

Table 1.CM. Carnelian-Marine Outlet Monitoring Station Information



Station Address: Little Carnelian Lake Outlet near Partridge Road, Stillwater, MN
County: Washington
Major Basin: St. Croix River Basin
Watershed: Carnelian Marine Watershed
Drainage Area: 30.05 square miles

Station Operator: Washington County Soil and Water Conservation District

Metropolitan Council Environmental Services Contact Information:

Contact Person: Casandra Champion
Address: 2400 Childs Road
St. Paul, MN 55106
Phone: 651-602-8745
E-mail: casandra.champion@metc.state.mn.us

Watershed District or Watershed Management Organization:

Carnelian Marine Watershed District

Station Overview: MCES has supported water quality monitoring of the Little Carnelian Lake Outlet since 1995. The monitoring station is located near Stillwater, Minnesota, about three miles upstream from the stream confluence with the St. Croix River. This stream flows from the outlet of Little Carnelian Lake and drains a large Washington County chain of lakes.

Composite samples for water chemistry analysis are not collected at this station because runoff events tend to be long and lake-attenuated, and therefore easily characterized by grab samples.

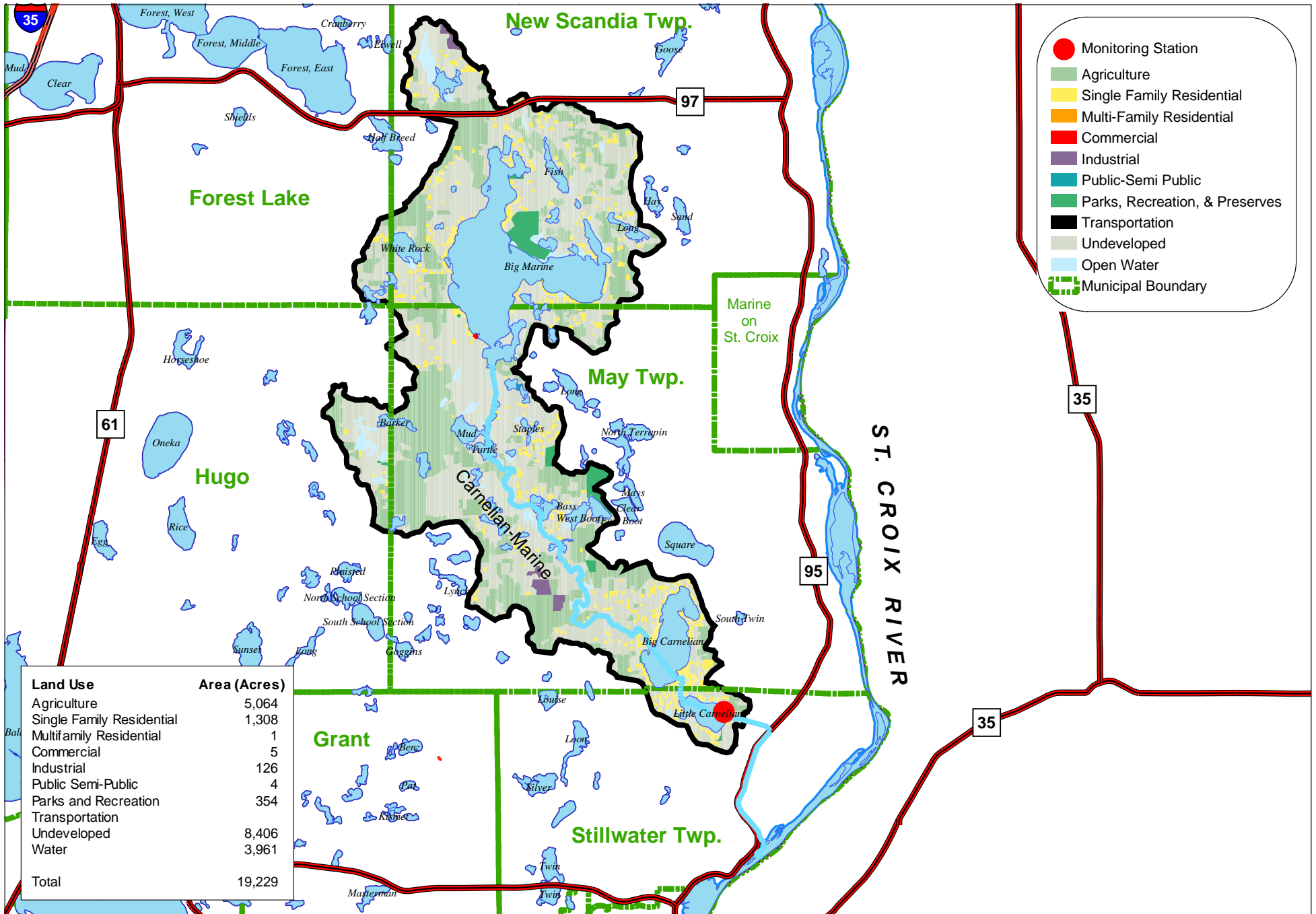
The rain gauge at this monitoring station collects rainfall data; however, supplemental winter precipitation data are obtained from the Minnesota Climatology Working Group, Stillwater Station Number 218037.

2002 Monitoring Year: The Little Carnelian Lake Outlet usually does not flow year around. In 2002, stream flow began on March 9 and continued through the end of the year. The peak daily average flow of 25 cfs occurred on October 19, 2002.

Twenty-four grab samples were collected for water quality analysis during 2002. 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). However, the MCES sampling scheme is modified for this monitoring station because of its unique hydrologic situation.

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

Figure 1.CM. Carnelian-Marine Monitoring Station Location and Watershed Characteristics



0 0.5 1 2 Miles



Figure 2.CM. Carnelian Marine Outlet 2002 Hydrograph, Precipitation and Sampling Information

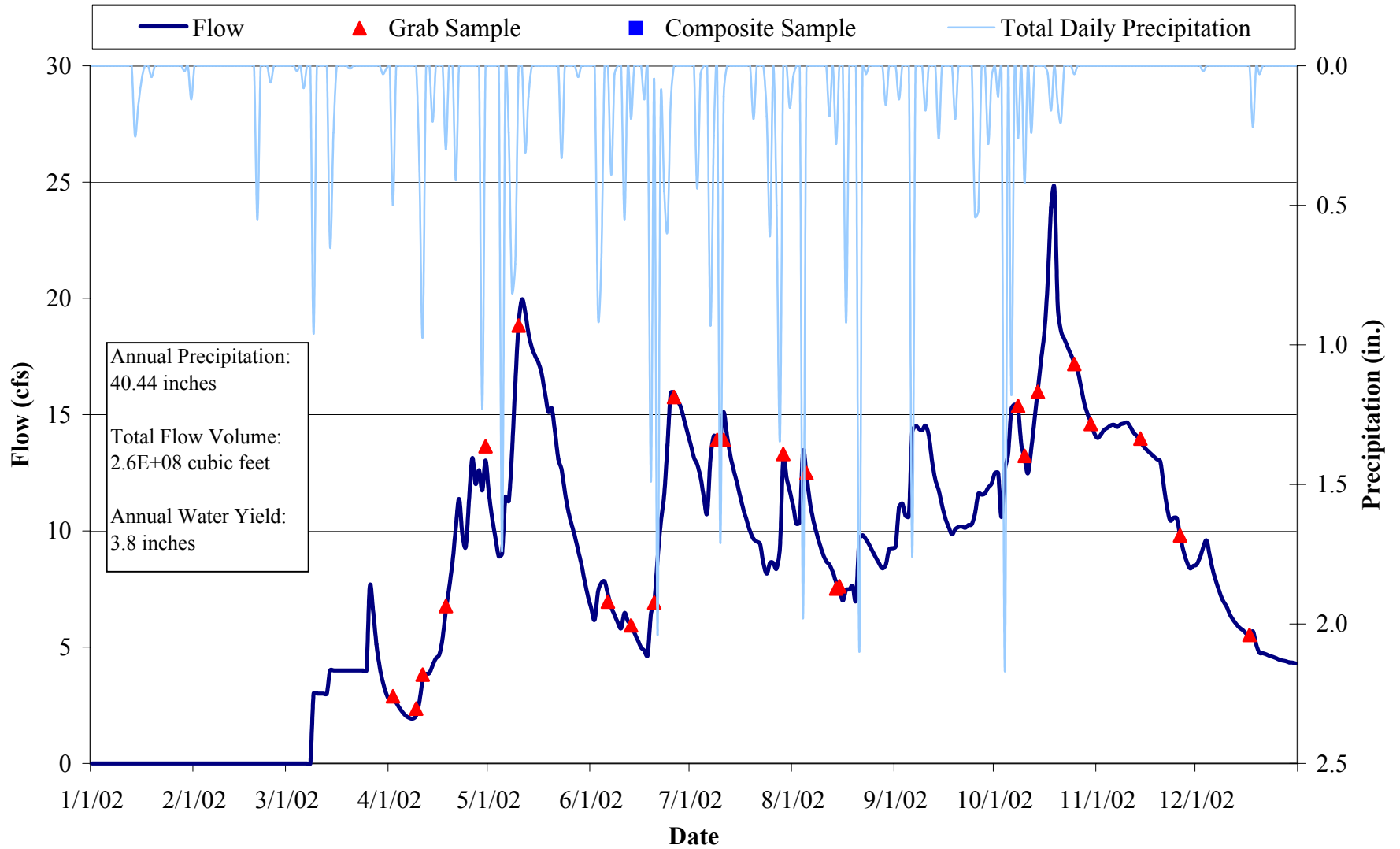


Table 2.CM. Carnelian-Marine Outlet 2002 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	19	8	9	2	10	8	9	2
Hardness, mg/L	19	106	112	16	122	104	115	23
Cadmium, ug/L	19	0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1
Chromium, ug/L	19	0.4	0.3	0.2	0.9	0.2	0.5	0.2
Copper, ug/L	19	1.5	1.2	0.7	6.8	0.8	1.5	1.3
Lead, ug/L	19	0.2	0.1	0.1	0.5	0.1	0.5	0.2
Nickel, ug/L	19	0.8	0.8	0.5	1.1	0.7	1.0	0.2
Zinc, ug/L	19	2.0	2.0	1.3	2.7	1.7	2.2	0.4
Total Kjeldahl Nitrogen, mg/L	19	0.40	0.42	0.20	0.54	0.34	0.49	0.09
Total Nitrate Nitrogen, mg/L	19	0.11	0.07	0.05	0.52	0.05	0.12	0.12
Total Phosphorus, mg/L	19	0.02	0.02	0.01	0.05	0.01	0.02	0.01
Total Dissolved Phosphorus, mg/L	19	0.01	0.01	0.01	0.02	0.01	0.02	<0.01
Total Suspended Solids, mg/L	19	3	2	1	13	2	3	3
Volatile Suspended Solids, mg/L	19	2	2	1	3	2	2	<1
Turbidity, NTU	19	1	1	1	2	1	1	<1

N: Sample Count

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

STD: Standard Deviation

Table 3.CM. Carnelian-Marine Outlet 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	21	2	1	3
Total Phosphorus	0.16	0.02	<0.01	0.02
Total Dissolved Phosphorus	0.09	0.01	<0.01	0.01
Total Nitrate Nitrogen	0.91	0.09	0.03	0.11

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

Figure 3.CM. Carnelian Marine Outlet 2002 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

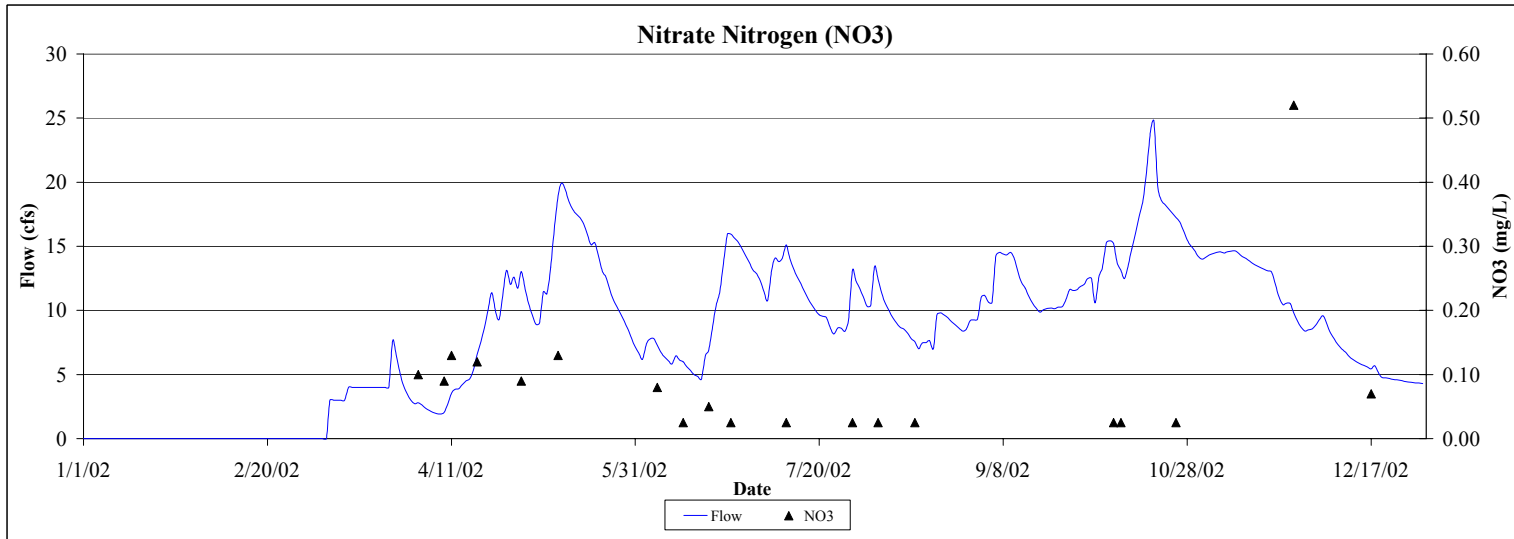
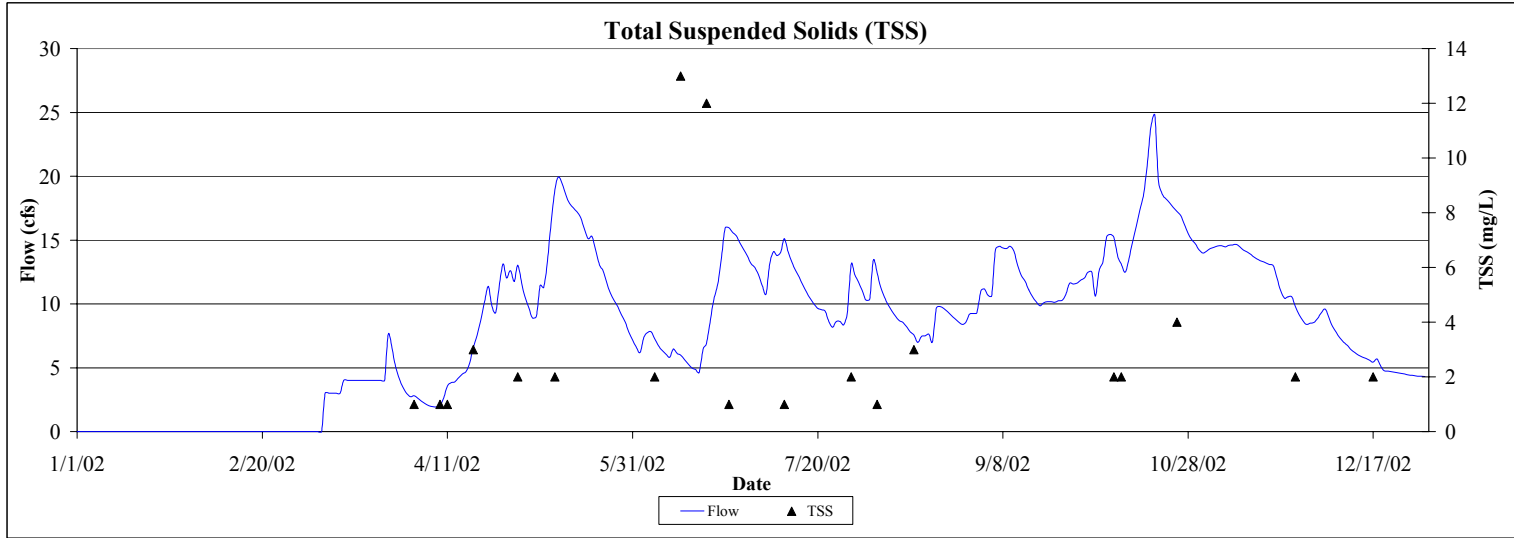


Figure 4.CM. Carnelian Marine Outlet 2002 Hydrograph with Total and Dissolved Phosphorus Concentrations

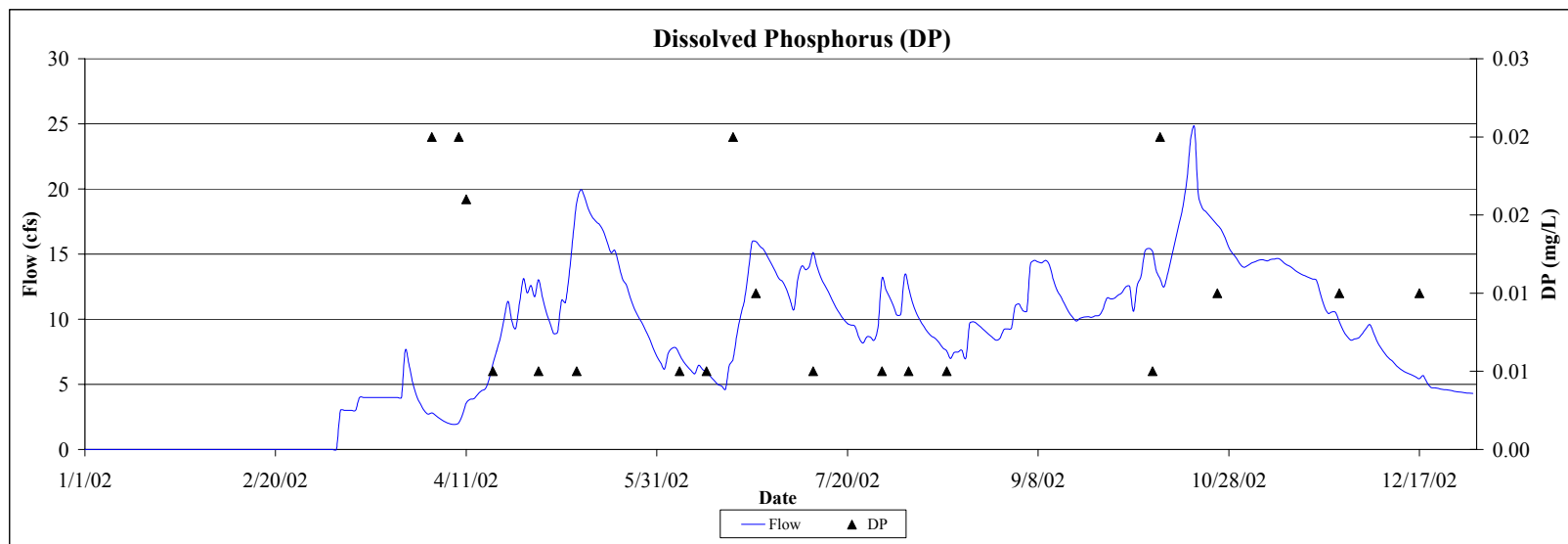
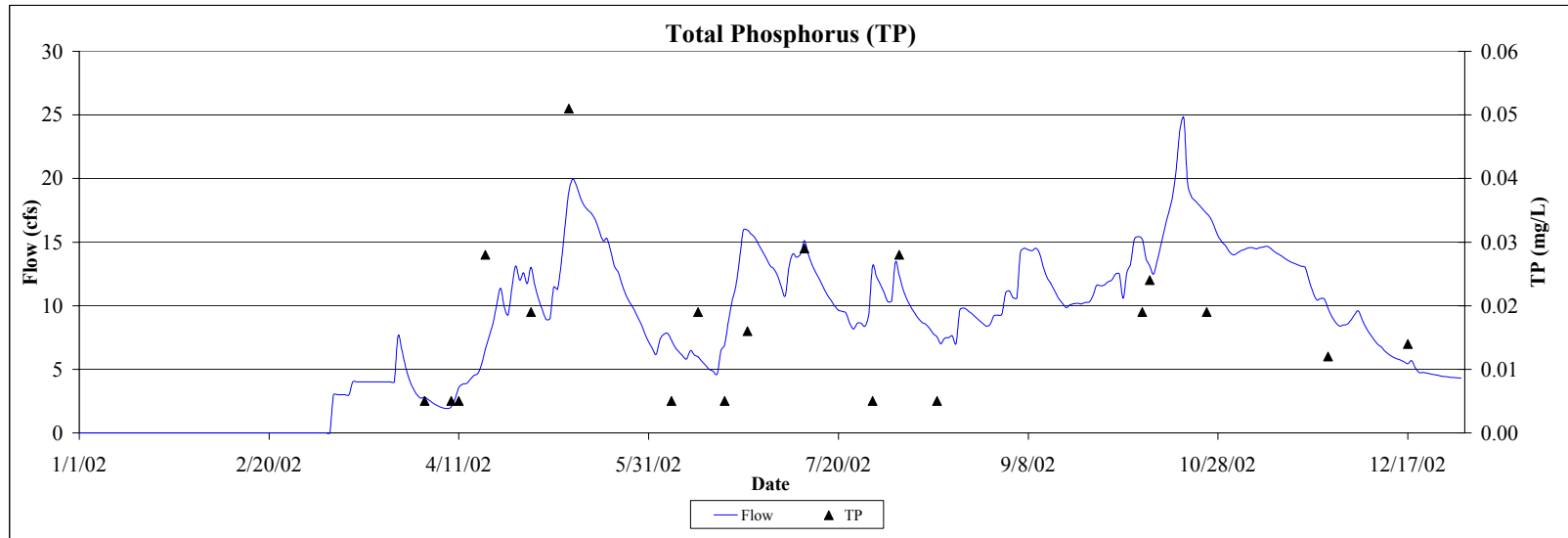


Table 4.CM. Carnelian Marine Outlet: Comparison of 2001-2002 Hydrology and Water Chemistry

	2001	2002
Hydrology		
Total Precipitation (in)	29.75	36.92
Water Yield (in)	2.5	3.8
Total Volume (cf)	1.8E+08	2.6E+08
Annual Load (tons)		
Solids, Total Suspended	14	21
Phosphorus, Total	0.15	0.16
Phosphorus, Total Dissolved	0.06	0.09
Nitrogen, Total Nitrate	0.91	0.91
Annual Yield (lbs/acre)		
Solids, Total Suspended	1	2
Phosphorus, Total	0.02	0.02
Phosphorus, Total Dissolved	0.01	0.01
Nitrogen, Total Nitrate	0.09	0.09
Annual Normalized Yield (lbs/acre/in of water)		
Solids, Total Suspended	1	1
Phosphorus, Total	0.01	<0.01
Phosphorus, Total Dissolved	<0.01	<0.01
Nitrogen, Total Nitrate	0.04	0.03
Flow-Weighted Mean Concentration (mg/L)		
Solids, Total Suspended	2	3
Phosphorus, Total	0.03	0.02
Phosphorus, Total Dissolved	0.01	0.01
Nitrogen, Total Nitrate	0.16	0.11