2011 Sampling Report for Emerging Constituents in the Santa Ana Region

Prepared for:
Santa Ana Watershed Project Authority

SAWPA

Prepared by:
Risk Sciences

RISK SCIENCES

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Section 1: Executive Summary

In 2009, water and wastewater agencies in the Santa Ana River region developed a voluntary program to characterize "Emerging Constituents" in 23 municipal wastewater effluents, 2 sites along the Santa Ana River, and in the 2man-made aqueducts used to import water to the area.[1]"Emerging Constituents (EC)" is a phrase used to describe a large number of pharmaceuticals, personal care products, food additives, pesticides and other common household chemicals for which federal and state authorities have not yet established an official water quality standard, approved a standard analytical method or required routine monitoring and reporting.

The first round of samples was collected and analyzed in the spring of 2010. Final results were reported to the Regional Water Quality Control Board later that same year.[2] The second round of samples was collected and analyzed in the spring of 2011.[3] The final results are presented in this report and summarized in Table 1. Where detected, EC concentrations fell well within the range where other studies have shown that "no adverse health effects would be expected."[4]

Table 1: Summary of Analytical Results for 27 Sampling Sites in 2011

Compound	Primary Use	Freq. of Detection	Reported Range[5]	Common Dose
Acetaminophen	Analgesic	26%	ND – 0.000048 mg/L	500 mg
Bisphenol A (BPA)	Plastic Coating	26%	ND – 0.000220mg/L	n/a
Caffeine	Food Additive	33%	ND – 0.000280mg/L	100 mg
Carbamazepine	Anti-Convulsant	85%	ND – 0.000360mg/L	200 mg
DEET	Insecticide	78%	ND – 0.000610mg/L	270 mg
Diuron[6]	Herbicide	81%	ND – 0.000260mg/L	n/a
17a Ethinyl Estradiol	Hormone	0%	Not Detected	1 mg
17b Estradiol	Hormone	0%	Not Detected	1 mg
Gemfibrozil	Anti-cholesterol	74%	ND – 0.005800mg/L	600 mg
Ibuprofen	Analgesic	67%	ND – 0.001800mg/L	300 mg
Sulfamethoxazole	Antibiotic	44%	ND – 0.001800mg/L	800 mg
TCEP	Flame Retardant	89%	ND – 0.000670mg/L	n/a
Triclosan	Antiseptic Biocide	26%	ND – 0.000130 mg/L	1 mg

Note: "mg/L" = milligram per Liter; 1 mg/L is one part per million. "ND" = Not Detected.

1The proposed program was reviewed and endorsed by the Santa Ana Regional Water Quality Control Board in Res. No. R8-2009-0071 (Dec. 10, 2009). Task Force members are listed on page 7 of this report.

2Santa Ana Watershed Project Authority. 2010 Emerging Constituents Sampling Report of the Emerging Constituents Program Task Force. December, 2010.

3The final Sampling and Analysis Plan is attached as Appendix A to this report.

4 Intertox, Inc. Comparison of Analytical Results for Trace Organics in the Santa Ana River at the Imperial Highway to Health Risk-based Screening Levels. Seattle, WA. June 25, 2009. This report did not develop or evaluate health based screening levels for BPA, 17a-Ethinyl Estradiol, or 17b-Estradiol.

5 The study imposed a mandatory reporting limit of 0.000010 mg/L (10 nanograms per liter). In some cases, a laboratory may have reported a value less than this level.

6 Diruon is Bayer's registered trade name for DCMU [3-(3,4-dichloropheynl)-1,1-dimethylurea] No endorsement or criticism is implied by this or any other trade name used in this document.

Although ECs were detected at many of the sampling sites, the measured concentrations were extremely small. For example, acetaminophen (the active ingredient in Tylenol) was detected at 7 (26%) of the 27 sampling sites. However, the highest reported concentration was less than five-one hundred-thousandths of a milligram. By comparison, one extra strength Tylenol capsule contains 500 milligrams of acetaminophen. Thus, a person would have to swallow more than 2 million gallons of treated municipal effluent to accidentally ingest the equivalent of one over-the-counter headache tablet. Similarly, one would have to deliberately drink at leastone million gallons from the Santa Ana River (all at once) in order to consume the amount of caffeine normally found in one can of soda.

Section 2: Background& Purpose of Study

Water quality is routinely analyzed at thousands of locations all across the country. Samples are collected from rain water, storm water runoff, freshwater streams, lakes and reservoirs, groundwater wells and tap water to characterize the quality of these various sources. Additional samples from the sewage systems are analyzed to ensure pollution prevention programs and wastewater treatment plants are meeting all federal and state water quality standards.

Recent improvements in analytical laboratory technology have dramatically improved our ability to detect a wider range of chemicals at much lower concentrations.[7] Today, we are able to identify and quantify these emerging constituents in the range of one part-per-trillion (ppt or nanogram per liter).[8]One trillion is one thousand billion. One part per trillion is equal to just one second in 31,546 years. One nanogram per liter is equivalent to a single drop in a volume of water equal to twenty Olympic-sized swimming pools.

Trace levels (approx. 1ppt to 100 ppt) of many different man-made chemicals, particularly pesticides, pharmaceuticals and personal care products, have been found in waters across the United States.[9] Collectively, these compounds are referred to as "Emerging Constituents" because their presence can now be detected by more sensitive analytical technology.

Emerging Constituents is one of several similar phrases used to describe the same phenomena. Synonyms include: chemicals of emerging concern (CEC), micro-constituents, micro-pollutants, trace organics, etc. However, such phrases may mistakenly imply that it is the concern that is "emerging" rather than the technology to detect these compounds in a water sample. Similarly, referring to such compounds as "Emerging Pollutants" or "Emerging Contaminants" may improperly suggest that the levels detected pose a known hazard to people or the environment when the true risk, if any, is not yet known.

7Vanderford, B.J., et al. "Analysis of Endocrine Disrupters and Personal Care Products in Water Using Liquid Chromatography and Tandem Mass Spectrometry." Analytical Chemistry. 2003 (75:6265-6274)
8Vanderford, B.J. and Shane Snyder. "Analysis of Pharmaceuticals in Water by Isotope Dilution Liquid Chromatography/Tandem Mass Spectrometry." Environmental Science and Technology. 2006 (p. 7312-7320).
9 New York City Environmental Protection. 2010 Occurrence of Pharmaceutical and Personal Care Products (PPCPs) in Source Water of the New York City Water Supply. August 19, 2011.

In general, chemical compounds can be divided into two categories: regulated and unregulated. Regulated chemicals include those for which formal water quality standards or a state notification levels have been established. State and federal authorities may issue orders governing the release of such compounds into the environment. These regulations may range from relatively simple monitoring and reporting requirements to strict discharge prohibitions.

By definition, ECs are usually considered unregulated chemicals. However, that status may change as new information is developed. To that end, additional data are needed to characterize the presence and persistence of ECs from various water sources. This information, along with epidemiological and toxicological data, may be used to set priorities for developing new water quality criteria, drinking water standards, Maximum Contaminant Levels (MCLs), state notification levels and future water quality monitoring requirements.[10]

Once new chemicals have been detected, the question naturally arises as to what effect, if any, these compounds may have on people and the environment.[11] Several different regulatory agencies share responsibility for determining the acceptable concentration of these chemicals. This is a formidable task as there are tens of thousands of chemical compounds in common use.[12] Consequently, state and federal authorities rely on sales/usage information and monitoring data to establish appropriate research priorities for setting new water quality standards through a sophisticated and thorough regulatory review process.[13]

The California Office of Environmental Health Hazard Assessment and U.S. EPA have primary legal responsibility for making the necessary risk assessments and recommending appropriate water quality standards for all chemicals including Emerging Constituents. The Regional Water Quality Control Boards and the California Department of Public Health (DPH) have primary responsibility for implementing these water quality standards.[14]

DPH has suggested that periodic monitoring for trace organic chemicals, including some unregulated ECs, may serve as a useful tool for understanding the possible influence of recycled water recharge projects on groundwater quality over time.Therefore, as part of the proposed Groundwater Recharge Reuse Regulations, DPH prepared a draft list of ECs to guide planning and permitting efforts for recycled water recharge projects.[15]However, the new regulation has not yet been finalized.

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[10]Additional information on the regulatory process governing Emerging Constituents is available at U.S. EPA"s official website: http://www.epa.gov/oppt/existingchemicals/

[11] See, for example, "How Safe is Our Water?" Reader's Digest. Aug., 2011; pg. 102.

[12] U.S. Senate Oversight Hearing on EPA's Unregulated Drinking Water Contaminants Program. July 12, 2011. http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearings&Hearing ID=fc5a8756-8021-23ad-454a-b9eeb7bf1c36

[13]U.S. Government Accountability Office. Environmental Health: Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water. GAO-11-346. August, 2011.

14 DPH serves several different regulatory roles with respect to groundwater recharge projects. DPH is responsible, under statute, for establishing water quality criteria for groundwater recharge projects. DPH also acts as a consultant to the Regional Boards on the permit requirements for specific groundwater recharge projects. And, DPH has a co-equal role with the Regional Boards in establishing appropriate permit requirements for groundwater recharge projects that rely on direct injection rather than surface percolation.

15California Department of Public Health. Draft Regulations for Groundwater Replenishment with Recycled Water. Proposed revisions published and posted to DPH website on November 21, 2011.

In early 2009, the California State Water Resources Control Board ("State Board') adopted a new Recycled Water Policy (RWP).[16] As part of that Policy, the State Board convened a Blue Ribbon Panel of Experts to recommend appropriate water quality monitoring strategies for ECs based on the best available pharmacological and toxicological information taking into consideration the fate and transport of such chemicals through advanced treatments systems and the natural environment. The Blue Ribbon Panel published their report in mid-2010.[17] The State Board has developed a draft EC monitoring policy based largely on the Blue Ribbon Panel's recommendations.[18] A public hearing was held in December of 2010 and the State Board is now in the process of revising the proposed policy in response to public comments.

Section 3: Study Approach and Methods

Relying on results reported in several previous studies, the EC Task Force selected eleven compounds for further investigation in 2010. In 2011, the EC Task Force added two more chemicals to the list based on the preliminary recommendations of the State Board's Blue Ribbon Panel: 17b-Estradiol and Triclosan. The Blue Ribbon Panel found that these particular chemicals posed no particular health threat but may serve as useful measures to demonstrate the overall effectiveness of advanced wastewater treatment.

Table 2: Emerging Constituents Analyzed in 2011

Compound	Category	Common Use
Acetaminophen (aka "Tylenol")	Pharmaceutical	Over-the Counter Analgesic
Bisphenol-A (BPA)	Industrial	Plastic Manufacturing
Caffeine (coffee, tea, soft drinks)	Food Additive	Non-Prescription Stimulant
Carbamazepine	Pharmaceutical	Prescription Anti-Convulsant
DEET (aka "Off")	Pesticide	Insect Repellent
Diuron	Pesticide	Weed Control
17a Ethinyl Estradiol	Pharmaceutical	Prescription Hormone
17b-Estradiol*	Pharmaceutical	Prescription Hormone
Gemfibrozil	Pharmaceutical	Prescription Anti-Cholesterol
Ibuprofen (aka "Advil")	Pharmaceutical	Over-the-Counter Analgesic
Sulfamethoxazole	Pharmaceutical	Prescription Antibiotic
TCEP	Industrial	Flame Retardant
Triclosan*	Antiseptic Biocide	Commercial Antiseptic

**Not analyzed in 2010; compound added to study in 2011.*

16SWRCB. Recycled Water Policy. Resolution No. 2009-0011 (adopted 2/3/09).

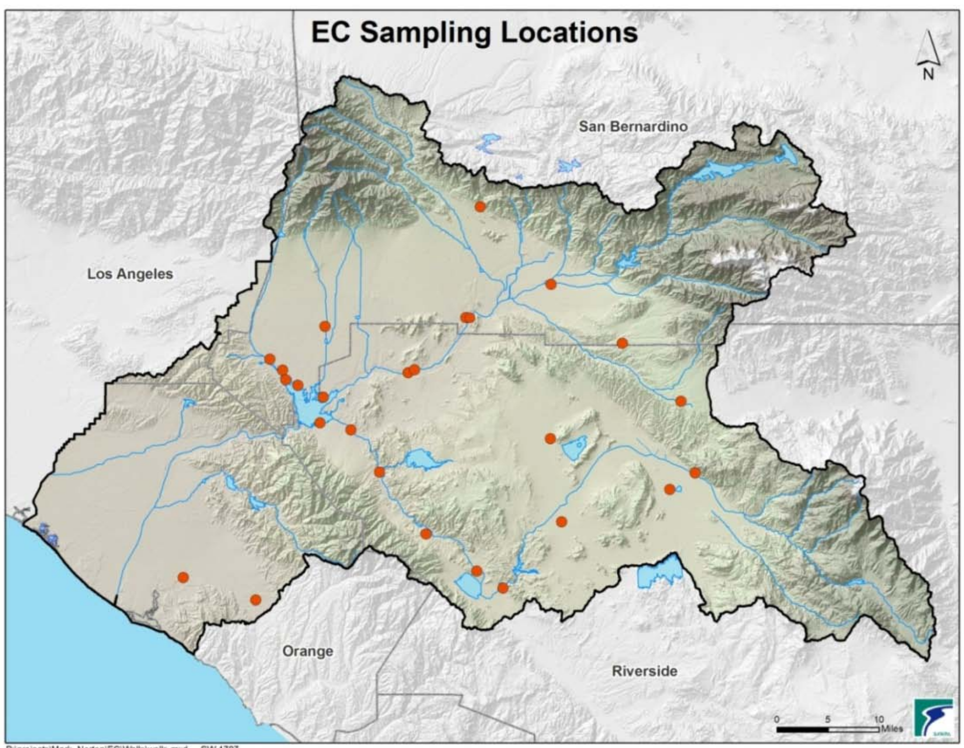
17Drewes, J.E., P. Anderson, N. Denslow, A. Olivieri, D. Schlenk & S. Snyder. Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water. Final Report and Recommendations of a Science Advisory Panel convened by the State Water Resources Control Board. Sacramento, CA. June 25, 2010.

18State Water Resources Control Board. Staff Report: Constituents of Emerging Concern (CEC) Monitoring for Recycled Water. November 8, 2010.

Samples were collected from 23 different wastewater treatment plants operating in the region. (See Fig. 1) A description of these facilities is attached as Appendix B to this report. Samples were also collected from two locations along the Santa Ana River (MWD crossing and Prado Dam), one location in the State Water Project (Devil Canyon) and one location near the terminus of the Colorado River Aqueduct (San Jacinto West Portal). Tabular results for all 27 locations are presented in Section 4.

All of the samples were evaluated with the best analytical technology commercially available: Liquid Chromatography/Tandem Mass Spectrometry using the isotope dilution method. This technique is capable of detecting select ECs in de-ionized laboratory water at concentrations in the range of 1 to 10 ng/L. However, the specific laboratory reporting level (LRL) for more complex water matrices varies over time and between laboratories. Therefore the mandatory reporting level for samples in this study was set to a minimum of 10 ng/L for all laboratories. Quality control and assurance data are presented in Sections 5, 6 and 7. The EC Task Force's 2011 sampling program was performed in accordance with the approved study plan and the reported results indicate a high level of quality control at all of the contract laboratories.[19]

Fig. 1: 2011 Sampling Locationsfor ECs in the Santa Ana River Watershed



19A detailed quality assurance and quality control program was developed and submitted to the Regional Board staff for review in March of 2010. The Executive Officer approved that plan prior to collecting or analyzing any samples. A copy of that plan is attached as Appendix A of this report.

Because the analytical techniques used to analyze for ECs have not yet been formally approved by federal or state authorities, great care must be exercised when interpreting and reporting the results of such studies. The data generated from the non-standard methods employed during the preliminary characterization studies have not been certified for regulatory purposes such as: 303(d) listing decisions, antidegradation analyses, or translating narrative criteria into numeric effluent limits. These legal determinations depend on detailed risk assessments that are not yet available. However, the data from such studies are useful for determining which ECs, if any, should be prioritized for additional method development in order to determine whether more formal regulatory assessments may be needed in the future.[20]

Unless the State Water Resource Control Board directs otherwise, the EC Task Force is committed to repeat the study in 2012 using the same sampling procedures and quality assurance plan previously approved by the Regional Board. Results will be summarized and reported to the Regional Board in December of 2012.

Please direct all comments and questions to:

Mr. Mark Norton, P.E.
Water Resources and Planning Manager

Santa Ana Watershed Project Authority (SAWPA)
11615 Sterling Ave.
Riverside, CA 92503

Phone: (615) 354-4221
Email: mnorton@sawpa.org

Members of SAWPA's Emerging Constituents Task Force:

Eastern Municipal Water District	City of Beaumont
Inland Empire Utilities Agency	City of Redlands
Orange County Water District	City of Corona
San Bernardino Valley Muni. Water Dist.	City of Rialto
Western Municipal Water District	City of Riverside
Irvine Ranch Water District	Yucaipa Valley Water District
Metropolitan Water District of So. Calif.	Lee Lake Water District
San Gorgonio Pass Water Agency	Jurupa Community Services District
Elsinore Valley Municipal Water District	Chino Basin Watermaster
Western Riverside County Regional Wastewater Authority	Colton/San Bernardino Regional Tertiary and Wastewater Reclamation Authority

[20] U.S. Government Accountability Office. Environmental Health: Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water. GAO-11-346. August, 2011.

Section 4: EC Sampling Results (ng/L) for 2011

Table 4a: June 2011 - POTWs

Sampling Location	Acetaminophen	Bisphenol A	Caffeine	Carbamazepine	DEET	Diuron	17β Estradiol (E2)	17α Ethynylestradiol (EE2)	Gemfibrozil	Ibuprofen	Sulfamethoxazole	TCEP	Triclosan
City of Beaumont WWTP No. 1	<10	<10	40	360	64	24	<10	<10	210	<10	340	250	21
City of Corona WRF 1B	45	<10	<10	160	180	<10	<10	<10	11	120	<10	390	<10
City of Corona WRF 2	24	<10	<10	180	610	62	<10	<10	750	150	620	670	<10
City of Corona WRF 3	<10	<10	<10	92	120	<10	<10	<10	15	160	<10	240	<10
EMWD MV-RWRF	<10	19	<10	<10	320	21	<10	<10	43	29	<10	130	<10
EMWD PV-RWRF	<10	<10	<10	11	160	<10	<10	<10	28	<10	<10[M2]	190	27
EMWD SJV-RWRF	<10	18	<10	320	<10	170	<10	<10	5800	92	1800	220	<10
EMWD TV-RWRF	10	<10	280	85	<10	100	<10	<10	940	170	150	140	<10
EVMWD Horsethief Canyon	<10	<10	<10	54	250	15	<10	<10	<10	840	<10	460	<10
EVMWD Railroad Canyon WRP	<10	110	<10	110	200	80	<10	<10	140	25	55	310	<10
EVMWD Regional WRP	<10	220	97	220	180	24	<10	<10	49	<10	200	330	26
IEUA CCWRF	<10	<10	20	81	98	100	<10	<10	<10	<10	<10	210	130
IEUA RP1 02	<10	<10	<10	110	380	40	<10	<10	<10	24	<10	340	<10
IEUA RP1 1B	<10	<10	<10	130	320	12	<10	<10	<10	19	<10	230	<10
IEUA RP5	<10	<10	14	89	100	31	<10	<10	<10	<10	<10	250	<10
IRWD Los Alisos Plant	48	44	80	340	290	120	<10	<10	1900	72	1300	120	42
IRWD Michelson Plant	<10	<10	10	38	<10	40	<10	<10	<10	31	<10	98	<10
City of Redlands WWTP	<10	<10	<10	210	180	39	<10	<10	17	<10	<10	200	<10
City of Rialto WWTP	<10	<10	<10	140	160	11	<10	<10	43	<10	<10	270	<10
City of Riverside RWQCP	<10	<10	<10	230	410	41[M1]	<10	<10	27	14	11[M2]	170	<10
City of San Bernardino RIX	23	26	<10	<10	<10	<10	<10	<10	2700	1800	<10	<10	77
WRCWRA Treatment Plant	<10	<10	14	200	400	42	<10	<10	250	85	520	540	<10
YVWD WRF	32	26	20	350	<10	51	<10	<10	2200	150	1100	190	79

Table 4b: June 2011 - River Sites

Sampling Location	Acetaminophen	Bisphenol A	Caffeine	Carbamazepine	DEET	Diuron	17β Estradiol (E2)	17α Ethynylestradiol (EE2)	Gemfibrozil	Ibuprofen	Sulfamethoxazole	TCEP	Triclosan
State Project Water at Devil Canyon (MWD)	<10	<10	<10	<10	<10	82	<10	<10	<10	<10	<10	<10	<10
Colo River at San Jacinto West Portal (MWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	12	<10	<10	<10
Santa Ana River near MWD crossing (OCWD)	13	<10	59	113	42	260	<10	<10	158	49	208	69	<10
Santa Ana River near Prado Dam (OCWD)	<10	<10	52	97	76	157	<10	<10	15	<10	78	229	<10

Table 4c: September 2010 - River Sites

Sampling Location	Acetaminophen	Bisphenol A	Caffeine	Carbamazepine	DEET	Diuron	17β Estradiol (E2)	17α Ethynylestradiol (EE2)	Gemfibrozil	Ibuprofen	Sulfamethoxazole	TCEP	Triclosan
Santa Ana River near MWD crossing (OCWD)	<10	<100	14	108	<10	39	<10	<10	<10	14	104	72	<10
Santa Ana River near Prado Dam (OCWD)	<10	<100	15	127	58	23	<10	<10	<10	<10	91	287	<10

Notes:

	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
M1	Matrix spike recovery was high, but the associated blank spike recovery was acceptable.
M2	Matrix spike recovery was low, but the associated blank spike recovery was acceptable.

Section 5: QA/QC Blank Data (ng/L) for 2011[5]

Table 5a: June 2011 - POTWs

Sampling Location	Acetaminophen	Bisphenol A	Caffeine	Carbamazepine	DEET	Diuron	17β Estradiol (E2)	17α Ethynylestradiol (EE2)	Gemfibrozil	Ibuprofen	Sulfamethoxazole	TCEP	Triclosan
City of Beaumont WWTP No. 1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of Corona WRF 1B	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of Corona WRF 2	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of Corona WRF 3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EMWD MV-RWRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EMWD PV-RWRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EMWD SJV-RWRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EMWD TV-RWRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EVMWD Horsethief Canyon	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EVMWD Railroad Canyon WRP	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EVMWD Regional WRP	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IEUA CCWRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IEUA RP1 02	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IEUA RP1 1B	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IEUA RP5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IRWD Los Alisos Plant	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
IRWD Michelson Plant	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of Redlands WWTP	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of Rialto WWTP	<10	<10	<10	<10	<10	<10	<10	<10	17	<10	<10	<10	14
City of Riverside RWQCP	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
City of San Bernardino RIX	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
WRCWRA Treatment Plant	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
YVWD WRF	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 5b: June 2011 - River Sites

State Project Water at Devil Canyon (MWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Colo River at San Jacinto West Portal (MWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Santa Ana River near MWD crossing (OCWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Santa Ana River near Prado Dam (OCWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	12	<10

Table 5c: September 2010 - River Sites

Santa Ana River near MWD crossing (OCWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Santa Ana River near Prado Dam (OCWD)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Notes:

	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.

Section 6: QA/QC Reference Samples Spiked with Known EC Concentrations

Table 6a: June 2011 - QC Data, MWD

Analyte	Acetaminophen		Bisphenol A		Caffeine		Carbamazepine		DEET		Diuron		17α Ethynylestradiol (EE2)		17β Estradiol (E2)		Gemfibrozil		Ibuprofen		Sulfamethoxazole		TCEP		Triclosan	
MRL (ng/L)	5		10		10		3		5		2		5		3		5		5		3		5		3	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
Devil Canyon Field Blank	<5		<10		<10		<3		<5		<2		<5		<3		< 5		< 5		<3		< 5		<3	
Devil Canyon	2.8		0.163		7.9		1.1		2.2		82.3		<5		<3		0.12		3.6		4.4		0.85		0.16	
Devil Canyon_spike 50 ppt	57.2	109%	55.1	110%	62.1	108%	51.8	101%	49.4	94%	136	107%	55.0	110%	51.5	103%	61.7	123%	63.2	119%	54.7	101%	29.2	57%	55.8	111%
Devil Canyon_spike 50 ppt duplicate	50.1	95%	57.1	114%	60.3	105%	53.3	104%	50.0	96%	137	109%	52.5	105%	53.7	107%	60.7	121%	65.3	124%	54.9	101%	30.7	60%	54.3	108%
MS/MSD Relative % Diff (RPD)	13.2		3.6		2.9		2.9		1.2		0.7		4.7		4.2		1.6		3.3		0.4		5.0		2.7	

Table 6b: June 14, 2011 - QC Data, OCWD

Analyte	Acetaminophen		Bisphenol A		Caffeine		Carbamazepine		DEET		Diuron		17α Ethynylestradiol (EE2)		17β Estradiol (E2)		Gemfibrozil		Ibuprofen		Sulfamethoxazole		TCEP		Triclosan	
MRL (ng/L)	5		10		3		1		1		5		2		2		1		1		1		5		1	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
True Value Low LFB (ng/L)	5		10		3		1		1		5		2		2		1		1		1		5		1	
laboratory Result Low LFB	5.5	111%	6.7	67%	4.1	137%	0.90	90%	0.64	64%	5.9	118%	2.6	128%	2.4	118%	1.1	108%	0.51	51%	0.89	89%	5.5	110%	0.82	82%
True Value LFB (ng/L)	10		50		30		10		10		10		10		10		10		10		10		10		10	
Laboratory Result mid-level LFB*	9.3	93%	47.8	96%	27.9	93%	9.8	98%	9.8	98%	14.0	140%	11.0	110%	11.1	111%	10.0	100%	8.9	89%	9.6	96%	9.6	96%	9.4	94%
SAR near Prado Dam (Initial)	9.0		<10		51.8		97.1		76.4		157		<2		<2		15.4		<1		78.3		229		2.2	
SAR near Prado Dam Matrix Spike*	216	103%	231	116%	653	100%	288	95%	266	95%	371	107%	201	101%	195	98%	214	99%	193	97%	259	90%	445	108%	199	98%
SAR near Prado Dam Mat Spk (dup)	202	96%	233	117%	649	100%	284	93%	268	96%	359	101%	185	93%	202	101%	210	97%	193	97%	277	99%	427	99%	210	104%
MS/MSD Relative % Diff (RPD)	6.7		0.86		0.61		1.4		0.75		3.3		8.3		3.5		1.9		0.00		6.7		4.1		5.4	

*Spike concentration = 200ng/L except Caffeine Spikes 3x higher than other targets

Table 6c: September 15, 2010 - QC Data, OCWD

Analyte	Acetaminophen		Bisphenol A		Caffeine		Carbamazepine		DEET		Diuron		17α Ethynylestradiol (EE2)		17β Estradiol (E2)		Gemfibrozil		Ibuprofen		Sulfamethoxazole		TCEP		Triclosan	
MRL (ng/L)	5		100		3		1		1		5		2		2		1		1		1		5		1	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
True Value Low LFB (ng/L)	1		---		3		1		1		1		5		5		1		1		1		5		1	
laboratory Result Low LFB	0.67	67%	---	---	7.57	252%	0.76	76%	0.91	91%	1	100%	8.48	170%	8.83	177%	1.01	101%	1.56	156%	1	100%	1.2	24%	1.47	147%
True Value LFB (ng/L)	10		50		30		10		10		10		10		10		10		10		10		10		10	
laboratory Result mid-level LFB**	8.73	87%	70	140%	46.3	154%	8.62	86%	9.97	100%	11	110%	12.8	128%	13.3	133%	8.96	90%	8.85	89%	8.9	89%	9.79	98%	9.14	91%
SAR MWDXING-01 (Initial)	1.09		0		14		108		7.99		39		0		0		1.2		13.5		104		72.2		1.31	
SAR MWDXING-01 Matrix Spike**	181	90%	673	135%	593	97%	311	102%	209	101%	233	97%	150	75%	166	83%	194	96%	211	99%	288	92%	268	98%	196	97%
SAR MWDXING-01 Matrix Spike	178	88%	691	138%	607	99%	308	100%	209	101%	237	99%	167	84%	182	91%	205	102%	211	99%	290	93%	265	96%	204	101%
MS/MSD Relative % Diff (RPD)	1.7		2.6		2.3		1.0		0.0		1.7		10.7		9.2		5.5		0.0		0.7		1.1		4.0	

**Spike concentration = 200ng/L except Caffeine at 600ng/L and BisPHA at 500ng/L

Section 7: QA/QC Identical Split Sample Data for 2011

Table 7a: ERA - QC Low-Level Check

Analyte	%RSD	Assigned Value	Mean Recovery (ng/L)	Mean Recovery (%)	OCWD Result (ng/L)	MWD Result (ng/L)	E.S.Babcock Result (ng/L)	MWH Result (ng/L)	OCWD Percent Recovery	MWD Percent Recovery	E.S.Babcock Percent Recovery	MWH Percent Recovery
Acetaminophen	10.3	**13.0**	13.5	103.8	**11.8**	**13.5**	**13.5**	**15.2**	**90.8**	**103.8**	**103.8**	**116.9**
Bisphenol A	22.8	**14.4**	14.4	100.2	**11.5**	**16.8**	**11.7**	**17.7**	**79.9**	**116.7**	**81.3**	**122.9**
Caffeine	38.5	**14.0**	18.4	131.6	**13.2**	**26.3**	**11.7**	**22.5**	**94.3**	**187.9**	**83.6**	**160.7**
Carbamazepine	6.9	**11.0**	10.9	99.3	**10.4**	**12.0**	**10.4**	**10.9**	**94.5**	**109.1**	**94.5**	**99.1**
DEET	14.3	**14.8**	15.9	107.3	**14.8**	**16.7**	**13.4**	**18.6**	**100.0**	**112.8**	**90.5**	**125.7**
Diuron	--	--	--	--	**<5**	**<5**	**<10**	**<5**	---	---	---	---
17 alpha Ethynylestradiol	11.3	**10.5**	10.3	98.2	**9.3**	**9.9**	**10.0**	**12.0**	**89.0**	**94.3**	**95.2**	**114.3**
17 Beta Estradiol (E2)	18.1	**11.5**	9.9	86.0	**9.6**	**8.9**	**12.5**	**8.6**	**83.7**	**77.4**	**108.7**	**74.3**
Gemfibrozil	--	--	--	--	**<1**	**<5**	**<10**	**<5**	---	---	---	---
Ibuprofen	17.9	**10.0**	9.4	93.6	**8.3**	**9.1**	**8.2**	**11.8**	**83.3**	**91.0**	**82.0**	**118.0**
Sulfamethoxazole	--	--	--	--	**<1**	**<3**	**<10**	**<5**	---	---	---	---
TCEP	--	--	--	--	**<5**	**<5**	**<10**	**<5**	---	---	---	---
Triclosan	--	--	--	--	**2.3**	**<3**	**<10**	**<10**	---	---	---	---

Table 7b: ERA - QC Mid-Level Check

Analyte	%RSD	Assigned Value	Mean Recovery (ng/L)	Mean Recovery (%)	OCWD Result (ng/L)	MWD Result (ng/L)	E.S.Babcock Result (ng/L)	MWH Result (ng/L)	OCWD Percent Recovery	MWD Percent Recovery	E.S.Babcock Percent Recovery	MWH Percent Recovery
Acetaminophen	2.8	**130**	125	96.1	**122**	**124**	**124**	**130**	**93.8**	**95.2**	**95.4**	**100.0**
Bisphenol A	11.5	**79.9**	85.4	106.8	**78.5**	**80.4**	**82.7**	**99.8**	**98.2**	**100.6**	**103.5**	**124.9**
Caffeine	8.5	**160**	164	102.3	**154**	**179**	**171**	**150**	**96.3**	**112.1**	**106.9**	**93.8**
Carbamazepine	6.1	**117**	120	102.2	**123**	**118**	**127**	**110**	**105.1**	**100.9**	**108.5**	**94.0**
DEET	5.7	**78.8**	82.2	104.3	**81.2**	**76.6**	**82.8**	**88.0**	**103.0**	**97.2**	**105.1**	**111.7**
Diuron	12.3	**191**	182	95.4	**199**	**184**	**196**	**150**	**104.2**	**96.3**	**102.6**	**78.5**
17α Ethynylestradiol (EE2)	11.9	**135**	108	80.3	**118**	**105**	**119**	**91.6**	**87.4**	**77.9**	**88.1**	**67.9**
17β Estradiol (E2)	8.3	**42.0**	36.7	87.4	**40.7**	**33.4**	**35.8**	**37.0**	**96.9**	**79.5**	**85.2**	**88.1**
Gemfibrozil	3.2	**175**	176	100.7	**182**	**169**	**175**	**179**	**104.0**	**96.6**	**100.0**	**102.3**
Ibuprofen	17.6	**39.0**	38.4	98.5	**39.1**	**31.5**	**35.6**	**47.4**	**100.3**	**80.8**	**91.3**	**121.5**
Sulfamethoxazole	5.1	**185**	181	97.9	**170**	**188**	**177**	**190**	**91.9**	**101.4**	**95.7**	**102.7**
TCEP	12.6	**46.3**	42.2	91.1	**40.8**	**37.2**	**41.0**	**49.7**	**88.1**	**80.3**	**88.6**	**107.3**
Triclosan	7.2	**185**	180	97.4	**180**	**162**	**189**	**190**	**97.3**	**87.6**	**102.2**	**102.7**

Table 7c: SAR-BELOWDAM-01 (Matrix Split)

					OCWD	MWD	E.S.Babcock	MWH
Analyte	**%RSD**		**Mean Result (ng/L)**		**Result (ng/L)**	**Result (ng/L)**	**Result (ng/L)**	**Result (ng/L)**
Acetaminophen	---		---		**9.0**	**<5**	**<10**	**<5**
Bisphenol A	---		---		**<10**	**<10**	**<10**	**<10**
Caffeine	24.3		68.4		**51.8**	**68.8**	**91.0**	**62.1**
Carbamazepine	7.2		101		**97.1**	**112**	**97.0**	**98.3**
DEET	12.2		85.3		**76.4**	**79.8**	**85.0**	**100**
Diuron	4.5		151		**157**	**142**	**149**	**155**
17α Ethynylestradiol (EE2)	---		---		**<2**	**<5**	**<10**	**<5**
17β Estradiol (E2)	---		---		**<2**	**<3**	**<10**	**<5**
Gemfibrozil	17.3		17.0		**15.4**	**17.1**	**21.0**	**14.3**
Ibuprofen	---		---		**<1**	**17.9**	**<10**	**<10**
Sulfamethoxazole	16.4		73.3		**78.3**	**84.6**	**73.5**	**56.6**
TCEP	24.9		203		**229**	**184**	**257**	**142**
Triclosan	---		---		**2.2**	**8.3**	**<10**	**<10**

Site Blank	**OCWD**	**MWD**	**E.S.Babcock**	**MWH**
	Result (ng/L)	**Result (ng/L)**	**Result (ng/L)**	**Result (ng/L)**
TCEP	11.7	11.1	17.0	14.0
DEET	ND	ND	ND	4.2
Caffeine	ND	ND	10.0	ND

Appendix B

Summary Description of Treatment Processes at POTWs in the Santa Ana Region

December 31, 2011

City of Beaumont	
Facility(ies)	**City of Beaumont WWTP No. 1**
Preliminary & Primary Treatment	Bar Screens & Equalization tanks
Secondary Treatment	Variation of Activated sludge process called Biolac and Secondary Clarification
Tertiary Treatment	Sand filtration and disinfection by Ultra Violet
Design Capacity (mgd)	4
Solids Handling	Sludge is gravity thickened aerobically digested and centrifuged . It is then hauled off – site for disposal.
Location (X,Y)	(33.92411000,-116.99210000)
Comments	Effluent is discharged to Cooper's Creek and Marshall Creek

City of Corona Facilities				
Facility(ies)	**WRF 1**		**WRF 2**	**WRF 3**
	WRF 1a	**WRF 1b**		
Preliminary & Primary Treatment	Flow process starts through headworks equipped with a solids grinders, screenings removal systems and grit removal. Flow is then split and metered to two separate processes		Influent is pumped from a wet well to an elevated headworks consisting of a channel grinder assembly, and a grit removal chamber. Flow continues through 2 primary clarifiers. Primary effluent flows to two equalization basins and is pumped to aeration. The activated sludge aeration basin has 3 mechanical aerators. Aeration basin effluent enters three secondary clarifiers. Secondary effluent is discharged to percolation ponds (Lincoln, South Cota or North Cota).	Influent is pumped from a wet well to a rotating drum screen system.
Secondary Treatment	2 primary clarifiers 3 activated sludge aeration basins arranged in serpentine flow. Each basin has step feed and an anoxic zone. 6 rectangular secondary clarifiers All solids from both facilities are thickened by a gravity belt system and sent to anaerobic digestion.	2 activated sludge carrousel oxidation ditches 2 circular secondary clarifiers All solids from both facilities are thickened by a gravity belt system and sent to anaerobic digestion.	All primary and waste activated sludge and scum are gravity fed into the sewer system for treatment at WRF #1.	Flow continues into three activated sludge trains through anoxic zones then into aeration portion of the three trains.
Tertiary Treatment	Secondary effluent from both facilities then flows into an equalization basin. Effluent is then pumped to percolation ponds (Lincoln, South Cota, and North Cota) or tertiary sand filtration. Filtered effluent then flows through two chlorine contact basins for disinfection. Disinfected effluent is then sent to the recycled water distribution reservoir system or through a dechlorination system for discharge to the Butterfield Drain.			Water is then permeated by negative pressure through membrane modules. Permeate flow is then pumped and dosed for disinfection into a chlorine contact basin. From the chlorine contact basin permeate is pumped into the recycled water system or is dechlorinated for discharge into the Temescal Creek
Design Capacity (mgd)	5.5	6	3	1
Solids Handling	Anaerobic digestion solids are dewatered by a belt filter press. Filter press cake is then thermally dried to a 90% dry pellet.			
Location (X,Y)		(33.89202000, -117.60907000)	(33.88220442, -117.55613382)	(33.82240000,-117.50724000)
Comments				

City of Riverside	
Facility(ies)	**Riverside Regional Water Quality Control Plant**
Preliminary & Primary Treatment	Mechanical bar screens, grit chambers, chemical addition, primary clarifiers.
Secondary Treatment	Aeration trains with oxic/anoxic zones, secondary clarifiers, flow equalization.
Tertiary Treatment	Coagulation/Flocculation, sedimentation, filtration, chlorination, dechlorination
Design Capacity (mgd)	40
Solids Handling	Dissolved Air Flotation Thickening (DAFT) of Waste Activated Sludge (WAS), mesophilic anaerobic digestion of primary and secondary solids, and belt press and centrifuge dewatering of digested sludge.
Location (X,Y)	(33.96405000,-117.45873000)
Comments	

City of Redlands WWTP	
Facility(ies)	**WWTP**
Preliminary & Primary Treatment	• Headworks with grit removal • Primary clarification • Trickling filter to reduce peak organic loadings
Secondary Treatment	• Equalization basins • Nitrification/denitrification basins • Secondary clarification • Percolation ponds • Chlorine contact basins
Tertiary Treatment	• MBR (Membrane Biological Reactor) to provide coagulated, filtered and disinfected effluent (recycled water use)
Design Capacity (mgd)	9.5
Solids Handling	• 3 Primary anaerobic digesters • 1 Secondary digester • 2 Dissolved air floatation thickeners • 2 Centrifuges • Degas ponds • Drying Beds
Location (X,Y)	(33.96405000,-117.4587300)
Comments	

City of Rialto Facility	
Facility(ies)	**City of Rialto WRF**
Preliminary & Primary Treatment	Mechanical bar screens, grit chambers, primary clarifiers, flow equalization/emergency storage basins
Secondary Treatment	Aeration trains with oxic/anoxic zones, secondary clarifiers
Tertiary Treatment	Coagulation/Flocculation, filtration, chlorination, dechlorination
Design Capacity (mgd)	11.7
Solids Handling	Solids treatment includes gravity thickener, anaerobic digestion, digester gas utilization, and belt press dewatering. Belt press filtrate is pumped to the headworks for re-treatment
Location (X,Y)	
Comments	

City of San Bernardino Facilities			
Facility(ies)	**Colton**	**San Bernadino**	**RIX**
Preliminary & Primary Treatment	Mechanical bar screens, grit chambers, chemical addition, primary clarifiers.	Mechanical bar screens, grit chambers, chemical addition, primary clarifiers.	
Secondary Treatment	Aeration trains with oxic/anoxic zones, oxidation ditches, secondary clarifiers.	Aeration trains with oxic/anoxic zones, oxidation ditches, secondary clarifiers.	
Tertiary Treatment			Infiltration/extraction through in-situ soil (conventional tertiary filtration using Dynasand or Aquadisk also available for partial flows) followed by ultraviolet disinfection.
Design Capacity (mgd)			40 MGD, influent flow to RIX.
Solids Handling			
Location (X,Y)			(34.04290345,-117.36050077)
Comments	Colton and San Bernardino Facilities provide treatment through secondary effluent.		RIX receives secondary effluent treated water only for infiltration.

EMWD Regional Water Reclamation Facilities Treatment Processes

RWRF	**San Jacinto Valley**	**Moreno Valley**	**Perris Valley**		**Sun City**	**Temecula Valley**
Plant #	**1**	**1 & 2**	**1**	**2**	**1**	**1 & 2**
Preliminary Treatment	Mechanical Screens and Grit removal	Common Mechanical Screens and Grit removal (Plant 1 Influent EQ Basin)	Screens and Grit removal	Mechanical Screens and Grit removal	Screens and Grit removal	Common Mechanical Screens and Grit
Primary Treatment	Primary Clarifiers	Plant 1Primary Clarifiers; Plant 2 Modified Bardenpho Selectors	Primary Clarifiers	Modified Bardenpho Selectors	Primary Clarifiers w/ Primary EQ Basin	Primary Clarifiers w/ Primary EQ Basin
Secondary Treatment	Diffused activated sludge modified for biological nitrification/denitrification (NDN), secondary clarifiers	Plant 1Diffused activated sludge modified for biological NDN, secondary clarifiers; Plant 2 MLE modified, secondary clarifiers	Diffused activated sludge, secondary clarifiers	Temporary Modified Bardenpho with additional aeration	Diffused activated sludge, secondary clarifiers	Diffused activated sludge w/ biological NDN, secondary clarifiers
Secondary EQ Basin	Yes	Yes	No	Yes	No	Yes
Secondary Capacity (mgd)	11	16	3	12 (Temporary)	3	18
Tertiary Train #	1	1	1 (Not in Use)	2	N/A	1
Tertiary Treatment	Coagulant, Filtration (cloth), Chlorination	Coagulant, Filtration (media), Chlorination	Diverted to Tertiary Train 2	Coagulant, Filtration (media & cloth), Chlorination	N/A	Coagulant, Filtration (media & cloth), Chlorination
Tertiary Capacity, mgd	12.45	15.8	2.41	30	N/A	22.4
Solids Handling	Sludge thickening, Anaerobic digestion, belt press & centrifuge, sludge drying beds and co-generation (future)	Sludge thickening, Anaerobic digestion, belt press & centrifuge, sludge drying beds and Fuel Cell (future)	Aqua belt thickener, Aerobic digestion Belt Press & Centrifuge	Straight Waste	Aqua belt thickener, Aerobic digestion, Belt Press	Sludge thickening, Anaerobic digestion, belt press & centrifuge, sludge drying beds and co-generation (future)
Location	(33.79858075,-117.01134973)	(33.87057566,-117.21547013)	(33.75201130,-117.19584693)			(33.50632258,-117.16913646)
Comments						

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<u>**Pictures of EMWD's RWRF's**</u>

Moreno Valley Plant

Perris Valley Plant

San Jacinto Valley Plant

Temecula Valley Plant

Elsinore Valley Municipal Water District Facilities			
Facility(ies)	**Regional WRP**	**Railroad Canyon WRP**	**Horsethief Canyon Facility**
Preliminary & Primary Treatment	Mechanical bar screens, grit chambers	Mechanical rotating screen	Mechanical bar screens, gravity grit chambers
Secondary Treatment	Aeration trains with oxic/anoxic zones for nitrification/denitrification, secondary clarifiers, Biological and Chemical P removal	Aeration trains with oxic/anoxic zones for nitrification/denite, secondary clarifiers	Oxidation Ditch, secondary clarifiers
Tertiary Treatment	Coagulation/Flocculation, sedimentation, filtration, UV disinfection	Coagulation/Flocculation, sedimentation, filtration, chlorination,	Coagulation/Flocculation, sedimentation, filtration, chlorination
Design Capacity (mgd)	8	1.3	0.5
Solids Handling	The solids handling for this facilityis accomplished in one of two processes (drying beds and mechanical dewatering) and is comprised of waste activated sludge. Mechanical dewatering is through a belt filter press. The belt press filtrate is recycled through the headworks. Dewatered solids are sent off site to be composted and disposed of.	Biosolids (WAS) from this facility is sent to the District's Regional Facility for final treatment and disposal.	Waste activated sludge is dewatered and sent off site for composting and final disposal
Location (X,Y)	(33.68152116,-117.34027456)	(33.65741929,-11729547283)	(33.73423322,-117.42690348
Comments			

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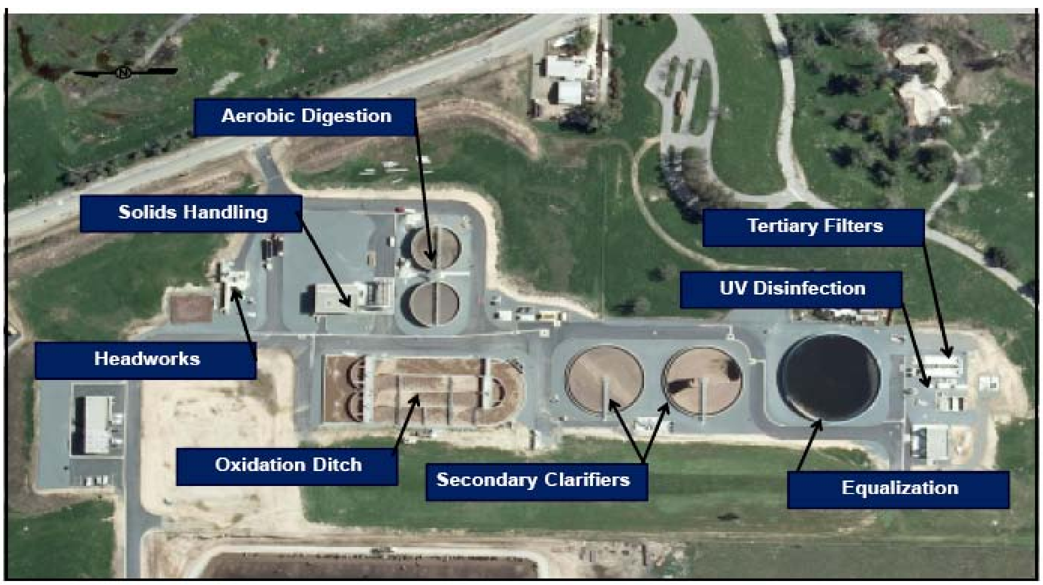
Inland Empire Utilities Agency Facilities				
Facility(ies)	**RP-1**	**RP-4**	**RP-5**	**CCWRF**
Preliminary & Primary Treatment	Mechanical bar screens, grit chambers, chemical addition,primary clarifiers, flow equalization/emergency storage basins	Mechanical bar screens, grit chambers, chemical addition, primary clarifiers	Mechanical bar screen, grit chambers, one storage basin, primary clarifiers	Mechanical bar screen, grit removal, chemical addition, primary clarifiers, emergency storage basin
Secondary Treatment	Aeration trains with oxic/anoxiczones, secondary clarifiers	Aeration basins with oxic/anoxic zones, secondary clarifiers	Aeration basins with anoxic/oxic zones, secondary clarifiers	Aeration basins with anoxic/oxic zones, secondary clarifiers
Tertiary Treatment	Coagulation/Flocculation, sedimentation, filtration, chlorination, dechlorination	Coagulation/Flocculation, filtration, chlorination, de-chlorination (not used), emergency diversion pond	Coagulation/Flocculation, filtration, chlorination, dechlorination, emergency overflow pond	Coagulation/flocculation, filtration, chlorination, dechlorination
Design Capacity (mgd)	44	14	15 (and 1.3 mgd RP-2 sludge treatment system wastewater flows)	11.4
Solids Handling	The solids handling for these facilities takes place at RP-1. RP-4 primary sludge and waste activated sludge are conveyed through the sewer system and enter RP-1 as influent. Solids treatment includes gravity thickener and dissolved air flotation thickeners, anaerobic digestion, digester gas utilization, and belt press dewatering. Belt press wash water is pumped to the DAFT units where the solids can be recovered and the remaining liquid is returned to the activated sludge process Belt press filtrate is pumped to the Non-Reclaimable Waste System (NRWS) line and is ultimately treated by the County Sanitation Districts of Los Angeles County.		Primary and waste activated sludge wastes from RP-5 and CCWRF are piped to the regional solids handling facility at RP-2 for sludge treatment. The solids treatment system at RP-2 includes gravity thickeners; dissolved air flotation thickeners; anaerobic digestion; aerobic digestion; belt press, and centrifuge dewatering. Dewatered biosolids are hauled away to approved disposal sites Sludge treatment system wastewater from RP-2 is pumped back to headworks of RP-5.	
Location (X,Y)			(33.96655000,-117.67358000)	(33.98223500, -117.69530000)
Comments	IEUA plans to construct a building to house four new centrifuges for dewatering digested sludge. This will replace the belt press dewatering. The tentative project completion and start-up date is 2012.	Sample identified as RP-1 002 is a blend of RP-1 and RP-4		

Irvine Ranch Water District Facilities		
Facility(ies)	**Michelson Water Reclamation Plant Unit Processes**	**Los Alisos Water Reclamation Plant Unit Processes**
Preliminary & Primary Treatment	In-channel grinders, Chemically Enhanced Primary Treatment (CEPT), Primary Sedimentation	Gravity grit removal and disposal, Stair screens, grinders
Secondary Treatment	Biological Nitrogen Removal (BNR) activated sludge, Methanol addition for enhanced denitrification, Magnesium Hydroxide addition alkalinity adjustment	Sequential aerated pond system with settling, CBOD removal only
Tertiary Treatment	Dual media gravity filtration, Aluminum Sulfate addition, Disinfection with sodium hypochlorite, extended contact time to meet Title 22 requirements	Chemical addition, dual media gravity filtration, Disinfection with sodium hypochlorite
Design Capacity (mgd)	18.0	7.5
Solids Handling	Primary and secondary sludge mixed with iron salts and pumped to Orange County Sanitation District for treatment and disposal	Sludge digestion in the aerated pond system, chemical addition, plate and frame filter press dewatering, hauled off site for disposal/reuse.
Location (X,Y)	(33.67001735,-117.84088528)	(33.63874857,-117.71700366)
Comments		

Western Riverside County Regional Wastewater Authority Facility	
Facility(ies)	**WRCRWA River Road Plant**
Preliminary & Primary Treatment	Mechanical Bar Screen, Grit Chamber
Secondary Treatment	Oxidation Ditch, Secondary Clarifiers
Tertiary Treatment	EQ Basin UV Disinfection Tertiary Filters
Design Capacity (mgd)	8 mgd
Solids Handling	Thickening, Aerobic Digestion, Dewatering
Location (X,Y)	(33.92829244,-117.60371742)
Comments	



WRCRWA River Road Plant

Yucaipa Valley Water District Facility	
Facility(ies)	**Henry N. Wochholz Regional Water Reclamation Facility (WRWRF)**
Prelimiary & Primary Treatment	Mechanical bar screens, grit chambers, primary clarifiers, flow equalization and emergency storage basins
Secondary Treatment	Parallel anoxic basins, Integrated fixed-film activated sludge aeration basins, secondary clarification basins
Tertiary Treatment	Secondary equalization basins, Pall Microfiltration system, Ultraviolet disinfection system
Design Capacity, mgd	6.7
Solids Handling	DAF (dissolved air flotation) system, Anaerobic digesters receive sludges from primary sedimentation basins and DAF system. Belt Filter Press for dewatering of solids. Solids are taken to a local recycler for additional treatment (composting).
Location (X,Y)	(34.00692000,-117.09277000)
Comments	