Task 3.2

Quarterly Status Report # 5

for the project entitled

Dairy Best Available Technologies in the Okeechobee Basin

(SFWMD Contract No. C-11652)

Submitted by

SWET, Inc.

Soil and Water Engineering Technology, Inc.

In Association With

MOCK•ROOS

CH2M HILL

ENTEL

November 6, 2003

The SWET Team

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Introduction

This is the fifth quarterly status report for the Dairy Best Available Technologies (BAT) project. This report covers two quarters from April 1, 2003 through September 30, 2003. The primary activities during these two quarters have been the construction of the three edge-of-farm treatment systems at the dairies, completing the RFP process for Amendment 1, conducting routine monitoring, and analyzing the monitoring data. Table 1 shows the status of each individual task.

Monitoring Activities and Problems Encountered

Monitoring has continued successfully, but as noted in the previous status reports, flow measurement has been continued to be hampered by the lack of sensitivity of the velocity meters due to clear water conditions. The filtering processing has been working quite well, so it has been decided to continue using this technique for now, but a more in depth evaluation of other possible analysis techniques will be done during the final assessment of the data. Because the District is also using similar monitoring equipment, their staff will be consulted as to other analysis techniques. If a better analysis technique is found, then all of the data will be redone using it.

During May and June two of the duplicate samples came back from the laboratory (Severn Trent Services Laboratory) with high differences. This was the same period that the District informed us that they had a QC concern with this particular laboratory. The laboratory was contacted and they indicated that the problem was fixed and subsequent QC samples have been fine. Therefore, it was decided to continue with the same laboratory.

The flow to sites KREA 41 and 41B at Butler Dairy was diverted to the site 41A during May and therefore the two sites were no longer needed. These sites were removed on May 27th. Site KREA 32B at Dry Lake Dairy was taken out of service on September 9th due to construction activities and will be replaced as soon as the new culvert has been installed and the area stabilized.

On July 1 site KREA 41A was temporarily knocked out of service because the in-stream transducers and control section were destroyed by a ditch cleaning crew. The site was quickly repaired requiring the replacement of the transducers and inlet tube. The site was back in service on July 12th. The ditch cleanout clearly lowered water levels and increased velocities. The new transducer was found to have a diurnal noise cycle for the stage reading, which needed to be corrected during data processing. Field verification found that the true stage was 0.4 feet lower than the minimum of the fluctuations. The transducer's problem could not be resolved so the transducer was replaced. During the period the stage data would have lower confidence.

TABLE 1. STATUS REPORT
FOR
DAIRY BEST AVAILABLE TECHNOLOGIES PROJECT
September 30, 2003

TASK NO PHASE I	TASK / DELIVERABLES DESCRIPTION	SCHEDULED COMPLETION DATE	STATUS
1	**Development of Goals, Performance Measures and Potential Impacts**		
	1.1 Project Kick-Off Meeting	11/9/2000	Completed
	1.2 Develop Draft Goals, Potential Impacts/Performance Measures and Evaluation Method	12/2/2000	Completed
	1.3 Conduct and Submit Literature/Data Search and Summary	1/2/2001	Completed
	1.4 Submit Final Goals, Potential Impacts/Performance Measure and Evaluation Method	2/2/2001	Completed
2	**Assessment and Selection of Project Sites**		
	2.1 Ranking and Selection of Dairy Sites	2/2/2001	Completed
	2.2 Development of Landowner Agreements	4/2/2001	Completed
	2.3 Develop and Submit Draft QAPP and Monitoring Plans	6/2/2001	Completed
	2.4 Formulate Technology Alternatives and Submit Draft Report	6/2/2001	Completed
	2.5 Finalize and Submit Final QAPP and Monitoring Plans for Existing Dairy Conditions	8/2/2001	Completed
	2.6 Finalize Technology Alternatives and Submit Final Report	8/2/2001	Completed
	2.7 Complete Evaluation of Alternatives and Submit Draft Report	9/2/2001	Completed
	2.8 Develop and Submit Draft CNMPs for the Three Selected Dairies	10/2/2001	Completed
	2.9 Prepare for and Conduct One Stakeholders Meeting	10/2/2001	Completed
	2.10 Finalize the Evaluation of Alternatives and Submit Final Report	11/2/2001	Completed
	2.11 Finalize the CNMPs for the Three Selected Dairies and Submit Final Report	11/2/2001	Completed
	2.12 Governing Board Presentation	11/2/2001	Completed
	STOP/GO DECISION POINT for Phase II		
PHASE II	(Requires Governing Board Approval)		
3	**Implementation and Monitoring of Alternatives**		
	3.1 Farm Level P Load Monitoring		
	3.1.1 Equipment purchase (up to a total of 9 sites)	11/2/2001	Completed
	3.1.2 Install and Test Monitoring Stations (9 stations assumed)	11/2/2001	Completed
	3.1.3 Conduct Routine Field Monitoring Activities - TP (52 Biweekly trips from RPB)	Starting 11/2/2001	Started 5/1/02
	3.1.4 Laboratory Analyses (assume 9 biweekly samples for 52 trips TP @$15/sam.)*	Starting 1/2/2002	Started 5/1/02
	3.1.5 Labor & Lab for 9 monthly samples for 24 mo. Fecal and TSS @ $45/sample *	Starting 1/2/2002	Started June, 2002
	3.2 Preparation and Submittal of Quarterly Reports	Starting 11/2/2001	Fifth/Sixth Quarterly Reports
	3.2.A Amendment No. 1	1/15/2004	To be scheduled
	3.3 Develop Draft Vendor Project Documents	1/2/2002	Completed
	3.3.A Amendment No. 1	7/2/2003	Completed
	3.4 Finalize Vendor Project Documents	3/2/2002	Completed
	3.4.A Amendment No. 1	8/1/2003	Completed
	3.5 Draft Implementation Plan for Selected Technologies	3/2/2002	Completed
	3.5.A Amendment No. 1	3/1/2004	In Process
	3.6 Draft Monitoring Plan for Selected Technologies	3/2/2002	Completed
	3.6.A Amendment No. 1	2/1/2004	To be scheduled
	3.7 Development of the Final Implementation Plan for Selected Technologies	5/2/2002	Completed
	3.7.A Amendment No. 1	5/1/2004	To be scheduled
	3.71 Cost of Implementing Vendor Technology	Starting 5/2/2002	Completed
	3.7.1.A Amendment No. 1	5/1/2004	To be scheduled
	3.72 Review and Inspect Vendor Construction Activities	Starting 5/2/2002	In Process
	3.7.2.A Amendment No. 1	Starting 5/1/2004	To be scheduled
	3.7.3 Vendor Payments	Starting 5/2/2002	In Process
	3.8 Final Monitoring Plan for Selected Technologies	Starting 5/2/2002	In Process
	3.8.A Amendment No. 1	3/1/2004	To be scheduled
	3.8.1 Equipment Purchase (up to a total of 6 sites)	6/2/2002	Completed
	3.8.1.A Amendment No. 1	3/1/2004	To be scheduled
	3.8.2 Install and Test Monitoring Stations	6/2/2002	2 sites completed
	3.8.2.A Amendment No. 1	5/1/2004	To be scheduled
	3.8.3 Conduct Routine Monitoring Activities - TP	Starting 8/2/2002	In Process
	3.8.3.A Amendment No. 1	5/1/2004	To be scheduled
	3.8.4 Laboratory Analyses TP	Starting 8/2/2002	In Process
	3.8.4.A Amendment No. 1	5/1/2004	To be scheduled
	3.9 Prepare for and Attend Bi-annual Site Meeting (5 qtrs)	Starting 8/2/2002	1 Meeting during period
	3.9.A Amendment No. 1	Starting 8/2/2004	To be scheduled
	3.10 Prepare for and Conduct Public Workshop	11/2/2002	To be scheduled
	3.11 Submit Workshop Minutes	12/2/2002	To be scheduled
4	**Evaluation of Alternatives Performance**		
	4.1 Prepare and Submit Draft Final Report	9/2/2003	To be scheduled
	4.2 Prepare for and Conduct Public Workshop	10/2/2003	To be scheduled
	4.3 Prepare and Submit Final Report and Associated Project Data	11/2/2003	To be scheduled
	4.4 Prepare and Submit Workshop Minutes	11/2/2003	To be scheduled

Analysis of Flow and Water Quality Data

The flow and water quality data for the monitoring sites has been analyzed (see Appendix A). Table 2 provides a summary of the estimated flow and phosphorus loads from the sites through the end of the reporting period. As previously noted, the estimated flow volumes are subject to error. All sites were functional during the 2nd and 3rd quarter this year, with the exception of KREA 41 and KREA 41B, which were removed in late May, 2003. In addition, KREA 32B was taken offline on September 9, 2003 due to earthwork at the site.

Flow has been recorded at all sites except for Site KREA 41, which had no flow during the period of record. The transducer at Site KREA 41 is approximately 2 feet below the overflow weir crest; the indicated low stages were never high enough to cause flow.

Monthly, all entered water quality data and downloaded velocity and depth data were processed through the EXCEL data management spreadsheet which checks the QC samples and calculates the flow and P loads. The spreadsheet plots all the data for a visual inspection and validation. An important data management function of cleaning the very noisy velocity data is performed in a spreadsheet. The filtering process is done by developing a stage to velocity relationship using data from stable periods of record. This function is used to fill missing periods of record. During noisy periods a moving average of the maximum flow values is used because most of the noise is caused by the clean water conditions dropping signal levels to zero. As noted earlier this method has worked well, but if a better analysis technique is found then all data will be redone using it.

The phosphorus data (Figure A-27) are consistent with District data measured at the same locations. The phosphorus data are also presented on the flow plots Figures (A-3 to A-26) to show the sample compositing period and how the phosphorus concentrations relate to flow. Fecal coliform levels (Figure A-28) are generally very low except for a few sites (note, site KREA 32B had a very high single spike in the first quarter) that have animal grazing around or just upstream of the site. At most of the sites, the level of total suspended solids (TSS) levels are low (Figure A-29), but are similarly correlated with nearby animal grazing.

The equipment blanks (Table 3) analyzed as part of the quality assurance program were all below detectable limits during this reporting period, which indicate excellent field protocol. With the exception of two samples at site KREA 41A, as noted in the previous section “Monitoring Activities and Problems Encountered”, results from duplicate samples have been acceptable, see Table 4.

Table 2. Summary of Flow and P Concentration Data for Dairy BAT Monitoring Sites
All site data is averaged for the period of 3/02 through 9/03, except for KREA 41 and 41B which are through 5/03.

Dairy Name	Davie Dairy			Butler Oak Dairy				Dry Lake Dairy	
Site Name	Davie South	Davie North	Davie East	KREA 41	KREA 41A	KREA41B	KREA10D	KREA 32B	KREA 49A
Volume (ac-in)	104456	11747	37598	0	53655	149	33869	8249	8989
Runoff (in)	41.78	36.25	37.59	0.00	25.06	1.84	22.58	21.37	29.96
Runoff (in/yr)	28.26	24.44	25.43	0.00	16.49	1.63	15.27	14.54	21.22
Area (ac)	2500*	324	1000*	20	2141*	81	1500*	386	300
P load (lbs)	34770	11129	3528	0	23060	341	9712	6292	9125
Flow Avg P (ppm)	1.47	4.18	0.41	4.48	1.90	10.08	1.27	3.36	4.48

* Areas have been updated based on more recent assessments.

Table 3. Results of the Equipment Blanks for the Project to Date

Site	Date	Time	Duplicate	Total P (mg/l)	Fecal Coliform (mg/l)	TSS (mg/l)
#1	7/31/2002	8:00		BDL	BDL	BDL
#2	7/31/2002	14:45		BDL	BDL	BDL
#1	8/7/2002	0:00		BDL		
#2	8/7/2002	0:00		BDL		
#1	8/21/2002	0:00		BDL	BDL	BDL
#2	8/21/2002	0:00		BDL	BDL	BDL
#1	8/27/2002	0:00		BDL		
#2	8/27/2002	0:00		BDL		
#1	9/11/2002	8:00		BDL	BDL	BDL
#2	9/11/2002	15:20		BDL	BDL	BDL
#1	11/21/2002	0:00		BDL	BDL	BDL
#2	11/21/2002	0:00		BDL	BDL	BDL
#1	12/17/2002	0:00		BDL	BDL	BDL
#2	12/17/2002	0:00		0.692	270	4
#1	1/2/2003	0:00		BDL		
#2	1/2/2003	0:00		BDL		
#1	1/30/2003	0:00		BDL	BDL	BDL
#1	2/26/2003	1:00		BDL	BDL	BDL
#1	3/11/2003	8:25		BDL		
#1	3/20/2003	8:10		BDL	BDL	BDL
#1	4/21/2003	8:15		BDL		
#1	4/30/2003	8:35		BDL	BDL	BDL
#1	5/29/2003	13:25		BDL		
#1	6/30/2003	9:30		BDL	BDL	BDL
#1	7/30/2003	9:28		BDL	BDL	BDL
#1	8/18/2003	7:45		BDL	BDL	BDL
#1	8/26/2003	8:00		BDL		
#1	9/8/2003	9:05		BDL		
#1	9/30/2003	8:00		BDL	BDL	BDL
#1	10/22/2003	8:30		BDL	BDL	BDL
#1	11/7/2003	8:15		BDL		
#1	11/25/2003	0:00		BDL	BDL	BDL
#1	12/17/2003	10:00		BDL		
#1	12/30/2003	8:10		BDL	BDL	BDL
#1	1/19/2004	10:15		BDL		
#1	1/29/2004	8:45		BDL	BDL	BDL
#1	2/12/2004	8:00		BDL		
#1	2/24/2004	8:15		BDL	BDL	BDL
#1	3/12/2004	8:30		BDL		
#1	3/30/2004	8:55		BDL		BDL

Table 4. The Percentage Difference for Duplicate Samples Collected at the Same Time and Location

Davie T-Out		Davie South		Davie East		KREA 10D		KREA 41		KREA 41A		KREA 49A	
Date	% Diff	Date	% Diff	Date	% Diff	Date	% Diff	Date	% Diff	Date	% Diff	Date	% Diff
2/12/04	4.5%	7/31/02	-0.8%	9/30/03	0.0%	7/30/03	-5.1%	8/27/02	-2.2%	7/11/02	0.6%	7/24/02	-0.2%
		8/7/02	-1.9%			8/18/03	-2.3%			7/18/02	-1.6%	8/21/02	66.4%
		11/21/02	1.0%			11/7/03	-5.4%			9/11/02	0.0%		
						11/25/03	-2.1%			1/30/03	-4.5%		
						12/17/03	-1.0%			3/11/03	1.1%		
						12/30/03	2.8%			4/21/03	-3.6%		
						1/19/04	1.9%			5/29/03	-55.9%		
						1/29/04	7.6%			6/30/03	59.6%		
						2/24/04	0.0%			8/26/03	5.3%		
						3/12/04	8.1%			9/8/03	10.5%		
						3/30/04	-3.6%			10/22/03	-2.0%		

Vendor and Construction Progress

All three of the current dairy projects were in the construction phase of the project during these two quarters. A summary of the construction activities will be provided for each dairy.

Construction started at Davie Dairy during April and was 95 percent complete by the end of the third quarter. The access road from Berman Road was completed first and was topped with materials taken from the soils removed to contruct the floc pond. The diversion structure in Nubbin Slough was completed during August when the final gates were installed. The chemical injection building and all equipment have also been installed. The only major problem encountered that was quickly corrected was an erosion gully that was forming on the downstream side of the diversion structure. This gully was repaired and the area between the pond and diversion structure was re-graded to divert all surface runoff away from this area. As of September 30th the only remaining items to be completed at this site were final electrical work, soil stabilization around the pond area, and the construction of the diversion ditch to reroute sprayfield runoff upstream of the treatment area. These items will have to be completed before construction will be considered complete at this site.

Construction started at Butler Dairy during April and was about 75 percent complete by the end of the third quarter. The majority of the construction activity during the period was earthwork associated with the construction of the interior collection ditch along the south side of the farm, diversion ditch from the north side of property to the retention pond, raising and improving the dike around the retention pond, distribution ditches within the retention pond, the floc pond, and drying basin. All of the primary culverts were also installed. The chemical storage and injection building's slab was completed, but none of the chemical injection equipment has been installed. The modular two-pump unit at the floc pond has also been installed. The primary problems noted during site inspections were primarily associated with soil stabilization. Due to heavy rains during the construction period, severe erosion of ditch and dike banks has occurred and will need to be addressed. Critical area sodding was not done in a timely fashion and therefore added to the degree of erosion that has occurred. The vendor was starting repairs at the end of the period and intended to have all areas stabilized within a few weeks. As of September 30th the remaining items to be completed at the site are: stabilization of soils, chemical injection and storage building, electrical, recycle line to waste pond, flapper gate on north diversion ditch, access road improvement, roof over pumps, and tying in to farm's existing irrigation system.

Construction started at Dry Lake Dairy during May and was about 75 percent complete by the end of the third quarter. The majority of the construction activity during the period was earthwork associated with the construction of the retention pond dike, bypass ditch, and the alum floc ponds. Ditch and dike bank soil stabilization was a major concern and was not yet completed by the end of the period. All culverts except a cattle crossing culvert and the bypass culvert by the pump station have been installed. The concrete pad, pump, and diesel power unit are in place, but not connected. The floc pond

inlet and outlet culvert were installed, but the chemical storage and injection building and equipment were not yet installed. The electrical work for the injection system will not be done until after the building and equipment are completely installed.

A summary of the costs by the vendors to date is provided in Table 3. MWBE forms have been submitted as required. The majority of the costs during this period have been for actual construction. Table 4 provides an adjusted project schedule.

Table 3. Invoiced Expenditures for Vendors through September 15, 2003

Vendor Name	Percentage	Invoiced through September 15, 2003
Engineering & Water Resources, Inc.	69%	$397,623.20
CDM	97%	$555,791.68
Environmental Research & Design	94%	$543,361.76
Total	**87%**	**$1,496,776.64**

Table 4. EOF Implementation Schedule

Tasks	Schedule 2003/2004						
	Sept	Oct	Nov	Dec	Jan	Feb	March
Construction							
Substantial completion							
Completion of construction							
System Startup and Testing							
Monitoring plan and installation							
Monitoring started							

Permitting Issues

All necessary permits have been received for the project. No permitting issues arose during this period. It should be noted though that the gopher tortoise relocation permit for Butler had to be renewed just prior to the reporting period. Traps were set out for the tortoises, but none were found in the project area, so none had to be relocated. Note that over $10,000 was expended in conjunction with the tortoise relocation efforts.

APPENDIX A

FLOW AND WATER QUALITY DATA FOR MONITORING SITES

List of Figure

Figure A-1. Davie North - Stage

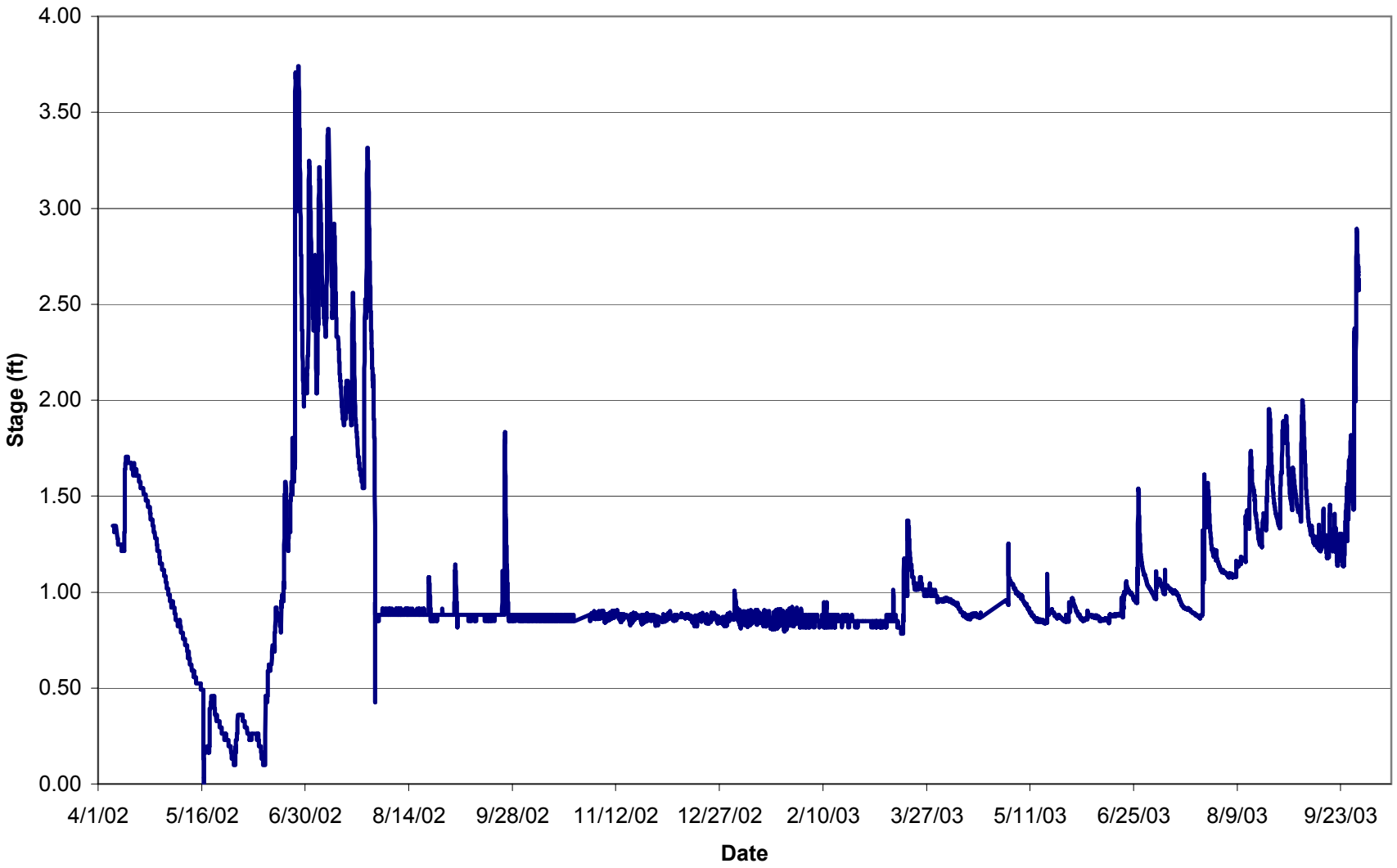


Figure A-2. Davie North - Velocity

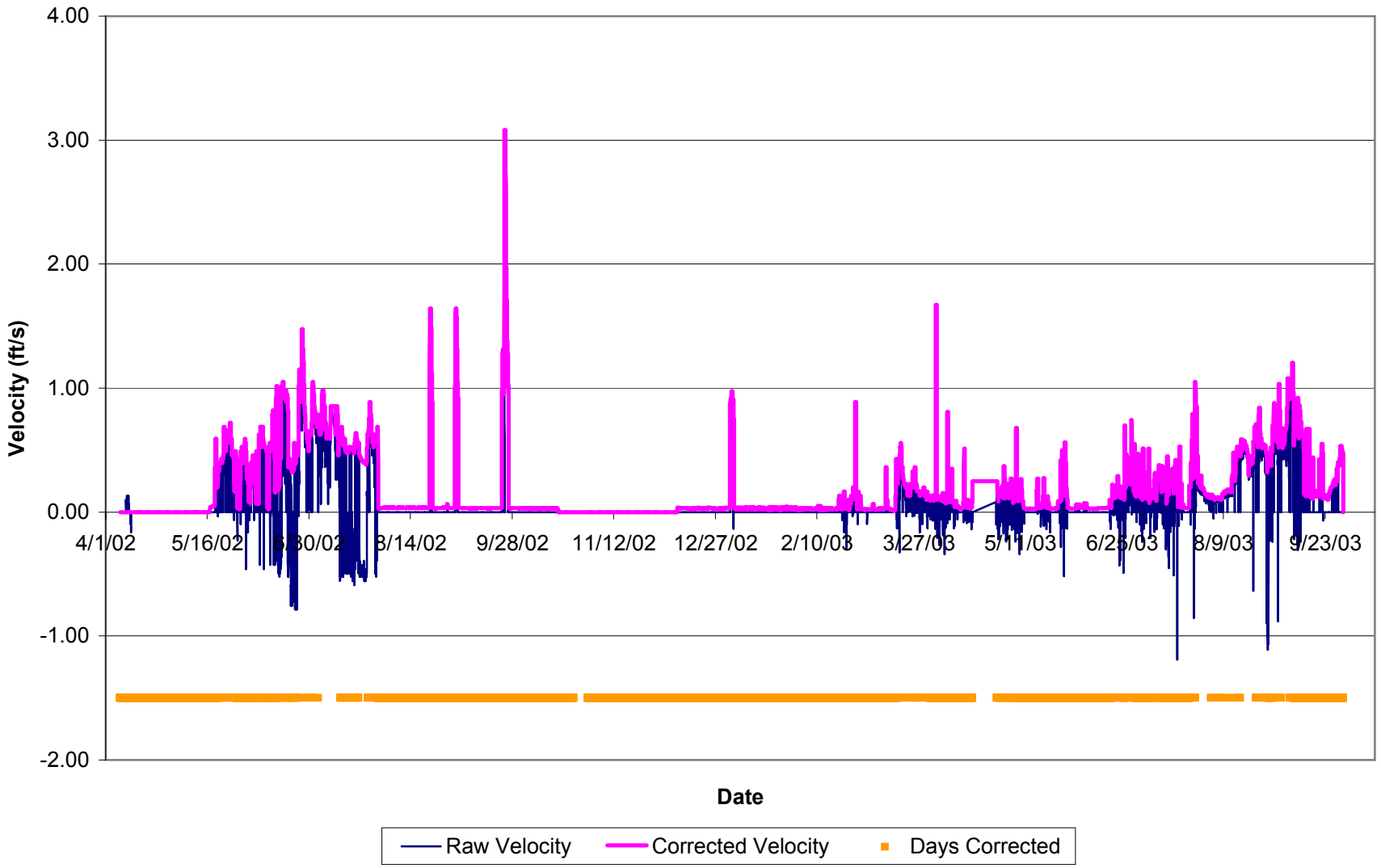


Figure A-3. Davie North - Flow and P Concentration

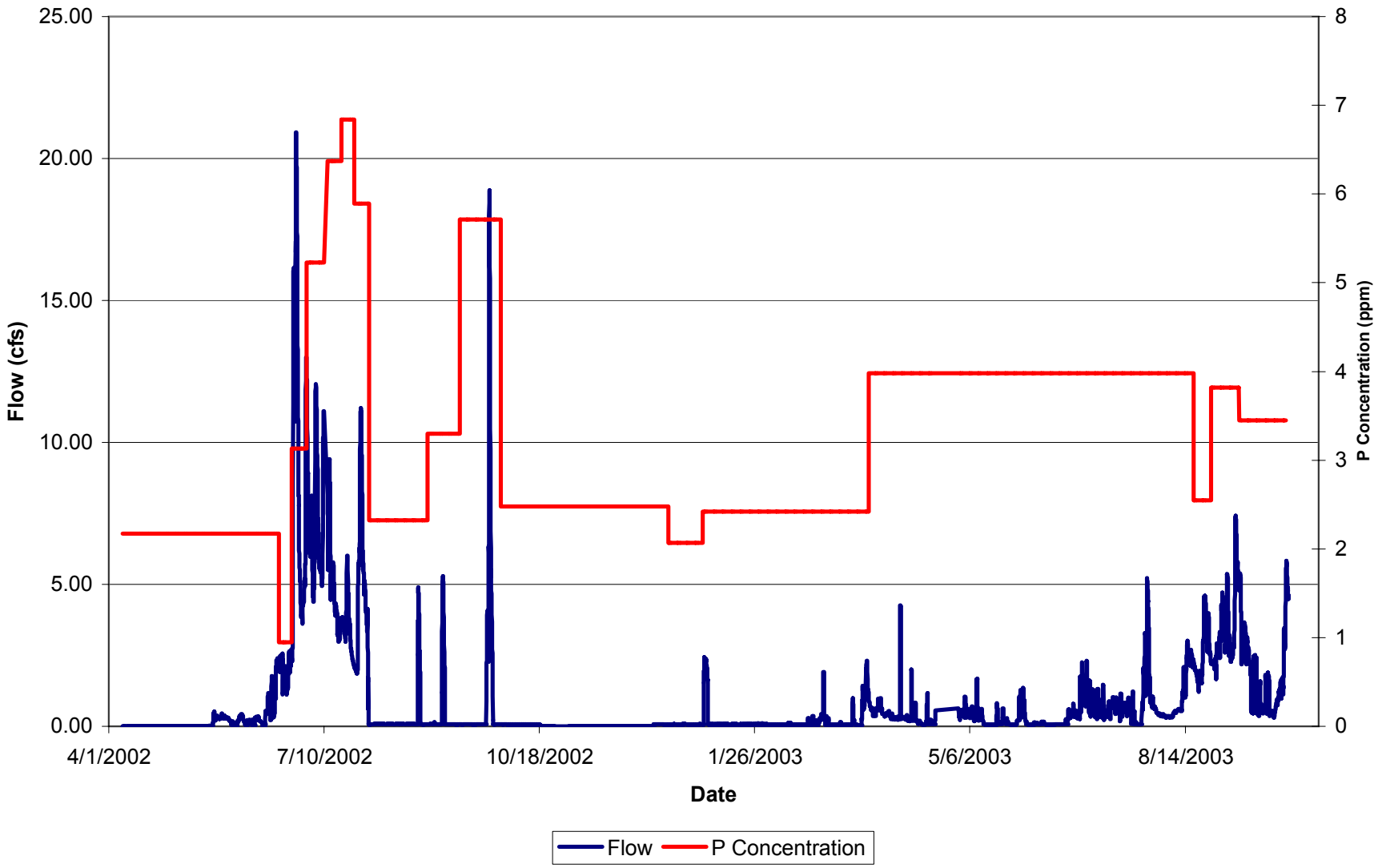


Figure A-4. Davie East - Stage

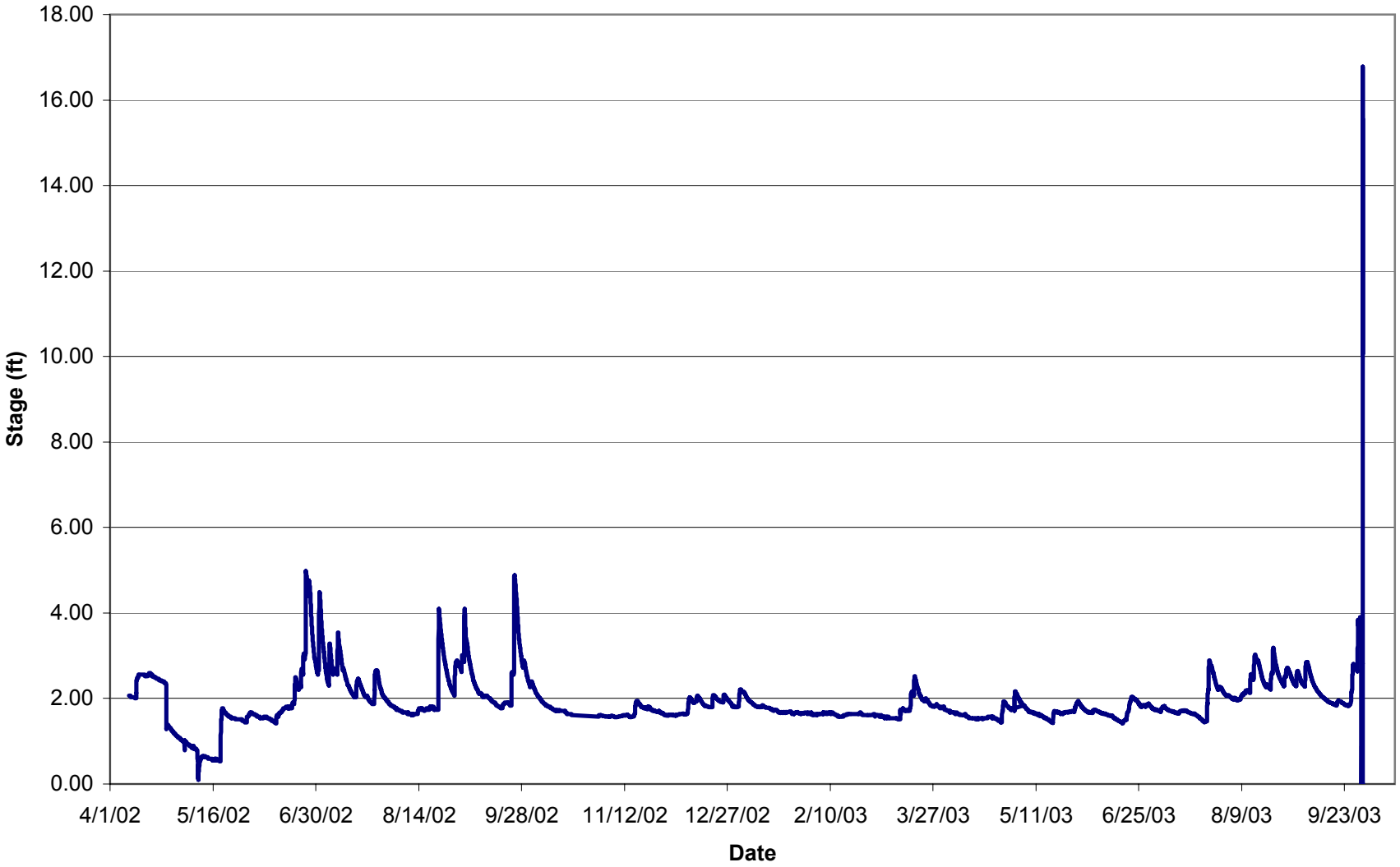


Figure A-5. Davie East - Velocity

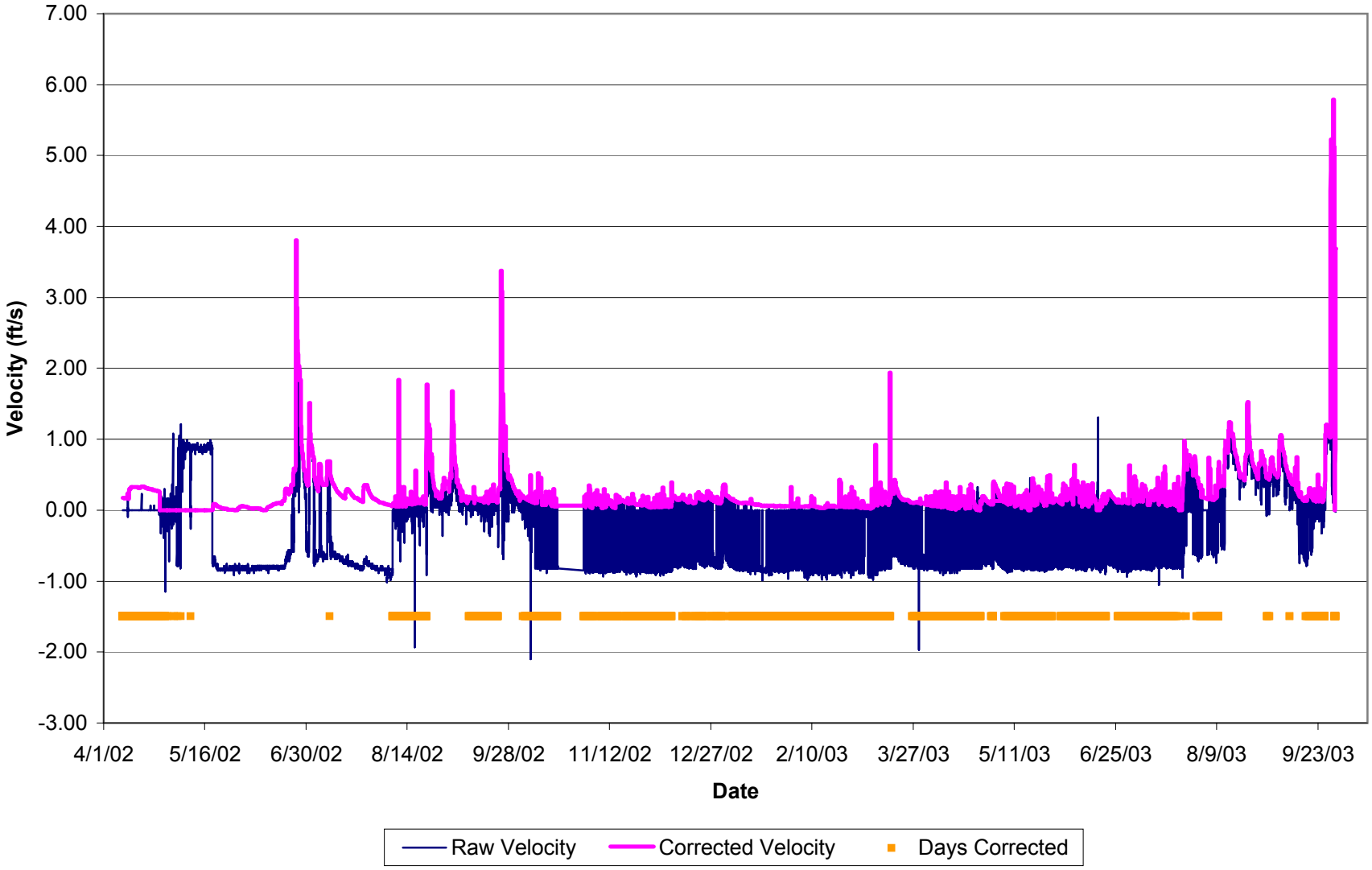


Figure A-6. Davie East - Flow and P Concentration

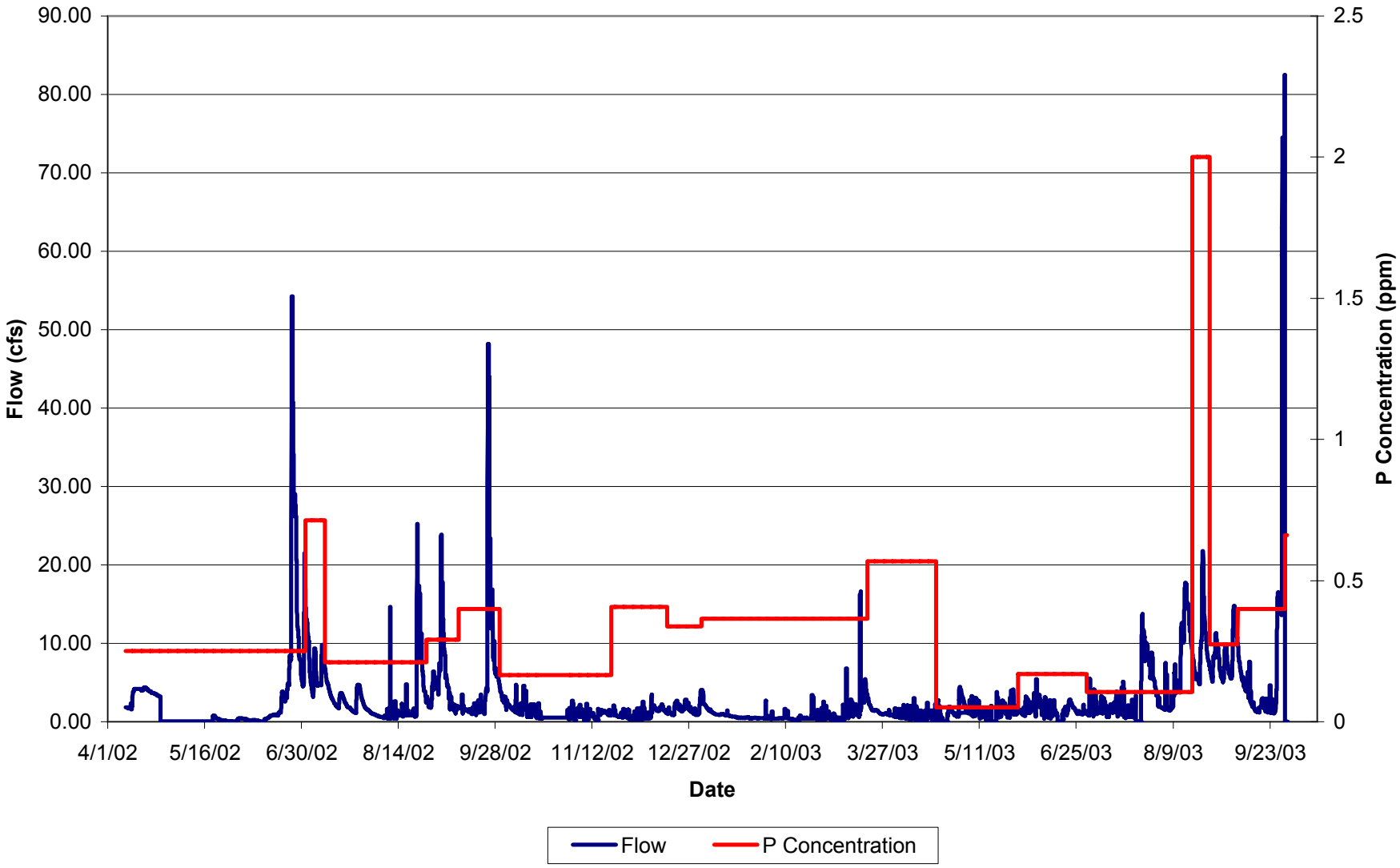


Figure A-7. Davie South - Stage

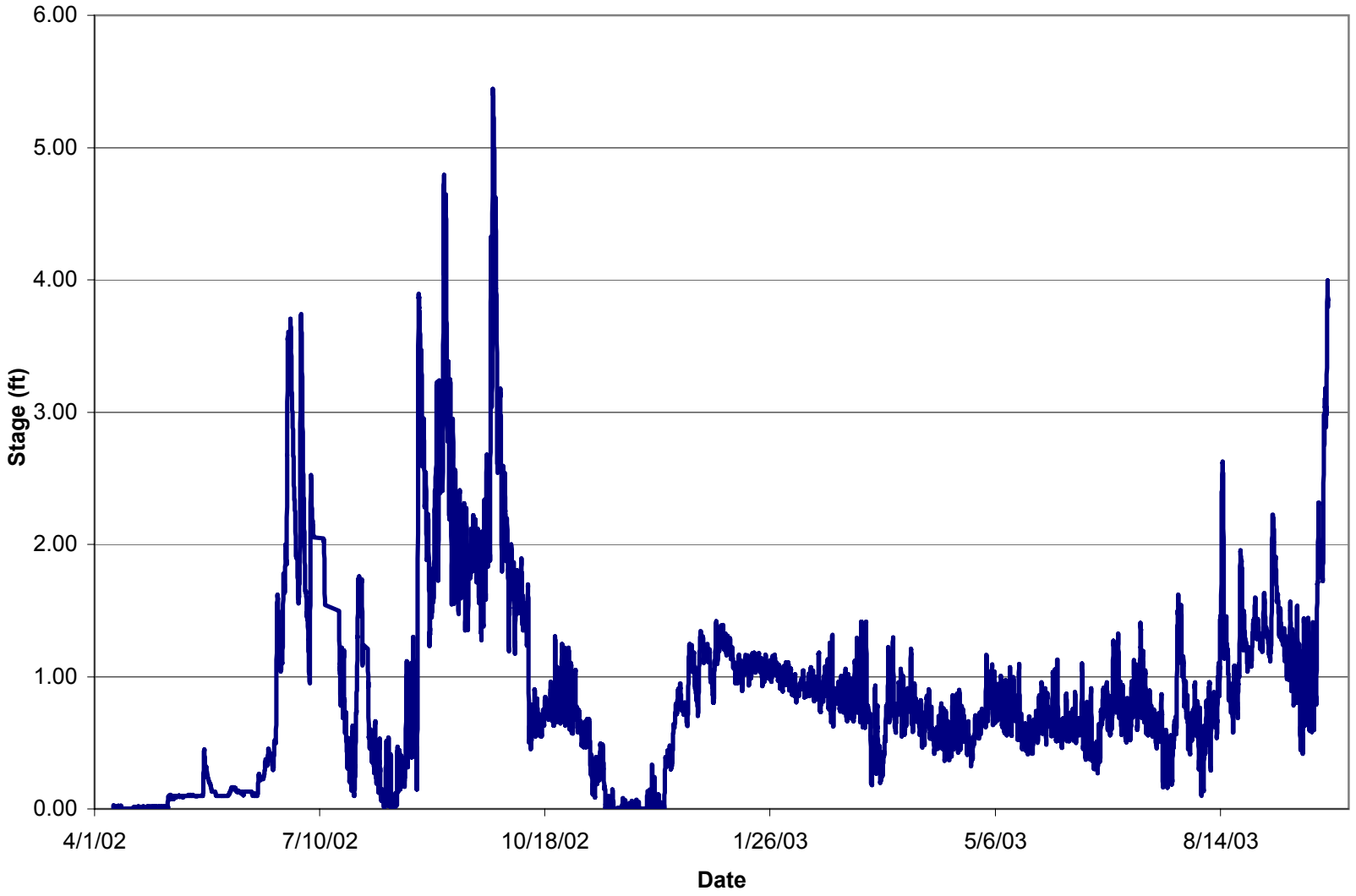


Figure A-8. Davie South - Velocity

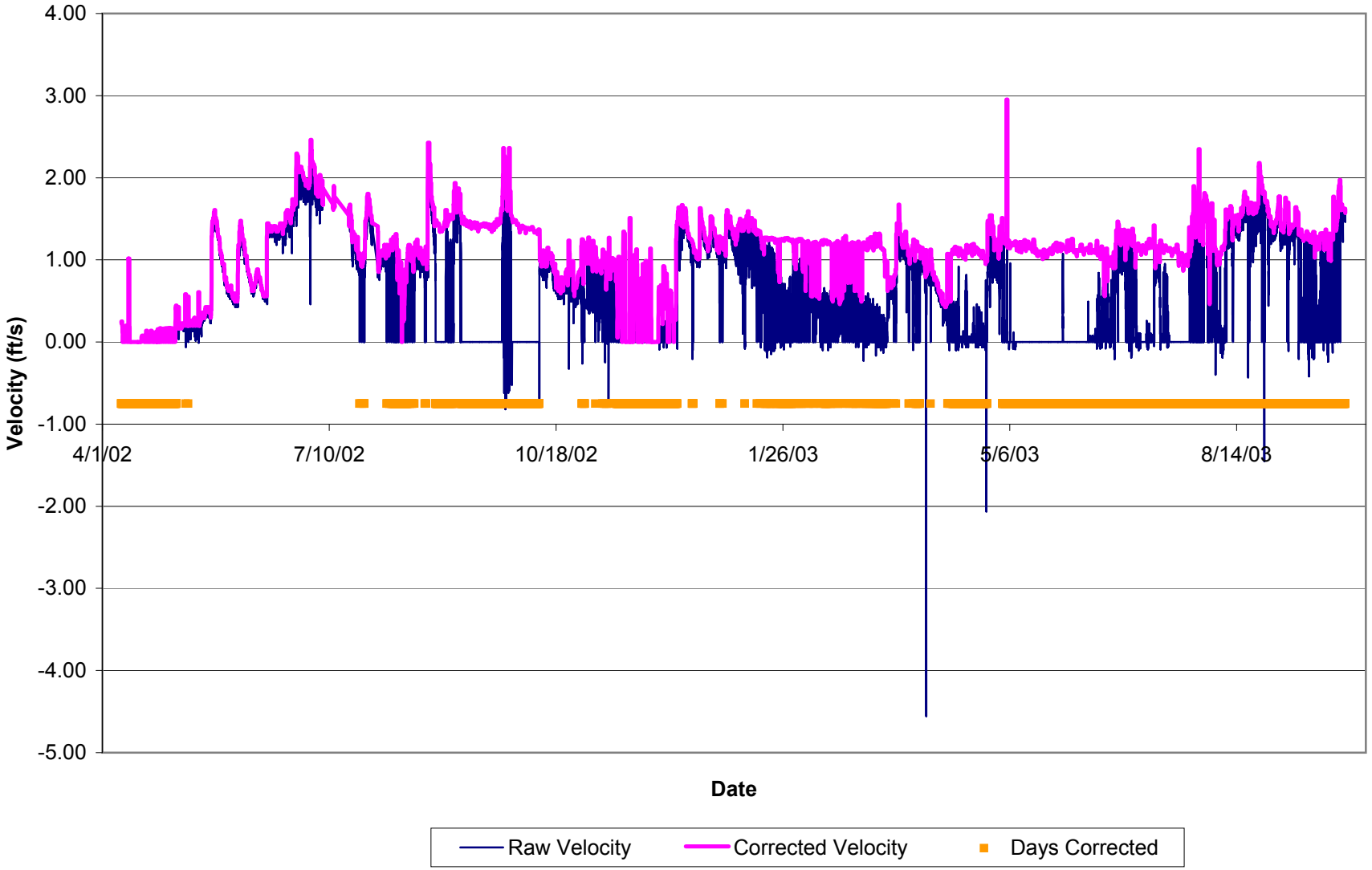


Figure A-9. Davie South - Flow and P Concentration

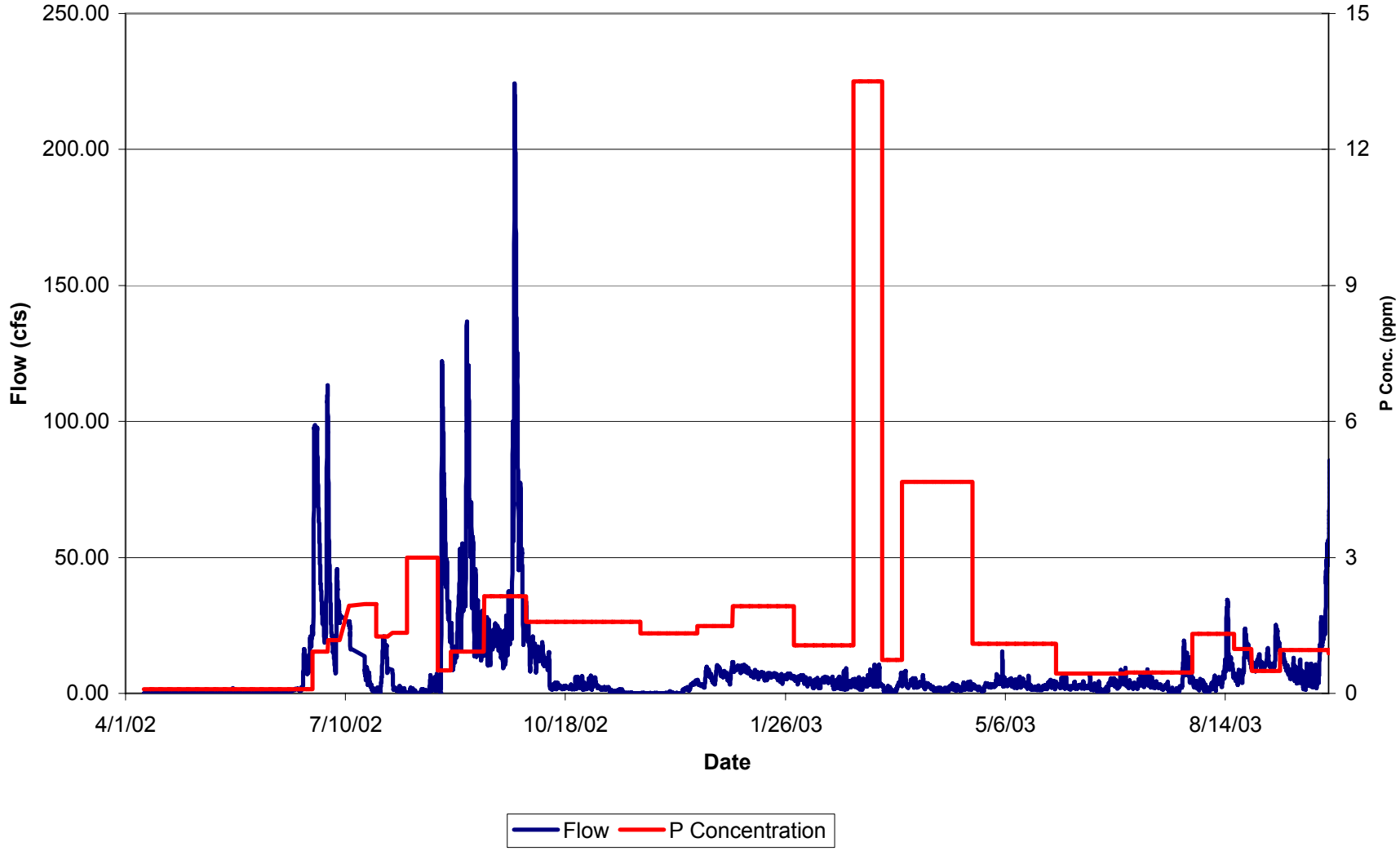


Figure A-10. KREA 41 - Stage

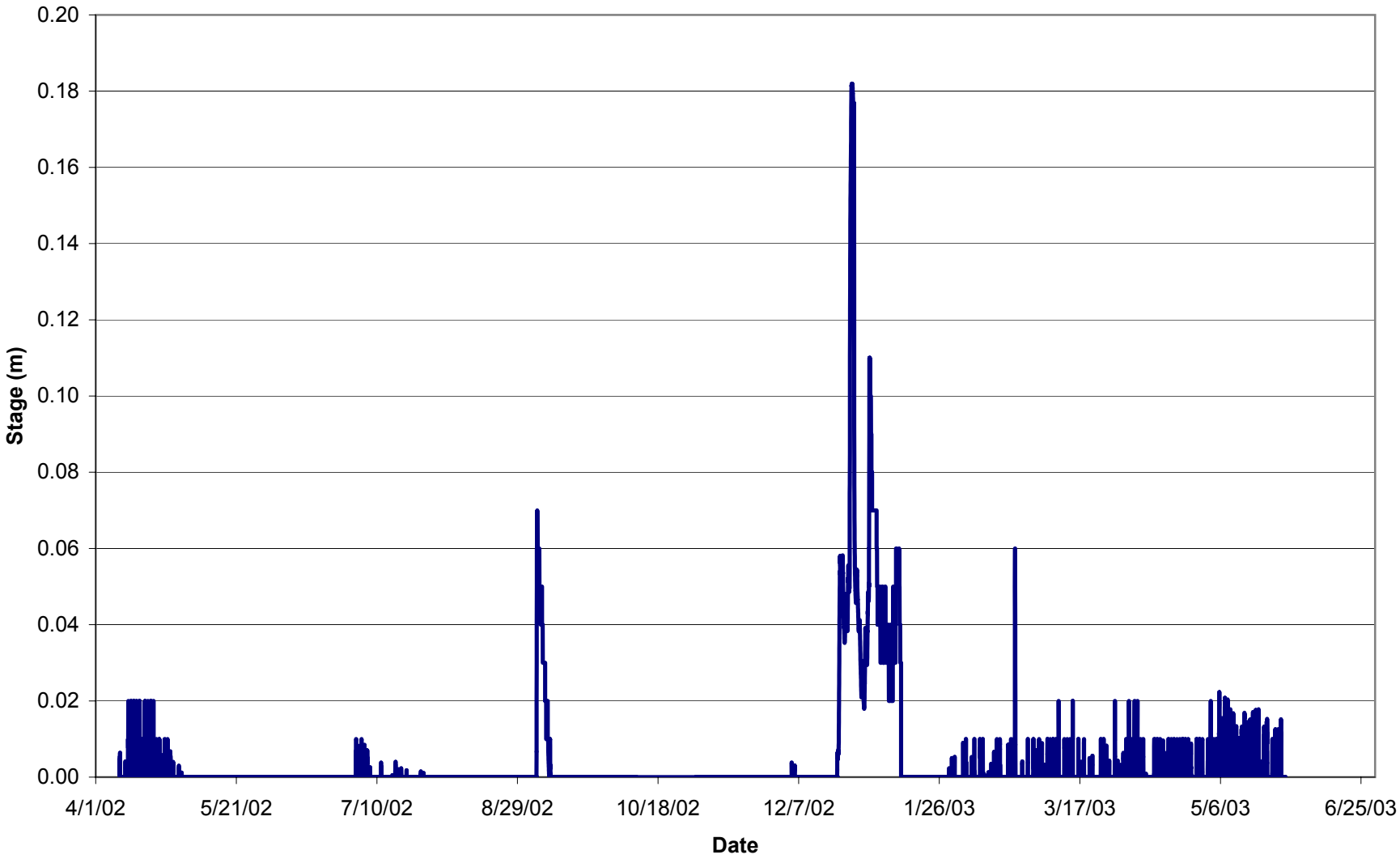


Figure A-11. KREA 41 - Velocity

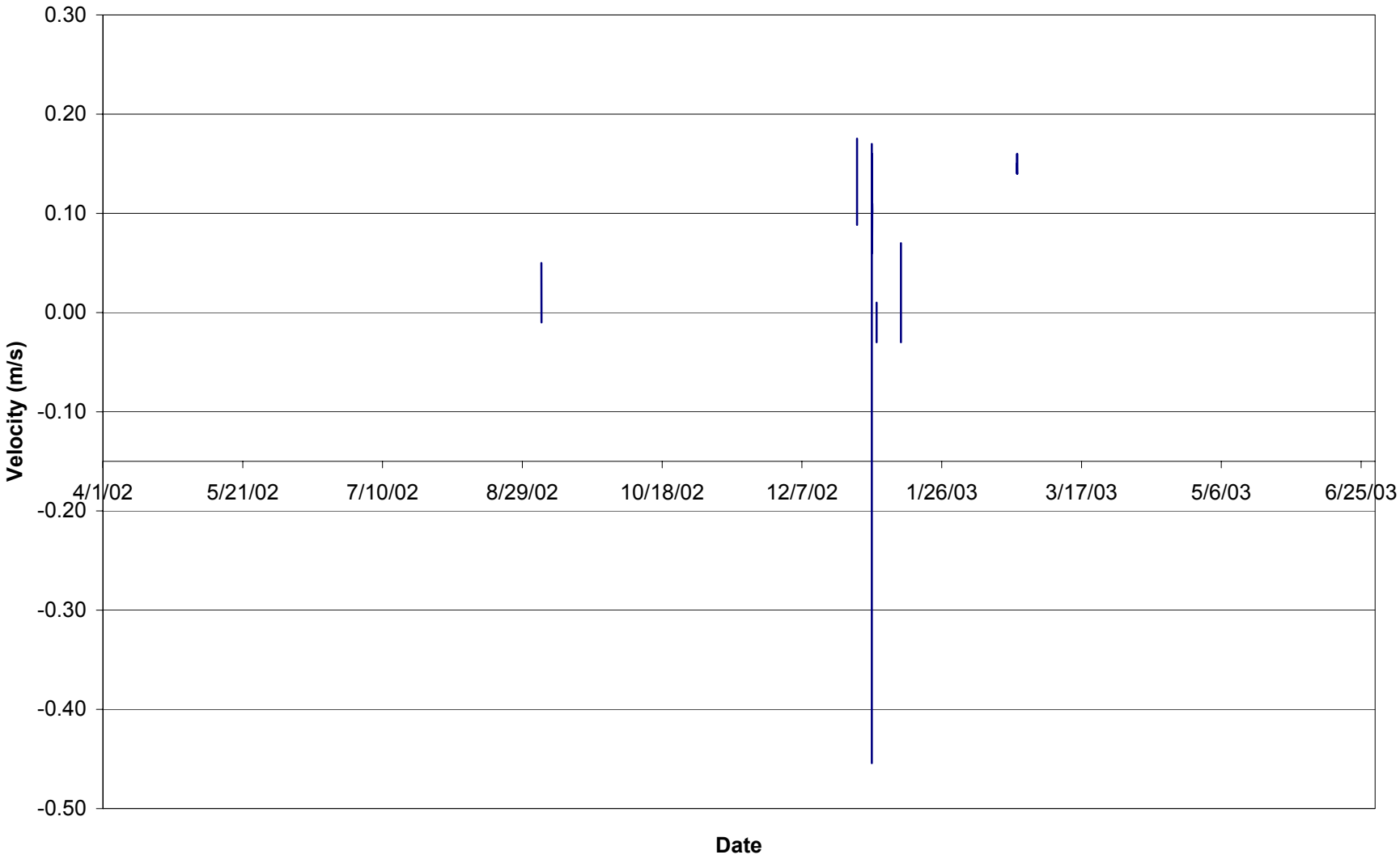


Figure A-12. KREA 41A - Stage

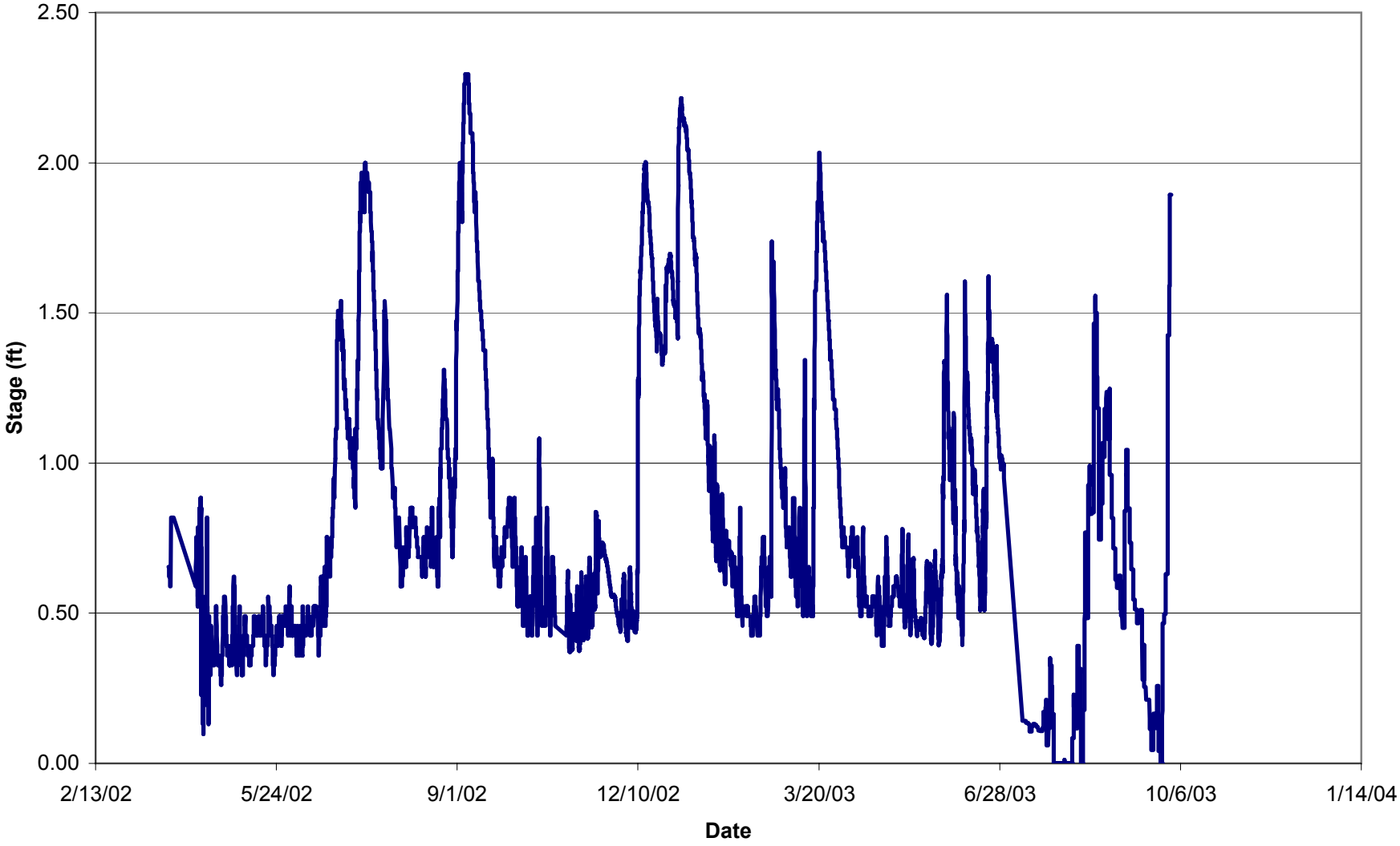


Figure A-13. KREA 41A - Velocity

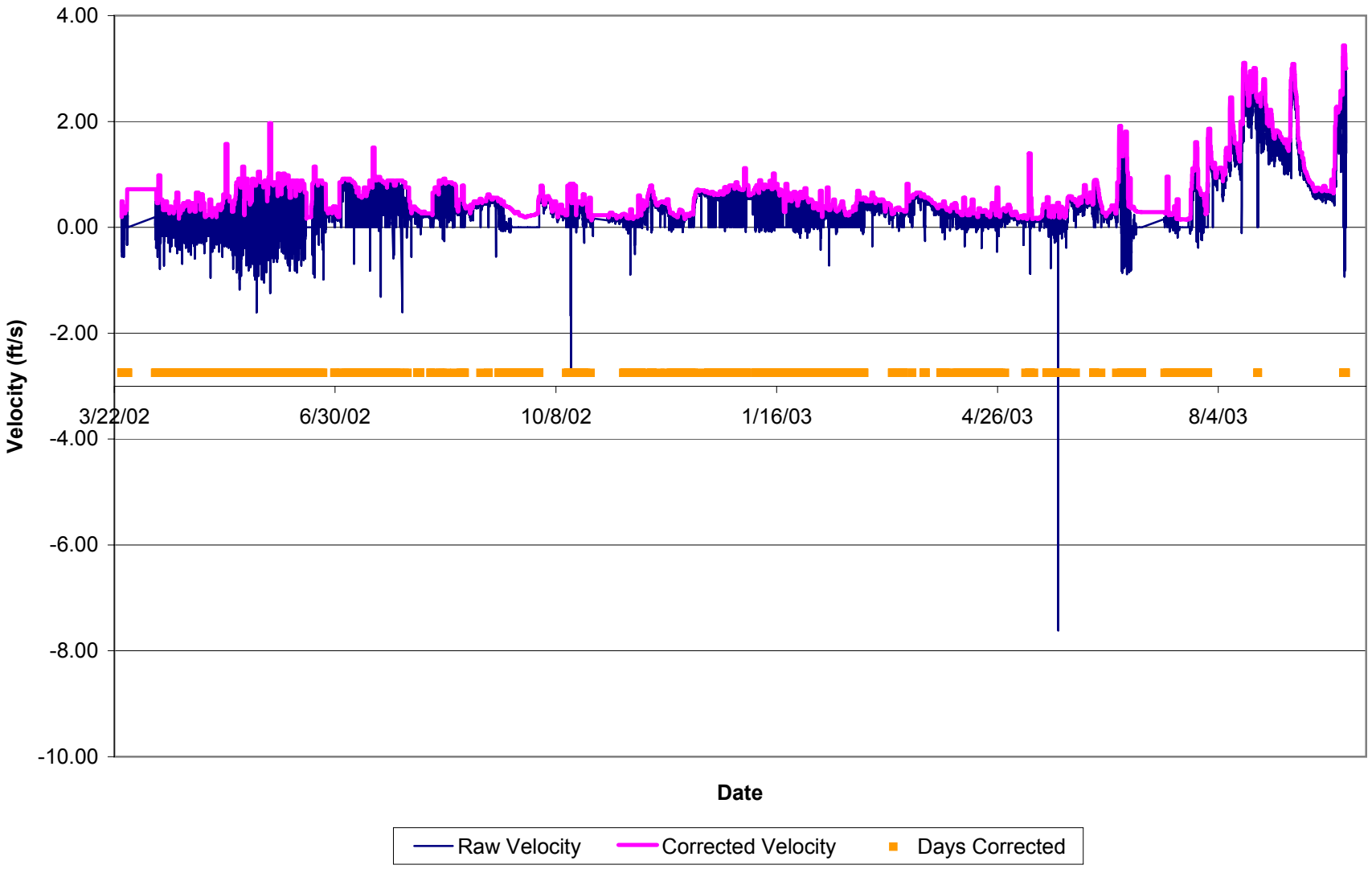


Figure A-14. KREA 41A - Flow and P Concentration

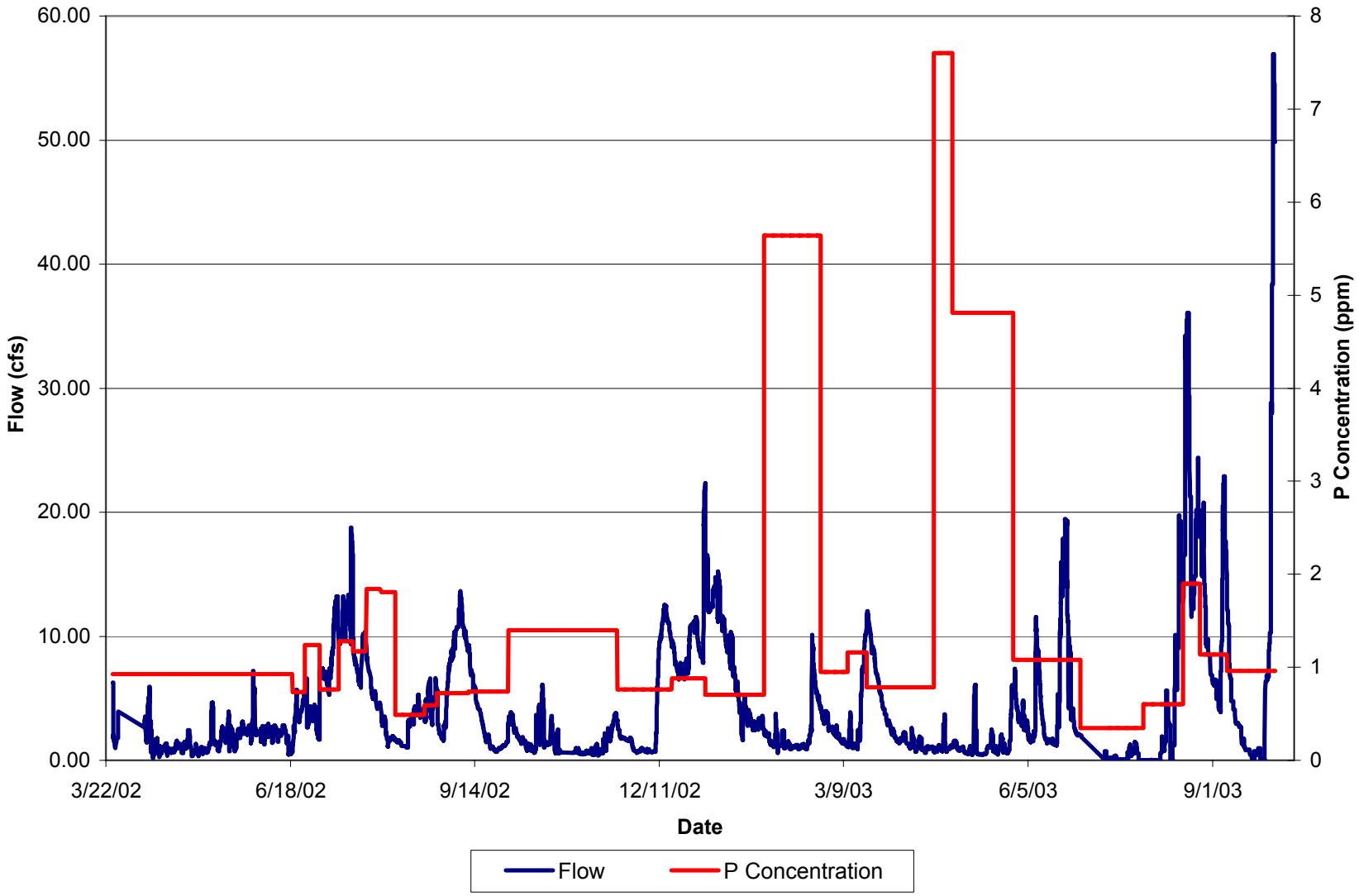


Figure A-15. KREA 41B - Stage

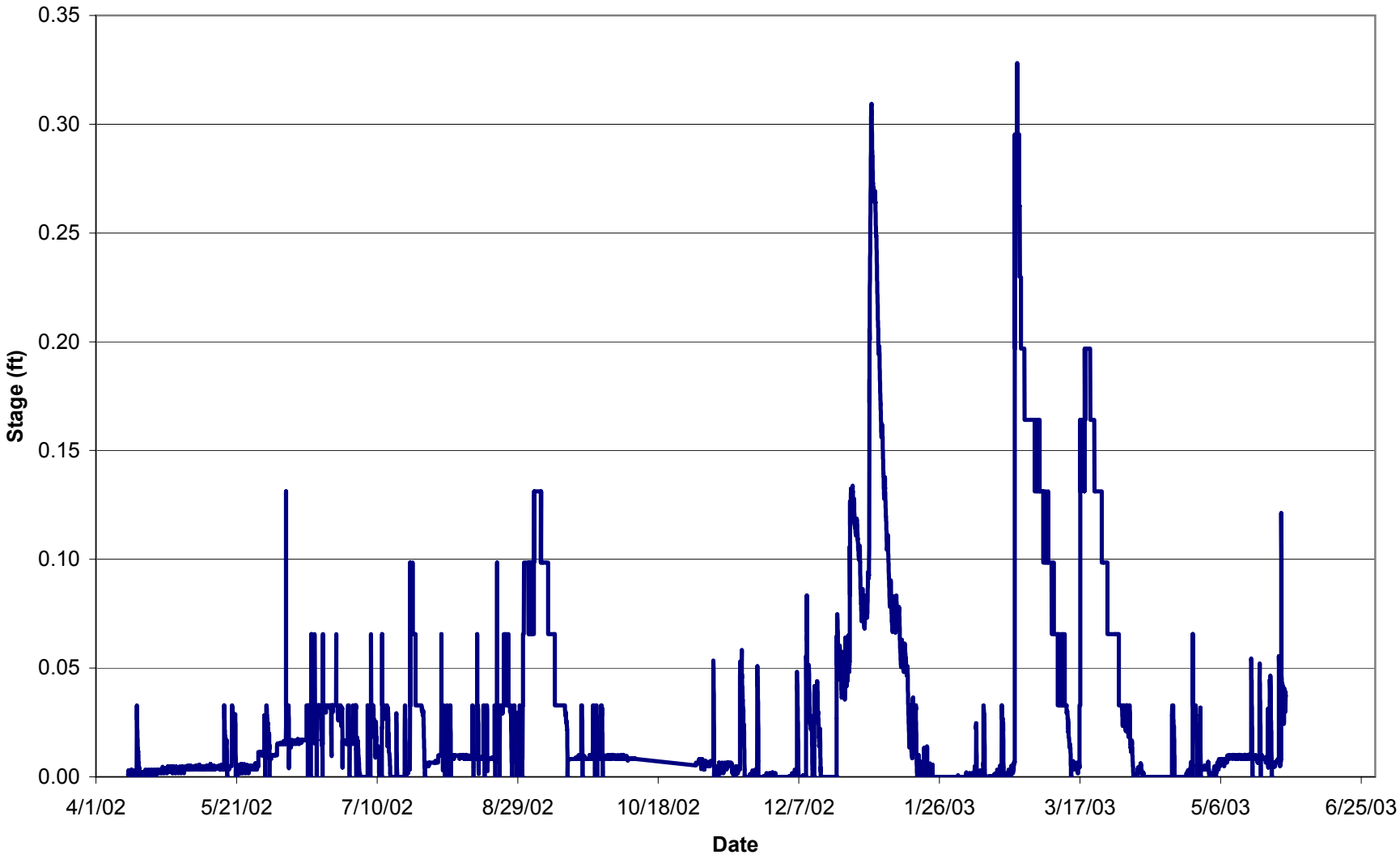


Figure A-16. KREA 41B - Velocity

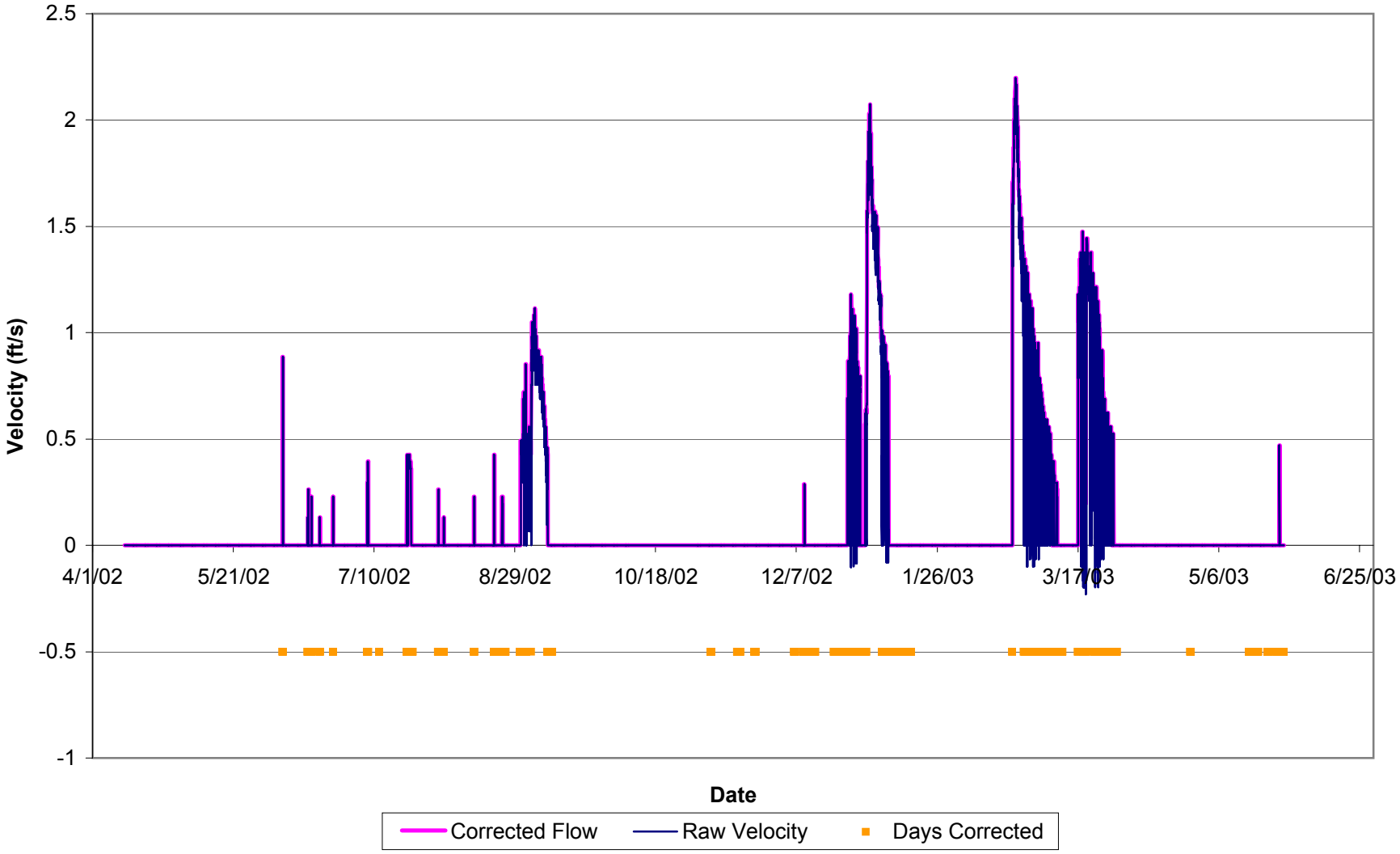


Figure A-17. KREA 41B - Flow and P Concentration

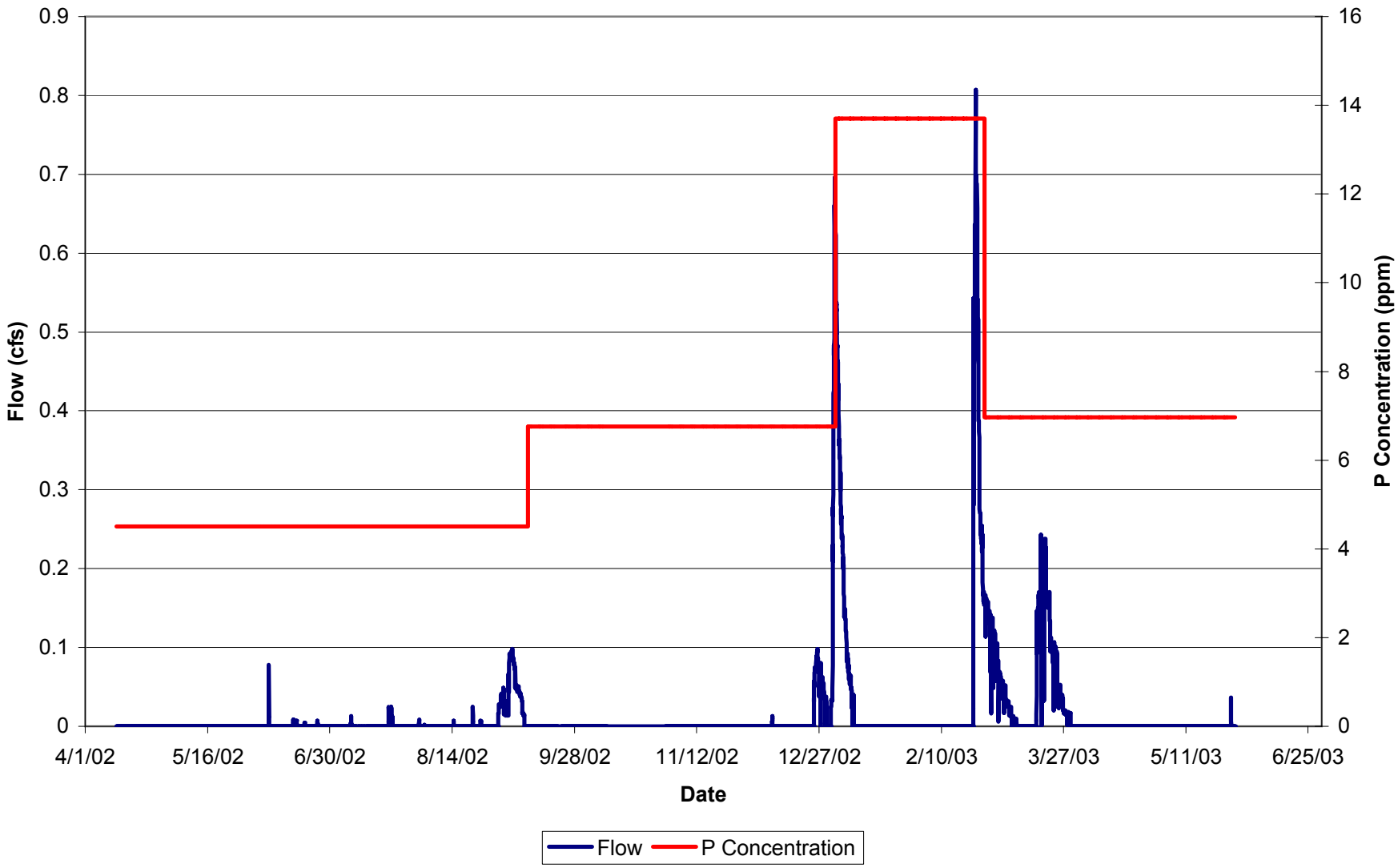


Figure A-18. KREA 10D - Stage

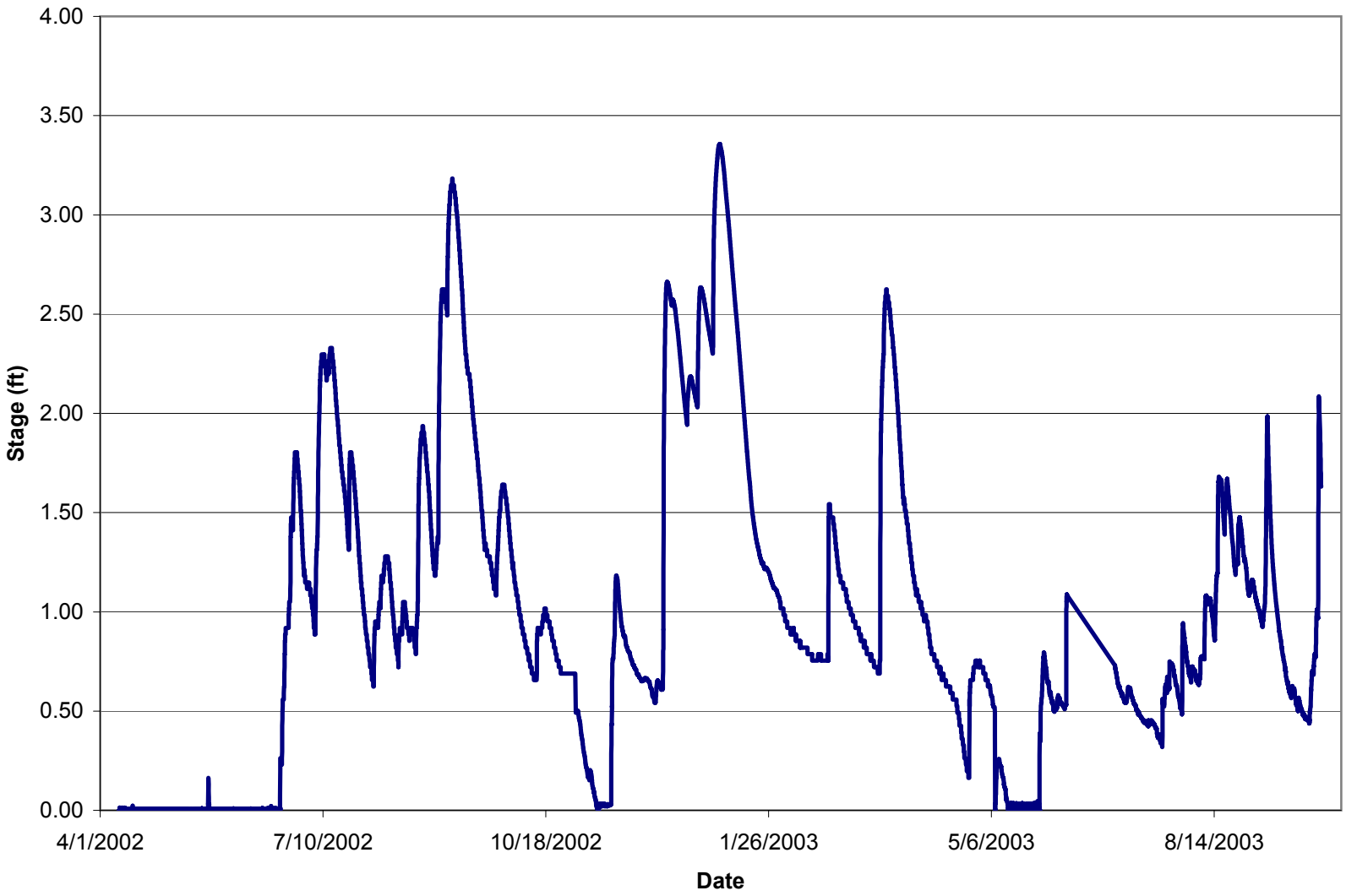


Figure A-19. KREA 10D - Velocity

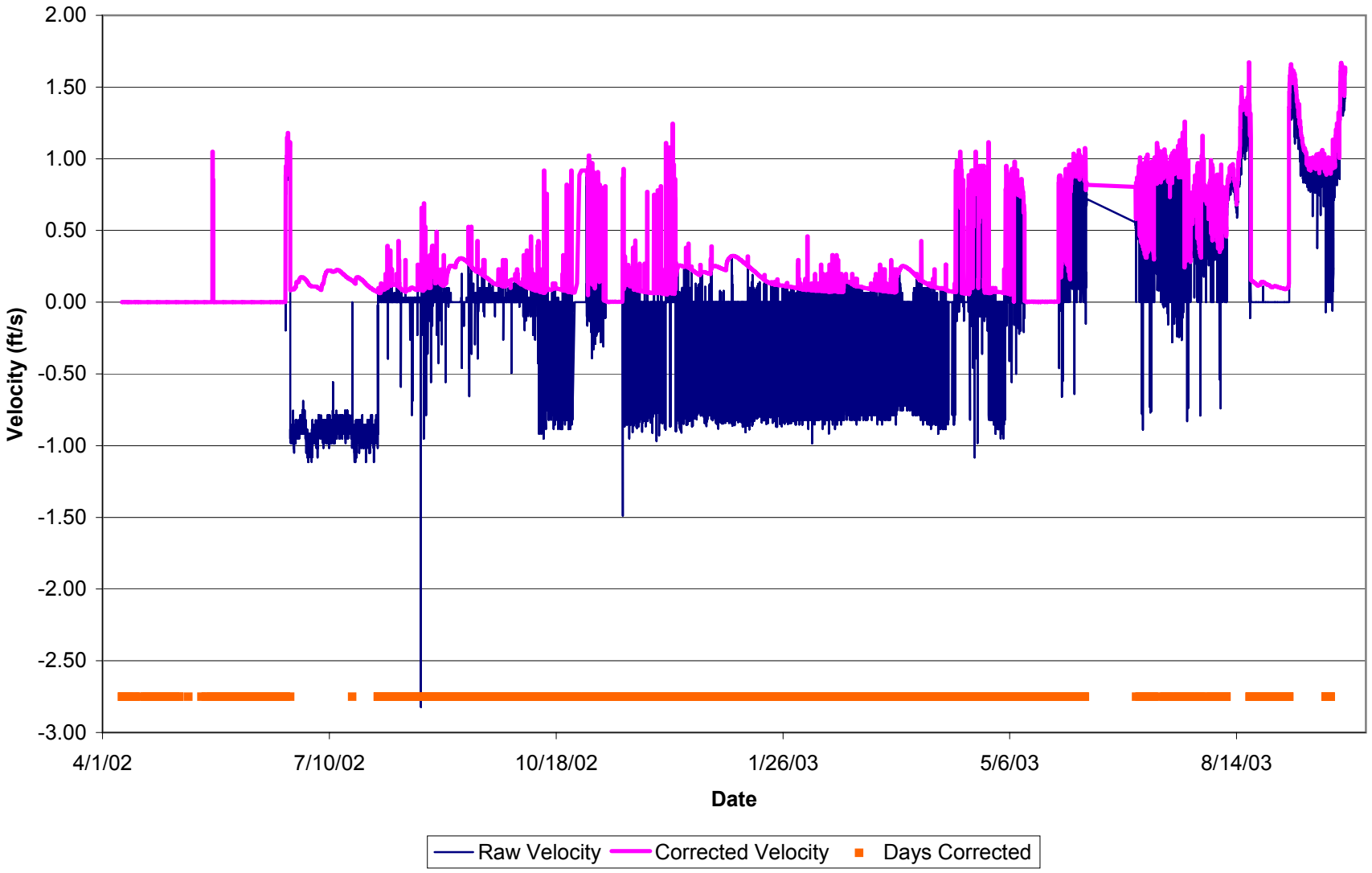


Figure 20. KREA 10D - Flow and P Concentration

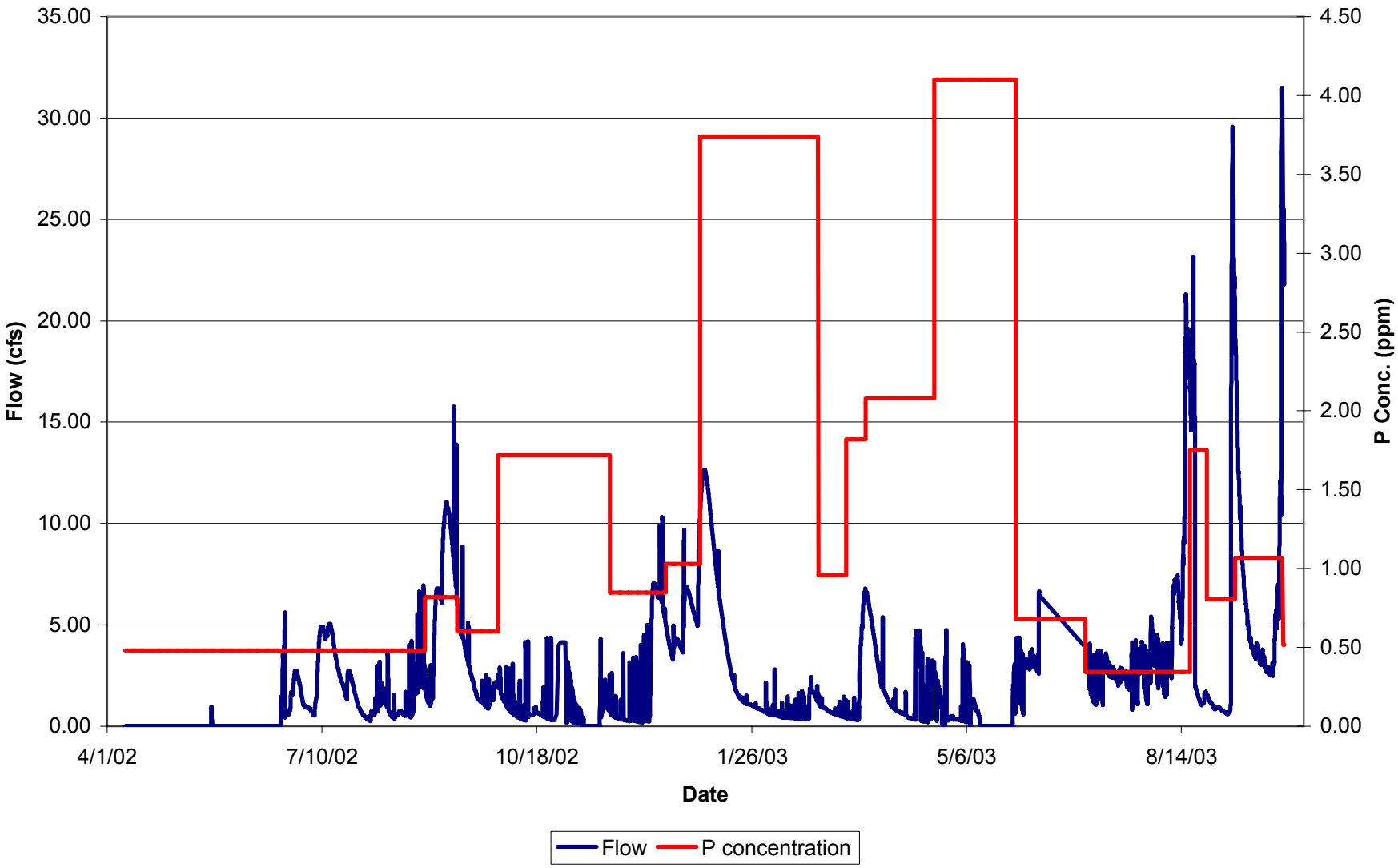


Figure A-21. KREA 32B - Stage

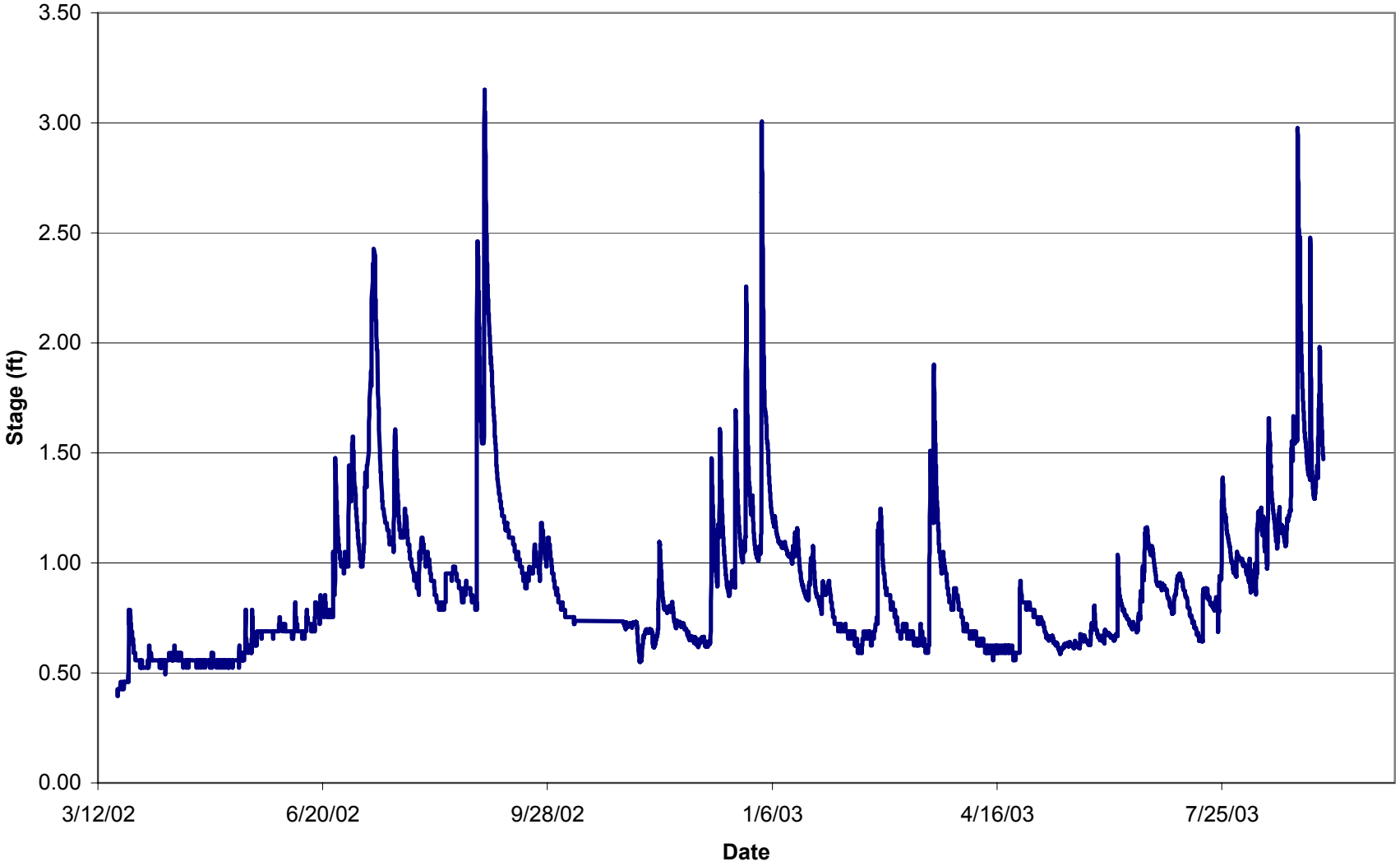


Figure A-22. KREA 32B - Velocity

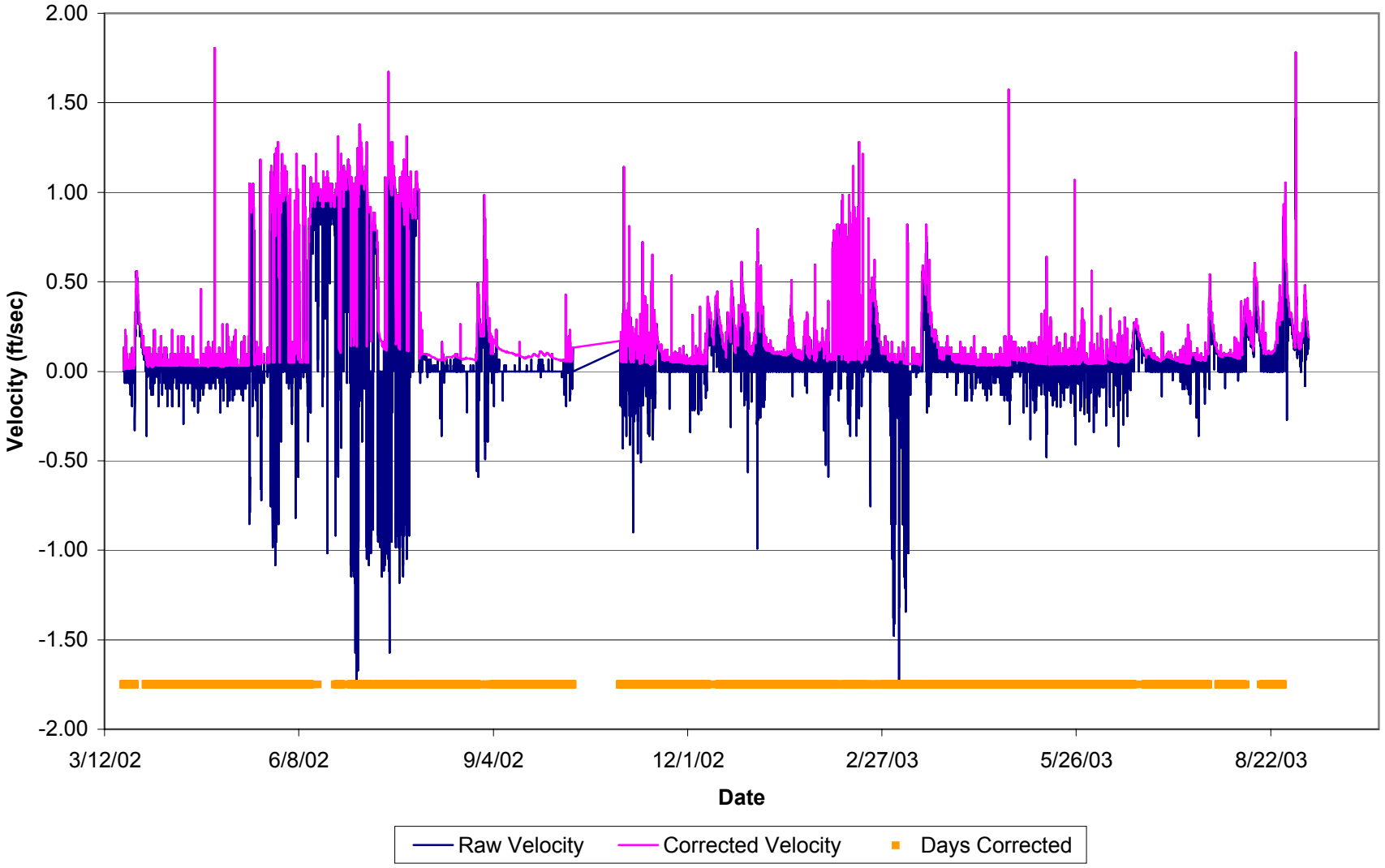


Figure A-23. KREA 32B - Flow and P Concentration

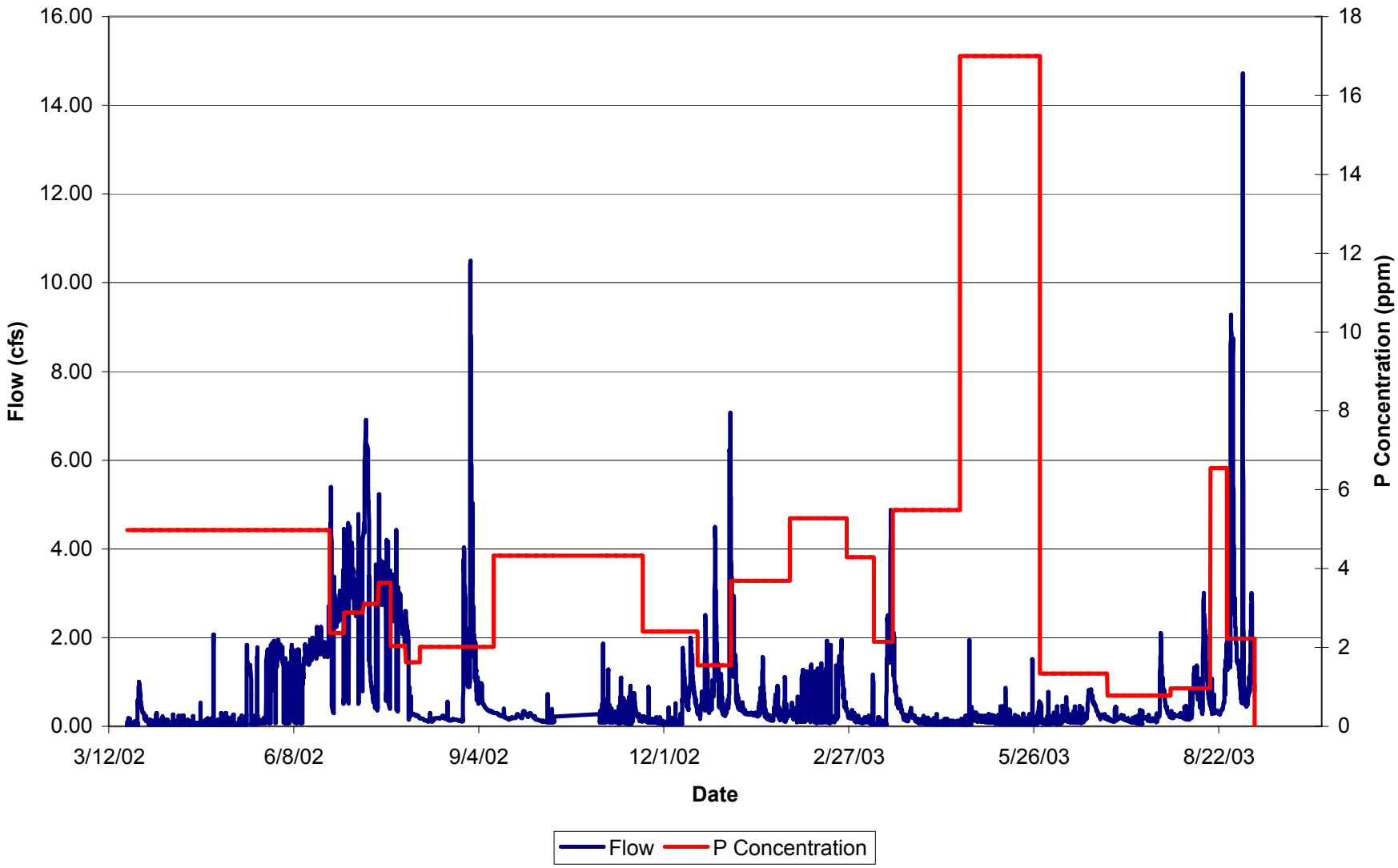


Figure A-24. KREA 49A - Stage

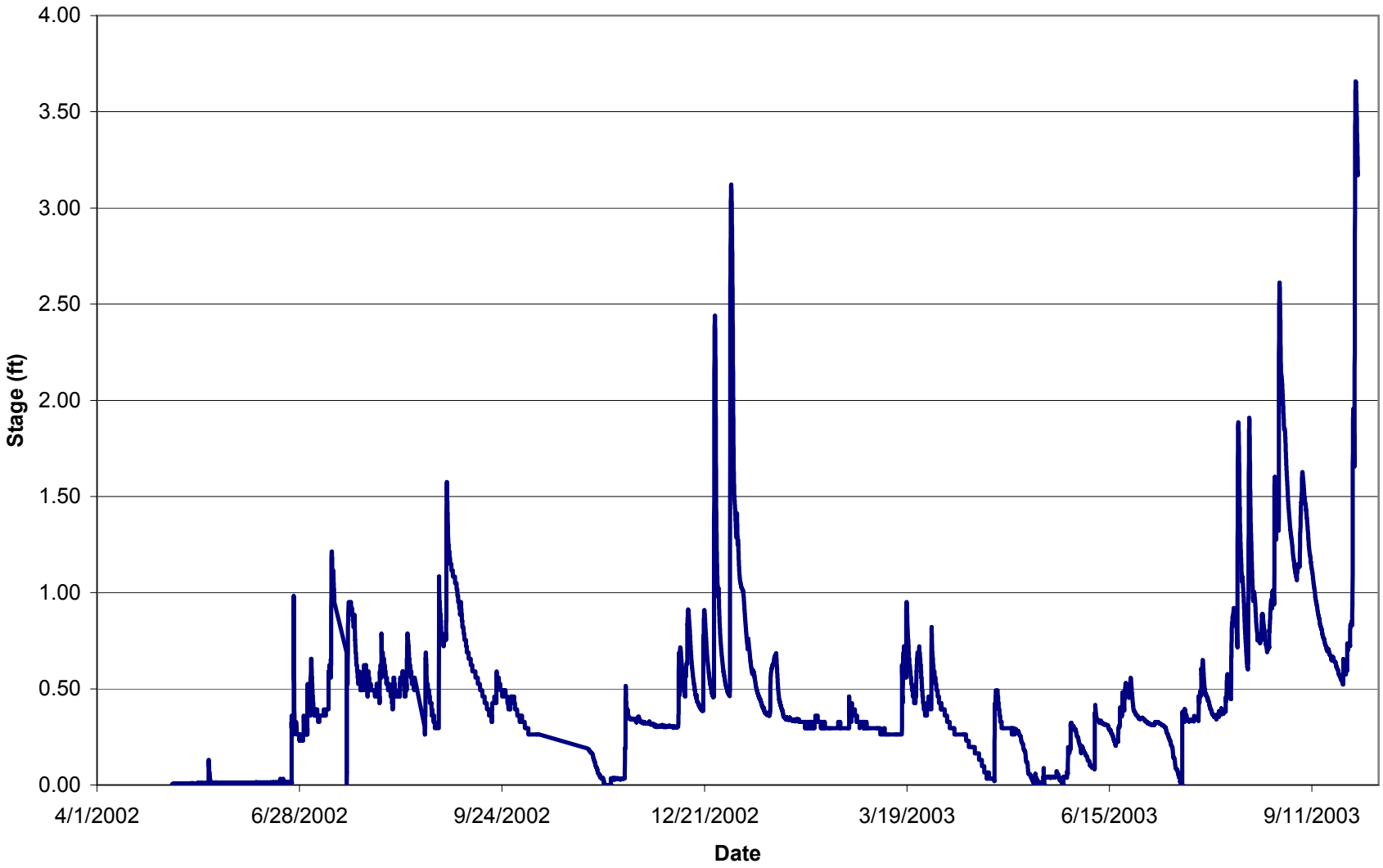


Figure A-25. KREA 49A - Velocity

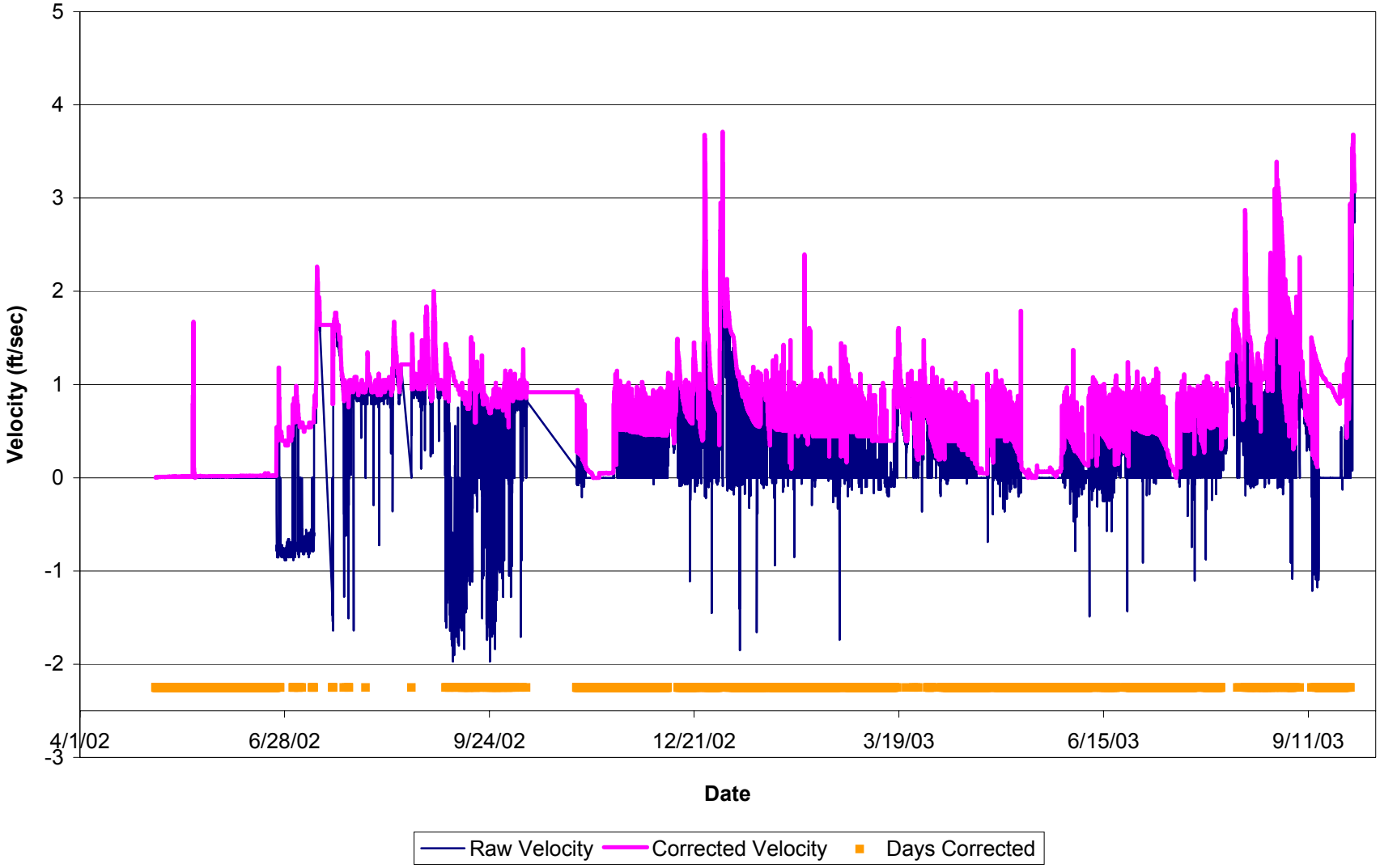


Figure A-26. KREA 49A - Flow and P Concentration

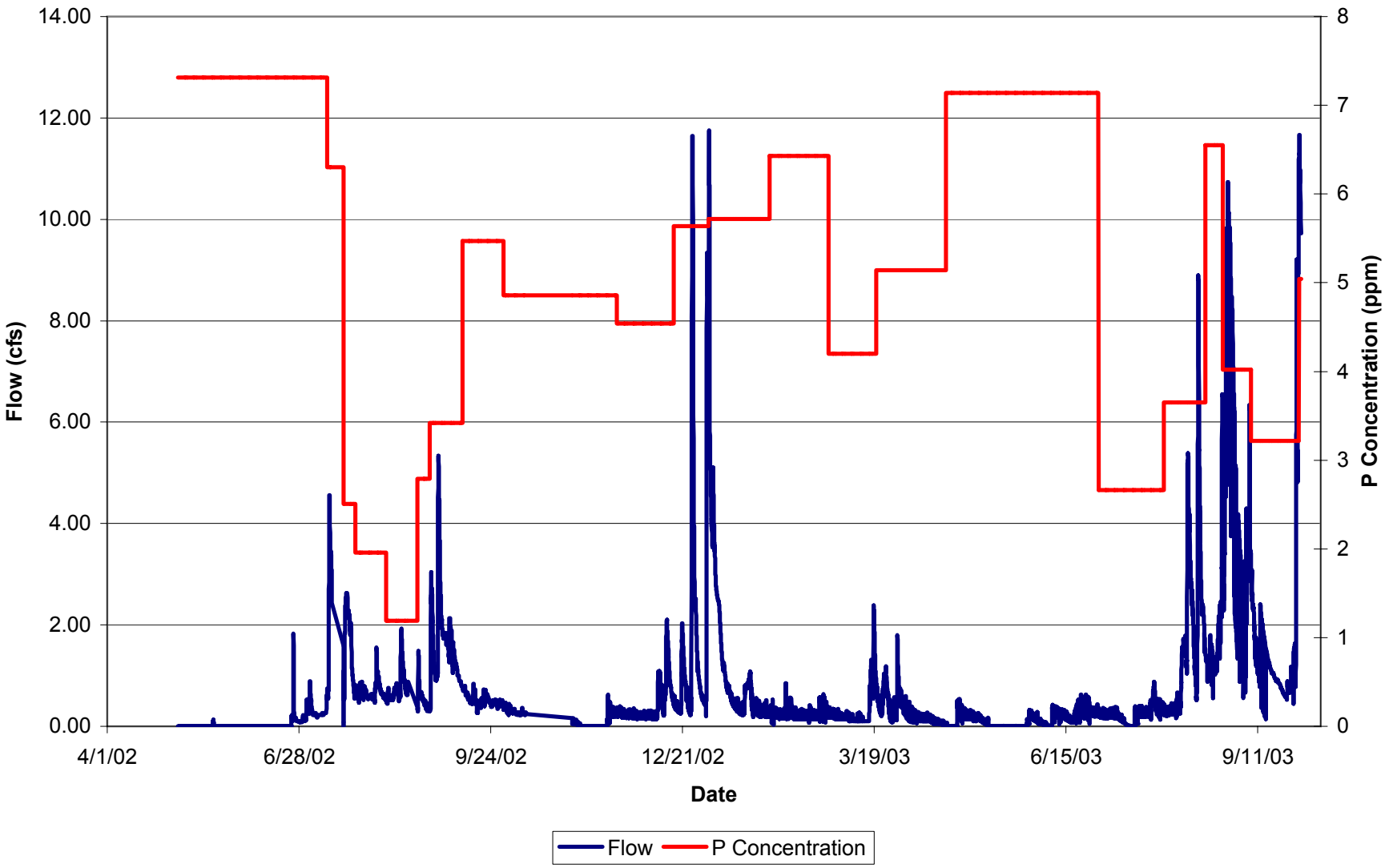


Figure A-27. Total P Concentrations at Monitoring Sites

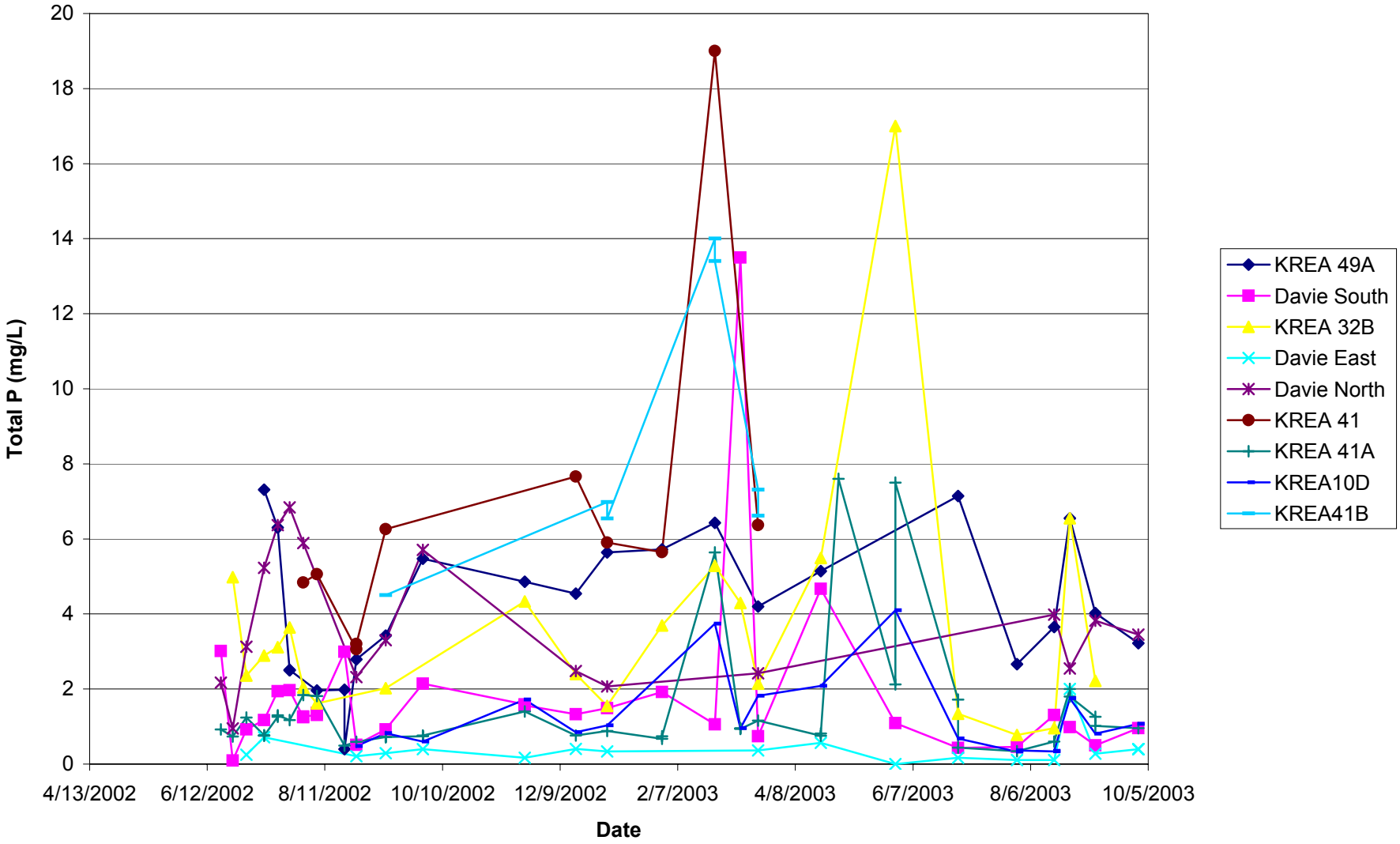


Figure A-28. Fecal Coliform at Monitoring Sites

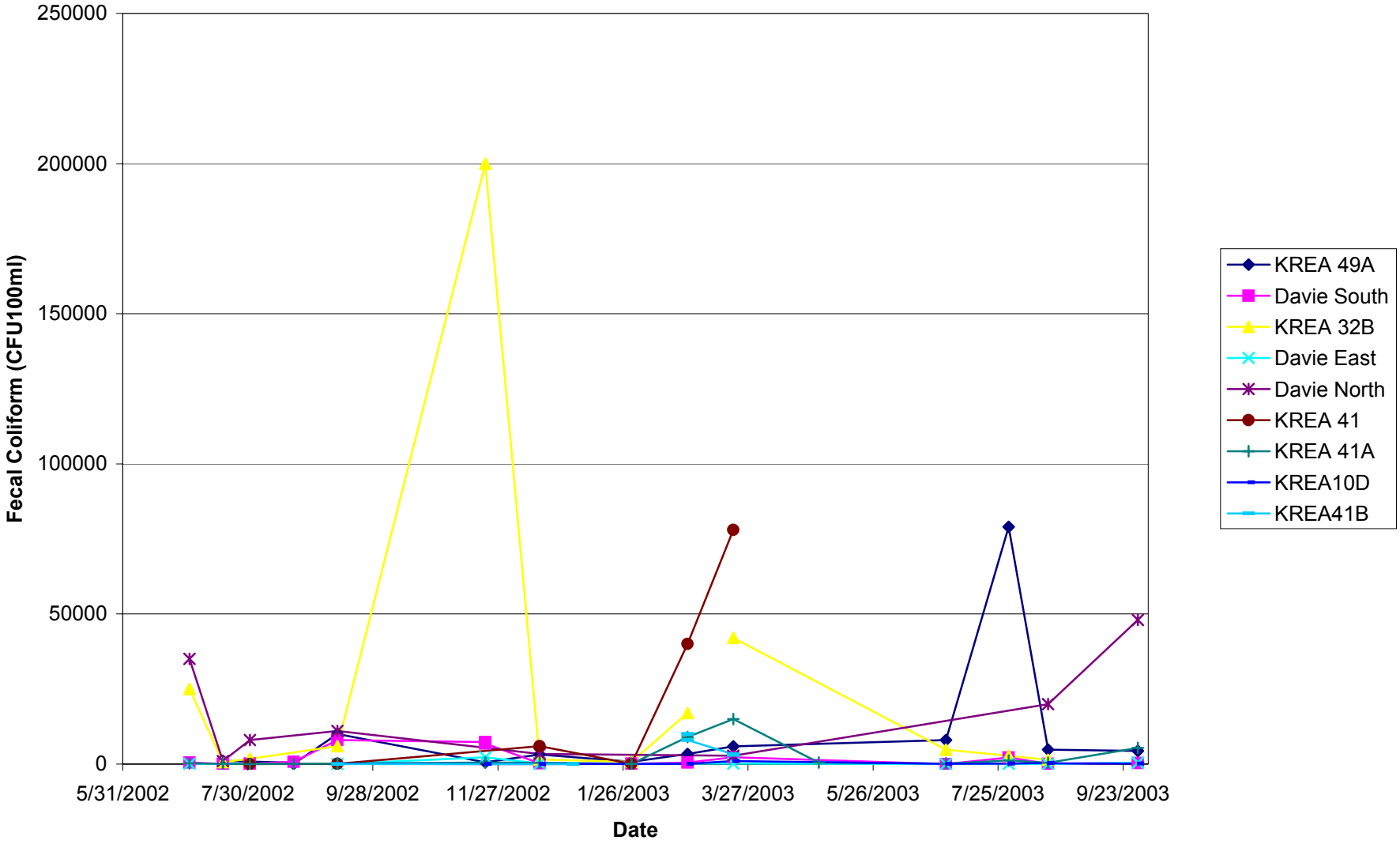
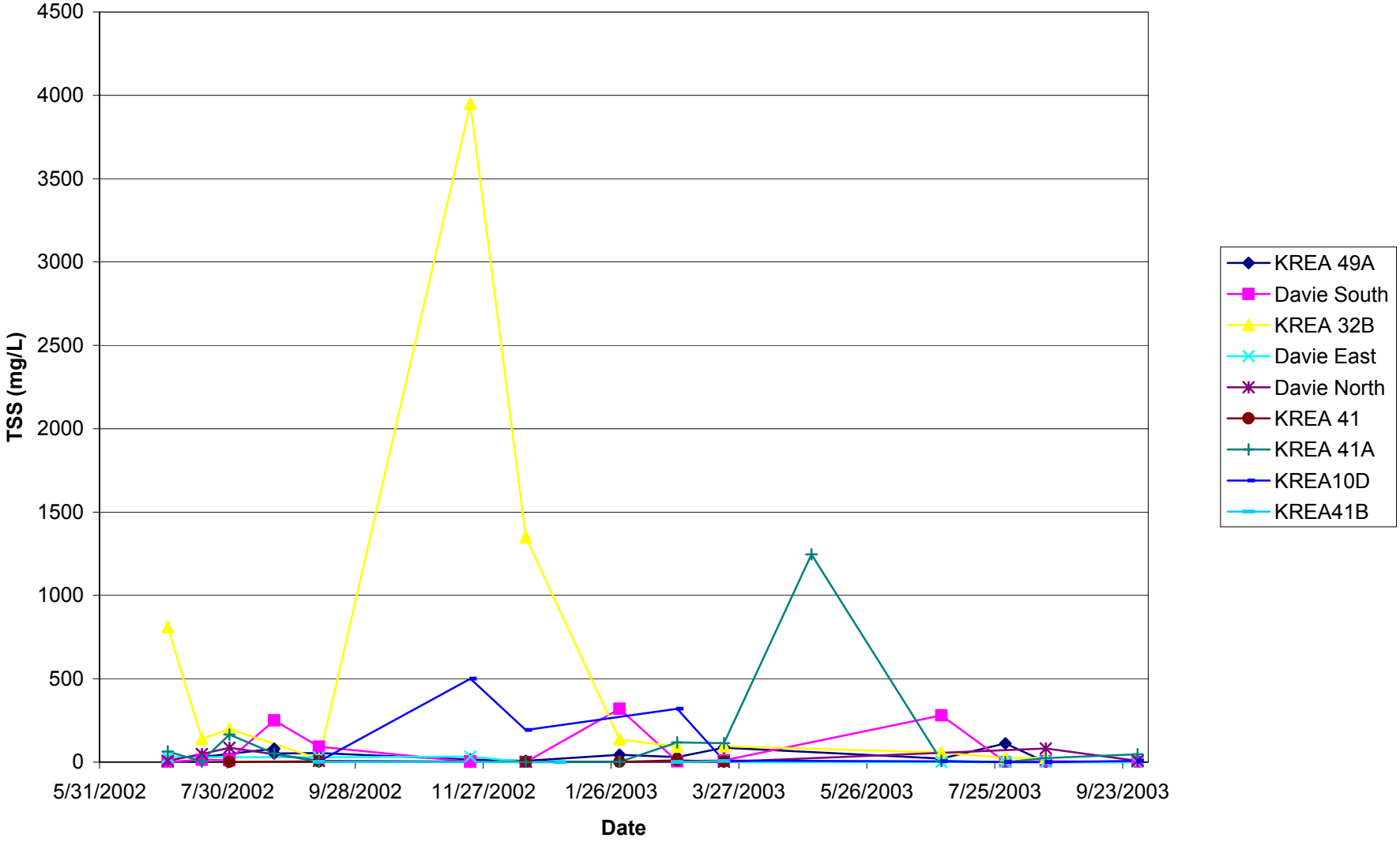


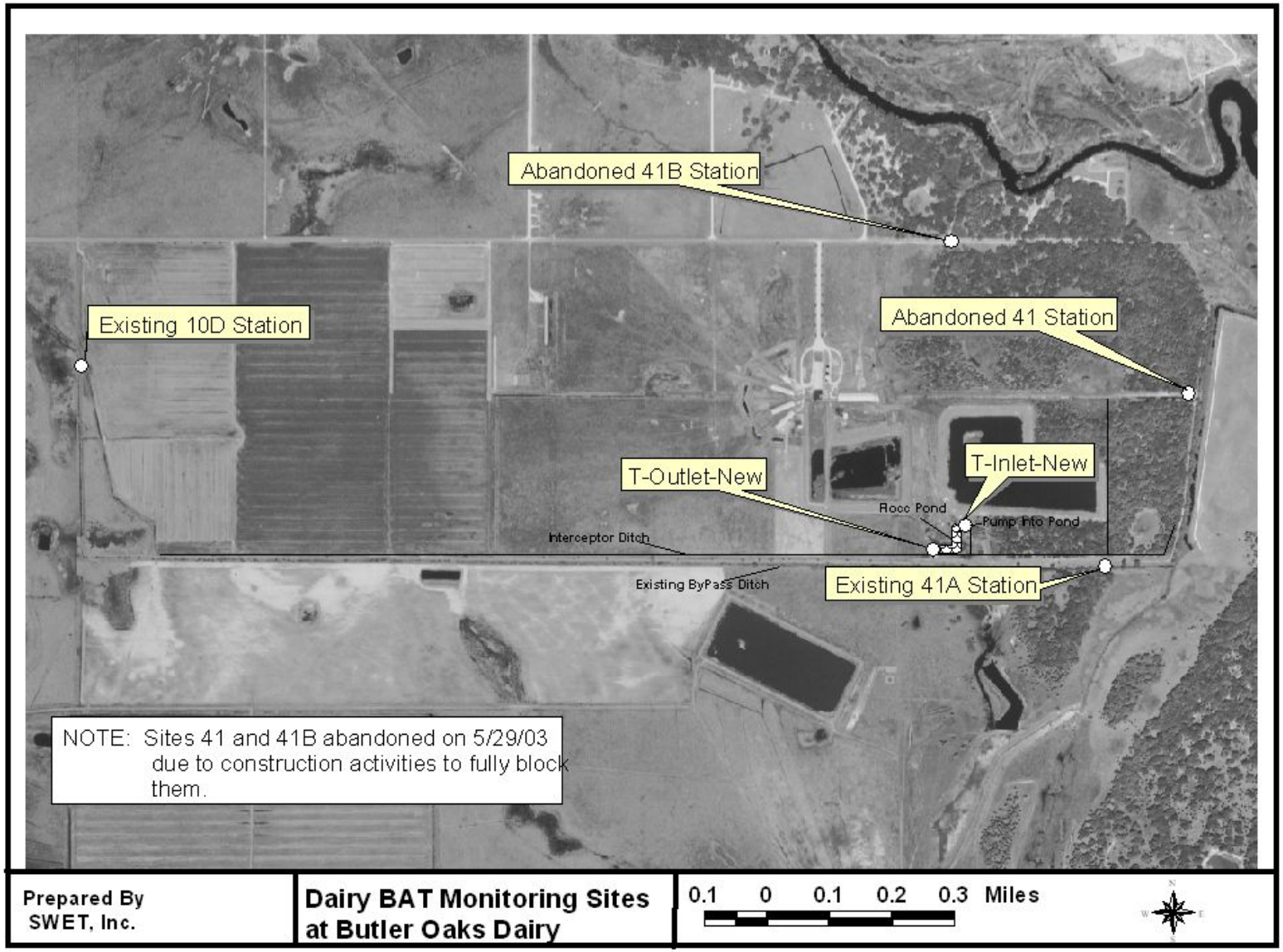
Figure A-29. Total Suspended Solids Concentrations at Monitoring Sites



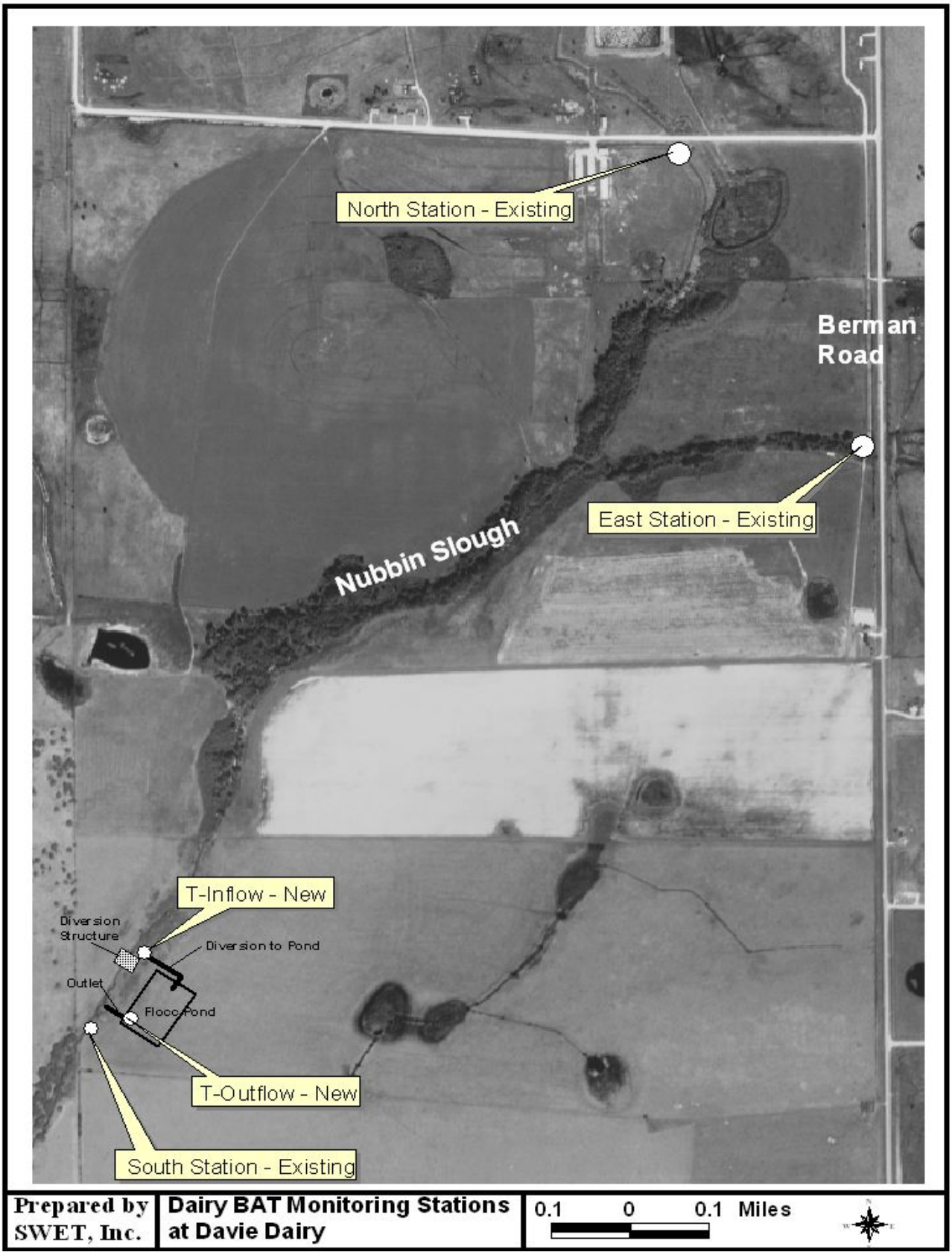
APPENDIX B

UPDATED SITE MAPS WITH MONITORING LOCATIONS

Map of Butler Oaks Dairy Monitoring Sites



Map of Davie Dairy Inc. Monitoring Sites



Map of Dry Lake Dairy Monitoring Sites