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Central Valley Regional Water Quality Control Board
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The Sacramento Valley Water Quality Coalition (SVWQC) and the Yolo Subwatershed request Executive Officer approval for completion of the *Ceriodaphnia dubia* Toxicity Management Plan for Cache Creek. The basis for this request is that Cache Creek has been determined to meet the Water Quality Objectives (WQOs) for toxicity, and agricultural pesticides are unlikely to have contributed to the observed exceedances. Additional factors supporting the request include the lack of observed toxicity to *Selenastrum* and *Pimephales* and predominantly undetected pesticide results.

BACKGROUND FOR MANAGEMENT PLAN REQUIREMENT

The management plan requirement for *Ceriodaphnia dubia* was triggered by exceedances observed in August 2007 and July 2008. The Cache Creek monitoring location (CCCPY) was originally selected as an upstream site to characterize source water entering the lower Cache Creek and Willow Slough drainages. This site characterizes water from the Cache Creek drainage upstream from the CCCPY site. Willow Slough at Pole Line Road (WLSPL) is the representative ILRP monitoring site for the drainage. The diversion dam on Cache Creek near Capay is the main diversion point for irrigation water in the 190,000 acre Yolo County Flood Control and Water Conservation District. The Diversion Dam is located 1.9 miles west of the town of Capay. During the summer irrigation season, the water at this site is released from storage approximately 50-60 miles upstream from the Clear Lake and Indian Valley Reservoirs. There is no snow pack in this coastal watershed, and consequently winter flows are very "flashy" (i.e., rising and falling quickly). Major crops in drainage upstream from the Capay diversion dam include orchards, hay and silage, grain crops, alfalfa, and miscellaneous row crops.

DATA AND EXCEEDANCES

Relevant monitoring data for *Ceriodaphnia* toxicity are provided in **Table 1** through **Table 5**. These monitoring results indicate the following:

- A total of 33 sample events have been conducted for *Ceriodaphnia dubia* toxicity in Cache Creek, including three follow-up events. There have been three (3) exceedances, all observed at the CCCPY site.
- There have been no *Ceriodaphnia* toxicity exceedances in the seven (7) samples collected since August 16, 2011 for the management plan.

- 1,694 pesticide results have been analyzed for 43 sample events collected between January 26, 2005 and June 19, 2013. Pesticides were detected in 7 samples, with 7 detected results overall (0.4% of the total), with no exceedances of ILRP Trigger Limits or water quality objectives. *None of the toxicity exceedances were associated with pesticide exceedances.*
- Trace metals were monitored for two of the three events (August 2007 and July 2008) with significant *Ceriodaphnia* toxicity. Available monitoring results indicate that, with the exception of boron, trace metals have not been observed to exceed objectives in Cache Creek and are not elevated to concentrations expected to result in toxicity to sensitive invertebrate species (Table 4). In addition, available monitoring results for Willow Slough Bypass at Poleline (WLSPL), which is the downstream location that eventually receives water from the Cache Creek system, indicate that with the exception of boron and selenium, trace metals have not been observed to exceed objectives (Table 5). Some parameters (e.g., boron and selenium) are elevated in Cache Creek and Willow Slough, especially when groundwater is a primary irrigation source, but these parameters are not present at levels expected to cause toxicity to *Ceriodaphnia*.

There was one (1) *Selenastrum* toxicity exceedance in the 17 samples collected between February 10, 2007 and September 18, 2008, on June 20, 2007.

- There were no statistically significant *Hyaella* sediment toxicity exceedances in the four (4) samples collected between April 2007 and August 2008.

Overall, these monitoring data indicate that *Ceriodaphnia dubia* toxicity is not a chronic problem in the Cache Creek drainage, and that management practices in this represented area are adequate to prevent exceedances of *Ceriodaphnia dubia* toxicity from agricultural discharges.

SUMMARY OF EVALUATIONS SUPPORTING REQUEST

The following evaluations and factors support this request:

Assessment of Compliance with Water Quality Objectives	No exceedances of the water quality objective for toxicity have occurred in the six (6) <i>Ceriodaphnia</i> samples collected since February 2011 (>2 years).
Lack of agricultural contribution to toxicity	A Source Evaluation Report was submitted on August 18, 2011. Based on the available evidence (evaluations of land uses, reported pesticide applications, the timing of irrigation and precipitation, chemistry and toxicity results, TIE results, and chemical and toxicity characteristics), agricultural pesticides were unlikely to have caused or contributed to the exceedances.
Outreach and Education	As part of the response to the observed exceedances, growers were informed of the exceedances. Because no specific agricultural cause was identified, there was no targeted outreach to promote pesticide-specific management practices.
Implemented Practices	The pesticide application and runoff management practices commonly in use for the predominant crops in the drainage have the potential to successfully prevent the runoff and transport of the pesticides of concern, and monitoring results support a conclusion that practices are generally successful in doing that.

SOURCE EVALUATIONS

A Source Evaluation Report was submitted in August 2011.¹ The source evaluation assessed land uses, reported pesticide applications, the timing of irrigation and precipitation, chemistry and toxicity results, results of Toxicity Identification Evaluations (TIEs), and chemical and toxicity characteristics. Non-agricultural sources were also considered. The conclusions of the evaluations were as follows:

- Specific causes and sources could not be definitively identified for the toxicity exceedances in Cache Creek. Based on the available evidence, agricultural pesticides were unlikely to have contributed to the exceedances:
 - No pesticides were detected at concentrations expected to cause toxicity to *Ceriodaphnia*.
 - TIE results for the August 2007 and July 2008 exceedances were unable to determine a cause of the toxicity because the toxicity was not persistent. However, the TIE results supported a finding that pesticides with the highest potential for causing the toxicity based on use and toxicological characteristics (organophosphates and pyrethroids) were not the likely cause.
 - 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 of *Ceriodaphnia*.
 - Chlorpyrifos, malathion, permethrin, and esfenvalerate were identified as having a higher relative risk of contributing to the observed toxicity, but these were determined to be unlikely causes based on monitoring and sediment toxicity testing results, the methods and timing of applications, and the low potential for agricultural runoff and transport during the events with observed toxicity.
 - No unmonitored agricultural pesticides were identified as having a significant potential to cause or contribute to the *Ceriodaphnia* toxicity observed in the Cache Creek samples. Consequently, no additional pesticides were recommended for analysis based on the evaluation of pesticide use in the drainage.
 - Potential non-agricultural sources of toxicity are limited in the Cache Creek drainage above CCCPY, but include the small towns of Guinda and Rumsey, and the Cache Creek Casino Resort.

OUTREACH AND EDUCATION

Outreach was not conducted targeting specific pesticides because no pesticides were identified as likely causes of the observed toxicity. SVWQC conducted general outreach informing growers in the drainage of the observed toxicity and the Management Plan. No implementation of additional practices was

¹ *Source Evaluation Report: Ceriodaphnia Toxicity in Cache Creek*. Prepared by Larry Walker Associates for the Sacramento Valley Water Quality Coalition. August 2011.

recommended or warranted based on the findings of source evaluations and management plan monitoring by SVWQC. Consequently, the outreach conducted by SVWQC is not considered a significant basis for this request for completion of the management plan.

MANAGEMENT PRACTICES

No implementation of additional practices was recommended or warranted based on the findings of source evaluations and management plan monitoring by SVWQC. The pesticide application and runoff management practices commonly in use for the predominant crops in the drainage have been demonstrated through monitoring to generally prevent the runoff and transport of the pesticides with the potential to result in toxicity.

SURVEYS

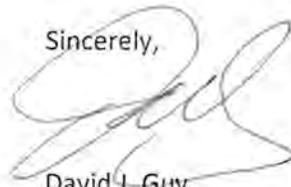
The degree to which management practices are implemented in the drainage would typically be determined through surveys of selected growers in the drainage, if appropriate. However, agricultural pesticides do not appear likely to have been the cause of the observed exceedances. If agriculture *had* contributed to the observed toxicity, grower response to the initial exceedances may have successfully mitigated problems from agricultural operations, but this is not possible to determine.

CONCLUSIONS

Based on the monitoring results, with no water column or sediment toxicity exceedances since August 2011 and virtually no detected pesticides in 33 events since 2007, Cache Creek is meeting the Central Valley Basin Plan WQO for toxicity to *Ceriodaphnia* and other aquatic species. Additionally, based on the findings presented previously and summarized in this request, we conclude that agricultural practices have been and continue to be sufficient to prevent discharges of toxic pesticides and other chemicals to Cache Creek, and that agriculture was not the likely source of the observed *Ceriodaphnia* exceedances that triggered the Management Plan.

As specified in the SVWQC's Criteria for Completion of a Management Plan, we respectfully request that you make a determination of the completeness of this management plan.

Sincerely,



David J. Guy
President

Northern California Water Association

Cc: Joe Karkoski
Susan Fregien
Mark Cady
Denise Sagara
Bruce Houdesheldt
Claus Suverkropp

TABLES

Table 1. Monitoring Results for *Ceriodaphnia* in Stony Creek

Event	Sample Date	Sample Replicate	<i>Ceriodaphnia</i> survival, % of control
17	2/10/2007	1	100
19	4/18/2007	1	100
20	5/16/2007	1	70
21.1	6/27/2007	1	100
22	7/18/2007	1	100
23	8/22/2007	1	5.3*
23.1	8/30/2007	1	100
24	9/19/2007	1	100
25	12/20/2007	1	100
26	1/29/2008	1	100
27	2/22/2008	1	80
28	4/23/2008	1	100
29	5/21/2008	1	95
30	6/19/2008	1	95
31	7/16/2008	1	15*
31.1	7/23/2008	1	100
32	8/20/2008	1	95
33	9/18/2008	1	100
39	5/19/2009	1	100
40	6/18/2009	1	100
41	7/21/2009	1	84.2
42	8/19/2009	1	100
63	5/18/2011	1	95
64	6/22/2011	1	70
65	7/20/2011	1	100
66	8/16/2011	1	5*
72	2/21/2012	1	100
74	4/18/2012	1	106
76	6/21/2012	1	100
78	8/21/2012	1	100
84	2/20/2013	1	100
86	4/17/2013	1	100
88	6/19/2013	1	100

* Exceedance or statistically significant toxicity

Table 2. Summary of Monitoring Results for Toxicity in Water and Sediment Samples (2007 – 2013)

Toxicity test species	Number of events	Number of toxicity exceedances
<i>Ceriodaphnia</i> survival	33	3
<i>Pimephales</i> survival	9	0
<i>Selenastrum</i> growth	17	1
<i>Hyalella</i> survival (in sediment)	4	0

Table 3. Summary of Monitoring Results for Pesticides Analyzed in Water

Pesticide Category	Number of results	Detected results	Notes for detected pesticides	Sampled Period (Min and Max dates)	
Carbamates	224	0		10-Feb-2007	18-Sep-2008
Herbicide	277	0		10-Feb-2007	18-Sep-2008
Organochlorines	479	1	Endrin	10-Feb-2007	18-Sep-2008
Organophosphates	437	0		10-Feb-2007	19-Jun-2013
Pyrethroids	77	0		21-Feb-2012	19-Jun-2013
Triazine	192	6	Simazine	10-Feb-2007	18-Sep-2008
Unclassified	8	0		10-Feb-2007	20-Dec-2007
Totals	1,694	7 (0.4%)			

Table 4. Summary of Monitoring Results for Trace Metals Analyzed in Water (CCCPY)

Analyte	Number of Events	Max Detected Value ($\mu\text{g/L}$)	Minimum Trigger Limit ($\mu\text{g/L}$)	Trigger Limit Source
Arsenic, dissolved	16	3.3	150	CTR FW AL Chronic ⁽¹⁾
Arsenic, total	16	3.7	10	1° MCL ⁽³⁾
Boron, dissolved	11	2500	—	<i>none for dissolved fraction</i>
Boron, total	14	3100	700	Narrative (Ayers & Westcot)
Cadmium, dissolved	16	N/A	2.3	CTR FW AL Chronic ⁽²⁾
Cadmium, total	16	N/A	5	1° MCL ⁽³⁾
Copper, dissolved	16	1.7	9.3	CTR FW AL Chronic ⁽²⁾
Copper, total	16	6	1300	1° MCL ⁽³⁾
Lead, dissolved	16	0.3	2.7	CTR FW AL Chronic ⁽²⁾
Lead, total	16	1	15	1° MCL ⁽³⁾
Nickel, dissolved	16	4.6	54	CTR FW AL Chronic ⁽²⁾
Nickel, total	16	26	100	1° MCL ⁽³⁾
Selenium, dissolved	16	4	—	<i>none for dissolved fraction</i>
Selenium, total	16	1	5	CTR FW AL Chronic ⁽¹⁾
Zinc, dissolved	16	7	120	CTR FW AL Chronic ⁽²⁾
Zinc, total	16	10	5000	1° MCL ⁽⁴⁾

(1) California Toxics Rule, Freshwater Aquatic Life Chronic Criterion

(2) California Toxics Rule, Freshwater Aquatic Life Chronic Criterion, hardness-adjusted

(3) Primary Drinking Water MCL

(4) Secondary Drinking Water MCL

Table 5. Summary of Monitoring Results for Trace Metals Analyzed in Water (WLSPL)

Analyte	Number of Events	Max Detected Value ($\mu\text{g/L}$)	Minimum Trigger Limit ($\mu\text{g/L}$)	Trigger Limit Source
Arsenic, dissolved	16	3.7	150	CTR FW AL Chronic ⁽¹⁾
Arsenic, total	18	22	10	1° MCL ⁽³⁾
Boron, dissolved	11	2000	—	<i>none for dissolved fraction</i>
Boron, total	31	2600	700	Narrative (Ayers & Westcot)
Copper, dissolved	19	5.6	9.3	CTR FW AL Chronic ⁽²⁾
Copper, total	20	20	1300	1° MCL ⁽³⁾
Lead, total	15	4.4	15	1° MCL ⁽³⁾
Molybdenum, total	7	20.81	10	Narrative (Ayers & Westcot)
Nickel, dissolved	16	7.3	54	CTR FW AL Chronic ⁽²⁾
Nickel, total	16	31	100	1° MCL ⁽³⁾
Selenium, dissolved	11	11	—	<i>none for dissolved fraction</i>
Selenium, total	16	11	5	CTR FW AL Chronic ⁽¹⁾
Zinc, dissolved	14	20	120	CTR FW AL Chronic ⁽²⁾
Zinc, total	17	60	5000	1° MCL ⁽⁴⁾

(1) California Toxics Rule, Freshwater Aquatic Life Chronic Criterion

(2) California Toxics Rule, Freshwater Aquatic Life Chronic Criterion, hardness-adjusted

(3) Primary Drinking Water MCL

(4) Secondary Drinking Water MCL