

Table 1.BU. Blue Earth River Monitoring Station Information



Station Address: County Road 9 Near the Rapidan Dam, Rapidan, MN 56079
County: Blue Earth
Major Basin: Minnesota River Basin
Watershed: Blue Earth River
Drainage Area: 1,550 square miles

Station Operators: Metropolitan Council Environmental Services
Minnesota Department of Agriculture (MDA)

Metropolitan Council Environmental Services Contact Information:

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Station Overview: MCES and MDA have conducted water quality monitoring of the Blue Earth River since 1999. The monitoring station is located near Rapidan, Minnesota, 12 miles upstream from the river confluence with the Minnesota River. This location presents a unique challenge for monitoring because the station is situated just downstream from the Rapidan Dam, an operating hydroelectric dam. The Blue Earth River originates in Iowa and flows north-northeast through a region of gently rolling ground moraines. The Watonwan River, a major tributary, joins the Blue Earth River just upstream from the reservoir created by the Rapidan Dam. As such, the Blue Earth River

station monitors any impacts of the Watonwan River on Blue Earth River flow and water quality.

MCES and MDA cooperatively operate this monitoring station, but partner with the USGS, which maintains the rating curve at this location. USGS has been monitoring river flow at this location, station number 05320000, since 1909. USGS has also intermittently collected water quality samples at this station, in 1960-1967, 1969, and 2000. A rain gauge at this monitoring station collects rainfall data during the April-December period.

2002 Monitoring Year: Snowmelt began during the third week of March 2002. The peak daily average flow of 2,900 cfs, with a stage of 4.88 feet, occurred on June 14, 2002.

Runoff event-based composite sampling began in mid-June 2002 and lasted until the end of the month. The total suspended solids (TSS) concentration (526 mg/L) measured in the composite sample collected on the rising hydrograph during this June runoff event was the highest for the entire year. Composite samples were also collected during two runoff events in mid and late August. In September, the river receded slowly and remained at base flow until a late season storm in October. Grab samples were obtained during this final significant runoff event of the year. The remainder of the year was also represented by grab sampling.

Twenty-nine samples were collected for water quality analysis during 2002, including 9 composite samples and 20 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 met the goals of the MCES monitoring work plan.

The month of April 2002 brought unexpected work to the Rapidan Dam, located just upstream of the monitoring site. Blue Earth County, owner of the dam, discovered that the structure was weak at the base and in imminent jeopardy of failing, thereby releasing an estimated 12 million cubic yards of sediment that had accumulated behind the dam since its construction in 1904. Blue Earth County contacted the U.S. Army Corps of Engineers, which spearheaded an emergency repair job to stabilize the dam, at a cost exceeding \$1.2 million. The repair work was completed quickly, and the temporary road built across the Blue Earth River, as shown below, was removed by the end of April.



Blue Earth River,
April 2002. A road is
being built across the
river to allow the U.S.
Army Corps of
Engineers access to
the foot of the
Rapidan Dam, for
repairs.

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

Figure 1.B.U. Blue Earth River Monitoring Station Location and Watershed



Blue Earth River
July 2002

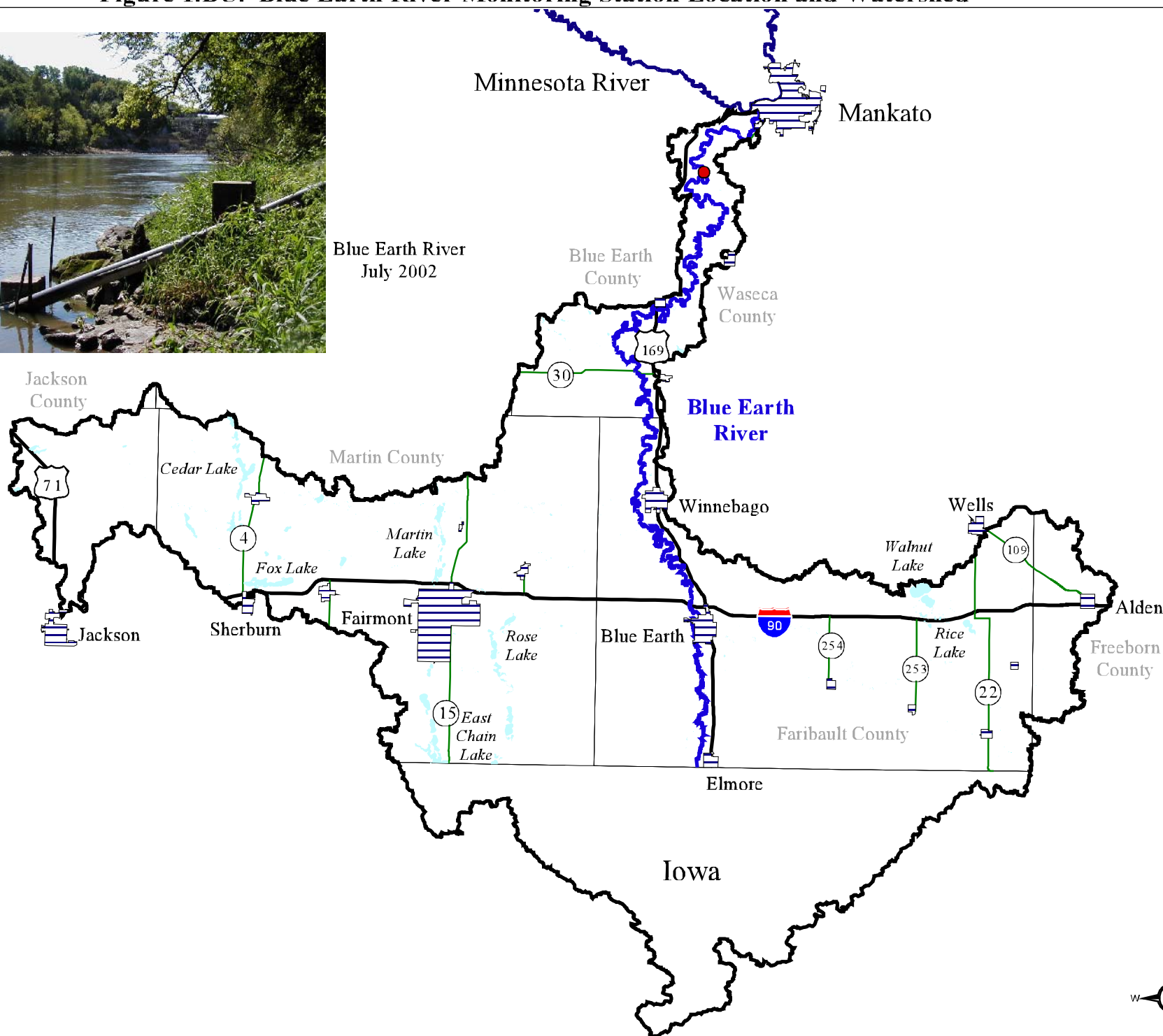


Figure 2. BU. Blue Earth River 2002 Hydrograph with Rainfall and Sampling Information

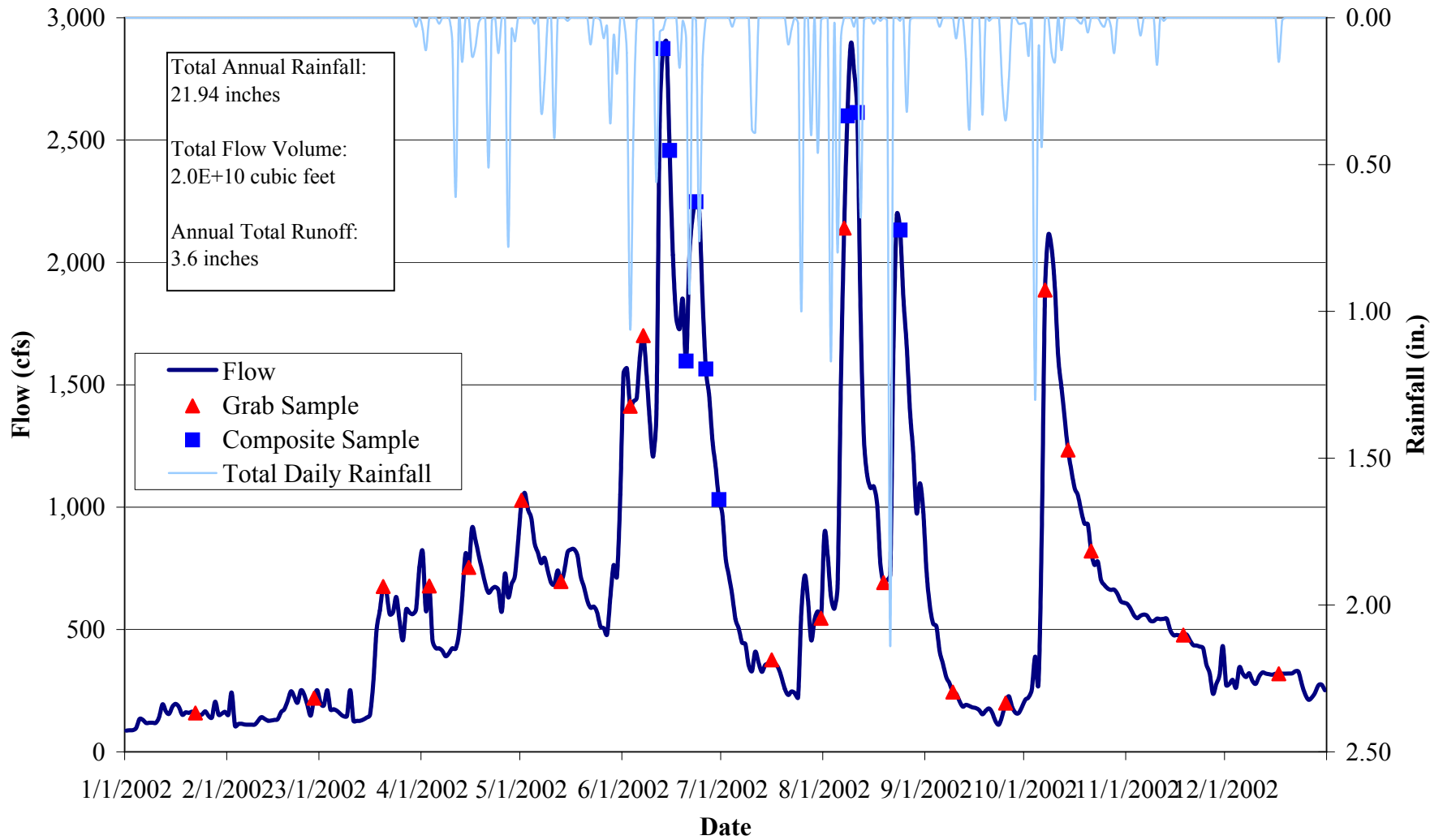


Table 2.BU. Blue Earth River 2002 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	26	27	25	18	41	20	33	7
Hardness, mg/L	14	276	266	186	456	243	294	64
Cadmium, ug/L	10	0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1
Chromium, ug/L	10	1.0	0.7	0.3	3.1	0.4	1.3	0.9
Copper, ug/L	10	3.2	3.4	1.8	5.8	2.2	3.9	1.2
Lead, ug/L	10	0.8	0.6	0.1	2.4	0.2	1.1	0.7
Nickel, ug/L	10	5.0	4.8	3.4	7.7	4.4	5.5	1.2
Zinc, ug/L	10	5.0	4.6	1.3	12.0	2.3	7.2	3.3
Nitrogen, Total Kjeldahl, mg/L	29	1.22	1.20	0.45	2.50	0.98	1.45	0.42
Nitrogen, Total Nitrate, mg/L	29	8.37	8.40	0.73	15.60	4.70	12.10	3.97
Phosphorus, Total, mg/L	29	0.23	0.19	0.05	0.66	0.14	0.32	0.13
Phosphorus, Total Dissolved, mg/L	29	0.09	0.09	0.01	0.17	0.04	0.12	0.05
Solids, Total Suspended, mg/L	29	91	62	2	526	30	136	102
Solids, Volatile Suspended, mg/L	29	14	12	2	66	6	21	12
Turbidity, NTU	29	29	22	2	160	13	40	30
Transparency Tube, cm	20	18	13	2	60	11	21	15

N: Sample Count

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

STD: Standard Deviation

Table 3.BU. Blue Earth River 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)
Solids, Total Suspended	49,600	64	18	79
Phosphorus, Total	133	0.17	0.05	0.21
Phosphorus, Total Dissolved	53.3	0.07	0.02	0.08
Nitrogen, Total Nitrate+Total Nitrite	5,300	6.82	1.91	8.42

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

Figure 3.BU. Blue Earth River 2002 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

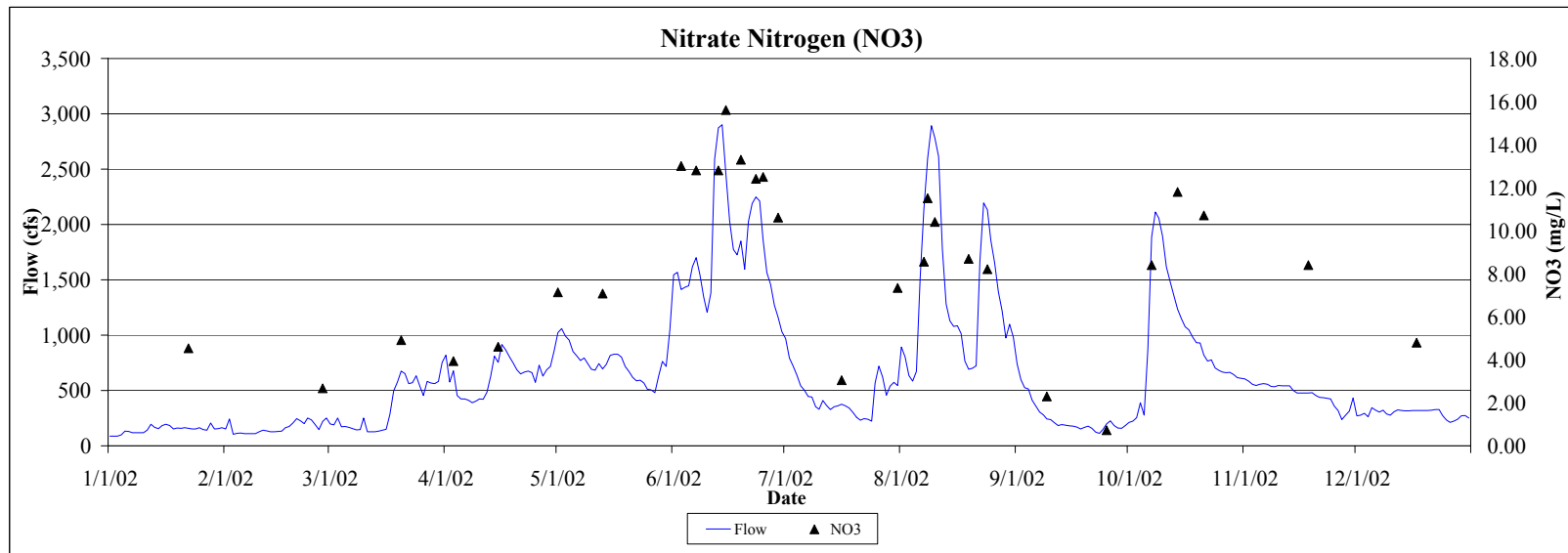
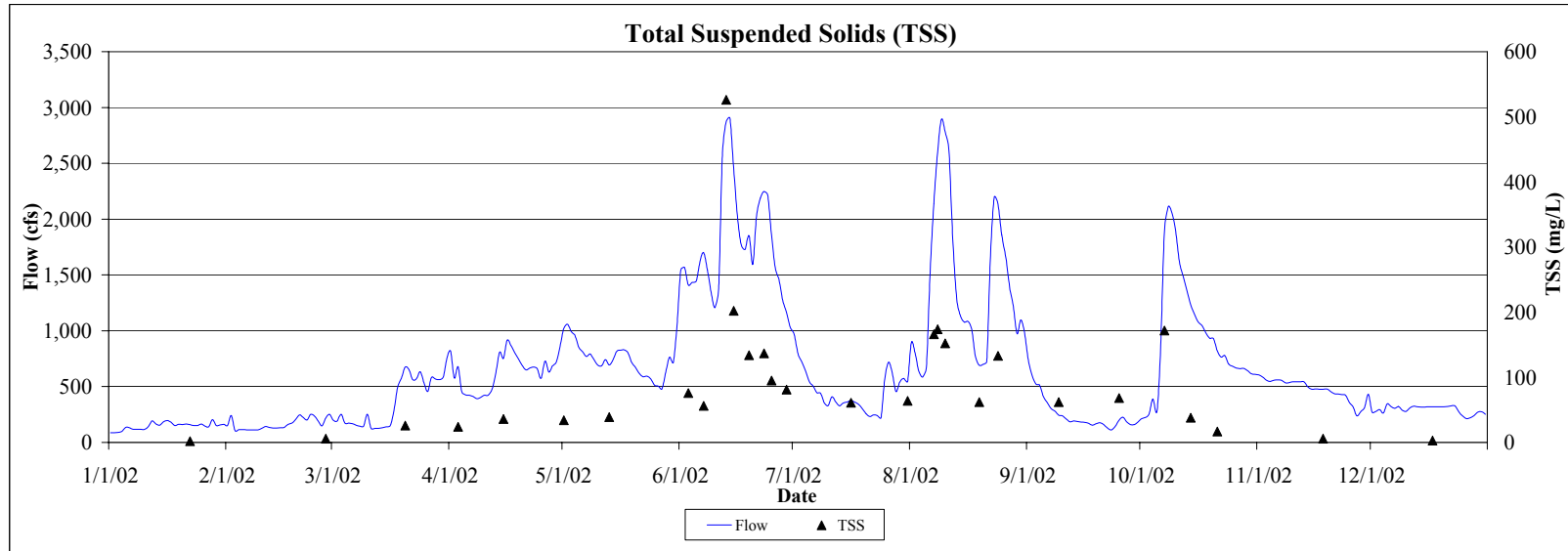


Figure 4.BU. Blue Earth River 2002 Hydrograph with Total and Dissolved Phosphorus Concentrations

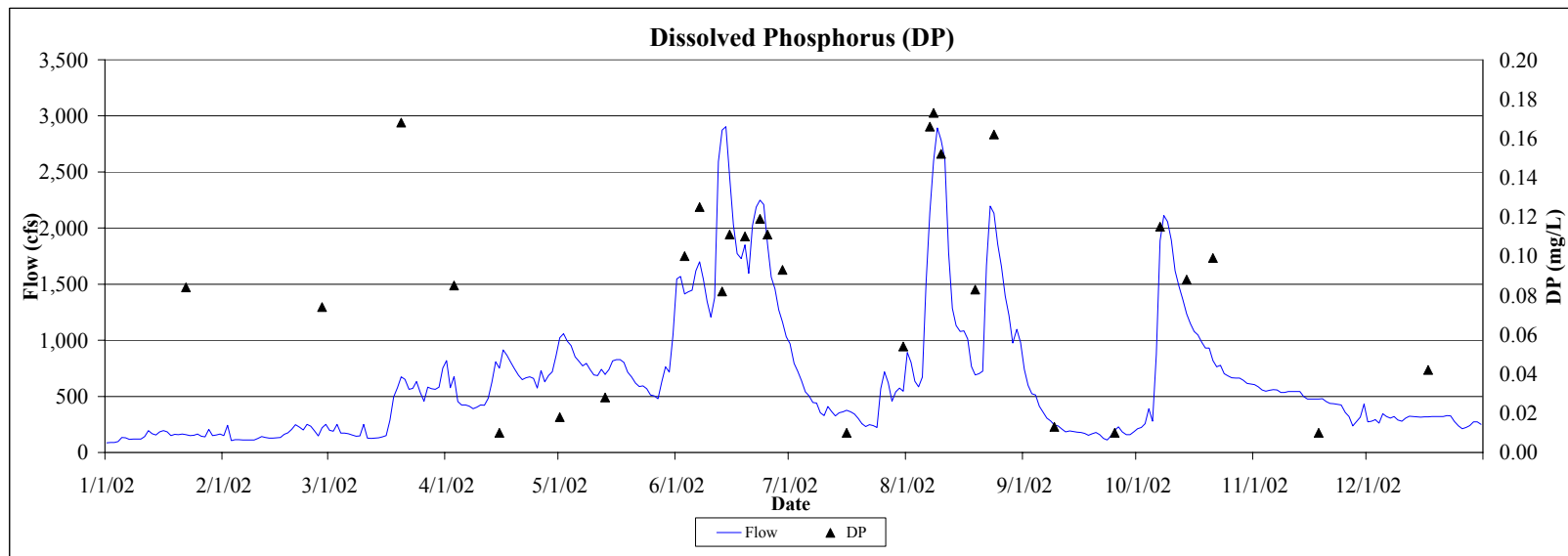
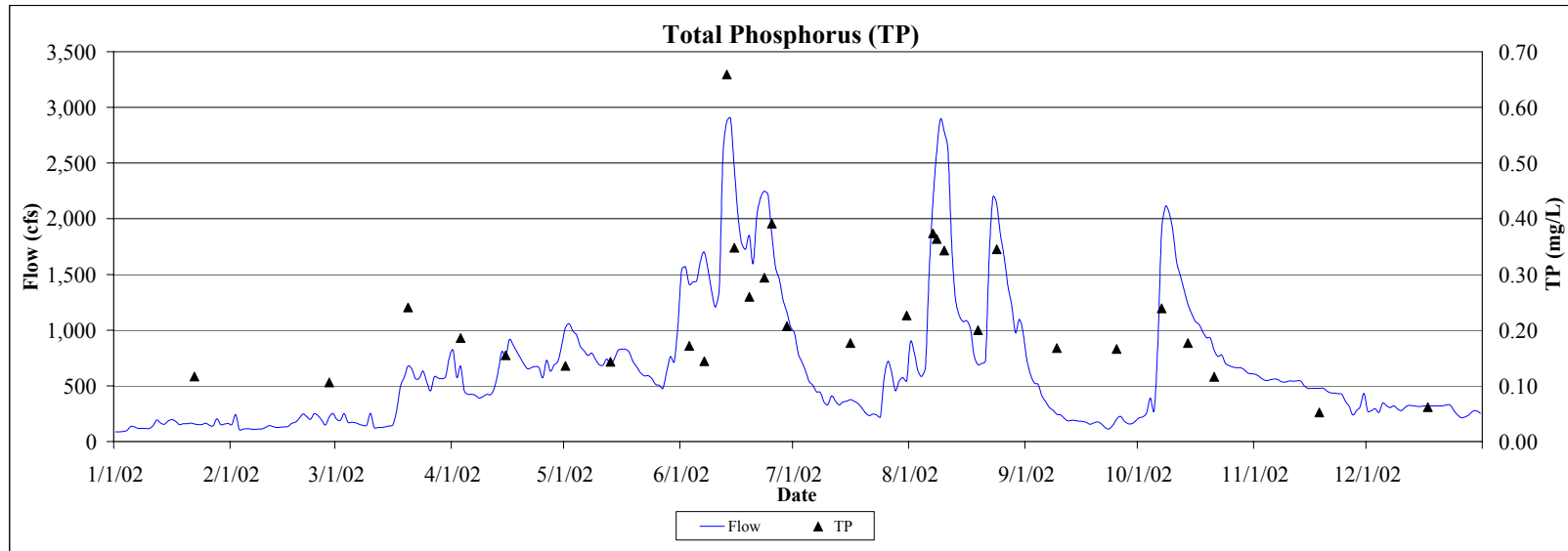


Table 4.BU. Blue Earth River: Comparison of 2001-2002 Hydrology and Water Chemistry

	2001	2002
Hydrology		
Total Precipitation (in)	26.13	21.94
Water Yield (in)	12.4	3.6
Total Volume (cf)	7.0E+10	2.0E+10
Annual Load (tons)		
Total Suspended Solids	449,000	49,600
Total Phosphorus	1,000	133
Total Dissolved Phosphorus	395	53.3
Total Nitrate + Total Nitrite Nitrogen	20,300	5,300
Annual Yield (lbs/acre)		
Total Suspended Solids	577	64
Total Phosphorus	1.29	0.17
Total Dissolved Phosphorus	0.51	0.07
Total Nitrate + Total Nitrite Nitrogen	26.1	6.82
Annual Normalized Yield (lbs/acre/in of water)		
Total Suspended Solids	47	18
Total Phosphorus	0.10	0.05
Total Dissolved Phosphorus	0.04	0.02
Total Nitrate + Total Nitrite Nitrogen	2.11	1.91
Flow-Weighted Mean Concentration (mg/L)		
Total Suspended Solids	206	79
Total Phosphorus	0.46	0.21
Total Dissolved Phosphorus	0.18	0.08
Total Nitrate + Total Nitrite Nitrogen	9.48	8.42

Table 5.BU. Blue Earth River 2002 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 11/4/2002

Class	Order	Family	Common Name	Life Stage	Organism Count
Hirudinea			Leeches		3
Insecta	Coleoptera	Elmidae	Riffle Beetles	Adult	1
Insecta	Coleoptera	Elmidae	Riffle Beetles	Larvae	1
Insecta	Coleoptera	Noteridae	Burrowing Water Beetles	Adult	1
Insecta	Diptera	Chironomidae	Midges	Larvae	15
Insecta	Diptera	Simuliidae	Black Flies	Larvae	6
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	Larvae	8
Insecta	Ephemeroptera	Ephemeridae	Common Burrowers	Larvae	1
Insecta	Ephemeroptera	Heptageniidae	Flatheaded Mayflies	Larvae	9
Insecta	Ephemeroptera	Leptophlebiidae	Pronggills	Larvae	1
Insecta	Hemiptera	Corixidae	Water Boatman	Larvae	4
Insecta	Plecoptera	Perlodidae	Perlodidae	Larvae	13
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygid Broadbacks	Larvae	17
Insecta	Trichoptera	Hydropsychidae	Common Netspinners	Larvae	23
Pelecypoda			Clams and Mussels		8

Macroinvertebrate Taxa Metrics

Total Taxa	15
EPT Taxa	7
% EPT Taxa	47
Diptera Taxa	2
% Diptera Taxa	13
Mean Tolerance Value	4.5

Macroinvertebrate Organism Metrics

Total Organisms	111
EPT Individuals	72
% EPT Individuals	65
Diptera Individuals	21
% Diptera Individuals	19
Chironomidae Individuals	15
% Chironomidae Individuals	14

Water Quality

Degree of Organic Pollution

Family-Level Biotic Index	4.2	Very Good	Possible slight organic pollution
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