APPENDIX G

MONITORING ANNUAL REPORT

FISCAL YEAR 2004-2005

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FIGURES AND TABLES

G-1.0 Introduction

A major objective of the Municipal Separate Storm Sewer (MS4) program is to manage the quality of Urban Runoff to prevent impacts to receiving waters. To this end, the Permittees established water quality monitoring stations throughout the Santa Margarita Region. The stations were situated, for the most part, at the downstream end of a major MS4 system, such as Long Canyon and Santa Gertrudis Channels, or in a receiving water, such as Murrieta Creek and Temecula Creek. A reference station was established on Cole Creek in 2001. Adobe Creek is used as an alternative reference station for dry weather samples if there is no dry weather flow at Cole Creek.

G-2.0 A Description of Monitoring Methods for Each Type of Monitoring

The draft Consolidated Monitoring Program (CMP) included in Attachment B contains a description of monitoring methods for each type of monitoring, including but not limited to:

- Monitoring equipment;
- Sampling procedures;
- Quality Assurance/quality control (QA/QC) procedures; and
- Laboratory analytical methods including the method detection limits (MDLs).

The CMP was initially revised and updated in 2003. The core part of the CMP identifies monitoring elements common to all three of Riverside County's MS4 permits. Watershed-specific appendices include specific MS4 permit provisions. The CMP is in the process of being revised to include the provisions for the recently adopted Board Order R9-2004-001, Santa Ana Region TMDL requirements, and other recent amendments to the Monitoring and Reporting Programs of other MS4 permit regions within the County. The revised CMP is included as Attachment B to this Monitoring Annual Report. Although the document itself has not been completed, revisions to procedures necessary to implement the Monitoring and Reporting Program of Board Order R9-2004-001 were completed by October 2004 and are contained within the CMP. The draft CMP outlines four objectives:

1. Develop and Support an effective MS4 management program.
2. Identify those Receiving Waters, which, without additional action to control pollution from Urban Runoff, cannot reasonably be expected to achieve or maintain applicable Water Quality Standards
3. Characterize pollutants associated with Urban Runoff and assess the influence of Urban land uses on Receiving Water Quality.
4. Analyze and interpret the collected data to identify trends, if any, both to prevent impairments through the implementation of preventative BMPs and to track improvements based on the MS4 management program.

These objectives support the goal of the MS4 Urban Runoff management program, which is to manage the quality of Urban Runoff to prevent impacts within the Permittee's jurisdictions. These objectives are also a superset of the Model Monitoring Program core management questions developed by the Southern California Coastal Watershed Research Project (SCCWRP).

The draft CMP includes the following sampling types:

- Dry Weather
- Wet Weather
- Bioassessment
- Toxicity
- Special Studies

In addition, the draft CMP now contains:

- Health and Safety Guidance
- Field Reconnaissance Guidance
- Water Chemistry Guidance
- Toxicity Guidance
- Bioassessment Guidance
- Special Study Guidance
- Sampling Procedures
- Monitoring Costs
- Quality Assurance/Quality Control Procedures
- Data Collection and Analysis Procedures

Discussion previously contained in the Monitoring Annual Report regarding these standardized guidance and procedures is now contained in the draft CMP (Attachment B). The CMP will continue to be updated and reported upon in this Monitoring Annual Report.

Nearly all of the laboratory analyses of samples collected under the CMP have been performed by E. S. Babcock and Sons[1], Riverside, CA (Environmental Laboratory Certification No. 1156). However, laboratory analyses for Diazinon and Chlorpyrifos are performed by Aqua-Science Environmental Toxicology Consultants, Davis, CA.

G-3.0 Description of Each Receiving Water Monitoring Station

The Santa Margarita Region of Riverside County contains only the upper portion of the Santa Margarita River watershed. This upper portion of the watershed can be further subdivided into the Temecula Creek and Murrieta Creek sub-watersheds. The Murrieta Creek sub-watershed can be further subdivided into five smaller urbanized sub-watersheds tributary to Murrieta Creek (Empire Creek, Long Canyon Creek, Santa Gertrudis Creek, Warm Springs Creek and Wildomar Channel). The confluence of Murrieta Creek and Temecula Creek, which forms the Santa Margarita River, occurs just upstream of the County line.

[1] The use of company, trademark or brand names does not connote a recommendation of a particular product.

Section 2.4 of the Riverside County Drainage Area Management Plan for the Santa Ana and Santa Margarita Regions contains a detailed discussion of population, land use, climate, hydrology, geology and water quality within the upper Santa Margarita Watershed. Key points from this discussion include:

- Over 50% of the upper Santa Margarita Watershed is controlled by Vail and Skinner reservoirs. Peak flow rates and sediment transport in downstream tributaries (Temecula and Murrieta Creeks, respectively) are significantly reduced by the retention of storm water flows behind the dams that form the reservoir.
- The climate of the SMR is considered Mediterranean, characterized by warm dry summers and cool rainy winters. Precipitation depths range from less than 10 inches near Vail Reservoir to over 40" west of Palomar Observatory. In general, however, shading from the coastal ranges forming the western boundary of the watershed lead to a marked decrease in precipitation throughout valley areas of this inland watershed.
- Runoff in the Receiving Waters is primarily due to rainfall. Almost all streams are ephemeral, only flowing during and immediately after rainfall events. A handful of mountainous streams are fed by groundwater and flow through parts of the summer. Rising groundwater near the confluence of Murrieta and Temecula Creeks also provides a small perennial base flow to the Santa Margarita River.
- Due to lack of flow, significant aquatic habitat is limited to a few locations.

The Monitoring and Reporting Program for Board Order R9-2004-001 requires Triad Monitoring (chemistry, bioassessment and toxicity) on both Temecula and Murrieta Creeks just upstream of their confluence. An additional Triad station known as Cole Creek is located west of, and tributary to, Murrieta Creek. It is used to establish reference water quality conditions for an un-urbanized watershed. Due to a lack of flow in Cole Creek during summer conditions, Adobe Creek was alternatively used to collect reference condition dry weather flows as it is fed part of the year by rising groundwaters. Monitoring of four Tributary stations (chemistry only) at major MS4 outfalls tributary to Murrieta Creek is also required.

A map showing the locations of the CMP Triad and Tributary stations is provided in Figure 1. Fact sheets for each Triad and Tributary CMP station are also provided. The first page of each fact sheet for each station contains location information, photographs and background information on the monitoring site. The second page of each fact sheet contains two maps, one showing the location of the drainage or subdrainage area, and the other depicting the land uses within the area. A land use breakdown is also given in a table following the maps. Table G-2 contains an additional summary of the land use acreages and percentages for several major drainage areas tributary to the Santa Margarita River.

Station names corresponding to the station numbers shown on the maps are provided in Table G-1. Table G-1 also provides a summary of the location and character of current and past CMP stations, and notes when samples were collected at each station.

Figure 1 – Monitoring Station Locations within the Santa Margarita Watershed

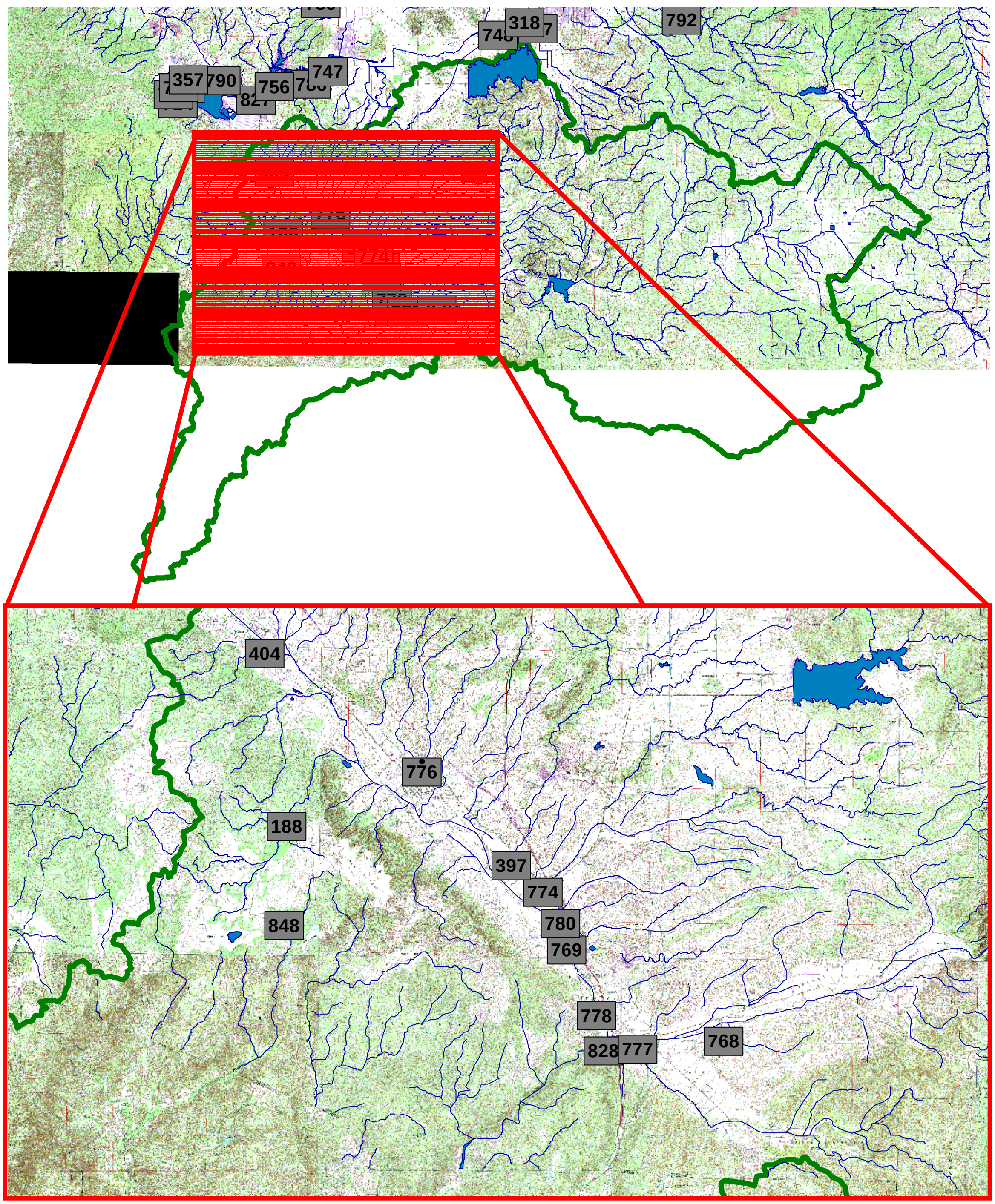
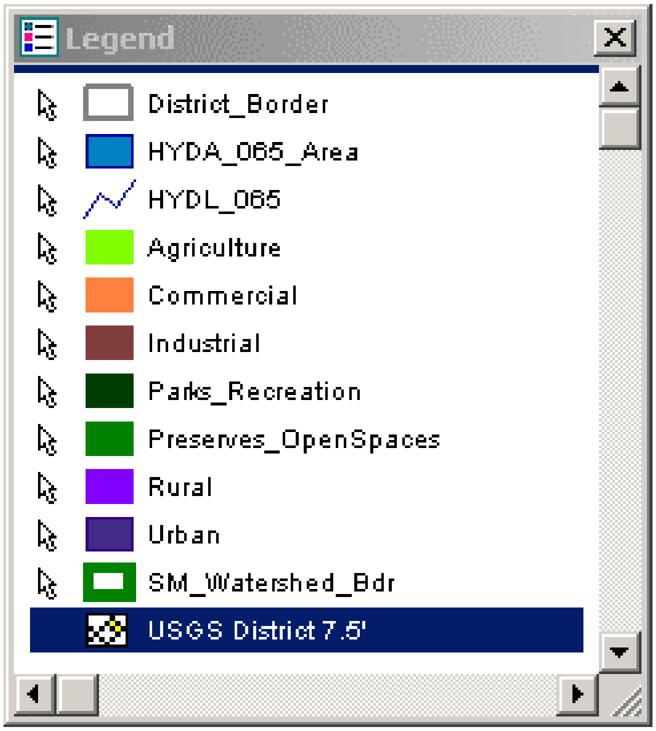


Table G-1. Santa Margarita Region Monitoring Station Summary

Stn #	Station Name	Easting	Northing	Flow Gauge?	Class	Type	Receiving Water	Comp. BPO	HUC	Co-Permittee	1993*		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
188	Cole Creek [C]-wet weather and dry weather when flowing	6285284.6	2062605.6	Active	Reference	Dirt	Murrieta Ck	902.3	902.32	County																	X				X		X	X	X	
397	Warm Springs Channel [T]	6278893.1	2138431.9	---	Outfall	Trap	Murrieta Ck	902.3	902.32	Murrieta																								X	X	
404	Wildomar NPDES Channel Outlet below Central Av [D]	6250323.5	2163023.3	---	Outfall	Trap	Murrieta Ck	902.3	902.31	County			X		X		X	X		X	X		X		X		X	X	X	X	X	X	X			
768	Redhawk Channel D/S of Overland Dr [T]	6303424	2118127.7	---	Outfall	Trap	Temecula Ck	902.5	902.51	County		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	
769	Empire Crk Chan Outlet @Murrieta Crk –Temecula [D]	6285276.3	2128652.3	---	Outfall	Trap	Murrieta Ck	902.3	902.32	Temecula			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
770	C Street Storm Drain Outlet @Murrieta Crk –Temecula [D]	6288450.8	2122521.7	---	Outfall	RCP	Murrieta Ck	902.3	902.32	Temecula		X	X																							
771	Rancho Way Storm Drain Outlet @Murrieta Crk –Temecula [D]	6284801.7	2128453.2	---	Outfall	CMP	Murrieta Ck	902.3	902.32	Temecula		X	X																							
772	Via Montezuma Storm Drain Outlet –Temecula [D]	6284020.8	2130014.9	---	Outfall	RCP	Murrieta Ck	902.3	902.32	Temecula			X			X																				
773	Avenida Alvarado Storm Drain Outlet @ Murrieta Crk [D]	6282403.1	2131912.8	---	Outfall	Dirt	Murrieta Ck	902.3	902.32	Temecula		X	X																							
774	Lateral A of Sta.Gert.Chan –Temecula [D]	6282551.1	2135419.3	---	Outfall	RCP	Santa Gertrudis	902.4	902.42	Temecula		X	X																					X	X	
775	Murrieta Line F-3 Outlet near Kalmia & Washington [D]	6266628.7	2147621.4	---	Outfall	RCP	Murrieta Ck	902.3	902.32	Murrieta			X																							
776	Cal Oaks Channel- Murrieta line F [D]	6268557.7	2149290.7	Active	Outfall	Trap	Murrieta Ck	902.3	902.32	Murrieta		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
777	Temecula Creek below Pala Rd [C]	6293503.1	2117224.4	---	Rec Wat	River	Santa Margarita	902.5	902.52	Temecula				X	X	X	X	X	X	X	X	X	X											X	X	
778	Lower Murrieta Creek @ USGS Weir [C]	6288711	2121113.1	Active	Rec Wat	River	Santa Margarita	902.3	902.32	Temecula				X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	
779	Upper Murrieta Creek @ Cole Canyon Junction [D]	6261438.6	2148708.4	---	Rec Wat	River	Murrieta Ck	902.3	902.32	Murrieta					X				X		X				X											
780	Long Canyon [T]	6284564.6	2131769.1	---	Outfall	Trap	Murrieta Ck	902.3	902.32	Murrieta																								X	X	
796	Hoover Ranch Pond -Murrieta-Clinton Keith Rd [D]	6250729.3	2157542.3	---	Rec Wat	Lake	Murrieta Ck	902.3	902.31	County					X																					
801	I-215 FB –Murrieta [D]	6278139.5	2150286.4	---	Outfall	FB	Murrieta Ck	902.3	902.32	Murrieta								X		X		X		X					X							
828	Santa Margarita River near Temecula [D]	6289592.0	2117064.5	Active	Rec Wat	River		902.5	902.52	Temecula														X	X	X	X	X	X	X	X	X	X			
825	Region 9 Misc. & Complaints	0	0	---	Misc.	Misc.	Misc.								X				X			X						X								
848	Adobe Creek[C]-dry weather alternate	6252588.9	2131581.1	--	Reference	Dirt	De Luz Creek	902.2	902.21	County																								X	X	

[C] Monitored as a Triad Monitoring station beginning FY 2004-05
[T] Monitored as a Tributary Monitoring station beginning FY 2004-05.
[D] Stations deleted from the CMP in FY 2004-05.

Below is the legend for the maps within this section.



G-3.1 Station Name: Temecula Creek below Pala Rd

Hydron Reference #: 777

Location:

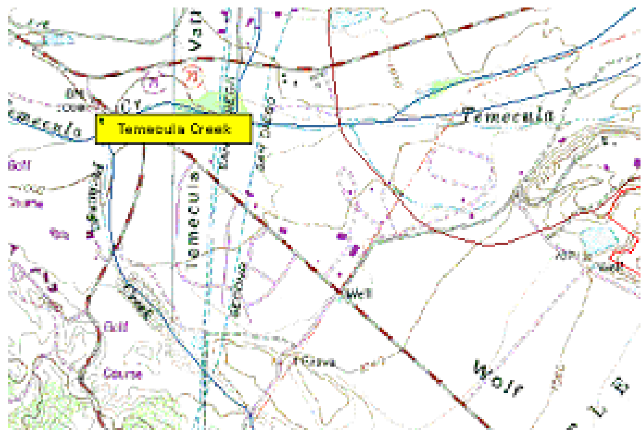
Latitude	33°28’26.4”
Longitude	117°07’46.1”
Elevation	1008 ft
Thomas Bros Pg	979B3

Classification: Receiving Water - Triad

Type of Channel: Natural River

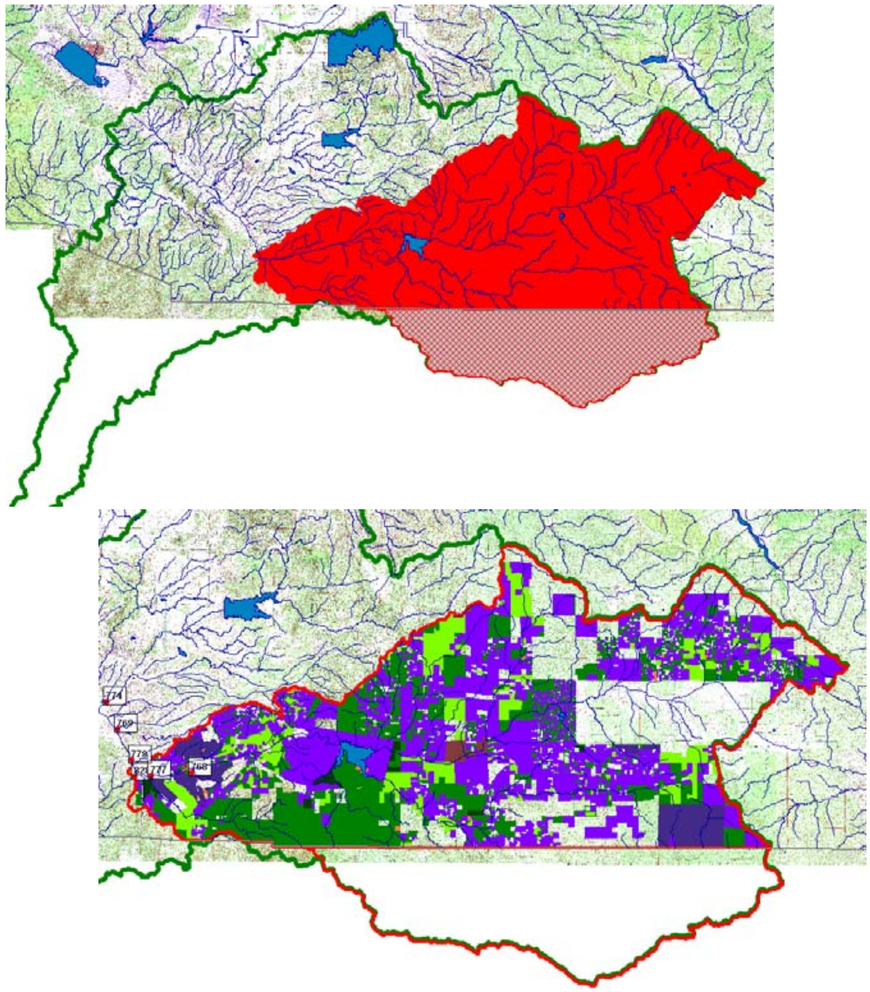
Receiving water: Santa Margarita River

Directions to the site:
Drive south on the I-215 freeway and exit at SR 79 South/Old Town Front Street. Go west of the freeway and turn left at the first stoplight. Turn left about 100 feet past the stop light onto a gravel/dirt road. Turn right, before the yellow EMWD gate. Drive to the dirt road that goes left and up. Go about 100 feet and turn right onto the dirt road. Go about 1700 feet and drive to where the dirt road meets up with the gravel road. Follow the gravel road to the L3437 Pala II Pump Station. Park just past the pump station. Walk to the east and sample water from the stream flow just under the bridge.



Temecula Creek at Pala Road flows only when there is a significant storm event. No aquatic habitat exists in this reach. Conditions for benthic invertebrates tend to be poor at best. Much of the urban flows tributary to Temecula Creek flow into a 100-foot-wide vegetated strip that is approximately 13,000 feet long and starts approximately 3½ miles upstream of this sampling location. Vail Lake lies approximately 18 miles upstream of the Pala Rd Crossing and traps some of the Temecula Creek storm flows, discharging them slowly into infiltration basins above Butterfield Stage Rd. The soil profile in this 18-mile reach of Temecula Creek consists of deep alluvium and has a high infiltration rate. Non-significant storm flows from this creek do not reach the Santa Margarita River.

Temecula Creek Drainage Area



Total drainage area - 232,251.2 acres, of which 175,591.9 acres are within Riverside County.

Land uses by frequency:

Land Use	Percent
Undesignated (e.g., Federal, Tribal)	50.9%
Rural	44.7%
Preserves & Open Space	33.6%
Agriculture	14.3%
Urban	5.0%
Parks & Rec	1.1%
Industrial	0.8%
Commercial	0.5%

G-3.2 Station Name: Lower Murrieta Creek @ USGS Weir

Hydron Reference #: 778

Location:

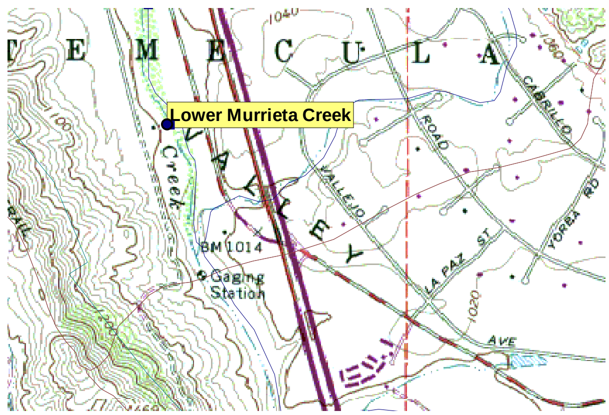
Latitude	33°28’47.0” N
Longitude	117°08’34.8” W
Elevation	1030 ft
Thomas Bros Pg	978J2

Classification: Receiving Water - Triad

Type of Channel: Natural River

Receiving water: Santa Margarita River

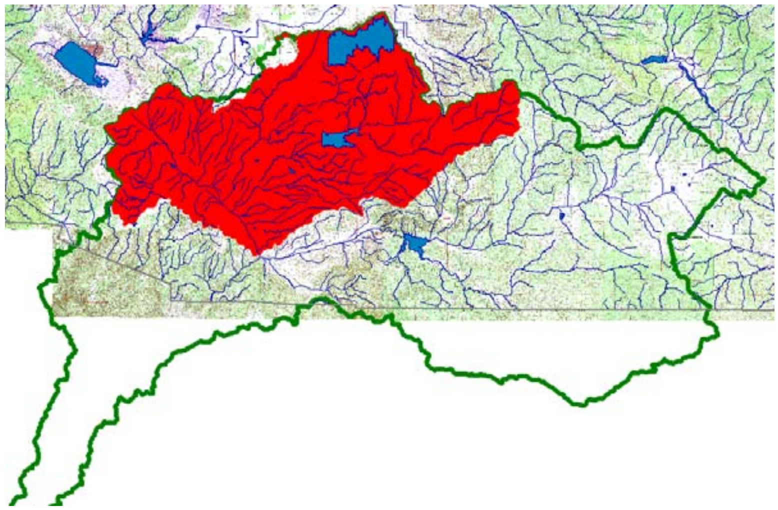
Directions to the site:
Exit Rancho California Road from Interstate 15 freeway. Drive west of the freeway and turn left to Front Street. Turn right to Main Street. Turn left to Pujol Street. When Pujol Street goes from asphalt to a dirt road, drive about 500 feet and turn left at the two (2) yellow vertical bollards. CAUTION: A 4-Wheel drive is recommended when driving in this area. Drive straight toward the creek. The picture shows the sampling location which is approx. 100 feet upstream of the RCWCD blow-off and approx. 600 feet upstream of the USGS gage house.

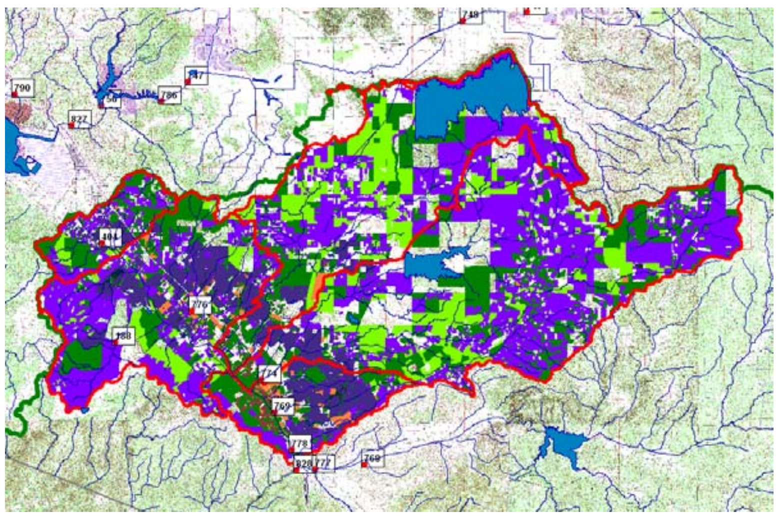


Lower Murrieta Creek @ USGS Weir is a receiving water station. It is located within Murrieta Creek and is earthen (except for a weir at the USGS gauge). It is the most downstream station within Murrieta Creek. Murrieta Creek is tributary to the Santa Margarita River. During dry weather, flows at this station consist of rising groundwater that begins approximately ½- to ¼- mile from Murrieta Creek’s confluence with the Santa Margarita River. There is an active USGS flow gauge at this station.

This sampling site is .4 miles upstream of the confluence of Temecula Creek and Murrieta Creek. The soil profile here indicates bedrock at the surface. The flow seen in the photo above is supplied by the mandated RCWD blow off just 100 yards upstream of the gauge and sampling point. The photo below shows the trickle flow (<0.1 cfs) coming into the RCWD blow off reach and the blow off discharge pipe.

Murrieta Creek Drainage Area





Total drainage area - 141,198.7 acres

Land uses by frequency:

Land Use	Percent
Rural	41.2%
Undesignated (e.g., Federal, Tribal)	39.5%
Preserves & Open Space	28.5%
Agriculture	19.5%
Urban	7.5%
Commercial	2.1%
Industrial	0.7%
Parks & Rec	0.5%

G-3.3 Station Name: Cole Creek

Hydron Reference #: 188

Location:

Latitude	33°32'37.1" N
Longitude	117°15'47.5" W
Elevation	1700 ft
Thomas Bros Pg	957D1

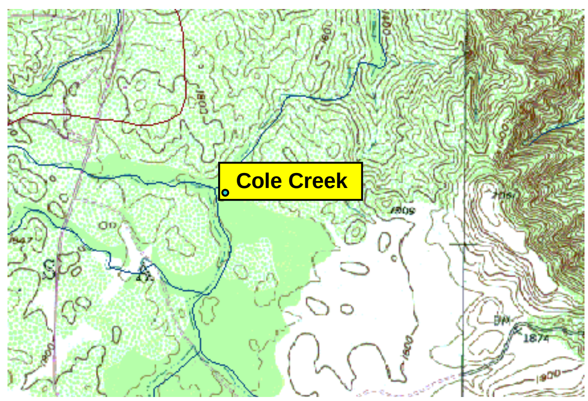
Classification: Reference - Triad

Type of Channel: Natural Creek

Receiving water: Murrieta Creek

Directions to the site:
See following pages for detailed instructions on how to get to the sampling location.

Cole Creek was added to the CMP in 2000 as a reference station. It is located within the Santa Rosa Plateau Ecological preserve and is a natural channel. Cole Creek is tributary to Murrieta Creek. There is an active USGS flow gauge at this station. Murrieta Creek at this location only flows when there is a significant winter storm event. The soil profile at this location indicates a very deep alluvium and will infiltrate a significant amount of flow. Storm drains outletting dry weather flows into this reach of Murrieta Creek infiltrate into the stream bed within a few yards of the outlet.



Driving directions to Cole Creek:
Exit the 15 Freeway at Clinton Keith Road and drive west (southwest) of the freeway. Drive about 4 miles and turn left into the "Santa Rosa Plateau Ecological Reserve Visitor Center". You will see this sign at the entrance.

You will also see this sign at the entrance to the Santa Rosa Plateau. When you drive past the sign, park on the left side of the gravel parkway in front of or near the sign that says "Granite Loop Trail".

Walk down the "Granite Loop Trail". It's advisable to use a walking stick; just in case of any critters…namely snakes. Continue walking this trail to the picnic tables.

When you get to this picnic area, continue walking the trail past the picnic tables and slightly to the right. Walk about 500' past the picnic tables and take small path to the left off of the main trail. Walk the foot trail and keep the small drainage area to your left as you walk. Continue walking this trail until the small drainage area meets up with Cole Creek. Turn right at this confluence and walk south parallel to Cole Creek until you start seeing big rocks on the banks (slopes) of Cole Creek.

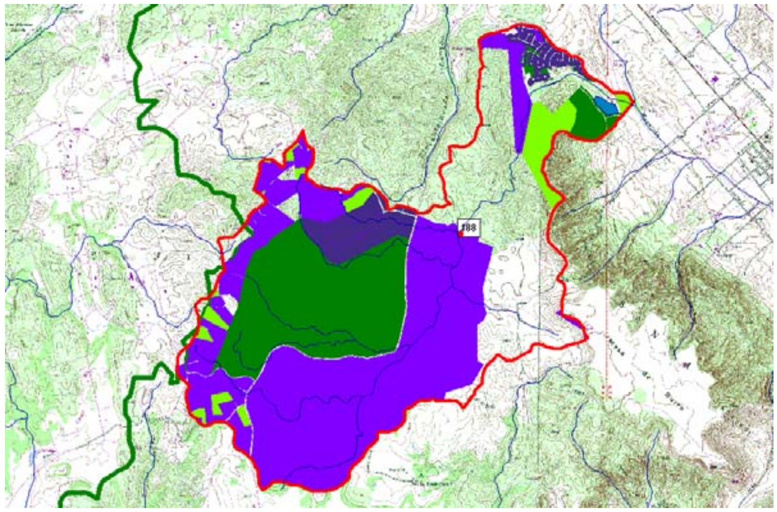
You will see this metal box that contains the gage sensor. The staff gage for Cole Creek is down the slope from this box.

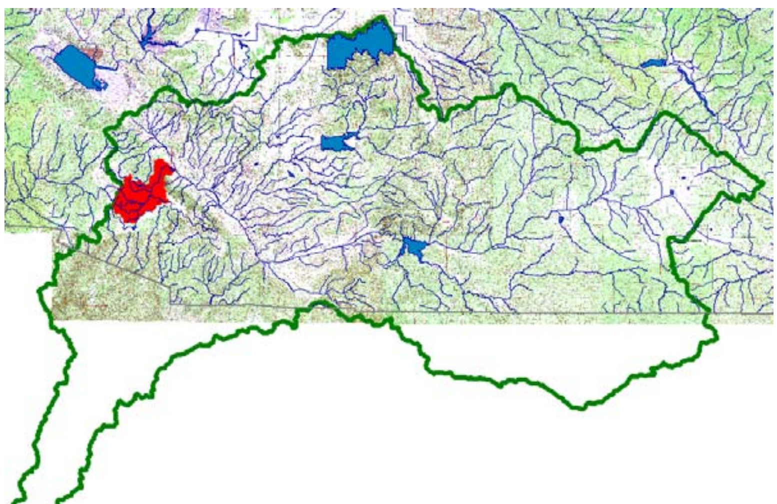
There is a staff gage on both sides of Cole Creek. You can sample at this gage if there are higher flows. Be careful with footing if there are rapid flows in this area.

This picture just shows some of the bigger rocks that are in Cole Creek where the water will flow over and around. Be careful with footing on these rocks.

These rocks are located about 200’ south (upstream) of the staff gage. During lower flows, it is recommended to sample water that runs over and around these rocks.

Cole Creek Subdrainage Area





Total drainage area - 5,227.6 acres

Land uses by frequency:

Land Use	Percent
Rural	57.9%
Undesignated (e.g., Federal, Tribal)	38.7%
Preserves & Open Space	28.6%
Urban	7.0%
Agriculture	6.4%
Commercial	0.0%
Industrial	0.0%
Parks & Rec	0.0%

G-3.4 Station Name: Redhawk Channel Downstream of Overland Dr.

Hydron Reference #: 768

Location:

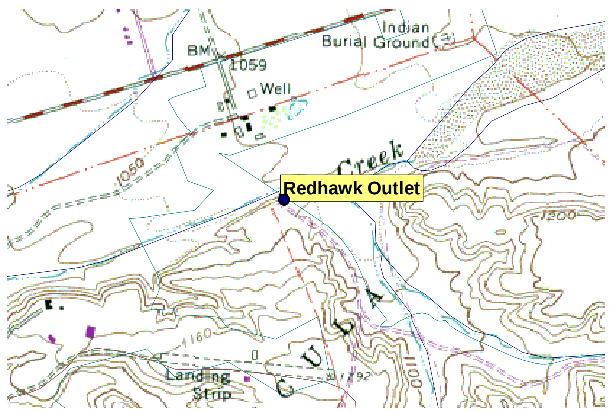
Latitude	33°28'34.6" N
Longitude	117°05'40.8" W
Elevation	1040 ft
Thomas Bros Pg	979F3

Classification: Outfall - Tributary

Type of Channel: Earthen

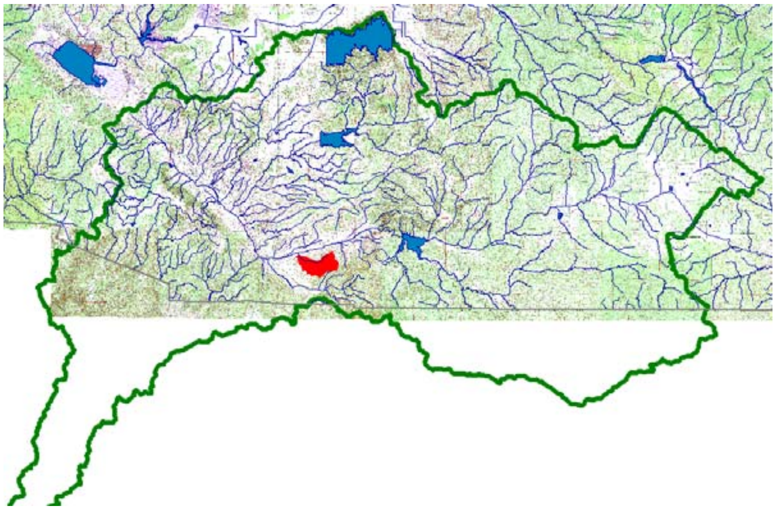
Receiving water: Temecula Creek

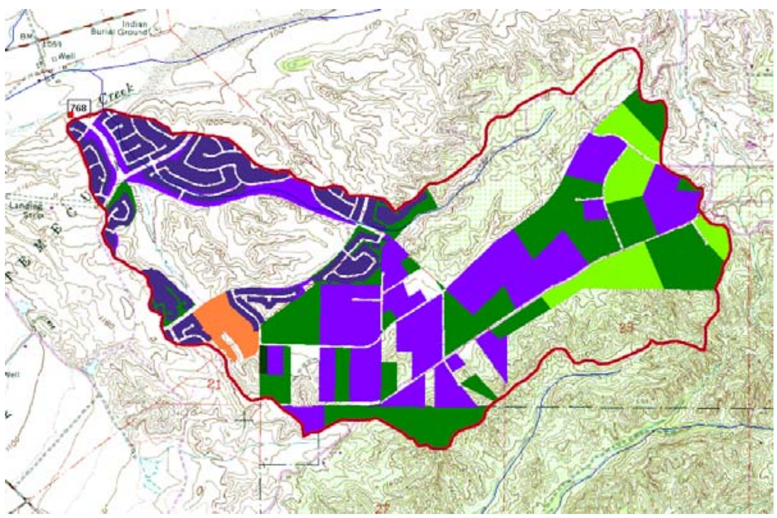
Directions to the site:
Exit Highway #79 East (to Indio) from Interstate 15 freeway. Turn right to Redhawk Parkway. Turn left to Overland. Turn left into first driveway and park there. Property belongs to County of Riverside Fire Dept. Walk across the street and through the swing gate (if it's not open). Sampling location is just south (upstream) of the concrete lined channel. The picture shows the sampling location.



Redhawk Channel Downstream of Overland Dr. is an outfall station. It is a concrete trapezoidal channel. The sampling location is in an earthen reach of the channel just upstream of the Concrete Channel. A major source of water in this channel is reclaimed water from RCWD being used to irrigate the side slopes of a channel in a park nearby and running off into the channel. There also appears to be a natural spring in a tributary contained within an upstream golf course that feeds the channel. Redhawk Channel is tributary to Temecula Creek. Non-storm runoff from Redhawk infiltrates into Temecula Creek within a few hundred feet of the confluence.

Redhawk Channel Subdrainage Area





Total drainage area - 1,582.4 acres

Land uses by frequency:

Land Use	Percent
Undesignated (e.g., Federal, Tribal)	86.5%
Rural	36.1%
Preserves & Open Space	33.6%
Urban	17.6%
Agriculture	9.5%
Commercial	2.9%
Parks & Rec	0.3%
Industrial	0.0%

G-3.5 Station Name: Santa Gertrudis Creek near Temecula

HYDSTRA Reference #: 774

Location:

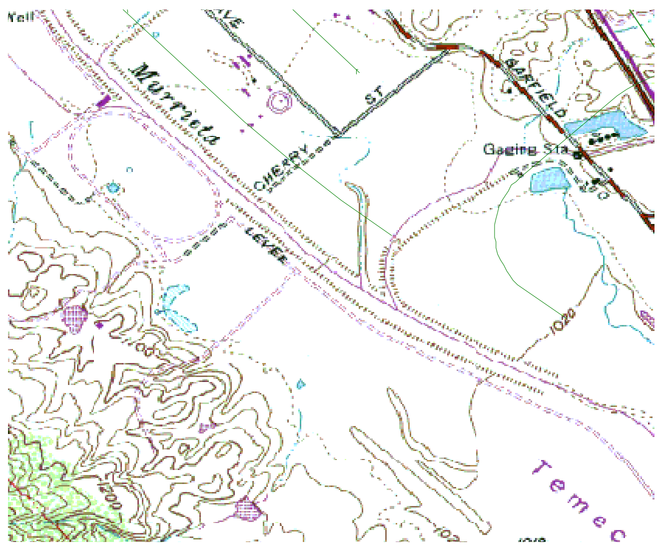
Latitude:	33°31’28.0” N
Longitude:	117°9’50.0” W
Elevation	1045 ft
Thomas Bros Pg	958F4

Classification`: MS4

Type of Channel: Concrete Trapezoidal

Receiving water: Murrieta Creek

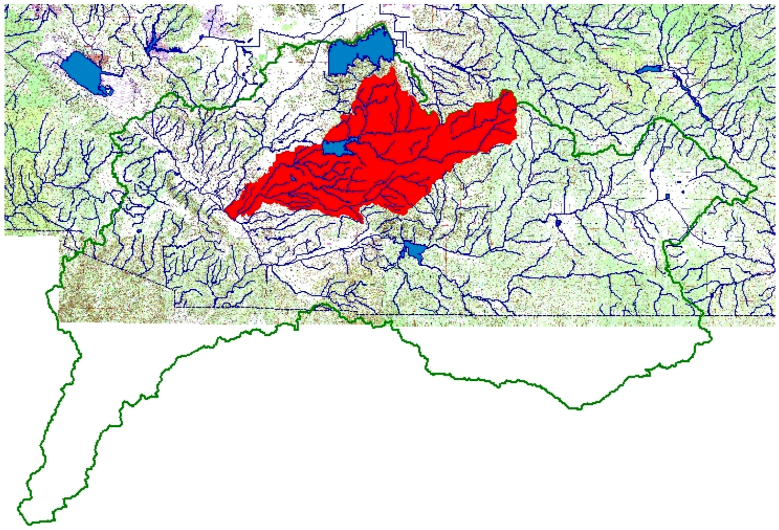
Directions to the site:
Exit Winchester Road from Interstate 15 freeway. Drive west of the freeway and turn right on to Jefferson Avenue. Drive about 450 feet and turn left into the access gate on the north side of the channel. The sampling point is off the bridge at Jefferson Street. The channel slope is too steep to climb in and out without a ladder. Twenty-two feet from the water line (during dry conditions) to the bridge rail.

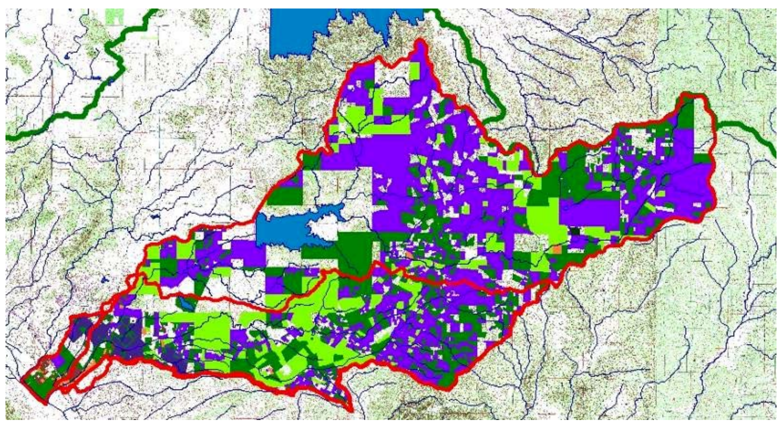


Santa Gertrudis Channel (774) is an outfall station tributary to Murrieta Creek. It is a concrete lined trapezoidal channel. Significant non-storm flows are provided from well blow offs into the channel that tend to occur in the mornings and evenings. One well blow off valve and outlet is located adjacent to the confluence of Santa Gertrudis and Murrieta Creeks. These blow offs can each release several CFS of water for short durations of time. Non-storm flows tend to infiltrate within a few hundred yards of the confluence with Murrieta Creek. Sediment and vegetation tends to accumulate near the confluence of Santa Gertrudis Channel and Murrieta Creek due to aggredation of Murrieta Creek.

It should also be noted that more than half of the watershed tributary to Santa Gertrudis is controlled by the Dam that forms Skinner Lake. Storm flows in Santa Gertrudis and the downstream reach of Murrieta Creek, are therefore significantly lower than they would be under natural conditions, even accounting for full build out of the watershed. There is an active USGS flow gauge at this station.

Santa Gertrudis at the USGS Station





Total drainage area – 57,476.8 acres

Land uses by frequency:

Land Use	Percent
Undesignated (e.g., Federal, Tribal)	29.1%
Rural	34.5%
Preserves & Open Space	21.0%
Agriculture	13.1%
Commercial	0.3%
Urban	1.6%
Industrial	0.3%
Parks & Rec	0.1%

G-3.6 Station Name: Long Canyon

Hydron Reference #: 780

Location:

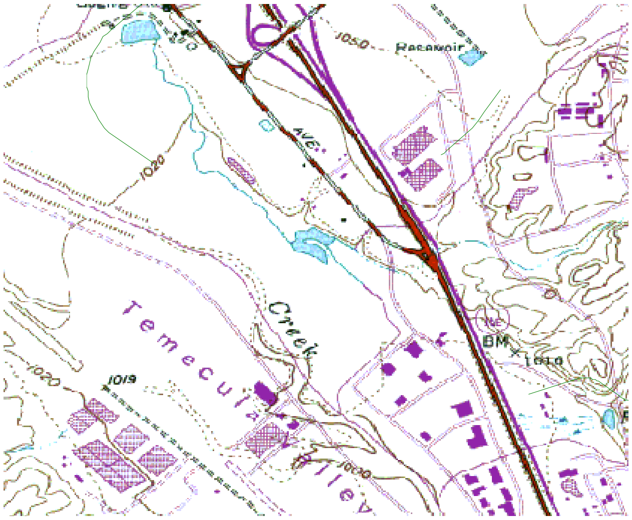
Latitude	33°30’38” N
Longitude	117°09’40” W
Elevation	1005 ft
Thomas Bros Pg	958G5

Classification: Outfall - Tributary

Type of Channel: Rip-Rap Trapezoidal Channel

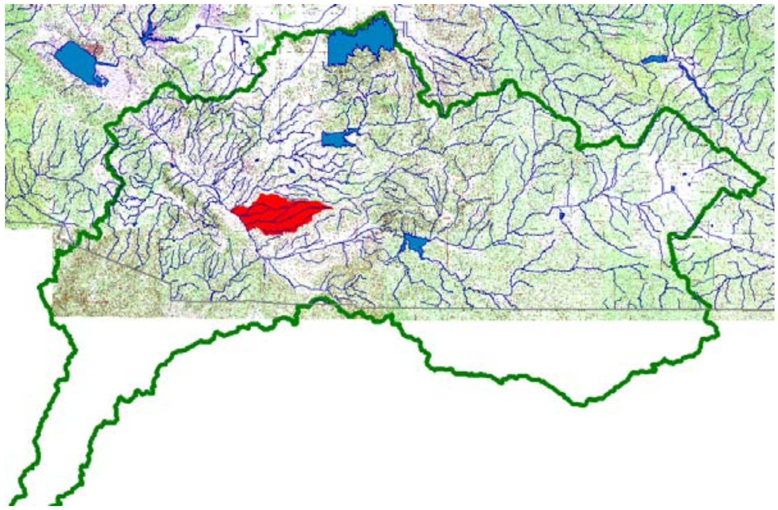
Receiving water: Murrieta Creek

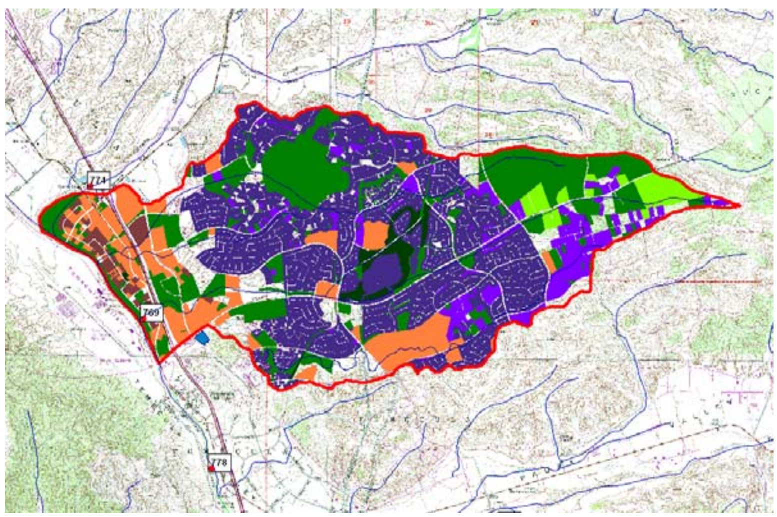
Directions to site: Exit Winchester Road from Interstate 15 freeway. Drive west of the freeway and turn left on to Jefferson Avenue. Drive about 900 feet and turn right on to Overland Drive. Turn left on to Commerce Center Drive. Drive about 230 feet and turn right in to access gate. Dry weather samples can be taken in the channel with hip boots and a backpack. Wet weather sampling should be conducted off of the Commerce Center Drive bridge with a rope and bucket.



Long Canyon Channel Outlet @ Murrieta Ck. (780) is an outfall station tributary to Murrieta Creek. It is a rip-rap trapezoidal channel. Non-storm flows from Long Canyon Channel tend to infiltrate within a few hundred feet of the confluence.

Long Canyon Creek Subdrainage Area





Total drainage area - 6,470.2 acres

Land uses by frequency

Land Use	Percent
Urban	38.8%
Undesignated (e.g., Federal, Tribal)	33.0%
Preserves & Open Space	29.3%
Commercial	14.2%
Rural	9.1%
Agriculture	3.5%
Parks & Rec	2.8%
Industrial	2.2%

G-3.7 Station Name: Warm Springs

Hydron Reference #: 397

Location:

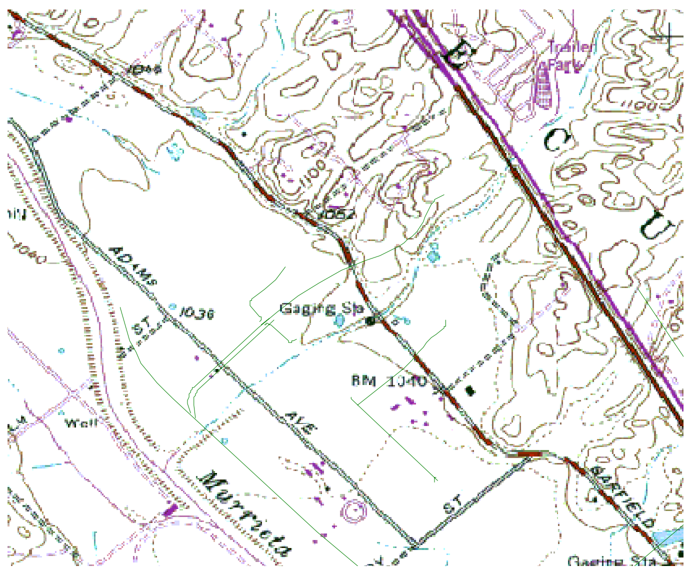
Latitude	33°31’56” N
Longitude	117°10’34” W
Elevation	1040 ft
Thomas Bros Pg	958E3

Classification: MS4

Type of Channel: Concrete Sidesloped, soft bottom Trapezoidal

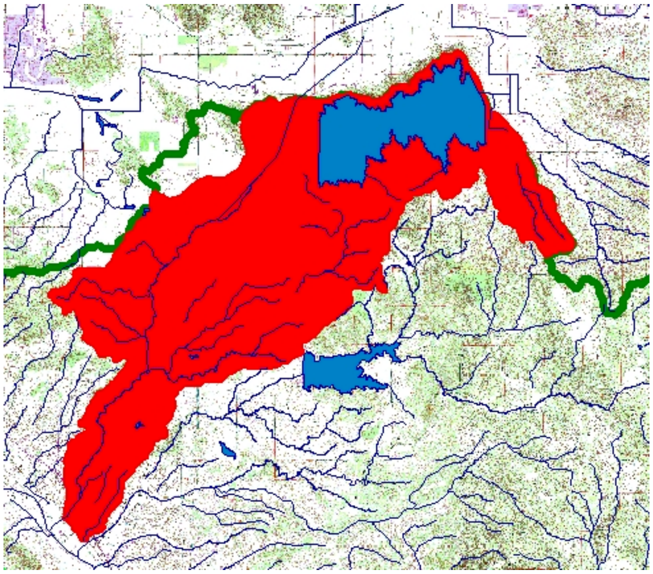
Receiving water: Murrieta Creek

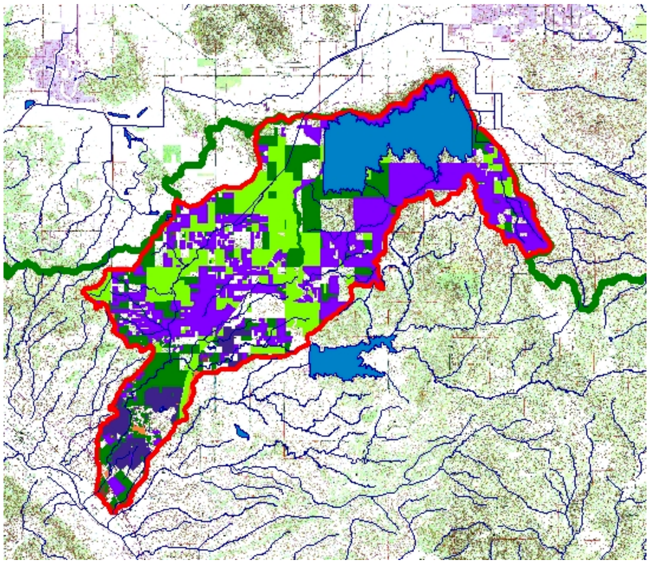
Directions to the site:
Exit Winchester Road from Interstate 15 freeway Drive west of the freeway and turn right on to Jefferson Avenue. Drive about 1 mile and turn left on to Eastman Drive. Turn right on to Adams Avenue. Drive about 250 feet and turn left on to dirt access road located south of the stream. Dry weather sampling can be performed downstream of the Adams Avenue bridge. Wet weather sampling should be conducted from the Adams Avenue bridge using a bucket and rope. 18 feet from the streambed to the bridge rail.



Warm Springs (397) is an outfall station. It is a concrete side-sloped, soft bottom channel tributary to Murrieta Creek. Flow in Warm Springs Channel only occurs during storm events. There may also be some sediment aggredation near the confluence of Warm Springs and Murrieta Creeks.

WARM SPRINGS SUBDRAINAGE AREA





Total drainage area – 37,476.92 acres
Land uses by frequency:

Land Use	Percent
Urban	2.7%
Undesignated (e.g., Federal, Tribal)	28.6%
Preserves & Open Space	16.3%
Commercial	0.5%
Rural	27.5%
Agriculture	24.1%
Parks & Rec	0%
Industrial	0.3%

G-3.8 Station Name: Santa Margarita River Near Temecula

Hydron Reference #: 828

Location:

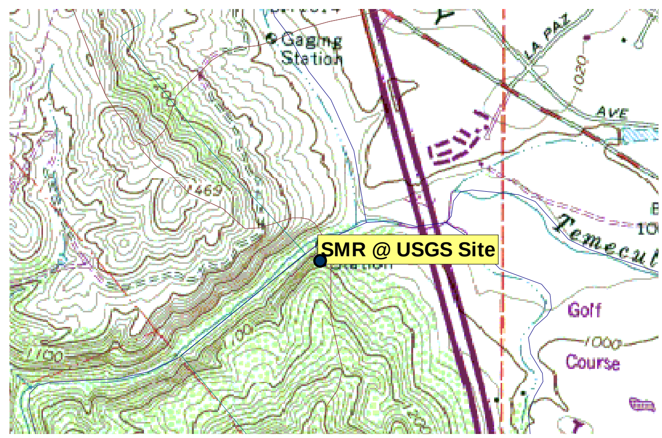
Latitude	33°28'26.0" N
Longitude	117° 08'29.0" W
Elevation	1020 ft
Thomas Bros Pg	978J4

Classification: Receiving Water

Type of Channel: Natural River

Directions to the site:

Wet weather sampling: Exit Rancho California Rd from I-15 freeway. Drive west of the freeway and turn left to Front Street. Turn right to Main Street. Turn left to Pujol Street. When Pujol Street goes from asphalt to a dirt road, drive about 500 feet and turn left at the two (2) yellow vertical bollards. CAUTION: A 4-Wheel drive is recommended when driving in this area. When you get to the bottom of the dirt slope, turn right and follow road for about 1/8th of a mile. This dirt road will dead end. The sampling location is about another 50 feet past the dead end at the weir. You will be able to see the USGS gage house directly across the river. CAUTION: It is not advisable to drive down the dirt slope when it is dark.



Dry weather sampling: Many times the RCWCD sends water through its blow off during dry weather. This blow off is located at the dead end of the dirt road. So, exit Highway #79 from the Interstate 15 freeway and drive west of the freeway. Turn left at the first stop light. Turn left about 200 feet past the stop light on to a gravel/dirt road. Follow the road and turn right before the yellow EMWD gate. Drive about 150 feet and turn left. Drive about 30 feet while climbing a small hill. Drive about 200 feet and turn right to a dirt road. Go about 1700 feet and drive to where the dirt road meets up with the gravel road. Follow the gravel road to the "L3437 Pala II Pump Station. Turn right to the dirt road. Drive about 125 feet then turn left to the dirt road. Drive along and past the "metal plate bridge" and park before the State of Calif. gate.

Santa Margarita River Near Temecula is a receiving water station located 0.4 miles downstream of the Lower Murrieta Creek sampling point and below the confluence of Temecula and Murrieta Creeks. The station is located within the river and is earthen (except for a weir at the USGS gauge). It is the most downstream station in the CMP. During dry weather, flows at this station consist of rising groundwater from Murrieta & Temecula Creeks and discharges of RCWD adjudicated raw potable water, which may range in flow from 3 cfs to 11.5 cfs. There is an active USGS flow gauge at this station. **It is important to note that since these RCWD flows originate near this sampling point, contribution of MS4 discharges is relatively insignificant.**

Table G-2. Santa Margarita Region - Land Uses of Selected Drainage Areas (As of October 2004)

Drainage Area	Agriculture		Commercial		Industrial		Preserves & Open Space		Parks & Recreation		Rural		Urban		Undesignated (e.g., Federal, Tribal)		Total
	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)
Redhawk Channel	80.7	9.5%	24.9	2.9%	0.0	0.0%	285.2	33.6%	2.4	0.3%	306.1	36.1%	149.3	17.6%	734.0	86.5%	1,582.4
Long Canyon Creek	170.9	3.5%	691.6	14.2%	106.4	2.2%	1,427.1	29.3%	137.4	2.8%	444.8	9.1%	1,886.8	38.8%	1,605.3	33.0%	6,470.2
Cole Canyon Creek	241.4	6.4%	0.0	0.0%	0.0	0.0%	1,078.2	28.6%	0.0	0.0%	2,184.4	57.9%	265.6	7.0%	1,457.9	38.7%	5,227.6
Temecula Creek	16,593.4	14.3%	537.4	0.5%	956.3	0.8%	39,112.8	33.6%	1,313.3	1.1%	51,955.0	44.7%	5,863.5	5.0%	59,260.4	50.9%	175,591.9
Murrieta Creek	19,779.6	19.5%	2,104.9	2.1%	720.9	0.7%	28,848.6	28.5%	460.2	0.5%	41,681.5	41.2%	7,604.3	7.5%	39,998.7	39.5%	141,198.7
Warm Springs Valley	9023.3	24.1%	179.3	0.5%	100.6	0.3%	6103.0	16.3%	0.0	0.0%	10,317.1	27.5%	1007.4	2.7%	10,746.3	28.7%	37,476.9
Santa Gertrudis Valley	7519.4	13.1%	196.3	0.3%	142.2	0.3%	12,068.7	21.0%	33.6	0.1%	19,815.3	34.5%	934.8	1.6%	16,766.6	29.1%	57,476.8
Wildomar Valley	432.4	8.8%	50.5	1.0%	5.7	0.1%	2,471.6	50.5%	3.1	0.1%	1,424.2	29.1%	507.7	10.4%	2,036.0	41.6%	6,931.2
Murrieta Valley	2,615.7	12.5%	665.8	3.2%	21.3	0.1%	5,403.5	25.8%	285.4	1.4%	8,828.8	42.1%	3,161.8	15.1%	7,633.8	36.4%	28,616.1
Temecula Valley	239.9	2.9%	902.6	11.0%	480.9	5.8%	2,758.9	33.5%	138.2	1.7%	1,594.9	19.4%	2,121.6	25.8%	2,534.7	30.8%	10,771.8
Anza	963.6	14.9%	39.1	0.6%	5.3	0.1%	1,484.4	22.9%	0.0	0.0%	3,970.9	61.3%	16.2	0.3%	4,453.6	68.7%	10,933.0

G-4.0 Precipitation Within the Santa Margarita Watershed

Annual precipitation for the Santa Margarita Watershed, expressed in terms of average annual precipitation, is characterized in Table G-3 below.

Table G-3. Average Annual Precipitation – Santa Margarita Watershed

Year*	% Above Normal	% Below Normal	Characterization
1992-93	114	--	Wet
1994-95	54	--	Wet
1995-96	--	44	Dry
1996-97	--	26	Dry
1997-98	86	--	Wet
1998-99	--	56	Dry
1999-2000	--	41	Dry
2000-2001	--	38	Dry
2001-2002	--	23	Dry
2002-2003	11	--	Normal
2003-2004	--	47	Dry
2004-2005	219	--	Wet

* Fiscal Year (July 1 – June 30)

Annual average precipitation for the watershed is computed on the basis of mean annual precipitation records of four precipitation stations located within the Santa Margarita watershed (Murrieta Creek @ Tenaja, Lake Skinner, Temecula, and Wildomar). Rainfall this reporting period set records at several locations. Although annual rainfall totals were extreme and significantly higher than 1993 when over $90,000,000 in damage occurred within the watershed due to flooding from a series of high intensity storms; the distribution of rainfall this year was distributed throughout the year, preventing excessive flooding problems within the watershed.

Tables G-4 through G-6 summarize annual rainfall records for four stations located in the Santa Margarita watershed (Wildomar, Murrieta Cr., Temecula, and Skinner Lake). Please note that quality control of reporting routines used to generate these reports has led to a modification of totals reported in prior reports. The numbers contained in this year's report have been verified as accurate.

Table G-7 is a four-page table with each page covering a three-month period from July 1, 2004 to June 30, 2005. The tables show the total rainfall for each day of the year for each of the four reference stations. Daily totals are for 24-hour intervals ending at 0800 of the date indicated.

Table G-4 Annual Rainfall (inches)

Year*	Murrieta Creek	Skinner Lake	Temecula	Wildomar
1993	29.82	28.39	36.10	31.86
1994	11.42	12.96	15.60	10.97
1995	25.64	20.57	27.60	23.29
1996	8.50	8.09	9.10	8.84
1997	10.98	10.77	13.60	10.13
1998	27.61	24.92	31.90	28.41
1999	5.75	7.04	8.20	6.28
2000	9.60	7.51	10.10	8.34
2001	11.70	9.75	13.70	12.64
2002	3.80	3.05	3.80	3.06
2003	18.10	13.81	16.05	18.10
2004	9.09	6.96	7.80	8.12
2005	34.82	25.33	33.75	34.55

*Fiscal Year = July 1 through June 30

Table G-5 Percent(%) of Normal = Current Year / Average Year

Year *	Murrieta W	Skinner Lake	Temecula	Wildomar	Mean(4)	Result
1993	189%	225%	226%	225%	216%	wet
1994	73%	103%	98%	77%	88%	dry
1995	163%	163%	173%	164%	166%	wet
1996	54%	64%	57%	62%	59%	dry
1997	70%	85%	85%	71%	78%	dry
1998	175%	198%	200%	200%	193%	wet
1999	37%	56%	51%	44%	47%	dry
2000	61%	60%	51%	59%	58%	dry
2001	74%	77%	63%	89%	76%	dry
2002	24%	24%	24%	22%	23%	dry
2003	115%	110%	100%	128%	113%	normal
2004	58%	55%	49%	57%	55%	dry
2005	221%	201%	211%	244%	219%	wet

* Fiscal Year = July 01 thru June 30

Table G-6 Station Information

Name	ID No	Avg	Years	Location
Murrieta Cr	128	15.74	38	7S/3W-18
Skinner Lake	205	12.60	58	7S/2W-10
Temecula	217	15.98	49	8S/3W-12
Wildomar	246	14.18	96	7S/4W-2

Table G-7(1). Daily Rainfall for Fiscal Year 2003-2004 (inches)

	Jul				Aug				- Sep			
Day	Murrieta -Crk	Skinne rLk	Temecula	Wildomar	Murrieta -Crk	Skinne rLk	Temecula	Wildomar	Murriets -Crk	Skinne rLk	Temecula	Wildoma r
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13						0.04	0.02	0.61				
14								0.02				
15												
16												
17												
18										0.01		
19											0.01	
20											0.01	
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
Sum	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.63	0.00	0.01	0.02	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.63	0.00	0.05	0.04	0.63

Sum represents total for month. Total represents total rainfall to date at the end of the month.

Table G-7(2). Daily Rainfall for Fiscal Year 2004-2005 (inches)

Day	Oct				Nov				Dec			
	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murriets-Crk	Skinner Lk	Temecula	Wildomar
1												
2												
3												
4												
5									0.07	0.10	0.14	0.06
6									0.46	0.37	0.50	0.53
7									0.02			
8					0.03	0.20	0.07	0.09	0.06	0.07	0.11	0.14
9					0.07	0.04	0.06	0.13	0.02	0.03	0.04	0.01
10					0.01	0.01						
11											0.01	
12						0.01						
13									0.01	0.01		
14	0.07	0.01										
15												
16			0.01									
17	0.26	0.78	0.66	0.50								
18	0.14	0.16	0.34	0.27								
19	0.05	0.05	0.29	0.02								
20	1.50	0.76	1.63	2.18								
21	0.73	1.37	1.52	0.46	1.39	0.80	0.88	0.69				
22			0.02		0.06	0.31	0.07	0.37				
23					0.01	0.01	0.01					
24		0.01										
25						0.01						
26		0.01										
27	2.42	1.38	2.01	3.05		0.01						
28	0.65	0.32	0.53	0.45	0.15	0.17	0.26	0.22	0.45	0.22	0.44	0.62

29	0.15	0.25	0.30	0.10			0.01		2.28	1.99	2.40	2.60
30		0.01							0.28	0.26	0.52	0.19
31			0.01						0.01			0.01
Sum	5.97	5.11	7.32	7.03	1.72	1.57	1.36	1.50	3.66	3.05	4.16	4.16
Total	5.97	5.16	7.36	7.66	7.69	6.73	8.72	9.16	11.35	9.78	12.88	13.32

Sum represents total for month. Total represents total rainfall to date at the end of the month.

Table G-7(3). Daily Rainfall for Fiscal Year 2004-2005 (inches)

Day	Jan				Feb				Mar			
	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murrieta-Crk	Skinner Lk	Temecula	Wildomar
1	0.30	0.30	0.42	0.30				0.10				
2	0.01											
3	0.62	0.46	0.50	0.46						0.01	0.02	
4	1.02	0.96	1.02	0.84							0.01	
5	0.07	0.06	0.05	0.07					0.07	0.14	0.22	0.04
6			0.01	0.01						0.01	0.01	
7	0.06	0.06	0.06	0.06	0.06	0.08	0.07	0.06				
8	1.57	0.70	1.32	1.00		0.01	0.01					
9	1.52	0.55	1.18	1.11			0.01		0.01			
10	2.13	2.19	2.64	2.25						0.01	0.01	
11	2.33	1.70	2.59	2.02	0.81	0.34	0.41	0.75				
12	0.02	0.06	0.06	0.06	2.07	0.87	1.18	1.59				
13			0.01		0.28	0.03	0.13	0.41	0.01			
14							0.01					
15												
16												
17												
18					0.72	0.45	0.53	0.66				
19					0.77	0.39	0.42	1.12	0.16	0.15	0.18	0.16
20					0.74	0.44	0.62	0.62	0.17	0.09	0.26	0.13
21					1.22	0.68	0.79	1.15		0.01	0.01	
22					1.63	0.81	1.12	2.04				
23					2.81	1.30	1.70	2.08	0.57	0.31	0.74	0.72
24					0.05	0.07	0.01	0.02	0.02	0.02	0.01	
25						0.26	0.34		0.06	0.18	0.02	0.07
26	0.02	0.02	0.02		0.01	0.02				0.01		
27	0.03	0.04	0.05	0.01	0.02			0.02		0.01		

28			0.01									
29	0.18	0.14	0.46	0.05							0.01	
30			0.01	0.01								
31												
Sum	9.88	7.24	10.41	8.25	11.19	5.75	7.35	10.62	1.07	0.95	1.50	1.12
Total	**21.23**	**17.02**	**23.29**	**21.57**	**32.42**	**22.77**	**30.64**	**32.19**	**33.49**	**23.72**	**32.14**	**33.31**

Sum represents total for month. Total represents total rainfall to date at the end of the month.

Table G-7(4). Daily Rainfall for Fiscal Year 2004-2005 (inches)

Day	Apr				May				Jun			
	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murrieta-Crk	Skinner Lk	Temecula	Wildomar	Murrieta-Crk	Skinner Lk	Temecula	Wildomar
1												
2												
3												
4												
5												
6					0.46	0.55	0.62	0.48				
7			0.07		0.01	0.20	0.01	0.02				
8								0.01				
9	0.02	0.06		0.02								
10	0.01											
11												
12												
13									0.05			
14												
15												
16												
17												
18												
19												
20												
21			0.04									
22												
23	0.01	0.06	0.06	0.02					0.01			
24	0.07	0.10	0.14	0.06								
25	0.01	0.01	0.03									
26		0.01		0.01								
27			0.02									
28	0.65	0.50	0.54	0.58								
29	0.03	0.11	0.08	0.03								
30		0.01		0.01								
31												

Sum	0.80	0.86	0.98	0.73	0.47	0.75	0.63	0.51	0.06	0.00	0.00	0.00
Total	**34.29**	**24.58**	**33.12**	**34.04**	**34.76**	**25.33**	**33.75**	**34.55**	**34.82**	**25.33**	**33.75**	**34.55**

Sum represents total for month. Total represents total rainfall to date at the end of the month.

G-5.0 Fires Within the Santa Margarita Watershed

Several significant fires occurred during the FY 2003-2004 reporting period. Fires impact a watershed for several years after their initial burn due to loss of ground cover and chemical changes in the soil. Naturally occurring elements that are usually retained by forest vegetation can be washed away during storm events, in addition to large amounts of sediment. Daniel Cozad, Deputy General Manager of the Santa Ana Watershed Project Authority, stated[1], “Normally, the forest filters water naturally absorbing nitrates, phosphorus and other elements. Because of the fires, more contaminants will reach stream channels.... Increasingly, rain will cause rocks and soil that usually trap particulate matter on the forest floor to fill watercourses, washing pollutants such as lead, mercury, copper, zinc and phosphorus into debris basins and groundwater.”

Although the fires affected watersheds tributary to each monitoring station, it should be noted that the Mesa fire, burning about 245 acres in the Santa Rosa Plateau, occurred on the ridge separating the Cole Creek and Adobe watersheds. This fire was tributary to both reference stations. This has been borne out by the presence this reporting period of chromium, copper, nickel, lead, and phosphorus at higher levels than expected at the Cole Creek reference station. As it takes several years for ashes and sediments displaced by forest fires to be washed down, these pollutants could be the result of fires that occurred in previous years. Fires should be considered as a possible source of pollutants in source investigations.

Table G-8 presents pertinent information about these fires, including the dates the fires started, their location, and the number of acres that were burned. Shaded rows indicate fires that occurred prior to the reporting period; runoff or aerial deposition from these fires could still affect water quality.

The figures on the following pages show the locations of the fires and the CMP stations that could show water quality impacts from them. Table F-1 lists the station names that correspond to the station numbers shown in the following maps. Fire names shown on the maps that are not listed in Table G-8 occurred after June 30, 2005.

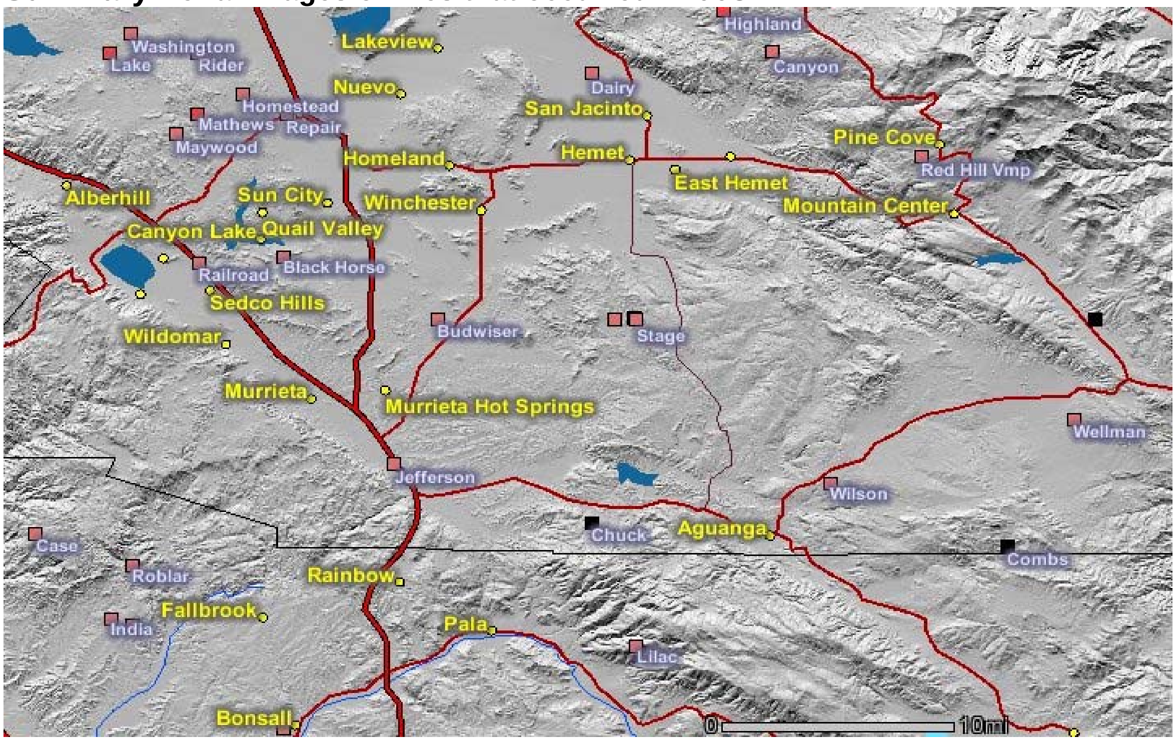
[1] “Forest Burned, Filter Broken – Water quality suffers after fires”, by Daniel Cozad, California Forests, Winter 2004, pgs. 6-7.

Table G-8. Fires Within the Santa Margarita Region During FY 2003-04 Reporting Period

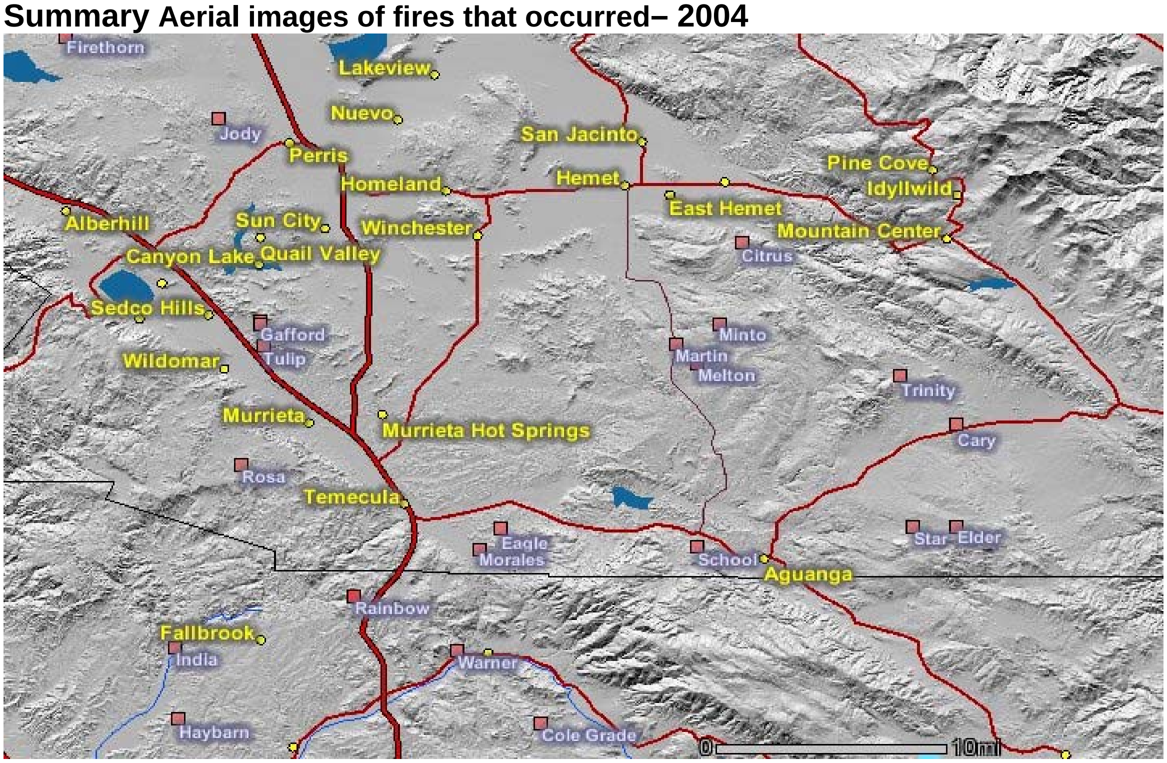
Event_ID	Fire Name	Start Date	Acres	Location	Percent Contained	Latitude	Longitude	Map Page
2003 Fires								
CA-RRU-0020251	Jefferson	3/14/2003	0	CITY OF TEMECULA	0	33.5003	-117.15111	A
CA-RRU-49644	Barranca	6/30/2003	263	De Portola Road C/O Barranca Road (S/O Sage)	100	33.6189	-116.96917	G
CA-RRU-50865	Stage	7/4/2003	1621	In Sage, South and west of Hemet	100	33.6172	-116.96722	G
CA-RRU-53996	Wilson	7/14/2003	37	Hwy 371 c/o Wilson Valley Road Anza, Ca.	100	33.4847	-116.81917	J
CA-RRU-057206	Lightning	7/15/2003	0	59200 MORRIS RANCH RD, GARNER VLY		33.6175	-116.61778	E
CA-MVU-5044	Coyote	7/16/2003	0	Coyote Canyon @ MVU/RRU/at the Riverside and San Diego County Line		33.4167	-116.53361	K
CA-RRU-60529	Budwiser	8/8/2003	0	3 MILES N/W OF TEMECULA (FRENCH VALLEY)		33.6172	-117.11833	F
CA-RRU-65117	Chuck	8/24/2003	10	TEMECULA	100	33.4522	-117.00083	C
CA-RRU-068060	Combs	9/4/2003	7	South of Anza just north of San Diego County Line	100	33.4336	-116.685	I
CA-RRU-82825	Wellman	10/26/2003	100	ANZA	100	33.5358	-116.63417	H
CA-RRU-082809	Mountain	10/26/2003	10331	Sage Area	100	33.6172	-116.98389	G
2004 Fires								
CA-RRU-35190	Eagle	5/2/2004	8831	SOUTHEAST OF THE CITY OF TEMECULA	100	33.4667	-117.06778	A
CA-RRU-36197	Gafford	5/2/2004	450	LOST RD X GAFFORD RD S/E OF LAKE ELSINORE	100	33.6358	-117.25250	D
CA-RRU-35567	School	5/3/2004	377	SAGE RD X TYLER RD IN THE COMMUNITY OF SAGE, EAST OF TEMECULA	100	33.4522	-116.91694	C
CA-RRU-039176	Cary	5/15/2004	20	Cary Rd X Mitchell Rd, Anza	100	33.5519	-116.71833	H
CA-RRU-039649	Mesa	5/21/2004	235	Santa Rosa Plateau west of the City of Murrieta	100	33.5186	-117.26667	B
CA-RRU-45160	Elder	6/5/2004	58	Lake Riverside east of Temecula	100	33.4683	-116.71861	I
CA-RRU-045438	Rosa	6/6/2004	15	Santa Rosa Plateau near Murrieta	100	33.5186	-117.26667	B
CA-RRU-056038	Lakeview	7/13/04	350	Lemon x Gafford, Wildomar TB897c3	100	33.6333	-117.2525	B
CA-RRU-56306	Tulip	7/14/2004	150	Bundy Canyon x Raciti Road, Sedco Hills	100	33.6167	-117.25	B
CA-RRU-57326	Melton	7/17/2004	3667	Sage Area, 5 mi. s. of Hemet	100	33.6014	-116.91694	
CA-RRU-58518	Martin	7/21/2004	135	Sage Area, Sage RDxRed Mtn Rd	100	33.6172	-116.93361	
CA-RRU-61308	Star	7/31/2004	85	Carrot Ln x Evening Star St; Aguanga	100	33.4683	-116.75194	I
CA-BDF-8335	Trinity	8/8/2004	0	North of Community of Anza		33.5914	-116.76139	H
CA-RRU-065467	Minto	8/14/2004	24	Minto Wy x Oak Dr. Sage, S/o Hemet	100	33.6342	116.90028	
CA-RRU-070756	Morales	09/02/2004	250	S/E of Temecula(Pechanga Res.)	100	33.4503	-117.08472	A
2005 Fires								
CA-RRU-41175	Johnson Ranch	6/25/2005		Johnson Ranch VMP		33.591	-117.079	
CA-RRU-53451	Sage	6/27/2005	8	Sage		33.628	-116.937	
CA-RRU-58293	Skinner	7/12/2005	60	Skinner	100	33.552	-117.034	
CA-RRU-74829	Bella	9/8/2005	198	Bella	100	33.561	-117.02	

Source: GeoMAC Wildfire Information (http://geomac2.cr.usgs.gov/#)

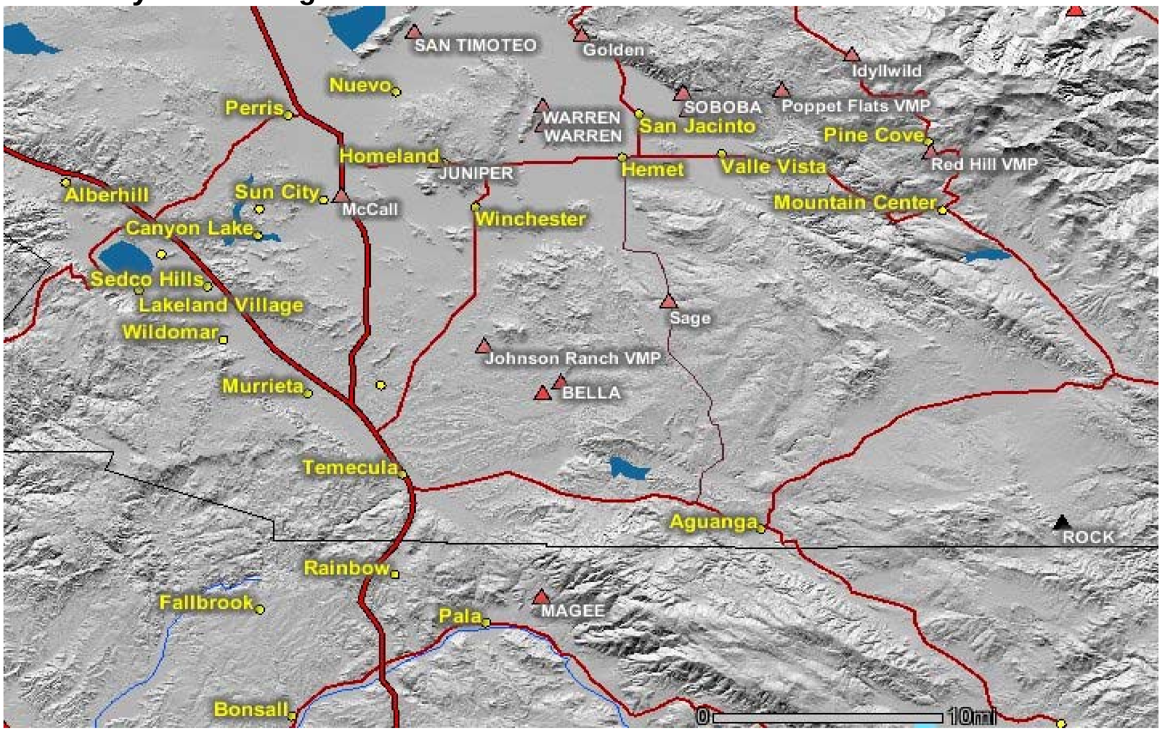
Summary Aerial images of fires that occurred– 2003



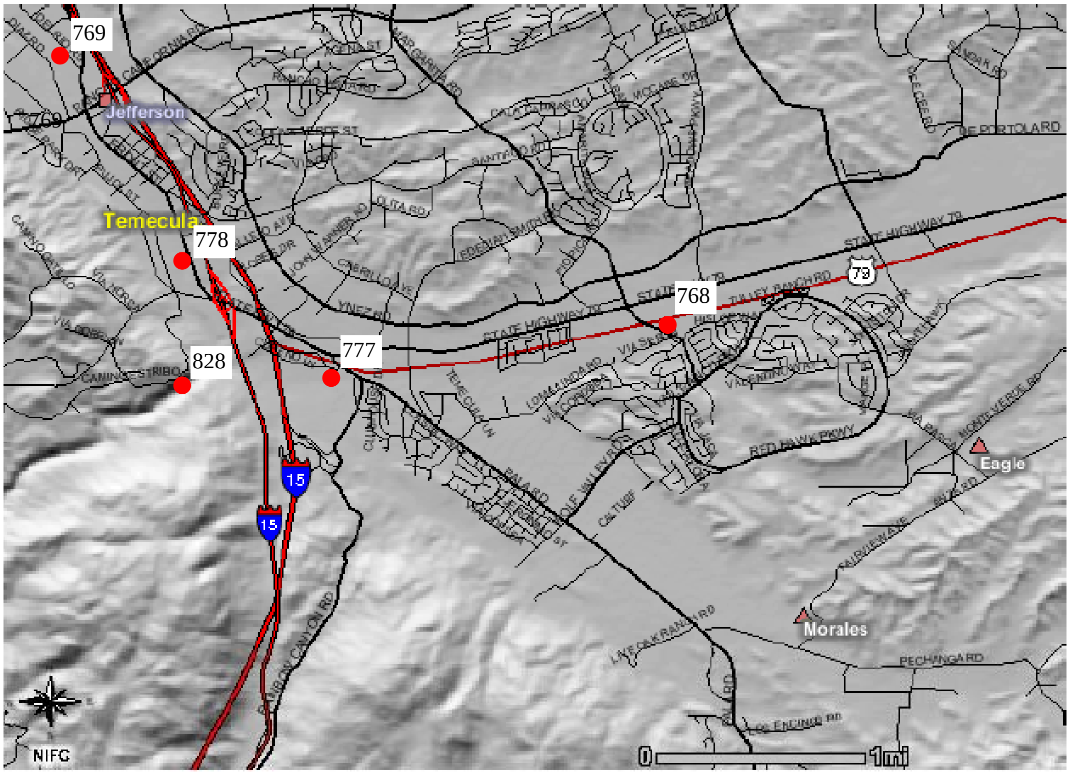
Summary Aerial images of fires that occurred– 2004



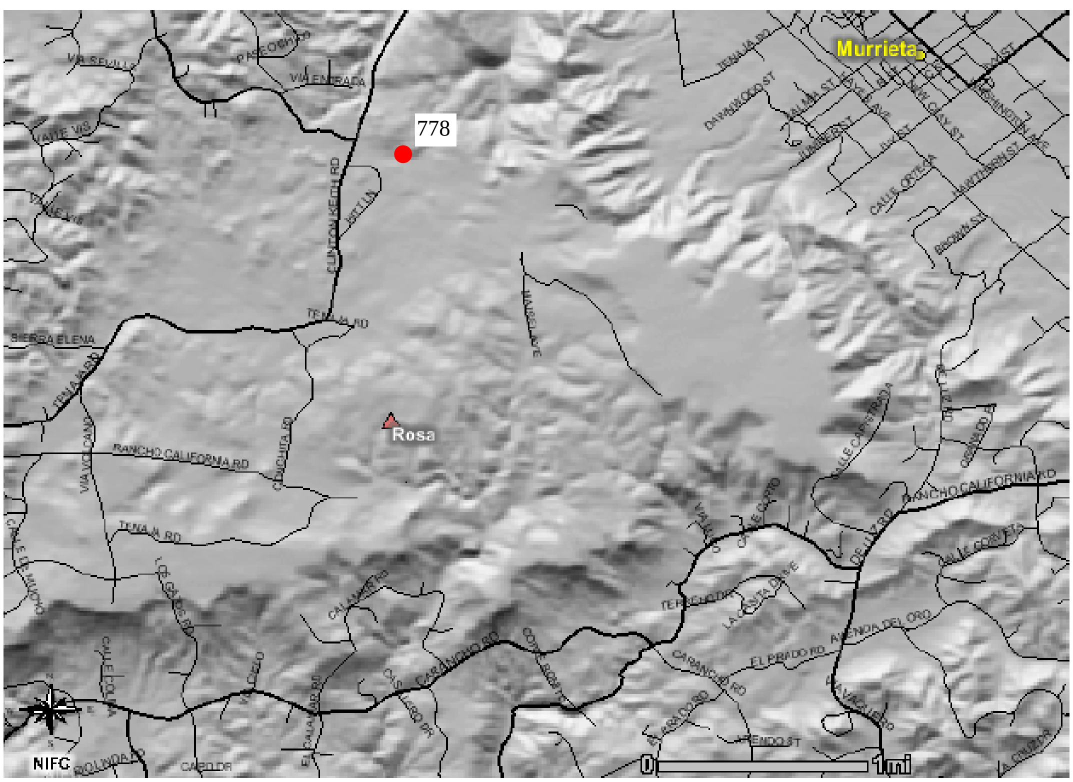
Summary Aerial images of fires that occurred– 2005



Aerial images of fires that occurred near a CMP station

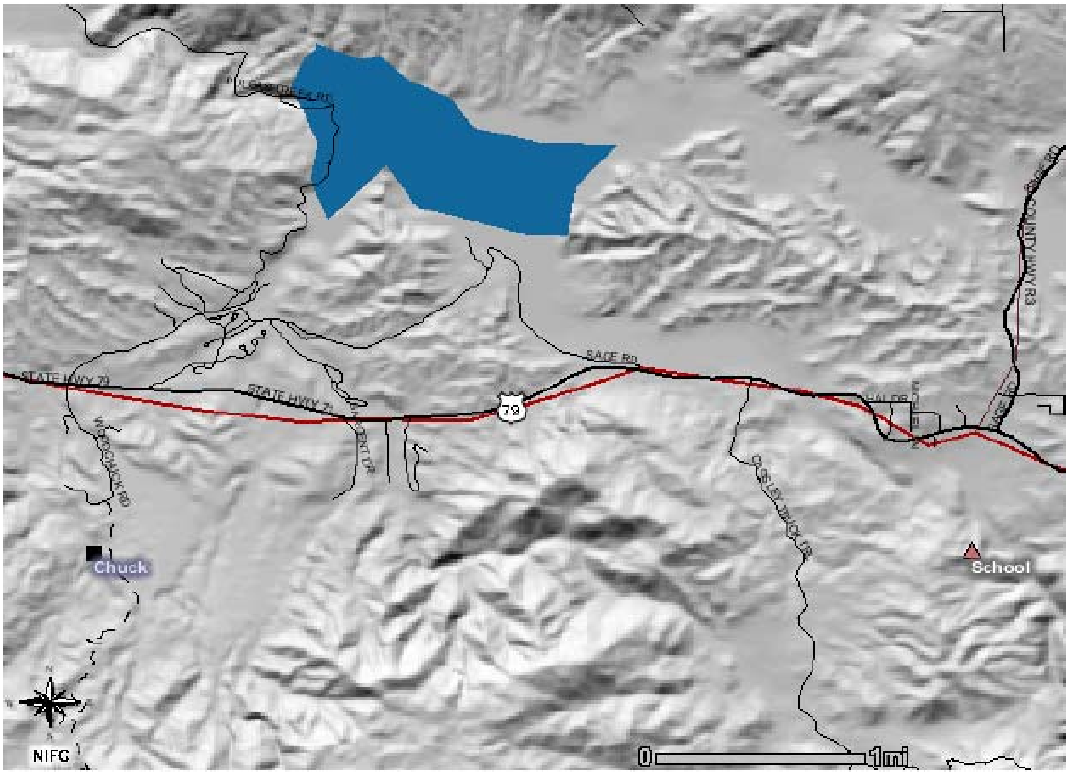


Map A

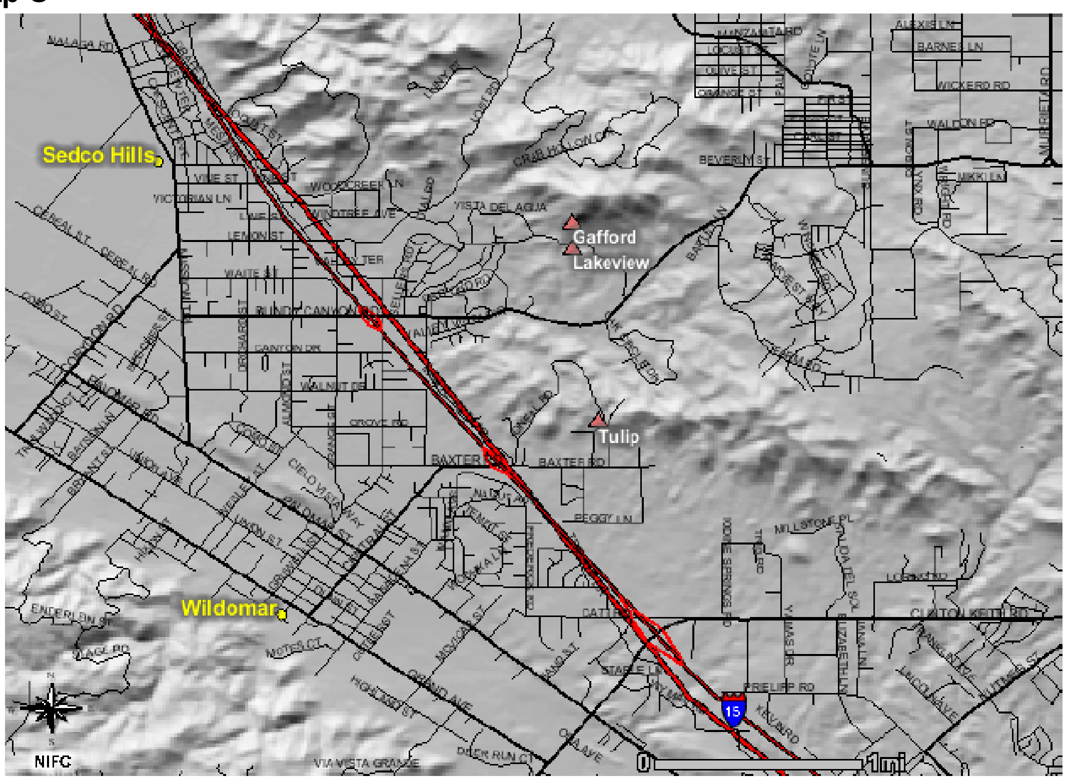


Map B

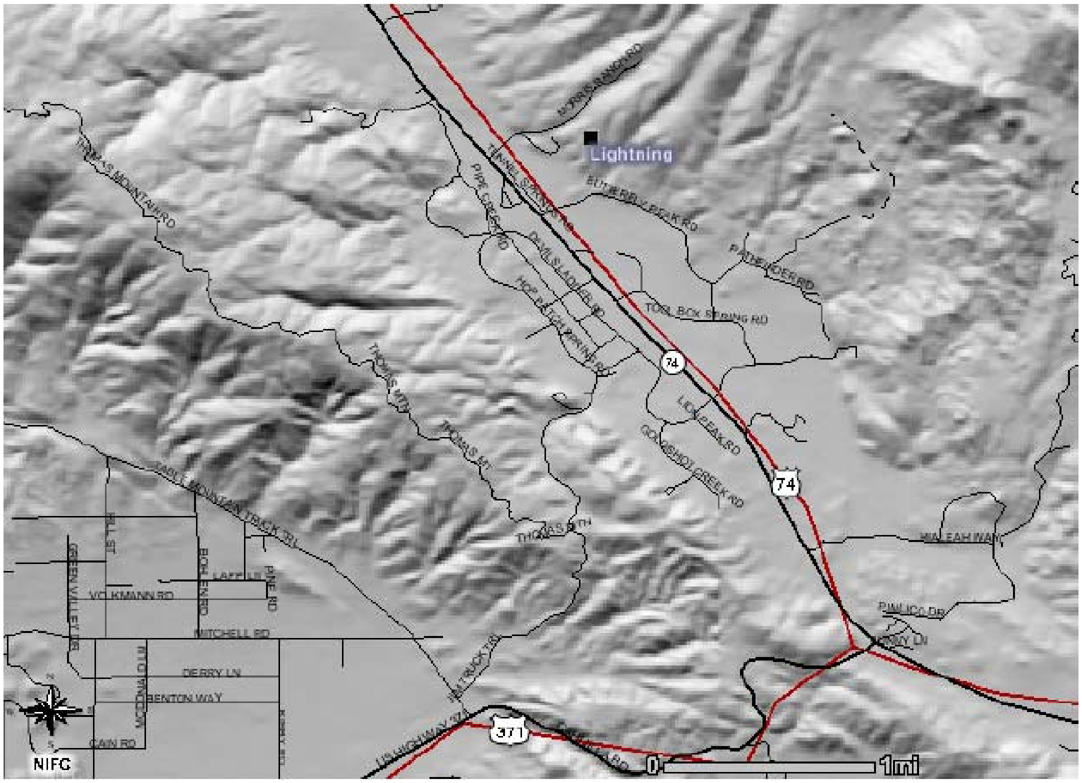
Aerial images of other fire locations



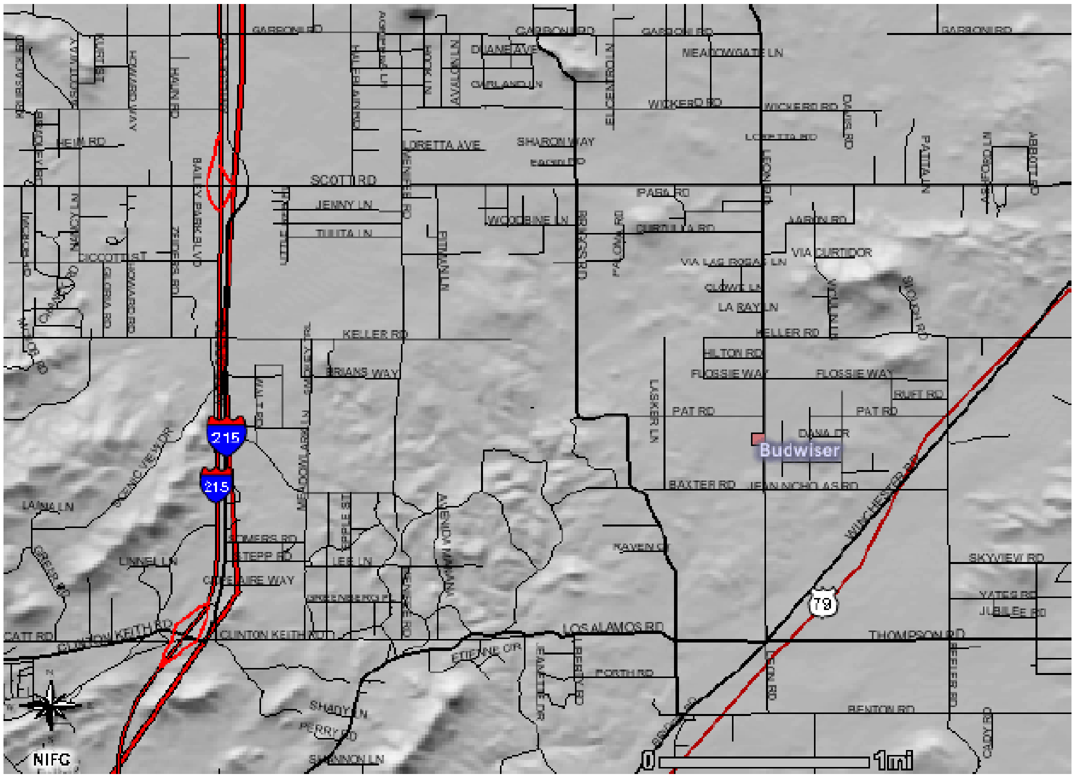
Map C



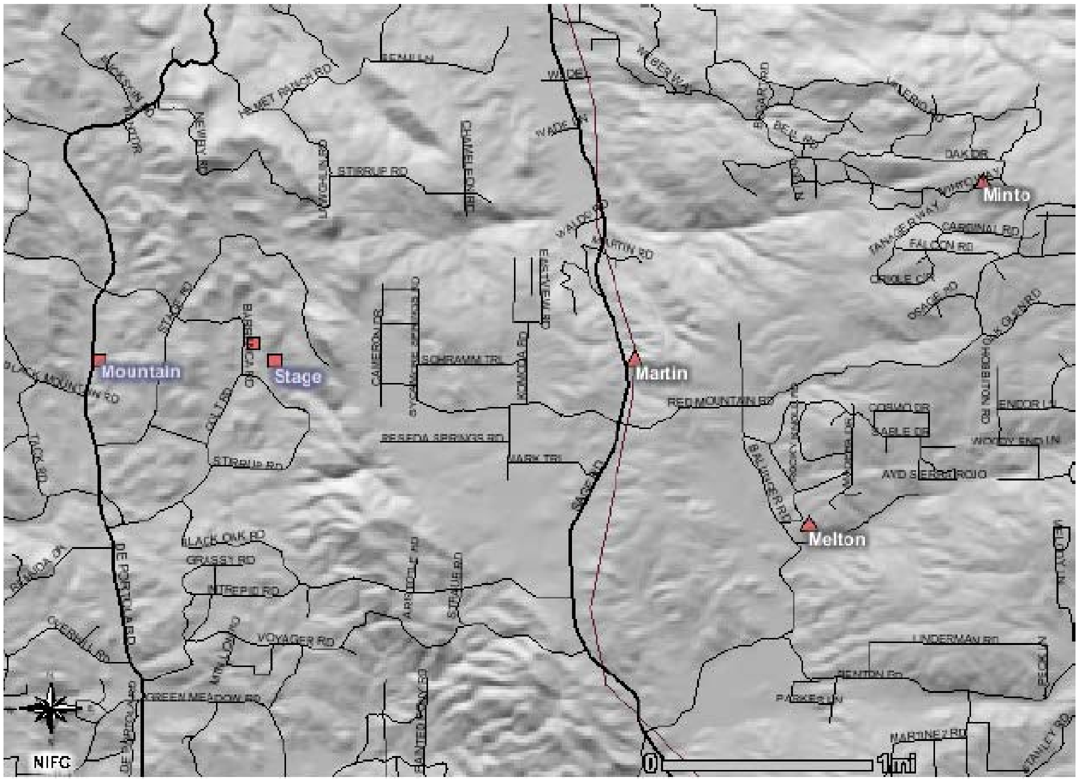
Map D



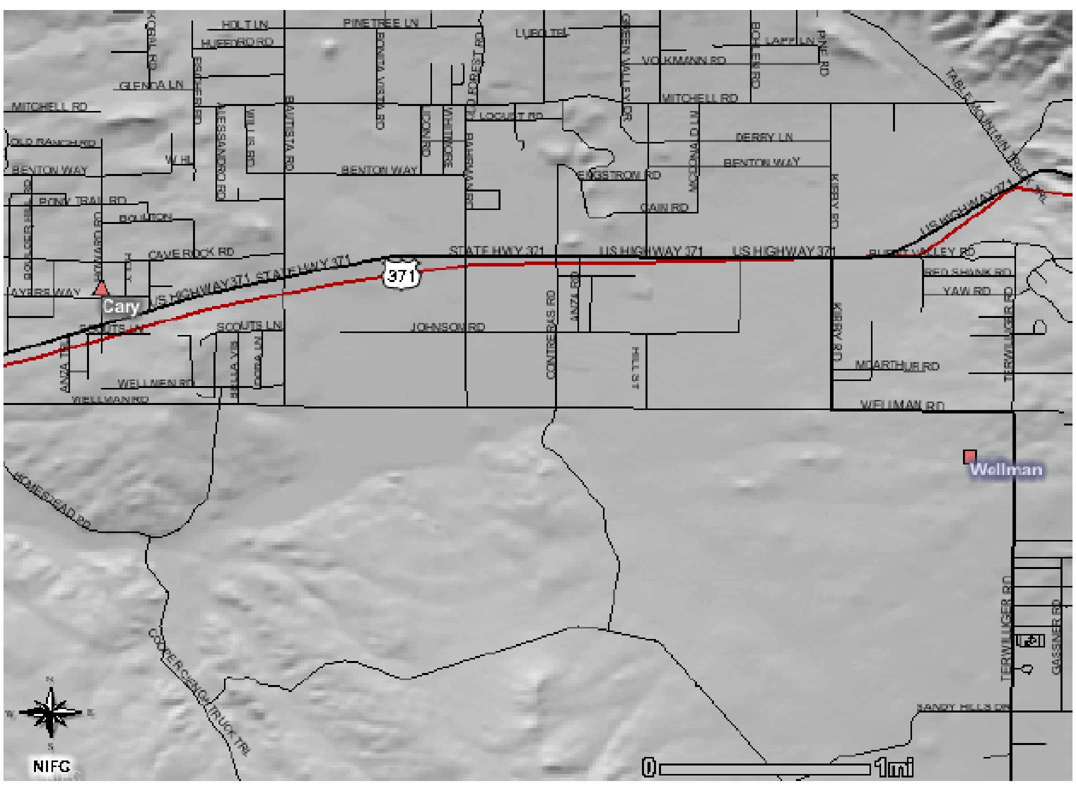
Map E



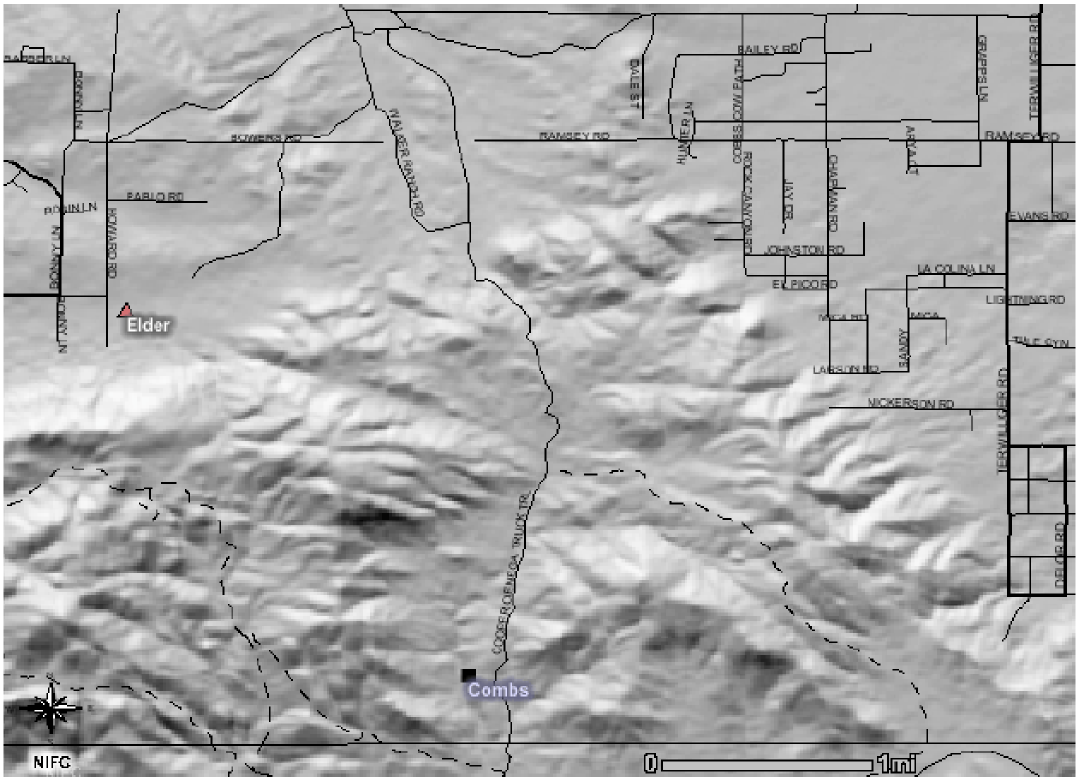
Map F


Mountain
Stage
Martin
Minto
Melton
NIFC
0
1mi

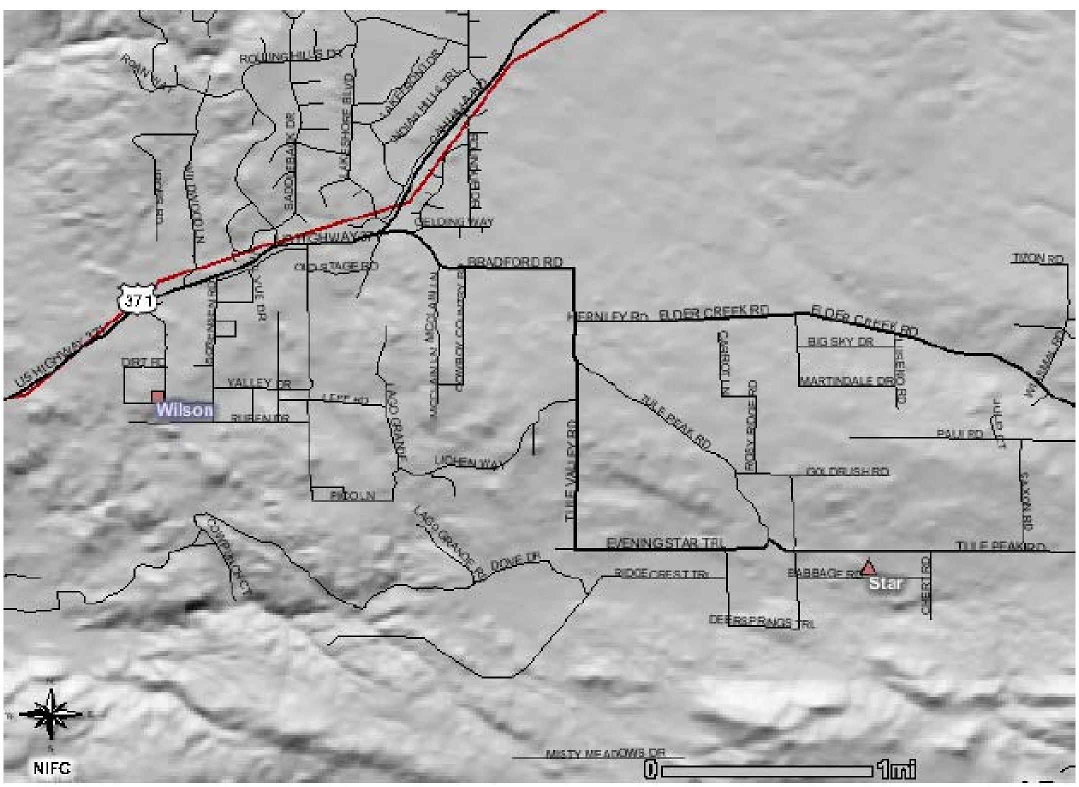
Map G


Cary
Wellman
371
STATE HWY 371
US HIGHWAY 371
NIFC
0
1mi

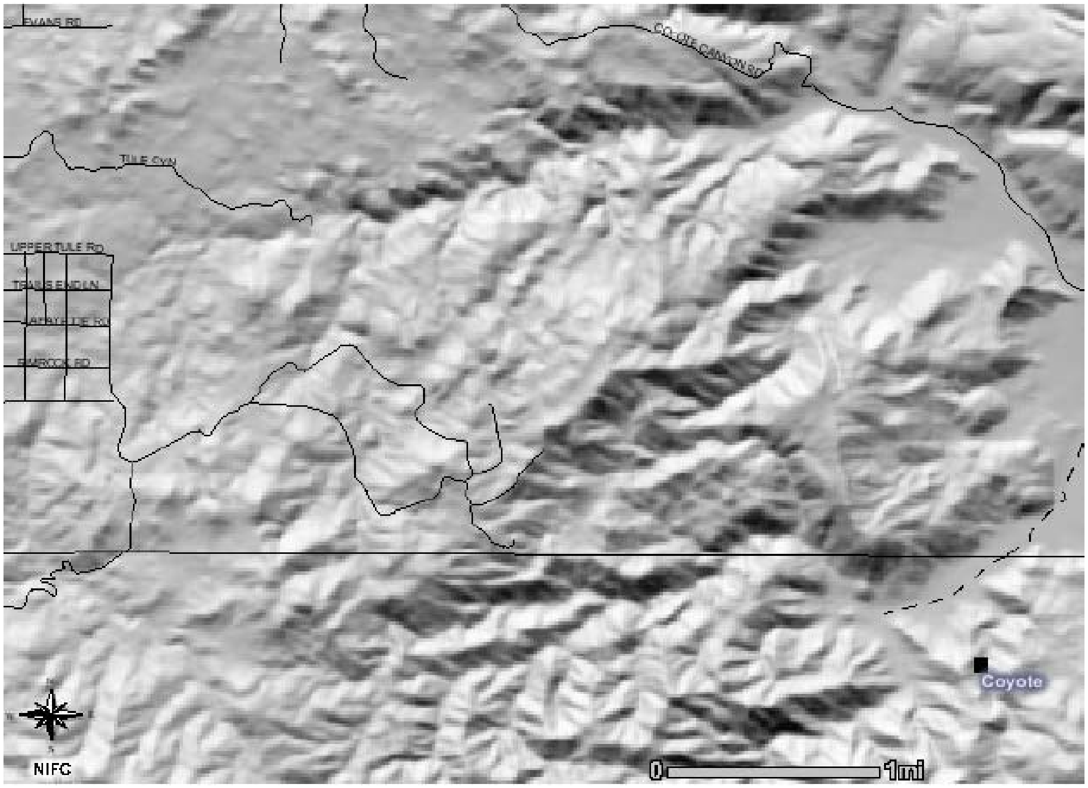
Map H



Map I



Map J



Map K

G-6.0 Water Quality Monitoring

Table G-9 summarizes the sample collection history for this reporting period. Several of the prior monitoring programs dry weather monitoring stations were inspected and monitored, where flowing, on July 14, 2004. This was the last of the monitoring done under the old CMP and Monitoring and Reporting Program.

Table G-9. FY 2003-04 Monitoring Station Sample History

Dates sampled	Adobe Cr (848)	Murrieta Cr At Tenaja Rd (128)	Lower Temecula Cr (777)	Warm Springs Cr (397)	Santa Gertudis Cr (774)	Long Canyon (780)	Cole Creek (188)	Wildomar (404)	Redhawk (768)	Empire Creek (769)	Cal Oaks (776)	Lower Murrieta Creek (778)	Santa Margarita River (828)
7/14/2004													
10/06/2004													
10/20/2004													
12/28/2004													
2/11/2005													
3/31/2005													
5/10/2005													
5/11/2005													
6/7/2005													

Wet weather, storm sample collected (trib sta)
Dry weather, quarterly sample collected
Dry weather, no water to sample
No sample collected
Dry Weather, Sample Collected (trib sta)
Wet Weather, Storm Spl Collected (triad sta)
Dry Weather, Sample Collected (triad sta)

The Monitoring and Reporting Program for Board Order R9-2004-001 requires that wet-weather samples be collected from the first storm event that produces flow and from any two additional storm events that follow during the reporting period. Although the wet season typically runs from October through April, the Monitoring and Reporting Program specifies that a monitoring year, for the purposes of collecting wet weather samples, begins July 1 and ends June 30 of the following year. It should be noted that in the Santa Margarita watershed, summertime thunderstorms tend to be localized and convective in nature, making them difficult to predict and to mobilize for sample collection. Further, in an ephemeral watershed such as the Upper Santa Margarita, the first storm of the monitoring year that falls under the USEPA-recommended sampling criteria (EPA-833-B-92-001) may not result in runoff from surrounding properties.

The District has developed guidance on when wet-weather samples should be collected. Two National Weather Service weather forecasts are monitored by District staff:

- The normal 7-day National Weather Service forecast for the possibility of a rain event, and
- When within 3 days of a storm, the Quantitative Precipitation Forecast (QPF), to determine how much rain is predicted to fall in 6-hour increments over the next 24-hour period and in 24-hour blocks for the following two days.

The antecedent moisture condition (AMC) of the watershed is also evaluated. AMC is a subjective measure of runoff potential. AMC I represents low runoff potential, such as from a dry watershed. AMC II represents moderate runoff potential. AMC III represents high runoff potential, such as a watershed saturated from previous rain events. Based on the QPF and AMC, the following guidelines are recommended in determining when a wet-weather sample should be collected:

- AMC I and QPF of ½ inch of precipitation in 24 hours
- AMC II and QPF of $^{3}/_{8}$ inch of precipitation in 24 hours
- AMC III and QPF of ¼ inch of precipitation in 24 hours

These guidelines may be modified based on differences success at implementing them in the field.

Table G-10 summarizes the storm parameters for the dates samples were collected, including the Qualitative Precipitation Forecast (QPF), length of storm, and total amount of rain that fell during the storm.

Table G-10. Upper Santa Margarita Watershed Storm History

Start Date	24-hr QPF (in.)	# hours of rain[2]	Total amt of rain[3] (in.)	Sampled?	Comments
7/14/2004	N/A[4]	0	0	Yes	Dry weather
10/6/2004	N/A	0	0	Yes	Dry weather
10/20/2004	2.0	14	2.46	Yes	Wet weather
12/28/2004	2.0	44	3.34	Yes	Wet weather
2/11/2005	1.8	42	1.7	Yes	Wet weather
3/31/2005	N/A	0	0	Yes	Dry weather
5/10/2005	N/A	0	0	Yes	Dry weather
5/11/2005	N/A	0	0	Yes	Dry weather
6/7/2005	N/A	0	0	Yes	Dry weather

G-6.1 Conditions for Collection of First Wet Weather Storm Sample

Monitoring and Reporting Program for Board Order R9-2004-001 states, “Sampling at triad stations shall begin no later than the first storm after October 2004 that produces sufficient flow to collect a composite sample. (M&RP Provision II.A.I.1.e)”

Forecasted weather, however, indicated that several significant storms were to occur in mid to late October. Despite not being required to collect samples until November, the Permittees monitored weather

[2] Based on an average of the four rain gauges listed on Table G-6.
[3] Based on an average of the four rain gauges listed on Table G-6.
[4] QPFs are typically not available prior to November 15.

reports to try to ensure that they captured the first wet weather event of the season.

The first event generating flow during the reporting period occurred on October 17, 2004. The District first became aware of the event after 4:00 p.m., on Friday, October 15. Once District staff was alerted, staff continued to stay in contact with NWS weather forecasters through mid-day Saturday, at which point a decision regarding whether to mobilize had to be made. The predicted rainfall depths from the attached October 16, 2004 Quantitative Precipitation Forecast (QPF) from the National Weather Service (NWS) predicted no more than 0.3" between 10:00 p.m., Saturday, October 16 and 4:00 a.m., Monday, October 18. The predicted depths did not meet the District's established criteria for a sampleable storm under dry (AMC I) watershed conditions and District staff were not mobilized.

Actual precipitation commenced just after midnight on Sunday, October 17, 2004 and lasted until approximately 10:00 am Sunday morning. Sporadic rainfall continued to occur throughout the evening. The total measured rainfall depth on Sunday was approximately 0.78", significantly higher than the predicted 0.3". However, the flow rate at the USGS station at Santa Margarita only increased to 38 cfs from its base flow of 3 cfs due to AMC I conditions. Significant response to the rainfall event did not occur until after five hours of rainfall (estimated cumulative rainfall depth of between 0.4" and 0.6"), and the peak flow rate did not occur until 5:15 p.m., almost seven hours after rainfall ceased.

A second significant storm moved into the watershed on Monday October 20. Predicted rainfall depths for this event were in excess of 2”, and the District did mobilize and capture wet weather samples at triad and tributary stations. Actual rainfall depths for this event measured approximately 2.33" near Temecula. Peak flow rates that day exceeded 5,000 cfs.

G-7.0 A description of monitoring results:

G-7.1 Data and data products

G-7.1.1 Actual Data

Chemical data is summarized in graphs contained in the electronic version of Attachment A.

Toxicity testing data are summarized in Table G-11.

Bioassessment data is summarized in Table G-12.

G-7.1.2 Identification of Parameters Detected Above BPO and CTR Objectives

Table G-13 provides a summary of parameters detected above a Basin Plan Objective (BPO) and Table G-14 provides a summary of parameters that were detected above a California Toxics Rule (CTR) objective. The corresponding figures that display these results are provided in Table G-15.

There were a number of instances where the analytical result was reported as less than the laboratory's established Reporting Detection Limit (RDL). For some of the results, such as 4,4-DDT, the RDL was greater than the BPO or the CTR. This incompatibility prevents comparison between the RDL and the CTR or BPO; therefore, these non-detect results were considered estimates. During the next reporting period the District will work with the analytical laboratory to establish a RDL that is less than the CTR or BPO, as appropriate. A station-by-station analysis of the comparisons along with how these comparisons relate to toxicity and bioassessment is provided in Section G.7.2.1.

G-7.1.3 Estimated annual mass loadings at each station.

Estimated instantaneous and annual mass loads were calculated for detected parameters at each of the Triad stations. The estimated instantaneous mass load results are displayed in Table G-16 and estimated annual mass loadings are displayed in Table G-17. Estimated annual mass loads were calculated by multiplying the mean concentration by the total volume of water that passed through each station. Total flow volumes were obtained from nearby USGS gauging stations. Estimated annual mass loads represent, at the most, only three sampling events. Therefore, the estimated annual mass loads provide only a crude estimate of pollutant loading and not representative of the entire monitoring period.

G-7.1.4 Toxicity testing results in Toxic Units (TUs)

Table G-11. Toxicity Testing Results in Toxic Units

	Acute Toxicity *Hyallea azteca*	**Acute Toxicity Ceriodaphnia**	**Chronic Toxicity Selenastrum capricornutum**
Cole Creek 10/20/04	0	0	1
Cole Creek 12/28/04	0.41	0	1
Cole Creek 2/11/05	0	0	>1
Temecula Creek 10/20/04	0	0	1
Temecula Creek 12/28/04	>1	0	1
Temecula Creek 2/11/05	0.82	0	1
Murrieta Creek 10/20/04	0	0	1
Murrieta Creek 12/28/04	>1	0	1
Murrieta Creek 2/11/05	0.77	0	1

Chronic toxicity was only observed in one of the Cole Creek samples and acute toxicity was observed for *H. azteca* in some samples. No acute toxicity was observed for *Ceriodaphnia.*

G-7.1.5 Bioassessment Data and Analysis using metrics in the CSBP and San Diego Index of Biotic Integrity (IBI)

Three stream bioassessment monitoring sites were monitored and evaluated within the upper Santa Margarita River watershed above the confluence of Murrieta and Temecula Creeks. Two of the sampling locations were selected based upon their proximity to urban development with one sampling location located in Murrieta Creek and the other in Temecula Creek. The Murrieta Creek site was located below the gauging station on a section of bedrock at latitude 33º 30’ 544” and longitude 117º 15’ 404”. The Temecula site was located just west of the I-15 Freeway, before its confluence with Murrieta Creek at latitude 33º 28’ 792” and longitude 117º 08’ 636”. The third site, Adobe Creek, was selected as a reference site and was located within the Santa Rosa Plateau Reserve. The Adobe Creek site is located in a small ravine just below its source at latitude 33º 28’ 470” and longitude 117º 08’ 351”. Station summaries identifying the rough locations where each bioassessment sample was collected are included in Section G-3.0.

Bioassessment data were collected in the fall of 2004 and in the spring of 2005. This data and the qualitative ratings presented below in Table G-12. Analysis of these metrics is contained in Section G-7.3.2.

Table G-12 Selected Biological Metrics and Habitat Parameters of the Upper Santa Margarita Watershed

	Murrieta Creek		Temecula Creek		Adobe Creek	
Survey Date	**Oct 04**	**May 05**	**Oct 04**	**May 05**	**Oct 04**	**May 05**
Metrics						
Index of biotic Integrity/Qualitative Rating	32 (Fair)	16 (Poor)	24 (Poor)	2 (Very Poor)	56 (Good)	53 (Good)
Taxa Richness	19	9	17	11	23	25
EPT Taxa	7	3	3	1	11	12
% Intolerant Taxa	1%	0.1%	0%	0%	2.6%	40%
Grazers	15%	0.3%	<1%	<1%	6%	0.9%
Shannon Diversity	1.82	1.52	2.14	1.29	2.28	2.14
Sensitive EPT Taxa	1.0%	0.1%	0.3%	0.1%	11%	41%
Percent Dominant Taxa	45.5%	33%	25.2%	52%	30.1%	37%
Habitat Parameters						
Physical Habitat Score	129 (Sub optimal)	101 (Marginal)	114 (Sub optimal)	84 (Marginal)	110 (Sub optimal	115 (Sub optimal
Elevation	98 Feet		968 Feet		1,614 Feet	
Riffle Frequency	15	50	15	4	10	4
Sediment Deposition	16	5	7	1	10	18
Instream Cover	10	12	12	10	15	11
Embeddedness	19	5	6	1	14	18
Channel Flow	10	7	5	5	7	8
Channel Alteration	11	11	14	11	13	14
Bank Stability	18	14	18	10	9	10
Velocity/Depth Ragime	11	10	7	8	6	6
Vegetative Protection	11	14	18	18	10	10
Riparian Vegetation Zone Width	8	18	12	16	16	16

G-7.1.6 Graphical Summaries of Data

Graphical summaries of the chemical and toxicity data collected between 1993 and 2005 from the Santa Margarita watershed are provided in Attachment A.

Table G-13. Riverside County Flood Control and Water Conservation District
Water Quality Parameters Measured Above Basin Plan Objectives (Percent)
Period 07/01/1993 - 07/01/2005

	Cole Creek	Lower Temecula Creek	Lower Murrieta Creek	Long Canyon Creek	Warm Springs Creek	Redhawk Channel'	Santa Gertudis Creek	Adobe Creek
Parameter	188	777	778	780	397	768	774	188
Antimony	0	0	0	0	0	0	0	0
Arsenic	0	0	0	0	0	0	0	0
Bact, fecal coliforms	50	50	50	100	100	57.1	66.7	0
Barium	0	0	0	0	0	2.9	0	0
Beryllium	0	0	0	0	0	0	0	0
Boron	0	0	0	0	0	14.7	0	0
Cadmium	0	0	0	0	0	5.9	25	0
Chloride	0	0	0	0	0	0	0	0
Chromium, all valences	25	4.2	0	0	0	2.9	25	100
Color	100	100	94.7	100	100	100	100	0
Copper	0	0	0	100	100	0	0	0
Cyanide, total	0	0	0	0	0	0	0	0
Detergent-Methylene Blue Active Substances	0	0	0	0	0	2.7	0	0
Fluoride	0	0	0	0	0	21.2	0	Not Sampled
Iron	Not Sampled	Not Sampled	Not Sampled	Not Sampled	100	87.5	100	0
Manganese	Not Sampled	Not Sampled	Not Sampled	0	0	100	57.1	0
Mercury	0	0	0	0	0	0	0	0
Nickel	0	0	0	0	0	3.3	0	0
Nitrogen, nitrate (as N)	0	0	0	0	0	2.6	0	0
Nitrogen, total (as N)	40	52.6	57.9	0	0	97.4	71.4	0
Odor	0	0	5.3	100	100	5.9	0	100
Oxygen, dissolved field conc	0	20	8.1	100	0	8	0	0
Phosphorus, total (as P)	42.9	73.9	52.4	100	100	100	100	0
Selenium	0	0	0	0	0	0	0	0
Silver	0	0	0	0	0	0	0	0
Solids, total dissolved (residue)	0	100	23.7	0	33	60.5	0	0
Sulfate (SO4)	0	89.5	2.6	0	0	2.9	0	0
Thallium	0	0	0	0	0	0	14.3	0
Turbidity, field	50	27.8	18.8	0	0	52	50	0
Turbidity, lab	57.1	17.4	19	100	67	23.5	66.7	0
Zinc	0	0	0	0	0	0	0	0
pH, field	0	4.8	15.8	25	67	40.6	75	0
pH, lab	0	0	0	0	0	28.9	14.3	

Table G-14. Riverside County Flood Control and Water Conservation District
Water Quality Parameters Measured Above California Toxics Rule Plan Objective (Percent)

Period 07/01/2004 - 06/30-2005

	Cole Creek	Lower Temecula Creek	Lower Murrieta Creek	Long Canyon Creek	Warm Springs Creek	Redhawk Channel'	Santa Gertudis Creek	Adobe Creek
	188	777	778	780	397	768	774	848
Parameter								
Copper	33	80	50	75	33	38	33	0
Lead	0	60	50	50	0	0	0	0
4,4'-DDE	0	50	0	0	0	0	0	0
Selenium	0	0	100	0	0	0	0	0
Zinc	0	20	33	0	0	0	0	0

TABLE G-16
STATION 188 COLE CREEK ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

			Station Number:	188	188	188	188	188	188	188	188	188	188	188	188
			Station Name:	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek	Cole Creek
	Water Quality Objectives		Sample ID:	A4J1836-01	A4J1848-01	A4L2341-01	A4L2532-01	A4L2566-01	A4L2566-02	A5B0967-01	A5B0967-02	A6B0967-03	A5B1122-01	A5B1157-01	A5B1157-02
	BPO	CTR	Sample Date:	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04	12/28/04	02/11/05	02/11/06	02/11/05	02/11/05	02/11/05	02/11/05
Bacteria															
Bact, fecal coliforms	2000		mpn	-	-	11000	-	-	-	500	2300	500	-	-	-
Bact, total coliforms			mpn	-	-	160000	-	-	-	17000	5000	11000	-	-	-
Bact, Escherichia Coli			mpn	-	-	11000	-	-	-	500	2300	500	-	-	-
General Minerals															
Conductance, specific -field			umho/cm	-	-	-	-	-	-	402	400	394	-	-	-
Conductance, specific -lab			umho/cm	-	-	-	350	-	-	-	-	-	400	-	-
Hardness, total (CaCO3)			mg/l	-	-	-	130	-	-	-	-	-	120	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	-	-	0.74	-	-	-	-	-	0.26	-	-
pH, field	8.5		units	-	-	-	-	-	-	8.3	8	8.13	-	-	-
pH, lab	8.9		units	-	-	-	7.4	-	-	-	-	-	8	-	-
Phosphorus, total (P)	0.1		mg/l	-	-	-	0.25	-	-	-	-	-	<0.05	-	-
Solids, total suspended(residu)			mg/l	-	-	-	240	-	-	-	-	-	8	-	-
Temperature, field-Centigrade			degree C	-	-	-	-	-	-	12.2	12.6	12.3	-	-	-
Turbidity, lab	20		ntu	-	-	-	220	-	-	-	-	-	16	-	-
Metals															
Arsenic	0.05	0.15	mg/l	-	0.0076	-	-	-	-	-	-	-	-	-	-
Calcium			mg/l	-	-	-	27	-	-	-	-	-	29	-	-
Chromium, all valences	0.05		mg/l	-	0.086	-	0.013	-	-	-	-	-	0.0016	-	-
Copper	1	0.009	mg/l	-	0.077	-	0.0099	-	-	-	-	-	0.0022	-	-
Lead		0.0025	mg/l	-	0.019	-	0.003	-	-	-	-	-	<0.0005	-	-
Magnesium			mg/l	-	-	-	14	-	-	-	-	-	12	-	-
Nickel	0.1	0.052	mg/l	-	0.032	-	0.0032	-	-	-	-	-	<0.001	-	-
Zinc	5	0.12	mg/l	-	0.12	-	0.023	-	-	-	-	-	0.0025	-	-
Pesticides & PCBs															
Chlorpyrifos (ELISA)			ug/l	-	-	-	-	-	0.0167	-	-	-	-	-	0.0166
Diazinon			ug/l	-	-	-	-	-	0.0086	-	-	-	-	-	0.0098
Semi-Volatile Organic Compounds															
bis(2-ethylhexyl)phthalate			ug/l	-	33	-	-	-	-	-	-	-	-	-	-
Toxicity Testing															
Toxicity, Acute Hyalleia Azteca			tua	0	-	-	-	0.41	-	-	-	-	-	0	-
Toxicity, Chronic Selenastrum			tuc	1	-	-	-	1	-	-	-	-	-	1	-
Volatile Organic Compounds															
Methylene chloride			ug/l	-	4.3	-	-	-	-	-	-	-	-	-	-

TABLE G-17
STATION 848 ADOBE CREEK
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4J0480-01	A4J0482-01	A4J0486-01	A5E0881-01	A5E0918-01	A5E0924-01
	BPO	CTR	Sample Date:	10/06/04	10/06/04	10/06/04	05/10/05	05/10/05	05/10/05
Bacteria									
Bact, fecal coliforms	2000		mpn	800	-	-	300	-	-
Bact, total coliforms			mpn	800	-	-	1300	-	-
Bact,Escherichia Coli			mpn	800	-	-	300	-	-
General Minerals									
Conductance, specific -field			umho/cm	-	437	-	-	522	-
Conductance, specific -lab			umho/cm	-	430	-	-	470	-
Hardness, total (CaCO3)			mg/l	-	170	-	-	150	-
Nitrogen, nitrate (N)	1		mg/l	-	<0.2	-	-	0.38	-
Nitrogen, total Kjeldahl (N)			mg/l	-	0.13	-	-	0.18	-
Oxygen, dissolved field conc	5		mg/l	-	7.95	-	-	15.4	-
pH, field	8.5		units	-	7.7	-	-	7.41	-
pH, lab	8.5		units	-	7.9	-	-	7.7	-
Phosphorus, total (P)	0.1		mg/l	-	0.05	-	-	<0.05	-
Redox Potential, field			mv	-	-	-	-	202	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	330	-
Temperature, field-Centigrade			degree C	-	17.1	-	-	16	-
Turbidity, field	20		ntu	-	-	-	-	6.1	-
Turbidity, lab	20		ntu	-	1.6	-	-	2.3	-
Metals									
Calcium			mg/l	-	40	-	-	34	-
Chromium, all valences	0.05		mg/l	-	0.0006	-	-	0.002	-
Copper	1	0.009	mg/l	-	0.0007	-	-	0.0019	-
Magnesium			mg/l	-	17	-	-	16	-
Nickel	0.1	0.052	mg/l	-	<0.001	-	-	0.0014	-
Zinc	5	0.12	mg/l	-	<0.001	-	-	0.0024	-
Pesticides & PCBs									
Chlorpyrifos (ELISA)			ug/l	-	-	0.0176	-	4	0.0139
Diazinon			ug/l	-	-	0.0202	-	-	0.0059

TABLE G-18
STATION 777 TEMECULA CREEK BELOW PALA RD
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservatin District
Riverside County, California

	Water Quality Objectives BPO	CTR	Station Number:	777	777	777	777	777	777	777	777	777	777	777
			Station Name:	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd
			Sample ID:	A4J0397-01	A4J0423-01	A4J0428-01	A4J1824-01	A4J1838-01	A4L2365-01	A4L2561-01	A4L2565-01	A4L2565-02	A5B0980-01	A5B1016-01
			Sample Date:	10/06/04	10/06/04	10/06/04	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04	12/28/04	02/11/05	02/11/05
Bacteria														
Bact. fecal coliforms	2000		mpn	300	-	-	-	-	30000	-	-	-	7000	-
Bact. total coliforms			mpn	24000	-	-	-	-	160000	-	-	-	3800	-
Bact.Escherichia Coli			mpn	300	-	-	-	-	8000	-	-	-	700	-
General Minerals														
Ammonia-nitrogen			mg/l	-	<0.1	-	-	-	-	0.28	-	-	-	-
Conductance, specific -field			umho/cm	-	1567	-	-	-	-	-	-	-	-	-
Conductance, specific -lab			umho/cm	-	1900	-	-	-	-	180	-	-	-	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	<0.05	-	-	-	-	<0.5	-	-	-	-
Hardness, total (CaCO3)			mg/l	-	510	-	-	-	-	520	-	-	-	-
Nitrogen, nitrate (N)	1		mg/l	-	0.43	-	-	-	-	0.95	-	-	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	0.51	-	-	-	-	12	-	-	-	-
Oxygen, dissolved field conc	5		mg/l	-	9.07	-	-	-	-	-	-	-	-	-
pH, field	8.5		units	-	7.8	-	-	-	-	-	-	-	-	-
pH, lab	8.5		units	-	7.9	-	-	-	-	8.3	-	-	-	-
Phosphorus, total (P)	0.1		mg/l	-	0.12	-	-	-	-	4.4	-	-	-	-
Redox Potential, field			mv	-	-	-	-	-	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	-	-	-	-	-	-	-
Solids, total suspended(resdu)			mg/l	-	48	-	-	-	-	3200	-	-	-	-
Temperature, field-Centigrade			degree C	-	14.8	-	-	-	-	-	-	-	-	-
Turbidity, field	20		ntu	-	-	-	-	-	-	-	-	-	-	-
Turbidity, lab	20		ntu	-	16	-	-	-	-	0	-	-	-	-
Metals														
Cadmium	0.005	0.0022	mg/l	-	<0.00025	-	-	<0.0012	-	0.0011	-	-	-	-
Calcium			mg/l	-	150	-	-	-	-	80	-	-	-	-
Chromium, all valences	0.05		mg/l	-	0.0012	-	-	0.046	-	0.099	-	-	-	-
Copper	1	0.009	mg/l	-	0.0016	-	-	0.038	-	0.058	-	-	-	-
Lead		0.0025	mg/l	-	<0.0005	-	-	0.0095	-	0.047	-	-	-	-
Magnesium			mg/l	-	34	-	-	-	-	76	-	-	-	-
Nickel	0.1	0.052	mg/l	-	0.0025	-	-	0.025	-	0.047	-	-	-	-
Zinc	5	0.12	mg/l	-	0.0021	-	-	0.11	-	0.28	-	-	-	-
Pesticides & PCBs														
Chlorpyrifos (ELISA)			ug/l	-	-	0.0149	-	-	-	-	-	0.0278	-	-
4,4'-dde			ug/l	-	-	-	-	0.085	-	-	-	-	-	-
Diazinon			ug/l	-	-	0.0282	-	-	-	-	-	0.0545	-	-
Simazine			ug/l	-	<4	-	-	-	-	<4	-	-	-	-
Toxicity Testing														
Toxicity, Acute Hyallela Azteca			tua	-	-	-	0	-	-	-	1	-	-	0.82
Toxicity, Chronic Selenastrum			tuc	-	-	-	1	-	-	-	1	-	-	1
Volatile Organic Compounds														
Methylene chloride			ug/l	-	<0.5	-	-	3.8	-	-	-	-	-	-

TABLE G-18
STATION 777 TEMECULA CREEK BELOW PALA RD
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservatin District
Riverside County, California
Page 2 of 2

	Water Quality Objectives		Station Number:	777	777	777	777	777
			Station Name:	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd
			Sample ID:	A5B1016-02	A5B1123-01	A5E0977-02	A5E0991-02	A5E0994-02
	BPO	CTR	Sample Date:	02/11/05	02/11/05	05/11/05	05/11/05	05/11/05
Bacteria								
Bact, fecal coliforms	2000		mpn	-	-	300	-	-
Bact, total coliforms			mpn	-	-	160000	-	-
Bact,Escherichia Coli			mpn	-	-	300	-	-
General Minerals								
Ammonia-nitrogen			mg/l	-	<0.1	-	<0.1	-
Conductance, specific -field			umho/cm	-	-	-	1380	-
Conductance, specific -lab			umho/cm	-	720	-	1200	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	<0.1	-	0.06	-
Hardness, total (CaCO3)			mg/l	-	240	-	370	-
Nitrogen, nitrate (N)	1		mg/l	-	1.4	-	1.1	-
Nitrogen, total Kjeldahl (N)			mg/l	-	1.4	-	1.3	-
Oxygen, dissolved field conc	5		mg/l	-	-	-	13.66	-
pH, field	8.5		units	-	-	-	7.67	-
pH, lab	8.5		units	-	7.8	-	7.6	-
Phosphorus, total (P)	0.1		mg/l	-	0.51	-	0.38	-
Redox Potential, field			mv	-	-	-	202	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	900	-
Solids, total suspended(resdu)			mg/l	-	310	-	120	-
Temperature, field-Centigrade			degree C	-	-	-	19.5	-
Turbidity, field	20		ntu	-	-	-	56.9	-
Turbidity, lab	20		ntu	-	330	-	47	-
Metals								
Cadmium	0.005	0.0022	mg/l	-	<0.00025	-	<0.00025	-
Calcium			mg/l	-	63	-	100	-
Chromium, all valences	0.05		mg/l	-	0.016	-	0.0075	-
Copper	1	0.009	mg/l	-	0.016	-	0.3	-
Lead		0.0025	mg/l	-	0.0045	-	0.0014	-
Magnesium			mg/l	-	20	-	27	-
Nickel	0.1	0.052	mg/l	-	0.007	-	0.0043	-
Zinc	5	0.12	mg/l	-	0.045	-	0.024	-
Pesticides & PCBs								
Chlorpyrifos (ELISA)			ug/l	0.0268	-	-	-	0.0167
4,4'-dde			ug/l	-	-	-	-	-
Diazinon			ug/l	0.035	-	-	-	0.0052
Simazine			ug/l	-	6	-	<4	-
Toxicity Testing								
Toxicity, Acute Hyalela Azteca			tua	-	-	-	-	-
Toxicity, Chronic Selenastrum			tuc	-	-	-	-	-
Volatile Organic Compounds								
Methylene chloride			ug/l	-	-	-	<0.5	-

TABLE G-19
STATION 778 MURRIETA CREEK AT TEMECULA ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4G1131-03	A4G1139-02	A4J0397-02	A4J0423-02	A4J0428-02	A4J1826-01	A4J1846-01	A4L2438-01	A4L2539-01	A4L2559-01
	BPO	CTR	Sample Date:	07/14/04	07/14/04	10/06/04	10/06/04	10/06/04	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04
Bacteria													
Bact. fecal coliforms	2000		mpn	-	-	<20	-	-	-	-	7000	-	-
Bact. total coliforms			mpn	-	-	800	-	-	-	-	160000	-	-
Bact.Escherichia Coli			mpn	-	-	<20	-	-	-	-	7000	-	-
General Minerals													
Alkalinity, total (CaCO3)			mg/l	250	-	-	-	-	-	-	-	-	-
Ammonia-nitrogen			mg/l	<0.1	-	-	<0.1	-	-	-	-	0.19	-
Bicarbonate (HCO3)			mg/l	310	-	-	-	-	-	-	-	-	-
Carbon, total organic (TOC)			mg/l	6	-	-	-	-	-	-	-	-	-
Chloride			mg/l	170	-	-	-	-	-	-	-	-	-
Color	0.05		units	10	-	-	-	-	-	-	-	-	-
Conductance, specific -field			umho/cm	1700	-	-	1440	-	-	-	-	-	-
Conductance, specific -lab			umho/cm	1300	-	-	1400	-	-	-	-	220	-
ElectroChemical Balance			me/l	0.2	-	-	-	-	-	-	-	-	-
Fluoride	1		mg/l	0.5	-	-	-	-	-	-	-	-	-
Hardness, total (CaCO3)			mg/l	310	-	-	290	-	-	-	-	170	-
Nitrogen, nitrate (N)	1		mg/l	0.36	-	-	<0.2	-	-	-	-	0.56	-
Nitrogen, organic (N)			mg/l	0.5	-	-	-	-	-	-	-	-	-
Nitrogen, total (N)			mg/l	0.99	-	-	-	-	-	-	-	-	-
Nitrogen, total Kjeldahl (N)			mg/l	0.63	-	-	0.5	-	-	-	-	2.9	-
Oxygen Demand, chemical (COD)			mg/l	41	-	-	-	-	-	-	-	-	-
Oxygen, dissolved field conc	5		mg/l	11.7	-	-	6.43	-	-	-	-	-	-
pH, field	8.5		units	7.7	-	-	7.5	-	-	-	-	-	-
pH, lab	8.5		units	8.1	-	-	7.9	-	-	-	-	7.9	-
Phosphorus, total (P)	0.1		mg/l	0.21	-	-	0.05	-	-	-	-	1.2	-
Phosphorus,total dissolved(P)			mg/l	0.063	-	-	-	-	-	-	-	-	-
Phosphorus,total insoluble(P)			mg/l	0.15	-	-	-	-	-	-	-	-	-
Redox Potential, field			mv	-	-	-	-	-	-	-	-	-	-
Solids, total			mg/l	930	-	-	-	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	-	-	-	-	-	-
Solids, total dissolved(resdu)	750		mg/l	820	-	-	-	-	-	-	-	-	-
Solids, total suspended(resdu)			mg/l	110	-	-	<5	-	-	-	-	1200	-
Sulfate (SO4)			mg/l	150	-	-	-	-	-	-	-	-	-
Temperature, field-Centigrade			degree C	31.8	-	-	18.6	-	-	-	-	-	-
Total Cations			units	13.1	-	-	-	-	-	-	-	-	-
Turbidity, field	20		ntu	290	-	-	-	-	-	-	-	-	-
Turbidity, lab	20		ntu	110	-	-	2.2	-	-	-	-	990	-
Metals													
Arsenic	0.05	0.15	mg/l	0.0071	-	-	-	-	-	0.0056	-	-	-
Barium			mg/l	0.13	-	-	-	-	-	-	-	-	-
Boron			mg/l	0.3	-	-	-	-	-	-	-	-	-
Cadmium	0.005	0.0022	mg/l	<0.002	-	-	<0.00025	-	-	<0.0012	-	0.00038	-
Calcium			mg/l	77	-	-	56	-	-	-	-	26	-
Chromium, all valences	0.05		mg/l	<0.02	-	-	0.0009	-	-	0.047	-	0.042	-
Copper	1	0.009	mg/l	<0.01	-	-	0.0018	-	-	0.037	-	0.036	-
Lead		0.0025	mg/l	<0.01	-	-	<0.0005	-	-	0.015	-	0.015	-
Magnesium			mg/l	27	-	-	35	-	-	-	-	25	-
Nickel	0.1	0.052	mg/l	<0.02	-	-	0.002	-	-	0.02	-	0.017	-
Potassium			mg/l	4.3	-	-	-	-	-	-	-	-	-

TABLE G-19
STATION 778 MURRIETA CREEK AT TEMECULA ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4G1131-03	A4G1139-02	A4J0397-02	A4J0423-02	A4J0428-02	A4J1826-01	A4J1846-01	A4L2438-01	A4L2539-01	A4L2559-01
	BPO	CTR	Sample Date:	07/14/04	07/14/04	10/06/04	10/06/04	10/06/04	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04
Selenium	0.05	0.005	mg/l	0.0058	-	-	-	-	-	<0.005	-	-	-
Sodium			mg/l	160	-	-	-	-	-	-	-	-	-
Zinc	5	0.12	mg/l	<0.01	-	-	0.0013	-	-	0.14	-	0.19	-
Pesticides & PCBs													
Chlorpyrifos (ELISA)			ug/l	-	0.0062	-	-	0.0111	-	-	-	-	-
Diazinon			ug/l	-	0.0133	-	-	0.0262	-	-	-	-	-
Simazine			ug/l	-	-	-	<4	-	-	-	-	32	-
Toxicity Testing													
Toxicity, Acute Hyalella Azteca			tua	-	-	-	-	-	0	-	-	-	1
Toxicity, Chronic Selenastrum			tuc	-	-	-	-	-	1	-	-	-	1
Volatile Organic Compounds													
Methylene chloride			ug/l	-	-	-	<0.5	-	-	4.5	-	-	-

TABLE G-19
STATION 778 MURRIETA CREEK AT TEMECULA ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4L2559-02	A5B0982-01	A5B1033-01	A5B1033-02	A5B1124-01	A5E0977-01	A5E0991-01	A5E0994-01
	BPO	CTR	Sample Date:	12/28/04	02/11/05	02/11/05	02/11/05	02/11/05	05/11/05	05/11/05	05/11/05
Bacteria											
Bact. fecal coliforms	2000		mpn	-	13000	-	-	-	40	-	-
Bact. total coliforms			mpn	-	160000	-	-	-	800	-	-
Bact.Escherichia Coli			mpn	-	13000	-	-	-	40	-	-
General Minerals											
Alkalinity, total (CaCO3)			mg/l	-	-	-	-	-	-	-	-
Ammonia-nitrogen			mg/l	-	-	-	-	<0.1	-	<0.1	-
Bicarbonate (HCO3)			mg/l	-	-	-	-	-	-	-	-
Carbon, total organic (TOC)			mg/l	-	-	-	-	-	-	-	-
Chloride			mg/l	-	-	-	-	-	-	-	-
Color	0.05		units	-	-	-	-	-	-	-	-
Conductance, specific -field			umho/cm	-	328	-	-	-	-	1280	-
Conductance, specific -lab			umho/cm	-	-	-	-	380	-	1100	-
ElectroChemical Balance			me/l	-	-	-	-	-	-	-	-
Fluoride	1		mg/l	-	-	-	-	-	-	-	-
Hardness, total (CaCO3)			mg/l	-	-	-	-	130	-	330	-
Nitrogen, nitrate (N)	1		mg/l	-	-	-	-	0.43	-	<0.2	-
Nitrogen, organic (N)			mg/l	-	-	-	-	-	-	-	-
Nitrogen, total (N)			mg/l	-	-	-	-	-	-	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	-	-	-	1	-	0.27	-
Oxygen Demand, chemical (COD)			mg/l	-	-	-	-	-	-	-	-
Oxygen, dissolved field conc	5		mg/l	-	-	-	-	-	-	14.4	-
pH, field	8.5		units	-	8.5	-	-	-	-	7.7	-
pH, lab	8.5		units	-	-	-	-	8	-	8	-
Phosphorus, total (P)	0.1		mg/l	-	-	-	-	0.48	-	0.21	-
Phosphorus,total dissolved(P)			mg/l	-	-	-	-	-	-	-	-
Phosphorus,total insoluble(P)			mg/l	-	-	-	-	-	-	-	-
Redox Potential, field			mv	-	-	-	-	-	-	203	-
Solids, total			mg/l	-	-	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	-	-	800	-
Solids, total dissolved(resdu)	750		mg/l	-	-	-	-	-	-	-	-
Solids, total suspended(resdu)			mg/l	-	-	-	-	300	-	<5	-
Sulfate (SO4)			mg/l	-	-	-	-	-	-	-	-
Temperature, field-Centigrade			degree C	-	12.7	-	-	-	-	15.8	-
Total Cations			units	-	-	-	-	-	-	-	-
Turbidity, field	20		ntu	-	-	-	-	-	-	6.4	-
Turbidity, lab	20		ntu	-	-	-	-	350	-	2.2	-
Metals											
Arsenic	0.05	0.15	mg/l	-	-	-	-	-	-	-	-
Barium			mg/l	-	-	-	-	-	-	-	-
Boron			mg/l	-	-	-	-	-	-	-	-
Cadmium	0.005	0.0022	mg/l	-	-	-	-	<0.00025	-	<0.00025	-
Calcium			mg/l	-	-	-	-	30	-	81	-
Chromium, all valences	0.05		mg/l	-	-	-	-	0.013	-	0.0031	-
Copper	1	0.009	mg/l	-	-	-	-	0.013	-	0.0046	-
Lead		0.0025	mg/l	-	-	-	-	0.0048	-	<0.0005	-
Magnesium			mg/l	-	-	-	-	14	-	29	-
Nickel	0.1	0.052	mg/l	-	-	-	-	0.0049	-	0.0024	-
Potassium			mg/l	-	-	-	-	-	-	-	-

TABLE G-19
STATION 778 MURRIETA CREEK AT TEMECULA ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4L2559-02	A5B0982-01	A5B1033-01	A5B1033-02	A5B1124-01	A5E0977-01	A5E0991-01	A5E0994-01
	BPO	CTR	Sample Date:	12/28/04	02/11/05	02/11/05	02/11/05	02/11/05	05/11/05	05/11/05	05/11/05
Selenium	0.05	0.005	mg/l	-	-	-	-	-	-	-	-
Sodium			mg/l	-	-	-	-	-	-	-	-
Zinc	5	0.12	mg/l	-	-	-	-	0.04	-	0.0033	-
Pesticides & PCBs											
Chlorpyrifos (ELISA)			ug/l	0.0222	-	-	0.0256	-	-	-	0.0148
Diazinon			ug/l	0.0522	-	-	0.0523	-	-	-	0.008
Simazine			ug/l	-	-	-	-	<4	-	<4	-
Toxicity Testing											
Toxicity, Acute Hyallela Azteca			tua	-	-	0.77	-	-	-	-	-
Toxicity, Chronic Selenastrum			tuc	-	-	1	-	-	-	-	-
Volatile Organic Compounds											
Methylene chloride			ug/l	-	-	-	-	-	-	<0.5	-

Table G-20
INSTANTANEOUS MASS LOADING
Riverside Flood Control and Water Conservation District

	Station Number:	188	188	188	848
	Station Name:	Cole Creek	Cole Creek	Cole Creek	Adobe Creek
	Sample Date:	10/20/04	12/28/04	02/11/05	05/10/05
	Flow (cfs):	2013	1937	20393	0.36
Analyte Class	Analyte	Load (lbs/day)	Load (lbs/day)	Load (lbs/day)	Load (lbs/day)
Nutrients	Ammonia-nitrogen				
	Nitrogen, nitrate (N)				0.737
	Nitrogen, total Kjeldahl (N)		7730	28600	0.349
	Phosphorus, total (P)		2610		
Physical Properties	Hardness, total (CaCO3)		1360000	13200000	291
	Solids, total dissolved(FdMtr)				640
	Oxygen, dissolved field conc				29.9
	Solids, total suspended(resdu)		2510000	879000	
Metals	Arsenic	82.5			
	Cadmium				
	Calcium		282000	3190000	66
	Chromium, all valences	933	136	176	0.0039
	Copper	835	103	242	0.0037
	Lead	206	31.3		
	Magnesium		146000	1320000	31
	Nickel	347	33.4		0.0027
	Zinc	1300	240	275	0.0047
Pesticides	Chlorpyrifos (ELISA)		0.174	1.82	0
	4,4'-dde				
	Diazinon		0.0898	1.08	0
	Simazine				
SVOCs	bis(2-ethylhexyl)phthalate	358			
VOCs	Methylene chloride	46.7			

Table G-20
INSTANTANEOUS MASS LOADING
Riverside Flood Control and Water Conservation District

	Station Number:	777	777	777
	Station Name:	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd	Temecula Creek below Pala Rd
	Sample Date:	10/20/04	12/28/04	02/11/05
	Flow (cfs):	8953	10867	433
Analyte Class	Analyte	Load (lbs/day)	Load (lbs/day)	Load (lbs/day)
Nutrients	Ammonia-nitrogen		15200	
	Nitrogen, nitrate (N)		55600	3270
	Nitrogen, total Kjeldahl (N)		703000	3270
	Phosphorus, total (P)		258000	1190
Physical Properties	Hardness, total (CaCO3)		30500000	560000
	Solids, total dissolved(FdMtr)			
	Oxygen, dissolved field conc			
	Solids, total suspended(resdu)		187000000	723000
Metals	Arsenic			
	Cadmium		64.4	
	Calcium		4690000	147000
	Chromium, all valences	2220	5800	37.3
	Copper	1830	3400	37.3
	Lead	458	2750	10.5
	Magnesium		4450000	46700
	Nickel	1210	2750	16.3
	Zinc	5310	16400	105
Pesticides	Chlorpyrifos (ELISA)		1.63	0.0602
	4,4'-dde	3.14		
	Diazinon		3.19	0.0817
	Simazine			11.7
SVOCs	bis(2-ethylhexyl)phthalate			
VOCs	Methylene chloride	188		

Table G-20
INSTANTANEOUS MASS LOADING
Riverside Flood Control and Water Conservation District

	Station Number:	778	778	778
	Station Name:	Murrieta Creek at Temecula	Murrieta Creek at Temecula	Murrieta Creek at Temecula
	Sample Date:	10/20/04	12/28/04	02/11/05
	Flow (cfs):	44773	96347	625
Analyte Class	Analyte	Load (lbs/day)	Load (lbs/day)	Load (lbs/day)
Nutrients	Ammonia-nitrogen		98700	
	Nitrogen, nitrate (N)		291000	1450
	Nitrogen, total Kjeldahl (N)		1510000	3370
	Phosphorus, total (P)		623000	1620
Physical Properties	Hardness, total (CaCO3)		88300000	438000
	Solids, total dissolved(FdMtr)			
	Oxygen, dissolved field conc			
	Solids, total suspended(resdu)		623000000	1010000
Metals	Arsenic	1350		
	Cadmium		197	
	Calcium		13500000	101000
	Chromium, all valences	11300	21800	43.8
	Copper	8930	18700	43.8
	Lead	3620	7790	16.2
	Magnesium		13000000	47200
	Nickel	4830	8830	16.5
	Zinc	33800	98700	135
Pesticides	Chlorpyrifos (ELISA)		11.5	0.0862
	4,4'-dde			
	Diazinon		27.1	0.176
	Simazine		16600	
SVOCs	bis(2-ethylhexyl)phthalate			
VOCs	Methylene chloride	1090		

Table G-21
ANNUAL MASS LOADING
Riverside Flood Control and Water Conservation District

	Station Number:	188		848	
	Station Name:	Cole Creek		Adobe Creek	
	Flow (actf/yr):	3910523		173.5	
Analyte Class	Analyte	Average Concentration (mg/l)	Load	Average Concentration (mg/l)	Load
Nutrients, Anions, Physical Properties and Demand	Alkalinity, total (CaCO3)				
	Ammonia-nitrogen				
	Bicarbonate (HCO3)				
	Carbon, total organic (TOC)				
	Chloride				
	Detergent-MethyleneBlueActiveS				
	ElectroChemical Balance				
	Fluoride				
	Hardness, total (CaCO3)	125	1.315E+12	160	74700000
	Nitrogen, nitrate (N)			0.38	177000
	Nitrogen, organic (N)				
	Nitrogen, total (N)				
	Nitrogen, total Kjeldahl (N)	0.5	5260000000	0.155	72400
	Oxygen Demand, chemical (COD)				
	Oxygen, dissolved field conc			11.7	5450000
	Phosphorus, total (P)	0.25	2630000000	0.05	23400
	Phosphorus,total dissolved(P)				
	Phosphorus,total insoluble(P)				
	Solids, total				
	Solids, total dissolved(FdMtr)			330	154000000
	Solids, total dissolved(resdu)				
	Solids, total suspended(resdu)	124	1.305E+12		
	Sulfate (SO4)				
Metals	Arsenic	0.0076	80000000		
	Barium				
	Boron				
	Cadmium				
	Calcium	28	2.947E+11	37	17300000
	Chromium, all valences	0.0335	353000000	0.0013	607
	Copper	0.0297	313000000	0.0013	607
	Lead	0.011	116000000		
	Magnesium	13	1.368E+11	16.5	7710000
	Nickel	0.0176	185000000	0.0014	654
	Potassium				
	Selenium				
	Sodium				
	Zinc	0.0485	511000000	0.0024	1120
Pesticides	Chlorpyrifos (ELISA)	0.0000167	175000	0.00134	628
	4,4'-dde				
	Diazinon	0.0000092	96800	0.0000131	6.1
	Simazine				
SVOCs	bis(2-ethylhexyl)phthalate	0.033	347000000		
VOCs	Methylene chloride	0.0043	45300000		

Table G-21
ANNUAL MASS LOADING
Riverside Flood Control and Water Conservation District
Page 2 of 2

	Station Number:	777		778	
	Station Name:	Temecula Creek below Pala Rd		Murrieta Creek at Temecula	
	Flow (actf/yr):	13080		73409	
Analyte Class	Analyte	Average Concentration (mg/l)	Load	Average Concentration (mg/l)	Load
Nutrients, Anions, Physical Properties and Demand	Alkalinity, total (CaCO3)			250	49400000000
	Ammonia-nitrogen	0.26	9150000	0.19	37500000
	Bicarbonate (HCO3)			310	61260000000
	Carbon, total organic (TOC)			6	1190000000
	Chloride			170	33590000000
	Detergent-MethyleneBlueActiveS	0.05	1760000		
	ElectroChemical Balance			0.2	39500000
	Fluoride			0.5	98800000
	Hardness, total (CaCO3)	410	14430000000	246	48610000000
	Nitrogen, nitrate (N)	0.97	34200000	0.45	88900000
	Nitrogen, organic (N)			0.5	98800000
	Nitrogen, total (N)			0.99	196000000
	Nitrogen, total Kjeldahl (N)	3.8	134000000	1.06	209000000
	Oxygen Demand, chemical (COD)			41	8100000000
	Oxygen, dissolved field conc	11.4	400000000	10.8	2140000000
	Phosphorus, total (P)	1.35	47400000	0.43	85000000
	Phosphorus,total dissolved(P)			0.063	12400000
	Phosphorus,total insoluble(P)			0.15	29600000
	Solids, total			930	1.837E+11
	Solids, total dissolved(FdMtr)	900	31690000000	800	1.58E+11
	Solids, total dissolved(resdu)			820	1.62E+11
	Solids, total suspended(resdu)	920	32370000000	537	1.06E+11
	Sulfate (SO4)			150	29640000000
Metals	Arsenic			0.00635	1250000
	Barium			0.13	25700000
	Boron			0.3	59300000
	Cadmium	0.0011	38700	0.00038	75100
	Calcium	98.3	3460000000	54	10670000000
	Chromium, all valences	0.0339	1200000	0.0212	4190000
	Copper	0.0827	2910000	0.0185	3650000
	Lead	0.0156	549000	0.0116	2290000
	Magnesium	39.3	1380000000	26	5140000000
	Nickel	0.0172	604000	0.00926	1830000
	Potassium			4.3	850000000
	Selenium			0.0056	1110000
	Sodium			160	31610000000
	Zinc	0.0922	3250000	0.0749	14800000
Pesticides	Chlorpyrifos (ELISA)	0.0000213	750	0.000016	3160
	4,4'-dde	0.000065	2290		
	Diazinon	0.0000307	1080	0.0000304	6010
	Simazine	0.005	176000	0.032	6320000
SVOCs	bis(2-ethylhexyl)phthalate				
VOCs	Methylene chloride	0.0039	137000	0.0045	889000

G-7.2 Methods used to evaluate data.

The hydrologic characteristics of runoff in the Santa Margarita Region differ significantly between dry weather and storm events. The source and chemical characteristics of storm flows primarily represent non-urban sources, which constitutes the majority of the watershed. During dry weather, flow consists of localized urban runoff and rising groundwater. Virtually all of the dry weather urban runoff infiltrates within a short distance and does not have contiguous flow to receiving waters. The most significant source of dry weather flow is rising groundwater. Similarly, the chemical characteristics of runoff in the Santa Margarita Region may vary significantly between samples collected during a dry weather sampling event versus those collected during a storm event. Therefore, a step-wise approach was utilized for data evaluation.

Data evaluation began with plotting the analytical results and then visually examining the plots to identify obvious patterns, (i.e. seasonal trends). The plots were then reviewed to identify any other trends (upward or downward). Next, if regulatory goals and/or objectives existed, then comparisons were made. For this assessment regulatory goals, including BPO and the CTR objectives, were utilized to identify levels above BPO or the CTR objective. Finally, the data was reviewed to confirm relationships between pollutants related to one another via a common source (i.e., agricultural, industrial, etc.). This method is described more completely in the Data Analysis Section of the Consolidated Monitoring Program (CMP) contained in Attachment B to this Monitoring Annual Report.

G-7.2.1 Core Monitoring

Core Monitoring stations were established to generate data to answer water quality management questions established in Section II.A. of the Monitoring and Reporting Program (MRP) and achieving the goals listed in Section 1 of the MRP to Board Order R9-2004-001. Several of these management questions are also reflected in the design of the Permittees CMP.

G-7.2.1.1 *Core Monitoring – Triad Stations*

Triad stations are those stations that were monitored for chemical parameters, toxicity, and bioassessment. The Triad stations were:

Station No. 777: Lower Temecula Creek;

Station No. 778: Lower Murrieta Creek at the USGS Weir;

Station No. 188: Cole Creek;

Station No. 848: Adobe Creek

During 2004–2005, water quality samples were collected at Triad stations 188, 777 and 778 during the first wet weather monitoring event as well as two additional storm events and two dry weather events. Stations 188 and 848 were reference stations that were selected by the District to be representative of natural, undeveloped conditions. Due to their accessibility and flow, the District selected the Cole Creek station (188) for wet weather sampling and the Adobe Creek station (848) for dry weather sampling. Table G-7 summarizes dates and types of samples collected for each station. Section G-6.1 of this report provides hydrologic details of the hydrologic conditions that occurred when the first storm event samples were collected.

During the first storm event of the reporting period, samples collected at the Triad stations were analyzed for the complete list of priority pollutants (40 CFR 122, Appendix D). The priority pollutant analytical results are provided in Tables G-16 through G-19. The estimated instantaneous and annual mass loadings at each station are presented in Tables G-20 and G-21 For the remaining wet and dry weather monitoring events, samples were analyzed only for the parameters listed in Table G-22.

Table G-22 Triad Station Analytical Parameters

Physical Properties	**Trace Metals**
Temperature	Cadmium
PH	Chromium
Specific Conductance	Copper
Total Suspended Solids	Nickel
Dissolved Oxygen	Lead
Hardness	Zinc
Nutrients	**Organic Compounds**
Ammonia –Nitrogen (as N)	PAHs
Total Kjeldahl Nitrogen (as N)	Organophosphate Pesticides
Nitrate-Nitrogen (as N)	Volatile Organic Compounds (dry weather only)
Total Phosphorus (as P)	
	Bacteriological
	Total Coliform
	Fecal Coliform
	E. coli

Water column toxicity testing was conducted during each wet weather sampling event at each of the Triad

Stations during the reporting period. The results of the water column toxicity testing are discussed for each Triad monitoring station in the site by site analyses contained within Section G-7.2.2 and are presented in Table G-25. Finally, bioassessment monitoring was conducted at the Triad stations bi-annually. Aquatic Bioassay and Consulting, Inc. collected and analyzed these samples. These results are summarized in Table G-12.

G-7.2.1.2 *Core Monitoring – Tributary Stations*

Tributary stations were established to generate data to identify specific sources of pollution. The tributary stations were selected to be representative of urban/urbanizing drainage areas and included:

Station No. 397: Warm Springs Creek near Murrieta;

Station No. 774: Lateral A of Santa Gertrudis Channel – Temecula;

Station No. 780: Long Canyon Creek near the confluence with Murrieta Creek;

Station No. 768: Redhawk Channel, near the confluence with Temecula Creek

Four sampling events were monitored at the Tributary stations during the 2004-2005 reporting period. Monitoring consisted of the collection of grab samples during the first storm event, an additional storm event and two dry weather events. On July 16, 2004 the District received a transmittal from the Regional Board that included a copy of the Board Order No. R9-2004-001. The letter included a directive pursuant to CWC §13267 to submit a report to the Regional Board that detailed the Permittees' sampling and analysis design for the tributary stations. Table G-23 summarizes the Constituents of Concern.

Samples were collected for the Constituents of Concern listed in Table G-23 and analytical results are displayed graphically in Attachment A and in Tables G-24 through G-27.

Table G-23. Tributary Stations – Constituents of Concern

Physical Properties	**Trace Metals**
Temperature (Field)	Antimony
pH (Field)	Beryllium
pH (Lab)	Copper
Turbidity (Field)	Thallium
Turbidity (Lab)	Iron
Color	Lead
Odor	Manganese
Specific Conductance	
Total Hardness	**Pesticides**
Total Dissolved Solids (TDS) (Field)	Chlorpyrifos (ELISA)
Total Dissolved Solids (TDS) (Residue)	Diazinon
Dissolved Oxygen (Field Concentration)	
Nutrients	
Ammonia-nitrogen (as N)	**Other**
Nitrate-Nitrogen (as N)	Detergent – Methylene Blue Active Substances
Nitrogen, Organic (as N)	Oil & Grease
Total Nitrogen (as N)	
Total Phosphorus (as P)	**Bacteriological**
	Total Coliform
	Fecal Coliform
	E. coli

TABLE G-24
STATION 780
LONG CANYON CREEK NEAR MURRIETA CREEK
ANALYTICAL DETECTIONS
Riverside Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4J1654-03	A4J1687-05	A4J1687-06	A4J1701-03	A4L2314-03	A4L2325-05	A4L2326-06	A4L2518-03
	BPO	CTR	Sample Date:	10/20/04	10/20/04	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04	12/28/04
Bacteria											
Bact. fecal coliforms	2000		mpn	50000	-	-	-	5000	-	-	-
Bact. total coliforms			mpn	160000	-	-	-	90000	-	-	-
Bact.Escherichia Coli			mpn	24000	-	-	-	5000	-	-	-
General Minerals											
Ammonia-nitrogen			mg/l	-	0.15	-	-	-	0.24	-	-
Color	0.05		units	-	50	-	-	-	15	-	-
Conductance, specific -field			umho/cm	-	187	-	-	-	63	-	-
Hardness, total (CaCO3)			mg/l	-	170	-	-	-	48	-	-
Nitrogen, nitrate (N)	1		mg/l	-	0.52	-	-	-	0.34	-	-
Nitrogen, total (N)			mg/l	-	3	-	-	-	1.6	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	2.5	-	-	-	1.3	-	-
pH, field	8.5		units	-	7.6	-	-	-	8.52	-	-
pH, lab	8.5		units	-	7.6	-	-	-	7.7	-	-
Phosphorus, total (P)	0.1		mg/l	-	1.4	-	-	-	0.43	-	-
Solids, total dissolved(resdu)	750		mg/l	-	210	-	-	-	70	-	-
Temperature, field-Centigrade			degree C	-	16.6	-	-	-	11.9	-	-
Turbidity, lab	20		ntu	-	1100	-	-	-	150	-	-
Metals											
Calcium			mg/l	-	23	-	-	-	9.6	-	-
Copper	1	0.009	mg/l	-	0.028	0.0095	-	-	0.017	0.0022	-
Iron			mg/l	-	90	-	-	-	17	-	-
Lead		0.0025	mg/l	-	-	0.0049	-	-	-	<0.0005	-
Magnesium			mg/l	-	26	-	-	-	5.8	-	-
Manganese			mg/l	-	1.1	-	-	-	0.24	-	-
Pesticides & PCBs											
Chlorpyrifos (ELISA)			ug/l	-	-	-	0.0338	-	-	-	0.0184
Diazinon			ug/l	-	-	-	0.042	-	-	-	0.0193

TABLE G-25
STATION 774 LATERAL A OF STATION GERTRUDIS CHANNEL -TEMECULA
ANALYTICAL DETECTIONS
Riverside Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4J1654-02	A4J1687-03	A4J1687-04	A4J1701-02
	BPO	CTR	Sample Date:	10/20/04	10/20/04	10/20/04	10/20/04
Bacteria							
Bact, fecal coliforms	2000		mpn	**50000**	-	-	-
Bact, total coliforms			mpn	**160000**	-	-	-
Bact,Escherichia Coli			mpn	**30000**	-	-	-
General Minerals							
Ammonia-nitrogen			mg/l	-	**0.14**	-	-
Color	0.05		units	-	**50**	-	-
Conductance, specific -field			umho/cm	-	**216**	-	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	<0.1	-	-
Hardness, total (CaCO3)			mg/l	-	**170**	-	-
Nitrogen, nitrate (N)	1		mg/l	-	**0.45**	-	-
Nitrogen, total (N)			mg/l	-	**2.6**	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	**2.2**	-	-
Oxygen, dissolved field conc	5		mg/l	-	-	-	-
pH, field	8.5		units	-	**7.7**	-	-
pH, lab	8.5		units	-	**7.3**	-	-
Phosphorus, total (P)	0.1		mg/l	-	**1.4**	-	-
Redox Potential, field			mv	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-
Solids, total dissolved(resdu)	750		mg/l	-	**200**	-	-
Temperature, field-Centigrade			degree C	-	**16.5**	-	-
Turbidity, field	20		ntu	-	-	-	-
Turbidity, lab	20		ntu	-	**700**	-	-
Metals							
Calcium			mg/l	-	**31**	-	-
Copper	1	0.009	mg/l	-	**0.03**	**0.0089**	-
Iron			mg/l	-	**71**	-	-
Lead		0.0025	mg/l	-	-	**0.0006**	-
Magnesium			mg/l	-	**24**	-	-
Manganese			mg/l	-	**0.85**	-	-
Pesticides & PCBs							
Chlorpyrifos (ELISA)			ug/l	-	-	-	**0.0259**
Diazinon			ug/l	-	-	-	**0.1084**

TABLE G-25
STATION 774 LATERAL A OF STATION GERTRUDIS CHANNEL -TEMECULA
ANALYTICAL DETECTIONS
Riverside Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4L2314-02	A4L2325-03	A4L2325-04	A4L2518-02
	BPO	CTR	Sample Date:	12/28/04	12/28/04	12/28/04	12/28/04
Bacteria							
Bact, fecal coliforms	2000		mpn	**800**	-	-	-
Bact, total coliforms			mpn	**90000**	-	-	-
Bact,Escherichia Coli			mpn	**800**	-	-	-
General Minerals							
Ammonia-nitrogen			mg/l	-	**0.21**	-	-
Color	0.05		units	-	**20**	-	-
Conductance, specific -field			umho/cm	-	**111**	-	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	<0.2	-	-
Hardness, total (CaCO3)			mg/l	-	**150**	-	-
Nitrogen, nitrate (N)	1		mg/l	-	**0.34**	-	-
Nitrogen, total (N)			mg/l	-	**2.1**	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	**1.8**	-	-
Oxygen, dissolved field conc	5		mg/l	-	-	-	-
pH, field	8.5		units	-	**9.59**	-	-
pH, lab	8.5		units	-	**8.3**	-	-
Phosphorus, total (P)	0.1		mg/l	-	**1.1**	-	-
Redox Potential, field			mv	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-
Solids, total dissolved(resdu)	750		mg/l	-	**160**	-	-
Temperature, field-Centigrade			degree C	-	**11.5**	-	-
Turbidity, field	20		ntu	-	-	-	-
Turbidity, lab	20		ntu	-	**580**	-	-
Metals							
Calcium			mg/l	-	**24**	-	-
Copper	1	0.009	mg/l	-	**0.02**	**0.0031**	-
Iron			mg/l	-	**64**	-	-
Lead		0.0025	mg/l	-	-	**0.0005**	-
Magnesium			mg/l	-	**20**	-	-
Manganese			mg/l	-	**0.75**	-	-
Pesticides & PCBs							
Chlorpyrifos (ELISA)			ug/l	-	-	-	**0.0226**
Diazinon			ug/l	-	-	-	**0.1381**

TABLE G-25
STATION 774 LATERAL A OF STATION GERTRUDIS CHANNEL -TEMECULA
ANALYTICAL DETECTIONS
Riverside Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A5C2632-02	A5C2658-03	A5C2658-04	A5D0161-02
	BPO	CTR	Sample Date:	03/31/05	03/31/05	03/31/05	04/04/05
Bacteria							
Bact, fecal coliforms	2000		mpn	20	-	-	-
Bact, total coliforms			mpn	11000	-	-	-
Bact,Escherichia Coli			mpn	20	-	-	-
General Minerals							
Ammonia-nitrogen			mg/l	-	<0.1	-	-
Color	0.05		units	-	25	-	-
Conductance, specific -field			umho/cm	-	1140	-	888
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	0.06	-	-
Hardness, total (CaCO3)			mg/l	-	260	-	-
Nitrogen, nitrate (N)	1		mg/l	-	<0.2	-	-
Nitrogen, total (N)			mg/l	-	0.53	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	0.53	-	-
Oxygen, dissolved field conc	5		mg/l	-	19.2	-	17.9
pH, field	8.5		units	-	9.06	-	8.65
pH, lab	8.5		units	-	9	-	-
Phosphorus, total (P)	0.1		mg/l	-	0.17	-	-
Redox Potential, field			mv	-	142	-	108
Solids, total dissolved(FdMtr)	700		mg/l	-	700	-	580
Solids, total dissolved(resdu)	750		mg/l	-	630	-	-
Temperature, field-Centigrade			degree C	-	20.2	-	19
Turbidity, field	20		ntu	-	10.2	-	28.9
Turbidity, lab	20		ntu	-	7.4	-	-
Metals							
Calcium			mg/l	-	59	-	-
Copper	1	0.009	mg/l	-	0.0029	0.0028	-
Iron			mg/l	-	0.72	-	-
Lead		0.0025	mg/l	-	-	<0.0005	-
Magnesium			mg/l	-	28	-	-
Manganese			mg/l	-	0.026	-	-
Pesticides & PCBs							
Chlorpyrifos (ELISA)			ug/l	-	-	-	0.0646
Diazinon			ug/l	-	-	-	0.0127

TABLE G-26
STATION 768 REDHAWK CHANNEL D/S OF OVERLAND DR ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives BPO	CTR	Sample ID: / Sample Date:	A4G1131-05 07/14/04	A4G1139-04 07/14/04	A4J1654-04 10/20/04	A4J1687-07 10/20/04	A4J1687-08 10/20/04	A4J1701-04 10/20/04	A4L2314-04 12/28/04	A4L2325-07 12/28/04	A4L2325-08 12/28/04	A4L2518-04 12/28/04
Bacteria													
Bact. fecal coliforms	2000		mpn	-	-	50000	-	-	-	50000	-	-	-
Bact. total coliforms			mpn	-	-	160000	-	-	-	90000	-	-	-
Bact.Escherichia Coli			mpn	-	-	30000	-	-	-	14000	-	-	-
General Minerals													
Alkalinity, total (CaCO3)			mg/l	200	-	-	-	-	-	-	-	-	-
Ammonia-nitrogen			mg/l	0.11	-	-	0.17	-	-	-	0.29	-	-
Bicarbonate (HCO3)			mg/l	240	-	-	-	-	-	-	-	-	-
Carbon, total organic (TOC)			mg/l	15	-	-	-	-	-	-	-	-	-
Chloride			mg/l	180	-	-	-	-	-	-	-	-	-
Color	0.05		units	80	-	-	75	-	-	-	20	-	-
Conductance, specific -field			umho/cm	1700	-	-	334	-	-	-	110	-	-
Conductance, specific -lab			umho/cm	1400	-	-	-	-	-	-	-	-	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	0.22	-	-	<0.1	-	-	-	<0.2	-	-
ElectroChemical Balance			me/l	0.5	-	-	-	-	-	-	-	-	-
Fluoride	1		mg/l	1	-	-	-	-	-	-	-	-	-
Hardness, total (CaCO3)			mg/l	260	-	-	150	-	-	-	77	-	-
Nitrogen, nitrate (N)	1		mg/l	1.1	-	-	0.72	-	-	-	0.52	-	-
Nitrogen, nitrite (N)			mg/l	0.28	-	-	<0.1	-	-	-	<0.1	-	-
Nitrogen, organic (N)			mg/l	1.8	-	-	-	-	-	-	-	-	-
Nitrogen, total (N)			mg/l	3.3	-	-	3.3	-	-	-	2.4	-	-
Nitrogen, total Kjeldahl (N)			mg/l	1.9	-	-	2.6	-	-	-	1.9	-	-
Oxygen Demand, chemical (COD)			mg/l	52	-	-	-	-	-	-	-	-	-
Oxygen, dissolved field conc	5		mg/l	8.8	-	-	-	-	-	-	-	-	-
pH, field	8.5		units	7.8	-	-	7.2	-	-	-	9.24	-	-
pH, lab	8.5		units	8.3	-	-	7.8	-	-	-	7.9	-	-
Phosphorus, total (P)	0.1		mg/l	0.81	-	-	1.6	-	-	-	1.1	-	-
Phosphorus,total dissolved(P)			mg/l	0.75	-	-	-	-	-	-	-	-	-
Phosphorus,total insoluble(P)			mg/l	0.06	-	-	-	-	-	-	-	-	-
Redox Potential, field			mv	-	-	-	-	-	-	-	-	-	-
Solids, total			mg/l	890	-	-	-	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	-	-	-	-	-	-
Solids, total dissolved(resdu)	750		mg/l	860	-	-	320	-	-	-	130	-	-
Sulfate (SO4)			mg/l	200	-	-	-	-	-	-	-	-	-
Temperature, field-Centigrade			degree C	31.1	-	-	-	-	-	-	11.7	-	-
Temperature, field-Fahrenheit			degree F	-	-	-	62.2	-	-	-	-	-	-
Total Cations			units	13.7	-	-	-	-	-	-	-	-	-
Turbidity, field	20		ntu	63	-	-	-	-	-	-	-	-	-
Turbidity, lab	20		ntu	2.5	-	-	690	-	-	-	320	-	-
Metals													
Arsenic	0.05	0.15	mg/l	0.007	-	-	-	-	-	-	-	-	-
Barium			mg/l	0.062	-	-	-	-	-	-	-	-	-
Boron			mg/l	0.64	-	-	-	-	-	-	-	-	-

TABLE G-26
STATION 768 REDHAWK CHANNEL D/S OF OVERLAND DR ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4G1131-05	A4G1139-04	A4J1654-04	A4J1687-07	A4J1687-08	A4J1701-04	A4L2314-04	A4L2325-07	A4L2325-08	A4L2518-04
	BPO	CTR	Sample Date:	07/14/04	07/14/04	10/20/04	10/20/04	10/20/04	10/20/04	12/28/04	12/28/04	12/28/04	12/28/04
Calcium			mg/l	71	-	-	28	-	-	-	14	-	-
Copper	1	0.009	mg/l	<0.01	-	-	0.028	0.0052	-	-	0.021	0.0022	-
Iron			mg/l	-	-	-	59	-	-	-	31	-	-
Lead		0.0025	mg/l	<0.01	-	-	-	0.0013	-	-	-	<0.0005	-
Magnesium			mg/l	21	-	-	20	-	-	-	9.9	-	-
Manganese			mg/l	-	-	-	0.72	-	-	-	0.36	-	-
Potassium			mg/l	17	-	-	-	-	-	-	-	-	-
Sodium			mg/l	180	-	-	-	-	-	-	-	-	-
Pesticides & PCBs													
Chlorpyrifos (ELISA)			ug/l	-	0.0248	-	-	-	0.0308	-	-	-	0.0192
Diazinon			ug/l	-	0.1048	-	-	-	0.0346	-	-	-	0.4817

TABLE G-26
STATION 768 REDHAWK CHANNEL D/S OF OVERLAND DR ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California
Page 3 of 4

	Water Quality Objectives		Sample ID:	A5C2632-03	A5C2658-05	A5C2658-06	A5D0161-01	A5F0544-01	A5F0549-01	A5F0552-01
	BPO	CTR	Sample Date:	03/31/05	03/31/05	03/31/05	04/04/05	06/07/05	06/07/05	06/07/05
Bacteria										
Bact, fecal coliforms	2000		mpn	500	-	-	-	-	-	30000
Bact, total coliforms			mpn	8000	-	-	-	-	-	90000
Bact,Escherichia Coli			mpn	500	-	-	-	-	-	30000
General Minerals										
Alkalinity, total (CaCO3)			mg/l	-	-	-	-	-	-	-
Ammonia-nitrogen			mg/l	-	<0.1	-	-	0.11	-	-
Bicarbonate (HCO3)			mg/l	-	-	-	-	-	-	-
Carbon, total organic (TOC)			mg/l	-	-	-	-	-	-	-
Chloride			mg/l	-	-	-	-	-	-	-
Color	0.05		units	-	15	-	-	50	-	-
Conductance, specific -field			umho/cm	-	1410	-	1360	1470	-	-
Conductance, specific -lab			umho/cm	-	-	-	-	-	-	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	0.11	-	-	0.06	-	-
ElectroChemical Balance			me/l	-	-	-	-	-	-	-
Fluoride	1		mg/l	-	-	-	-	-	-	-
Hardness, total (CaCO3)			mg/l	-	260	-	-	230	-	-
Nitrogen, nitrate (N)	1		mg/l	-	0.72	-	-	0.61	-	-
Nitrogen, nitrite (N)			mg/l	-	<0.1	-	-	<0.1	-	-
Nitrogen, organic (N)			mg/l	-	-	-	-	-	-	-
Nitrogen, total (N)			mg/l	-	2.1	-	-	2.5	-	-
Nitrogen, total Kjeldahl (N)			mg/l	-	1.4	-	-	1.9	-	-
Oxygen Demand, chemical (COD)			mg/l	-	-	-	-	-	-	-
Oxygen, dissolved field conc	5		mg/l	-	19.9	-	16.5	12.9	-	-
pH, field	8.5		units	-	8.82	-	8.5	8.18	-	-
pH, lab	8.5		units	-	8.9	-	-	8.5	-	-
Phosphorus, total (P)	0.1		mg/l	-	0.35	-	-	0.8	-	-
Phosphorus,total dissolved(P)			mg/l	-	-	-	-	-	-	-
Phosphorus,total insoluble(P)			mg/l	-	-	-	-	-	-	-
Redox Potential, field			mv	-	145	-	110	165	-	-
Solids, total			mg/l	-	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	900	-	900	0.9	-	-
Solids, total dissolved(resdu)	750		mg/l	-	750	-	-	780	-	-
Sulfate (SO4)			mg/l	-	-	-	-	-	-	-
Temperature, field-Centigrade			degree C	-	21.3	-	23.5	28.1	-	-
Temperature, field-Fahrenheit			degree F	-	-	-	-	-	-	-
Total Cations			units	-	-	-	-	-	-	-
Turbidity, field	20		ntu	-	4.2	-	6.7	249	-	-
Turbidity, lab	20		ntu	-	3.5	-	-	16	-	-
Metals										
Arsenic	0.05	0.15	mg/l	-	-	-	-	-	-	-
Barium			mg/l	-	-	-	-	-	-	-
Boron			mg/l	-	-	-	-	-	-	-

TABLE G-26
STATION 768 REDHAWK CHANNEL D/S OF OVERLAND DR ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A5C2632-03	A5C2658-05	A5C2658-06	A5D0161-01	A5F0544-01	A5F0549-01	A5F0552-01
	BPO	CTR	Sample Date:	03/31/05	03/31/05	03/31/05	04/04/05	06/07/05	06/07/05	06/07/05
Calcium			mg/l	-	71	-	-	61	-	-
Copper	1	0.009	mg/l	-	0.0074	0.0033	-	0.0066	-	-
Iron			mg/l	-	0.16	-	-	1.3	-	-
Lead		0.0025	mg/l	-	-	<0.0005	-	-	-	-
Magnesium			mg/l	-	21	-	-	19	-	-
Manganese			mg/l	-	0.092	-	-	0.18	-	-
Potassium			mg/l	-	-	-	-	-	-	-
Sodium			mg/l	-	-	-	-	-	-	-
Pesticides & PCBs										
Chlorpyrifos (ELISA)			ug/l	-	-	-	0.0039	-	0.0164	-
Diazinon			ug/l	-	-	-	0.0144	-	0.0377	-

TABLE G-27
STATION 397 WARM SPRINGS CREEK NEAR MURRIETA
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4J1654-01	A4J1687-01	A4J1687-02	A4J1701-01	A4L2314-01	A4L2325-01
	BPO	CTR	Sample Date:	10/20/04	10/20/04	10/20/04	10/20/04	12/28/04	12/28/04
Bacteria									
Bact. fecal coliforms	2000		mpn	30000	-	-	-	13000	-
Bact. total coliforms			mpn	160000	-	-	-	50000	-
Bact.Escherichia Coli			mpn	30000	-	-	-	5000	-
General Minerals									
Ammonia-nitrogen			mg/l	-	0.14	-	-	-	0.26
Color	0.05		units	-	50	-	-	-	20
Conductance, specific -field			umho/cm	-	285	-	-	-	226
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	<0.1	-	-	-	<0.2
Hardness, total (CaCO3)			mg/l	-	150	-	-	-	160
Nitrogen, nitrate (N)	1		mg/l	-	0.54	-	-	-	0.52
Nitrogen, total (N)			mg/l	-	2.6	-	-	-	3
Nitrogen, total Kjeldahl (N)			mg/l	-	2.1	-	-	-	2.5
Oxygen, dissolved field conc	5		mg/l	-	-	-	-	-	-
pH, field	8.5		units	-	8.4	-	-	-	8.91
pH, lab	8.5		units	-	7.9	-	-	-	7.8
Phosphorus, total (P)	0.1		mg/l	-	1.7	-	-	-	0.96
Redox Potential, field			mv	-	-	-	-	-	-
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	-	-
Solids, total dissolved(resdu)	750		mg/l	-	220	-	-	-	220
Temperature, field-Centigrade			degree C	-	16.3	-	-	-	11.5
Turbidity, field	20		ntu	-	-	-	-	-	-
Turbidity, lab	20		ntu	-	450	-	-	-	620
Metals									
Calcium			mg/l	-	32	-	-	-	29
Copper	1	0.009	mg/l	-	0.029	0.0041	-	-	0.02
Iron			mg/l	-	49	-	-	-	57
Lead		0.0025	mg/l	-	-	0.0013	-	-	-
Magnesium			mg/l	-	18	-	-	-	20
Manganese			mg/l	-	0.62	-	-	-	0.74
Pesticides & PCBs									
Chlorpyrifos (ELISA)			ug/l	-	-	-	0.0316	-	-
Diazinon			ug/l	-	-	-	0.0446	-	-

TABLE G-27
STATION 397 WARM SPRINGS CREEK NEAR MURRIETA
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A4L2325-02	A4L2518-01	A5C2632-01	A5C2648-01	A5C2658-01
	BPO	CTR	Sample Date:	12/28/04	12/28/04	03/31/05	03/31/05	03/31/05
Bacteria								
Bact, fecal coliforms	2000		mpn	-	-	130	-	-
Bact, total coliforms			mpn	-	-	7000	-	-
Bact,Escherichia Coli			mpn	-	-	130	-	-
General Minerals								
Ammonia-nitrogen			mg/l	-	-	-	-	<0.1
Color	0.05		units	-	-	-	-	30
Conductance, specific -field			umho/cm	-	-	-	-	1820
Detergent-MethyleneBlueActiveS	0.5		mg/l	-	-	-	-	0.08
Hardness, total (CaCO3)			mg/l	-	-	-	-	470
Nitrogen, nitrate (N)	1		mg/l	-	-	-	-	0.29
Nitrogen, total (N)			mg/l	-	-	-	-	1
Nitrogen, total Kjeldahl (N)			mg/l	-	-	-	-	0.74
Oxygen, dissolved field conc	5		mg/l	-	-	-	-	19.99
pH, field	8.5		units	-	-	-	-	8.7
pH, lab	8.5		units	-	-	-	-	8.7
Phosphorus, total (P)	0.1		mg/l	-	-	-	-	0.4
Redox Potential, field			mv	-	-	-	-	166
Solids, total dissolved(FdMtr)	700		mg/l	-	-	-	-	1200
Solids, total dissolved(resdu)	750		mg/l	-	-	-	-	1000
Temperature, field-Centigrade			degree C	-	-	-	-	18.3
Turbidity, field	20		ntu	-	-	-	-	4.1
Turbidity, lab	20		ntu	-	-	-	-	4
Metals								
Calcium			mg/l	-	-	-	-	110
Copper	1	0.009	mg/l	0.0041	-	-	-	0.0033
Iron			mg/l	-	-	-	-	0.41
Lead		0.0025	mg/l	0.0006	-	-	-	-
Magnesium			mg/l	-	-	-	-	45
Manganese			mg/l	-	-	-	-	0.037
Pesticides & PCBs								
Chlorpyrifos (ELISA)			ug/l	-	0.0218	-	0.3704	-
Diazinon			ug/l	-	0.0257	-	0.0117	-

TABLE G-27
STATION 397 WARM SPRINGS CREEK NEAR MURRIETA
ANALYTICAL DETECTIONS
Riverside County Flood Control and Water Conservation District
Riverside County, California

	Water Quality Objectives		Sample ID:	A5C2658-02
	BPO	CTR	Sample Date:	03/31/05
Bacteria				
Bact, fecal coliforms	2000		mpn	-
Bact, total coliforms			mpn	-
Bact,Escherichia Coli			mpn	-
General Minerals				
Ammonia-nitrogen			mg/l	-
Color	0.05		units	-
Conductance, specific -field			umho/cm	-
Detergent-MethyleneBlueActiveS	0.5		mg/l	-
Hardness, total (CaCO3)			mg/l	-
Nitrogen, nitrate (N)	1		mg/l	-
Nitrogen, total (N)			mg/l	-
Nitrogen, total Kjeldahl (N)			mg/l	-
Oxygen, dissolved field conc	5		mg/l	-
pH, field	8.5		units	-
pH, lab	8.5		units	-
Phosphorus, total (P)	0.1		mg/l	-
Redox Potential, field			mv	-
Solids, total dissolved(FdMtr)	700		mg/l	-
Solids, total dissolved(resdu)	750		mg/l	-
Temperature, field-Centigrade			degree C	-
Turbidity, field	20		ntu	-
Turbidity, lab	20		ntu	-
Metals				
Calcium			mg/l	-
Copper	1	0.009	mg/l	**0.0033**
Iron			mg/l	-
Lead		0.0025	mg/l	<0.0005
Magnesium			mg/l	-
Manganese			mg/l	-
Pesticides & PCBs				
Chlorpyrifos (ELISA)			ug/l	-
Diazinon			ug/l	-

In addition to the Constituents of Concern listed in Table G-23, the District also conducted analyses for a number of parameters not mandated by the MRP. These parameters are listed in Table G-28. Results for the analyses of these parameters are also displayed graphically in Attachment A and are summarized in a discussion in Attachment C.

Table G-28 Tributary Station Extra Analytical Parameters

Physical Properties	**Trace Metals**
Redox Potential (Field)	Barium
Total Dissolved Solids	Boron
Total Suspended Solids (Residue)	Cadmium
	Calcium
Demand	Chromium
Biochemical Oxygen Demand (BOD)	Magnesium
Chemical Oxygen Demand (COD)	Mercury
Total Organic Carbon Demand	Nickel
	Potassium
Anions	Silver
Total Alkalinity ($CaCO_3$)	Sodium
Bicarbonate (HCO_3)	Zinc
Carbonate (CO3)	
Hydroxide (OH)	**Organics**
Chloride	Total Petroleum Hydrocarbons
Sulfate (SO_4)	
Nutrients	
Nitrite-Nitrogen (as N)	
Total Kjeldahl Nitrogen (as N)	
Total Dissolved Phosphorus (as P)	

G-7.2.1.3 *Toxicity*

Monitoring for toxicity was initiated at the Triad stations in 2004 – 2005. Toxicity is expressed in toxic units (TU) for both acute and chronic toxicity. In this program the organisms used to measure acute toxicity were *Hyallela azteca* and *Ceriodaphnia dubia.* Mortality is the acute endpoint used for both organisms. Acute toxicity is calculated as follows:

$$TU_a = 100/LC_{50}, \text{ where}$$

the LC_{50} is the total lethal concentration for 50% of the test organisms. The LC_{50} is extrapolated from the results of the toxicity test and cannot be calculated if no toxicity is observed. Therefore, TU_a values range from a lower limit of zero (in the case of no mortality) to values much greater than one (in the case of very high mortality). A TU_a of one represents the case where 50% of the test organisms die in a 100% concentration of the sample.

The organism used to measure chronic toxicity in samples collected from the Triad stations was *Selenastrum capricornutum* (now known as *Pseudokirchneriella subcapitata*). Growth inhibition is the chronic endpoint used. Chronic toxicity is calculated as follows:

$$TU_c = 100 / NOEC$$

where the NOEC is the no observed effects concentration and is equivalent to 100 when no toxicity is observed. Therefore, TUc values range from a lower limit of one (in the case of no inhibition) to values much greater than one (in the case of very high inhibition).

G-7.2.1.4 *Bioassessment*

Bioassessments included assessment of physical habitat quality and biological sampling and evaluation. Physical habitat quality was assessed for the monitoring reaches using U.S. Environmental Protection Agency (USEPA) Rapid Bioassessment Protocols (RBPs)5. Sampling and laboratory procedures for the bioassessment surveys followed the California Stream Bioassessment Procedure6.

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5 Barbour, M.T., et al. 1999. Revision to rapid bioassessment protocols for use in stream and rivers: periphyton, BMIs and fish, USEPA 841-D-97-002. U.S. Environmental Protection Agency. Washington D.C.

6 CSBP, Harrington, J.M. 1999. California stream bioassessment procedures. California Department of Fish and Game, Water Pollution Control Laboratory. Rancho Cordova, CA.

G-7.2.1.5 *Analytical Laboratories*

Wet and dry weather samples were collected by the District under Chain-of-Custody procedures and were submitted to E.S. Babcock & Sons (an analytical laboratory certified by the National Environmental Laboratory Accreditation Conference, Certificate No. 0201CA) for analysis. Babcock & Sons utilized the standard methods displayed in the CMP (Attachment B). Toxicity and Bioassessment samples were sub-contracted by Babcock and Sons to Aquatic Bioassay & Consulting Laboratories, Inc.

G-7.2.2 Site-by-site summaries and comparisons of results at Triad and Tributary stations for wet and dry weather.

G-7.2.2.1 *Analytical Overview*

Chemical and bacteriological monitoring has been conducted on the Tributary and Triad stations since 1993. Bioassessment monitoring was initiated at Murrieta Creek and Adobe Creek in the 2003 - 2004 reporting period. Toxicity and bioassessment monitoring at all of the Triad stations was initiated in 2004 - 2005. Thus, it is not possible to determine if detections above BPOs and toxicity or bioassessment are co-related. Furthermore, although the toxicity and bioassessment data provides initial direction for future studies, it is important to remember that this data only represents a full single year of monitoring.

Events Affecting Data Analysis in the Upper Santa Margarita Watershed

The upper Santa Margarita watershed experienced significant fires during the 2003 – 2004 monitoring period followed by heavy winter storms (greater than 200% of the annual average, see Section G-4.0) during the 2004 – 2005 monitoring period. The fires and storms combined most likely contributed greatly to a peak in the environmental contaminants, therefore, it is not possible to establish a baseline or to establish trends as a result of this worse case scenario. Therefore, the ability to reliably identify patterns and trends in this data set is limited and it is not possible to determine if such detections are related to urban sources or non-urban sources in the watershed.

Hydrologic Modifications to the Watershed Affecting Data Analysis

Over 50 percent of the Upper Santa Margarita River watershed has been controlled by the construction of Vail Dam in 1949 and Skinner Reservoir in 1974, which created significant storage capacity in the upper watershed.7 Due to this storage capacity, peak flow rates during major flow events for both existing and future land use conditions will be lower than under natural conditions (assuming average storage conditions in the reservoirs).8 Although Vail Dam and Skinner Reservoir have been in place for several decades, it will take many more decades for the watersheds below these facilities to establish an equilibrium condition. In the interim, it is anticipated that physical habitat conditions may change substantially in response to storm flows and areas of aggradation and degradation of the stream courses will be observed. These processes may be reflected at the bioassessment stations.

Attributing Detections Above BPO and CTR Levels to Urban Sources.

In the Upper Santa Margarita watershed, 94 percent of the land area is comprised of non-urban (rural residential, agriculture, state lands, federal lands and tribal lands) land uses.9 As only a small portion of the watershed is urban and under the control of the Permittees, it will be especially difficult to distinguish between those sources that can be controlled by modification of the SWMPs and those where source control must be coordinated with other entities.

7 Phillip Wiliams & Associates, Santa Margarita Watershed Study: Hydrology and Watershed Processes, October 26, 1998, p. 14.
8 Phillip Williams & Associates, Santa Margarita Watershed Study: Hydrology and Watershed Processes, October 26, 1998, p. 20.
9 County of Riverside Assessor, 2002.

G-7.2.2.2 *Individual Station Analyses*

Cole Creek/Adobe Creek – 188/848

Section G-3.3. describes the location of the monitoring site and characteristics of the watershed tributary to this site. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. Cole Creek and Adobe Creek were established as reference sites and were monitored for the first time during the 2004-2005 reporting period.

Dry Weather Monitoring Results at Adobe Creek - 848

Dry weather flows at Adobe Creek arise from natural springs in the headwaters. The pollutants monitored during dry weather at the Adobe Creek station were below BPOs and CTR (Table G-16). The bioassessment results ranked the physical habitat as sub-optimal and the biological integrity was ranked as "Good."

Wet Weather Monitoring Results at Cole Creek -188

Section G-3.4. describes the location of the monitoring site and characteristics of the watershed tributary to this site. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results.

Toxicity testing was performed on storm water from the Cole Creek station for three wet weather events during 2004 - 2005. The Hyallela acute survival test and the S. capricornutum chronic survival test resulted in toxicity during one of three storm events. Copper concentrations in water quality samples collected during these events were about 2 to 9 times the CTR water quality objective of 0.009 mg/l and Chromium concentrations were about 2 times the CTR water quality objective of 0.05 mg/l. Fecal Coliform bacteria were detected above the BPO during two storm events and Phosphorus (Total) and Turbidity were detected at a level above the BPO during the second storm event of the monitoring period.

Recommendation

The sub-watershed tributary to the Cole Creek monitoring station was likely significantly impacted by the Mesa fire in May 2004 and extreme rainfall and weather flows and it is expected that the resulting monitoring data is atypical. Therefore, the recommended action for Cole Creek/Adobe Creek is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Table G-29 Cole Creek/Adobe Creek Triad Approach to Determining Follow-Up Actions

Chemistry	Toxicity	Bioassessment	Recommended Action
No persistent detections above BPO/CTR.	No evidence of persistent toxicity	No indication of benthic alteration	No action necessary. Continue monitoring to develop a more robust data set for long-term trend analysis.

Temecula Creek - 777

Section G-3.2 describes the location of the monitoring site and characteristics of the watershed tributary to this site. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. Temecula Creek has been monitored for wet and dry weather sampling events since 1993. The source of dry weather flows at the Temecula Creek station is rising groundwater just east of, and adjacent to, the I-15 Freeway.

Dry Weather Monitoring Results

During the 2004-2005 reporting period, Turbidity, Total Phosphorus, Total Dissolved Solids and Nitrate-nitrogen (as N) were detected at levels above the BPOs during the dry weather sampling event of the 2004-2005 monitoring period. The bioassessment results ranked the physical habitat as sub-optimal and marginal and the biotic integrity as poor and very poor.

Wet Weather Monitoring Results

Toxicity testing was also performed on storm water samples collected from Temecula Creek during three wet weather events during 2004 - 2005. The Hyallela acute survival test resulted in toxicity during two storm events and the chronic survival test resulted in no toxicity during the three storm events. In addition, water quality samples collected during these events had concentrations of Copper and Lead at levels greater than the CTR by 20% for the 2 wet weather sampling events. Concentrations of Total Phosphorus were detected at levels greater than the BPO by 20% during two wet weather sampling events. Fecal Coliform bacteria were measured at a level greater than the BPO during the two wet weather monitoring events. The concentration of 4,4-DDE was also above the CTR by 20% during the first storm event of the monitoring period. Concentrations of Nitrate-nitrogen, Chromium, and Turbidity were detected at levels greater than the BPO by 20% during a single wet weather event and Zinc was also greater than the CTR by 20% during a single wet weather event.

Recommendations

Based on these results, the possible impacts of recent fires, and the precipitation and flow conditions during 2004 - 2005, it is expected that the resulting monitoring data is atypical. Therefore, the recommended action for Temecula Creek is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Table G-30 Temecula Creek Triad Approach to Determining Follow-Up Actions

Chemistry	Toxicity	Bioassessment	Recommended Action
Total Phosphous, Cu and Pb detected above BPO/CTR on a persistent basis..	No evidence of persistent chronic toxicity	Poor – Very Poor	Continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis

Murrieta Creek – 778

Section G-3.3 describes the location of the monitoring station and characteristics of the watershed tributary to this station. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. This station has been monitored for chemical constituents since 1993. Dry weather flows in Murrieta Creek tend to arise from a natural spring located just upstream of its confluence with Temecula Creek. This past year, rising groundwater was noted as high up in Murrieta Creek and just below Santa Gertrudis Channel.

Dry Weather Monitoring Results

The bioassessment results ranked the physical habitat as Sub-Optimal in the fall and Marginal in the spring. The biotic integrity was ranked as fair and poor. Water quality results indicate that Copper and Lead were measured at levels above the CTR by 20% during a dry weather sampling event. Likewise, Total Phosphorus and Turbidity were greater than the BPO by 20% during a dry weather sampling event. Bioassessments conducted in the Spring and Fall of 2004 indicated that there was a significant increase in the IBI score (from 17 to 32) during the summer months. Habitat scores also increased slightly. The significant increase in the IBI score is another indicator that urban sources of runoff did not adversely impact Murrieta Creek Beneficial Uses during dry weather conditions.

Wet Weather Monitoring Results

During the 2004 – 2005 monitoring period, several parameters were greater than BPO and CTR water quality objectives as described below: Fecal coliform bacteria, Total Phosphorus, and Turbidity were detected at levels greater than the BPO during three wet weather events. Copper and Lead were detected at levels above the CTR during three wet weather sampling events, and Zinc was detected at a level greater than the CTR during two wet weather sampling events. Toxicity testing was also performed on samples collected at the Murrieta Creek station during three wet weather events of the 2004 – 2005 monitoring period. . The Hyallela acute survival test resulted in toxicity in samples collected during two storm events and the chronic survival test resulted in no toxicity in samples collected during all three storm events.

Recommendations

Based on the possible impacts of recent fires and the precipitation and flow conditions during 2004 - 2005, it is expected that the resulting monitoring data is atypical. Therefore, the recommended action for Murrieta Creek is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Table G-31 Murrieta Creek Triad Approach to Determining Follow-Up Actions

Chemistry	Toxicity	Bioassessment	Recommended Actions
Cu, Pb and Turbidity detected above BPO/CTR on a persistent basis.	No evidence of persistent chronic toxicity	Fair-Poor	Continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Santa Gertrudis Channel - 774

Section G-3.5. describes the location of the monitoring station and characteristics of the watershed tributary to this station. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. Dry weather flows in Santa Gertrudis appear to be mostly the result of various groundwater pumping well blow-offs into the channel that occur in the early mornings and late evenings. Flows from these blow-offs co-mingle with dry weather urban runoff. Dry weather flows from Santa Gertrudis Channel tend to infiltrate into the Murrieta Creek Channel within a few hundred yards of their confluence and do not impact downstream Beneficial Uses. Wet and dry weather monitoring have occurred at the Santa Gertrudis Channel since 1993.

Dry Weather Monitoring Results

Color, Odor, Total Phosphorus and Turbidity were measured at levels above the BPO during the one dry weather sampling event. Moreover, a significant increase in the IBI score at Murrieta Creek was observed during the summer of 2004 (from 17 to 32). Habitat scores also increased slightly. The significant increase in the IBI score and the habitat metrics score are another indicator that urban sources of runoff are not adversely impacting habitat during dry weather conditions.

Wet Weather Monitoring Results

During the 2004 - 2005 monitoring period a few parameters were greater than the BPO and CTR water quality objectives. Specifically, Fecal Coliform bacteria were detected above the BPO during the first storm event of the monitoring period. Color, Odor, Total Phosphorus, Turbidity and pH were measured at levels above the BPO during both wet weather monitoring events. Copper was measured at levels above CTR, but below BPO, during both wet weather events. These results along with the results from previous monitoring periods are presented in Attachment A.

Recommendations

Based on these results, the recommended action for Santa Gertrudis Channel is to continue to monitor for all elements of the program to obtain additional data for assessment and long-term trend analysis.

<u>Long Canyon Creek – 780</u>

Section G-3.6. describes the location of the monitoring station and characteristics of the watershed tributary to this station. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. When dry weather flows occur at the Long Canyon Creek station, they tend to infiltrate within a few hundred yards of the confluence with Murrieta Creek. The Long Canyon Creek station was monitored for the first time during the 2004 – 2005 reporting period.

Dry Weather Monitoring Results

The District mobilized for dry weather event sampling on March 31, 2005 and June 7, 2005. Based on observations documented on the Station Sampling Sheets no flow was observed and therefore water quality samples were not collected. There was a significant increase in the IBI score at Murrieta Creek during the summer of 2004 (from 17 to 32). Habitat metric scores also increased slightly. The significant increases in IBI and habitat are another indicator that urban sources of runoff are not adversely impacting Beneficial Uses during dry weather conditions.

Wet Weather Monitoring Results

Fecal Coliforms, Color, Odor and Turbidity were measured at levels above the BPO during both of the wet weather monitoring events. Lead was measured above CTR and pH was measured above the BPO during only one storm event during the monitoring period. Total Phosphorus, was measured at a level greater than the BPO during both storm water events and Copper was measured at a level greater than the CTR objective during both storm water monitoring events.

Recommendations

Based on the fact that data from this station represents only one monitoring period and no dry weather event data are available, the recommended action for Long Canyon Creek is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Redhawk Channel - 768

Section G-3.4. describes the location of the monitoring station and characteristics of the watershed tributary to this station. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. The source of dry weather flows in the Redhawk Channel are predominantly from rising groundwaters in headwaters contained within the Redhawk Golf Course. These flows are supplemented by dry weather urban runoff from upstream developments. These flows tend to infiltrate within a few hundred feet of the confluence of the Redhawk Channel with Temecula Creek. Beneficial Uses are not impacted by these flows. Wet and dry weather event monitoring have occurred at the Redhawk Channel since 1993.

Dry Weather Monitoring Results

Total Dissolved Solids were detected at levels above the BPO only during dry weather sampling events. Total Phosphorus, Color, and Odor were detected above BPO for all dry weather events.

Wet Weather Monitoring Results

During 2004 - 2005 Fecal Coliform bacteria, Color, Odor and Total Phosphorus were detected above the BPO during both wet weather monitoring events, whereas, pH was measured at a level above the BPO during a single wet weather monitoring event. Copper was measured at a level above the CTR objective during two wet weather monitoring events.

Recommendations

Based on these results, the recommended action for Redhawk Channel is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

Warm Springs Creek - 397

Section G-3.7. describes the location of the monitoring station and characteristics of the watershed tributary to this station. Section G.4 describes the precipitation that occurred during the wet season. Section G-5 discusses the significant fires of 2004 that may have impacted this watershed and current monitoring results. Dry weather flows in Warm Springs tend to infiltrate within a few hundred feet of their confluence with Murrieta Creek. Downstream Beneficial Uses are not impacted by these flows. Warm Springs Creek was established as a Tributary station during 2004 - 2005.

Dry Weather Monitoring Results

One dry weather sample was collected in March at Warm Springs Creek. Color, Odor, pH, Total Phosphorus and Total Dissolved Solids were measured at levels above the BPO during the dry weather sampling event. Furthermore, there was a significant increase in the IBI score at Murrieta Creek during the summer of 2004 (from 17 to 32). Habitat scores also increased slightly. The significant increase in the IBI and the Habitat metrics score is another indicator that urban sources of runoff are not adversely impacting Beneficial Uses during dry weather conditions.

Wet Weather Monitoring Results

Fecal Coliform bacteria, Color, Odor, pH, Total Phosphorus and Turbidity were detected at levels above the BPO during both wet weather monitoring events of the 2004 – 2005 reporting period. Copper was detected at a level greater than the CTR during both wet weather monitoring events.

Recommendations

Based on the fact that data from the Warm Springs Creek station represents only one monitoring period, the recommended action is to continue to monitor for all elements of the program to gather additional data for assessment and long-term trend analysis.

G-7.2.3 Maps of potential sources of pollutants

Section G-3.0 of the Monitoring Annual Report includes descriptions of each station, including tributary land uses.

G-7.2.4 Any other appropriate analysis

No other analysis was completed.

G-7.3 Discussion of results and analyses of each Monitoring Program Component

G-7.3.1 Discussion of Pollutants of Concern and Their Potential Sources

This section discusses pollutants exceeding BPO criteria for both the dry and wet weather sampling events. Sample results that were detected above BPO evaluation criteria are identified in Tables G-16 through G-19 and Tables G-24 through G-27 for Triad and Tributary stations, respectively. Attachment A includes graphs of all historical (1993-2005) water quality data collected at both the Triad and Tributary stations. Due to its size, Attachment A is only provided in the electronic format for this report.

Among the Triad and Tributary stations, parameters that were measured above the BPO include: Fecal Coliform Bacteria, Color, Odor, Nitrate-Nitrogen, pH, Total Phosphorus, Total Dissolved Solids, Turbidity and Total Chromium. Of these, the only parameters that were detected at levels above the BPO on a persistent basis include Fecal Coliform bacteria, Total Phosphorus, Color, Odor, Turbidity and Total Dissolved Solids. A discussion of these parameters and their possible sources is provided in the following section. These results and how they co-relate with toxicity and bioassessment are discussed in Section G-7.2.1. Due to significant storms, this being the first full year of implementation of the revised MRP, and recent fires, the Permittees will need to collect more data before conclusions can be drawn and problem areas identified.

Discussions of pollutants monitored above CTR levels and a general discussion of pesticides are also addressed below. In addition, the laboratory contaminant Bis(2-ethylehexyl)phthalate was detected in a single sample and the laboratory contaminant Methylene Chloride was detected in several samples (there are no BPO or CTR objectives for these parameters). Since these detections are likely the result of contamination at the lab during the analysis, they are also addressed below. The District will work with the lab to determine and eliminate these likely sources of laboratory contamination.

<u>Color</u>

There are numerous natural sources of color in water including breakdown of minerals (especially those containing iron or manganese compounds) or vegetable matter, humus, peat, tannins, algae, weeds, and protozoa. It can be expected that waters flowing through erodible soils, such as those found in the Santa Margarita River watershed, will have a detectable color concentration. Therefore the District finds that the detectable levels of color from samples collected in the upper Santa Margarita watershed are the result of natural processes and not the result of urban runoff.

<u>Odor</u>

Natural sources of odor in water include living microscopic organisms and decaying vegetation, including weeds, bacteria, fungi, actinomycetes, algae, and decaying organic matter. Chemicals responsible for tastes and odors may include halogens, sulfides, ammonia, turpentine, phenols and cresols, picrates, various hydrocarbons and unsaturated organic compounds, mercaptans, tar and tar oils, hydrocarbons, detergents, pesticides. These chemicals have never been detected at stations in the upper Santa Margarita watershed. Other parameters must be considered in concert with odor. It is frequently difficult, if not impossible, to identify the specific cause of an odor or taste, as many substances may cause what appears to be the same effect, or because mixtures of substances may be involved. As much of the drainage system in the watershed remains in its natural state, exceedences in odor alone cannot be considered indicative of water quality impacts associated with urban runoff.

Total Dissolved Solids (TDS)

In natural waters the dissolved solids consist mainly of carbonates, bicarbonates, chlorides, sulfates, phosphates, and possibly nitrates of calcium, magnesium, sodium, and potassium with traces of iron, manganese and other substances. Sources of dissolved solids may include chemical wastes, dissolved salts, acids, alkalis, or drainage waters from irrigated land. Evaporation also increases TDS levels. All results with TDS levels above the BPO were measured during dry weather monitoring events. Moreover, throughout the monitoring program it has been noted that concentrations tend to be higher during dry weather.

Volatile Organic Compounds

The detection of methylene chloride at relatively the same concentrations in samples collected at the Triad stations during the same monitoring event is indicative of a laboratory contaminant for the following reasons. Methylene chloride was the only volatile organic compound (VOC) that was detected at each of the Triad stations during the first storm event of the monitoring period. Methylene chloride was not detected at any of the Tributary stations or the Triad stations during the dry weather sampling events. Methylene chloride is a common residual laboratory contaminant that is used to clean VOC glassware as well as used to extract pesticides and most organic chemicals when analyzing samples. Therefore, this single detection is considered as a laboratory contaminant and not the result of an industrial discharge. During the next reporting period, the laboratory will be instructed to include a sampling field blank as well as take extra precautions to minimize the introduction of contaminants into the sampling glassware.

Semivolatile Organic Compounds

The single detection of Bis(2-ethylehexyl)phthalate is the result of laboratory contamination for the following reason. Bis(2-ethylhexyl)phthalate was detected at the Cole Creek station during the first wet weather sampling event of the reporting period. Phthalates are common laboratory contaminants. They are found in gloves worn by analysts who prepare samples and in other plastics found in the laboratory. This phthalate compound has never been detected in any of the District's watershed monitoring activities; therefore its presence is considered to be due to laboratory contamination. The laboratory will be notified and a request will be made to minimize the introduction of any phthalate contaminants into the sample stream by not utilizing any plastic-based labware.

4,4'-DDE

4,4'-DDE was detected above the CTR during the first storm event of the reporting period at the Temecula Creek Triad station. Although DDT has been banned as a pesticide for over thirty years, its degradation by-products, 4,4-DDD and 4,4-DDE, are still detected in a variety of environmental matrices.

Chlorpyifos (ELISA)

For the Triad stations, all concentrations of Chlorpyifos were relatively unchanged in dry and wet weather sampling events with detected levels ranging from 0.01110 μg/l to 0.02780 μg/l. At the Tributary stations, dry and wet weather sampling results indicated that Chlorpyifos was relatively unchanged when compared to the previous monitoring periods. However, Chlorpyifos was detected in a dry weather sample collected at the Warm Springs Creek station, at a concentration of 0.37040 μg/l. Since 2004 – 2005 was the first time this station has been sampled, more data will need to be collected and analyzed to determine what this detection represents. There are no established regulatory objectives to compare these results with.

Diazinon

Diazinon concentrations were relatively unchanged in dry weather and storm monitoring events during the 2004-2005 reporting period at both the Triad and Tributary stations. No long-term trend is evident in the data. There are no established regulatory objectives to compare these results with.

Trace Metals

Total Chromium

The Triad stations were sampled for trace metals during each wet weather and dry weather monitoring event. Total Chromium was detected at a level above the BPO at the Cole Creek station during the first wet weather event of the monitoring period and at Temecula Creek during the second wet weather monitoring event of the storm season. Because these results represent only a single detection, their presence in the upper Santa Margarita Watershed is not considered to be persistent.

Copper

The Copper results ranged from 0.0016 mg/l to 0.300 mg/l, which is less than the BPO, but greater than the CTR. The highest concentration was detected during a dry weather event at Temecula Creek. Land use within the contributing runoff area is a mix of Agriculture (2.9%), Industrial (5.8%), Preserves and Open Space 33.5%, Parks and Recreation (1.7%), Rural (19.4%), and Urban (25.8%). Among the Tributary and Triad stations, the Temecula Creek Triad station has the highest amount of industrial land use within its draining area (Table G-2). Typical industrial sources of copper include corrosion of copper and brass tubing, copper compounds used to control undesirable plankton organisms, alloy production, electrical wiring, pipes, roofing, and many purposes where its conductivity or corrosion resistance are important. Copper salts are used in textile processing, pigmentation, tanning, photography, engraving, electroplating, insecticides, fungicides, and many other industrial processes. Other sources of copper include algae control in reservoirs, brake pads, geologic formations and fires. It should also be noted that I-15, a major north-south artery between Riverside and San Diego County is immediately adjacent to, and upstream, of the sampling site for Temecula Creek. An outfall from the freeway outlets several hundred feet upstream of the sampling site and may be a significant source of copper due to brake pad wear.

Among the Triad and Tributary stations, the Lead results ranged from 0.00140 mg/l to 0.0470 mg/l. The highest concentration was detected during a wet weather sampling event at Temecula Creek. Other stations at which Lead was detected at levels above the CTR include one dry weather monitoring event at Redhawk, one wet weather monitoring event at Long Canyon, two wet weather monitoring events at Cole Creek, another wet weather monitoring event at Temecula Creek, and three wet weather monitoring events and a dry weather monitoring event at Murrieta Creek. Residual lead from the use of leaded gasoline remains in the environment. Natural sources of lead in water include leaching from mountain limestone and galena. Industrial sources of lead include mining effluents. A final source of lead is due to the impact of forest fires that wash pollutants such as lead into debris basins and groundwater.

Selenium

Among the Tributary stations, Selenium was only sampled at the Redhawk Creek station and it was not detected. Among the Triad stations, Selenium was only detected at Murrieta Creek. The detected concentration was sampled during a dry weather event and was less than the BPO but greater than the CTR.

Selenium is found in some soils as ferric selenite or calcium selenate. It may also be found in decayed plant tissue. Industrial sources of selenium may include pigmentation in paints, dyes, and glass production; as a component of rectifiers, semiconductors, photo-electrical cells, and other electrical apparatus; as a supplement to sulfur in the rubber industry; as a component of alloys; and for insecticide sprays. Selenium may also be found in the municipal sewage from industrial communities.

Zinc

Among the Tributary stations, Zinc was only sampled at the Redhawk Creek station and it was not detected. Among the Triad stations, Zinc was detected at a level above the CTR at the Temecula Creek station during a wet weather sampling event. At Murrieta Creek, Zinc was detected at a level above the CTR during two wet weather monitoring events.

Zinc is used in tire compounding and is frequently found at elevated levels in highway runoff. In addition, Zinc is a component of aerial deposition. Industrial sources of zinc and zinc salts may include galvanizing, alloy manufacture, for electrical purposes, in printing plates, dye manufacture and the dyeing process, paint pigments, cosmetics, pharmaceutics, dyes, and insecticides.

Fecal Coliform Bacteria

Coliform organisms are intestinal bacteria that originate in excretions from humans, mammals, amphibians, and birds. They are also found, primarily in the non-fecal forms on fibrous and vegetable matter in the water. Fecal Coliform bacteria were detected at levels above the BPO at all Tributary stations during both wet weather monitoring events and during a dry weather monitoring event at the Redhawk Station. At the Triad stations, Fecal coliform bacteria were detected at a level above the BPO at the Murrieta Creek and Temecula Creek stations during two wet weather monitoring event and one dry weather monitoring event. Fecal Coliform bacteria were below the BPO at the Adobe stations, whereas at the Cole Creek reference station, Fecal Coliform bacteria were detected above the BPO during the wet weather monitoring events. Fecal coliform bacteria originate from the feces of all warm blooded animals. Thus, its presence at the reference station and other Triad stations may be indicative of natural sources (e.g., birds, rodents, cattle, etc.) as well as human waste.

Nutrients

Nutrients in the form of Nitrogen and Phosphorus have been continually monitored since 1993 in the Upper Santa Margarita watershed. During the 2004-2005 reporting period Total Phosphorus was detected at a level above the BPO at all of the Triad and Tributary stations during all of the sampling events. Phosphorus in nature is found in the form of phosphates in several minerals and it is a constituent of fertile soils, plants, and the protoplasm, nervous tissue and bones of animal life. It is an essential nutrient for plant and animal growth. A potential source of additional phosphorus (greater than naturally occurring) is commercial agricultural fertilizers. Elevated phosphorus concentrations may lead to an overabundance of algae growth followed by low dissolved oxygen concentrations.

Turbidity

Turbidity in water is attributable to suspended and colloidal matter, which diminishes light penetration. Increased turbidity may also indicate the presence of pathogens. Natural sources of turbidity include microorganisms or organic detritus; silica or other mineral substances including zinc, iron, and manganese compounds; and clay or silt. Erosion may also lead to increased turbidity as well as domestic sewage and industrial wastes.

Field and laboratory measurements indicated that turbidity was detected at a level above the BPO at all Triad and Tributary stations, with higher values measured during storm events.

G-7.3.2 Interpretation of Bioassessment Metric Values

The results of the bioassessment data sets are presented in Table G-12. The Upper Santa Margarita watershed is a geomorphologically dynamic system. Therefore, bioassessment data will need to be collected over a number of years to establish a baseline of the physical and biological conditions before conclusions can be drawn. For example, bioassessment data was collected at Adobe Creek in the Spring and Fall of 2003 - 2004 reporting period and from Murrieta Creek in the Fall of the 2003-2004 reporting period. When comparing the 2003 – 2004 data sets with the 2004 - 2005 data sets, significant differences existed among the data sets such that the ability to see trends or draw conclusions was limited. However, a few interesting points can be drawn from a preliminary review of the two bioassessment data sets.

Impacts of Dry weather flows on IBI and Habitat metrics.

Habitat scores at Murrieta Creek increased from 124 to 129 and the IBI scores increased from 17 to 32 during the summer of 2004. The significant increase in the IBI score is a strong indication that urban flows are not adversely impacting downstream beneficial uses.

Bioassessment metrics for Adobe Creek reacted differently. For example, the Habitat metrics score decreased from 124 in Spring 2004 to 110 in October 2004, whereas, the IBI metrics score decreased from 59 to 56, which is still defined as "Good". The reduction in the habitat metric score could have been attributed to the dry summer or a result of the fires in the watershed tributary to Adobe Creek.

Impacts of Wet Season on IBI and Habitat Scores

During the Winter of 2004 - 2005, the IBI and Habitat scores in Murrieta Creek were decreased from Fair (32) and Sub-Optimal (129) to Poor (16) and Marginal (101) (Table G-12). The scores are most likely attributed to the extreme precipitation and flood flow events that were experienced in the SMR. Specifically, flow rates exceeded several thousand cubic feet per second (CFS) in the Santa Margarita River and each of its two tributaries, Murrieta and Temecula Creeks. These high volume flows often have significant impacts on streams, including work in the form of aggradation and degradation of bed and banks. Despite the lower habitat scores in the Spring of 2005, overall IBI scores were similar.

Although IBI scores also decreased during the winter of the 2004 – 2005 monitoring period at Adobe Creek, there was a slight improvement in Habitat scores. This improvement in Habitat scores may be attributed to the fact that Adobe Creek's habitat consists of a headwater stream with a small tributary area. Moreover, although rainfall during the reporting period set annual records, the intensity of rainfall tended to be relatively low. Given the small watershed area and the low rainfall intensity, flow rates at the Adobe station probably remained significantly lower than in the larger downstream watersheds thereby, performing much less work on the stream system, and preventing significant degredation of habitat.

Comparison of Conditions between Spring 2004 and Spring 2005

Although the IBI scores were similar at Murrieta Creek during Spring 2004 and Spring 2005, there was a significant reduction in the habitat score in Spring 2005. At Adobe Creek, Habitat and IBI conditions remained about the same. Again, the observation of lower Habitat scores at Murrieta Creek is most likely attributed to the significant cumulative rainfall that occurred during the 2004 – 2005 reporting period.

G-7.3.3 Discussion of any TIEs that were conducted and the potential sources of toxic pollutants

TIEs were not required or conducted during 2004 - 2005.

G-7.3.4 A discussion of the development, implementation and results of any TREs

TREs were not required or conducted for this reporting period.

G-7.3.5 Discussion of any relevant information or conclusions from the Illicit Discharge Monitoring Program

Provision II.B. of the MRP (Illicit Discharge Monitoring) was not fully implemented during the reporting period. Implementation of this provision is not required until July 14, 2005 (after the current reporting period). Based on the limited data available at the time of this report, no relevent information or conclusions were drawn from the existing Illicit Discharge Monitoring program.

G-7.3.6 Discussion of the progress towards answering the management questions listed in Section II.A. of the MRP and achieving the goals listed in Section 1 of the MRP.

This is the first year of implementation of the revised MRP. Several years of data collection will be required to identify long-term trends and establish pollutants of concern. However, based on preliminary results, the overall water quality of the Upper Santa Margarita watershed appears to be good. This report has specifically assessed compliance with SDRWQCB Order No. R9-2004-001, characterized discharges from MS4 outfalls, initiated assessments of sources of pollutants, assisted the Permittees in identifying potential IC/IDs within the MS4 and assessed the overall health of the Receiving Waters. Long term goals of the program include using data to measure effectiveness of the SWMPs, assess the impacts of urban runoff on Receiving Waters, and prioritizing watershed management actions.

Further discussion of the answers to the Management Questions identified in Section II.A of the MRP are addressed in the Section G-8.0 of this report.

G-7.3.7 Discussion of any other data analysis performed

No additional data analysis, beyond what was previously discussed, was performed.

G-8.0 Conclusions and Recommendations

G-8.1 Water Quality Assessment in the Upper Santa Margarita Watershed

An assessment of the water quality at both the Tributary and Triad stations in the Upper Santa Margarita watershed is provided as Attachment C. This assessment includes data from the current reporting period as well as from the previous monitoring periods. Figures that display historical data for each parameter measured at each station are provided in Attachment A. This assessment also provides a description of each of the water quality parameters along with their impact on urban runoff water quality as well as the types of sources likely to discharge them into a waste stream. The parameter descriptions are largely taken from Water Quality Criteria, 2nd Edition, J. McKee and H. Wold, State Water Resources Control Board, July 1978. Unless otherwise specified, the data is randomly distributed and no trends were evident. A further summary regarding water quality in the Upper Santa Margarita watershed and prioritization of water quality problems is provided in the following sections.

G-8.1.1 Extent and Magnitude of Current Receiving Water Problems

The Upper Santa Margarita watershed supports a variety of ecosystems and provides many beneficial uses (Table G-32)[10]. The USEPA has indicated that major potential sources creating impacts to the Upper Santa Margarita watershed include urban runoff/storm sewers as well as unknown point sources.11 Among the waterbodies within the Upper Santa Margarita watershed, (Table G-32), only Murrieta Creek has been listed as impaired. The single pollutant that Murrieta Creek is listed for is total phosphorus (Table G-33).

Table G-32. Beneficial Uses of Upper Santa Margarita Watershed

Beneficial Use	Murrieta Creek	Cole Canyon	Warm Springs Creek	Santa Gertrudis Creek	Long Valley	Temecula Creek	Santa Margarita River
Municipal and Domestic Supply	X	X	X	X	X	X	X
Agricultural Supply	X	X	X	X	X	X	X
Industrial Service Supply	X	X	X	X	X	X	X
Industrial Process Supply	X	X	X	X	X	X	
Ground Water Recharge	X					X	
Contact Water Recreation				X	X	X	X
Non-contact Water Recreation	X	X	X	X	X	X	X
Warm Freshwater Habitat	X	X	X	X	X	X	X
Cold Freshwater Habitat							X
Wildlife Habitat	X	X	X	X	X	X	X
Rare, Threatened or Endangered Species							X

10 www.waterboards.ca.gov/rwqcb9/programs/

11 State Water Resources Control Board. 2003. 2002 CWA Section 303(d) list of water quality limited segment; San Diego Regional Water Quality Control Board. <www.waterboards.ca.gov/tmdl/docs/2002reg9303dlist.pdf>

Table G-33. Murrieta Creek

Waterbody Name	Calwater Watershed	Pollutant/Stressor	TMDL Priority	Estimated Size Affected
Murrieta Creek	90252000	Phosphorus	Low	12 Miles

G-8.1.2 Are conditions in the watershed protective of Beneficial Uses

Overall, conditions in the watershed are protective of Beneficial Uses. This is evident in the long-term trends provided in Attachment A, that generally show decreases in chemical and biological indicators of water quality. Furthermore, Murrieta Creek is the only Receiving Water within the watershed that is listed as impaired, and it is only listed for Total Phosphorus. Although Total Phosphorus was detected at levels greater than the BPO of 0.1 mg/L, this BPO was set extremely low, and is based on objectives set for waterbodies outside of the State, in watersheds that are not similar to the Upper Santa Margarita River watershed. Moreover, Total Phosphorus was measured at a level greater than the BPO during a wet weather event at the Cole Creek station, which is a refererence station. The total phosphorus BPO was based on a study of the levels of total phosphorus needed to restore the Everglades, a Florida swamp. This objective may be unachievable using BAT/BCT. “Urban Stormwater BMP Performance Monitoring” [6] presents a table (Table 2.9, page 33) of “irreducible concentrations” of selected contaminants, the lowest concentration that can possibly be achieved using existing BMPs. The table, reprinted below, is:

Table G-34. Total Phosphorus Irriducible Concentration

Contaminant	Irreducible Concentration
Total Phosphorus	0.15 – 0.2 mg/L

G-8.2 Identification of Water Quality Improvement or Degradation

Overall, the water quality in the Upper Santa Margarita watershed appears to be good. Concentrations of volatile organic compounds, semivolatile organic compounds, and polyaromatic hydrocarbons were essentially not detected. Although there were low concentrations of metals, there were only two trace metals (Copper and Lead) that were consistently above the CTR regulatory objectives by 20% for three sampling events. Of the nutrients, only Total Phosphorus was above the regulatory objective on a persistent basis. Most organophosphate pesticides were not detected and concentrations of Diazinon and Chlorpyrifos are relatively unchanged based on all the data that has been collected since 1993. Turbidity has also been monitored since 1993 and although high levels were measured during the dry and wet weather events of 2004 - 2005, it does not appear to be consistently problematic.

Fecal Coliform bacteria were not considered a persistent problem because levels were above regulatory objectives only during two wet weather monitoring events at each Triad station. Fecal Coliform bacteria originate from the feces of all warm blooded animals. Thus, its presence in the environment can be indicative of natural sources (e.g., birds, rodents, cattle, etc.) as well as human sewage. Furthermore, fecal coliform bacteria are ubiquitous in the environment and are frequently found in high densities in urban runoff.

Although toxicity was associated with storm water, more monitoring will be required to determine if it appears to be related to specific storm events and conditions related to the extreme rainfall during the reporting period rather than a chronic condition. The bioassessment results indicate that an assessment of possible upstream sources causing detected chemicals above BPO and CTR objectives should be initiated for Murrieta Creek; an upstream source identification should be initiated for Temecula Creek; and no action is necessary for the reference station, Cole Creek/Adobe Creek. Since the bioassessment results represent only a few data points, and since bioassessment data may have been heavily skewed by the significant destruction of habitat due to the extreme wet weather events during the reporting period, the Permittees are recommending no action until further data can be collected. Bioassessment analysis will continue during the next reporting period to provide additional insights.

G-8.3 Prioritization of Water Quality Problems and Potential Sources

Although water quality was good within the watershed, several categories of pollutants were measured at levels greater than BPOs for both dry and wet weather conditions at all, or most, of the monitoring stations. These pollutants include Fecal Coliform bacteria, Total Phosphorus, Turbidity. Copper was measured at levels greater than the CTR objective. Total Phosphorus was measured in excess of the BPO in nearly every monitored data point. Copper, Turbidity and Fecal Coliform bacteria were prevalent in wet weather flows, but less prevalent in dry weather flows. Fecal Coliform Bacteria met the BPO in tributary stations during all dry weather sampling events. Copper met BPO objectives in all dry weather samples from tributary stations with the exception of one dry weather sample at Redhawk. All of these parameters have natural sources within the watershed, and were measured above the BPO at the designated reference stations. Given the limited data sets, lack of consistent measurements in excess of BPOs during dry weather, and the small urbanized portion of the watershed, urban sources of these pollutants cannot be verified.

However, these pollutants have been found at levels exceeding BPOs in other urbanized watersheds. To prevent these pollutants from exceeding BPOs in the Santa Margarita watershed, the Permittees will review their SWMPs to further focus local and regional programs on sources of these pollutants. The Permittees goal will be to focus on programs and activities to control the broad categories of Nutrients and Sediments within the watershed. In addition, the Permittees will continue to monitor Fecal Coliform bacteria and Copper to determine if there is a need to add additional priorities in the Upper Santa Margarita watershed.

Continual monitoring and data evaluation will confirm if the detections of Total Phosphorus and Turbidity above BPO regulatory objectives are the direct result of natural sources such as recent fires (concentrations should decrease over time) or actually the result of non-natural sources (concentrations will vary over time.)

Other pollutants that are detected above the BPO will also continue to be evaluated on an annual weight of evidence basis for inclusion and/or removal from the pollutants of concern list.

G-9.0 References

1. Water Quality Criteria, 2nd Ed., J. McKee & H. Wolf, SWRCB Publication No. 3-A, Revised 1963

2. Riverside County Flood Hazard Investigation - Murrieta Creek, DWR Bulletin No. 183-2, May 1975

3. Proposed Stormwater System and Receiving Waters Monitoring Program, Santa Ana Drainage Area, NPDES Permit CA 8000192 Phase I, March 1992

4. Chemistry for Environmental Engineering, 4^{th} Ed., C. Sawyer, P. McCarty, and G. Parkin, McGraw-Hill, Inc., 1994.

5. Urban Stormwater BMP Performance Monitoring, prepared by GeoSyntec Consultants, Urban Drainage and Flood Control District, and Urban Water Resources Council of ASCE, in cooperation with EPA Office of Water, April 2002.

6. Consolidated Program for Water Quality Monitoring, March 1994, Riverside County Flood Control and Water Conservation District.

7. "Forest Burned, Filter Broken – Water Quality Suffers After Fires," Daniel Cozad, California Forests, Winter 2004, pgs. 6-7.

8. California Regional Water Quality Control Board, San Diego Region, Order No. 98-02, adopted May 13, 1998.

9. California Regional Water Quality Control Board, San Diego Region, Order No. R9-2004-001, adopted July 14, 2004.

Attachment A

Station Fact Sheets

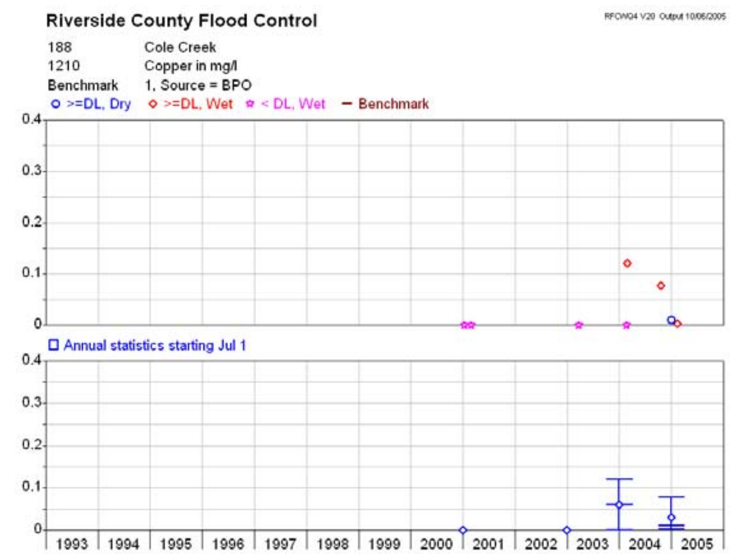
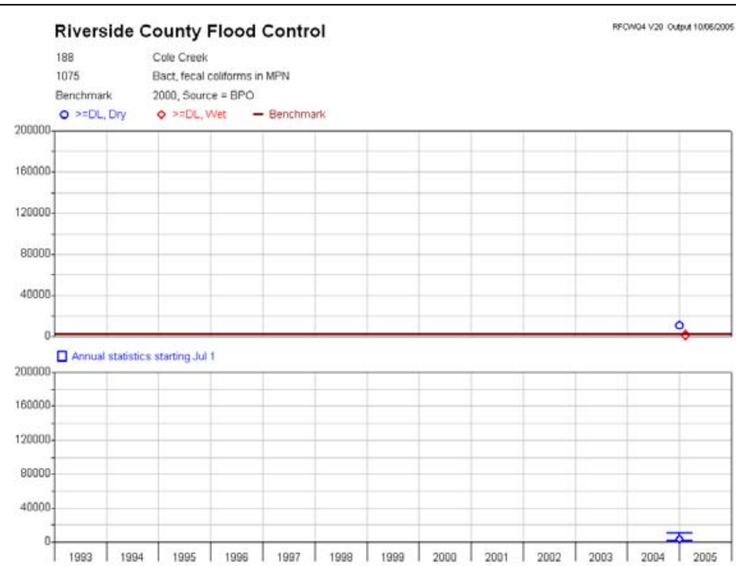
Digital Copies Only

Table G-15. Detected Parameters Above BPO and CTR Objectives

==

Triad - Station Name: Cole Creek

Hydron Reference #: 188

Parameters Detectved above CTR Objectives	**Parameter**	
	Chemical	Units
	Copper A decreasing trend in copper concentrations is evident in the data over the FY 2004 – 2005 data.	mg/l
Parameters Detected Above BPO	**Parameter**	**Units**
	Fecal coliform Not enough data to determine a trend.	count/ 100 ml

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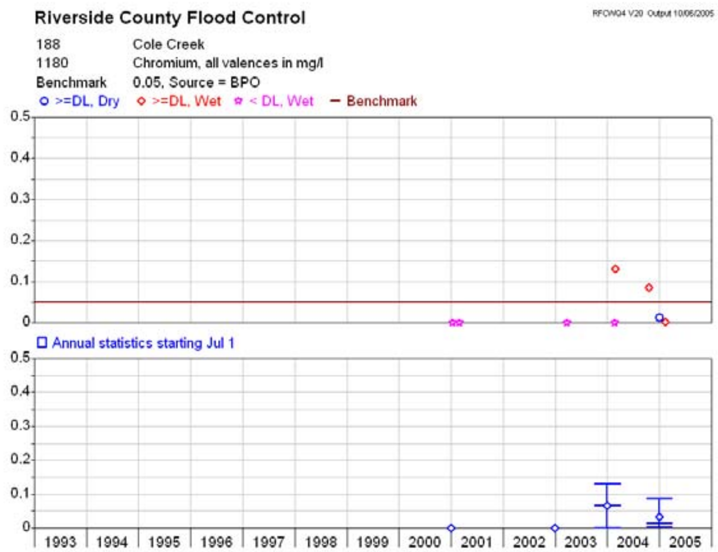
<td>
</td>
<td>Chromium, all valences

A decreasing trend in the concentration of total chromium is evident in the data over the FY 2004 – 2005 monitoring period.</td>
<td>mg/l</td>
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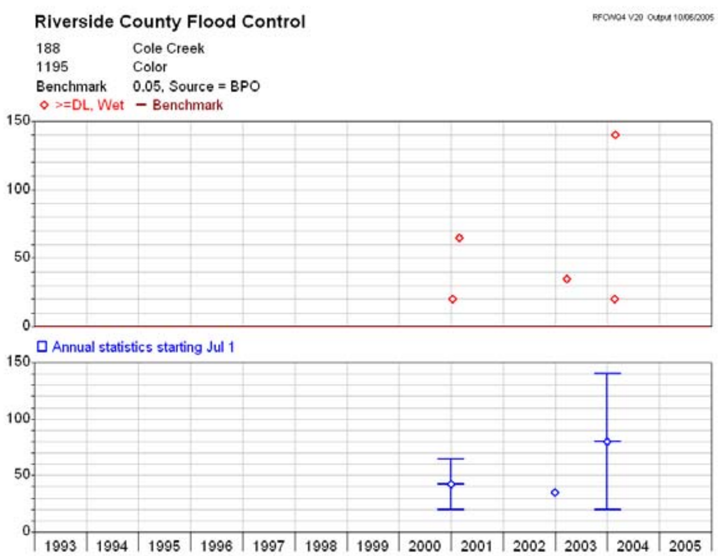
<td>
</td>
<td>Color

Color was not measured during FY 2004 - 2005.</td>
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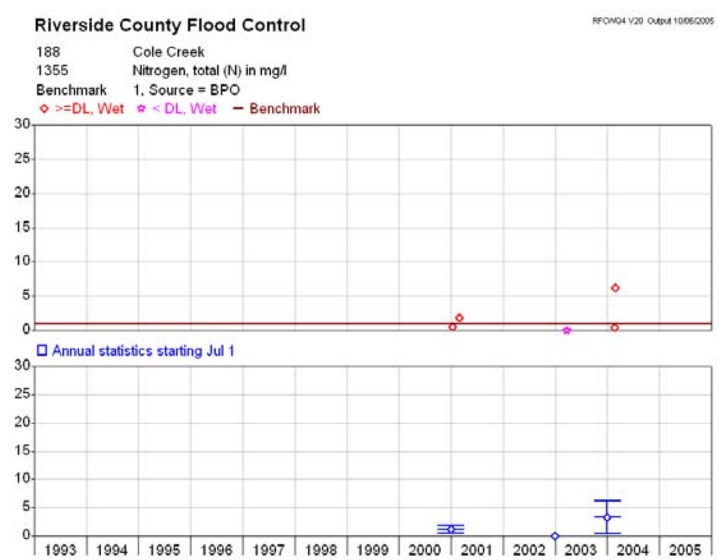
<td>
</td>
<td>Nitrogen, total (N)

Total Nitrogen, total (as N) was not measured during FY 2004 - 2005.</td>
<td>mg/l</td>
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</table>

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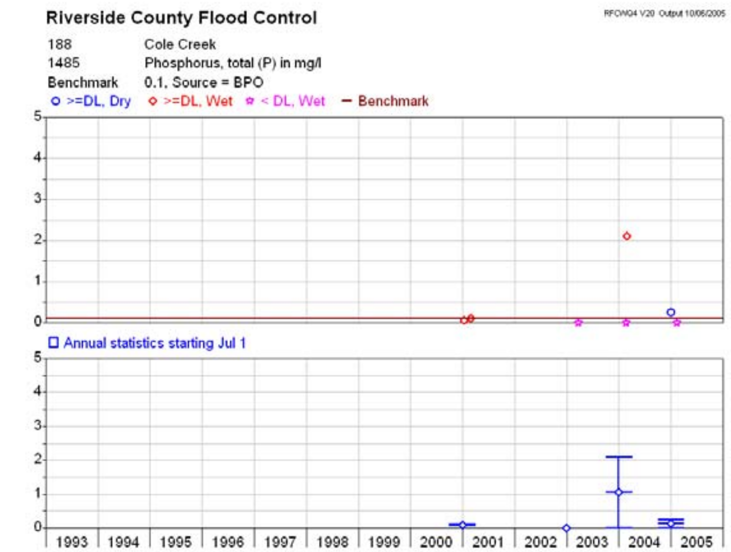
<td>
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<td>Phosphorus, total (P)

No long term trend is evident in the data.</td>
<td>mg/l</td>
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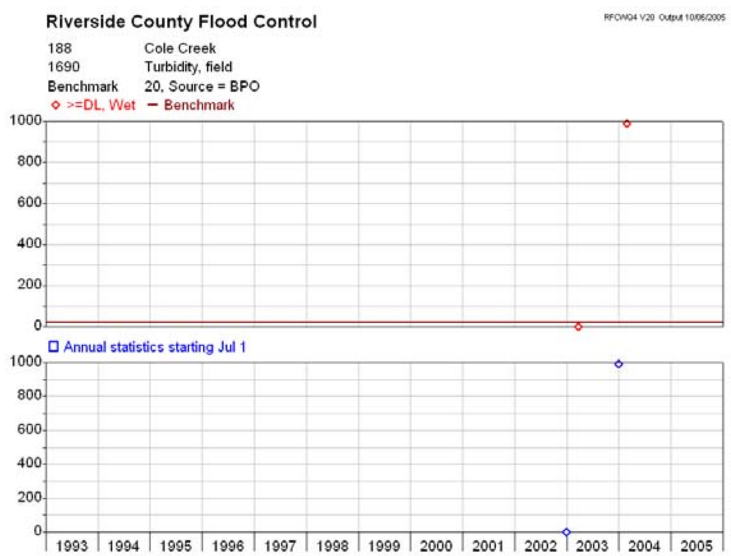
<td>
</td>
<td>Turbidity, field

Field Turbidity was not measured during the FY 2004 – 2005.</td>
<td>NTU</td>
</tr>
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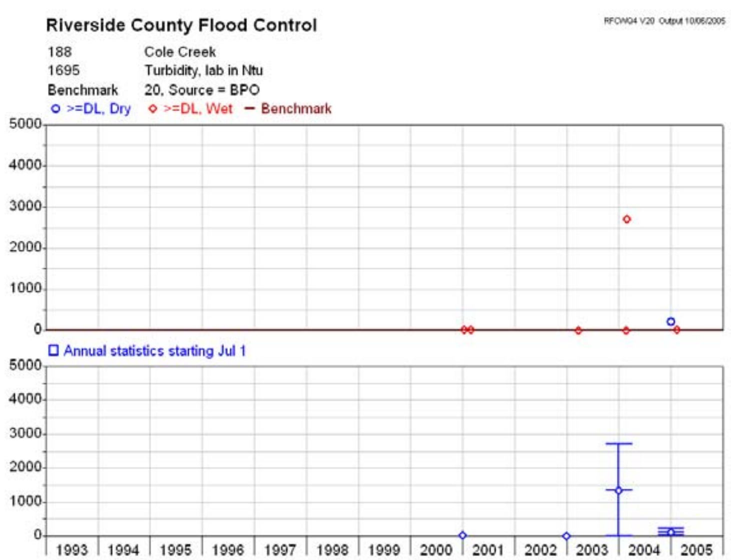
<td>
</td>
<td>Turbidity, lab

No long term trend is evident in the data.</td>
<td>NTU</td>
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</table>

Triad - Station Name: Lower Temecula Creek

Hydron Reference #: 777

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<tr><td>Detections Above CTR Objective</td><td>Parameter</td><td></td></tr>
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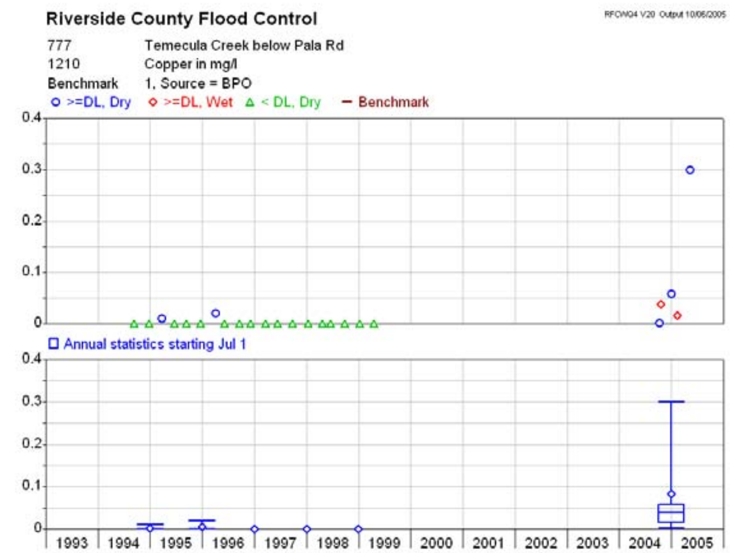

</td><td>Copper

Increasing trend is evident over the FY 2004 – 2005 reporting period.</td><td></td></tr>
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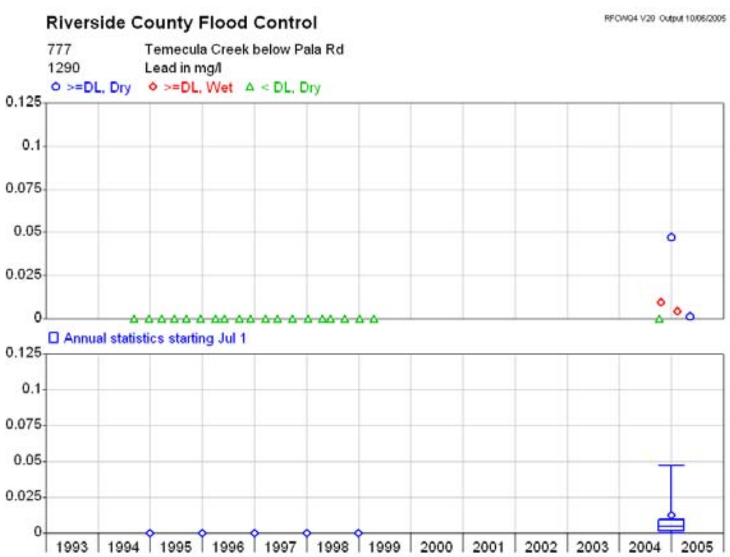

</td><td>Lead

Increasing trend is evident in the data for FY 2004 - 2005.</td><td></td></tr>
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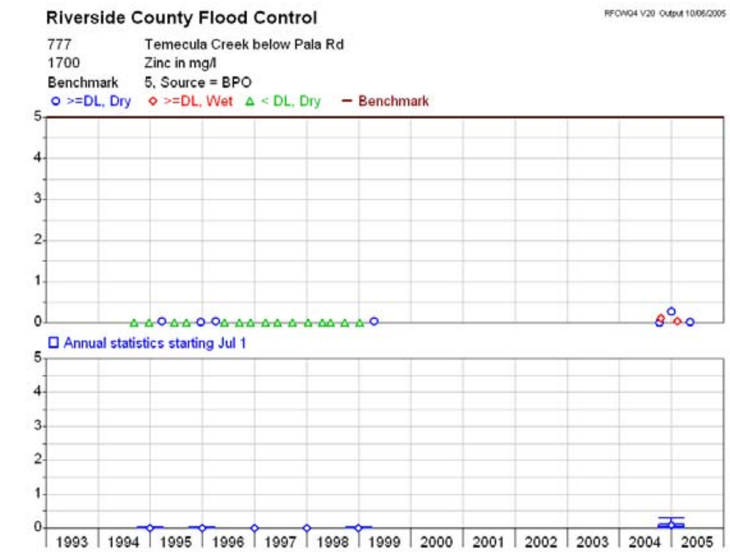
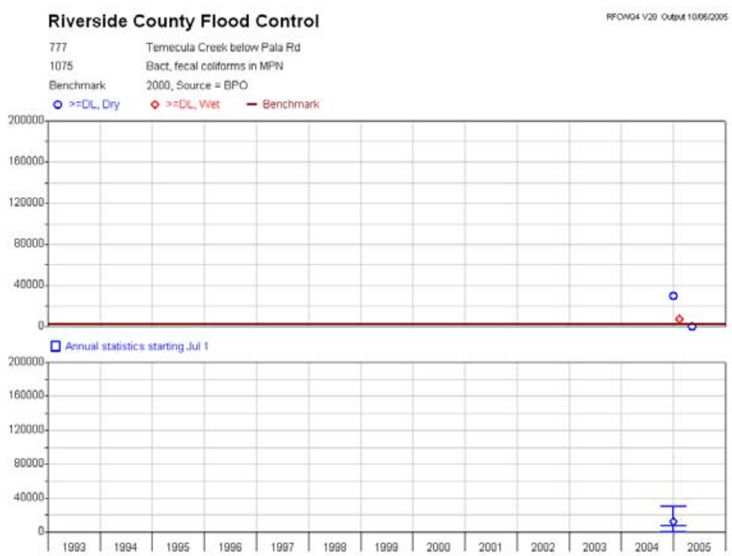
<tr><td>
</td><td>Zinc

No long term trend is evident in the data.</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Detected Parameters Above BPO</td><td>Parameter</td><td>Units</td></tr>
<tr><td>
</td><td>Fecal Coliforms

Not enough data to determine a trend.</td><td>count/ 100 ml</td></tr>
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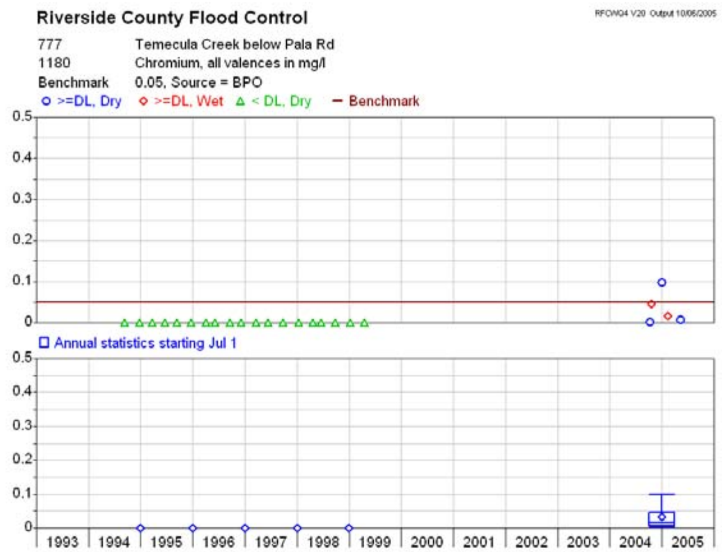
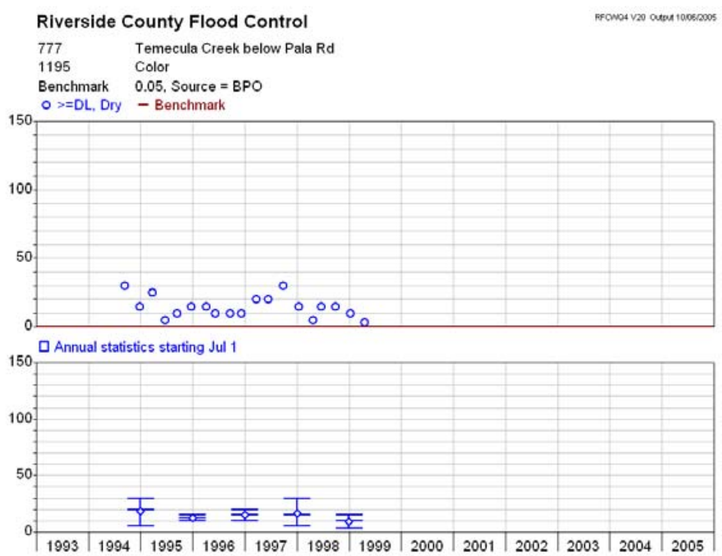
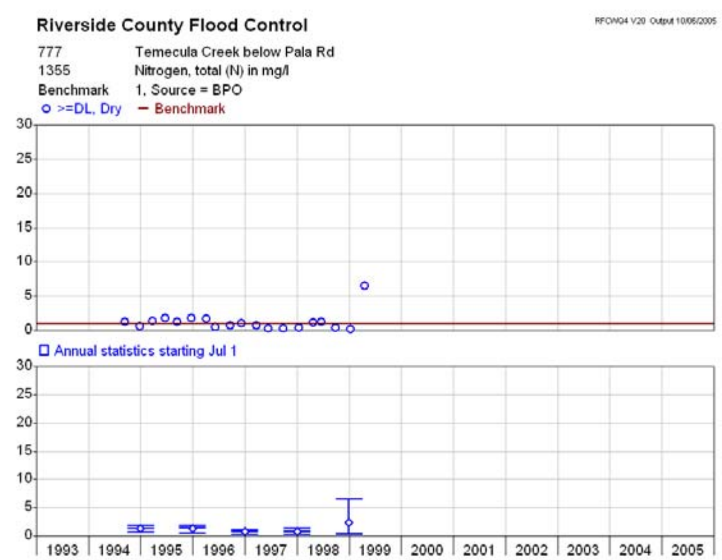
	Chromium, all valences An increasing trend is evident in the FY 2004 – 2005.	mg/l
	Color Color was not measured in FY 2004 – 2005.	
	Nitrogen, total (as N) Total Nitrogen (as N) was not measured in FY 2004 – 2005.	mg/l

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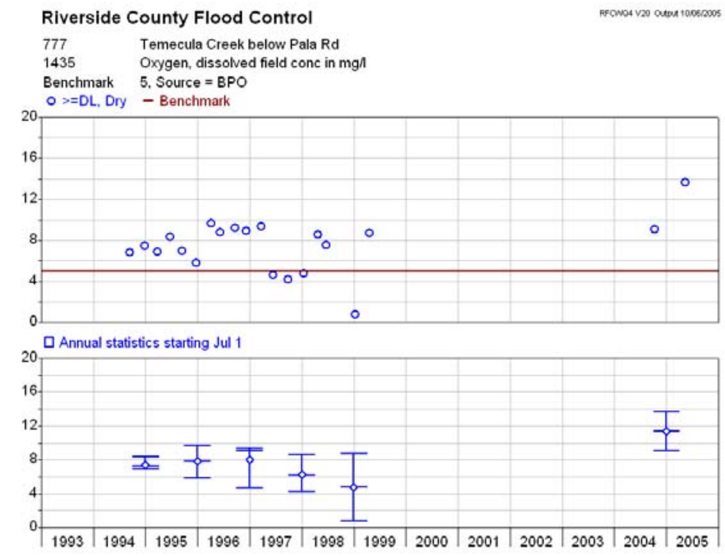
<td>
</td>
<td>Oxygen, dissolved field concentration

Increasing trend is evident in FY 2004 – 2005.</td>
<td>mg/l</td>
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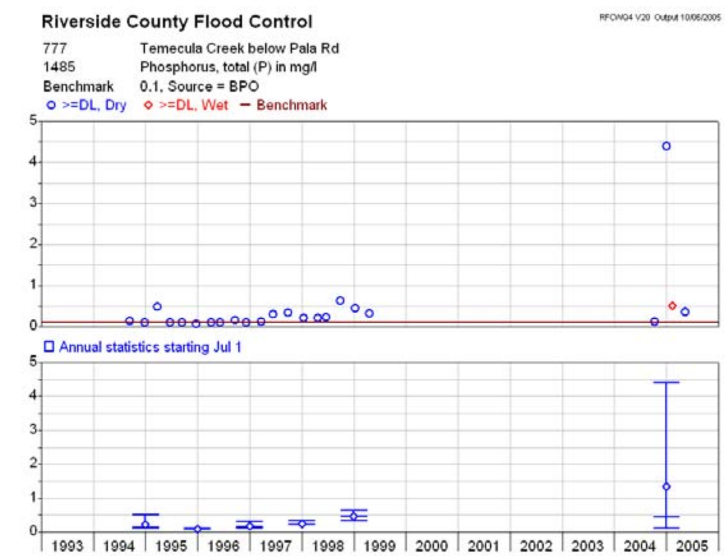
<td>
</td>
<td>Phosphorus, total (as P)

No long term trend is evident in the data.</td>
<td>mg/l</td>
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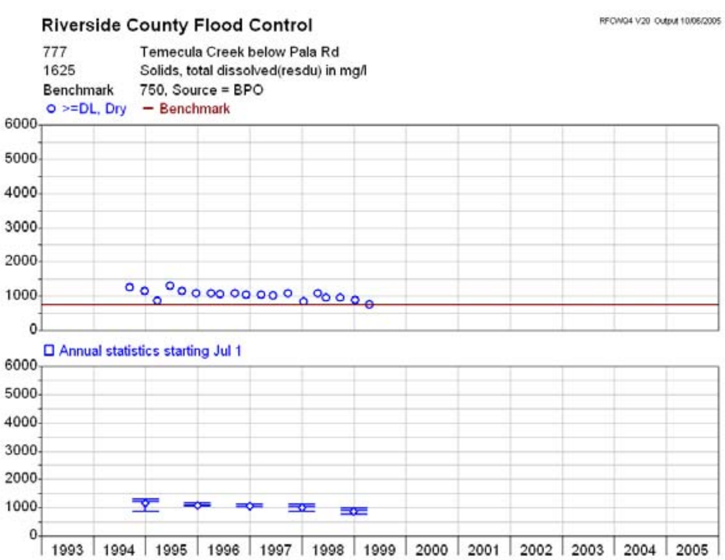
<td>
</td>
<td>Total Dissolved Solids (TDS)

Total Dissolved Solids was not measured in FY 2004 – 2005.</td>
<td>mg/l</td>
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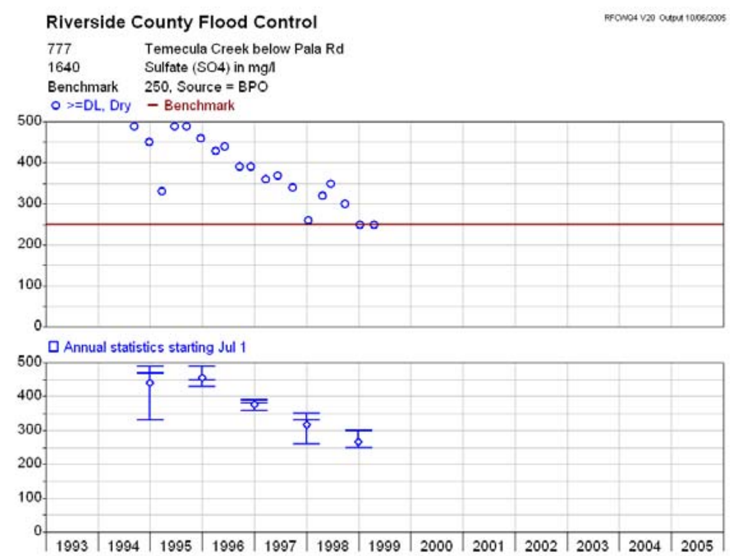
<td>
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<td>Sulfate (SO4)

Sulfate (SO4) was not measured in FY 2004 – 2005.</td>
<td>mg/l</td>
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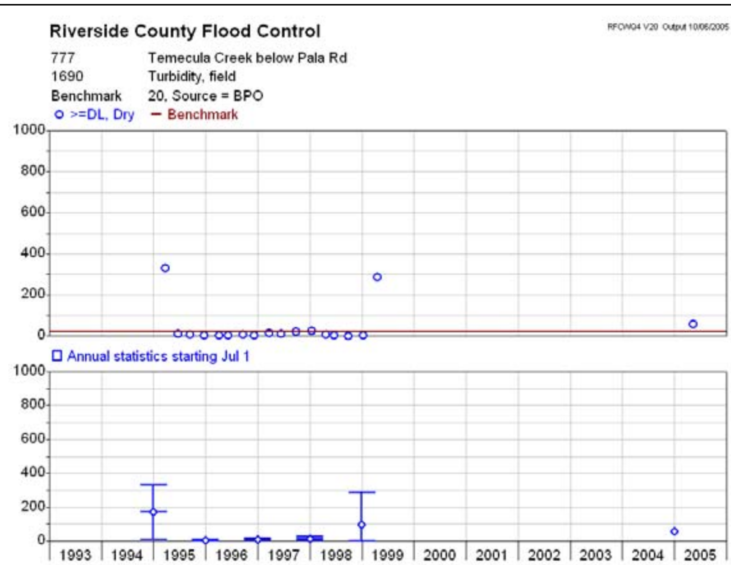
<td>
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<td>Turbidity, field

No long term trend is evident in the data.</td>
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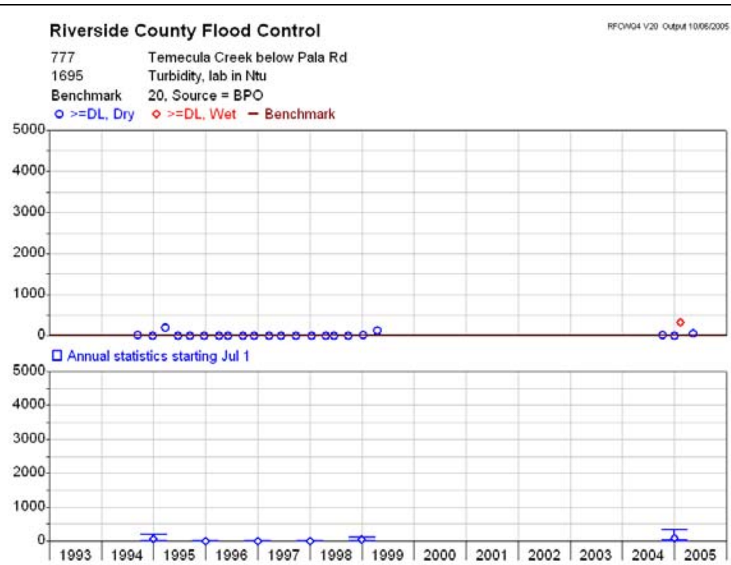
<td>
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<td>Turbidity, lab

No long term trend is evident in the data.</td>
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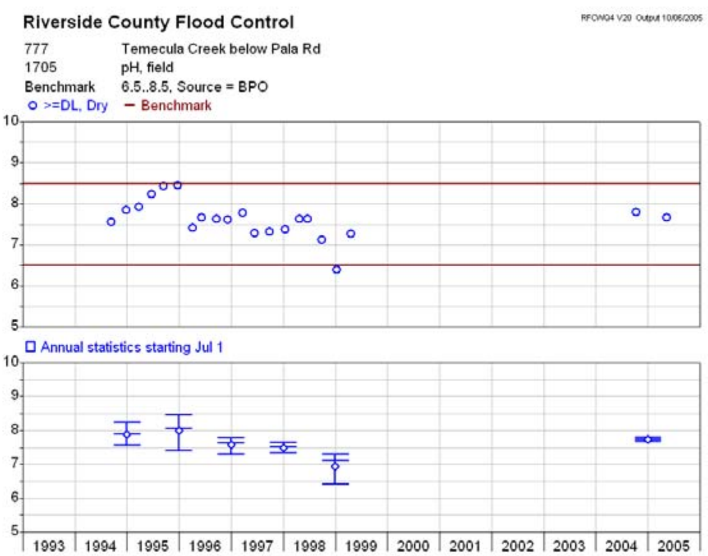
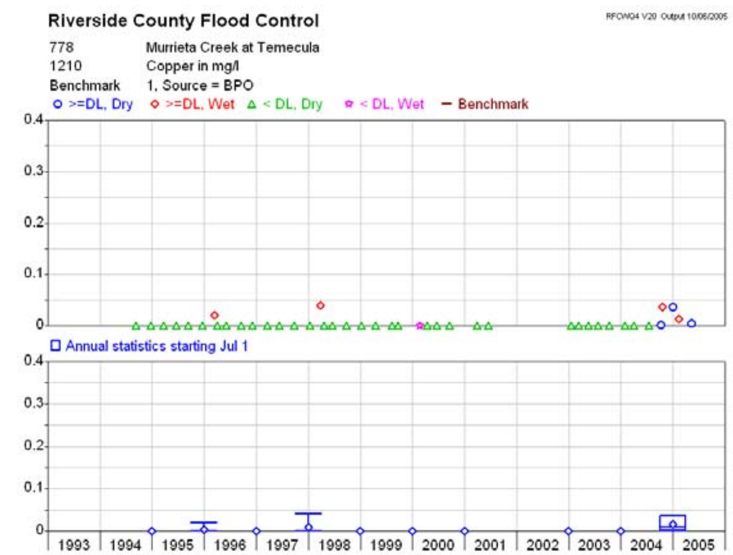
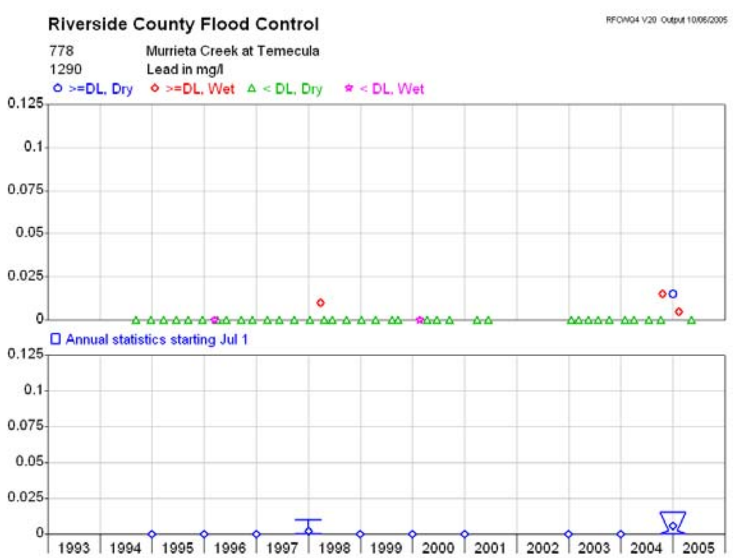
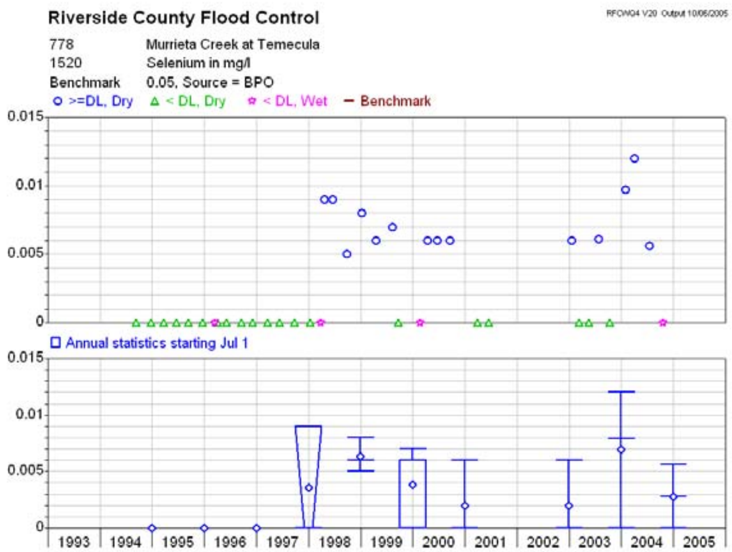
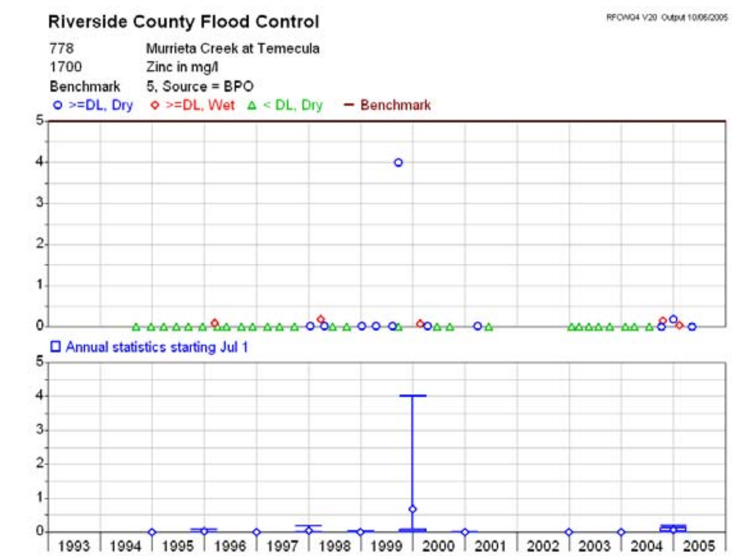
	pH, field No long term trend is evident in the data.	

Triad - Station Name: Lower Murrieta Creek

Hydron Reference #: 778

Parameters Detected Above CTR Objective	Parameter	
	Chemical	
	Copper Increasing trend is evident in the data for FY 2004 - 2005.	mg/l
	Lead No long term trend is evident in the data.	

	Selenium No long term trend is evident in the data.	
	Zinc Increasing trend is evident for FY 2004 – 2005.	
Parameters Detected Above BPO	**Parameter**	**Units**

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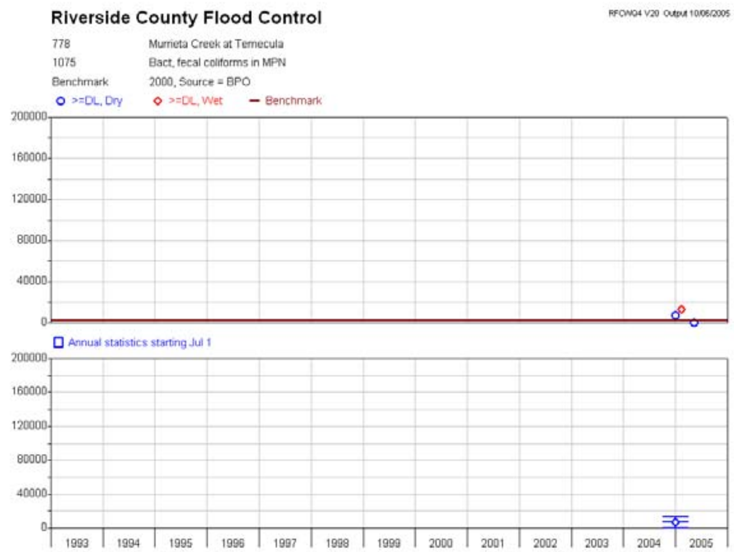
<td>
</td>
<td>Fecal coliform

Not enough data to determine a trend.</td>
<td>count/ 100 ml</td>
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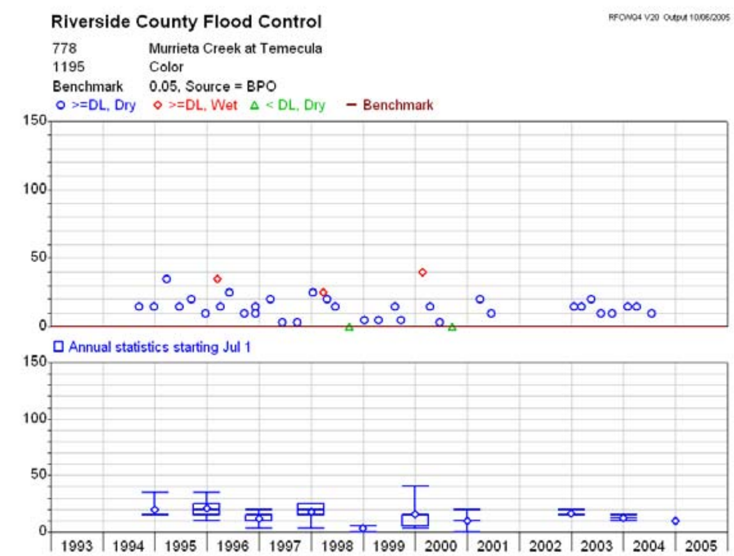
<td>
</td>
<td>Color

No long term trend is evident in the data.</td>
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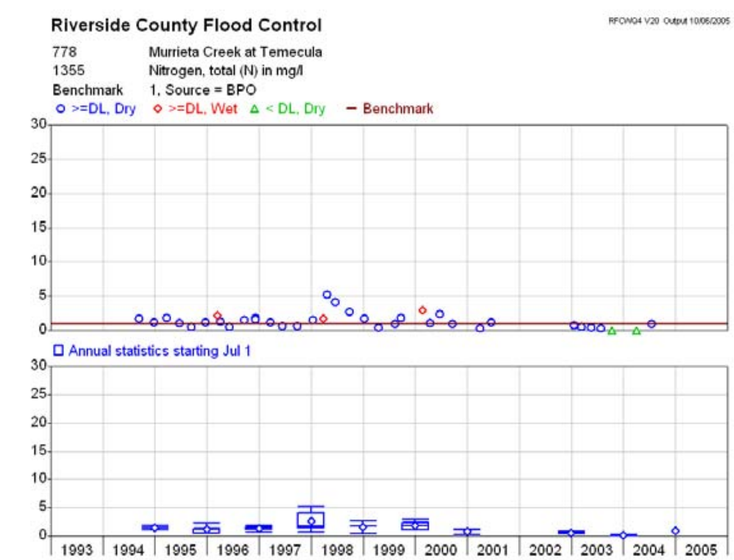
<td>
</td>
<td>Nitrogen, total (as N)

No long term trend is evident in the data.</td>
<td>mg/l</td>
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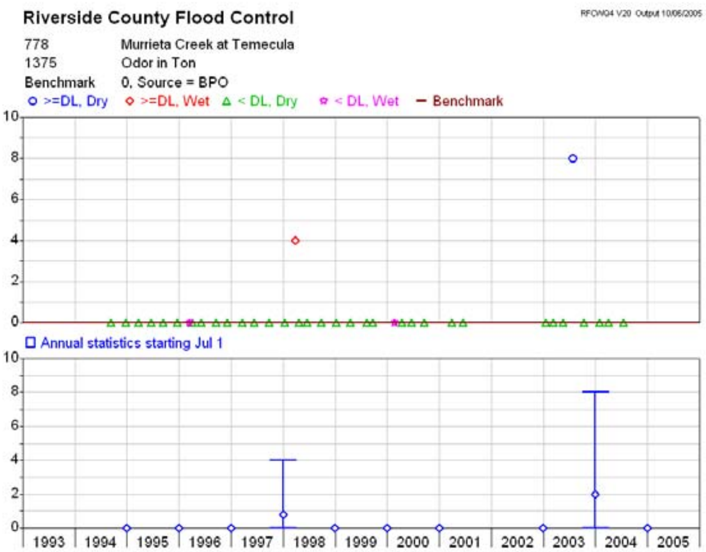
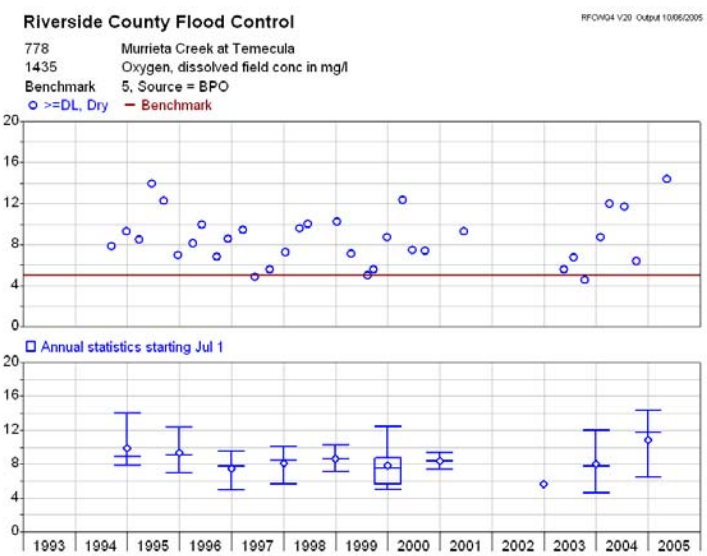
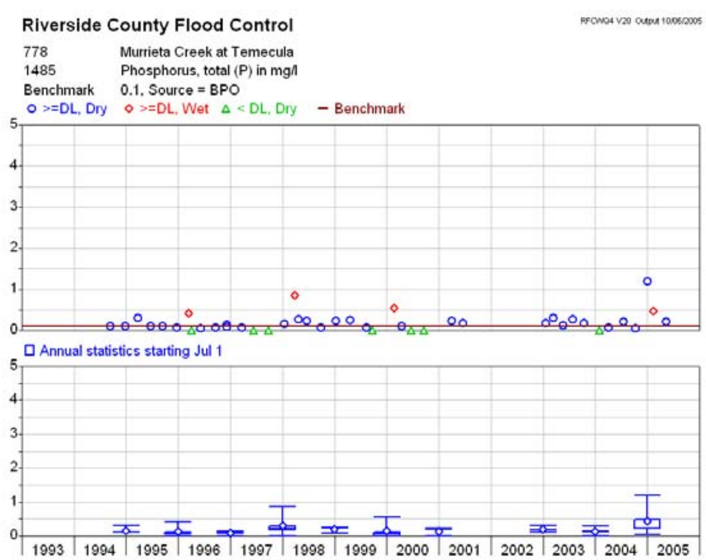
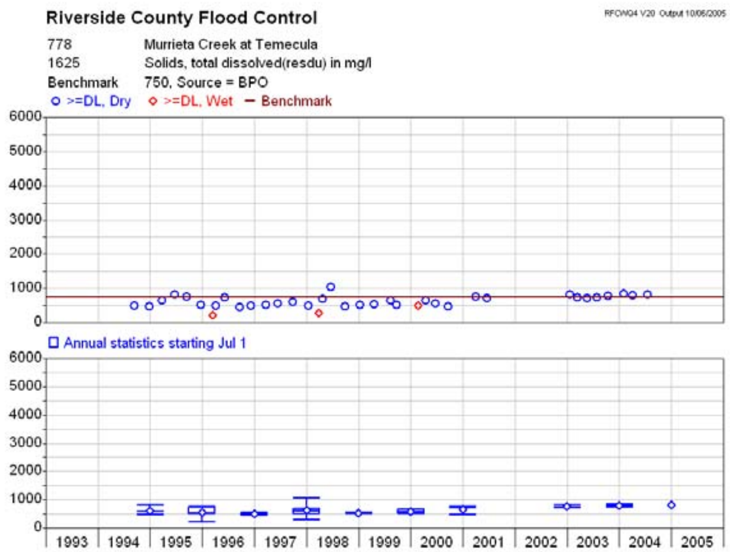
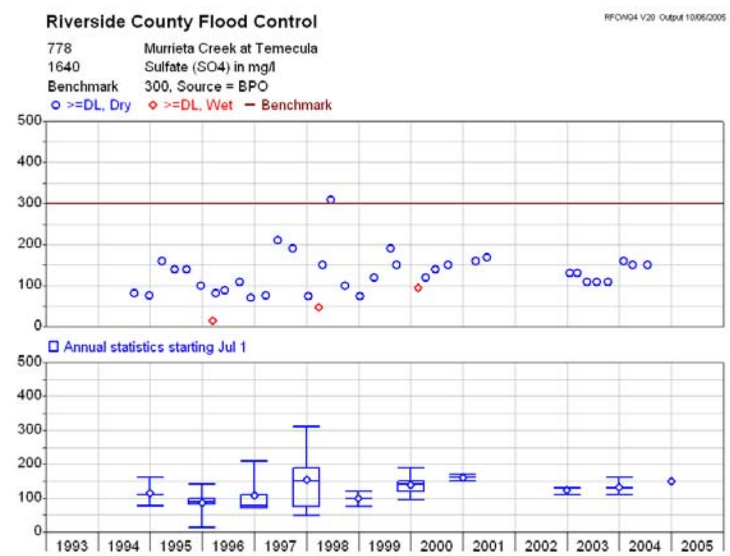
</table>

	Odor No long term trend is evident in the data.	TON
	Oxygen, dissolved field concentration Increasing trend is evident in FY 2004 – 2005.	mg/l
	Phosphorus, total (as P) No long term trend is evident in the data.	mg/l

<table>
<tr>
<td>
</td>
<td>Total Dissolved Solids
No long term trend is evident in the data.</td>
<td>mg/l</td>
</tr>
<tr>
<td>
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<td>Sulfate (SO4)

No long term trend is evident in the data.</td>
<td>mg/l</td>
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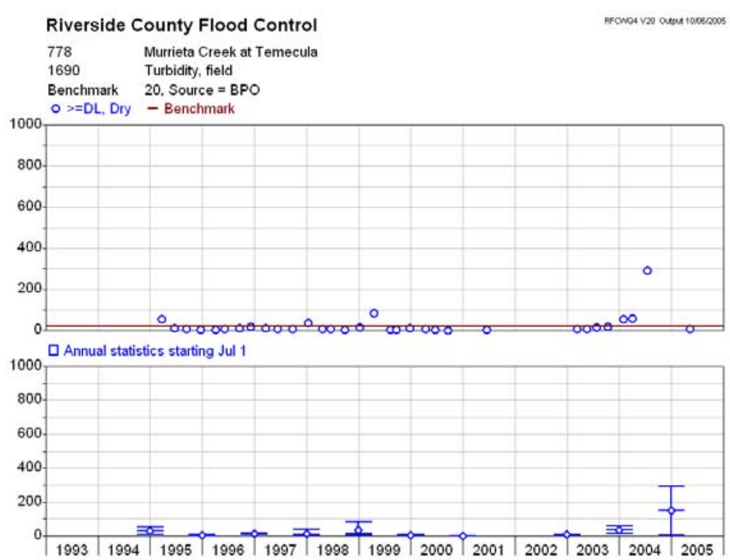
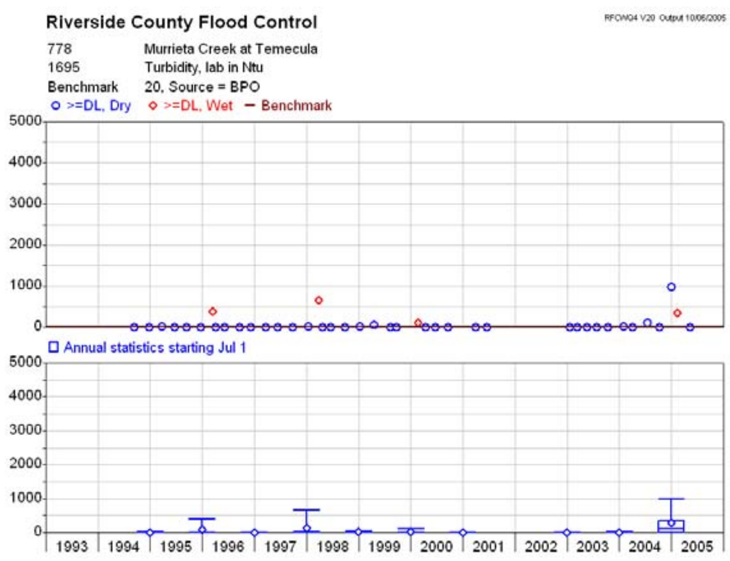
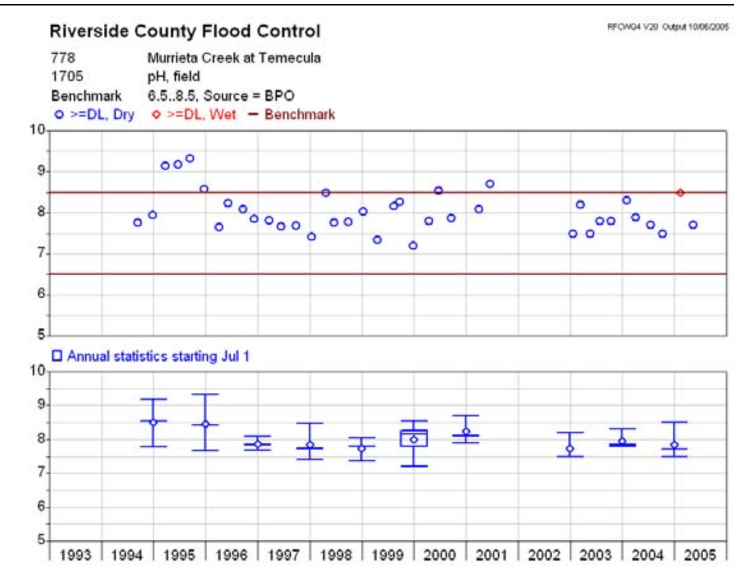
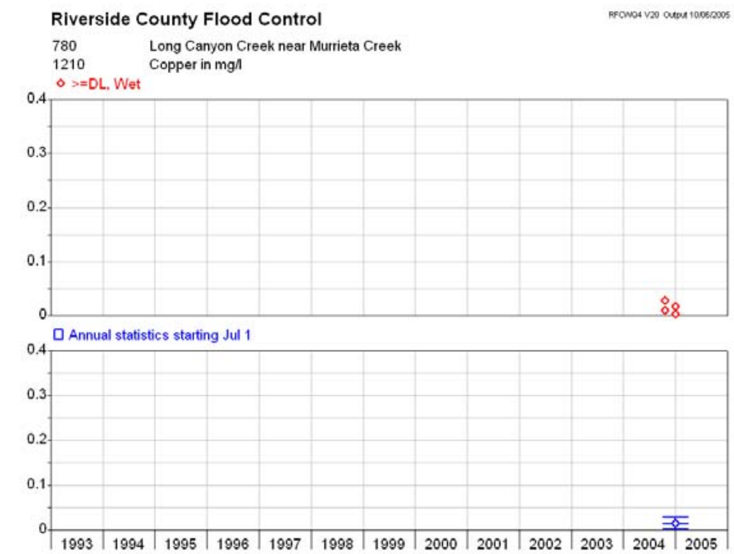
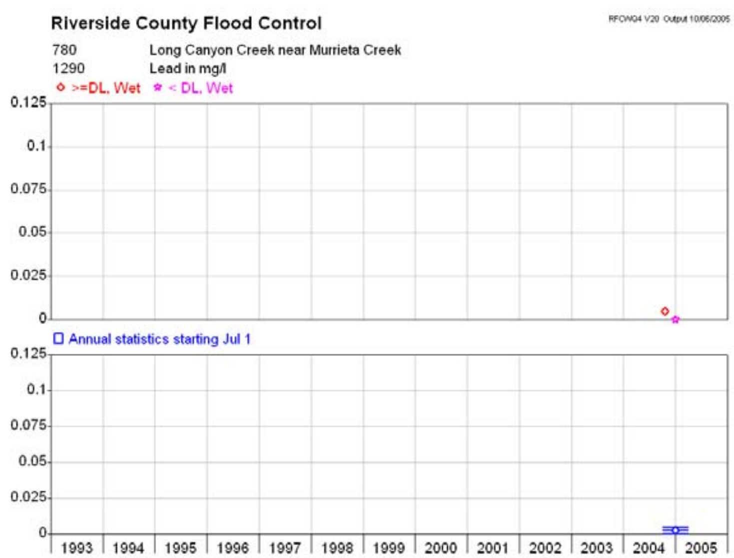
<td>
</td>
<td>Turbidity, field

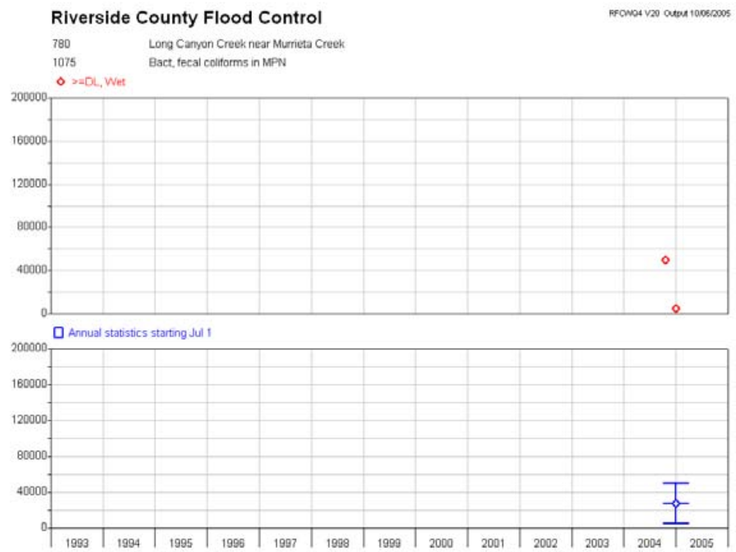
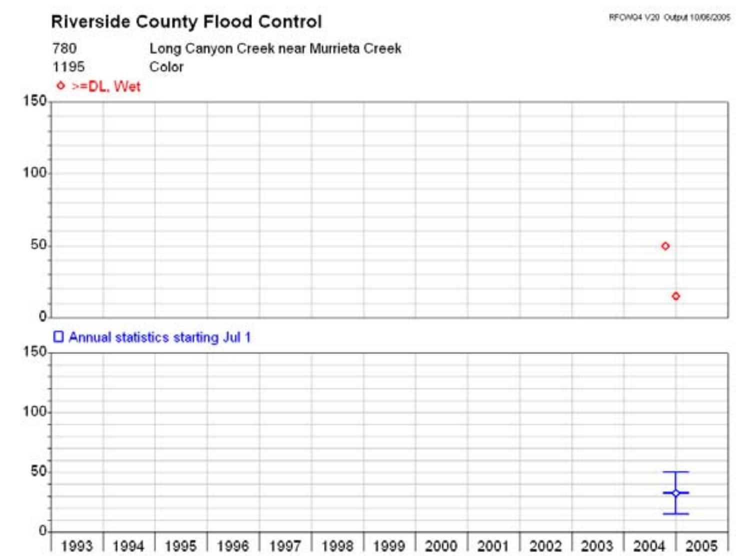
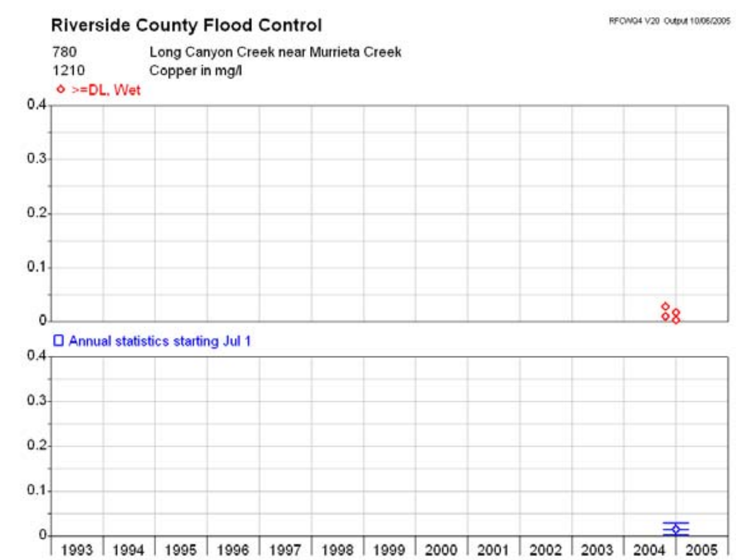
No long term trend is evident in the data.</td>
<td>NTU</td>
</tr>
</table>

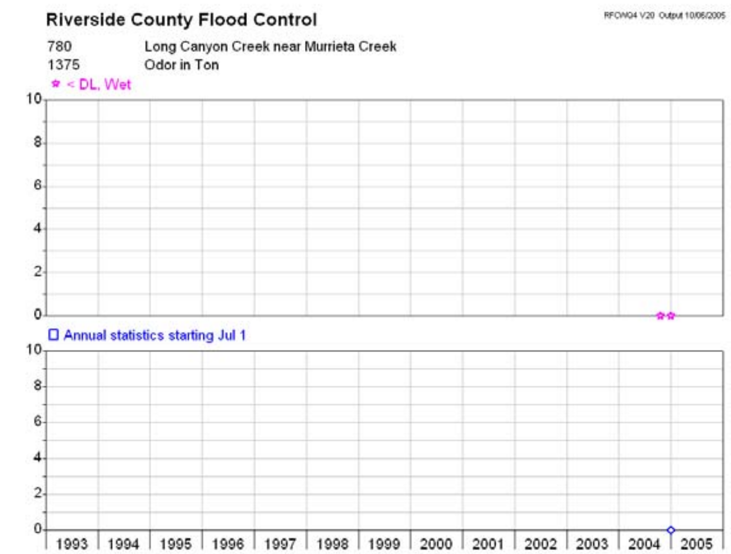
	Turbidity, lab No long term trend is evident in the data.	NTU
	pH, field No long term trend is evident in the data.	

Tributary - Station Name: Long Canyon

Hydron Reference #: 780

Parameters Detected Above CTR Objectives	Parameter	
	Copper Not enough data is present to determine a trend.	mg/l
	Lead Not enough data is present to determine a trend.	
Parameters Detected Above BPO	**Parameter**	**Units**

	Fecal coliform Not enough data is present to determine a trend.	count/ 100 ml
	Color Not enough data is present to determine a trend.	
	Copper Not enough data is present to determine a trend.	mg/l

<table>
<tr>
<td>
</td>
<td>Odor

Not enough data is present to determine a trend.</td>
<td>ton</td>
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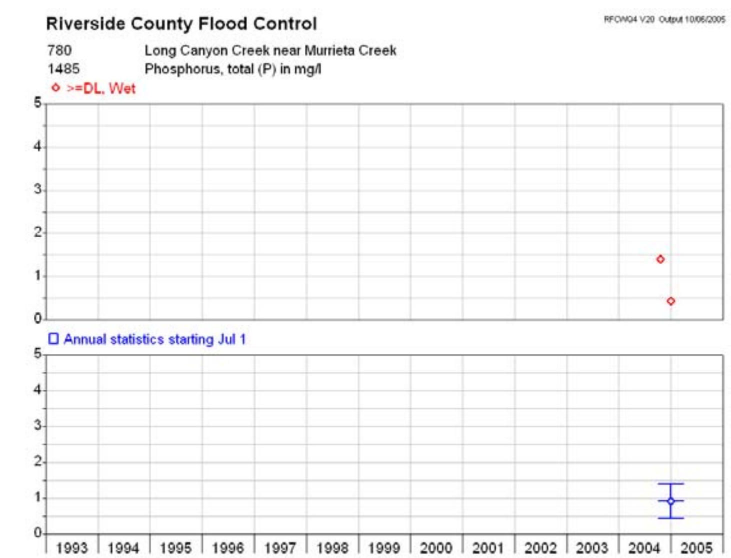
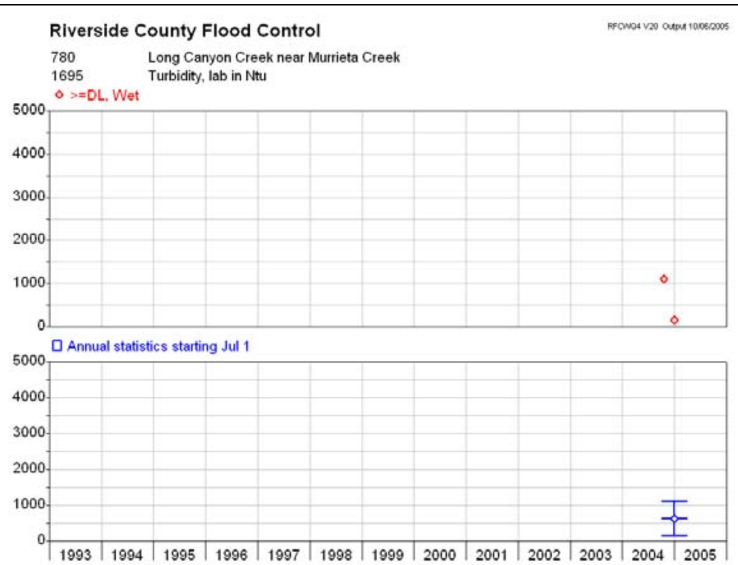
<td>
</td>
<td>Phosphorus, total (as P)

Not enough data is present to determine a trend.</td>
<td>mg/l</td>
</tr>
<tr>
<td>
</td>
<td>Turbidity, lab

Not enough data is present to determine a trend.</td>
<td>NTU</td>
</tr>
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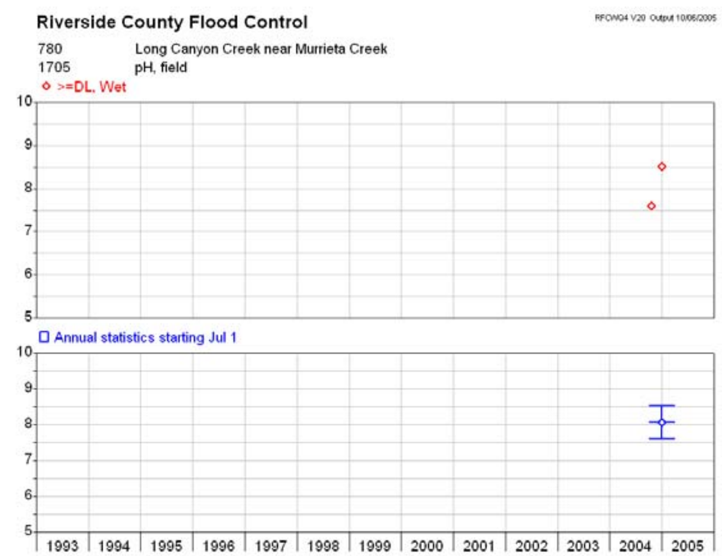	pH, field Not enough data is present to determine a trend.	

Tributary - Station Name: Warm Springs

Hydron Reference #: 397

<table>
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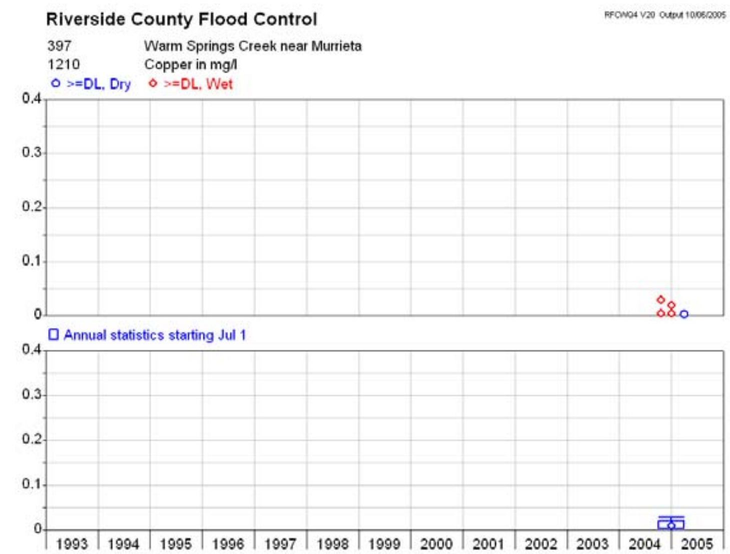
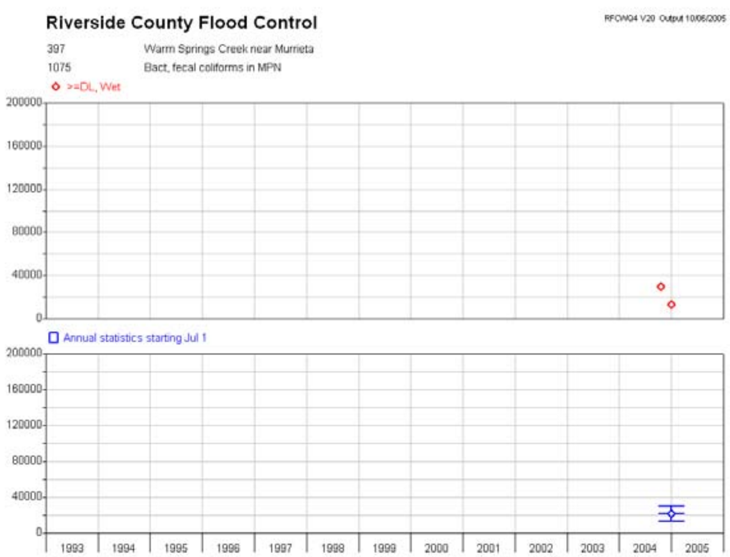
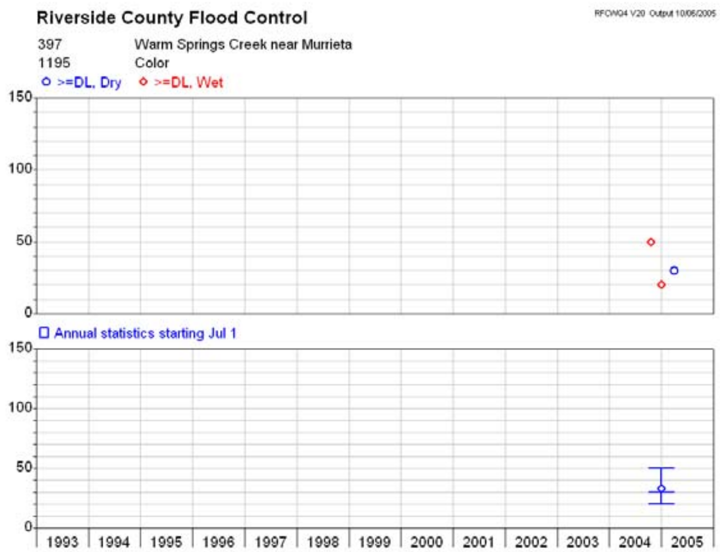
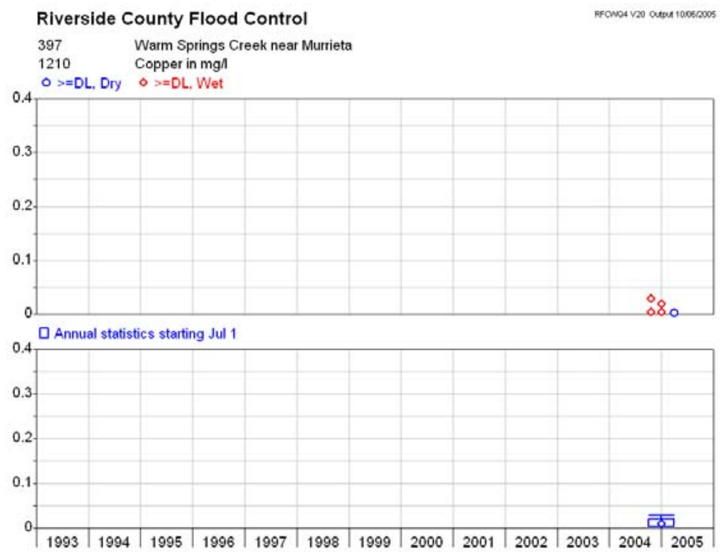
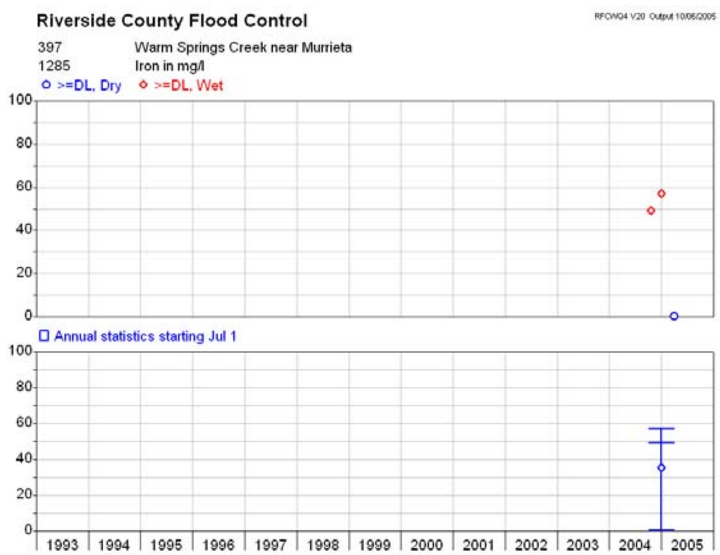
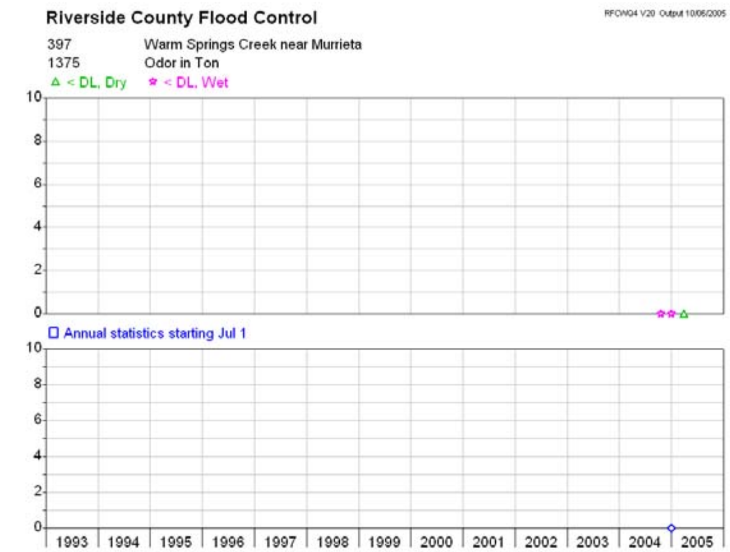
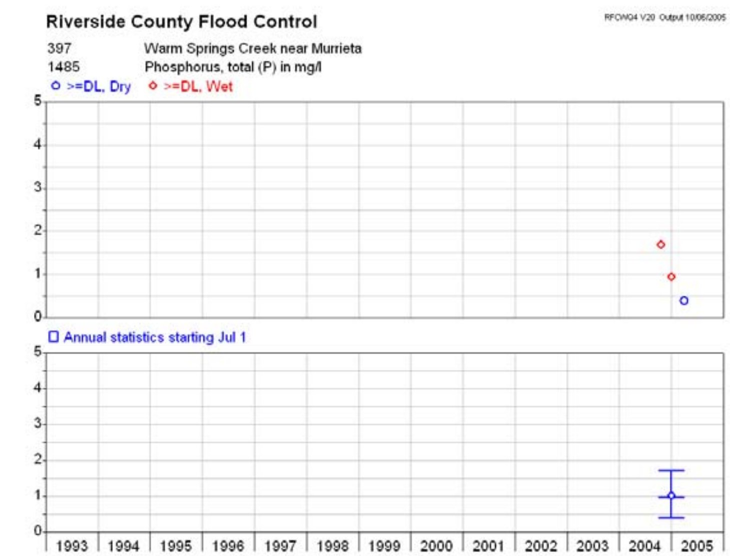
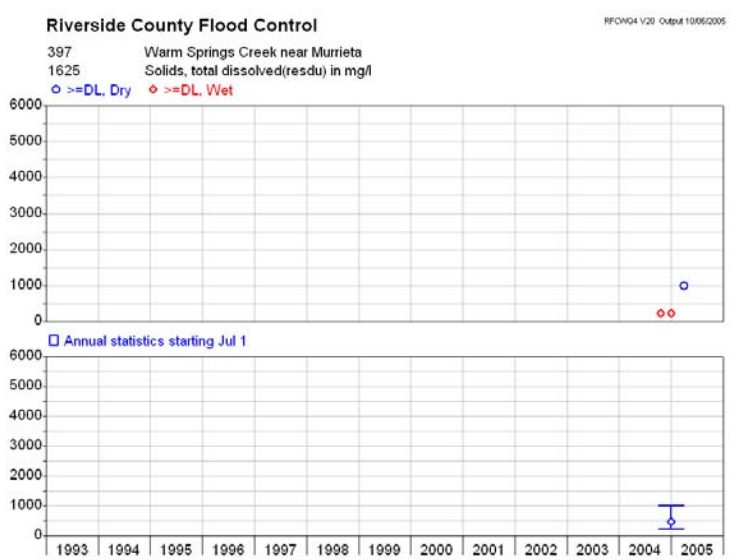
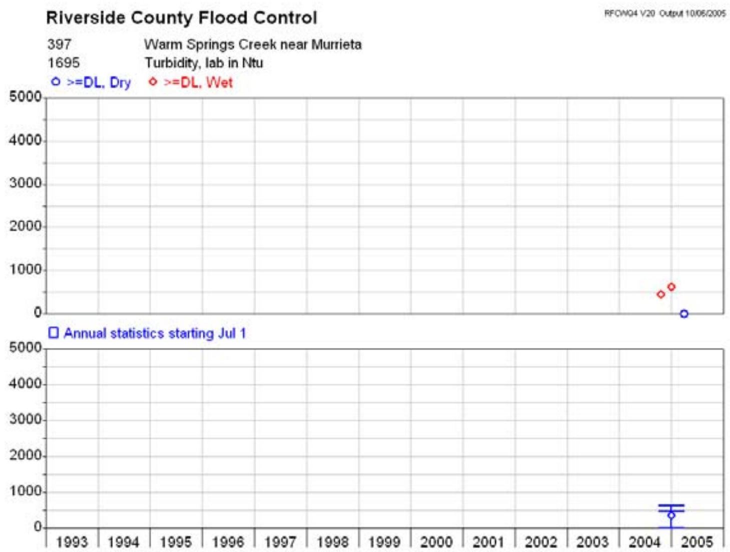
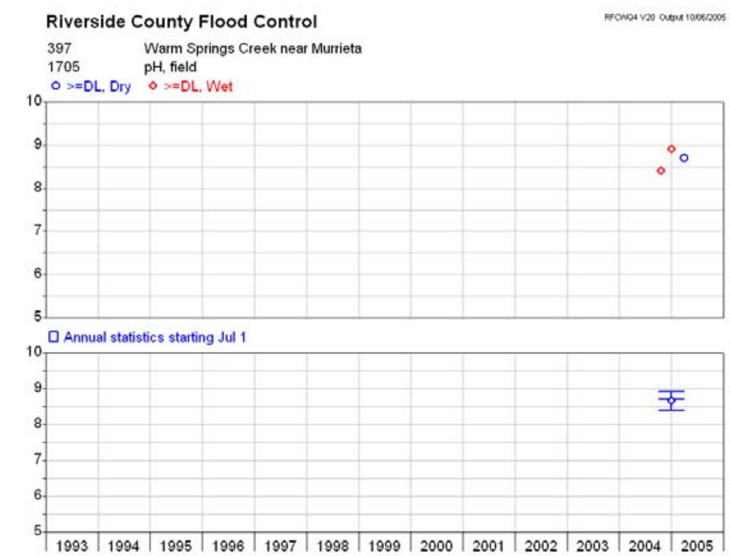
<tr><td>
</td><td>Copper

No trend is evident for FY 2004 – 2005.</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><th>Parameters Detected Above BPO</th><th>Parameter</th><th>Units</th></tr>
<tr><td>
</td><td>Bact, fecal coliforms

No enough data available to determine a trend.</td><td>count/ 100 ml</td></tr>
</table>

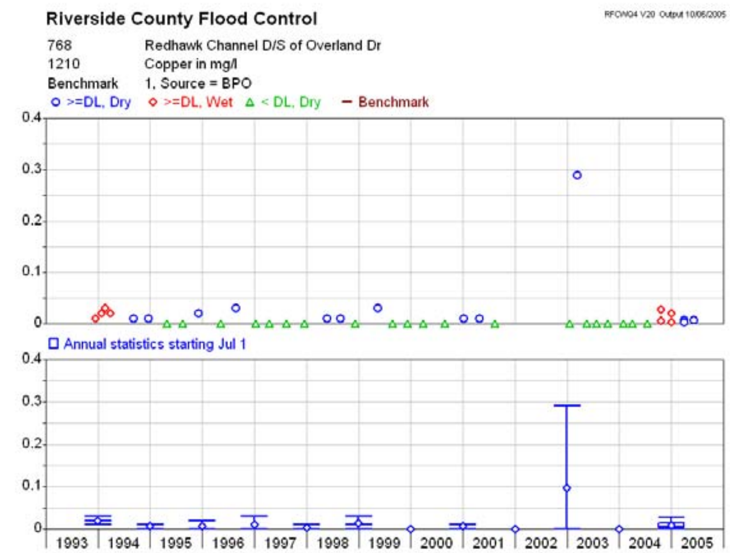
	Color Not enough data available to determine a trend.	
	Copper No trend is evident for FY 2004 – 2005.	mg/l
	Iron Not enough data available to determine a trend.	mg/l

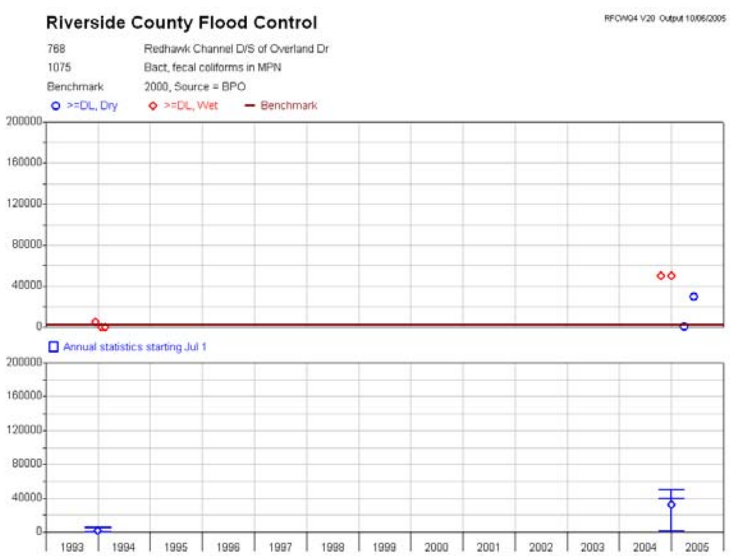
	Odor Not enough data available to determine a trend.	ton
	Phosphorus, total (as P) Not enough data available to determine a trend.	mg/l
	Total Dissolved Solids Not enough data available to determine a trend.	mg/l

	Turbidity, lab Not enough data available to determine a trend.	NTU
	pH, field Not enough data available to determine a trend.	

Tributary - Station Name: Redhawk

Hydron Reference #: 768

<table>
<tr><th>Parameters Detected Above CTR Objective</th><th>Parameter</th><th></th></tr>
<tr><td></td><td>Chemical</td><td></td></tr>
<tr><td>
</td><td>Copper

No long term trend is evident in the data.</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><th>Parameters Detected Above BPO</th><th>Parameter</th><th>Units</th></tr>
<tr><td>
</td><td>Fecal coliform

Not enough data to determine a trend.</td><td>count/ 100 ml</td></tr>
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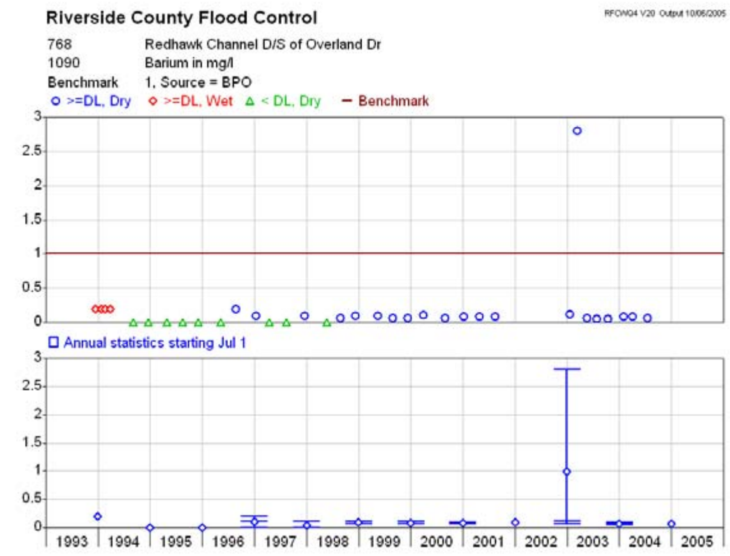
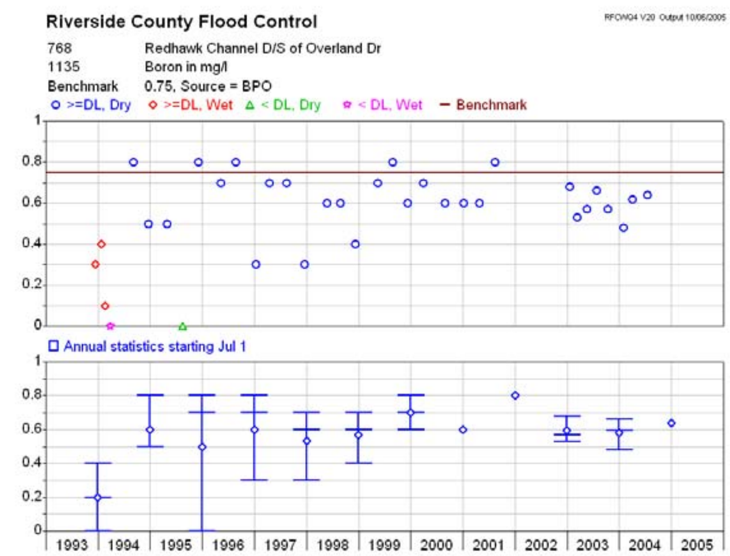
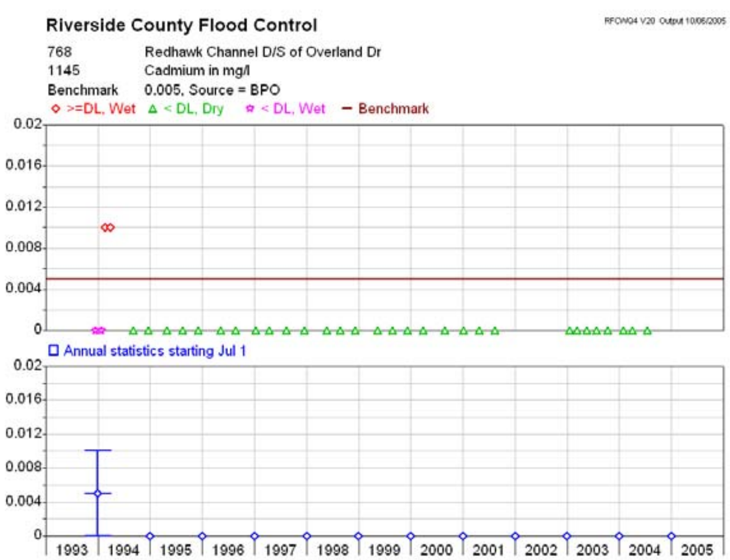
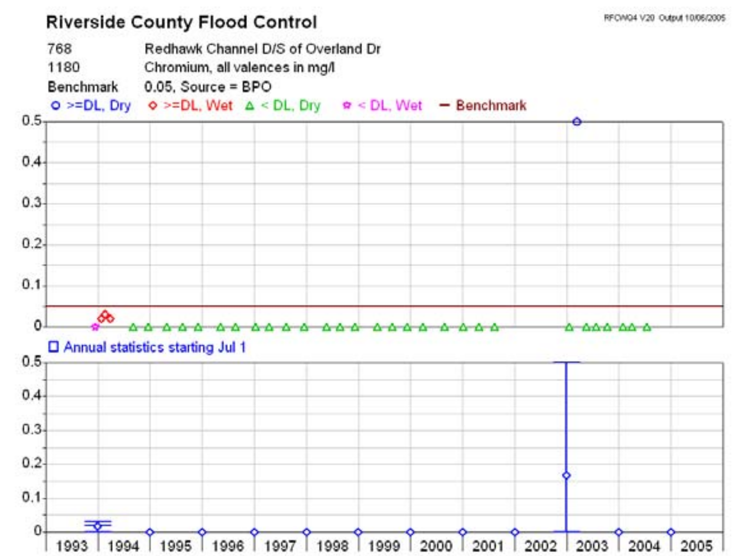
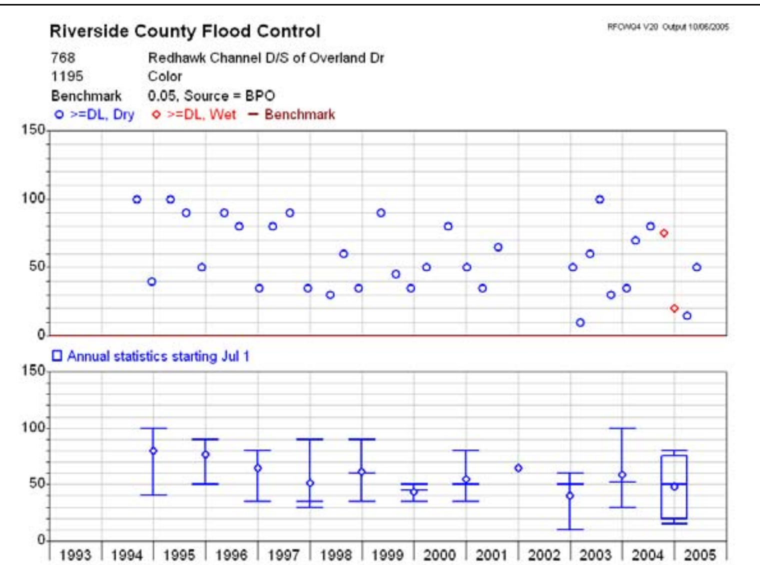
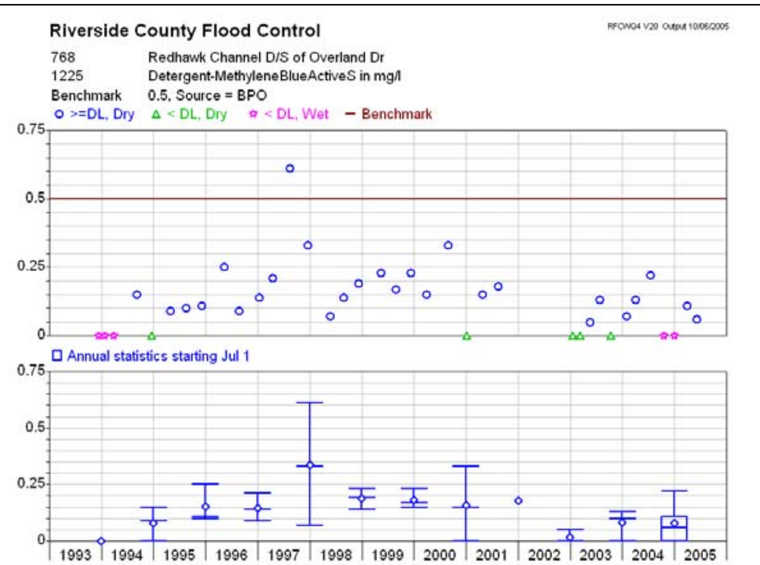
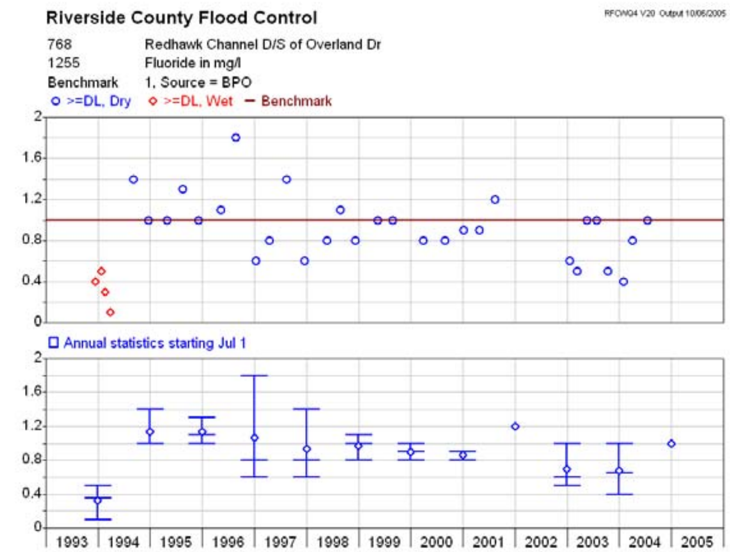
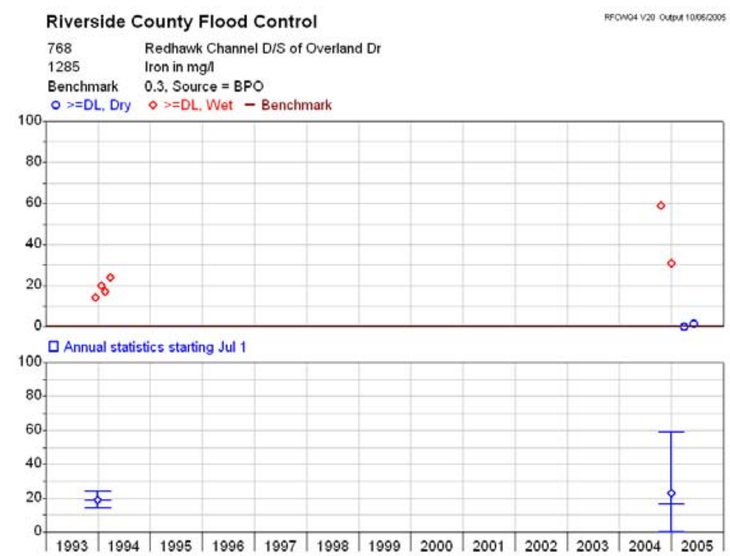
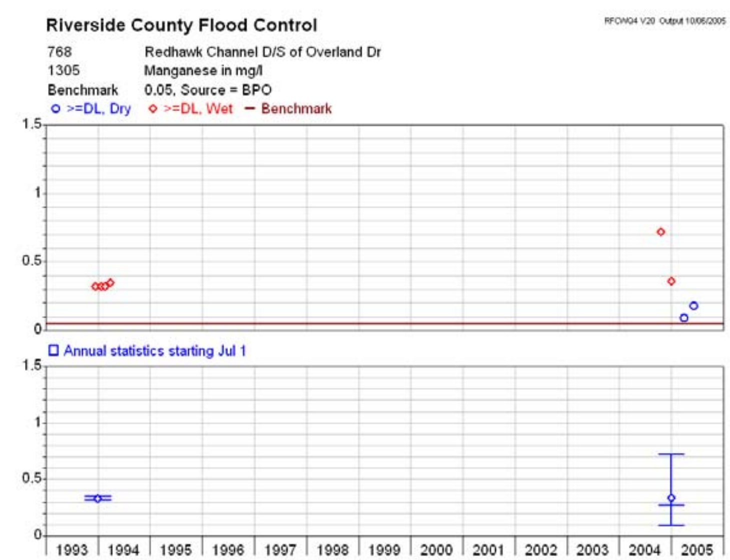
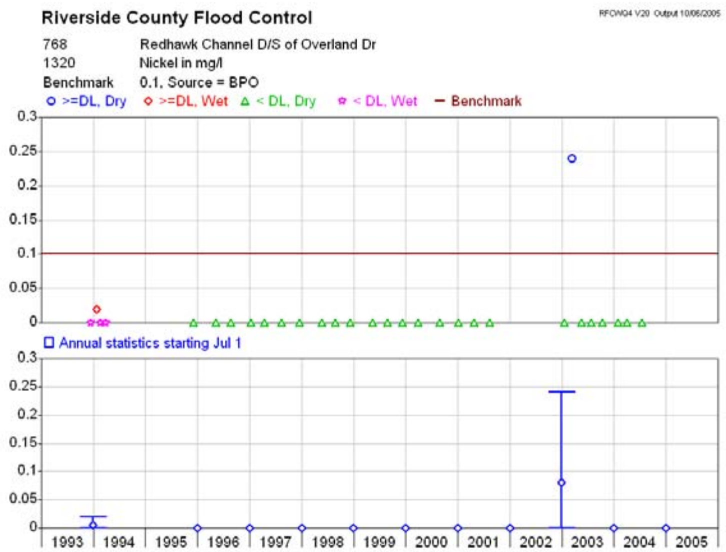
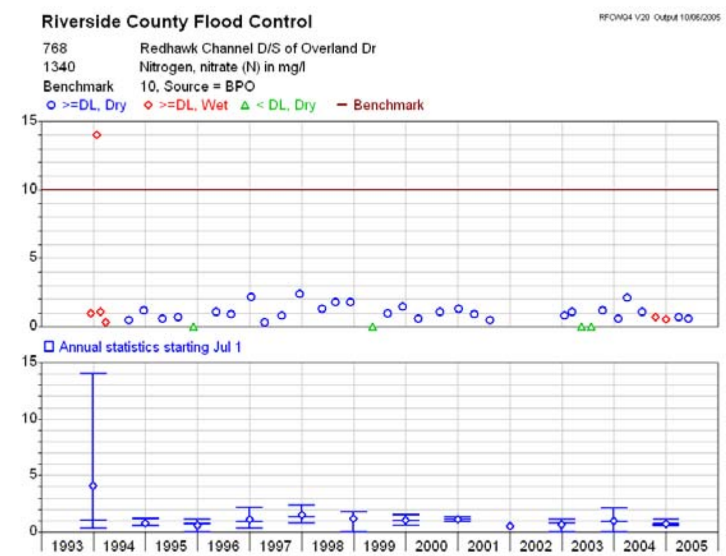
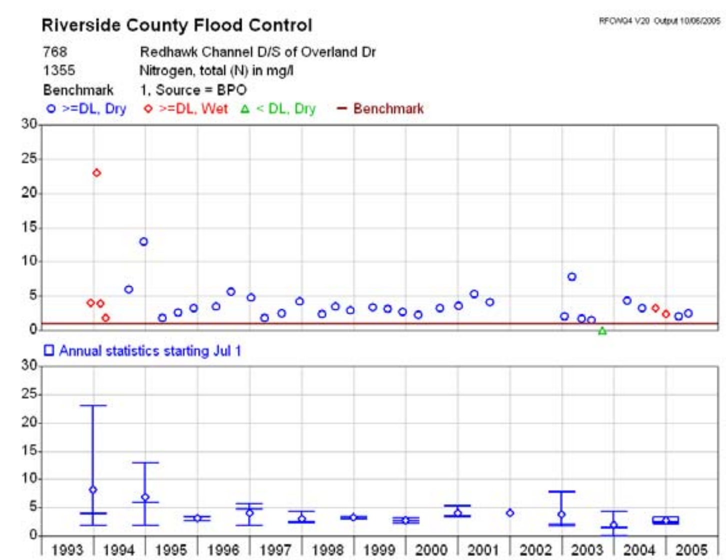
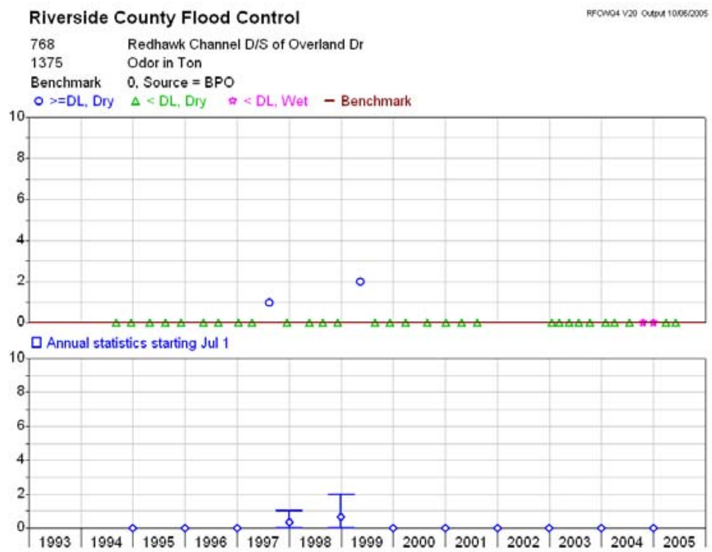
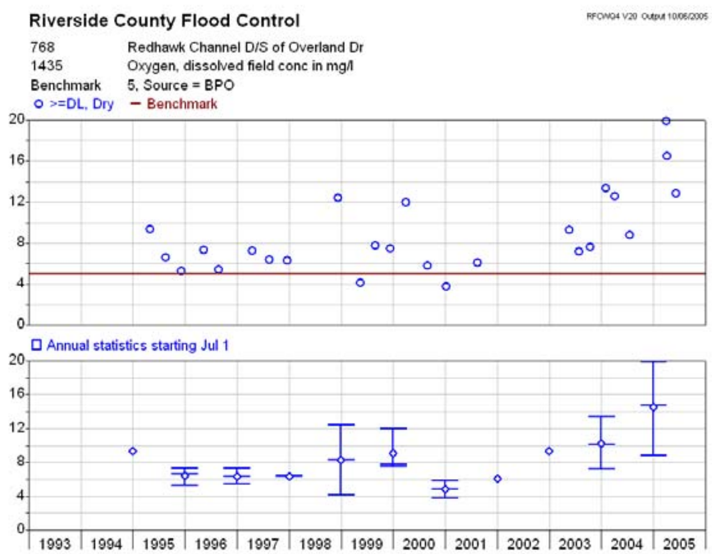
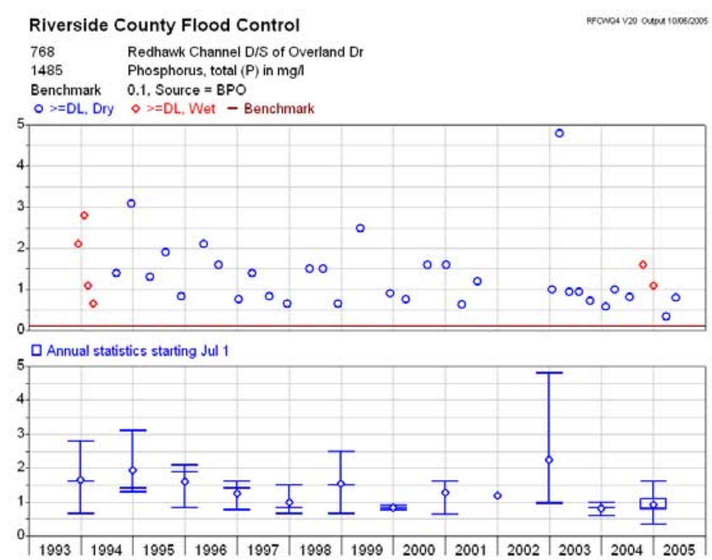
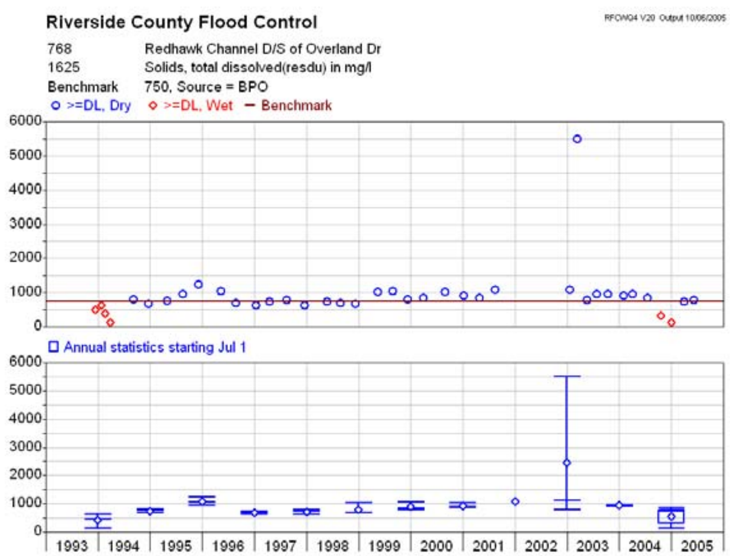
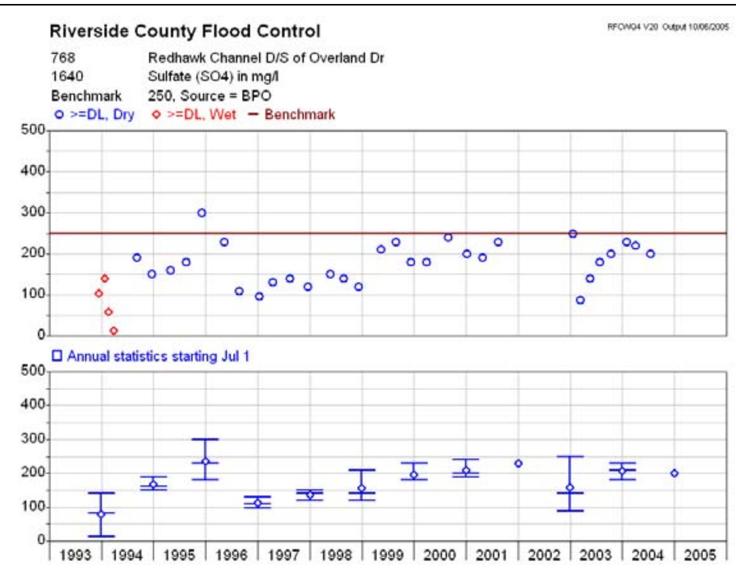
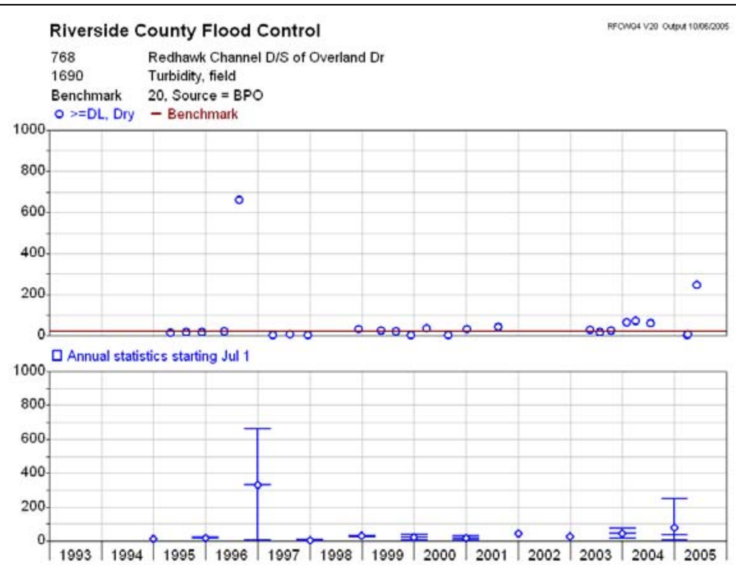
	Barium No long term trend is evident in the data.	mg/l
	Boron No long term trend is evident in the data.	mg/l
	Cadmium Cadmium was not detected during the FY 2004 – 2005.	mg/l

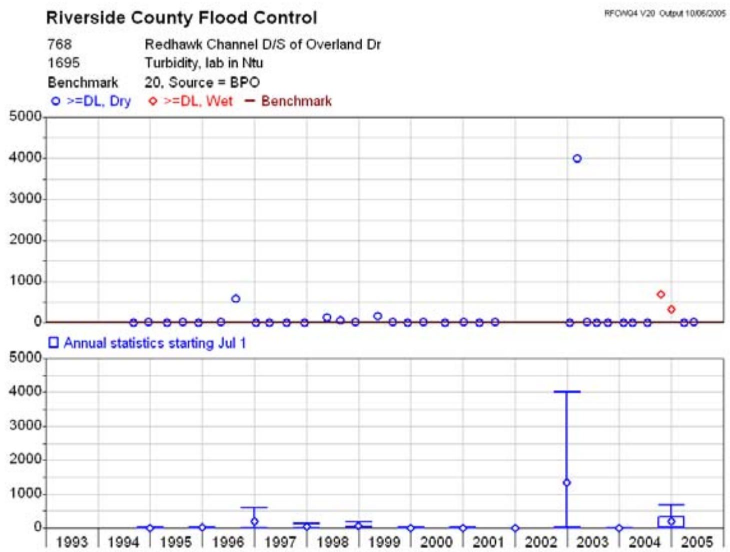
	Chromium, all valences Total Chromium, was not detected during FY 2004 – 2005.	mg/l
	Color Decreasing trend is evident during FY 2004 – 2005.	
	Detergent-Methylene Blue Active Substances Decreasing trend is evident during FY 2004 – 2005.	mg/l

	Fluoride Increasing trend is evident during FY 2004 – 2005.	mg/l
	Iron Not enough data to determine a trend.	mg/l
	Manganese Not enough data to determine a trend.	mg/l

	Nickel Nickel was not detected during FY 2004 – 2005.	mg/l
	Nitrogen, nitrate (N) No long term trend is evident in the data.	mg/l
	Nitrogen, total (N) No long term trend is evident in the data.	mg/l

	Odor Odor was not detected in FY 2004 – 2005.	TON
	Oxygen, dissolved field concentration Increasing long term trend is evident in the data.	mg/l
	Phosphorus, total (as P) No long term trend is evident in the data.	mg/l

	Total Dissolved No long term trend is evident in the data.	mg/l
	Sulfate (SO4) No long term trend is evident in the data.	mg/l
	Turbidity, field Increasing trend is evident for FY 2004 – 2005.	NTU

<table>
<tr>
<td></td>
<td>Turbidity, lab

No long term trend is evident in the data.</td>
<td>NTU</td>
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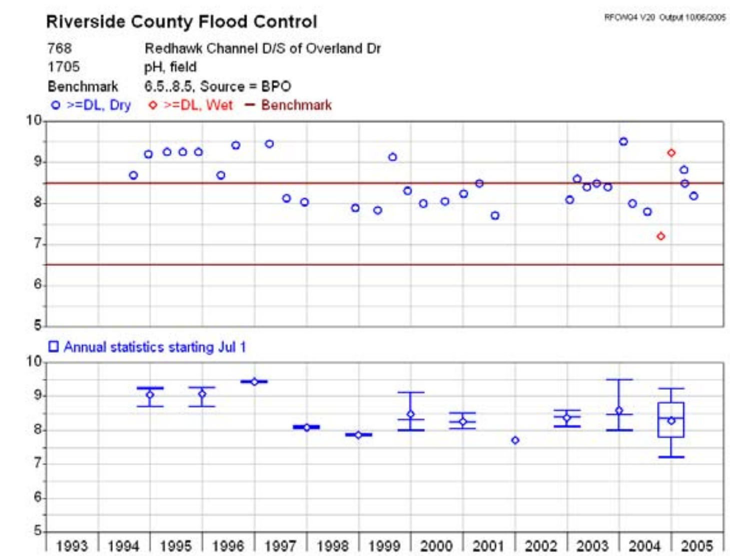
<td></td>
<td>pH, field

No long term trend is evident in the data.</td>
<td></td>
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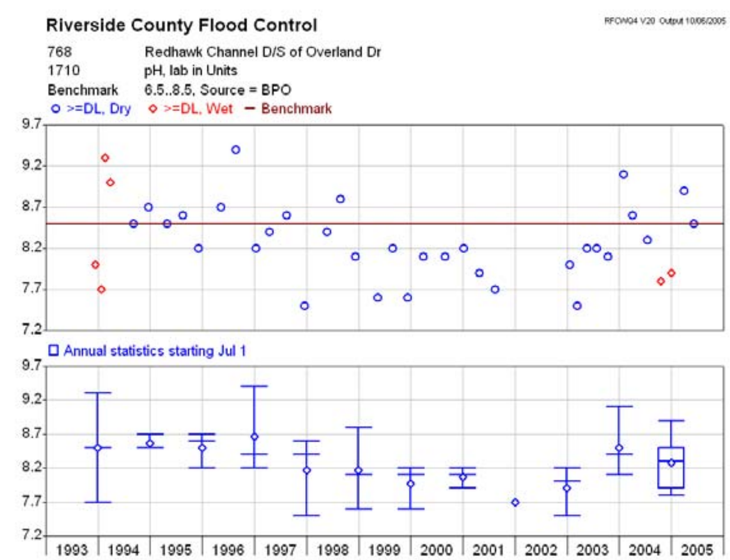
<td></td>
<td>pH, lab

No long term trend is evident in the data.</td>
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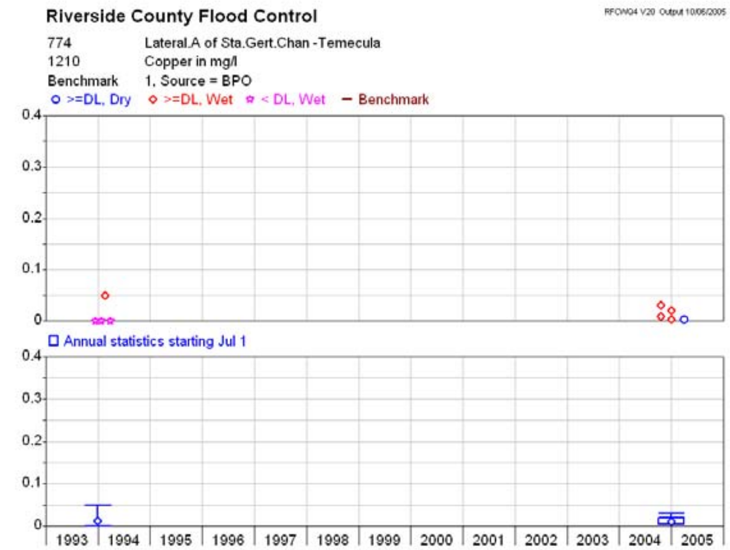
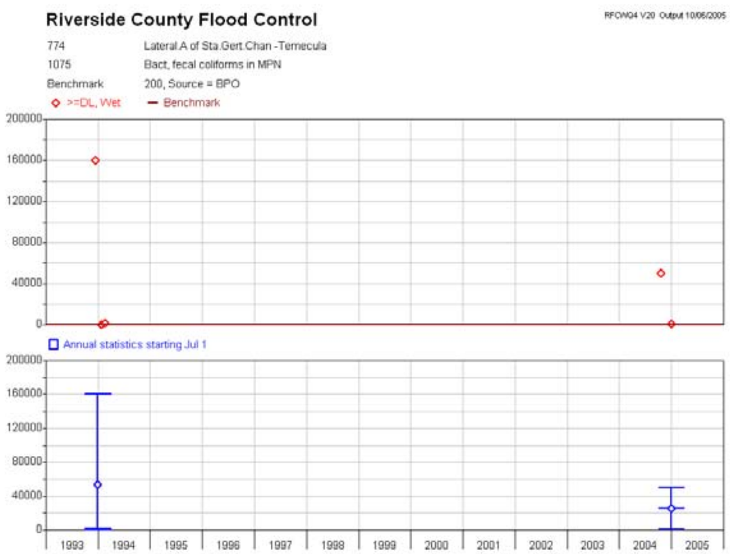
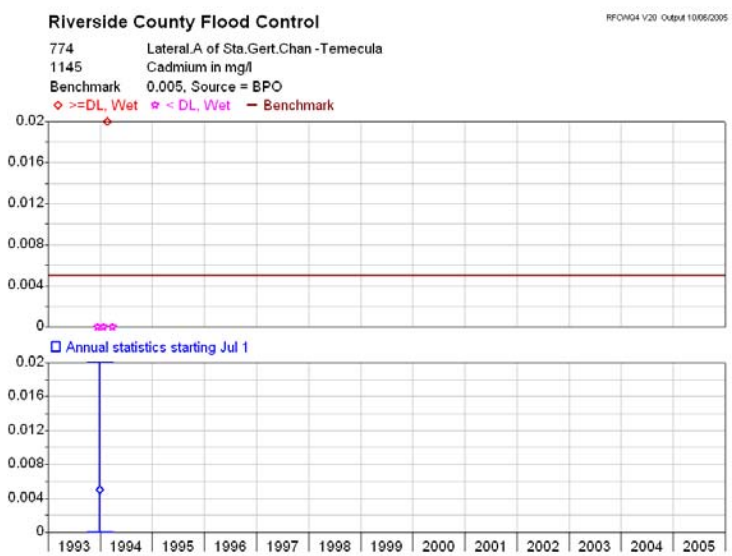
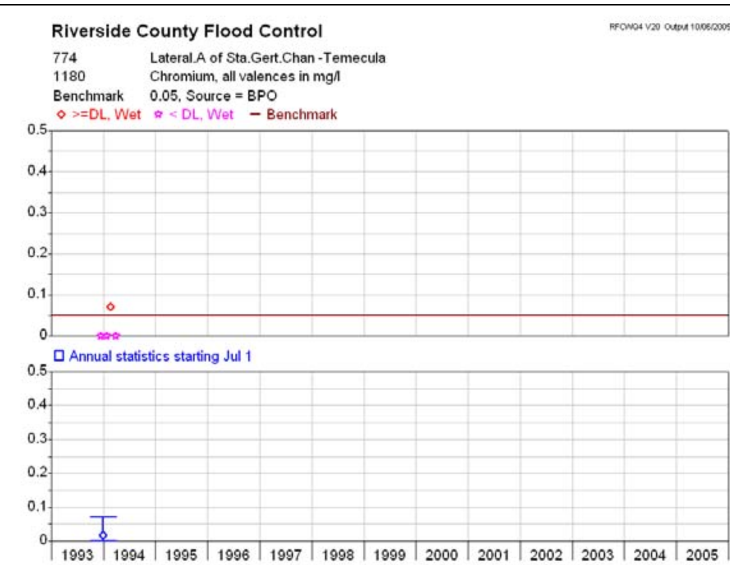
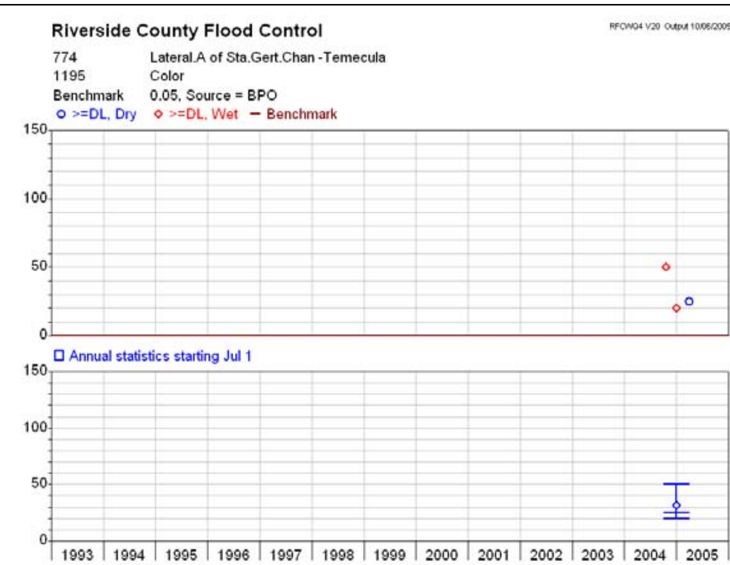
Tributary - Station Name: Santa Gertrudis

Hydron Reference #: 774

Parameters Detected Above CTR	Parameter	
	Copper Not enough data to determine a trend.	
Parameters Detected Above BPO	**Parameter**	**Units**
	Fecal Coliforms Not enough data to determine a trend.	count/ 100 ml

<table>
<tr>
<td></td>
<td>Cadmium

Cadmium was not measured during FY 2004 – 2005.</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>Chromium, all valences

Total Chromium was not measured during FY 2004 – 2005.</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>Color

Not enough data to determine a trend.</td>
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</tr>
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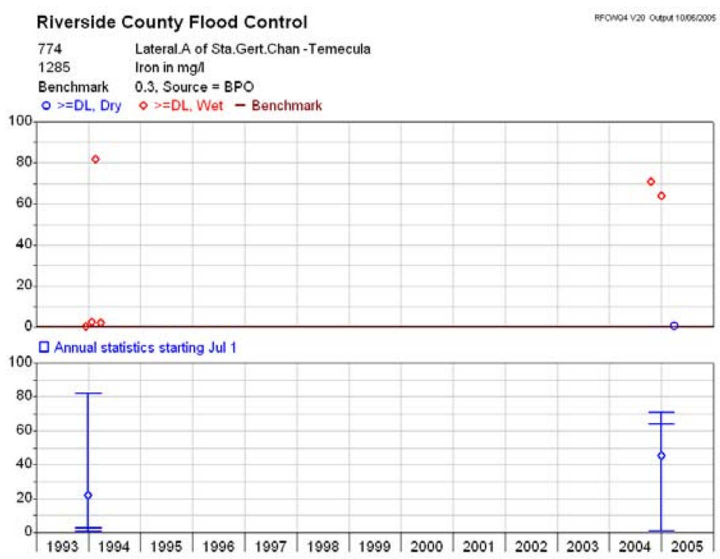
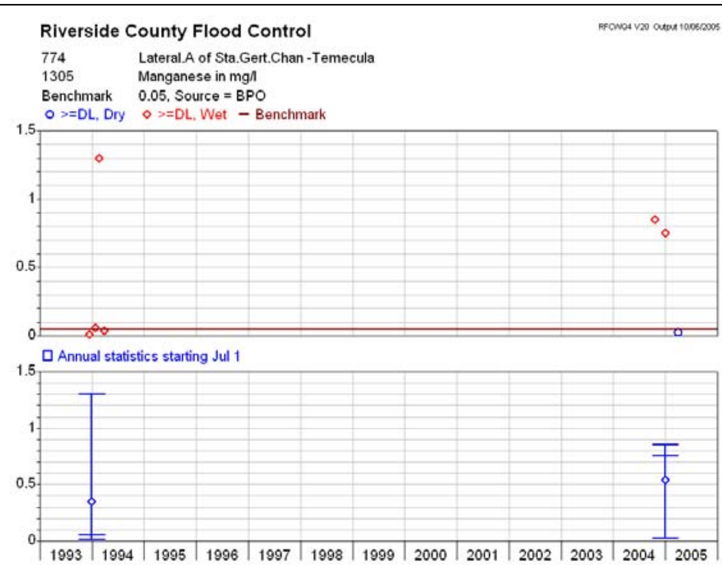
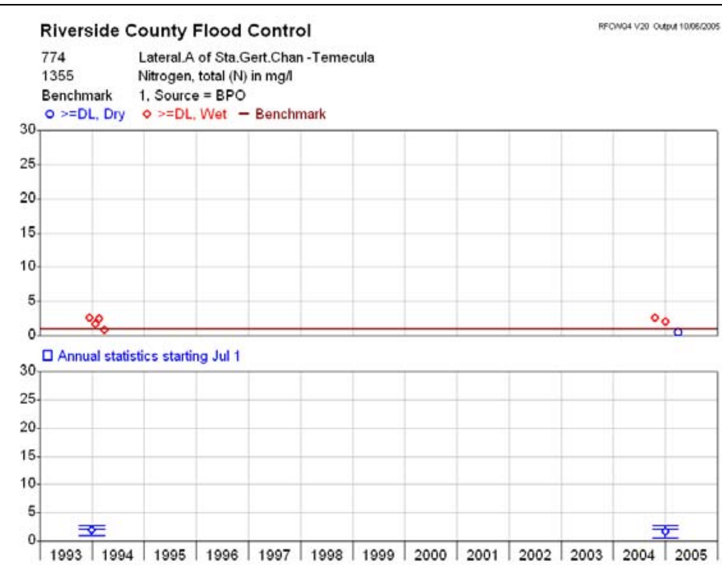
	Iron Not enough data to determine a trend.	mg/l
	Manganese Not enough data to determine a trend.	mg/l
	Nitrogen, total (N) Not enough data to determine a trend.	mg/l

<table>
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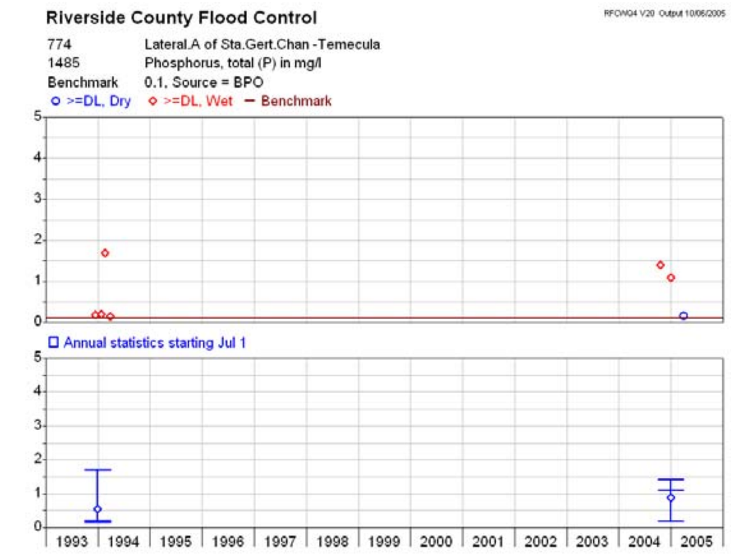
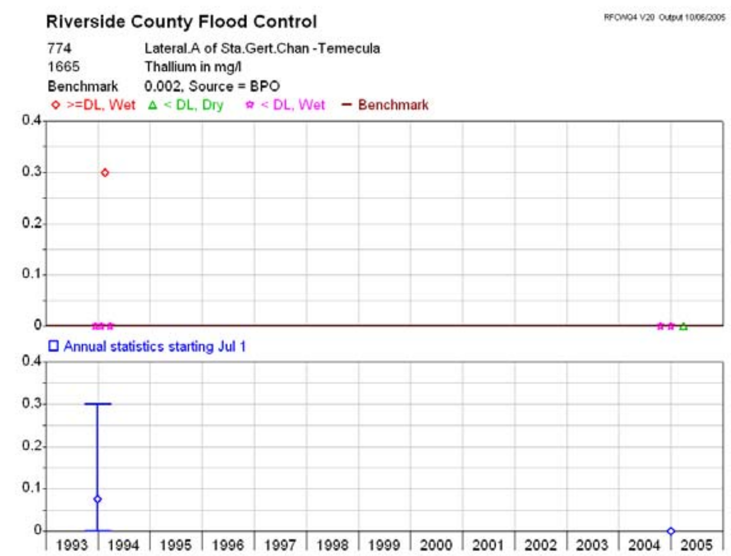
<td>
</td>
<td>Phosphorus, total (as P)

Not enough data to determine a trend.</td>
<td>mg/l</td>
</tr>
<tr>
<td>
</td>
<td>Thallium

Not enough data to determine a trend.</td>
<td>mg/l</td>
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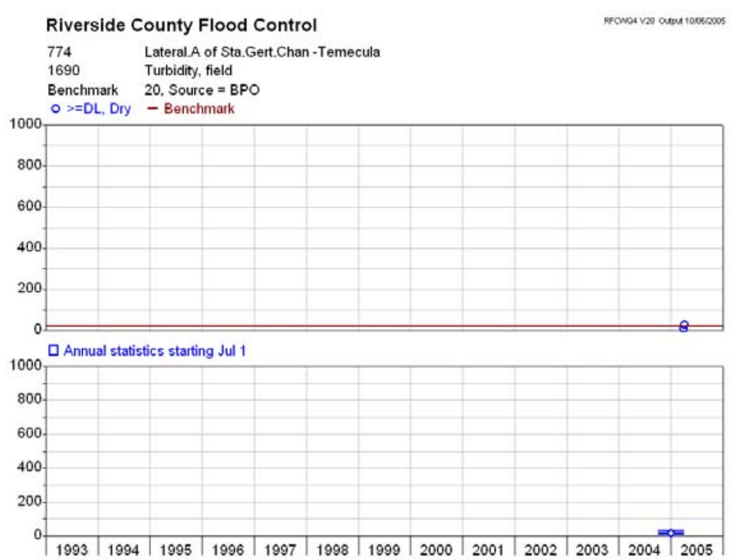
<td>
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<td>Turbidity, field

Not enough data to determine a trend.</td>
<td>NTU</td>
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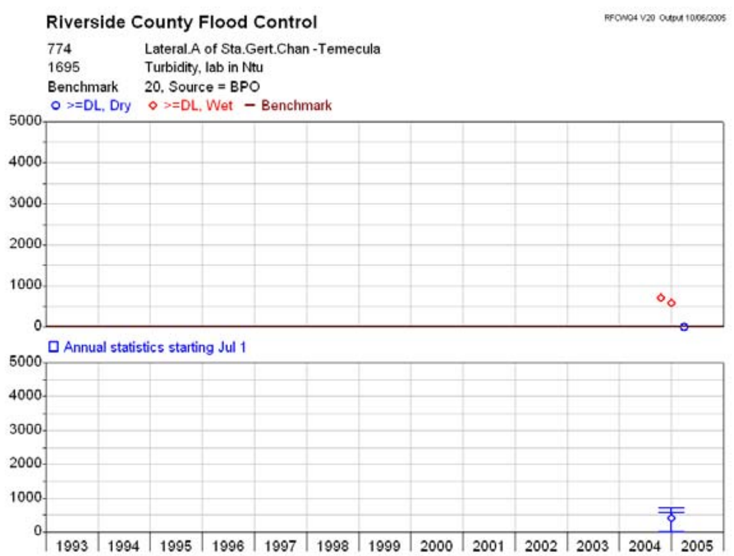
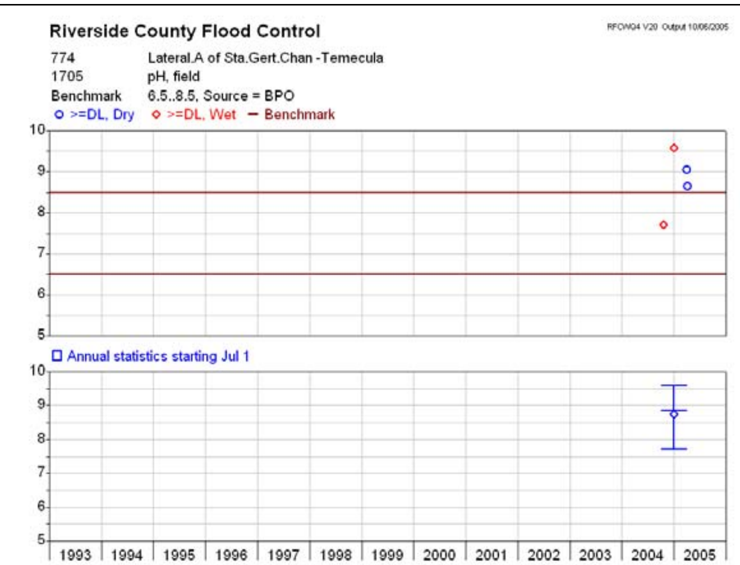
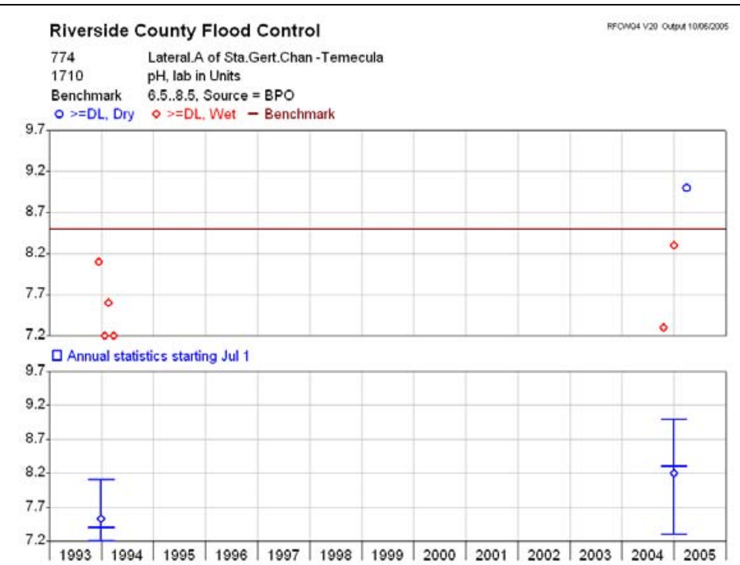
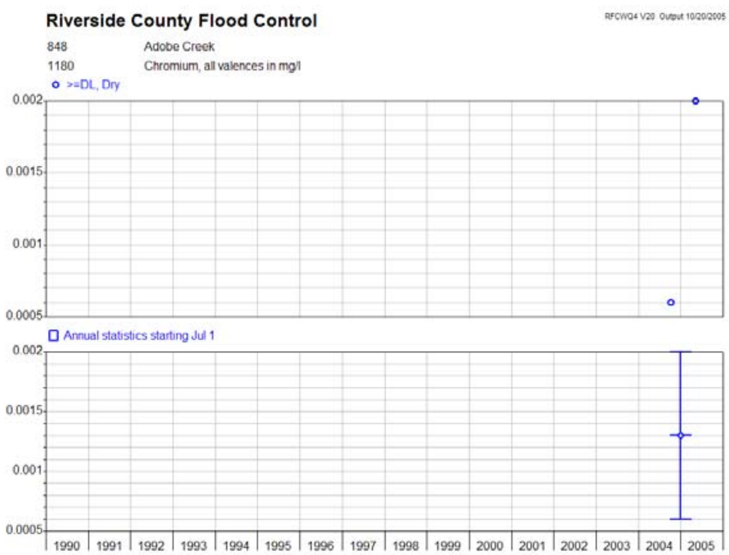
</table>

	Turbidity, lab Not enough data to determine a trend.	NTU
	pH, field Not enough data to determine a trend.	
	pH, lab Not enough data to determine a trend.	

Triad - Station Name: Adobe Creek

Hydron Reference #: 848

Parameters Detected Above BPO	**Parameter**	**Units**
	Chromium, all valences Not enough data to determine a trend.	mg/l

Attachment B

(Monitoring Annual Report)

Consolidated Monitoring Program

RIVERSIDE COUNTY
CONSOLIDATED PROGRAM FOR
WATER QUALITY MONITORING

WHITEWATER WATERSHED
SANTA ANA WATERSHEDSANTA MARGARITA WATERSHED

December 15, 2003
Amended [DATE]

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1. INTRODUCTION

A. Clean Water Act

The federal Clean Water Act (CWA) established a national policy designed to help maintain and restore the physical, chemical and biological integrity of the nation's waters. In 1972, the CWA established the National Pollutant Discharge Elimination System (NPDES) permit program to regulate the discharge of pollutants from "point sources" to waters of the United States. From 1972 to 1987, the main focus of the NPDES permit program was to regulate conventional point pollutant sources such as sewage treatment plants and industrial facilities. The 1987 amendments to the CWA established regulations for controlling discharges from Municipal Separate Storm Sewer Systems (MS4s) under NPDES.

B. The Role of Monitoring in the Overall MS4 Program

The goal of the NPDES MS4 regulatory program is to manage the quality of Urban Runoff to prevent impacts to Receiving Waters within the Permittees' collective jurisdictions.. To this end, the Permittees developed a Consolidated Program for Water Quality Monitoring (CMP) that included monitoring at selected stations throughout the Permittees' collective jurisdictional boundaries. The original CMP was drafted in March 1994 and was included with the application materials for the previous round of NPDES MS4 permits (MS4 permits). The CMP was accepted as part of the applications for MS4 permit renewal by the Colorado, San Diego and Santa Ana RWQCB in 1995. Subsequently, the RWQCBs directed the Riverside County Permittees to implement the CMP in the "second round" MS4 permits. In addition, in reissuing the second round MS4 permit for the Santa Margarita Region, USEPA Region IX directed the implementation of the CMP. The CMP is being updated to more effectively address the monitoring program objectives and the requirements of the third round MS4 permits issued by the Colorado and Santa Ana RWQCBs in 2001 and 2002, respectively. Additional revisions are being made to address the requirements of the MS4 permit for the Santa Margarita Region that was reissued in July 2004.

In 2004, the Stormwater Monitoring Coalition's Model Monitoring Technical Committee developed a Model Monitoring Program for Municipal Separate Storm Sewer Systems in Southern California. The purpose of developing the model program was to provide a tool, "a common framework for municipal urban runoff programs and Regional Board staff to use in developing and/or revising program requirements for monitoring receiving waters for impacts, status and trends, toxicity, mass emissions, and source identification." The model program was designed around five core management questions:

- Question 1: Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?
- Question 2: What is the extent and magnitude of the current or potential receiving water problems?
- Question 3: What is the relative urban runoff contribution to the receiving water problem(s)?
- Question 4: What are the sources to urban runoff that contribute to receiving water problem(s)?
- Question 5: Are conditions in receiving waters getting better or worse?

This Model Monitoring Program was presented as recommendations only, and has not been adopted by the SWRCB.

Deciding where to sample the MS4 is problematic because of the vast number of discharge locations to the MS4 and discharge locations from the MS4 to Receiving Waters. The manpower and expense that would be necessary to monitor every possible entrance and discharge location would outstrip available resources for implementation, and would overload the capacity of many contract analytical laboratories. The CMP proposes a sampling plan that includes representative land use and Receiving Water stations to generally characterize land uses and Receiving Waters, provides for the removal of illicit discharges, and makes the best use of available resources.

C. MS4 Functions

The primary purpose of MS4s is to protect life and property from the impacts of unconfined flooding. In addition to protecting life and property, flood prevention protects the environment by protecting materials from exposure to flood waters. Specifically, flooding of residential, commercial or industrial development results in inundation of stored materials and liquid and solid wastes. This results in the release of Pollutants to Receiving Waters, even where those materials and wastes are properly stored and managed using appropriate BMPs. In addition, flooding of developed areas results in the discharge of sanitary wastes to Receiving Waters. MS4s protect receiving waters from environmental damage that may result from such releases. An additional objective of the regional MS4 in Riverside County is water conservation. The District allows public agencies to use the MS4 for water transfers to facilitate water conservation and for groundwater recharge. Even though most of the point sources have brought the quality of their discharges under control or sent their wastes to a treatment facility, there are existing water quality impairments in Riverside County.

D. Climate

Precipitation patterns in Southern California are complex compared with the eastern and central United States. In Riverside County alone, there is one east-west and two north-south trending mountain ranges with intermediate valleys, and a major desert. In a matter of minutes one can travel from an area where convective (influenced by temperature differences in the atmosphere) storms are the most critical to one influenced primarily by orographic (influenced by topography) conditions. Average annual precipitation is generally correlated with altitude (it tends to rain more at higher elevations). The climate in the Santa Margarita and Santa Ana Regions is characterized as semi-arid with an average annual precipitation of 11-14 inches in the urbanized areas of the Santa Ana Region and 12-16 inches in the urbanized areas of the Santa Margarita Region. The climate in the Whitewater Region is characterized as arid, with an average annual precipitation of 4-6 inches in the urbanized areas.

E. Hydrology

The climate of Western Riverside County is typically Mediterranean, being characterized by warm dry summers and cool rainy winters. About 75% of the precipitation occurs during the four-month period from December through March. Mean seasonal depth of precipitation ranges from less than 10 inches in the valley areas to over 40 inches in the mountains, varying with elevation and topographic influences. Precipitation increases with increasing elevation to the summit of the Coastal range. Shading effects of the Coastal range lead to a marked decrease of precipitation throughout the lower portions of the Inland area. Precipitation increases again farther away from the Coastal range in the northeastern area of the Inland area. Further description of the hydrologic conditions of the three watersheds can be found in the DAMP.

Due to the climate, geology, geography, and development conditions, the flows in the MS4s and the Receiving Waters in Riverside County are generally ephemeral or intermittent. In arid and semi-arid Riverside County, dry-weather flows that reach the MS4 generally soak into the ground or evaporate long before reaching a Receiving Water. Even during smaller storms, the only rainfall that reaches an MS4 is what directly falls into one. In general, flow is only observed as a result of larger storms. Exceptions include flows from springs, rising groundwater, POTW discharges, and water delivery discharges.The following table identifies those Receiving Waters with perennial flows and the sources of non-storm flows:

Receiving Water	Watershed	Source of Non-Storm Flows
Santa Ana River	Santa Ana	• POTW effluent • Rising groundwater
Arlington Wash	Santa Ana	Produced water from Arlington Desalter
Temescal Wash	Santa Ana	POTW effluent Produced water from Arlington Desalter
Lake Evans	Santa Ana	
Lake Mathews	Santa Ana	Imported potable water
La Sierra Channel	Santa Ana	Rising groundwater
Anza Channel	Santa Ana	Rising groundwater
Box Springs Channel	Santa Ana	Raw potable water from OCWD
Sunnyslope Channel	Santa Ana	Rising groundwater
Lower reach of Murrieta Creek	Santa Margarita	Rising groundwater
Lower reach of Temecula Creek	Santa Margarita	Rising groundwater
Upper Whitewater River (to North Palm Springs Recharge Basins)	Whitewater	80% Colorado River Water, 20% snowmelt

F. Water Quality and Potential Pollution Sources

Urban Runoff is a complex blend of countless diverse point and non-point sources conveyed in such a way that they outlet at measurable points. The non-point inputs are varied, and, in Riverside County, include significant inputs from open space, agricultural, and other non-Urban sources.

Even though most point sources have brought the quality of their discharges under control or sent their wastes to a treatment facility, there remain water quality impairments in Riverside County. These impairments, as identified in the SWRCB 303(d) list, are nutrients and suspended solids in the San Jacinto watershed, elevated bacterial levels in the Santa Ana River and phosphorous in the upper Santa Margarita River and Murrieta Creek. As described in the NPDES MS4 Permits, the Regional Boards believe that Urban Runoff contributes to each of these impairments. Many non-point sources, including agricultural discharges and discharges from open space and government lands not under the jurisdiction of the Permittees, are not treated or are inadequately treated and may be discharged into an MS4 or Receiving Water, further contributing to impairment.

In most cases, discharges to MS4s receive no additional treatment. It is important that the nature of all sources of Pollutants contributing to these impairments, including Urban Runoff, be characterized, both in identifying the types and amounts of Pollutants present, and in identifying the point and non-point sources most likely to have contributed to the Pollution. For purposes of the MS4 permits, the sources and nature of discharges from urban land uses need to be characterized for the development of effective control programs.

Sources of Pollutants in Riverside County include aerial deposition, motor vehicles, agricultural runoff and overflows from holding ponds, illegal dumping and discharges, overflows from fire suppression activities, and malfunctioning and leaking sanitary sewer systems or improperly treated discharges from publicly-owned treatment works (POTWs). Even transferred water may exceed water quality objectives such as TDS. In most cases, discharges to MS4s receive no additional treatment prior to discharge to Receiving Waters. Other sources may include improperly stored materials at industrial and commercial facilities, runoff from landscape irrigation and discharge of pool water from residences and apartments, and parking lot wash water. Although industrial and commercial facilities are required to have Waste Discharge Requirements or NPDES Permits, discharges may occur, whether by an accidental spill or a deliberate violation of an existing Permit. These point and non-point sources discharge to the MS4, where they may ultimately be conveyed to a Receiving Water.

The chemical makeup of the MS4 discharges may differ immensely by location, from storm to storm and even during a storm. The volumetric rate of Urban Runoff in Riverside County may vary from nonexistent to hundreds of cfs. Conditions may range from a gentle, uneventful storm, to a very high rain intensity with hazardous materials entering the MS4 from a major traffic accident or facility breakdown. During dry weather, inputs to the MS4 may include industrial accidents, broken sprinkler or pressure mains, rising ground water, sanitary sewer overflows, agricultural irrigation discharges, and intentional discharges. Flows may enter the MS4 from sheet flow, through a pipe, or through an illicit connection cut into the wall of a MS4.

G. Coverage Under Three MS4 Permits

Riverside County is under the purview of three California Regional Water Quality Control Boards: the Colorado River (Whitewater) Region, the Santa Ana River Region, and the San Diego (Santa Margarita) River Region. The MS4 permit for the Whitewater Region was adopted in September 2001, for the Santa Ana Region in October 2002, and for the Santa Margarita Region in July 2004. The CMP is intended to comply with the core programmatic elements of each of the watershed MS4 permits.

The Riverside County Flood Control and Water Conservation District (District) serves as the Principal Permittee in all three MS4 Permits. As Principal Permittee, the District is responsible for, among other things, administering the required monitoring programs, including processing contracts and service agreements for laboratory, consulting, and interagency services. Under the past and current round of MS4 permits, the District has also been responsible for collecting samples required under the MS4 permits, ensuring that the samples are analyzed at a certified laboratory, and analyzing the resulting data. Co-Permittees may also conduct monitoring activities, such as water quality sampling and field reconnaissance, either under the umbrella of the CMP or due to MS4 permit-specific monitoring requirements.

H. CMP Elements

The five program elements of the CMP are:

- Field Reconnaissance
- Water Chemistry
- Toxicity
- Bioassessment
- Special Studies

These elements will be described in more detail later in this document.

I. Revisions to CMP

This document represents a major revision to the original CMP and will be revised as necessary to ensure its ongoing efficacy, address safety considerations, measure cost effectiveness, and to address MS4 permit requirements.

2. GOALS AND OBJECTIVES

The goal of the MS4 Urban Runoff program is to manage the quality of Urban Runoff to prevent impacts to Receiving Waters within the Permittees' collective jurisdictions. Urban Runoff management consists of more than merely monitoring water quality, and the objectives necessary to support this goal are a superset of the Model Monitoring Program (MMP) core management questions. These objectives, with reference to the MMP core questions, are as follows:

- Objective 1: Develop and support an effective MS4 management program.
- Objective 2: Identify those Receiving Waters, which, without additional action to control Pollution from Urban Runoff, cannot reasonably be expected to achieve or maintain applicable Water Quality Standards. (MMP Questions 1 and 3)
- Objective 3: Characterize Pollutants associated with Urban Runoff and assess the influence of Urban land uses on Receiving Water quality. (MMP Questions (2, 3, and 4)
- Objective 4: Analyze and interpret the collected data to identify trends, if any, both to prevent impairments through the implementation of preventive BMPs and to track improvements based on the MS4 management program. (MMP Question 5)

3. EPA GUIDANCE

The information in this section is largely taken from EPA's NPDES Storm Water Sampling Guidance Document (EPA 833-B-92-001), which provides recommendations on the frequency and method of collecting samples. Although the guidance document was specifically intended for "individual industrial storm water applications, group storm water applications (Part 2), and municipal part 2 storm water permit applications for storm water discharges," it continues to be used as a requirement in the current MS4 permits**.** A summary of pertinent parts of the EPA guidance and its application to Riverside County follows.

A. Representative Storm

The USEPA guidance document states that three different storm events should be sampled each year. A "representative" storm is defined as:

- Greater than 0.1 inch accumulation;
- Preceeded by at least 72 hours of dry weather; and
- Where feasible, the depth of rain and duration of the event should not vary by more than 50 percent from the average depth and duration.

These criteria were established to:

- Ensure adequate flow;
- Allow Pollutants to build up during the dry weather intervals; and
- Ensure that the storm would be typical for the area in terms of intensity, depth, and duration.

In ephemeral watersheds, the USEPA's recommended storm may not generate sufficient flow in the MS4 to sample. For example, in a previously dry watershed, the first rainfall will soak into the ground and will not generate runoff. A subsequent storm on a saturated watershed may generate substantial flow in portions of the MS4. Therefore, a storm is further defined as one in which there is sufficient flow to collect a sample.

The District has prepared guidance on when wet-weather sampling should be initiated (See Section 4.C.2).

USEPA's wet weather sampling guidance recognizes that it may not be feasible to collect a sample. For instance, flow in a channel may be too swift for safe collection or lightning may be active in the area. Also, antecedent conditions may preclude generation of adequate runoff, and there may not be sufficient flow to allow collection of a sample adequate for analysis (i.e., samples should be collected only when appropriate QA/QC procedures can be followed). In cases such as these, attempts to collect a sample should be noted and submitted to the Regional Board for their certification.

B. Composite Sampling

The EPA guidance requires composite sampling for industrial and municipal stormwater permit applicants, except for certain parameters such as bacteria or oil & grease, must be collected as a grab sample. Composite samples are intended to characterize the average quality of the entire storm water discharge. The most accurate type of composite sampling is flow-weighted, where the amount of sample collected is proportional to the flow rate. Composite samples may be collected manually (as outlined in the CMP) or with the use of an automatic device. However, there are several problems inherent in using an automatic sampler. As several pollutants must still be measured in the field, including pH and temperature, no reduction in field staff requirements will be realized with the use of automatic samplers. Other concerns include the fact that biological indicators of sanitary contamination, such as fecal streptococcus, fecal coliform and chlorine have very short (i.e., 6 hours) holding times. Collection of samples for oil and grease requires teflon-coated equipment to prevent adherence to the sampling equipment. Volatile organic compounds (VOCs) are likely to volatilize as a result of agitation during automatic sampler collection and/or may contaminate other samples already collected. Also, pH, temperature, cyanide, total phenols, residual chlorine, oil and grease, fecal coliform, and fecal streptococcus tend to transform to different substances or change in concentration after a short period of time, particularly in the presence of other reactive pollutants. The requirements for grab sampling are stated in 40 CFR 122.21(g)(7). Outside of water quality issues, equipment vandalism is a common occurrence. Replacing the equipment is expensive and it takes time for replacement equipment to be ordered and delivered.

Sampling across the hydrograph, using flow-weighted proportions, results in the most accurate estimate of mass loading of a Pollutant for a given storm. However, knowing when and for how long to sample is problematic as it is not possible to predict storm duration or intensity, and the resulting flow conditions, to the accuracy needed to calculate mass loading. Storms in Riverside County are often of short duration and high intensity. The "storm" may actually consist of many spotty periods of rainfall with a half-hour or so between cloudbursts. In addition, precipitation is generally inconsistent across a watershed as "storms" generally move across a watershed in cells. Hydrographs in Riverside County are very spiky and the rise and fall cannot be determined until after the storm has passed. USEPA's guidance document states that the flow-weighted composite sample must be taken for either the first 3 hours of a storm or for the entire discharge (if the event is less than 3 hours long). For stop/start rains (rainfall is intermittent), the USEPA reference recommends that samples be taken until an adequate sample volume is obtained. In either event, the grab samples collected during the first 30 minutes of a storm event will generally contain higher concentrations of pollutants, since they pick up pollutants that have accumulated since the previous storm event and are on the rising arm of the hydrograph, i.e., there is less runoff for dilution. This guidance is implemented in the CMP.

A composite sample may be collected on a flow-weighted basis to estimate the load over a storm. The composited concentration is assumed to be the same over the course of the storm. Samples may be collected on an equal-time basis as long as flow is also measured or estimated at the time the sample is collected. The composite is proportioned according to the flow represented by the individual samples.

C. Sampling Locations

USEPA's guidance says that the ideal sampling location would be at the lowest point in the drainage area where a conveyance discharges storm water to Waters of the U.S. or to a MS4. Typical sampling locations may include the discharge at the end of a pipe, a ditch, or a channel. The sample point should be in a safe area that is easily accessible on foot.

In addition to considering USEPA guidance, the Permittees considered urban land uses in siting the sampling locations, although isolating an individual land use was not always possible. Reference stations have also been established in locations above the influence of Urban Runoff.

D. Challenges of Ephemeral Watersheds

During dry weather in an ephemeral MS4 where flows are not present except during storms, a better use will be made of finite resources to focus on reconnaissance of the MS4. This consists of visual inspection of the channels and determining the sources of flows found in the MS4. The flow may be coming from discharges permitted, allowed (e.g., springs), or exempted by a Regional Board (e.g., agriculture, water transfer discharges), but it may also be coming from an illegal discharge or an illicit connection. Once the source of the discharge is determined, steps should be taken to minimize or eliminate the flow. If the source cannot be determined, a sample should be collected and analyzed for parameters based on the surrounding land use. Use of the MS4 for water conservation transfers (e.g., imported water deliveries) may confound finding illegal discharges. In this situation, other possible sources of the non-storm water discharge should be examined and ruled out.

E. Video Reconnaissance

Extensive videotape "reconnaissance surveys" of the Permittees' underground MS4s and visual inspections of open channel facilities were completed in September 1994. The surveys revealed that illicit connections are essentially non-existent, and connections tended to occur to open facilities. Regular surveys of underground facilities require entry into confined spaces, and as illicit connections are not expected, would be putting municipal personnel at unnecessary risk. Reconnaissance surveys will be limited to open facilities, and if flows originate in underground facilities, they will be discovered during the survey.

4. CONSOLIDATED MONITORING PROGRAM

A. *Health and Safety*

The information provided in this section are general safety guidelines. Additional, site specific safety instructions are provided for most CMP stations. This guidance is available in David Ortega's (951-955-4390) office.

Safety of the sampling team is paramount. The field vehicle should start out with a full tank of gas and be in good repair. Extra care must be taken when driving at night or in the rain. If the sampling location is unsafe, make note of the unsafe situation and either do not collect a sample or come back after the hazardous situation has ceased.

1. Before You Leave

1.1 Always let someone else at the office know where you are, what your intended route or set of activities is, when you intend to return, and what to do if you don't come back at the appointed time. If in rough terrain, communicate with base when leaving and arriving at sampling sites.

1.2 Inspect the vehicle prior to leaving base. Make sure communication equipment and vehicle are in proper working condition. All safety equipment should be in the vehicle. Gas up the vehicle before you leave.

1.3 Know your equipment, sampling instructions, and procedures before going out into the field. Prepare labels, calibrate field meters, and clean equipment before you get started.

1.4 Know how to use and store chemicals. Do not expose chemicals or equipment to temperature extremes or long term direct sunshine.

2. Arriving at the Sampling Location

2.1 Prior to sampling, always assess the situation at the site. If it is unsafe, move on and return later or find a safer alternate location that will give comparable water quality results. If the situation remains unsafe, record the hazardous conditions in the *Field Data Sheet*, including photos, and do not collect a sample. **Your safety is more important than the data.**

2.2 If visibility is poor, use the vehicle lights to sweep the sampling site for safe entry and to illuminate the path. Use flashlights for additional lighting.

2.3 Do not cross low water crossings as the depth of the water and the integrity of the underlying roadway is uncertain. Floating debris may damage the vehicle or even push it from the roadway. Water as shallow as two feet deep can float a car.

2.4 Never cross private property without the permission of the landowner. Carry your employee identification card with you.

2.5 Watch for irate dogs, farm animals, wildlife, and insects such as ticks, hornets, wasps, and bees. Know what to do if you get bitten or stung.

3 Sampling Safety

3.1 When working with potentially hazardous materials, follow EPA, OSHA, and specific health and safety procedures. HAZWOPER certification is required if you will be sampling potentially hazardous materials.

3.2 Confined space entry is not allowed.

3.3 Avoid contact between chemical reagents and skin, eyes, nose, and mouth.

3.4 Know chemical cleanup and disposal procedures. Wipe up all spills when they occur.

3.5 Monitoring should be a team activity. Two person teams are required for night and wet weather sampling.

3.6 If you have health considerations such as epilepsy, severe allergies, or diabetes, let your partner know, as well as instructions on what to do if you need emergency assistance.

3.7 If in an active traffic area, cones should be placed around the parked vehicle, and personnel should be wearing reflective clothing. Make sure you are visible to passing traffic. Do not stand in front of the vehicle while sampling; better yet, park the vehicle a safe distance away. If visibility is poor, use flashlights when walking to and from the sampling site.

3.8 If sampling from a bridge, be wary of passing traffic, and personnel should be wearing reflective clothing. Never lean over the bridge rails unless you are firmly anchored to the ground or the bridge with good hand/foot holds. Never stand in front of the vehicle while sampling if it is parked on the bridge. Place flashing lights uproad when sampling off a roadway bridge. If visibility is poor, use flashlights when walking to and from the sampling site.

3.9 The person performing the sampling should be properly secured, such as on a lifeline, and be wearing adequate protective equipment.

3.10 Stay out of the channel if at all possible. Dip sample rather than enter the channel.

3.11 If you must enter the channel, use two hands to descend and ascend the iron ladder attached to the channel wall. Have your partner lower the sample bottles in an ice chest attached to a rope.

3.12 Test the traction before walking down a slope.

3.13 Do not walk on unstable stream banks. Disturbing these banks can accelerate erosion, contaminate your sample, and might prove dangerous if a bank collapses.

3.14 Be very careful when walking in the stream itself. Rocky-bottom streams can be very slippery and can contain deep pools; muddy-bottom streams might also prove treacherous in areas where mud, silt, or sand have accumulated in sink holes. If you must cross the stream, use a walking stick to steady yourself and to probe for deep water or muck. Your partner(s) should wait on dry land ready to assist you if you fall. Never wade in swift or high water. A rule of thumb used by USGS is to not attempt wading in a stream where the depth multiplied by the velocity is equal to or greater than 10 sq ft/s. Watch the stream stage, especially if there is a chance it could rise rapidly.

3.15 Wear hip boots or chest waders. Boots and waders protect against contaminants, cold, and underwater objects. Be aware that traction may be impaired while wearing them. Do not allow water to get into the boots or waders.

3.16 If sampling at night, carry a bright flashlight or use a head-mounted lantern. Avoid shining the light in others' eyes.

3.17 Do not go sampling if severe weather is predicted. If there is active lightning, find cover to avoid being struck.

3.18 Watch for poison ivy, oak or sumac, and other types of vegetation in your area, such as nettles, that can cause rashes and irritation.

3.19 Never drink the water in a stream, no matter how pristine the environment appears. Assume it is unsafe to drink, and bring your own water or sports drink from home. After monitoring, wash your hands with antibacterial soap.

3.20 The ideal comfort range for humans is between 60 and 90 degrees Fahrenheit. Hypothermia (cold) and hyperthermia (heat) may occur outside this range. Be aware of the symptoms of either and leave the sampling area if symptoms begin to appear.

3.21 If you become injured in the field, contact your supervisor or another supervisor for instructions. Contact the nearest worker's compensation medical clinic (Appendix D.4) for an appointment. If the injury creates an emergency situation, call 911 and contact the District after the situation is stabilized.

B. Field Reconnaissance

Field monitoring is the most important element of an ephemeral watershed monitoring program. The MS4 permits require that the Permittees effectively prohibit the discharge of non-storm water into the respective MS4s and to Waters of the U.S. During dry weather, regular surveys of the MS4s need to be conducted by each Permittee. If water is observed in an MS4 during dry weather, its source must be located. Sources of dry weather flows may be permitted, allowable, or illegal. If the water is associated with a permitted discharge, the facility owner may have records of laboratory analyses as required by a discharge permit issued by a Regional Board. That permit can be used to verify compliance with water quality standards. Other discharges may be allowed as discussed below or may be illegal and required to be ceased by the jurisdictional Permittee.

1. Summary of Method

1.1 In an ephemeral watershed, and in the absence of water transfers, permitted discharges, or surfacing groundwater, there should be no significant flows in the MS4. The most efficient use of public resources in tracking illicit discharges is to make regular inspections of the MS4, and where water is noted, track the water to its source.

1.2 Sources may not always be obvious. For example, a pipe or hose may be buried under debris or in thick vegetation. The pipe could also be underground but not through a channel sidewall and discharge could seep through a concrete joint. USGS flow gauges are good for checking real-time flow, where sudden increases in flows may indicate illicit discharges.

1.3 MS4 Map

1.3.1 The MS4s within the municipality's jurisdiction are required by the Permits to be identified and located so that areas can be prioritized for inspection. It is also important to know where one Permittee's MS4 ends and another Permittee's begins.

1.3.2 The District collects and consolidates individual Permittee facility maps into a single watershed wide MS4 map for each Permit area. These maps are provided to the Regional Board and Permittees as part of the Annual Reports and are available in the NPDES section.

1.3.3 Although not required by the Permits, the District recommends that facility maps be maintained in an electronic GIS or CAD format. Permittees should contact the District to discuss formatting so that compilation of watershed-wide maps can be facilitated.

1.4 MS4 Reconnaissance

Section 4.3 of the **Drainage Area Management Plan**[1] (**DAMP**) indicates that each Permittee is required to actively seek and eliminate illicit connections and illegal discharges to the MS4 through routine inspection, monitoring and reporting programs. These programs should be described in the Permittees local procedures manual or Individual **Storm Water Management Plan** (**SWMP**).

1.5 Collecting Evidence

Field screening and visual observation are used to indicate if there is an illicit discharge or if an analytical sample may be required. Section 4.B.3.4.9 contains specific sample collection procedures and constituents to be analyzed.

1.6 Enforcement/Compliance Strategy

Enforcement/Compliance Strategy guidelines are described in **DAMP** Section 3.4.2. **DAMP** Appendix E contains a list of Permittee departments that are responsible for enforcement and compliance in various MS4 Permit program areas. Additionally, individual policies and procedures that provide guidance for enforcement of the stormwater ordinance(s) are contained in the Administrative and Legal Procedures section of the **SWMP** or in Permittees' local documentation, as appropriate.

2. Allowed or Permitted Discharges

40 CFR 122.26(d)(2)(iv)(B)(1) includes a provision that certain categories of discharges need not be prohibited. These categories are (see Appendices A – C for watershed-specific modifications to the list):

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration [as defined at 40 CFR 35.2005(20)] to MS4s;
- Uncontaminated pumped ground water;
- Discharges from potable water sources

[1] Documents denoted in bold text are external to the CMP. Documents denoted in italic text are available in an Appendix.

- Foundation drains;
- Air conditioning condensation;
- Irrigation water;
- Springs;
- Water from crawl space pumps;
- Footing drains;
- Lawn watering;
- Individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges;
- Street wash water; and
- Non-emergency fire fighting flows.

MS4 permits may include additional exempt discharge categories. Section 4.1 of the **DAMP** identifies specific exempts discharge categories for the Santa Ana/Santa Margarita Permits. Permits may also prohibit one or more of the aforementioned discharge categories if they have been shown to contribute pollutants within a particular watershed. Discharges covered by an NPDES permit, Waste Discharge Requirements, or waivers issued by the Regional or State Board are not prohibited from entering a MS4, but they also do not have to be accepted by the jurisdictional Permittee.

3. Field Procedure for IC/ID Activities

3.1 Reconnaissance Activities (Proactive IC/ID Activities)

3.1.1 Reconnaissance activities involve regular field inspections of the MS4s. Field inspections may be as simple as visually inspecting open channels while driving by, to walking the facility and looking for signs of discharge into it, to opening manholes to find illegal connections to the facility. Illicit discharges may vary from relatively innocuous trickle flows to significant Hazmat situations.

3.1.2 Reconnaissance activities are generally scheduled in advance. The locations should be prioritized according to the likelihood that illicit discharges may be occurring. For example, inspecting facilities in an industrial area would take precedence to inspecting facilities in a sparsely-populated area. Information that should be considered in prioritizing facilities for inspection include:

3.1.2.1 Land use type

3.1.2.2 Types of businesses in the area

3.1.2.3 Past history of complaints in the area

3.2 Responding to Complaints (Reactive IC/ID Activities)

3.2.1 Complaints may come from various locations:

3.2.1.1 Member of the public, *e.g.*, via phone, e-mail, or direct communication

3.2.1.2 In-house staff, *e.g.*, field staff, inspectors, or maintenance crews

3.2.1.3 Other agencies, *e.g.*, other county agency, a neighboring city, state agency

3.2.2 Office Procedures for Addressing Complaints

3.2.2.1 Addressing non-stormwater complaints

3.2.2.1.1 Neighbor disputes involving non-stormwater issues are a civil matter. Refer complaint to appropriate Permittee or Code Enforcement department (Appendix E).

3.2.2.1.2 If there are health hazards with no MS4 connectivity, refer complaint to DEH. Appendix E contains DEH contact information.

3.2.2.1.3. If there is a flooding issue with no pollutant issue, refer complaint to the District Project Planning Section. Contact Alberto Martinez (951-955-1917) for Zones 1, 2, 5, and 6, and Benjie Cho (951-955-1348) for Zones 3, 4, and 7. The Project Planning Section has developed internal procedures for handling flooding complaint issues.

3.2.2.1.4 For complaints occurring on private property where the owner of the property is in violation, *e.g.*, accumulated rubbish, construction without permits, junk yard, abandon vehicles, contact the appropriate Permittee or Code Enforcement Department. See Appendix E for tables of communities and the local Code Enforcement office that handles them.

3.2.2.1.5 If sewage or treated effluent is involved, implement the **Unified Sanitary Sewer Spill Response Procedure** (Appendix I of the **DAMP**).

3.2.2.2. Addressing stormwater complaints

3.2.2.2.1 Take information from complainant and write it down on the *IC/ID Incident Reporting Form* (See Appendix D.1)

3.2.2.3 Identify appropriate jurisdiction

3.2.2.3.1 Check location of incident on **Thomas Bros.**[2] and District **facility maps**.

3.2.2.3.2 If a non-MS4 facility is involved, notify the appropriate City or County NPDES coordinator (Appendix E) or alternate point of contact. Referral to City and/or respective Regional Board must be made within 2 business days.

3.2.2.3.3 If a natural waterway is involved with no MS4 connectivity, notify appropriate Code Enforcement staff. See Appendices A–C for permit-specific notification requirements.

3.2.2.3.4 If District facility

3.2.2.2.2.4.1 Notify watershed coordinator (Appendix E)

3.2.2.3.4.2 If other District staff need to be involved, notify them also. See Staff list for current phone numbers.

3.2.2.3.4.3 Generally, Section 4.4 of the **DAMP** specifies illegal discharge reporting requirements – these reporting procedures should be followed. If hazardous materials are involved, notify County HazMat (see Appendix E)

[2] Mention of specific products or trade names does not constitute an endorsement.

and OES (800-852-7550) immediately. If injuries have occurred, call 911. The District's **Policy for Notification and Disposal of Spilled or Discovered Hazardous Materials** also contains additional guidance that should be followed. This policy is available on the District's Intranet.

3.2.2.3.5 Report actions on the *IC/ID Incident Reporting Form* (Appendix D.1).

3.3 Preparing for Field Work

3.3.1 Schedule date and time to make field visit to incident or reconnaissance location.

3.3.1.1 Staff should investigate spills, leaks, and/or illegal discharges within 24 hours of receipt of notice and inspect the incident location as soon as possible. See Appendices A – C for permit-specific requirements.

3.3.2 Notify members of inspection team of upcoming inspection.

3.4 Field Procedures

3.4.1 Before collecting a sample, the field equipment must be calibrated to make sure accurate results are being recorded. Calibration should occur in the laboratory prior to going out in the field. Follow all methods to ensure proper use and disposal of calibration fluids and rinse water. Neutralize any acids or bases before disposal. See Appendix F for specific instructions on field instruments.

3.4.2 Gather inspection team.

3.4.3 Notify Babcock Labs (951-653-3351) that you are going into the field and may be bringing in a sample. Let them know if you will be arriving after 5 p.m. or will be needing other special services so they can prepare. Appendix E.6 contains a map and driving directions to Babcock.

3.4.4 Pick up ice chest and sample equipment boxes outside of David Ortega's office (951-955-4390). Confirm that the ice chest is packed appropriately. A different bottle set may be required depending on the parameters expected to be found at the incident site. Standard kits containing bottle sets for petroleum products and sewage spills are available. Appendix G contains examples of bottle sets that may be needed.

3.4.5 Load into the field vehicle the equipment and supplies listed in Section 4.G.4.

3.4.6 If the incident is part of a HazMat incident, check with HazMat coordinator as soon as you arrive. Tell him/her what you intend to do, e.g., collecting water and/or soil samples. The HazMat coordinator will tell you what to do and when, including providing advice on where it may be safe to collect samples. Under no circumstances should you enter a site or collect samples if conditions are unsafe.

3.4.7 Note pertinent information on the *Field Data Sheet* (Appendix D.2):

3.4.8 Investigate incident – prior to collecting a sample

3.4.8.1 If active discharge, take photos at point of entry to MS4. Also document recent stains which may be indicative of recent active discharges.

3.4.8.2 Trace discharge as far upstream as possible. Spills may be traced into catch basins and through storm drains.

3.4.8.3 If the discharge can be traced to a business or other entity where you can talk with a person, inquire as to why the discharge is occurring

3.4.8.4 If discharge is permitted, request copy of regulatory permit, District Encroachment permit, or any other document authorizing the discharge. No further action is required where the source is determined to be a permitted, allowed, or exempted discharge. The District has developed a **Third Party Non-Stormwater Discharge** application that is intended for discharges where a Encroachment permit is required. The application may also be used for any discharge to District facilities where the District is previously notified and the discharge may result in a violation of the District MS4 permit.

3.4.8.5 If a permitted, allowed, or exempted discharge is exposed to a source of pollutants (e.g., recently-applied fertilizers or pesticides) it will be treated as an illegal discharge.

3.4.8.6 If not a permitted discharge, implement **Enforcement and Compliance Strategy (E/CS) procedures** per **DAMP** Section 3.4.2. Permittee Administrative and Legal Procedures are also contained in the Permittees' Individual **SWMP** or other local Permittee procedures. These actions will take place until the discharger is able to obtain a permit from the jurisdictional Regional Board and the discharge is determined to be acceptable by the Permittees. In addition, at least one sample of the discharge may need to be collected and analyzed as specified in Section 4.B.3.4.9 for evidence in a complaint investigation.

3.4.8.7 If the discharger representative becomes belligerent or abusive, remove yourself from the situation and contact your supervisor. You may be advised to return to the office to prepare a report.

3.4.8.8 If discharge can be traced to an underground MS4:

3.4.8.8.1 If the MS4 belongs to another jurisdiction, coordinate response or transfer complaint to them as approprate.

3.4.8.8.2 Otherwise, find upstream extent of discharge. May need to go back to the office to consult original plans.

3.4.8.9 Take enough photos to document extent and severity of impact. Photos should be attached to the *Field Data Sheet*

3.4.8.10 Other people may be on scene (refer to Appendix D.3)

3.4.8.10.1 Introduce yourself to others there and record contact info

3.4.8.10.2 Get supplemental information from them, e.g., time discharge started, any treatment of the spill

3.4.8.11 Sewage flows may be bubbling up through manhole

3.4.8.11.1 If you can avoid coming in contact with the discharge, examine the manhole cover to see if it identifies the sewer agency.

3.4.8.11.2 Contact the sewer agency representative for additional assistance and/or referral

3.4.8.12 Other evidence of illicit discharges

3.4.8.12.1 Nearby field may be saturated or ponded when it is not usually so. May need to find out who is conveying water (e.g., reclaimed or potable water lines) through the area and have them check for pipe breaks.

3.4.9 Sample Collection[3]

A field screening sample should be collected where there is no other evidence of the IC/ID source, or as an adjunct to an IC/ID investigation. Samples may also be collected if there is a concern that water of unknown origin could impact the MS4 or receiving water, such as flowing water, significant ponded water where there is evidence of recent flow, or significant ponded water where there is a potential for mobilization (e.g., a storm is expected within 72 hours).

The following procedure is recommended in determining when to collect samples and what level of analysis is necessary. See the suggested equipment list under Appendix G , Water Chemistry for a suggested equipment list for field personnel. See Appendices A – C for permit-specific requirements.

3.4.9.1 What should be analyzed in the sample?

3.4.9.1.1 Use Horiba multimeter (see Appendix F.1) to collect :

3.4.9.1.1.1 pH
3.4.9.1.1.2 Electrical conductivity (Specific conductance)
3.4.9.1.1.3 Turbidity
3.4.9.1.1.4 Dissolved Oxygen
3.4.9.1.1.5 Water Temperature
3.4.9.1.1.6 Salinity (optional; may be useful for certain types of wastes)
3.4.9.1.1.7 Total Dissolved Solids
3.4.9.1.1.8 Oxidation-Reduction Potential (optional; useful if sewage is suspected)

3.4.9.1.2 If source known, analyze for the known parameters

3.4.9.1.2.1 Know what spilled

3.4.9.1.2.2 If unknown, the facility owner or operator may have an SPCC on site. The SPCC shows what is stored.

3.4.9.1.2.3 May have discharger pay for analysis at their or District's contract lab

3.4.9.1.3 If source not known, look for obvious clues to the type of material being discharged. Tables 4, 5, and 6 provide guidance on determining the potential source of the flow. Below are general items to keep in mind:

[3] Samples will be collected only if there is adequate flow or significant ponded water to allow for proper field quality assurance and quality control for sample collection. For example, due to sample preservation requirements, a separate sample must be collected for analysis of Oil & Grease and the sample must be collected without compromising the amount of preservative in the sample bottle.

3.4.9.1.3.1 Odors or colors (e.g., water or surface stains) may provide clues. Table 4 contains guidance.

3.4.9.1.3.2 Note surrounding businesses or land uses, e.g., may be in a business park or ag area. Tables 5 and 6 list contaminants that may be associated with various business and industry types.

3.4.9.1.3.3 Is there a history of complaints in the area? What was sampled then?

3.4.9.1.3.4 See Appendix G for examples of parameters that may need to be sampled based on the IC/ID type. This list is non-exclusive. Other situations may exist which will lead to the selection of other parameters to monitor.

3.4.9.1.4 If it is not possible to identify the source of the discharge (e.g., there could be multiple sources of the discharge), other situations preclude determining the source of the discharge (e.g., property owners are not being cooperative), field screening indicates potential water quality impairment (e.g., very high specific conductance, total dissolved solids, or turbidity, pH below 6 or above 9.5, dissolved oxygen below 4 mg/L, unusually high or low water temperature), and/or visual observations in the area of the discharge indicate the presence of Pollutants (e.g., staining, water sheen, water color and/or odor, algae, foaming), a sample should be collected for laboratory analysis. Best Professional Judgement (BPJ) should be used to decide if field parameters indicate pollution, as ambient conditions may be naturally higher. Section 3.7.2 provides suggested numeric criteria should the inspector not be able to apply BPJ. The decision of what parameters to monitor should be based on the visual observations, the types of nearby businesses or land uses, and history of complaints in the area. Suggested parameters may include:

3.4.9.1.4.1 Total Hardness
3.4.9.1.4.2 Oil and Grease
3.4.9.1.4.3 Nitrate Nitrogen
3.4.9.1.4.4 Ammonia Nitrogen
3.4.9.1.4.5 Total Phosphorus
3.4.9.1.4.6 Surfactants (MBAS)
3.4.9.1.4.7 Copper (total and dissolved)
3.4.9.1.4.8 Lead (dissolved)
3.4.9.1.4.9 Diazinon
3.4.9.1.4.10 Chlorpyrifos
3.4.9.1.4.11 E. coli
3.4.9.1.4.12 Total coliform
3.4.9.1.4.13 Fecal coliform
3.4.9.1.4.14 Total Nitrogen (Optional; useful in helping to determine source type)
3.4.9.1.4.15 Total Kjeldahl Nitrogen (Optional; high Kjeldahl nitrogen may indicate sewage)

3.4.9.2 If the inspector is not able to apply BPJ to determine if impairment may be occuring based on field water quality measurements, the following numeric guidance may be used:

3.4.9.2.1 Specific Conductance >25% higher than WQO
3.4.9.2.2 Total Dissolved Solids >25% higher than WQO
3.4.9.2.3 Turbidity >25% higher than the long-term average
3.4.9.2.4 pH below 6 or above 9.5
3.4.9.2.5 Dissolved Oxygen below 4 mg/L

3.4.9.3 Sample Measurement
See Section 3.G for general sample collection procedures

4. Field Procedures for Stormwater Monitoring

Stormwater monitoring is routine monitoring that is required for MS4 Permit compliance. Many of the procedures outlined for IC/ID monitoring can be followed for stormwater monitoring.

4.1 Prior to sampling
4.1.1 Field monitoring equipment should be checked at regular intervals and repaired promptly if needed.
4.1.2 Bottle supplies should be replenished after each sampling event. Supplies should be checked prior to the storm season and extra bottles ordered as anticipated.
4.1.3 Supplies should be checked at regular intervals. Damaged or worn-out supplies should be replaced.

4.2 Schedule monitoring activities
4.2.1 Put together sampling team. Two person teams are required for wet-weather sampling. A single person may collect dry-weather samples as long as a means of communication (*e.g.*, radio or cell phone) with base is constantly available.
4.2.2 Bottle list varies depending on:
4.2.2.1 Watershed
4.2.2.2 Wet- or dry-weather sampling event

4.3 Day of sampling
4.3.1 Calibrate monitoring equipment (see Section 4.B.3.4.1)
4.3.2 Notify members of sampling team (see Section 4.B.3.4.2)
4.3.3 Notify Babcock Labs (see Section 4.B.3.4.3)
4.3.4 Load equipment and sample bottles into vehicle (see Section 4.G.4). The laboratory contains boxes pre-filled with sampling equipment, ice chests, and a binder with the bottle sets required. David Ortega (951-955-4390) has keys to the laboratory.
4.3.5 Fill ice chest(s) with ice

4.4 Sample collection
4.4.1 Arrive at sampling location
4.4.2 Follow the procedure outlined in Section 4.G.5. The sample category (Section 4.G.5.1.1.1) will vary according to the sampling event (*e.g.*, wet or dry weather). The sample type (Section 4.G.5.1.1.2) may be "Grab" or "Composite" depending on permit requirements.
4.4.3 Collect a field screening sample and record the results on the Field Data Sheet (Appendix D.2). Section 4.B.3.4.9.1 contains a list of field parameters.
4.4.4 Calculate or estimate flow and record the results on the Field Data Sheet
4.4.5 Collect samples (see Section 4.G.3) and place the filled bottles in the ice chest. During wet weather, or if there are high flow during dry weather, it may not be safe to stand in the flow (see Section 4.G.5.1.10). Use a pole sampler to collect the sample.

4.4.6 Record sample information and any pertinent notes on the Field Data Sheet.
4.4.7 Fill out the Chain of Custody Form (Appendix D.5).
4.4.8 Take the samples to Babcock Laboratories (see Appendix D.6 for a map and driving directions).

C. Water Chemistry

This section addresses monitoring requirements that are common to all three watershed MS4 permits. Permit requirements that deviate from this protocol will be outlined in the watershed-specific appendix.

1. Need for Both Chemistry and Flow Data

Chemical data allow for comparisons with Basin Plan Water Quality Objectives, other benchmarks, and among monitoring stations. An understanding of impacts, however, requires an understanding of the flows throughout the MS4 and Receiving Waters. For example, a water quality analysis may indicate a high concentration of a pollutant in an MS4, but flows may be very low and visual observation may show that the flow will not reach a Receiving Water. Development of a watershed computer model may be an effective approach to understand the impacts of point and non-point discharges. However, establishing and maintaining a watershed computer model requires both chemical and flow data, and can be complex and expensive.

2. Wet-Weather Monitoring

The MS4 permits require that wet-weather samples be collected from the first storm event and one or two more storm events during the rainy or wet season. The definition of wet season may differ by watershed, but in general falls between October 1 and April 30. In an ephemeral watershed, the first storm of the year that falls under the USEPA-recommended criteria may not result in runoff from surrounding lands. The District has developed guidance on when wet-weather samples should be collected. Two National Weather Service weather forecasts are monitored, the normal 7-day forecast for the possibility of a rain event and the Qualitative Precipitation Forecast (QPF) to determine how much rain is predicted to fall in 6-hour increments over the next 24-hour period and during days 2 and 3 of the rain event. The antecedent moisture condition (AMC) of the watershed is also evaluated. AMC is a subjective measure of runoff potential.

AMC I represents low runoff potential, such as from a dry watershed. AMC II represents moderate runoff potential. AMC III represents high runoff potential, such as a watershed saturated from previous rain events. Based on the QPF and AMC, and keeping the EPA Guidance (see Section 3.A) in mind, the following guidelines are recommended in determining when a wet-weather sample should be collected:

- AMC I and QPF of ½ inch of precipitation in 24 hours
- AMC II and QPF of $^{3}/_{8}$ inch of precipitation in 24 hours
- AMC III and QPF of ¼ inch of precipitation in 24 hours

These guidelines may be modified based on differences in hydrology in a particular drainage area or per specific permit requirements. Permit-specific requirements will be noted in Appendices A-C.

During the first storm event, the analysis may include the entire priority pollutant list (Table 1). Other analyses may include a subset of the priority pollutant list or may include parameters listed in Table 2. Sediment samples may also be collected, if required. Permit-specific requirements will be noted in Appendices A–C.

3. Dry-Weather Monitoring

A minimum of two dry-weather samples should also be collected to evaluate the effects of seasonality, if they exist. In an ephemeral watershed, monitoring efforts should be focused on characterizing flows that cannot be traced to a source during field reconnaissance.

4. Factors Influencing the Nature of Urban Runoff

Regular monitoring is needed to assess the quality of Urban Runoff, identify seasonal differences, and determine if Urban Runoff is impacting Receiving Waters. Several factors influence the nature of Urban Runoff:

- Land Use – Certain types of Pollutants may be expected from specific land use categories. For example, metals and organics may be found in industrial wastes, nutrients may be found in agricultural return flows and precipitation, and pesticides and herbicides may be found in residential or commercially landscaped areas.
- Season – As Riverside County is arid or semi-arid, most of the Receiving Waters are ephemeral or at most intermittent. During dry weather the only flows that typically discharge to Receiving Waters are rising groundwater, water conservation transfers, treated sanitary sewer effluent, discharges from sources not under control of the Permittees, and illegal discharges. During dry weather Urban Runoff flows carried by MS4s tend to evaporate or soak into the ground before they reach a Receiving Water. During small storms, the only stormwater entering a MS4 is what directly falls on it as precipitation or from highly paved adjacent surfaces. Only during larger storms will the watershed become sufficiently saturated for surface runoff to be generated and sustain continued flows in a MS4.
- MS4 Type – An earthen channel will absorb discharges entering the stream bed and will sustain flows only when the stream bed is saturated. Low-volume discharges to concrete-lined channels may evaporate before reaching a Receiving Water. During large storms, both types may sustain flows for several days following the storm.
- Storm Interval – A watershed may still be saturated for several days after a significant rainfall event. A subsequent storm may sustain flows through a MS4 and carry additional Pollutants. After a few weeks, the watershed may have dried enough that flows will not occur.
- Illicit and Accidental Discharges – Pollutants may be intentionally discharged directly or indirectly into a MS4. Examples range from the illegal discharge of wastewater from mobile operations into a MS4 to legal discharges of overflow water to a MS4 from fire-suppression activities.

D. Toxicity

Toxicity testing may provide an assessment of impacts a discharge may have on aquatic life. Studies throughout California have shown that the most common sources of toxicity are pesticides, such as diazinon and chlorpyrifos, and metals.

The toxicity tests were developed using East Coast species in perennial flow conditions. Difficulties have been encountered in the use of toxicity tests for POTWs in ephemeral systems as no dilution occurs in the Receiving Water and the species the tests are based on may thrive poorly if at all under ephemeral flow conditions, even in the absence of treated effluent or Urban Runoff discharges.

Additionally, if marine species are used, changing the water chemistry (e.g., salinity, pH, temperature) to ensure survival of the test species may create conditions, unrelated to those in the original test water, which could be toxic to the test species. This could result in a false positive, and could lead to a time-consuming and costly search for a toxicant that is an artifact of the test procedure.

Many times, the drainage area contributing flows to a station selected for toxicity testing will include land uses other than Urban, such as agriculture, parks, and state and federal lands. Repeated indications of toxicity, even after the implementation of measures to control the toxicant(s)' presence in Urban Runoff, may indicate that the toxicant(s) are being contributed from these other land uses, which are outside of the Permittee's ability to control. Therefore, the presence of toxicity does not in itself indicate that Urban Runoff is contributing to Receiving Water impairment.

The MS4 permits generally specify the species to be tested and under what conditions the samples are to be collected. If toxicity is found, the source must be determined and reduced or eliminated. The procedure to find the source is a Toxicity Identification Evaluation (TIE) and to reduce it is a Toxicity Reduction Evaluation (TRE). The MS4 permits usually require that criteria be identified that will trigger the initiation of TIEs and TREs. The County of San Diego utilizes a "triad approach" decision matrix that includes actions to be undertaken based on the results of chemical, toxicity, and bioassessment tests at a single station. This decision matrix has been incorporated into the Southern California Stormwater Monitoring Coalition's Model Monitoring Program and the SMR MS4 Permit.

Table 3 includes a list of toxicity tests that may be required or recommended in the MS4 permits, the volume of water required, and the cost. MS4 permit-specific requirements are outlined in the watershed-specific appendices. Toxicity testing requires personnel with proper equipment and expertise in handling the test species.

E. Bioassessment

Bioassessment may be used to assess the cumulative impacts of discharges to water-supported native stream species including benthic invertebrates, algae, fish and plants. It is the direct measurement of the biological and physical condition of a watershed. Additionally, bioassessment may provide a direct measurement of the impacts of cumulative, sub-lethal doses of pollutants that may be not be detectable in a water chemistry analysis, but that may still have biological effects, therefore, it may detect impacts that chemical and toxicity monitoring cannot. However, there are some limitations to this method. From USEPA's Rapid Bioassessment Protocol guidance, an accurate assessment of stream biological data is difficult because natural variability cannot be controlled. Unlike analytical assessments conducted in the laboratory, in which accuracy can be verified in a number of ways, the accuracy of field assessments cannot be objectively verified. For example, it isn't possible to "spike" a stream with a known species assemblage and then determine the accuracy of a bioassessment method. Depending on which methods are chosen, the actual structure and condition of the assemblage present or the trends in status of the assemblage over time may be misinterpreted.

USEPA protocol allows the use of fish, macroinvertebrates, periphyton (algae), and macrophytes (plants). The MS4 permits currently require the use of the macroinvertebrate protocol. Extreme care must be taken when conducting bioassessments. Bioassessment includes comparing the biological integrity of the monitoring station with that of a reference station. Differences in habitat quality between a reference and the monitored station could lead to false indications of impairment. For example, if a bioassessment indicator species is found at the reference station but not at a monitored station or at a reduced population, it may indicate the presence of toxicity, or it may be due to the lack of specific habitat necessary for their survival at the monitored station. For this reason, it is important that the reference station represent the same hydrogeology as the monitoring stations.

Bioassessment requires personnel with expertise in identifying and classifying the target species.

F. Special Studies

Special studies may be needed to address unique watershed-based issues or to answer specific questions that the routine monitoring program may generate. Generally, special studies are short-term efforts with a predefined goal. As research, special studies are often expensive, and may be beyond the expertise and/or ability of the Permittees to fund without outside state and federal sources. Special studies do not have to involve field investigation. Where watershed issues are not unique, special studies may consist of a literature review and a discussion of the applicability of the findings to the identified issue.

1. Irreducible Concentrations

One of the purposes for collecting water quality data is to evaluate BMP performance. For example, studies, many by product vendors, have been conducted that evaluate percent reductions of various Pollutants. In addition, GeoSyntec Consultants, in cooperation with the Urban Water Resources Research Council of the American Society of Civil Engineers and USEPA's office of Water, prepared a guidance manual that provides an overview of BMP monitoring, discusses difficulties in assessing BMP performance, and addresses "the relationship between BMP study design and the attainment of monitoring program goals." The manual presents a table (Table 2.9, page 33) of "irreducible concentrations," the lowest concentration that can possibly be achieved using existing BMPs, of selected Pollutants. The table, reprinted below, is:

Contaminant	Irreducible Concentration
Total Suspended Solids	20 – 40 mg/L
Total Phosphorus	0.15 – 0.2 mg/L
Total Nitrogen	1.9 mg/L
Nitrate as Nitrogen	0.7 mg/L
Total Kjeldahl Nitrogen	1.2 mg/L

G. SAMPLING PROCEDURES

1. Interferences

1.1 There are two primary interferences or potential problems with surface water sampling, cross-contamination of samples and improper sample collection.

1.1.1 Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to Section 4.G.5.1.18 for sampling equipment decontamination procedures.

1.1.2 Improper sample collection can involve using contaminated equipment or field meters, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area. It also includes touching the inside of the sample bottle or bottle cap, touching the bottle screw threads, or using a bottle that had been dropped.

1.2 Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

2. Personnel Qualifications

2.1 Personnel handling potentially hazardous materials need to have current HAZWOPER certification. If only reporting the presence of potentially hazardous materials, HAZWOPER awareness training is sufficient. Staff should never handle potentially hazardous materials; they should be reported to Riverside County HazMat (Appendix E). They will advise on proper handling and disposal procedures.

2.2 All field samplers are required to take safety and regular refresher courses prior to engaging in any field collection activities. At a minimum, sampling personnel will have taken the following training:

- 2.2.1 Driver safety (an **Authorization to Drive Riverside County Vehicle or Private Vehicle for County Business** must be on file)
- 2.2.2 Safety awareness
  - 2.2.2.1 Review of field sampling hazards, safety rules, and pre-sampling site visit
  - 2.2.2.2 Hazard Communication refresher including review of MSDSs for chemicals used in sampling process
  - 2.2.2.3 Review of spill prevention and clean-up procedures
- 2.2.3 Field meter use and calibration
- 2.2.4 Sample collection
- 2.2.5 Training on in-house procedures and policies for illicit discharge clean-up within District rights of way
- 2.2.6 General NPDES training as described in Section 5 of the Riverside County **DAMP**

3. Sampling Procedure and Recommended Equipment

For safety reasons and to minimize sample contamination, at least two people are recommended for each sampling team. Samples need to be collected in a way that minimizes disturbance of sediments and avoids introduction of additional contaminants. The USGS recommends a "Clean Hands/Dirty Hands" technique, in which the "Clean Hands" (CH) person conducts the tasks related to direct contact with the sample bottles and record-keeping and the "Dirty Hands" (DH) person collects the samples and makes equipment and gauge readings.

When collecting samples, CH fills out the labels, places them on the bottles, opens the bottles, and hands the bottles to DH. DH takes the bottles and either fills them directly from the flow or uses a pole sampler or bucket to collect the water and pours the water into the bottle. DH also fills a bucket or cup with water for the field meters and reads the measurements to CH. After samples are collected, the field data sheet needs to be filled out and the bottles placed in the ice chest. The chain of custody form can be filled out as the samples are collected or prior to arrival at the lab, where the information is transcribed from the Field Data Sheet. Sampling equipment should be as inert as possible (e.g., glass, stainless steel, teflon) to minimize the introduction of contaminants that could leach from the sampling equipment. Sampling equipment, such as a bucket, that is reused during a sampling event should be thoroughly wiped clean with a fresh towel or wipe after a sample is collected and rinsed at least three times in the water to be sampled before the next sample is collected.

During IC/ID response, there may be only a single person collecting the sample. Every effort should be made to prevent contaminating the samples.

Sampling equipment should be stored in a secure location where it can be accessed when needed. There should be a working power source for charging batteries. A work table is needed to hold materials to calibrate field equipment and make repairs. A sink is needed for cleaning equipment and rinsing non-hazardous calibration standards. Hazardous materials should be properly stored and disposed of.

Flow measurements may be:

- Determined by using an available USGS flow gauge. During storm sampling, uncalibrated flows will be used in determining proportions for preparing a flow-weighted composite.
- Calculated where there is a staff gauge and knowledge of channel geometry. A calibration curve will be available that correlates gauge height and volumetric flow.
- Estimated by dropping a floatable object such as a leaf or twig in the water, timing (T) how long it takes to move from one landmark to another, and measuring the distance (D) between the two landmarks. With knowledge or an estimate of the channel cross-sectional area, the volumetric flow rate may be calculated as

$$Q = \frac{A*D}{T}$$

- Where flows are very low or not amenable to the measurement methods noted above, a visual estimate will be recorded based on the experience of the field staff.

4. Equipment and Supplies

4.1 Recordkeeping

4.1.1 Map to write on
4.1.2 Notepad
4.1.3 Clipboard
4.1.4 Straightedge
4.1.5 Agency facilities map book or MS4 map
4.1.6 Labels for sample bottles
4.1.7 Laboratory *Chain of Custody* form
4.1.8 *Field Data Sheets*
4.1.9 Educational brochures and doorhangers
4.1.10 Pen/pencil/permanent marker
4.1.11 Map Book (**Thomas Guide**)

4.2 Field Equipment

4.2.1 Sample bottles (see Appendix A – C for Permit-specific requirement. See Appendix G for examples of parameters that may need to be sampled based on the IC/ID type. This list is non-exclusive. Other situations may exist which will lead to the selection of other parameters to monitor.). Bring an extra set of bottles in case of breakage
4.2.2 Cellular phone
4.2.3 Tool box with basic tools
4.2.4 Ice for ice chest(s) – can obtain at Building #3 or purchase in the field
4.2.5 Ice chest(s) – 1 Empty and 1 with sampling bottles
4.2.6 Nitrile or latex gloves (powder-free)
4.2.7 Stainless steel and poly buckets
4.2.8 Thermometer(s)
4.2.9 pH meter(s) or papers
4.2.10 Multimeter (e.g., Horiba U-22, Water Quality Meter (if available))
4.2.11 Clock or watch

4.2.12 pH Singles set – One each: Rinse, 4.0, 7.0 & 10.0 packets
4.2.13 Tap water for pH Meter(s)
4.2.14 Conductivity Meter(s)
4.2.15 Pole Sampler – in lab
4.2.16 Office phone numbers and/or other team cell phone numbers

4.3 Clothing
4.3.1 Hip waders/knee boots
4.3.2 Rain gear
4.3.3 Hat/sun screen/sunglasses
4.3.4 Heavy cloth or leather work gloves

4.4 Supplies
4.4.1 Antibacterial soap or hand cleaner
4.4.2 Drinking water/sports drinks
4.4.3 Paper towels and/or clean rags
4.4.4 Flashlight or lantern and spare batteries
4.4.5 Digital camera and spare batteries or disposable camera
4.4.6 Rope
4.4.7 Bucket(s)
4.4.8 Tape measure
4.4.9 Ziplock bags for soil samples
4.4.10 Batteries for pH and Conductivity Tester(s)
4.4.11 Vehicle has a full tank of gas
4.4.12 Agency locks and gate keys
4.4.13 Chain (about 3 lengths)
4.4.14 Bolt cutters
4.4.15 Shovels – in lab.
4.4.16 Steel Garden Trowel
4.4.17 Small poly scoop (for soil sampling)
4.4.18 Bottle Carrier – in lab
4.4.19 Lanyard
4.4.20 Equipment wash containers - 3 each, poly cylinders.
4.4.21 Bottle brush
4.4.22 Distilled water
4.4.23 Steel Tape (measuring flow)
4.4.24 Trash bags
4.4.25 Food/snacks
4.4.26 Head mounted lamp

4.5 Safety
4.5.1 First aid kit
4.5.2 Fire extinguisher
4.5.3 Spill kits (for preservatives)
4.5.4 Material Safety Data Sheets (MSDS) for preservatives
4.5.5 Hand held eye wash unit
4.5.6 Protective goggles
4.5.7 List of emergency phone numbers/office contacts/towing service
4.5.8 Safety vest or bright clothes (working near traffic or on bridges)
4.5.9 Orange safety cones (working near traffic or on bridges)
4.5.10 Personal floatation device (PFD), if conditions warrant

4.5.11 Jumper cables
4.5.12 Tool box

4.6 Bottle Set
The contract laboratory should provide the necessary bottles. Some tests require the use of preservatives, usually an acid, in the sample bottle. The contract laboratory provides the preservative in the bottle. Bottle sets needed for Stormwater monitoring are noted in the Watershed-specific appendices. Appendix G notes bottle sets for select IC/ID examples.

5. Sample Measurement

5.1 Collecting a sample[4]

5.1.1 Fill out *Field Data Sheet* (see Appendix D.2). The back of the *Field Data Sheet* contains instructions for filling it out.

5.1.1.1 Note sample as "Complaint" type

5.1.1.2 Sample type is "Grab"

5.1.1.3 Sample matrix is either Aqueous or Soil

5.1.1.4 Note the location of the sample as accurately as possible. If a GPS unit is available, note the sample location coordinates.

5.1.1.5 Note field conditions

5.1.2 Hook-up the Horiba U-22 probe to the field meter

5.1.3 Fill out sample bottle labels. Dry label if needed before writing.

5.1.4 If labels not already attached, dry outside of bottle before attaching label.

5.1.5 Cut top off the half-gallon poly container, leaving the handle attached

5.1.6 Put on nitrile gloves

5.1.7 Take the labeled sample bottles, prepared poly container, pole sampler, and field meter(s) to the sampling location

5.1.8 Write down the location, date, and time the sample was collected on the label.

5.1.9 Avoid cross-contamination when collecting samples

5.1.9.1 Don't touch underside of lid or threads on outside of bottle

5.1.10 Stand downstream of flow. Let the sample flow into the bottle

5.1.11 Sample the surface water only, avoiding plant material, rocks, scum, etc., that could interfere with sample analysis.

[4] Samples will be collected only if there is adequate flow or significant ponded water to allow for proper field quality assurance and quality control for sample collection. For example, due to sample preservation requirements, a separate sample must be collected for analysis of Oil & Grease and the sample must be collected without compromising the amount of preservative in the sample bottle.

5.1.12 Section 4.A contains sampling Safety guidance

5.1.13 May have to let a contractor or HazMat collect the sample

5.1.14 After the sample is collected, fill the poly container one last time for the field meter readings. The depth of sample in the container should be sufficient to submerge the meter, keeping in mind any depth limitations for specific field meters.

5.1.15 Place the field meter into the water. Allow the readings to equilibrate before recording the readings onto the *Field Data Sheet*. Refer to Appendix F for instructions on field meter use.

5.1.16 Make sure the lids to the sample bottles are on securely. Place the bottles into the ice-filled cooler.

5.1.17 If other trained personnel collecting a sample, ask for a copy of their analyses or if they will split a sample with you.

5.1.18 Decontamination

5.1.18.1 For soil sampling, rinse the three wash containers (cylinders) with distilled and tap water, detergent, and scrub with the bottle brushes.

5.1.18.2 For the poly and/or steel scoop, rinse them with distilled and tap water, detergent, and scrub with the bottle brushes.

5.1.18.3 If only one container is available to collect the sample, rinse the container with distilled water, triple rinse the container with agitation in new sampling location, then collect the sample. Rinsing more than once in the stream before collecting the sample eliminates dilution.

5.1.18.4 Samples need to be kept on ice once they are collected

5.2 Fill out *Chain of Custody* form (see Appendix D.5)

6. Data and Records Management

6.1 At each inspected site, the following information should be recorded on the *Field Data Sheet*:

6.1.1 Time since last rain. May be filled in at the office.

6.1.2 Quantity of last rain. May be filled in at the office.

6.1.3 Site description, including conveyance type and dominant land uses in drainage area (may be filled in at the office)

6.1.4 Flow estimation (e.g., width of surface, approximate depth of water, approximate flow velocity, flow rate) or measured flow rate

6.1.5 Visual observations (e.g., odor, color, clarity, floatables, deposits/stains, oil sheen, surface scum, vegetation condition, structural condition, and biology)

6.1.6 Station location (lat/long) and a narrative description. If lat/long information is not available, note the Thomas Bros. page and cell.

6.1.7 Photo of the station

7. Sample Handling and Preservation

7.1 Some of the sample bottles will contain preservatives or acids. Care must be taken to avoid contact with these additives and to avoid their loss during sampling. Use proper first aid procedures to neutralize and wash off any acids that contact the skin or eyes.

7.2 Make sure the bottle lids are securely attached, but do not tighten them too much, lest they crack.

7.3 The samples must be kept on ice from the time they are collected until the time they reach the laboratory. Ice cubes are preferred to blue ice as they stay cold longer and provide some insulation from warming as long as the ice has not melted too much.

7.4 If sampling at more than one location, avoid cross-contamination

7.4.1 Segregate bottle sets – plastic bags, physical divider in ice chest, separate ice chests

7.4.2 Need clean equipment for each site sampled

7.4.2.1 New set of gloves

7.4.2.2 New dip bottle

7.5 Take samples to Babcock Labs (951-653-3351) in Riverside. The samples must be kept on ice from when they are sampled to when they arrive at Babcock. Refer to Appendix E.6 for map and driving directions. The technician will fill out the Sample Integrity portion of the *Chain of Custody* and give you one of the pages after you both sign it. If you need a rush analysis or have any special instruction, let the technician know.

5. MONITORING COSTS

Monitoring costs include monitoring program design, establishment of monitoring stations, equipment purchase and installation, field time, sampling time, laboratory analysis, flow gauge operation and maintenance, data management and analysis, reporting, regulatory coordination, contract administration, training, other staff time, and vehicle operation. Costs can vary greatly; for example, a TMDL station requires an installed flow gauge that can cost $15,000 – $20,000 for installation and upwards of $17,000 for yearly operation. Alternatively, a staff gauge on the wall of a concrete channel may cost only $100. Sampling over the course of a storm could take 12 hours of staff overtime, while dry weather monitoring is usually conducted during regular working hours.

Analytical costs for chemical analyses are included in Tables 1 and 2, and for toxicity testing in Table 3. The full USEPA priority pollutant screening costs approximately $1000 per test. Some methods incur a cost for all parameters analyzed under that method. Bioassessment costs, which include collection and evaluation of three replicate samples, range from $2,000 – $4,000 per station.

6. QUALITY ASSURANCE/QUALITY CONTROL

The measurement of chemical constituents in Urban Runoff at the trace level is often difficult due to inherent variability of environmental samples, field sampling techniques, and analytical techniques. In order to assess and maximize data quality, a Quality Assurance and Quality Control (QA/QC) Plan is implemented as an integral part of the monitoring program. The QA/QC program is designed to enable an evaluation and validation of the analytical data for representativeness, accuracy, and precision. The following text includes separate descriptions for the field and laboratory portions of the QA/QC program.

A. Data Acquisition

1. Receive Analytical Data From Laboratory

2. Import Laboratory and Field Data Into Hydstra
   E.S. Babcock Lab will send "edd"s – electronic data text files, periodically via email. The text files will be attachments to the email. A sample data file name is given for this example and will be different for each file sent by the lab.

   2.1 Match the paper copy of the lab results with the text file from the email. The paper copy of the lab results will accompany the invoices from the lab.
   2.2 Open up the text file and review its format. It should read similar to:
   "A5D1827-01 813 Bactee Sampling 04/22/2005 14:30 David Ortega 04/22/2005 16:35 Fecal Streptococcus 40 MPN/100 mL 20 SM 9230B 04/22/2005 SAMP"
   2.2.1 The first item (**A5D1827-01**) is the lab number.
   2.2.2 The Hydstra station number (**813**) is next. This number should match the Sample ID on the *Chain of Custody* form.
   2.2.3 The project name (**BACTEE Sampling**) should match the Project Name on the *Chain of Custody* form**.**
   2.2.4 The date (**4/22/05**) should match the sample date on the *Chain of Custody* form.
   2.2.5 The time (**14:30**) should match the sample time on the *Chain of Custody* form.
   2.2.6 The name (**David Ortega**) should match the name under Sampler Information on the *Chain of Custody* form.
   2.2.7 The next date (**4/22/05**) is the date that the samples were received by the lab, and should match the *Chain of Custody* form.
   2.2.8 The next time (**16:35**) is the time that the lab received the samples, and should match the *Chain of Custody* form.
   2.2.9 **Fecal Streptococcus** refers to the type of lab analysis performed by the lab.
   2.2.10 **MPN/100 mL** refers to the reporting units of the lab results.
   2.2.11 **SM 9230B** refers to the analytical method use by the lab.
   2.3 If there is a discrepancy or difference between the paper copy of the lab report and the electronic lab data, contact Linda Garcia (951-955-1248) at the District and Maria Mondloch (951-653-3351) at the lab.
   2.4 Open **Q:\NPDES\LABORATORY REPORTS\Babcock Data 04-05** (the reporting year at the end of the filename may be different).
   2.5 If there are no discrepancies between the paper copy of the lab report and the electronic lab data, then copy the text file and paste to the file **Babcock Data 04-05** in **Q:\NPDES\LABORATORY REPORTS.** Make a note of the entire text file name, *e.g.*: **A5D1827 FINAL SIMPLE 27 Apr 05 10481.txt**
   2.6 Log on to the Hydstra database, double click on file: **"Programs by Function"**, double click on file: **"Hydstra/WQ – Water Quality"**, double click on **"RFCWQIN – Import WQ Samples from lab"**. Wait for Window labeled **"RFCWQIN – Import WQ Samples from**

lab” appears. Click **“Program”** tab, click **“Previous run F8”**. Insert Data File Name: **Q:\NPDES\LABORATORY REPORTS\Babcock Data 04-05**.: **A5D1827 FINAL SIMPLE 27 Apr 05 10481.txt**, Insert Work file name: **A5D1827**, Insert Date Format: **B** (for Babcock), click **RUN**.

2.7 Successful import will produce a page on the HYEXPLORE window. The page will read: **Perl – opening input file [Q:\NPDES\LABORATORY REPORTS\Babcock Data 04-05**.: **A5D1827]**. The next line will read: **Perl – Preprocessor read** a number **lines, wrote** same number **lines**. The following line will read: **Summary for Samples**.

2.8 Double click on **WQWRK – WQ Samples and Results Management**.

2.9 Click on work file: **A5D1827** to highlight it, then click on **OK**.

2.10 Click on the **Toggle browse/form view** tab for each site number listed in the work file. Check the site number, sample number, collection date and time. Match this information to the *Chain of Custody* form, *Field Data Sheet* and the lab results. Perform a check off procedure as you match the information.

2.11 The Lab Sample number should match the Sample number on this page for Dry Weather or Wet Weather sampling (WWR, SMR and SAR). For TMDL samples, the sample number will begin with an S (example: S010205O5A).

2.12 To manually enter in the Field Data, click on **RESULTS – Water Quality Results (work area)** while in WQWRK Manage.

2.13 Click on the green plus symbol button at the top left to **“Add a New Record”**.

2.14 Enter in a three or four digit numerical variable from *Field Data Sheet*:

- 2.14.1 **262: CFS, Discharge (Flow) Q**
- 2.14.2 **1690: Turbidity (NTU)**
- 2.14.3 **1200: Conductivity (uS/cm)**
- 2.14.4 **1435: Dissolved Oxygen, Field Concentration (mg/l)**
- 2.14.5 **1515: ORP (Redox Potential) Field (mV)**
- 2.14.6 **1620: TDS (Field) mg/L**
- 2.14.7 **1655: Temperature Field (Centigrade)**
- 2.14.8 **1660: Temperature Field (Fahrenheit)**
- 2.14.9 **1705: pH, Field**
- 2.14.10 **8998: IC/ID sample; Value: 1 = Yes; 0 = No**
- 2.14.11 **8999: Visited not Sampled; Value: 1 = Yes; 0 = No**
- 2.14.12 **9000: Visited (Sampled); Value: 1 = Wet weather; 0 = Dry weather**

2.15 Enter in value and enter in a comment (if needed).

2.16 Double click on **WQ Manage – WQ Archive Management**

2.17 Highlight a site number that matches with the work file, then click **SAMPLES – Water Quality Samples**.

2.18 Click the **Options** button at the top.

2.19 Click on **Import a WQ workfile**.

2.20 Click on the Workfile number to import into **Archive**.

2.21 Successful Archiving will allow you to go to the site number(s) and check the sample number and results as a double check against the *Chain of Custody* form, *Field Data Sheets* and the paper copy of the lab results.

B. Field Equipment QA/QC Procedures

See Appendix F.

C. Field Analytical QA/QC Procedures

Several additional samples will be collected and analyzed to help identify potential sources of error introduced during the storm water sampling process. Procedures are being developed that will incorporate the following QA/QC samples:

Grab Sample Equipment Blanks – Assesses whether contamination is being introduced during the sampling process.

Grab Sample Duplicate – Assesses sampling and analytical precision.

Flow-Weighted Duplicate – Assesses analytical precision.

D. Laboratory Analytical QA/QC Procedures

Edward S. Babcock & Sons, Inc., located in Riverside, has been contracted by the Permittees to perform or to have a Permittee-approved subcontract laboratory perform all chemical analyses. The laboratory maintains a Quality Assurance Manual that is available on request.

The suite of chemical analyses, including Reporting Limits, for all storm water parameters is shown in Tables 1 and 2. In addition to performing the analyses, the laboratory will make every effort to meet holding times and target detection limits for each analyte. The following laboratory QA/QC procedures will be followed for both the flow-weighted sampling program and the manual grab sampling program:

Standards – Calibration standards with known concentrations will be prepared and used in the laboratory to obtain instrument calibration curves in accordance with the provisions of the various analysis method specifications.

Method Blanks – Analyte-free water will be processed through all sample preparation procedures and analyzed as a method blank. One such method blank will be analyzed per storm event. This will provide an indication as to whether contamination is occurring as a result of laboratory procedures.

Internal Spikes – Internal spikes (matrix spikes) will be prepared in the laboratory by adding a known amount of target and or surrogate analyte(s) into a field sample prior to laboratory preparation. The matrix spike will be at one to five times the analyte concentration, based on prior analysis for the analyte. If the matrix spike is outside of the desired “one to five” range, a second spike will be required. Each of the spiked samples will also be analyzed in duplicate for an assessment of the analytical method precision. One internal spike will be analyzed per storm event.

E. Data Reduction, Validation and Reporting

Results of precision and contamination checks (described above) will be reviewed by an in-house staff person familiar with water quality chemistry after each monitoring event. In the event that data quality objectives are not met, data will be qualified as necessary in the final data report.

F. Biological Parameters

Bacteria – Accuracy for bacteria will be determined by analyzing a positive control sample twice annually. A positive control is similar to a standard, except that a specific discreet value is not assigned to the bacterial concentrations in the sample. This is due to the fact that bacteria are alive and capable of mortality and reproduction. Instead of a specific value, an approximate target value of the bacterial concentration is assigned to the sample by the laboratory preparing the positive control sample.

Benthic Macroinvertebrates – MACTEC and/or their subcontractors conducts bioassessment monitoring for the Riverside County Permittees and maintains a Quality Assurance Manual. For benthic macroinvertebrate analysis, accuracy will be determined by having 20% of the samples (annually) re-analyzed and validated to CSBP Level 3 (genus level) by a professional taxonomist.

7. DATA COLLECTION AND ANALYSIS

A. *Database*

The District maintains its rainfall and water quality data in a proprietary integrated data management system known as Hydstra©[5]. The Hydstra© software system was installed early in FY 1999-2000. It uses stringent quality control procedures and includes a set of data analysis and reporting procedures. Additional reports have been created under contract to improve presentation of the raw data. The District also uses Statistica© to develop reports and graphs that will later be implemented as part of Hydstra© or to prepare more complicated statistical analyses. Water quality data collected by other Co-Permittees may also be stored in the District's database.

B. *Trend Analysis*

Part of a proper statistical analysis is to plot the raw data (e.g., chemistry or mass load) and examine it to identify the existence of obvious patterns, such as seasonality, if they exist. Upward or downward trends should also be analyzed, if they exist. The data may be so scattered that no trend is apparent. Characteristics of Urban Runoff may vary significantly if collected during dry weather as opposed to during storm conditions.

In addition to evaluating trends in chemical concentrations over time, correlations and trends may also be determined between or among sets of parameters, for example, "Is there a correlation between changes in urban land use and metals concentrations?" Trends may also be evaluated spatially, for example, "Do concentrations or mass loads tend to be higher in one geographical area?" As trends are identified, focused measures may be taken to reduce or eliminate sources of the identified Pollutant. Trend analysis may also allow proactive measures to be taken, for example, if concentrations of a particular Pollutant are rising.

The Permittees currently examine data for trends and make comparisons with Basin Plan Objectives (see Section 7.C) in the Annual Report. The data are plotted as concentration vs. date both as the raw data and as box-and-whisker plots which summarize statistical measures such as minimum, maximum, quartiles, and average. Other analyses may be added, such as land use correlations, power analysis (see Section 7.F), or cluster analysis, to further utilize the water quality data in implementing the Permittees' Urban Runoff management program.

C. *Comparison with a Benchmark*

If an appropriate benchmark exists, such as Basin Plan Objectives, direct comparisons may be made. It is possible that water quality data do not exhibit a clear trend, but still exceed a benchmark value.

When comparing data to a benchmark the appropriateness of the objective should be considered. The classic SWRCB reference Water Quality Criteria warned that water quality objectives were meant to represent "an aim or a goal toward which to strive, and it may represent an ideal condition that is difficult, if not impossible, of economic attainment. Most certainly, however, it does not imply strict adherence nor rigid enforcement by a regulatory agency." It also says that "[t]he fact that a standard has been established by authority makes it quite rigid, official, or quasi-legal. An authoritative origin does not necessarily mean that the standard is fair, equitable, or based on sound scientific knowledge, for it may have been established somewhat arbitrarily on the basis of inadequate technical data tempered by a cautious factor of safety. There is a tendency ... for regulatory authorities to promulgate standards of questionable scientific justification to serve as a crutch that facilitates

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[5] Although Hydstra is a proprietary data management system, the program supports export of data in commonly used spreadsheet and database formats. The use of trademark or brand names does not connote a recommendation of a particular product.

administrative action and enforcement." This implies that based on numeric objective alone, exceedences may not indicate environmental harm. Toxicity testing and biological assessment may provide additional information needed to indicate whether environmental harm is occurring or has the potential to occur. The statements made in this classic reference have proven prophetic, as the objectives have, over the years, gone from being goals, often based on limited science, to be reevaluated over time, to concrete, legally-enforceable standards that are nearly impossible to modify.

The Permittees have developed a report that lists the data collected on a given date. If a Basin Plan Objective exists and is exceeded, the report flags it. The District intends to print these reports as the monitoring results are submitted by the contract laboratory and forward them to the appropriate Permittee for follow-up, if necessary.

D. Calculating Mass Load

Mass load information is important in determining the amount of pollutant passing through a MS4, either instantaneously or over a period of time, such as during a storm event. Watershed models are based on mass load in addition to chemical concentrations and flow.

To calculate mass load over a storm, two approaches may be used.

- Assume that the concentration of a grab sample is constant over the storm event. Mass load (ML) is calculated as the concentration (C) multiplied by the total flow (Q) over the storm period, or

  $$ML = C * Q$$

  Adjustments for units may be necessary.

- Collect a flow-weighted composite of samples collected during a storm event and assume that the composite concentration (Event Mean Concentration, or EMC) is constant over the storm event. EMC is calculated as the sum of flow (Q_i) measured at the time a sample was collected multiplied by the concentration (C_i) of that sample and the sum divided by the total flow over the storm period, or

  $$ML = EMC * Q$$

  Mass load (ML) is calculated as the EMC multiplied by the total flow (Q) over the storm period, or

  $$EMC = \frac{\sum(C_i * Q_i)}{\sum Q_i}$$

  Adjustments for units may be necessary.

E. Consideration of Historical Data

Many sources of data exist. Historical water quality data may have been entered into USEPA's STORET (STOrage and RETrieval) database. USGS also maintains a database of water quality and flow data they have collected. Other municipalities may have collected data that are stored in in-house databases or spreadsheets. These datasets may be useful in looking at long-term trends or in establishing baseline conditions.

Using historical data can be problematic. For example, detection levels for certain constituents may have been higher under older test methods. The level of quality control in collecting and analyzing the data may have been less rigorous, especially if an in-house, uncertified laboratory was used. The original paper records may have been lost, preventing the establishment of a paper trail to verify questionable data.

Land Use Considerations

F. Power Analysis

A goal in developing a monitoring design is to detect trends in the data and take action based on those trends. For example, if water quality trends show that concentrations of a Pollutant are increasing and could exceed a benchmark value in the future, measures need to be taken to eliminate nonpermitted sources of that Pollutant. Trends may not be apparent in the short term due to natural variability, but may be more obvious over a longer period of time. Or more frequent monitoring may point out trends in a shorter period of time.

The statistical power of a monitoring design is its ability to detect a change, such as a trend, if it in fact has occurred. Power analysis is used to estimate the power of a given design and can provide insight into the sampling effort, both in terms of the number of samples and the number of years, required to observe trends of different sizes. In addition, power analyses can reveal important inherent constraints on the ability to detect trends imposed by underlying variability in the system being monitored. This can provide a realistic basis for establishing both management and monitoring goals, as well as a basis for making tradeoffs in the monitoring design (e.g., between the number of samples collected per year and the number of years over which the trend monitoring will extend).

In one instance, a power analysis may show that a trend will not be evident even after decades of monitoring at frequent intervals, and, therefore trend monitoring would be futile and monitoring resources should be shifted to another site and/or issue. In another instance, improving the sampling design's ability to detect a trend may require an increase in the number of years to be monitored. In this case, the length of time needed to detect a trend must be compared against both the management time horizon (e.g., How quickly is information needed?) and the timeframe over which changes are expected to occur (e.g., How rapidly are BMPs expected to reduce loads?). In a third instance, the main way to improve the design's power is to increase the number of samples collected per year. However, there is a natural constraint imposed by the relatively small number of storms per year in Riverside County. In such cases, the monitoring design will have an inherent limit on its ability to detect trends within a given time period. Sampling additional times per year and monitoring for more years must be traded off against each other, since increasing both kinds of sampling intensity improves power. Such tradeoffs should be based on the management time horizon, the timeframe over which changes are expected to occur, and the resources available to the Permittees.

The Stormwater Monitoring Coalition has developed Urban Runoff monitoring program guidance that includes information on calculating statistical power. The Permittees will use the information to evaluate the statistical power of its current monitoring program design and that of any proposed revisions. The results will be discussed in future Annual Reports.

G. Measurable Goals

Because ephemeral stormwater drainages are, by their very nature, particularly random in character, it is nearly impossible to establish specific long-term numeric or percentage pollutant reduction goals. In a dry year, very little runoff occurs, so there may be lower annual total or average loadings. In another year there may be a major disaster resulting in the release of a large quantity of pollutants, which when examined out of context would make it appear that progress toward reduction goals were not being made.

Identification of water quality improvement or degradation can be made, however, by looking at long-term trends. If long-term trends indicate that water quality degradation is increasing, additional steps may be taken to reverse the trend.

A single excessive value in an otherwise decreasing trend, may indicate, for example, an IC/ID event or a natural disaster, and may cloud the overall mathematical calculation of the trend. If the outlier can be explained as a unique incident, it will be acknowledged and otherwise excepted from consideration in calculating the overall trend.

Tools to identify long-term trends include:

- Statistical summaries and plots
- Power analysis
- Tables and plots of correlations among land use, pollutants, pollutant load, and other relevant parameters

Table 1. EPA Priority Pollutant List*

Hydstra No.	Parameter	container	holding time (days)	field preserv **	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
2000	1,1,1-trichloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	$ 176.00	Incls. All 624 param.
2005	1,1,2,2-tetrachloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2010	1,1,2-trichloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2015	1,1-dichloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2020	1,1-dichloroethene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2025	1,2,4-trichlorobenzene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2030	1,2-dichlorobenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2035	1,2-dichlorobenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2040	1,2-dichloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2045	1,2-dichloropropane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	1	ug/L	---	Analyzed with EPA 624
2050	1,2-diphenylhydrazine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2055	1,3-dichlorobenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2245	cis-1,3-dichloropropene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2060	1,4-dichlorobenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
†	2,3,7,8-TCDD (Dioxin)									
2070	2,4,6-trichlorophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	$ 296.00	Incls. All 625 param.
2075	2,4-dichlorophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2080	2,4-dimethylphenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2085	2,4-dinitrophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2090	2,4-dinitrotoluene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2100	2,6-dinitrotoluene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2105	2-chloroethylvinyl ether (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	10	ug/L	---	Analyzed with EPA 624
2110	2-chloronaphthalene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2115	2-chlorophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2120	2-methyl-4,6-dinitrophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2125	2-nitrophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2130	3,3'-dichlorobenzidine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2135	4,4'-ddd (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.11	ug/L	---	Analyzed with EPA 608

Table 1. EPA Priority Pollutant List*

Hydstra No.	Parameter	container	holding time (days)	field preserv **	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
2140	4,4'-dde (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.04	ug/L	---	Analyzed with EPA 608
2145	4,4'-ddt (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.12	ug/L	---	Analyzed with EPA 608
2150	4-bromophenyl phenyl ether (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2155	4-chloro-3-methylphenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2160	4-chlorophenyl phenyl ether (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2165	4-nitrophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1005	Acenaphthene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1010	Acenaphthylene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1011	Acrolein (ug/l)	VOA Vial	14	Na2S2O3		EPA 624 (8260B)	10	ug/L	---	Analyzed with EPA 624
1012	Acrylonitrile (ug/l)	VOA Vial	14	Na2S2O3		EPA 624 (8260B)	10	ug/L	---	Analyzed with EPA 624
1013	Aldrin (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.04	ug/L	$ 160.00	Incls. All 608 Pests & PCBs
1060	Anthracene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1065	Antimony (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1070	Arsenic, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	2	ug/L	$ 12.00	
†	Asbestos									
1092	Benzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1093	Benzidine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	50	ug/L	---	Analyzed with EPA 625
1095	Benzo(a)anthracene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1096	Benzo(a)pyrene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1097	Benzo(b)fluoranthene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1098	Benzo(ghi)perylene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1099	Benzo(k)fluoranthene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1101	Benzyl butyl phthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1120	Beryllium (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1127	bis(2-chloroethoxy)methane (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625

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Hydstra No.	Parameter	container	holding time (days)	field preserv **	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
1128	bis(2-chloroethyl)ether (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1129	bis(2-chloroisopropyl)ether (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1131	bis(2-ethylhexyl)phthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1141	Bromodichloromethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.75	ug/L	---	Analyzed with EPA 624
1142	Bromoform (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
†	Butylbezyl Phthalate									
1145	Cadmium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	2	ug/L	$ 12.00	
1156	Carbon tetrachloride (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2215	chlordane (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.1	ug/L	---	Analyzed with EPA 608
2220	chlorobenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2225	chloroethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	1	ug/L	---	Analyzed with EPA 624
2230	chloroform (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1180	Chromium, total, all valences (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	20	ug/L	$ 12.00	
2240	chrysene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1210	Copper, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1215	Cyanide, total (mg/l)	500 mL Poly	14	NaOH		SM 4500 CN E	0.005	mg/L	$ 32.00	
2255	di-n-butylphthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2260	di-n-octylphthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1230	Dibenzo(a,h)anthracene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1231	Dibromochloromethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1233	Dieldrin (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.02	ug/L	---	Analyzed with EPA 608
1234	Diethyl phthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1236	Dimethyl phthalate (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2265	endosulfan ii (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.04	ug/L	---	Analyzed with EPA 608
2270	endosulfan i (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.14	ug/L	---	Analyzed with EPA 608
2275	endosulfan sulfate (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.66	ug/L	---	Analyzed with EPA 608
2285	endrin (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.06	ug/L	---	Analyzed with EPA 608

Table 1. EPA Priority Pollutant List*

Hydstra No.	Parameter	container	holding time (days)	field preserv **	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
2280	endrin aldehyde (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.23	ug/L	---	Analyzed with EPA 608
2290	ethylbenzene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1245	Fluoranthene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1250	Fluorene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2305	heptachlor epoxide (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.01	ug/L	---	Analyzed with EPA 608
2310	heptachlor (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.01	ug/L	---	Analyzed with EPA 608
2315	hexachlorobenzene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
†	Hexachlorobutadiene									
†	Hexachlorocyclopentadiene									
2330	hexachloroethane (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2335	indeno(1,2,3-cd)pyrene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2340	isophorone (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1290	Lead, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1310	Mercury, total (mg/l)	500 mL Poly	28	HNO3	digest	SM 3112 B	0.2	ug/L	$ 18.40	
†	Methyl Bromide									
†	Methyl Chloride									
1308	Methylene chloride (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	3	ug/L	---	Analyzed with EPA 624
2350	n-nitrosodi-n-propylamine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2355	n-nitrosodimethylamine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
2360	n-nitrosodiphenylamine (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1315	Napthalene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1320	Nickel, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	20	ug/L	$ 12.00	
1331	Nitrobenzene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1447	Pentachlorophenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1455	Phenanthrene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1459	Phenol (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
†	Polychlorinated Biphenyls (PCBs)									

Table 1. EPA Priority Pollutant List*

Hydstra No.	Parameter	container	holding time (days)	field preserv **	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
2175	aroclor 1016 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
2180	aroclor 1221 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
2185	aroclor 1232 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
2190	aroclor 1242 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
2195	aroclor 1248 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
2200	aroclor 1254 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	2	ug/L	---	Analyzed with EPA 608
2205	aroclor 1260 (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
1505	Pyrene (ug/l)	1 L Amber	7 e + 40 a	Na2S2O3		EPA 625	10	ug/L	---	Analyzed with EPA 625
1520	Selenium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	5	ug/L	$ 12.00	
1535	Silver, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1661	Tetrachloroethene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1665	Thallium(mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	200	ug/L	$ 12.00	
1671	Toluene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1681	Toxaphene (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1	ug/L	---	Analyzed with EPA 608
1682	Trans-1,2-dichloroethene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1683	Trans-1,3-dichloropropene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1684	Trichloroethene (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.75	ug/L	---	Analyzed with EPA 624
1698	Vinyl Chloride (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1700	Zinc, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
2170	a-bhc (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.03	ug/L	---	Analyzed with EPA 608
2210	b-bhc (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.06	ug/L	---	Analyzed with EPA 608
2250	d-bhc (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.09	ug/L	---	Analyzed with EPA 608
2380	y-bhc (Lindane) (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.04	ug/L	---	Analyzed with EPA 608
1292	Lindane (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	0.04	ug/L	---	Analyzed with EPA 608

* The analysis cost for the EPA Priority Pollutants as a suite is approximately $1,000 per sample.
** Additional steps may need to be taken, such as dechlorination, contact lab
7 e + 40 a = seven days to extraction, 40 days to analyze
† Parameter not sampled in the past, will be assigned a number as results are entered in the database.

Table 2. Non-Priority Pollutant Parameters that may be required.

Hydstra No.	Parameter	container	holding time (days)	field preserv *	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
810	Turbidity (NTU)	Quart Poly	2	Unpres.		SM 2130 B	0.2	NTU	$ 8.00	
1035	Alkalinity, total (CaCO3) (mg/l)	Quart Poly	14	Unpres.		SM 2320 B	3	mg/L	$ 8.00	
1040	Aluminum (mg/l)	500 mL Poly	180	HNO3		EPA 6010B	50	ug/L	$ 12.00	
1050	Ammonia, un-ionized (NH3) (mg/l)								$ 12.00	
1051	Ammonia-nitrogen (mg/l)	Quart Poly	28	H2SO4	fix	SM 4500 NH3H	0.1	mg/L	$ 12.00	
1055	Ammonium (NH4) (mg/l)	N/A							---	Analyzed with Total Ammonia
1075	Bact, fecal coliforms (MPN)	125 mL Sterile	0.25	Na2S2O3		SM 9221 E	2	MPN/100 mL	$ 20.00	Must be performed in conjunction with coliform test
1077	Bact,Escherichia Coli (MPN)	125 mL Sterile	0.25	Na2S2O3		SM 9221 E	1.1	MPN/100 mL	$ 20.00	Must be performed in conjunction with coliform test
1080	Bact, fecal streptococci (MPN)	125 mL Sterile	0.25	Na2S2O3		SM 9230 B	2	MPN/100 mL	$ 40.00	
1085	Bact, total coliforms (MPN)	125 mL Sterile	0.25	Na2S2O3		SM 9221 B	1.1	MPN/100 mL	$ 40.00	
1090	Barium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	20	ug/L	$ 12.00	
1125	Bicarbonate (HCO3) (mg/l)	(see Alkalinity)							---	Analyzed with Alkalinity
1135	Boron, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	100	ug/L	$ 12.00	
1140	Bromide (mg/l)	Quart Poly	28	Unpres.		EPA 300.0	0.02	mg/L	$ 40.00	
1143	Bromomethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1150	Calcium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	1	ug/L	$ 12.00	
1155	Carbon, total organic (TOC) (mg/l)	500 mL Poly	28	H2SO4		SM 5310 B	0.7	mg/L	$ 32.00	
1160	Carbonate (CO3) (mg/l)	(see Alkalinity)							---	Analyzed with Alkalinity
1165	Chloride (mg/l)	Quart Poly	28	Unpres.		EPA 300.0	1	mg/L	$ 8.00	
1170	Chlorine, free (mg/l)	Quart Poly	1	Unpres.		SM 4500 Cl G	0.1	mg/L	$ 8.00	
1175	Chlorine, total (mg/l)	Quart Poly	1	Unpres.		SM 4500 Cl G	0.1	mg/L	$ 8.00	
2235	chloromethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624

Table 2. Non-Priority Pollutant Parameters that may be required.

Hydstra No.	Parameter	container	holding time (days)	field preserv *	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
1178	Chlorpyrifos (ppb)	1 L Amber	7 e + 40 a	Na2S2O3		ELISA	4	ug/L	$ 100.00	
1194	Cobalt (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1195	Color (units)	Quart Poly	2	Unpres.		SM 2120B	3	Color Units	$ 8.00	
1205	Conductance, specific-lab (umho/cm)	Quart Poly	28	Unpres.		SM 2510	1	umhos/cm	$ 8.00	
1225	Detergent-MethyleneBlueActiveS (mg/l)	Quart Poly	2	Unpres.		SM 5540 C	0.05	mg/L	$ 28.00	
1227	Diazinon (ppb)	1 L Amber	7 e + 40 a	Na2S2O3		ELISA	4	ug/L	$ 100.00	
1232	Dichlorodifluoromethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
1235	ElectroChemical Balance (me/l)	Quart Poly	10	Unpres.		Calculation	N/A	me/L	---	Calculation
2300	ethylene glycol (mg/l)	1 L Amber	7	Unpres.		GCMS	1	mg/L	$ 150.00	
1255	Fluoride (mg/l)	Quart Poly	28	Unpres.		SM 4500 F C	0.1	mg/L	$ 8.00	
1260	Glycol, ethylene (mg/l)	1 L Amber	7	Unpres.		GCMS	1	mg/L	$ 120.00	
1265	Hardness, total (CaCO3) (mg/l)	Quart Poly	180	HNO3	digest	EPA 200.7	3	mg/L	$ 24.00	Incls. Ca + Mg
1270	Hydrocarbons, total petroleum (mg/l)	1 L Amber	28	H2SO4		EPA 418.1	1	mg/L	$ 60.00	
1275	Hydroxide (OH) (mg/l)	(see Alkalinity)							---	Analyzed with Alkalinity
1285	Iron (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	50	ug/L	$ 12.00	
1300	Magnesium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	1	mg/L	$ 12.00	
1305	Manganese (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1306	Methoxychlor (ug/l)	1 L Amber	7 e + 40 a	NaSO3		EPA 608	1.8	ug/L	---	Analyzed with EPA 608
1307	Methyl tert butyl ether (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	5	ug/L	---	Analyzed with EPA 624
1311	Molybdenum (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
1325	Nitrate (NO3) (mg/l)	Quart Poly	2	Unpres.		EPA 300.0	0.2	mg/L	$ 8.00	
1330	Nitrite (NO2) (mg/l)	Quart Poly	2	Unpres.		SM4500 NO2 B	0.1	mg/L	$ 8.00	
1340	Nitrogen, nitrate (N) (mg/l)	Quart Poly	2	Unpres.		EPA 300.0	0.2	mg/L	$ 8.00	
1345	Nitrogen, nitrite (N) (mg/l)	Quart Poly	2	Unpres.		SM 4500 NO2 B	0.1	mg/L	$ 8.00	
1350	Nitrogen, organic (N) (mg/l)	(difference of Ammonia-N and Kjeldahl-N)				Calculation	0.1	mg/L	$ 44.00	diff btwn Ammonia-N and Kjeldahl-N

Table 2. Non-Priority Pollutant Parameters that may be required.

Hydstra No.	Parameter	container	holding time (days)	field preserv *	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
1355	Nitrogen, total (N) (mg/l)	(sum of Kjeldahl-N, Nitrite-N, and Nitrate-N)				Calculation	0.2	mg/L	$ 48.00	sum of Kjeldahl-N, Nitrite-N, and Nitrate-N
1360	Nitrogen, total Kjeldahl (N) (mg/l)	500 mL Poly	28	H2SO4	fix	EPA 351.1	0.1	mg/L	$ 32.00	
1365	Nitrogen, total inorganic (N) (mg/l)	(sum of Ammonia-N, Nitrite-N, and Nitrate-N)				Calculation	0.2	mg/L	$ 28.00	sum of Ammonia-N, Nitrite-N, and Nitrate-N
1370	Nitrogen, un-ionized Ammonia(N) (mg/l)	N/A								
1375	Odor (TON)	1 L Amber	2	Unpres.		SM 2150	1	T.O.N	$ 8.00	
1380	Oil & Grease (mg/l)	500 mL Amber	28	H2SO4		EPA 1664	2.55	mg/L	$ 45.00	
1384	Organic matter (%)	16 oz jar	28	-		S-9.10 W.S	0.1	%	$ 32.00	
1425	Oxygen Demand, biochemical BOD (mg/l)	Quart Poly	2	Unpres.		SM 5210 B	5	mg/L	$ 28.00	
1430	Oxygen Demand, chemical (COD) (mg/l)	Quart Poly	28	H2SO4		SM 5220 D	10	mg/L	$ 16.00	
1435	Oxygen, dissolved field conc (mg/l)	BOD Bottle	0.33	-		SM 4500 O C	0.1	mg/L	$ 8.00	
1710	pH, lab (units)	Quart Poly	1	Unpres.		SM 4500 H+ B	1	pH units	$ 8.00	
1460	Phenols (mg/l)	500 mL Poly	28	H2SO4		EPA 420.2	0.02	mg/L	$ 24.00	
1465	Phosphate, ortho (PO4) (mg/l)	(see Ortho-P, lab can manually add a data flag with this conversion, if required)							---	Analyzed with Phosphorus, ortho
1475	Phosphorus, organic (P) (mg/l)	Quart Poly	28	H2SO4		SM 4500 P B E	0.05	mg/L	$ 40.00	sum of reactive and hydrolyzable Phosphorus
1480	Phosphorus, ortho (P) (mg/l)	Quart Poly	2	Unpres.		SM 4500 P E	0.05	mg/L	$ 12.00	
1485	Phosphorus, total (P) (mg/l)	Quart Poly	28	H2SO4	digest	SM 4500 P B E	0.05	mg/L	$ 16.00	
1490	Phosphorus,total dissolved(P) (mg/l)	Quart Poly	28	H2SO4	filt, digest	SM 4500 P B E	0.05	mg/L	$ 16.00	
1495	Phosphorus,total insoluble(P) (mg/l)	Quart Poly	28	H2SO4	-	SM 4500 P B E	0.05	mg/L	$ 12.00	
1500	Potassium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	1	mg/L	$ 12.00	
---	Silicone	500 mL Poly	180	HNO3		EPA 200.7	0.5	mg/L	$ 12.00	
1540	Sodium, total (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.7	1	mg/L	$ 12.00	
1615	Solids, total (mg/l)	1 L Amber	7	Unpres.		SM 2540 B	10	mg/L	$ 12.00	

Table 2. Non-Priority Pollutant Parameters that may be required.

Hydstra No.	Parameter	container	holding time (days)	field preserv *	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
1616	Solids, total (%)	N/A	(convert from Solids, total (mg/l), if required)						---	convert from Solids, total, if req
1625	Solids, total dissolved(resdu) (mg/l)	Quart Poly	7	Unpres.	filt	SM 2540 C	10	mg/L	$ 12.00	
1630	Solids, total suspended(resdu) (mg/l)	Quart Poly	7	Unpres.		SM 2540 D	5	mg/L	$ 12.00	
1631	Solids, non filterable (%)	N/A	(convert from Solids, total suspended(resdu) (mg/l), if required)						---	convert from Solids, total suspended, if req
1640	Sulfate (SO4) (mg/l)	Quart Poly	28	Unpres.		EPA 300.0	0.5	mg/L	$ 8.00	
1645	Sulfide (S-) (mg/l)	500 mL Poly	7	ZnAce/NaOH		SM 4500 S2 D	0.1	mg/L	$ 8.00	
1675	Total Anions (me/l)	(sum of anions)				Calculation	0.05	me/L	---	no charge for calc only
1680	Total Cations (me/l)	(sum of cations)				Calculation	0.05	me/L	---	no charge for calc only
1686	Trichlorofluoromethane (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	5	ug/L	---	Analyzed with EPA 624
1695	Turbidity, lab (NTU)	Quart Poly	2	Unpres.		SM 2130 B	0.2	NTU	$ 8.00	
1697	Vanadium (mg/l)	500 mL Poly	180	HNO3	digest	EPA 200.8	10	ug/L	$ 12.00	
2370	xylenes (m+p) (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
2375	xylenes (ortho) (ug/l)	VOA Vial	14	Na2S2O3		EPA 624	0.5	ug/L	---	Analyzed with EPA 624
---	Particle Size	16 oz jar	28	-		ASA 43-5	0.1	%	$ 50.00	
1517	Sand (%)	(see Particle Size)							---	Measured as part of Particle Size
1532	Silt (%)	(see Particle Size)							---	Measured as part of Particle Size
1067	Soil Antimony, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	All soils incl. digest charge
1072	Soil Arsenic, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1089	Soil Barium, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1091	Barium (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1122	Soil Beryllium, total (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	
1146	Cadmium (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	
1147	Soil Cadmium, total (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	

Table 2. Non-Priority Pollutant Parameters that may be required.

Hydstra No.	Parameter	container	holding time (days)	field preserv *	pre-treat	Analysis Method	Reporting Limit Value	Reporting Limit Units	Current cost	Comments
1192	Soil Cobalt, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1211	Copper (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1212	Soil Copper, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1288	Soil Lead, soluable (mg/l)	N/A							---	Analyzed with Soil Lead, total
1289	Soil Lead, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1313	Soil Molybdenum, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1321	Soil Nickel, soluable (mg/l)	N/A							---	Analyzed with Soil Nickel, total
1322	Soil Nickel, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1550	Soil cadmium (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	
1555	Soil chromium all valences (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1560	Soil clay (%)	(see Particle Size)							---	Measured as part of Particle Size
1574	Soil Mercury, total (mg/Kg)	16 oz jar	28	-		EPA 7471A	0.2	mg/Kg	$ 24.00	
1575	Soil mercury (mg/Kg)	16 oz jar	28	-		EPA 7471A	0.2	mg/Kg	$ 24.00	
1586	Soil petroleum hydrocarbons (mg/Kg)	8 oz jar	28	-		EPA 418.1	10	mg/Kg	$ 60.00	
1595	Soil selenium (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	
1596	Soil Selenium, total (mg/Kg)	8 oz jar	180	-		EPA 6020	5	mg/Kg	$ 24.00	
1604	Soil Silver, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1605	Soil silver (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1606	Soil thallium (mg/Kg)	8 oz jar	180	-		EPA 6020	50	mg/Kg	$ 24.00	
1607	Soil Vanadium (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1610	Soil zinc (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	
1611	Soil Zinc, total (mg/Kg)	8 oz jar	180	-		EPA 6020	10	mg/Kg	$ 24.00	

* Additional steps may need to be taken, such as dechlorination, contact lab

7 e + 40 a = seven days to extraction, 40 days to analyze

Table 3. Water Column Toxicity Testing

Parameter	Hydstra #	EPA Method	Analysis Cost	Water Required
Ceriodaphnia dubia survival (acute, freshwater)	†	821-R-02-012	$450	1 gal
Ceriodaphnia dubia survival & reprod. (chronic, freshwater)	†	821-R-02-013	$1,100	1 gal
Fathead Minnow larval survival (acute, freshwater)	1685	821-R-02-012	$450	1 gal
Pseudokirchneriella subcapitata (Selenastrum Capricornutum) growth (chronic)	†	821-R-02-013	$900	1 gal
Hyalella azteca (acute, freshwater)	†	821-R-02-012	$1200	1 gal
Toxicity Identification Evaluation (Phase I)	†	600-3-88-034	$4,500 - $6,000	5 gal
Toxicity Identification Evaluation (Phase II)	†	600-3-88-035	$20,000+	Depends on the tests run

† Parameter not sampled in the past

Table 4.[6] Typical Chemical and Physical properties of Industrial Non-Stormwater Discharges.

Industrial Categories Major Classifications SIC Group Numbers	Odor	Color	Turbidity	Floatables	Debris and Stains	Structural Damage	Vegetation	pH	TDS
Primary Industries									
20 Food and Kindred Products									
201 Meat Products	Spoiled Meats, Rotten Eggs and Flesh	Brown to Reddish-Brown	High	Animal Fats, Byproducts, Pieces of Processed Meats	Brown to Black	High	Flourish	Normal	High
202 Dairy Products	Spoiled Milk, Rancid Butter	Grey to White	High	Animal Fats, Spoiled Milk Products	Grey to Light Brown	High	Flourish	Acidic	High
203 Canned and Preserved Fruits and Vegetables	Decaying Products Compost Pile	Various	High	Seeds, Skins, Cores, Leaves	Brown	Low	Normal	Wide Range	High
204 Grain Mill Products	Slightly Sweet & Musty, Grainy	Brown to Reddish Brown	High	Grain Hulls and Skins, Straw & Plant Fragments	Light Brown	Low	Normal	Normal	High
205 Bakery Products	Sweet and/or Spoiled	Brown to Black	High	Cooking Oils, Lard, Flour, Sugar	Grey to Light Brown	Low	Normal	Normal	High
206 Sugar and Confectionary Products	NA	NA	Low	Low Potential	White Crystals	Low	Normal	Normal	High
207 Fats and Oils	Spoiled Meats, Lard or Grease	Brown to Black	High	Animal Fats, Lard	Grey to Light Brown	Low	Normal	Normal	High
208 Beverages	Flat Soda, Beer or Wine, Alcohol, Yeast	Various	Moderate	Grains & Hops, Broken Glass, Discarded Canning Items	Light Brown	High	Inhibited	Wide Range	High
21 Tobacco Manufactures	Dried Tobacco, Cigars, Cigarettes	Brown to Black	Low	Leaves, Papers and Fillers	Brown	Low	Normal	Normal	Low
22 Textile Mill Products	Wet Burlap, Bleach, Soap, Detergents	Various	High	Fibers, Oils, Grease	Grey to Black	Low	Inhibited	Basic	High
23 Apparel and Other Finished Products	NA	Various	Low	Some Fabric Particles	NA	Low	Normal	Normal	Low
Material Manufacture									
24 Lumber & Wood Products	NA	NA	Low	Some Sawdust	Light Brown	Low	Normal	Normal	Low
25 Furniture & Fixtures	Various	Various	Low	Some Sawdust, Solvents	Light Brown	Low	Normal	Normal	Low

6 Dr. Robert Pitt of the University of Alabama developed a table of chemical and physical properties of Industrial Non-Stormwater Discharges. This provides an aid to identifying potential sources of illicit discharges when no other evidence is available.

Table 4.[6] Typical Chemical and Physical properties of Industrial Non-Stormwater Discharges.

Industrial Categories Major Classifications SIC Group Numbers	Odor	Color	Turbidity	Floatables	Debris and Stains	Structural Damage	Vegetation	pH	TDS
26 Paper & Allied Products	Bleach, Various Chemicals	Various	Moderate	Sawdust, Pulp Paper, Waxes, Oils	Light Brown	Low	Normal	Wide Range	Low
27 Printing, Publishing, and Allied Industries	Ink, Solvents	Brown to Black	Moderate	Paper Dust, Solvents	Grey to Light Brown	Low	Inhibited	Normal	High
31 Leather & Leather Products	Leather, Bleach, Rotten Eggs or Flesh	Various	High	Animal Flesh & Hair, Oils, Grease	Grey to Black, Salt Crystals	High	Highly Inhibited	Wide Range	High
33 Primary Metal Industries	Various	Brown to Black	Moderate	Ore, Coke, Oils, Limestone, Millscale	Grey to Black	High	Inhibited	Acidic	High
34 Fabricated Metal Products	Detergents, Rotten Eggs	Brown to Black	High	Dirt, Grease, Oils, Sand, Clay Dust	Grey to Black	Low	Inhibited	Wide Range	High
32 Stone, Clay, Glass, and Concrete Products	Wet Clay, Mud, Detergents	Brown to Reddish-Brown	Moderate	Glass Particles Dust from Clay or Stone	Grey to Light Brown	Low	Normal	Basic	Low
Chemical Manufacture									
28 Chemicals & Allied Products									
2812 Alkalies and Chlorine	Strong Halogen or Chlorine, Pungent, Burning	Alkalies - NA Chlorine - Yellow to Green	Low	NA	Alkalies – White Carbonate Scale Chlorine - NA	High	Highly Inhibited	Basic	High
2816 Inorganic Pigments	NA	Various	High	Low Potential	Various	Low	Highly Inhibited	Wide Range	High
282 Plastic Materials and Synthetics	Pungent, Fishy	Various	High	Plastic Fragments, Pieces of Synthetic Products	Various	Low	Inhibited	Wide Range	High
283 Drugs	NA	Various	High	Gelatin Byproducts for Capsulating Drugs	Various	Low	Highly Inhibited	Normal	High
284 Soap, Detergents & Cleaning Preparations	Sweet or Flowery	Various	High	Oils, Grease	Grey to Black	Low	Inhibited	Basic	High
285 Paints, Varnishes, Lacquers, Enamels and Allied Products (SB - Solvent Base)	Latex - Ammonia SB – Dependent Upon Solvent (Paint Thinner, Mineral Spirits)	Various	High	Latex - NA SB - All Solvents	Grey to Black	Low	Inhibited	Latex-Basic SB-Normal	High
286 Indust. Organic Chemicals									
2861 Gum and Wood Chemicals	Pine Spirits	Brown to Black	High	Rosins and Pine Tars	Grey to Black	Low	Inhibited	Acidic	High

Table 4.[6] Typical Chemical and Physical properties of Industrial Non-Stormwater Discharges.

Industrial Categories Major Classifications SIC Group Numbers	Odor	Color	Turbidity	Floatables	Debris and Stains	Structural Damage	Vegetation	pH	TDS
2865 Cyclic Crudes, & Cyclic Intermediates Dyes, & Organic Pigments	Sweet Organic Smell	NA	Low	Translucent Sheen	NA	Low	Highly Inhibited	Normal	Low
287 Agricultural Chemicals									
2873 Nitrogenous Fertilizers	NA	NA	Low	NA	White Crystalline Powder	High	Inhibited	Acidic	High
2874 Phosphatic Fertilizers	Pungent Sweet	Milky White	High	NA	White Amorphous Powder	High	Inhibited	Acidic	High
2875 Fertilizers, Mixing Only	Various	Brown to Black	High	Pelletized Fertilizers	Brown Amorphous Powder	Low	Normal	Normal	High
29 Petroleum Refining and Related Industries									
291 Petroleum Refining	Rotten Eggs, Kerosene, Gasoline	Brown to Black	High	Any Crude or Processed Fuel	Black Salt Crystals	Low	Inhibited	Wide Range	High
30 Rubber & Miscellaneous Plastic Products	Rotten Eggs, Chlorine, Peroxide	Brown to Black	Moderate	Shredded Rubber Pieces of Fabric or Metal	Grey to Black	Low	Inhibited	Wide Range	High
Transportation & Construction									
15 Building Construction	Various	Brown to Black	High	Oils, Grease, Fuels	Grey to Black	Low	Normal	Normal	High
16 Heavy Construction	Various	Brown to Black	High	Oils, Grease, Fuels, Diluted Asphalt or Cement	Grey to Black	Low	Normal	Normal	High
Retail									
52 Building Materials, Hardware, Garden Supply, and Mobil Home Dealers	NA	Brown to Black	Low	Some Seeds, Plant Parts, Dirt, Sawdust, or Oil	Light Brown	Low	Normal	Normal	Low
53 Gen. Merchandise Stores	NA	NA	NA	NA	NA	Low	Normal	Normal	Low
54 Food Stores	Spoiled Produce, Rancid, Sour	Various	Low	Fragments of Food, Decaying Produce	Light Brown	Low	Flourish	Normal	Low
55 Automotive Dealers & Gasoline Service Stations	Oil or Gasoline	Brown to Black	Moderate	Oil or Gasoline	Brown	Low	Inhibited	Normal	Low
56 Apparel & Accessory Stores	NA	NA	Low	NA	NA	Low	Normal	Normal	Low

Table 4.[6] Typical Chemical and Physical properties of Industrial Non-Stormwater Discharges.

Industrial Categories Major Classifications SIC Group Numbers	Odor	Color	Turbidity	Floatables	Debris and Stains	Structural Damage	Vegetation	pH	TDS
57 Home Furniture, Furnishings, & Equip. Stores	NA	NA	Low	NA	NA	Low	Normal	Normal	Low
58 Eating & Drinking Places	Spoiled Foods Oil & Grease	Brown to Black	Low	Spoiled or Leftover Foods	Brown	Low	Normal	Normal	Low
Miscellaneous									
Coal Steam Electric Power	NA	Brown to Black	High	Coal Dust	Black Amorphous Powder	Low	Normal	Slightly Acidic	Low
Nuclear Steam Electric Power	NA	Light Brown	Low	Oils, Lubricants	Light Brown	Low	Normal	Normal	Low

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Commercial / Industrial	
Above-ground storage tanks	Arsenic, Barium, Benzene, Cadmium, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Lead, Trichloroethylene (TCE), Tetrachloroethylene or Perchlorethylene (Perc)
Automobile, Body Shops/Repair Shops	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, Copper, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Lead, Fluoride, 1,1,1-Trichloroethane or Methyl Chloroform, Dichloromethane or Methylene Chloride, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE), Xylene (Mixed Isomers)
Boat Repair/Refinishing/Marinas	Benzene, Cadmium, cis 1,2-Dichloroethylene, Coliform, Cryptosporidium, Dichloromethane or Methylene Chloride, Giardia Lambia, Lead, Mercury, Nitrate, Nitrite, trans 1,2-Dichloroethylene, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE), Vinyl Chloride, Viruses
Cement/Concrete Plants	Barium, Benzene, Dichloromethane or Methylene Chloride, Ethylbenzene, Lead, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, Xylene (Mixed Isomers)
Chemical/Petroleum Processing	Acrylamide, Arsenic, Atrazine, Alachlor, Aluminum (Fume or Dust), Barium, Benzene, Cadmium, Carbofuran, Carbon Tetrachloride, Chlorobenzene, Copper, Cyanide, 2,4-D, 1,2-Dibromoethane or Ethylene Dibromide (EDB), 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2 Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Di(2-ethylhexyl) phthlate, 1,2-Dichloroethane or Ethylene Dichloride, Dioxin, Endrin, Epichlorohydrin, Ethylbenzene, Hexachlorobenzene, Hexachlorocyclopentadiene, Lead, Mercury, Methoxychlor,Polychlorinated Biphenyls, Selenium, Styrene, Sulfate, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Construction/Demolition	Arsenic, Asbestos, Benzene, Cadmium, Chloride, Copper,Cyanide, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Fluorides, Lead, Selenium, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Turbidity, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Dry Cleaners/Dry Cleaning	Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane
Dry Goods Manufacturing	Barium, Benzene, Cadmium, Copper, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Lead, 1,1,1-Trichloroethane or Methyl Chloroform, Polychlorinated Biphenyls, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, Trichloroethylene (TCE), Xylene (Mixed Isomers)

[7] EPA maintains a chart that lists some potential facilities and activities where one might find the contaminants referred to as primary and secondary drinking water standards. The listing of a contaminant does not mean that it will always occur at the associated source, nor does it encompass all contaminants that may be present. This list is intended as a resource guide for creating an inventory list. A state or local community may have different sources of concern from the list below, based on local variability such as existing industrial activity, and known contaminant occurrence information.

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Electrical/Electronic Manufacturing	Aluminum (Fume or Dust), Antimony, Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, Copper, Cyanide, Carbon Tetrachloride, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Ethylbenzene, Lead, Mercury, Polychlorinated Biphenyls, Selenium, Styrene, Sulfate, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene (TCE), Thallium, Toluene, Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Fleet/Trucking/ Bus Terminals	Arsenic, Acrylamide, Barium, Benzene, Benzo(a)pyrene, Cadmium, Chlorobenzene, Cyanide, Carbon Tetrachloride, 2,4-D, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Epichlorohydrin, Heptachlor (and Epoxide), Lead, Mercury, Methoxychlor, Pentachlorophenol, Propylene Dichloride or 1,2-Dichloropropane, Selenium, Styrene, Toxaphene, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers)
Food Processing	Arsenic, Benzene, Cadmium, Copper, Carbon Tetrachloride, Dichloromethane or Methylene Chloride, Lead, Mercury, Picloram, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Xylene (Mixed Isomers)
Funeral Services/Taxidermy	Glyphosate, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Total Coliforms, Viruses
Furniture Repair/Manufacturing	Barium, 1,2-Dichloroethane or Ethylene Dichloride, Dichloromethane or Methylene Chloride, Ethylbenzene, Lead, Mercury, Selenium, Trichloroethylene (TCE)
Gas Stations (see also above ground/underground storage tanks, motor-vehicle drainage wells)	cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE)
Graveyards/Cemetaries	Dalapon, Lindane, Nitrate, Nitrite, Total Coliforms, Viruses.
Hardware/Lumber/Parts Stores	Aluminum (Fume or Dust), Barium, Benzene, Cadmium, Chlorobenzene, Copper, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl)adipate, Di(2-ethylhexyl) phthlate, 1,4-Dichlorobenzene or P-Dichlorobenzene, Ethylbenzene, Lead, Mercury, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Toluene, Xylene (Mixed Isomers)
Historic Waste Dumps/Landfills	Atrazine, Alachlor, Carbofuran, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Diquat, Dalapon, Glyphosate, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Oxamyl (Vydate), Sulfate, Simazine, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene(TCE)
Home Manufacturing	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, Copper, Carbon Tetrachloride, 1,2-Dichlorobenzene or O-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Ethylbenzene, Lead, Mercury, Selenium, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Toluene, Turbidity, Xylene (Mixed Isomers)

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Industrial Waste Disposal Wells (see UIC for more information on concerns, and locations)	Acrylamide, Arsenic, Atrazine, Alachlor, Aluminum (Fume or Dust), Ammonia, Barium, Benzene, Cadmium, Carbofuran, Carbon Tetrachloride, Chlorobenzene, Copper, Cyanide, 2,4-D, 1,2-Dibromoethane or Ethylene Dibromide (EDB), 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or p-Dichlorobenzene, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2 Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Di(2-ethylhexyl) phthlate, 1,2-Dichloroethane or Ethylene Dichloride, Dioxin, Endrin, Epichlorohydrin, Hexachlorobenzene, Hexachlorocyclopentadiene, Lead, Mercury, Methoxychlor, Oxamyl (Vydate), Polychlorinated Biphenyls, Selenium, Styrene, Sulfate, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Junk/Scrap/Salvage Yards	Barium, Benzene, Copper, Dalapon, cis 1,2-Dichloroethylene, Diquat, Glyphosate, Lead, Polychlorinated Biphenyls, Sulfate, Simazine, Trichloroethylene (TCE), Tetrachloroethylene or Perchlorethylene (Perc)
Machine Shops	Arsenic, Aluminum (Fume or Dust), Barium, Benzene, Boric Acid, Cadmium, Chlorobenzene, Copper, Cyanide, Carbon Tetrachloride 2,4-D, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Ethylbenzene, Fluoride, Hexachlorobenzene, Lead, Mercury, Polychlorinated Biphenyls, Pentachlorophenol, Selenium, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene (TCE), Xylene (Mixed Isomers), Zinc (Fume or Dust)
Medical/Vet Offices	Arsenic, Acrylamide, Barium, Benzene, Cadmium, Copper, Cyanide, Carbon Tetrachloride, Dichloromethane or Methylene Chloride, 1,2-Dichloroethane or Ethylene Dichloride, Lead, Mercury, Methoxychlor, 1,1,1-Trichloroethane or Methyl Chloroform, Radionuclides, Selenium, Silver, Tetrachloroethylene or Perchlorethylene (Perc), 2,4,5-TP (Silvex), Thallium, Xylene (Mixed Isomers)
Metal Plating/Finishing/Fabricating	Antimony, Aluminum (Fume or Dust), Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, Chlorobenzene, Chromium, Copper, Cyanide, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Ethylbenzene,Lead, Mercury, Polychlorinated Biphenyls, Pentachlorophenol, Selenium, Styrene, Sulfate, Tetrachloroethylene or Perchlorethylene (Perc), , Thallium, Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene(TCE), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Military Installations	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Hexachlorobenzene, Lead, Mercury, Methoxychlor, 1,1,1-Trichloroethane or Methyl Chloroform, Radionuclides, Selenium, Tetrachloroethylene or Perchlorethylene (Perc), , Toluene, Trichloroethylene (TCE)
Mines/Gravel Pits	Lead, Selenium, Sulfate, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Turbidity
Motor Pools	cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride,

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Motor Vehicle Waste Disposal Wells (gas stations, repair shops) See UIC for more on concerns for these sources http://www.epa.gov/safewater/uic/cv-fs.html	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, Copper, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Lead, Fluoride, 1,1,1-Trichloroethane or Methyl Chloroform, Dichloromethane or Methylene Chloride, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE), Xylene (Mixed Isomers)
Office Building/Complex	Barium, Benzene, Cadmium, Copper, 2,4-D, Diazinon, 1,2-Dichlorobenzene or O-Dichlorobenzene, Dichloromethane or Methylene Chloride, Diquat, 1,2-Dichloroethane or Ethylene Dichloride, Ethylbenzene, Glyphosate, Lead, Mercury, Selenium, Simazine, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers)
Photo Processing/Printing	Acrylamide, Aluminum (Fume or Dust), Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, Chlorobenzene, Copper, Cyanide, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, 1,2-Dibromoethane or Ethylene Dibromide (EDB), Heptachlor epoxide, Hexachlorobenzene, Lead, Lindane, Mercury, Methoxychlor, Propylene Dichloride or 1,2-Dichloropropane, Selenium, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Toluene, 1,1,2-Trichloroethane, Trichloroethylene(TCE), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Synthetic / Plastics Production	Antimony, Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, Chlorobenzene, Copper, Cyanide, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Di(2-ethylhexyl) phthlate, Ethylbenzene, Hexachlorobenzene, Lead, Mercury, Methyl Chloroform or 1,1,1-Trichloroethane, Pentachlorophenol, Selenium, Styrene, Tetrachloroethylene or Perchlorethylene (Perk), Toluene, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
RV/Mini Storage	Arsenic, Barium, Cyanide, 2,4-D, Endrin, Lead, Methoxychlor
Railroad Yards/Maintenance/Fueling Areas	Atrazine, Barium, Benzene, Cadmium, Dalapon, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Lead, Mercury, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE).
Research Laboratories	Arsenic, Barium, Benzene, Beryllium Powder, Cadmium, Carbon Tetrachloride, Chlorobenzene, Cyanide, 1,2-Dichloroethane or Ethylene Dichloride, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Endrin, Lead, Mercury, Polychlorinated Biphenyls, Selenium, Tetrachloroethylene or Perchlorethylene (Perc), Thallium, Thiosulfates, Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers)
Retail Operations	Arsenic, Barium, Benzene, Cadmium, 2,4-D, 1,2-Dichloroethane or Ethylene Dichloride, Lead, Mercury, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), Toluene, 1,1,1-Trichloroethane, Vinyl Chloride
Underground Storage Tanks	Arsenic, Barium, Benzene, Cadmium, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Lead, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE).
Wood Preserving/Treating	cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Lead, Sulfate

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Wood/Pulp/Paper Processing	Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, Copper, Dichloromethane or Methylene Chloride, Dioxin, 1,2-Dichloroethane or Ethylene Dichloride, Ethylbenzene, Lead, Mercury, Polychlorinated Biphenyls, Selenium, Styrene, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE), Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Xylene (Mixed Isomers)
Residential / Municipal	
Airports (Maintenance/Fueling Areas)	Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, cis 1,2- Dichloroethylene, Dichloromethane or Methylene Chloride, Ethylbenzene, Lead, Mercury, Selenium, Tetrachloroethylene or Perchlorethylene (Perc), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Xylene (Mixed Isomers)
Apartments and Condominiums	Atrazine, Alachlor, Coliform, Cryptosporidium, Dalapon, Diquat, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Picloram,Sulfate,Simazine, Vinyl Chloride, Viruses
Camp Grounds/RV Parks	Benomyl, Coliform, Cryptosporidium, Diquat, Dalapon, Giardia Lambia, Glyphosate, Isopropanol, Nitrate, Nitrite, Picloram,Sulfate,Simazine, Turbidity, Vinyl Chloride, Viruses
Cesspools - Large Capacity (see UIC for more information)	Atrazine, Alachlor, Carbofuran, Coliform, Cryptosporidium, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram,Sulfate,Simazine, Vinyl Chloride, Viruses
Drinking Water Treatment Facilities	Atrazine, Benzene, Cadmium, Cyanide, Fluoride, Lead, Polychlorinated Biphenyls, Toluene, Total Trihalomethanes, 1,1,1-Trichloroethane or Methyl Chloroform
Gas Pipelines	cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene or TCE
Golf Courses and Urban Parks	Arsenic, Atrazine, Benzene, Chlorobenzene, Carbofuran, 2,4-D, Diquat, Dalapon, Glyphosate, Lead, Methoxychlor, Nitrate, Nitrite, Picloram, Simazine, Turbidity
Housing developments	Atrazine, Alachlor, Coliform, Cryptosporidium, Carbofuran, Diquat, Dalapon, Giardia Lambia, Glyphosate, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Picloram, Simazine, Trichloroethylene (TCE), Turbidity, Vinyl Chloride, Viruses
Landfills/Dumps	Arsenic, Atrazine, Alachlor, Barium, Benzene, Cadmium, Carbofuran, cis 1,2 Dichloroethylene, Diquat, Glyphosate, Lead, Lindane, Mercury, 1,1,1-Trichloroethane or Methyl Chloroform, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Picloram, Selenium, Simazine, Trichloroethylene (TCE)
Public Buildings (e.g., schools, town halls, fire stations, police stations) and Civic Organizations	Arsenic, Acrylamide, Barium, Benzene, Beryllium Powder, Cadmium, Carbon Tetrachloride, Chlorobenzene, Cyanide, 2,4-D, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, 1,2-Dichloroethane or Ethylene Dichloride, Endothall, Endrin, 1,2-Dibromoethane or Ethylene Dibromide (EDB), Lead, Lindane, Mercury, Methoxychlor, Selenium, Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene (TCE), Vinyl Chloride, Xylene (Mixed Isomers)
Septic Systems	Atrazine, Alachlor, Carbofuran, Coliform, Cryptosporidium, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram, Sulfate, Simazine, Vinyl Chloride, Viruses
Sewer Lines	Coliform, Cryptosporidium, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram,Sulfate,Simazine, Vinyl Chloride, Viruses

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Stormwater infiltration basins/injection into wells (UIC Class V), runoff zones	Atrazine, Alachlor, Coliform, Cryptosporidium, Carbofuran, Chlorine, Diquat, Dalapon, Giardia Lambia, Glyphosate, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Phosphates, Picloram, Simazine, Trichloroethylene(TCE), Turbidity, Vinyl Chloride, Viruses
Transportation Corridors (e.g., Roads, railroads)	Dalapon, Picloram, Simazine, Sodium, Sodium Chloride, Turbidity
Utility Stations	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, Cyanide, 2,4-D, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Lead, Mercury, Picloram, Toluene, 1,1,2,2- Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perc), Trichloroethylene (TCE), Xylene (Mixed Isomers)
Waste Transfer /Recycling	Coliform, Cryptosporidium, Giardia Lambia, Nitrate, Nitrite, Vinyl Chloride, Viruses
Wastewater Treatment Facilities/Discharge locations (incl. land disposal and underground injection of sludge)	Cadmium, Coliform, Cryptosporidium, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Fluoride, Giardia Lambia, Lead, Mercury, Nitrate, Nitrite, Tetrachloroethylene or Perchlorethylene (Perc) Selenium, sulfate,Trichloroethylene (TCE), Vinyl Chloride, Viruses
Agricultural / Rural	
Auction Lots/Boarding Stables	Coliform, Cryptosporidium, Giardia Lambia, Nitrate, Nitrite,Sulfate,Viruses
Animal Feeding Operations/ Confined Animal Feeding Operations	Coliform, Cryptosporidium, Giardia Lambia, Nitrate, Nitrite, Sulfate, Turbidity, Viruses
Bird Rookeries/Wildlife feeding /migration zones	Coliform, Cryptosporidium, Giardia Lambia, Nitrate , Nitrite , Sulfate, Turbidity, Viruses
Crops - Irrigated + Non-irrigated	Benzene, 2,4-D, Dalapon, Dinoseb, Diquat, Glyphosate, Lindane, Lead, Nitrate, Nitrite , Picloram, Simazine, Turbidity
Dairy operations	Coliform, Cryptosporidium, Giardia Lambia, Nitrate , Nitrite,Sulfate,Turbidity, Viruses
Drainage Wells, Lagoons and Liquid Waste Disposal - Agricultural	Atrazine, Alachlor, Coliform, Cryptosporidium, Carbofuran, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram,Sulfate,Simazine, Vinyl Chloride, Viruses
Managed Forests/Grass Lands	Atrazine, Diquat, Glyphosate, Picloram, Simazine, Turbidity
Pesticide/Fertilizer Storage Facilities	Atrazine, Alachlor, Carbofuran, Chlordane, 2,4-D, Diquat, Dalapon, 1,2-Dibromo-3-Chloropropane or DBCP, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram, Simazine, 2,4,5-TP (Silvex)
Rangeland/Grazing lands	Coliform, Cryptosporidium, Giardia Lambia, Nitrate, Nitrite, Sulfate, Turbidity, Viruses
Residential Wastewater lagoons	Atrazine, Alachlor, Carbofuran, Coliform, Cryptosporidium, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite, Oxamyl (Vydate), Picloram,Sulfate,Simazine, Vinyl Chloride, Viruses
Rural Homesteads	Atrazine, Alachlor, Carbofuran, Coliform, Cryptosporidium, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Diquat, Dalapon, Giardia Lambia, Glyphosate, Nitrate, Nitrite,Oxamyl (Vydate), Picloram, Sulfate, Simazine, Vinyl Chloride, Viruses

MISCELLANEOUS SOURCES

Table 5.[7] Contaminants Commonly Associated With Selected Facilities and Activities.

POTENTIAL SOURCE	CONTAMINANT
Abandoned drinking water wells (conduits for contamination)	Atrazine, Alachlor, Coliform, Cryptosporidium, Carbofuran, Diquat, Dalapon, Giardia Lambia, Glyphosate, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Oxamyl (Vydate), Picloram, Simazine, Trichloroethylene (TCE), Turbidity, Vinyl Chloride, Viruses
Naturally Occurring	Arsenic, Asbestos, Barium, Cadmium, Chromium, Coliform, Copper, Cryptosporidium, Fluoride, Giardia Lambia, Iron, Lead, Manganese, Mercury, Nitrate, Nitrite, Radionuclides, Selenium, Silver, Sulfate, Viruses, Zinc (Fume or Dust)
Underground Injection Control (UIC) Wells CLASS I - deep injection of hazardous and non-hazardous wastes into aquifers separated from underground sources of drinking water	see UIC
UIC Wells CLASS II deep injection wells of fluids associated with oil/gas production (for more detailed list of sites click here)	see UIC
UIC Wells CLASS III re-injection of water/steam into mineral formations for mineral extraction	see UIC
UIC Wells CLASS IV - officially banned. Inject hazardous or radioactive waste into or above underground sources of drinking water	see UIC

Table 6.[8] Possible Contaminating Activities (PCAs).

Risk	Activities			
	Commercial/Industrial	Residential/Municipal	Agricultural/Rural	Other
Very High (VH)	-Gas stations -Chemical/petroleum processing/storage -Dry cleaners -Metal plating/ finishing/fabricating -Plastics/synthetics producers	-Airports – maintenance/fueling areas -Landfills/dumps -*Septic systems - High density (>1/acre) (for groundwater sources otherwise M) -*Wastewater Treatment Plants	-* Animal Feeding Operations -* Concentrated Aquatic Animal Production Facilities -* Managed Forests (VH for surface water otherwise H)	-Underground injection of commercial/ industrial discharges -Historic gas stations -Historic waste dumps/landfills -Injection wells/dry wells/ sumps -Known contaminant plumes -Military installations -Historic Mining operations -Active Mining operations -Confirmed leaking underground storage tanks
High (H)	-Auto Body shops -Auto Repair shops -Boat services/repair/ refinishing -Chemical/petroleum pipelines -Electrical/electronic manufacturing -Fleet/trucking/bus terminals -Furniture repair/ manufacturing -Home manufacturing -Junk/scrap/salvage yards -Machine shops -Photo processing/ printing -Research laboratories -Wood preserving/ treating -Lumber processing and manufacturing -Wood/pulp/paper processing and mills -*Sewer collection systems	-Railroad yards/ maintenance/fueling areas -*Sewer collection systems -Utility stations - maintenance areas -*Wastewater Treatment Plants	-* Grazing (> 5 animals/ acre) -* Animal Feeding Operations -* Other animal operations -Concentrated Aquatic Animal Production Facilities -Other aquatic animal operations -Farm chemical distributor/ application service -Farm machinery repair -*Septic systems- low density (<1/acre) -*Lagoons/liquid wastes -Machine shops -Pesticide/fertilizer/ petroleum storage and transfer areas -Managed Forests (VH for surface water otherwise H) -Agricultural Drainage and Irrigation Wells	-Industrial discharges -Illegal activities/unauthorized dumping -Mining - Sand/Gravel -Wells- Oil, Gas, Geothermal -Salt water intrusion -*Recreational area - surface water source -Non-regulated Underground storage tanks (tanks smaller than regulatory limit) -Not yet upgraded or registered Underground storage tanks -Snow Ski Areas -Recent (< 10 years) Burn Areas -Dredging

[8] The Navy Environmental Health Center (NEHC) has prepared tables based on EPA's State Source Water Assessment And Protection Programs Guidance, identifying Possible Contaminating Activities (PCAs) associated with various potential risks for drinking water contamination. The concept is largely applicable to stormwater, as activities with the runoff potential to contaminate drinking water are also likely to impact stormwater. In addition, rising contaminated groundwater could enter an MS4. This table is taken from the NEHC's efforts. It identifies PCAs divided by land use type and risk to drinking/receiving water. The risk rankings are based on the general nature of activities and the contaminants associated with them. An asterisk (*) indicates PCAs that may be associated with microbiological contamination.

Table 6.[8] Possible Contaminating Activities (PCAs).

Risk	Activities			
	Commercial/Industrial	Residential/Municipal	Agricultural/Rural	Other
Moderate (M)	-Car washes -Parking lots/malls (>50 spaces) -Cement/concrete plants -*Food processing -Funeral services/ graveyards -Hardware/lumber/parts stores	-*Septic systems - High density (>1/acre) -Drinking water treatment plants -Golf courses -Housing – High density (>1 house/0.5 acres) -Motor pools -Parks -Waste transfer/ recycling stations	-* Other animal operations -Other aquatic animal operations (H in Zones for surface water, otherwise M) -Crops, irrigated (berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetables) NOTE: Drip-irrigated crops are considered Low risks. -*Sewage sludge (biosolids) land application -Fertilizer, pesticide/ herbicide application -Managed Forests (M for ground water) -Agricultural Drainage	-Above ground storage tanks -Wells - water supply -Construction/demolition staging areas -Contractor or government agency equipment storage yards -Managed forests -Freeways/state highways -Railroads -Historic railroad right-of-ways -Road right-of-ways (herbicide use areas) -Hospitals -Storm drain discharge points -Storm water detention facilities -Artificial recharge projects – nonpotable water (includes recycled, storm, and untreated imported water) -Injection wells -Spreading basins -Snow Ski Areas (H in Zones for surface water, otherwise M) -Recent (< 10 years) Burn Areas (H in Zones for surface water, otherwise M) -Dredging (H in Zones for surface water, otherwise M)
Low (L)	-*Sewer collection systems -Appliance/Electronic repair -Office buildings/ complexes -Rental yards -RV/mini storage	-*Sewer collection systems -Apartments and condominiums -Campgrounds/ Recreational areas -Fire stations -RV parks -Schools -Hotels, Motels	-Crops, non-irrigated (e.g. Christmas trees, grains, grass seeds, hay) (or drip-irrigated crops) -* Septic systems - low density (<1/acre)	-Decommissioned underground storage tanks – inactive -Upgraded and/or registered underground storage tanks – active -Roads/Streets -Artificial recharge projects – potable water-Injection wells -Artificial recharge projects – potable water -Spreading basins -Medical/dental offices/clinics -Veterinary offices/clinics -*Surface water - streams/lakes/ rivers -Wells - Monitoring, test holes, borings

APPENDIX A

WHITEWATER WATERSHED

4.6.3 Whitewater

4.6.3.1 WWR Wet Weather

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
2	500-mL Amber Glass wide mouth	H2SO4
10	1 L Amber glass narrow mouth	None
2	1 L Amber glass narrow mouth	H2SO4
4	40 mL VOA vial	HCl
1	40 mL VOA vial	H2SO4
1	½-gallon poly	None

4.6.3.2 WWR Dry Weather

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
2	500-mL Amber Glass wide mouth	H2SO4
10	1 L Amber glass narrow mouth	None
2	1 L Amber glass narrow mouth	H2SO4
4	40 mL VOA vial	HCl
1	40 mL VOA vial	H2SO4
1	½-gallon poly	None

Table B-___. Useful Web Sites		
NWS 7-day forecast	http://www.cnrfc.noaa.gov/versprod.php?sid=CA&node=KLOX&numvers=0	
NWS QPF/QPS	http://www.wrh.noaa.gov/sgx/display_product.php?sid=SGX&pil=QPS	
USGS Flow gauges	http://waterdata.usgs.gov/ca/nwis/current/?county_cd=06065&county_cd=06071&type=flow&group_key=huc_cd	
Alert (on Internet?)		

APPENDIX B

SANTA ANA WATERSHED

[Need to add IC/ID requirements from Permit. Section 4.B.3.3.1.1 complies with Permit Section VI.B]

1. INTRODUCTION

A MS4 Permit (Order No. R8-2002-0011, NPDES No. CAS618033) for the Santa Ana Watershed was adopted by the Santa Ana Regional Board on October 25, 2002. This permit establishes monitoring and reporting requirements for discharges from the MS4.

The development of the revised CMP was initiated following the adoption of the Order on October 25, 2002. To oversee this process, a Monitoring Subcommittee to the Santa Ana/Santa Margarita Technical Committee was established. The Monitoring Subcommittee was chaired by the District and included Co-Permittee representatives. Regional Board staff were noticed of each of these meetings.

The Order also required the development of an Interim Monitoring Program that focused on areas with elevated pollutant concentrations. In response, the Monitoring Subcommittee prepared an Interim Monitoring Program that proposed the removal of stations that did not serve the goals of an Urban Runoff monitoring program. The justifications for removal included:

- flows do not represent primarily urban land uses;
- flows consist primarily of produced water
- a majority of the drainage area and/or flow originates in another county;
- the station was sampled as part of a preliminary survey of the watershed and was never intended to be part of the CMP; and
- sediment samples were collected as part of a pilot program to test, remove, and properly dispose of sediment deposits accumulated in large detention and retention basins which may contain relatively high concentrations of pollutants.

Subsequent to submittal of the Interim Monitoring Program, the Monitoring Subcommittee continued to revise the CMP. A variety of information sources were utilized by the Monitoring Subcommittee, including land use, chemical and flow data from the District and other agencies, and comparison benchmarks. In addition, field inspections of existing and proposed monitoring station sites were conducted. All of this information was used in concert in selecting monitoring stations for inclusion in the Santa Ana Watershed element of the CMP.

The CMP, as well as this appendix, is intended to be a "living document," subject to revision based on changes in accessibility to the monitoring location, Permit requirements, and program guidance. Changes will undergo review by the Permittees and Regional Board staff before being incorporated into the CMP.

2. OBJECTIVES

According to the Urban Runoff Monitoring & Reporting Program (Appendix 3 of the MS4 Permit), the overall goal is to support the development of an effective Urban Runoff management program. The following are the major objectives (Section II of Appendix 3):

- To identify those Receiving Waters, which, without additional action to control Pollution from Urban Runoff, cannot reasonably be expected to achieve or maintain applicable Water Quality Standards required to sustain the Beneficial Uses, the goals, and the objectives of the Basin Plan.
- To develop and support an effective MS4 management program.
- To identify significant water quality problems related to discharges of Urban Runoff within the Permit Area.

- To define water quality status, trends, and pollutants of concern associated with Urban discharges and their impact on the Beneficial Uses of the Receiving Waters.
- To analyze and interpret the collected data to determine the impact of Urban Runoff and/or validate any water quality models.
- To characterize pollutants associated with Urban Runoff, and to assess the influence of Urban land uses on Receiving Water quality and the beneficial uses of Receiving Waters.
- To identify other sources of Pollutants in storm water runoff to the maximum extent possible (e.g., including, but not limited to, atmospheric deposition, and contaminated sediments, other non-point sources, etc.)
- To identify and prohibit illicit connections and discharges.
- To verify and to identify sources of Urban Runoff pollutants.
- To evaluate the effectiveness of the DAMP and WQMPs, including an estimate of pollutant reductions achieved by the structural and nonstructural BMPs implemented by the Permittees.
- To conduct monitoring in cooperation with San Bernardino County for investigation of bacteriological impairments in the upper Santa Ana River due to Urban Runoff.
- To evaluate the costs and benefits of proposed Urban Runoff management programs to protect Receiving Water quality.

3. MONITORING PROGRAM REQUIREMENTS

The Monitoring Program has certain required elements, but there is flexibility in how the Permittees may implement them. The discussion that follows will present the Monitoring Program Requirements (Section III of Appendix 3) and will discuss how the CMP complies with the Requirement. For Program Requirements that are not part of the CMP, activities that will comply will be discussed.

A. <u>TMDL/303(d) Listed Waterbody Monitoring</u>: The Permittees should continue to participate in the TMDL and Southern California Cooperative Storm Water Research/Monitoring programs as they relate to Urban Runoff. In addition, strategies shall be revised/developed to evaluate the impacts of Urban Runoff on identified impairments within the Santa Ana River watershed and other tributary 303(d) listed waterbodies.

The Permittees have been participating and will continue to participate in the San Jacinto River/Lake Elsinore Watersheds nutrient TMDL (Table B-2) and Middle Santa Ana River pathogen indicator TMDL (monitoring conducted by the City of Riverside). The Permittees also participate with the Southern California Stormwater Monitoring Coalition and have provided funds for specific studies, including development of a rapid microbiological indicator, and a model Urban Runoff monitoring program to assist the SWRCB to partially fulfill SB72 requirements.

B. 1. <u>Mass Emissions Monitoring</u>:

a. An estimate of flow in cubic feet per second (cfs) from the outfall/stream at the time of sampling.

Flow is either estimated or measured when a sample is collected. The data are stored in the District's water quality database under parameter number 232 (water level) or 262 (discharge).

b. Monitor mass emissions in Urban Runoff to: (a) estimate the total mass emissions from the MS4 to Receiving Waters; (b) assess trends in mass emissions associated with Urban Runoff over time; and (c) to determine if Urban Runoff is contributing to exceedences of Water Quality Objectives or Beneficial Uses in Receiving Waters by comparing results to the Basin Plan.

CMP Section 7.D discusses how mass load is calculated. The calculated mass load will be used in the manner required above.

c. Representative samples from the first storm event and two more storm events shall be collected during the rainy season. A minimum of three dry-weather samples shall also be collected. Samples from the first rain event each year shall be analyzed for the entire suite of priority pollutants. All samples must be analyzed for metals, pH, TSS, TOC, pesticides/herbicides, and constituents that are known to have contributed to impairment of local receiving waters. Dry weather samples should also include an analysis for oil and grease. Sediments associated with mass emissions should be analyzed for constituents of concern identified in the water analyses.

See CMP Sections 4.C.2) and 4.C.3).

If Constituents of Concern (e.g., parameters that exceed an applicable Basin Plan Objective) that could impact aquatic habitat (e.g., metals) are identified, sediment samples may be collected and analyzed for those parameters.

2. Microbial Monitoring: A monitoring program to determine the sources of bacteriological contamination in the Upper Santa Ana River, is being developed in collaboration with the MS4 Permittees in San Bernardino County. This program associated with Urban Runoff shall include wet and dry weather monitoring, as appropriate, for bacteriological constituents in the Santa Ana River and its tributaries.

On March 23, 2000, the Santa Ana Regional Board issued a 13267 directive for the Santa Ana Region Permittees to collaborate with the MS4 Permittees in San Bernardino County to develop a bacterial source identification study for the Santa Ana River. As a result, a draft study design was developed and monitoring was initiated at the stations identified in CMP Table B-3. The San Bernardino County submitted the draft study design with to fulfill their MS4 Permit requirements, and the Riverside County Permittees intended to do the same in conjunction with this CMP.

[Needs to be updated to acknowledge more recent meetings.] On October 15, 2003, Riverside County Permittees were made aware of a study, to be conducted by Dr. Stanley Grant of UC Irvine, to evaluate the dynamics of point and non-point source fecal pollution in the Santa Ana River. The study is expected to produce:

- *Information on the sediment and water column ecology of fecal indicator bacteria (FIB) (specifically speciation and microbial diversity) in an Urban watershed under both dry and wet weather conditions.*
- *Information on the temporal variability of in-stream FIB concentrations and loading, and the effect of both local and external forcing.*

- *A mathematical model for predicting FIB concentrations (and loads) in Urban streams that captures the dominant ecological and transport phenomena identified during the field phase of the project.*

The study will be among the first to investigate how storm flows affect the ecology of FIB microbial populations in ephemeral watersheds.

Riverside, San Bernardino, and Orange Counties, and other interested agencies have formed the Stormwater Quality Standards Task Force (SWQTF). The SWQTF is working with the Regional Board to evaluate stormwater quality standards, including the applicability of REC-1 bacterial standards during wet weather, when water flows in most waterbodies at an unsafe velocity.

Section XIV of the MS4 Permit (Page 52) allows "the Permittees to participate in regional, statewide, national or other monitoring and reporting programs in lieu of or in addition to" the Monitoring Program. In lieu of the Monitoring Program requirement, and in collaboration with San Bernardino County Permittees, the Riverside County Permittees will contribute funds to participate in Dr. Grant's study.

A summary of the study is available on the Internet at http://www.nwri-usa.org/asp/sp.asp?main=m6&sub=s1&id=6.

3. <u>Water Column Toxicity Monitoring</u>: Analyses for toxicity to aquatic species shall be performed on Receiving Water samples to determine the impacts of Urban Runoff on toxicity of Receiving Waters. *Ceriodaphnia dubia* fertilization, Fathead Minnow larval survival test, and Selenastrum Capricornutum growth test shall be used to evaluate toxicity on the sample from the first rain event, plus one other wet weather sample. In addition, where applicable collect two dry weather samples or propose equivalent procedures in the CMP. In addition, criteria shall be identified which will trigger the initiation of Toxicity Identification Evaluations (TIEs) and Toxicity Reduction Evaluations (TREs).

See CMP Section 4.D. EPA freshwater toxicity guidance does not contain a protocol for Ceriodaphnia dubia *fertilization. It does, however, contain a protocol for* Ceriodaphnia dubia *reproduction. Pursuant to an e-mail letter sent on December 3, 2003, by Regional Board staff to the Permittees, the reproduction test will be substituted.*

4. <u>Reconnaissance</u>: The Permittees shall review and update their reconnaissance strategies to identify and prohibit illicit discharges. Where possible, the use of GIS to identify geographic areas with a high density of industries associated with gross pollution (e.g. electroplating industries, auto dismantlers) and/or locations subject to maximum sediment loss (e.g. new development) may be used to determine areas for intensive monitoring efforts. Additionally, the Permittees shall coordinate with the Regional Board to develop a comprehensive database to include enforcement actions for storm water violations and unauthorized, non-storm water discharges that can then be used to more effectively target reconnaissance efforts.

CMP Section 4.B outlines the Permittees' reconnaissance strategies.

5. Land Use Correlations: The Permittees shall develop and implement strategies for determining the effects of Urban land use on the quality of Receiving Waters. While it is recognized that a wide range of land uses exist across the region and within each sub-watershed, one relationship that may be determined is the impact of Urban development on sediment loading within Receiving Waters, since developed areas contribute relatively little sediment loading compared to areas under construction. Consequently, the Permittees shall, at a minimum, analyze the impacts of increasing development and the conversion of agricultural land to Urban land uses to the sediment loading of Canyon Lake, Lake Elsinore, and the Santa Ana River (Reaches 3 and 4).

See CMP Section 7. [Need text that describes what Permittees are doing to comply with this.]

6. Sources of Data: Where possible and applicable, data shall be obtained from monitoring efforts of other public or private agencies/entities (e.g., Caltrans).

CMP Section 7.E discusses historical data considerations.

7. Bioassessments: The development of an Index of Biological Integrity for Southern California. This shall include the selection and identification of appropriate bioassessment station locations, sampling scheme(s), and shall also be capable of attaining the objectives mentioned in Section II (of Permit, Section 2 of this Appendix), above. The Permittees may develop bioassessments in coordination or cooperation with other parties...

In lieu of developing an independent bioassessment program, the Permittees have contributed $25,000 towards a regional bioassessment study ("Building a Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program") being spearheaded by SCCWRP and including the counties of Los Angeles, Orange, San Bernardino, San Diego, and Ventura, and the Santa Ana, San Diego, and Los Angeles Regional Boards.

C. ...At a minimum, the CMP shall address the following and any requirements developed by the State Board in accordance with Water Code Section 13383.5:

1. Uniform guidelines for quality control, quality assurance, data collection and data analysis.

CMP Section 6 discusses quality assurance and quality control issues. CMP Section 7 discusses data collection and analysis issues.

2. A procedure for the collection, analysis, and interpretation of existing data from local, regional or national monitoring programs. These data sources may be utilized to characterize different sources of pollutants discharged to the MS4; to determine pollutant generation, transport and fate; to develop a relationship between land use, development size, storm size and the event mean concentration of pollutants; to determine spatial and temporal variances in Urban Runoff quality and seasonal and other bias in the collected data; and to identify any unique features of the Permit Area. The Permittees are encouraged to use data from similar studies, if available.

CMP Section 7 discusses data collection and analysis issues.

3. A description of the CMP including:

a. The number of monitoring stations;

See CMP Table B-1 for Core CMP (7) stations, CMP Table B-2 for San Jacinto nutrient TMDL (14) stations, and Table B-3 for current Santa Ana River bacterial indicator study (3) stations. The bacterial indicator study will be changing (See Section B.2. above).

b. Monitoring locations within MS4s, major outfalls, and Receiving Waters; Environmental indicators (e.g., ecosystem, flow, biological, habitat, chemical, sediment, stream health, etc.) chosen for monitoring;

See Tables B-1, B-2, and B-3.

c. Total number of samples to be collected from each station, frequency of sampling during wet and dry weather, short duration or long duration storm events, type of samples (grab, 24-hour composite, etc.), justification for composite versus discrete sampling, type of sampling equipment, quality assurance/quality control procedures followed during sampling and analysis, analysis protocols to be followed (including sample preparation and maximum reporting limits), and qualifications of laboratories performing analyses;

Table B-4 summarizes the sampling requirements for each station. CMP Section 3.B discusses the issue of storm duration withing Riverside County. [Refer to permit requirement regarding justification for composite versus discrete sampling]. CMP Appendix F contains sampling equipment specifications. CMP Section 6 outlines quality assurance/quality control procedures. Analysis protocols to be followed are listed in CMP Tables 1, 2, and 3.

E.S. Babcock & Sons, Inc., is a National Environmental Laboratory Accreditation Program (NELAP)-certified laboratory. In 2004, they were awarded the American Council of Independent Laboratories Seal of Excellence Award. Of the 800 state certified laboratories in California, ESB is 1 of only 5 laboratory organizations in the state to receive this award.

d. A procedure for analyzing the collected data and interpreting the results including an evaluation of the effectiveness of the management practices, and need for any refinement of the WQMPs or the DAMP.

CMP Section 7 discuss data collection and analysis issues.

e. Parameters selected for field screening and for laboratory work; and

CMP Section 4.B.3 discusses IC/ID Field Activities. CMP Section 4.B.4 discusses Stormwater Field Activities.

f. A description of the responsibilities of all the participants in this program, including cost sharing.

The Implementation Agreement was updated in 1993. A copy of the Agreement is located in Appendix E of theRiverside County DAMP.

4. IC/ID REQUIREMENTS

3.4.1.1 Staff should investigate spills, leaks, and/or illegal discharges within 24 hours of receipt of notice [SAR permit Section VI.B. – move reference to watershed appendix] and inspect the incident location as soon as possible

Table B-1. Core CMP Stations in the Santa Ana Watershed

Station Number	Station Name	Notes	Land Uses in Drainage Area			Flow Gauge Cost
			Land Use	Acres	Percent	
040	Corona SD Line K (Will be relocated to Butterfield Storm Drain in Corona)	Line K has a small drainage area, and the drainage may start in the mountains. Butterfield Storm Drain may be a better Industrial Land Use location.	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets Undefined Total	There are two candidates for Butterfield Storm drain. A Land Use breakdown will be made once the final station location is determined.		Staff gauge $100
316	Sunnymead Channel Line B	Undergoing intense development, esp. Commercial & Industrial	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets Undefined Total	574 380 13 211 2786 1612 2305 1059 6 8946	6.4 4.2 0.1 2.4 31.1 18.0 25.8 11.8 0.1 100.0	Staff gauge $100
318	Hemet Ch @ Sanderson (May be relocated to beyond its confluence with Stetson Channel)	Primarily Urban Land Use Also monitored as part of TMDL	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets	56 452 54 40 273 128 1092 532	2.1 16.6 2.0 1.5 10.0 4.7 40.2 19.6	Gauge cost in Table B-2

Table B-1. Core CMP Stations in the Santa Ana Watershed

Station Number	Station Name	Notes	Land Uses in Drainage Area			Flow Gauge Cost
			Land Use	Acres	Percent	
			Undefined Total	90 2717	3.3 100.0	
364	Magnolia Center	There was more ag use in the past. Orange Co. discharges raw potable water flow down this channel; samples are not collected when this water is flowing	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets Undefined Total	14 325 18 73 255 799 1491 746 236 3957	0.4 8.2 0.5 1.8 6.4 20.2 37.7 18.9 6.0 100.0	Staff gauge $100
702	University Wash (Will be relocated to Springbrook Channel)	University Wash has been enclosed in a concrete box. Springbrook is an upstream accessible location.	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets Undefined Total	1423 774 719 54 3099 815 1171 972 1224 10251	13.9 7.6 7.0 0.5 30.2 8.0 11.4 9.5 11.9 100.0	Staff gauge $100
707	North Norco Channel (May relocate to Hamner Channel)	Both stations are still being evaluated.	Agricultural Commercial Industrial Recreational Open Space Rural Urban Streets Undefined Total	452 302 19 14 365 859 1194 339 585 4129	10.9 7.3 0.5 0.3 8.8 20.8 28.9 8.21 14.2 100	Staff gauge $100
752	Perris Line J, Sunset Ave. SD	Sandy soils, nonstorm tends to infiltrate rather than run off. Ag is mostly turf farms. Diurnal flows – irrigation water, e.g., lawns.	Agricultural Commercial Industrial Recreational Open Space	11 95 42 0 983	0.5 4.1 1.8 0.0 42.1	Staff gauge $100

Table B-1. Core CMP Stations in the Santa Ana Watershed

Station Number	Station Name	Notes	Land Uses in Drainage Area			Flow Gauge Cost
			Land Use	Acres	Percent	
			Rural Urban Streets Undefined Total	244 530 370 58 2333	10.5 22.7 15.9 2.5 100.0	

Table B-2. San Jacinto Watershed Nutrient TMDL Stations.

Station Number	Station Name	Notes	Responsible Agency	Flow Gauge Cost
318	Hemet Ch @ Sanderson	Urban Land Use Instrumented	RCFC&WCD	O&M $5000
325	Perris Valley Storm Drain @ Nuevo Rd	Mixed Land Use, including Dairy and very large upper watershed (e.g., Moreno Valley) Land Use-specific stations already located throughout watershed	RCFC&WCD	O&M $17,000
357	Four Corners Storm Drain	Mostly Urban Land Use Some Commercial Occasional ponding at station if Lake level rises above 1255'	RCFC&WCD	O&M $5000
712	Leach Canyon Channel	Small watershed area Mixed Land Use Canyon & Mountain drainage upstream Purpose of channel is to move mountain flows to Lake without property damage	RCFC&WCD	O&M $5,000
714	Ortega Canyon Channel	Small watershed area Mixed Land Use Canyon & Mountain drainage upstream Purpose of channel is to move mountain flows to Lake without property damage	RCFC&WCD	O&M $5,000
741	SJR @ Ramona Expressway	Primarily Ag & Dairy Land Use	RCFC&WCD	O&M $17,000
745	Salt Ck. @ Murrieta Rd.	Mixed Land Uses, incl. Ag, Dairy, Urban, and Open Space Used to calibrate P inputs to Canyon Lake	RCFC&WCD	O&M $17,000
759	SJR @ Goetz Rd.	Mixed Land Use, incl. Urban, Ag, & Open Space	RCFC&WCD	O&M $17,000
790	Canyon Lake Storm Drain @ Fair Weather Drive	High Density residential from Canyon Lake Canyon Lake residents monitor this station	City of Canyon Lake	O&M 5,000
792	SJR @ Cranston	TMDL Reference Station	RCFC&WCD	O&M $17,000
827	SJR @ Elsinore	Good indicator site for impacts to Lake Elsinore Includes Cottonwood Canyon Flows (10 sq mi watershed) & Canyon Lake	RCFC&WCD	O&M $17,000
834	Canyon Lake @ Sierra Park	Rural Residential Land Use Quail Valley area is on septic tanks Canyon Lake residents monitor this station	City of Canyon Lake	O&M $5,000
836	Stream @ Ramona Expressway & Warren Rd	Dairy Land Use	EMWD (Dairy)	O&M $17,000
841	SJR @ Canyon Lake Spillway	Represents flows out of Canyon Lake	RCFC&WCD	O&M $5,000

Table B-3. – SAR Pathogen Indicator Study Stations

Station Number	Station Name
754	Santa Ana River at River Road
829	Santa Ana River at Market Street
830	Santa Ana River at Pueblo Street

May want to use monitoring summary tables. Add'l info needed:

Total # of samples

Frequency of sampling dry/wet

Short or long duration storm events – varies. As storms are infrequent and unpredictable, the first three sampleable storms, irrespective of anticipated duration, are sampled.

Type of samples [belong with Tables B-1 to B-3]

Justification for composite or discrete sampling [belong with Tables B-1 to B-3]

Table B-4. Sampling Requirements [Checks in columns need to be made consistent with column headings]

Parameter	Hydron #	1st Storm	2nd Storm	3rd Storm	1st Dry	2nd Dry
General						
pH	1710	✓	✓			
TSS	1630	✓	✓			
TOC	1155	✓	✓			
Oil & Grease	1380		✓			
Metals						
Arsenic	1070	✓	✓			
Barium	1090	✓	✓			
Boron	1135	✓	✓			
Cadmium	1145	✓	✓			
Total Chromium	1180	✓	✓			
Copper	1210	✓	✓			
Lead	1290	✓	✓			
Mercury	1310	✓	✓			
Nickel	1320	✓	✓			
Selenium	1520	✓	✓			
Silver	1535	✓	✓			
Zinc	1700	✓	✓			
Pesticides						
Entire EPA Suite	n/a	✓				
Aldrin	1013	✓	✓			
Dieldrin	1233	✓	✓			
Lindane	1292	✓	✓			
Methoxychlor	1306	✓	✓			
Toxaphene	1681	✓	✓			
4,4'-DDD	2135	✓	✓			
4,4'-DDE	2140	✓	✓			
4,4'-DDT	2145	✓	✓			
α-BHC	2170	✓	✓			

Table B-4. Sampling Requirements [Checks in columns need to be made consistent with column headings]

Parameter	Hydron #	1st Storm	2nd Storm	3rd Storm	1st Dry	2nd Dry
Arochlor 1016	2175	✓	✓			
Arochlor 1221	2180	✓	✓			
Arochlor 1232	2185	✓	✓			
Arochlor 1242	2190	✓	✓			
Arochlor 1248	2195	✓	✓			
Arochlor 1254	2200	✓				
Arochlor 1260	2205	✓	✓			
β-BHC	2210	✓				
Chlordane	2215	✓				
δ-BHC	2250	✓				
Endosulfan II	2265	✓				
Endosulfan I	2270	✓				
Endosulfan Sulfate	2275	✓				
Endrin Aldehyde	2280	✓				
Endrin	2285	✓				
Heptachlor Epoxide	2305	✓				
Heptachlor	2310	✓				
γ-BHC	2380	✓				
Herbicides						
Chlorpyrifos	1178	✓	✓	✓		
Diazinon	1227	✓				
Microbial						
Total Coliforms	1085	✓	✓	✓	✓	✓
Fecal Coliforms	1075	✓				
Fecal Streptococcus	1080	✓				
E. Coli	1077	✓				

4.6.1 Santa Ana

4.6.1.1 Bacti

No. Bottles	Bottle Type	Preservative
2	120 mL Bacti	Na2S2O3

4.6.1.2 SAR 1st Storm

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
1	1 qt poly container	NaOH
6	1 L Amber glass narrow mouth	None
2	40 mL VOA vial	HCl
1	40 mL VOA vial	H2SO4

3	1-gallon teflon cubitainers	None

4.6.1.3 SAR 2nd and 3rd Storms

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
4	1 L Amber glass narrow mouth	None
1	40 mL VOA vial	H2SO4
3	1-gallon teflon cubitainers	None

4.6.1.4 SAR 1st, 2nd, and 3rd Dry

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
4	1 L Amber glass narrow mouth	None
2	40 mL VOA vial	HCl

Table B-5. Useful Web Sites		
NWS 7-day forecast	http://www.cnrfc.noaa.gov/versprod.php?sid=CA&node=KLOX&numvers=0	
NWS QPF/QPS	http://www.wrh.noaa.gov/sgx/display_product.php?sid=SGX&pil=QPS	
USGS Flow gauges	http://waterdata.usgs.gov/ca/nwis/current/?county_cd=06065&county_cd=06071&type=flow&group_key=huc_cd	
Alert (on Internet?)		

APPENDIX C

SANTA MARGARITA WATERSHED

1. INTRODUCTION

A MS4 Permit (Order No. R9-2004-0011, NPDES No. CAS0108766) for the Santa Margarita Watershed was adopted by the Santa Diego Regional Board on July 14, 2004. This permit establishes monitoring and reporting requirements for discharges into and from the MS4.

2. OBJECTIVES

According to Urban Runoff Monitoring & Reporting Program No. R9-2004-0011, the overall purpose is to comply with the permit requirements. The following are the major objectives (Section I):

1. Assess compliance with Order No. R9-2004-001;
2. Measure and improve the effectiveness of the SWMPs;
3. Assess the chemical, physical, and biological impacts of receiving waters resulting from urban runoff;
4. Characterize urban runoff discharges;
5. Identify sources of specific pollutants;
6. Prioritize drainage and sub-drainage areas that need management actions;
7. Detect and eliminate illicit discharges and illicit connections to the MS4; and
8. Assess the overall health of receiving waters.

3. MONITORING PROGRAM REQUIREMENTS

The Monitoring Program has certain required elements, with little flexibility in how the Permittees may implement them. The Monitoring and Reporting Program is referenced in the MS4 Permit:

L. MONITORING AND REPORTING PROGRAM

Pursuant to CWC section 13267, the Permittees shall comply with all requirements contained in the **MRP**.

The provisions are contained in a separate document. The discussion that follows will present the Monitoring Program Requirements and will discuss how the CMP complies with the Requirement. For Program Requirements that are not part of the CMP, activities that will comply will be discussed.

A. Receiving Waters Monitoring

The Receiving Waters Monitoring consists of: 1) **Core Monitoring** requirements to address on-going, site-specific needs, such as estimating pollutant loads and assessing trends; 2) **Regional Monitoring** to address watershed-wide issues; and 3) **Special Studies** to address specific research or management issues.

A.I Core Monitoring
In order to achieve the above goals, the triad[9] and tributary Core Monitoring requirements are intended to generate water quality data that will build upon existing data to begin answering the following management questions:

- Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?
- What is the extent and magnitude of the current or potential receiving water problems?
- What is the relative urban runoff contribution to the receiving water problem(s)?
- What are the sources of urban runoff that contribute to receiving water problem(s)?
- Are conditions in receiving waters getting better or worse?

1. Mass Loadings
   a) The Permittees shall monitor mass loadings from the following three triad stations. Alternative locations representative of urban/urbanizing drainage areas may be selected.

      (1) Lower Temecula Creek;
      (2) Lower Murrieta Creek @ USGS Weir; and
      (3) A reference station representative of natural, undeveloped conditions. Permittees shall evaluate the reference station annually for suitability and select new reference stations as needed.

   Table C-__ provides a list of triad monitoring stations.

   b) At each triad station, the Permittees shall monitor the first storm event of each monitoring year[10] that produces sufficient flow to collect a composite sample, and a minimum of two additional storm events during each monitoring year.

   CMP Section 4.C.2 discusses Wet-Weather Monitoring requirements.

   c) In the event that the required number of storm events are not sampled during one monitoring year at any given station, the Permitees shall submit, with the subsequent Annual Report, a written explanation for a lack of sampling data, including streamflow data from the nearest USGS gauging station.

   This requirement will be followed.

   d) In addition to the storm events, the Permittees shall analyze a minimum of two dry weather samples from each triad station per monitoring year. If flow is insufficient to collect a sample, this shall be documented in the subsequent annual report.

   CMP Section 4.C.3 discusses Dry-Weather Monitoring requirements.

   e) Sampling at triad stations shall begin no later than the first storm after October 2004 that produces sufficient flow to collect a composite sample.

[9] Triad means a station where chemical, toxicity, and bioassessment monitoring occur.
[10] A monitoring year is from July 1 through June 30.

This requirement will be followed.

f) Mass loading sampling and analysis protocols shall be consistent with 40 CFR 122.21(g)(7)(ii) and with the EPA Storm Water Sampling Guidance Document (EPA 833-B-92-001). Storm water samples shall be flow-weighted composites[11], collected during the first 3 hours of flow, or for the duration of the storm if it is less than 3 hours. A minimum of 3 sample aliquots, separated by a minimum of 15 minutes, shall be taken within each hour of discharge, unless the SDRWQCB Executive Officer approves an alternate protocol. Automatic samplers are recommended, but manual samples may be collected from mass loading stations where it is not feasible to install an automatic sampler. Grab samples[12] shall be taken for pathogen indicators and oil and grease. Grab samples are acceptable for dry weather sample collection.

CMP Section 3 discusses EPA's Storm Water Sampling guidance for "municipal part 2 storm water permit applications for storm water discharges", which is consistent with this requirement.

g) Permittees shall measure or estimate flow rates and volumes for each triad sampling event in order to determine mass loadings of pollutants. Data from nearby USGS gauging stations may be utilized, or flow rates may be estimated in accordance with the EPA Storm Water Sampling Guidance Document (EPA-833-B-92-001), Section 3.2.1.

This requirement will be followed.

h) At triad stations, the first storm of every sampling year shall be analyzed for the full EPA priority pollutant list (40 CFR 122, Appendix D). For the remaining sampling events, analysis may be reduced to the constituents listed in Table 1 below, unless data from the first storm indicate the need for additional constituents.

CMP Section 4.C notes that the EPA priority polutant list may be required for the first storm. Subsequent storm requirements are referred to the permit-specific appendix.

Table 1. Short List of Constituents

Trace Metals	**Pesticides**
Total Cadmium	Diazinon
Total Chromium	chlorpyrifos
Total Copper	Other OP pesticides
Total Nickel	
Total Lead	**Conventionals**
Total Zinc	Temperature
Nutrients	pH
Ammonia (NH_3)	Hardness
Total Kjeldahl Nitrogen (TKN)	Specific conductance
Nitrate (NO_3)	Dissolved oxygen
Total phosphorus	MBAS
Bacteria	**PAHs**

[11] A flow-weighted composite sample is a mixed or combined sample that is formed by combining a series of individual and discrete samples of specific volume in proportion to flow.
[12] A grab sample is a discrete, individual sample taken within a short period of time (usually less than 15 minutes).

Table 1. Short List of Constituents	
Total coliform	
Fecal coliform	**Volatiles** (dry weather only)
E. coli	
	Total suspended solids

2. Water Column Toxicity Testing

The Permittees shall conduct toxicity testing at triad stations to evaluate the extent and causes of toxicity in receiving waters.

CMP Section 4.D discusses toxicity testing requirements.

a) The Permittees shall analyze all storm samples (at least three annually) collected at the three triad stations for toxicity. The Permittees shall conduct toxicity testing using the following three species and EPA protocol for each sample:

- *Ceriodaphnia dubia* (water flea) – EPA-821-R-02-012 or EPA-821-R-02-013;
- *Hyalella azteca* (freshwater amphipod) – EPA-821-R-02-012; and
- *Pseudokirchneriella subcapitata*, formally known as *Selenastrum capricornutum*, (unicellular algae) – EPA-821-R-02-013.

CMP Table 3 lists toxicity test species that may be required in a MS4 Permit.

b) The presence of acute toxicity shall be determined in accordance with EPA protocol (EPA-821-R-02-012). The presence of chronic toxicity shall be determined in accordance with EPA protocol (EPA-821-R-02-013).

This requirement will be followed.

3. Bioassessment

The Permittees shall conduct bioassessment monitoring at the three triad stations to evaluate the biological integrity of receiving waters, to detect biological responses to pollutants in urban runoff, and to identify probable causes of impairment not detected by chemical and toxicity monitoring. The program required in this section replaces the program currently being conducted by the Permittees under CWC section 13225 Directive for Assessing Water Quality Impacts of Urban Runoff in the Santa Margarita Watershed, issued by the SDRWQCB on March 6, 2003. Bioassessment monitoring shall include the following:

a) Each bioassessment station shall be monitored twice annually, in May and October of each year. A minimum of three replicate samples shall be collected at each station during each sampling event.

b) Sampling, laboratory, quality assurance, and analysis procedures shall follow the standardized procedures set forth in the California Department of Fish and Game's

California Stream Bioassessment Procedure (CSBP)[13]. Analysis procedures shall include comparison between station mean values for various biological metrics and the Preliminary San Diego Index of Biotic Integrity (IBI)[14], or any subsequently developed applicable IBI. Sampling, laboratory, quality assurance, and analytical procedures shall follow the standardized "Non-Point Source Bioassessment Sampling Procedures" for professional bioassessment set forth in the CSBP. In the event that the CSBP "Point-Source Professional Bioassessment Procedure" is performed in place of the "Non Point Source Bioassessment Sampling Procedure," justification and documentation of the procedure shall be submitted with the annual monitoring report.

c) A professional environmental laboratory shall perform all sampling, laboratory, quality assurance, and analytical procedures. Permittee staff trained in CSBP methods may collect samples, but data collected by volunteer monitoring organizations shall not be submitted in place of professional assessments.

CMP Section 4.E discusses bioassessment monitoring requirements.

4. Follow-up Analysis and Actions Based on Triad Approach

When results from the chemistry, toxicity, and bioassessment monitoring described above indicate urban runoff-induced degradation, Permittees shall evaluate the extent and causes of urban runoff pollution in receiving waters and prioritize management actions to eliminate or reduce sources. Toxicity Identification Evaluations (TIEs) shall be used to determine the cause of toxicity, and Toxicity Reduction Evaluations (TRE) shall be used to identify sources and implement management actions to reduce pollutants in urban runoff causing toxicity. Permittees shall conduct TIE(s) and TRE(s) based on Table 2 below.

This requirement will be followed.

Table 2. Triad Approach to Determining Follow-Up Actions

	Chemistry	Toxicity	Bioassessment	Action
1.	Persistent[15] exceedance of water quality objectives	Evidence of toxicity[16]	Indications of benthic alteration[17]	Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE
2.	No persistent exceedances of water quality objectives	No evidence of toxicity	No indications of benthic alteration	No action necessary
3.	Persistent exceedance of water quality	No evidence of toxicity	No indications of benthic alteration	Assess possible upstream sources causing

[13] California Stream Bioassessment Procedure (Protocol Brief for Biological and Physical/Habitat Assessment in Wadeable Streams), California Department of Fish and Game – Aquatic Bioassessment Laboratory, May 1999.
[14] This document can be downloaded from http://www.swrcb.ca.gov/rwqcb9/programs/bioassessment.html
[15] Persistent exceedance shall mean the exceedance of relevant Basin Plan or California Toxics Rule objectives by 20% for 3 sampling events.
[16] Evidence of toxicity shall mean a high score, in relation to other stations, on metric that combines magnitude and persistence of toxicity over an entire year.
[17] Indications of benthic alteration shall mean an IBI score of Fair, Poor, or Very Poor.

Table 2. Triad Approach to Determining Follow-Up Actions				
	Chemistry	**Toxicity**	**Bioassessment**	**Action**
	objectives			exceedances
4.	No persistent exceedances of water quality objectives	Evidence of toxicity	No indications of benthic alteration	Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE
5.	No persistent exceedances of water quality objectives	No evidence of toxicity	Indications of benthic alteration	No action necessary due to toxic chemicals Initiate TRE for physical sources of benthic alteration
6.	Persistent exceedance of water quality objective	Evidence of toxicity	No indications of benthic alteration	If chemical and toxicity tests indicate persistent degradation, conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE
7.	No persistent exceedances of water quality objectives	Evidence of toxicity	Indications of benthic alteration	Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE
8.	Persistent exceedance of water quality objectives	No evidence of toxicity	Indications of benthic alteration	Initiate upstream source identification

a) Toxicity Identification Evaluations (TIE)

The goal of a TIE is to identify the pollutant(s) causing toxicity in the receiving waters.

CMP Section 4.D includes a TIE discussion.

(1) Permittees shall conduct Phase I TIEs in accordance with Table 2 above. Permittees shall use EPA protocol described in *Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures* (EPA/600/6-91/003) or subsequent editions.

(2) If the Phase I TIE is not sufficient to identify the toxicant(s), a Phase II TIE may be required in order to identify or confirm the identity of the pollutants causing toxicity. Phase II TIEs shall be conducted in accordance with Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity (EPA/600/R-92/080), or subsequent editions.

(3) In the event that the pollutant causing toxicity has been sufficiently identified through previous TIEs or corresponding chemical monitoring data, a TIE may not need to be conducted.

These requirements will be followed.

b) Toxicity Reduction Evaluations (TRE)

The purpose of a TRE is to investigate the cause of and to identify corrective actions to eliminate toxicity from urban runoff in receiving waters.

CMP Section 4.D includes a TRE discussion.

When a TIE identifies a pollutant(s) associated with urban runoff as a cause of toxicity, Permittees shall initiate a TRE immediately. The TRE shall include all reasonable steps to identify the source(s) of toxicity and propose appropriate BMPs to eliminate the causes of toxicity. Once the source of toxicity and appropriate BMPs are identified, the Permittees shall submit the TRE to the SDRWQCB for review. Within 30 days following the approval by the SDRWQCB, Permittees shall revise their SWMPs to incorporate the modified BMPs that will be implemented. At a minimum, a TRE shall include a discussion of the following items:

(1) The potential sources of pollutant(s) causing toxicity;

(2) A list of municipalities and other entities that may have jurisdiction over sources of pollutant(s) causing toxicity; and

(3) Proposed actions that will be taken to reduce the pollutants causing toxicity and methods to measure the effectiveness of those actions.

These requirements will lbe followed.

5. Tributary Monitoring

a) The Permittees shall collect a grab sample from the first storm event of each monitoring year, a minimum of one additional storm event, and two dry weather events during each monitoring year at the following four tributary stations to help identify sources of pollutants. Alternative locations representative of urban/urbanizing drainage areas may be selected.

CMP Sections 4.C.2 and 4.C.3 discuss Wet- and Dry-Weather Monitoring requirements.

(1) Warm Springs Creek, near the confluence with Murrieta Creek;

(2) Santa Gertrudis Creek, near the confluence with Murrieta Creek;

(3) Long Canyon Creek near the confluence with Murrieta Creek; and

(4) Redhawk Channel, near the confluence with Temecula Creek

Table C-___ provides a list of tributary monitoring stations.

b) If flow is insufficient to collect a sample, this shall be documented in the subsequent annual report.

This requirement will be followed.

c) Tributary samples shall be analyzed for constituents of concern. Constituents of concern shall be determined based on exceedances of water quality objectives at respective triad and dry weather monitoring stations, as well as land uses in the area.

This requirement will be followed.

d) Sampling at tributary stations shall begin no later than the first storm after October 2004.

This requirement will be followed.

A.II Regional Monitoring

The Permittees shall participate and coordinate with federal, state, and local agencies and other dischargers in the Santa Margarita Watershed in development and implementation of a regional watershed monitoring program as directed by the Executive Officer. The intent of a regional monitoring program is to maximize the efforts of all monitoring partners using a more cost-effective monitoring design and to best utilize the pooled resources of the watershed. During a coordinated watershed sampling effort, the Permittees' sampling and analytical effort may be reallocated to provide a regional assessment of the impact of discharges to the watershed.

Specific details on participation with regional monitoring efforts will be discussed in the Annual Report.

A.III Special Studies

Special studies are intended to address specific research or management issues that are not addressed by the routine core monitoring program. The Permittees' shall conduct special studies as directed by the Executive Officer, including the study described below.

CMP Section 4.F discusses the need for special studies.

Numeric Criteria to Control Runoff from New Developments

The Permittees shall develop and implement a study to determine numeric criteria for controlling the volume, velocity, duration, and peak discharge rate of runoff from new developments (required in section F.2.b(9) of Order No. 2004-001) to minimize erosion of natural stream channels and impacts to instream habitat. The Permittees shall propose numeric criteria and a time-schedule for implementation of the criteria on Priority Development Projects within 365 days of the identification of the criteria and no later than the fourth-year Annual Report, or the application for permit renewal. In each Annual Report, the Permittees shall describe the status of this special study, details of implementation, and progress towards the development of numeric criteria. Permittees may satisfy this requirement if they can demonstrate to the SDRWQCB that criteria developed in other areas of Southern California are applicable to and protective of the conditions in the Upper Santa Margarita Watershed. This should be accomplished through demonstrating similarities in areas monitored as part of studies outside of the Santa Margarita Watershed.

This requirement will be followed.

B. Illicit Discharge Monitoring

Each Permittee shall develop and implement an Illicit Discharge Monitoring program that meets or exceeds the requirements of this section within 365 days of the adoption of Order No. R9-2004-001. Each Permittees' program shall be designed to emphasize frequent, geographically widespread inspections, monitoring, and follow-up investigations to detect illicit discharges and connections. Each Permittees' Illicit Discharge Monitoring Program shall be described in the Individual SWMP.

1. Station Location

   a) Each Permittee shall select Illicit Discharge Monitoring stations within its jurisdiction. The number of stations shall be sufficient to represent the MS4 and detect illicit discharges that may occur throughout the system. Stations shall be accessible points in the MS4 (i.e., outfalls, manholes or open channels) located downstream of potential sources of illicit discharges (i.e., commercial, industrial, and residential areas). Permittees shall use the MS4 map, developed pursuant to section J.2 of Order No. R9-2004-001, to help locate dry weather monitoring stations and to determine the number necessary to adequately represent the entire MS4. Each identified station shall be inspected at least twice between May 1st and September 30th of each year, and more frequently if the Permittee determines necessary to comply with section J of Order No. R9-2004-001.

   Table C-___ contains a list of Illicit Discharge Monitoring stations

   b) In addition to the stations required in section B.1.a. above, each Permittee shall inspect all other dry weather flows that are observed or reported.

CMP Section 4.B.3 describes field procedures for IC/ID activities.

2. Illicit Discharge Monitoring Methods

   a) At each inspected site, Permittees shall record the following general information:

      - Time since last rain;
      - Quantity of last rain;
      - Site descriptions (i.e., conveyance type, dominant land uses in drainage area);
      - Flow estimation (i.e., width of surface, approximate depth of water, approximate flow velocity, flow rate); and
      - Visual observations (e.g., odor, color, clarity, floatables, deposits/stains, oil sheen, surface scum, vegetation condition, structural condition, and biology).

   The Field Data Sheet (CMP Appendix D.2) includes these requirements.

   b) If flow or ponded water is observed at a station and there has been at least seventy-two hours of dry weather, a field screening analysis using suitable methods to estimate the following constituents shall be conducted:

(1) Specific conductance (or calculate estimated Total Dissolved Solids);
(2) Turbidity;
(3) pH;
(4) Temperature; and
(5) Dissolved Oxygen.

CMP Section 4.B.3.4.9 discusses field screening procedures. CMP Section 4.B.3.4.9.1.1 includes the above parameters.

c) If field screening analysis or visual observations at a site indicate a potential illicit discharge, a sample shall be collected for laboratory analysis. At a minimum, samples shall be analyzed at a laboratory for the following constituents:

(1) Total hardness;
(2) Oil and grease;
(3) Ammonia Nitrogen;
(4) Total phosphorus;
(5) Copper (total and dissolved);
(6) Surfactants (MBAS);
(7) Diazinon and Chlorpyrifos;
(8) Lead (dissolved);
(9) Nitrate Nitrogen;
(10) E. coli;
(11) Total coliform; and
(12) Fecal coliform.

CMP Section 4.B.3 contains procedures for IC/ID activities. CMP Section 4.B.3.4.9.1.4 includes the above parameters.

3. As part of the Illicit Discharge Monitoring Program, the Permittees shall develop numeric criteria for field screening and analytical monitoring results that will trigger follow-up investigations to identify the source causing the exceedance of the criteria. In the event of an exceedance of the criteria, Permittees shall implement the follow-up investigation procedures developed pursuant to section J.4 of Order No. R9-2004-001.

CMP Section 4.B.3.4.9.1.4 recommends reliance on Best Professional Judgement (BPJ) to decide if monitoring results incate pollution. CMP Section 4.B.3.4.9.2 provides numeric criteria guidance to be used should the inspector not be able to apply BPJ.

C. Monitoring Provisions

All monitoring activities shall meet the following requirements:

These requirements will be followed.

a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity [40 CFR 122.41(j)(1)].

b) The Permittees shall retain records of all monitoring information, including all calibration and maintenance of monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the Report of Waste Discharge and application for this Order, for a period of at least five (5) years from the date of the sample, measurement, report, or application. This period may be extended by request of the SDRWQCB or EPA at any time and shall be extended during the course of any unresolved litigation regarding this discharge. [40 CFR 122.41(j)(2), CWC section 13383(a)]

c) Records of monitoring information shall include [40 CFR 122.41(j)(3)]:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and,
(6) The results of such analyses.

d) All sampling, sample preservation, and analyses must be conducted according to test procedures approved under 40 CFR part 136, unless other test procedures have been specified in this MRP or approved by the Executive Officer [40 CFR 122.41(j)(4)].

e) Where procedures are not otherwise specified in this MRP, sampling, analysis and quality assurance/quality control must be conducted in accordance with the Quality Assurance Program Plan (QAPP) for the State of California's Surface Water Ambient Monitoring Program, adopted by the State Water Resources Control Board (SWRCB). The QAPP can be downloaded from the SWRCB web page at: http://www.swrcb.ca.gov/swamp/docs/swamp_qapp.pdf.

f) The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this Order shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both. [40 CFR 122.41(j)(5)]

g) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this MRP [40 CFR 122.41(l)(4)(iii)].

h) All chemical, bacteriological, and toxicity analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services or a laboratory approved by the Executive Officer.

i) For priority toxic pollutants that are identified in the California Toxics Rule (CTR) (65 *Fed. Reg.* 31682), the Permittees shall instruct its laboratories to establish calibration standards that are equivalent to or lower than the Minimum Levels (MLs) published in Appendix 4 of the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP). If a Permittee can demonstrate that a particular ML is not attainable, in accordance with procedures set forth in 40 CFR 136, the lowest quantifiable 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) may be used instead of the ML listed in Appendix 4 of the SIP. The Permittee must submit documentation from the laboratory to the SDRWQCB for approval prior to raising the ML for any priority toxic pollutant.

j) The SDRWQCB Executive Officer or the SDRWQCB may make revisions to this MRP at any time during the term of Order No R9-2004-001, and may include a reduction or increase in the number of parameters to be monitored, locations monitored, the frequency of monitoring, or the number and size of samples collected.

IC/ID provisions are contained in Section J. of Order No. R9-2004-001, NPDES No. CAS0108766. The discussion that follows will present the IC/ID Program Requirements and will discuss how the CMP complies with the Requirement. For Program Requirements that are not part of the CMP, activities that will comply will be discussed.

J. ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM

Each Permittee shall implement an Illicit Discharge Detection and Elimination program containing measures to actively seek and eliminate illicit discharges and connections. At a minimum the Illicit Discharge Detection and Elimination program shall address:

1. Illicit Discharges and Connections
Each Permittee shall implement a program to actively seek and eliminate illicit discharges and connections into its MS4. The program shall address all types of illicit discharges and connections excluding those non-storm water discharges not prohibited by the Permittee in accordance with Section B of this Order.

CMP Section 4.B.3.1 describes proactive IC/ID activities.

2. Develop/Maintain MS4 Map
Each Permittee shall develop or obtain an up-to-date labeled map of its entire MS4 and the corresponding drainage areas within its jurisdiction. The use of a GIS is highly recommended. The accuracy of the MS4 map shall be confirmed and updated at least annually.

CMP Section 4.B.1.3 discusses the necessity of maintaining an MS4 map.

3. Illicit Discharge Monitoring
Each Permittee shall implement the Illicit Discharge Monitoring Program in accordance with Section II.B of the MRP to detect illicit discharges and connections.

Section 3.B of this Appendix describes compliance with this requirement.

4. Investigation/Inspection and Follow-Up
Each Permittee shall investigate and inspect any portion of its MS4 that, based on visual observations, monitoring results or other appropriate information, indicates a reasonable potential for illicit discharges, illicit connections, or other sources of non-storm water (including non-prohibited discharge(s) identified in Section B of this Order). Each Permittee shall develop numeric criteria in accordance with section II.B.3. of the MRP to determine when follow-up actions will be necessary. Numeric

criteria and follow-up procedures shall be described in each Permittees' Individual SWMP.

Section 3.B of this Appendix and CMP Section 4.B.3.3.1.1 describes compliance with this requirement.

5. Elimination of Illicit Discharges and Connections
   Each Permittee shall eliminate all illicit discharges, illicit discharge sources, and illicit connections as soon as possible after detection. Elimination measures may include an escalating series of enforcement actions for those illicit discharges that are not a serious threat to public health or the environment. Illicit discharges that are a serious threat to public health or the environment must be eliminated immediately.

CMP Sections 4.B.1.6, 4.B.3.3, 4.B.3.4.8.6, and 4.B.3.2.2.3.4.3 specifically address these requirements.

6. Enforce Ordinances
   Each Permittee shall implement and enforce its ordinances, orders, or other legal authority to prevent illicit discharges and connections to its MS4. Each Permittee shall also implement and enforce its ordinance, orders, or other legal authority to eliminate detected illicit discharges and connections to it MS4.

This request will be followed.

7. Sewage Spill Prevention and Response
   Each Permittee shall take appropriate actions to prevent, respond to, contain and cleanup sewage spills (including private laterals and failing septic systems) into the MS4 and to prevent the contamination of surface water, ground water and soil to the MEP. Appropriate actions may include the following:

   - Develop and implement a mechanism to be notified of all sewage spills from private laterals and failing septic systems into the MS4;
   - Coordinate sewage spill prevention, containment and response activities throughout all appropriate departments, programs and agencies to ensure maximum water quality protection at all times;
   - Require adequately sized and properly maintained private property sewerage systems, such as at residential and commercial complexes;
   - Require proper connections of private laterals to the public sewer main;
   - Require adequately-sized, and properly maintained grease control devices at food establishments which otherwise could result in sewer line grease blockages;
   - Conduct municipal activities such as street repair or tree plantings in a manner that minimizes sewer line damages or root blockages;
   - Identify priority areas, produce maps and other information on systems obtained during development review;
   - Educate the public on measures to prevent sewage spills; and
   - Ensure that private sewer lines are inspected.

CMP Section 4.B.3.2.2.1.5 complies with the above requirements.

8. <u>Facilitate Public Reporting of Illicit Discharges and Connections - Public Hotline</u>

Each Permittee shall promote, publicize and facilitate public reporting of illicit discharges or water quality impacts associated with discharges into or from MS4s. Each Permittee shall facilitate public reporting through development and operation of a public hotline. Public hotlines can be Permittee-specific or shared by Permittees. All storm water hotlines shall be capable of receiving reports in both English and Spanish 24 hours per day / seven days per week. Permittees shall respond to and resolve each reported incident. All reported incidents, and how each was resolved, shall be summarized in each Permittee's Individual Annual Report.

This requirement will be followed.

9. <u>Facilitate Disposal of Used Oil and Toxic Materials</u>

Each Permittee shall facilitate the proper management and disposal of used oil, toxic materials, and other household hazardous wastes. Such facilitation shall include educational activities, public information activities, and establishment of collection sites operated by the Permittee or a private entity. Neighborhood collection of household hazardous wastes is encouraged.

This requirement will be followed.

[Include SMR monitoring spreadsheet]

4.6.2 Santa Margarita

4.6.2.1 SMR Triad – 1st Storm

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	HNO3
1	1 qt poly container	NaOH
4	1 L Amber glass narrow mouth	None
2	40 mL VOA vial	HCl
3	1-gallon teflon cubitainers	None

4.6.2.2 SMR Triad – 2nd and 3rd Storms

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
4	1 L Amber glass narrow mouth	None
3	1-gallon teflon cubitainers	None

4.6.2.3 SMR Triad – 1st and 2nd Dry

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
4	1 L Amber glass narrow mouth	None
2	40 mL VOA vial	HCl

4.6.2.4 SMR Tributary – 1st and 2nd Storms

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
1	500-mL Amber glass wide mouth	H2SO4
1	1 L Amber glass narrow mouth	None

4.6.2.5 SMR Tributary – 1st and 2nd Dry

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None

1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
1	500-mL Amber Glass wide mouth	H2SO4
1	1 L Amber glass narrow mouth	None

4.6.2.6 IC/ID Screening

No. Bottles	Bottle Type	Preservative
1	1 qt poly container	None
1	1 qt poly container	HNO3
1	1 qt poly container	H2SO4
2	120 mL Bacti	Na2S2O3
1	500-mL Amber Glass wide mouth	H2SO4
1	1 L Amber glass narrow mouth	None

Table B-___. Useful Web Sites		
NWS 7-day forecast	http://www.cnrfc.noaa.gov/versprod.php?sid=CA&node=KLOX&numvers=0	
NWS QPF/QPS	http://www.wrh.noaa.gov/sgx/display_product.php?sid=SGX&pil=QPS	
USGS Flow gauges	http://waterdata.usgs.gov/ca/nwis/current/?county_cd=06065&county_cd=06071&type=flow&group_key=huc_cd	
Alert (on Internet?)		

APPENDIX D

FORMS AND PROCEDURES

D.1 IC/ID Incident Reporting Form

Riverside County Flood Control & Water Conservation District

Illicit Connection / Illegal Discharge Incident Reporting Form

Received by: ____________
Date: ________ Time Received: ________
Complaint Routed to: ____________

Reporting Party

Name: ______________________ ☐Anon. Agency: ______________________
Address: ______________________ City: ______________ Zip Code: ____________
Phone: ____________ Ext.: ______ Pager/Cell: ____________ e-mail: ______________

Incident Location

Incident Address: ______________________ City: ______________ Zip Code: ________
Incident Location or Business Name: ______________________ Thos. Bros. Page ______ Zone: ____
Incident Date: ____________ Time (24-hr clock): __________ Discharge Currently Occurring: ☐Yes ☐No
Incident Description (attach add'l sheets as needed): ______________________
____
____
____
____ Photos Available: ☐Yes ☐No

Substance Involved

Substance Description/Chemical Name: ______________________
Quantity: ☐Less than ☐Greater than Amount: ____________ Units: ____________
Color: ______________ Odor: ______________ Duration of Discharge: ______________
Other Details: ____
____
Special Precautions Needed: ☐No ☐Yes ______________________
Other parties contacted: ☐HazMat Team ☐County Env. Health ☐County Exec. ☐City of ______________
by Reporting Party ☐RWQCB ____ ☐OES – Control # ______ ☐Other ______________

Containment

______% Contained Containment Measure Used: ______________________
Waterbody or MS4 Involved: ______________________
Cleaned Up: ☐No ☐Yes, by whom ______________________ on Date __________ Time (24-hr) ________

Alleged Responsibility Party/Parties (If Known)

Name: ______________________ Business: ______________________
Address: ______________________ City: ______________ Zip Code: ____________
Phone: ____________ Vehicle License No.: ____________ Make: ____________ Model: ____________
Precautions Needed: ☐No ☐Yes ______________________

Action Needed

Investigation Required: ☐No ☐Yes Details: ______________________
____
Investigation Team: Name: ______________ Agency: ______________ Phone No. ____________
Name: ______________ Agency: ______________ Phone No. ____________
Name: ______________ Agency: ______________ Phone No. ____________
Name: ______________ Agency: ______________ Phone No. ____________
Copy sent to: ☐City of ______________ via ☐Mail ☐Fax ☐e-mail ☐ ______________

IC/ID Incident Reporting Form Instructions

A. Reporting Party

1. Self-explanatory.

2. If the person doesn't want to give our their name, try to get at least their last name. If the caller hesitates in giving out a phone number, ask for a callback number. Be sure to also fill in the "Received by" information in the box above.

B. Incident Location

1. Mostly self-explanatory.

2. Get detailed directions to the incident location, including cross streets and Thomas Bros. map page, especially if it is in an out-of-the-way location.

3. Ask the complainant if evidence of the incident is still present. If the incident occurred more than two days prior to the complaint, inform the caller that if there is no evidence of the incident nothing may be able to be done this time and request that the caller call sooner next time.

4. Get as detailed a description of the incident as possible, including whether the complainint has taken photos or video. This information may be needed if formal enforcement actions will be taken.

5. Let the caller know that if a District facility is not involved, you will be referring their complaint to the local jurisdiction. Thank the person for the call and tell him/her that you appreciate their helping to prevent pollution.

C. Substance Involved

1. Mostly self-explanatory.

2. Find out if the substance discharged has any known risks, such as toxic, respiratory irritant, etc.

3. Get the names and agencies of other people the complainant contacted, if available.

a. The complainant may have already notified several other people, and may feel they are getting the runaround or that their complaint is not being taken seriously. If you have to refer the complainant to another person, let the complainant know and try to get them a specific person to call.

b. If another County or City employee referred the complainant to you and the referral was not appropriate, help the complainant and notify the municipal coordinator.

c. The complainant may have contacted someone from a state or federal agency.

d. If someone on the County Board of Supervisors is involved, the priority of response may need to be elevated, even if it is a minor issue.

D. Containment

1. Self-explanatory.

E. Alleged Responsible Party

1. Mostly self-explanatory.

2. Note if any precautions will be needed in approaching the alleged responsible party. If anyone at the incident site behaves in a threatening manner, leave the site and contact your supervisor for further instruction.

F. Action Needed

1. Self-explanatory.

D.2a Field Data Sheet - Front

Riverside County Flood Control & Water Conservation District

Field Data Sheet

Station Information

Station ID No.: ________ Station Name: ______________________________ Watershed: ☐SAR ☐SMR ☐WWR

Location (if not standard site): ______________________________ Thos. Bros Page: __________

Conveyance type: ______________________________ District Zone: __________

GPS Info: Lat __________ Long __________ Major land uses in area: Urban/Rural/Ind/Comm/Ag/Non-juris/Open

Sample Date (MM/DD/YYYY): __________ Time (24-hr clock): __________ Sequence (if duplicate): _____

Printed Names of Sampling Team: ______________________________

Signature of lead sampler: ______________________ Agency conducting sampling: ______________________

Sample Information

No. of containers: ___	Sample Category:	Sample Type:	Sample Matrix:	Flow Conditions:
Chilled: ☐Yes ☐No	☐ Wet Weather	☐ Grab	☐ Storm Water	☐ Ponded
Sealed: ☐Yes ☐No	☐ Dry Weather	☐ Composite	☐ Other Water	☐ Tranquil
Preservatives Used:	☐ Recon / IC/ID	☐ Visited, not sampled	☐ Soil	☐ Rapid
☐HNO_3 ☐HCl	☐ Complaint		☐ Other __________	☐ Storm/Flood
☐H_2SO_4 ☐NaOH	☐ Other __________	☐ __________	__________	☐ Other __________
☐$Na_2S_2O_3$	__________	__________		__________

Weather Conditions

Now		Past 24 hrs	Wind:
☐	Storm (heavy rain)	☐	☐ Speed __________
☐	Rain (steady rain)	☐	☐ Calm (0-5 mph)
☐	Showers (intermittent)	☐	☐ Breezy (5-10 mph)
☐	Partly cloudy	☐	☐ Windy (11-25 mph)
☐	Haze	☐	☐ Gusty (occ. 25+ mph)
☐	Fog	☐	☐ __________
☐	Clear	☐	

Time since last rain: ____ hrs/days Quant of last rain: ____ in

Flow Estimation

☐ Directly Measured _____

Units: ☐cfs ☐gpm ☐gph ☐_____

☐ USGS Gage height _____ ft

Depth _____ Stage _____ Elev _____ Level _____

Q(cfs) = ________

[coef(1,2/3,____)]*[depth____ft]*[width____ft]*[vel____fps]

Parameters Measured

Field (*include units*):	IC/ID (Analytical Parameters):		Reasons for selecting IC/ID parameters:
☐ _____ Air Temp	☐ Total Hardness	☐ Dissolved Cu	
☐ _____ Water Temp	☐ Oil & Grease	☐ Total Cu	
☐ _____ pH	☐ Nitrate-N	☐ Dissolved Pb	
☐ _____ EC	☐ Ammonia-N	☐ E. Coli	
☐ _____ Turbidity	☐ Total P	☐ Total Coliform	
☐ _____ DO	☐ MBAS	☐ Fecal Coliform	
☐ _____ TDS	☐ Diazinon	☐ __________	
☐ _____ ORP (Redox)	☐ Chlorpyrifos	☐ __________	
☐ _____ Salinity			

Observations

Items to include:	Write your observations here:
☐ Odors	
☐ Color	
☐ Clarity	
☐ Floatables	
☐ Settleables	
☐ Stains	
☐ Condition of surrounding vegetation	
☐ Sediments	
☐ Structural	
☐ Photographs	

Composite Samples

No.	Time	Flow
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____

D.2b Field Data Sheet – Back

Field Data Sheet Instructions:

Station Information

Mostly self-explanatory. Major land uses can be estimated in the field or back in the office.

Sample Information

Mostly self-explanatory.
Bottles must be stored on ice from when the sample is collected to when they reach the laboratory.
Make sure the bottles are properly sealed (caps on snug).
Different preservatives may be used on different bottles. Note which ones are used.
A grab sample is a single sample collected at one time.
A composite sample is a series of grab samples collected over a period of time. The separate samples are combined into a single flow-proportioned sample prior to analysis.

Weather Conditions

Self-explanatory.
The time since and quantity of last rain may be filled out at the office.

Flow Estimation

If the flow can be directly measured, enter the measurement and make a note of the instrument that was used.
If there is a USGS gage, enter the gage height.
If needed, note the channel shape parameters so flow can be calculated. Flow speed can be measured with a leaf or stick and a stopwatch. Do not use trash as a floatable!

Parameters Measured

Field parameters must be measured at every sample. Be sure to include the units.
Follow the IC/ID guidance for instructions on what to sample. If the full list is not sampled, describe how you decided what parameters to sample.

Observations

Note any observations regarding the sampling location. Take photographs. Use the categories below to assist in describing the flow and the surroundings:

Odor: None, Musty, Sewage, Rotten Egg, Sour Milk, Fishy, Petroleum, Ammonia, Chlorine, Decaying Organisms, Other (describe)
Color: None, Yellow, Brown, Grey, Red, Green, Amber, Blue, Olive Brown, Other (describe)
Clarity: Clear, Cloudy, Opaque, Other (describe)
Floatables: None, Oil, Foam, Animal Waste, Green Waste, Algae, Food, Paper, Plastic, Other (describe). Include estimated percentage and character of the floatables, e.g., foam with approx. 1” high bubbles, trash is approx. 75% paper, light sheen oil, etc.
Settleables: None, Minor, Major, Other (describe)
Stains: None, Salt, Clay, Oil, Rust, Microbes, Other (describe)
Vegetation: None, Normal, Excessive, Dying, Color, Other (describe)
Sediments: None, Normal, Excessive, Other (describe)
Structural: Normal, Cracking, Spauling, Other (describe)
Biological: Unobserved, Algal Bloom, Larvae, Crawfish, Frogs, Fish, Water Fowl, Other (describe)

Composite Samples

Note the time and the flow for each sample collected. The composited sample will be flow-proportioned in the laboratory.

D.3 IC/ID Incident Investigation Report

Riverside County Flood Control & Water Conservation District

Illicit Connection / Illegal Discharge Incident Investigation Report

Response Time:
1-6 hrs 12 hrs 24 hrs 48 hrs
Other: ____________________

Responsible Party

Name: ______________________________ Business: ______________________________
Address: ______________________________ City: ____________________ Zip Code: ______________
Phone: ______________ Ext.: ______ Pager/Cell: ______________ e-mail: ____________________
Responsible Party Notified: ☐No ☐Yes, via ☐Mail ☐Fax ______________ ☐e-mail ☐ ______________
Repeat Violation: ☐Yes ☐No Discharge Stopped: ☐Yes ☐No ☐Industrial ☐Commercial ☐Residential
Corrective Action Required: ☐No ☐Yes, describe ____
____

Outreach

Outreach Material Distributed:
☐None ☐Door Hanger ☐Business Card ☐Supplement "A" ☐Brochure ______________________________
Other: ____

Followup Visit

Date: ________________ Time (24-hr): __________ Investigator's Name: ______________________________
Discharge Stopped: ☐Yes ☐No Proper Cleanup Action Taken: ☐Yes ☐No
Explain "No" answer: ____
____
Further Action Required: ☐No ☐Yes ____
Additional Followup Visit(s) Required: ☐Yes ☐No
Details: ____
____
____

Investigation

Description of Discharge and Analyses Made: ☐Attach Field Data Sheet for Additional Details
Date/Time Discharge Started: ______________ Date/Time Discharge Ceased: ______________ Total Amount: ________
Incident Occurred: ☐On Land ☐In Water ☐In Air Waterbody/MS4 Involved: ☐No ☐Yes ______________________
Substance(s) Involved: ☐ Oil & Grease ☐Soil/Sediment ☐Sewage ☐Reclaimed Water ☐Petroleum (Gas/Diesel/Jet Fuel)
☐ Chemicals ____________________________ ☐Other ____________________________
Photos Taken: ☐Yes (attach) ☐No Field Testing: ☐Yes ☐No Samples Collected: ☐Yes ☐No
Attach pages as needed for investigation details, photos, analyses, phone logs, meeting notes, etc.
Other parties contacted: ☐HazMat Team ☐County Env. Health ☐County Exec. ☐City of ______________________
☐RWQCB ____ ☐OES – Control # ________ ☐Other ______________________________
Reason for Investigation: ☐Discharge/Spill Response ☐Citizen Complaint ☐Sewage Spill
☐Visual Monitoring ☐Construction Concern ☐Industrial Concern

Enforcement

Enforcement: ☐None ☐Verbal Warning ☐Door Hanger ☐Written Warning (attach copy)
☐Cease and Desist Order: ☐Verbal ☐Written ☐Stop Work Order
Other Enforcement Actions: ____
____

Investigator's Name: ______________________ Agency: ______________________ Phone No. ______________
Signature: ____ Date: ______________________

IC/ID Incident Investigation Report Instructions

Fill out this form as completely as possible. All of the information is required for the Annual Reports.

A. Responsible Party
   1. *Self-explanatory.*
   2. *Be sure to also fill in the "Received by" information in the box above.*

B. Outreach
   1. *Self-explanatory.*
   2. *If no outreach materials are distributed, explain why.*

C. Followup Visit
   1. *Self-explanatory.*

D. Investigation
   1. *Self-explanatory.*

E. Enforcement
   1. *Self-explanatory.*
   2. *If no enforcement action is taken, explain why.*

D.4 Medical Referral List

COUNTY OF RIVERSIDE
WORKERS' COMPENSATION DIVISION
P.O. BOX1120, RIVERSIDE, CA 92502-1120
PHONE (909) 955-3530
MEDICAL REFERRAL LIST

BLYTHE
Palo Verde Hospital *
250 N. First Street
Blythe, CA 92225
(760) 922-4115 Available 24 hours

CATHEDRAL CITY
Eisenhower Immediate Care Center
67-780 E. Palm Canyon Drive
Cathedral City, CA 92234
(760) 328-1000
Hours: M-F 8:00 a.m. to 8:00 p.m. S/S 4:00 pm

CORONA
Comp Access
760 Washburn Street, Ste 4A
Corona, CA 92882
(909) 808-6700
Hours: M-W-F 8:00 a.m. to 6:00 p.m.

ELSINORE

HEMET
Employee Health Center
301 E. Florida Avenue, Ste. E
Hemet, CA 92543
(909) 766-5220
Hours: M-F 8:00 a.m. to 6:00 p.m.

IDYLLWILD
Eisenhower Health Center
54910 Pine Crest (across from Charthouse)
Idyllwild, CA 92549
(909) 659-4908
Hours: M-F - 9am to 5:30pm/Sat - 9am to 1pm

LA QUINTA
Eisenhower Immediate Care Center
78822 Hwy. 111
La Quinta, CA 92253
(760) 564-7000
Hours: M-F 8:00 a.m. to 8:00 p.m. S/S 4:00 pm

PALM DESERT
Desert Urgent Care
74-990 Country Club Drive
Palm Desert, CA 92260
(760) 341-8800
Hours: M-F 8:00 a.m. to 8:00 p.m. S/S 4:00 pm

MORENO VALLEY
U.S. Healthworks
6485 Day Street, Suite 302
Riverside, CA 92507
(909) 653-5291
Hours: M-F 8:00 a.m. to 5:00 p.m.

RIVERSIDE
Parkview Center of Occupational Medicine
9041 Magnolia Avenue, Suite 107-B
Riverside, CA 92503
909-354-8020
Hours: Urgent Care available up to 11: p.m. M – F
9:00 a.m. – 9:00 p.m. Sat - Sun

Inland Empire Occupational Medicine (IEOM)
3579 Arlington Avenue, Suite 300
Riverside, CA 92506
(909) 341-9333
Hours: 7:00 a.m. to 6:00 p.m. 24 hour on call

U.S. Healthworks
1760 Chicago Avenue, Suite J
Riverside, CA 92507
(909) 781-2200
Hours: M-F 8:00 a.m. to 6:00 p.m.

TEMECULA
First Care Industrial Medicine Center
28991 Front Street, Suite 102
Temecula, CA 92590
(909) 699-5282
Hours: M-F 7:00 a.m. to 6:00 p.m.

*** Use the hospital as no other approved clinic is available.**
NOTE: Please contact clinics for possible transportation services.

Employees are NOT to be referred to emergency hospitals except in cases where immediate emergency treatment is necessary and our designated medical clinic is not open. Emergency room care will not be paid by the County of Riverside when other approved care is available. Employees will be held responsible for self-procured treatment. Self-procured treatment means medical care not authorized by the County of Riverside; in these cases, the employee is responsible for payment of all charges.

g:work comp\manual\medrefer1.doc Revised: February 10, 2004

D.5 Babcock Chain of Custody Form

E.S. BABCOCK & SONS, INC.

E.S. Babcock & Sons, Inc.
6100 Quail Valley Court Riverside, CA 92507
(909) 653-3351 • FAX (909) 653-1662

Chain of Custody & Sample Information Record

Client: Contact: Phone No.

Project Name: ____________________

Project Location:

Turn Around Time: Routine 3-5 Days 48 Hours 24 Hours *(Rushes Require Approval, Additional Charges May Apply)*

Sampler Information

Name: ____________________

Employer: ____________________

Signature: ____________________

ESB #	Sample ID	Date	Time	# of Containers & Preservatives: Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH			Total # of Containers	Analysis Requested	Matrix	Notes
														DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil SG = Sludge L = Liquid M = Miscellaneous	

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company

(For Lab Use Only) *Sample Integrity Upon Receipt*

Sample(s) Submitted on Ice? Yes No

Custody Seal(s) Intact? Yes No N/A

Sample(s) Intact? Yes No

Temperature ºC

Lab No. ____________________

Page ______ of ______

Chain of Custody Form Instructions

Example filled-out Chain of Custody Forms are available in the monitoring location-specific binders at David Ortega's (951-955-4390) office. Additional, site specific instructions are provided for most CMP stations.

1. Client: RCFC&WCD

2. Contact: Your name or your supervisor's name

3. Phone number: The Contact's phone number

4. Project Name: SAR/SMR/WWR (note which one) Complaint Response

5. Project Location: Brief description

6. Turn Around Time: Usually Routine.

7. Sampler Name: The name of the person collecting the sample

8. Employer: RCFC&WCD or the company name if other than a District employee collected the sample.

9. Signature: Signature of the person collecting the sample

10. Sample ID: If at an existing MS4 monitoring station, note the station number here. If at a different location, use station number 823 for WWR complaints, 809 for SAR complaints, and 825 for SMR complaints. This number is used to enter the analysis into the database; **do not use other than the station number and a sequence number, if needed**. For example, the first of a sequence for a complaint sample collected in the Santa Ana Region would be IDed as "809-01".

11. # of Containers & Preservatives: Write the number of bottles with a specific preservative under the preservative's column. Write the number of unpreserved bottles under the Unpreserved column. Write the total number of containers under the appropriate column as a check.

12. Analysis Requested: Indicate the analyses you want done on the samples.

13. Matrix: Usually wastewater (WW) or soil (S)

14. Relinquished By: This area is important and <u>must</u> be filled out. When a person hands the sample to another person, the date and time the transfer took place and the signature of both parties involved in the transfer must be included. For example, when the samples are delivered to the lab, the District and lab staff people will sign and date the *Chain of Custody*. If someone outside of the District collects the sample, that person and you will be the first signatories.

D.6 Map to Babcock Laboratories

Driving directions to Babcock (taken from Mapquest)

From the South (e.g., Temecula):

Merge onto I-15 N	
Take I-215 N toward Riverside/San Bernardino	28.8 miles
Take the EUCALYPTUS AVE / EASTRIDGE AVE exit.	0.2 miles
Turn SLIGHT LEFT to take the EASTRIDGE AVE ramp.	<0.1 miles
Turn LEFT onto EUCALYPTUS AVE / EASTRIDGE AVE. Continue to follow EASTRIDGE AVE.	0.1 miles
Turn RIGHT onto BOX SPRINGS BLVD.	0.4 miles
Turn LEFT to stay on BOX SPRINGS BLVD.	0.1 miles
Turn RIGHT onto QUAIL VALLEY CT.	0.1 miles
End at **6100 Quail Valley Ct**	

From the West (e.g., Corona)

Take the CA-91 E toward SAN BERNARDINO	
Merge onto I-215 S / CA-60 E	4.2 miles
Take the BOX SPRINGS exit toward FAIR ISLE DR.	0.2 miles
Turn RIGHT onto BOX SPRINGS RD.	<0.1 miles
Turn LEFT onto SYCAMORE CANYON BLVD	0.5 miles
Turn LEFT onto BOX SPRINGS BLVD	0.2 miles
Turn LEFT onto QUAIL VALLEY CT.	0.1 miles
End at **6100 Quail Valley Ct**	

From the North (e.g., Norco)

Merge onto I-15 S toward SAN DIEGO	
Merge onto CA-60 E toward RIVERSIDE	16.5 miles
Take the BOX SPRINGS exit toward FAIR ISLE DR	0.2 miles
Turn RIGHT onto BOX SPRINGS RD	<0.1 miles
Turn LEFT onto SYCAMORE CANYON BLVD	0.5 miles
Turn LEFT onto BOX SPRINGS BLVD	0.2 miles
Turn LEFT onto QUAIL VALLEY CT.	0.1 miles
End at **6100 Quail Valley Ct**	

From the East (e.g., Banning)

Merge onto I-10 W toward LOS ANGELES	
Merge onto CA-60 W via the exit on the LEFT toward RIVERSIDE	18.4 miles
Take the BOX SPRINGS exit toward FAIR ISLE DR	0.1 miles
Turn LEFT onto BOX SPRINGS RD.	0.1 miles
Turn LEFT onto SYCAMORE CANYON BLVD.	0.5 miles
Turn LEFT onto BOX SPRINGS BLVD	0.2 miles
Turn LEFT onto QUAIL VALLEY CT	0.1 miles
End at **6100 Quail Valley Ct**	

APPENDIX E

NPDES CONTACTS

E.1 NPDES Watershed Coordinators

Santa Ana Watershed Tom Rheiner 951-955-2901 tmrheiner@co.riverside.ca.us
Santa Margarita Watershed Tina Tuason 951-955-8602 tttuason@co.riverside.ca.us
Whitewater Watershed Arlene Chun 951-955-1330 abchun@co.riverside.ca.us

E.2 County and other District Contacts

Riverside County Exec. Office Mr. Alex Gann 4080 Lemon Street, 5th Floor Riverside, CA 92501 951.955.1180 Fax 951.955.1105 agann@co.riverside.ca.us
Water Quality Coordinator Riverside County Flood Control and Water Conservation District Ms. Linda Garcia 1995 Market Street Riverside, CA 92501 951.955.1248 Fax 951.788.9965 lcgarcia@co.riverside.ca.us
Riverside Co. Env. Health Mr. Damian Meins 4080 Lemon Street, 2nd Floor Riverside, CA 92501 951.955.3910 Fax 951.781.9653 dmeins@co.riverside.ca.us
Riverside County TLMA Mr. Paul Russell 4080 Lemon Street, 8th Floor Riverside, CA 92501 951.955.6884 prussell@co.riverside.ca.us

E.3 County Code Enforcement Contacts

Riverside County Code Enforcement

Ed Nicholls, Deputy Director, (951) 955-8807

Code Enforcement Offices

Code Enforcement Administration
P.O. Box 1440
Riverside CA 92502-1440
(951) 955-2004

In the communities of:

Arnold Heights	Highgrove	Norco (not city)
Belltown	Home Gardens	Orangecrest
Corona (not city)	Indian Hills	Pedley
Coronita	Jurupa Hills	Perris (not city)
Crestmore	Lake Elsinore (N of I-15)	Reche Canyon
Eastvale	Lake Mathews N. of Cajalco	Rubidoux
El Cerrito	La Sierra (not city area)	Sunnyslope
Glen Avon	Mead Valley N. of Cajalco	University City
Glen Valley	Mira Loma	Woodcrest

The Code Enforcement Office is located at:
Jurupa
5317 Mission Blvd.
Riverside CA 92509
Phone: (951) 275-8739
Fax: (951) 275-8791
Primary Contact: Supervisor Dave Christenson (951) 275-8773

In the Communities of:

Alberhill	Good Hope	Lake Mathews
Gavilan Hills	Horsethief Canyon	Meadowbrook
Glen Ivy	Lake Elsinore	Mead Valley

The Code Enforcement Office is located at:

117 South Langstaff
Lake Elsinore CA 92530
Phone: (951) 245-3371
Fax: (951) 245-3375
Primary Contact: Supervisor Marr Christian

In the communities of:

Aguanga	Lakeland Village	Pine Meadow
Anza	Lake Mathews (S. of Cajalco)	Quail Valley
Canyon Lake	Lake Riverside	Rancho California
Cottonwood Canyon	Lake Skinner	Romoland
Garner Valley	Lakeview	San Jacinto
Gilman Hot Springs	Mead Valley S. of Cajalco	Sedco Hills
Green Acres	Menifee	Soboba Hot Springs
Hemet (not city)	Mountain Center	Sun City
Homeland	Murrieta (not city)	Temecula (not city)
Idyllwild	Murrieta Hot Springs	Vail Lake
Juniper Flats	Nuevo	Valle Vista
Lake Elsinore (S of I-15)	Perris (not city)	Wildomar
El Cariso	Pine Cove	Winchester

The Code Enforcement Office is located at:

39493 Los Alamos Rd.
Murrieta CA 92563
Phone: (951) 600-6100
Fax: (951) 600-6105
Primary Contact: Supervisor Brian Black (951) 600-6140

In the communities of:

Arabia	Eagle Mountain	Painted Hills
Banning	Eden Hot Springs	Palm Springs (not city)
Beaumont	Flowing Wells	Pinyon Pines
Bermuda Dunes	Garnet	Poppet Flats
Blythe (not city)	Hayfield Lake	Rancho Mirage (not city)
Cabazon	Indio (not city)	Ripley
Calimesa	Indio Hills	Salton
Cathedral City (not city)	Lake Perris	San Gorgonio Pass
Cherry Valley	La Quinta	Sky Valley
Ciriaco Summit	Mecca	Thousand Palms
Coachella (not city)	Midland	Thermal
Cottonwood Springs	Moreno Valley (not city)	Twin Pines
Desert Beach	Nichols Warm Springs	Valerie
Desert Center	North Palm Springs	Whitewater
Desert Haven	North Shore	
Desert Hot Springs (not city)	Oasis	

The Code Enforcement Office is located at:

82-675 Highway 111, Room 211
Indio CA 92201
Phone: (760) 863-7180
Fax: (760) 863-7066
Primary Contact: Supervisor Dave Lawless, (760) 863-7805

The above listed offices handle complaints that occur on private property where the owner of the property is in violation. examples; accumulative rubbish, construction without permits, junk yard, abandon vehicles.

S.E.T.
Special Enforcement Team
4080 Lemon St. 12th floor
Riverside, CA 92502
Phone: (951) 955-8802
Fax: (951) 955-2023

Code Enforcement Supervisor Lou Pizatella

ILLEGAL DUMPING: Dumping misc. debris in locations other then designated landfills or waste management facilities.

NPDES: Pollutants being put into the Storm Drain or water systems.

EPD: Illegal Grading where environmental concerns and violations are occurring or present.

E.4 City NPDES Coordinators

City of Beaumont Mr. John Wilder 550 E. 6th Street Beaumont, CA 92223 951.769.8520 Fax 951.769.8526 jwilder@cityofbeaumont.ca.us	**City of Calimesa** Mr. Elroy Kiepke 908 Park Avenue Calimesa, CA 92320 909.795.9801 Fax 951.795.4399 ekiepke@cityofcalimesa.net
City of Canyon Lake Mr. Carl Armburst 31516 Railroad Cyn. Rd., Ste 101 Canyon Lake, CA 92587 951.244.2955 Fax 951.246.2022 Kathy@cityofcanyonlake.com	**City of Corona** Mr. Ed Lockhart 730 Corporation Yard Way, 1st Floor Corona, CA 92880 951.736.2443 Fax 951.279.3613 Cell 951.232.2510 Ed.lockhart@ci.corona.ca.us
City of Hemet Ms. Linda Nixon 3777 Industrial Avenue Hemet, CA 92545 951.765.3880 Fax 951.765.3878 lnixon@cityofhemet.org	**City of Lake Elsinore** Mr. Ken Seumalo 130 South Main Street Lake Elsinore, CA 92530 951.674.3124 Ext. 244 Fax 951.674.2392 kseumalo@lake-elsinore.org
City of Moreno Valley Mr. Kent Wegelin or Mrs. Phuong Hunter 14177 Frederick Street Moreno Valley, CA 92552-0805 951.413.3497 Fax 951.413.3498 kentw@moval.org or phuongh@moval.org	**City of Murrieta** Ms. Farida Naceem 26442 Beckman Court Murrieta, CA 92562 951.461.6075 Fax 951.698.4509 fnaceem@murrieta.org
City of Norco Ms. Lori Askew 2870 Clark Avenue Norco, CA 91760 951.270.5678 Fax 951.270.5619 laskew@ci.norco.ca.us	**City of Perris** Mr. Michael Morales 101 N."D" Street Perris, CA 92570 951.943.5003 Fax 951.943.3293 mmorales@perris-ca.org
City of Riverside Mr. Sandy Caldwell 3900 Main Street Riverside, CA 92522 951.826.5348 Fax 951.826.5542 scaldwell@riversideca.gov	**City of San Jacinto** Mr. Tim Hults 201 E. Main Street San Jacinto, CA 92583 951.487.7330 Fax 951.487.6779 thults@sanjacintoca.us
City of Temecula Mr. Aldo Licitra P.O. Box 9033 Temecula, CA 92589-9033 951.3694.6411 Fax 951.694.6475 licitra@cityoftemecula.org	

E.5 Fire Department Contacts

The County of Riverside contracts with the following cities for emergency response services. For hazardous materials incidents within these cities, or within unincorporated Riverside County, contact County Environmental Health at 951-358-5055

Banning	Beaumont	Calimesa	Canyon Lake
Coachella	Desert Hot Springs	Indian Wells	Indio
La Quinta	Lake Elsinore	Moreno Valley	Murrieta
Palm Desert	Palm Springs	Perris	Rancho Mirage
Rubidoux	San Jacinto	Temecula	

The following cities have their own hazardous material management program:
City of Riverside
Fire Station No. 2
9449 Andrew St.
Riverside, CA 92503
951-351-6102

Cathedral City
Call 9-1-1

City of Corona
Call 9-1-1

City of Hemet
Hemet Fire Department
510 E. Florida Ave.
Hemet, CA 92543
951-765-2450 during business hours
951-765-2400 outside of business hours

City of Norco
Fire Department Administration Office
3902 Hillside Ave.
Norco, CA 92680
951-737-8097

APPENDIX F

INSTRUMENT CALIBRATION, MEASUREMENT, AND SPECIFICATIONS

F.1 Horiba U-22XD Multi-Parameter Water Quality Monitoring System

For detailed instructions with graphics, along with important notes, please refer to the **Operation Manual**.

A. Calibration

1. Ensure that the sensor probe is connected.

2. Press the POWER key.

3. Wash the sensor in distilled water a few times and put some of the pH 4 standard solution into the calibration beaker to the marked line.

4. Immerse the sensor in the calibration beaker.

5. Press the CAL auto calibration mode key in one of the Measurement modes pH, COND, TURB, DO. AUTO and CAL appear and the instrument enters the AUTO calibration mode.

6. Press the ENT key to start AUTO calibration. Upon completion of the pH, COND, TURB, DO, and DEP modes, “End” will be displayed on the screen.

7. Press the MEAS key to return to the Measurement mode.

B. Measurement

1. Slowly immerse the sensor in the sample.

2. Select the measurement item. Use the MEAS key to switch measurement items in the following order: pH, COND, TURB, DO, TEMP, DEP, SAL, TDS, σ, ORP, TIME, then back to pH.

3. After taking the measurement:

    3.1 Turn the power off.

    3.2 Use tap water to completely wash off the sample on the sensor and then wipe water drops.

    3.3 Pour about 20 mL (about 2 cm from the bottom) of distilled water in the probe cap and install it on the sensor probe. Place the rubber cap on the connector and store the instrument in the carrying case.

4. Water quality data should always be recorded to the *Field Data Sheet* while out in the field. To additionally manually store the measurement data (up to 2880 sets) in the instrument for later download:

    4.1 Make sure that MAN is displayed as the Measurement mode.

    4.2 Press the ENT key. Data storage starts, DATA IN and the data set number is displayed on the screen, and the measured value to be stored and the measurement item are displayed in order at approximately 0.5 second intervals. After the data are stored to memory, the screen returns to the original Measurement mode. Note the data set number on the *Field Data Sheet*.

5. Viewing stored data on the Horiba (note that the data cannot be transferred to a PC, only to a Horiba printer):

5.1 Press the DATA key in the Measurement mode. The instrument goes into DATA mode.

5.2 Press the DATA key. The measurement data are displayed. Data you want to call can be displayed by selecting a measurement item and data number.

5.3 Press the UP/DOWN keys to switch the measurement item or number that has been selected with the DATA key.

5.4 Press the DATA key. Use the UP/DOWN keys to switch between "Year, Month, Day' and "Hour, Minute, Second".

C. Specifications

Measurement range

Measurement item		Measurement range		Measurement units
		Expanded	Standard	
pH		0.00 to 14.00	0.0 to 14.0	pH
		—	−1999 to 1999	mV in pH measurement
Conductivity (COND)	Range 1	0.90 to 9.99	0.9 to 9.9	S/m
		9.0 to 99.9	9 to 99	mS/cm
	Range 2	0.090 to 0.999	0.09 to 0.99	S/m
		0.90 to 9.99	0.9 to 9.9	mS/cm
	Range 3	0.0 to 99.9	0 to 99	mS/m
		0.000 to 0.999	0.00 to 0.99	mS/cm
Turbidity (TURB) *1		0.0 to 800.0	0 to 800	NTU (nephelometric turbidity units) or mg/L
Dissolved-oxygen (DO)		0.00 to 19.99	0.0 to 19.9	mg/L
		0.0 to 199.9	0 to 199	%
Temperature (TEMP)		0.00 to 55.00	0.0 to 55.0	°C
Water depth (DEP)		0.0 to 100.0	0 to 100	m
		0.0 to 330.0	0 to 330	ft
Salinity (SAL)		0.00 to 4.00	0.0 to 4.0	%
Total dissolved solids (TDS) *2	Range 1	5.5 to 65.0	5 to 65	g/L
	Range 2	0.55 to 6.50	0.5 to 6.5	g/L
	Range 3	0.000 to 0.650	0.00 to 0.65	g/L
Seawater specific gravity (σ_t)		0.0 to 50.0	0 to 50	–
Oxygen-reduction potential (ORP)		—	−1999 to 1999	mV

*1: Depending on the concentration range, the minimum turbidity is displayed as follows:
0 to 100 NTU ... 1 NTU for standard readout, 0.1 NTU for expanded readout.
100 to 800 NTU ... 10 NTU for standard readout, 1 NTU for expanded readout.

*2: The TDS range depends on the TDS factor settings. (Above ranges are given for a TDS coefficient of 0.65.)

F.2 Oakton Waterproof pHTestr 2

For detailed instructions with graphics, along with important notes, please refer to the **Operation Manual**.

A. Calibration

1. Before you Begin: Remove electrode cap. To condition electrode, immerse electrode in electrode storage solution, buffer, or tap water for at least 30 minutes. DO NOT use de-ionized water.

2. Calibration: Calibration should be done regularly, typically every day that the Testr is used. Calibrate the pHTestr 2 at three points (pH 4, 7, 10).

    2.1 Press ON/OFF button to switch unit on.

    2.2 Dip electrode 1/2" to 1" into chosen buffer (pH 4, 7, or 10).

    2.3 Press CAL button to enter Calibrate (CA) mode. 'CA' flashes on the display. Then, a pH value close to the pH buffer value will flash repeatedly.

    2.4 After at least 30 seconds (about 30 flashes) press the HOLD/CON button to confirm calibration. The display will show 'CO' and then switch to the buffer value reading.

    2.5 Repeat with other buffers if necessary (pHTestr 2 only). Rinse electrode in tap water before dipping into next buffer.

B. Measurement

1. Remove cap from the electrode and press the ON/OFF button to switch Testr on.

2. Dip the electrode 1/2" to 1" into the test solution. Stir once and let the reading stabilize.

3. Note the pH or press HOLD/ CON button to freeze the reading. Press HOLD/CON again to release the reading.

4. Press ON/OFF to turn off Testr. If you do not press a button for 8.5 minutes the Testr will automatically shut off to conserve batteries.

5. If possible, keep a small piece of paper or sponge in the electrode cap—moistened with clean water or electrode storage solution (NOT de-ionized water)—and close the cap over the electrode.

C. Specifications

Specifications

	WP pHTestr 1	WP pHTestr 2
Range	–1.0 to 15.0 pH	
Resolution	0.1 pH	
Accuracy	±0.2 pH	±0.1 pH
Calibration	1 point (pH 4.0; 7.0; or 10.0)	3 points (pH 4.0; 7.0 and 10.0)
ATC	No	Yes
Operating Temperature	0 to 50°C (32 to 122°F)	
Functions	ON/OFF; HOLD; CA (Calibrate); CO (Confirm display); auto buffer recognition; auto-shutoff after 8.5 min. of nonuse	
Power	Three 1.5 V batteries (included). 24 hours continuous use (approx. 720 tests per battery set)	
Dimensions	6.5"L x 1.5" dia. (165 x 38 mm dia.)	
Weight	3.25 oz (90 gms)	

F.3 Oakton TDSTestr 20

For detailed instructions with graphics, along with important notes, please refer to the **Operation Manual**.

A. Calibration

1. Before you Begin: Remove electrode cap. Switch unit on for 15 minutes to stabilize the batteries. Soak electrodes for a few minutes in alcohol to remove oils. Caution: Never immerse the electrode above color band as it will damage the instrument electronics.

2. Calibration: Your testr features push- button calibration at two points (one per range). Select a calibration standard appropriate for each range: low range, between 150 to 1999 µS; high range, between 2.0 to 19.99 mS. It is best to select a standard close to the test solution value, and one that has a similar chemical make-up to the test solution.

   2.1 Rinse the electrode in tap or deionized water, then in a known calibration standard.

   2.2 Switch unit on (ON/OFF button).

   2.3 Dip electrode into calibration standard. DO NOT immerse above color band!

   2.4 Press CAL/CON button to enter Calibrate mode. 'CA' flashes on the display. An uncalibrated conductivity value close to the calibration standard value will flash.

   2.5 Wait at least 30 seconds (about 30 flashes) for the reading to stabilize. Press the HOLD/INC button repeatedly to adjust reading to match value of the known calibration standard.

   2.6 Press CAL/CON button to confirm calibration. The display will show 'CO' and then switch to a calibrated conductivity reading.

   2.7 For second range, repeat steps 1-6.

B. Measurement

1. Remove cap from electrode. Switch unit on (ON/OFF button).

2. Rinse the electrode in tap or deionized water, then in a small portion of test solution.

3. Dip the electrode into the test solution. Stir once and let the reading stabilize. DO NOT immerse electrode above color band!

4. Allow time for the Automatic Temperature Compensation to correct the readings for solution temperature changes.

5. Note the reading once the display is stable. Press HOLD/CON button to freeze the reading. Press HOLD/CON again to release the reading.

6. Press ON/OFF to turn off Testr. If you do not press a button for 8.5 minutes, the Testr will automatically shut off to conserve batteries.

C. Specifications

Specifications

TDSTestr	10	20
Range	0 to 999 ppm/ 1.00 to 9.99 ppt	0 to 1999 µS/ 2.0 to 19.99 mS
Resolution	1 ppm/ 0.01 ppt	1 µS/ 0.01 mS
Accuracy	±2% full scale	
Calibration	two-point push button slope adjustments (one in each range)	
Calibration Standard	100 to 999 ppm 2.00 to 9.99 ppt	150 to 1999 µS/ 2.0 to 19.99 mS
Operating Temperature	32 to 122°F / 0 to 50°C	
ATC	32 to 122°F / 0 to 50°C (1.11% per °F / 2% per °C)	
Power	Four 1.5 V alkaline batteries (Eveready A76BP; supplied) 20 hrs. continuous use Alternate replacement Model Eveready 303 silver oxide, 70 hrs. continuous use.	
Dimensions	5.9" x 1.7" x 1" (151 x 42 x 24 mm)	
Weight	3.25 oz (90 gms)	

F.4 Hanna Instruments HI 98129 Waterproof pH, EC/TDS & Temperature Multimeter

For detailed instructions with graphics, along with important notes, please refer to the **Operation Manual**.

A. Calibration

1. pH calibration:

   1.1 From measurement mode, press and hold the MODE button until CAL is displayed on the lower LCD. Release the button. The LCD will display pH 7.01 USE or pH 6.86 USE (if you have selected the NIST buffer set). The CAL tag blinks on the LCD.

   1.2 For a single-point pH calibration, place the electrode in any buffer from the selected buffer set (e.g. pH 7.01 or pH 4.01 or pH 10.01). The meter will recognize the buffer value automatically.

   1.2.1 If using pH 4.01 or pH 10.01, the meter will display OK for 1 second and then return to measurement mode.

   1.2.2 If using pH 7.01, after recognition of the buffer the meter will ask for pH 4.01 as second calibration point. Press the MODE button to return to measurement mode or, if desired, proceed with the 2-point calibration as explained below.

   1.3 A two-point pH calibration give better accuracy. For a two-point pH calibration, place the electrode in pH 7.01 (or 6.86 if you have selected the NIST buffer set). The meter will recognize the buffer value and then display pH 4.01 USE.

   1.3.1 Rinse the electrode thoroughly to eliminate cross-contamination.

   1.3.2 Place the electrode in the second buffer value (pH 4.01 or 10.01, or, if using NIST, pH 4.01 or 9.18). When the second buffer is recognized, the LCD will display OK for 1 second and the meter will return to normal measurement mode.

   1.4 The CAL symbol on the LCD means that the meter is calibrated.

2. EC/TDS calibration:

   2.1 From measurement mode, press and hold the MODE button until CAL is displayed on the lower LCD.

   2.2 Release the button and immerse the probe in the proper calibration solution: HI7031 (1413 µS/cm) for HI98129 and HI7030 (12.88 mS/cm) for HI98130.

   2.3 Once the calibration has been automatically performed, the LCD will display OK for 1 second and the meter will return to normal measurement mode.

   2.4 Since there is a known relationship between EC and TDS readings, it is not necessary to calibrate the meter in TDS

   2.5 The CAL symbol on the LCD means that the meter is calibrated.

B. Measurement

1. pH measurement:

   1.1 Select the pH mode with the SET/HOLD button.

   1.2 Submerge the electrode in the solution to be tested.

   1.3 The measurements should be taken when the stability symbol on the top left of the LCD disappears.

   1.4 The pH value automatically compensated for temperature is shown on the primary LCD while the secondary LCD shows the temperature of the sample.

2. EC/TDS measurement:

   2.1 Select either EC or TDS mode with the SET/HOLD button.

   2.2 Submerge the probe in the solution to be tested. Use plastic beakers to minimize any electromagnetic interferences.

   2.3 The measurements should be taken when the stability symbol on the top left of the LCD disappears.

   2.4 The EC (or TDS) value automatically compensated for temperature is shown on the primary LCD while the secondary LCD shows the temperature of the sample.

C. Specifications

Range Temperature:	0.0 to 60.0°C or 32.0 to 140.0°F	
HI 98129	pH: 0.00 to 14.00	
	EC: 0 to 3999 µS/cm	
	TDS: 0 to 2000 ppm	
HI 98130	pH: 0.00 to 14.00	
	EC: 0.00 to 20.00 mS/cm	
	TDS: 0.00 to 10.00 ppt	
Resolution	0.1°C or 0.1°F	
HI 98129	0.01 pH; 1 µS/cm ; 1 ppm	
HI 98130	0.01 pH, 0.01 mS/cm ; 0.01 ppt	
Accuracy (@20°C/68°F)	Temperature	±0.5°C or ±1°F
	EC/TDS	±2% f.s.
	pH	±0.01
Typical EMC Deviation	Temperature	±0.5°C or ±1°F
	pH	±0.02 pH
	EC/TDS	±2% f.s.
Temp.Compensation	pH: Automatic	
	EC/TDS: with β=0.0 to 2.4%/°C	
Environment	0 to 50°C (32 to 122°F); RH 100%	
EC/TDS Conversion Factor	0.45 to 1.00 (CONV)	
Calibration	pH: at 1 or 2 points with 2 sets of memorized buffers (pH 4.01/7.01/10.01 or pH 4.01/6.86/9.18)	
	EC/TDS: automatic, at 1 point	
EC/TDS Calibration Solutions		
HI 98129	HI7031 (1413 µS/cm)	
	HI7032 (1382 ppm; CONV=0.5)	
	HI70442 (1500 ppm; CONV=0.7)	
HI 98130	HI7030 (12.88 mS/cm)	
	HI70038 (6.44 ppt; CONV=0.5 or 9.02 ppt; CONV=0.7)	
Electrode	HI 73127 pH electrode (**included**)	
BatteryType/Life	4 x 1.5V with BEPS / typical 100 hours	
Auto-off	After 8 min.	
Dimensions	163 x 40 x 26 mm (6.4 x 1.6 x 1.0")	
Weight	85 g (3.0 oz)	

APPENDIX G

IC/ID PARAMETER SELECTION EXAMPLES

A. Auto body shop or gas station [need to complete table]

No. Bottles	Bottle Type	Preservative	Analysis
			Petroleum hydrocarbons – depends on fuel type.
			Light HC fraction
			Medium HC fraction
			Heavy HC fraction
			BTEX – gas stations
			Oil & grease

B. Confined Animal Feeding Operation [need to complete table]

No. Bottles	Bottle Type	Preservative	Analysis
			E. Coli
			Nitrate
			Total Nitrogen
			General Minerals (includes nitrate)

C. Golf Course [need to complete table]

No. Bottles	Bottle Type	Preservative	Analysis
			E. Coli
			Nitrate
			Total Nitrogen
Check with analytical laboratory			Pesticides – check on-site records

D. Petroleum Spill

No. Bottles	Bottle Type	Preservative	Analysis
1	1 L Amber glass	H_2SO_4	TPH
1	500 mL Amber glass	H_2SO_4	Oil & Grease
2	40 mL Amber vial	HCl	Gasoline
1	0.5 gal poly container	None	Use as scoop
2	4 oz glass jar	None	Soil Samples

APPENDIX H

WATER QUALITY PARAMETERS THAT MAY BE MONITORED

[Check with Annual Reports – may have updated info]

The following parameters may have a Basin Plan Objective (BPO) comparison benchmark. A description of the parameter's importance to Urban Runoff water quality and the types of industries likely to discharge it in their waste stream are also included. This information is largely taken from Water Quality Criteria, 2 nd Edition. This list does not include all parameters on EPA's Priority Pollutant list.

Alkalinity, Total (CaCO3) (Hydron #1035)
Alkalinity measures the ability of a solution to neutralize hydrogen ions and is expressed in terms of an equivalent amount of calcium carbonate. Alkalinity may indicate the presence of carbonates, bicarbonates, hydroxides, and to a lesser extent borates, silicates, phosphates, and organic substances. Waters with pH values between 7 and 8 and having a total alkalinity of 100 to 120 mg/L or more serves as a buffer to help prevent any sudden change in pH value, which could harm fish and other aquatic life. Some natural waters, especially those in the southwestern U.S., are highly alkaline. The alkalinity of streams can also be increased by the addition of municipal sewage and many industrial wastes.

Ambient Air Temperature (#1017, °C; #1018, °F)
Air temperature can affect water temperature, which can, in turn affect the concentration of dissolved oxygen. Drinking water standards for fluoride are based on maximum daily air temperatures.

Ammonia-nitrogen (#1051)
Ammonia may be found naturally in surface or ground waters from the decomposition of nitrogenous organic matter, being one of the constituents of the complex nitrogen cycle. Rivers known to be unpolluted have very low ammonia concentrations, generally less than 0.2 mg/L as N. Ammonia may be discharged in industrial wastes. Ammonia is also a component of fertilizer and urine, and its presence may indicate agricultural use or overapplication in domestic and recreational areas.

Antimony (#1065)
This silvery-white metal is seldom found in the pure state in nature. Antimony is used for alloys and other metallurgical purposes. The salts, primarily sulfides and oxides, are employed in the rubber, textile, fireworks, paint, ceramic, and glass industries.

Arsenic (#1070)
Elemental arsenic may be found to a small extent in nature mostly as the arsenides of true metals or pyrites. Its major use, however, is as a component of pesticides (insects, weeds, fungi) and as a wood preservative.

Bacteria; Fecal coliforms (#1075)
Bacteria; Total coliforms (#1085)
Coliform organisms originate in excretions from humans, mammals, amphibians, and birds. They are also found, primarily in the non-fecal forms on fibrous and vegetable matter in the water. More coliforms are discharged by healthy individuals than by sufferers of diarrhea.

Bacteria; Fecal streptococci (#1080)
Fecal streptococci is considered a useful indicator of potential pathogen contamination by intestinal wastes as this group of bacteria is characteristic of fecal pollution, they do not multiply in surface waters, and they rarely occur in surface soil or on vegetation (unless contaminated by sewage). Primary sources of bacteria include agricultural drainage, feeding pens, grazing areas, and sanitary sewer and septic tank leaks.

Barium (#1090)
Barium is not normally present in natural surface or ground waters. Industrial uses of barium and its salts include metallurgy, paint manufacturing, cement production (for mixtures designed to withstand salt water), and in ceramic and glass manufacturing.

Beryllium (#1120)
Beryllium is relatively rare and not likely to occur in natural waters. Industrial uses of beryllium include metallurgy, manufacturing of X-ray diffraction tubes and electrodes for neon signs, and nuclear reactors.

Bicarbonate (HCO3) (#1125)
Bicarbonates contribute to the alkalinity of water, or the capacity of water to neutralize acids. Bicarbonates have many natural and industrial sources. Natural sources include absorption of carbon dioxide from the air and the decomposition of organic materials. Bicarbonates are one of the most commonly used salts in industry. Bicarbonates are not generally considered environmentally harmful, but can add to the salinity and total solids content of water.

Boron (#1135)
Boron in nature is found as sodium borate (borax) or as calcium borate (colemanite) in mineral deposits and natural waters of Southern California and in Italy. Industrial uses of boron, boron salts, or boric acid include metallurgy (to harden metals), weatherproofing of wood, fireproofing fabrics, glass and porcelain manufacturing, production of leather and carpets, cosmetics, photography, and artificial gems, and as a bactericide, fungicide, or detergent.

Cadmium (#1145)
Cadmium has many industrial uses, including metallurgy, electroplating, ceramics, pigmentation, photography, textile printing, and nuclear reactors. Cadmium salts are sometimes employed as insecticides and antihelminthics. Cadmium can concentrate in the liver, kidneys, pancreas, and thyroid of humans and animals, and tends to persist.

Calcium (#1150)
Calcium is typically found as a salt or in the ionic form. Natural sources include leaching from soil or decomposition of skeletal remains. They may also be found in sewage and many types of industrial wastes.

Carbon, total organic (TOC) (#1155)
Organic carbon is not in itself a pollutant, but is an indicator of pollution and benthic deposits. In the TOC test, the carbon in the sample is oxidized by dichromate or another strong oxidizing agent.

Carbonate (CO3) (#1160)
Carbonate concentration in water is a function of temperature, pH, cations, and other dissolved salts. Carbonate salts may be removed from polluted waters by precipitation and adsorption

Chloride (#1165)
Natural sources of chlorides include dissolution from minerals or seawater intrusion. Industrial sources include agricultural use, human and animal sewage, paper manufacturing, galvanizing plants, water softening plants, oil wells, and petroleum refineries. Chlorine is a commonly-used disinfectant in water treatment.

Chlorpyrifos (#1178)
No info

Chromium, all valences (#1180)
Chromium wastes occur mostly in the hexavalent form. Industrial sources of hexavalent chromium include metal pickling and plating operations, aluminum anodizing, leather tanning, cooling water antifouling, and in the manufacture of paints, dyes, explosives, ceramics, and paper. Industrial sources of trivalent chromium salts include textile dyeing, ceramic and glass manufacturing, and in photography.

Color (#1195)
There are numerous natural sources of color in water including breakdown of minerals (especially those containing iron or manganese compounds) or vegetable matter, humus, peat, tannins, algae, weeds, and protozoa. Industrial sources include irrigation return water, nailworks, mining, refining, and manufacture of explosives, pulp and paper, and chemicals. It can be expected that waters flowing through erodible soils, such as those found in the Santa Margarita River Watershed, will have a detectable color concentration.

Conductance, specific (#1200, field; #1205, lab)
Specific conductance measures the ion concentration of water. Increased conductivity increases the osmotic pressure of water, which can be harmful to aquatic organisms. Natural inland waters usually contain small quantities of mineral salts in solution, but waters containing brine, chemical, and agricultural irrigation wastes may have excessive levels of specific conductance.

Copper (#1210)
Copper salts are not commonly found in natural surface waters. Industrial sources of copper include corrosion of copper and brass tubing, copper compounds used to control undesirable plankton organisms, alloy production, electrical wiring, pipes, roofing, and many purposes where its conductivity or corrosion resistance are important. Copper salts are used in textile processing, pigmentation, tanning, photography, engraving, electroplating, insecticides, fungicides, and many other industrial processes.

Cyanide, total (#1215)
Cyanides may be found in effluents from gas works and coke ovens, from the scrubbing of gases at steel plants, from metal cleaning and electroplating processes, and from chemical industries.

Detergent – MBAS (#1225)
Surface-active agents such as soaps, detergents, emulsifiers, wetting agents, and penetrants lower the surface tension or other interfacial properties of their solvents. This allows dirt to be removed from clothing and for greater absorption of pesticides into their target organisms.

Diazinon (#1227)
Diazinon is commonly-used insecticide.

Discharge (#262)
Also known as the flow rate, high discharge rates may cause erosion in an earthen channel. Used along with chemical concentration to calculate mass loading.

Electrochemical Balance (#1235) No BPO
If positive, there are more cations than anions in the sample, and if negative, there are more anions.

Fluoride (#1255)
Fluoride may be found in natural waters, its value in preventing tooth decay being based on observations that people living in areas with elevated levels had lower rates of tooth decay. Industrial sources of fluoride include insecticide manufacture and use, brewery apparatus disinfection, as a flux in steel manufacturing, wood and mucilage preservation, glass and enamel manufacturing, chemical industries,

and for water treatment. It not normally found in industrial wastes. Drinking water standards are based on maximum daily air temperatures.

Hardness, total (CaCO3) (#1265)
Hardness in water may be caused by the natural accumulation of salts (primarily calcium and magnesium ions) from contact with soil and geological formations. Industrial sources include tannery wastes and irrigation return flows. Imported water may also be a source of elevated hardness levels, for example, Colorado River Water has an average hardness of 250-300 mg/L, which is considered hard water.

Hydrocarbons, total petroleum (#1270)
Industrial sources of petroleum hydrocarbons include those involved in the production, transportation, handling, and use of oil, such as oil wells, oil-loading points, refineries, railroads, civic dumps, salvage dumps, and garages.

Hydroxide (OH) (#1275)
Hydroxides contribute to the alkalinity of water. It is not present in to an appreciable degree in natural waters. Industrial sources of hydroxide includes tanneries, soda and sulfate pulping mills, and textile mills.

Iron (#1285)
Iron may be found naturally from the corrosion of iron in mineral deposits and iron-bearing ground water. Industrial sources include pickling operations, acid-mine drainage, and corrosion from iron pipes and other materials.

Lead (#1290)
Lead is a harmful substance that can lead to neurological damage. Natural sources of lead in water include leaching from mountain limestone and galena. Industrial sources of lead include mining effluents, use in solder in electronics and piping.

Level (# 232)
In a well-defined channel, the water level, along with the rating curve, can be used to calculate the flow rate.

Magnesium (#1300)
Magnesium ions are present in significant concentrations in natural waters, and along with calcium form the bulk of the hardness reaction. Industrial sources of magnesium include light alloy and other metallurgical production, and in the manufacture of electrical and optical apparatus.

Manganese (#1305)
Manganese ions are rarely found in natural surface waters above a concentration of 1.0 mg/L. Industrial sources of manganese include manufacture of steel alloys, dry-cell batteries, glass and ceramics, paints and varnished, inks and dyes, matches and fireworks, and in agriculture to enrich manganese-deficient soils.

Mercury (#1310)
Mercury can appear in the metallic state in some natural waters, but the ionic form is most harmful to aquatic life. Industrial sources of mercury include use in scientific and electrical instruments, in dentistry, in power generation, in solders, in the manufacture of lamps and batteries, and in the improper disposal of thermostat switches and old thermometers and manometers.

Nickel (#1320)
Nickel as a pure metal it is not a problem as it is not soluble in water. Many nickel salts, however, are highly soluble in water. Industrial uses of nickel salts include the metal-plating industry.

Nitrogen, Nitrate (N) (#1340)
Nitrates are an essential fertilizer for plant life, and are therefore rarely found in natural surface waters at high concentrations. Nitrates may also be present in groundwaters as a result of excessive application of fertilizer or cesspool or septic tank leachate. Industrial uses of nitrogen include chemical fertilizer production, field application of fertilizer, livestock sewage, and irrigated agriculture.

Nitrogen; Nitrite (N) (#1345)
Nitrites are usually quickly oxidized to nitrates by bacterial action in natural waters and are therefore seldom found at significant concentrations. The presence of nitrite alone does not always signify the presence of pollution, but in conjunction with ammonia and nitrate, often indicate pollution.

Nitrogen; Organic (N) (#1350)
No info

Nitrogen; Total (N) (#1355)
Nitrogen is present in natural and polluted waters as ammonia, organic nitrogen, nitrites, and nitrates. The total concentration of nitrogen is not as important as the form in which it exists. Organic nitrogen, amino acids, and ammonia may inhibit biological growth whereas nitrates stimulate phytoplankton. Industrial sources of the various components of total nitrogen are discussed under their proper headings.

Nitrogen; total inorganic (N) (#1365)
No info

Nitrogen; total Kjeldahl (N) (#1360)
No info

Nitrogen; un-ionized ammonia (N) (#1370)
No info

Odor (#1375)
Natural sources of odor in water include living microscopic organisms and decaying vegetation, including weeds, bacteria, fungi, actinomycetes, algae, and decaying organic matter. Industries that may generate odor-causing wastes include: pulp and paper; explosives; petroleum, gasoline, and rubber; wood distillation; coke and coal tar; gas; tanneries, meat-packing and glue; chemicals and dyes; and milk products, canneries, beet-sugar, distillation and other food products.

Odor is reported in terms of “threshold odor number” (TON) which is calculated from the amount of sample in the most diluted portion giving perceptible odor. The threshold odor number equals the volume of the dilution divided by the volume of the sample in the dilution.

It is frequently difficult, if not impossible, to identify the specific cause of an odor or taste, as many substances may cause what appears to be the same effect, or because mixtures of substances may be involved. Among the chemicals responsible for tastes and odors are halogens, sulfides, ammonia, turpentine, phenols and cresols, picrates, various hydrocarbons and unsaturated organic compounds, mercaptans, tar and tar oils, detergents, pesticides, and innumerable others, many of unknown identity. Hydrocarbons may be a major source of taste and odors in water.

Oil & Grease (#1380)
Oil and grease in water may coat aquatic life and create undesirable odors. Industrial sources of oil and grease include all aspects of the petroleum industry, packing plants, slaughter houses, rendering plants, cotton seed processing plants, textile mills, milk-processing plants, chemical works, machining operations, and garages.

Organic matter (%) (#1384)
No info

Organics; BNA extractible (625) (#1385)
No info

Organics; purgeable halocarbons (624) (#1410)
No info

Oxygen Demand, Biochemical (BOD) (#1425)
In itself, BOD is not a pollutant and does not directly cause environmental harm. When dissolved oxygen is depressed to harmful levels, BOD will indirectly exacerbate the effects of diminished oxygen. BOD does not indicate the presence of a single substance, but measures the effect of a combination of substances and conditions.

Oxygen Demand, Chemical (COD) (#1430)
The COD test measures the organic strength of domestic, agricultural, and industrial wastes, but it does not differentiate between the biologically oxidizable (could be taken up by fish and plants) and biologically inert organic matter.

Oxygen, dissolved (#1435)
Dissolved oxygen concentration is a function of the temperature and salinity of the water. Increasing temperature or salinity results in a decreasing oxygen-holding capacity of water. Dissolved oxygen is not constant in a natural system, as organisms, chemical reactions, and physical conditions use or generate oxygen at various rates. As dissolved oxygen levels decrease, aquatic life suffers or dies, and in the absence of oxygen, anaerobic decomposition may lead to unfavorable odors and colors in the water.

Oxygen; field saturation (#1445)
No info

pH (#1705, field; #1710, lab)
pH is not a pollutant in itself, but an indicator of pollution. Natural waters and treated sewage is usually neutral or slightly alkaline, but many industrial wastes are strongly acidic or alkaline. Acid wastes include tan liquors, acid dyes, coal-mine drainage, sulfite waste liquors, pickling liquors, and some brewery wastes. Alkaline wastes include soda- and sulfate-pulp rinse waters, laundry wastes, and bottle wash waters.

Phenols (#1460)
Phenols are widely used as disinfectants, in the manufacture of synthetic resins, medical, and industrial compounds, and as a reagent for chemical analyses. Sources of phenolic wastes include the distillation of wood, coke ovens, oil refineries, chemical plants, sheep dips, and human and animal refuse.

Phosphorus, organic (P) (#1475)
No info

Phosphorus, ortho (P) (#1480)
No info

Phosphorus, total (P) (#1485)
Phosphorus in nature is found in the form of phosphates in several minerals and it is a constituent of fertile soils, plants, and the protoplasm, nervous tissue and bones of animal life. It is an essential nutrient for plant and animal growth. Excessive phosphorus leads to an overabundance of algae growth.

Phosphorus, total dissolved (P) (#1490)
No info

Phosphorus, total insoluble (P) (#1495)
No info

Potassium (#1500)
Potassium is commonly found in fertilizers.

Redox Potential (mV) (#1515)
No info

Salinity (ppt) (#1518)
Inland waters typically contain low levels of dissolved mineral salts, but brines and various chemical wastes may increase salinity to levels harmful to living organisms because of the increase in osmotic pressure.

Selenium (#1520)
Selenium is found in some soils as ferric selenite or calcium selenate. It may also be found in decayed plant tissue. Industrial sources of selenium include pigmentation in paints, dyes, and glass production; as a component of rectifiers, semiconductors, photo-electrical cells, and other electrical apparatus; as a supplement to sulfur in the rubber industry; as a component of alloys; and for insecticide sprays. Selenium may also be found in the municipal sewage from industrial communities.

Silver (#1535)
Industrial sources of silver include manufacture of jewelry and silverware, in alloys, for electroplating, and in the processing of food and beverages. Silver nitrate is used in photography, ink manufacture, electroplating, coloring porcelain, and as an antiseptic.

Sodium (#1540)
Sodium salts are extensively found in nature and in industrial and agricultural wastes. As most sodium salts are extremely soluble in water, any sodium that is leached from soil or discharged to streams will remain in solution.

Solids, total (#1615, mg/l; #1616, %)
Solids in water are classified as either "dissolved" (capable of passing through a laboratory filter) or "suspended," (retained on the filter). Both dissolved and suspended solids may be differentiated further as "fixed" (inorganic) and "volatile" (organic or volatile material). It is the nature of the solids in water that may indicate a pollutant, not the presence of the solids themselves.

Solids, total dissolved (#1625)
In natural waters the dissolved solids consist mainly of carbonates, bicarbonates, chlorides, sulfates, phosphates, and possibly nitrates of calcium, magnesium, sodium, and potassium, with traces of iron,

manganese and other substances. Sources of dissolved solids include chemical wastes, dissolved salts, acids, alkalis, gas and oil-well brines, or drainage waters from irrigated land.

Solids, total suspended (#1630)
In natural waters, suspended solids consist normally of erosion silt, organic detritus, and plankton. Sources of suspended solids include industrial and domestic wastes, increased erosion from cleared or cultivated land, gravel washings and mine tailings, steel mill wastes, and dusts that are blown into streams.

Sulfate (SO4) (#1640)
Sulfates occur in waters of the western United States as a result of leachings from gypsum and other common minerals. Other natural sources include oxidized organic matter. Industrial sources include agricultural runoff, tanneries, sulfate-pulp mills, textile mills, and other plants that use sulfates or sulfuric acid.

Sulfide (S-) (#1645)
Sulfides may be found in natural waters from anaerobic decomposition of organic matter. Sewage may also contribute sulfide. Industrial sources of sulfides include tanneries, paper mills, chemical plants, and gas works

Temperature, field (#1655, deg. C; #1660, deg. F)
Water temperature in natural waters is influenced by ambient temperature, vegetative cover, nature of bed material *(e.g.*, gravel vs. sand), and stream depth. Many industrial and agricultural wastes lead to raising of water temperatures, as does concrete-lining of streams. Increased water temperature may result in decreased oxygen capacity, generation of anaerobic zones, and fungal growth.

Thallium (#1665)
Thallium salts are used as poisons for rodents, as ant bait, and are used in dyes and pigments in fireworks, in optical glass, and as a depilatory.

Total Anions (#1675)
No info

Total Cations (#1680)
No info

Turbidity (#810; #1690, field; #1695, lab)
The turbidity of a water sample is a measure of the extent to which the intensity of light passing through is reduced by the suspended matter. Turbidity in water is attributable to suspended and colloidal matter, which diminishes light penetration. Increased turbidity may also indicate the presence of pathogens. Natural sources of turbidity include microorganisms or organic detritus; silica or other mineral substances including zinc, iron, and manganese compounds; and clay or silt. Erosion may also lead to increased turbidity as well as domestic sewage and industrial wastes, such as mining, dredging, logging, and pulp and paper manufacturing.

Zinc (#1700)
Industrial sources of zinc and zinc salts include galvanizing, alloy manufacture, for electrical purposes, in printing plates, dye manufacture and the dyeing process, paint pigments, cosmetics, pharmaceutics, dyes, and insecticides.

APPENDIX I

GLOSSARY

Basin Plan - Water Quality Control Plan developed by a Regional Board..

CMP - Consolidated Program for Water Quality Monitoring

Conditions of Concern - Scour, erosion (sheet, rill and/or gully), aggradation (raising of a streambed from sediment deposition), changes in fluvial geomorphology, hydrology and changes in aquatic ecosystem.

Co-Permittees -

In the Whitewater Region: County of Riverside and the Cities of Banning, Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage, and the Coachella Valley Water District.

In the Santa Ana Region: County of Riverside and the Cities of Beaumont, Calimesa, Canyon Lake, Corona, Hemet, Lake Elsinore, Moreno Valley, Murrieta, Norco, Perris, Riverside, and San Jacinto.

In the Santa Margarita Region: County of Riverside and the Cities of Murrieta and Temecula.

County - County of Riverside, legal entity

CWA - Federal Clean Water Act

GIS – Geographical Information Systems.

"illegal discharge" – Illegal discharge means any disposal, either intentionally or unintentionally, of material or waste to land or MS4s that can pollute storm water or create a nuisance. The term illegal discharge includes any discharge to the MS4 that is not composed entirely of storm water, except discharges pursuant to an NPDES permit, discharges that are identified in the MS4 Permit, and discharges authorized by a Regional Board Executive Officer.

"illicit connection" - Illicit Connection means any connection to the storm drain system that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term illicit connection includes all non storm-water discharges and connections except discharges pursuant to an NPDES permit, discharges that are identified in the MS4 Permit, and discharges authorized by the Executive Officer.

Impaired Waterbody – Section 303(b) of the CWA requires each of California's Regional Water Quality Control Boards to routinely monitor and assess the quality of waters of their respective regions. If this assessment indicates that beneficial uses are not met, then that waterbody must be listed under Section 303(d) of the CWA as an impaired waterbody. The 1998 water quality assessment listed a number of waterbodies within the three Permit Areas as impaired pursuant to Section 303(d).

In the Whitewater Region:

Water Body Name	TMDL Priority	Estimated Size Affected	Unit	Pollutant_Stressor	Potential Sources	Proposed TMDL Completion
Coachella Valley Storm Channel	Medium	69	Miles	Pathogens	Source Unknown	

In the Santa Ana Region:

Water Body Name	TMDL Priority	Estimated Size Affected	Unit	Pollutant_Stressor	Potential Sources	Proposed TMDL Completion
Canyon Lake (Railroad Canyon Reservoir)	Low	453	Acres	Nutrients	Nonpoint Source	
Canyon Lake (Railroad Canyon Reservoir)	Low	453	Acres	Pathogens	Nonpoint Source	
Elsinore, Lake	High	2431	Acres	Unknown Toxicity	Unknown Nonpoint Source	2004
Elsinore, Lake	High	2431	Acres	Nutrients	Unknown Nonpoint Source	2003
Elsinore, Lake	High	2431	Acres	Sedimentation/Siltation	Urban Runoff/Storm Sewers	2003
Elsinore, Lake	High	2431	Acres	Organic Enrichment/Low Dissolved Oxygen	Unknown Nonpoint Source	2004
Santa Ana River, Reach 3	High	26	Miles	Pathogens	Dairies	2004
Santa Ana River, Reach 4	Low	14	Miles	Pathogens	Nonpoint Source	

In the Santa Margarita Region:

Water Body Name	TMDL Priority	Estimated Size Affected	Unit	Pollutant_Stressor	Potential Sources	Proposed TMDL Completion
Murrieta Creek	Low	12	Miles	Phosphorus	Urban Runoff/Storm Sewers	
Murrieta Creek	Low	12	Miles	Phosphorus	Unknown Nonpoint Source	
Murrieta Creek	Low	12	Miles	Phosphorus	Unknown point source	
Santa Margarita River (Upper)	Low	18	Miles	Phosphorus	Urban Runoff/Storm Sewers	
Santa Margarita River (Upper)	Low	18	Miles	Phosphorus	Unknown Nonpoint Source	
Santa Margarita River (Upper)	Low	18	Miles	Phosphorus	Unknown point source	

MS4 (Municipal Separate Storm Sewer System) – An MS4 is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, natural drainage features or channels, modified natural channels, man-made channels, or storm drains): (i) Owned or operated by a State, city town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under Section 208 of the CWA that discharges to Waters of the U.S.; (ii) Designated or used for collecting of conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the POTW as defined at 40 CFR 122.2.

Historic and current developments make use of natural drainage patterns and features as conveyances for Urban Runoff. Urban streams used in this manner are part of the municipalities MS4 regardless of whether they are natural, man-made, or partially modified features. In these cases, the urban stream is both an MS4 and a receiving water.

"non-point source" - Non-point source refers to diffuse, widespread sources of pollution. These sources may be large or small, but are generally numerous throughout a watershed. Non-point sources, include but are not limited to urban, agricultural or industrial area, roads, highways, co nstruction sites, communities served by septic systems, recreational boating activities, timber harvesting, mining, livestock grazing, as well as physical changes to stream channels, and habitat degradation. Non-point source pollution can occur year round any time rainfall, snowmelt, irrigation, or any other source of water runs over land or through the ground, picks up pollutants from these numerous, diffuse sources and deposits them into rivers, lakes and coastal waters or introduces them into ground water.

"non-storm water" – Non-storm water consists of all discharges to and from a storm water conveyance system that do not originate from precipitation events (i.e., all discharges from a conveyance system other than storm water). Non-storm water includes illicit discharges, non-prohibited discharges and NPDES permitted discharges. An illicit discharge is defined at 40 CFR 122.26(b)(2) as any discharge to a MS4 that is not composed entirely of storm water except discharges pursuant to a separate NPDES permit and discharges resulting from emergency fire fighting activities.

NPDES (National Pollutant Discharge Elimination System) – Permits issued under Section 402(p) of the CWA for regulating discharge of pollutants to Waters of the U.S.

"nuisance" – As defined in the Porter-Cologne Water Quality Control Act a nuisance is "anything which meets all of the following requirements:

1) Is injurious to health, or is indecent, or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.
2) Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.
3) Occurs during, or as a result of, the treatment or disposal of wastes."

Order

In the Whitewater Region: Order No. 01-077 (NPDES No. CAS617002)

In the Santa Ana Region: Order No. R8-2002-0011 (NPDES No. CAS618033)

In the Santa Margarita Region: Order No. 98-02 (NPDES No. CAS0108766), currently in revision.

Permit Area -

In the Whitewater Region: "The urbanized areas that lie approximately between the San Gorgonio Pass area to the northwest and the Salton Sea to the southeast. The majority of this area is in the Coachella Valley. The generally northwest-southeast trending Coachella Valley is in the northern portion of a large low area in the Colorado Desert known as the Salton Basin with major drainage to the Salton Sea. The San Jacinto Mountains bound the Coachella Valley on the southwest, and the San Gorgonio Mountains, Indio Hills and Mecca Hills bound the Coachella Valley on the northeast side. Major drainage is through the Whitewater River, and its tributaries, which reach the northern end of the Salton Sea. The headwaters of the Whitewater River originate from Mt. San Gorgonio. The valley surface is characterized as wide, boulderly, alluvial fans and sand dunes."

In the Santa Ana Region: "The portion of the Santa Ana River Watershed that is within the County of Riverside and identified on Appendix 1 as 'Urban Area' and those portions of 'Agriculture' and 'Open Space', as identified on Appendix 1, that do convert to industrial, commercial, or residential use during the term of the Order."

In the Santa Margarita Region: "The permitted area is delineated by the Santa Ana RWQCB-SDRWQCB boundary line on the north, the SDRWQCB-Colorado River Basin RWQCB boundary line on the east, and the County of Riverside boundary line on the south and west."

Permittees - Co-Permittees and the Principal Permittee

"point source" – Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operations, landfill leachate collection systems, vessel, or other floating craft from which pollutants are or may be discharged.

"pollutant" – A pollutant is broadly defined as any agent that may cause or contribute to the degradation of water quality such that a condition of pollution or contamination is created or aggravated.

Pollutants of Concern – A list of potential pollutants to be analyzed for in the Monitoring and Reporting Program. In developing this list, consideration should be given to the chemicals and potential pollutants available for storm water to pick-up or transport to Receiving Waters, all pollutants for which a waterbody within the Permit Area that has been listed as impaired under CWA Section 303(d)), the category of development and the type of pollutants associated with that development category.

"pollution" – As defined in the Porter-Cologne Water Quality Control Act, pollution is the alteration of the quality of the Waters of the U.S. by waste, to a degree that unreasonably affects either of the following: A) the waters for beneficial uses; or 2) facilities that serve these beneficial uses. Pollution may include contamination.

POTW – Publicly-Owned Treatment Works

Principal Permittee - Riverside County Flood Control and Water Conservation District.

Rainy Season – October 1 through May 31st of each year.

RCFC&WCD - Riverside County Flood Control and Water Conservation District

"receiving water(s)" – The Waters of the U.S. that includes surface and ground waters.

Receiving Water(s) - The receiving waters within the Permit Area

Receiving Water Limitations – Receiving Water Limitations are requirements included in Orders issued by a Regional Board to assure that the regulated discharges do not violate water quality standards established in the Basin Plan at the point of discharge to Waters of the U.S. Receiving Water Limitations are used to implement the requirement of CWA Section 301(b)(1)(C) that NPDES permits must include any more stringent limitations necessary to meet water quality standards.

Receiving Water Quality Objectives - Water quality objectives specified in a Basin Plan for Receiving Waters.

Region

In the Whitewater Region: Whitewater River Watershed within Riverside County and within the Principal Permittee's jurisdiction.

In the Santa Ana Region: Santa Ana River Watershed within Riverside County

In the Santa Margarita Region: Santa Margarita River Watershed within Riverside County

Regional Board

In the Whitewater Region: California Regional Water Quality Control Board, Colorado River Region

In the Santa Ana Region: California Regional Water Quality Control Board, Santa Ana Region

In the Santa Margarita Region: California Regional Water Quality Control Board, San Diego Region

Riverside County - Territory within the geographical boundaries of the County.

"sediment" – Soil, sand, and minerals washed from land into water. Sediment resulting from anthropogenic sources (i.e. human induced land disturbance activities) is considered a pollutant. This Order regulates only the discharges of sediment from anthropogenic sources and does not regulate naturally occurring sources of sediment. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud waters so that sunlight does not reach aquatic plants.

"source control BMPs" – In general, activities or programs to educate the public or provide low cost non-physical solutions, as well as facility design or practices aimed to limit the contact between pollutant sources and stormwater or authorized non-storm water. Examples include: activity schedules, prohibitions of practices, street sweeping, facility maintenance, detection and elimination of illicit connections and illegal dumping, and other non-structural measures. Facility design examples include providing attached lids to trash containers, or roof or awning over material and trash storage areas to prevent direct contact between water and pollutants. Additional examples are provided in Section 4 of Supplement A to the **DAMP** dated April 1996.

State Board - California State Water Resources Control Board

"storm water" – Runoff from urban, open space, and agricultural areas consisting only of those discharges that originates from precipitation events. Storm water is that portion of precipitation that flows across a surface to the MS4 or receiving waters. Examples of this phenomenon include: the water that flows off a building's roof when it rains (runoff from an impervious surface); the water that flows into streams when snow on the ground begins to melt (runoff from a semi-pervious surface); and the water that flows from a vegetated surface when rainfall is in excess of the rate at which it can infiltrate into the underlying soil (runoff from a pervious surface). During precipitation events in urban areas, rain water picks up and transports pollutants through storm water conveyance systems, and ultimately to Waters of the U.S.

TDS - Total dissolved solids.

TMDL (Total Maximum Daily Load) – TMDL is the maximum amount of a pollutant that can be discharged into a water body from all sources (point and non-point) and still maintain water quality standards. Under CWA Section 303(d), TMDLs must be developed for all water bodies that do not meet water quality standards after application of technology-based controls.

"toxicity" – Adverse responses of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

TSS - Total suspended solids.

Urban Runoff – Urban Runoff includes those discharges from residential, commercial, industrial, and construction areas within the Permit Area and excludes discharges from feedlots, dairies, farms, and open space. Urban Runoff discharges consist of storm water and non-storm water surface runoff from drainage sub-areas with various, often mixed, land uses within all of the hydrologic drainage areas that discharge into the Waters of the U. S. In addition to Urban Runoff, the MS4s regulated by this Order receive flows from agricultural activities, open space, state and federal properties and other non-urban land uses not under the control of the Permittees. The quality of the discharges from the MS4s varies considerably and is affected by, among other things, past and present land use activities, basin hydrology, geography and geology, season, the frequency and duration of storm events, and the presence of past or present illegal and allowed disposal practices and illicit connections.

The Permittees lack legal jurisdiction over storm water discharges into their respective MS4s from agricultural activities, California and federal facilities, utilities and special districts, Native American tribal lands, wastewater management agencies and other point and non-point source discharges otherwise permitted by or under the jurisdiction of the Regional Board. The Regional Board recognizes that the Permittees should not be held responsible for such facilities and/or discharges. Similarly, certain activities that generate pollutants present in Urban Runoff are beyond the ability of the Permittees to eliminate. Examples of these include operation of internal combustion engines, atmospheric deposition, brake pad wear, tire wear, residues from lawful application of pesticides, nutrient runoff from agricultural activities, and leaching of naturally occurring minerals from local geography.

USEPA - United States Environmental Protection Agency

Waste Discharge Requirements – As defined in Section 13374 of the California Water Code, the term "waste discharge requirements" is the equivalent of the term "permits" as used in the Federal Water Pollution Control Act, as amended. The Regional Board usually reserves reference to the term "permit" to Waste Discharge Requirements for discharges to surface Waters of the U.S.

Water Code - California Water Code

Waters of the U.S. – Waters of the U.S. can be broadly defined as navigable surface waters and all tributary surface waters to navigable surface waters. Groundwater is not considered to be a Waters of the U.S. As defined in 40 CFR 122.2, the Waters of the U.S. are defined as: (a) All waters, which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (b) All interstate waters, including interstate "wetlands;" (c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation or destruction of which would affect or could affect interstate or foreign commerce including any such waters: (1) Which are or could be used by interstate or foreign travelers for recreational or other purposes; (2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (3) Which are used or could be used for industrial purposes by industries in interstate commerce; (d) All impoundments of waters otherwise defined as Waters of the U.S. under this definition**:** (e) Tributaries of waters identified in paragraphs (a) through (d) of this definition; (f) The territorial seas; and (g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition. Waters of the U.S. do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the USEPA.

"water quality objectives" – Numerical or narrative limits on constituents or characteristics of water designated to protect designated beneficial uses of the water [California Water Code Section 13050 (h)]. California's water quality objectives are established by the State/Regional Water Boards in the Water Quality Control Plans.

As stated in the Porter-Cologne requirements for discharge (CWC 13263): "(Waste discharge) requirements shall implement any relevant water quality control plans that have been adopted, and shall take into consideration the beneficial uses to be protected, the water objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Section 13241."

Numeric or narrative limits for pollutants or characteristics of water designed to protect the beneficial uses of the water. In other words, a water quality objective is the maximum concentration of a pollutant that can exist in a Receiving Water and still generally ensure that the beneficial uses of the Receiving Water remain protected (i.e., not impaired). Since water quality objectives are designed specifically to protect the beneficial uses, when the objectives are violated the beneficial uses are, by definition, no longer protected and become impaired. This is a fundamental concept under the Porter Cologne Act. Equally fundamental is Porter Cologne's definition of pollution. A condition of pollution exists when the water quality needed to support designated beneficial uses has become unreasonably affected or impaired; in other words, when the water quality objectives have been violated. These underlying definitions (regarding beneficial use protection) are the reason why all waste discharge requirements implementing the federal NPDES regulations require compliance with water quality objectives. (Water quality objectives are also called water quality criteria in the CWA.)

"water quality standards" – are defined as the water quality goals of a waterbody (or a portion of the waterbody) designating beneficial uses (e.g., swimming, fishing, municipal drinking water supply, etc.,) to be made of the water and the water quality objectives or criteria necessary to protect those uses.

"watershed" – That geographical area which drains to a specified point on a watercourse, usually a confluence of streams or rivers (also known as drainage area, catchments, or river basin).

APPENDIX J

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Attachment C

(Monitoring Annual Report)

Parameters Analyzed within the Current SMR MS4 Monitoring Program

Alkalinity, Total (CaCO3) (#1035) No BPO

Alkalinity measures the ability of a solution to neutralize hydrogen ions and is expressed in terms of an equivalent amount of calcium carbonate. Alkalinity may indicate the presence of carbonates, bicarbonates, hydroxides, and to a lesser extent borates, silicates, phosphates, and organic substances. Waters with pH values between 7 and 8 and having a total alkalinity of 100 to 120 mg/L or more serve as a buffer to help prevent any sudden change in pH value, which could harm fish and other aquatic life. Some natural waters, especially those in the southwestern U.S., are highly alkaline. The alkalinity of streams can also be increased by the addition of municipal sewage and many industrial wastes.

Although seasonal or cyclic variation in the data is likely, there were no significant changes in the total alkalinity data during the 2004-2005 reporitng period.

Ambient Air Temperature (#1017, °C; #1018, °F) No BPO

Air temperature can affect water temperature, which can, in turn affect the concentration of dissolved oxygen and un-ionized ammonia. Drinking water standards for fluoride are based on maximum daily air temperatures. Benthic organisms may not thrive as well in warmer climates.

Ambient air temperature was recorded primarily between 1998 and 2001. No trends are evident other than obvious seasonality, with higher temperatures occurring during the summer.

Ammonia-nitrogen (#1051) No BPO

Ammonia may be found naturally in surface or ground waters from the decomposition of nitrogenous organic matter, being one of the constituents of the complex nitrogen cycle. Rivers known to be unpolluted have very low ammonia concentrations, generally less than 0.2 mg/L as N. Ammonia may be discharged in industrial wastes. Ammonia is also a component of fertilizer and urine, and its presence may indicate agricultural use or overapplication in domestic and recreational areas.

For the Tributary Stations, three samples were below the detection limit (RDL = 0.1 mg/l), and the remaining samples were below 0.5 mg/l.

Arsenic (#1070) BPO = 0.05 mg/l
CTR = 150 µg/l

Elemental arsenic may be found to a small extent in nature mostly as the arsenides of true metals or pyrites. Its major use, however, is as a component of pesticides (insects, weeds, fungi) and as a wood preservative.

Arsenic was detected at Tributary Station No. 768 and Triad Station No. 188 and 788, however, the detected levels were below the BPO and CTR

Bacteria; Fecal coliforms (#1075) BPO = 200 or 2000 MPN, site-specific

Coliform organisms are intestinal bacteria that originate in excretions from humans, mammals, amphibians, and birds. They are also found, primarily in the non-fecal forms on fibrous and vegetable matter in the water. More coliforms are discharged by healthy individuals than by sufferers of diarrhea.

Levels detected above Basin Plan Objective in fecal colifom counts were noted at all Triad stations during the October 2004 and February 2005 storm events, however, fecal coliform concentrations were measured at levels less than the BPO during the October 2004 wet weather event and all dry weather events for the reporting period.

For the Tributary Stations, Fecal Coliform bacteria was detected at a level above the BPO at stations 397, 768, and 780 during two storm events. Station 786, Redhawk Channel, had a concentration greater than the BPO during the June 2005 dry weather monitoring event. Fecal coliforms were measured as less than the BPO for the remaining events dry and wet weather monitoring events during the reporting period.

Bacteria; Total coliforms (#1085) No BPO
Bacteria; E. coli (#1077) No BPO

High levels of both total coliforms and E. coli have been noted at all stations.

Bacteria; Fecal streptococci (#1080) No BPO

Fecal streptococci is considered a useful indicator of potential pathogen contamination by intestinal wastes as this group of bacteria is characteristic of fecal pollution, they do not multiply in surface waters, and they rarely occur in surface soil or on vegetation (unless contaminated by sewage). Primary sources of bacteria include agricultural drainage, feeding pens, grazing areas, and sanitary sewer and septic tank leaks.

Fecal streptococci were monitored only between 1993 and 1996.

Barium (#1090) BPO = 1 mg/l

Barium is not normally present in natural surface or ground waters. Industrial uses of barium and its salts include metallurgy, paint manufacturing, cement production (for mixtures designed to withstand salt water), and in ceramic and glass manufacturing.

During the 2004 – 2005 reporting period, the detected concentrations of Barium were below the Basin Plan Objective at both the Tributary and Triad stations.

Beryllium (#1120) BPO = 0.004 mg/l

Beryllium is relatively rare and not likely to occur in natural waters. Industrial uses of beryllium include metallurgy, manufacturing of X-ray diffraction tubes and electrodes for neon signs, and nuclear reactors.

Beryllium was not detected at the Triad Stations during the first wet weather monitoring event of the reporting period. For the Tributary Stations, Beryllium was reported as less than the RDL, (i.e. “Not Detected”) during all monitoring events, however, the analytical laboraotry’s RDL is greater than the BPO. Therefore, during the next reporting period, the District shall instruct the laboratory to establish a RDL that is less than the BPO.

Bicarbonate (HCO_3^-) (#1125) No BPO

Bicarbonates contribute to the alkalinity of water, or the capacity of water to neutralize acids. Bicarbonates have many natural and industrial sources. Natural sources include absorption of carbon dioxide from the air and the decomposition of organic materials. Bicarbonates are one of the most commonly used salts in industry. Although not generally considered environmentally harmful, bicarbonates can add to the salinity and total solids content of water.

Concentrations are generally higher in dry weather. The patterns and trends in the bicarbonate data are almost identical to those of alkalinity. There may be seasonal or cyclic variation in the data. For the Redhawk Channel, a long-term increasing trend in hardness was evident, although the 2003-2004 and 2004-2005 concentrations were significantly lower than the previous data collected from 1993 through 2002. A long-term increasing trend is evident at the Lower Murrieta Creek station.

Boron (#1135) BPO = 0.75 mg/l

Boron in nature is found as sodium borate (borax) or as calcium borate (colemanite) in mineral deposits and natural waters of Southern California. Industrial uses of boron, boron salts, or boric acid include metallurgy (to harden metals), weatherproofing of wood, fireproofing fabrics, glass and porcelain manufacturing, production of leather and carpets, cosmetics, photography, and artificial gems, and as a bactericide, fungicide, or detergent.

Although levels above the BPO had been noted in the past at the Redhawk Channel, during the 2004-2005 monitoring period Boron levels were less than the BPO during the dry weather sampling event. The Lower Murrieta Creek station had an increasing trend but concentrations have been lower since 2003, and no concentrations above the BPO were noted at this station during the 2004-2005 reporting period.

Cadmium (#1145) BPO = 0.005 mg/l
CTR = 2.2 µg/l

Cadmium has many industrial uses, including metallurgy, electroplating, ceramics, pigmentation, photography, textile printing, and nuclear reactors. Cadmium salts are sometimes employed as insecticides and antihelminthics. Cadmium can concentrate in the liver, kidneys, pancreas, and thyroid of humans and animals, and tends to persist.

Although levels above regulatory goals had been noted in the past at the Redhawk Channel, total cadmium was not detected during the 2003-2004 and 2004 – 2005 reporting period. At the Triad Stations, total cadmium was either not detected or detected at a level well below the BPO and CTR during all dry and wet weather sampling events.

Calcium (#1150) No BPO

Calcium is typically found as a salt or in the ionic form. Natural sources include leaching from soil or decomposition of skeletal remains. They may also be found in sewage and many types of industrial wastes.

Trends and patterns in calcium concentration resemble those of bicarbonate, alkalinity, and hardness. There may be seasonal or cyclic fluctuations in the data during the 2004-2005 reporting period.

Carbon, total organic (TOC) (#1155) No BPO

Organic carbon is not in itself a pollutant, but is an indicator of pollution and benthic deposits. In the TOC test, the carbon in the sample is oxidized by dichromate or another strong oxidizing agent.

Most of the concentrations are below 20 mg/l.

Carbonate (CO_3) (#1160) No BPO

Carbonate concentration in water is a function of temperature, pH, cations, and other dissolved salts. Carbonate salts may be removed from polluted waters by precipitation and adsorption

During the 2004-2005 reporting period, results were reported as below the detection limit (RDL = 3 mg/l). An elevated value was noted in the Redhawk Channel station in early 2004, which may be due to the fires that occurred in late 2003.

Chloride (#1165) BPO = 300 mg/l

Natural sources of chloride include dissolution from minerals or seawater intrusion. Industrial sources include agricultural use, human and animal sewage, paper manufacturing, galvanizing plants, water softening plants, oil wells, and petroleum refineries. Chlorine is a commonly-used disinfectant in water treatment.

During the 2004-2005 reporting period, results were reported as less than the BPO at both the tributary and triad station.

Chlorpyrifos (#1178) No BPO

Chlorpyrifos is an organophosphate pesticide. EPA reports it as one of the most widely used organophosphate insecticides in the United States. It is used on more than 40 agricultural crops, in non-agricultural settings as a termiticide, in homes, lawns, and offices, and on pet collars. Its use is considered a risk to children.

For the Triad stations, all concentrations were measured as below 0.03 µg/l. Except at Station No. 397, concentrations are for the most part consistently below 0.04 µg/l.

Chromium, all valences (#1180) BPO = 0.05 mg/l

CTR = 180 µg/l (trivalent), 11 µg/l (hexavalent)

Chromium wastes occur mostly in the hexavalent form. Industrial sources of hexavalent chromium include metal pickling and plating operations, aluminum anodizing, leather tanning, cooling water antifouling, and in the manufacture of paints, dyes, explosives, ceramics, and paper. Industrial sources of trivalent chromium salts include textile dyeing, ceramic and glass manufacturing, and in photography.

During the 2004-2005 reporting period, only Redhawk Channel and Murrietta Creek reported non-detectable (RDL = 20 µg/l) levels. The remaining Triad stations had detectable levels of total chromium. Of these, levels above the regulatory goals were only measured at Cole Creek and Temecula Creek during wet weather monitoring events. In the FY2003-04 reporting period, levels above regulatory goals were noted at the Cole Creek (reference station) and Santa Margarita River stations. These levels may be due to the fires that occurred during late 2003.

Chromium, hexavalent (#1185)

During the 2004-2005 reporting period, Hexavalent Chromium was reported as less than the laboratory's RDL, however, the laboratory's established RDL is greater than the CTR. Therefore, during the next reporting period, the District shall instruct the laboratory to establish a RDL that is less than the CTR.

Color (#1195) BPO = 0.05 units

There are numerous natural sources of color in water including breakdown of minerals (especially those containing iron or manganese compounds) or vegetable matter, humus, peat, tannins, algae, weeds, and protozoa. Industrial sources include irrigation return water, nailworks, mining, refining, and manufacture of explosives, pulp and paper, and chemicals. It can be expected that waters flowing through erodible soils, such as those found in the Santa Margarita River Watershed, will have a detectable color concentration.

Levels above regulatory goals were measured at the Redhawk Channel station during a dry weather sampling event and at all Triad stations during both wet weather and dry weather sampling events. As many of the waterbodies in the watershed are in their natural state, levels above regulatory goals alone cannot be considered indicative of water quality impacts. Other parameters must be considered in concert with color.

Conductance, specific (#1200, field; #1205, lab) No BPO

Specific conductance measures the ion concentration of water. Increased conductivity increases the osmotic pressure of water, which can be harmful to aquatic organisms. Natural inland waters usually contain small quantities of mineral salts in solution, but waters containing brine, chemical, and agricultural irrigation wastes may have excessive levels of specific conductance.

There may be seasonal or cyclic fluctuations in the data. Concentrations tend to be higher during dry weather.

Copper (#1210) BPO = 1 mg/l
CTR = 9 µg/l

Copper salts are not commonly found in natural surface waters. Industrial sources of copper include corrosion of copper and brass tubing, copper compounds used to control undesirable plankton organisms, alloy production, electrical wiring, pipes, roofing, and many purposes where its conductivity or corrosion resistance are important. Copper salts are used in textile processing, pigmentation, tanning, photography, engraving, electroplating, insecticides, fungicides, and many other industrial processes.

During the 2004-2005 reporting period, Copper concentrations at all of the Triad and Tributary stations were never measured at levels above the Basin Plan Objective, however, levels were detected above the CTR at a number of the Triad and Tributary stations during both wet and dry weather monitoring events.

Cyanide, total (#1215) BPO = 0.2 mg/l
CTR = 5.2 µg/l

Cyanides may be found in effluents from gas works and coke ovens, from the scrubbing of gases at steel plants, from metal cleaning and electroplating processes, and from chemical industries.

Cyanide concentrations have never been detected at levels above the Basin Plan Objective, and is often below the detection limit (RDL = 5 µg/l). Cyanide has not been monitored since 1994.

Detergent – MBAS (#1225) BPO = 0.5 mg/l

Surface-active agents such as soaps, detergents, emulsifiers, wetting agents, and penetrants lower the surface tension or other interfacial properties of their solvents. This allows dirt to be removed from clothing and for greater absorptions of pesticides into their target organisms.

No levels above regulatory objectives have been noted at any station since 1997.

Diazinon (#1227) No BPO

Diazinon is an organophosphate pesticide. EPA reports it as one of the most widely used organophosphate insecticides in the United States. It is used on more than 60 agricultural crops, in non-agricultural settings as a termiticide, and in homes, lawns, and offices. Its use is considered a risk to humans, birds, and other forms of wildlife.

Diazinon concentrations were relatively unchanged during the 2004-2005 reporting period. No long-term trend is evident in the data.

Discharge Level (Hydron # 232) No BPO

Also known as the flow rate, high discharge rates may cause erosion in an earthen channel. Discharge is used along with chemical concentration to calculate mass loading. In a well-defined channel, the water level, along with the rating curve, can be used to calculate the flow rate.

As discussed in the main body of this Section, outfall discharge rates during dry weather are very low to nonexistent during dry weather and there are almost no flows in the receiving waters. At the bottom of the watershed, approximately ¼ - ½ mile from their confluence with the Santa Margarita River, surfacing bedrock forces groundwater to rise, creating perennial flows. Where there are dry-weather flows, there has not been a significant change over time. Observing trends in flows near the bottom of the watershed are confounded by the continual addition of imported flows and well blowoff by the Rancho California Water District.

Wet weather flows depend on the size and duration of the storm, the antecedent moisture condition (e.g., moisture content of the soil prior to the storm), and the rate at which the rain falls.

Total Anions (#1675) No BPO
Total Cations (#1680) No BPO
Electrochemical Balance (#1235) No BPO

If positive, there are more cations than anions in the sample, and if negative, there are more anions.

The electrochemical balance generally ranges between -2 mg/l and 2 mg/l.

Fluoride (#1255) BPO = 1 mg/l

Fluoride may be found in natural waters, its value in preventing tooth decay being based on observations that people living in areas with elevated levels had lower rates of tooth decay. Industrial sources of fluoride include insecticide manufacture and use, brewery apparatus disinfection, as a flux in steel manufacturing, wood and mucilage preservation, glass and enamel manufacturing, chemical industries, and for water treatment. It not normally found in industrial wastes. Drinking water standards are based on maximum daily air temperatures.

Levels above regulatory objectives have been noted at the Redhawk Channel station during dry weather, although a decreasing trend is evident in the data. Concentrations tend to be higher during dry weather.

Hardness, total (as $CaCO_3$) (#1265) No BPO

Hardness measures the presence of the following ions, converted to an equivalent concentration of $CaCO_3$:

Ca^{+2}	HCO_3^-
Mg^{+2}	SO_4^{-2}
Na^+	Cl^-
K^+	

Analysis of specific ions are included elsewhere in this section.

Hardness in water may be caused by the natural accumulation of salts (primarily calcium and magnesium ions) from contact with soil and geological formations. Industrial sources include tannery wastes and irrigation return flows. Imported water may also be a source of elevated hardness levels, for example, Colorado River Water has an average hardness of 250-300 mg/L, which is considered hard water.

Trends and patterns in hardness concentration resemble those of calcium and magnesium. There may be seasonal or cyclic fluctuations in the data. Overall, during the 2004-2005 reporting period, there were no significant changes in the hardness concentration trends among the tributary and triad stations.

Hydrocarbons, total petroleum (#1270) No BPO

Industrial sources of petroleum hydrocarbons include those involved in the production, transportation, handling, and use of oil, such as oil wells, oil-loading points, refineries, railroads, civic dumps, salvage dumps, gas stations, and garages.

Total petroleum hydrocarbons were measured at below the detection limit (RDL = 1 mg/L) at both the Redhawk Channel station and at the Murrietta Creek station.

Hydroxide (OH) (#1275) No BPO

Hydroxides contribute to the alkalinity of water. It is not present in to an appreciable degree in natural waters. Industrial sources of hydroxide includes tanneries, soda and sulfate pulping mills, and textile mills.

Hydroxide has never been detected at any of the monitoring stations.

Iron (#1285) BPO = 0.3 mg/l

Iron may be found naturally from the corrosion of iron in mineral deposits and iron-bearing ground water. Industrial sources include pickling operations, acid-mine drainage, and corrosion from iron pipes and other materials.

Levels above the regulatory objective have been noted in the past at all stations. Iron was detected at the tributary stations at levels ranging from 0.16 mg/L to 90 mg/L. The higher detections were measured during storm event sampling.

Lead (#1290) No BPO
CTR = 2.5 µg/l

Lead is a harmful substance that can lead to neurological damage. Natural sources of lead in water include leaching from mountain limestone and galena. Industrial sources of lead include mining effluents, and use in solder in electronics and piping.

Lead was detected at levels above the CTR at all Triad stations during the wet weather events and it was also detected at levels above the CTR at the Murrieta Creek station during two dry weather sampling events. There was one sample that was detected above regulatory goals at the Long Canyon Creek tributary station during the first storm event of the monitoring period. Furthermore, there were two instances where levels were detected above the CTR during dry weather events at a Triad and a Tributary station, however, these levels are due to the fact that the laboratory's established RDL was greater than the CTR. The laboratory will be instructed to establish a RDL for lead that is less than the CTR.

Magnesium (#1300) No BPO

Magnesium ions are present in significant concentrations in natural waters, and along with calcium form the bulk of the hardness reaction. Industrial sources of magnesium include light alloy and other metallurgical production, and in the manufacture of electrical and optical apparatus. Magnesium may also be present in pesticides.

Trends and patterns in magnesium concentrations resemble those of hardness. There may be seasonal or cyclic fluctuations in the data. Overall, during the 2004-2005 reporting period, there were no significant changes in trends already established for the tributary and Triad stations.

Manganese (#1305) BPO = 0.05 mg/l

Manganese ions are rarely found in natural surface waters above a concentration of 1.0 mg/L. Industrial sources of manganese include manufacture of steel alloys, dry-cell batteries, glass and ceramics, paints and varnished, inks and dyes, matches and fireworks, and in agriculture to enrich manganese-deficient soils.

Manganese was not monitored at any of the Triad stations during the 2004-2005 reporting period. At the tributary stations, detected concentrations for Manganese ranged from 0.03 mg/L to 1.1 mg/L.

Mercury (#1310) BPO = 0.002 mg/l

Mercury can appear in the metallic state in some natural waters, but the ionic form is most harmful to aquatic life. Industrial sources of mercury include use in scientific and electrical instruments, in dentistry, in power generation, in solders, in the manufacture of lamps and batteries, and in the improper disposal of thermostat switches and old thermometers and manometers.

Mercury was not detected at the Redhawk Channel station or at any of the Triad monitoring stations during the 2004-2005 reporting period. A single detection occurred at the Empire Creek Channel station in 1997.

Nickel (#1320) BPO = 0.1 mg/l
CTR = 52 µg/l

Nickel as a pure metal it is not a problem as it is not soluble in water. Many nickel salts, however, are highly soluble in water. Industrial uses of nickel salts include the metal-plating industry.

During the 2004-2005 reporting period, Nickel was detected at concentrations below the BPO and CTR at all Triad stations and during all wet and dry weather monitoring events. Although a detection above regulatory goals occurred at the Redhawk Channel station in early 2003, during the 2004-2005 reporting period, Nickel was not detected at this station.

Nitrogen, Nitrate (N) (#1340) BPO = 10 mg/l

Nitrates are an essential fertilizer for plant life, and are therefore rarely found in natural surface waters at high concentrations. Nitrates may also be present in groundwaters as a result of excessive application of fertilizer or cesspool or septic tank leachate. Industrial uses of nitrogen include chemical fertilizer production, field application of fertilizer, livestock sewage, and irrigated agriculture.

Nitrate-Nitrogen was detected at a concentration greater than the BPO during a dry weather and a wet monitoring event at the Temecula Creek station. There were no other results with detections above the BPO at any of the remaining Triad stations during the 2004-2005 reporting period. There was one sample with a detection above the BPO at the Redhawk Channel station during a dry weather monitoring event.

Nitrogen; Nitrite (N) (#1345) No BPO

Nitrites are usually quickly oxidized to nitrates by bacterial action in natural waters and are therefore seldom found at significant concentrations. The presence of nitrite alone does not always signify the presence of pollution, but in conjunction with ammonia and nitrate, often indicate pollution.

Most concentrations are below the detection limit (RDL = 0.1 mg/l) at the Triad stations and at the Murrieta Creek station.

Nitrogen; Organic (N) (#1350) No BPO

High organic nitrogen concentrations may indicate the presence of treated effluent or manure-based wastes.

Most concentrations are below 4 mg/l.

Nitrogen; Total (N) (#1355) BPO = 1 mg/l

Nitrogen is present in natural and polluted waters as ammonia, organic nitrogen, nitrites, and nitrates. The total concentration of nitrogen is not as important as the form in which it exists. Organic nitrogen, amino acids, and ammonia may inhibit biological growth whereas nitrates stimulate phytoplankton. The various components of total nitrogen are discussed under separate headings.

Overall, during the 2004-2005 reporting period there have been no significant fluctuations in the detected total nitrogen results among the tributary as well as the Triad stations.

Nitrogen; total inorganic (N) (#1365) No BPO

Total inorganic nitrogen is the sum of ammonia, nitrate, and nitrite as nitrogen.

Total inorganic nitrogen was reported only in 1994 and 1995. The separate components of total inorganic nitrogen are reported elsewhere in this section.

Nitrogen; total Kjeldahl (N) (#1360) No BPO

High total Kjeldahl nitrogen concentrations may indicate the presence of treated effluent or manure-based wastes.

Trends and patterns in total Kjeldahl nitrogen concentrations resemble those of organic nitrogen. Total Kjeldahl nitrogen was detected at a concentration of 12 mg/L at the Temecula Creek station. This concentration was measured during the second storm event of the reporting year and represents a significant increase. The remaining detected results from the tributary and Triad stations are below 4 mg/l.

Nitrogen; un-ionized ammonia (N) (#1370) BPO = 0.025 mg/l

No info

Levels greatere than the BPO have been noted at the Redhawk Channel, Cal Oaks Channel, Upper Murrieta Creek, and Wildomar Channel stations. Un-ionized ammonia has not been monitored since 1995.

Odor (#1375) BPO = 0 TON

Industries that may generate odor-causing wastes include: pulp and paper; explosives; petroleum, gasoline, and rubber; wood distillation; coke and coal tar; gas; tanneries, meat-packing and glue; chemicals and dyes; and milk products, canneries, beet-sugar, distillation and other food products.

Odor is reported in terms of "threshold odor number" (TON) which is calculated from the amount of sample in the most diluted portion giving perceptible odor. The threshold odor number equals the volume of the dilution divided by the volume of the sample in the dilution.

It is frequently difficult, if not impossible, to identify the specific cause of an odor or taste, as many substances may cause what appears to be the same effect, or because mixtures of substances may be involved. Chemicals responsible for tastes and odors may include halogens, sulfides, ammonia, turpentine, phenols and cresols, picrates, various hydrocarbons and unsaturated organic compounds, mercaptans, tar and tar oils, hydrocarbons, detergents, pesticides, and innumerable others, many of unknown identity.

All of the odor levels at the Tributary stations and the Murrieta Creek Triad station are below the detection limit (RDL = 1 TON). Levels above the BPO have been observed at the Santa Margarita River, Redhawk Channel, Lower Murrieta Creek, Empire Creek Channel, Cal Oaks Channel, and Wildomar Channel stations. An increasing trend is evident at the Cal Oaks Channel and Santa Margarita River stations. As many of the waterbodies in the watershed are in their natural state, levels above regulatory goals alone cannot be considered indicative of water quality impacts. Other parameters must be considered in concert with odor.

Oil & Grease (#1380) No BPO

Oil and grease in water may coat aquatic life and create undesirable odors. Industrial sources of oil and grease include all aspects of the petroleum industry, packing plants, slaughter houses, rendering plants, cotton seed processing plants, textile mills, milk-processing plants, chemical works, machining operations, and garages.

All of the concentrations at the tributary stations and at the Murrieta Creek Triad station are below the detection level (RDL = 2.55 mg/l).

Organics; BNA extractable (625) (#1385) No BPO

BNA stands for Base/Neutral and Acid extractible. Also referred to as polyaromatic hydrocarbons (PAHs).

Method 625 was monitored in 1994 as part of the screening prior to obtaining Board Order No. 98-02 and then again during the current reporting period at the Triad monitoring stations. PAHs were not detected, (RDL = 10 µg/l), at any of the Triad stations during the 2004-2005 reporting period.

Organics; purgeable halocarbons (624) (#1410) No BPO

No info

Monitored only in 1994 as part of the screening prior to obtaining Board Order No. 98-02. It was not detected (RDL = 10 µg/l).

Oxygen Demand, Biochemical (BOD) (#1425) No BPO

In itself, BOD is not a pollutant and does not directly cause environmental harm. When dissolved oxygen is depressed to harmful levels, BOD will indirectly exacerbate the effects of diminished oxygen. BOD does not indicate the presence of a single substance, but measures the effect of a combination of substances and conditions.

Most BOD concentrations have been below 40 mg/l, and since 1999, most have been below 20 mg/l. Furthermore, during the 2004-2005 reporting period, the BOD concentrations measured at the Triad and tributary stations were below 5.0 mg/L.

Oxygen Demand, Chemical (COD) (#1430) No BPO

The COD test measures the organic strength of domestic, agricultural, and industrial wastes, but it does not differentiate between the biologically oxidizable (could be taken up by fish and plants) and biologically inert organic matter.

Most COD concentrations are below 100 mg/l.

Oxygen, dissolved (#1435) BPO = 5 mg/l

Dissolved oxygen concentration is a function of the temperature and salinity of the water. Increasing temperature or salinity decreases the oxygen-holding capacity of water. Dissolved oxygen is not constant in a natural system, as organisms, chemical reactions, and physical conditions use or generate oxygen at various rates. As dissolved oxygen levels decrease, aquatic life suffers or dies, and in the absence of oxygen, anaerobic decomposition may lead to unfavorable odors and colors in the water.

During the 2004-2005 monitoring period, dissolved oxygen was measured at a level greater than 5 mg/l at all of the Triad and Tributary stations.

Oxygen; field saturation (#1445) No BPO

Oxygen saturation is a function of air oxygen pressure, water temperature, and dissolved solids present. Oxygen solubility is higher in fresh waters than in saline waters.

Field saturation oxygen was measured between 1995 and 1998. Values ranged from 40% to 170% of saturation. Dissolved oxygen is a better measure of oxygen levels in the water and gives a direct concentration reading.

pH (#1705, field; #1710, lab) BPO = 6.5 to 8.5 units

pH is not a pollutant in itself, but an indicator of pollution. Natural waters and treated sewage is usually neutral or slightly alkaline, but many industrial wastes are strongly acidic or alkaline. Acid wastes include tan liquors, acid dyes, coal-mine drainage, sulfite waste liquors, pickling liquors, and some brewery wastes. Alkaline wastes include soda- and sulfate-pulp rinse waters, laundry wastes, and bottle wash waters.

Field and lab pH levels outside the limits of the BPO have been noted at the Redhawk Channel, Gertrudis Creek, and Warm Springs Creek. Furthermore, all levels wre within range at the Triad stations.

Phenols (#1460) No BPO

Phenols are widely used as disinfectants, in the manufacture of synthetic resin, medical, and industrial compounds, and as a reagent for chemical analyses. Sources of phenolic wastes include the distillation of wood, coke ovens, oil refineries, chemical plants, sheep dips, and human and animal refuse.

Most of the concentrations are below the detection limit (RDL = 0.02 mg/l), and many concentrations have been below 0.1 mg/l.

Phosphorus, organic (P) (#1475) No BPO

Organic phosphorus is phosphorus that is bound to plant or animal tissue.

Organic phosphorus was measured between 1994 and 1995. Many of the concentrations were below the detection limit (RDL = 0.05 mg/l), and most detected concentrations were below 0.4 mg/l.

Phosphates, ortho (P) (#1480) No BPO

Also known as reactive phosphorus. It is the most stable form of phosphate and is the form taken up by plants. It can be formed in natural processes and is found in sewage.

Orthophosphates were measured between 1993 and 1995. Concentrations ranged between below the detection limit (RDL = 0.05 mg/l) to 1.6 mg/l.

Phosphorus, total (P) (#1485) BPO = 0.1 mg/l

Phosphorus in nature is found in the form of phosphates in several minerals and it is a constituent of fertile soils, plants, and the protoplasm, nervous tissue and bones of animal life. It is an essential nutrient for plant and animal growth. Excessive phosphorus may lead to an overabundance of algae growth.

Levels above the BPO have been noted at all tributary stations and most Triad stations during the 2004 –2005 reporting period.

Phosphorus, total dissolved (P) (#1490) No BPO

No information.

During the 2004-2005 reporting period, total phosphorus was generally detected at a level less than 1 mg/L.

Phosphorus, total insoluble (P) (#1495) No BPO

No info

Most concentrations have been below 1 mg/l and some concentrations have been below the detection limit (RDL = 0.05 mg/l).

Potassium (#1500) No BPO

Potassium is commonly found in fertilizers and is a component of hardness.

Patterns and trends for potassium are similar to those of hardness at the Redhawk Channel station. Most of the concentrations are below 30 mg/l.

Redox Potential (mV) (#1515) No BPO

A high redox potential (e.g., above 500-750 mg/l) may indicate the presence of treated effluent.

Redox potential measured at the Tributary stations ranged from 108 to 166 mV. Redox potential measured at the Triad stations was less than 250 mV.

Salinity (ppt) (#1518) No BPO

Inland waters typically contain low levels of dissolved mineral salts, but brines and various chemical wastes may increase salinity to levels harmful to living organisms because of the increase in osmotic pressure.

Salinity was measured from 1998 to 2001. It ranged between 0.01 ppt to 0.1 ppt. Average ocean salinity is 35 ppt. Freshwater salinity is usually less than 0.5 ppt.

Selenium (#1520) BPO = 0.05 mg/l
CTR = 5 µg/l

Selenium is found in some soils as ferric selenite or calcium selenate. It may also be found in decayed plant tissue. Industrial sources of selenium include pigmentation in paints, dyes, and glass production; as a component of rectifiers, semiconductors, photo-electrical cells, and other electrical apparatus; as a supplement to sulfur in the rubber industry; as a component of alloys; and for insecticide sprays. Selenium may also be found in the municipal sewage from industrial communities.

The selenium concentration measured at the Redhawk Station was below the detection limit. Among the Triad stations, Selenium was detected at a concentration above the CTR during a dry weather event at Murrieta Creek station. Selenium concentrations at the remaining Triad stations were not detected.

Silver (#1535) BPO = 0.1 mg/l

Industrial sources of silver include manufacture of jewelry and silverware, in alloys, for electroplating, and in the processing of food and beverages. Silver nitrate is used in photography, ink manufacture, electroplating, coloring porcelain, and as an antiseptic.

Silver concentrations were below the detection limit (RDL = 10 µg/l) at all of the Triad stations as well as at the Redhawk Channel station.

Sodium (#1540) No BPO

Sodium salts are extensively found in nature and in industrial and agricultural wastes. As most sodium salts are extremely soluble in water, any sodium that is leached from soil or discharged to streams will remain in solution.

Seasonality is evident in the sodium data, with concentrations tending to be higher in the summer.

Solids, total (#1615, mg/l; #1616, %) No BPO

Solids in water are classified as either “dissolved” (capable of passing through a laboratory filter) or “suspended,” (retained on the filter). Both dissolved and suspended solids may be differentiated further as “fixed” (inorganic) and “volatile” (organic or volatile material). It is the nature of the solids in water that may indicate a pollutant, not the presence of the solids themselves.

No trends are evident.

Solids, total dissolved (#1625) BPO = 750 mg/l

In natural waters the dissolved solids consist mainly of carbonates, bicarbonates, chlorides, sulfates, phosphates, and possibly nitrates of calcium, magnesium, sodium, and potassium with traces of iron, manganese and other substances. Sources of dissolved solids include chemical wastes, dissolved salts, acids, alkalis, gas and oil-well brines, or drainage waters from irrigated land.

During the 2004-2005 reporting period, levels above the BPO were noted at all of the Triad stations during dry weather sampling events, at Redhawk Channel tributary station during four dry weather sampling events and at the Warm Springs Creek stations during a dry weather monitoring event. Throughout the monitoring program it has been noted that concentrations tend to be higher during dry weather.

Solids, total suspended (#1630) No BPO

In natural waters, suspended solids consist normally of erosion silt, organic detritus, and plankton. Sources of suspended solids include industrial and domestic wastes, increased erosion from cleared or cultivated land, gravel washings and mine tailings, steel mill wastes, and dusts that are blown into streams.

Throughout the monitoring program it has been noted that total suspended solids concentrations tend to be higher during wet weather.

Sulfate (SO4) (#1640) BPO = 250 or 300 mg/l, site-specific

Sulfates are present in waters of the western United States as a result of leachings from gypsum and other common minerals. Other natural sources include oxidized organic matter. Industrial sources include agricultural runoff, tanneries, sulfate-pulp mills, textile mills, and other plants that use sulfates or sulfuric acid.

No levels above the BPO have been noted at any station since 1998.

Temperature, field (#1655, deg. C; #1660, deg. F) No BPO

Water temperature in natural waters is influenced by ambient air temperature, vegetative cover, nature of bed material (*e.g.*, gravel vs. sand), and stream depth. Many industrial and agricultural wastes lead to raising of water temperatures, as does concrete-lining of streams. Increased water temperature may result in decreased oxygen capacity, generation of anaerobic zones, and fungal growth.

There is obvious seasonality in the data, with temperature tending to be higher in the summer and colder in the winter.

Thallium (#1665) BPO = 0.002 mg/l

Thallium salts are used as poisons for rodents, as ant bait, and are used in dyes and pigments in fireworks, in optical glass, and as a depilatory.

Although the Thallium results for the Triad and Tributary stations are reported as non-detect, the laboratory's RDL is greater than the BPO. Therefore, the laboratory will be instructed to establish a RDL that is less than the BPO during the next reporting period.

Turbidity (#1690, field; #1695, lab) BPO = 20 NTU

The turbidity of a water sample is a measure of the extent to which the intensity of light passing through is reduced by the suspended matter. Turbidity in water is attributable to suspended and colloidal matter, which diminishes light penetration. Increased turbidity may also indicate the presence of pathogens. Natural sources of turbidity include microorganisms or organic detritus; silica or other mineral substances including zinc, iron, and manganese compounds; and clay or silt. Erosion may also lead to increased turbidity as well as domestic sewage and industrial wastes, such as mining, dredging, logging, and pulp and paper manufacturing.

Levels above the BPO, in both field and lab turbidity, have been noted at all Triad and tributary stations, with higher values measured during storm events.

Zinc (#1700) BPO = 5 mg/l
CTR = 120 µg/l

Industrial sources of zinc and zinc salts include galvanizing, alloy manufacture, for electrical purposes, in printing plates, dye manufacture and the dyeing process, paint pigments, cosmetics, pharmaceutics, dyes, and insecticides.

Zinc was below the detection limit (RDL = 10 µg/l) at the Redhawk Channel tributary station. Levels above regulatory goals were detected at the Temecula Creek and Murrieta Creek Triad stations, however, these levels were detected during storm monitoring events.

Attachment D

(Monitoring Annual Report)

Historical Water Quality Data

Source: Bulletin No. 57, Santa Margarita River Investigation, Vol. I, State of California Dept. of Public Works, Division of Water Resources, June 1956, pgs. 89-90

Historical data that exceed current BPOs are marked with a box around the value.

TABLE 17

TYPICAL MINERAL ANALYSES OF SURFACE WATERS[a]

Mineral constituents in parts per million / equivalents per million

Stream	Stream mile	Date / Time[b]	Discharge, second-feet	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
Hydrographic Unit 1																			
Cole Canyon Creek	93-30.1-9.0-0.1	1-25-54	23	149	7.6	10/0.5	6/0.50	10/0.5	2/0.06	--	43/0.7	15/0.32	14/0.4	$\boxed{7/0.12}$	0.3	0.01	132	50	30
Murrieta Creek	93-30.1-0.4	6-4-54	1[c]	1,266	7.6	44/2.2	15/1.22	196/8.53	15/0.38	--	256/4.2	76/1.58	223/6.3	4/0.06	0.6	0.4	743	171	69
Santa Gertrudis Creek	93-30.1-3.9-0.6	1-25-54	55	96	7.0	8/0.4	3/0.25	5/0.23	2/0.06	--	31/0.5	10/0.20	7/0.2	$\boxed{6/0.09}$	0.0	0.01	103	32	24
Warm Springs Creek	93-30.1-4.8-0.5	2-27-53	0.12	1,040	7.9	38/1.9	11/0.89	169/7.35	--	--	140/2.3	80/1.67	216/6.1	2/0.03	--	$\boxed{1.05}$	586[d]	140	73
		3-22-54	110	417	7.6	28/1.4	8/0.67	40/1.73	4/0.09	--	79/1.3	50/1.05	50/1.4	$\boxed{5/0.07}$	0.1	0.03	306	104	45
Hydrographic Unit 2																			
Coahuila Creek	93-41.6-11.3	12-9-53 / 1515	0.17	600	8.0	40/2.0	13/1.10	73/3.19	4/0.11	--	165/2.7	83/1.72	67/1.9	4/0.07	0.4	0.1	419	155	50
Lancaster Creek	93-41.6-5.5	11-21-50 / 1615	0.28	1,410	8.6	60/3.0	33/2.7	250/10.90	--	--	244/4.0	247/5.14	220/6.2	4/0.06	--	0.0	$\boxed{936^d}$	285	67
Wilson Creek	93-41.6-7.2-1.8	5-14-54 / 0855	0.19	1,321	8.3	126/6.3	39/3.25	125/5.43	7/0.17	--	396/6.5	$\boxed{257/5.35}$	119/3.35	3/0.04	0.6	0.1	$\boxed{957}$	478	36
Hydrographic Unit 3																			
Arroyo Seco Creek	93-41.1-1.7	4-8-54	5[c]	357	8.1	35/1.75	11/0.90	34/1.49	3/0.07	--	149/2.45	41/0.86	32/0.9	4/0.06	0.4	0.1	282	132	35
Chihuahua Creek	93-55.1-4.0	1-10-51 / 1730	0.02	2,130	8.1	234/11.7	92/7.50	230/10.0	--	--	390/6.4	$\boxed{802/16.7}$	195/5.5	3/0.05	--	0.1	$\boxed{1,751^d}$	960	34
Temecula Creek	93-45.0	3-22-54	350	135	7.3	16/0.8	2/0.2	9/0.39	3/0.08	0/0	49/0.8	15/0.31	2/0.05	1/0.02	0.1	0.01	116	50	27
	93-45.2	11-30-51	0.5[c]	1,920	8.3	250/12.5	2/0.2	210/9.12	--	--	486/7.8	$\boxed{470/9.80}$	160/4.5	2/0.03	--	0.2	$\boxed{1,337^d}$	635	42

TYPICAL MINERAL ANALYSES OF SURFACE WATERS[a]
(continued)

Stream	Stream mile	Date / Time[b]	Discharge, second-feet	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Pe cen so diu
						Mineral constituents in parts per million / equivalents per million													
Hydrographic Unit 3 (continued)																			
Temecula Creek	93-55.6	11-19-51 / 1630	0.5	710	8.5	71 / 3.55	21 / 1.70	69 / 3.01	--	--	269 / 4.4	115 / 2.39	43 / 1.2	4 / 0.06	--	0.1	457[d]	262	37
Hydrographic Unit 4																			
Temecula Creek	93-30.9	4-12-54 / 1200	12[c]	1,058	7.9	87 / 4.34	21 / 1.73	120 / 5.22	3 / 0.07	0 / 0	307 / 5.04	144 / 3.0	108 / 3.05	0 / 0	--	0.1	620	304	46
	93-35.6	4-19-54	0.12	870	7.9	70 / 3.5	20 / 1.62	106 / 4.60	2 / 0.04	--	244 / 4.0	131 / 2.72	99 / 2.8	2 / 0.04	0.6	0.1	596	256	47
Hydrographic Unit 5																			
De Luz Creek	93-12.2-6.5	12-22-53	0.14	490	7.8	38 / 1.9	18 / 1.47	48 / 2.09	1 / 0.03	--	208 / 3.4	16 / 0.34	60 / 1.7	4 / 0.07	0.2	0.0	333	168	38
Santa Margarita River	93-20.0	5-12-52[e] / 1100	6	1,010	7.9	67 / 3.34	25 / 2.06	106 / 4.61	43 / 0.11	10 / 0.33	264 / 4.33	110 / 2.29	118 / 3.33	1 / 0.01	0.4	0.3	607[d]	270	46
Hydrographic Unit 6																			
Fallbrook Creek	93-8.8-7.9	4- 2-54 / 1130	--	1,710	8.3	107 / 5.35	50 / 4.15	173 / 7.54	1 / 0.02	--	275 / 4.5	264 / 5.51	238 / 6.7	27 / 0.44	0.7	0.3	1,138	475	44

a. All Analyses by Division of Water Resources unless otherwise noted.
b. Pacific Standard Time indicated by 24-hour time system.
c. Estimated.
d. Total dissolved solids determined by summation.
e. Analyzed by United States Geological Survey, Water Quality Branch, unpublished records subject to revision.