

## COMMUNICATION REPORT

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DATE: July 2, 2007  
TO: Jodi Pontureri, Central Valley Regional Water Quality Control Board  
CC: Margaret Wong, Central Valley Regional Water Quality Control Board  
Bill Croyle, Central Valley Regional Water Quality Control Board  
FROM: Sacramento Valley Water Quality Coalition  
SUBJECT: Follow-up to Exceedance Report dated April 26, 2007 (Event 19)

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### SAMPLE DATES AND SITES

The Sacramento Valley Water Quality Coalition (Coalition) conducted irrigation season water sampling from April 17, 2007 through April 19, 2007 as required by the Irrigated Lands Conditional Waiver and the Coalition's Monitoring and Reporting Program Plan (MRP). This event was an Irrigation Season sample event. This Communication Report presents the results of additional evaluations and provides information supplemental to the Exceedance Report dated 04/26/07. Results are discussed for the following sites:

Subwatershed	Site ID	Site	Sample Dates
ColusaBasin	WLKRC	Walker Creek at Co Rd 48	4/17/2007
EIDorado	COONH	Coon Hollow Creek	4/17/2007
PlacerNevadaSSutterNSacramento	CCBRW	Coon Creek at Brewer Road	4/18/2007
SacramentoAmador	LAGAM	Laguna Creek at Alta Mesa Rd	4/17/2007
SolanoYolo	WLSBP	Willow Slough Bypass at SP	4/17/2007

### TEST TYPE AND RESULTS

The results of toxicity tests discussed in this report are provided in Table 2. Copies of the lab reports for referenced results are provided with this report. The following exceedances were observed:

Walker Creek at Co Rd 48 (WLKRC): In a toxicity test conducted on water samples with *Ceriodaphnia*, the Coalition observed a reduction in survival of 54% compared to the control. However, the control survival for this test was below the test acceptance criterion and the sample was retested. The results of this retest met test acceptance criteria and confirmed the apparent toxicity observed in the initial test, with a reduction in survival of 83% compared to the control. This result was statistically significant and is in exceedance of the Basin Plan narrative objective for toxicity.

Coon Hollow Creek (COONH): In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 85% compared to the control. This result was statistically significant and is in exceedance of the Basin Plan narrative objective for toxicity.

Coon Creek at Brewer Road (CCBRW): In a toxicity test conducted with *Selenastrum*, the Coalition observed a reduction in cell growth of 53% compared to the control. This result was statistically significant and is in exceedance of the Basin Plan narrative objective for toxicity.

Laguna Creek at Alta Mesa Rd (LAGAM): In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 75% compared to the control. This result was statistically significant and is in exceedance of the Basin Plan narrative objective for toxicity.

Willow Slough Bypass at SP (WLSBP): In a toxicity test conducted with *Ceriodaphnia*, the Coalition observed a reduction in survival of 100% compared to the control (complete mortality). In a toxicity test conducted with *Selenastrum*, the Coalition observed a reduction in cell growth of 24% compared to the control. These results were statistically significant and in exceedance of the Basin Plan narrative objective for toxicity.

The results of these tests met all test acceptability QA requirements, with the exception of the results for Walker Creek noted above. Other samples in same batch as with the Walker Creek sample were not significantly toxic compared to the control in the initial test or the retest.

## FOLLOW-UP ACTIONS

In response to the observed exceedances of Basin Plan narrative toxicity objectives, information regarding these exceedances was provided to local growers in the affected subwatersheds through local outreach efforts. Additional follow-up actions were initiated with the representatives of the affected subwatersheds as outlined in the Coalition’s communication strategy document.

The following actions to evaluate the causes of toxicity were implemented:

### Follow-Up Sampling

Follow-up sampling was conducted at the initial sites, and additional samples were collected upstream from each site on April 24 and April 25. Appropriate upstream sample locations were determined through consultation with representatives of the affected subwatersheds. The upstream follow-up samples were collected at the locations provided in Table 1.

**Table 1. Follow-Up Site Table**

Site Name	Site ID	subwatershed	Latitude	Longitude
Willow Slough North Fk at CR99	WLSNO	SolanoYolo	38.6049	-121.7854
Willow Slough South Fk at CR99	WLSSO	SolanoYolo	38.5952	-121.7856
Coon Hollow Creek at North Canyon Creek Rd	CNHFU	EIDorado	38.7481	-120.7239
Walker Creek near 99W and CR33	WLKCH	ColusaBasin	39.6242	-122.1965
Laguna Cr below Reclamation Canal	LAGFU	SacramentoAmador	38.3310	-121.1915
Freshwater Creek at Freshwater Road	FRSFW	ColusaBasin	39.1748	-122.2265
Coon Creek at Dowd Road	CCDOW	PNSSNS	39.9313	-121.3771

The results of follow-up testing are provided in Table 3. To summarize:

- There was no significant *Selenastrum* toxicity in the follow-up sample collected on 4/24/07 from the WLSBP location. There was a small but statistically significant reduction in *Selenastrum* cell density in the WLSNO sample (11.7% reduction compared to control), and no reduction in the WLSSO sample.

- There was no significant *Ceriodaphnia* toxicity in any of the follow-up samples collected on 4/24/07 in the Willow Slough drainage.
- There was significant *Ceriodaphnia* toxicity in both of the follow-up samples collected on 4/25/07 in the Coon Hollow Creek drainage. This suggests that toxicity in these samples originated from the upper part of the drainage with limited irrigated acreage. Most of the irrigated acreage is below the CNHFU site.
- There was significant *Ceriodaphnia* toxicity in both of the follow-up samples collected on 4/25/07 in the Laguna Creek drainage. This suggests that toxicity in these samples originated from the upper part of the drainage above LAGFU.
- There was no significant *Selenastrum* toxicity in the follow-up samples collected on 4/24/07 from the CCBRW or CCDOW locations.
- There was no significant *Ceriodaphnia* toxicity in the follow-up samples collected on 4/24/07 in the Walker Creek drainage.

### Toxicity Identification Evaluations

The observed toxicity (>50% reductions compared to control) triggered initiation of Toxicity Identification Evaluation (TIE) procedures for the initial samples from COONH, LAGAM, WLSBP, and WLKRC using *Ceriodaphnia*, and for CCBRW using *Selenastrum*. TIE's were initiated on the day following observance of >50% mortality for *Ceriodaphnia* tests, and on the day following confirmation of >50% reduction in cell growth for the *Selenastrum* test. TIEs were also initiated on follow-up samples collected at COONH, CNHFU, LAGAM, and LAGFU. The results of the TIEs are summarized below, and provided in the attached files (SVWQC\_19\_WaterTox.xls, SVWQC\_19FU\_WaterTox.xls).

- *Ceriodaphnia* toxicity was persistent in the initial WLSBP sample collected on 4/17/07. The removal of organic compounds (C8SPE treatment) and PBO treatments both completely removed toxicity, indicating that a metabolically activated, non-polar organic contaminant contributed to the toxicity. Toxicity was also partially removed by centrifugation, indicating a particulate-associated toxicant. This pattern is consistent with organophosphate pesticides, including chlorpyrifos.
- The toxicity to *Ceriodaphnia* was persistent in the ambient WLKRC sample collected on 4/17/07. Centrifugation and piperonyl butoxide (PBO) addition removed the toxicity, suggesting that a particulate-associated contaminant and/or metabolically activated substance contributed to the toxicity. This pattern is consistent with some organophosphate pesticides, including chlorpyrifos.
- *Ceriodaphnia* toxicity was not persistent in the initial samples collected from LAGAM, and COONH, or in the follow-up samples collected from the COONH, CNHFU, LAGAM, and LAGFU sites. These TIEs were therefore inconclusive regarding the cause of toxicity.
- *Selenastrum* toxicity was not persistent in the initial sample collected from CCBRW, and this TIE was inconclusive regarding the cause of toxicity.

## Serial Dilution Test

The observed toxicity at WLSBP was 100% and triggered a serial dilution test. This test was initiated the following day that 100% mortality was observed in the test.

- *Ceriodaphnia* toxicity was persistent at a reduced level in the initial sample collected from the WLSSP site. There was approximately 1.4 Toxic Units (TU) remaining in this samples.
- *Ceriodaphnia* toxicity was not persistent in the follow-up sample collected from the CNHFU site. There was less than 1 Toxic Unit (TU) remaining in this samples.

## Results of Chemical Analyses

Results of chemical analyses were reviewed for possible causes of the observed *Ceriodaphnia* and *Selenastrum* toxicity. Pesticide analyses conducted on the initial samples included organophosphate and triazine pesticides, organochlorine pesticides, carbamates, and various herbicides. Detected concentrations of pesticides were compared to the water quality objectives and to reported benchmarks for invertebrates and non-vascular plants (algae) in USEPA's Ecological Risk Assessment Aquatic Life Benchmark Table ([http://www.epa.gov/oppefed1/ecorisk\\_ders/aquatic\\_life\\_benchmark.htm](http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm)). The values in the Benchmark Table are intended to be concentrations below which pesticides are not expected to have the potential for adverse effects on aquatic life.

The results of trace metals analyses were evaluated in comparison to water quality objectives based on the protection of aquatic life. Trace metals were not detected at concentrations that exceeded water quality criteria and were determined to be unlikely to cause or contribute to the observed toxicity. Although *Selenastrum* is relatively sensitive to copper, the concentrations of dissolved copper in WLSSP and CCBRW were a fraction of the EC50<sup>1</sup> of 40-50 ug/L. Based on this, copper and other trace metals were considered not likely to have contributed to the observed toxicity.

- In the WLSBP sample, chlorpyrifos was 0.083 ug/L. This concentration exceeds the proposed Basin Plan chronic and acute objectives for chlorpyrifos (0.015 ug/L and 0.025 ug/L), and appears to explain the *Ceriodaphnia* toxicity observed in the 4/17/07 Willow Slough sample. Low levels of simazine and trifluralin herbicides were also detected, but these concentrations were not high enough to explain even the low algae toxicity. Detected concentrations of diuron in the WLSSP sample (3.7 ug/L) were higher than the reported benchmark of 2.4 ug/L for non-vascular plants in USEPA's Ecological Risk Assessment Aquatic Life Benchmark Table. Concentrations of diuron above this level indicate that this pesticide may be sufficient to explain the observed toxicity to *Selenastrum*.
- In the COONH samples, DDE and atrazine were detected below concentrations expected to result in *Ceriodaphnia* toxicity.

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<sup>1</sup> USEPA 2007. *Aquatic Life Ambient Freshwater Quality Criteria – Copper, 2007 Revision*. U.S. Environmental Protection Agency, Office of Water, EPA-822-R-07-001. February 2007.

- In the CCBRW sample, simazine was detected below concentrations expected to result in *Selenastrum* toxicity.
- In the LAGAM samples collected on 4/17/07 and 4/25/07, simazine was detected below concentrations expected to result in *Ceriodaphnia* toxicity. Paraquat was detected below the quantitation limit and below concentrations expected to result in *Ceriodaphnia* toxicity.
- No organophosphate or triazine pesticides were detected in the LAGFU sample collected on 4/25/07.
- In the WLKRC sample, malathion was detected at 0.013 ug/L and diazinon was detected at 0.014 ug/L. Concentrations of both pesticides were below levels expected to affect *Ceriodaphnia*. However, malathion has a short half-life (~6 days) in water, and these organophosphate pesticides have similar modes of action and therefore may both have contributed to the observed *Ceriodaphnia* toxicity. Simazine and trifluralin were also detected at concentrations not expected to adversely affect *Ceriodaphnia*.

### **Pesticide Applications**

Applications of pesticides that were not monitored for the *ILP* are being investigated in the LAGAM, CCBRW, and WLKRC drainages with the assistance of the local Agriculture Commissioners.

### **CONCLUSIONS AND ADDITIONAL FOLLOW-UP ACTIONS**

The following conclusions were based on the results discussed above:

**WLSSP** – The TIE and chemical analyses indicated that chlorpyrifos was the primary cause of the *Ceriodaphnia* toxicity observed in the 4/17/07 sample. Chemical analyses indicated that diuron was the most likely cause of the *Selenastrum* toxicity in this sample. The *Ceriodaphnia* and *Selenastrum* toxicity was not persistent in ambient follow-up samples collected in this drainage on 4/24/07.

**COONH** – The TIE results were inconclusive and chemical analyses did not detect any pesticides or other chemicals at concentrations toxic to *Ceriodaphnia* in the initial samples or the follow-up samples. Results of the follow-up sampling suggested that the source of toxicity in these samples was from the upper part of the Coon Hollow Creek drainage, which has limited agricultural acreage. These results suggest that the toxicity is probably not from an agricultural source.

**LAGAM** –The TIE results were inconclusive and chemical analyses did not detect any pesticides or other chemicals at concentrations toxic to *Ceriodaphnia* in the initial samples or the follow-up samples. Results of the follow-up sampling suggested that the toxicity in these samples may be from a persistent source in the drainage above the Folsom Reclamation Canal. This part of the Laguna Creek drainage has a diverse array of potential sources, including agriculture, low-density residential areas, Rancho Seco Nuclear Generating Station (decommissioned), an active fish hatchery, and dredge tailings for historic mining.

**CCBRW** – The results of the follow-up evaluations did not identify any potential causes or sources of the toxicity to *Selenastrum*. The chemical analyses did not detect any pesticides or

other chemicals at concentrations toxic to *Selenastrum* in the initial samples or the follow-up samples in this drainage. There was no toxicity to *Selenastrum* in the follow-up samples in this drainage, indicating that toxicity was not persistent in ambient waters.

**WLKRC** –The TIE results indicated that a metabolically-activated particulate-associated compound was the primary cause of the *Ceriodaphnia* toxicity observed in the 4/17/07 sample. Chemical analyses detected malathion and diazinon at concentrations below levels acutely toxic to *Ceriodaphnia*. Malathion and diazinon are highly soluble and would not be effectively removed by centrifugation, suggesting that another metabolically-activated compound might be contributing to the *Ceriodaphnia* toxicity. There was no toxicity to *Ceriodaphnia* in the follow-up samples in this drainage, indicating that toxicity was not persistent in ambient waters.

Additional follow-up actions planned to address the toxicity observed during this event include the following:

- Inform local growers of the probable causes of toxicity in the WLSSP and WLKRC drainages through local outreach efforts as outlined in the Coalition’s communication strategy document.
- Complete an evaluation of the unmonitored pesticides applied in the LAGAM, CCBRW, and WLKRC drainages in the month preceding sampling.

**Table 2. Aquatic toxicity test results for samples collected April 17 – 19, 2007**

Site	Sample Dates	Species	Endpoint Units	Result	% of Control	% Reduction
Control (019-CD-LWControl-01)	NA	<i>Ceriodaphnia</i>	% Survival	100%	NA	NA
Coon Hollow Creek	4/17/07	<i>Ceriodaphnia</i>	% Survival	15.0%	15.0%	85.0%
Laguna Creek at Alta Mesa Rd	4/17/07	<i>Ceriodaphnia</i>	% Survival	25.0%	25.0%	75.0%
Willow Slough Bypass at SP	4/17/07	<i>Ceriodaphnia</i>	% Survival	0.0%	0.0%	100.0%
Control (019-CD-LWControl-02)	NA	<i>Ceriodaphnia</i>	% Survival	65%	NA	NA
Walker Creek at Co Rd 48	4/17/07	<i>Ceriodaphnia</i>	% Survival	30.0%	46.2%	53.8%
Control (019-CD-LWControl-05)	NA	<i>Ceriodaphnia</i>	% Survival	90%	NA	NA
Walker Creek at Co Rd 48 (retest)	4/17/07	<i>Ceriodaphnia</i>	% Survival	15.0%	16.7%	83.3%
Control (019-SC-LWControl-01)	NA	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.29	NA	NA
Willow Slough Bypass at SP	4/17/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	0.985	76.4%	23.6%
Control (019-SC-LWControl-04)	NA	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	.773	NA	NA
Coon Creek at Brewer Road	4/18/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	0.36	46.6%	53.4%

**Table 3. Aquatic toxicity test results for follow-up samples collected April 24 – 25, 2007**

Site	Sample Dates	Species	Endpoint Units	Result	% of Control	% Reduction
Control (019FU-SC-LWControl-01)	NA	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.262	N/A	NA
Willow Slough Bypass at SP	4/24/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.183	93.7%	6.3% <sup>(2)</sup>
Control (019FU-SC-LWControl-02)	NA	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	0.980	N/A	NA
Willow Slough North Fork	4/24/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	0.865	88.3%	11.7% <sup>(1)</sup>
Willow Slough South Fork	4/24/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.601	163%	0% <sup>(2)</sup>
Coon Creek at Brewer Road	4/24/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.532	156%	0% <sup>(2)</sup>
Coon Creek at Dowd Road	4/24/07	<i>Selenastrum</i>	Cells/mL • 10 <sup>6</sup>	1.574	161%	0% <sup>(2)</sup>
Control (019FU-CD-LWControl-01)	NA	<i>Ceriodaphnia</i>	% Survival	95%	N/A	NA
Willow Slough Bypass at SP	4/24/07	<i>Ceriodaphnia</i>	% Survival	100%	105%	0% <sup>(2)</sup>
Willow Slough North Fork	4/24/07	<i>Ceriodaphnia</i>	% Survival	100%	105%	0% <sup>(2)</sup>
Willow Slough South Fork	4/24/07	<i>Ceriodaphnia</i>	% Survival	100%	105%	0% <sup>(2)</sup>
Walker Creek at 99W and CR33	4/24/07	<i>Ceriodaphnia</i>	% Survival	100%	105%	0% <sup>(2)</sup>
Walker Creek at Co Rd 48	4/24/07	<i>Ceriodaphnia</i>	% Survival	100%	105%	0% <sup>(2)</sup>
Control (019FU-CD-LWControl-01)	NA	<i>Ceriodaphnia</i>	% Survival	100%	N/A	NA
Coon Hollow Creek	4/25/07	<i>Ceriodaphnia</i>	% Survival	20%	20%	80% <sup>(3)</sup>
Coon Hollow Creek Follow-Up	4/25/07	<i>Ceriodaphnia</i>	% Survival	0%	0%	100% <sup>(3)</sup>
Laguna Creek at Alta Mesa Rd	4/25/07	<i>Ceriodaphnia</i>	% Survival	5%	5%	95% <sup>(3)</sup>
Laguna Creek Follow-Up	4/25/07	<i>Ceriodaphnia</i>	% Survival	15%	15%	85% <sup>(3)</sup>

1. Statistically significant toxicity, less than 20% reduction.
2. No significant reduction compared to control.
3. Statistically significant toxicity, greater than 20% reduction.

**Table 4. Pesticides detected in samples with significant toxicity**

Station Code	Sample Date	Analyte Name	Result, ug/L	Result Qual Code	WQO (Source) <sup>(1)</sup>	Risk Assessment Benchmarks <sup>(2)</sup>	
						Invert.	Algae
WLSBP	4/17/07	DDE(p,p')	0.004	J <sup>(3)</sup>	0.00059 (CTR)	NA	NA
WLSBP	4/17/07	Carbofuran	0.72		0.4 (BP)	0.75	NA
WLSBP	4/17/07	Diuron	3.7	J	NA	80	2.4
WLSBP	4/17/07	Simazine	0.012		4.0 (MCL)	500	36
WLSBP	4/17/07	Trifluralin	0.127		NA	2.4	7.5
WLSBP	4/17/07	Chlorpyrifos	0.083		0.015 (BPA)	0.04	1,400
COONH	4/17/07	DDE(p,p')	0.007		0.00059 (CTR)	NA	NA
COONH	4/25/07	Atrazine	0.066		1.0 (MCL)	62	32
LAGAM	4/17/07	Paraquat	<0.4	J	NA	NA	NA
LAGAM	4/17/07	Simazine	0.006	J	4.0 (MCL)	500	36
CCBRW	4/18/07	Diuron	0.21	J	NA	80	2.4
CCBRW	4/18/07	Simazine	0.012		4.0 (MCL)	500	36
WLKRC	4/17/07	Malathion	0.013		0.1 (BP)	0.06	NA
WLKRC	4/17/07	Simazine	0.243		4.0 (MCL)	500	36
WLKRC	4/17/07	Diazinon	0.014		0.1 (BPA)	0.1	3,700
WLKRC	4/17/07	Diuron	0.66		NA	80	2.4
WLKRC	4/17/07	Trifluralin	0.007		NA	2.4	7.5
CNHFU	4/25/07	Atrazine	0.006	J	1.0 (MCL)	62	32
LAGAM	4/25/07	Simazine	0.005	J	4.0 (MCL)	500	36

1 Water quality objective and source: BP = Basin Plan; BPA = Basin Plan Amendment; MCL = California Drinking Water Maximum Contaminant Limit; CTR = California Toxics Rule; NA = No Applicable objective

2 Ecological Risk Assessment Aquatic Life Benchmark Table  
([http://www.epa.gov/oppefed1/ecorisk\\_ders/aquatic\\_life\\_benchmark.htm](http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm))

3 Detected below the quantitation limit