TECHNICAL MEMORANDUM

Results of Cyanobacteria and Microcystin Monitoring in the Vicinity of the Klamath Hydroelectric Project: July 6, 2009

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Introduction

This technical memorandum summarizes the latest results of monitoring during 2009 for cyanobacteria species and the associated toxin microcystin in Copco and Iron Gate reservoirs in PacifiCorp's Klamath Hydroelectric Project (Project) and in one monitoring station in the Klamath River below Iron Gate dam. This monitoring is particularly focused on *Microcystis aeruginosa* (MSAE), a cyanobacterium with a recent history of summertime blooms in Copco and Iron Gate reservoirs that is known to produce microcystin. This monitoring also estimates the presence of other potentially-toxigenic cyanobacteria, including *Anabaena* spp. and *Planktothrix (Oscillatoria)* spp. This monitoring is being conducted pursuant to Interim Measure 12, Water Quality Monitoring, contained in the Klamath Hydroelectric Project Agreement in Principle (AIP) executed between the United States Department of Interior, the States of California and Oregon, and PacifiCorp.

The results specifically addressed in this memorandum are for samples collected on July 6, 2009. Subsequent memoranda such as this will be prepared every two weeks to report the results of continued monitoring. PacifiCorp plans to prepare a final report of the results and interpretation of the complete set of collected data after the conclusion of the sampling effort in winter 2009.

Methods

PacifiCorp is conducting phytoplankton sampling for laboratory analysis of potentially-toxigenic cyanobacteria, notably MSAE, and microcystin at six sites in Copco and Iron Gate reservoirs and one site below Iron Gate dam as listed in Table 1, including:

- Two open-water reservoir sites in the lower ends of Iron Gate and Copco reservoirs (near the log booms). These sites are part of the basic water quality monitoring that is being performed under the 2009 AIP Measure 12 water quality monitoring plan (http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/klamath_river/klamath_river_aip/).

- Four shoreline sites in coves in Copco and Iron Gate reservoir (i.e., two cove sites in each reservoir).

- One Klamath River site below Iron Gate dam near the hatchery bridge.

Sampling will occur at the two open-water monitoring sites once per month in June through December. Samples will be taken at the shoreline locations in the reservoirs twice per month in June through October. Samples for the river site below Iron Gate dam will be collected twice per month in June, July and October and weekly in August and September.

Phytoplankton samples from the river sites are taken as grab samples offshore according to the standard operating procedure (SOP) developed by the Klamath Blue Green Algae Working Group (see Appendix A in the 2009 AIP Monitoring Plan). At the open-water reservoir sites public health samples will be collected according to the published SOP. Additional samples, including a grab sample at 0.5 m depth and an integrated sample over 8 m depth, will be collected as part of the baseline water quality monitoring.

Samples for phytoplankton speciation, density, and biovolume are preserved in Lugol's solution and sent to Aquatic Analysts in Milwaukie, Oregon for analysis. The laboratory analysis of phytoplankton speciation and density is performed on prepared microscope slides of filtered samples using phase contrast microscopy. Species are counted as algal units of cell, filament, or colony depending on the natural growth form of the species. Algal forms are identified to species or otherwise to the lowest practicable taxonomic level. Biovolumes are estimated by multiplying the cell counts by the average geometric dimensions of the cells for a given phytoplankton taxa. Results for cyanobacteria species are reported as individual cells per milliliter.

Samples for determination of microcystin toxin are placed in a cooler on ice and shipped to the EPA Region 9 Laboratory in Richmond, California. The samples are analyzed using the competitive Enzyme-Linked ImmunoSorbent Assay (ELISA) method based on the EnviroLogix QuantiPlate Kit for Microcystins. The quantitation limit is 0.16 µg/L or parts per billion (ppb). This test method does not distinguish between the specific microcystin congeners, but detects their presence to differing degrees. That is, ELISA test results yield one value as the sum of all measurable microcystin variants.

Table 1. Sites of Cyanobacteria and Microcystin Public Health Monitoring in Copco and Iron Gate Reservoirs during 2009

Location	Approximate River Mile	Site ID
Copco reservoir at Mallard Cove ramp	201.5	CRMC
Copco reservoir at Copco Cove ramp	200.0	CRCC
Copco reservoir near dam at cable line	198.6	CR01
Iron Gate reservoir at Camp Creek ramp	192.8	IRCC
Iron Gate reservoir at Williams campground	192.4	IRJW
Iron Gate reservoir near dam at log boom	190.2	IR01
Klamath R. at Iron Gate Hatchery bridge	189.7	KRBI

Results

Samples of July 6, 2009

Five samples were collected for public health purposes on July 6, 2009. Samples were collected from Mallard Cove and Copco Cove in Copco reservoir, from Jay Williams campground and Camp Creek campground in Iron Gate reservoir, and from the Klamath River below Iron Gate dam near the Iron Gate hatchery bridge. Samples were sent to the EPA Region 9 laboratory for analysis for microcystin, and to Aquatic Analysts for cyanobacteria species identification and enumeration. Results for microcystin analysis for July 6 samples are not yet available.

The results of cyanobacteria species identification and enumeration are summarized in Table 2; cumulative data are included in Appendix 1. Three cyanobacteria species were present in the samples collected on July 6, 2009; *Anabaena* sp., and *Aphanizomenon flos-aquae*, and *Microcystin aeruginosa*. Both *Anabaena* and *Aphanizomenon* have been reported to produce anatoxin, a potentially dangerous neurotoxin (Codd et al 2005), although *Aphanizomenon* does not appear to produce toxins in Upper

Klamath Lake or the Klamath River. *Anabaena* was present in the sample from Iron Gate reservoir at Camp Creek access. *Aphanizomenon* was observed at all sites sampled except for Camp Creek on Iron Gate reservoir. The concentration of *Anabaena* sp. at Camp Creek in Iron Gate reservoir did not exceed the relevant guidelines for protection of individuals engaged in water contact recreation.[1]

Microcystis aeruginosa was observed in samples collected from all the sites. *Microcystis* has been observed to produce microcystin, a potentially dangerous liver toxin (Codd et al 2005). The abundance of *Microcystis* cells at Copco Cove in Copco reservoir and Jay Williams campground (Mirror Cove) in Iron Gate reservoir, exceeded WHO and California guidelines, and could pose a potential health risk to persons or pets engaged in water contact recreation. Laboratory data sheets for phytoplankton are included as Appendix 2.

Results of analysis for microcystin toxin for samples collected on July 6 are not yet available. Results of microcystin analysis for all sites sampled by sampling entities pursuant to the 2009 AIP Monitoring Plan through June 25, 2009 are presented in Appendix 3. Through June 25, 2009, no sample has exceeded the relevant guideline (8 µg/L) for microcystin.

Table 2. Summary of cyanobacteria and microcystin public health monitoring results in Copco and Iron Gate Reservoirs on July 6, 2009.

Date	Sample	Location[1]	Species	Biovolume um^3/mL	Rank[2]	Cells/mL
07/06/09	KR9096	CRCC	*Microcystis aeruginosa*	25,950,397	1	3,243,800
			Aphanizomenon flos-aquae	422,813	8	6,711
07/06/09	KR9095	CRMC	*Aphanizomenon flos-aquae*	7,941	13	126
			Microcystis aeruginosa	1,471	26	184
07/06/09	KR9098	IRCC	*Microcystis aeruginosa*	227,276	2	28,409
			Anabaena sp.	36,222	8	533
07/06/09	KR9097	IRJW	*Microcystis aeruginosa*	8,312,549	1	1,039,069
			Aphanizomenon flos-aquae	417,838	13	6,632
07/06/09	KR9099	KRBI	*Aphanizomenon flos-aquae*	10,005	20	159
			Microcystis aeruginosa	4,065	21	508

[1]CRMC = Copco reservoir at Mallard Cove ramp, CRCC = Copco reservoir at Copco Cove ramp, IRCC = Iron Gate reservoir at Camp Creek ramp, IRJW = Iron Gate reservoir at Williams campground, KRBI = Klamath R. at Iron Gate Hatchery bridge . [2]Rank = The rank of the species in the sample based on the count of algal units.

[1]The World Health Organization (WHO) has recommended guidelines for safe recreational water environments based on a low, moderate, or high probability of adverse health effects from exposure to concentrations of cyanobacterial cells and microcystin toxins in recreational waters (WHO 2003). The WHO guideline values for low and moderate probability of adverse health in recreational waters are 20,000 and 100,000 cyanobacterial cells/mL, respectively. WHO equates these cell count values to microcystin toxin concentrations of 4 µg/L and 20 µg/L, respectively (WHO 2003). The WHO guideline for high probability of adverse health effects is a narrative; i.e., "Cyanbacterial scum formation in areas where whole-body contact and/or risk of ingestion/aspiration occur". No specific cyanobacterial cell or microcystin concentrations are provided by WHO for high probability of adverse health effects. The WHO (2003) guidance values were derived from calculations based on a 20 kg child that would swim for up to two hours (in a day) and would accidentally ingest 0.05 L of water per hour.

The California State Water Resources Control Board (SWRCB 2007) and Oregon Department of Health Services (ODHS 2005) provide guidelines for posting advisories in recreation waters. These guidelines were developed using information provided in WHO (2003). Both SWRCB (2007) and ODHS (2005) recommend posting advisories in recreation waters under three circumstances: (1) if "scum is present associated with toxigenic species"; (2) if scum is not present, but the density of *Microcystis* or *Planktothrix* is 40,000 cells/ml or greater; and (3) if scum is not present, but the density of all potentially toxigenic BGA is 100,000 cells/ml or greater. Based on WHO (2003) information, SWRCB (2007) and ODHS (2005) indicate that cell counts of 40,000 cells/mL and 100,000 cells/mL equate to microcystin toxin concentrations of 8 µg/L and 20 µg/L, respectively.

References

AIP Interim Measure 12: water quality Monitoring Activities Monitoring Year 2009. June 2009. Posted on the California North Coast Regional Water Quality Control Board. http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/klamath_river/klamath_river_aip/.

Codd, G. A., J. Lindsay, F. M. Young, L. F. Morrison, and J. S. Metcalf. 2005. Harmful cyanobacteria: from mass mortalities to management measures. In Harmful Cyanobacteria, J. Juisman, H. C. P. Matthijs, and P. M. Visser eds. Springer 2005.

ODHS. 2005. Public Health Advisory Guidance for Toxigenic Cyanobacteria in Recreational Waters. Oregon Department of Human Services, Environmental Toxicology Program.

PacifiCorp. 2008. Agreement in Principle to address issues pertaining to the resolution of certain litigation and other controversies in the Klamath Basin, including a path forward for possible Facilities removal. U.S. Secretary of the Interior, November 18, 2008.

SWRCB. 2007. Cyanobacteria in California Recreational Water Bodies: Providing Voluntary Guidance about Harmful Algal Blooms, Their Monitoring, and Public Notification. June 2007. Document provided as part of Blue-green Algae Work Group of State Water Resources Control Board (SWRCB) and Office of Environmental Health and Hazard Assessment (OEHHA).

World Health Organization (WHO). 2003. Guidelines for safe recreational waters, Volume 1 – Coastal and fresh waters, Chapter 8: Algae and cyanobacteria in fresh water. WHO Publishing, Geneva, pp. 136-158.

Appendix 1

Cumulative Data for 2009 Public Health Samples.

Date	Sample	Location[1]	Species	Biovolume, $\mu m^3/mL$	Rank[2]	Cells/mL
06/08/09	KR9060	CRCC	*Anabaena flos-aquae*	1,019,824	2	15,221
06/22/09	KR9065	CRCC	*Anabaena flos-aquae*	61,364	4	916
06/08/09	KR9060	CRCC	*Aphanizomenon flos-aquae*	9,471	26	150
06/22/09	KR9065	CRCC	*Aphanizomenon flos-aquae*	1,262,193	1	20,035
07/06/09	KR9096	CRCC	*Aphanizomenon flos-aquae*	422,813	8	6,711
07/06/09	KR9096	CRCC	*Microcystis aeruginosa*	25,950,397	1	3,243,800
06/08/09	KR9059	CRMC	*Anabaena flos-aquae*	271,627,386	1	4,054,140
06/22/09	KR9064	CRMC	*Aphanizomenon flos-aquae*	826,007	1	13,111
07/06/09	KR9095	CRMC	*Aphanizomenon flos-aquae*	7,941	13	126
07/06/09	KR9095	CRMC	*Microcystis aeruginosa*	1,471	26	184
06/08/09	KR9062	IRCC	*Anabaena flos-aquae*	83,936	2	1,253
06/22/09	KR9067	IRCC	*Anabaena flos-aquae*	1,303,884	1	19,461
07/06/09	KR9098	IRCC	*Anabaena sp.*	36,222	8	533
06/22/09	KR9067	IRCC	*Aphanizomenon flos-aquae*	406,734	2	6,456
07/06/09	KR9098	IRCC	*Microcystis aeruginosa*	227,276	2	28,409
06/08/09	KR9061	IRJW	*Anabaena flos-aquae*	18,829,827	1	281,042
06/22/09	KR9066	IRJW	*Anabaena flos-aquae*	22,136	12	330
06/22/09	KR9066	IRJW	*Aphanizomenon flos-aquae*	272,567	3	4,326
07/06/09	KR9097	IRJW	*Aphanizomenon flos-aquae*	417,838	13	6,632
07/06/09	KR9097	IRJW	*Microcystis aeruginosa*	8,312,549	1	1,039,069
06/08/09	KR9063	KRBI	*Anabaena flos-aquae*	9,306	27	139
06/22/09	KR9068	KRBI	*Anabaena flos-aquae*	14,238	10	213
06/08/09	KR9063	KRBI	*Aphanizomenon flos-aquae*	12,353	26	196
06/22/09	KR9068	KRBI	*Aphanizomenon flos-aquae*	83,305	2	1,322
07/06/09	KR9099	KRBI	*Aphanizomenon flos-aquae*	10,005	20	159
07/06/09	KR9099	KRBI	*Microcystis aeruginosa*	4,065	21	508

[1]CRMC = Copco reservoir at Mallard Cove ramp, CRCC = Copco reservoir at Copco Cove ramp, IRCC = Iron Gate reservoir at Camp Creek ramp, IRJW = Iron Gate reservoir at Williams campground, KRBI = Klamath R. at Iron Gate Hatchery bridge

[2]Rank = The rank of the species in the sample based on the count of algal units.

Appendix 2

Laboratory Data Sheets for July 6, 2009 Public Health Samples.

Phytoplankton Sample Analysis

Sample: Klamath Basin
Sample Site: KR 9095
Sample Depth:
Sample Date: 6-Jul-09

Total Density (#/mL): 636
Total Biovolume (um^3/mL): 245,592
Trophic State Index: 39.7

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Rhodomonas minuta	204	32.0	4,070	1.7
2	Cryptomonas erosa	79	12.4	40,964	16.7
3	Nitzschia frustulum	66	10.3	11,817	4.8
4	Asterionella formosa	46	7.2	10,110	4.1
5	Chlamydomonas sp.	39	6.2	12,801	5.2
6	Ankistrodesmus falcatus	26	4.1	656	0.3
7	Nitzschia paleacea	20	3.1	1,930	0.8
8	Melosira granulata	13	2.1	25,274	10.3
9	Glenodinium sp.	13	2.1	9,191	3.7
10	Nitzschia amphibia	13	2.1	1,260	0.5
11	Fragilaria vaucheriae	13	2.1	5,672	2.3
12	Chromulina sp.	13	2.1	263	0.1
13	Aphanizomenon flos-aquae	8	1.2	7,941	3.2
14	Navicula minuscula	7	1.0	295	0.1
15	Nitzschia dissipata	7	1.0	1,766	0.7
16	Hannaea arcus	7	1.0	11,488	4.7
17	Gomphoneis herculeana	7	1.0	35,450	14.4
18	Stauroneis sp.	7	1.0	2,232	0.9
19	Mallomonas sp.	7	1.0	2,495	1.0
20	Stephanodiscus hantzschii	7	1.0	788	0.3
21	Kephyrion sp.	7	1.0	414	0.2
22	Stephanodiscus astraea minutula	7	1.0	2,298	0.9
23	Fragilaria capucina mesolepta	7	1.0	50,221	20.4
24	Scenedesmus quadricauda	7	1.0	1,707	0.7
25	Cocconeis placentula	7	1.0	3,020	1.2
26	Microcystis aeruginosa	5	0.7	1,471	0.6

Note: 4X count for toxic species.

Microcystis aeruginosa cells/mL = 184

Aphanizomenon flos-aquae cells/mL = 126

Aquatic Analysts　　Sample ID: ML43

Phytoplankton Sample Analysis

Sample: Klamath Basin
Sample Site: KR 9096
Sample Depth:
Sample Date: 6-Jul-09

Total Density (#/mL): 60,625
Total Biovolume (um^3/mL): 36,107,964
Trophic State Index: 75.7

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Microcystis aeruginosa	32,438	53.5	25,950,397	71.9
2	Chlamydomonas sp.	17,897	29.5	5,816,468	16.1
3	Rhodomonas minuta	2,685	4.4	53,690	0.1
4	Nitzschia palea	1,790	3.0	322,143	0.9
5	Nitzschia frustulum	1,119	1.8	134,226	0.4
6	Gomphonema subclavatum	895	1.5	912,738	2.5
7	Cocconeis placentula	671	1.1	308,720	0.9
8	Aphanizomenon flos-aquae	447	0.7	422,813	1.2
9	Fragilaria capucina mesolepta	447	0.7	285,231	0.8
10	Navicula cryptocephala veneta	447	0.7	42,505	0.1
11	Nitzschia linearis	224	0.4	340,935	0.9
12	Selenastrum minutum	224	0.4	4,474	0.0
13	Amphora ovalis	224	0.4	129,305	0.4
14	Gomphoneis herculeana	224	0.4	1,208,036	3.3
15	Fragilaria vaucheriae	224	0.4	64,429	0.2
16	Nitzschia amphibia	224	0.4	21,476	0.1
17	Fragilaria construens	224	0.4	50,111	0.1
18	Gomphonema angustatum	224	0.4	40,268	0.1

Note: 4X count for toxic species.

Microcystis aeruginosa cells/mL = 3,243,800

Aphanizomenon flos-aquae cells/mL = 6,711

Aquatic Analysts **Sample ID:** ML44

Phytoplankton Sample Analysis

Sample: Klamath Basin
Sample Site: KR 9097
Sample Depth:
Sample Date: 6-Jul-09

Total Density (#/mL): 45,321
Total Biovolume (um^3/mL): 26,450,575
Trophic State Index: 73.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Microcystis aeruginosa	10,391	22.9	8,312,549	31.4
2	Chlamydomonas sp.	9,727	21.5	3,161,422	12.0
3	Fragilaria construens	5,969	13.2	3,476,414	13.1
4	Fragilaria construens venter	5,085	11.2	1,269,167	4.8
5	Cocconeis placentula	3,758	8.3	1,728,833	6.5
6	Synedra ulna	1,990	4.4	3,959,515	15.0
7	Nitzschia frustulum	1,105	2.4	132,647	0.5
8	Nitzschia amphibia	884	2.0	84,894	0.3
9	Synedra radians	884	2.0	318,353	1.2
10	Rhoicosphenia curvata	884	2.0	124,158	0.5
11	Fragilaria vaucheriae	663	1.5	248,315	0.9
12	Rhodomonas minuta	663	1.5	13,265	0.1
13	Aphanizomenon flos-aquae	442	1.0	417,838	1.6
14	Gomphonema subclavatum	442	1.0	265,294	1.0
15	Cymbella tumida	442	1.0	1,105,392	4.2
16	Fragilaria capucina mesolepta	221	0.5	676,500	2.6
17	Melosira granulata	221	0.5	243,186	0.9
18	Nitzschia communis	221	0.5	9,949	0.0
19	Nitzschia palea	221	0.5	39,794	0.2
20	Gomphonema angustatum	221	0.5	39,794	0.2
21	Cryptomonas erosa	221	0.5	114,961	0.4
22	Melosira ambigua	221	0.5	520,861	2.0
23	Denticula elegans	221	0.5	165,809	0.6
24	Nitzschia paleacea	221	0.5	21,666	0.1

Note: 4X count for toxic species.

Microcystis aeruginosa cells/mL = 1,039,069

Aphanizomenon flos-aquae cells/mL = 6,632

Aquatic Analysts **Sample ID:** ML45

Phytoplankton Sample Analysis

Sample: Klamath Basin
Sample Site: KR 9098
Sample Depth:
Sample Date: 6-Jul-09

Total Density (#/mL): 4,457
Total Biovolume (um^3/mL): 1,610,372
Trophic State Index: 53.3

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Chlamydomonas sp.	3,551	79.7	1,154,134	71.7
2	Microcystis aeruginosa	284	6.4	227,276	14.1
3	Rhodomonas minuta	124	2.8	2,486	0.2
4	Ankistrodesmus falcatus	71	1.6	1,776	0.1
5	Synedra radians	53	1.2	19,176	1.2
6	Cryptomonas erosa	36	0.8	18,466	1.1
7	Nitzschia frustulum	36	0.8	6,392	0.4
8	Anabaena sp.	36	0.8	36,222	2.2
9	Nitzschia paleacea	36	0.8	3,480	0.2
10	Nitzschia capitellata	36	0.8	12,784	0.8
11	Nitzschia palea	36	0.8	6,392	0.4
12	Fragilaria vaucheriae	18	0.4	5,114	0.3
13	Nitzschia amphibia	18	0.4	1,705	0.1
14	Synedra ulna	18	0.4	35,334	2.2
15	Asterionella formosa	18	0.4	3,906	0.2
16	Melosira granulata	18	0.4	19,531	1.2
17	Navicula minuscula	18	0.4	799	0.0
18	Fragilaria crotonensis	18	0.4	14,915	0.9
19	Gomphonema angustatum	18	0.4	3,196	0.2
20	Trachelomonas hispida	18	0.4	37,287	2.3

Note: 4X count for toxic species.

Anabaena sp. cells/mL = 533
Anabaena sp. heterocysts/mL = 18

Microcystis aeruginosa cells/mL = 28,409

Aquatic Analysts **Sample ID:** ML46

Phytoplankton Sample Analysis

Sample: Klamath Basin
Sample Site: KR 9099
Sample Depth:
Sample Date: 6-Jul-09

Total Density (#/mL): 3,325
Total Biovolume (um^3/mL): 2,895,909
Trophic State Index: 57.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Cocconeis placentula	1,080	32.5	496,735	17.2
2	Diatoma vulgare	476	14.3	933,761	32.2
3	Gomphonema subclavatum	413	12.4	272,506	9.4
4	Gomphonema angustatum	222	6.7	52,024	1.8
5	Chlamydomonas sp.	191	5.7	61,933	2.1
6	Rhoicosphenia curvata	191	5.7	26,755	0.9
7	Gomphoneis herculeana	159	4.8	857,535	29.6
8	Cocconeis klamathensis	95	2.9	26,679	0.9
9	Ankistrodesmus falcatus	64	1.9	1,588	0.1
10	Fragilaria vaucheriae	64	1.9	27,441	0.9
11	Nitzschia frustulum	64	1.9	11,434	0.4
12	Glenodinium sp.	64	1.9	44,465	1.5
13	Nitzschia paleacea	32	1.0	3,113	0.1
14	Cryptomonas erosa	32	1.0	16,515	0.6
15	Gomphonema ventricosum	32	1.0	26,996	0.9
16	Fragilaria construens venter	32	1.0	3,049	0.1
17	Nitzschia innominata	32	1.0	1,525	0.1
18	Stephanodiscus astraea minutula	32	1.0	11,116	0.4
19	Gomphonema tenellum	32	1.0	6,670	0.2
20	Aphanizomenon flos-aquae	16	0.5	10,005	0.3
21	Microcystis aeruginosa	6	0.2	4,065	0.1

Note: 4X count for toxic species.

Aphanizomenon flos-aquae cells/mL = 159

Microcystis aeruginosa cells/mL = 508

Aquatic Analysts **Sample ID:** ML47

Appendix 3

Laboratory Results for Microcystin Analysis.

These results are provided by the EPA Region 9 laboratory. The samples were collected by the Bureau of Reclamation, PacifiCorp, Karuk Tribe Department of Natural Resources, and Yurok Tribe Environmental Program. Refer to publications of the sampling entities for information about sample names and site locations.

SAMPLENAME	SAMPDATE	RESULT	RL	UNITS	ANOTE
KR9031	05/23/2009 00:00:00	0.12	0.18	ug/L	C1, J
KR9034	05/23/2009 00:00:00	0.13	0.18	ug/L	C1, J
KR9033	05/23/2009 00:00:00	0.14	0.18	ug/L	C1, J
KR9035	05/23/2009 00:00:00	0.15	0.18	ug/L	C1, J
KR9040	05/23/2009 00:00:00	0.15	0.18	ug/L	C1, J
KR9041	05/23/2009 00:00:00	0.14	0.18	ug/L	C1, J
KR9042	05/23/2009 00:00:00	0.13	0.18	ug/L	C1, J
KR9044	05/23/2009 00:00:00	0.17	0.18	ug/L	C1, J
KR9045	05/23/2009 00:00:00	0.11	0.18	ug/L	C1, J
KR9052	05/23/2009 00:00:00	0.12	0.18	ug/L	C1, J
KR9053	05/23/2009 00:00:00	0.11	0.18	ug/L	C1, J
KR9054	05/24/2009 00:00:00	0.14	0.18	ug/L	C1, J
KR9055	05/24/2009 00:00:00	0.14	0.18	ug/L	C1, J
SV051409-OC	05/14/2009 10:10:00	0.11	0.18	ug/L	C1, J
SC051409-OC	05/14/2009 10:45:00	0.11	0.18	ug/L	C1, J
HC052809-OC	05/28/2009 09:32:00	0.14	0.18	ug/L	C1, J
SV052809-OC	05/28/2009 10:12:00	0.14	0.18	ug/L	C1, J
WA052809-OC	05/28/2009 11:13:00	0.12	0.18	ug/L	C1, J
WA051409-OC	05/14/2009 11:15:00	0.13	0.18	ug/L	C1, J
SA052809-OC	05/28/2009 08:33:00	0.12	0.18	ug/L	C1, J
SA051409-OC	05/14/2009 08:35:00	0.13	0.18	ug/L	C1, J
SH051409-OC	05/14/2009 12:06:00	0.12	0.18	ug/L	C1, J
SC052809-OC	05/28/2009 10:42:00	0.19	0.18	ug/L	
SH052809-OC	05/28/2009 12:11:00	0.16	0.18	ug/L	C1, J
OR051409-OC	05/14/2009 08:00:00	0.16	0.18	ug/L	C1, J
KR9058	06/08/2009 15:43:00	0.12	0.18	ug/L	C1, J
KR9059	06/08/2009 12:40:00	1.5	0.18	ug/L	
KR9060	06/08/2009 13:28:00	0.18	0.18	ug/L	
KR9061	06/08/2009 14:44:00	0.84	0.18	ug/L	
KR9062	06/08/2009 14:10:00	0.14	0.18	ug/L	C1, J
KR9063	06/08/2009 15:07:00	0.14	0.18	ug/L	C1, J
2009AIP-001	05/27/2009 06:50:00	0.16	0.18	ug/L	C1, J
2009AIP-002	05/27/2009 09:10:00	0.16	0.18	ug/L	C1, J
2009AIP-003	05/27/2009 11:50:00	0.14	0.18	ug/L	C1, J
2009AIP-004	06/10/2009 07:30:00	0.16	0.18	ug/L	C1, J
KR9064	06/22/2009 10:56:00	ND	0.18	ug/L	U
KR9065	06/22/2009 11:35:00	0.23	0.18	ug/L	
KR9066	06/22/2009 12:54:00	0.12	0.18	ug/L	J, C1
KR9067	06/22/2009 12:20:00	2.5	0.18	ug/L	
KR9068	06/22/2009 13:18:00	0.09	0.18	ug/L	J, C1
TG062509-SG	06/25/2009 09:40:00	ND	0.18	ug/L	U

WE062509-SG	06/25/2009 11:24:00	ND	0.18	ug/L	U
HC062509-SG	06/25/2009 09:20:00	ND	0.18	ug/L	U
KBW062509-SG	06/25/2009 09:05:00	ND	0.18	ug/L	U
TG062509-OC	06/25/2009 08:53:00	ND	0.18	ug/L	U
LES062509	06/25/2009 07:41:00	ND	0.18	ug/L	U
TC062509	06/25/2009 10:38:00	0.10	0.18	ug/L	J, C1
OR061109-SG	06/11/2009 07:50:00	0.10	0.18	ug/L	J, C1
SB061109-OC	06/11/2009 10:20:00	ND	0.18	ug/L	U
SV061109-OC	06/11/2009 10:05:00	ND	0.18	ug/L	U
SH061109-OC	06/11/2009 13:30:00	ND	0.18	ug/L	U
SV061109-SG	06/11/2009 10:05:00	ND	0.18	ug/L	U
BB061109-SG	06/11/2009 11:10:00	ND	0.18	ug/L	U
IG061109-OC	06/11/2009 12:41:00	ND	0.18	ug/L	U
HC061109-SG	06/11/2009 09:15:00	0.11	0.18	ug/L	J, C1
SC061109-OC	06/11/2009 10:50:00	0.09	0.18	ug/L	J, C1
SA061109-OC	06/11/2009 08:21:00	ND	0.18	ug/L	U
SD061109-OC	06/11/2009 10:30:00	ND	0.18	ug/L	U
OR061109-OC	06/11/2009 07:50:00	ND	0.18	ug/L	U
HC062509-SG	06/25/2009 10:10:00	0.09	0.18	ug/L	C1, J
SH062509-OC	06/25/2009 14:15:00	ND	0.18	ug/L	U
SA062509-OC	06/25/2009 08:52:00	ND	0.18	ug/L	U
OR062509-OC	06/25/2009 08:15:00	0.11	0.18	ug/L	C1, J
SC062509-OC	06/25/2009 12:05:00	0.09	0.18	ug/L	C1, J
BB062509-SG	06/25/2009 12:24:00	ND	0.18	ug/L	U
OR062509-SG	06/25/2009 08:20:00	ND	0.18	ug/L	U
SV062509-SG	06/25/2009 11:20:00	ND	0.18	ug/L	U
SD062509-SG	06/25/2009 11:50:00	ND	0.18	ug/L	U
HC062509-OC	06/25/2009 10:00:00	ND	0.18	ug/L	U
WA062509-OC	06/25/2009 12:35:00	ND	0.18	ug/L	U
SD062509-OC	06/25/2009 11:50:00	ND	0.18	ug/L	U
SB062509-OC	06/25/2009 12:00:00	ND	0.18	ug/L	U
SV062509-OC	06/25/2009 11:20:00	ND	0.18	ug/L	U
TG052809	05/28/2009 08:20:00	ND	0.18	ug/L	U
TC052809	05/28/2009 10:22:00	ND	0.18	ug/L	U
LES052809	05/28/2009 07:33:00	ND	0.18	ug/L	U
LES061109-OC	06/11/2009 07:52:00	ND	0.18	ug/L	U
TG061109-OC	06/11/2009 08:35:00	ND	0.18	ug/L	U
TC061109-OC	06/11/2009 10:34:00	ND	0.18	ug/L	U
TR061109-OC	06/11/2009 11:40:00	ND	0.18	ug/L	U
WE061109-OC	06/11/2009 11:24:00	0.09	0.18	ug/L	C1, J
WE061109-SG	06/11/2009 11:24:00	ND	0.18	ug/L	U
TG061109-SG	06/11/2009 08:35:00	ND	0.18	ug/L	U