

6.0 RESULTS

Summary tables for each constituent monitored are listed in this section. These summary tables provide a snap shot for all constituents monitored and include the total number of samples collected as well as the minimum, mean, and maximum concentrations detected.

Limited data was available for toxicity and trace elements. Depending on the site, toxicity was analyzed in January, March, September and/or October. Trace element samples were analyzed in June at all sites. Total selenium was analyzed in October at most sites. Additional trace element data was collected at Cosumnes River @ Twin Cities Road (SAC001) and Mokelumne River @ New Hope Road (SAC002) through the monthly SWAMP trend monitoring.

Data was also limited depending on the ephemeral nature of some sites. Data sets for Cosumnes River @ Twin Cities Road (SAC001), Sutter Creek (AMA002), Calaveritas Creek @ Highway 49 (CAL002), North Fork Calaveras River @ Gold Strike Road (CAL003), and Calaveras River @ Highway 88 (SJC513) show reduced number of sampling events due dry periods.

Funding limitations eliminated sampling during the month of July except at sites included in the long term SWAMP drainage basin monitoring. Of the two sites included in both programs, only Mokelumne River @ New Hope Road (SAC002) was flowing.

Turbidity and *E. coli* sampling also occurred less frequently than the other field constituents due to delays in equipment availability. Monitoring for this basin started in January 2002, however, the turbidity and *E. coli* analysis equipment was not ready for use until the March 2002 sampling events. Turbidity and *E. coli* monitoring continued until the end of the rotation in December 2002.

For samples with concentrations less than the reporting detection level (RDL), the concentration was set to half the RDL to calculate the mean. Means were not calculated for *E. coli* samples, since some results were above the maximum reporting limits. Instead, median values were used to represent midpoint concentrations.

Tables 3, 4, and 5 list the river sites sorted by sub areas (Cosumnes, Mokelumne, and Calaveras Watersheds), respectively. The river sites are arranged from left to right, upper watershed to lower watershed. The tables also indicate where an impoundment is located within the stream run. Table 6 depicts data from the impoundment (reservoir) sites. The tables are also arranged by constituent from top to bottom: field constituents; Total Organic Carbon (TOC); Total Suspended Solids (TSS); Toxicity; Nutrients; Total Trace Elements and Dissolved Trace Elements.

Although all individual data points are sorted by site in Appendix B, selected constituents have not been included in the summary tables. The excluded results include: all samples analyzed for total and dissolved nickel, lead, mercury, and arsenic as well as dissolved chromium and cadmium, which were below detection levels and samples analyzed for total coliform which were frequently above detection levels. Photo monitoring is depicted in Appendix A.

Table 3 Summary Field Results: Cosumnes Watershed River Sites, January - December 2002

Constituent	ELD003				ELD004				SAC003				SAC001			
	Cosumnes @ Gold Beach				Cosumnes @ Highway 49				Cosumnes @ Michigan Bar				Cosumnes @ Twin Cities			
Field Constituents,	TSS, TOC, E. coli, Toxicity															
	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max
Temperature (°C)	25	2.8	12	26	25	2	11	23	25	3.9	13	24	21	4.6	13	24
DO (mg/L)	25	6.87	11.5	16.3	25	8.46	12	17.2	25	6.31	11.3	15.2	21	4.14	10.9	14.6
pH	25	6.1	7.7	9	25	6.2	7.8	8.9	25	6.5	7.8	8.8	21	6.8	7.7	8.6
EC (umhos/cm)	25	42	71	99	25	45	69	89	25	47	86	119	21	32	98	161
Turbidity (NTU)	17	0.2	2.6	9.3	18	0	2.2	17	17	0	1.6	5.7	9	3.4	40	250
TSS (mg/L)	3	<1.0	2	<10	3	<1.0	2	<10	2	<1.0		<10	1	<10		
TOC (mg/L)	5	<1.0	1.5	2.1	5	<1.0	1	2.1	2	<1.0		<1.0	6	<1.0	2	4.7
E. coli (MPN)	18	4	17*	525	18	3	14*	416	18	4	41*	272	10	38	85*	549
48 Hour Tox	N/A				3	90	97	100	N/A				5	95	86	100
96 Hour Tox	N/A				2	95	95	95	N/A				5	55	95	100
Nutrients																
K (mg/L)	2	<1.0		1.7	2	<1.0		6.4	3	<1.0	0.56	0.68	2	<1.0		3.1
H ₃ PO ₄ (mg/L)	2	<1.0		<1.0	2	<1.0		<1.0	3	<0.03	0.34	<1.0	2	<1.0		<1.0
P (mg/L)	2	<0.1		<0.1	2	<0.1		<0.1	3	<0.05	0.04	<0.1	2	<0.1		<0.1
NO ₂ + NO ₃ (mg/L)	N/A				N/A				N/A				N/A			
NO ₃ (mg/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0
NH ₃ N (mg/L)	2	<1.0		<1.0	2	<1.0		<1.0	3	<0.05	0.34	<1.0	2	<1.0		<1.0
TKN (mg/L)	1	<2.0			1	<2.0			2	0.18		<2.0	1	<2.0		
Total Trace																
	Elements															
Hardness	2	21		23	2	20		22	2	24		27	2	26		33
Chromium (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	7	<1.0	0.67	1.7
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	7	<1.0	1.2	3.5
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	7	<2.0	1.8	4.9
Cadmium (ug/L)	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		<0.1	7	<0.1	<0.1	<0.1
Selenium (ug/L)	1	<0.4			1	<0.4			1	<0.4			N/A			
Dissolved Trace																
	Elements															
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	7	<2.0	1.7	6.1
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	7	<1.0	0.77	2.4

* Median values

Table 4. Summary Field Results: Mokelumne Watershed River Sites, January - December 2002

Constituent	AMA001				AMA002				CAL004				SJC512				SAC002			
	N. Fork Mokelumne @ Hwy 26				Sutter Creek				Mokelumne @ Hwy 49				Mokelumne @ Van Assen				Mokelumne River @ New Hope			
Field Constituents, TSS, TOC, E. coli, Toxicity																				
	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max
Temperature (°C)	25	1.3	8.3	13	21	3.1	12	27	25	2.6	11	24	25	9.3	12	15	34	7	15	25
DO (mg/L)	25	9.84	12.2	19.4	21	5.7	11.6	18.3	25	8.65	12.7	20.7	24	7.53	10.4	17.8	34	6.6	9.87	14
pH	25	6.8	7.6	8.4	21	6.9	7.7	8.2	25	7.4	7.9	8.2	25	6.4	7.5	8.7	34	6.6	7.8	8.6
EC (umhos/cm)	25	21	33	65	21	120	188	314	25	21	37	62	25	33	50	56	34	34	54	71
Turbidity (NTU)	16	0.2	1.6	4.6	12	0.4	3.2	17	16	0	1.9	5.7	15	1.7	3.1	4.8	20	2.2	4.6	16
TSS (mg/L)	23	<1.0	1.4	<10	19	<1.0	2.0	<10	23	<1.0	1.5	<10	18	1.1	2.9	<10	2	8.4	20	31
TOC (mg/L)	5	<1.0	1.4	2.5	5	<1.0	8.5	38	5	1.3	1.6	1.8	5	<1.0	1.9	4.6	10	1	2.1	5.5
E. coli (MPN)	18	<1	3*	55	14	17	76*	>2420	18	<1	11*	49	18	3	23*	141	19	23	56*	260
48 Hour Toxicity	N/A				N/A				2	100	100	100	1	70			N/A			
96 Hour Toxicity	N/A				N/A				2	90	95	100	1	100			N/A			
Nutrients																				
K (mg/L)	11	0.42	0.53	0.72	9	0.88	1.3	2	11	0.42	0.57	<1.0	9	<1.0	0.77	1.2	2	<1.0	<1.0	<1.0
H ₃ PO ₄ (mg/L)	12	<0.03	0.11	<1.0	10	<0.03	0.11	<1.0	12	<0.03	0.11	<1.0	10	<0.03	0.11	<1.0	2	<1.0	<1.0	<1.0
P (mg/L)	12	<0.05	0.03	<0.1	10	<0.05	0.03	<0.1	12	<0.05	0.03	<0.1	8	<0.05	0.04	0.06	2	<0.1	<0.1	<0.1
NO ₂ + NO ₃ (mg/L)	3	<0.01	0.01	0.03	4	<0.01	0.04	0.1	6	<0.01	0.01	0.02	6	<0.01	0.03	0.06	N/A			
NO ₃ (mg/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0
NH ₃ N (mg/L)	12	<0.05	0.12	<1.0	10	<0.05	0.12	<1.0	12	<0.05	0.12	<1.0	10	<0.05	0.12	<1.0	2	<1.0		<1.0
TKN (mg/L)	2	0.07		<2.0	4	0.8	0.55	<2.0	6	<0.05	0.38	<2.0	6	0.07	0.04	<2.0	1	<2.0		
Total Trace Elements																				
Hardness	2	7.2		7.6	2	95		100	2	8		10	1	18			4	17	19	21
Chromium (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	10	<1.0	0.7	2.4
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		1.1	10	<1.0	1.8	2.8
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	2		5.4	10	<2.0	3	6.4
Cadmium (ug/L)	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		<0.1	10	<0.1	<0.1	<0.1
Selenium (ug/L)	1	<0.4			1	<0.4			1	0.48			1	<0.4			2	<0.4		<0.4
Dissolved Trace Elements																				
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		4.2	10	<2.0	1.7	5.4
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	10	<1.0	1.4	4.8

* Median Value

Table 5. Summary Field Results: Calaveras Watershed River Sites, January - December 2002

Constituent	CAL001				CAL002				CAL003				CAL008				SJC513			
	San Antonio Creek @ Sheep Ranch Road				Calaveritas Creek @ Highway 49				N. Fork Calaveras @ Gold Strike				Calaveras River @ Monte Vista Trailhead				Calaveras River @ Highway 88			
Field Constituents, TSS, TOC, E. coli, Toxicity																				
	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max	Count	Min	Mean	Max
Temperature (°C)	25	0.41	9.2	19	20	4.3	11	23	17	2.9	11	24	25	8.8	11	13	13	10	17	22
DO (mg/L)	25	8.84	11.9	19	20	5.1	11.4	18.6	17	7.75	12.6	18.6	24	6.9	11.2	17.8	12	6.32	9.14	12.6
pH	25	6.7	7.7	8.3	20	6.7	7.7	8.2	17	7.6	7.9	8.1	25	7.3	7.8	8.1	13	7.3	7.8	8.8
EC (umhos/cm)	25	49	65	87	20	145	270	504	17	102	208	395	25	157	191	221	13	79	186	259
Turbidity (NTU)	15	0.2	2.1	6.4	10	0.4	1.3	2.9	7	1.3	2.1	3.4	15	0.3	1.2	2	11	0.5	4.9	17
TSS (mg/L)	21	<1.0	1.4	<10	17	<1.0	1.4	<10	14	<1.0	1.7	<10	17	<1.0	1.2	<10	10	<10	2.6	<10
TOC (mg/L)	5	<1.0	3.3	12	5	<1.0	1.3	2.8	3	<1.0	1.1	1.8	5	2	3.1	5.3	3	1.6	3.8	6.6
E. coli (MPN)	18	3	13*	238	13	33	65*	261	10	17	48*	145	18	<1	12*	61	12	7	114*	>2420
48 Hour Toxicity	3	90	90	100	N/A				N/A				1	95			1	90		
96 Hour Toxicity	3	80	90	100	N/A				N/A				1	90			1	90		
Nutrients																				
K (mg/L)	10	<1.0	1	1.8	9	1.12	1.9	2.2	7	<1.0	1.6	2.2	9	1.4	1.7	2	7	1.6	2.2	3.5
H ₃ PO ₄ (mg/L)	10	<0.03	0.11	<1.0	10	<0.03	0.11	<1.0	8	<0.03	0.14	<1.0	10	<0.03	0.11	<1.0	7	<0.03	0.15	<1.0
P (mg/L)	10	<0.05	0.03	<0.1	10	<0.05	0.04	0.07	8	<0.05	0.031	<0.1	8	<0.05	0.031	<0.1	5	<0.05	0.04	0.07
NO ₂ + NO ₃ (mg/L)	6	<0.01	0.01	0.03	4	0.01	0.03	0.05	3	<0.01	0.019	0.04	6	0.09	0.21	0.28	4	<0.01	0.01	0.01
NO ₃ (mg/L)	2	<2		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0
NH ₃ N (mg/L)	10	<0.05	0.12	<1.0	10	<0.05	0.12	<1.0	8	<0.05	0.14	<1.0	10	<0.05	0.12	<1.0	7	<0.05	0.16	<1.0
TKN (mg/L)	6	<0.05	0.39	<2.0	4	0.12	0.56	<2.0	4	0.13	0.57	<2.0	6	0.06	0.44	<2.0	5	0.22	0.56	<2.0
Total Trace Elements																				
Hardness	2	19		22	2	140		160	2	120		130	1	79			1	81		
Chromium (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	1		1.3	2	<1.0		1.7
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0
Cadmium (ug/L)	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		0.12
Selenium (ug/L)	1	<0.4			1	1.02			N/A				1	<0.4			N/A			
Dissolved Trace Elements																				
Zinc (ug/L)	2	<2.0		2.2	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		1.7

IMPOUNDMENT

* = Median Value

Table 6. Summary Results: Northeast Basin Reservoir Sites, January – December 2002

Constituent	Cosumnes Watershed								Mokelumne Watershed								Calaveras Watershed							
	ELD001				ELD002				AMA003				CAL005				CAL006				CAL007			
	Pinecone				Mormon Immigrant				Lake Amador				Camanche				Acorn East				Wrinkle Cove			
Field Constituents, TSS, TOC, E. coli, Toxicity																								
	Ct	Min	Mean	Max	Ct	Min	Mean	Max	Ct	Min	Mean	Max	Ct	Min	Mean	Max	Ct	Min	Mean	Max	Ct	Min	Mean	Max
Temperature (°C)	25	5.2	14	24	25	5.2	13	24	25	10	17	27	25	9.6	18	27	25	9.1	17	29	25	9.2	17	28
DO (mg/L)	24	6.46	10.1	12.9	24	7.97	10.4	13.5	23	5.83	10.1	17	24	8.24	10.6	17.8	22	8.53	11	17.4	23	7.94	11.1	17.9
pH	25	6.1	7.6	9	25	6.1	7.6	8.8	25	7.5	8.3	9.3	25	6.7	7.8	8.6	25	6.8	8.1	8.7	25	7.3	8.2	8.7
EC (umhos/cm)	25	32	37	81	25	30	36	51	25	137	171	204	25	34	50	56	25	159	192	220	25	121	191	221
Turbidity (NTU)	16	1.6	38	324	16	1.2	4.3	23	15	1.8	3.4	8.2	15	1.7	12	60	15	1.2	8.2	36	15	0.8	9.4	42
TSS (mg/L)	16	<1.0	24	140	16	<1.0	1.1	<10	17	<1.0	2.8	<10	17	1.3	5.2	19	17	<1.0	8.4	95	17	<1.0	3.9	12
TOC (mg/L)	3	<1.0	1	1.5	3	1	1.5	2.3	4	2.2	4.8	8.5	4	1.2	2.3	4.5	4	2.7	4.2	6.6	4	2	3.3	5.5
E. coli (MPN)	18	<1	2*	63	17	<1	2*	19	18	<1	8*	118	18	<1	3*	30	18	<1	5*	30	18	<1	2*	48
48 Hour Tox.	3	80	90	100	N/A				1	100			1	70			N/A				N/A			
96 Hour Tox.	2	95		100	N/A				1	100		100	1	95			N/A				N/A			
Nutrients																								
K (mg/L)	9	<1.0	0.83	1.2	9	<1.0	1.01	2.8	7	1.3	1.5	2	7	<1.0	0.83	1.2	7	1.4	1.8	2	7	1.42	1.8	2
H ₃ PO ₄ (mg/L)	10	<0.03	0.11	<1.0	10	<0.03	0.11	<1.0	8	<0.03	0.14	<1.0	8	<0.03	0.14	<1.0	8	<0.03	0.14	<1.0	8	<0.03	0.14	<1.0
P (mg/L)	9	<0.05	0.03	<0.1	9	<0.05	0.03	<0.1	6	<0.05	0.04	<0.1	6	<0.05	0.03	<0.1	6	<0.05	0.031	<0.1	6	<0.05	0.031	<0.1
NO ₂ + NO ₃ (mg/L)	5	<0.01	<0.01	<0.01	5	<0.01	<0.01	<0.01	5	<0.01	0.15	0.36	5	<0.01	0.01	0.01	3	<0.01	0.08	0.16	5	<0.01	0.08	0.15
NO ₃ (mg/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	0.12		0.17	2	<2.0		<2.0	2	<2.0		<2.0
NH ₃ N (mg/L)	10	<0.05	0.12	<1.0	10	<0.05	0.12	<1.0	8	<0.05	0.14	<1.0	8	<0.05	0.14	<1.0	8	<0.05	0.14	<1.0	8	<0.05	0.14	<1.0
TKN (mg/L)	4	0.05	0.31	<2.0	4	0.06	0.32	<2.0	5	0.18	0.59	<2.0	5	0.11	0.48	<2.0	5	0.17	0.52	<2.0	5	0.06	0.48	<2.0
Total Trace Elements																								
Hardness	2	12		12	2	<1.0		12	1	68			1	19			1	82			1	81		
Chromium (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0	2	<1.0		<1.0
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	1.5		1.7	2	<1.0		1.1	2	1.4		2	2	1.3		1.7
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		3.1	2	<2.0		<2.0	2	<2.0		<2.0
Cadmium (ug/L)	2	<0.1		<0.1	2	<0.1		<0.1	2	<0.1		0.11	2	<0.1		0.13	2	<0.1		0.13	2	<0.1		0.64
Selenium (ug/L)	2	<0.4		<0.4	2	<0.4		<0.4	1	<0.4			1	<0.4			1	0.4			1	<0.4		
Dissolved Trace Elements																								
Zinc (ug/L)	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		<2.0	2	<2.0		2	2	<2.0		<2.0	2	<2.0		<2.0
Copper (ug/L)	2	<1.0		<1.0	2	<1.0		<1.0	2	1.4		3.8	2	<1.0		1.1	2	1.2		2.1	2	<1.0		1.4

* = Median Value

6.1 Cosumnes River Watershed

6.1.1 River Sites

Table 3 summarizes the results for data collected from the Cosumnes Watershed river sites.

Samples with the lowest minimum, mean, and maximum dissolved oxygen (DO) concentrations were collected at SAC001, with concentrations of 4.14, 10.9, and 14.6 mg/L, respectively. The highest dissolved oxygen concentrations were found in samples collected from ELD004 at 8.46, 12.0, and 17.2 mg/L.

The pH concentrations were more consistent than dissolved oxygen concentrations, with the range for all sites between 6.1 and 9.0. Mean concentrations were 7.7 to 7.8.

Minimum electrical conductivity concentrations ranged from 42 to 47 umhos/cm except for samples taken at SAC001, which had a minimum concentration of 32 umhos/cm. Mean concentrations ranged from 69 umhos/cm at ELD004 to 98 umhos/cm at SAC001. Maximum concentrations were more variable than minimum or mean concentrations, with the lowest maximum concentration of 89 umhos/cm at ELD004 and the highest maximum concentration of 161 umhos/cm at SAC001.

Minimum temperatures ranged from 2.0 °C at ELD004, to 4.6 °C at SAC001. Mean temperatures ranged from 11 to 13 °C, while maximum temperatures ranged from 23 to 26 °C.

Turbidity at all sites except SAC001, had minimum concentrations of 0 NTU. The minimum turbidity at SAC001 was 3.4 NTU. Mean concentrations were under 3 NTU except for SAC001, which had an mean concentration of 40 NTU. Maximum concentrations ranged from 5.7 NTU at SAC003, to 250 NTU at SAC001.

Total suspended solids samples were analyzed by two labs, which used differing reporting limit levels (<1.0 mg/L and <10.0 mg/L). All sample results were below the reporting limit levels.

Minimum total organic carbon (TOC) results were below reporting limit levels for all river sites. Mean and maximum concentrations at SAC003 remained below detection levels. The highest mean and maximum TOC concentrations resulted from samples collected at SAC001, at 2.0 and 4.7 mg/L, respectively.

Minimum *E. coli* concentrations were below 5 MPN/100mL at all sites except SAC001. At this site, the minimum concentration was 38 MPN/100mL. Mean concentrations ranged from 14 MPN/100mL at ELD004 to 85 MPN/100mL at SAC001. Maximum concentrations ranged from 272 MPN/100mL at SAC003 to 549 MPN/100mL at SAC001.

Toxicity samples were limited to sampling at ELD004 and SAC001. Generally, results for both 48 Hour Ceriodaphnia and 96 Hour Fathead Minnow toxicity analyses were at or above 80% survival rates. The one exception was a 48 Hour Ceriodaphnia Toxicity analysis at SAC001 with a 55% survival rate.

Nutrient samples were also analyzed by labs using differing reporting limits due to leveraged funding from a variety of programs and contracts. Samples collected for phosphate, phosphorus, nitrate and ammonia at all sites remained below reporting levels for minimum and maximum values. Total Kjeldhal nitrogen minimum and maximum samples were below reporting levels for all sites except SAC003, which had a minimum value of 0.18 mg/L and a maximum concentration that was below detection level of <2.0 mg/L. Minimum potassium concentrations were below the detection level of <1.0 mg/L at all sites. Mean potassium concentrations ranged from 0.56 mg/L at SAC003 to 3.45 mg/L at ELD004. Maximum concentrations ranged from 0.68 mg/L at SAC003 to 6.4 mg/L at ELD004.

Minimum hardness concentrations ranged from 20 mg/L at ELD004 to 26 mg/L at SAC001. Maximum concentrations ranged from 22 mg/L at ELD004 to 33 mg/L at SAC001.

Minimum concentrations for all total and dissolved trace elements were below reporting levels. SAC001 was the only site in the Cosumnes Watershed that had detectable maximum results for total chromium (1.7 ug/L), copper (3.5 ug/L), and zinc (4.9 ug/L), as well as dissolved zinc (6.1 ug/L) and copper (2.4 ug/L).

6.1.2 Impoundment Sites

Cosumnes impoundment site summaries are in Table 6. Unless noted, summary results for the impoundment sites (Jenkinson Lake) fell within the ranges detailed for the river.

Average and maximum dissolved oxygen concentrations at Jenkinson Lake dipped below the river sites, with an average of 10.1 mg/L and maximum of 12.9 mg/L at ELD001.

Electrical conductivity concentrations at Jenkinson Lake was lower at both sites than at the river sites, with a minimum concentration of 30 umhos/cm, mean of 14 umhos/cm, and maximum of 51 and 81 umhos/cm.

Turbidity at ELD001 was much higher than the highest concentration at the river sites, with minimum, mean, and maximum results at 1.6, 38, and 320 NTU, respectively. The results at ELD002, were also higher than the other river sites, with summary minimum, mean, and maximum results at 1.2, 4.3, and 23 NTU, respectively.

Total suspended solids samples were analyzed by two labs, which used differing reporting limit levels (<1.0 mg/L and <10.0 mg/L). All sample results were below the reporting limit levels, except for the maximum concentration at ELD001 (140 mg/L).

Minimum total organic carbon (TOC) results were below reporting limit (1.0 mg/L) for ELD001 and ELD002. Mean concentrations were 1.0 mg/L at ELD001 and 1.5 mg/L at ELD002. Maximum concentrations were 1.5 mg/L at ELD001 and 2.3 mg/L at ELD002.

E. coli concentrations at Jenkinson Lake were much lower than the river sites. Minimum concentrations were below detection levels of <1 MPN, and the median concentration at both sites was 2 MPN. Maximum concentrations were 19 MPN at ELD002 and 63 MPN at ELD001.

Toxicity samples were limited to ELD001. Results for both 48-Hour Ceriodaphnia and 96-Hour Fathead Minnow toxicity analysis were at or above 80% survival rates.

Both impoundment sites had detectable total Kjeldhal Nitrogen minimum concentrations at 0.05 mg/L at ELD001 and 0.06 mg/L at ELD002. Nitrate and Nitrate+nitrite were also analyzed at the impoundment sites. Nitrate+nitrite was below reporting levels for all samples at both sites, however nitrate was detectable at both sites, with a minimum concentration of 0.07 mg/L, mean of 0.11 mg/L, and maximum of 0.14 mg/L.

Hardness concentrations at the impoundment sites was lower than the river sites, with the lowest concentrations at ELD002 below reporting levels, mean at 6.3 mg/L, and maximum at 12 mg/L. Concentrations at ELD001 were 12 mg/L for the two samples collected.

6.2 Mokelumne River Watershed

6.2.1 River Sites

Table 4 summarizes the results for data collected from the Mokelumne Watershed sites.

Minimum dissolved oxygen (DO) concentrations ranged from 5.7 mg/L at AMA002 to 9.84 mg/L at AMA001. Mean concentrations ranged from a low of 9.96 mg/L at SAC002 to a high of 14.0 mg/L at CAL004. Maximum dissolved oxygen concentrations ranged from 14 mg/L at SAC002 to 20.7 mg/L at CAL004.

The lowest minimum (6.4) and mean (7.5) pH concentrations were found at SJC512. The highest minimum concentration of 7.4 was collected at CAL004, while the highest mean concentration of 7.9 was measured at CAL004. Maximum concentrations ranged from 8.2 at AMA002 and CAL004 to 8.7 at SJC512.

Minimum electrical conductivity (EC) concentrations at most sites ranged from 21 umhos/cm at AMA001 and CAL004 to 34 umhos/cm at SAC002. Mean concentrations ranged from 33 umhos/cm at AMA001 to 54 umhos/cm at SAC002. Maximum concentrations ranged from 56 umhos/cm at SJC512 to 71 umhos/cm. Results from AMA002 varied greatly from these results, with a minimum concentration at 120 umhos/cm and a maximum concentration at 314 umhos/cm.

The lowest minimum (1.3 °C), mean (8.3 °C) and maximum (13 °C) temperatures were recorded at AMA001. The highest minimum temperature was 9.3 °C at SJC512, while the highest mean temperature was 15 °C at SAC002 and the highest maximum temperature was 27 °C at AMA002.

Minimum turbidity concentrations were below 5 NTU at all river sites. Mean concentrations ranged from 1.6 NTU at AMA001 to 4.6 NTU at SAC002. Maximum concentrations ranged from 4.6 NTU at AMA001 to 17 NTU at AMA002.

Total suspended solids (TSS) concentrations were below minimum reporting limits except for samples collected at SJC512 and SAC002. Due to the differing reporting limits and differing number of samples collected, mean concentrations were calculated using half the reporting limit of the lab that conducted the analysis - .5 mg/L for samples analyzed by Sierra Foothill Lab, and 5 mg/L for samples analyzed by Twinning Lab. The lowest minimum reported concentration was 1.1 mg/L at SJC512. SAC002 had the highest concentration, ranging from 8.4 mg/L to 31 mg/L.

Total organic carbon (TOC) concentrations fell below reporting limits at AMA001, AMA002, and SJC512. The highest minimum concentration was 1.3 mg/L at CAL004. Mean TOC concentrations ranged from 1.4 mg/L at AMA001 to 8.5 mg/L at AMA002. Maximum concentrations ranged from 1.8 mg/L at CAL004 to 38 mg/L at AMA002.

The lowest *E. coli* concentrations were below counting levels at both AMA001 and CAL004. The highest minimum concentration was 23 MPN/100 mL at SAC002. The lowest median concentration was 3 MPN/100mL at AMA001, while the highest median concentration was 76 MPN/100mL at AMA002. Maximum concentrations ranged from 49 MPN/100mL at CAL004 to above detection limit of >2419.6 at AMA002. The highest maximum concentration at CAL005 was lower than the free flowing river sites at 30 MPN/100mL.

Toxicity sample collection was limited to CAL004 and SJC512. Generally, results for both 48 Hour Ceriodaphnia and 96 Hour Fathead Minnow toxicity analyses were at or above 90% survival rates. The exceptions were 48 Hour Ceriodaphnia Toxicity analyses at SJC512 and CAL005 with 70% survival rates, each.

Nutrient samples analyzed for phosphate, and ammonia were below reporting limits for all sites. Phosphorus samples for all sites except SJC512 were also below reporting limits. With a

minimum concentration below reporting level at SJC512, the calculated mean was 0.04 mg/L and the maximum concentration was 0.06 mg/L. Total Kjeldhal Nitrogen samples were below reporting limits except for the concentrations of 0.07 mg/L at SJC512 and AMA001, and 0.8 mg/L at AMA002. The minimum nitrate+nitrite concentrations were below reporting levels at all sites. The highest maximum concentration was 0.10 mg/L at AMA002.

Nitrate+nitrite was not analyzed at SAC002. All nitrate results were below the reporting limit. Minimum potassium concentrations ranged from 0.42 mg/L at AMA001 and CAL004 to 0.88 mg/L at AMA002. Mean concentrations ranged from 0.53 mg/L at AMA001 to 1.3 mg/L at AMA002. Maximum concentrations ranged from 0.72 mg/L at AMA001 to 2.0 mg/L.

Upper watershed sites had a mean hardness concentration of 7.4 mg/L at AMA001 and 9 mg/L at CAL004. Lower watershed sites had higher mean hardness concentrations of 18 mg/L at SJC512 and 19 mg/L at SAC002. AMA002, a main tributary of the Mokelumne River, reported the highest hardness values with a mean of 98 mg/L.

Total trace element samples were below reporting levels at all sites for cadmium. Total chromium concentrations were below reporting levels for all sites except SAC002, which had a minimum concentration below reporting levels, maximum concentration of 2.4 ug/L and a calculated mean concentration of 0.7 ug/L. Selenium concentrations were below reporting levels for all sites except CAL004, which had a single result of 0.477 ug/L. Total copper and zinc concentrations were below reporting levels at AMA001, AMA002, and CAL004. Results were above reporting levels at the lower watershed sites, with maximum concentrations of 1.1 ug/L for copper and 5.4 ug/L for zinc at SJC512 and 2.8 for copper and 6.4 ug/L for zinc at SAC002.

Dissolved trace element concentrations were below detection levels for all constituents at the upper watershed sites. Similar to total zinc and copper, maximum concentrations at lower watershed sites were above reporting limits. The maximum dissolved zinc concentration at SJC512 was 4.2 ug/L, while the maximum dissolved zinc concentration at SAC002 was 5.4 ug/L. The maximum dissolved copper concentration at SAC002 was 4.8 ug/L.

6.2.2 Impoundment Sites

The Mokelumne impoundment site summaries are in Table 6. Unless noted below, summary results for the impoundment sites fell within the ranges detailed for the river sites.

The pH concentrations at AMA003 were higher than the highest minimum, mean, and maximum river results, with summary results at 7.5, 8.3, and 9.3.

Even though Sutter Creek (AMA002) and Lake Amador (AMA003) are in separate sub basins within the foothills of the Mokelumne Watershed, summary EC results from both sites were much higher than the sites along the main stem of the Mokelumne River, at a minimum of 137 umhos/cm, mean of 171 umhos/cm, and maximum of 204 umhos/cm.

Minimum and mean temperatures were higher at the impoundment sites, with minimum results of 9.6 °C at Camanche and 10 °C at AMA003, and means of 18 °C at Camanche and 17 °C at AMA003. The highest temperature was 27°C at both sites.

Turbidity concentrations at the impoundment sites were similar to the river sites, except the maximum concentration at CAL005 at 60 NTU.

Total Suspended Solid concentrations were above detection levels for the samples collected from CAL005 as well, with minimum, mean, and maximum concentrations at 1.3, 5.2, and 19 mg/L, respectively.

The minimum TOC concentration at AMA003 of 2.2 mg/L was higher than the minimum at any of the river sites. The mean and max at CAL005 were 2.3 and 4.5, respectively, which was similar to the sites downstream of the discharge. The mean and max at AMA003 were 4.8 mg/L and 8.5 mg/L, which were second highest in the watershed to AMA002.

One set of toxicity samples collected at both sites in September. Results for both 48-Hour Ceriodaphnia and 96-Hour Fathead Minnow toxicity analysis were at 100% survival rates for AMA003. Results for 48-Hour Ceriodaphnia were 70% survival and 96-Hour Fathead Minnow was 95% survival at CAL005.

Summary results for many of the nutrient constituents were higher at AMA003 than they were for the river sites, including: minimum potassium (1.3 mg/L), mean potassium (1.5 mg/L), mean nitrate+nitrite (0.15 mg/L), and mean Total Kjeldahl Nitrogen (0.59 mg/L). Nutrient summary results for CAL005 were minimums below reporting levels for potassium, phosphate, phosphorus, nitrite+nitrate, nitrate, and ammonia. Minimum concentration for TKN was 0.11 mg/L. Maximum concentrations for phosphate, phosphorus, ammonia and TKN were below reporting levels. The maximum concentration for potassium was 1.2 mg/L, for nitrite+nitrate was 0.01 mg/L.

One sample was analyzed in June 2002 at each site for hardness. Hardness concentrations at the impoundment sites were 19 mg/L at CAL005 and 68 mg/L at AMA003.

Unlike the river sites, cadmium results were detectable at the impoundment sites, with maximum concentrations of 0.11 ug/L at AMA003 and 0.13 ug/L at CAL005. Similar to the lower watershed sites, copper was also detectable at the impoundment sites, with concentrations at a maximum of 1.1 ug/L at CAL005 and a range of 1.5 to 1.7ug/L at AMA003. Copper was also detectable at CAL005, with a maximum concentration of 3.1 ug/L.

Dissolved zinc, while lower in concentration than the river sites, was detectable at CAL005 at 2 ug/L. Dissolved copper was also detected during the two sampling events at both impoundment sites. Concentrations reported were <1 and 1.1 ug/L at CAL005 and 1.4 and 3.8 ug/L at AMA003.

6.3 Calaveras River Watershed

6.3.1 River Sites

Table 5 summarizes the results for data collected from the Calaveras Watershed river sites.

Minimum dissolved oxygen concentrations at the Calaveras Watershed river sites ranged from 5.10 mg/L at CAL002 to 8.84 mg/L at CAL001. Mean concentrations ranged from 9.14 mg/L at SJC513 to 12.6 mg/L at CAL003. Maximum concentrations ranged from 12.6 mg/L at SJC513 to 19 mg/L at all three upper watershed sites (CAL001, CAL002, and CAL003).

Mean pH concentrations ranged between 7.7 and 7.9, with the lowest concentration of 6.7 at CAL001 and CAL002, and the highest pH of 8.8 at SJC513.

The range of electrical conductivity (EC) concentrations both within the watershed and within sites had a spread approximately one and a half that of concentrations recorded from the Mokelumne Watershed and approximately three and a half times that of the concentrations recorded from the Cosumnes Watershed. The lowest minimum (49 umhos/cm), mean (65 umhos/cm) and maximum (87 umhos/cm) concentrations were recorded at CAL001. The highest minimum concentration was recorded at CAL008 (157 umhos/cm), while the highest mean (270 umhos/cm) and maximum (504 umhos/cm) were recorded at CAL002.

Minimum and mean temperatures were lowest at CAL001, with values of 0.41 °C and 9.2 °C, respectively. The highest minimum and mean temperatures were recorded at SJC513, at 10 °C and 17 °C, respectively. Maximum temperatures ranged from 13 °C at CAL008 to 24 °C at CAL003.

Minimum turbidity concentrations were generally below 0.5 NTU at all sites, except CAL003, which had a minimum concentration of 1.3 NTU. Mean and maximum turbidity concentrations ranged from 1.2 NTU and 2.0 NTU, respectively, at CAL008, to 4.9 NTU and 17 NTU, respectively, at SJC513.

Minimum and maximum total suspended solids (TSS) sample concentrations were below reporting levels at all river sites during the sample collection period of January – November 2002. These results correlate with low turbidity readings.

Minimum total organic carbon (TOC) concentrations were below reporting limits for samples collected at the upperwatershed sites – CAL001, CAL002, and CAL003. The highest minimum concentration (2.0 mg/L) was recorded at CAL008. Mean concentrations ranged from a calculated low of 1.1 mg/L at CAL003 to mean 3.8 mg/L at SJC513. Maximum concentrations ranged from 1.8 mg/L at CAL003 to 12 mg/L at CAL001.

The lowest minimum, median, and maximum *E. coli* concentrations were reported for samples collected from CAL008 at <1, 12, and 61 MPN/100 mL, respectively. The highest minimum concentration was recorded from samples collected at CAL002, at 33 MPN/100mL, while the highest median (114 MPN/100mL) and maximum (>2420 MPN/100mL) concentrations were recorded from samples collected from SJC513.

Toxicity samples were limited to CAL001 and CAL008. Generally, results for both 48-Hour Ceriodaphnia and 96-Hour Fathead Minnow toxicity analysis were at or above 90% survival rates. The exception was a 48 Hour Ceriodaphnia and 96 Hour Fathead Minnow Toxicity analyses at CAL001 with a 80% survival rate for both analyses.

Nutrient scan results for phosphate and ammonia were below reporting limits for samples collected at all sites. Phosphorus samples were below the reporting limit at most sites and nitrate samples were below the reporting limit at all sites. At CAL002 and SJC513, maximum phosphorus concentrations were as high as 0.07 mg/L. Total kjeldhal nitrogen minimum concentrations were below reporting limits at all sites. However, due to analysis by labs with differing detection levels, minimum concentrations ranged from <0.05 mg/L to <2.0 mg/L, both at CAL001. The maximum TKN concentration was 0.37 mg/L at SJC513. The lowest minimum potassium, and nitrite+nitrate concentrations were below reporting limits of <1.0, <0.01, and <0.05, respectively. The highest minimum (1.6 mg/L), mean (2.2 mg/L), and maximum (3.5 mg/L) potassium concentrations resulted from samples collected at SJC513. The highest minimum (0.09 mg/L), mean (0.21 mg/L) and maximum (0.28 mg/L) nitrite + nitrate concentrations resulted from samples collected at CAL008.

Mean hardness concentrations varied based on more than one variable. Ephemeral upper watershed sites mean 125 mg/L at CAL003 and 150 mg/L at CAL002. The perennial CAL001 had the lowest hardness concentration of all sites at 21 mg/L. One set of hardness samples was collected from the lower watershed sites at CAL008 and SJC513. Resulting hardness concentrations were 79 mg/L at CAL008 and 81 mg/L at SJC513.

Samples analyzed for total chromium and total zinc were below reporting limits for all sites. Minimum concentrations for total cadmium were below reporting limits at all sites, and maximum concentrations were below reporting limits for all sites except for SJC513, which had a maximum concentration of 0.12 ug/L. Samples were not analyzed for selenium at CAL003 and SJC513. Selenium samples were below reporting limits (<0.4 ug/L) at CAL001 and CAL008, while the sample from CAL002 had a concentration of 1.02 ug/L. Total copper concentrations were below

reporting limits (<1.0 ug/L) at all upper watershed sites. Total copper concentrations in the two samples collected at SJC513 were below detection levels and 1.7 ug/L, while samples collected at CAL008 were 1.0 ug/L and 1.3 ug/L.

Dissolved zinc samples were below reporting levels for all sites except CAL001, which had one sample that had a concentration of 2.2 ug/L. Dissolved copper samples were below detection levels for all sites except SJC513, which had one sample that had a concentration of 1.7 ug/L.

6.3.2 Impoundment Sites

Calaveras impoundment site summaries are in Table 6. Unless noted, summary results for the impoundment sites fell within the ranges detailed for the river sites.

Mean pH at the impoundment sites was slightly higher than the river sites at 8.1 at CAL006 and 8.2 at CAL007.

Minimum electrical conductivity at CAL007 was slightly lower than CAL008, 121 umhos/cm. However, the minimum at CAL006 and the means and maximum results were similar to results from CAL008, 159 umhos/cm, 191 umhos/cm, and 221 umhos/cm, respectively.

Maximum temperatures were highest at the impoundment sites, at 36 °C at CAL006 and 42 °C at CAL007.

Mean and maximum turbidity concentrations were highest at the impoundment sites. Concentrations at CAL006 were 8.2 and 36 NTU, respectively, and at CAL007 were 9.4 and 42 NTU, respectively.

Maximum TSS concentrations at the impoundment sites were 12 mg/L at CAL007 and 95 mg/L at CAL006 on the same day. Turbidity monitoring was not conducted in conjunction with this monitoring event since the equipment was not yet available.

Minimum and mean TOC concentrations were higher at AMA003 than the river sites, at 2.7 and 4.2 mg/L, respectively.

Median *E. coli* concentrations were lowest at the impoundment sites, at 2 MPN/100mL at CAL007 and 5 MPN/100mL at CAL006.

Hardness at the impoundment sites was similar to the lower watershed sites. One set of hardness samples was collected from the lower watershed sites, resulting in hardness concentrations at 81 mg/L at CAL007 and 82 mg/L at CAL006.

Two samples were collected for trace elements during June 2002. Total copper and cadmium were detectable, with concentrations being higher than the river sites. Minimum, mean, and maximum copper concentrations were 1.3, 1.5, and 1.7 ug/L at CAL007 and 1.4, 1.7, and 2.0 ug/L at CAL006. Minimum cadmium was below detection levels at both impoundment sites, while maximum concentrations were 0.13 ug/L at CAL006 and 0.64 ug/L at CAL007. Selenium was detectable at CAL006, with a concentration of 0.436 ug/L.

Dissolved copper was detectable for both samples collected at CAL006 at 1.2 and 2.1 ug/L. One of two samples had detectable results at CAL007, at 1.4 ug/L.