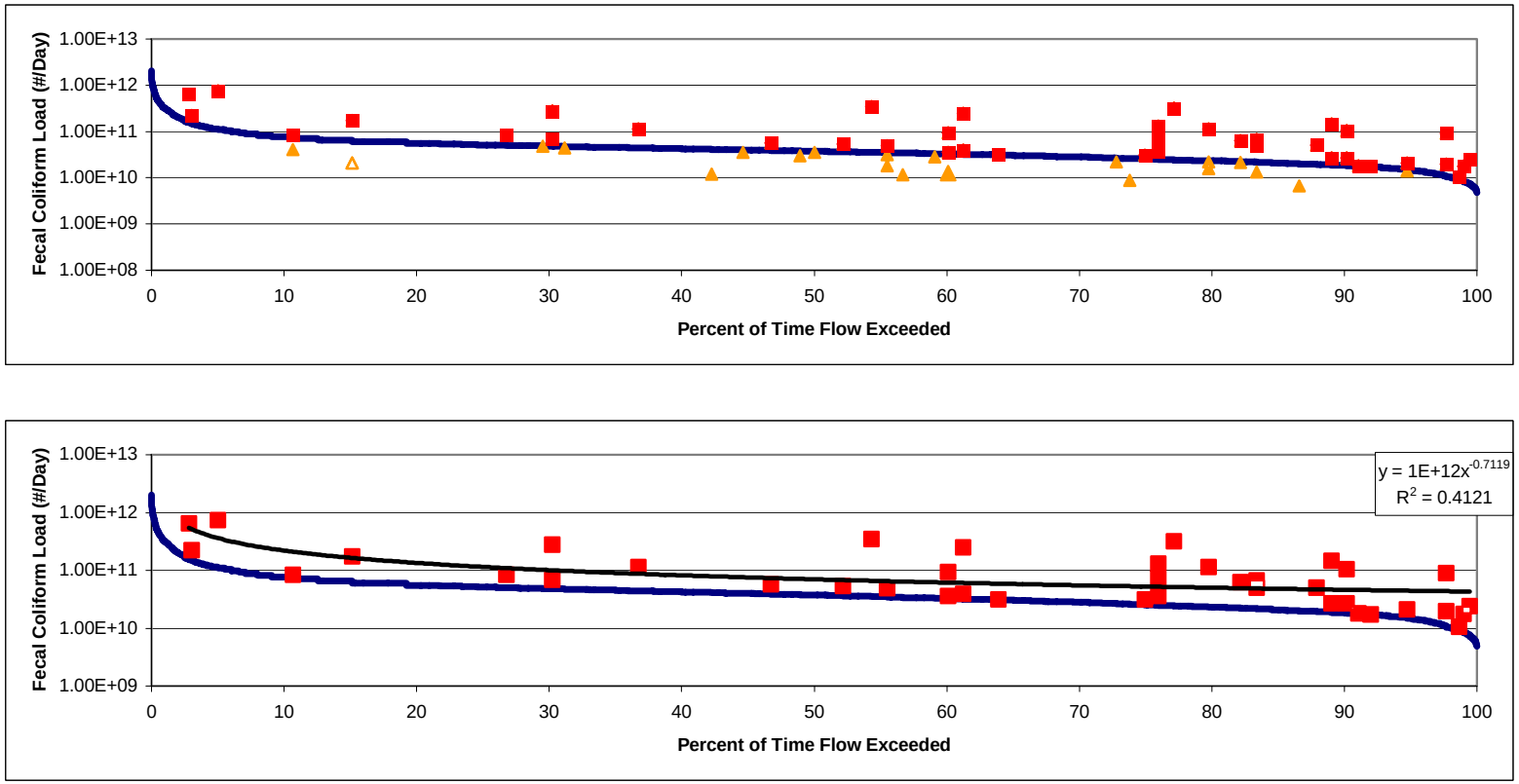
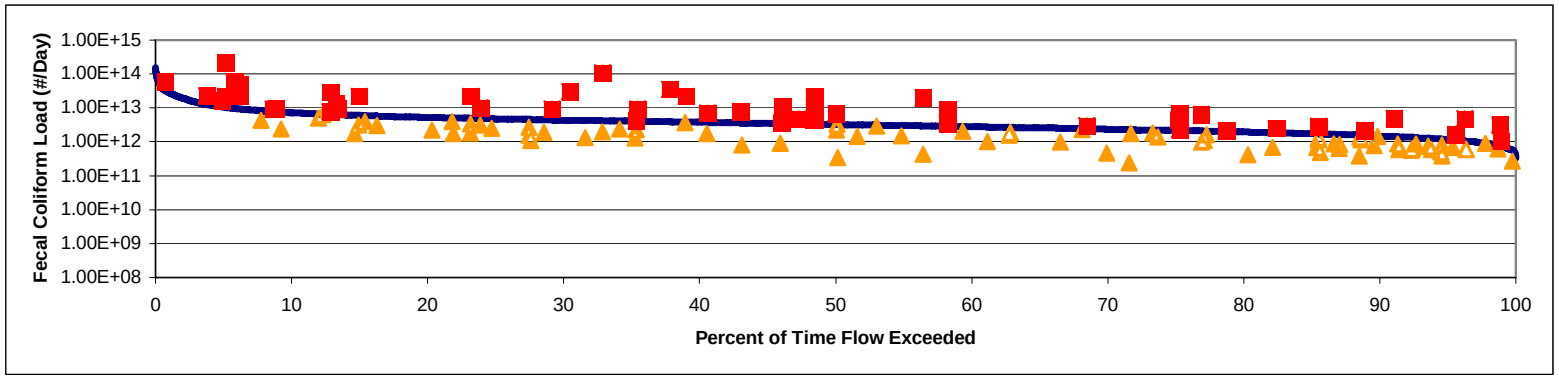


Figure B-6 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-008



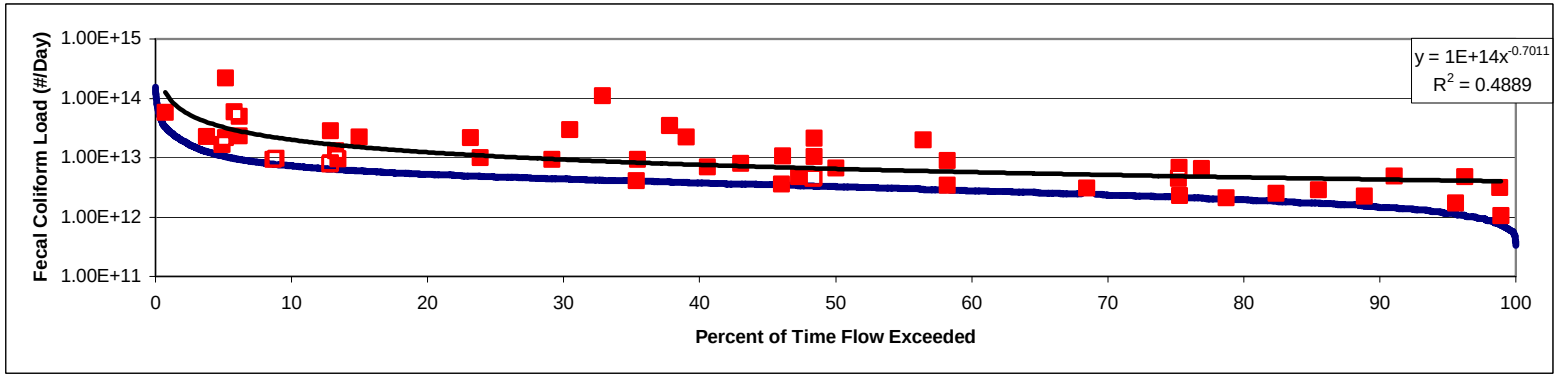


Figure B-7 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-012

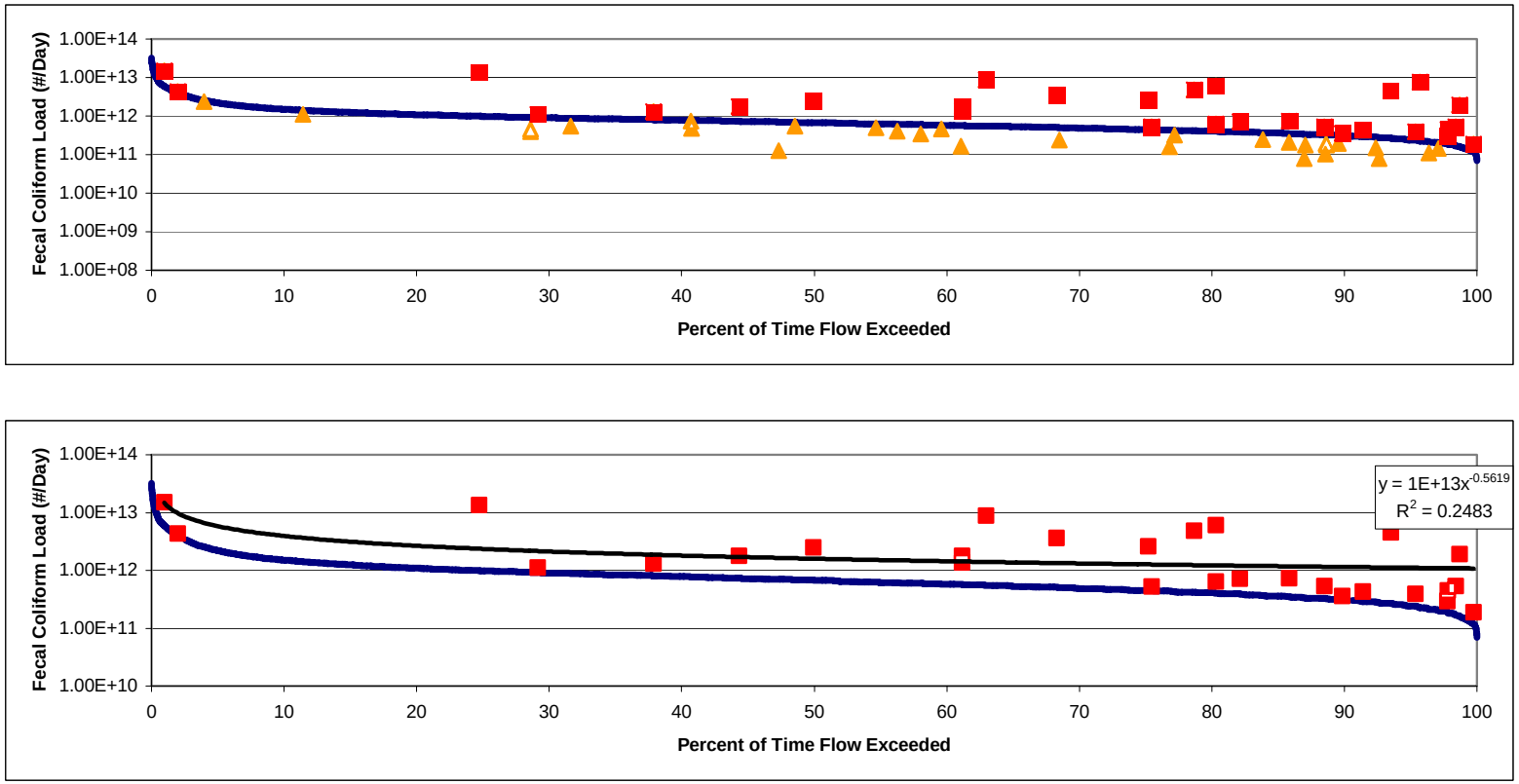


Figure B-8 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-014

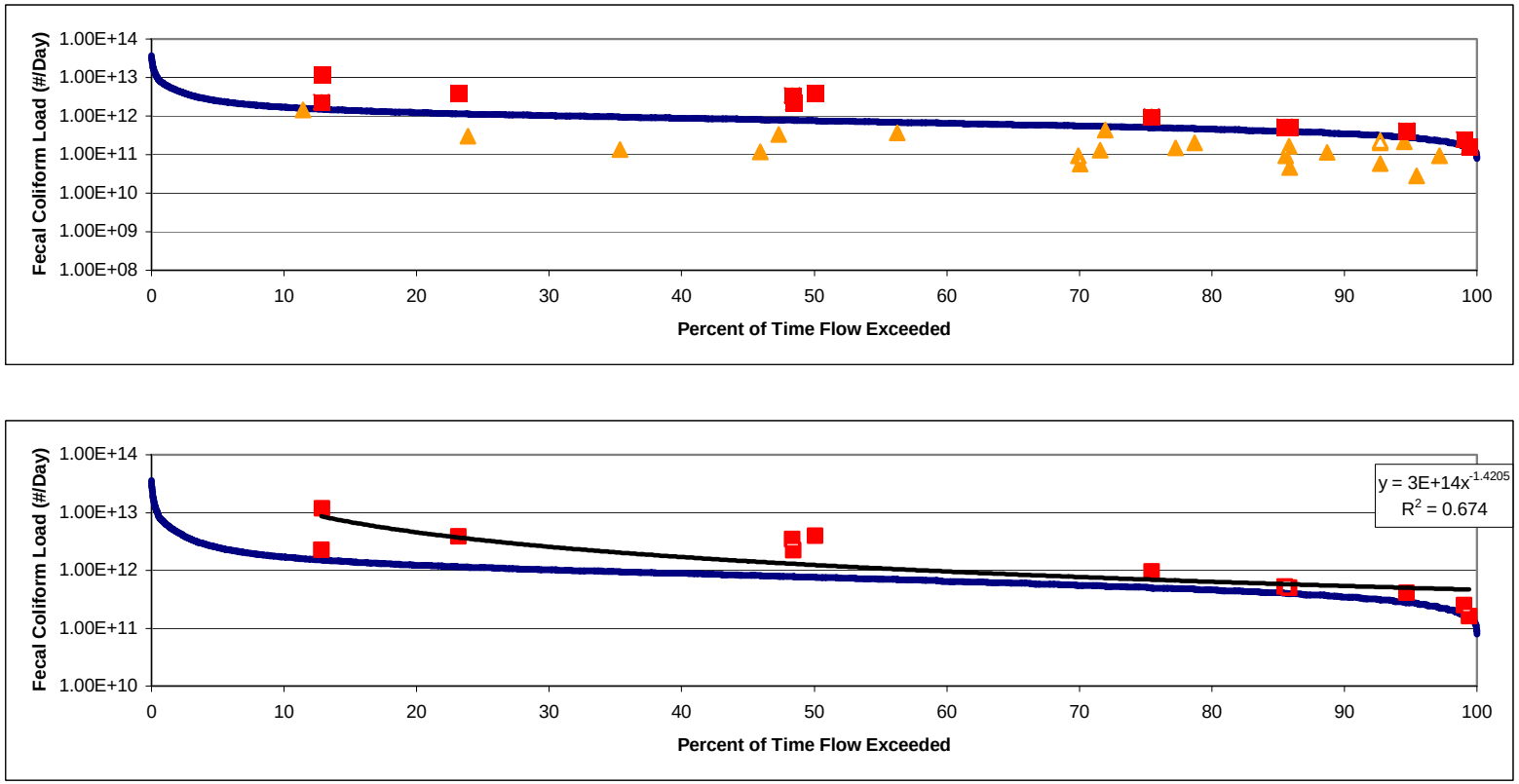


Figure B-9 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-018A

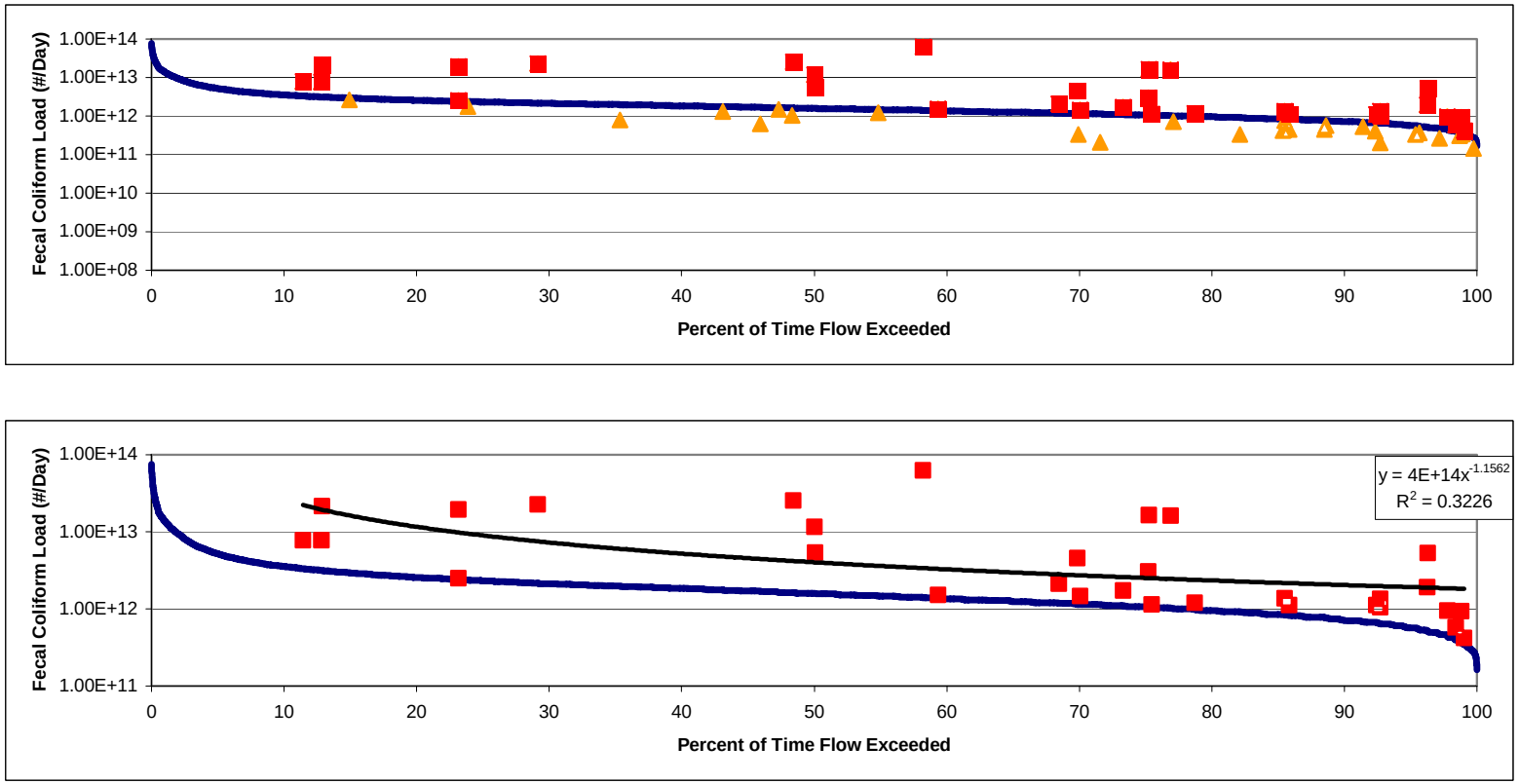
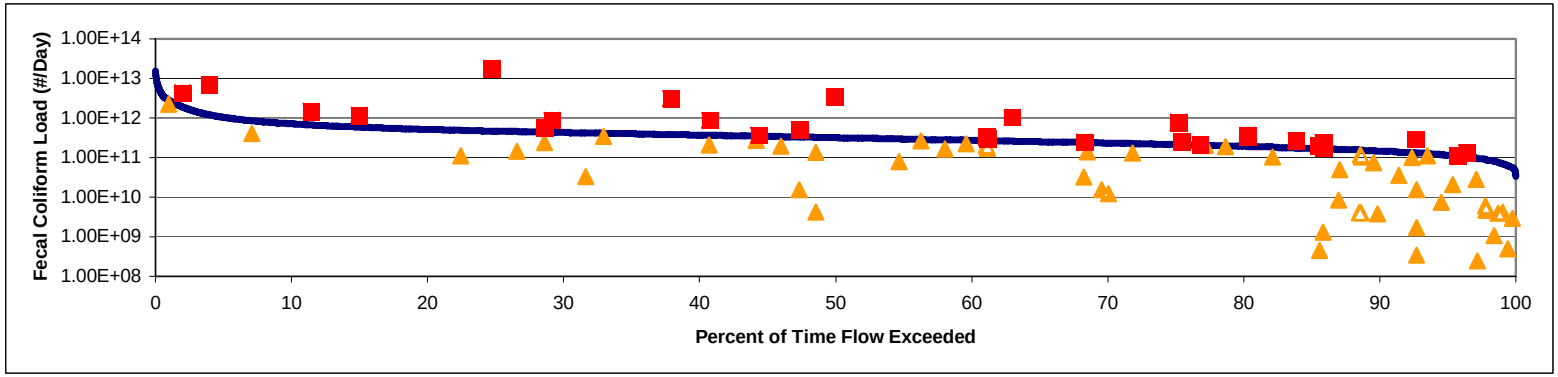


Figure B-10 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-219



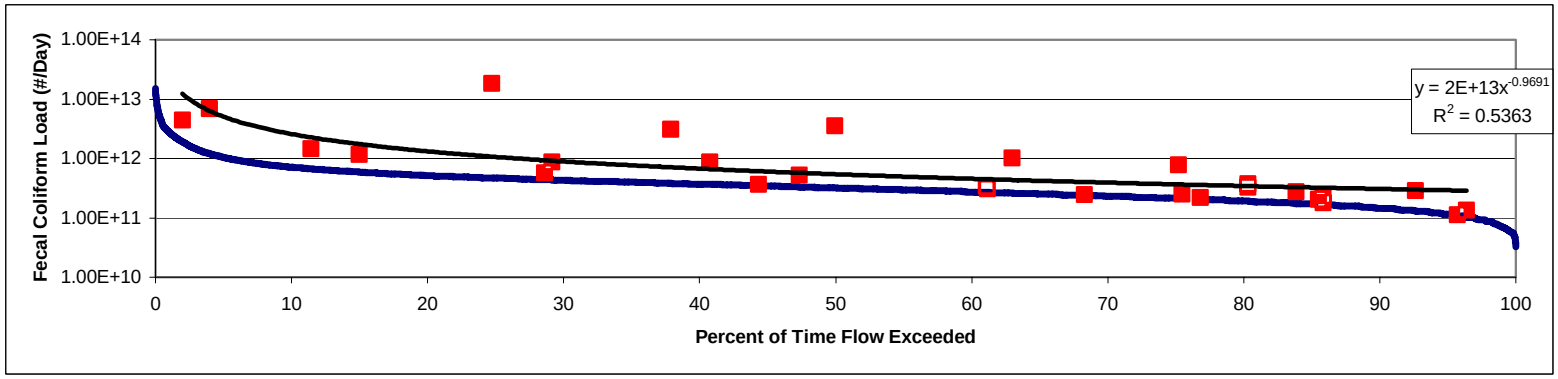


Figure B-11 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-315

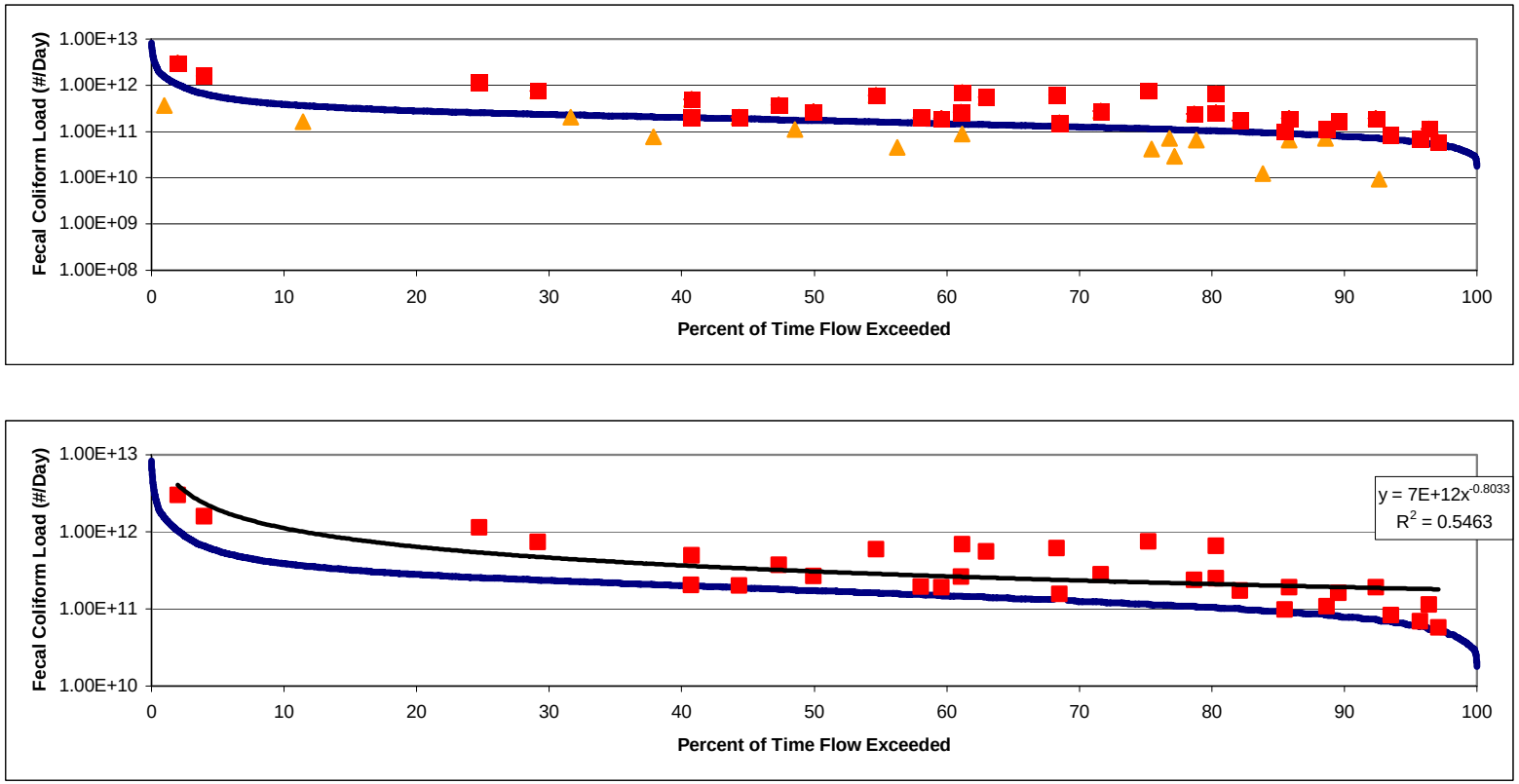


Figure B-12 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-332

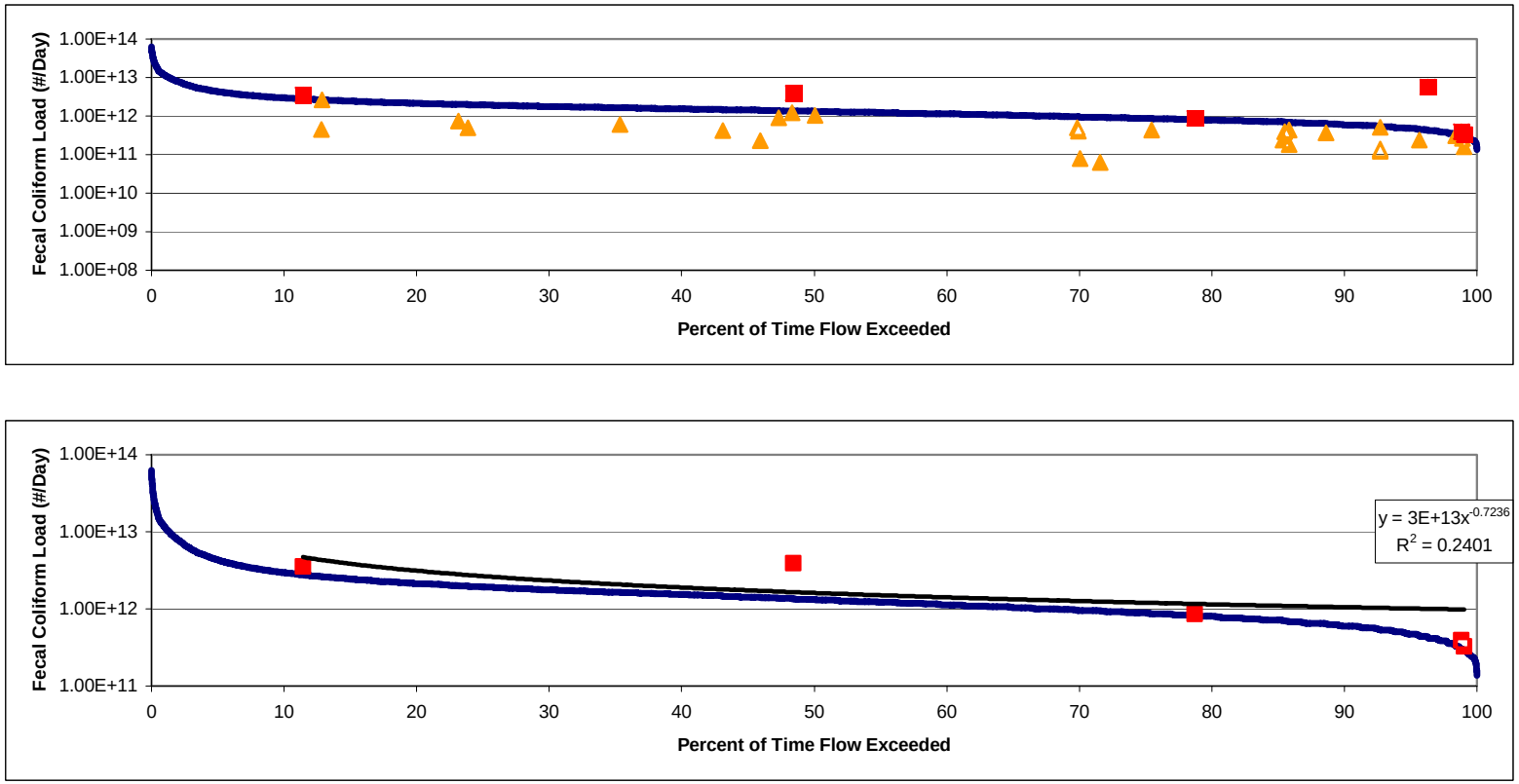


Figure B-13 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-005

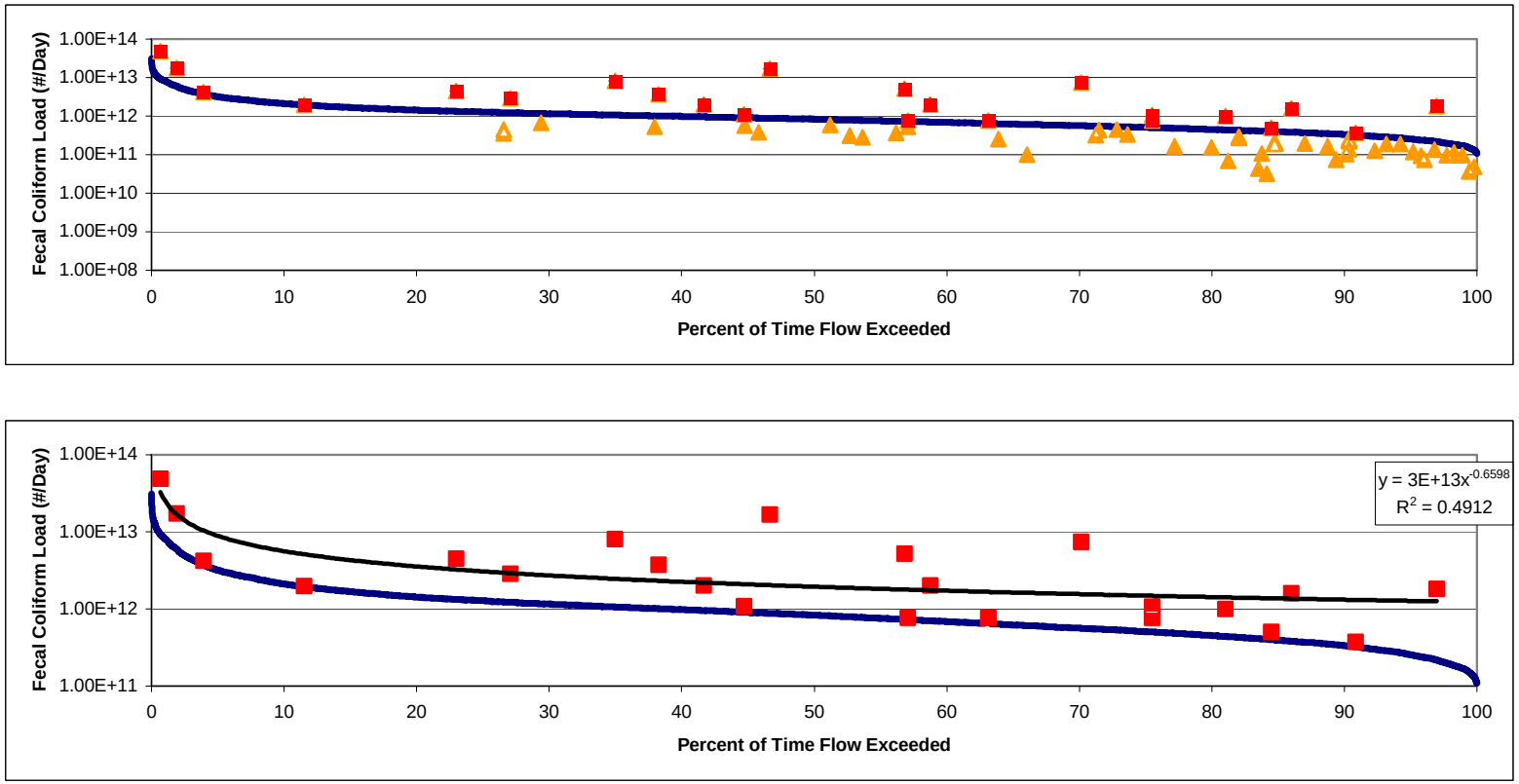
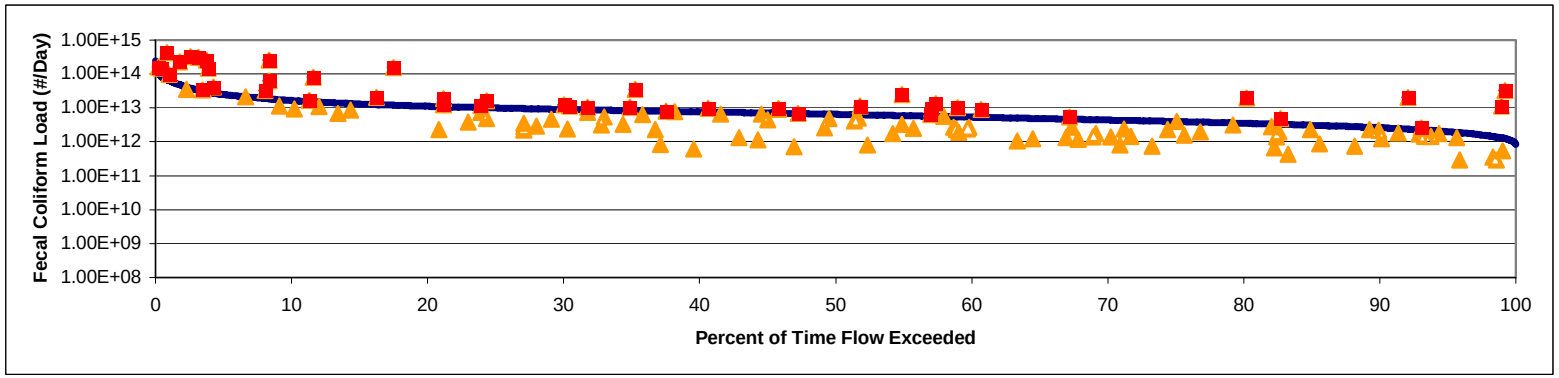


Figure B-14 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-051



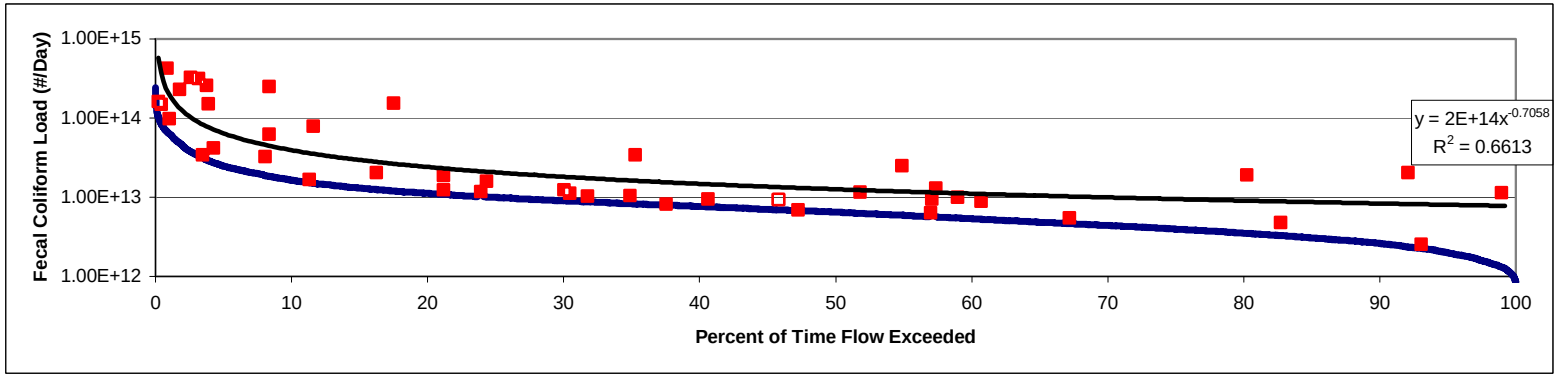


Figure B-15 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-263

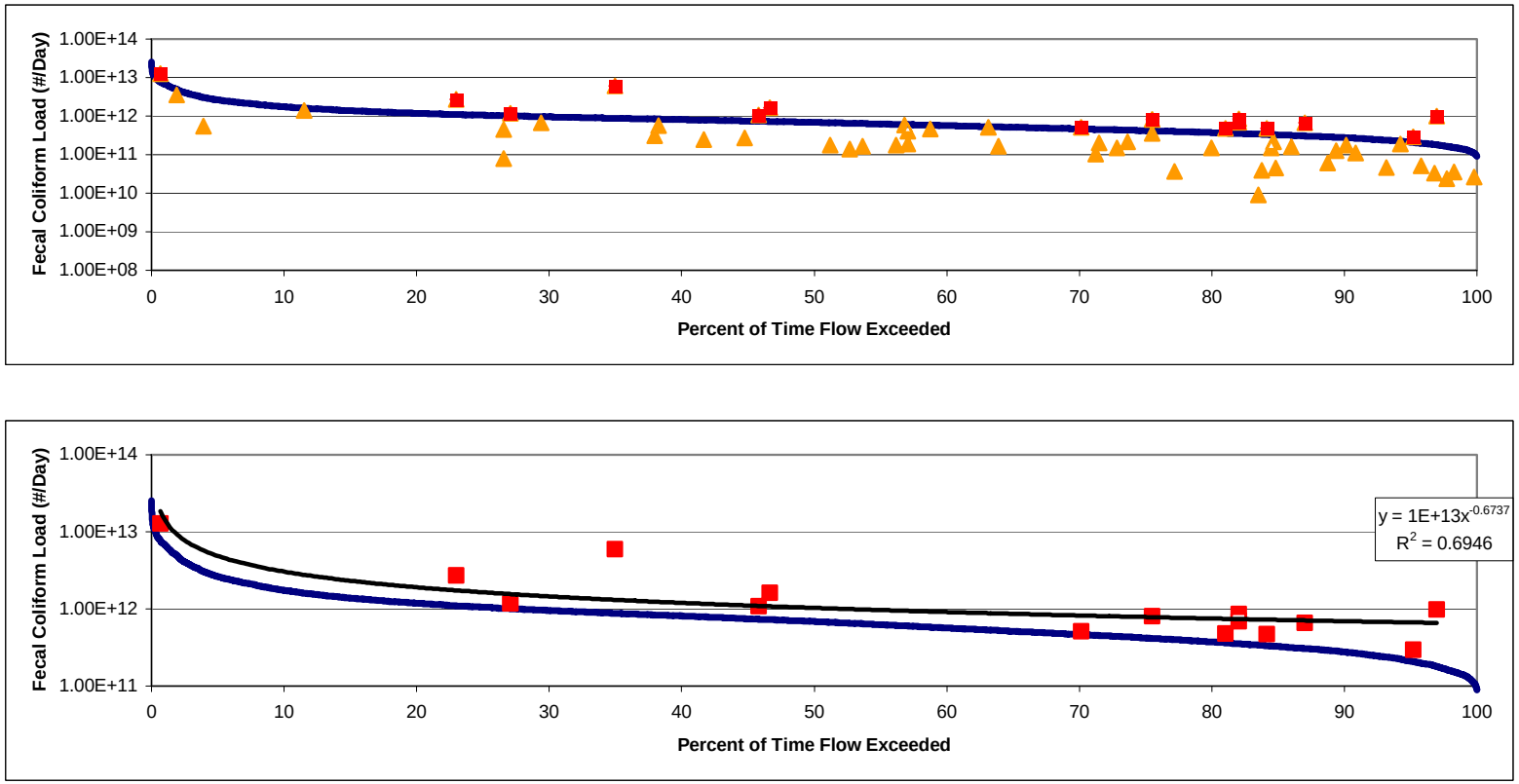
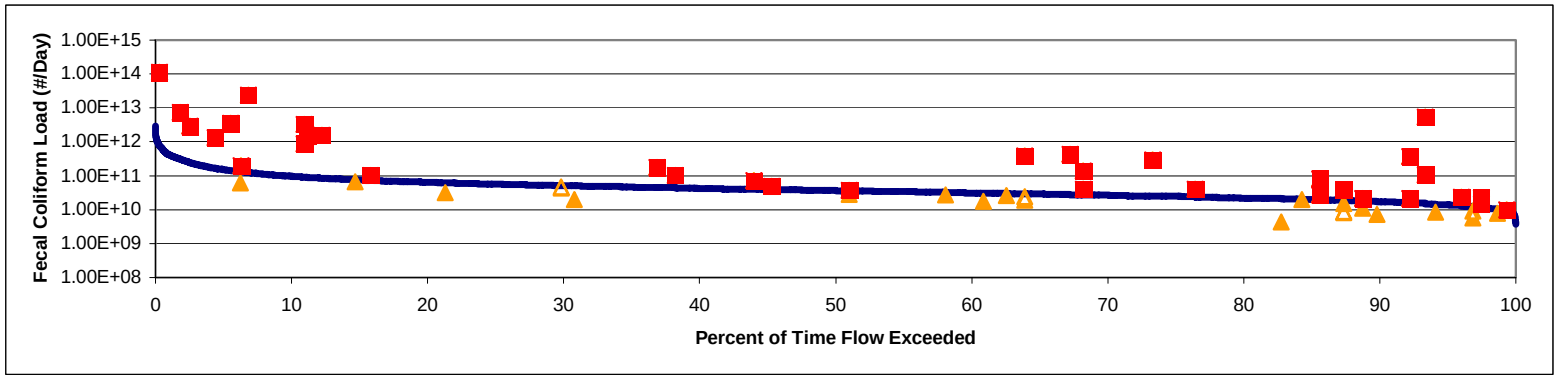


Figure B-16 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-019



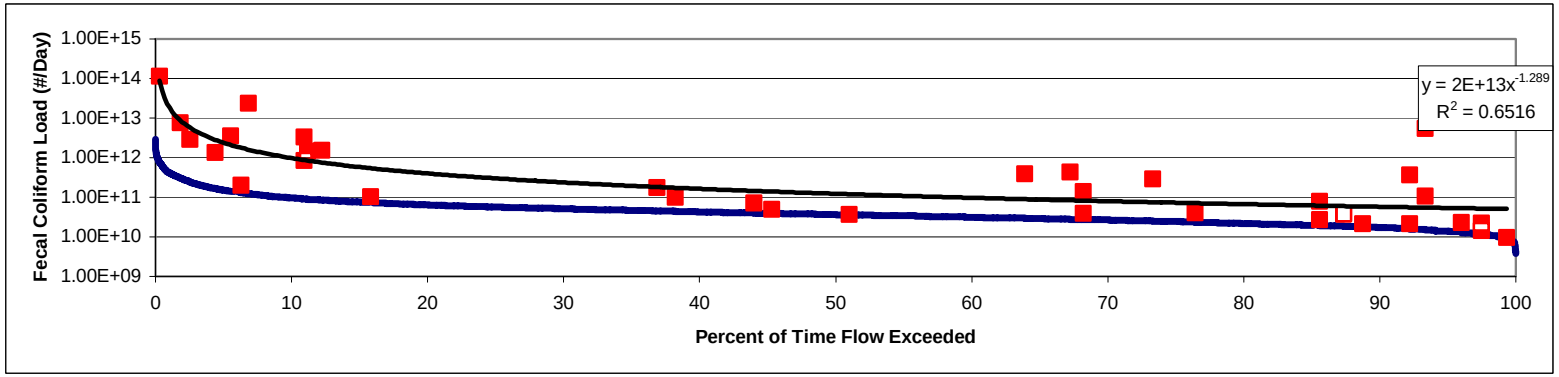
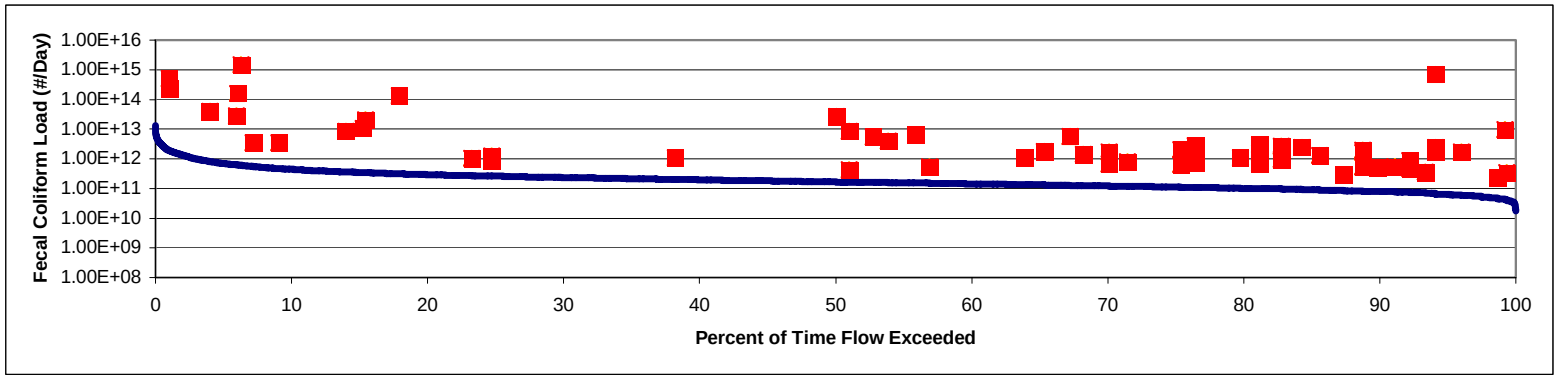


Figure B-17 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-020



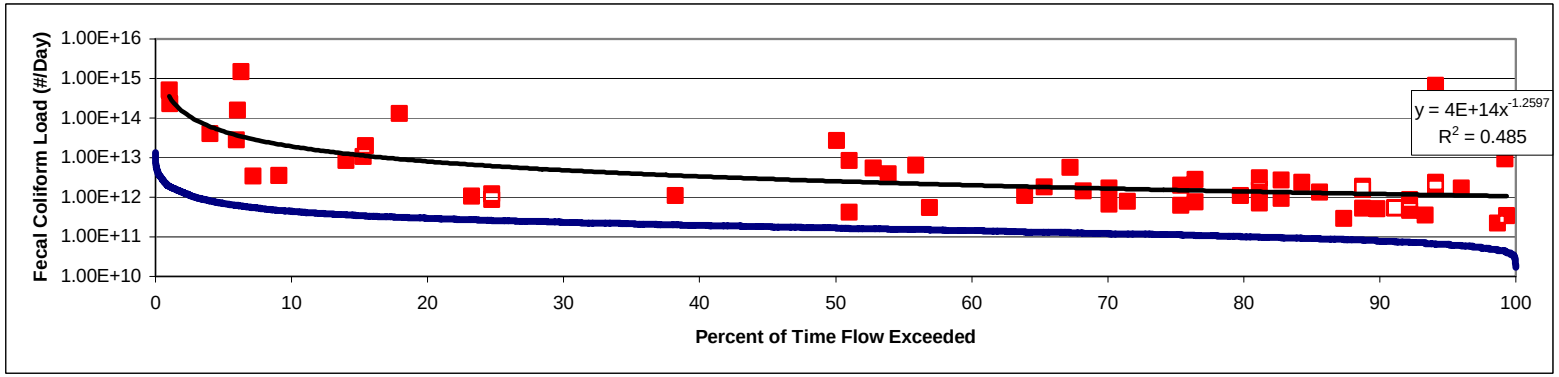


Figure B-18 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-021

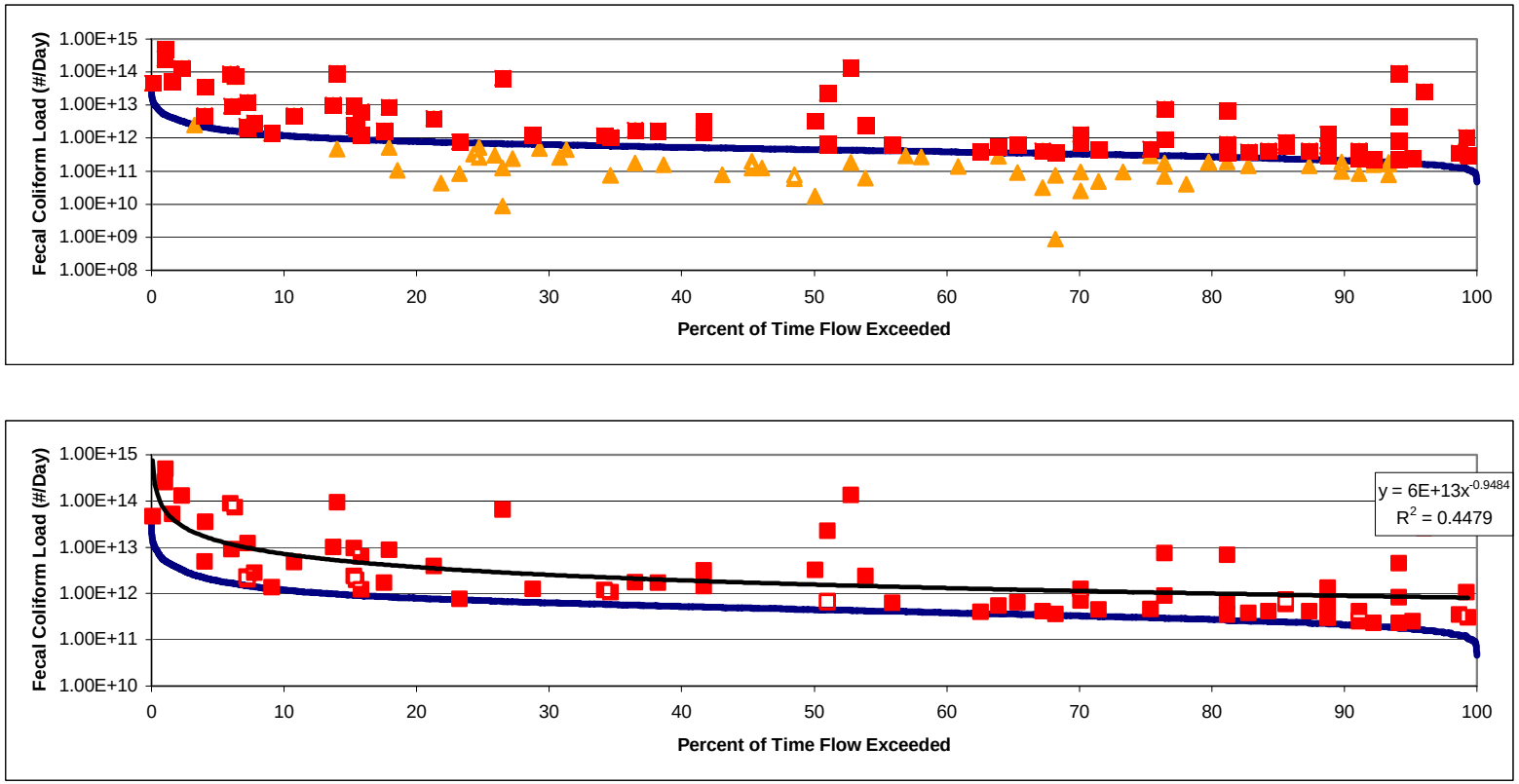
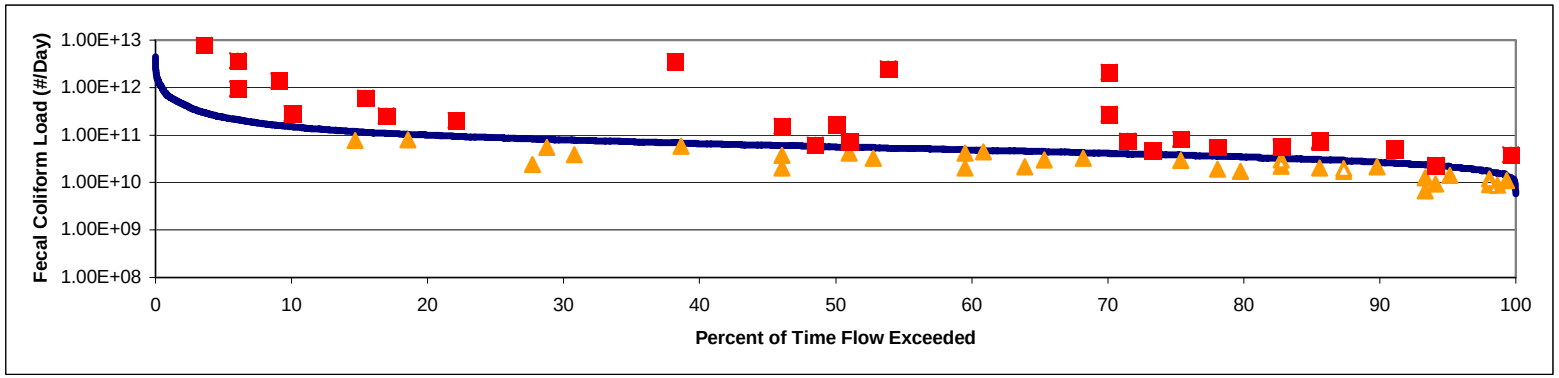


Figure B-19 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-067A



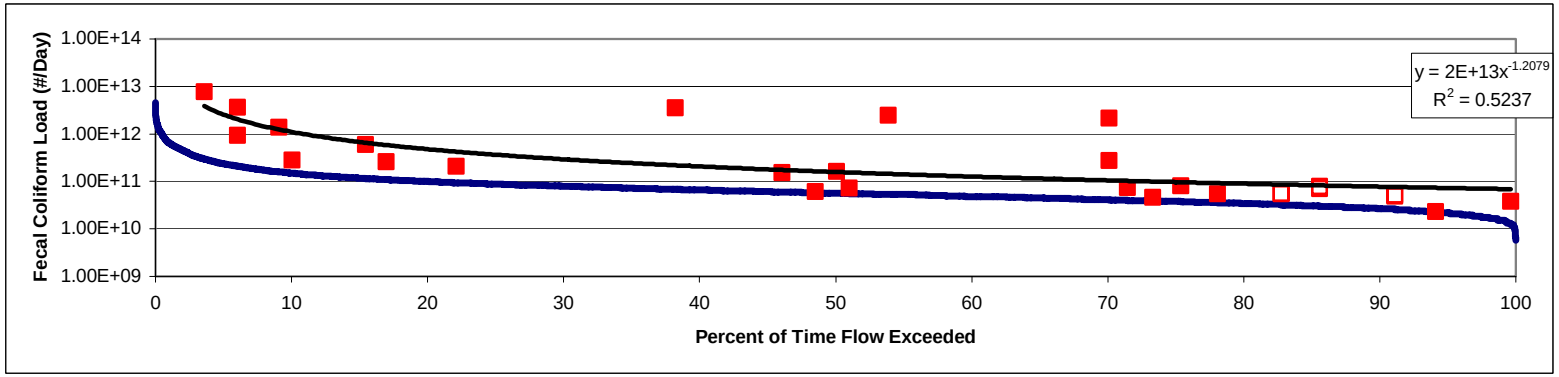


Figure B-20 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-067B

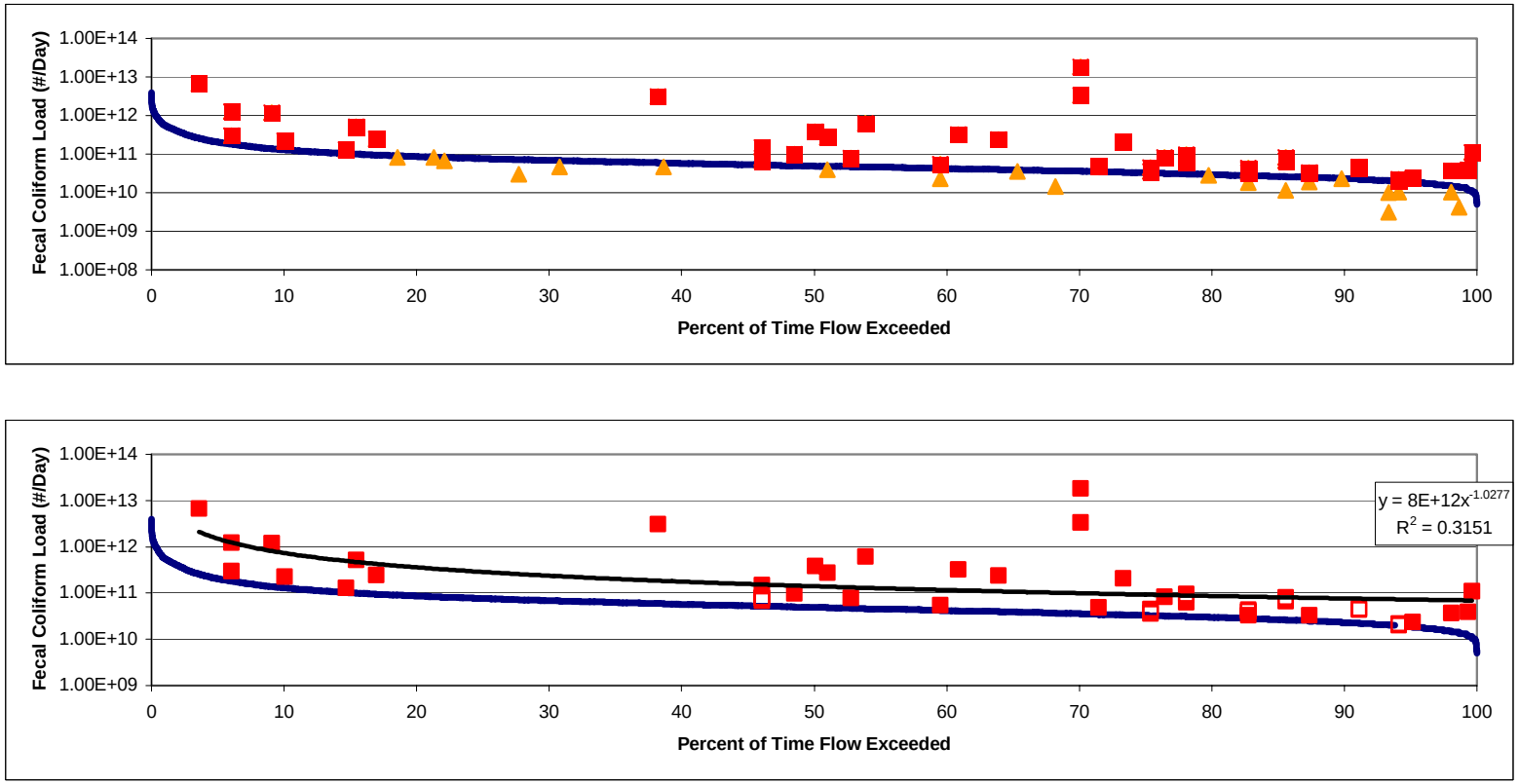
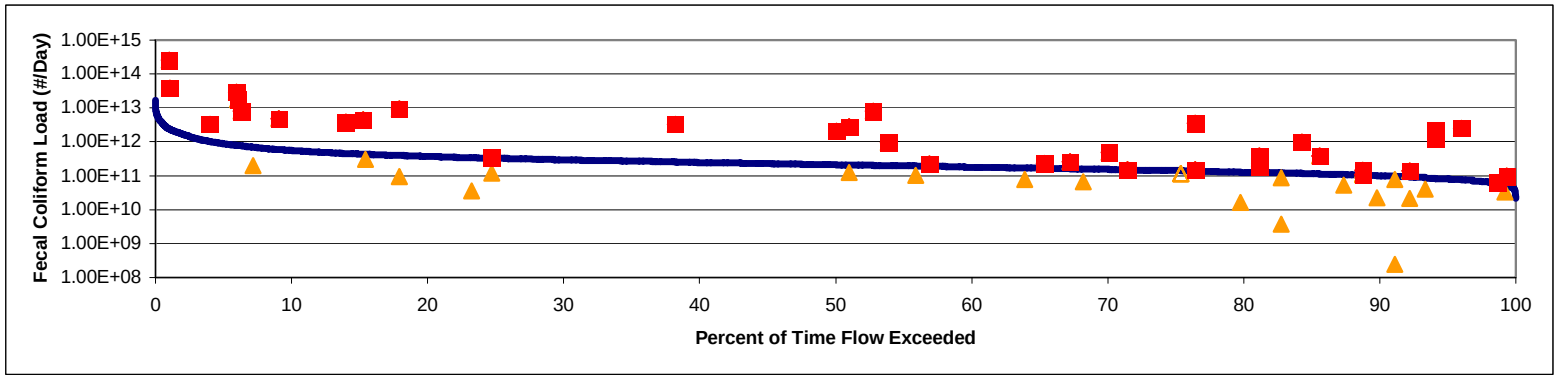


Figure B-21 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-164



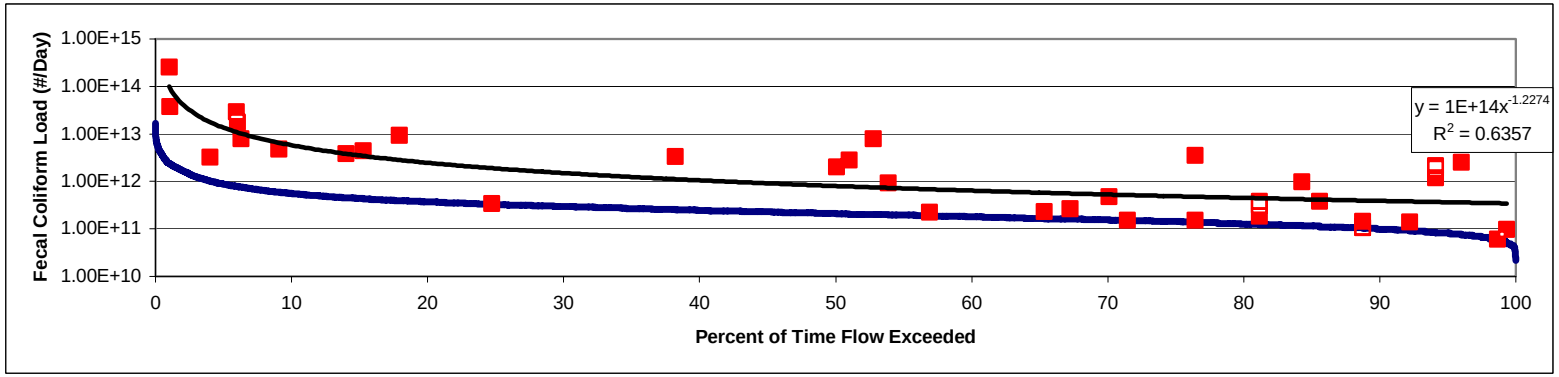
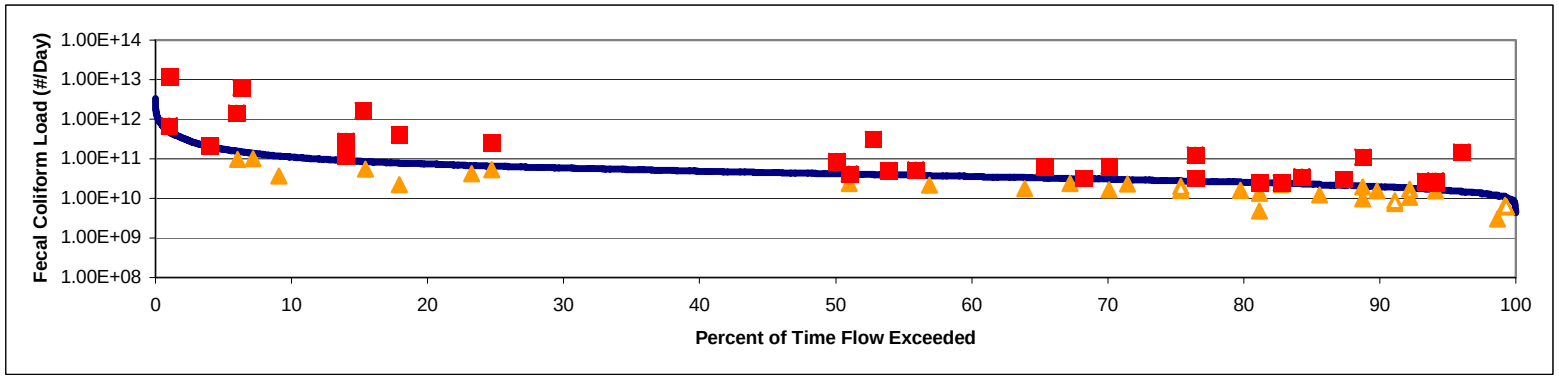


Figure B-22 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-235



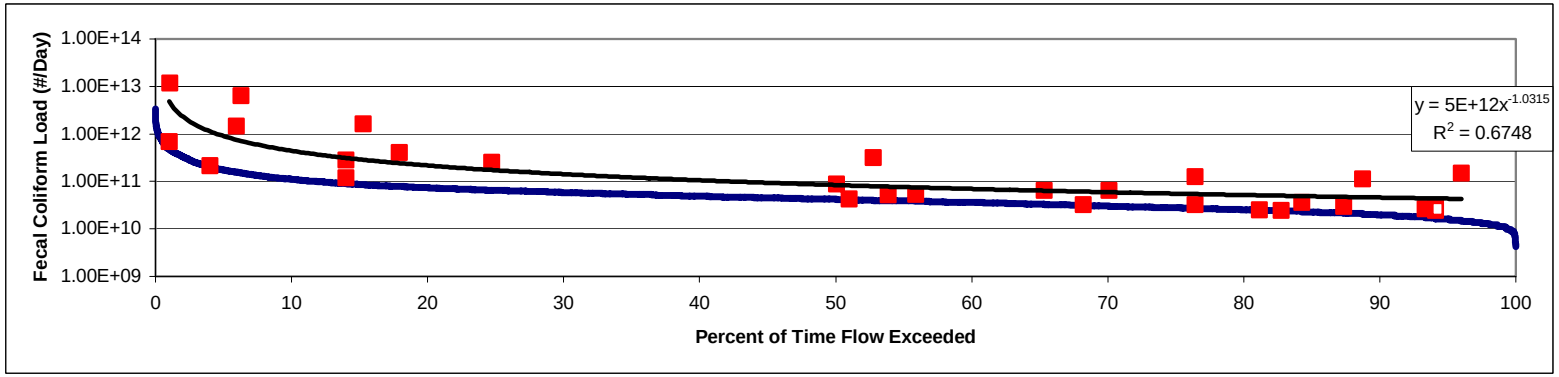


Figure B-23 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-286

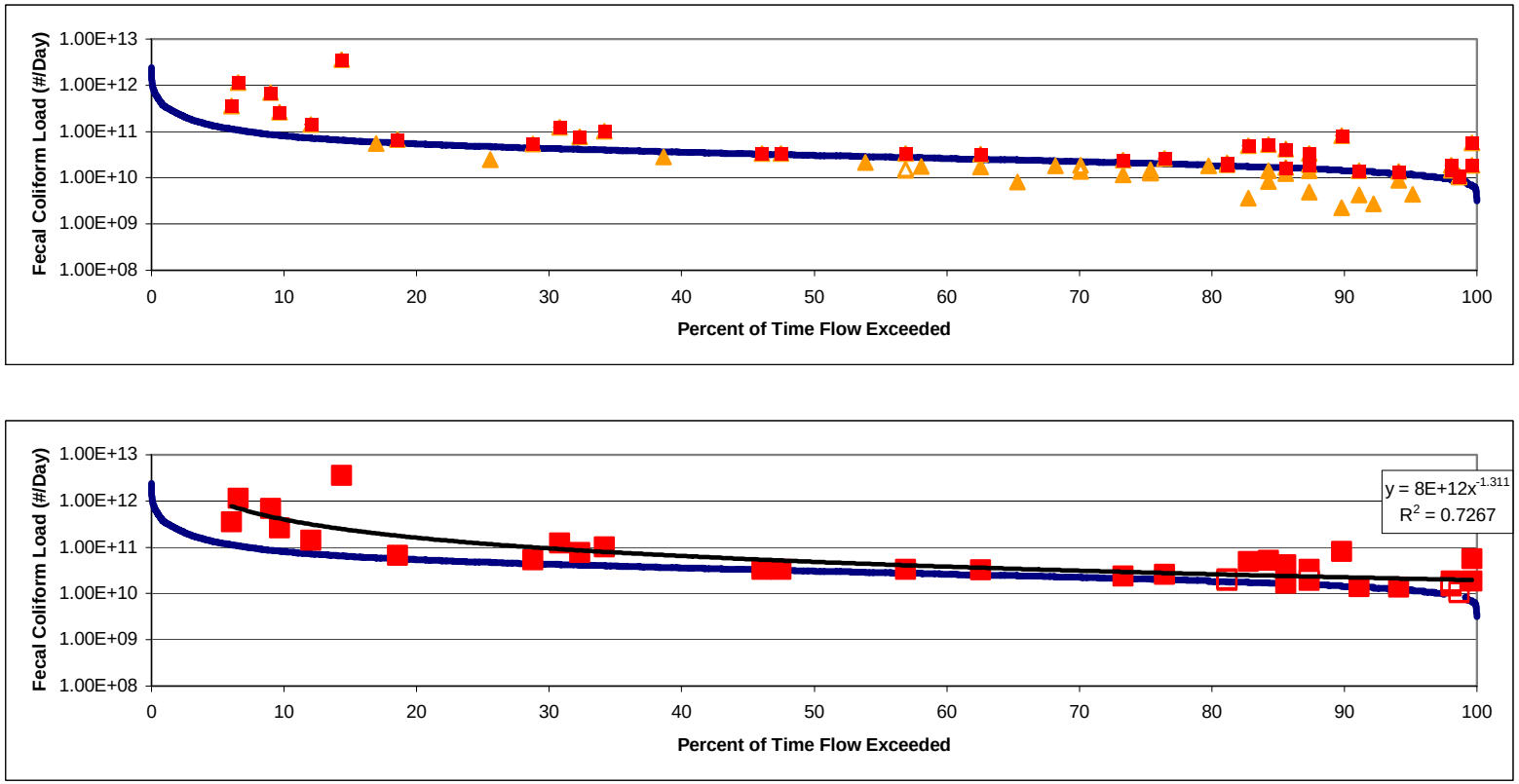
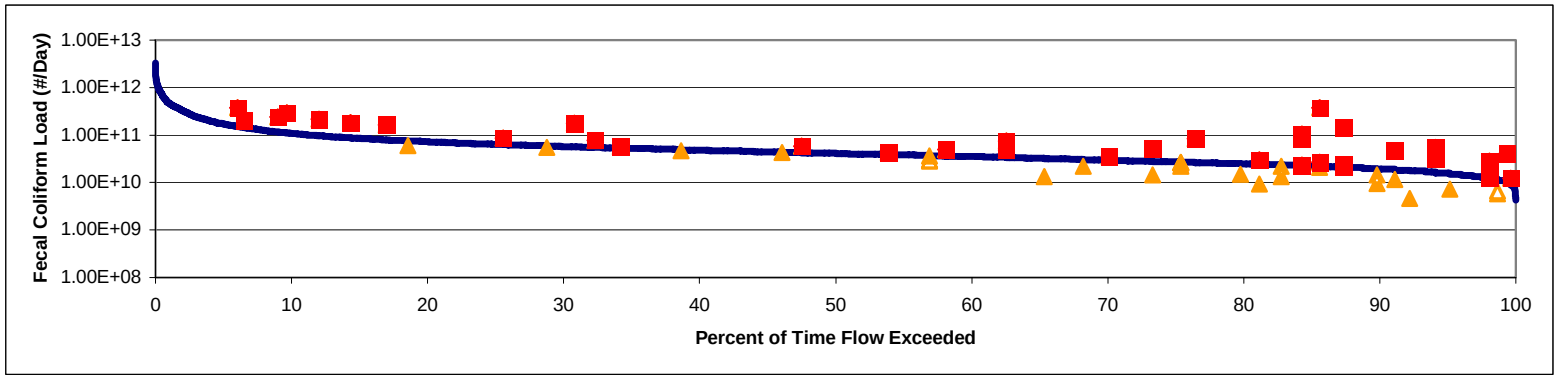


Figure B-24 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-287



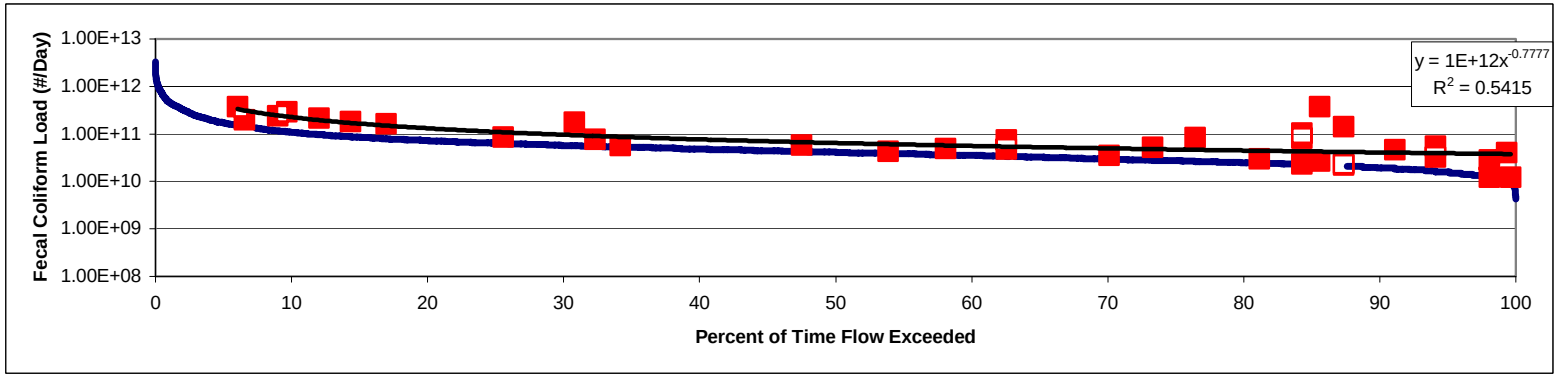


Figure B-25 Load Duration Curve with All Measured Data and Power Trend Line Generated from Violating Fecal Coliform Bacteria Measured at B-321

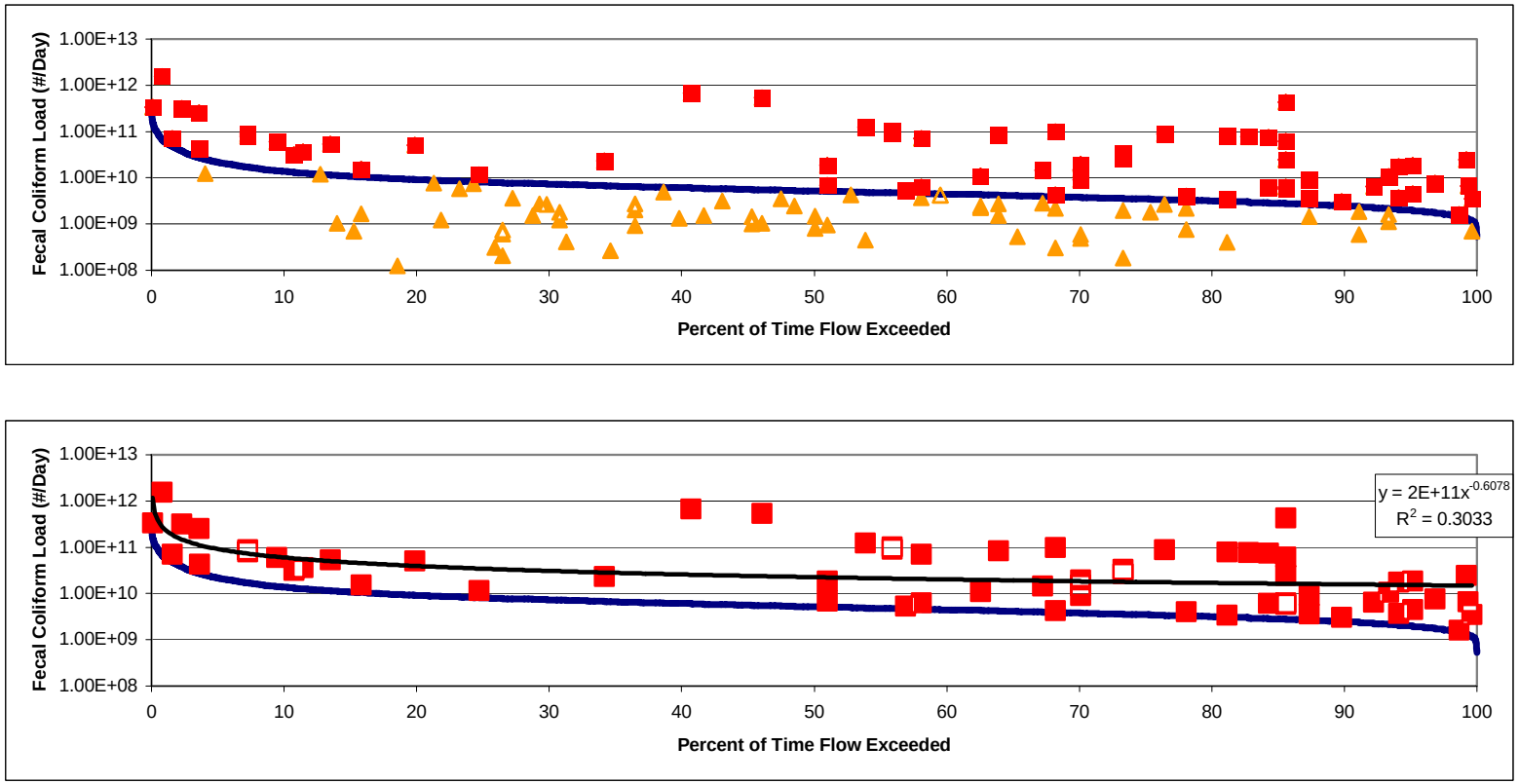


Figure B-26 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02153780

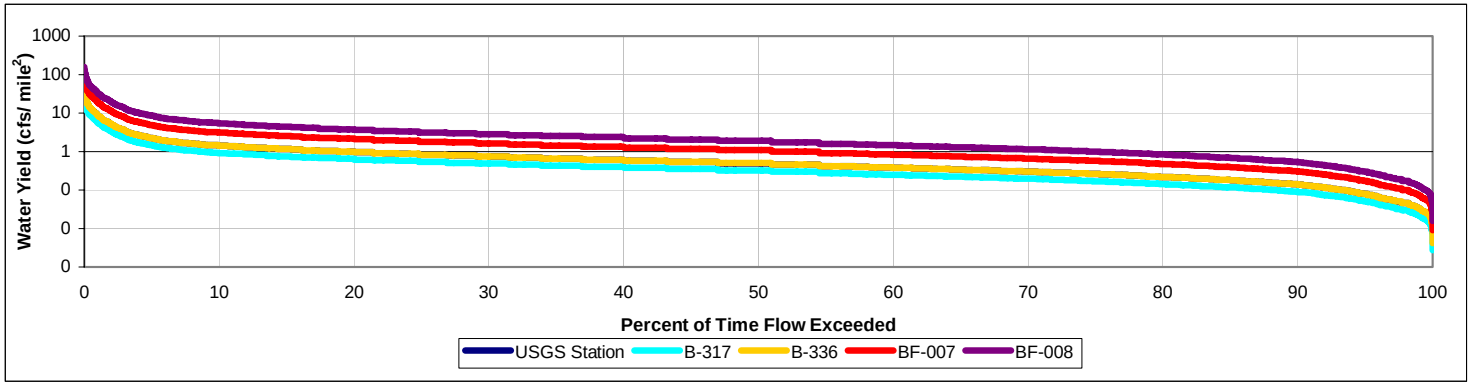


Figure B-27 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02156050

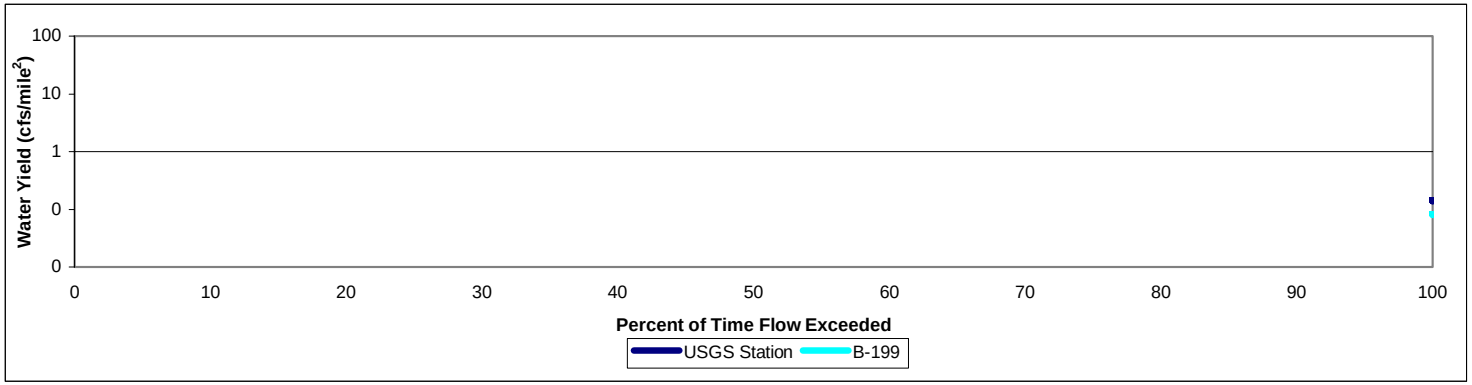
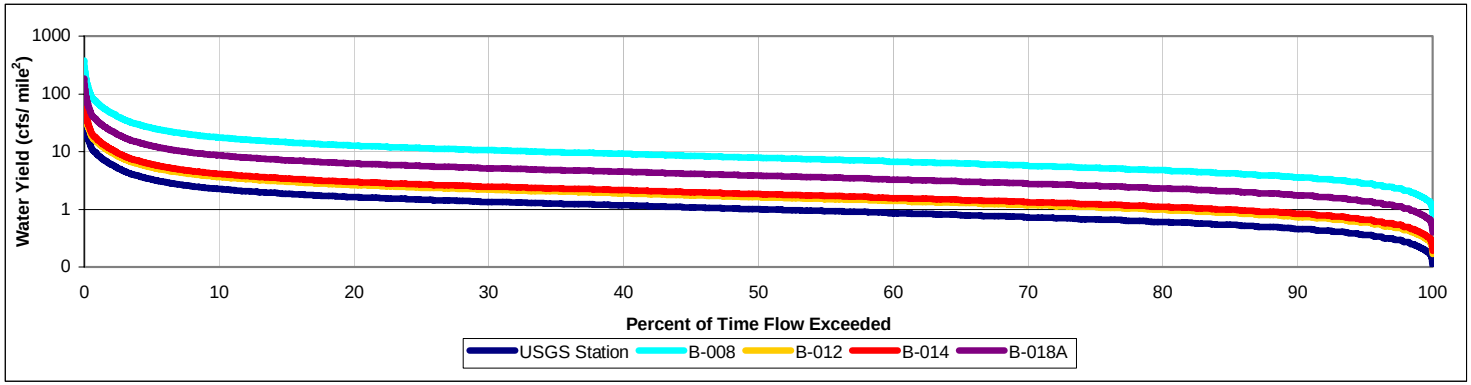


Figure B-28 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02157000



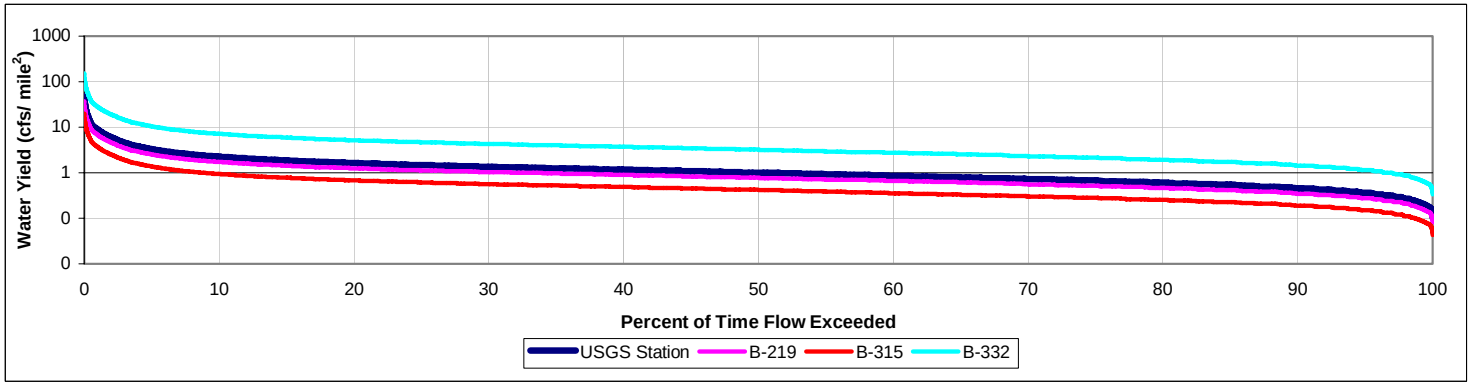


Figure B-29 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02160105

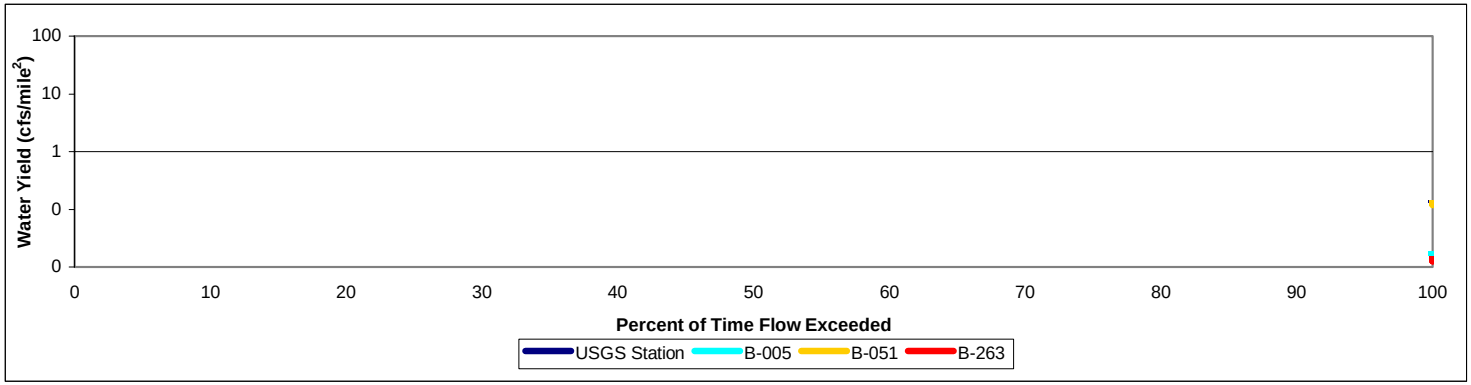
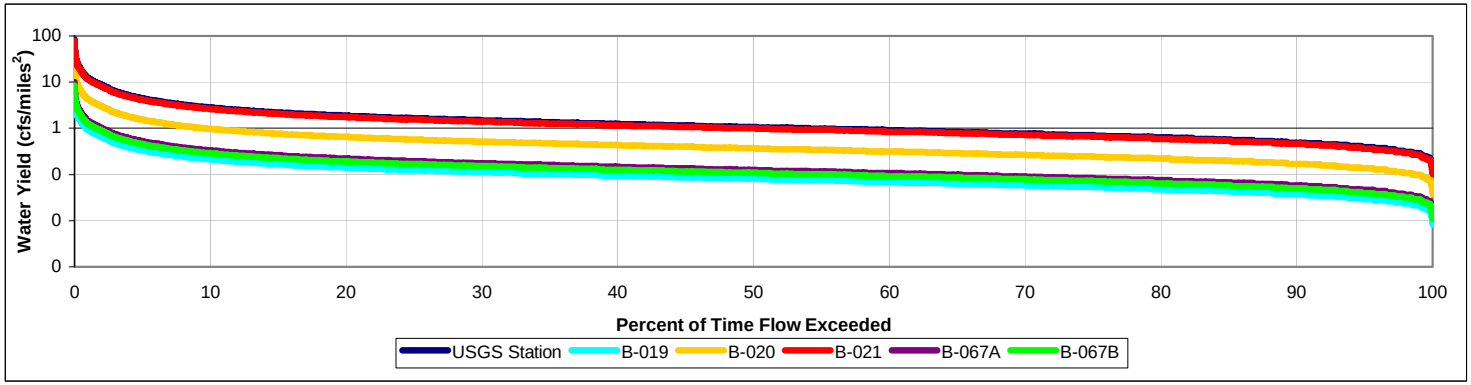
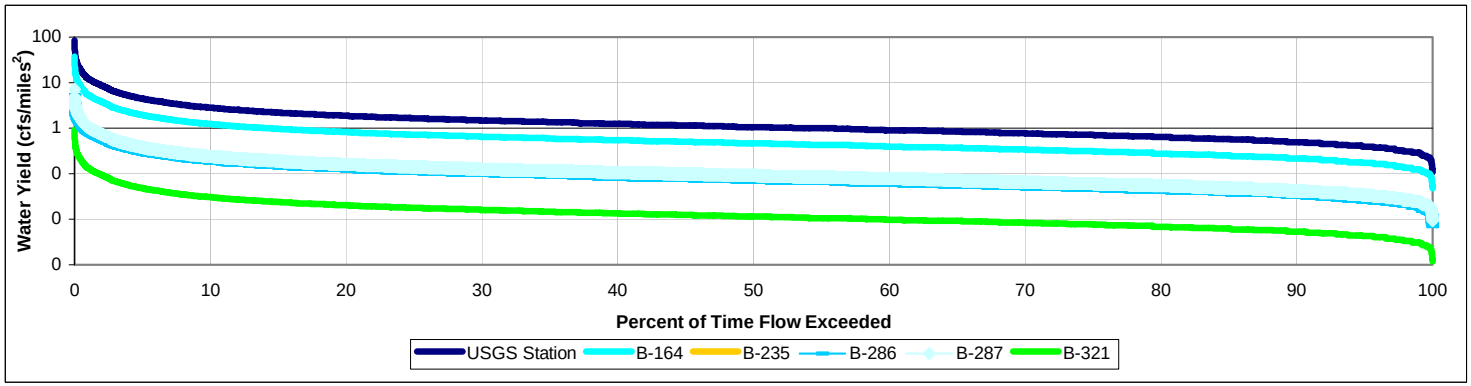


Figure B-30 Water Yield (cubic feet per second per square mile) Based on Measured Daily Streamflow from USGS station 02164000





APPENDIX C Public Notification

APPENDIX D MOVE.1

Constructing Flow Curves Using MOVE.1

The concept of record extension is to transfer the characteristics of distribution shape, serial correlation, and seasonality from the base station to the short-record station with adjustments of location and scale appropriate to the short-record station. MOVE.1 is a statistical technique developed by the USGS (Hirsch, 1982) for extending discharge records at partial or discontinued gages using continuous records at a base station having a common period of record as the partial station. Record extension is based on the following equation:

$$Y(i) = m(y_1) + (S(y_1)/S(x_1))(x(i) - m(x_1)) \qquad \text{Equation 1}$$

Where: Y = discharge at partial record station on particular date
$m(y_1)$ = mean value at partial record station
$S(y_1)$ = standard deviation of discharge record at partial station
$S(x_1)$ = standard deviation of discharge record at continuous station
X(i) = discharge at continuous gage on a particular date
$m(x_1)$ = mean value at continuous record station

Application of the MOVE.1 technique is explained below; however, for more information on the derivation of the equations used in the analysis, please refer to Hirsch (1982).

The record extension procedure can be easily performed in a spreadsheet, such as Excel, having the "analysis woolpack" feature loaded as an add-in program. In Excel, the "descriptive statistic" feature in the "analysis woolpack" is used to compute the complex statistical parameters described in Equation 1. The first step in utilizing MOVE.1 is to compute the logarithms of the discharges at each gage during the concurrent time period. By selecting the "descriptive statistic" feature from the data analysis menu (in Excel, this is located under the "tools" menu bar), and highlighting the cells containing the logarithms of the discharges at both the partial and continuous record stations, the summary statistics used in Equation 1 can be calculated. Flows at other time periods at the partial record station can be estimated by using Equation 1, the summary statistics from the analysis woolpack, and flow at the continuous record station.

A partial flow record is available for the North Tyger River near Fairmont at USGS station 02157000. MOVE.1 was used to establish the missing period of record between 1989 and 2001 for the purpose of developing loads for water quality samples. The partial station was matched with a USGS station with complete records. The USGS station 02160105 on the Tyger River near Delta was used to extend the record at USGS station 02157000. The concurrent time period for each pair was used in the MOVE.1 analysis. Statistical parameters derived from the MOVE.1 analysis are shown in Table D-1. The resulting flow duration curve is presented in Figure D-1.

Table D-1 Statistical Parameters Derived from the MOVE.1 Analysis Comparing USGS 02157000 and USGS 02160105

X		Y	
log USGS 02160105		***log USGS 02157000***	
Mean	2.878924437	Mean	1.663064606
Standard Error	0.004364591	Standard Error	0.0040405
Median	2.878521796	Median	1.653212514
Mode	3.041392685	Mode	1.556302501
Standard Deviation	0.323068192	Standard Deviation	0.299078896
Sample Variance	0.104373057	Sample Variance	0.089448186
Kurtosis	1.038952146	Kurtosis	1.821416656
Skewness	0.492513072	Skewness	0.535553667
Range	2.423747272	Range	2.577791417
Minimum	1.991226076	Minimum	0.662757832
Maximum	4.414973348	Maximum	3.240549248
Sum	15773.62699	Sum	9111.930978
Count	5479	Count	5479
Standard Deviation Y / Standard Deviation X = 0.926			

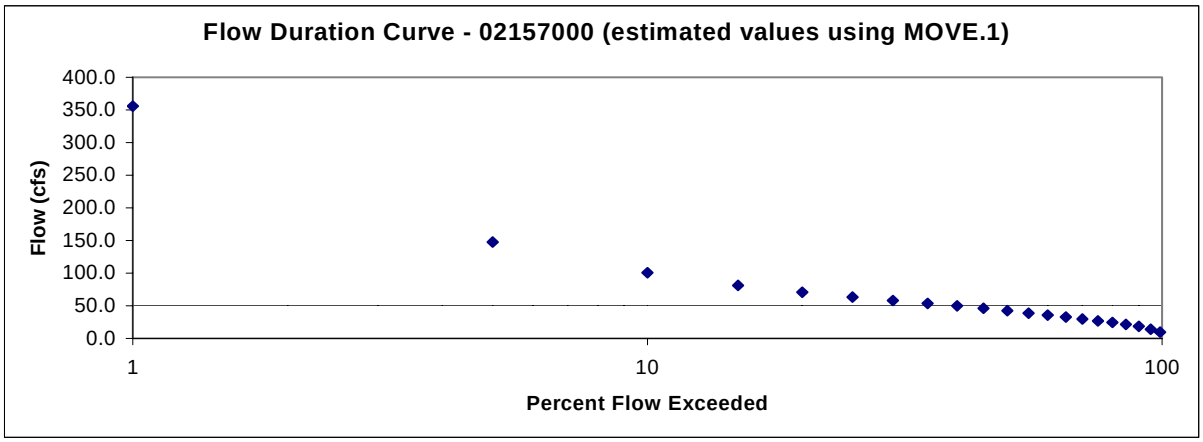


Figure D-1 Flow Duration Curve for the Tyger River near Fairmont (Estimated Using MOVE.1)