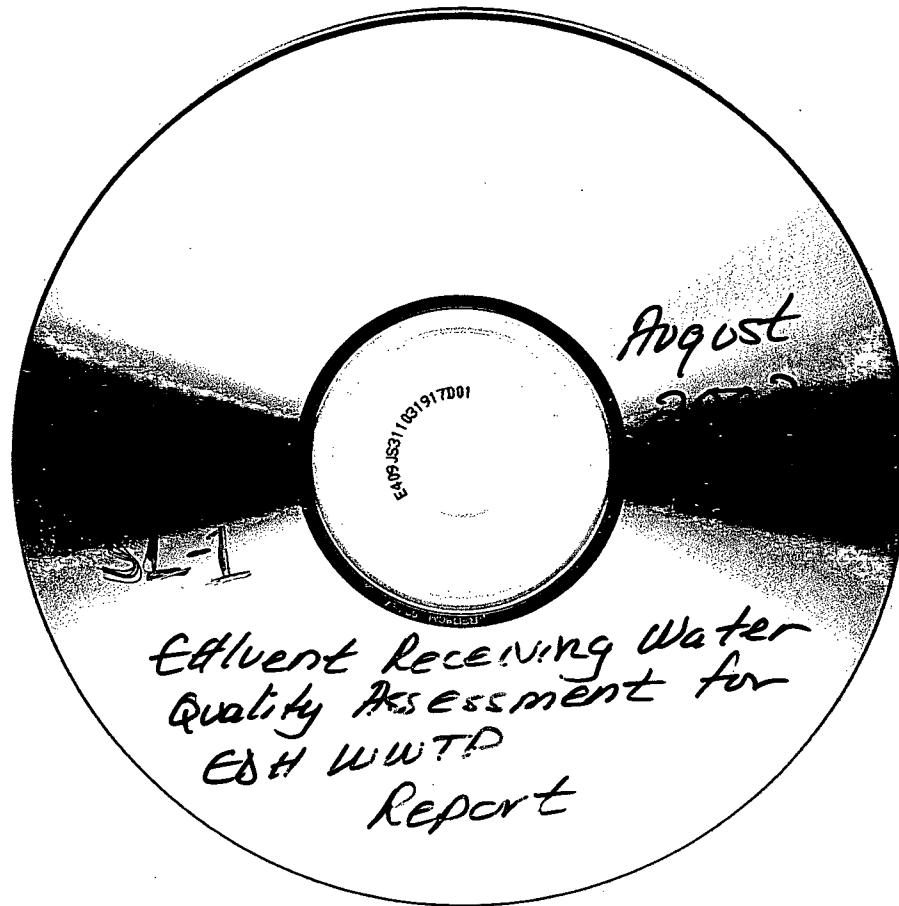


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August

Effluent Receiving Water
Quality Assessment for
EDH WWTP
Report

**PHASE II EFFLUENT AND RECEIVING WATER QUALITY
ASSESSMENT FOR THE
EL DORADO HILLS WASTEWATER TREATMENT PLANT**

***A QUALITY ASSURANCE PROJECT PLAN FOR THE
COLLECTION AND ANALYSIS OF SAMPLES***

Prepared for:

El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667

And

Central Valley Regional Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827

Prepared by:



9766 Waterman Road, Suite L2
Elk Grove, CA 95624

May 4, 2001

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May 4, 2001

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Appendix B:	Procedure Followed to Decontaminate the 9.5-L Glass ISCO Container
Appendix C:	Procedure Followed to Decontaminate the Composite Sampler Tubing and the 4-L Glass Bottle Used for Dioxin and Furan Sample Collection
Appendix D:	RBI Sampling Data Sheet
Appendix E:	Analytical Laboratory Chain-of-Custody Forms

1 PROJECT DESCRIPTION

1.1 DESCRIPTION OF PROJECT AREA

El Dorado Irrigation District (District) owns and operates the El Dorado Hills Wastewater Treatment Plant (EDHWWTP), which provides service to El Dorado Hills and adjacent areas. The EDHWWTP is located approximately 30 miles east of Sacramento in Section 14, T9N, R8E, MDB&M. Treated municipal wastewater is discharged for reclamation and to Carson Creek, which is tributary to Deer Creek and the Cosumnes River. Wastewater discharged for reclamation is regulated under separate waste discharge requirements and must meet the requirements of California Code of Regulations, Title 22. The facility has undergone significant treatment modifications and upgrades in the past two years, and its NPDES permit (NPDES No. CA0078671) is currently up for renewal by the Central Valley Regional Water Quality Control Board (RWQCB). The new facility has a design dry weather flow capacity of 3.0 mgd

1.2 STATEMENT OF PROJECT NEED

Because the treatment plant has recently undergone significant treatment modifications and upgrades, no data currently exists that would accurately characterize effluent contaminant levels during the period of the year that the facility discharges to Carson Creek. Consequently, RWQCB NPDES permitting staff requested that the District characterize effluent contaminant levels for the new facility. Development and implementation of this Quality Assurance Project Plan (QAPP) provides assurance that the appropriate data will be collected (see **Table 1**), and that the quality of the data will be adequate to address RWQCB staff needs.

1.3 PROJECT OBJECTIVES

As a means of characterizing effluent and receiving water quality for the EDHWWTP, the RWQCB required that the District conduct a second-phase "Effluent and Receiving Water Quality Assessment" (ERWQA) in the District's tentative NPDES permit issued on March 6, 2001. This "Phase II ERWQA" is to be conducted to determine: if the discharge has a reasonable potential to cause or contribute to an exceedance of fully adopted and applicable federal and State water quality standards in Carson Creek; and determine effluent and receiving water concentrations of other constituents of interest to the RWQCB permitting staff.

Therefore, the following objectives have been defined for this Phase II ERWQA.

1. Determine whether the EDHWWTP discharge has California Toxics Rule/National Toxics Rule (CTR/NTR) constituents and/or non-priority metals/organics that: a) cause; b) have reasonable potential to cause; or c) significantly contribute to an excursion in the receiving waters above current State numeric standards/narrative criteria or federal water quality criteria for the protection of freshwater aquatic life.
2. Considering: a) seasonal effluent quality; b) seasonal rates of effluent discharge to Carson Creek; c) seasonal receiving water flows; d) aquatic life present in Carson Creek; and e) expected bioavailability (in Carson Creek) of constituents detected at measurable levels,

determine whether effluent quality is adequate to provide reasonable protection of Carson Creek aquatic life against effluent-related acute and chronic toxicity.

- For any constituent found to pose a significant risk to Carson Creek's aquatic life or other beneficial uses, determine the most appropriate action(s) to be taken to reduce or eliminate said risk.

Table 1. Contaminants to be monitored in the treated effluent of the El Dorado Hills Wastewater Treatment Plant, and applicable state and federal water quality criteria.

All concentrations are reported in µg/l, unless otherwise noted.						
Contaminants	Monitoring Frequency: Monthly (M) Quarterly (Q)	Low Reporting Limits ^a	Human Health		Aquatic Life ^b	
			DHS MCL ^c	CA Tox. Rule/ Nat. Tox. Rule ^d	U.S. EPA Criteria ^e	CA Tox. Rule/ Nat. Tox. Rule ^d
EPA METHOD 130.2 - Hardness			Analyzed by: EDHWA/TP Lab			
Hardness (as CaCO ₃)	M	1.0	--	--	--	--
EPA METHOD 160.1 - Total Dissolved Solids			Analyzed by: EDHWA/TP Lab			
Total dissolved solids	M	10	500,000 ^m	--	--	--
EPA METHOD 300 - Anions			Analyzed by: California Laboratory Services			
Chloride	M	0.5	250,000 ^m	--	230,000	--
Fluoride	M	100	2,000	--	--	--
Nitrate (as N)	M	0.5	10,000 ^f	--	--	--
Nitrite (as N)	M	0.5	1,000	--	--	--
Sulfate	M	0.5	250,000 ^m	--	--	--
EPA METHOD 335.2 - Cyanide			Analyzed by: California Laboratory Services			
Cyanide	M	5.0	200 (150 proposed)	700	5.2	5.2
EPA METHOD 365.4 - Total Phosphorus			Analyzed by: California Laboratory Services			
Phosphorus, Total (as P)	M	0.05	--	--	--	--
EPA METHOD 376.2 - Sulfide			Analyzed by: California Laboratory Services			
Sulfide (as S)	M	0.5	--	--	--	--
EPA METHOD 377.1 - Sulfite			Analyzed by: EDHWA/TP Lab			
Sulfite (as SO ₃)	M	2.0	--	--	--	--
EPA METHOD 425.1 - Foaming Agents (MBAS)			Analyzed by: California Laboratory Services			
MBAS	M	0.5	500 ^m	--	--	--
EPA METHOD 506 - Phthalate Esters			Analyzed by: California Laboratory Services			
Di(2-ethylhexyl)adipate	Q	5.0	400	--	--	--
EPA METHOD 507 - Nitrogen and Phosphorus Containing Pesticides			Analyzed by: California Laboratory Services			
Atrazine	Q	1.0	3	--	--	--
Chlorpyrifos	Q	0.14	--	--	--	--
Diazinon	Q	0.05	--	--	--	--
Molinate	Q	2.0	20	--	--	--
Simazine	Q	1.0	4	--	--	--
Thiobencarb	Q	1.0	70 (1 ^m)	--	--	--
EPA METHOD 547 - Glyphosate			Analyzed by: California Laboratory Services			
Glyphosate	Q	25	700	--	--	--
EPA METHOD 548 - Endothall			Analyzed by: California Laboratory Services			
Endothall	Q	45	100	--	--	--
EPA METHOD 549 - Diquat			Analyzed by: California Laboratory Services			
Diquat	Q	4.0	20	--	--	--
EPA METHOD 601 - Purgeable Halocarbons			Analyzed by: California Laboratory Services			
1,1-Dichloroethane	M	0.5	5	--	--	--
1,1-Dichloroethene	M	0.5	6	0.057	--	--

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cis-1,2-Dichloroethene	M	0.5	6	--	--	--
1,1,1-Trichloroethane	M	0.5	200	--	--	--
1,1,2-Trichloroethane	M	0.5	5	0.60	9,400 LOEL ^h	--
1,1,2,2-Tetrachloroethane	M	0.5	1	0.17	2,400 LOEL ^h	--
1,2-Dichlorobenzene	M	0.5	600	2,700	763 LOEL ^h	--
1,2-Dichloroethane	M	0.5	0.5	0.38	20,000 LOEL ^h	--
1,2-Dichloropropane	M	0.5	5	0.52	--	--
1,3-Dichlorobenzene	M	0.5	130 ^h	400	763 LOEL ^h	--
1,3-Dichloropropene	M	0.5	0.5	10	244 LOEL ^h	--
1,4-Dichlorobenzene	M	0.5	5	400	763 LOEL ^h	--
2-Chloroethyl vinyl ether	M	0.5	--	--	--	--
Bromodichloromethane	M	0.5	100 (80 proposed) ^g	0.56	--	--
Bromoform	M	0.5	100 (80 proposed) ^g	4.3	--	--
Bromomethane	M	0.5	--	48	--	--
Carbon Tetrachloride	M	0.5	0.5	0.25	--	--
Chlorobenzene	M	0.5	70	680	--	--
Chloroethane	M	0.5	--	--	--	--
Chloroform	M	0.5	100 (80 proposed) ^g	--	1,240 LOEL ^h	--
Chloromethane	M	0.5	--	--	--	--
Dibromochloromethane	M	0.5	100 (80 proposed) ^g	0.401	--	--
Dichloromethane	M	0.5	5	4.7	--	--
Tetrachloroethene	M	0.5	5	0.8	840 LOEL ^h	--
Trans-1,2-dichloroethene	M	0.5	10	700	--	--
Trichloroethene	M	0.5	5	2.7	21,900 LOEL ^h	--
Trichlorofluoromethane	M	0.5	150	--	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane	M	0.5	1200	--	--	--
Vinyl Chloride	M	0.5	0.5	2	--	--
EPA METHOD 602 - Purgeable Aromatics				Analyzed by: California Laboratory Services		
Benzene	M	0.3	1	1.2	--	--
Ethylbenzene	M	0.3	700 (300 proposed)	3,100	--	--
Toluene	M	0.3	150	6,800	--	--
Xylenes	M	0.5	1750	--	--	--
EPA METHOD 608 - Chlorinated Pesticides & PCBs				Analyzed by: I/O Systems		
Aldrin	Q	0.010	0.05 ⁱ	0.00013	--	--
Aroclor 1016	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1221	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1232	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1242	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1248	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1254	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Aroclor 1260	Q	0.20	0.5	0.00017 ^j	0.014 ^j	0.014 ^j
Chlordane	Q	0.010	0.1	0.00057	0.0043	0.0043

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4,4'-DDD	Q	0.010	--	0.00083	--	--
4,4'-DDE	Q	0.010	--	0.00059	--	--
4,4'-DDT	Q	0.010	--	0.00059	0.001	0.001
Dieldrin	Q	0.010	0.05 ⁱ	0.00014	0.056	0.056
Endosulfan I	Q	0.010	--	110	0.056	0.056
Endosulfan II	Q	0.010	--	110	0.056	0.056
Endosulfan sulfate	Q	0.010	--	110	--	--
Endrin	Q	0.010	2	0.76	0.036	0.036
Endrin Aldehyde	Q	0.010	--	0.76	--	--
Heptachlor	Q	0.010	0.01	0.00021	0.0038	0.0038
Heptachlor epoxide	Q	0.010	0.01	0.00010	0.0038	0.0038
Hexachlorocyclohexane (BHC)	Q				--	
Alpha	Q	0.010	0.7 ⁱ	0.0039	--	--
Beta	Q	0.010	0.3 ⁱ	0.014	--	--
Gamma (Lindane)	Q	0.010	0.2	0.019	--	--
Delta	Q	0.010	--	--	--	--
Methoxychlor	Q	0.050	40 (30 proposed)	--	--	--
Toxaphene	Q	0.20	3	0.00073	0.0002	0.0002
EPA METHOD 625 - Semi-volatile organics						
1,2-Dichlorobenzene	Q	0.10	600	2,700	763 LOEL ^h	--
1, 2-Diphenylhydrazine	Q	0.20	--	0.040	--	--
1,2,4-Trichlorobenzene	Q	0.10	70 (5 proposed)	--	50 LOEL ^h	--
1,3-Dichlorobenzene	Q	0.10	130 ^h	400	763 LOEL ^h	--
1,4-Dichlorobenzene	Q	0.10	5	400	763 LOEL ^h	--
2-Chloronaphthalene	Q	0.10	--	1,700	--	--
2-Chlorophenol	Q	0.20	--	120	2,000 LOEL ^h	--
2,4-Dichlorophenol	Q	0.10	--	93	365 LOEL ^h	--
2,4-Dimethylphenol	Q	3.0	400 ^h	540	--	--
2,4-Dinitrophenol	Q	0.50	--	70	--	--
2,4-Dinitrotoluene	Q	0.10	--	0.11	230 LOEL ^h	--
2,4,6-Trichlorophenol	Q	0.10	--	2.1	970 LOEL ^h	--
2,6-Dinitrotoluene	Q	0.10	--	--	--	--
2-Nitrophenol	Q	0.20	--	--	150 LOEL ^h	--
3,3'-Dichlorobenzidine	Q	0.20	--	0.04	--	--
4-Bromophenyl phenyl ether	Q	0.10	--	--	122 LOEL ^h	--
4-Chloro-3-methylphenol	Q	0.10	--	--	--	--
4-Chlorophenyl phenyl ether	Q	0.10	--	--	122 LOEL ^h	--
4-Nitrophenol	Q	0.50	--	--	150 LOEL ^h	--
4,6 Dinitro-2-methylphenol	Q	0.50	--	13.4	150 LOEL ^h	--
Acenaphthene	Q	0.10	--	1,200	520	--
Acenaphthylene	Q	0.10	--	--	--	--
Anthracene	Q	0.10	--	9,600	--	--
Benzidine	Q	1.0	--	0.00012	--	--
Benzo (a) anthracene	Q	0.10	0.1 (proposed) ^k	0.0044	--	--
Benzo (a) pyrene	Q	0.20	0.2	0.0044	--	--
Benzo (b) fluoranthene	Q	0.10	0.2 (proposed) ^k	0.0044	--	--

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			DHS MCL ^c	CA Tox. Rule/ Nat. Tox. Rule ^d	U.S. EPA Criteria ^e	CA Tox. Rule/ Nat. Tox. Rule ^d
Benzo (g,h,i) perylene	Q	0.20	--	--	--	--
Benzo (k) fluoranthene	Q	0.10	--	0.0044	--	--
Bis (2-chloroethoxy) methane	Q	1.0	--	--	--	--
Bis (2-chloroethyl) ether	Q	1.0	--	0.031	122 LOEL ^h	--
Bis (2-chloroisopropyl) ether	Q	0.20	--	1,400	122 LOEL ^h	--
Bis (2-ethylhexyl) phthalate	Q	1.0	4	1.8	3	--
Butyl benzyl phthalate	Q	0.10	100 (proposed) ^k	3,000		
Chrysene	Q	0.10	--	0.0044	--	--
Dibenzo (a,h) anthracene	Q	0.20	--	0.0044	--	--
Diethyl phthalate	Q	0.10	--	23,000	3	--
Dimethyl phthalate	Q	0.10	--	313,000	3	--
Di-n-butyl phthalate	Q	0.40	--	2,700	3	--
Di-n-octyl phthalate	Q	0.20	--	--	3	--
Fluoranthene	Q	0.10	--	300	--	--
Fluorene	Q	0.10	--	1,300	--	--
Hexachlorobenzene	Q	0.10	1	0.00075	30 LOEL ^h	--
Hexachlorobutadiene	Q	0.20	--	0.44	9.3 LOEL ^h	--
Hexachlorocyclopentadiene	Q	0.20	50	240	5.2 LOEL ^h	--
Hexachloroethane	Q	0.20	--	1.9	540 LOEL ^h	--
Indeno (1,2,3-c,d) pyrene	Q	0.20	--	0.0044	--	--
Isophorone	Q	0.50	--	8.4	--	--
Naphthalene	Q	0.10	--	--	620 LOEL ^h	--
Nitrobenzene	Q	0.50	--	17	--	--
N-Nitrosodimethylamine	Q	1.0	--	0.00069	--	--
N-Nitroso-di-n-propylamine	Q	1.0	--	0.005	--	--
N-Nitrosodiphenylamine	Q	0.20	--	5.0	--	--
Pentachlorophenol	Q	0.50	1	0.28	6.7 (at pH 7)	6.7 (at pH 7)
Phenanthrene	Q	0.10	--	--	--	--
Phenol	Q	0.20	5 ⁱ	21,000	2,560 LOEL ^h	--
Pyrene	Q	0.10	--	960	--	--
EPA METHOD 632 - Carbamates Analyzed by: California Laboratory Services						
Carbofuran	Q	0.2	18	--	--	--
Oxamyl	Q	0.1	200	--	--	--
EPA METHOD 1631B - Dioxins & Furans Analyzed by: Apex Analytical						
		pg/l	pg/l	pg/l	Pg/l	
2,3,7,8-TCDD	Q	10	30	0.000000013	<10	--
1,2,3,7,8-PeCDD	Q	50	--	--	--	--
1,2,3,4,7,8-HxCDD	Q	50	--	--	--	--
1,2,3,6,7,8-HxCDD	Q	50	--	--	--	--
1,2,3,7,8,9-HxCDD	Q	50	--	--	--	--
1,2,3,4,6,7,8-HpCDD	Q	50	--	--	--	--
OCDD	Q	100	--	--	--	--
2,3,7,8-TCDF	Q	10	--	--	--	--
1,2,3,7,8-PeCDF	Q	50	--	--	--	--
2,3,4,7,8-PeCDF	Q	50	--	--	--	--
1,2,3,4,7,8-HxCDF	Q	50	--	--	--	--
1,2,3,6,7,8-HxCDF	Q	50	--	--	--	--
2,3,4,6,7,8-HxCDF	Q	50	--	--	--	--

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			DHS MCL ^c	CA Tox. Rule/ Nat. Tox. Rule ^d	U.S. EPA Criteria ^e	CA Tox. Rule/ Nat. Tox. Rule ^d
1,2,3,7,8,9-HxCDF	Q	50	--	--	--	--
1,2,3,4,6,7,8-HpCDF	Q	50	--	--	--	--
1,2,3,4,7,8,9-HpCDF	Q	50	--	--	--	--
OCDF	Q	100	--	--	--	--
EPA METHOD 8151A - Herbicides			Analyzed by: California Laboratory Services			
2,4-D	Q	1.0	70	--	--	--
Bentazon	Q	0.1	18	--	--	--
Dalapon	Q	2.0	200	--	--	--
Dinoseb	Q	1.0	7	--	--	--
Picloram	Q	1.0	500	--	--	--
2,4,5-TP (Silvex)	Q	0.2	50	--	--	--
EPA METHOD 8260B - Volatile Organics			Analyzed by: California Laboratory Services			
Dibromochloropropane	M	10	0.2	--	--	--
Ethylene dibromide	M	1.0	0.05	--	--	--
Methyl-tert-butyl ether (MTBE)	M	5.0	13 (5 ^m)	--	--	--
Styrene	M	1.0	100	--	--	--
EPA METHOD 8316 - Acrolein & Acrylonitrile			Analyzed by: California Laboratory Services			
Acrolein	M	10	--	320	21 LOEL ^h	--
Acrylonitrile	M	10	--	0.059	2,600 LOEL ^h	--
EPA/600/R-94/134 - (100.2) - Asbestos			Analyzed by: EMSE Analytical, Inc.			
Asbestos	M	0.2 mf/l ^l	7 mf/l ^l	7 mf/l ^l	--	--
Low Level Mercury (AFS) and Trace Metals (ICP-MS/GFAA/HGA/FS)			Analyzed by: Frontier Geosciences, Inc.			
Aluminum (Al)	M	2	1,000 (200 ^m)	--	87	--
Antimony (Sb)	M	0.030	6	14	1,600 LOEL ^h	--
Arsenic (As)	M	0.30	50	--	150	150
Barium (Ba)	M	0.2	1,000	--	--	--
Beryllium (Be)	M	0.05	4	--	--	--
Cadmium (Cd)	M	0.020	5	--	2.2 ⁿ	2.2 ⁿ
Chromium III (Cr)	M	0.10 ^o	50 ^o	--	74 ⁿ	180 ⁿ
Chromium VI (Cr)	M	0.10 ^o	50 ^o	--	11	11
Copper (Cu)	M	0.10	1,000 ^m	1,300	9 ⁿ	9 ⁿ
Iron (Fe)	M	5 / 0.5 ^p	300 ^m	--	--	--
Lead (Pb)	M	0.040	15	--	2.5 ^l	2.5 ^l
Manganese (Mn)	M	0.1	50 ^m	--	--	--
Mercury (Hg)	M	0.0005	2	0.050	0.77 ⁿ	--
Nickel (Ni)	M	0.05	100	610	52 ⁿ	52 ⁿ
Selenium (Se)	M	0.050	50	--	5.0	5.0
Silver (Ag)	M	0.040	100 ^m	--	--	--
Thallium (Tl)	M	0.005	2	1.7	40 LOEL ^h	--
Zinc (Zn)	M	0.15	5,000 ^m	--	120 ⁿ	120 ⁿ
CC/EPD - Tributyltin			Analyzed by: ToxScan			
Tributyltin	M	0.002	--	--	0.063 (proposed)	--

^a Values in **bold** are greater than the listed human health or aquatic life criteria.

- ^b Water quality criteria for the chronic protection of freshwater aquatic life.
- ^c From A Compilation of Water Quality Goals, Regional Water Quality Control Board, Central Valley Region, August 2000.
- ^d U.S. EPA, Federal Register, Vol. 65, No. 97 (Thursday, May 18, 2000), pp. 31682-31719.
- ^e From National Recommended Water Quality Criteria – Correction, Office of Water, U.S. Environmental Protection Agency Publication No. EPA 822-Z-99-001, April 1999.
- ^f DHS primary maximum contaminant level (MCL) for the sum of nitrate and nitrite.
- ^g For total trihalomethanes (sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane).
- ^h Lowest observable effect level. From A Compilation of Water Quality Goals, Regional Water Quality Control Board, Central Valley Region, August 2000.
- ⁱ DHS action level from Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.
- ^j The aquatic life and human health criteria apply to the sum of the seven aroclors.
- ^k U.S. EPA primary maximum contaminant level (MCL).
- ^l Value represents millions of fibers per liter; limited to fibers greater than 10 microns in length.
- ^m DHS secondary maximum contaminant level (MCL).
- ⁿ Based on a hardness of 100 mg/L as CaCO₃.
- ^o Value provided in table is for total chromium.
- ^p Reporting limit for iron is 5 ppb for ICP-MS analyses and 0.5 for colorimetric analyses.
- ^q U.S. EPA criterion continuous concentration (CCC) for mercury (II). This CCC may not adequately protect rainbow trout, coho salmon, and bluegill (EPA-820-96-001).

2 QUALITY ASSURANCE PROJECT PLAN OVERVIEW

2.1 PURPOSE OF THIS PLAN

The purpose of this QAPP is to relate objectives of the project to specific field sampling and laboratory analytical procedures to achieve those objectives. In addition, this QAPP was written to ensure that all field-sampling procedures are conducted in a technically appropriate, efficient, and cost-effective manner, ultimately contributing to the attainment of project objectives. This QAPP addresses the methodologies employed to physically collect effluent and creek samples in the field, procedures for the transport of samples to specified analytical laboratories, and the laboratory methods and reporting limits for quantifying constituent concentrations.

This QAPP was written to demonstrate:

- ☐ sample-collection procedures are appropriate for achieving project objectives;
- ☐ identified analytical procedures are appropriate for achieving project objectives;
- ☐ quality control (QC) procedures are sufficient for obtaining data of known and adequate quality; and
- ☐ data collected will be defensible if challenged technically or legally.

Robertson-Bryan, Inc. (RBI) reserves the flexibility to modify protocols identified in this QAPP, as necessary, due to constraints not anticipated upon drafting this document. Any modifications to the sampling protocols discussed herein would be performed, as necessary, in order to best meet the project objectives. Any significant modifications to sampling protocols discussed in this QAPP will be clearly documented and communicated to Project Managers for the District and the RWQCB.

2.2 UNDERLYING LOGIC AND ORGANIZATION OF THIS PLAN

This QAPP has been written to incorporate all applicable criteria required for U.S. EPA-defined Category III projects. Category III projects are defined by the U.S. EPA as projects intended to produce results used to evaluate and select basic options, or to perform feasibility studies or preliminary assessments of unexplored areas which might lead to further work (USEPA 1991). This plan specifically addresses the following:

- ☐ relationship of field sampling and laboratory analysis methodologies to the project and data quality objective(s);
- ☐ quality and quantity of data that will be collected and how the intended quality will be consistently obtained; and
- ☐ data recording, calculating, review, and reporting procedures.

It should be noted that sections of a U.S. EPA Category III QAPP that were clearly not applicable to this monitoring project were not included in this plan.

2.3 QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM

Signatures on this form indicate that the principals involved with this project have reviewed this QAPP and agree that adherence to the sampling/analysis methodologies and data quality objectives outlined herein will acceptably achieve the stated project objectives.

3 PROJECT APPROACH

3.1 EFFLUENT AND RECEIVING WATER CONSTITUENT QUANTIFICATION

Trace metals, anions, organics, asbestos, cyanide, tributyltin, and dioxins and furans (listed in Table 1) will be monitored in the effluent and receiving water over a 12-month period, from March 2001 through February 2002, according to the schedule presented in **Figure 1**. Data from this study will be compared to current federal and State water quality criteria/standards to determine if Waste Discharge Requirements (WDRs) are needed in the EDHWWTP NPDES permit to protect the beneficial uses of Carson Creek.

Trace metals, anions, asbestos, tributyltin, and volatile organics will be sampled in the effluent every month. Pesticides, herbicides, and semi-volatile organics will be sampled on a quarterly basis. Dioxins and furans will be sampled once during the wet season and once during the dry season.

Carson Creek monitoring will be conducted in a manner that effectively characterizes background contaminant levels during the winter/spring precipitation period and the summer/fall non-precipitation period. Initially, receiving water sampling will be conducted for all constituents identified in Table 1 during the March 2001 sampling event at the R1 site, except dioxins and furans. Because there is no assimilative capacity for dioxins or furans in the receiving water, it is only necessary to determine whether dioxins and furans are present in the effluent. Contaminant concentration data from the March R1 monitoring will reasonably characterize the creek's background quality during the winter/spring precipitation period of the year. This is because receiving water contaminant levels generally vary seasonally, as land uses and precipitation patterns change, but typically vary relatively little month-to-month within a given season.

Based on concentrations determined from samples collected during March 2001 for both the creek and the effluent, individual constituents of concern will be identified. Constituents of concern are those that, based on creek and effluent concentrations and relative flow rates, may potentially be approaching or exceeding fully adopted and enforceable federal and State water quality standards in the creek and/or levels believed to cause toxicity, downstream of the discharge. Sampling of the creek, at R1, during subsequent months will be restricted to the constituents of concern only. Creek sampling for all other constituents will be suspended until June 2001.

All constituents will again be monitored in the creek, at R1, during June to characterize the creek's background contaminant levels during the summer season. Constituents of concern will again be identified, and only constituents of concern monitored at R1 through February 2002. Finally, Carson Creek will not be sampled for any constituent if there is no visible flow in the creek. Effluent samples will, nevertheless, be collected and analyzed.

		2001													
Constituent		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Apr	
EPA Method 130.2 Hardness	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 160.1 TDS	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 300 Anions	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 335.2 Cyanide	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 365.3 Total Phosphorus	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 376.2 Sulfide	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 377.1 Sulfite	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 425.1 Foaming Agents	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 506 Phthalate Esters	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 507 N & P Pesticides	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 547 Glyphosate	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 548 Endothall	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 549 Diquat	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 601 Purg. Halocarbons	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 602 Purg. Aromatics	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 608 Chlor. Pest. & PCBs	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 625 Organics	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 632 Carbamates	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 1613B Dioxins & Furans	Effluent R1	■ ■							■ ☒						
EPA Method 8151A Herbicides	Effluent R1	■ ■			■ ■				■ ☒			■ ☒			
EPA Method 8260B Volatile Organics	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA Method 8316 Acrol. & Acrylonitrile	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
EPA/600/R-94/134- (100.2) – Asbestos	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
AFS Low Level Mercury	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
ICP-MS/GFAA/HGA/FS Trace Metals	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
Tributyltin (GC/FPD)	Effluent R1	■ ■	■ ☒	■ ☒	■ ■	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒	■ ☒		
Report															

■ Sample will be collected this month.

☒ Sample will be collected if concentrations from previous effluent and receiving water sampling show a potential to cause an exceedance of an applicable water quality criterion.

Figure 1. Schedule for conducting the Phase II ERWQA for the EDHWWTP.

As designated in Table 1, different laboratories were selected to perform the analytical work for various contaminants to assure that high-quality analyses, with appropriate reporting limits, would be performed for all classes of constituents. The District's EDHWWTP water quality laboratory will analyze for sulfite, TDS, and hardness. Frontier Geosciences, Inc. of Seattle, Washington will perform all mercury and trace metals analyses. California Laboratory Services (CLS) of Rancho Cordova, California will analyze for anions, herbicides, some pesticides, and volatile organic compounds. CLS will send the asbestos samples to EMSL Analytical, Inc., located at 382 S. Abbott Avenue, Milpitas, California, 95035 [(888) 455-3675]. ToxScan, Inc. of Watsonville, California will analyze for tributyltin and constituents identified under EPA Methods 608 and 625. Alta Analytical of El Dorado Hills, California, will conduct analysis of effluent samples for dioxins and furans. Laboratory Quality Assurance Plans for each laboratory are available upon request from the laboratories directly, or from RBI's Project Manager.

Samples analyzed by Frontier Geosciences, Inc. and ToxScan, Inc. will be shipped by overnight mail. All samples to be analyzed by CLS, the District, and Alta Analytical will be hand delivered to these laboratories by sampling personnel. Standard chain-of-custody procedures will be followed for all sample transfers and shipments.

3.2 EFFLUENT AND RECEIVING WATER FLOW MEASUREMENTS

EDHWWTP effluent discharge rates to Carson Creek are monitored electronically on a continuous basis at the effluent discharge Parshall flume.

Carson Creek flows will be measured each day that samples are collected, and at least weekly during the study period. District staff will conduct flow measurements according to standard USGS flow gaging techniques, as described by Orth (1983). Once each month, duplicate measurements of creek flows will be made, using District equipment, to facilitate determining measurement precision. Measurement precision under wadeable, low-flow conditions is anticipated to be $\pm 10\text{-}15\%$. Accuracy of late spring, summer and fall low-flow measurements will be determined by conducting duplicate measurements, on two occasions, using the standard USGS methodology cited above and two different flow meters. The first measurement will be made using a flow meter rented from EquipCo of Concord, CA, and the second, duplicate measurement will be made using the District's meter. Creek flows under non-wadeable, high-flow conditions will be estimated based on use of the U.S. Army Corps of Engineer's HEC RAS model.

5 QUALITY ASSURANCE OBJECTIVES

Quality assurance (QA) is a set of operating principles that, if strictly followed during sample collection and analysis, will produce data of known and defensible quality. This section describes the QA objectives that specific measurements must meet in order to achieve the project objectives. The quality control (QC) procedures to be followed to attain the stated QA objectives are discussed in Section 8 of this QAPP. Thus, Section 5 specifies the quantitative and qualitative requirements, whereas Section 8 describes how these specifications will be met (USEPA 1991).

5.1 DETERMINING QUALITY ASSURANCE OBJECTIVES

QA objectives should be defined in terms of the project requirements, and not in terms of the capabilities of the intended methods. If QA objectives exceed the capabilities of available methods, either the method must be modified or the QAPP must reflect such deficiencies. Nevertheless, the QAPP must include sufficient evidence to prove that the methods selected are capable of achieving the desired performance defined by the data quality objectives (USEPA 1991). Data-collection criteria should provide a balance between constraints of time and cost and the quality of data necessary to achieve project objectives. This QAPP is designed to accomplish the following QA/QC objectives:

- develop and implement a technically appropriate experimental design and sampling and analytical methodologies that, when employed for all sampling events, will facilitate achieving the project objective;
- establish quality assurance objectives and equipment specifications that must be met to produce unadulterated samples for analysis;
- define quality assurance objectives for the laboratory analytical procedures; and
- use assessment samples (i.e., QC samples) and procedures to verify the quality of the samples and analytical data collected.

It is necessary to define both qualitative and quantitative estimates of the quality of the field samples and analytical data needed to meet project objectives. In doing so, this QAPP focuses on the definition, implementation, and assessment of data quality objectives (DQOs) that are specified for the entire field component of the project. The DQOs for this project are defined according to the six attributes listed below.

Precision: The level of agreement among multiple measurements of the same parameter.

Bias: The difference between an observed value and the "true" value of the parameter being measured (precision and bias together constitute a measure of "accuracy").

Completeness: The quantity of samples that are successfully collected and analyzed with respect to the quantity intended in the experimental design.

Equipment Specifications: Physical design, construction, and/or preparation requirements of sampling equipment needed to collect unadulterated samples.

Representativeness: The degree to which the data collected accurately represent the population of interest.

Comparability: The similarity of data from different sources (e.g., locations or periods in time) included within individual or multiple data sets.

5.1.1 Quantitative Quality Assurance Objectives: Sample Collection

Quantitative QA objectives constitute a critical element of this QAPP, as they provide information necessary to assess the degree to which identified methods can produce the quality of samples and subsequent analytical data desired to achieve project objectives. The quantitative DQOs of bias and precision (accuracy), reporting limits, and completeness (as they relate to field samples and associated analytical data collection) are described individually below.

Bias and Precision (Accuracy): For analysis of all constituents monitored under this project, accuracy of constituent concentration will be ensured by the contract laboratories performing the analysis via conducting applicable QA/QC procedures when analyzing project samples.

Analytical Reporting Limits: The analytical reporting limit for a contaminant is the lowest concentration that can be consistently and accurately quantified using the indicated analysis method. Reporting limits for the analyses being performed for this project are provided in Table 1. The reporting limit provided in Table 1 with regard to chromium is for total chromium.

Completeness: Completeness objectives are presented as the percentage of all planned field sample collections (see Figure 1) and subsequent laboratory analyses that are actually made during the project. All monthly and quarterly effluent composite and grab samples must be collected. Hence, the completeness objective is 100% for all constituents to be monitored during the project.

5.1.2 Qualitative Quality Assurance Objectives: Equipment Specifications and Data Representativeness and Comparability

5.1.2.1 Sampling Equipment Specifications

Automated Composite Sampler

All 24-hour composite samples for this project will be collected into appropriate, decontaminated sample containers via a portable ISCO, or compatible, automated composite sampler. Ice will be packed into the sampler to keep the composite effluent samples as cold as possible throughout their collection.

Tubing

The following two types of tubing will be used in the collection of composite samples:

- semi-rigid, Teflon-lined, polyethylene tubing; and
- silicone tubing (which goes through the pumphead of the composite sampler).

Prior to its use each month, all tubing used to collect effluent samples for mercury and trace metals, cyanide, tributyltin, asbestos, anions, and organics analyses will be decontaminated by

Frontier Geosciences, Inc. according to the procedures in Appendix A. Alta Analytical will decontaminate a separate set of this same type of tubing according to the procedures in Appendix C for collecting composite effluent samples for dioxin and furan analyses.

Sample Collection and Transport Containers

Table 2 summarizes the sample collection and transport containers for each analytical method. Prior to its use each month, the 9.5-L glass ISCO container used to collect samples for chlorinated pesticides, organics, cyanide, and asbestos analyses will be decontaminated by CLS. Frontier Sciences, Inc. will decontaminate the 5-L Teflon bottle used to collect samples for mercury and trace metals analysis. Alta Analytical will decontaminate the 4-L clear borosilicate glass bottle used to collect samples for dioxins and furans analysis.

Table 2. Sample Collection and Transport Containers.

Method	Analysis	Effluent Sample Collection Method/Container	Receiving Water Sample Collection Method/Container	Sample-Transport Containers	Preservative
AFS	Mercury	24-hr composite: 5-L Teflon bottle	Grab: Sample-transport container	Two 500-ml Teflon (or glass)	Preserved at lab
ICP-MS/ GFAA/ HGAFS	Trace Metals			Two 125-ml HDPE	Preserved at lab
GC/FPD	Tributyltin			Two 1-L amber glass	None
/600/R-94/134- (100.2)	Asbestos	24-hr composite: 9.5-L clear glass ISCO sample bottle	Grab: Sample-transport container	Two 1-L amber glass	None
130.2	Hardness			One 250-ml polyethylene	None
160.1	TDS			One 500-ml polyethylene	None
300	Anions			One 1-L polyethylene	None
365.3	Total Phosphorus				
425.1	Foaming Agents				
376.2	Sulfide			One 250-ml polyethylene	NaOH
608	Chlorinated Pesticides			Two 1-L amber glass	None
625	Organics			Two 1-L amber glass	None
377.1	Sulfite	Grab: 125 ml polyethylene bottle	Grab: 125 ml polyethylene bottle	One 125-ml polyethylene	EDTA
335.2	Cyanide	24-hr composite: 9.5-L clear glass ISCO sample bottle	Grab: Sample-transport container	One 500-ml polyethylene	NaOH
506	Phthalate Esters			One 1-L amber glass	Na ₂ S ₂ O ₄
507	N & P Pesticides			One 1-L amber glass	None
547	Glyphosates			One 1-L amber glass	None
548	Endothall			One 1-L amber glass	None
549	Diquat			One 1-L amber glass	None
632	Carbamates			One 1-L amber glass	None
8151	Herbicides			One 1-L amber glass	None
601	Purgeable Halocarbons			Two 40-ml VOA	None (Na ₂ S ₂ O ₄ for sample with chlorine residual)
602	Purgeable Aromatics	Grab: 40-ml VOA (without preservative)	Grab: 40-ml VOA (without preservative)	One 40-ml VOA	HCl (Na ₂ S ₂ O ₄ for sample with chlorine residual)
8260	Volatiles			Two 40-ml VOA	None (Na ₂ S ₂ O ₄ for sample with chlorine residual)
8316	Acrolein & Acrylonitrile			Three 40-ml VOAs	None (Na ₂ S ₂ O ₄ for sample with chlorine residual)
1613B	Dioxins and Furans	Composite: 4-L clear borosilicate glass bottle	Not applicable	Two 1-L amber glass	None

5.1.2.2 Data Representativeness and Comparability

Representativeness is the degree to which a sample or group of samples is indicative of the population being studied. An environmental sample is representative of a particular parameter of interest when the average value obtained from multiple samples tends towards the true value of that parameter in the environment. Representativeness is typically achieved by collecting a sufficiently large number of unbiased samples (USEPA 1991), and/or by collecting a composite sample. Multiple and/or composite samples will be analyzed during this study in order to obtain representative effluent and receiving water contaminant concentration data.

Comparability is the degree to which one data set can be compared to another. For example, methods used at different locations or points in time should be comparable. Comparability of monthly samples/data collected throughout this project will be achieved by adhering to the sampling analysis methodologies outlined in this QAPP during all months of the project.

5.2 WHAT IF QUALITY ASSURANCE OBJECTIVES ARE NOT MET?

Failure to completely meet the DQOs defined above for critical field sampling activities will have the following consequences regarding overall project integrity, quality, and technical defensibility.

5.2.1 Quantitative QA Objectives

Analytical QA/QC and Reporting Limits

Adherence by each laboratory to their respective Laboratory Quality Assurance Plan and standard operating procedures for specific test methods will assure that these DQOs are met.

Collection of Samples

Equipment failure and other factors beyond RBI's control may prevent the collection of effluent samples, as planned, during a particular sampling event. Not meeting the stated DQO of collecting 100% of planned effluent samples would have unacceptable consequences to the overall integrity and technical defensibility of this project. Therefore, in the event that an effluent sample cannot be collected from a given sampling event, re-sampling will occur as soon thereafter as possible in order to assure that all planned samples are ultimately collected and analyzed.

5.2.2 Qualitative QA Objectives

Equipment Specifications

All equipment acquired for use in this project meets the qualitative QA specifications identified in Section 5.1.2 of this plan. This QAPP serves to define standard field sampling procedures to be employed during each sampling event, thereby assuring consistency of methodologies and approaches throughout the project. Thus, adherence to the procedures outlined in this QAPP will assure that the samples collected and subsequent analytical data produced will be: 1) representative of effluent quality at the time of sampling; and 2) comparable among sampling events (i.e., through time).

6 COLLECTION OF EFFLUENT SAMPLES

This section of the QAPP defines specific locations, equipment, and sample collection protocols that will be followed throughout the project.

6.1 SAMPLING LOCATION

When effluent is being discharged to Carson Creek, samples will be collected at the effluent discharge Parshall flume, which is located immediately prior to the Carson Creek discharge point. When 100% of the effluent is being reclaimed, resulting in no discharge to Carson Creek, the effluent samples will be collected at the end of the chlorine contact tank. Note, the volatile organics samples collected from the chlorine contact tank will require sodium thiosulfate preservative. Also, reporting limits may be higher for some metals (arsenic, selenium, chromium, and manganese) and some semi-volatile organics, due to the presence of chlorine residual. The exact effect on reporting limits cannot be known until samples are analyzed. Nevertheless, effects on reporting limits are not anticipated to conflict with the data quality objectives specified in Section 5.

6.2 SAMPLING EQUIPMENT AND PROCEDURES

In order to collect sufficient volumes of effluent for laboratory analyses, effluent sampling will be conducted from two to four days each month, depending on the constituents being sampled. The procedures for collecting effluent samples are discussed in detail below.

Day 1: Preparation of Equipment Blanks. Frontier Geosciences, Inc. will decontaminate all tubing used in the collection of effluent samples, the sample collection bottle, and the sample transport bottles according to standard operating procedures defined in **Appendix A**. Following decontamination, all sampling equipment will be shipped to RBI in sealed bags to ensure the equipment remains free of contamination prior to use. The bags will not be opened until equipment is used at the EDHWWTP.

Powder-free, vinyl gloves (Oak Technical, Inc.; No. 96-284) will be worn when the bags containing decontaminated equipment are opened at the project site. Tubing will be removed from the bags in such a way that the ends of the tubing do not touch any surfaces, and will be immediately installed into the ISCO composite sampler.

Trace Metals Blanks: The 5-L Teflon collection container will be removed from its bag, placed into the composite sampler and connected to the delivery end of the silicone tubing. A bottle of reagent water, provided by Frontier Geosciences, Inc., will be removed from its bag and the sampling end of the Teflon-lined tubing placed into the reagent water bottle. The composite sampler will then be programmed to continuously pump reagent water into the collection bottle. Two 500-ml Teflon (or glass) and two 125-ml HDPE sample-transport containers will be removed from their bags and filled with the reagent water contained within the sample collection container. These samples constitute the equipment blanks for the trace metals sampling event. Such equipment blanks will be collected and analyzed during every monthly sampling event.

The equipment blanks will be stored in the RBI office refrigerator until collection of the 24-hour effluent sample is complete.

Tributyltin Equipment Blank (March 2001 only): Two 1-L amber glass bottles from ToxScan will be filled with the remaining reagent water contained in the 5-L sample-collection container. The equipment blank will be stored in the RBI office refrigerator until collection of the 24-hour effluent sample is complete.

After collection of the equipment blanks for the trace metals and tributyltin analyses is complete, the composite sampler will be programmed to continuously pump reagent water obtained from Frontier Geosciences into the 9.5-L clear-glass ISCO sample container, decontaminated by CLS according to standard procedures identified in **Appendix B**.

EPA Methods 608 and 625 Blanks (March 2001 only): Four (4) clean, 1-L amber-glass bottles obtained from ToxScan will be filled with reagent water contained in the 9.5-L container.

EPA Methods 335.2, 506, 507, 547, 548, 549, 632, and 8151 Blanks (March 2001 only): Additional reagent water obtained from Frontier Geosciences will be pumped into the 9.5-L container. The reagent water in the 9.5-L container will then be used to fill seven 1-L amber glass bottles, one 250-ml polyethylene bottle, and one 500-ml polyethylene bottle from CLS. These equipment blanks will be stored in the RBI office refrigerator until collection of the 24-hour effluent sample is complete.

The 9.5-L ISCO sample-collection container will be capped to prevent contamination until used on day 2 for collection of effluent samples.

Day 1 (Continued): Trace Metals. After collection of the equipment blank(s), the composite sampler will be set-up to collect the 24-hour composite effluent sample for trace metal and tributyltin analyses using the same 5-L Teflon collection container. The free end of the semi-rigid tubing will be placed in the center of the effluent discharge Parshall flume, and the tubing fixed in place. The composite sampler will then be calibrated to collect approximately 200 ml of effluent once every hour for a 24-hour period, creating a sample volume of approximately 4.8 liters.

Upon collection of all 24 aliquots, the sample-collection container will be disconnected from the silicone tubing and removed from the composite sampler. Two 500-ml Teflon and two 125-ml HDPE bottles will then be removed from their bags. The bottles will be filled with the effluent sample and labeled. All trace metals samples (equipment blanks and effluent) will be placed into a cooler containing blue ice.

Day 1 (Continued): Tributyltin. The remainder of the 24-hour composite sample collected on day 1 will be transferred from the sample collection container into two 1-L amber glass bottles, placed in a cooler containing blue ice. An equipment blank will be analyzed along with the effluent sample the first time that tributyltin is analyzed. In the event that the equipment blank shows non-detectable levels of tributyltin, thereby confirming that the sampling procedure being

employed does not contaminate the sample, no equipment blank will be collected for analysis during the remaining sampling events.

Day 2: Asbestos, Hardness, TDS, Anions, Phosphorus, Sulfide, Foaming Agents, and EPA Methods 608 and 625. Immediately after the 24-hour composite sample for trace metals and tributyltin has been collected, collection of the 24-hour composite sample for asbestos, hardness, TDS, anions, phosphorus, sulfide, foaming agents, and EPA Methods 608 and 625 will commence using the same equipment set-up, but a different sample-collection container. The 9.5-L clear-glass ISCO sample container, decontaminated by CLS according to standard procedures identified in **Appendix B**, will be used to collect this 24-hour composite sample. The composite sampler will be re-calibrated to collect approximately 375 ml of effluent each hour for a 24-hour period, creating approximately 9 liters of sample.

Upon collection of this composite sample, the ISCO sample-collection container will be removed from the composite sampler and its content poured into the appropriate clean sample transport bottles (see **Table 2** in Section 5.1.2.1). All samples will receive labels identifying the date and time of collection, contents, and personnel having collected the sample. The asbestos, anions, phosphorus, sulfide, and foaming agents samples will be placed into a CLS cooler containing blue ice. The hardness and TDS samples will be placed in a cooler containing blue ice for delivery to the EDHWWTP laboratory. The samples for analysis by EPA Methods 608 and 625 will be placed in a ToxScan cooler containing blue ice.

For the March 2001 sampling event, an equipment blank will be analyzed along with the effluent sample for EPA Methods 608 and 625. In the event that the equipment blank shows non-detectable levels of the constituents being analyzed, thereby confirming that the sampling procedure being employed does not contaminate the sample, no equipment blank will be collected for analysis during subsequent sampling events.

Upon collection of all samples, appropriate chain-of-custody forms will be filled-out and placed into the respective coolers with these samples. The samples for asbestos, phosphorus, sulfide, and foaming agents analyses will then immediately be delivered to CLS. CLS will forward the asbestos sample to EMSL Analytical, Inc. for analysis. The samples for analysis by EPA Methods 608 and 625 will be shipped, with the tributyltin sample collected the previous day, by overnight mail to ToxScan, Inc.

Day 2 (Continued): Sulfite and EPA Methods 601, 602, 8260 and 8316. A grab sample will be collected for sulfite and EPA Methods 601, 602, 8260 and 8316. Grab samples will be collected immediately following the collection of the 24-hour composite sample. Non-powdered, vinyl gloves (Oak Technical, Inc.; No. 96-284), will be worn during the collection of these samples. The 40-ml VOA vials and 125-ml polyethylene bottle containing preservative will be filled by collecting sample into a vial without preservative and transferring the effluent into the container with preservative. The vials will be overflowed to make sure all air is removed, and then capped and placed into the cooler containing blue ice. The vials without preservative will be submerged into the effluent. Holding the vial at a 45-degree angle below the effluent surface,

the vial will be uncapped. After all air has escaped, the vial will be capped, removed from the effluent flow, labeled, and placed into the CLS cooler containing blue ice.

For the March 2001 sampling event, travel blanks prepared by CLS will accompany the EPA Method 601, 602, 8260 and 8316 samples from time of collection to delivery to CLS. If the travel blanks show no detectable levels of the 601, 602, 8260 and 8316 constituents, thereby confirming that contamination is not being introduced by sample handling/transport in the field, the use and analysis of travel blanks may be discontinued thereafter.

Day 3: EPA Methods 335.2, 506, 507, 547, 548, 549, 632, and 8151: Immediately after the composite sample for asbestos, hardness, TDS, phosphorus, sulfide, sulfite, foaming agents, and EPA Methods 608 and 625 has been collected, collection of a 24-hour composite sample for EPA Methods 335.2, 506, 507, 547, 548, 549, 632, and 8151 will commence using the sample equipment set-up and 9.5-L ISCO collection container. The composite sampler will be calibrated to collect 375 ml of effluent each hour for a 24-hour period, creating approximately 9 liters of sample.

Upon collection of this composite sample, the ISCO sample-collection container will be removed from the composite sampler and its content poured into the appropriate clean sample transport bottles (see **Table 2** in Section 5.1.2.1). All samples will receive labels identifying the date and time of collection, contents, and personnel having collected the sample. The samples will be placed into a CLS cooler containing blue ice.

Day 4: Dioxins and Furans. Alta Analytical will decontaminate all tubing used in the collection of samples and the sample collection bottle according to standard operating procedures defined in **Appendix C**. First, all tubing used to collect previous samples will be removed from the composite sampler and replaced with the same type of tubing that has been decontaminated by Alta Analytical. Second, the decontaminated 4-L glass sample collection bottle will be put into place inside the refrigerated sampler. The sampling end of the semi-rigid, Teflon-lined tubing is then inserted into a 4-L bottle of certified-clean water provided by Alta Analytical. The composite sampler is then programmed to pump 2 liters of this water into the sample-collection container. This water will be transferred into two clean, 1-L amber glass bottles, and will constitute the equipment blank for the sampling event. The equipment blank will be stored in a refrigerator until collection of the effluent sample is completed and both samples will be hand delivered to Alta Analytical.

Following collection of the equipment blank, the free end of the semi-rigid tubing will be placed in the center of the effluent discharge Parshall flume, and the tubing fixed in place. The composite sampler will be calibrated to collect approximately 125 ml of effluent once every hour for a 24-hour period, creating a sample volume of approximately 3 liters. Upon collection of the 24-hour composite effluent sample, the sample-collection container will be removed from the refrigerated sampler and its contents transferred into two clean, 1-L amber glass bottles. This effluent sample, along with its equipment blank, will then be transported to Alta Analytical in a cooler containing blue ice and a completed chain-of-custody form.

The equipment blank will be held by Alta Analytical until results of the analysis of the effluent sample are available. If no dioxin or furan congeners are detected in the effluent, the equipment blank will not be analyzed. Conversely, if one or more congener is detected in the effluent sample, the equipment blank will be analyzed to confirm that the congeners were not introduced via the sample-collection and transport procedures.

7 COLLECTION OF RECEIVING WATER SAMPLES

This section of the QAPP defines specific locations, equipment, and sample collection protocols that will be followed throughout the project.

7.1 SAMPLING LOCATION

All receiving water samples will be collected at the EDHWWTP R1 (upstream) monitoring location in Carson Creek, as identified in the District's NPDES permit for this facility.

7.2 SAMPLING EQUIPMENT AND PROCEDURES

The collection of receiving water samples will occur during the same days that effluent samples are collected. All creek samples will be collected directly into the appropriate sample-transport containers (see Table 2), in the following manner.

First, sample-collection containers will be carried to the R1 site in a cooler. Once at the site, personnel will put on vinyl gloves, and remove the first sample-transport container to be filled. Personnel will then wade into Carson Creek at the appropriate location, and move upstream several meters, being careful to minimize the disturbance of bottom sediments. While facing upstream, the sample bottle will be submerged below the water surface immediately upstream of the individual's position with the cap still on the bottle. Care will be taken to submerge the bottle in a portion of the creek where sediments have not been disturbed. If notable creek flow is occurring, the bottle cap will be removed (under water) after waiting 5-10 seconds, the bottle allowed to fill, the cap replaced (while the bottle is still under water), and the bottle labeled and placed in the cooler. This process will then be repeated for all other creek samples to be collected.

Under high-flow events, when personnel cannot safely wade into the creek, the same protocol will be implemented from the shoreline.

In the event that creek flow rates are very low, and downstream water movement very slow, the following additional precautions will be employed. Once in position, the bottle (cap on) will be submerged and the outside of the bottle rubbed to remove all dust that is present. Upon doing so, the bottle will be re-positioned slightly upstream, the cap removed and the bottle filled as above. This additional step under low-flow conditions is important to prevent having dust on the outside of the sample bottle (which may contain contaminant) from being pulled into the bottle during filling.

The bottles containing preservative will be filled by dipping one of the bottles without preservative into Carson Creek, and transferring the creek water into the bottle containing preservative. The VOA vials will be overflowed to make sure all air is removed.

All creek samples will be placed into the same cooler containing the effluent samples and equipment/travel blanks, along with blue ice and a completed chain-of-custody form, and the cooler delivered to the appropriate laboratory as described in Section 8.3.

8 QUALITY CONTROL PROCEDURES

8.1 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Prior to the collection of effluent samples for trace metals, anions, tributyltin, cyanide, asbestos, pesticides, herbicides, and non-volatile organic analyses, all sampling tubing will be decontaminated according to standard operating procedures developed by Frontier Geosciences, Inc. (**Appendix A**). These procedures also will be used to decontaminate the sample-collection container used to collect the trace metal and tributyltin samples.

The 9.5-L glass ISCO sample container used to collect the 24-hour composite sample for analyses of non-volatile organic constituents, pesticides, herbicides, cyanide, anions, and asbestos will be decontaminated according to procedures developed by CLS (**Appendix B**). Sample-transport containers for composite samples will be clean containers provided by CLS and ToxScan. All grab samples for volatile organics will be collected in clean, 40-ml VOA vials provided by CLS.

Prior to the collection of equipment blank and effluent samples for dioxin and furan analyses, all tubing will be replaced with similar tubing decontaminated by Alta Analytical according to procedures defined in **Appendix C**. The 4-L sample-collection container also will be decontaminated according to standard operating procedures developed by Alta Analytical (**Appendix C**). Sample-transport containers for dioxin and furan samples will be clean, 1-L amber glass bottles provided by Alta Analytical.

8.2 SAMPLE LOGGING AND FIELD STORAGE

As samples are collected, field notes pertaining to the collection process will be recorded by RBI personnel and maintained in RBI's project files (**Appendix D**). The information contained in the field notes will include, but is not limited to, date and time of sample collection, initials of individuals assisting in the collection and delivery of samples, and comments related to any significant deviations from the protocols defined in this QAPP. All samples will be maintained on ice in coolers throughout the sample transfer period.

8.3 SAMPLE TRANSPORT AND CHAIN-OF-CUSTODY PROCEDURES

Following the completion of a field-sampling event, RBI personnel will transport the trace metal and EPA Methods 608 and 625 samples back to the RBI office, and oversee their packaging and overnight shipment. Trace metals samples will be shipped to Frontier Geosciences, Inc. (414 Pontius North, Seattle, WA 98109 [(206) 622-6960]). EPA Methods 608 and 625 samples will be shipped to ToxScan, Inc. (42 Hangar Way, Watsonville, CA 95076 [(831) 724-4522]). Specific sample-shipping procedures are described below.

1. The shipping containers will be clearly labeled with sufficient information (company name, site of collection, time and date container was sealed) to enable positive identification by laboratory personnel.

2. Individual sample containers will be packed in bubble wrap or other material to prevent breakage and transported in a sealed cooler containing blue ice.
3. A chain-of-custody form (**Appendix E**) will be placed inside the cooler.

RBI personnel will deliver all other samples to CLS (3249 Fitzgerald Rd., Rancho Cordova, CA [(916) 638-7301]) or Alta Analytical (5070 Robert J. Matthews Parkway, El Dorado Hills, CA [(916) 933-1640]). Samples delivered to these laboratories will be transported from the site of collection in a cooler containing blue ice, and will be accompanied by the appropriate chain-of-custody form (**Appendix E**). Upon transfer of sample possession, the chain-of-custody forms will be signed by RBI personnel and the laboratory personnel receiving the samples. The sampler's copy of the chain-of-custody forms will be kept in RBI's project files.

Upon receipt of samples by analytical laboratory staff, the condition of the samples will be recorded. It will be assumed that samples were received in good condition unless otherwise noted in the report issued by the laboratory performing the analyses.

8.4. INTERNAL QUALITY CONTROL CHECKS

This section of the QAPP describes all internal quality control (QC) checks that will be associated with the collection of field samples. The QC procedures specified follow from the QA objectives stated in Section 5 of this plan. Thus, Section 5 specifies the analytical requirements, while Section 7.4 describes how these specifications will be met (USEPA 1991).

8.4.1 QC Checks on Effluent Sampling Procedures

Because the potential for contamination of trace metal samples during collection is high, an equipment blank will be collected and analyzed for trace metals during each monthly sampling event (**Table 3**). This equipment blank will be kept refrigerated for the 24 hours that the effluent sample is being collected, then shipped in the same cooler with the effluent sample to Frontier Geosciences, Inc. Results of effluent sample analyses can then be corrected, if necessary, based on trace metal concentrations detected in the equipment blank.

Because the potential for contamination during collection, albeit low, does exist for many of the other contaminants being monitored, a minimum of one equipment blank will be analyzed during the project for all constituent analyses being performed, with the exception of asbestos and dioxins/furans (**Table 3**). Because the potential to contaminate the effluent sample upon its collection with asbestos is minimal, no equipment blank need be collected or analyzed. Because the volatile organics samples (i.e. EPA Methods 601, 602, 8260, and 8316) will be collected directly into clean sample containers using clean sampling techniques, equipment blanks will not be collected for these constituents. However, travel blanks will be prepared by CLS and analyzed during the first month that these contaminants are monitored in the effluent. If the travel blanks show no detectable levels of the 601, 602, 8260, and 8316 constituents, thereby confirming that contamination is not being introduced by sample handling in the field, the use and analysis of travel blanks may be discontinued thereafter.

Table 3. Quality control checks for effluent sampling procedures.

Contaminant Group	QC Type & Frequency	Acceptance Criteria/Use of Blank	Corrective Action/Action
Trace Metals	<ul style="list-style-type: none"> • Equipment blank • All sampling events 	Minimal to no detectable levels in blank	<ul style="list-style-type: none"> • Effluent results corrected from blank • Identify and eliminate contamination source, if possible
EPA Methods 335.2, 506, 507, 547, 548, 549, 608 and 625	<ul style="list-style-type: none"> • Equipment blank • Once during project, preferably during first sampling event. 	No detectable concentration of any constituents in blank	<ul style="list-style-type: none"> • Effluent results corrected from blank • Identify and eliminate contamination source
Volatile Organics EPA Methods 601, 602, 8260, and 8316	<ul style="list-style-type: none"> • Travel blank • Once during project, preferably during first sampling event. 	No detectable concentration of any constituents in blank	<ul style="list-style-type: none"> • Effluent results corrected from blank • Identify and eliminate contamination source
Tributyltin	<ul style="list-style-type: none"> • Equipment blank • Once during project, preferably during first sampling event. 	No detectable concentration of any constituents in blank	<ul style="list-style-type: none"> • Effluent results corrected from blank • Identify and eliminate contamination source
Asbestos	• N/A	N/A	• N/A
Dioxin/Furans	<ul style="list-style-type: none"> • Equipment blank • Collected during each sampling event 	No analysis required if no detectable concentration found in <i>effluent</i> sample	<ul style="list-style-type: none"> • Analyze blank to confirm effluent findings, if necessary

Alta Analytical will store the equipment blanks collected for dioxin and furan analyses. These blanks will only be analyzed in the event that detectable levels of dioxins and/or furans are determined to exist in the effluent samples. If detectable levels of one or more of these compounds are found in the effluent, analysis of the equipment blank will aid in determining whether the detected compounds truly exist in the effluent or whether they were introduced into the sample during its collection.

The QC checks described above are not meant to replace any of the QA/QC measures outlined previously, or those conducted by the analytical laboratories. Rather, they constitute an integral part of an overall QA/QC program.

8.4.2 QC Checks on Data Recording, Reduction, and Storage

Dr. Bryan will perform a QC check on data sheet correctness, completeness, and legibility prior to filing field data sheets to RBI's permanent project files.

8.4.3 QC Checks on Analytical Procedures

Frontier Geosciences, Inc., CLS, Alta Analytical, and the District will employ their own internal QA/QC measures for the work they are to perform for this project to insure the accuracy of analytical results. Because laboratory QA/QC procedures are outside the scope of this QAPP, these QA/QC measures will not be discussed here. However, RBI has contacted these laboratories regarding this issue, and has found the QA/QC protocols to be followed by each laboratory to be acceptable for meeting the objectives of this project. Moreover, Quality Assurance Plans for each laboratory are available upon request from the laboratories directly, or from RBI.

9 ANALYTICAL PROCEDURES AND CALIBRATIONS

This section of the QAPP describes all analytical procedures used for physical measurements conducted in the field. All methods selected must be appropriate for their intended use. This section, when coupled with QC measures described in Section 7, provides enough detail to permit experienced field personnel to carry out the necessary procedures unambiguously. Requirements of this section can often be met by referencing appropriate standard methods (USEPA 1991).

During each sampling event, calibration of the automated sampler will be performed prior to the collection of effluent samples to assure that adequate volumes of effluent are collected. Electronic calibration of automated samplers will be confirmed through the manual collection of an hourly aliquot into a graduated cylinder or beaker for volumetric measurement.

10 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 DATA REDUCTION

No data reduction will be needed for the field-sampling component of this project. For each of the analytical laboratories, data reduction of laboratory analytical results will be the responsibility of the individual identified in the Approval Form of this QAPP.

10.2 DATA VALIDATION

Field data that is to be summarized in project reports will be evaluated for validity, accuracy, and completeness by RBI. In addition, RBI will coordinate with Frontier Geosciences, Inc., ToxScan, Inc., CLS, and Alta Analytical personnel, as needed, to assure they are able to clearly identify all individual samples, and have the information they need to appropriately process all samples. Validation of laboratory analytical results will be the responsibility of individual named in the Approval Form of this QAPP for each laboratory.

10.3 DATA REPORTING

10.3.1 Definitions

Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in 40 CFR 136, Appendix B, revised as of May 14, 1999. For low-level mercury and trace metals analyses, the estimated MDL is defined as three times the standard deviation of the prep-blanks.

Minimum Level (ML) is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed. The ML represents the lowest quantifiable concentration in a sample based on proper application of all method-based analytical procedures and the absence of any matrix interferences. For low-level mercury and trace metals analyses, the ML is defined as 3-5 times the estimated MDL.

Estimated Concentration is the estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the reported ML value.

10.3.2 Laboratory Reporting Protocols

The laboratories shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting:

1. Sample results greater than or equal to the ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

2. Sample results less than the ML, but greater than or equal to the laboratory's MDL, shall be reported as an estimated concentration. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported estimated result. Numerical estimates of data quality may be percent accuracy (\pm a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.
3. Sample results less than the laboratory's MDL shall be reported as "Not Detected" or ND.

All data reports submitted by the laboratories to RBI shall have the following constituent information:

1. Name of constituent
2. Analytical results of the effluent and receiving water monitoring
3. Method detection limit (MDL)
4. Minimum level (ML)
5. Measured or estimated concentration

10.3.3 Project Reporting Protocols

A progress report disclosing analytical results for the first 5 months of sampling will be prepared by RBI and submitted to the District by or before September 30, 2001. The final project report will be completed by or before April 30, 2002. These project reports will include, but not be limited to, the following:

- ☐ brief introduction;
- ☐ description of any sampling event(s) for which deviation(s) from the protocols identified in this QAPP were required, the justification for deviations, and identification of any limitations the procedural deviations may impart on data quality or inferences which can be drawn from the data generated;
- ☐ summary of contaminant concentrations determined by the analytical laboratories for each sample collected; and
- ☐ conclusions.

The Project Manager for the District will be responsible for forwarding RBI's technical reports to the RWQCB.

11 CORRECTIVE ACTION

The corrective action plan must include predetermined acceptance limits, the corrective action to be initiated whenever such limits are not met, and the names of the individuals responsible for implementing necessary corrective actions. Routine QC procedures already identified in Section 7 of this plan need not be repeated here. This section is primarily devoted to "non-routine" corrective action not described elsewhere. Non-routine corrective action may result from unforeseen logistical constraints/problems with these sampling procedures as identified in this QAPP.

Dr. Bryan, the Quality Assurance Manager, will be responsible for assessing whether the DQOs identified in the QAPP were met, and for implementing corrective actions, as necessary, to achieve these project objectives. In the event that unforeseen logistical constraints arise while sampling in the field, Dr. Bryan will be responsible for supervising: 1) deviations from procedures identified in this QAPP to solve the problem; and 2) documentation (in the field notes) of problem and the corrective action taken. If any significant modifications to procedures identified in this QAPP are required, such modifications will be clearly communicated to all individuals identified in the Approval Form.

12 REFERENCES

- California Department of Water Resources. 1997. Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria. State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance. June 1997.
- Central Valley Regional Water Quality Control Board. 2000. A Compilation of Water Quality Goals. Staff Report of the California Regional Water Quality Control Board, Central Valley Region. August 2000.
- Orth, D. J. 1983. Aquatic habitat measurements. p. 61-84 In: Fisheries Techniques. L. A. Nielsen and D. J. Johnson, eds. Southern Printing Company, Inc., Blacksburg, Virginia. 468 p.
- U.S. Environmental Protection Agency. 2000. Federal Register, Vol. 65, No. 97 (Thursday, May 18, 2000), pp. 31682-31719.
- U.S. Environmental Protection Agency. 1999. National Recommended Water Quality Criteria - Correction. Office of Water, U.S. Environmental Protection Agency Publication No. EPA 822-Z-99-001. April 1999.
- U.S. Environmental Protection Agency. 1991. Preparation Aids for the Development of Category III Quality Assurance Project Plans. Office of Research and Development, Risk Reduction Engineering Laboratory, Cincinnati, Ohio. PB91-211920.

**APPENDIX A: PROCEDURE FOLLOWED TO DECONTAMINATE THE
COMPOSITE SAMPLER TUBING AND THE 5-L TEFLON BOTTLE
USED FOR TRACE METAL AND TRIBUTYL TIN SAMPLE
COLLECTION, AND BOTTLES USED FOR MERCURY AND TRACE
METALS ANALYSIS**

Cleaning of Sampling Equipment and Bottles for Mercury Analysis

FGS-007.2

Frontier Geosciences Inc.
414 Pontius Avenue North
Seattle, WA 98109

Originated by: Nicolas S Bloom
Revised by: A. Malaika Lafferty

January 3, 2000

Effective Date: July 7, 2000

On July 7, 2000, this procedure was reviewed and validated by Michelle L. Gauthier, Laboratory Manager and Beverly H. van Buuren, Quality Assurance Program Director. Signatures are on file.

1.0 SCOPE AND APPLICATION

1.1 This SOP details the procedure for ultra-cleaning of Teflon[®] and glassware for sample collection and storage. This protocol is directed primarily at the collection of ambient level aqueous mercury samples, which are the most easily contaminated of all environmental trace metal media. In the event that only trace metals other than Hg are to be measured, the same procedures described for Teflon[®] and glass may be applied to other plastics. Notes are made where a lesser degree of diligence is warranted, for example, in the case of sediments.

2.0 SUMMARY OF METHOD

2.1 Teflon containers for mercury samples are generally cleaned by filling with a solution of 1% 0.2N BrCl and allowing bottles to sit for 24 hours. This solution is then neutralized with hydroxylamine hydrochloride before being deposited in a waste carboy for disposal. Both procedures are carried out under a fume hood to reduce the noxious fumes that are produced when BrCl is added to water, and when hydroxylamine hydrochloride is added to BrCl. Sample bottles are rinsed before an 8.0 hour soak at 65-75 °C in a vat of 30% HCl, rinsed again, and then filled with reagent water and acidified to contain

0.1% (v/v) HCl before being heated in an oven at 70 °C for an additional 8.0 hours. Lastly, the bottles are rinsed copiously with water known to be low in mercury, with a final rinse of reagent water. They are left empty to dry in a class-100 laminar flow hood, before being double-bagged for storage in clean cabinets. Special cleaning procedures are noted in the text for specifically contaminated containers.

3.0 LIMITATIONS

3.1 If samples are to be analyzed for mercury, then only Teflon® or glass/quartz containers with Teflon-lined caps may be used. Use of other plastics, especially linear polyethylene, will result in Hg contamination through gas phase diffusion through the container walls.

3.2 Colored plastics should be avoided, as they sometimes contain metal compounds as dyes (i.e., cadmium sulfide for yellow, ferric oxide for brown, etc.).

4.0 SAFETY

4.1 Personnel will don appropriate laboratory attire according to the Chemical Hygiene Plan. This includes, but is not limited to, laboratory coat, safety goggles, and latex gloves under clean gloves.

4.2 The toxicity or carcinogenicity of reagents used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable. All laboratory personnel should refer to the MSDS for each chemical they are working with.

4.3 All personnel handling environmental samples known to contain or to have been in contact with human waste should be immunized against known disease-causative agents. Frontier will reimburse the expense of Hepatitis A and B immunizations for any laboratory staff member who desires this protection.

4.4 Waste Management and Pollution Prevention: Any wastes generated by this procedure should be disposed of according to SOPs FGS-099 and FGS-100, which provide instruction on dealing with laboratory and client waste. Pollution prevention information can be found in the current Frontier

Geosciences Hazardous Materials Management Plan (HMMP), which details and tracks various waste streams and disposal procedures.

5.0 EQUIPMENT AND REAGENTS

5.1 Equipment for bottle and glassware cleaning

- 5.1.1 100-200 L HDPE vat, half filled with 30% HCl (reagent grade) in reagent water.
- 5.1.2 500 watt all-Teflon[®] immersion heater (120 vac). Safety note: Read instructions carefully!! Heater will maintain steady state, without temperature feedback control, of 60-75 °C in a vat of the size described--equilibrium temperature will be higher (up to boiling!) in a smaller vat. Also, heater plate MUST be maintained in a vertical position, completely submerged and away from vat walls to avoid melting vat or burning out!
- 5.1.3 Laboratory sink in class-100 clean area, with high-flow low Hg reagent water.
- 5.1.4 Class-100 clean air station for drying rinsed bottles. Laboratory air needs to be monitored on a monthly basis. For achieving best results in low-level aquatic mercury research, it is very important that the laboratory air be low in both particulate and gaseous mercury. This is generally not the case for existing laboratories. As years of broken thermometers, use of Hg salts as reagents, and mercury preserved paints on the walls have permanently elevated room air levels to hundreds of ng·m⁻³. Ideally, mercury work should be conducted in a new laboratory, with mercury-free paint on the walls. Outside air, which is very low in Hg should be brought directly into the class-100 clean air station intakes. If this is impossible, air coming into the clean air stations can be cleaned for mercury by placing a gold-coated cloth pre-filter over the intake. This is constructed as followed:
 - 5.1.4.1 Soak several square meters of cotton gauze in 100 mL of 10% gold chloride solution at pH 7. In a hood, add 100 mL of 30% NH₂OH·HCl solution, and homogenize into the cloth with gloved hands. The material will turn black as

colloidal gold is precipitated. Allow the mixture to sit for several hours, then rinse with copious amounts of deionized water. Considerable colloidal gold will be washed out, so you may wish to collect and settle the rinse water to recover it. Squeeze dry the rinsed cloth, and spread flat on newspapers to air-dry. When dry, fold and place over the intake pre-filter of your laminar flow hood. **CAUTION: THIS PROCESS IS MESSY, SO GREAT CARE SHOULD BE TAKEN TO AVOID SPREADING GOLD DUST THROUGHOUT THE LABORATORY. THIS COULD CAUSE INTERFERENCES WITH ANALYSIS IF GOLD BECOMES INCORPORATED IN THE SAMPLES. THE GILDING PROCEDURE SHOULD BE DONE IN A REMOTE LABORATORY IF AT ALL POSSIBLE.**

- 5.1.5 Drying Oven. Stainless steel, in class-100 clean area, capable of maintaining ± 5.0 °C in the 60-70 °C temperature range.

5.2 Sampling Containers

5.2.1 Water Sample Collection Bottles

5.2.1.1 Teflon[®] (FEP or PFA), 125-mL, 250-mL, 500-mL, 1000 milliliters, or 2000-mL.

5.2.1.2 Borosilicate Glass or quartz with Teflon[®] or Teflon[®]-lined polyethylene cap, 125-mL, 250-mL, 500-mL, or 1000-mL.

5.2.2 Containers for Tissues, Sediments, Sludges.

5.2.2.1 Teflon[®] (FEP) vials (18.2-mL, 25.6-mL, 57.6-mL from Savillex (Minnetonka, MN).

5.2.2.2 Teflon[®] (FEP) jars (90-mL, 500-mL, 1000-mL from Savillex (Minnetonka, MN).

5.2.2.3 Borosilicate Glass Jars, with Teflon[®] Lined Polyethylene Caps (60-mL, 125-mL, 500-mL, 1000-mL I-CHEM[™] EPA-clean, or equivalent.

5.2.2.4 Polyethylene Jars (60-mL, 125-mL, 500-mL, 1000-mL).
Generally acceptable even for mercury sampling of tissues, sediments, etc.

6.0 PROCEDURES

6.1 Initial Cleaning. New bottles are cleaned by heating to 65-75 °C in 30% HCl for at least 48 hours. Next the bottles are rinsed 3 times with ultra-clean water and filled with ultra-clean water containing 0.1% HCl. These bottles are capped and placed in a clean oven at 60-70 °C overnight. After cooling, they are rinsed three more times and placed in a mercury-free class 100 clean-air station until dry. The bottles are then tightly capped (with a wrench, if necessary) and double bagged in new polyethylene zipper bags until needed. A random selection (10%) of all newly cleaned sets of bottles should be tested for contamination by trace metals of interest before using. This is done by filling with reagent with 0.5% HCl and allowing to sit one week. The filling solution is then tested, and must be found to be low enough in trace metals to meet specific project goals.

6.2 Ongoing Cleaning Procedure. After the initial cleaning, if bottles have been returned with only low-level trace-metals in water samples, bottles are initially filled with 1% (v/v) 0.2N BrCl and allowed to sit for 24 hours. The bottles are emptied and rinsed and then cleaned as above, except with only 6-12 hours in the hot 30% HCl step.

6.3 Pre-cleaning Procedure for Teflon® or Quartz Bottles Contaminated with Organics (but not high levels of trace metals). Scrub the bottle thoroughly with an alkaline detergent (i.e., Alkanox™, Formula 409™, etc.) and bottle brush, until all visible organic deposits are removed. Rinse thoroughly with reagent water, and then clean as in 5.1. Non-Teflon® or quartz bottles contaminated with organics should be discarded.

6.4 Pre-cleaning Procedure for Teflon® Vials contaminated with high Methyl Mercury Concentrations (for example, by fish tissue KOH /methanol digestions). These vials should be placed into a Teflon® beaker containing concentrated HNO₃ (Caution!) and heated for 8.0 hours at 100 °C in the fume hood. Upon cooling, the vials should be cleaned as in 5.1. As a precaution, bottles from such a batch should be randomly tested for Hg contamination (10%) prior to re-use.

6.5 Pre-cleaning Procedure for Teflon® Containers Contaminated with High Levels of Mercury or other Trace Metals. For Hg, high levels are > 100 ng/L. For most other trace metals, high levels are > 100 µg/L. Teflon® containers which have become contaminated with high levels of mercury or other trace metals should not be used for low level Hg work again until they have tested clean (< 1 ng/L). These bottles should be pre-cleaned in a 30% HCl vat reserved for "dirty containers" as in 5.1, but they should remain in the "dirty" vat for a minimum five days. The containers should then be passed through the normal cleaning procedure (5.1.2). Following this, a random selection of at least 10% of the containers must be tested for contamination by the metals of interest prior to re-use.

6.6 "Quick Cleaning." At the discretion of the project manager, clean sample containers which are known to have contained only ultra-low level water samples may be "quick-cleaned" to improve turn-around time. This involves rinsing the container inside and out with copious quantities of reagent water, and filling with 1% HCl in reagent. The containers are dried in the laminar flow hood, and then placed over night in a clean oven at 55-65 °C. The next day, the containers are emptied, rinsed with reagent, and filled with reagent plus 0.5% (v/v) HCl. The containers are then dried in the laminar flow hood and double bagged for shipping. As a matter of routine, Teflon® vials used in low level aqueous MMHg distillations are always "quick-cleaned" between uses.

7.0 QUALITY ASSURANCE

7.1 Twenty bottles of each type (Teflon® and glass) are tested for total mercury monthly. If any of the bottles have a concentration ≥ 1 ng/L, then 20 more bottles are tested. If any of those bottles have a concentration ≥ 1 ng/L, then corrective action is determined by the Sr. Sample Custodian, Laboratory Manager, and the QA Program Director.

7.2 Bottle washing vats are tested for Hg on a monthly basis. Refer to vat testing SOP for control limits and corrective action.

8.0 CORRECTIVE ACTIONS

8.1 If after performing the monthly bottle testing, it is determined that there is contamination, then a procedure for corrective action is determined by the Sr.

Sample Custodian, Laboratory Manager, and the QA Program Director.

8.2 Refer to the vat testing SOP for control limits and corrective actions.

9.0 REFERENCES

- 9.1 Bloom, N.S., Horvat, M., and Watras, C.J. (1995) "Results of the International Mercury Speciation Intercomparison Exercise," *Wat Air Soil Pollut*, (in Press).
- 9.2 Bloom, N.S. (1995) "Mercury as a Case Study of Ultra-Clean Sample Handling and Storage in Aquatic Trace Metal Research," *Environ Lab* (March/April).
- 9.3 Bloom, N.S. and Crecelius, E.A. (1983) "Determination of Mercury in Sea Water at Subnanogram per Liter Levels". *Mar. Chem.* 14: 49.
- 9.4 Bothner, M.H. and Robertson, D.E. (1975) "Mercury Contamination of Sea Water Samples Stored in Polyethylene Containers," *Anal Chem* 47: 592.
- 9.5 Gill, G.A. and Fitzgerald, W.F. (1985) "Mercury Sampling of Open Ocean Waters at the Picogram Level". *Deep Sea Res.* 32: 287.

water, acidified to 0.5% (v/v) HNO_3 , dried (exterior surfaces) in the clean hood, capped, and stored in enclosed cabinets.

- 2.2. Glass, polyethylene, and Teflon® labware to be used in speciation analyses are cleaned by heating (70 °C) in 30% (v/v) HCl for 48 hours, followed by copious rinsing with reagent water known to be low in the trace-metals of interest. Following final rinse, water containers are filled with reagent water and acidified to 0.1% (v/v) HCl. Special pre-cleaning procedures for specifically contaminated containers are noted in the text.

3.0 INTERFERENCES

- 3.1. If samples are to be analyzed for mercury, as well as other trace metals, then only Teflon® or glass/quartz sampling containers with Teflon®-lined caps may be used. These containers should be cleaned using FGS-007. The use of other plastics, especially linear polyethylene, will result in Hg contamination or loss by gas phase diffusion through the container walls.
- 3.2. Colored plastics and glass should be avoided, as they sometimes contain metal compounds as dyes (i.e., cadmium sulfide for yellow, ferric oxide for brown, red for selenium etc.).
- 3.3. Samples to be analyzed using the hydrofluoric acid (HF) digestion method (FGS-052.2) should be oven-cleaned with HF/ HNO_3 mixture prior to use.

4.0 SAFETY

- 4.1. Extreme care must be taken when handling HF due to its inherent dangers (please refer to MSDS before use). HF waste must be stored safely (lab-packed) prior to removal by the hazardous waste disposal company. See the EH&S officer for further details.
- 4.2. When working with a vat containing acid of the types described The following safety precautions **must be taken**:
 - 4.2.1. Eyeglasses, which protect the eyes completely and are resistant to acid attack, must be worn.
 - 4.2.2. The vat must be vented, to remove acidic fumes, by means of a fume hood or other fume extraction device when the technician is placing in or removing items from a vat.

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- 4.2.3. Acid resistant, elbow length, gloves must be worn when placing in or removing items from a vat.
- 4.2.4. Vats must not be worked on when the heating paddle is plugged in, due to the risk of electric shock, or while the vats are still warm and producing a lot of fumes.
- 4.3. Waste Management and Pollution Prevention: Any wastes generated by this procedure should be disposed of according to SOPs FGS-099 and FGS-100, which provide instruction on dealing with laboratory and client waste. Pollution prevention information can be found in the current Frontier Geosciences Hazardous Materials Management Plan (HMMP), which details and tracks various waste streams and disposal procedures.

5.0 EQUIPMENT

- 5.1. Equipment for bottle and glassware cleaning
- 5.2. 100 to 200-L HDPE vat, half filled with 25% (v/v) HNO_3 (reagent grade) in reagent water.
- 5.3. 22 to 27-L HDPE vat, half filled with 0.5% (v/v) HCl (reagent grade) in reagent water.
- 5.4. 50 to 75-L HDPE vat, half filled with 5% (v/v) acetic acid (reagent grade) in reagent water.
- 5.5. 500 watt, Teflon®-coated immersion heater (120 vac). Safety note: Read instructions carefully!! Heater will maintain steady state, without temperature feedback control, of 60-75°C in a 100-200L vat. Equilibrium temperature will be higher (up to boiling!) in a smaller vat. Also, heater plate MUST be maintained

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in a vertical position, completely submerged and away from vat walls to avoid melting vat or burning out!

5.6. Laboratory sink in clean area, with high-flow, low trace metal, reagent water.

5.7. Class-100 Clean air station for drying rinsed bottles (clean hood).

5.8. Drying Oven. Stainless steel, capable of maintaining ± 5 °C in the 60-85°C temperature range.

5.9. Masterflex® L/S™ peristaltic pump.

5.10. Sampling Equipment

5.10.1. Water Sample Collection Equipment

5.10.1.1. High density polyethylene bottles (60-mL, 125-mL, 250-mL, 500-mL, 1000-mL, or 2000-mL).

5.10.1.2. Borosilicate glass bottles with Teflon® lined caps (125-mL, 250-mL, 500-mL, or 1000-mL); I-CHEM™ EPA-clean, or equivalent.

5.10.1.3. Teflon® (FEP or PFA) bottles; 125-mL, 250-mL, 500-mL, 1-L, and 2-L

5.10.1.4. Tubing; Bev-a-Line™, Teflon® (FEP or PFA), Masterflex®, silastic and semi-rigid Teflon®-lined.

5.10.2. Containers for Tissues, Sediments, and Sludges

5.10.2.1. Borosilicate glass jars with Teflon®-lined polyethylene caps (60-mL, 125-mL, 500-mL, 1000-mL); I-CHEM™ EPA-clean, or equivalent.

5.10.2.2. High density polyethylene bottles, 125-mL.

5.10.2.3. Teflon® 60-mL high-pressure digestion vessels ("bombs") suitable for microwave digestions.

5.10.3. Additional Laboratory Equipment

5.10.3.1. Polyethylene laboratory equipment: 15-mL, 30-mL, 60-mL bottles; filtering apparatus, spatulas, autosampler (AS) cups, and reagent bottles (30-mL, 125-mL, 250-mL, 500-mL, and 1000-mL).

5.10.3.2. Teflon® (FEP or PFA) laboratory equipment: bottles (5-mL, 60-mL, 125-mL), beakers (250-mL), and watchglasses.

5.10.4. Glass laboratory equipment

5.10.4.1.1. 250-mL digestion jars with polyethylene lids, marbles, 50-mL and 250-mL beakers, volumetric flasks (all sizes) and 50-mL Erlenmeyer flasks

6.0 REAGENTS

6.1. Hydrochloric acid (HCl) – reagent or trace metal grade.

6.2. Nitric acid (HNO₃) – reagent or trace metal grade.

6.3. Hydrofluoric acid (HF) – reagent or trace metal grade (see safety note 5.3.1).

6.4. Acetic acid (CH₃COOH) – reagent or trace metal grade.

7.0 PROCEDURES

7.1. Initial Cleaning of New Equipment

7.1.1. New Teflon® bottles, Teflon® vials, Teflon® beakers, Teflon® “bombs”, and AFS cups, are cleaned by heating to 65-75°C in 30% (v/v) HCl for at least 48 hours. The Teflon® beakers and vials are then rinsed three times with reagent water before being stored, respectively, in a vat of 5% HCl, or on shelves acidified to 0.1% HCl. The Teflon® bottles and bombs are rinsed three times and then filled with DW containing 0.1% HCl, or 0.5% HNO₃, depending on the future usage of the container. After being heated in an oven for at least 8 hours at 70 °C, the bottles and bombs are rinsed copiously with reagent water ending with a final rinse and fill with reagent water. The Teflon® bottles and bombs are again acidified according to each ones' purpose, and placed in a class-100 clean-air station to dry. Dry Teflon® bottles and bombs can be shelved until needed. They are then stored in new polyethylene zipper bags until needed. New Teflon® tubing is cleaned by heating it in a vat of 30% HCl for at least eight hours. It is then rinsed

copiously with reagent water until litmus paper shows that water both coming out of the tubing and on the surface of the tubing is pH neutral. The tubing is then drained and placed in a class-100 clean-air station to dry. Once dry, the tubing is double-bagged in virgin polyethylene zipper bags, and stored in clean cabinets until needed.

¹ Equipment to be used for speciation work should contain 0.1% HCl (v/v). Equipment for other purposes can be filled with 0.5% HNO₃ (v/v).

² Tubing, of any type, over 5ft in length is filled with the aid of a Masterflex® L8™ peristaltic pump. Shorter lengths are gravity filled.

- 7.1.2. New 250-mL Teflon® bottles to be used for the HF digestion are initially cleaned by heating to 65-75 °C in 30% (v/v) HCl for at least 48 hours. The bottles are cooled, rinsed 3 times and filled with reagent water, containing 0.8% HNO₃/ 0.2% HF, and placed in a class 100 clean-air station until dry. The bottles are then capped and placed in a clean oven at 70 °C overnight. After cooling, they are stored in a clean cabinet until required.
- 7.1.3. New Polyethylene bottles are cleaned by cold soaking in 30% (v/v) HNO₃ for 48hrs. They are then rinsed 3 times and filled with reagent water, acidified to 0.2%(v/v) HF/0.8%(v/v) HNO₃, capped and placed in a class 100 clean-air station until dry. The bottles are then ovened at 70 °C for 24 hours. Following this period the bottles are re-rinsed three times with reagent water and once with reagent water again, and placed in a class 100 clean-air station until dry. The bottles are then tightly capped, double-bagged in zip-lock bags and stored in clean cabinets until needed.
- 7.1.4. New Glassware is cleaned by cold soaking in 30% (v/v) HNO₃ for 48hrs. It is then rinsed three times and filled with reagent water, containing 0.5% HNO₃, and placed in a class 100 clean-air station until dry. The bottles are then tightly capped and stored in clean cabinets until needed.
- 7.1.5. Glassware and polyethylene equipment, other than bottles, are cleaned by cold soaking in 25% (v/v) HNO₃ for 48hrs. Spatulas and filter equipment are rinsed in copious amounts of reagent water and placed on a class 1.5 compatible clean glove in a class 100 clean-air station until dry. They are then bagged in new polyethylene zipper bags until needed. Erlenmeyer flasks, Marbles and Glass beakers having spent 48hrs cold soaking are rinsed 3 times in reagent water and placed in an acid vat containing 0.5% HCL (v/v) until required.

7.1.6. Silastic tubing, Bev-a-line and Masterflex™ are initially cleaned by soaking filled tubing at 60-75 °C in 5% (v/v) Acetic acid for 4hrs. Following this period the tubing is rinsed with copious amounts of reagent water prior to four hours soaking at 60-75 °C in reagent water. The tubing is then rinsed with reagent water, drained and placed in a class 100 clean-air station until dry. It is then double bagged (in new zippered bags) until required.

7.1.7. Lids for volumetric flasks are cleaned by a cold soak in 5 % (v/v) HCL overnight. They are then rinsed with copious amounts of reagent water and placed in a class 100 clean-air station until dry. They can then be used as required.

7.2. Ongoing Cleaning Procedures.

7.2.1. 60mL Teflon® bottles, AFS cups, 5.0 mL Teflon® vials (for speciation work), and Glass volumetric flasks (for speciation work), are cleaned by heating them to 65-75 °C in 30% (v/v) HCl for at least eight hours. The equipment is then cooled and rinsed three times with reagent water. Bottles, vials and volumetric flasks are filled with reagent water containing 0.5% HCL and placed in a class 100 clean-air station until dry. This equipment is then tightly capped and stored in clean cabinets until needed. AFS cups having been rinsed three times with ultra-clean water are left empty in a class 100 clean air station until dry, when they are stored in new zipper bags until required.

7.2.2. Teflon® tubing is cleaned by heating at 70 °C for at least eight hours in 30% HCl, followed by a thorough rinse with de-ionized water known to be low in mercury. When litmus paper shows that both the water on the surface of the tubing, and the water running through it is neutral, the tubing can be drained and place in a class-100 clean-air station to dry. Dry tubing is double-bagged in virgin polyethelene zipper bags and stored in a lean cabinet until it is needed.

7.2.3. 250-mL Teflon® bottles for HF digests are cleaned by cold soaking in 30% (v/v) HNO₃ for 48hrs. They are then rinsed and filled with reagent water, containing 0.2% HF/0.8% HNO₃ and placed in a class 100 clean-air station until dry. The bottles are then capped and placed in a clean oven at 85 °C overnight. After cooling, they are stored in a clean cabinet until required.

- 7.2.4. 60-mL Teflon® 'bombs' should be thoroughly scrubbed with a brush and a general purpose cleaning fluid low in metals (e.g. 409™) to ensure the removal of any sediment prior to acid washing. Once scrubbed, the containers are cold soaked in 30% (v/v) HNO₃ for 48 hrs. They are then rinsed three times and filled with reagent water, containing 0.5% (v/v) HNO₃, and ovened for eight hours at 80 °C. They are then rinsed three times with reagent water and placed in a class-100 clean-air station until dry. When dry they are capped and stored in clean cabinets until required.
- 7.3. Remaining equipment is processed using the method described in section 5.1 (Initial cleaning).
- 7.4. NOTE: For jars to be sent into the field for solids samples, and at client request, the containers may be sent empty. These should be dried in the laminar flow hood, sealed, and double bagged.
- 7.5. NOTE: 125-mL HDPE bottles used for sediment digestions should be marked with an 'S' and used only for future sediment digestions. The bottles are cleaned as per ongoing cleaning instructions for polyethylene.

8.0 CORRECTIVE ACTIONS

- 8.1. 20 HDPE bottles of various sizes are tested for total recoverable trace metals monthly. At a minimum, the following metals must be tested for: Al, Cr, Zn, Sb, Pb, Cd, Cu, Ni. If any of the bottles have a concentration above the control limit (see attachment A), then 20 more bottles are tested. If any of those bottles have a concentration above the control limit, then corrective action is determined by the Sr. Sample Custodian, Laboratory Manager, and the QA Program Director
- 8.2. Bottle washing vats are tested for Trace Metals on a monthly basis. Refer to vat testing SOP for control limits and corrective action.

9.0 REFERENCES

- 9.1. Bloom, N.S., Horvat, M., and Watras, C.J. (1995) "Results of the International Mercury Speciation Intercomparison Exercise," Wat Air Soil Pollut, (in Press)
- 9.2. Bloom, N.S. (1995) "Mercury as a Case Study of Ultra-Clean Sample Handling and Storage in Aquatic Trace Metal Research," Environ Lab (March/April).

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**APPENDIX B: PROCEDURE FOLLOWED TO DECONTAMINATE THE 9.5-L,
GLASS ISCO CONTAINER**

Standard procedure used by CLS to decontaminate the 9.5-L glass ISCO sample-collection container prior to use each month to collect a composite effluent sample for asbestos, cyanide, and organics analyses.

- 1) wash with Alconox or equivalent detergent;
- 2) triple rinse with deionized, organic-free water;
- 3) triple rinse with hexane;
- 4) triple rinse with deionized, organic-free water;
- 5) allow cleaned container to air-dry; and
- 6) place cleaned cap on container.

**APPENDIX C. PROCEDURE FOLLOWED TO DECONTAMINATE THE
COMPOSITE SAMPLER TUBING AND THE 4-L GLASS BOTTLE
USED FOR DIOXIN AND FURAN SAMPLE COLLECTION**

Standard procedure used by Alta Analytical to decontaminate the composite sampler tubing and 4-L glass sample-collection container prior to its use for collecting a composite effluent sample for dioxin and furan analyses.

Sample-collection container:

- 1) wash with Alconox or equivalent detergent and rinse with deionized water;
- 2) rinse with acetone;
- 3) rinse with toluene;
- 4) rinse with hexane;
- 5) rinse with methylene chloride;
- 6) allow container to air-dry; and
- 7) place cover over top of container.

Tubing:

- 1) wash with Alconox or equivalent detergent and rinse with deionized water;
- 2) rinse with acetone;
- 3) allow tubing to air-dry; and
- 4) place tubing in a clean plastic bag.

APPENDIX D: RBEFFLUENT SAMPLING DATA SHEET

SAMPLING DATA SHEET

Date: _____ Time: _____ County: El Dorado

WWTP: El Dorado Hills Operated by: El Dorado Irrigation District

Sampling Personnel: _____

[illegible]**Comments:**

APPENDIX E: ANALYTICAL LABORATORY CHAIN-OF-CUSTODY FORMS

TOXSCAN CHAIN-OF-CUSTODY

PAGE ____ OF ____

COMPANY NAME:	COMMENTS / SPECIAL INSTRUCTIONS:
ATTN:	
ADDRESS:	
PHONE:	
FAX:	SEND INVOICE TO:
E-MAIL:	
PROJECT NAME:	
PROJECT NUMBER:	P.O. / CONTRACT NO:

ANALYSIS(ES) REQUESTED						TOXSCAN INC. 42 Hangar Way Watsonville, CA 95076 PHONE: 831/724-4522 FAX: 831/724-3188 E-mail: chemistry@toxscan.com					
LAB USE ONLY: STORAGE LOCATION: FREEZER #: REFRIGERATOR #: SHELF #											

Lab Use Only: ID Number	Client Sample Identification	Sample Information:			Bottle or Container Information:												SAMPLE CONDITION
		Sampling Date	Sampling Time	Sample Type	Sample Preservative	Bottle Type:	Bottle Size:	No. of Bottles:	CHECK THE APPROPRIATE BOX BELOW:								

SAMPLER'S SIGNATURE AND PRINTED NAME:

RELINQUISHED BY (SIGNATURE AND PRINTED NAME):	RECEIVED BY (SIGNATURE AND PRINTED NAME):	DATE:	TIME:

LOG NO.

[illegible]

INET FORM

Environmental Research & Specialty Analytical Laboratory

414 Pontius Avenue North, Suite B Seattle WA 98109
(206) 622-6960 fax (206) 622-6870 Info@Frontier.WA.com

Chain-of-Custody Record & Laboratory Analysis Request

Date: _____ Page: _____ of _____

[illegible]



CHAIN OF CUSTODY RECORD

Laboratory Project ID

...the ...

Storage ID:

Storage

Secured

Yes ☐ **No** ☐

Project I.D.: _____ P.O. #: _____ Sampler: _____

Relinquished by: (Signature and Printed Name) Date: Time: Received by: (Signature and Printed Name) Date: Time:

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
---	-------	-------	---	-------	-------

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
---	-------	-------	---	-------	-------

See "Sample Log-in Checklist" for additional sample information

SHIP TO: Alta Analytical Laboratory
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
(916) 933-1640 • Fax (916) 933-0940
www.altalab.com

Method of Shipment:

**Circle or Add
Analysis(es)
Requested**

Shipment ID:

STANDARD TAT = 21 DAYS.
Surcharge may be applied
for less than 21 days.

ATTN: _____

TAT (Analytical Turnaround Times): 1 = 7 days, 2 = 14 days, 3 = 21 days, 4 = 28 days

[illegible]

Special Instructions/Comments: _____

**SEND
DOCUMENTATION
AND RESULTS TO:**

Name: _____
Company: _____
Address: _____
City: _____ State: _____ Zip: _____
Phone: _____ Fax: _____

Container Types: A = 1 Liter Amber, G = Glass Jar
P = PUF, T = MM5 Train, O = Other

*Bottle Preservative Type: T = Thiosulfate,
O = Other

Matrix Types: DW = Drinking Water, EF = Effluent, PP = Pulp/Paper, SD = Sediment, SL = Sludge, SO = Soil, WW = Wastewater, O = Other

WHITE - ORIGINAL

YELLOW - ARCHIVE

PINK - COPY

1001

ALTA ANALITICAL

05/07/2001 15:41 FAX 9169331640



El Dorado Irrigation District
 2890 Mosquito Road., Placerville, CA 95667
 (530) 642-4001 FAX: (530) 622-8597

CHAIN OF CUSTODY

PROJECT MANAGER						ANALYSES REQUESTED													
Facility RBI _____ Address _____ Phone _____ FAX _____ Attention Michelle Brown _____						TDS	Hardness	Sulfite									Field Temp.	Field DO	Field pH
Sampler _____ Date _____																			
SAMPLE ID	DAYS	DATE	TIME	AMT	LAB ID														
Plant Effluent				500 ml		X													
Plant Effluent				250 ml			X												
Plant Effluent				125 ml				X											
R1				500 ml		X													
R1				250 ml			X												
R1				125 ml				X											
STAT: Normal: Rush 24hr 48hr 72hr 1wk Note: 'NS' in date column indicated no sample collected						Comments: _____ If Chlorine Residual is under 8, please do not transfer bacti Video taken during sampling: YES NO													
Relinquished By (Sign)		Print Name/Company				Date/Time		Received By (Sign)				Print Name/Company							

Samples Received on ice? Yes _____ No _____

Sample Temp: _____ °C

Sample condition when received: _____

SL-1
157

Effluent and Receiving Water Quality Assessment for the El Dorado Hills Wastewater Treatment Plant

Final Report

Prepared for:

El Dorado Irrigation District

2890 Mosquito Road
Placerville, CA 95667

Prepared by:



ROBERTSON - BRYAN, INC.
Specializing In Water and Power Resources

9766 Waterman Road, Suite L2
Elk Grove, CA 95624

August 2002

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Figure 1. Dissolved copper concentration versus hardness in the El Dorado Hills Wastewater Treatment Plant effluent for the period March through September 2001. The solid line shows the CTR chronic aquatic life copper criteria for various effluent hardness levels. 5

APPENDICES

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- APPENDIX C: SUMMARY ANALYTICAL RESULTS BY CONSTITUENT
- APPENDIX D: LABORATORY ANALYTICAL REPORTS

ACRONYMS AND ABBREVIATIONS

BHC	hexachlorocyclohexane
CQL	criterion quantitation limit
CTR	California Toxics Rule
DHS	California Department of Health Services
District	El Dorado Irrigation District
EDHWWTP	El Dorado Hills Wastewater Treatment Plant
MCL	maximum contaminant level
MDL	method detection limit
mgd	million gallons per day
mg/l	milligram per liter
ML	minimum level
na	not applicable
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
QAPP	Quality Assurance Project Plan
PCBs	polychlorinated biphenyls
pg/l	picograms per liter
RL	reporting limit
RWQCB	Regional Water Quality Control Board, Central Valley Region
SIP	Statewide Implementation Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
µg/l	microgram per liter
U.S. EPA	United States Environmental Protection Agency

1 INTRODUCTION

1.1 DESCRIPTION OF PROJECT AREA

El Dorado Irrigation District (District) owns and operates the El Dorado Hills Wastewater Treatment Plant (EDHWWTP), which provides service to El Dorado Hills and adjacent areas. The EDHWWTP is located approximately 30 miles east of Sacramento in Section 14, T9N, R8E, MDB&M. This plant reclaims treated municipal wastewater for uses within the District and discharges treated effluent to Carson Creek, seasonally. Carson Creek is tributary to Deer Creek, which is tributary to the Cosumnes River. Wastewater reclamation is regulated under separate waste discharge requirements and must meet the requirements of California Code of Regulations, Title 22. The EDHWWTP has undergone significant treatment modifications and upgrades in the past two years. The new facility has a design dry weather flow capacity of 3.0 million gallons per day (mgd).

1.2 STATEMENT OF PROJECT NEED

Provision #2 of the District's NPDES permit (Order No. 5-01-135; NPDES No. CA0078671), adopted June 14, 2001, requires a contaminant monitoring study be conducted. This Provision #2 study was to collect the data necessary to determine whether effluent discharges from the EDHWWTP contain California Toxic Rule (CTR) and National Toxics Rule (NTR) constituents, U.S. Environmental Protection Agency (U.S. EPA) priority pollutants, aluminum, ammonia, and nitrates in concentrations that have a reasonable potential to cause or contribute to an exceedance of water quality standards in Carson Creek. The current NPDES permit's Monitoring and Reporting Program also requires the District to monitor priority pollutants plus aluminum on a quarterly basis, when discharging to Carson Creek. Because the permit was adopted in June 2001, the first requirement for quarterly priority pollutant monitoring at this facility occurred during the last quarter of 2001.

In addition to the NPDES permit requirements, the Central Valley Regional Water Quality Control Board (RWQCB) required the District to perform effluent and receiving water monitoring, pursuant to California Water Code Section 13267, as directed in Section 1.2 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries* (SWRCB 2000), also referred to as the Statewide Implementation Plan or "SIP." The RWQCB request was made in a letter to the District dated September 10, 2001 and revised on December 27, 2001 (henceforth referred to as the 13267 letter) (**Appendix A**). The 13267 letter states:

"In order to prepare appropriate NPDES permits, it is necessary to have adequate characterization of the discharged effluent and the receiving water."

The Water Code Section 13267 letter requires the District to:

"...submit data sufficient to (1) determine if priority pollutants require effluent limitations (Reasonable Potential Analysis) and (2) calculate water quality-based effluent limitations."

In addition to monitoring priority pollutants, as required by the NPDES permit, the RWQCB 13267 letter requested monitoring of other constituents, including organophosphorus pesticides,

drinking water constituents, and conventional constituents, such as pH and hardness, some of which are currently monitored by the District as required by its NPDES permit.

1.3 PROJECT PURPOSE

This study collected the data requested by the RWQCB in its 13267 letter and produced the priority pollutant data required by the current NPDES permit for the first two quarters following permit adoption, when the facility was discharging treated effluent to Carson Creek. The priority pollutant data required by the NPDES permit for the last quarter of 2001 and the first quarter of 2002 have been submitted to RWQCB staff previously, under separate cover. These data also are contained herein to provide a complete data set in response to the 13267 letter's request.

The specific objectives defined for this effluent and receiving water quality monitoring study are:

- determine whether the EDHWWTP discharge has CTR/NTR constituents and/or non-priority metals/organics that: a) cause; b) have reasonable potential to cause; or c) significantly contribute to an excursion in the receiving waters above current State numeric/narrative objectives or federal water quality standards; and
- provide data sufficient to conduct the determination based on the analysis in Section 1.3 of the SIP and to calculate water quality-based effluent limitations in accordance with Section 1.4 of the SIP.

1.4 PURPOSE OF REPORT

The purpose of this report is to:

- meet the requirement of the District's NPDES permit, Provision #2, which requires the District to conduct a study of the potential effects of U.S. EPA priority pollutants, CTR and NTR constituents, aluminum, ammonia, and nitrates in the receiving water; and
- meet the requirement of the RWQCB's 13267 letter to conduct effluent and receiving water monitoring (Appendix A).

2 PROJECT APPROACH AND METHODOLOGIES

2.1 MONITORING SCHEDULE

Effluent and receiving water sampling was conducted between March 2001 and February 2002 according to the schedule provided in the Quality Assurance Project Plan (QAPP) (RBI 2001). Effluent samples for trace metals, volatile organics, cyanide, tributyltin, and other conventional constituent analyses were collected monthly. Effluent samples for semi-volatiles and pesticides analyses were collected quarterly. Effluent samples for dioxins and furans were collected semi-annually. Additional sampling was conducted during May 2002 to obtain results for constituents that either were not previously reported during one month due to laboratory error, or to obtain a sufficient number of results with appropriate reporting limits, per the RWQCB's 13267 letter.

During March, June, and October 2001, and January 2002, receiving water samples were collected for all analyses. In other months, receiving water samples were collected for copper, aluminum, hardness, sulfite, ammonia, total dissolved solids (TDS), and specific conductance.

2.2 SAMPLING METHODS

A portable composite sampler was used to collect 24-hour, time-weighted composite effluent samples for all contaminant analyses, except the volatile organic constituents and sulfite analyses. For the volatile organic constituents and sulfite analyses, grab samples were collected. A detailed description of all procedures used for collection and transport of all effluent samples is provided in the QAPP prepared for this study (RBI 2001). All receiving water samples were grab samples.

2.3 ANALYTICAL METHODS

The laboratory analytical methods used to quantify the effluent concentrations of all contaminants monitored under the ERWQA study are identified in **Appendix A**. For some of the constituent analyses, the method employed by the analytical laboratory changed in the later part of the study. These changes were made to address the RWQCB's reporting limit requirements specified in the 13267 letter issued during September 2001. Detailed information pertaining to these methods can be acquired by contacting the project representatives at each of the analytical laboratories used for this study. Name, affiliation, address, and phone number for each laboratory representative are provided in **Appendix B**.

2.4 SAMPLING LOCATION

When effluent was being discharged to Carson Creek, samples were collected at the effluent discharge Parshall flume, which is located immediately prior to the Carson Creek discharge point. When 100 percent of the effluent was being reclaimed, resulting in no discharge to Carson Creek, the effluent samples were collected at the end of the chlorine contact tank. Note that from June through October 2001, the EDHWWTP was conducting reclaim operations, rather than discharging treated effluent to Carson Creek. Samples collected during these months were collected from the chlorine contact tank and, therefore, contained chlorine residual. In addition, during May 2001, effluent samples for all but the trace metals and tributyltin analyses were collected at the effluent Parshall flume. Samples for trace metals and tributyltin analyses were

collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations during that month's sampling event.

2.5 DEVIATIONS FROM THE QAPP

The effluent and receiving water monitoring study was initiated in March 2001, consistent with the QAPP prepared by RBI (RBI 2001) and submitted to and reviewed by the RWQCB permitting staff. In September 2001, the RWQCB issued a letter to the District (as well as all other dischargers within the region) to complete effluent and receiving water monitoring pursuant to California Water Code Section 13267. This letter contained one constituent that had not been identified by the RWQCB staff as requiring monitoring in February 2001, when the original QAPP was prepared. In addition, the 13267 letter specified reporting limit requirements for each constituent, some of which differed from reporting limits specified in the original QAPP. This section describes deviations from the QAPP that were necessary to address the 13267 letter requirements and/or resulting from other unforeseen circumstances.

1. Sampling was initiated for Alachlor by EPA Method 507 in October 2001, in response to the 13267 letter issued by the RWQCB to the District in September 2001. The letter required this constituent be monitored quarterly, for a total of four samples to be collected. Samples for this constituent were collected in October and December 2001, and in January and February 2002 for a total of four samples.
2. Due to laboratory instrumentation problems, California Laboratory Services (CLS) could not analyze the October 2001 effluent and receiving water samples for EPA Method 632 constituents (Carbofuran and Oxamyl). Therefore, effluent and receiving water samples for this analysis were collected in December 2001, to provide a total of four samples for the study.
3. The 13267 letter specified reporting limit requirements for ethylene dibromide and dibromochloropropane that were more stringent than those specified in the QAPP. Therefore, the monitoring program was changed in December 2001 to analyze these compounds using EPA Method 504, rather than EPA Method 8260B. To provide a sufficient number of samples at the correct reporting limit, samples were collected during December 2001, and January, February, and May 2002.
4. In response to the 13267 letter requirements, CLS began using different analyses for some constituents, in order to obtain appropriate reporting limits. The analytical method used each month for each constituent is detailed in **Appendix C**.

3 ANALYTICAL RESULTS

The following sections summarize the analytical results from the effluent and receiving water monitoring at the EDHWWTP. The major categories of constituents, which are consistent with the 13267 letter categories are: (1) trace metals; (2) pesticides, herbicides, and polychlorinated biphenyls (PCBs); (3) volatile organics; (4) semi-volatile organics; (5) dioxin and furans; and (6) other conventional constituents.

3.1 TRACE METALS

3.1.1 Effluent

Trace metal concentrations in the undiluted effluent are provided along with the applicable water quality standards in **Table 1**. Undiluted effluent trace metal concentrations were below detection limits and/or below applicable water quality standards, with the exception of copper.

The dissolved copper concentrations ranged from 9.89 to 19.1 $\mu\text{g/l}$. These concentrations are below the Department of Health Services (DHS) secondary maximum contaminant level (MCL) for copper of 1,000 $\mu\text{g/l}$ and the CTR human health criterion, for the consumption of water and organisms, of 1,300 $\mu\text{g/l}$. However, the dissolved copper concentrations are greater than the CTR chronic aquatic life criteria for copper, when the criteria are calculated using the measured effluent hardness (see **Figure 1**).

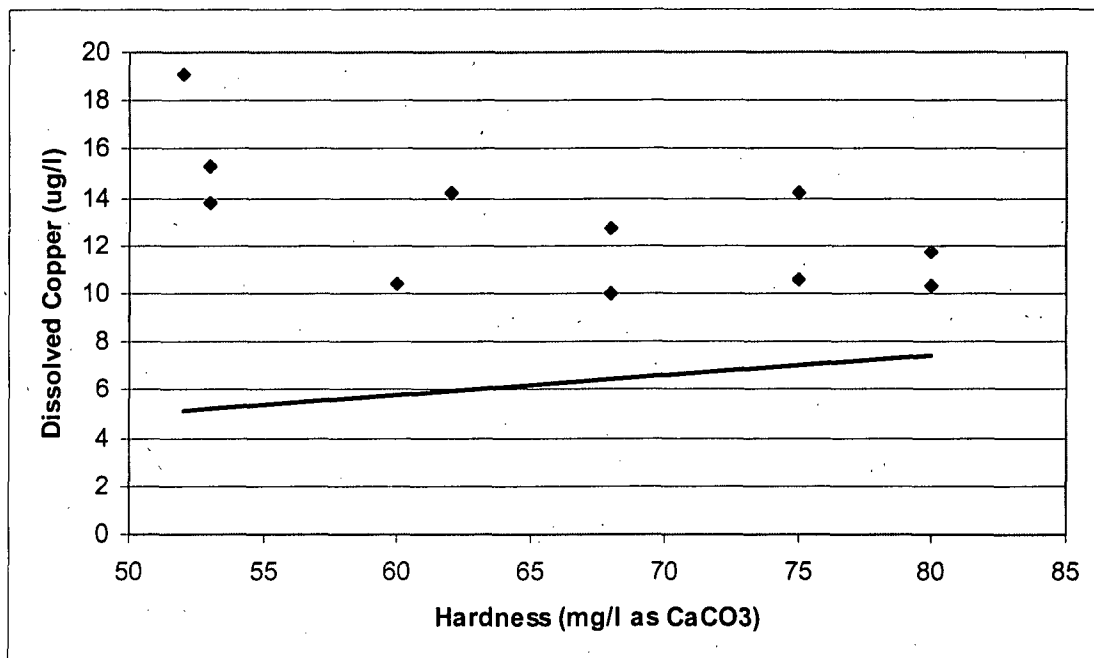


Figure 1. Dissolved copper concentration versus hardness in the El Dorado Hills Wastewater Treatment Plant effluent for the period March through September 2001. The solid line shows the CTR chronic aquatic life copper criteria for various effluent hardness levels.

Table 1. Trace metal concentrations in the El Dorado Hills Wastewater Treatment Plant effluent for the period March 2001 through February 2002.

Constituent	Units	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
Sampling Location *		EFFLUENT	EFFLUENT	RECLAIM	RECLAIM	RECLAIM	RECLAIM	RECLAIM	RECLAIM	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	DHS MCL ^b	CTR / NTR	CTR / NTR
Aluminum (Al)																
Total Recoverable	µg/l	44.0	46.4	296	66.0	378	493	507	64	57.7	23.5	18.9	30.0	1,000 (200 ^c)	—	—
Dissolved	µg/l	23.6	24.6	271	55.6	369	439	466	41	39.2	12.2	9.4	12.0	1,000 (200 ^c)	—	—
Antimony (Sb)																
Total Recoverable	µg/l	0.221	0.220	0.217	0.253	0.247	0.238	0.274	0.368	0.301	0.202	0.201	0.212	6	14	—
Dissolved	µg/l	0.229	0.213	0.235	0.252	0.239	0.229	0.275	0.373	0.301	0.203	0.186	0.203	6	14	—
Arsenic (As)																
Total Recoverable	µg/l	0.29	0.73	0.467	0.554	0.464	0.617	0.651	0.608	0.580	0.526	0.310	0.245	50	—	150
Dissolved	µg/l	< 0.24	0.70	0.468	0.509	0.416	0.576	0.639	0.579	0.493	0.507	0.275	0.241	50	—	150
Barium (Ba)																
Total Recoverable	µg/l	2.49	2.30	2.29	2.31	2.24	1.54	1.73	1.56	1.88	2.17	1.66	2.32	1,000	—	—
Dissolved	µg/l	2.35	2.19	2.12	2.24	2.16	1.45	1.33	1.48	1.82	2.10	1.57	2.13	1,000	—	—
Beryllium (Be)																
Total Recoverable	µg/l	< 0.009	< 0.017	< 0.016	< 0.006	0.003	< 0.006	< 0.010	< 0.005	< 0.007	< 0.005	< 0.003	< 0.003	4	—	—
Dissolved	µg/l	< 0.009	< 0.017	< 0.016	< 0.006	0.008	< 0.006	< 0.010	< 0.005	< 0.007	< 0.005	< 0.003	< 0.003	4	—	—
Cadmium (Cd)																
Total Recoverable	µg/l	0.097	0.083	0.121	0.090	0.112	0.104	0.060	0.042	0.045	0.038	0.030	0.034	5	—	2.2 ^d
Dissolved	µg/l	0.102	0.087	0.121	0.080	0.106	0.107	0.061	0.043	0.045	0.040	0.028	0.031	5	—	2.2 ^d
Chromium (Cr)																
Total Recoverable	µg/l	0.09	< 0.11	0.20	0.49	0.12	< 0.42	< 0.34	0.15	0.11	< 1.5	0.19	0.47	50	—	11 ^d
Dissolved	µg/l	< 0.05	< 0.11	0.23	0.70	0.15	< 0.42	< 0.34	0.14	0.32	< 1.5	0.26	0.25	50	—	11 ^d
Copper (Cu)																
Total Recoverable	µg/l	10.8	10.2	10.8	13.0	14.6	15.6	19.5	14.2	10.5	10.3	12.7	15.2	1,000 ^c	1,300	9 ^d
Dissolved	µg/l	10.6	10.0	9.89	12.7	14.2	15.3	19.1	13.8	10.4	10.3	11.7	14.2	1,000 ^c	1,300	9 ^d
Iron (Fe)																
Total Recoverable	µg/l	< 4.7	< 10.6	7.0	6.1	5.1	9.3	24.9	7.3	9.2	6.1	5.5	7.6	300 ^c	—	—
Dissolved	µg/l	< 4.7	< 5.3	1.1	5.3	7.5	5.9	11.1	4.4	8.4	6.5	5.9	5.3	300 ^c	—	—
Lead (Pb)																
Total Recoverable	µg/l	0.049	0.077	0.041	0.049	0.055	0.063	0.074	0.080	0.057	0.063	0.057	0.067	15	—	2.5 ^d
Dissolved	µg/l	0.042	0.065	0.037	0.030	0.048	0.049	0.045	0.049	0.054	0.058	0.055	0.058	15	—	2.5 ^d
Manganese (Mn)																
Total Recoverable	µg/l	3.02	2.99	1.16	2.24	1.10	1.17	3.17	0.71	2.56	2.00	6.85	3.81	50 ^c	—	—
Dissolved	µg/l	2.79	2.77	0.54	1.32	0.91	0.85	0.81	< 0.42	2.31	1.92	6.60	3.96	50 ^c	—	—
Mercury (Hg)																
Total Recoverable	µg/l	0.00155	0.00144	0.0015	0.0016	0.00184	0.0051	0.0023	0.0023	0.0014	0.0015	0.0017	0.0020	2	0.05	—
Dissolved	µg/l	0.00125	0.00129	0.0012	0.0012	0.00145	0.0032	0.0023	0.0024	0.0010	0.0011	0.0012	0.0012	2	0.05	—
Nickel (Ni)																
Total Recoverable	µg/l	9.43	1.63	2.01	2.13	2.21	8.10	3.26	2.47	3.09	1.69	1.82	1.86	100	610	52 ^d
Dissolved	µg/l	9.82	1.57	1.84	2.05	2.30	8.11	3.26	2.46	3.09	1.75	1.73	1.75	100	610	52 ^d
Selenium (Se)																
Total Recoverable	µg/l	0.79	1.15	0.155	0.148	0.136	0.127	0.182	0.208	0.144	0.112	0.132	0.126	50	—	5
Dissolved	µg/l	0.89	1.20	0.197	0.181	0.163	0.121	0.174	0.154	0.155	0.117	0.142	0.164	50	—	5
Silver (Ag)																
Total Recoverable	µg/l	< 0.012	< 0.021	< 0.006	< 0.004	< 0.004	0.004	0.008	0.006	0.004	< 0.002	0.003	0.005	100 ^c	—	—
Dissolved	µg/l	< 0.012	< 0.021	0.009	< 0.004	< 0.004	0.003	0.007	0.008	0.003	< 0.002	0.003	0.004	100 ^c	—	—
Thallium (Tl)																
Total Recoverable	µg/l	0.002	0.017	0.027	0.002	0.003	< 0.10	0.002	< 0.001	0.003	0.002	0.001	0.001	2	1.7	—
Dissolved	µg/l	0.002	0.011	< 0.006	0.002	0.004	< 0.10	0.004	0.003	0.005	0.002	0.001	0.001	2	1.7	—
Zinc (Zn)																
Total Recoverable	µg/l	29.1	27.6	21.2	20.2	18.4	17.8	18.4	21.1	19.0	19.7	21.4	21.2	5000 ^c	—	120 ^d
Dissolved	µg/l	28.6	27.1	20.0	19.5	17.8	16.7	17.7	20.5	18.5	20.1	19.6	21.8	5000 ^c	—	120 ^d

Table 1 Footnotes:

-
- ^a "Effluent" denotes samples collected at the effluent Parshall flume. "Reclaim" denotes samples collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.
- ^b California Department of Health Services primary maximum contaminant level.
- ^c California Department of Health Services secondary maximum contaminant level.
- ^d Based on a hardness of 100 mg/l as CaCO₃.

3.1.2 Carson Creek

Trace metal concentrations in Carson Creek are provided along with the applicable water quality standards in **Table 2**. Carson Creek's trace metal concentrations were below detection limits and/or below applicable water quality standards, with the exception of aluminum during several high-flow months. Carson Creek's concentrations of aluminum (expressed as total recoverable) ranged from $<3.1 \mu\text{g/l}$ in September 2001 (i.e., below the laboratory detection limit for the September sample) to $2,110 \mu\text{g/l}$ in April 2001. The samples collected in March and April 2001 had aluminum concentrations of $1,250 \mu\text{g/l}$ and $2,110 \mu\text{g/l}$, respectively, which are greater than the DHS primary MCL of $1,000 \mu\text{g/l}$. The relatively high aluminum concentrations are attributed to elevated suspended sediment concentrations resulting from high Carson Creek flows. As shown in Table 2, the dissolved aluminum concentrations were two orders of magnitude lower than the total recoverable concentrations during these months, indicating that most of the aluminum was associated with the creek's suspended sediment load. In addition, during the summer "low-flow" period, when creek suspended sediment concentrations and turbidity were relatively low (i.e., not visible to the naked eye), total recoverable aluminum concentrations were orders of magnitude lower than the March and April 2001 concentrations, further indicating that the elevated spring aluminum concentrations were due to high suspended sediment loads.

3.2 PESTICIDES, HERBICIDES, AND PCBs

3.2.1 Effluent

Concentrations of pesticides, herbicides, and PCBs in the undiluted effluent are provided along with the applicable water quality standards in **Table 3**. Undiluted effluent concentrations of pesticides, herbicides, and PCBs were below detection limits and/or below applicable water quality standards, with the exception of 4,4'-DDT and alpha-hexachlorocyclohexane (BHC).

4,4'-DDT was detected in the January 2002 sample at a concentration of $0.047 \mu\text{g/l}$, which is greater than the CTR human health criterion, for consumption of water and organisms, of $0.00059 \mu\text{g/l}$ and the CTR aquatic life chronic criterion of $0.001 \mu\text{g/l}$. 4,4'-DDT use was banned in 1973, though it can still be detected in streambed sediments and aquatic organisms within the Sacramento River basin, due its persistent chemical nature (Domagalski et. al 2000). However, its source in a wastewater effluent stream, given that the pesticide has been banned for almost 20 years, is uncertain.

Alpha-BHC was detected in the March 2001 sample at a concentration of $0.013 \mu\text{g/l}$, which is greater than the CTR human health criterion, for the consumption of water and organisms, of $0.0039 \mu\text{g/l}$. The alpha-BHC concentrations were below the DHS action level of $0.015 \mu\text{g/l}$. Alpha-BHC is an insecticide, so its sources could be industrial or domestic in nature; however, it is no longer produced or sold for domestic use in the United States.

Table 2. Trace metal concentrations in Carson Creek for the period March 2001 through February 2002.

Constituent	Units	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
														DHS MCL ^a	CTR / NTR	CTR / NTR
Aluminum (Al)																
Total Recoverable	µg/l	1,250	2,110	--	11.3	9.6	3.9	< 3.1	1.4	64.2	850	32	36	1,000 (200 ^b)	--	--
Dissolved	µg/l	46.0	73.8	--	2.4	< 0.6	1.6	< 3.1	< 0.5	11.6	30.9	1.9	3.6	1,000 (200 ^c)	--	--
Antimony (Sb)																
Total Recoverable	µg/l	0.043	0.04	--	0.022	--	--	--	0.021	--	--	--	--	6	14	--
Dissolved	µg/l	0.046	0.04	--	0.021	--	--	--	0.018	--	--	--	--	6	14	--
Arsenic (As)																
Total Recoverable	µg/l	0.24	0.63	--	0.173	--	--	--	0.30	--	--	--	--	50	--	150
Dissolved	µg/l	0.27	< 0.63	--	0.143	--	--	--	0.41	--	--	--	--	50	--	150
Barium (Ba)																
Total Recoverable	µg/l	12.4	11.7	--	11.7	--	--	--	14.4	--	--	--	--	1,000	--	--
Dissolved	µg/l	8.27	7.62	--	11.6	--	--	--	13.8	--	--	--	--	1,000	--	--
Beryllium (Be)																
Total Recoverable	µg/l	0.018	< 0.083	--	< 0.060	--	--	--	< 0.026	--	--	--	--	4	--	--
Dissolved	µg/l	< 0.005	< 0.083	--	< 0.060	--	--	--	< 0.026	--	--	--	--	4	--	--
Cadmium (Cd)																
Total Recoverable	µg/l	0.014	< 0.02	--	< 0.036	--	--	--	< 0.008	--	--	--	--	5	--	2.2 ^c
Dissolved	µg/l	0.006	< 0.02	--	< 0.036	--	--	--	< 0.008	--	--	--	--	5	--	2.2 ^d
Chromium (Cr)																
Total Recoverable	µg/l	2.33	2.68	--	< 0.26	--	--	--	< 0.08	--	--	--	--	50	--	11 ^d
Dissolved	µg/l	< 0.03	< 0.55	--	< 0.26	--	--	--	< 0.08	--	--	--	--	50	--	11 ^d
Copper (Cu)																
Total Recoverable	µg/l	13.7	15.5	--	0.95	0.95	3.49	1.17	1.24	4.12	8.28	1.85	2.13	1,000 ^c	1,300	9 ^d
Dissolved	µg/l	2.65	2.70	--	0.85	0.93	3.45	1.16	1.07	3.51	3.56	1.62	1.88	1,000 ^c	1,300	9 ^d
Iron (Fe)																
Total Recoverable	µg/l	168	4250	--	147	--	--	--	193	--	--	--	--	300 ^c	--	--
Dissolved	µg/l	64.4	232	--	47.4	--	--	--	59.5	--	--	--	--	300 ^c	--	--
Lead (Pb)																
Total Recoverable	µg/l	0.259	0.273	--	< 0.018	--	--	--	< 0.068	--	--	--	--	15	--	2.5 ^d
Dissolved	µg/l	0.009	< 0.039	--	< 0.018	--	--	--	< 0.068	--	--	--	--	15	--	2.5 ^d
Manganese (Mn)																
Total Recoverable	µg/l	66.1	69.7	--	41.1	--	--	--	88.2	--	--	--	--	50 ^c	--	--
Dissolved	µg/l	15.8	16.1	--	29.8	--	--	--	63.6	--	--	--	--	50 ^c	--	--
Mercury (Hg)																
Total Recoverable	µg/l	0.00400	0.00816	--	0.0017	0.00135	--	--	0.0022	--	--	--	--	2	0.05	--
Dissolved	µg/l	0.00361	0.00218	--	0.0010	0.00110	--	--	0.0017	--	--	--	--	2	0.05	--
Nickel (Ni)																
Total Recoverable	µg/l	2.61	2.72	--	1.11	--	--	--	1.67	--	--	--	--	100	610	52 ^d
Dissolved	µg/l	0.92	1.00	--	1.05	--	--	--	1.28	--	--	--	--	100	610	52 ^d
Selenium (Se)																
Total Recoverable	µg/l	0.25	< 1.67	--	< 0.043	--	--	--	< 0.88	--	--	--	--	50	--	5
Dissolved	µg/l	0.32	< 1.67	--	< 0.043	--	--	--	0.92	--	--	--	--	50	--	5
Silver (Ag)																
Total Recoverable	µg/l	0.016	< 0.105	--	< 0.039	--	--	--	< 0.004	--	--	--	--	100 ^c	--	--
Dissolved	µg/l	< 0.006	< 0.105	--	< 0.039	--	--	--	< 0.004	--	--	--	--	100 ^c	--	--
Thallium (Tl)																
Total Recoverable	µg/l	0.004	0.007	--	< 0.006	--	--	--	< 0.002	--	--	--	--	2	1.7	--
Dissolved	µg/l	0.001	0.013	--	< 0.006	--	--	--	< 0.002	--	--	--	--	2	1.7	--
Zinc (Zn)																
Total Recoverable	µg/l	14.9	16.9	--	0.47	--	--	--	< 0.22	--	--	--	--	5000 ^c	--	120 ^d
Dissolved	µg/l	1.47	2.78	--	0.72	--	--	--	0.22	--	--	--	--	5000 ^c	--	120 ^d

Table 2 Footnotes:

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- ^a California Department of Health Services primary maximum contaminant level.
^b California Department of Health Services secondary maximum contaminant level.
^c Based on a hardness of 100 mg/l as CaCO₃.

Table 3. Pesticide, herbicide, and PCB concentrations in the El Dorado Hills Wastewater Treatment Plant effluent for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
Sampling Location ^a			EFFLUENT			RECLAIM				RECLAIM		EFFLUENT	EFFLUENT	EFFLUENT	DHS MCL ^b	CTR/NTR	CTR/NTR
2,4,5-TP (Silvex)	µg/l	0.20-1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	50	--	--
2,4-D	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	70	--	--
4,4'-DDD	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00083	--
4,4'-DDE	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00059	--
4,4'-DDT	µg/l	0.020	ND	--	--	ND	--	--	--	ND	--	--	0.047	--	--	0.00059	0.001
Alachlor	µg/l	1.0	--	--	--	--	--	--	--	ND	--	ND	ND	ND	2	--	--
Aldrin	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.05 ^c	0.00013	--
Alpha BHC	µg/l	0.010	0.013	--	--	ND	--	--	--	ND	--	--	ND	--	0.015 ^c	0.0039	--
Alpha Chlordane	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.1	0.00057	0.0043
Aroclor 1016	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1221	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1232	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1242	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1248	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1254	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1260	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Atrazine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	ND	3	--	--
Bentazon	µg/l	0.10-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	18	--	--
Beta BHC	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.3 ^c	0.014	--
Carbofuran	µg/l	0.2-5.0	ND	--	--	ND	--	--	--	--	--	ND	ND	--	18	--	--
Chlorpyrifos	µg/l	0.05-1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	--	--	--
Dalapon	µg/l	2.0-100	ND	--	--	7.4 E	--	--	--	ND	--	--	ND	--	200	--	--
Delta BHC	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Di(2-ethylhexyl)adipate	µg/l	5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	400	--	--
Diazinon	µg/l	0.05-0.25	ND	--	--	ND	--	--	--	ND	--	ND	ND	ND	--	--	--
Dieldrin	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.05 ^c	0.00014	0.056
Dinoseb	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	7	--	--
Diquat	µg/l	4.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	20	--	--
Endosulfan I	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	110	0.056
Endosulfan II	µg/l	0.010	ND	--	--	0.0088 E	--	--	--	ND	--	--	ND	--	--	110	0.056
Endosulfan sulfate	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	110	--
Endothall	µg/l	45	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100	--	--
Endrin	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	0.017	--	2	0.76	0.036
Endrin Aldehyde	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.76	--
Gamma BHC (Lindane)	µg/l	0.010	ND	--	--	0.0099 E	--	--	--	ND	--	--	ND	--	0.2	0.019	--
Gamma Chlordane	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.1	0.00057	0.0043
Glyphosate	µg/l	25	ND	--	--	ND	--	--	--	ND	--	--	ND	--	700	--	--
Heptachlor	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.01	0.00021	0.0038
Heptachlor epoxide	µg/l	0.001-0.01	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.01	0.0001	0.0038
Methoxychlor	µg/l	0.050	ND	--	--	ND	--	--	--	ND	--	--	ND	--	40 (30 proposed)	--	--
Molinate	µg/l	2.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	ND	20	--	--
Oxamyl	µg/l	0.10-20	ND	--	--	ND	--	--	--	--	--	ND	ND	--	200	--	--
Picloram	µg/l	1	ND	--	--	ND	--	--	--	ND	--	--	ND	--	500	--	--
Simazine	µg/l	1.0-4.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	ND	4	--	--
Thiobencarb	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	ND	70 (1 ^e)	--	--
Toxaphene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	3	0.00073	0.0002

Table 3 Footnotes:

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

" - " = sample not collected this month.

^a "Effluent" denotes samples collected at the effluent Parshall flume. "Reclaim" denotes samples collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.

^b California Department of Health Services primary maximum contaminant level.

^c California Department of Health Services action level from *Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

^d The aquatic life and human health standards apply to the sum of the seven aroclors.

^e California Department of Health Services secondary maximum contaminant level.

3.2.2 Carson Creek

Concentrations of pesticides, herbicides, and PCBs in Carson Creek are provided along with the applicable water quality standards in **Table 4**. Carson Creek's concentrations of pesticides, herbicides, and PCBs were below detection limits and/or below applicable water quality standards, with the exception of aldrin, Aroclor 1248, and heptachlor epoxide.

Aldrin was detected in the January 2002 sample at a concentration of 0.040 µg/l, which is greater than the CTR human health criterion, for the consumption of organisms and water, of 0.00013 µg/l. The aldrin concentrations were below the DHS action level of 0.05 µg/l. Aldrin is a pesticide that was produced for crops like corn and cotton. U.S. EPA banned all uses of aldrin in 1987.

Aroclor 1248 was detected in the January 2002 sample at a concentration of 1.03 µg/l, which is greater than the CTR human health criterion, for the consumption of water and organisms, of 0.00017 µg/l, the CTR aquatic life chronic criterion of 0.014 µg/l, and the DHS primary MCL of 0.5 µg/l. Aroclor 1248 is one of the seven PCBs, which were formerly used as hydraulic fluids, plasticizers, adhesives, fire retardants, way extenders, de-dusting agents, pesticide extenders, inks, lubricants, cutting oils, in heat transfer systems, carbonless reproducing paper. Therefore, the sources of Aroclor 1248 are generally industrial in nature.

Heptachlor epoxide was detected in the October 2001 sample at a concentration of 0.0015 µg/l, which is greater than the CTR human health criterion, for the consumption of water and organisms, of 0.0001 µg/l. The heptachlor epoxide concentrations were lower than the CTR aquatic life chronic criterion of 0.0038 µg/l and the DHS primary MCL of 0.01 µg/l. Heptachlor epoxide was used as a non-agricultural insecticide until most of its uses were cancelled in 1978. The only permitted commercial use of heptachlor products is for fire ant control in buried, pad-mounted electric power transformers, and in underground cable television and telephone cable boxes.

3.3 VOLATILE ORGANICS

3.3.1 Effluent

Concentrations of volatile organic compounds in the undiluted effluent are provided along with the applicable water quality standards in **Table 5**. Undiluted effluent concentrations of volatile organics were below detection limits and/or below applicable water quality standards, with the exception of bromodichloromethane, carbon tetrachloride, dibromochloromethane, and the sum of total trihalomethanes (i.e., sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane).

Table 4. Pesticide, herbicide, and PCB concentrations in Carson Creek for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
															DHS MCL ^a	CTR/NTR	CTR/NTR
2,4,5-TP (Silvex)	µg/l	0.20-1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	50	--	--
2,4-D	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	70	--	--
4,4'-DDD	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00083	--
4,4'-DDE	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00059	--
4,4'-DDT	µg/l	0.020	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00059	0.001
Alachlor	µg/l	1.0	--	--	--	--	--	--	--	ND	--	ND	ND	--	2	--	--
Aldrin	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	0.040	--	0.05 ^b	0.00013	--
Alpha BHC	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.015 ^c	0.0039	--
Alpha Chlordane	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.1	0.00057	0.0043
Aroclor 1016	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^c	0.00017 ^d	0.014 ^d
Aroclor 1221	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1232	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1242	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1248	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	1.03	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1254	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Aroclor 1260	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^d	0.00017 ^d	0.014 ^d
Atrazine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	3	--	--
Bentazon	µg/l	0.10-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	18	--	--
Beta BHC	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.3 ^c	0.014	--
Carbofuran	µg/l	0.2-5.0	ND	--	--	ND	--	--	--	--	--	ND	ND	--	18	--	--
Chlorpyrifos	µg/l	0.05-1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	--	--	--
Dalapon	µg/l	2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	200	--	--
Delta BHC	µg/l	0.005-0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Di(2-ethylhexyl)adipate	µg/l	5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	400	--	--
Diazinon	µg/l	0.05-0.25	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	--	--	--
Dieldrin	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.05 ^c	0.00014	0.056
Dinoseb	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	7	--	--
Diquat	µg/l	4.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	20	--	--
Endosulfan I	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	110	0.056
Endosulfan II	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	110	0.056
Endosulfan sulfate	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	110	--
Endothall	µg/l	45	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100	--	--
Endrin	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	2	0.76	0.036
Endrin Aldehyde	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.76	--
Gamma BHC (Lindane)	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.2	0.019	--
Gamma Chlordane	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.1	0.00057	0.0043
Glyphosate	µg/l	25	ND	--	--	ND	--	--	--	ND	--	--	ND	--	700	--	--
Heptachlor	µg/l	0.010	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.01	0.00021	0.0038
Heptachlor epoxide	µg/l	0.001-0.01	ND	--	--	ND	--	--	--	0.0015	--	--	ND	--	0.01	0.0001	0.0038
Methoxychlor	µg/l	0.050	ND	--	--	ND	--	--	--	ND	--	--	ND	--	40 (30 proposed)	--	--
Molinate	µg/l	2.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	20	--	--
Oxamyl	µg/l	0.1-20	ND	--	--	ND	--	--	--	--	--	ND	ND	--	200	--	--
Picloram	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	500	--	--
Simazine	µg/l	1.0-4.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	4	--	--
Thiobencarb	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	ND	ND	--	70 (1 ^d)	--	--
Toxaphene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	3	0.00073	0.0002

Table 4 Footnotes:

ND = not detected above the laboratory's method detection limit.

" – " = sample not collected this month.

^a California Department of Health Services primary maximum contaminant level.

^b California Department of Health Services action level from *Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

^c The aquatic life and human health standards apply to the sum of the seven aroclors.

^d California Department of Health Services secondary maximum contaminant level.

Table 5. Volatile organic compound concentrations in the El Dorado Hills Wastewater Treatment Plant effluent for the period March 2001 through May 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	May-02	Human Health		Aquatic Life
Sampling Location *			EFFLUENT	EFFLUENT	EFFLUENT	RECLAIM	RECLAIM	RECLAIM	RECLAIM	RECLAIM	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	DHS MCL ^b	CTR/NTR	CTR/NTR
1,1,1-Trichloroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	200	--	--
1,1,2,2-Tetrachloroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	1	0.17	--
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	1,200	--	--
1,1,2-Trichloroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	0.6	--
1,1-Dichloroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	--	--
1,1-Dichloroethene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	6	0.057	--
1,2-Dichlorobenzene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	600	2,700	--
1,2-Dichloroethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	0.5	0.38	--
1,2-Dichloropropane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	0.52	--
1,3-Dichlorobenzene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	130 ^c	400	--
1,3-Dichloropropene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	0.5	10	--
1,4-Dichlorobenzene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	400	--
2-Chloroethyl vinyl ether	µg/l	0.5-1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--
Acrolein	µg/l	2-30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	320	--
Acrylonitrile	µg/l	2-30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	0.059	--
Benzene	µg/l	0.30-0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	1	1.2	--
Bromodichloromethane	µg/l	0.50	17	7.4	15	16	13	5.9	13	15	11	5.4	5.5	8.0	--	100 (80 proposed) ^d	0.56	--
Bromoform	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	100 (80 proposed) ^d	4.3	--
Bromomethane	µg/l	0.50-2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	48	--
Carbon Tetrachloride	µg/l	0.50	ND	ND	0.42 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	0.5	0.25	--
Chlorobenzene	µg/l	0.50-2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	70	680	--
Chloroethane	µg/l	0.50-2.0	ND	ND	ND	ND	0.18 E	ND	ND	0.35 E	ND	ND	ND	ND	--	--	--	--
Chloroform	µg/l	0.5-5.0	69	33	80	97	100	75	84	120	47	23	17	29	--	100 (80 proposed) ^d	--	--
Chloromethane	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--
cis-1,2-Dichloroethene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	6	--	--
Dibromochloromethane	µg/l	0.50	2.2	0.86	1.8	1.7	1.2	ND	1.4	1.3	1.1	ND	0.94	1.0	--	100 (80 proposed) ^d	0.401	--
Dibromochloropropane	µg/l	0.010-10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	--	--
Dichloromethane	µg/l	0.50-2.0	ND	ND	ND	ND	ND	0.15 E	0.21 E	ND	ND	0.19 E	ND	ND	--	5	4.7	--
Ethylbenzene	µg/l	0.30-2.0	ND	0.20 E	ND	ND	ND	ND	0.26 E	ND	0.65	ND	ND	ND	--	700 (300 proposed)	3,100	--
Ethylene dibromide	µg/l	0.020-5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	--	--
Methyl-tert-butyl ether	µg/l	3.0-5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5 E	--	13 (5 ^e)	--	--
Styrene	µg/l	0.50-5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	100	--	--
Tetrachloroethene	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	0.8	--
Toluene	µg/l	0.30-2.0	ND	0.18 E	0.11 E	ND	ND	ND	0.17 E	ND	0.31	0.92	0.75 E	ND	--	150	6,800	--
Trans-1,2-dichloroethene	µg/l	0.50-1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	10	700	--
Trichloroethene	µg/l	0.50-2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	5	2.7	--
Trichlorofluoromethane	µg/l	0.50-5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	150	--	--
Vinyl Chloride	µg/l	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	0.5	2	--
Xylenes	µg/l	0.50	ND	0.70	ND	ND	ND	ND	0.54	ND	2.0	ND	ND	ND	--	1,750	--	--

Table 5 Footnotes:

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

" - " = sample not collected this month.

^a "Effluent" denotes samples collected at the effluent Parshall flume. "Reclaim" denotes samples collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.

^b California Department of Health Services primary maximum contaminant level.

^c California Department of Health Services action level from *Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

^d For total trihalomethanes (sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane).

^e California Department of Health Services secondary maximum contaminant level.

Carbon tetrachloride was detected in one of the twelve samples collected at an estimated concentration of 0.42 µg/l, which is greater than the CTR human health standards, for the consumption of water and organisms, of 0.25 µg/l, but less than the DHS MCL of 0.5 µg/l. Carbon tetrachloride uses include as a dry cleaning agent, in fire extinguishers, in the making of nylon, and as a solvent for rubber cement, soaps, and insecticides. Therefore, its sources are generally industrial in nature.

Bromodichloromethane concentrations ranged from 5.9 to 17 µg/l, which are greater than the CTR human health standards, for the consumption of water and organisms, of 0.56 µg/l. Dibromochloromethane concentrations ranged from non-detects to 2.2 µg/l. Detected concentrations that ranged from 0.86 to 2.2 µg/l are greater than the CTR human health standards, for the consumption of water and organisms, of 0.401 µg/l. The sum of the trihalomethanes was greater than the DHS primary MCL of 100 µg/l in June, July, and October 2001, at concentrations of 114.7 µg/l, 114.2 µg/l, and 136.3 µg/l, respectively. Bromodichloromethane, chloroform, and dibromochloromethane are likely formed as a by-product when chlorine is added in the effluent treatment process.

3.3.2 Carson Creek

Concentrations of volatile organic compounds in Carson Creek are provided along with the applicable water quality standards in **Table 6**. Concentrations of volatile organic compounds in Carson Creek were below detection limits in all samples collected.

3.4 SEMI-VOLATILE ORGANICS

3.4.1 Effluent

Concentrations of semi-volatile organic compounds in the undiluted effluent are provided along with the applicable water quality standards in **Table 7**. Undiluted effluent concentrations of semi-volatile organics were below detection limits and/or below applicable water quality standards, with the exception of bis(2-chloroethyl)ether. Bis(2-chloroethyl)ether was detected in one of the four quarterly samples at a concentration of 3.2 µg/l, which is greater than the CTR human health criterion, for the consumption of water and organisms, of 0.031 µg/l. Uses of bis(2-chloroethyl)ether include pesticides, as a solvent, cleaner, component of paint and varnish, rust inhibitor, or as a chemical intermediate to make other chemicals.

Certain of the semi-volatile constituents that were detected in effluent/creek samples also were detected in the laboratory method blank, associated with that sample, at documented concentrations (**Table 8**). The purpose of laboratory method blanks is to determine the magnitude of contamination problems resulting from laboratory activities. The phthalate, phenol, and phenanthrene contamination comes from the sodium sulfate used in the laboratory extraction process. Although baked at high temperatures for several hours, sometimes contamination remains and is evident at these low detection limits.

Table 6. Volatile organic compound concentrations in Carson Creek for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
															DHS MCL ^a	CTR/NTR	CTR/NTR
1,1,1-Trichloroethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	200	--	--
1,1,2,2-Tetrachloroethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1	0.17	--
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	0.5-10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1,200	--	--
1,1,2-Trichloroethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	0.6	--
1,1-Dichloroethane	µg/l	0.5-1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	--	--
1,1-Dichloroethene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	6	0.057	--
1,2-Dichlorobenzene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	600	2,700	--
1,2-Dichloroethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5	0.38	--
1,2-Dichloropropane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	0.52	--
1,3-Dichlorobenzene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	130 ^b	400	--
1,3-Dichloropropene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5	10	--
1,4-Dichlorobenzene	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	400	--
2-Chloroethyl vinyl ether	µg/l	0.5-1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Acrolein	µg/l	5-30	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	320	--
Acrylonitrile	µg/l	2-30	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.059	--
Benzene	µg/l	0.30-0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1	1.2	--
Bromodichloromethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100 (80 proposed) ^c	0.56	--
Bromoform	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100 (80 proposed) ^d	4.3	--
Bromomethane	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	48	--
Carbon Tetrachloride	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5	0.25	--
Chlorobenzene	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	70	680	--
Chloroethane	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Chloroform	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100 (80 proposed) ^d	--	--
Chloromethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
cis-1,2-Dichloroethene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	6	--	--
Dibromochloromethane	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100 (80 proposed) ^d	0.401	--
Dibromochloropropane	µg/l	0.010-10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.2	--	--
Dichloromethane	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	4.7	--
Ethylbenzene	µg/l	0.3-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	700 (300 proposed)	3,100	--
Ethylene dibromide	µg/l	0.020-5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.05	--	--
Methyl-tert-butyl ether	µg/l	3.0-5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	13 (5 ^d)	--	--
Styrene	µg/l	0.5-5	ND	--	--	ND	--	--	--	ND	--	--	ND	--	100	--	--
Tetrachloroethene	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	0.8	--
Toluene	µg/l	0.3-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	150	6,800	--
Trans-1,2-dichloroethene	µg/l	0.5-1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	10	700	--
Trichloroethene	µg/l	0.5-2.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	2.7	--
Trichlorofluoromethane	µg/l	0.5-5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	150	--	--
Vinyl Chloride	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5	2	--
Xylenes	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1,750	--	--

Table 6 Footnotes:

ND = not detected above the laboratory's method detection limit.

" - " = sample not collected this month.

^a California Department of Health Services primary maximum contaminant level.

^b California Department of Health Services action level *from Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

^c For total trihalomethanes (sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane).

^d California Department of Health Services secondary maximum contaminant level.

Table 7. Semi-volatile organic compound concentrations in the El Dorado Hills Wastewater Treatment Plant effluent for the period March 2001 through February 2002.

Constituent Sampling Location ^a	Units	Reporting	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
		Limit	EFFLUENT			RECLAIM				RECLAIM			EFFLUENT	EFFLUENT	DHS MCL ^b	CTR/NTR	CTR/NTR
1,2-Dichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	600	2,700	--
1, 2-Diphenylhydrazine	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.04	--
1,2,4-Trichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	70 (5 proposed)	--	--
1,3-Dichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	0.071 E	--	--	ND	--	130 ^c	400	--
1,4-Dichlorobenzene	µg/l	0.10	0.022 E	--	--	0.025 E	--	--	--	0.069 E	--	--	ND	--	5	400	--
2-Chloronaphthalene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,700	--
2-Chlorophenol	µg/l	0.20	ND	--	--	0.061 E	--	--	--	ND	--	--	ND	--	--	120	--
2,4-Dichlorophenol	µg/l	0.10	ND	--	--	0.52	--	--	--	0.10	--	--	ND	--	--	93	--
2,4-Dimethylphenol	µg/l	1.0-3.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	400 ^c	540	--
2,4-Dinitrophenol	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	70	--
2,4-Dinitrotoluene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.11	--
2,4,6-Trichlorophenol	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	2.1	--
2,6-Dinitrotoluene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
2-Nitrophenol	µg/l	0.20	0.10 E	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
3,3'-Dichlorobenzidine	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.04	--
4-Bromophenyl phenyl ether	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4-Chloro-3-methylphenol	µg/l	0.10	ND	--	--	ND U	--	--	--	0.047 E	--	--	ND	--	--	--	--
4-Chlorophenyl phenyl ether	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4-Nitrophenol	µg/l	0.50	0.49 E	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4,6 Dinitro-2-methylphenol	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	13.4	--
Acenaphthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,200	--
Acenaphthylene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Anthracene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	9,600	--
Benidine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00012	--
Benzo (a) anthracene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Benzo (a) pyrene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.2	0.0044	--
Benzo (b) fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--]	0.0044	--
Benzo (g,h,i) perylene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Benzo (k) fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Bis (2-chloroethoxy) methane	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Bis (2-chloroethyl) ether	µg/l	1.0	ND	--	--	3.2	--	--	--	ND	--	--	ND	--	--	0.031	--
Bis (2-chloroisopropyl) ether	µg/l	0.20	ND	--	--	0.071 E	--	--	--	ND	--	--	ND	--	--	1,400	--
Bis (2-ethylhexyl) phthalate	µg/l	2.0	ND	--	--	ND U	--	--	--	ND	--	--	ND	--	4	1.8	--
Butyl benzyl phthalate	µg/l	0.10	ND	--	--	0.058 E	--	--	--	ND	--	--	ND	--	--	3,000	--
Chrysene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Dibenzo (a,h) anthracene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Diethyl phthalate	µg/l	0.30	0.44	--	--	ND U	--	--	--	0.26 E	--	--	ND	--	--	23,000	--
Dimethyl phthalate	µg/l	0.10	0.066 E	--	--	0.062 E	--	--	--	ND U	--	--	ND	--	--	313,000	--
Di-n-butyl phthalate	µg/l	0.40	ND	--	--	ND U	--	--	--	ND	--	--	0.74	--	--	2,700	--
Di-n-octyl phthalate	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	300	--
Fluorene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,300	--
Hexachlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1	0.00075	--

Table 7. (Continued).

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
Sampling Location ^a			EFFLUENT	—	—	RECLAIM	—	—	—	RECLAIM	—	—	EFFLUENT	EFFLUENT	DHS MCL ^b	CTR/NTR	CTR/NTR
Hexachlorobutadiene	µg/l	0.20	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	0.44	—
Hexachlorocyclopentadiene	µg/l	0.20	ND	—	—	ND	—	—	—	ND	—	—	ND	—	50	240	—
Hexachloroethane	µg/l	0.20	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	1.9	—
Indeno (1,2,3-c,d) pyrene	µg/l	0.20	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	0.0044	—
Isophorone	µg/l	0.50	0.12 E	—	—	ND	—	—	—	ND	—	—	ND	—	—	8.4	—
Naphthalene	µg/l	0.10	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	—	—
Nitrobenzene	µg/l	0.50	0.30 E	—	—	ND	—	—	—	ND	—	—	ND	—	—	17	—
N-Nitrosodimethylamine	µg/l	1.0	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	0.00069	—
N-Nitroso-di-n-propylamine	µg/l	1.0	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	0.005	—
N-Nitrosodiphenylamine	µg/l	0.20	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	5	—
Pentachlorophenol	µg/l	0.50	ND	—	—	ND	—	—	—	ND	—	—	ND	—	1	0.28	6.7 (at pH 7)
Phenanthrene	µg/l	0.10	0.020 E	—	—	ND U	—	—	—	ND	—	—	ND	—	—	—	—
Phenol	µg/l	0.30	0.49	—	—	ND	—	—	—	ND	—	—	ND	—	5 ^c	21,000	—
Pyrene	µg/l	0.10	ND	—	—	ND	—	—	—	ND	—	—	ND	—	—	960	—

Table 7 Footnotes:

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

U = Constituent was detected in laboratory method blank. Reported concentration was less than 5 times the method blank concentration, therefore, the result is reported as "ND." This approach is used by U.S. EPA in its Contract Laboratory Program, as described in *National Functional Guidelines for Organic Data Review* (October, 1999).

— = sample not collected this month.

^a "Effluent" denotes samples collected at the effluent Parshall flume. "Reclaim" denotes samples collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.

^b California Department of Health Services primary maximum contaminant level.

^c California Department of Health Services action level from *Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

Table 8. Semi-volatile compounds detected in laboratory method blanks and associated interpretation of effluent and creek analytical results.

Constituent	Lab Method Blank Concentration (µg/l)	Lab Reported Effluent Concentration (µg/l)	Lab Reported Carson Creek Concentration (µg/l)	Qualified Reported Effluent Concentration (µg/l)	Qualified Reported Carson Creek Concentration (µg/l)
4-chloro-3-methylphenol	0.047	0.06 E	ND	ND	ND
bis(2-ethylhexyl)phthalate	2.8	2.5	2.5	ND	ND
diethyl phthalate	0.39	0.5	0.39	ND	ND
dimethyl phthalate	0.048	0.061	0.046	ND	ND
di-n-butylphthalate	0.45	0.75	0.74	ND	ND
phenanthrene	0.022	0.037 E	0.033 E	ND	ND

E = estimated concentration between the method detection limit and reporting limit.

The U.S. EPA developed data review guidelines for its Contract Laboratory Program. These guidelines, provided in *National Functional Guidelines for Organic Data Review* (U.S. EPA 1999), state the following with regards to detections of constituents in the method blank and interpretation of analytical results:

"[1.]. If a semivolatile compound is found in a blank but not found in the sample, no action is taken. If the contaminants found are volatile target compounds (or interfering non-target compounds) at significant concentrations above the CRQL, then this should be noted for EPA Project Officer action.

2. Any semivolatile compound detected in the sample (other than the common phthalate contaminants), that was also detected in any associated blank, is qualified if the sample concentration is less than five times (5x) the blank concentration. The quantitation limit may also be elevated. Typically, the sample CRQL is elevated to the concentration found in the sample. The reviewer should use professional judgement to determine if further elevation of the CRQL is required. For phthalate contaminants, the results are qualified "U" by elevating the sample quantitation limit to the sample concentration when the sample result is less than 10x the blank concentration."

Bis(2-ethylhexyl)phthalate was reported at 2.5 µg/l in June 2001, in both the effluent and creek. However, the laboratory method blank concentration was 2.8 µg/l, which is greater than the reported effluent concentration of 2.5 µg/l. Therefore, the effluent bis(2-ethylhexyl)phthalate is reported in Table 7 as a qualified "non-detect." Concentrations of the other constituents were less than 5 times the method blank concentration; therefore, these also are reported as a qualified "non-detect" in Table 7, per U.S. EPA guidance (U.S. EPA 1999).

3.4.2 Carson Creek

Concentrations of semi-volatile organic compounds in Carson Creek are provided along with the applicable water quality standards in **Table 9**. Undiluted effluent concentrations of semi-volatile organics were below detection limits and/or below applicable water quality standards. As discussed in the previous section, some constituents known to result from laboratory contamination were detected in the method blank as well as in the creek samples (Table 8). The constituent concentrations were less than 5 times the concentration reported in the method blank; therefore, the results are reported as qualified non-detects.

3.5 DIOXINS AND FURANS

The CTR includes standards for 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). In addition to this compound, the State is concerned with levels of 16 other congeners of chlorinated dibenzodioxins and chlorinated dibenzofurans. However, no standards have been formally adopted for these other congeners. The results from sampling for the 17 dioxin and furan congeners are presented below.

3.5.1 Effluent

Dioxin and furan congener concentrations were monitored during two months – March and December 2001. With the exception of the dioxin congener OCDD, no dioxin or furan congeners were detected in the effluent. It should be noted that OCDD was detected in the laboratory method blank at a level less than the measuring instrument's lower calibration limit. In addition, the OCDD level reported in the effluent sample (7.45 pg/l) was less the level reported in the method blank (8.78 pg/l). When multiplied by the toxic equivalency factor for 2,3,7,8-TCDD equivalents of 0.0001, the reported OCDD level in the effluent sample is 0.000745 pg/l. This concentration is orders of magnitude lower than the CTR human health criterion, for water and organism consumption, of 0.013 pg/l. **Table 10** summarizes results from the dioxin and furans analyses.

Per the RWQCB's 13267 letter, additional samples for analyses of all 17 dioxin and furan congeners will be collected twice a year (once during the wet season and once during the dry season) for the next two years, to provide six sample results over three years.

3.5.2 Carson Creek

Because there is no assimilative capacity for dioxins or furans in the receiving water, it was only necessary to determine whether dioxins and furans are present in the effluent. Therefore, Carson Creek water was not sampled for dioxin and furans analyses.

Table 9. Semi-volatile organic compound concentrations in Carson Creek for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
															DHS MCL ^a	CTR/NTR	CTR/NTR
1,2-Dichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	600	2,700	--
1,2-Diphenylhydrazine	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.04	--
1,2,4-Trichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	70 (5 proposed)	--	--
1,3-Dichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	130 ^b	400	--
1,4-Dichlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5	400	--
2-Chloronaphthalene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,700	--
2-Chlorophenol	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	120	--
2,4-Dichlorophenol	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	93	--
2,4-Dimethylphenol	µg/l	1.0-3.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	400 ^c	540	--
2,4-Dinitrophenol	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	70	--
2,4-Dinitrotoluene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.11	--
2,4,6-Trichlorophenol	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	2.1	--
2,6-Dinitrotoluene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
2-Nitrophenol	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
3,3'-Dichlorobenzidine	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.04	--
4-Bromophenyl phenyl ether	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4-Chloro-3-methylphenol	µg/l	0.10	ND	--	--	ND	--	--	--	0.030 E	--	--	ND	--	--	--	--
4-Chlorophenyl phenyl ether	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4-Nitrophenol	µg/l	0.50	0.14 E	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
4,6-Dinitro-2-methylphenol	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	13.4	--
Acenaphthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,200	--
Acenaphthylene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Anthracene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	9,600	--
Benidine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00012	--
Benzo (a) anthracene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Benzo (a) pyrene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.2	0.0044	--
Benzo (b) fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Benzo (g,h,i) perylene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Benzo (k) fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Bis (2-chloroethoxy) methane	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Bis (2-chloroethyl) ether	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.031	--
Bis (2-chloroisopropyl) ether	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,400	--
Bis (2-ethylhexyl) phthalate	µg/l	2.0	ND	--	--	ND U	--	--	--	ND	--	--	ND	--	4	1.8	--
Butyl benzyl phthalate	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	3,000	--
Chrysene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Dibenzo (a,h) anthracene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Diethyl phthalate	µg/l	0.30	ND	--	--	ND U	--	--	--	ND	--	--	ND	--	--	23,000	--
Dimethyl phthalate	µg/l	0.10	ND	--	--	0.030 E	--	--	--	ND U	--	--	ND	--	--	313,000	--
Di-n-butyl phthalate	µg/l	0.40	ND	--	--	ND U	--	--	--	ND	--	--	0.93	--	--	2,700	--
Di-n-octyl phthalate	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Fluoranthene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	300	--
Fluorene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1,300	--
Hexachlorobenzene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1	0.00075	--

Table 9. (Continued).

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
															DHS MCL ^a	CTR/NTR	CTR/NTR
Hexachlorobutadiene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.44	--
Hexachlorocyclopentadiene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	50	240	--
Hexachloroethane	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	1.9	--
Indeno (1,2,3-c,d) pyrene	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.0044	--
Isophorone	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	8.4	--
Naphthalene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Nitrobenzene	µg/l	0.50	ND	--	--	0.22 E	--	--	--	ND	--	--	ND	--	--	17	--
N-Nitrosodimethylamine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.00069	--
N-Nitroso-di-n-propylamine	µg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	0.005	--
N-Nitrosodiphenylamine	µg/l	0.20	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	5	--
Pentachlorophenol	µg/l	0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	1	0.28	6.7 (at pH 7)
Phenanthrene	µg/l	0.10	ND	--	--	ND U	--	--	--	ND	--	--	ND	--	--	--	--
Phenol	µg/l	0.30	ND	--	--	ND	--	--	--	ND	--	--	ND	--	5 ^c	21,000	--
Pyrene	µg/l	0.10	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	960	--

Table 9 Footnotes:

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

U = Constituent was detected in laboratory method blank. Reported concentration was less than 5 times the method blank concentration, therefore, the result is reported as "ND." This approach is used by U.S. EPA in its Contract Laboratory Program, as described in *National Functional Guidelines for Organic Data Review* (October, 1999).

-- = sample not collected this month.

^a California Department of Health Services primary maximum contaminant level.

^b California Department of Health Services action level from *Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria*, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, June 1997.

Table 10. Dioxin and furan congener concentrations in the El Dorado Hills Wastewater Treatment Plant effluent during March and December 2001.

Constituent	Units	Effluent Concentrations		Human Health		Aquatic Life
		Mar-01	Dec-01	DHS MCL ^a	CTR/NTR	CTR/NTR
2,3,7,8-TCDD	pg/l	< 0.473	< 1.02	30	0.013	--
1,2,3,7,8-PeCDD	pg/l	< 1.19	< 2.43	--	--	--
1,2,3,4,7,8-HxCDD	pg/l	< 1.28	< 4.13	--	--	--
1,2,3,6,7,8-HxCDD	pg/l	< 1.62	< 4.51	--	--	--
1,2,3,7,8,9-HxCDD	pg/l	< 1.33	< 4.14	--	--	--
1,2,3,4,6,7,8-HpCDD	pg/l	< 2.71	< 3.57	--	--	--
OCDD	pg/l	7.45 U	< 13.1	--	--	--
2,3,7,8-TCDF	pg/l	< 0.573	< 0.697	--	--	--
1,2,3,7,8-PeCDF	pg/l	< 0.693	< 1.92	--	--	--
2,3,4,7,8-PeCDF	pg/l	< 0.722	< 1.54	--	--	--
1,2,3,4,7,8-HxCDF	pg/l	< 0.589	< 0.852	--	--	--
1,2,3,6,7,8-HxCDF	pg/l	< 0.680	< 0.852	--	--	--
2,3,4,6,7,8-HxCDF	pg/l	< 0.721	< 1.00	--	--	--
1,2,3,7,8,9-HxCDF	pg/l	< 0.943	< 1.22	--	--	--
1,2,3,4,6,7,8-HpCDF	pg/l	< 0.722	< 0.952	--	--	--
1,2,3,4,7,8,9-HpCDF	pg/l	< 1.05	< 1.21	--	--	--
OCDF	pg/l	< 3.62	< 4.01	--	--	--

U = Constituent was detected in laboratory method blank.

^a California Department of Health Services primary maximum contaminant level.

3.6 OTHER CONVENTIONAL CONSTITUENTS

3.6.1 Effluent

Concentrations of other conventional constituents in the undiluted effluent are provided along with the applicable water quality standards in **Table 11**. Undiluted effluent concentrations of other conventional constituents were below detection limits and/or below applicable water quality standards, with the exception of nitrate. Nitrate concentrations ranged from 74 mg/l as NO₃ (17 mg/l as N) to 111 mg/l as NO₃ (25 mg/l as N), which are greater than the DHS primary MCL of 45 mg/l as NO₃ (10 mg/l as N). It should be noted that the EDHWWTP's NPDES permit already contains an effluent limitation (effective June 15, 2004) and compliance schedule for nitrate.

In addition to the constituents presented in Table 11, the 13267 letter required monitoring of pH and temperature. These parameters are required to be monitored in the effluent, per the EDHWWTP's NPDES permit, on a daily basis. This frequency exceeded that required by the 13267 letter, which was monthly. Therefore, no additional monitoring for pH and temperature was necessary to meet the pH and temperature data requirements defined by the 13267 letter. For effluent pH and temperature data, refer to the District's monthly self-monitoring reports for the EDHWWTP.

Table 11. Other conventional constituent concentrations in the El Dorado Hills Wastewater Treatment Plant effluent for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	May-02	Human Health		Aquatic Life
Sampling Location ^a			EFFLUENT	EFFLUENT	EFFLUENT	RECLAIM	RECLAIM	RECLAIM	RECLAIM	RECLAIM	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	DHS MCL ^b	CTR/NTR	CTR/NTR
Asbestos	mf/l ^c	0.2 - 1.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	7	7	—
Ammonia	mg/l	0.1-1.0	ND ^d	ND ^d	ND ^d	—	ND	ND	ND	ND	ND	ND	ND	ND	0.38	—	—	—
Chloride	mg/l	5.0-10	57	59	60	70	84	83	79	73	71	57	64	57	63	250 ^e	—	—
Cyanide	µg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	2.6 E	ND	ND	ND	—	200 (150 proposed)	700	5.2
Fluoride	mg/l	0.1 - 0.5	0.047 E	ND	0.086 E	0.087 E	ND	0.087 E	ND	0.058 E	ND	ND	0.038 E	0.094 E	0.2	2.0	—	—
Hardness (as CaCO ₃)	mg/l	1.0	75	68	—	68	62	53	52	53	60	80	82 / 79	75	66	—	—	—
MBAS	mg/l	0.1-0.5	0.18	0.17	0.15	0.36	—	0.33	0.39	0.33	0.18	0.16	0.20 E	0.23 E	0.11 E	0.5 ^e	—	—
Nitrate																		
as N	mg/l	0.50-10	17	17	—	19	25	21	21	21	20	20	22	25	19	10	—	—
as NO ₃	mg/l	0.50-10	74	76	—	86	110	91	93	95	88	88	97	111	84	45	—	—
Nitrite																		
as N	mg/l	0.40-0.50	ND	0.29	0.05	ND	ND	ND	0.04	ND	ND	ND	ND	ND	ND	10	—	—
as NO ₂	mg/l	0.40-0.50	ND	0.95	0.15 E	ND	ND	ND	0.12 E	ND	ND	ND	ND	ND	ND	—	—	—
Phosphorus, Total	mg/l	0.25-1.0	2.5	1.8	2.1	3.0	1.0	0.98	2.6	2.5	2.4	2.4	1.9	1.9	—	—	—	—
Specific conductance	µmhos/cm	—	670 ^d	—	737 ^d	—	790	830	793	770	940	720	700 / 720	740	770	—	—	—
Sulfate (as SO ₄)	mg/l	0.5 - 10	69	67	72	38	33	36	38	39	67	71	58	70	67	250 ^e	—	—
Sulfide (as S)	mg/l	1.0	4.0	0.6 E	5.0	ND	ND	ND	ND	ND	2.2	6.6	ND	ND	—	—	—	—
Sulfite (as SO ₃)	mg/l	2.0 - 5.0	8.80	5.00	6.8	2.8	4.2 E	4.0	4.0	ND	15	7.5	10	11	—	—	—	—
Total dissolved solids	mg/l	1.0-10	430	440	510	540	590	540	390	510	430	470	460 / 410	480	520	1,000 ^e	—	—
Tributyltin	µg/l	0.002-0.010	0.0067	ND	0.0065 ^f	ND	ND	ND	ND	ND	0.018	0.006	ND	ND	—	—	—	—

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

— = sample not collected this month.

^a "Effluent" denotes samples collected at the effluent Parshall flume. "Reclaim" denotes samples collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.

^b California Department of Health Services primary maximum contaminant level.

^c Value represents millions of fibers per liter; limited to fibers greater than 10 microns in length.

^d Monthly average as reported in this month's NPDES Discharge Self Monitoring Report and/or Operations Report.

^e California Department of Health Services secondary maximum contaminant level. Range for TDS is 500 mg/l (recommended) to 1000 mg/l (upper limit).

^f This sample was a "reclaim" sample collected at the chlorine contact tank, because discharges to Carson Creek had ceased for reclaim operations.

3.6.2 Carson Creek

Concentrations of other conventional constituents in Carson Creek are provided along with the applicable water quality standards in **Table 12**. Carson Creek's concentrations of other conventional constituents were below detection limits and/or below applicable water quality standards.

In addition to the constituents presented in Table 11, the 13267 letter required monitoring of pH and temperature. These parameters are required to be monitored in the effluent, per the EDHWWTP's NPDES permit, on a weekly basis. This frequency exceeded that required by the 13267 letter, which was monthly. Therefore, no additional monitoring for pH and temperature was conducted beyond that performed to meet the monitoring requirements of the NPDES permit. For Carson Creek pH and temperature data, refer to the District's monthly self-monitoring reports for the EDHWWTP.

Table 12. Other conventional constituent concentrations in Carson Creek for the period March 2001 through February 2002.

Constituent	Units	Reporting Limit	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Human Health		Aquatic Life
															DHS MCL ^a	CTR/NTR	CTR/NTR
Asbestos	mf/l ^b	0.2 - 1.13	ND	--	--	ND	--	--	--	ND	--	--	ND	--	7	7	--
Ammonia	mg/l	1.0	ND ^c	ND ^c	ND ^c	--	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--
Chloride	mg/l	5.0	15	--	--	29	--	--	--	50	--	--	23	--	250 ^d	--	--
Cyanide	µg/l	5.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	200 (150 proposed)	700	5.2
Fluoride	mg/l	0.10	0.051 E	--	--	0.091 E	--	--	--	0.063 E	--	--	0.05 E	--	2.0	--	--
Hardness (as CaCO ₃)	mg/l	1.0	110	--	--	150	160	160	180	180	160	67	140 / 130	110	--	--	--
MBAS	mg/l	0.10-0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	0.5 ^e	--	--
Nitrate																	
as N	mg/l	5.0	0.13	--	--	0.12	--	--	--	0.13	--	--	1.5	--	10	--	--
as NO ₃	mg/l	5.0	0.57	--	--	0.54	--	--	--	0.58	--	--	6.6	--	45	--	--
Nitrite																	
as N	mg/l	0.40-0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	10	--	--
as NO ₂	mg/l	0.40-0.50	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Phosphorus, Total	mg/l	0.050	0.14	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Specific conductance	µmhos/cm	--	241 ^c	300 ^c	369 ^c	--	440	441	496	500	550	200	310 / 310	270	--	--	--
Sulfate (as SO ₄)	mg/l	0.5	17	--	--	20	--	--	--	26	--	--	25	--	250 ^e	--	--
Sulfide (as S)	mg/l	1.0	ND	--	--	ND	--	--	--	ND	--	--	ND	--	--	--	--
Sulfite (as SO ₃)	mg/l	2.0 - 5.0	ND	--	--	ND	ND	ND	0.25	ND	--	ND	ND	ND	--	--	--
Total dissolved solids	mg/l	1.0-10	170	--	--	270	400	270	300	140	290	150	180 / 140	200	1,000 ^e	--	--
Tributyltin	µg/l	0.002 - 0.003	ND	ND	--	ND	--	--	--	0.003	--	--	ND	--	--	--	--

E = estimated concentration between laboratory's method detection limit and reporting limit.

ND = not detected above the laboratory's method detection limit.

-- = sample not collected this month.

^a California Department of Health Services primary maximum contaminant level.

^b Value represents millions of fibers per liter; limited to fibers greater than 10 microns in length.

^c Monthly average as reported in this month's NPDES Discharge Self Monitoring Report and/or Operations Report.

^d California Department of Health Services secondary maximum contaminant level. Range for TDS is 500 mg/l (recommended) to 1000 mg/l (upper limit).

4 CARSON CREEK HYDROLOGY

The District is required to monitor Carson Creek flow, per the EDHWWTP's NPDES permit Monitoring and Reporting Program, when discharging treated effluent to Carson Creek. Additional monitoring of creek flows during the non-discharge period (April through October 2001) was conducted to obtain data during the summer, low-flow period. The flow data for the period March 2001 through May 2001, which is the period during which the monitoring was conducted, are summarized in **Table 13**. Because the District monitors flow when discharging to Carson Creek, as required by the NPDES permit reporting and monitoring requirements, additional flow data are available that are not reported here.

Table 13. Carson Creek flow for the period March 2001 through May 2002.

Parameter	Mar 01	Apr 01	May 01	Jun 01	Jul 01	Aug 01	Sep 01	Oct 01	Nov 01	Dec 01	Jan 02	Feb 02	Mar 02	Apr 02	May 02
Units: million gallons per day															
Count	5	2	2	2	1	2	4	4	4	4	5	4	4	5	2
Average	13.8	1.7	1.4	0.4	0.2	0.2	0.2	0.2	3.0	30.2	20.9	16.6	32.7	12.6	18.1
Minimum	0.8	1.3	1.3	0.2	0.2	0.1	0.2	0.2	0.2	15.3	1.5	10.8	15.5	7.3	0.6
Maximum	58.0	2.1	1.4	0.5	0.2	0.3	0.2	0.2	9.3	45.2	44.7	25.8	45.8	24.7	35.7

5 SUMMARY

Effluent and receiving water monitoring was conducted at the EDHWWTP from March 2001 through May 2002. The constituents listed in **Table 14** were detected in the undiluted effluent or Carson Creek at concentrations greater than an applicable water quality standard.

Table 14. Summary of El Dorado Hills Wastewater Treatment Plant effluent and receiving water monitoring results for the period March 2001 through May 2002.

Constituent Group	Constituent	Units	Lowest CTR Standard	Effluent		Carson Creek	
				Concentration Range	# Samples > CTR	Concentration Range	# Samples > CTR
Trace metals	Aluminum (total recoverable)	µg/l	1,000 ^a	18.9 – 507	none	ND – 2,110	2 out of 11
	Copper (dissolved)	µg/l	7.6 ^b	9.89 – 19.1	12 out of 12	0.85 – 3.56	none
Pesticides, herbicides, and PCBs	4,4'-DDT	µg/l	0.00059 ^c	ND – 0.047	1 out of 4	ND	none
	Aldrin	µg/l	0.00013 ^c	ND	none	ND – 0.040	1 out of 4
	Alpha-BHC	µg/l	0.0039 ^c	ND – 0.013	1 out of 4	ND	none
	Aroclor 1248	µg/l	0.00017 ^c	ND	none	ND – 1.03	1 out of 4
	Heptachlor epoxide	µg/l	0.0001 ^c	ND	none	ND – 0.0015	1 out of 4
Volatile organics	Bromodichloromethane	µg/l	0.56 ^c	5.4 – 17	12 out of 12	ND	none
	Carbon tetrachloride	µg/l	0.25 ^c	ND – 0.42	1 out of 12	ND	none
	Chloroform	µg/l	100 ^{a,d}	17 – 120	3 out of 12	ND	none
	Dibromochloromethane	µg/l	0.401 ^c	ND – 2.2	10 out of 12	ND	none
Semi-volatile organics	Bis(2-chloroethyl)ether	µg/l	0.031 ^c	ND – 3.2	1 out of 12	ND	none
Conventional constituents	Nitrate (as NO ₃)	mg/l	45 ^a	74 – 111	12 out of 12	ND	none

ND = not detected above the laboratory's reporting limit.

^a California Department of Health Services primary maximum contaminant level.

^b California Toxics Rule criterion for the chronic protection of freshwater aquatic life, based on a hardness of 82 mg/l.

^c California Toxics Rule criterion for the protection of human health (water and organism consumption).

^d For the total trihalomethanes (sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane).

It should be noted that the EDHWWTP NPDES permit already contains an effluent limitation for nitrate of 10 mg/l (as N) and a compliance schedule for achieving this limitation, which becomes effective June 15, 2004.

It also should be noted that the highest aluminum concentrations were measured during March and April 2001, when the creek was more turbid than during subsequent sampling events. Dissolved aluminum concentrations were two orders of lower than the total recoverable

concentrations during these months (see Table 2), indicating that most of the total recoverable aluminum measured was associated with the creek's suspended sediment load.

6 REFERENCES

- Domagalski, J.L., Knifong, D.L., Dileanis, P.D., Brown, L.R., May, J.T., Connor, V., and Alpers, C.N. 2000. Water Quality in the Sacramento River Basin, California, 1994-98. U.S. Geological Survey Circular 1215.
- DWR (Department of Water Resources). 1997. Quality Assurance Technical Document 3: Compilation of Federal and State Drinking Water Standards and Criteria, State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance. June.
- RBI (Robertson-Bryan, Inc.). 2001. Phase II effluent and receiving water quality assessment for the El Dorado Hills Wastewater Treatment Plant. A quality assurance project plan for the collection and analysis of samples. Prepared for the El Dorado Irrigation District by Robertson-Bryan, Inc. May 4, 2001.
- SWRCB (State Water Resources Control Board). 2000. Policy for the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Phase 1 of the Inland Surface Waters Plan and the Enclosed Bays and Estuaries Plan), State Water Resources Control Board.
- U.S. EPA (United States Environmental Protection Agency). 1999. National Functional Guidelines for Organic Data Review. October.

APPENDIX A: RWQCB Letters Dated September 10, 2001 and December 27, 2001

APPENDIX B: Analytical Laboratory Contacts

ANALYTICAL LABORATORY CONTACTS

Ms. Misty Kennard

(Ms. Anne Fowler, the project manager during the actual monitoring, no longer works for Frontier Geosciences)

Project Manager

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Mr. Raymond Osowski, Jr. or

Sales/Marketing Manager

California Laboratory Services

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Rancho Cordova, CA 95742

(916) 638-7301

Mr. James Liang

Laboratory Director

Ms. Martha Maier

HRMS Services Coordinator

Alta Analytical Laboratory

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Ms. Kathryn Hart

Organics Director

ToxScan, Inc.

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Watsonville, CA 95076

(831) 724-4522

APPENDIX C: Summary of Analytical Results by Constituent

MARCH 2001

MAY 2001

JULY 2001

SEPTEMBER 2001

NOVEMBER 2001

JANUARY 2002

MAY 2002

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A*

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8636

Bruce Gwynne
- play etc.



El Dorado Irrigation District

LETTER OF TRANSMITTAL

EL DORADO IRRIGATION DISTRICT

2890 Mosquito Road, Placerville, CA 95667

Telephone: (530) 622-4534; Fax: (530) 622-8597

In Reply Refer To: FMT0604-094

Date: 6-7-04

To: SWRCB
PO Box 100
Sacramento, CA 95812-0100

Date Mailed 6/7/04

Attention: Craig J. Wilson

Project: Deer Creek and EDH WWTP

Project No. DC2716

Subject: Quality Assurance Project Report For The Collection and Analysis of Samples

We are transmitting:

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- ☒ Information
- ☐ Review and Comment
- ☐ Signature(s)
- ☐ Work

Status:

- ☐ Preliminary
- ☐ Final

From: Tim Sullivan 

Project Engineer

TS/tf