

Table 1.BA. Battle Creek Monitoring Station Information



Station Address: Battle Creek near U.S. Highway 61, St. Paul, MN
County: Ramsey
Major Basin: Mississippi River Basin
Watershed: Battle Creek
Drainage Area: 11.40 square miles

Station Operator: Ramsey-Washington-Metro Watershed District

Metropolitan Council Environmental Services Contact Information:

Contact Person: Casandra Champion
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Watershed District or Watershed Management Organization:

Ramsey-Washington-Metro Watershed District

Station Overview: MCES has supported water quality monitoring of Battle Creek since 1996. The monitoring station is located in St. Paul, Minnesota, 2.2 miles upstream from the creek confluence with the Mississippi River. There is no rain gauge at this station; however, precipitation data are obtained from the Minnesota Climatology Working Group, St. Paul Airport Station Number 217386.

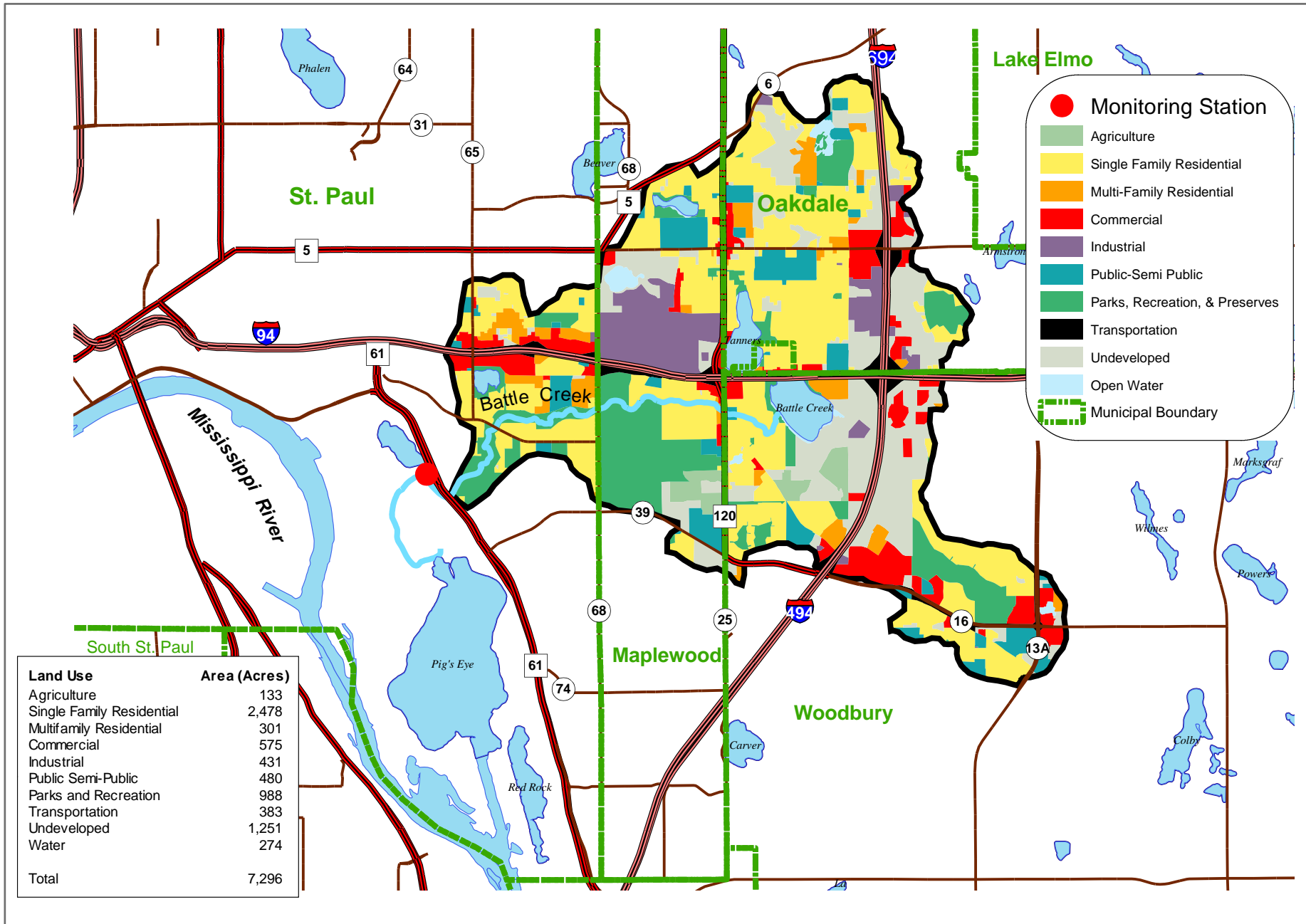
2002 Monitoring Year: Monitoring equipment was installed on April 11, 2002 and removed on November 8, 2002. Daily average flows were estimated prior to April 11 and after November 8. Snowmelt began during the last week of March 2002. The peak daily average flow of 53 cfs occurred on May 8, 2002.

Runoff event-based composite sampling began in early May 2002 and continued through late August. A significant runoff event occurred during the May 4-18, 2002 period. A composite sample collected during this event (May 5-6) had the highest total suspended solids (TSS) concentration (424 mg/L) of all 2002 samples.

Twenty-three samples were collected for water quality analysis during 2002, including 16 composite samples and 7 grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow (“non-event”) grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open-water season (March-November). The 2002 sampling scheme did not meet the goals of the MCES monitoring work plan. January and February baseflow conditions were not characterized with grab samples, and the 2002 snowmelt period was not sampled. Necessary adjustments to the sampling scheme will be made prior to the 2003 monitoring year.

For additional stream monitoring information and monitoring methods regarding this site, see www.metrocouncil.org/environment/RiversLakes.

Figure 1.BA. Battle Creek Monitoring Station Location and Watershed Characteristics



0 0.25 0.5 1 Miles



Figure 2.BA. Battle Creek 2002 Hydrograph, Precipitation and Sampling Information

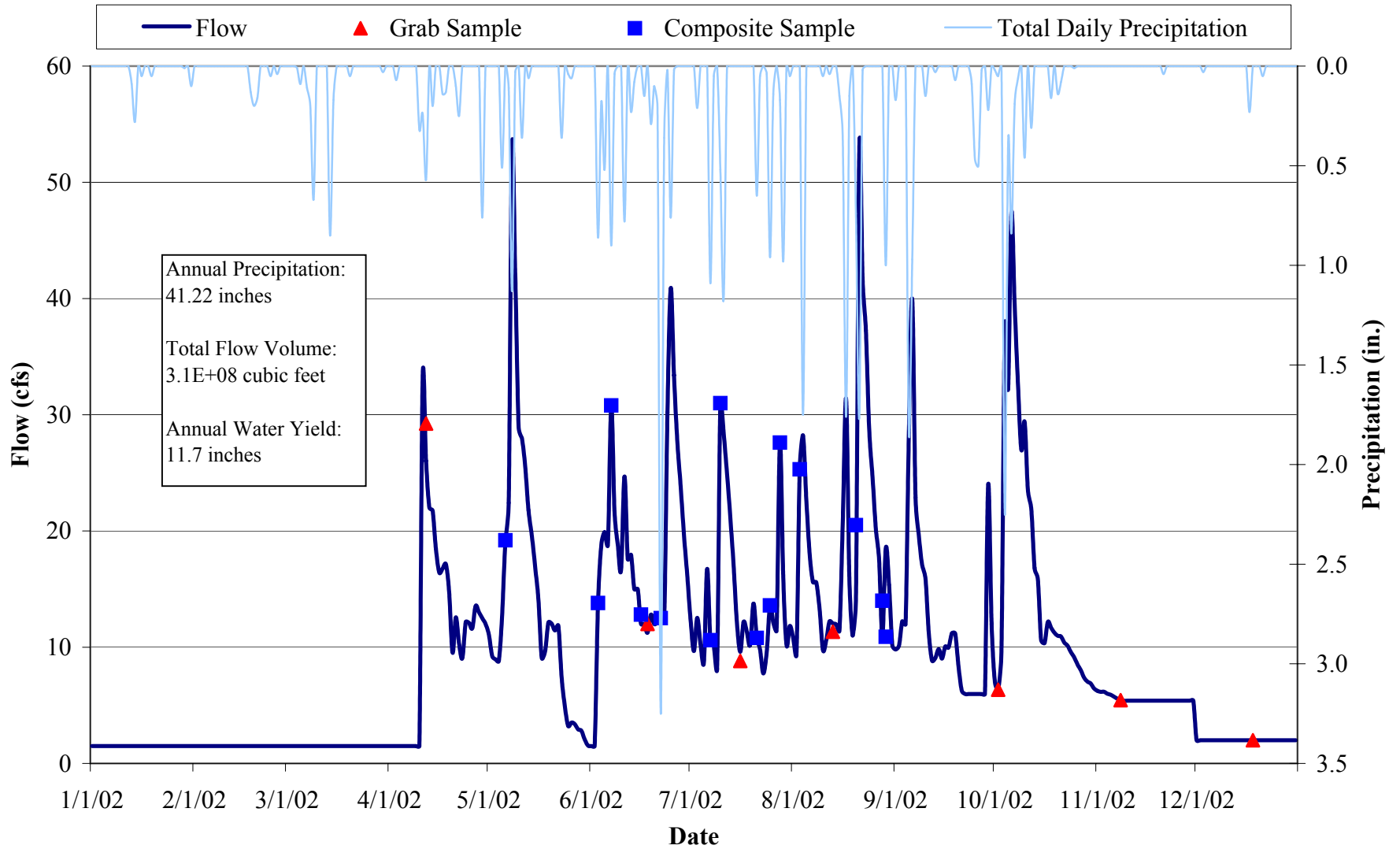


Table 2.BA. Battle Creek 2002 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	22	91	93	39	177	61	102	39
Hardness, mg/L	23	125	122	68	256	96	156	48
Cadmium, ug/L	21	0.2	0.1	<0.1	1.5	0.1	0.3	0.3
Chromium, ug/L	21	1.9	1.5	0.2	8.9	0.6	2.5	1.9
Copper, ug/L	21	5.9	5.1	2.2	21.2	3.3	6.4	4.1
Lead, ug/L	21	3.9	2.2	0.1	24.8	0.8	4.7	5.5
Nickel, ug/L	21	3.0	2.5	1.8	8.4	2.2	3.4	1.4
Zinc, ug/L	21	18.8	13.8	2.3	96.0	6.2	20.5	20.4
Total Kjeldahl Nitrogen, mg/L	23	1.00	0.86	0.41	2.80	0.65	1.20	0.55
Total Nitrate Nitrogen, mg/L	22	0.42	0.44	0.14	1.06	0.26	0.52	0.21
Total Phosphorus, mg/L	23	0.15	0.12	0.03	0.49	0.08	0.18	0.11
Total Dissolved Phosphorus, mg/L	23	0.05	0.04	0.02	0.10	0.03	0.06	0.02
Total Suspended Solids, mg/L	23	69	49	2	424	8	96	91
Volatile Suspended Solids, mg/L	23	13	10	1	75	3	17	16
Turbidity, NTU	23	11	10	2	45	3	16	10

N: Sample Count

25%, 75%: 25th and 75th Percentiles

STD: Standard Deviation

Table 3.BA. Battle Creek 2002 Annual Loading Information* for Suspended Solids and Nutrients

Variable	Annual Load (tons)	Annual Yield (lbs/acre)	Annual Normalized Yield (lbs/acre/in of water)	Flow Weighted Mean Concentration (mg/L)
Total Suspended Solids	634	174	15	66
Total Phosphorus	1.37	0.38	0.03	0.14
Total Dissolved Phosphorus	0.45	0.12	0.01	0.05
Total Nitrate Nitrogen	3.90	1.07	0.09	0.40

* 2002 Annual Loading Information is provisional and may be subject to minor revisions.

Figure 3.BA. Battle Creek 2002 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

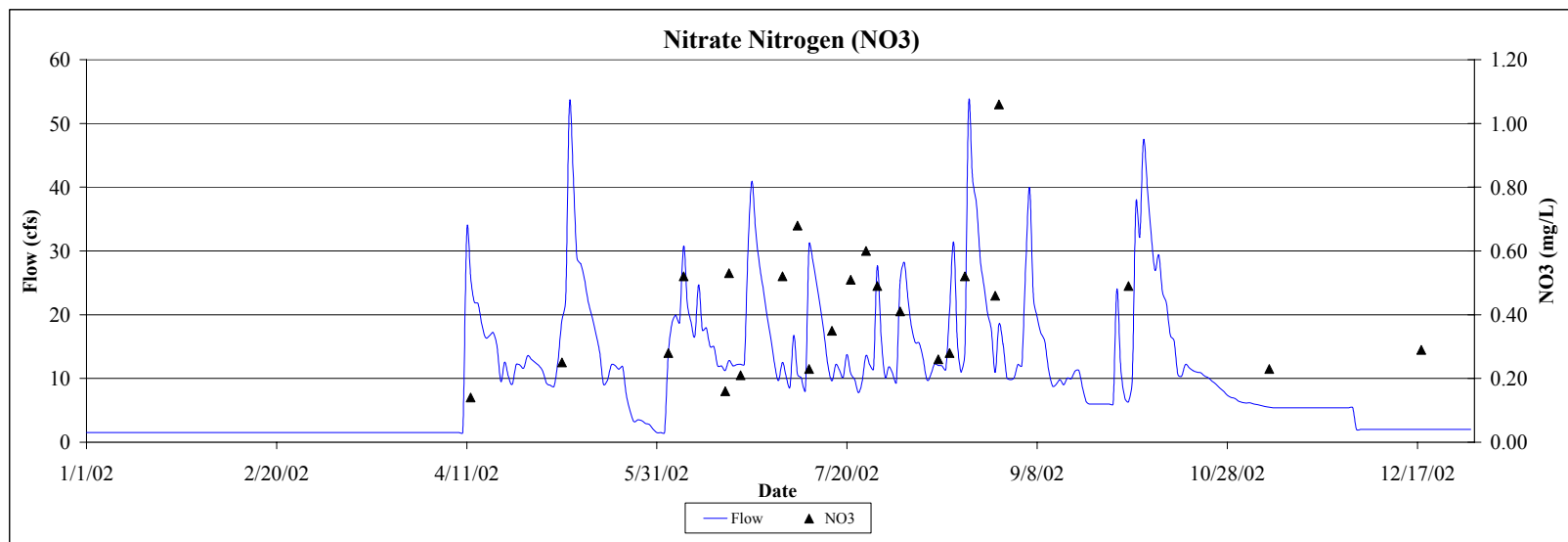
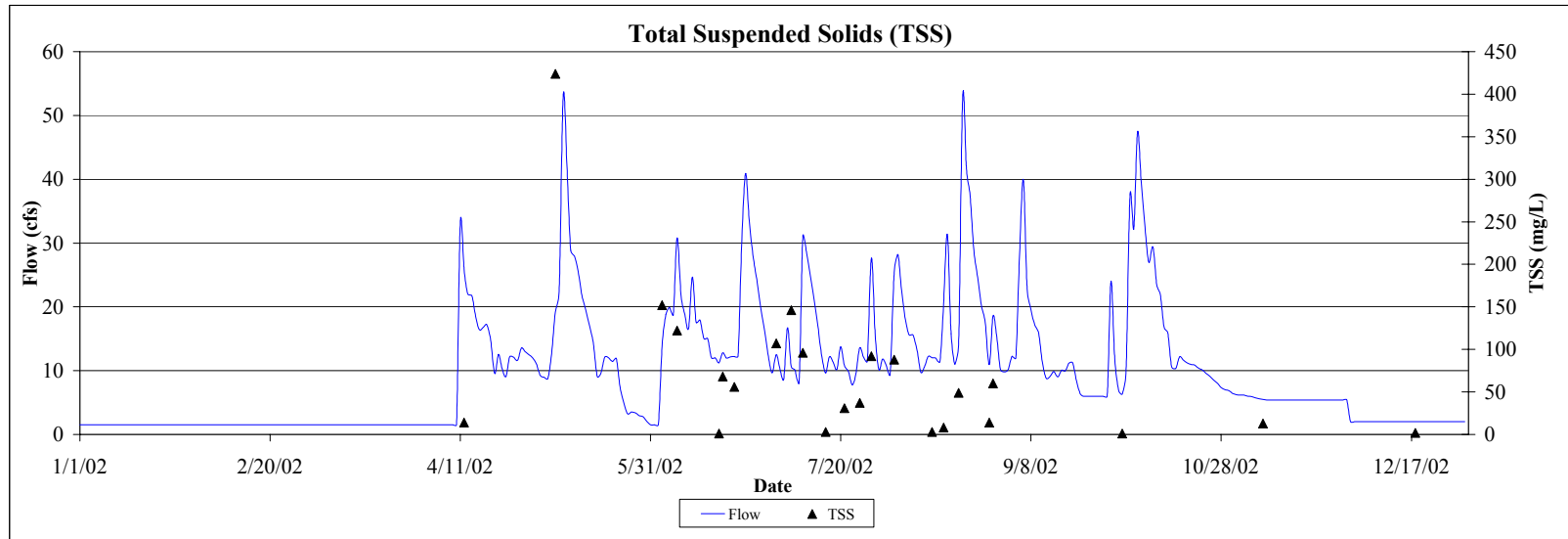


Figure 4.BA. Battle Creek 2002 Hydrograph with Total and Dissolved Phosphorus Concentrations

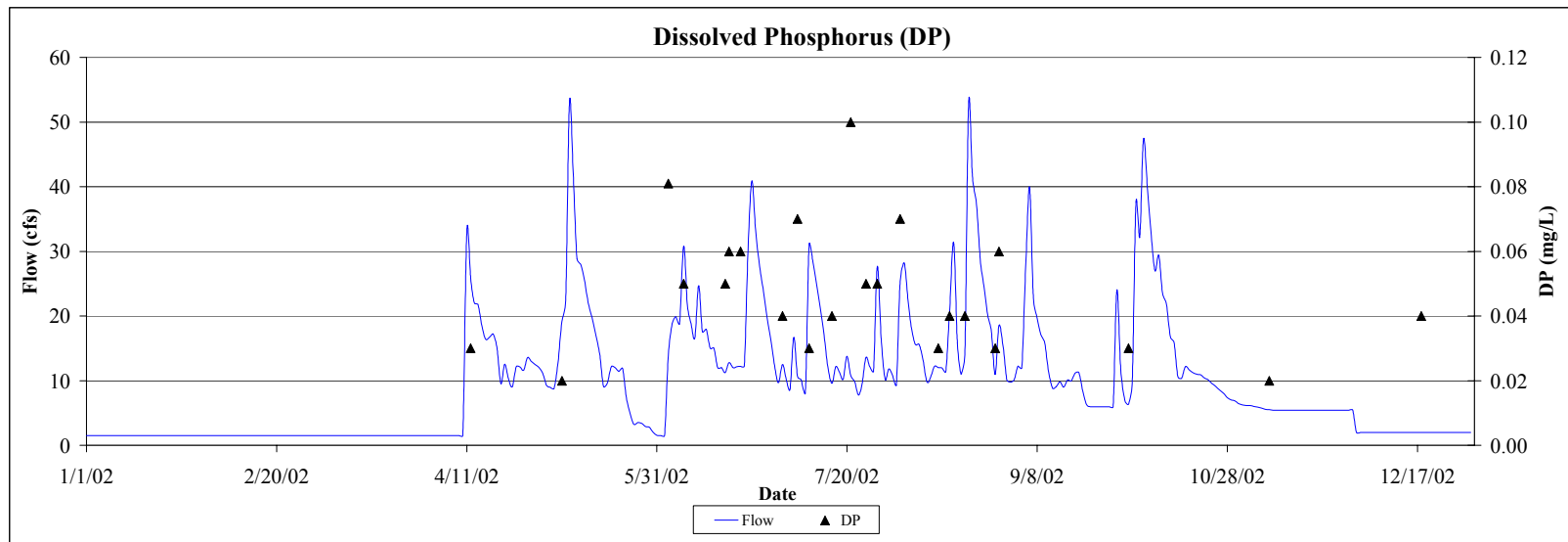
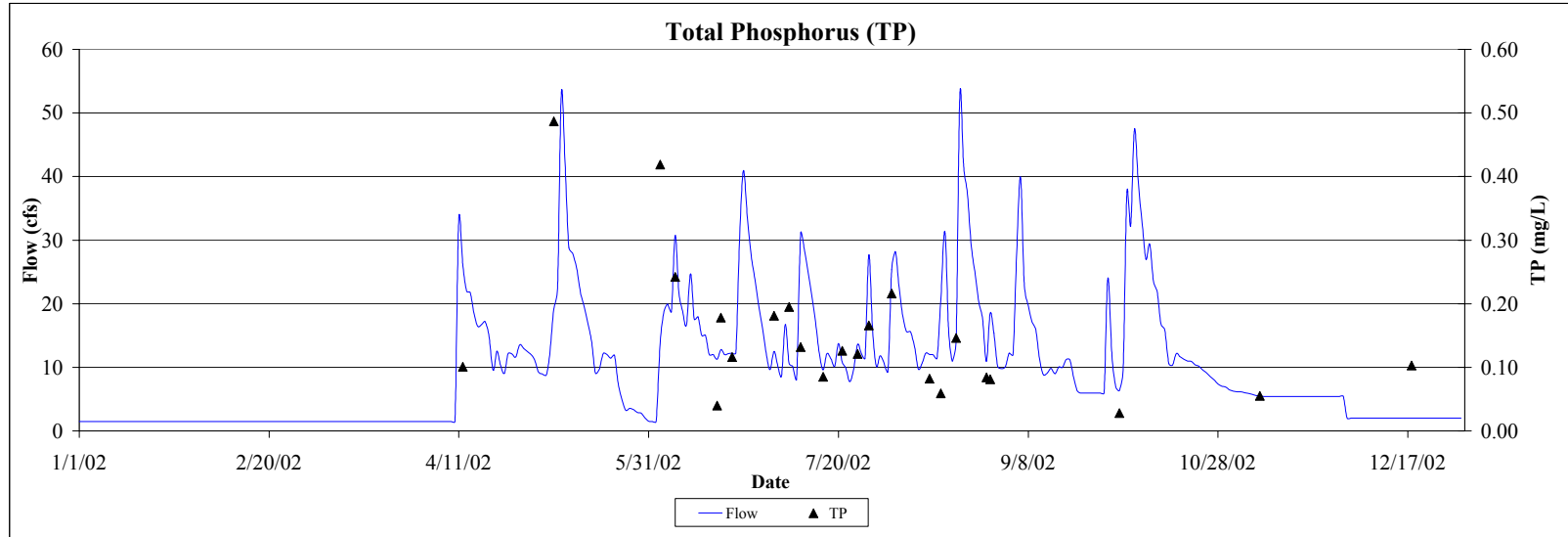


Table 4.BA. Battle Creek: Comparison of 2001-2002 Hydrology and Water Chemistry

	2001	2002
Hydrology		
Total Precipitation (in)	31.55	41.22
Water Yield (in)	7.2	11.7
Total Volume (cf)	1.9E+08	3.1E+08
Annual Load (tons)		
Solids, Total Suspended	177	634
Phosphorus, Total	0.80	1.37
Phosphorus, Total Dissolved	0.31	0.45
Nitrogen, Total Nitrate	2.38	3.90
Annual Yield (lbs/acre)		
Solids, Total Suspended	49	174
Phosphorus, Total	0.22	0.38
Phosphorus, Total Dissolved	0.08	0.12
Nitrogen, Total Nitrate	0.65	1.07
Annual Normalized Yield (lbs/acre/in of water)		
Solids, Total Suspended	7	15
Phosphorus, Total	0.03	0.03
Phosphorus, Total Dissolved	0.01	0.01
Nitrogen, Total Nitrate	0.09	0.09
Flow-Weighted Mean Concentration (mg/L)		
Solids, Total Suspended	30	66
Phosphorus, Total	0.14	0.14
Phosphorus, Total Dissolved	0.05	0.05
Nitrogen, Total Nitrate	0.40	0.40

Table 5.BA. Battle Creek 2002 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 6/27/2002

Class	Order	Family	Common Name	Life Stage	Organism Count
Crustacea	Amphipoda		Scuds	Adult	479
Crustacea	Isopoda		Sowbugs	Adult	7
Hirudinea			Leeches	Adult	2
Insecta	Coleoptera	Curculionidae	Water Weevils	Adult	2
Insecta	Coleoptera	Dytiscidae	Predaceous Diving Beetles	Larvae	2
Insecta	Coleoptera	Elmidae	Riffle Beetles	Larvae	2
Insecta	Diptera	Chironomidae	Midges	Larvae	84
Insecta	Diptera	Simuliidae	Black Flies	Larvae	32
Insecta	Diptera		True Flies	Pupa	2
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	Larvae	136
Insecta	Hemiptera	Gerridae	Water Striders	Adult	1
Insecta	Odonata	Calopterygidae	Broadwinged Damselflies	Larvae	1
Insecta	Odonata	Coenagrionidae	Narrowwinged Damselflies	Larvae	1
Insecta	Trichoptera	Hydropsychidae	Common Netspinners	Larvae	8

Macroinvertebrate Taxa Metrics

Total Taxa	13
EPT Taxa	2
% EPT Taxa	15
Diptera Taxa	2
% Diptera Taxa	15
Mean Tolerance Value	6.1

Macroinvertebrate Organism Metrics

Total Individuals	759
EPT Individuals	144
% EPT Individuals	19
Diptera Individuals	118
% Diptera Individuals	16
Chironomidae Individuals	84
% Chironomidae Individuals	11

Water Quality

Degree of Organic Pollution

Family-Level Biotic Index	5.6	Fair	Fairly substantial pollution likely
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