A Water Quality Inventory Series
Biological and Physical/ Habitat Assessment of
California Water Bodies

San Diego Regional Water Quality Control Board: 1999 Biological Assessment Annual Report

Report in SD River Folder

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ORANGE COUNTY SW PERMIT FACT SHEET PARAGRAPHS

I. WATER QUALITY
II. IMPACTS OF URBAN RUNOFF
III. ECONOMIC IMPLICATIONS
IV. OTHER NOTES (ORPHAN TOPICS, not yet included)

(6/8/01) draft (6/11/01 or 7/3/01) draft

I. WATER QUALITY

Inland surface water quality data in southern Orange County has been collected under the NPDES program by the Municipal Stormwater Copermittees and under a number of other efforts, notably the Aliso Creek Watershed Management Study that was funded by a 205(j) grant from the State Water Resources Control Board. Data from these two sources have been among the most thoroughly assessed in the region and provide the best representation of contemporary water quality during the period of the Copermittees' DAMP. In particular, the U.S. Army Corps of Engineers (USACE) has assessed available water quality data in the Aliso Creek and San Juan Creek watersheds as part of comprehensive watershed studies to determine a process for restoring habitat and alleviating potential flood damage. A qualitative analysis of urban runoff was also performed by at least four Orange County Grand Juries from 1998-2001. Together, these sources of data and subsequent analyses indicate that urban runoff and stormwater in southern Orange County is impairing water quality and that additional management efforts can have a positive impact of constituents of concern.

upon entry to seawater!

EMC = Event Mean [ ]

NPDES STORMWATER SAMPLING: Stormwater monitoring in the San Diego region in the 1999/2000 reporting period showed CTR (California Toxics Rule) exceedances of acute metals at the point of discharge to receiving waters in 94% of reported samples. From 1992 to 2000 the copermittees report EMC data for one stream in the south county, Oso Creek. There are no discernible trends over time in the Oso Creek EMC data. There were no assessments for 1997, 1998, 2000. At best, the data show a lack of water quality improvement, implying that the DAMP is not having a positive effect on EMC parameters in Oso Creek.

ALISO CREEK 205(J) BACTERIA INVESTIGATIONS: Bacteriological sampling demonstrated that high levels of total and fecal coliform and enterococcus were commonplace in the watershed. REC-2 standards were exceeded at all monitored stations except the uppermost. For example, three sampling locations on tributaries to Aliso creek had E. coli averages over 2,000 MPN/100ml and two sampling locations on the mainstem of Aliso Creek had average fecal coliform or E.coli averages greater than 2,000 MPN/100ml during the study period.

SOUTH EAST REGIONAL RECLAMATION AUTHORITY (SERRA) SURF ZONE BACTERIA DATA: Bacteriological sampling conducted by SERRA in the surf zone near the mouths of Prima Deshecha indicate elevated levels of fecal coliform and enterococcus are present. One surf zone station is approximately 100 feet north of the Prima Deshecha beach outfall. From June 2000 through February 2001, 26 of 59 (44%) samples exceeded ocean water criteria for enterococcus at this station. Regional Board staff does not attribute these elevated levels to the effluent discharged from SERRA's ocean outfall, but believe the creek may be a significant source of fecal coliform and enterococcus.

USACE SAN JUAN CREEK WATERSHED STUDY: The USACE San Juan Creek Watershed Management Feasibility Study identifies high fecal coliform counts measured at the lowermost end of San Juan Creek as the greatest water quality concern in the watershed. Their analysis of water quality data from 1992-1995 further showed moderate contamination in San Juan Creek, Trabuco Creek, and Oso Creek. Their survey of historical data indicated that lead levels have dropped, copper levels have increased, and spikes of chromium and nitrates occur. The Feasibility Study concludes that *"WATER QUALITY IN THE SAN JUAN CREEK WATERSHED AREA IS PRIMARILY INFLUENCED BY NONPOINT SOURCE STORMWATER RUNOFF PRIMARILY FROM URBAN AND RESIDENTIAL AREAS."* (P.E44, SEC. 4.4.2.1).

USACE ALISO CREEK WATERSHED STUDY: In the USACE environmental evaluation for Aliso Creek watershed water quality, pollution concerns include runoff of pesticides and herbicides in areas near the creek. Nonpoint source pollution is attributed to an increase in urban developments and the associated stormwater runoff. *"DUE TO THE INCREASE IN DEVELOPMENT IN THE UPPER REGIONS OF THE ALISO CREEK WATERSHED, STORMWATER RUNOFF IS LIKELY THE MOST PROMINENT ON-GOING FACTOR CAUSING DETERIORATION OF WATER QUALITY."* (P.E40, SEC. 4.4.1.1).

GRAND JURY FINDINGS: The 1999-2000Grand Jury investigating "The Rainy Season's "First Flush" Hits the Harbors of Orange County," found that in spite of the County's strong emphasis on public education as required by the DAMP, a significant amount of trash finds its way into the County-maintained flood control channels and County-maintained storm drains, rather than being disposed of properly. In "The Urban Runoff Battle: Ready, Fire, Aim!" the 2001 Grand Jury examined beach advisory postings and concluded that since the total number of postings is nearly identical in 1999 and 2000, "virtually no improvement has occurred."

II. IMPACTS OF URBAN RUNOFF

Urban runoff enters the storm drains and then discharges to inland surface waters or, in some coastal areas, discharges directly to the ocean. Urban runoff carries with it pollutants from land surfaces, such as lawns and hillsides or pollutants that were deposited into the streets and storm drains. Impacts from pollutants carried by urban runoff and the discharge of the runoff itself to surface waters include damage to riparian and in-stream habitats, increased flooding potential, threats to human and animal health, and economic ramifications thereto.

A May 1999 draft of the Aliso Creek Watershed Management Feasibility Study (Aliso Study), led by the USACE, concluded that the Aliso Creek watershed "is not in good health," and attributes many of the problems to stormwater runoff. The Aliso Study developed a watershed management plan intended to identify feasible management options to improve environmental and economic conditions in the watershed and reestablish a stable, healthy, and sustainable watershed environment. The feasibility study and a concurrent one prepared for the San Juan Creek watershed do not guarantee the "feasible" projects will be implemented, but instead provide information to the County of Orange, the cities, water districts and other partners regarding potential corrective actions and the current impacts from urban runoff.

BEACH CLOSURES: Several beach postings in the area of the copermittees, including locations in Dana Point, Aliso Beach, and others are attributed to pollution from urban runoff. Beaches are posted and can be closed when bacteria levels indicate a potential health risk to humans. Coastal economies suffer when people decrease their time spent at beaches due to beach closings or fear of coastal water pollution.

Copermittees understand the connection between urban runoff pollution and beach impairments. Several of the coastal copermittees, including Laguna Beach and Dana Point, have implemented or are proposing dry-weather diversions that route urban runoff in streams or storm drain outfalls to sewer lines in an attempt to keep pollution contained in urban runoff from impacting beaches.

The following table, adapted from the 2001 Grand Jury report "The Urban Runoff Battle: Ready, Fire, Aim!" and based on data obtained from the Orange County Health Care Agency, lists the number of beach postings at South County Beaches in 2000.

Posting Location	Number of Postings	Total Days Posted	Posting Location	Number of Postings	Total Days Posted
Crystal Cove State Park	9	23	Doheny State Beach Park	9	315
Laguna Beach	32	77	Capistrano County Beach	6	248
Aliso Beach	13	23	Capistrano Bay District	7	107

Monarch Beach	5	49	Poche Beach	5	163
Salt Creek Beach	3	4	San Clemente City Beach	8	20
Dana Point Harbor	12	739*	San Clemente State Beach	1	3
* includes 2 long term postings totaling 569 days					

HABITAT STRESS: An aquatic life assessment conducted as part of the Aliso Creek Watershed 205(j) study demonstrated habitat within the study sites is unstable and under considerable environmental stress. The poor conditions were deemed likely attributable to high variability in flow volumes and velocities, sediment load and movement, high water temperatures, poor riparian development, and poor water quality. All of these influences can, at least in part, be attributable to a change in the runoff regime associated with urban development. The 205(j) study report concludes that continued development in the watershed without appropriate mitigation would lead to increased riparian habitat degradation. In addition, the USACE studies conclude that channel downcutting is responsible for the loss of riparian habitat in many reaches of both Aliso Creek and San Juan Creek watersheds. Downcutting of channels decreases the ability of water to reach the floodplains and riparian zones. Downcutting is attributable to altered hydrology, including increased volume of runoff. Habitat loss and degradation were also cited as a major problem in the USACE San Juan Creek Watershed Study.

CHANNEL INSTABILITY: According to the USACE San Juan Creek Watershed Study, intense development since the 1980's is correlated with significant downcutting and bank erosion on San Juan Creek and its main tributaries, especially in the lower reaches. Erosion and channel instability are identified in the USACE study as one of the major watershed problems. Channel instability and erosion degrade existing in-stream and riparian habitat and prevent the establishment of further stable habitat areas.

In addition, private and public property, including important infrastructure such as rail lines, sewer and water lines, and roads, have been threatened by erosion within the San Juan Creek and Aliso Creek watersheds.

FLOODING: The USACE San Juan Creek Watershed Study concluded that the threat of flooding in the lower San Juan Creek watershed has been exacerbated by changes to the creek's hydrology as a result of urbanization in the watershed. Potential flooding of the downstream portions of Oso, Trabuco, and San Juan Creeks is characterized by the USACE as a major watershed problem.

TOXICITY: A water quality data assessment conducted as part of the Aliso 205(j) study characterized surface water from several locations in the watershed and determined aquatic toxicity tests during two storm events caused varying degrees of mortality to test organisms. Storm sampling for toxicity was conducted twice at five locations within Aliso Creek during the study period. While two of the ten samples showed no mortality for Ceriodaphnia, six samples resulted in 100% mortality, one showed 85% mortality and one showed 95% mortality. The report suggests several possible sources of aquatic toxicity, all of which are derived from urban runoff.

III. ECONOMIC IMPLICATIONS OF URBAN RUNOFF

Urban runoff degrades surface water quality, but its impacts spread beyond the channel banks. Beach closures and other losses of recreational opportunity have a direct economic impact on communities whose economies are dependant on access to surface waters. Furthermore, property loss or damage from erosion and flooding has direct and indirect economic impacts on communities. In addition, replacement or perennial protection of public infrastructure from problems associated with urban runoff requires significant amount of public expenditures, thus diverting funds from other public agency concerns. The copermittees have the power to encourage choices that decrease the impacts of urban runoff though activities such as public education on water quality issues and enforcement of water quality-related ordinances. The relationship between urban runoff, water quality, and both

micro and macro-economics in southern Orange County has been addressed in several reports, including the USACE watershed studies, Orange County Grand Jury reports, and others.

Water quality affects the recreational value of a waterbody and watershed. A recreational use analysis conducted within the Aliso 205(j) Watershed Study identified potential increases in recreational value would occur if the water quality improvements in the USACE Aliso Creek Watershed studies were implemented. The analysis noted that the largest benefit would be realized at Aliso Beach Park, but would require watershed-scale action because of the nature of the impacts derived from urban runoff.

An individual's choice to protect water quality may be a decision based on micro-economics. The enforcement of local ordinances is an important tool of the copermittees that affects an individual's decisions. The disincentive to pollute created by enforcement, however, has been found to be insufficient by the 1998-1999 Orange County Grand Jury investigating "Coastal Water Quality and Urban Runoff in Orange County." The Grand Jury concluded that current local fines were less than abatement costs, thus the level of enforcement may actually invite some polluters to continue polluting. The Grand Jury recommended that the County address the possibility of increasing fines for violators.

DANA POINT: In response to a Grand Jury finding (1999-2000 Rainy Season's First Flush Hits the Harbors of Orange County), the city of Dana Point notes the interrelationship between the clean coastal water and the economic health of the city. Dana Point reports receiving $5.2 million in T.O.T. funds in FY 1999-2000 "due in large part because of proximity to the beach. Without clean beaches, Dana Point risks losing its major revenue source."

LAGUNA BEACH: Tourism is one of the primary components of the Laguna Beach economy, and the beach is one of the main tourist attractions in the city. In 1999, hotel/motel bed tax revenue was approximately $3 million, representing 13% of the City's general fund revenue. The City Council recognizes the value of the beaches to tourists and the local population and has funded several low-flow diversion systems in an attempt to decrease beach pollution and beach closures.

DOHENY STATE BEACH: In 1997, the USACE prepared an economic analysis as part of the San Juan Creek and Aliso Creek Watershed Study. Recreational value for Doheny State Beach, based on annual visitation of 670,545 people in 1995, was calculated at $2,850,000. Furthermore, the USACE notes that lifeguards reported that beach attendance falls dramatically when there are unhealthy conditions in the ocean. In 1999, the USACE prepared an updated economic study as part of the Feasibility Phase of the San Juan Creek Watershed Management Study. The 1999 study reports that average beach attendance from 1996 to 1998 increased to 918,735. The USACE places a recreation value per visitor at $5.76, which implies the annual recreational value of Doheny State Beach for 1996 to 1998 was $5,291,914.

ALISO BEACH: In 1997, the USACE prepared an economic analysis as part of the San Juan Creek and Aliso Creek Watershed Study. Recreational value for Aliso Beach, based on annual visitation of 3,477,369 people in 1995, was calculated at $14,779,000. In the 1999 Draft Feasibility Report for the Aliso Creek Watershed Management Study, the USACE noted that the average beach attendance from 1996 to 1998 decreased to 1,148,374. The recreation value per visitor was calculated at $4.50 and the average annual impact from water quality-related beach closures at Aliso Beach Park was estimated to be $468,392. This number is comparable to an economic analysis conducted as part of the Aliso Creek Watershed 205(j) study that estimated the annual average recreational value impact of beach closures at Aliso Beach Park to be $468,400.

SAN JUAN AND ALISO CREEKS WATERSHED MANAGEMENT STUDY ORANGE COUNTY, CALIFORNIA

RECONNAISSANCE REPORT

The U.S. Army Corps of Engineers
Los Angeles District

February 1997

US Army Corps
of Engineers

General Investigations

San Juan Creek Watershed Management Study

Orange County, California

Feasibility Phase

Draft Watershed Management Report

U.S. Army Corps of Engineers

Los Angeles District

December 1999

901.260 → 901.270

From: Linda Pardy
To: Keri Cole; Lisa Brown
Date: 3/26/01 8:02AM
Subject: Fwd: San Juan Ck hydrologic study, Orange Co. ... Water Rights application #30696

Keri, Is this something you want to consider in the impaired water listing? -Linda

From: Linda Pardy
To: Art Coe; Bob Morris; Christopher Means; David Gibson; Mike McCann; Stacey Baczkowski
Date: 3/26/01 7:59AM
Subject: San Juan Ck hydrologic study, Orange Co. ... Water Rights application #30696

Staff, a Mr. David Zoutendyke of USFWLS, Carlsbad **(760) 431-9440** left a voice mail message 3/23/2001 to say that their Fish and Wildlife hydrologist just completed a modeling study/report showing what would happen to the flow in San Juan Creek with regard to application #30696 by Capristrano Valley Water District to appropriate water from San Juan Creek. FYI, this is one the RB protested and I have a copy of that correspondence. I will call and ask him to forward a copy of this report to John Robertus. -Linda

CC: John Robertus

From: Linda Pardy
To: Bob Morris; Keri Cole
Date: 5/4/01 11:27AM
Subject: Re: San Juan Ck hydrologic study, Orange Co. ... Water Rights application #30696

Keri, I think I gave the study to Bob Morris, or someone in his unit. Or did you want the water application? I have some comments we made on applications from the Region in years past, if you need me to look up the number...let me know if you need me to find it.

Bob, Do you have the USACOE study? -Linda

>>> Keri Cole 05/04/01 09:13AM >>>
Linda
Do you have a copy of this study? If not, do you suggest I just call Mr. David Zoutendyke of USFWLS and ask him for it?
Keri

CC: Paul Richter

From: Linda Pardy
To: Bob Morris; Keri Cole
Date: 5/4/01 11:27AM
Subject: Re: San Juan Ck hydrologic study, Orange Co. ... Water Rights application #30696

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Keri

CC: Paul Richter

Table 2

Nutrients In Aliso Creek Watershed September 30 - October 21, 1998

STATION	DATE/TIME	Turb NTU	NO3-N mg/L	NH3 mg/L	Total Inorg N	NH3* mg/L	TKN mg/L	PO4-P mg/L	N : P Ratio	TSS mg/L	VSS mg/L
Cook's Corner	9/30/1998 @ 1110	2.7	1.4	<0.05	1.40	0.0014	0.77	<0.02	71.8	10	5
	10/7/1998 @ 1115	2.2	1.6	0.14	1.70	0.0039	1.15	0.14	12.1	8	5
	10/14/1998 @1115	5.0	1.5	0.11	1.62	0.0049	1.53	0.18	9.0	12	12
	10/21/1998 @ 1210	2.2	1.5	0.15	1.64	0.0038	0.75	0.14	11.7	11	6
d/s English Canyon	9/30/1998 @ 1050	2.0	1.8	<0.05	1.83	0.0038	0.72	<0.02	93.7	9	6
	10/7/1998 @1100	1.4	2.0	<0.05	2.06	0.0022	0.64	0.11	18.5	4	2
	10/14/1998 @1100	1.3	1.8	<0.05	1.81	0.0053	0.97	0.13	13.9	5	6
	10/21/1998 @ 1140	39	1.99	<0.05	2.04	0.0033	0.64	0.18	11.4	92	20
d/s Sulphur Creek	9809291000 - 9809300900	6.5	1.17	<0.05	1.22	0.0021	1.15	0.15	8.2	28	9
	9810060953 - 9810070853	4.1	1.45	0.12	1.57	0.0037	0.98	0.21	7.5	18	6
	9810131000 - 9810140900	8.5	1.49	0.17	1.66	0.0137	1.5	0.28	5.9	26	12
	9810201000 - 9810210900	6.6	1.96	0.16	2.12	0.0079	1.08	0.24	8.9	40	12
J03P02 tributary	10/21/1998 @ 1055	3.4	2.96	0.25	3.21	0.0059	1.45	0.24	13.5	22	8

NH3* un-ionized ammonia

Concentrations exceeded San Diego RWQCB Basin Plan Table 3.2 surface water standard

QA/QC

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

A project organization table is presented below which summarizes the various participants and their respective roles.

TOXICITY TESTING

RESPONSIBILITIES	AGENCY/COMPANY	PERSON
Sampling: - collection and shipment - field analysis - instrument calibration	PFRD and consultant	Eric Klein/consultant
Sample Storage	ABC Laboratories	Michael Machuzak
Laboratory Analyses	ABC Laboratories	Michael Machuzak
Laboratory Analyses QC	ABC Laboratories	Michael Machuzak
Principal Investigator	PFRD	Karen Ashby
Project Quality Assurance Officer	PFRD	Bruce Moore
Contract Management	California SWRCB	Joanne Cox

4.0 METHODS

4.1 Study Approach

At the present time there is no evidence that toxicity exists through either field observation of organism mortality, or elevated toxics concentrations in water quality or sediment samples. No prior bioassay sampling has been attempted in the creek or its tributaries. Therefore, this investigation will employ a screening rather than a definitive approach to the analysis of Aliso Creek samples. The screening procedure analyzes undiluted samples in duplicate in contrast to the definitive approach that utilizes a series of five dilutions to assess the degree of toxicity. If the screening procedure suggests the presence of toxicity then additional definitive and/or TIE screening analysis can be undertaken in the future.

The toxicity sampling will occur in three phases during 1998 (**Table 1**). Samples will be collected at five locations including near Cook's Corner, south of the Interstate 5

freeway, downstream of the English Canyon Channel and Sulphur Creek confluences, and upstream of Aliso Beach.

The first phase will consist of collecting water samples at all five sites during low flow, dry weather conditions in September 1998. The second and third phases will be conducted during stormflow conditions. The second phase samples will be collected at each of the five sites during the first significant storm event of the 1998-1999 storm season. The third phase samples will be collected all five sites during another storm event in 1998.

4.2 Bioassay Sampling Stations

Several criteria were used to select the creek locations for investigation including:

1. Unique geographic location within the watershed
2. High degree of habitat disturbance and channel degradation near the site
3. Location immediately downstream of a major tributary
4. Location near potential source of toxicity
5. High potential value as wildlife habitat or species reintroduction area
6. Special designation of the segment as impaired by regulatory agencies or statutes

The locations of the five sampling sites selected for this investigation are indicated on **Figure 2**. The selection criteria applicable to a particular sampling location are noted after each of the following site descriptions:

1. *Cook's Corner*
   The site is located immediately south (downstream) of Cook's Corner at the intersection of El Toro Road and Ridgeline Road. There is a small amount of development upstream along Santiago Canyon Road, however the creek is relatively undisturbed over this reach. This site will serve as a control station representative of the natural character of the creek. **(1,5)**

2. *d/s English Canyon Channel*
   The site is immediately downstream of the confluence of English Canyon Channel and Aliso Creek between Trabuco Road and Jeronimo Road. This section of Aliso Creek watershed is highly developed and drains large portions of the cities of Lake Forest and Mission Viejo. **(1,2,3)**

3. *d/s Leisure World*
   The site is immediately downstream of Moulton Parkway at the northern extreme of Aliso/Wood Canyons Regional Park. This section of the watershed is highly developed and drains large portions of Lake Forest, Mission Viejo, Laguna Hills, and Leisure World. **(2,4)**

4. *d/s Sulphur Creek*
   The site is immediately downstream of the confluence of Sulphur Creek and Aliso Creek near the Alicia Parkway entrance to Aliso/Wood Canyons Regional Park. The Sulphur Creek watershed is highly developed and drains most of Laguna Niguel. The reach of Aliso Creek between this site and the upstream Leisure World site is undergoing rapid development and drains portions of Laguna Hills and Aliso Viejo. **(1,2,3,5)**

5. *d/s Aliso Creek Golf Course*
   The site is downstream of Aliso Creek Golf Course approximately 0.2 miles from Aliso Beach. The reach of Aliso Creek between this site and the Sulphur Creek site is sparsely developed and included drainage from most of Aliso/Wood Canyons Regional Park including the Wood Canyon watershed, and portions of Aliso Viejo, and Laguna Beach. **(1,2,5,6)**

4.3 Sample Collection

A trained PFRD Environmental Resources Specialist or consultant will collect all samples. During low flow conditions the samples will be collected in the center of the creek as subsurface grabs in traceable, one-liter, low-density polyethylene containers provided by Aquatic Bioassay and Consulting (ABC) Laboratories. The samples will be kept on ice at 4°C while in transport. During stormflow conditions the samples will be collected from the edge of the creek with all other protocols remaining the same. Field readings for electrical conductivity, pH, dissolved oxygen, and temperature will be taken at the time of sample collection with a Hydrolab Scout 2 water quality meter calibrated according to manufacturer's instructions. Samples will be immediately transported in an ice chest to ABC Laboratories in Ventura, California for analysis within 48 hours of collection.

4.3.1 Electrical Conductivity Screening

Electrical conductivity in Aliso Creek varies according to location along the creek and flow conditions, however a typical range is 2000 – 3200 µmhos/cm. Sampling during dry weather, low flow conditions will be conducted only if the conductivity measurement taken at the time of sampling is <3,000 µmhos/cm. Above this conductivity range the water may be unsuitable for testing with freshwater bioassay organisms. Dry weather samples will be analyzed for chronic effects with the 7-day juvenile fathead minnow growth and survival bioassay.

Unsuitably high dissolved solids concentrations are unlikely during stormflow conditions however, the same electrical conductivity screening procedure described above will be employed. Samples collected during storm conditions will be analyzed for acute effects with the 96-hour juvenile fathead minnow, and water flea (*Ceriodaphnia sp.*) growth and survival bioassays.

4.4 Sample Analysis

The samples will be analyzed by ABC using U.S. EPA standard toxicity testing procedures outlined in the following publications:

1. Chronic 7-day Screening (1-2 dilutions) and Acute 96-hour Screening (1-2 dilutions) Using the Juvenile Fathead Minnow

   - APHA, 1995. Standard Methods for the Examination of Water and Wastewater. 19th edition. American Public Health Association, Washington, DC.

   - USEPA, 1985. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. (3rd Ed.) EPA/600/4-85/013.

2. Acute 48-hour Screening (1-2 dilutions) Using Ceriodaphnia

   - USEPA, 1994. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA-600/4-91/002.

   - USEPA, 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. EPA-600/4-90/027F.

4.5 Time Schedule

Site Reconnaissance	May - June, 1998
Quality Assurance Project Plan	July 1, 1998
Low Flow Toxicity Sampling	September, 1998
Phase I High Flow Toxicity Sampling	First Storm of 1998 –1999 Season
Phase II High Flow Toxicity Sampling	November - December, 1998
Quarterly Progress Reports	October 10, 1998, & January 10, 1999

4.6 Additional Bioassay Work

Additional follow-up studies may be conducted at the discretion of the Principal Investigator. These may include the following:

1. Resampling a toxic site to confirm toxicity or to determine the duration and frequency of toxicity
2. Running a dilution series to determine the magnitude of the toxicity
3. Sampling an additional site(s) to determine the source of the toxicity
4. Conducting additional chemical analyses

Toxicity Identification Evaluation (TIE), pathological analysis, and comprehensive follow-up sampling/analyses are beyond the scope of this investigation. If the results of this preliminary assessment indicate the presence of toxicity in Aliso Creek, additional investigation may be recommended.

4.6.1 Reporting Requirements

Project progress will be summarized and included as part of the quarterly reports submitted to the Contract Manager of the California SWRCB as outlined in the Standard Agreement (SWRCB No. 7-042-250-0), Exhibit B, Section D. The Principal Investigator will describe the activities undertaken, the accomplishment of milestones, and any problems encountered during the previous quarter. In addition, a California Department of Health Services (DHS) laboratory certification for Aquatic Bioassay and Consulting Laboratories Inc., will be provided to the California SRWQCB by PFRD.

A final report will be submitted at the conclusion of the project. The report will include a description of methods, data, a statistical analysis of the data in tabular form, results, conclusions, and recommendations.

5.0 QUALITY ACCEPTABILITY CRITERIA

5.1 Test Acceptability Criteria

The test acceptability criteria for the organisms and the respective tests are as follows:

1. Juvenile Fathead Minnow Chronic 7-day Screening

   - Survival in controls is 80% or greater and the average dry weight of surviving fish = 0.25 mg.

2. Juvenile Fathead Minnow Acute 96-hour Screening

   - Survival of 90% or more in control waters.

3. *Ceriodaphnia dubia* Acute 48-hour Screening

   - Survival in controls is 80% or greater and *Ceriodaphnia* neonates will be less than 48-hours old at the initiation of testing.

All tests are conducted according to methodologies outlined in references given in Section 4.5. All tests are initiated within 48 hours of sample collection. All unacceptable bioassay analyses will be reported to the Quality Assurance Officer so that corrective action can be taken. Unacceptable bioassay analyses will be reported in the quarterly quality assurance reports, but will not be used to draw conclusions regarding the degree of toxicity of the tested waters.

5.2 Precision Criteria

Precision criteria have not been established for these tests. If they are performed according to recommended guidelines and meet the standard test acceptability criteria, it is assumed that they provide the level of precision intended by the EPA.

ABC Laboratories performs standard toxicant testing with each batch of chronic tests and for each new population of adult acute animals purchased from outside ABC. In accordance with California (DHS) guidelines for organisms raised in-house, standard toxicant testing is performed monthly on *Ceriodaphnia dubia* at ABC. If a reference toxicant result falls outside of any acceptability requirement, all associated bioassays are performed again.

The results of standard toxicant testing are used to construct quality control (QC) charts. In general, a new QC Chart is calculated whenever a standard toxicant testing result approaches either the upper or lower control limit. Recent trends in reference toxicant testing results can be observed in the QC charts and can be used to assess ABC's precision over time. ABC will provide current control charts along with reports of bioassay results.

5.3 Accuracy Criteria

Accuracy criteria are not applicable to toxicity testing.

5.4 Completeness Criteria

1. Juvenile Fathead Minnow Chronic 7-day Survival and Growth

    - Mortality must be measured daily
    - Growth must be measured at the end of the test
    - Acceptability criteria must be met
    - One duplicate and one control must be included

2. Juvenile Fathead Minnow Acute 96-hour Survival

    - Growth must be measured at the end of the test
    - Acceptability criteria must be met
    - One duplicate and one control must be included

3. *Ceriodaphnia dubia* Acute 48-hour Survival

    - Growth must be measured at the end of the test
    - Acceptability criteria must be met
    - One duplicate and one control must be included

The following water quality parameters must be monitored at 24-hour intervals during each analysis:

- pH
- Conductivity
- Temperature
- Dissolved Oxygen

In addition, total hardness and alkalinity must be measured on each sample at the beginning and end of the acute tests and every 24 hours when conducting the chronic test.

5.5 Representativeness Criteria

The US EPA Technical Support Document summarizes several studies that support the use of Ceriodaphnia and fathead minnow as appropriate surrogates for native species of freshwater fish and crustacea. Ceriodaphnia and juvenile fathead minnow are known to be sensitive to pesticides and ammonia, respectively. Toxicity test results will be considered representative of toxicity at the sampling site if the sampling protocol is followed, tests are initiated within 48 hours of collection, and laboratory water chemistry results are within ranges observed in the field.

5.6 Comparability Criteria

If EPA's protocols are strictly observed and documented, and results from reference toxicant tests are acceptable, lab results should be comparable to results that would be obtained by another lab.

5.7 Test Sensitivity Criteria

The level of effect detected will vary depending on the test species and parameter, however, the procedures will generally detect 30 – 40% differences from the control.

5.8 Laboratory Certification

Aquatic Bioassay and Consulting Laboratory is certified by the California Department of Health Services for Aquatic Toxicity Bioassays for Hazardous Waste and all NPDES bioassay methods (see **Appendix A**). Since 1997, ABC Laboratory has been inspected three times by the U.S Department of Fish and Game staff and has been involved in three acute and chronic standard toxicant testing programs for both the Department of Health Services and the EPA.

6.0 SAMPLING PROCEDURES

6.1 Sampling Locations

Refer to **Figure 1** for a map of the sampling sites and Section 4.2 for a description of the individual sites and the site selection criteria. The sampling sites were chosen according to six criteria including their locations relative to potential sources of aquatic toxicity, degree of channel disturbance, and potential as wildlife habitat.

6.2 Sampling Frequency

Three sampling phases will be conducted (Section 4.4). An initial low flow phase performed in September 1998 will be followed by two phases of high flow sampling in late 1998.

6.3 Sample Containers

Samples will be collected in certified, clean, one-liter and five-liter plastic containers provided by ABC Laboratory.

6.4 Sample Collection, Transport, and Storage

The samples will be collected as surface grab samples as described in Section 4.3. Sample containers will be triple-rinsed in the field with sample water and then filled without air space, placed in coolers and chilled to 4°C with ice, and transported to ABC Laboratory in Ventura, California.

The sample volumes and collection schedules vary according to the requirements of the respective bioassays:

Type of Bioassay	Total Sample Volume	Collection Schedule
Chronic 7-day FH minnow	three gallons	one gallon each – days 1,3, and 5
Acute 96-hr. FH minnow	two gallons	two gallons on day 1
Acute 48-hr. *Ceriodaphnia*	one gallon	one gallon on day 1

For the 7-day chronic bioassay, the test water must be replaced after 48 and 96 hours. Therefore, follow-up sampling will be conducted in low flow conditions and the samples will be submitted to ABC Laboratory. For the acute bioassays sufficient sample will be collected initially during stormflow conditions to allow for the replacement of test water after 48 hours for the acute juvenile fathead minnow analysis.

All sampling containers will be labeled with a laboratory identification number, location, date, time, analysis required, and the initials of the sampling personnel. Field readings

for electrical conductivity, pH, dissolved oxygen, and temperature will be taken during sampling operations and provided to ABC with the samples.

Samples will be stored by ABC Laboratory at 4°C in a carefully controlled refrigerator. All bioassays will be initiated within 36 hours of sample receipt.

7.0 SAMPLE CUSTODY

County of Orange PFRD or consultant personnel are responsible for sample collection and notification of ABC Laboratory. Michael Machuzak of ABC Laboratory will arrange for the transport of samples to the Ventura laboratory and will oversee the bioassay testing. An example of the chain of custody form is given in **Appendix B**.

Each sample received by ABC Laboratory is given a sequential analytical number that is included on the sample container, the laboratory logbook, and the laboratory worksheets. The samples are kept in chronological order as received, in a designated cold storage area unless an aliquot is being removed for analysis. A log is kept near the door of the designated storage area, and any sample removal is documented with the analyst's initials and the date and time of removal. Visitors to the laboratory must sign in and be escorted by a staff member. Storage and documentation areas are locked in the evenings and during weekends.

8.0 CALIBRATION FREQUENCY AND PROCEDURES

All laboratory instruments are calibrated, standardized, or maintained according to procedures detailed by the manufacturer of the specified instrument. These procedures include step-by-step procedures, troubleshooting, and corrective actions. Detailed records are kept of all calibration, maintenance, and repair work.

Table 2 summarizes the calibration and preventative maintenance procedures employed by ABC Laboratory on bioassay equipment and instrumentation.

8.1 Fresh Water Source

ABC Laboratory is served by two completely independent, large capacity deionizing units. For chronic bioassay control waters, the deionized water is further refined with two ion-exchange cartridges followed by carbon and organic clean-up cartridges.

8.2 Test Organisms: Sources, Culturing, and Holding

Fathead minnow larvae are obtained from Aquatic Resources in Sebastopol, California. *Ceriodaphnia* are cultured in-house. Freshwater holding water is made from reagent grade chemicals in deionized water, or diluted "Perrier" water for chronic organisms. Water is circulated in each holding tank through a fiberglass filter, an activated carbon filter, and a gravel trickling filter specially designed for these holding tanks.

The ABC Laboratory monitors holding water and animal conditions very closely. Ammonia and temperature are checked in each fresh water holding tank at a minimum of once per week. Tanks are cleaned of detritus and 50% of the water is changed weekly. Any dead or unhealthy looking organisms are immediately removed.

8.3 Temperature and Light Control

Temperature control for chronic and acute bioassay laboratories at ABC Laboratory are conducted by forced-air heating and air conditioning units specifically designed for laboratory purposes. The computerized thermostat adjusts the temperatures every two seconds.

The light regime for all organism incubators and holding areas is 8 hours of light followed by 16 hours of dark at an intensity of 50 ± 5 microeinsteins.

9.0 PREVENTATIVE MAINTENANCE

The bioassay area at ABC Laboratory houses all of the instruments and supplies needed for measuring freshwater species. Equipment includes light tables, a Coulter Counter, microscopes, analytical balances, water baths, drying ovens, and a deionized water system with a final bank of water polishing cartridge. This equipment is calibrated, standardized, and maintained according to procedures referenced in the ABC Laboratory's Standard Operating Procedures Manual (SOP Manual).

The Hydrolab Scout 2 multiparameter water quality instrument is maintained and calibrated according to the instrument's operating manual. The instrument is calibrated before each day of usage with certified standard solutions and the performance of the instrument is periodically checked against other water quality probes used by PFRD.

10.0 TESTING PROCEDURES

Test Organisms

Pimephales promelas
Larvae, obtained from Aquatic Resources in Sebastopol, California are hatched in transport. The exposures will be initiated before the larvae are more than 24 hours old.

Ceriodaphnia dubia
These organisms are cultured in-house. The test organisms are released within a 16-hour period and used before they are 24 hours old. Cultures used for testing are all derived asexually from one animal and that animal is preserved for possible identification.

A summary of test conditions is presented in **Table 3**.

11.0 PERFORMANCE AND SYSTEM AUDITS

Representatives of the California SWRCB or PFRD may conduct quarterly inspections of the physical facilities, operational systems, and operating procedures in the toxicity testing facility at their discretion. The inspections will be conducted while toxicity tests are being performed. The facility will be given 24-hour notice of the inspections.

The California SWRCB Contract Manager Joanne Cox will evaluate the quarterly quality assurance reports. Deviations from procedures outlined in this QA Project Plan will be brought to the attention of the PFRD Principal Investigator, Karen Ashby. Corrective action will be taken by the Principal Investigator to address all concerns.

Formal performance audits will not be conducted. The results of recent EPA and California DHS Performance Evaluation studies have been examined and found to be satisfactory. In addition, all laboratory quality control data will be carefully examined along with updated control charts as the project proceeds.

12.0 CORRECTIVE ACTION

Corrective action will be pursued if the data collected do not meet the acceptance criteria outlined in Section 5. Specific procedures and corrective actions are referenced and briefly described in **Table 2** and in the Standard Operating Procedures (SOPs) for specific toxicity tests performed by ABC Laboratory. The following is a list of applicable SOPs, prepared by ABC Laboratories, will be used for this investigation:

Title

1. Acute Effluent Toxicity Tests (EPA, 3rd Ed.)
2. Acute Effluent Toxicity Tests (EPA, 4th Ed.)
3. Chronic Fathead Minnow Larvae Toxicity Test (ABC Laboratories, 1995)
4. *Ceriodaphnia* Survival and Reproduction Toxicity Test (ABC Laboratories, 1993)

13.0 DATA REDUCTION, VALIDATION, AND REPORTING

Statistical and mathematical calculations will be monitored for accuracy by separately repeating the procedures and double-checking the equations entered into the calculation spreadsheets. Data from toxicity testing will be double-checked for transcription errors after computer entry.

The Principal Investigator and ABC Laboratory will double check for any significant discrepancies between field and lab measurements of dissolved oxygen, temperature, pH, and conductivity.

14.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The Principal Investigator will include quality assurance information in the quarterly progress reports to the California SWRCB. The quality assurance reports will include:

- a summary of work performed to date
- the results of completed toxicity tests
- the number of unacceptable and incomplete tests
- the results of reference toxicant tests
- problems encountered in the field while collecting toxicity samples and water quality data and an assessment of the effect of these problems on the overall data collection effort
- problems encountered with the transport of samples to ABC that compromise holding times or jeopardize the integrity of the bioassays
- deviations from the protocols described in this document and adequate justifications
- the results of site visits by the Principal Investigator or the Project Manager
- a description of all corrective actions
- results of audits performed

15.0 TESTING PROCEDURES (SOPs)

15.1 SOPs for the Chronic Fathead Minnow Larvae Toxicity

ENDPOINT DESCRIPTION

Twenty-four hour old fathead minnow larvae *(Pimephales promelas)* are exposed in a static renewal system to various test solutions for seven days. The endpoints are survival and growth (increase in weight) of the larvae compared to the controls.

DILUTION WATER

Water used for this test is moderately hard, reconstituted fresh water. Dilution water is prepared by mixing a 20% solution of "Perrier" and highly purified deionized water.

EFFLUENT CONCENTRATIONS

Test solutions are prepared at test initiation and every 24 hours for seven days. Five concentrations and a control, each with three replicate test chambers, are used. The chambers are 250 ml borosilicate glass crystallizing dishes. The larvae are contained within 200-micron Nytex screens cemented around a petri dish with silicone sealant. Each cylinder fits inside the dish, the liquid is poured in and the fish are added. All dishes are labeled. Glassware cleaning procedure:

1) Wash in warm, soapy water, rinse with tap water.
2) Rinse with reagent grade acetone, rinse with DI water.

3) Soak in 3N HCL for 24 hours, rinse with DI water.
4) Rinse with 2N HN03, rinse with DI water.
5) Soak in DI water for 24 hours.
6) Rinse with DI water.
7) Air dry.

Effluent samples arrive on ice and must be placed on a heat plate until temperatures reach 25 deg C before set-up. Various sizes of graduated cylinders are used to prepare solutions. A total volume of 1,000 ml is needed for each concentration: three replicates and one 250 ml sample for measuring chemical parameters. Effluent concentrations are typically set at 100%, 56%, 32%, 18% and 10% but if higher toxicity is suspected, concentrations may be at lower ranges as long as the 56% difference between dilutions is maintained.

STANDARD TOXICANT CONCENTRATIONS

A reference toxicant test is run in conjunction with each effluent test conducted. "Tropic Marin" brand sea salts are used as the standard. One replicate of four concentrations is prepared at 10 ppt, 7.5 ppt, 5.0 ppt, and 2.5 ppt. One gallon of each concentration is prepared at the beginning of the test and renewals are made daily.

SHIPPING OF TEST ORGANISMS

Newly hatched larvae are shipped from a Northern California supplier (Aquatic Resources in Sebastopol) and arrive at Aquatic Bioassay the following day. The conditions of the organisms are checked, and the tests begin the day of arrival to ensure that 24-hour old larvae are used.

CHEMICAL PARAMETERS

Aeration is used only when D.O. concentrations fall below 40% saturation. If this becomes necessary, chambers are aerated at a rate not to exceed 100 bubbles per minute. At the beginning of the test and every 24 hours thereafter, the following measurements are recorded: dissolved oxygen, temperature, pH, and conductivity. Hardness and alkalinity measurements are made daily on the control and highest concentration as well.

INITIATION OF THE TEST

After concentrations are prepared and chemical measurements are recorded, 10 animals are carefully transferred into each Nytex cylinder using disposable transfer pipets. Containers are randomly placed on racks in a temperature controlled room at 25 $\pm$ 1 deg C with a photoperiod of 16 hours light and 8 hours dark. Thermographs continuously record temperatures during the testing period.

FEEDING

The fish in each chamber are fed approximately 700-1000 newly hatched (<24 hours old) brine shrimp twice daily, once in the morning and then after renewal of the test solutions. The larvae are not fed on the last day of the test. All brine shrimp nauplii are rinsed with DI water and concentrated before use. The amount of food provided is sufficient to ensure the presence of a small amount of uneaten food at the next feeding. The suitability of each new food supply is determined in a side-by-side test using two treatments with four replicates per treatment. One treatment is fed the new food and the other is fed food already known to be suitable.

TEST SOLUTION RENEWAL

Test solutions are renewed daily and prepared in clean 1000 ml beakers. Each Nytex cylinder is carefully lifted from the old solution and transferred into the new solution, taking care not to disturb the larvae. The effluent which has been stored in the refrigerator is warmed to 25 deg C before mixing, solutions. Before transferring larvae, the bottom of each petri dish is cleaned of all debris by siphoning, with a transfer pipet. Numbers of live larvae is recorded and all dead animals are removed.

TERMINATION OF TEST

After the 7-day exposure period, the test is terminated. The number of surviving larvae are recorded and then transferred into labeled vials containing 70% ethanol for subsequent weight determination. Immediately before drying, the larvae are rinsed in DI water. They are then placed in clean, tared aluminum weigh boats and dried at 105 deg C for a minimum of 2 hours. Immediately after removal from the oven, boats are placed in a desiccator overnight to completely cool before weighing. All weights are measured to the nearest 0.01 mg. The average dry weight is determined for each replicate and used in analysis.

ANALYSIS

The Toxcalc computer program is used to analyze data. The flowcharts for statistical analysis of survival and growth as described in the EPA manual (USEPA 1989 & 1991) are followed to obtain NOEC estimates.

TEST ACCEPTABILITY

1) Control survival must be greater than 80%.
2) Average dry weight must be greater than 0.25 mg,

Revised: 9/28/95

15.2 SOPs for *Ceriodaphnia* Survival and Reproduction Toxicity Test

ENDPOINT DESCRIPTION

Less than 24 hour old *Ceriodaphnia* are exposed to different concentrations in a static renewal system until 60% of the surviving organisms have three broods of offspring. Control organisms usually produce three broods during a seven day period. The endpoints are survival and reproduction.

DILUTION WATER AND CULTURE MEDIA

Water used for this test is moderately hard reconstituted fresh water. Dilution water is prepared by mixing a 20% solution of "Perrier" brand water and highly purified deionized water.

EFFLUENT CONCENTRATIONS

Test solutions are prepared at test initiation and every 24 hours for seven days. Five concentrations and a control, each with ten replicate test chambers, are used. 30 ml disposable plastic cups are used as testing chambers. The cups are not washed prior to use but glassware used to make effluent dilutions are cleaned by the following method:

1) Wash in warm, soapy water, rinse with tap water.
2) Rinse with reagent grade acetone, rinse with DI water.
3) Soak in 3N HCL for 24 hours, rinse with DI water.
4) Rinse with 2N HN03, rinse with DI water.
5) Soak in DI water for 24 hours.
6) Rinse with DI water.
7) Air dry.

Effluent samples typically arrive on ice and must be warmed on a hot plate until temperatures reach 25 deg C. Various sizes of graduated cylinders are used to prepare solutions. A total volume of 500 ml is needed for each concentration: ten replicates and one 250 ml sample for measuring chemical parameters. Effluent concentrations are typically set at 100%, 56%, 32%, 18%, and 10%, but if higher toxicity is suspected, concentrations are set at lower ranges provided there is a 56% difference between dilutions. .

STANDARD TOXICANT CONCENTRATIONS

A reference toxicant test is run in conjunction with each effluent test conducted. "Tropic Marine" brand sea salts are used as the standard. Ten replicates of five concentrations are prepared at 5.0, 2.5, 1.25, and 0.75 ppt. One gallon of each concentration is prepared at the beginning of the test and renewals are made daily.

TEST ORGANISMS

A Culture brood stock of *Ceriodaphnia* is kept on an ongoing, basis to ensure adequate supply of neonates. The brood board consists of sixty cups, each containing 15 ml of culture media. One neonate is placed in each cup in the board initiation day and its survival and young are monitored for a period of two weeks. The organisms are fed daily and are transferred to a fresh medium three times weekly. On transfer days, the adult is transferred to fresh medium and the young are counted and discarded (or used in a test). After two weeks, a new board is started using neonates from adults who produce at least eight young in their third brood. Cultures usually produce at least 15 young per adult in three broods (7 days or less). A mass culture is also maintained in case a population crash occurs in the brood board. Neonates from this culture are used only to start a new brood board and are not directly used for the test. Mass cultures are fed daily and transferred to fresh media weekly. The population is culled periodically to about 50 individuals.

FOOD PREPARATION

Ceriodaphnia are fed a combination of yeast, cerophyll, "Tetramin" brand fish food, and green algae *(Selenastrum).* The yeast, cerophyll, and Tetramin mixture is prepared in the following manner. One week prior to making food, 5.0 grams of Tetramin is added to one liter of deionized water and mixed in a blender. The slurry is poured into an Imhoff cone, covered and aerated for seven days at ambient laboratory temperatures. Any water lost during this digestion procedure is replaced. At the end of the digestion period, the mixture is poured into a flask and allowed to settle for one hour. The supernatant is then filtered through a nytex 100-mesh screen into another 1-liter beaker. The filtered supernatant is combined with the cerophyll and yeast. Fresh, dry "Fleischmans" brand yeast (5.0 grams) is dissolved into one liter of deionized water on a stir plate. The suspension is not allowed to settle and is immediately combined with equal parts of cerophyll and Tetramin. Excess suspension is discarded. 5.0 grams of cerophyll is placed in a blender with one liter of deionized water and mixed for five minutes. This mixture is filtered through a 110-mesh nytex screen. Equal portions of the three types of prepared food are mixed, and aliquots are poured into 125-ml plastic beakers and frozen until needed. Thawed food is kept in the refrigerator for up to two weeks and fed to the *Ceriodaphnia* daily. Following food preparation and before aliquots are poured, a suspended solids analysis is performed and the mixture is either concentrated of diluted to obtain a result of 1800 mg/l. The suspended solids are monitored in the following manner:

1) Two pans are oven dried and weighed.
2) The combined YCTF is shaken to get a uniform sample.
3) 5.0 ml is dispensed in each of the two pans.
4) Pans are dried for at least four hours then allowed to cool in the desiccator.
5) Pans are weighed again.

6) The weights are converted to mg/l by:

$$\text{Difference in wt. of pans} \times \frac{1000}{0.005}$$

7) The dilution factor is obtained by:

$$\frac{\text{mg/l TSS}}{1800 \text{ mg/l}}$$

this result is multiplied by volume of YCTF to set the final volume after dilution.

8) If a large dilution factor was used, this is repeated after dilution to confirm TSS.
9) The acceptable solids level is between 1700 and 1900 mg/l.

Algae are prepared from an ongoing stock culture maintained in the laboratory. The algae used for the *Selenastrum* toxicity test is inoculated into fresh media weekly. The remainder of algae is placed in the refrigerator, allowed to settle, and then concentrated. When algae is needed for feeding, a portion of the concentrate is diluted to 3.0 - 3.5 x 10 (7) cells/ml. The density is obtained by hemacytometer counts. Once the final cell density is obtained, the bottle is labeled and recorded in a log, book. This concentrate is used for one month. The suitability of each new food supply is determined in a side-by-side test using two treatments with four replicates per treatment. One treatment is fed the new food and the other is fed food already known to be suitable.

FEEDING

Cultures are fed daily. 0.1 ml YCTF and 0.1 ml algae are delivered to each cup.

INITIATION OF THE TEST

After effluent concentrations are prepared, the chemical measurements are recorded: dissolved oxygen, pH and conductivity are measured at the beginning and end of each 24-hour exposure period in each test concentration and the control. Alkalinity and hardness are measured in the highest concentration and the control at the beginning of the test. Thermographs continuously record temperatures (25 $\pm$ 1 deg C), and a photoperiod of 16 hours light and 8 hours dark is maintained throughout the testing period. Neonates who are less than 24 hours old and within 12 hours of the same age are selected from individual brood boards. Ten board animals with 8 or more young are selected for setting up the test. The ten brood cups are placed in a row. Each concentration of effluent has ten cups. One neonate from the same female is placed in each concentration of effluent. This blocking procedure allows the performance of each female to be tracked. If the female produces one weak offspring or male, the likelihood of producing all weak offspring or males is greater. By using this technique, poor performance of young from a given female can be omitted from all concentrations (See USEPA 1989.)

TEST SOLUTION RENEWAL

Test solutions are renewed daily and prepared in clean 500-ml beakers. A minimum of three effluent samples is received from the client for use on days 1, 3 and 5. Samples are stored at 4 deg C. The test organisms are transferred to fresh solutions using disposable transfer pipets. Care is taken to release the animals beneath the surface of the water so that no air is trapped under the carapace. The number of live young and the adult mortality is reported. The young, are discarded after recording

TERMINATION OF THE TEST

Tests are finished when at least 60% of surviving control females have produced a third brood (usually seven days).

ANALYSIS

The computer program Toxcalc is used to analyze data. The flow charts for statistical analysis of survival and growth as described in the EPA manual (USEPA 1989 & 1991) are followed to obtain NOEC estimates.

TEST ACCEPTABELITY

1) Control survival must be greater than 80%.
2) Reproduction in controls must average 15 or more young per surviving female.

Revised: 8/28/95

15.3 SOPs for Acute Effluent Toxicity Tests (EPA 1985 and Kopperdahl 1976 Methodologies)

ENDPOINT DESCRIPTION

Adult fish or invertebrates are exposed to various concentrations of effluent for 96 hours. The endpoint is mortality.

DILUTION WATER

Water used for this test is reconstituted fresh or saltwater. Known amounts of reagent grade salts or standard sea salts are added to high quality DI water until the dilution hardness and alkalinity or salinity is equal to that of the effluent.

EFFLUENT CONCENTRATIONS

Test dilutions are typically prepared at 100%, 56%, 32%, 18%, and 10%. If needed, lower dilutions can be set at ranges where the lowest is at least 56% that of the next highest concentration. If the toxicity of the sample is unknown, a 24-hour preliminary

range-finding, test using, a wider range of concentrations can be prepared. A control using the same dilution water is included with all tests. Test chambers are new disposable 16-liter glass aquaria. The volume in each tank is 10-15 liters, leaving enough space at the top of the tank- so fish will not jump out of tanks and bias results. Each of six tanks per test is labeled with a lab number and effluent concentration. Tanks are placed on wire racks in a constant temperature room of 18-22 deg C for freshwater bioassays or 14-17 deg C for seawater bioassays. Two-liter plastic beakers are used to pour the proper amount of well-mixed effluent in each tank, beginning with the lowest concentration. Dilution water is added to each tank to desired volume. One ml disposable pipets that come in contact with the effluent are connected to an air source (Whisper air pumps) and adjusted for single bubble aeration in each tank. Seventy percent of oxygen saturation is required. Occasionally, effluents are received that cause dissolved oxygen concentrations to be below 70% air saturation. The air delivery is then increased above single bubble aeration. If this is insufficient, the sample is oxygenated using compressed oxygen prior to or (if necessary) during testing.

TEST ORGANISMS

Adult animals are obtained from licensed breeders or collectors (Thomas Fish Company at Anderson, Ca. or Brezina and Associates at Dillon Beach, Ca.) and are delivered to Aquatic Bioassay via Greyhound bus. Each batch of organisms is held under similar test conditions for a minimum of seven days prior to testing. Upon arrival, the condition of the animals and number of mortalities during shipment are recorded. Condition of the holding tank is also recorded (dissolved oxygen, temperature, pH, hardness, and alkalinity (or salinity), and cleanliness). Acclimating fish are fed daily and monitored for any disease, and tanks are cleaned on a regular basis. Animals typically range in weight from 0.2 g to 0.9 g, with the length of the largest individual not exceeding 1.5 times the length of the smallest. Weights and lengths of 15 random organisms in each batch are recorded.

PERCENT SURVIVAL TESTS

Occasionally, only a percent survival test in undiluted effluent is required. The same procedures apply in this test as a standard bioassay; except that only undiluted waste and the control are used. Results are reported as percent survival in undiluted sample rather than LC50's.

CHEMICAL AND PHYSICAL PARAMETERS

Dissolved oxygen, pH, and temperature are measured in all controls and concentrations before introducing fish and at 24-hour intervals thereafter. The hardness and alkalinity are measured in the control and highest concentration at the beginning and end of each test. Residual chlorine and, conductivity or salinity are measured in the control and highest treatment concentration at the beginning of the test. Calibrated thermographs record temperatures throughout the test continuously.

DELIVERY OF ORGANISMS AND TEST DURATION

Within one hour after the preparation of test solutions, 20 randomly chosen animals are delivered to each test tank using a small-mesh dip-net. The test begins when animals are introduced into the test chambers and continues for 96 hours. Mortalities and chemical measurements are recorded every 24 hours, and dead animals are removed as soon as they are observed.

DISPOSAL OF FISH AND TANKS

At the end of the test, fish are destroyed before being disposed of by placing them in a ziplock bag with ethanol. Effluents are poured down the drain unless they are highly toxic, in which case the client is asked to pick up the sample and any dilutions. Test tanks and aeration pipets are broken down and disposed of at a local landfill.

ANALYSIS

The linear interpolation method (binomial test), as provided to us by State Department of Fish and Game, is used most often for estimating the LC50. When survival is greater than 50% in the highest concentration tested, the percent survival for this concentration is reported. When an LC50 can be determined, the toxicity of the waste is also expressed as toxic units where:

$$TC(tu) = \frac{100}{96\text{ hr LC50}}$$

When there is less than 50% mortality in 100% waste, the toxic units are expressed as:

$$TC\ (tu) = \frac{\text{Log (\% Mortality)}}{1.7}$$

TEST VALIDITY

1) Mortality cannot exceed 10% in the controls.
2) Test must be set within 24 hours of collection.
3) Dissolved oxygen above or equal to 70% saturation.
4) Weight to volume ratio not to exceed one gm per liter of solution.
5) Temperature between 18 and 22 deg C for freshwater tests and 14 and 17 deg C for seawater tests.

Revised 8/26/93

15.4 SOPs for Acute Effluent Toxicity Tests (EPA 1991 Methodology)

ENDPOINT DESCRIPTION

Juvenile fish or invertebrates are exposed to various concentrations of effluent for 96 hours. The endpoint is mortality.

DILUTION WATER

Water used for this test is reconstituted fresh or salt-water. Known amounts of reagent grade salts or standard sea salts are added to high quality DI water until the dilution hardness and alkalinity or salinity is equal to that of the effluent.

EFFLUENT CONCENTRATIONS

Test dilutions are typically prepared at 100%, 50%, 25%, 12.5%, and 6.25%. If needed, lower dilutions can be set at ranges where a dilution is at least 50% that of the next highest concentration. If the toxicity of the sample is unknown, a 24-hour preliminary range-finding test using a wider range of concentrations can be prepared. A control using the same dilution water is included with all tests. Test chambers are new or pre-cleaned, glass beakers, ranging in size from 30-250 ml (depending upon the species chosen). For rainbow or brook trout, 5-liter disposable glass aquaria are used. Test solution volumes range from 25-200 ml (or 4 liters for trout). Each beaker or aquarium is labeled with a tab number and effluent concentration. Test containers are placed on wire racks in a constant temperature room of either 19-21 or 24-26 deg C (11-13 deg C for trout). Beginning with the lowest concentration, graduated cylinders are used to pour the proper amount of the well-mixed effluent in each beaker. Dilution water is then poured in each container to the desired volume. Solutions are not aerated unless oxygen values fall below 4.0 mg/l (6.0 mg/l for trout). Rate of aeration should not exceed 100 bubbles per minute.

TEST ORGANISMS

Juvenile animals are obtained from licensed breeders or collectors (Thomas Fish Company at Anderson, Ca., Brezina and Associates at Dillon Beach, Ca., or Aquatic Resources in Sebastopol, Ca.) and are delivered by Greyhound bus, UPS, or Federal Express. Upon arrival, the condition of the animals and number of mortalities during shipment are recorded.

PERCENT SURVIVAL TESTS

Occasionally, only a percent survival test in undiluted effluent is required. The same procedures apply in this test as a standard bioassay, except that only undiluted waste and the control are used. Tests are reported as percent survival in undiluted sample instead of LC50.

CHEMICAL AND PHYSICAL PARAMETERS

Dissolved oxygen, pH, and temperature are measured in all controls and concentrations before introducing fish, and at 24-hour intervals thereafter. The hardness and alkalinity are measured in the control and highest concentration at the beginning and end of each test. Residual chlorine, and conductivity or salinity are measured in the control and highest treatment concentration at the beginning of the test. Calibrated thermographs record temperatures continuously. A uniform photoperiod of 16 hours light and 8 hours dark- at an intensity of 50-100 foot-candles is maintained.

DELIVERY OF ORGANISMS AND TEST DURATION

Within one hour after the preparation of test solutions, typically 10 randomly chosen animals are delivered to each duplicate test tank using a small-mesh dip-net or disposable pipette (total of 20 animals per concentration). The test begins when animals are introduced into the test chambers and continues for 24, 48, or 96 hours, depending upon requirements. Test solutions are renewed and all animals are fed at 48 hours, if the test lasts longer than this. Mortalities and chemical measurements are recorded every 24 hours, and dead animals are removed as soon as they are observed. Excess food is removed after feeding.

DISPOSAL OF FISH AND TANKS

At the end of the test, animals are destroyed before being disposed of by placing them in a zip-lock bag with ethanol. Effluents are poured down the drain unless they are highly toxic, in which case the client is asked to pick up the sample and any dilutions. Test tanks and aeration pipets are broken down and disposed of at a local landfill.

ANALYSIS

The flowchart shown in Figure 6 of the method reference (USEPA 1991) is used for determining the LC50 statistical test. When an LC50 can be determined the toxicity of the waste is also expressed as toxic units, where:

$$TC(tu) = \frac{100}{96\text{ hr LC50}}$$

When there is less than 50% mortality in 100% waste, the toxic units are expressed as:

$$TC(tu) = \frac{\text{Log (\% Mortality)}}{1.7}$$

TEST VALIDITY

1) Mortality cannot exceed 10% in the controls.
2) Test must be set within 36 hours of collection.
3) D.O. above or equal to 4 mg/l (6 mg/l for trout).
4) Loading limits must not exceed 1.1 g/l at 25 deg C, 0.65 g/l at 20 deg C, and 0.4 g/l at 25 deg C.

Revised 8/30/93

16.0 REFERENCES

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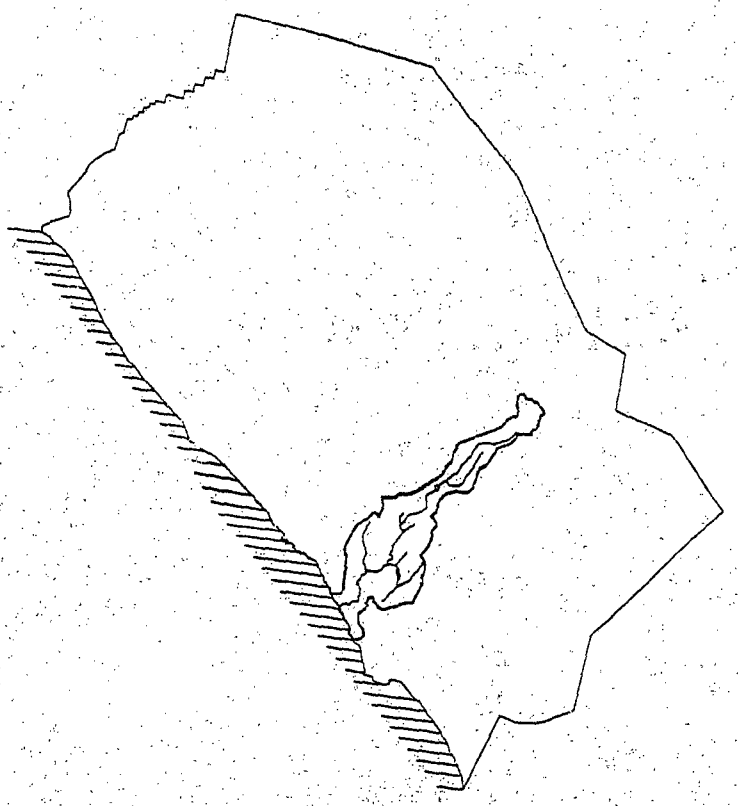
Aliso Creek Water Quality Planning Study

(Full Report w/ J. Haas)

DRAFT FINAL REPORT
ALISO CREEK 205(j) WATER QUALITY PLANNING STUDY

Agreement No. 7-042-250-0
June 2000



9.5 Toxicity Data Analysis

The initial water quality investigation included dry weather and stormwater toxicity testing at four and five locations along Aliso Creek, respectively **(Figure 9.2 and Table 9.11)**. A 7-day chronic fathead minnow survival and growth test was run on the low flow samples that were collected on September 29, 1998. Ten juvenile fathead minnow individuals were placed in the respective samples and their growth and survival was measured at the end of seven days. A total of four, undiluted duplicates were run along with four duplicates of a control sample for each of the stations. The results of the low flow sampling showed no inhibition of growth or survival for the juvenile fathead minnow test organism at any of the stations.

Two storm events were monitored for aquatic toxicity. The same configuration of duplicate samples and controls described for the low flow phase bioassays above were used in each of the two storm events. Samples were collected at each of the five locations including the Pacific Coast Highway site. Two separate bioassays were conducted on each sample: 1) acute 96-hour fathead minnow survival and, 2) acute 48-hour Ceriodaphnia survival.

The first storm event toxicity sampling was conducted on November 8, 1998 at the onset of storm runoff. For the acute 96-hour fathead minnow bioassay all sampling locations exhibited a 90% - 100% survival. For the acute 48-hour Ceriodaphnia bioassay, the Cook's Corner location exhibited 5% survival, and the remaining four sites exhibited 0% survival.

The second storm flow sampling was conducted on January 20, 1999 during a low-intensity drizzle that produced moderate runoff along Aliso Creek. For the 96-hour fathead minnow bioassay, survival ranged from 45% to 80%. Survival of Ceriodaphnia during the 48-hour bioassay was 100% at the Cook's Corner and downstream Dairy Fork/Aliso Hills Channel stations and ranged from 0% to 15% at the remaining locations **(Table 9.11 and Figure 9.10)**.

The Basin Plan (Page 3-15,16) guidelines for toxic pollutants state that, 'All waters should be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by the use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board'.

The Basin Plan also cites the numerical objectives for toxic pollutants given in 40 CFR, Part 131.36 as specific guidelines.

Possible sources of aquatic toxicity include trace metals, polynuclear aromatic hydrocarbons (PAHs), pesticides, herbicides, polychlorinated biphenyls (PCBs), and ammonia. While no confirming tests have been completed, based on studies in other

parts of Orange County it is expected that organophosphate pesticides are a significant component of the aquatic toxicity in the storm samples in Aliso Creek.

9.6 Bacteriological Water Quality Data Analysis

9.6.1 Water Quality Objectives for Bacteria

Aliso Creek is designated as having REC-1 (contact recreation) and REC-2 (non-contact recreation) beneficial uses at the creek mouth, and a REC-2 beneficial use upstream in the creek and in the Sulphur Creek, Wood Canyon, and English Canyon tributaries (with a potential REC-1 beneficial use in the creek and the same tributaries). The lower mile of Aliso Creek is listed as impaired (303(d)) because of bacteria (1996 Water Quality Assessment) and there is ongoing community concern related to periodic high bacteriological levels at Aliso Beach.

The water quality objectives for REC-1 and REC-2 are based on fecal coliform levels. They are specified in the Basin Plan as follows:

1. **REC-1**: 'fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log (geometric) mean of 200 MPN/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 MPN/100 ml' (Basin Plan, page 3-5).

2. **REC-2**: 'in waters designated for non-contact recreation (REC-2) and not designated for contact recreation (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2,000 MPN/ 100 ml nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000 MPN/100 ml' (Basin Plan, page 3-5).

The water quality objectives for non-contact recreation (REC-2) are based on arithmetic rather than geometric means.

The Basin Plan also indicates that E. coli and enterococcus criteria may be employed in special studies to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation. The objectives for infrequently used freshwater contact recreation waters are 151 colonies per 100 ml (CFU/ 100 ml) for enterococcus and 576 MPN/ 100 ml for E. coli. The objectives for designated beach recreation use are 61 CFU/ 100 ml for enterococcus and 235 MPN/ 100 ml for E. coli.

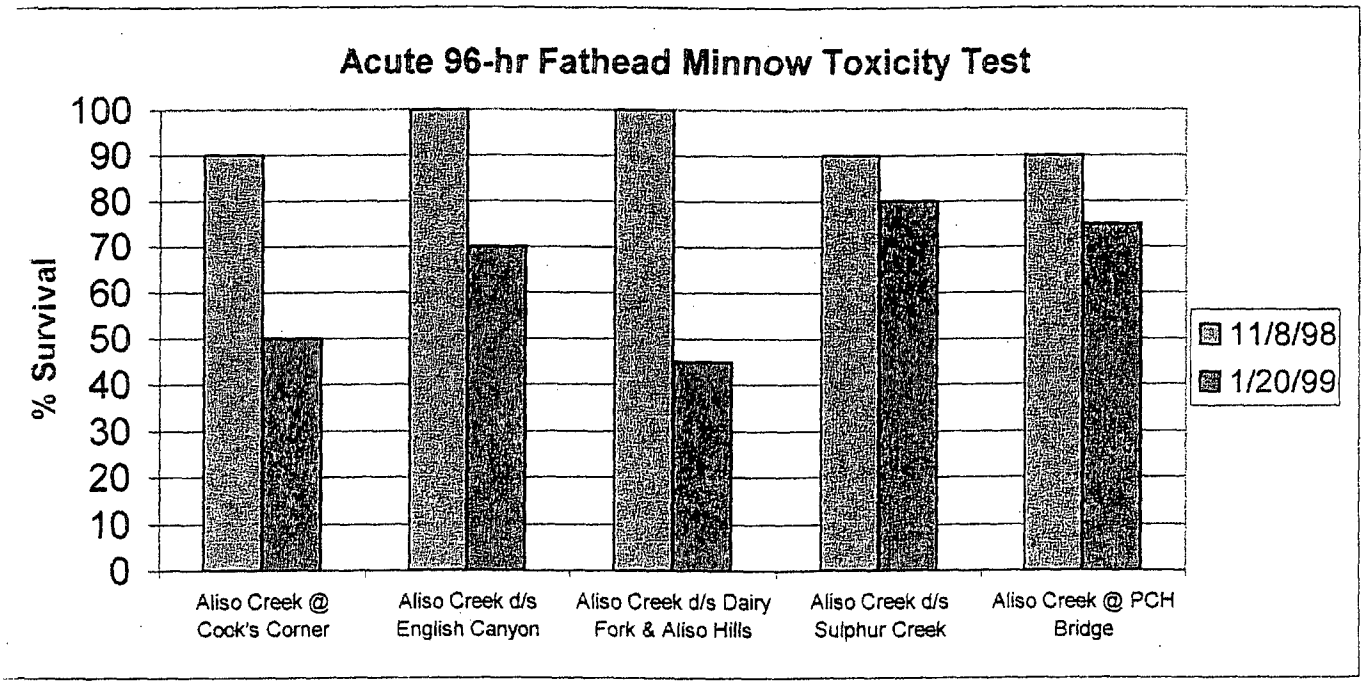
During the initial water quality investigation (September – December 1998), the County of Orange Health Care Agency (HCA) Public Health Laboratory analyzed all of the samples for total and fecal coliform. Subsequent to the initial water quality investigation and prior to the intensive watershed and J03P02 subwatershed studies, the HCA laboratory revised their testing procedures to produce results that were consistent with new ocean water contact standards (AB 411). This meant that instead of analyzing

Table 9.11 - Toxicity Results in Aliso Creek During Low Flow and Storm Conditions

			Low Flow Sampling	Storm Sampling	
			Chronic 7-day fathead minnow	Acute 96-hour fathead minnow	Acute 48-hour Ceriodap
Sampling Location	Date	Time	% survival/ growth	% survival	% survival
Aliso Creek	9/29/98	1245	100/ 100		
@ Cook's Corner	11/8/98	622		90	5
	1/20/99	1145		50	100
Aliso Creek	9/29/98	1220	100/ 100		
d/s English Canyon	11/8/98	646		100	0
	1/20/99	1205		70	0
Aliso Creek	9/29/98	1145	100/ 100		
d/s Dairy Fork &	11/8/98	706		100	0
Aliso Hills Ch.	1/20/99	1220		45	100
Aliso Creek	9/29/98	1055	100/ 100		
d/s Sulphur Creek	11/8/98	721		90	0
	1/20/99	1235		80	0
Aliso Creek	9/29/98		N/A		
@ PCH Bridge	11/8/98	746		90	0
	1/20/99	1300		75	15

N/A not analyzed because electrical conductivity of creek at that location was outside of the physiological tolerance of the test organism

Figure 9.10 - Toxicity Sampling of Stormwater Runoff in Aliso Creek



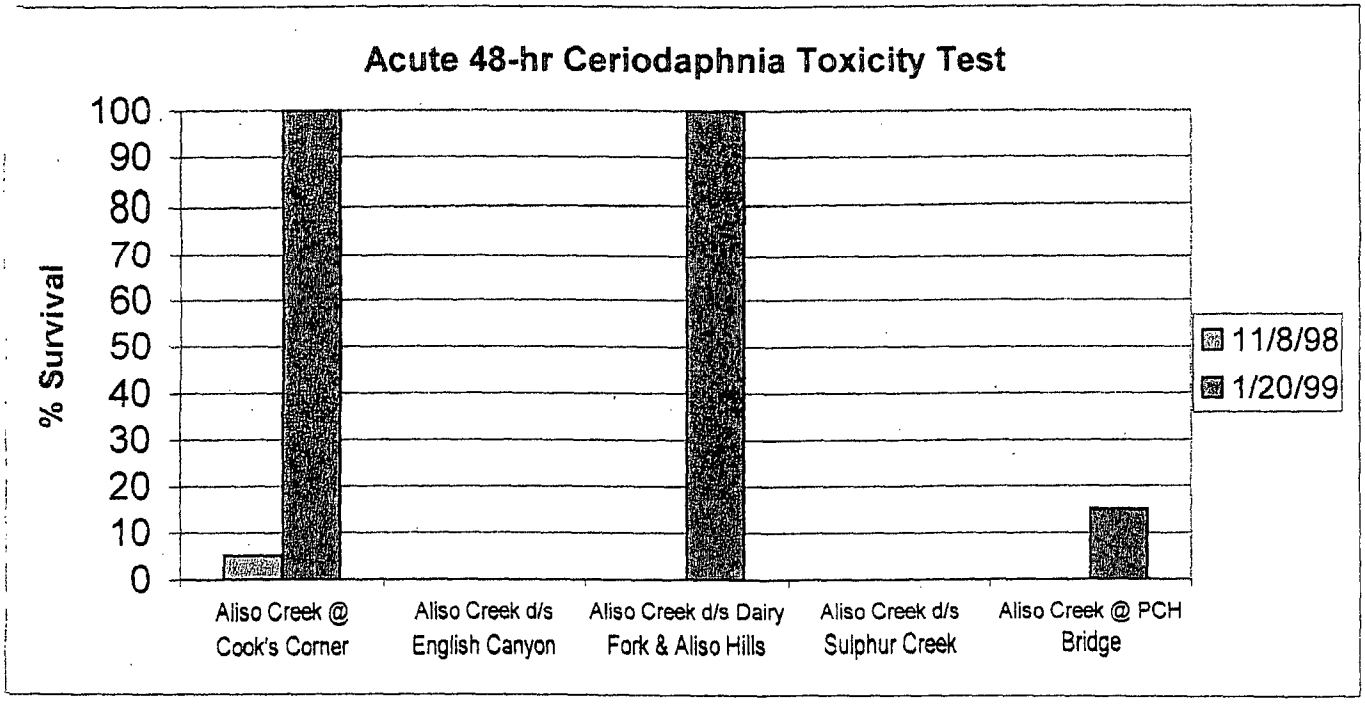
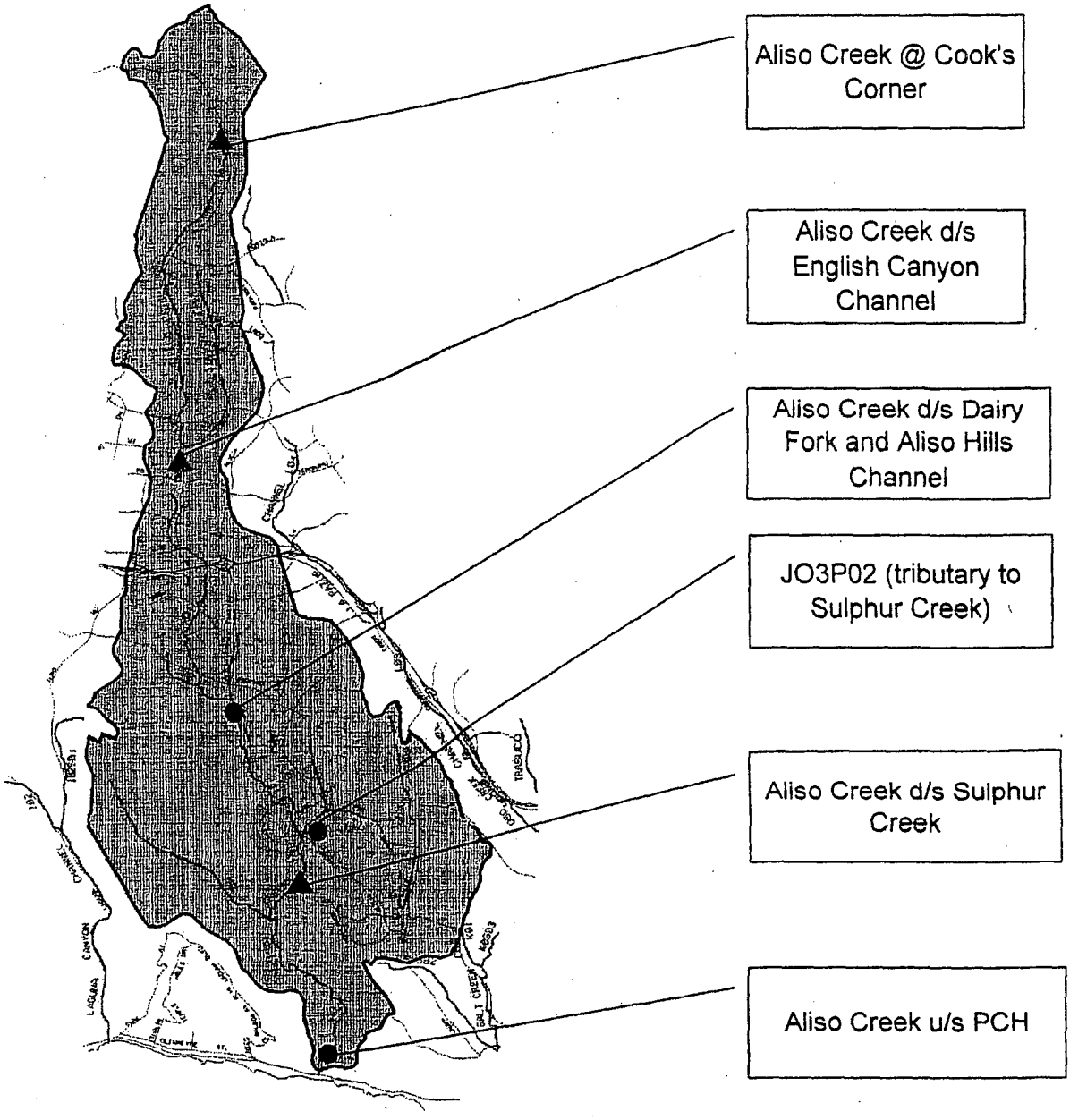


Figure 9.1: Initial Water Quality Study - Monitoring Locations
September 30 - October 21, 1998



▲ Nutrients, General Mineral, Trace Metals, Bacteriological

● Bacteriological

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INDEPENDENT TESTING, FORENSIC SCIENCE, AND ENVIRONMENTAL ANALYSES
Established 1931
14201 FRANKLIN AVENUE • TUSTIN, CALIFORNIA 92780-7008
PHONE (714) 730-6239 • FAX (714) 730-6462

REPORT

CLIENT: CRWQCB-San Diego
9771 Clairemont Mesa Blvd., "B"
San Diego, CA 92124
Attention: Greig Peters

DATE: Oct. 8, 1998

RECEIVED: June 30, 1998

LABORATORY NO. 410996-61

SAMPLE: 978-330

INVESTIGATION: Analysis as requested

RESULTS

Milligrams per Kilogram (wet weight)

Parameter	Date Analyzed	Method	Detection Limit	Concentration
Antimony	9/28/98	EPA 6010	1.0	ND
Arsenic	9/28/98	EPA 6010	1.0	1.2
Beryllium	9/28/98	EPA 6010	0.4	ND
Cadmium	9/28/98	EPA 6010	0.4	ND
Chromium	9/28/98	EPA 6010	0.4	7.6
Copper	9/28/98	EPA 6010	0.4	2.2
Lead	9/28/98	EPA 6010	1.0	ND
Mercury	9/25/98	EPA 245.1	0.05	ND
Nickel	9/28/98	EPA 6010	0.4	3.4
Selenium	9/21/98	SM3114B	0.10	ND
Silver	9/28/98	EPA 6010	0.4	ND
Thallium	9/28/98	EPA 6010	1.0	1.2
Zinc	9/28/98	EPA 6010	0.4	16.0

ND = not detected, below the detection limit.

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Divina B. Pascual, Project Manager
Water and Waste Laboratory

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PHONE (714) 730-6239 • FAX (714) 730-6462

REPORT

CLIENT: **CRWQCB-San Diego**
Clairemont Mesa Blvd., "B"
San Diego, CA 92124
Attention: Greig Peters

DATE: July 6, 1998

RECEIVED: June 11, 1998

LABORATORY NO. 409363-4
SAMPLER: Linda Pardy

SAMPLE: DFG-978-330

INVESTIGATION: **Analysis as requested**

RESULTS

MILLIGRAMS PER LITER

Parameter	Date Analyzed	Method	Detection Limit	Concentration
Ammonia-N	6/16/98	SM 4500NH	0.14	3.3
Nitrate-N	6/11/98	EPA 300.0	0.20	3.1
Nitrite-N	6/11/98	EPA 354.1	0.01	1.0
Total Kjeldahl Nitrogen	7/2/98	ASTM D3590	0.1	0.81
Orthophosphate-P	6/12/98	SM 4500PE	0.04	1.1
Total Phosphate	6/17/98	EPA 365.3	1.0	14.0
Total Dissolved Solids	6/12/98	EPA 160.1	10.0	1,712
Turbidity,NTU	6/12/98	EPA 180.1	0.10	4.1

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Divina B. Pascual, Project Manager
Water and Waste Laboratory

TRUESDAIL LABORATORIES, INC.
INDEPENDENT TESTING, FORENSIC SCIENCE, AND ENVIRONMENTAL ANALYSES
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REPORT

CLIENT: **CRWQCB-San Diego**
Clairemont Mesa Blvd., "B"
San Diego, CA 92124
Attention: Greig Peters

DATE: July 6, 1998

RECEIVED: June 11, 1998

LABORATORY NO. 409363-5
SAMPLER: Linda Pardy

SAMPLE: DFG-978-331

INVESTIGATION: **Analysis as requested**

RESULTS

MILLIGRAMS PER LITER

Parameter	Date Analyzed	Method	Detection Limit	Concentration
Ammonia-N	6/16/98	SM 4500NH	0.14	0.18
Nitrate-N	6/11/98	EPA 300.0	0.20	1.0
Nitrite-N	6/11/98	EPA 354.1	0.01	0.03
Total Kjeldahl Nitrogen	7/2/98	ASTM D3590	0.1	0.56
Orthophosphate-P	6/12/98	SM 4500PE	0.04	0.15
Total Phosphate	6/17/98	EPA 365.3	1.0	~~18.5~~ revised
Total Dissolved Solids	6/12/98	EPA 160.1	10.0	1,961
Turbidity,NTU	6/12/98	EPA 180.1	0.10	1.1

Respectfully submitted,
TRUESDAIL LABORATORIES, INC.

Divina B. Pascual, Project Manager
Water and Waste Laboratory

mg/kg
ug/kg
Truesdail Lab Inc
mg/l

Sampling Date	Station Name	Station ID	Hydrologic Subarea	Station Location	Detection Limit:	0.14	0.20	0.01	0.1	0.02	5.0		10.0		0.10	0.25	0.15	0.56	1.0	40.0	1.0		0.005	0.0
						Ammonia-N	Nitrate as N	Nitrite-N	Total Kjeldahl Nitrogen	Orthophosphate-P	Total Phosphate as P (revised)	Total Phosphate as PO_4	Total Dissolved Solids	Turbidity, NTU	Calcium	Sodium	Magnesium	Potassium	Chloride	Sulfate	Total Hardness	Ec, umhos	Antimony	Arsenic
5/20/98	LAC-CB-T1	DFG-978-300	—	Loma Alta Creek at College Blvd		0.23	0.61	0.04	0.70	0.12	0.40		2800	0.98										
5/20/98	BVC-SVW-T3	DFG-978-301	—	Buena Vista Creek at South Vista Way		<.14	2.50	0.02	0.42	0.22	0.22		1378	0.79										
5/20/98	SLRR-FR-T1	DFG-978-302	✓	San Luis Rey River at Foussat Road		<.14	2.40	0.01	0.39	0.58	0.24		850	5.10										
5/20/98	LAC-ECR-A	DFG-978-303	✓	Loma Alta Creek at El Camino Real		<.14	0.27	0.00	0.36	0.44	0.14		2459	0.58										
6/2/98	SR-79	DFG-978-304	✓	Sweetwater River at Hwy 79 near Interstate 8		<.14	0.33	0.00	0.29	0.13	0.13		224	1.90										
6/2/98	SR-94	DFG-978-305	✓	Sweetwater River upstream of Hwy 94 (Campo Road)		<.14	0.36	0.01	0.16	0.07	0.06		397	2.80										
6/2/98	SR-WS	DFG-978-306	✓	Sweetwater River downstream of Willow Street		<.14	0.35	0.01	0.40	0.05	0.20		825	0.76										
6/2/98	SDR-MD	DFG-978-307	7.11✓	San Diego River up stream of Mission Dam		0.19	0.35	0.02	0.38	0.22	0.09		1038	3.70										
6/2/98	SDR-MT	DFG-978-308	7.11✓	San Diego River at Mission Trails Regional Park		<.14	0.28	0.01	0.49	0.14	0.05		1046	0.77										
6/2/98	SDR-FVR	DFG-978-309	7.11✓	San Diego River at Fashion Valley Road		<.14	0.23	0.00	0.42	0.23	0.06		1217	5.00										
6/3/98	LPC-BMR	DFG-978-310	—	Los Penasquitos Creek upstream of Black Mountain Road		<.14	0.34	0.01	0.76	0.30	0.55		1678	0.67										
6/3/98	LPC-CCR	DFG-978-311	✓	Los Penasquitos Creek at Cobblestone Creek Road.		<.14	1.10	0.03	1.90	0.17	0.55		1633	3.80										
6/3/98	RC-HP	DFG-978-312	— 6.20	Rattlesnake Creek at Hilleary Park, off Community Road		<.14	1.50	0.02	1.50	0.46	0.67		1412	0.54										
6/3/98	EC-HRB	DFG-978-313	4.60✓	Escondido Creek below Harmony Grove Bridge.		<.14	7.20	0.07	0.46	0.46	0.37		1196	0.99										
6/3/98	EC-EF	DFG-978-314	✓ 4.60	Escondido Creek at intersection Elfin Forest and Harmony Grove (end of Elfin Forest Resort).		<.14	6.90	0.02	0.55	0.77	0.29		1145	0.38									ND	3.8
6/3/98	EC-LCA	DFG-978-315	—	Encinitas Creek at Green Valley Road		<.14	0.34	<.01	0.54	0.34	0.32		2082	3.70										
6/3/98	SMC-RSFR	DFG-978-316	4.51	San Marcos Creek at Rancho Santa Fe Road		<.14	0.00	0.01	0.60	0.42	0.52		780	0.99										
6/3/98	SMC-M	DFG-978-317	4.51✓	San Marcos Creek at McMahr		<.14	6.20	0.04	0.62	0.49	0.56		1346	13.80										
6/9/98	MC-WB	DFG-978-318	✓	Murrieta Creek at Calle Del Oso Rd		<.14	1.29	<.01	0.31	0.21	0.28		709	0.38									ND	3.0
6/9/98	MC-GS	DFG-978-319	✓	Murrieta Ck behind cement factory		<.14	0.32	0.01	0.44	0.09	0.06		753	2.31									ND	3.1
6/9/98	TC-I15	DFG-978-320	✓	Temecula Ck east of confluence, west of I-15		<.14	1.40	0.01	0.44	0.30	0.17		840	0.67										

Linda_Pardy
Sheet 1

Sampling Date	Station Name	Station ID	Hydrologic Subarea	Station Location	Beryllium	Cadmium	Chromium, Total	Chromium, Dissolved	Copper	Lead, Total	Lead, Dissolved	Mercury	Nickel	Selenium	Silver	Thallium	Zinc, Total	Zinc, Dissolved	Ceriodaphnia-survival	Ceriodaphnia-reproduction	Pimephales-survival	Pimephales-growth
			Detection Limit		0.0005	0.0005	0.4	0.01	0.01	0.001	0.001	0.0005	0.01	0.002	0.01	0.001	0.01	0.01				
5/20/98	LAC-CB-T1	DFG-978-300		Loma Alta Creek at College Blvd																		
5/20/98	BVC-SVW-T3	DFG-978-301		Buena Vista Creek at South Vista Way																		
5/20/98	SLRR-FR-T1	DFG-978-302		San Luis Rey River at Foussat Road																		
5/20/98	LAC-ECR-A	DFG-978-303		Loma Alta Creek at El Camino Real																		
6/2/98	SR-79	DFG-978-304		Sweetwater River at Hwy 79 near Interstate 8																		
6/2/98	SR-94	DFG-978-305		Sweetwater River upstream of Hwy 94 (Campo Road)																		
6/2/98	SR-WS	DFG-978-306		Sweetwater River downstream of Willow Street																		
6/2/98	SDR-MD	DFG-978-307	7.11	San Diego River up stream of Mission Dam																		
6/2/98	SDR-MT	DFG-978-308	7.11	San Diego River at Mission Trails Regional Park																		
6/2/98	SDR-FVR	DFG-978-309	7.11	San Diego River at Fashion Valley Road																		
6/3/98	LPC-BMR	DFG-978-310		Los Penasquitos Creek upstream of Black Mountain Road																		
6/3/98	LPC-CCR	DFG-978-311		Los Penasquitos Creek at Cobblestone Creek Road.																		
6/3/98	RC-HP	DFG-978-312	6.20	Rattlesnake Creek at Hilleary Park, off Community Road																		
6/3/98	EC-HRB	DFG-978-313	4.60	Escondido Creek below Harmony Grove Bridge.																		
6/3/98	EC-EF	DFG-978-314	4.60	Escondido Creek at intersection Elfin Forest and Harmony Grove (end of Elfin Forest Resort).	ND	ND	11.0		13.7	150		ND	2.4	ND	ND	ND	72.8					
6/3/98	EC-LCA	DFG-978-315		Encinitas Creek at Green Valley Road																		
6/3/98	SMC-RSFR	DFG-978-316	4.51	San Marcos Creek at Rancho Santa Fe Road	These are in units of mg/kg wet weight.																	
6/3/98	SMC-M	DFG-978-317	4.51	San Marcos Creek at McMahr																		
6/9/98	MC-WB	DFG-978-318		Murrieta Creek at Calle Del Oso Rd	ND	1.1	16.2		26.3	36.7		0.068	9.4	ND	ND	ND	182					
6/9/98	MC-GS	DFG-978-319		Murrieta Ck behind cement factory	ND	ND	2.8		6.1	9.2		ND	1.9	ND	ND	3.0	53.8					
6/9/98	TC-I15	DFG-978-320		Temecula Ck east of confluence, west of I-15																		

Linda_Pardy
Sheet1

Sampling Date	Station Name	Station ID	Detection Limit	Hydrologic Subarea	Station Location	Ammonia-N	Nitrate as N	Nitrite-N	Total Kjeldahl Nitrogen	Orthophosphate-P	Total Phosphate as P (revised)	Total Phosphate as PO_4	Total Dissolved Solids	Turbidity, NTU	Calcium	Sodium	Magnesium	Potassium	Chloride	Sulfate	Total Hardness	EC, umhos	Antimony	Arsenic
						0.14	0.20	0.01	0.1	0.02	5.0	1.1	10.0		0.10	0.25	0.15	0.56	1.0	40.0	1.0		0.005	0.0
6/9/98	RC-WGR	DFG-978-321		✓	Rainbow Creek at Willow Glen Rd	<.14	11.47	0.02	0.44	0.95	0.77		810	0.30										
6/9/98	SMR-WGR	DFG-978-322		—	Santa Margarita at Willow Glen Rd (Stage Coach Ln).	<.14	3.76	0.02	0.47	0.11	0.62		913	0.46										
6/9/98	SMR-SCD	DFG-978-323		✓	SMR at DeLuz/ Pico Rd near Sandia Ck	<.14	4.69	0.01	0.34	0.18	0.35		923	0.50										
6/9/98	SC-SCR	DFG-978-324		—	Sandia Ck at Sandia Ck Rd, 0.5 to 1 mile above confluence	<.14	5.83	0.01	0.17	0.24	0.30		817	1.80									ND	7.8
6/9/98	SMR-CP	DFG-978-325		✓	Santa Margarita River below diversion weir on Camp Pendleton	<.14	2.71	0.01	0.34	0.23	0.41		667	3.77									ND	5.9
6/9/98	SMR-SMB	DFG-978-326		✓	SMR at Stuart Mesa Rd bridge on Camp Pendleton	<.14	1.63	0.01	0.28	0.23	0.35		713	3.60									ND	2.3
6/10/98	BVR-ED	DFG-978-327		✓	San Marcos Creek at Rancheros Drive	<.14	14.70	0.05	0.53	0.14	0.95		1372	0.49										
6/10/98	AHC-SA	DFG-978-328		—	Agua Hedionda Ck at Sycamore Ave	0.17	15.30	0.08	0.58	1.00	0.90		1144	1.10										
6/10/98	SMC-SP	DFG-978-329		✓	Buena Vista Ck at Wildwood Park	0.23	3.40	0.09	0.62	0.12	0.75		1360	1.70										
6/10/98	AC-CCR	DFG-978-330		—	Aliso Ck along Country Club Rd	3.30	3.10	1.00	0.81	1.10	0.93		1712	4.10									ND	1.2
6/10/98	AC-PPD	DFG-978-331		✓	Aliso Ck at Pacific Park Dr/ Oso Pkwy	0.18	1.00	0.03	0.56	0.15	0.81		1961	1.10										
6/10/98	AHC-ECR	DFG-978-332		✓	Agua Hedionda Ck at El Camino Real	<.14	5.80	0.02	0.53	0.44	0.61		1716	0.55										
6/11/98	SLRR-395	DFG-978-333		✓	San Luis Rey River at old Hwy 395 (Couser Canyon Rd)	<.14	4.20	0.03	0.42	0.75	0.99		970	3.73										
6/29/98		LLP-978-405-BUV		✓	Buena Vista Creek	<.14	1.20	0.02	0.64	0.83		7.1	1133	1.3	120	254	80.7	3.6	454	281	570	1965	ND	ND
6/29/98		LLP-978-405-AGH		✓	Agua Hedionda Creek	<.14	4.50	0.03	0.76	0.25		4.2	1624	0.6	168	255	97.9	3.3	465	363	745	2300	ND	ND
6/29/98		LLP-978-405-ESC		✓	Escondido Creek	<.14	3.60	0.01	0.76	0.25		4.6	1382	4.4	109	251	87.5	3.4	322	342	570	1969	ND	ND

These ar

Total = TKP + NO_3 + NO_2

NH_3 - N

NO_3 - N

NO_2 - N

organic + NH_3

PO_4^{3-}

mg/kg wt wet

WQO

1. Inorganics in MHN — NO_3 - 45 NO_3+NO_2
2. Nitrates 45 ppm
3. Bio stim Subst => Narr
   TN 1.0 ppm
   TP 0.1 ppm
   Concen prevent NO_3 algae nuisance
4. Unionized NH_3
5. DO

NO_3 45 mg/L

NO_3-N 10 mg/L

4.43

Linda_Pardy
Sheet1

mg/l

Sampling Date	Station Name	Station ID	Detection Limit / Hydrologic Subarea	Station Location	Beryllium 0.0005	Cadmium 0.0005	Chromium, Total 0.4	Chromium, Dissolved 0.01	Copper 0.01	Lead, Total 0.001	Lead, Dissolved 0.001	Mercury 0.0005	Nickel 0.01	Selenium 0.002	Silver 0.01	Thallium 0.001	Zinc, Total 0.01	Zinc, Dissolved 0.01	Ceriodaphnia survival	Ceriodaphnia reproduction	Pimephales survival	Pimephales growth
6/9/98	RC-WGR	DFG-978-321		Rainbow Creek at Willow Glen Rd																		
6/9/98	SMR-WGR	DFG-978-322		Santa Margarita at Willow Glen Rd (Stage Coach Ln).																		
6/9/98	SMR-SCD	DFG-978-323		SMR at DeLuz/ Pico Rd near Sandia Ck																		
6/9/98	SC-SCR	DFG-978-324		Sandia Ck at Sandia Ck Rd, 0.5 to 1 mile above confluence	ND	ND	17.0		20.0	1.7		ND	7.7	ND	ND	ND	26.2					
6/9/98	SMR-CP	DFG-978-325		Santa Margarita River below diversion weir on Camp Pendleton	ND	ND	5.7		4.0	6.7		ND	2.8	ND	ND	1.5	24.3					
6/9/98	SMR-SMB	DFG-978-326		SMR at Stuart Mesa Rd bridge on Camp Pendleton	ND	0.44	14.7		9.1	12.3		ND	5.5	ND	ND	ND	81.1					
6/10/98	BVR-ED	DFG-978-327		San Marcos Creek at Rancheros Drive																		
6/10/98	AHC-SA	DFG-978-328		Agua Hedionda Ck at Sycamore Ave																		
6/10/98	SMC-SP	DFG-978-329		Buena Vista Ck at Wildwood Park																		
6/10/98	AC-CCR	DFG-978-330		Aliso Ck along Country Club Rd	ND	ND	7.6		2.2	ND		ND	3.4	ND	ND	1.2	16.0					
6/10/98	AC-PPD	DFG-978-331		Aliso Ck at Pacific Park Dr/ Oso Pkwy																		
6/10/98	AHC-ECR	DFG-978-332		Agua Hedionda Ck at El Camino Real																		
6/11/98	SLRR-395	DFG-978-333		San Luis Rey River at old Hwy 395 (Couser Canyon Rd)	are in units of milligrams per liter.																	
6/29/98		LLP-978-405-BUV		Buena Vista Creek	ND	ND	0.0	0.01	ND	ND	ND	ND	ND	ND	ND	ND	0.04	0.02	No Difference			
6/29/98		LLP-978-405-AGH		Agua Hedionda Creek	ND	ND	0.0	0.01	ND	ND	ND	ND	ND	ND	ND	ND	0.03	0.02	No Difference			
6/29/98		LLP-978-405-ESC		Escondido Creek	ND	ND	0.0	0.01	ND	ND	0.002	ND	ND	ND	ND	ND	0.06	0.04	No Difference			

Linda_Pardy
Sheet1

From: Linda Pardy
To: Tracy_Weddle@nps.gov
Date: 3/5/01 2:45PM
Subject: Re: Cabrillo National Monument Water Quality Data

Tracy, FYI. In reply to your email:
The source of 1998 water quality data was the San Diego Regional Water Quality Control Board (Regional Board). The Regional Board collected water samples at selected sites throughout the Region to scan sites for elevated levels of the sampled parameters. The June 1998 sampling was limited to those samples/constituents shown. The samples were delivered to the lab by the Regional Board. The contract lab which did the analyses was Truesdail Laboratories, Inc is located at 14201 Franklin Ave, Tustin, CA 92780-7008. The project manager at that time for the testing was Divina B. Pascual. Their phone number was 714 730-6239. -Linda

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Linda Pardy, Environmental Specialist
California Regional Water Quality Control Board
San Diego Region
9771 Clairemont Mesa Blvd, Suite A
San Diego, CA 92124-1324
(858) 627-3932, fax (858) 571-6972
calnet 8-734-3932
email <PARDL@RB9.SWRCB.CA.GOV>
Internet Address <www.swrcb.ca.gov/~rwqcb9>
Primary Office Phone Number (858) 467-2952
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The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways to reduce demand and cut your energy costs, see the tips at: http://www.swrcb.ca.gov/news/echallenge.html

>>> <Tracy_Weddle@nps.gov> 03/05/01 10:18AM >>>
Ms. Pardy,

I am currenty establishing a baseline water quality report for Cabrillo National Monument for the National Park Service. I am taking over the work of Brett Atkinson, whom you spoke to previously. Brett prepared the data which you sent him for these reports, but there is one bit of information missing before these reports can be completed and the data uploaded to the EPA database STORET. A paragraph description is needed, describing the source of data and purpose for data collection and monitoring. I have looked on your agency's website to try and determine this, but there are so may projects that I could not determine where the data you sent came from. Could you please describe to me what the monitoring was for, the extent of monitoring, and any other information you feel is significant? I am attaching a copy of the data you sent in case you are unsure about what data I'm referring to. Thank you for your help!

Sincerely,

Tracy Weddle
Water Quality Data Analyst
National Park Service
Water Resources Division
1201 Oakridge Drive, Suite 250
Fort Collins, CO 80525

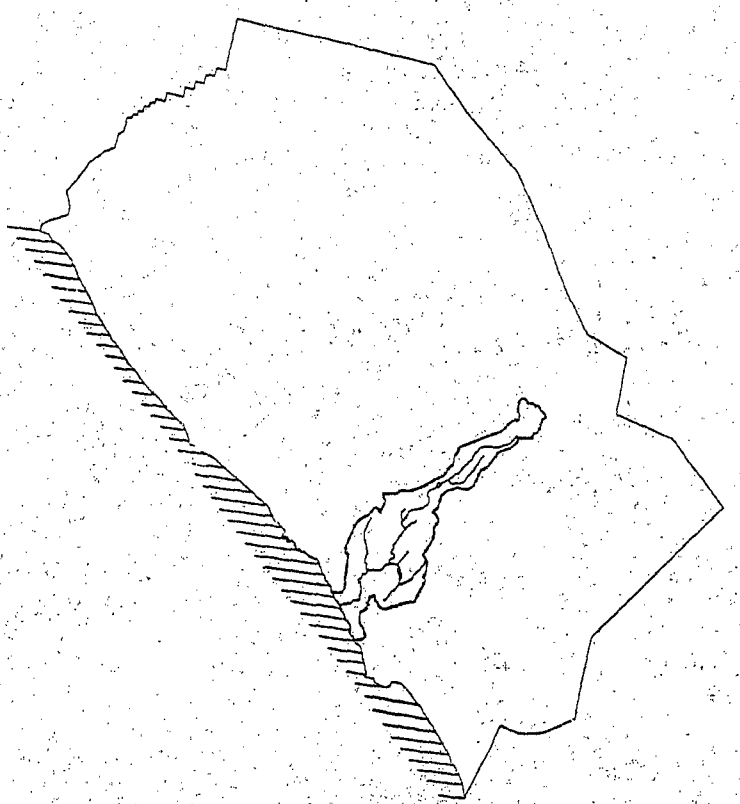
JR

Aliso Creek Water Quality Planning Study

(Full Report w/ J. Haas)

DRAFT FINAL REPORT
ALISO CREEK 205(j) WATER QUALITY PLANNING STUDY

Agreement No. 7-042-250-0
June 2000



parts of Orange County it is expected that organophosphate pesticides are a significant component of the aquatic toxicity in the storm samples in Aliso Creek.

9.6 Bacteriological Water Quality Data Analysis

9.6.1 Water Quality Objectives for Bacteria

Aliso Creek is designated as having REC-1 (contact recreation) and REC-2 (non-contact recreation) beneficial uses at the creek mouth, and a REC-2 beneficial use upstream in the creek and in the Sulphur Creek, Wood Canyon, and English Canyon tributaries (with a potential REC-1 beneficial use in the creek and the same tributaries). The lower mile of Aliso Creek is listed as impaired (303(d)) because of bacteria (1996 Water Quality Assessment) and there is ongoing community concern related to periodic high bacteriological levels at Aliso Beach.

The water quality objectives for REC-1 and REC-2 are based on fecal coliform levels. They are specified in the Basin Plan as follows:

1. **REC-1**: 'fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log (geometric) mean of 200 MPN/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 MPN/100 ml' (Basin Plan, page 3-5).

2. **REC-2**: 'in waters designated for non-contact recreation (REC-2) and not designated for contact recreation (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2,000 MPN/ 100 ml nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000 MPN/100 ml' (Basin Plan, page 3-5).

The water quality objectives for non-contact recreation (REC-2) are based on arithmetic rather than geometric means.

The Basin Plan also indicates that E. coli and enterococcus criteria may be employed in special studies to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation. The objectives for infrequently used freshwater contact recreation waters are 151 colonies per 100 ml (CFU/ 100 ml) for enterococcus and 576 MPN/ 100 ml for E. coli. The objectives for designated beach recreation use are 61 CFU/ 100 ml for enterococcus and 235 MPN/ 100 ml for E. coli.

During the initial water quality investigation (September – December 1998), the County of Orange Health Care Agency (HCA) Public Health Laboratory analyzed all of the samples for total and fecal coliform. Subsequent to the initial water quality investigation and prior to the intensive watershed and J03P02 subwatershed studies, the HCA laboratory revised their testing procedures to produce results that were consistent with new ocean water contact standards (AB 411). This meant that instead of analyzing

bacteriological samples for total and fecal coliform, they now analyzed all bacteriological samples for total coliform, E. Coli and enterococcus.

The relationship between E. coli and fecal coliform indicators is imprecisely defined however; it is generally accepted that E. coli bacteria comprise approximately 80 – 90 % of the fecal coliform organisms in a typical surface water sample. General comparisons of E. coli levels with the REC-2 fecal coliform objectives outlined above are made in the following sections in order to provide additional perspective on the bacteriological results. Such comparisons should be interpreted carefully, recognizing that the objective is not based on E. coli.

9.6.2 Bacteriological Investigations of Aliso Creek and Tributaries 1998 - 2000

The initial and subsequent intensive watershed studies of the Aliso Creek watershed assessed bacteriological contamination at a total of twelve sites in the watershed including five locations along Aliso Creek, six tributaries of the creek, and the J03P02 tributary to Sulphur Creek. Six sites were sampled during the initial investigation (**Figure 9.1**) and twelve sites were sampled during the subsequent intensive watershed study (**Figure 9.3**).

Subsequent monitoring during the Dairy Fork sampling (four sites) (**Figure 9.6**), and the Sulphur Creek/ J03P02 sampling (three sites) (**Figure 9.7**) during early 2000 provided additional information on the bacteriological status of the Aliso Creek watershed.

The bacteriological results of the initial water quality investigation (September – December 1998) are presented in **Table 9.12**. Fecal coliform concentrations in Aliso Creek watershed exceeded the REC-2 guidelines on several occasions at the sampled sites during the initial water quality investigation.

The highest average total and fecal coliform bacteria levels during the September – December 1998 period were observed at the J03P02 tributary to Sulphur Creek. The lowest bacteria levels, which met REC-2 guidelines, occurred at the Aliso Creek @ Cook's Corner site in the comparatively rural, upper watershed. Bacteria levels were highest during the September – October period and appeared to decrease during November and December. This trend was generally evident at each of the sixsampling locations.

The intensive watershed study (June 3 – August 5, 1999) was intended to determine whether any tributary subwatersheds within the Aliso Creek watershed were experiencing elevated levels of bacterial indicators. The results of this study are presented in **Table 9.13**.

Included in **Table 9.13** are the log mean and arithmetic mean concentrations of total coliform, E. Coli, and enterococcus at each sampling location during the period of the intensive watershed investigation. All reported values of total coliform, E. coli, and enterococcus were used in calculating the averages. For values below the reporting

detection limits (RDL), the RDL was used in the log and arithmetic mean calculations. With the exception of the location at the PCH bridge, mean total coliform levels in the intensive watershed investigation were similar or substantially higher than in the initial investigation.

Figure 9.11 is a graphical depiction of the arithmetic mean concentrations of total coliform, E. coli, and enterococcus at each sampling location during the intensive watershed investigation. The furthest upstream station is at the top of the plot and the mouth of the creek is at the bottom. The bars representing the total coliform concentrations are the most useful in comparing bacterial water quality between sampling locations because the E. coli and enterococcus levels used to generate the arithmetic mean values were below the detection limits of 1000 MPN/ 100 ml for E. Coli and 1000 CFU/ 100 ml for enterococcus for many locations.

The mean total coliform in the creek appears to increase after the confluence with each major tributary down to and including the Aliso Creek downstream Aliso Hills and Dairy Fork sampling site. After the confluence with Sulphur Creek the total coliform levels decrease. This same pattern can also be seen in the initial investigation data. The decrease may be the result of the high dissolved solids from Sulphur Creek contributing to the mortality of coliform bacteria. It should also be noted that the mean total coliform level in Aliso Creek downstream of the Dairy Fork and Aliso Hills Channels is much greater than the total coliform levels recorded for the two tributaries. This may be indicative of the high variability of the bacteriological data. One to three orders of magnitude fluctuations in total coliform levels were commonly observed at the sampling site downstream of Dairy Fork and Aliso Hills Channel during the study period. The high total coliform levels in Aliso Creek downstream of the Dairy Fork and Aliso Hills Channels may also be explained by unidentified sources of high total coliform between English Canyon Channel and Aliso Hills Channel.

It can be concluded from the intensive investigation data that some locations on Aliso Creek and certain of its tributaries continued to experience elevated bacteriological values during the period (June – August 1999). The tributary that exhibited the highest bacteria levels was J03P02 (Table 9.13). Eight of the nine samples collected at the the end of the J03P02 30-inch steel pipe had E. coli levels in excess of 4,000 MPN/ 100 ml. The Munger Storm Drain and Dairy Fork tributaries experienced three and two E. coli readings above 4,000 MPN/ 100 ml, respectively. The Sulphur Creek, Aliso Hills Channel, and English Canyon Channel tributaries each had one out of nine samples with E. coli levels above 4,000 MPN/ 1000 ml. The Wood Canyon tributary had no readings in excess of 4,000 MPN/ 100 ml.

The highest E. coli values for Aliso Creek were present at the sampling location located downstream of Dairy Fork and Aliso Hills Channel where six of the nine samples collected had levels above 4,000 MPN/ 100 ml. With the exception of this site, the Aliso Creek locations typically had lower E. coli levels than the tributaries. The Aliso Creek sampling locations at Cook's Corner, downstream of English Canyon Channel,

downstream of Sulphur Creek, and at Pacific Coast Highway had no readings above 4,000 MPN/ 100 ml during the intensive investigation.

Bacteria levels at the Aliso Creek sampling locations downstream of the Sulphur Creek confluence and at Pacific Coast Highway appeared to improve from 1998 to 1999. The Aliso Creek sites at Cook's Corner and downstream of English Canyon exhibited comparable bacteria levels over the two sampling periods.

Additional sampling in Dairy Fork and Aliso Creek upstream and downstream of the Dairy Fork confluence was conducted in January 2000 and indicated significantly lower levels of bacteriological indicators in Dairy Fork than those observed in the summer of 1999 (**Table 9.14**). The Aliso Creek sites upstream and downstream of Dairy Fork were within the Basin Plan REC-2 objective for fecal coliform. The highest fecal coliform level of 5,000 MPN/ 100 ml was observed in the sample collected from the Dairy Fork Retention Basin on January 12, 2000, but concurrent sampling in Dairy Fork downstream of the retention basin indicated a value of 600 MPN/ 100 ml.

Low flow samples collected in January 2000 upstream and downstream of the J03P02/ Sulphur Creek confluence indicated that despite periodic elevated fecal coliform levels in the J03P02 tributary, Sulphur Creek met the REC-2 objective during the sampling period (**Figure 9.7, Table 9.15**). The relatively small effect of J03P02 on the bacterial status of Sulphur Creek is probably due to the comparatively low volume of water from J03P02.

Streamgaging measurements made during the sampling period indicated that dry weather flows in J03P02 decreased significantly from a field estimate of 1 – 2 cubic feet per second (cfs) in April 1998 to a measured flow of 0.2 cfs in late 1999/ early 2000. Public education, the diversion of flow from the upper-J03P02 subwatershed to a previously blocked vegetated swale, and dry conditions have probably combined to contribute to the flow decrease at the outlet. Dry weather flows in Sulphur Creek have varied from approximately 1.5 – 3 cfs depending on the management of water upstream at the Laguna Niguel Lake dam.

9.6.3 J03P02 Bacteriological Data Analysis

During 1999 and 2000 the following bacteriological investigations focused on the J03P02 subwatershed.

1. J03P02 Subwatershed Study (June – August 1999)
2. J03P02 Surface Runoff Study (November 24, 1999)
3. Sulphur Creek/ J03P02 Sampling (January 2000)

Samples were analyzed for total coliform, E. coli, and enterococcus indicator organisms during the J03P02 subwatershed study. The J03P02 surface study and the Sulphur Creek/ J03P02 sampling each assessed total and fecal coliform and enterococcus indicators.

The J03P02 subwatershed study included the sampling of six subsurface sites and the end of the 30-inch steel pipe (**Figure 9.4**). The J03P02 surface water study assessed 22 curb and gutter sites in the J03P02 subwatershed (**Figure 9.5**). The Sulphur Creek/ J03P02 sampling included sampling at the end of the J03P02 30-inch steel pipe, and Sulphur Creek upstream and downstream of the J03P02 confluence (**Figure 9.7**).

Concurrent with these three studies, additional subsurface investigations were performed by the Moulton Niguel Water District (MNWD) and the City of Laguna Niguel in the J03P02 subwatershed. These investigations assessed the structural integrity of the subsurface storm drain and sewer systems.

MNWD videotaped all of the storm drain lines within the sub-watershed boundary in 1999. Although there were no signs of broken pipe or illicit connections, there were signs of groundwater infiltration in the Kite Hill South area (Avocet to Alicia Parkway). MNWD also videotaped the sewers along the Kite Hill South and Sea Bird streets to help confirm that the observed infiltration was caused by groundwater and not a broken sewer line or lateral. The work included all sewer lines that ran parallel or near storm drain pipes in the Kite Hill South area. MNWD reported that all of the lines appeared to be in excellent condition, supporting the fact that groundwater was the source of the infiltration.

As a result of the storm drain and sewer line videotaping, in November 1999 the City of Laguna Niguel cleaned out an 18" bypass line that was located near Highlands Avenue and repaired the section of storm drain along Kite Hill South that was found to have heavy groundwater infiltration. Cleaning the 18" bypass line has allowed runoff water from the upper J03P02 sub-watershed (above Highlands Avenue) to flow through a vegetated swale area before it re-enters the lower J03P02 (surface) drainage approximately 500 feet upstream of the Sulphur Creek confluence.

The results of the J03P02 subwatershed study of June – August 1999 are presented in **Table 9.16**. The levels of total coliform, E. Coli, and enterococcus indicators were elevated at each of the six subsurface sites and at the end of the 30-inch steel pipe that was sampled during the initial and intensive investigations. The mean total coliform levels at the end of the 30-inch steel pipe were higher during the June – August 1999 period (**Tables 9.13 and 9.16**) than the initial investigation (September – December 1998) (**Table 9.12**). However, if the December 1998 data is omitted from the initial investigation data set then the differences between the data sets are insignificant given the inherent variability of the data.

Figure 9.12 is a graphical representation of the arithmetic mean concentrations of total coliform, E. Coli, and enterococcus during the period of the J03P02 subwatershed investigation. The results from the furthest upstream sampling site are shown at the top of the graph and those from the end of the 30-inch steel pipe are shown at the bottom. **Figure 9.13** presents the arithmetic and log mean total coliform and E. coli concentrations for the seven sampling locations superimposed on a map of the J03P02

subwatershed. The results of the J03P02 investigation suggest that bacteria sources are ubiquitous in the subwatershed. There appears to be no observable pattern in the data that would indicate a single bacteriological source. Another important feature of the data is the extremely high variability for each bacterial indicator at most of the sampling sites. For example, E. coli at the Highland site ranged from 1000 to 365,400 MPN/ 100 ml over the sampling period (**Table 9.16**).

On August 5th a surface water sample was collected from the curb/gutter at the intersection of Ridgeview, Highlands, and Kensington (**Table 9.16**). At the time of sampling, this area had the only flowing water of sufficient depth that could be collected. The bacteriological levels from this sample were typical of the underground system and the outlet. The result of this surface sample suggested that at least a portion of the contamination that was detected in the subsurface drainage and at the end of the J03P02 30-inch steel pipe was attributable to surface sources. In addition, the ubiquitous and relatively uniform levels of bacterial contaminants and the apparent soundness of the subsurface infrastructure also suggested that the source of the bacteriological indicators in the J03P02 drainage could be surface runoff.

The J03P02 Surface Runoff Study (see Section 9.2.4) was conducted on November 24, 1999. The surface sampling locations and results are shown in **Figures 9.14 and 9.15**, and **Table 9.17**. High concentrations of fecal coliform (>2000 MPN / 100 ml) in surface samples were observed at approximately 27 % of the sampled locations across the J03P02 subwatershed.

The surface contamination appeared to be randomly distributed geographically and temporally. Fecal coliform concentrations of at least 24,000 MPN/ 100 ml were observed in six samples representing five sites in the sub-watershed. Only one site (Kite Hill Drive @ Becard Drive) exhibited extremely high fecal coliform concentrations at both 6 a.m. and 9 a.m. on November 24, 1999. The other sites that exhibited greater than 24,000 MPN/ 100 ml fecal coliform levels for one of the sample collections had less than detectable levels for the second collection. The fecal coliform levels of these elevated samples were not related to the time of sample collection (6 a.m. or 9 a.m.).

High enterococcus levels also appeared to be randomly distributed in the J03P02 subwatershed on November 24, 1999 (**Figure 9.15**). Many samples that contained high fecal coliform levels had low levels of enterococcus and vice versa.

A single source or sources of bacteria cannot be isolated from these results. In addition, field observations made during the surface sampling indicated no obvious sources for the bacteria. The results of this investigation suggest that unknown sources present on the surface of the J03P02 subwatershed are significant contributors to the elevated bacteria levels in the subsurface drainage. This is consistent with the findings of the June 1 – August 3, 1999 subsurface investigation that indicated the presence of high fecal coliform levels throughout the underground storm drain system.

9.6.4 Summary of Bacteriological Water Quality Findings

1. The sampling locations on the mainstem of Aliso Creek that exhibited average fecal coliform or E. coli levels greater than 2,000 MPN/ 100 mls, and multiple individual readings in excess of 4,000 MPN/ 100 mls during the 1998 – 2000 study period included the locations downstream of Dairy Fork/ Aliso Hills Channel (both studies), and the Pacific Coast Highway site (initial study only). E. coli levels in 1999 were substantially lower than fecal coliform levels in the 1998 initial study for the Aliso Creek sites downstream of Sulphur Creek and at Pacific Coast Highway.

2. The tributary sampling locations with elevated E. coli averages (> 2,000 MPN/ 100 ml) and multiple elevated readings were J03P02, Munger Storm Drain and Dairy Fork. J03P02 had the highest number of E. coli readings in excess of 4,000 MPN/ 100 ml (8 out of 9), followed by Munger Storm Drain (3/9) and Dairy Fork (2/9).

3. Sampling of Dairy Fork and Aliso Creek upstream and downstream of Dairy Fork in January 2000 indicated significantly lower levels of bacteriological indicators than observed in the summer of 1999. The average fecal coliform level for Dairy Fork was significantly below 2,000 MPN/ 100 ml and no sample was in excess of 4,000 MPN/ 100 ml.

4. Several sampling locations had fecal coliform or E. coli averages below 2,000 MPN/ 100 ml and no more than one reading above 4,000 MPN/ 100 ml (**Tables 9.12 and 9.13**). Stations exhibiting this pattern included the Aliso Creek sites located at Cook's Corner and downstream of English Canyon Channel during the initial and intensive investigations, the Aliso Creek sites downstream of the Sulphur Creek confluence and at Pacific Coast Highway during the intensive study, and the English Canyon Channel and Wood Canyon tributaries during the intensive watershed investigation. The Sulphur Creek and Aliso Hills Channel tributaries each had average E. coli levels above 2,000 MPN/ 100 ml and 1 of 9 E. coli readings above 4,000 MPN/ 100 ml during the intensive study.

5. The Aliso Creek sampling location at Pacific Coast Highway had elevated fecal coliform levels during the first four weeks of the initial investigation but much lower levels during the rest of that study. In addition, the arithmetic mean bacterial levels were lower during the intensive study than the initial study with eight of nine samples exhibiting E. coli levels below 1000 MPN/ 100 mls.

6. The results of the J03P02 investigation suggest that fecal coliform levels at the end of the J03P02 30-inch steel pipe cannot be attributed to a single source or area. The results of the J03P02 surface study on November 24, 1999 suggest that a significant portion of the bacteria that have been observed at the outlet originate on the subwatershed surface.

7. Fecal coliform levels at the end of the J03P02 30-inch steel pipe were lower in January 2000 than in the previous investigations. In addition, recent measurements of

the discharge rate from the J03P02 30-inch steel pipe are lower than past field flow estimates. This indicates that bacterial loading to Sulphur Creek from the subwatershed has been decreased by reestablishing flow through a vegetated swale area below Highlands Avenue (Section 9.6.3). The ongoing sampling and discharge measurements conducted by the County of Orange and the City of Laguna Niguel will enable a more accurate assessment of this trend.

8. A significant feature of each bacteriological data set collected during the 1998 – 2000 period is high variability. Bacteria levels routinely exhibited order of magnitude fluctuations from one sampling to the next. Two to three order of magnitude fluctuations were also observed in each investigation. The J03P02 surface study illustrated that this bacteriological data variability in water bodies is also inherent in surface sources on neighborhood streets. Most of the surface samples that were collected during the one-day study had fecal coliform levels below the laboratory limits of detection (<200 MPN/ 100 ml), however; approximately 27 % of the samples had concentrations greater than 2,000 MPN/ 100 mls.

Many factors may influence bacteria levels in surface and subsurface drainage waters. Among these are water temperature, topography, runoff dynamics and irrigation practices, and land usage.

The effects of ambient water temperature and ultraviolet radiation on bacteria levels in the Aliso Creek watershed may be an important relationship to understand more precisely. The seasonal fluctuations of these parameters may effect the concentrations and life cycles of bacterial indicator organisms in ways that are not well understood at this time. The initial study was the only investigation that encompassed a wide enough seasonal range to begin to evaluate these relationships. The ongoing sampling of Sulphur Creek and J03P02 by the County of Orange and the City of Laguna Niguel may provide additional information to allow these issues to be better understood.

The steep topography in much of the Aliso Creek watershed may also contribute to the bacteria problem by allowing irrigation water to flow readily along the land surface and into the drainage system without infiltrating into the ground. Management actions that promote the slowing of surface water runoff and that enhance infiltration may be effective in reducing bacteria levels.

The data collected during this study indicate that important management initiatives to decrease bacteria in Aliso Creek should include the following:

1. Reduction of excess irrigation runoff
   While the irrigation water being applied in the watershed is sterile and potable, it appears to efficiently transport bacterial indicators from the watershed surface into the storm drain system.

2. Additional research-level investigations

There is a need to more precisely determine the sources of bacteria in Aliso Creek watershed including those on the surface of the streets. One of these investigations may be focused on soil amendments (organic fertilizers and mulches) that may serve as a source or a medium for regrowth of bacterial indicators. This information will allow the watershed communities to institute more specific and effective source control measures, and more focused public education initiatives then are currently possible.

3. Creek restoration initiatives
   Effective restoration will promote the natural removal of bacteria from the creek water. Examples of potential creek restoration programs include wetland construction and riparian revegetation and habitat restoration

Initiatives 1 and 3 above are addressed in more detail in subsequent chapters, as is the current state of the art for bacterial source control measures.

Figure 9.11: Arithmetic Mean Bacteriological Levels in Aliso Creek and Tributaries June 3 - August 5, 1999

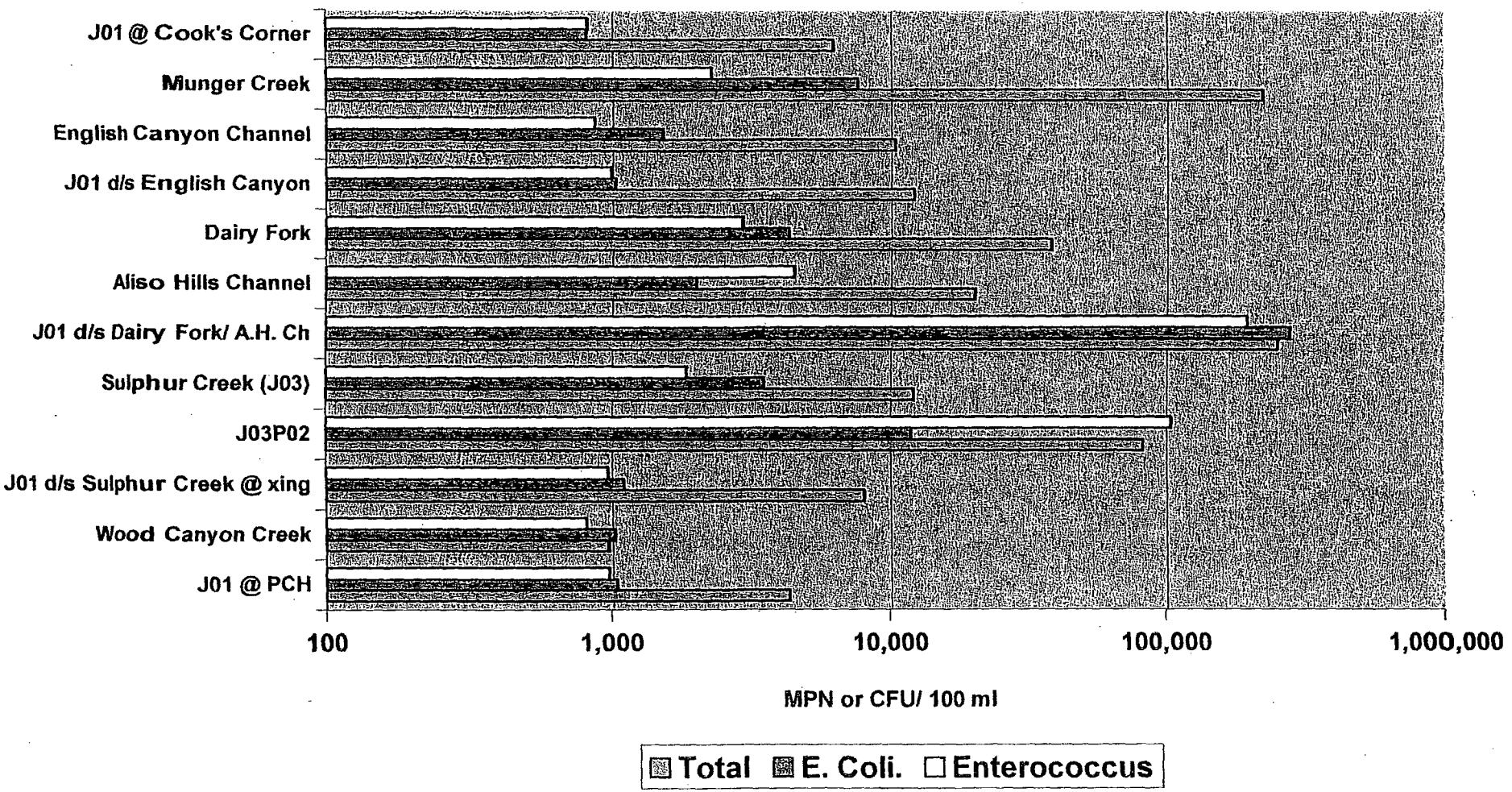


Figure 9.12: Arithmetic Mean Bacteriological Levels in the J03P02 Subwatershed
June 1 - August 3, 1999

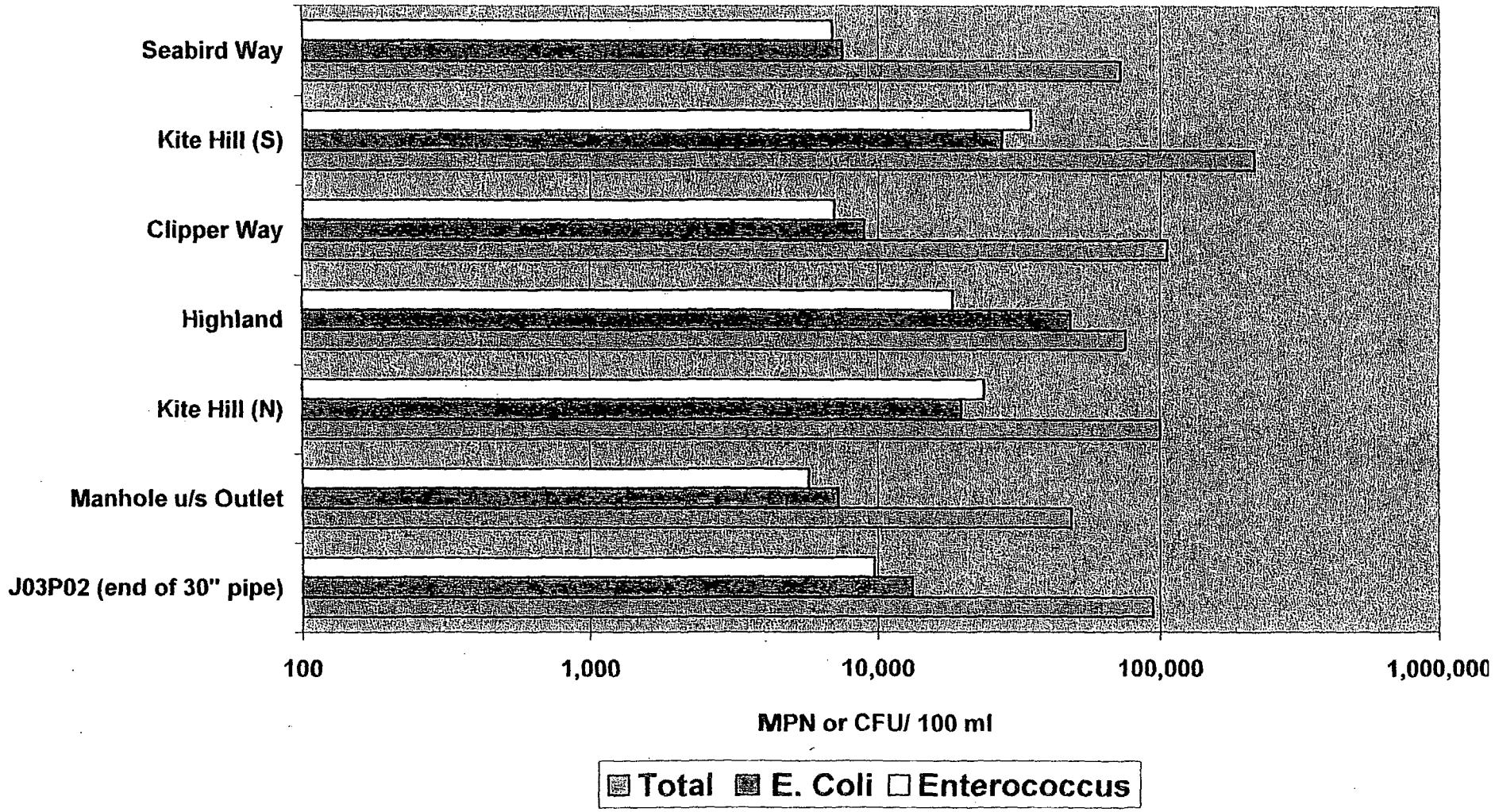


Table 9.12 - Bacteriological Results Of Initial Water Quality Investigation

(MPN/100 mls)

	Aliso Creek at Cook's Corner		Aliso Creek d/s English Canyon		Aliso Creek d/s Dairy Fk & A.Hills		J03P02 (end of 30"pipe)		Aliso Creek d/s Sulphur Creek		Aliso Creek at PCH	
Sample Date	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**
9/30/98	2,800	130	5,000	1,100	50,000	3,000	50,000	30,000	2,400	2,400	16,000	3,000
10/7/98	1,600	1,600	17,000	1,300	16,000	3,000	160,000	90,000	50,000	8,000	5,000	3,000
10/14/98	<20	<20	5,000	400	17,000	11,000	7,000	5,000	13,000	1,100	30,000	8,000
10/21/98	1,600	500	16,000	500	16,000	3,000	16,000	16,000	240	240	9,000	9,000
10/28/98	1,100	22	22,000	5,000	50,000	5,000	24,000	500	2,200	1,100	2,800	500
11/4/98	900	900	500000*	800	9,000	1,300	50,000	5,000	16,000	230	24,000	800
11/19/98	50	4	130	13	500	130	9000	700	2400	90	900	13
11/23/98	5,000	500	5,000	500	30,000	1,700	22,000	13,000	17,000	500	3,000	300
12/9/98	2,300	40	3,000	1,700	30,000	2,300	3,300	1,400	24,000	5,000	3,000	20
12/17/98	1,300	<2	1,300	<2	17,000	<2	30,000	1,100	3,000	400	1,700	400
12/23/98	30	<2	50	<2	22	8	240	50	30	4	23	8
12/30/98	2,600	70	11,000	200	800	200	17,000	70	2,100	200	1,100	200
log mean	700	100	3,000	200	7,000	600	14,000	2,300	3,400	500	3,000	400
arithmetic mean	1,600	300	7,800	1,000	20,000	2,600	32,000	14,000	11,000	1,600	8,000	2,100

GM = 1074

GM = 4308

GM = 10,155

GM = 2184

GM = 1410

GM = 5045

GM = 3178

Objectives For Aliso Creek Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* false positive result due to presence of interfering organisms highly probable (reading omitted from log and arithmetic mean calculations)

[redacted]tributaries

Table 9.13: Bacteriological Results of Intensive Watershed Study
(MPN/ 100 mls or CFU/ 100 mls)

entero = ...
E Coli = 126/100 ml

	Aliso Creek @ Cook's Corner			Munger Storm Drain			English Canyon Channel			Aliso Creek d/s English Canyon		
Date	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.
6/3/99	1,300	218	278	16,000	3,654	4,611	16,000	960	717	16,000	1,100	836
* 6/10/99	13,000	100	<100	5,000	3,290	2,750	5,000	410	<100	5,000	200	<100
5 ** 6/17/99	700	<1,000	1,000	1,600,000	42,800	2,000	23,000	<1,000	<1,000	3,000	1,000	<1,000
6/24/99	3,000	<1,000	<1,000	23,000	9,800	1,000	8,000	1,000	1,000	17,000	2,000	2,000
7/1/99	8,000	<1,000	<1,000	110,000	1,000	<1,000	8,000	<1,000	1,000	11,000	<1,000	<1,000
7/15/99	1,700	1,000	<1,000	50,000	1,000	2,000	13,000	6,300	1,000	17,000	<1,000	<1,000
4 07/22/99	2,400	<1,000	<1,000	23,000	<1,000	2,000	11,000	<1,000	<1,000	6,000	1,000	1,000
07/29/99	3,000	<1,000	1,000	80,000	5,200	4,100	8,000	<1,000	<1,000	30,000	1,000	<1,000
8/5/99	23,000	1,000	1,000	80,000	1,000	1,000	1,700	<1,000	1,000	5,000	<1,000	<1,000
logmean	3,500	<700	<700	51,000	<3,100	<2,000	8,500	<1,100	<700	9,600	<900	<800
arithmetic mean	6,200	<800	<800	220,000	<7,600	<2,300	10,000	<1,500	<900	12,000	<1,000	<1,000

	Dairy Fork			Aliso Hills Channel			Aliso Cr. d/s Dairy Fork& A.H. Chan.			Sulphur Creek		
Date	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	3,441	3,873	>16,000	8,164	1,918	>16,000	3,654	1,076	>16,000	>24,192	2,282
* 6/10/99	30,000	860	740	8,000	960	2,820	24,000	730	630	5,000	310	<100
** 6/17/99	13,000	<1,000	<1,000	8,000	2,000	7,400	110,000	4,100	<1,000	7,000	1,000	<1,000
6/24/99	30,000	<1,000	1,000	11,000	<1,000	9,700	6,600	<1,000	<1,000	8,000	<1,000	4,100
7/1/99	50,000	19,900	<1,000	5,000	<1,000	2,000	240,000	5,200	1,000	22,000	<1,000	<1,000
7/15/99	50,000	3,100	8,600	50,000	1,000	3,100	80,000	12,100	4,100	17,000	<1,000	<1,000
7/22/99	50,000	1,000	2,000	50,000	2,000	6,300	60,000	>2,419,200	1,732,870	13,000	1,000	<1,000
7/29/99	30,000	3,100	3,000	13,000	<1,000	4,100	110,000	12,100	4,100	17,000	<1,000	5,200
8/5/99	80,000	5,200	5,200	23,000	1,000	3,100	>1,600,000	28,200	4,100	5,000	<1,000	<1,000
logmean	>34,000	<2,400	<2,100	>15,000	<1,500	3,900	>73,000	>9,400	<3,500	>11,000	1,300	<1,200
arithmetic mean	>39,000	<4,300	<2,900	>20,000	<2,000	4,500	>250,000	>280,000	<190,000	>12,000	3,500	<1,900

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event

Table 9.13 (cont): Bacteriological Results of Intensive Watershed Study (MPN/ 100 mls or CFU/ 100 mls)

	J03P02 (end of 30" pipe)			Aliso d/s Sulphur Cr. @ NPDES			Wood Canyon Creek			Aliso Creek @ PCH		
Date	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	15,531	12,033	>16,000	2,755	1,664	1,400	131	243	>16,000	2,247	583
* 6/10/99	11,000	2,920	4,220	2,300	200	<100	1,100	<100	<100	2,300	100	200
** 6/17/99	50,000	9,800	866,400	3,000	<1,000	1,000	270	<1,000	<1,000	8,000	<1,000	<1,000
6/24/99	80,000	5,200	18,500	3,000	1,000	<1,000	400	<1,000	<1,000	3,000	<1,000	<1,000
7/1/99	240,000	12,100	6,300	5,000	<1,000	<1,000	700	2,000	1,000	3,000	<1,000	<1,000
7/15/99	50,000	12,200	4,100	8,000	1,000	1,000	800	<1,000	<1,000	1,100	<1,000	<1,000
7/22/99	80,000	5,200	6,200	3,000	<1,000	<1,000	1,700	2,000	<1,000	1,100	<1,000	2,000
7/29/99	170,000	9,800	17,500	30,000	<1,000	<1,000	1,300	<1,000	<1,000	3,000	<1,000	<1,000
8/5/99	50,000	35,000	3,100	2,300	<1,000	1,000	1,100	<1,000	<1,000	1,300	<1,000	<1,000
logmean	>56,000	9,500	12,000	>5,200	<900	<800	800	<700	<700	>2,900	<800	<900
arithmetic mean	>83,000	12,000	100,000	>8,100	<1,100	<1,000	1,000	<1,000	<800	>4,300	<1,000	<1,000

	4" MWD Pipe		
Date	Total	E. Coli	Enterococ.
7/15/99	<20	<1,000	<1,000

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event

Table 9.14: Dairy Fork Bacteriological Sampling - January 2000

Date	Dairy Fork			Aliso Creek u/s Dairy Fork			Aliso Creek d/s Dairy Fork			Dairy Fork Retarding Basin		
	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.
1/11/00	900	<200	1,008	30,000	<200	26	900	<200	288			
1/12/00	30,000	600	1,140	2,300	<200	63	14,000	<200	720	>160,000	5,000	450
1/13/00	17,000	<200	870	1,100	<200	715	3,000	<200	1,150			
1/14/00	>16,000	1,300	55	1,300	140	138	5,000	800	415			
1/18/00	50,000	<200	<200	2,700	500	75	800	700	126			
1/19/00	5,000	300	>200	2,400	300	66	9,000	3,000	189			
logmean	>11,000	<400	400	2,900	<200	96	3,300	<500	370			
arith. mean	>20,000	<500	600	6,600	<300	181	5,400	<800	481			

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objective for Aliso Creek samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

Table 9.15: County of Orange PFRD Bacteriological Sampling Sulphur Creek/ J03P02 January 2000

J03P02 (end of 30" steel pipe)

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Enterococcus CFU/100 ml
1/6/00	2,200	<20	480
1/7/00	5,000	900	<1
1/10/00	30,000	30,000	1,440
1/11/00	5,000	600	576
1/12/00	5,000	1,100	1,008
1/13/00	1,100	700	416
1/14/00	>16,000	>16,000	2,450
1/18/00	50,000	<200	>200
1/19/00	22,000	3,000	>200
1/20/00	160,000	17,000	138
1/21/00	90,000	22,000	>200
1/24/00	400	<200	>200
log mean	**>10,000**	**1,500**	**300**
arithmetic mean	**>32,000**	**7,600**	**600**

OK

Sulphur Creek u/s J03P02

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Enterococcus CFU/100 ml
1/6/00	2,800	<20	54
1/7/00	3,000	<20	<1
1/10/00	1,700	1,700	288
1/11/00	300	300	144
1/12/00	8,000	400	1,226
1/13/00	3,000	800	300
1/14/00	900	700	279
1/18/00	8,000	800	>200
1/19/00	3,000	500	96
1/20/00	1,300	220	148
1/21/00	9,000	2,600	>200
1/24/00	1,700	1,300	>200
log mean	**2,400**	**<400**	**100**
arithmetic mean	**3,600**	**<800**	**300**

OK

Sulphur Creek d/s J03P02

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Entero-coccus CFU/100 ml
1/6/00	3,000	<20	89
1/7/00	2,400	900	<1
1/10/00	2,400	2,400	288
1/11/00	1,700	1,700	720
1/12/00	8,000	170	432
1/13/00	<200	<200	200
1/14/00	9,000	3,000	279
1/18/00	13,000	500	>200
1/19/00	3,000	800	126
1/20/00	2,400	500	>200
1/21/00	13,000	8,000	>200
1/24/00	13,000	<200	>200
log mean	**<4,000**	**<600**	**100**
arithmetic mean	**<6,000**	**<1,500**	**200**

OK

Table 9.16: J03P02 Sub-Watershed Bacteriological Results June 1 - August 3, 1999 (MPN/100 mls)
(MPN/ 100 ml or CFU/ 100 ml)

	J03P02 (end of 30" steel pipe)			Manhole u/s Structure			Kite Hill (N)			Highland		
Date	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus
6/1/99	>16,000	3,873	10,462	>16,000	1,515	7,701	>16,000	1,576	6,131	>16,000	24,192	19,863
6/8/99	>16,000	5,475	6,131	16,000	1,483	8,664	>16,000	3,448	10,462	>16,000	3,873	6,488
* 6/15/99	80,000	7,400	8,600	60,000	2,000	6,300	30,000	16,100	1,000	50,000	3,100	3,100
6/22/99	500,000	7,400	9,700	28,000	16,000	5,200	23,000	5,200	1,000	50,000	1,000	5,200
6/29/99	80,000	5,100	4,100	80,000	6,200	5,100	300,000	12,200	17,100	50,000	22,600	5,200
7/6/99	50,000	8,600	3,000	30,000	6,300	<1,000	50,000	2,000	3,100	30,000	5,200	8,500
7/13/99	50,000	7,400	6,300	70,000	3,000	3,100	300,000	7,400	18,900	300,000	365,400	4,100
7/20/99	30,000	2,000	5,200	30,000	9,700	16,000	22,000	4,100	12,100	50,000	7,400	4,100
7/27/99	11,000	62,400	38,400	130,000	21,100	2,000	140,000	139,600	160,700	170,000	45,000	120,100
8/3/99	110,000	22,800	5,200	23,000	5,200	2,000	110,000	6,300	6,300	23,000	3,100	7,300
log mean	>49,000	8,000	7,300	>38,000	5,000	<4,300	>55,000	7,000	7,700	>47,000	10,000	8,200
arithmetic mean	>94,000	13,000	9,700	>48,000	7,200	<5,700	>100,000	20,000	23,700	>76,000	48,000	18,400

	Clipper Way			Kite Hill (S)			Seabird Way		
Date	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus
6/1/99	>16,000	4,611	24,192	>16,000	17,329	>24,192	>16,000	15,531	11,199
6/8/99	16,000	670	6,488	9,000	216	>24,192	>16,000	250	7,701
* 6/15/99	50,000	9,800	4,100	17,000	<1,000	<1,000	30,000	1,000	<1,000
6/22/99	13,000	<1,000	<1,000	23,000	<1,000	1,000	17,000	1,000	<1,000
6/29/99	130,000	6,300	6,200	130,000	7,400	6,300	80,000	2,000	3,000
7/6/99	300,000	4,100	3,100	900,000	8,500	18,700	130,000	6,300	1,000
7/13/99	300,000	43,500	9,800	900,000	88,000	88,000	220,000	24,300	24,300
7/20/99	80,000	<1,000	1,000	130,000	2,000	1,000	22,000	3,100	4,100
7/27/99	80,000	11,000	13,400	230	133,300	172,500	110,000	9,800	12,100
8/3/99	80,000	7,400	1,000	50,000	14,800	9,600	80,000	12,000	4,100
log mean	>60,000	<4,400	<4,200	>40,000	<6,000	10,000	>47,000	3,600	<4,100
arithmetic mean	>100,000	<8,900	<7,000	>220,000	<27,000	35,000	>72,000	7,500	<7,000

Gutter of Highland/ Ridgeview/Kensington			
Date	Total	E. Coli	Enterococcus
8/3/99	80,000	16,100	29,200

* - *The samples submitted on and after 6/15/99 were analyzed using a 2X dilution*

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Table 9.17: Surface Bacteriological Sampling in J03P02 Subwatershed

November 24, 1999

Sampling Location	Sampling Time	Total Coliform MPN/100ml*	Fecal Coliform MPN/100ml*	Enterococcus CFU/100ml**
ea Bird Way at Pelican Way	9:49	2,300	<200	>5,700
elican Way at Sea Bird Way	7:35	30,000	<200	<1
elican Way at Sea Bird Way	9:40	24,000	<200	<1
cross the street from 29602 Belmar Circle	7:12	30,000	<200	1,113
9602 Belmar Circle	7:11	>160,000	<200	<1
9602 Belmar Circle	9:15	90,000	<200	<1
obolink Drive at Kite Hill Drive (South)	7:04	160,000	<200	>5,700
obolink Drive at Kite Hill Drive (South)	9:19	24,000	<200	<1
ite Hill Drive (South) opposite Bobolink Drive	6:28	30,000	<200	<1
ite Hill Drive (South) opposite Bobolink Drive	9:06	24,000	24,000	<1
elican Way at Shell Cove	7:15	30,000	<200	318
elican Way at Shell Cove	9:29	5,000	<200	320
cross from 29343 Kensington Drive U/S Balloch Street	7:19	>160,000	30,000	<1
9311 Troon Street at Balloch Street	6:46	160,000	<200	<1
cross From 29036 Ridgeview Drive at Highlands Avenue	6:37	>160,000	50,000	<1
9036 Ridgeview Drive at Highlands Avenue	9:37	160,000	<200	<1
9082 Dean Street at Highlands Avenue	7:05	13,000	3,000	<1
9082 Dean Street at Highlands Avenue	9:25	50,000	<200	1,120
cross from 29092 Dean Street at Highlands Avenue	7:00	8,000	5,000	<1
cross from 29092 Dean Street at Highlands Avenue	9:22	>160,000	<200	1,600
9062 Jarod Way	7:10	50,000	<200	1,920
9062 Jarod Way	9:15	30,000	3,000	640
3951 Drakes Bay at Highlands Avenue	9:42	>160,000	<200	<1
ite Hill Recreational Center (Private Road)	6:46	30,000	<200	<1
aeger Drive between Cormorant Lane and Ironhead Lane	6:41	3,000	<200	795
aeger Drive between Cormorant Lane and Ironhead Lane	9:19	>160,000	<200	2,240
Kite Hill Drive and Becard Drive	6:55	90,000	50,000	785
ite Hill Drive and Becard Drive	9:23	90,000	30,000	<1
rant Lane Culdesac	6:36	22,000	<200	1,092
rant Lane Culdesac	9:14	>160,000	30,000	<1
Culdesac at Shrike Drive	6:22	90,000	<200	<1
ite Hill Drive across from Jaeger Drive	6:46	30,000	<200	<1
ite Hill Drive across from Jaeger Drive	9:07	50,000	<200	800
wallowtail Drive and Kite Hill Drive	6:34	>160,000	<200	<1
nipe Lane Culdesac	9:02	50,000	<200	<1

Most Probable Number per 100 ml

Colony Forming Units per 100 ml

County of Orange

Public Facilities & Resources Department

John W. Sibley, Director

June 24, 1999

Paul Richter
Regional Water Quality Control Board – San Diego Region
9771 Clairemont Mesa Boulevard, Ste A
San Diego, CA 92124-1324

SUBJECT: Submittal of the Aliso Creek Watershed 205(j) Quarterly Progress Report For January – March, 1999

Dear Mr. Richter:

Please find enclosed a final, bound version of the Aliso Creek Watershed 205(j) Quarterly Progress Report.

If there are any questions regarding this submittal, please contact Karen Ashby at (714) 567-6297.

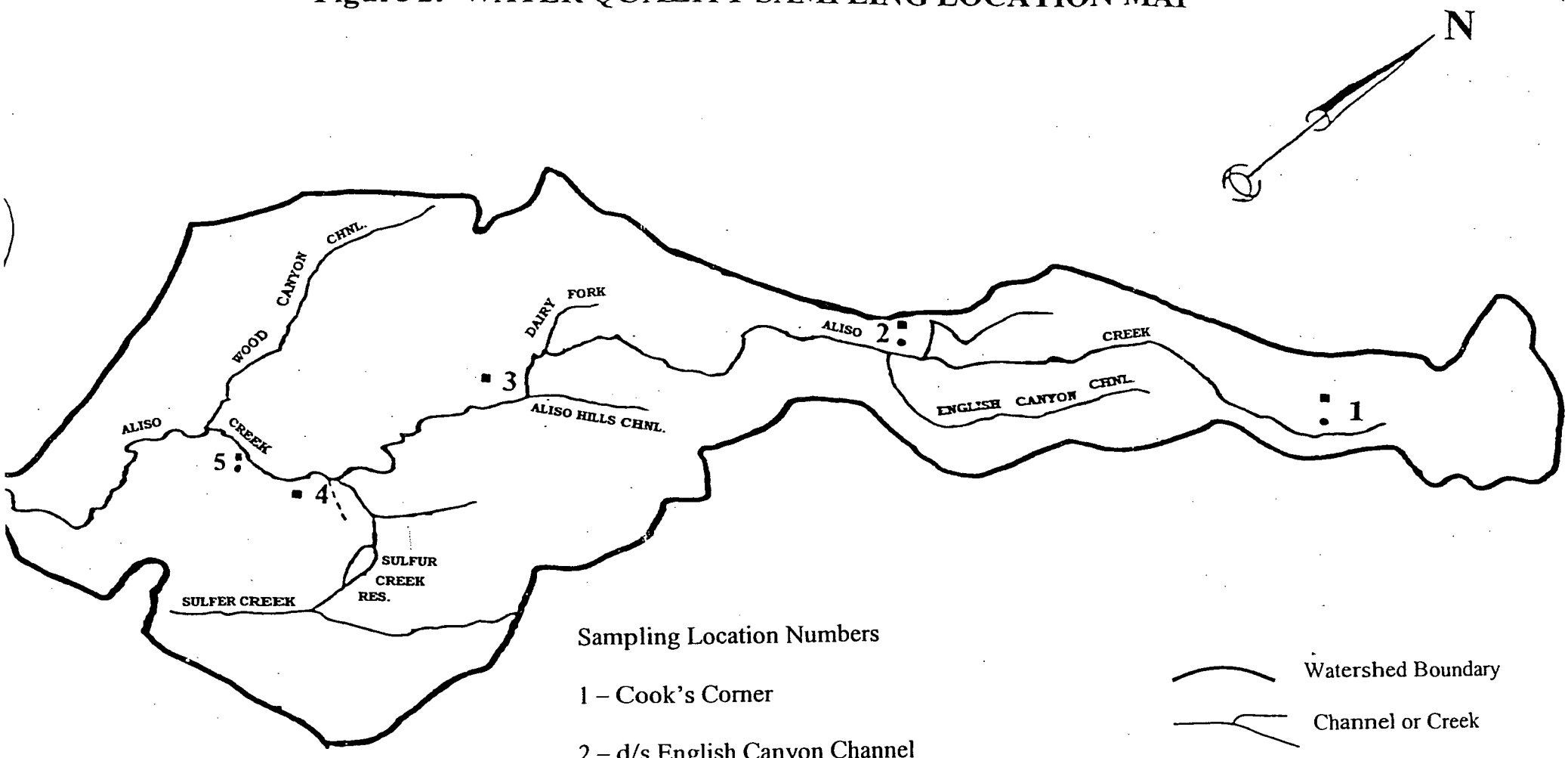
Very truly yours,

Chris Crompton, Manager
Environmental Resources

LOCATION:
10852 DOUGLASS RD
ANAHEIM, CALIFORNIA 92806

TELEPHONE:
(714) 567-6363
FAX # 567-6220

Figure 2: WATER QUALITY SAMPLING LOCATION MAP



[redacted]

COUNTY OF ORANGE

PUBLIC FACILITIES & RESOURCES DEPARTMENT

QUARTERLY PROGRESS REPORT

Agreement No. 7-042-250-0
Period Covered: January 1, 1999 – March 31, 1999

JOHN SIBLEY
Director

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TABLE 3

Toxic Substances Monitoring Program
1999 Species Code List

Freshwater Fish *

Species Code	Common Name	Species Name	Family Name
AC	Arroyo Chub	*Gila orcutti*	Cyprinidae
BB	Brown Bullhead	*Ameiurus nebulosus*	Ictaluridae
BCR	Black Crappie	*Pomoxis nigromaculatus*	Centrarchidae
BG	Bluegill	*Lepomis macrochirus*	Centrarchidae
BK	Brook Trout	*Salvelinus fontinalis*	Salmonidae
BLB	Black Bullhead	*Ameiurus melas*	Ictaluridae
BN	Brown Trout	*Salmo trutta*	Salmonidae
CCF	Channel Catfish	*Ictalurus punctatus*	Ictaluridae
CP	Carp	*Cyprinus carpio*	Cyprinidae
GAM	Mosquitofish	*Gambusia affinis*	Poeciliidae
GSF	Green Sunfish	*Lepomis cyanellus*	Centrarchidae
LMB	Largemouth Bass	*Micropterus salmoides*	Centrarchidae
PCP	Prickly Sculpin	*Cottus asper*	Cottidae
PRS	Red Shiner	*Cyprinella lutrensis*	Cyprinidae
RBT	Rainbow Trout	*Oncorhynchus mykiss*	Salmonidae
RCH	California Roach	*Hesperoleucus symmetricus*	Cyprinidae
SKR	Sucker	*Catostomus sp.*	Catostomidae
SPM	Sacramento Pike Minnow	*Ptychocheilus grandis*	Cyprinidae
STB	Threespine Stickleback	*Gasterosteus aculeatus*	Gasterosteidae
TL	Tilapia	*Tilapia sp.*	Cichlidae

Marine Fish *

Species Code	Common Name	Species Name	Family Name
CKF	California Killifish	*Fundulus parvipinnis*	Cyprindontidae
ORC	Orangemouth Corvina	*Cynoscion xanthulus*	Sciaenidae
SSP	Shiner Perch	*Cymatogaster aggregata*	Embiotocidae
STF	Starry Flounder	*Platichthys stellatus*	Pleuronectidae
YFC	Yellowfin Croaker	*Umbrina roncador*	Sciaenidae

Non-Fish

Species Code	Common Name	Species Name	Family Name
TFC	Asiatic Clam (transplant)	*Corbicula manilensis*	Corbiculidae

* Common and scientific fish names were obtained from Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 20, Bethesda, Maryland.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
904.21.02	Buena Vista Lagoon	LMB	F	08/25/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
904.31.##	Agua Hedionda Cr/El Camino Real	GAM	W	08/24/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	4.7	2.6	7.2	<2.0	<2.0
904.51.03	San Marcos Cr	LMB	F	08/24/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
904.61.07	Escondido Cr/Elfin Forest Park	GSF	F	08/24/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
907.11.03	San Diego R/u/s Taylor St	LMB	F	08/23/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	3.0	<1.0	3.0	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
904.21.02	<2.0	<2.0	<2.0	<2.0	2.2	<3.0	<5.0	<3.0	NA	2.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
904.31.##	<2.0	<2.0	3.3	<2.0	42.8	<3.0	<5.0	<3.0	NA	46.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
904.51.03	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
904.61.07	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
907.11.03	<2.0	<2.0	<2.0	<2.0	4.8	<3.0	<5.0	<3.0	NA	4.8	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
904.21.02	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
904.31.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	7.2
904.51.03	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
904.61.07	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
907.11.03	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	18.0	<10.0	18.0	<20.0	3.0

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TC = WC * 1000
BCF
chlordane BCF = 14100
↳ WC = 0.00125 ug/l > WQO

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
801.11.09	San Diego Cr/Barranca Pkwy	PRS	W	08/05/99	<1.0	<1.0	4.2	<1.0	2.3	2.3	5.7	2.1	16.6	<2.0	<2.0
801.11.89	Lower Newport Bay/Rhine Ch	YFC	F	08/10/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
801.11.96	Peters Canyon Channel	PRS	W	08/05/99	<1.0	<1.0	3.2	<1.0	2.6	2.9	9.1	1.4	19.3	4.2	<2.0
801.11.96	Peters Canyon Channel	PRS	W	08/05/99	<1.0	<1.0	3.3	<1.0	2.8	3.2	9.8	1.5	20.7	5.2	<2.0
801.11.99	Upper Newport Bay/Newport Dunes	ORC	F	08/04/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.9	<1.0	1.9	<2.0	<2.0
901.12.##	Aliso Cr/Pacific Park Dr ✓	PRS	W	08/27/99	<1.0	<1.0	5.4	1.2	2.0	<2.0	5.3	3.6	17.5	4.3	4.1
902.11.01	Santa Margarita R/Stuart Mesa Rd ✓	CKF	W	08/25/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
902.22.03	Rainbow Creek ✓	GSF	F	08/26/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
902.32.##	Murrietta Cr/u/s Temecula Cr ✓	BLB	F	08/26/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.0	<1.0	2.0	<2.0	<2.0
904.10.##	Loma Alta Cr/College Blvd ✓	GAM	W	08/26/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.6	<1.0	1.6	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
801.11.09	4.1	3.2	27.0	<2.0	139.0	<3.0	<5.0	8.9	NA	178.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.89	<2.0	<2.0	<2.0	<2.0	22.8	<3.0	<5.0	<3.0	NA	22.8	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.96	3.3	5.8	24.4	2.7	503.0	<3.0	<5.0	10.9	NA	546.8	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.96	3.4	5.8	25.8	2.8	516.0	3.1	<5.0	11.4	NA	564.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.99	<2.0	<2.0	6.0	<2.0	54.5	<3.0	<5.0	3.3	NA	63.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
Aliso Crk - 901.12.##	8.8	<2.0	<2.0	<2.0	9.4	<3.0	<5.0	<3.0	NA	9.4	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
902.11.01	<2.0	2.6	4.8	<2.0	15.2	<3.0	<5.0	<3.0	NA	22.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
902.22.03	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
902.32.##	<2.0	<2.0	<2.0	<2.0	2.9	<3.0	<5.0	<3.0	NA	2.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
904.10.##	<2.0	<2.0	<2.0	<2.0	7.6	<3.0	<5.0	<3.0	NA	7.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
801.11.09	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.7	<5.0	329.0	<2.0	<4.0	<25.0	71.0	14.0	85.0	81.4	102.1
801.11.89	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	39.0	<10.0	39.0	<20.0	ND
801.11.96	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.6	<5.0	59.6	<2.0	<4.0	<25.0	26.0	15.0	41.0	72.0	94.6
801.11.96	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.6	<5.0	62.7	<2.0	<4.0	<25.0	29.0	15.0	44.0	80.5	104.6
801.11.99	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	21.0	<10.0	21.0	<20.0	1.9
Aliso Crk - 901.12.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	2.9	0.4	<5.0	41.9	<2.0	<4.0	<25.0	22.0	<10.0	22.0	<20.0	29.2
902.11.01	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	5.2	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
902.22.03	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
902.32.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	2.0
904.10.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	4.9	<2.0	<4.0	<25.0	21.0	<10.0	21.0	<20.0	1.6

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TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
719.47.00	Coachella Valley Stormwater Ch	TL	W	12/08/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.8	<1.0	1.8	<2.0	3.0
723.10.02	New R/Westmorland	CP	F	12/09/99	<1.0	<1.0	5.2	<1.0	3.7	2.4	6.6	<1.0	17.9	44.1	337.0
723.10.12	Wiest Lake	LMB	F	12/06/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	5.7	3.2
723.10.21	Holtville Main Drain	CCF	F	12/05/99	<1.0	<1.0	2.1	<1.0	<2.0	2.3	6.9	<1.0	11.3	<2.0	938.0
723.10.30	Central Drain	CP	F	12/05/99	<1.0	<1.0	21.0	<1.0	23.9	12.1	25.1	3.2	85.3	177.0	945.0
723.10.31	South Central Drain	CCF	F	12/05/99	<1.0	<1.0	6.6	<1.0	3.4	6.3	16.2	1.4	33.8	44.0	940.0
728.00.90	Salton Sea/South	ORC	F	12/06/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	3.2
801.11.05	Delhi Channel	GAM	W	08/05/99	<1.0	<1.0	2.6	<1.0	<2.0	<2.0	3.7	<1.0	6.2	<2.0	<2.0
801.11.07	San Diego Cr/Michelson Dr	PRS	W	08/05/99	<1.0	<1.0	3.7	<1.0	2.9	2.2	5.2	2.3	16.4	2.9	<2.0
801.11.07	San Diego Cr/Michelson Dr	PRS	W	08/05/99	<1.0	<1.0	4.9	<1.0	3.6	2.5	6.1	2.9	19.9	3.4	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
719.47.00	3.1	<2.0	6.9	<2.0	277.0	<3.0	15.3	<3.0	NA	299.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
723.10.02	13.0	9.4	30.3	7.5	467.0	<3.0	<5.0	11.7	NA	525.9	NA	<20.0	2.8	<10.0	<10.0	2.8	<2.0	<6.0
723.10.12	<2.0	<2.0	2.1	<2.0	36.4	<3.0	<5.0	<3.0	NA	38.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
723.10.21	11.7	3.6	22.6	8.6	807.0	<3.0	11.8	11.7	NA	865.3	NA	<20.0	9.6	11.7	26.9	48.2	<2.0	<6.0
723.10.30	96.2	75.0	176.0	33.6	3026.0	7.1	13.9	52.8	NA	3384.4	NA	<20.0	4.8	<10.0	<10.0	4.8	<2.0	<6.0
723.10.31	72.7	20.3	41.6	18.0	2403.0	6.8	22.8	17.0	NA	2529.6	NA	<20.0	2.1	<10.0	<10.0	2.1	10.8	<6.0
728.00.90	<2.0	<2.0	<2.0	<2.0	78.7	<3.0	<5.0	<3.0	NA	78.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.05	<2.0	<2.0	7.3	<2.0	38.9	<3.0	<5.0	<3.0	NA	46.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
801.11.07	5.4	2.1	18.4	<2.0	128.0	<3.0	<5.0	5.6	NA	154.1	NA	42.8	<2.0	NA	NA	ND	<2.0	<6.0
801.11.07	6.4	2.7	21.6	<2.0	137.0	<3.0	<5.0	6.4	NA	167.7	NA	49.1	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
719.47.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	12.0	<10.0	12.0	27.6	32.5
723.10.02	<1.0	<2.0	<2.0	1.2	1.2	<2.0	<1.0	4.4	<5.0	<3.0	<2.0	<4.0	66.0	72.0	78.0	216.0	138.0	172.9
723.10.12	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	117.0	<10.0	<10.0	117.0	<20.0	ND
723.10.21	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	2.3	<5.0	<3.0	<2.0	<4.0	<25.0	37.0	<10.0	37.0	246.0	317.2
723.10.30	<1.0	<2.0	<2.0	1.2	1.2	<2.0	<1.0	7.3	<5.0	<3.0	<2.0	<4.0	40.0	65.0	25.0	130.0	2196.0	2383.6
723.10.31	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	3.1	<5.0	<3.0	<2.0	<4.0	<25.0	51.0	<10.0	51.0	1964.0	2083.4
728.00.90	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
801.11.05	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	27.0	<10.0	27.0	<20.0	6.2
801.11.07	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	1.1	<5.0	172.0	<2.0	<4.0	<25.0	37.0	13.0	50.0	54.1	75.9
801.11.07	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	1.3	<5.0	188.0	<2.0	<4.0	<25.0	40.0	11.0	51.0	67.0	93.3

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
634.10.##	Tallac Lagoon	RBT	F	09/17/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
634.10.#A	Tahoe Keys/Sailing Lagoon Marina	LMB	F	06/01/00	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
634.10.#B	Tahoe Keys/Sailing Lagoon	LMB	F	06/01/00	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	2.0
634.10.00	Upper Truckee R/d/s HWY 50	RBT	F	09/16/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
635.20.##	Trout Cr/Truckee/d/s Golf Course	BK	F	10/21/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
637.20.##	Gold Run Creek	RBT	F	10/21/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
637.20.25	Susan R/d/s Piute Creek	BK	F	10/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
637.20.31	Susan R/u/s Susanville	RBT	F	10/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
715.40.08	Palo Verde Outfall Drain	LMB	F	12/07/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
715.50.90	Colorado R/u/s Imperial Dam	LMB	F	12/07/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
634.10.##	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
634.10.#A	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
634.10.#B	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
634.10.00	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
635.20.##	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
637.20.##	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
637.20.25	<2.0	<2.0	<2.0	<2.0	11.3	<3.0	<5.0	<3.0	NA	11.3	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
637.20.31	<2.0	<2.0	<2.0	<2.0	2.9	<3.0	<5.0	<3.0	NA	2.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
715.40.08	<2.0	<2.0	<2.0	<2.0	33.2	<3.0	<5.0	<3.0	NA	33.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
715.50.90	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
634.10.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
634.10.#A	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
634.10.#B	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.4	<5.0	<3.0	<2.0	<4.0	<25.0	10.0	<10.0	10.0	28.8	28.8
634.10.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
635.20.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	5.8	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
637.20.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
637.20.25	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.4	<5.0	8.7	8.7	<4.0	<25.0	15.0	<10.0	15.0	<20.0	ND
637.20.31	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
715.40.08	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
715.50.90	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
404.21.04	Malibu Cr/Tapia Park	AC	W	09/10/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	4.2	1.1	5.3	<2.0	<2.0
404.21.05	Malibu Cr/u/s Tapia Discharge	LMB	W	09/10/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.1	<1.0	1.1	<2.0	<2.0
404.21.07	Malibou Lake	LMB	F	08/12/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.2	<1.0	2.2	<2.0	<2.0
404.25.01	Westlake Lake	LMB	F	08/12/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	3.0	<1.0	3.0	<2.0	<2.0
405.12.03	Los Angeles River	TL	W	09/09/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.8	<1.0	1.8	<2.0	<2.0
405.15.04	San Gabriel River	TL	F	09/09/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
405.21.06	Los Angeles R/Los Feliz Rd	GAM	W	09/09/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	3.5	2.8	6.3	2.4	<2.0
405.52.01	Puddingstone Res	LMB	F	08/10/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.8	<1.0	2.8	<2.0	<2.0
511.10.08	Putah Creek/South Fork	LMB	F	09/30/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.7	<1.0	1.7	2.1	2.0
511.10.08	Putah Creek/South Fork	SKR	F	09/30/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
404.21.04	<2.0	<2.0	2.1	<2.0	16.9	<3.0	<5.0	<3.0	NA	19.0	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
404.21.05	<2.0	<2.0	<2.0	<2.0	7.1	<3.0	<5.0	<3.0	NA	7.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
404.21.07	<2.0	<2.0	<2.0	<2.0	5.7	<3.0	<5.0	<3.0	NA	5.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
404.25.01	<2.0	<2.0	<2.0	<2.0	8.1	<3.0	<5.0	<3.0	NA	8.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
405.12.03	3.7	<2.0	2.4	<2.0	7.3	<3.0	<5.0	<3.0	NA	9.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
405.15.04	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
405.21.06	6.4	<2.0	4.3	<2.0	16.5	<3.0	<5.0	<3.0	NA	20.8	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
405.52.01	<2.0	<2.0	<2.0	<2.0	10.7	<3.0	<5.0	<3.0	NA	10.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
511.10.08	<2.0	2.6	22.0	<2.0	63.9	<3.0	7.2	5.2	NA	100.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
511.10.08	<2.0	<2.0	2.9	<2.0	10.3	<3.0	<5.0	<3.0	NA	13.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
404.21.04	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.5	<5.0	4.7	<2.0	<4.0	<25.0	14.0	<10.0	14.0	<20.0	5.3
404.21.05	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.1
404.21.07	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	2.2
404.25.01	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	3.0
405.12.03	<1.0	<2.0	<2.0	5.3	5.3	<2.0	<1.0	<0.3	13.0	3.9	<2.0	<4.0	<25.0	25.0	11.0	36.0	<20.0	10.8
405.15.04	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
405.21.06	<1.0	<2.0	<2.0	7.4	7.4	<2.0	<1.0	<0.3	<5.0	4.5	<2.0	<4.0	27.0	31.0	10.0	68.0	<20.0	20.2
405.52.01	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	13.0	<10.0	13.0	<20.0	2.8
511.10.08	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	19.0	<10.0	19.0	<20.0	1.7
511.10.08	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
310.31.00	Arroyo Grande Creek Lagoon	STB	W	09/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.3	1.2	3.5	2.3	3.2
312.10.00	Santa Maria R/Mouth	STB	W	09/21/99	<1.0	<1.0	3.4	<1.0	<2.0	4.3	35.9	<1.0	43.6	25.8	12.6
314.10.00	Santa Ynez River Lagoon	STF	F	09/21/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
315.34.00	Carpinteria Marsh	CKF	W	09/21/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.9	<1.0	1.9	<2.0	<2.0
402.10.05	Ventura R/d/s OVSD Discharge	AC	W	08/13/99	<1.0	<1.0	3.8	1.1	2.5	<2.0	5.3	2.7	15.4	<2.0	<2.0
402.10.06	Ventura R/u/s OVSD Discharge	AC	W	08/13/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.9	1.2	4.2	<2.0	<2.0
403.11.00	Santa Clara River Estuary	AC	W	08/13/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.4	<1.0	1.4	<2.0	6.6
403.12.06	Calleguas Creek	BB	F	08/11/99	<1.0	<1.0	2.1	<1.0	<2.0	<2.0	3.4	<1.0	5.5	<2.0	4.7
403.64.03	Arroyo Conejo/d/s Forks	BB	F	08/11/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.1	<1.0	2.1	6.0	<2.0
403.67.08	Arroyo Simi/Madera Rd	AC	W	08/12/99	<1.0	<1.0	2.9	<1.0	<2.0	3.2	6.8	3.5	16.3	<2.0	16.6

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
310.31.00	2.8	2.9	10.0	<2.0	120.0	<3.0	7.6	4.2	NA	144.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
312.10.00	188.0	204.0	803.0	23.2	5116.0	236.0	971.0	170.0	NA	7523.2	NA	<20.0	<2.0	NA	NA	ND	148.0	<6.0
314.10.00	<2.0	<2.0	<2.0	<2.0	3.9	<3.0	<5.0	<3.0	NA	3.9	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
315.34.00	<2.0	<2.0	7.2	<2.0	49.1	<3.0	<5.0	3.2	NA	59.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
402.10.05	5.7	2.9	<2.0	<2.0	10.8	<3.0	<5.0	<3.0	NA	13.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
402.10.06	<2.0	<2.0	<2.0	<2.0	11.4	<3.0	<5.0	<3.0	NA	11.4	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
403.11.00	<2.0	<2.0	5.8	<2.0	36.8	<3.0	<5.0	<3.0	NA	42.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
403.12.06	3.5	2.6	14.4	<2.0	208.0	5.7	42.0	3.5	NA	276.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
403.64.03	<2.0	<2.0	<2.0	<2.0	19.1	<3.0	<5.0	<3.0	NA	19.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
403.67.08	3.7	<2.0	2.1	<2.0	67.4	<3.0	<5.0	<3.0	NA	69.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
310.31.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	2.4	0.5	<5.0	<3.0	<2.0	<4.0	<25.0	11.0	<10.0	11.0	83.1	91.9
312.10.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	1.4	9.3	<3.0	<2.0	<4.0	<25.0	248.0	<10.0	248.0	7593.0	7972.6
314.10.00	<1.0	<2.0	<2.0	1.0	1.0	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.0
315.34.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	148.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.9
402.10.05	<1.0	<2.0	<2.0	47.4	47.4	<2.0	<1.0	1.0	<5.0	<3.0	2.0	<4.0	<25.0	17.0	<10.0	17.0	<20.0	68.5
402.10.06	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.6	<5.0	<3.0	<2.0	<4.0	<25.0	11.0	<10.0	11.0	<20.0	4.2
403.11.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	3.3	<4.0	<25.0	<10.0	<10.0	ND	77.7	79.1
403.12.06	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.8	<5.0	<3.0	<2.0	<4.0	<25.0	30.0	<10.0	30.0	424.0	433.0
403.64.03	<1.0	<2.0	<2.0	1.3	1.3	<2.0	<1.0	0.6	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	3.4
403.67.08	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	1.4	<5.0	53.0	<2.0	<4.0	<25.0	40.0	<10.0	40.0	32.9	53.0

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
308.00.0#	Big Sur River Lagoon	STB	W	10/06/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
309.10.##	Salinas Rec Canal 5	TFC	W	04/29/99	<1.0	<1.0	10.4	<1.0	7.0	5.2	10.5	<1.0	33.1	304.0	540.0
309.10.00	Salinas R Lagoon	STB	W	10/07/99	<1.0	<1.0	4.3	<1.0	<2.0	3.2	7.1	2.7	17.2	<2.0	11.6
309.10.10	Alisal Sl/West Salinas	TFC	W	04/29/99	3.8	1.2	21.5	<1.0	12.6	3.4	10.2	2.3	51.2	18.7	38.1
309.10.17	Salinas Rec Canal/Airport Rd	TFC	W	04/29/99	<1.0	<1.0	2.8	<1.0	2.1	<2.0	2.9	<1.0	7.8	345.0	2901.0
310.12.00	Arroyo de la Cruz	STB	W	10/06/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
310.13.#A	Pico Creek Lagoon	PCP	W	09/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.6	<1.0	1.6	<2.0	<2.0
310.13.00	San Simeon Creek Lagoon	STB	W	09/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
310.14.00	Santa Rosa Cr Lagoon	STB	W	09/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.3	<1.0	1.3	<2.0	<2.0
310.24.00	San Luis Obispo Cr Lagoon	SSP	W	09/22/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.0	<1.0	2.0	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
308.00.0#	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
309.10.##	91.6	18.6	44.8	7.5	261.0	41.2	168.0	6.6	NA	547.6	NA	<20.0	3.8	<10.0	19.7	23.5	6.1	<6.0
309.10.00	57.6	12.8	42.5	2.9	311.0	8.4	48.4	18.6	NA	444.6	NA	<20.0	<2.0	NA	NA	ND	2.7	<6.0
309.10.10	195.0	96.5	194.0	10.9	517.0	9.4	28.2	32.4	NA	888.4	NA	<20.0	<2.0	<10.0	<10.0	ND	11.0	<6.0
309.10.17	70.8	20.3	57.2	2.3	94.0	<3.0	6.6	5.9	NA	186.3	NA	286.0	20.6	<10.0	19.2	39.8	8.3	<6.0
310.12.00	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
310.13.#A	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
310.13.00	<2.0	<2.0	<2.0	<2.0	8.1	<3.0	<5.0	<3.0	NA	8.1	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
310.14.00	<2.0	<2.0	<2.0	<2.0	4.7	<3.0	<5.0	<3.0	NA	4.7	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
310.24.00	<2.0	<2.0	<2.0	<2.0	18.0	<3.0	<5.0	<3.0	NA	18.0	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
308.00.0#	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
309.10.##	<1.0	<2.0	<2.0	2.8	2.8	<2.0	1.4	1.3	<5.0	9.2	4.8	<4.0	<25.0	29.6	<10.0	29.6	946.0	1104.4
309.10.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	1.1	0.7	<5.0	<3.0	2.5	<4.0	<25.0	37.0	<10.0	37.0	135.0	213.7
309.10.10	<1.0	<2.0	<2.0	<1.0	ND	<2.0	1.1	0.4	<5.0	<3.0	<2.0	<4.0	<25.0	44.1	<10.0	44.1	503.0	765.1
309.10.17	<1.0	<2.0	<2.0	11.7	11.7	<2.0	4.0	1.0	<5.0	17.1	<2.0	<4.0	<25.0	40.5	<10.0	40.5	219.0	361.4
310.12.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
310.13.#A	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.6
310.13.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
310.14.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.6	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.3
310.24.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	56.0	<10.0	56.0	<20.0	2.0

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
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F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
206.60.##	San Pablo Reservoir	CP	F	04/17/00	1.1	1.4	27.5	2.0	13.0	12.1	27.5	3.9	87.4	<2.0	<2.0
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	<1.0	<1.0	9.9	1.0	4.1	3.7	11.4	1.4	31.6	<2.0	<2.0
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	1.7	2.3	51.2	3.1	23.6	23.0	45.4	4.8	153.4	<2.0	<2.0
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	1.2	1.3	28.2	1.9	12.6	12.0	26.2	3.1	85.3	<2.0	2.3
3##.##.#D	Gabilan Creek	TFC	W	04/29/99	<1.0	<1.0	2.1	<1.0	<2.0	<2.0	2.8	<1.0	5.0	4.0	4.8
304.10.00	Waddell Creek Lagoon	STB	W	10/05/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
305.10.##	Pajaro R/Pajaro	RCH	W	10/07/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.4	1.2	3.6	<2.0	3.1
305.10.##	Pajaro R/Pajaro	RCH	W	10/07/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	2.5	1.2	3.7	<2.0	2.9
306.00.05	Elkhorn Sl/u/s Elkhorn Rd Brg	TFC	W	04/29/99	<1.0	<1.0	6.4	<1.0	4.6	2.1	6.3	<1.0	19.5	3.8	11.4
307.00.01	Carmel Lagoon	STB	W	10/06/99	<1.0	<1.0	3.1	<1.0	<2.0	<2.0	6.8	<1.0	9.9	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
206.60.##	62.7	2.1	14.8	<2.0	58.9	<3.0	<5.0	3.0	NA	78.8	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	63.1	<2.0	5.1	<2.0	22.4	<3.0	<5.0	<3.0	NA	27.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	110.0	2.3	17.7	<2.0	93.8	<3.0	12.0	3.9	NA	129.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	120.0	<2.0	10.4	<2.0	55.5	<3.0	6.1	<3.0	NA	72.0	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
3##.##.#D	11.9	2.6	4.7	2.5	88.3	8.1	27.2	<3.0	NA	133.4	NA	30.5	<2.0	NA	NA	ND	<2.0	<6.0
304.10.00	<2.0	<2.0	<2.0	<2.0	8.5	<3.0	<5.0	<3.0	NA	8.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
305.10.##	15.0	3.3	14.7	<2.0	97.4	<3.0	<5.0	7.2	NA	122.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
305.10.##	15.2	3.4	14.8	<2.0	100.0	<3.0	<5.0	7.3	NA	125.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
306.00.05	45.9	11.8	27.1	2.9	123.0	4.1	17.9	4.1	NA	190.9	NA	<20.0	5.8	<10.0	18.7	24.5	5.3	<6.0
307.00.01	2.0	<2.0	<2.0	<2.0	37.4	<3.0	<5.0	<3.0	NA	37.4	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	2.7	0.8	<5.0	50.3	<2.0	<4.0	<25.0	67.0	38.0	105.0	21.0	174.9
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	2.2	0.5	<5.0	42.5	<2.0	<4.0	<25.0	28.0	15.0	43.0	<20.0	96.9
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	4.4	1.1	<5.0	69.0	<2.0	<4.0	<25.0	158.0	40.0	198.0	61.1	330.5
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	4.1	0.8	<5.0	92.3	<2.0	<4.0	<25.0	81.0	29.0	110.0	40.4	251.0
3##.##.#D	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	15.3	<10.0	15.3	74.8	91.7
304.10.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
305.10.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.4	<5.0	<3.0	3.0	<4.0	25.0	<10.0	<10.0	25.0	61.2	79.8
305.10.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.4	<5.0	4.9	4.7	<4.0	<25.0	<10.0	<10.0	ND	61.2	80.1
306.00.05	<1.0	<2.0	<2.0	<1.0	ND	<2.0	6.5	0.4	<5.0	27.1	<2.0	<4.0	<25.0	32.9	<10.0	32.9	204.0	305.6
307.00.01	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	48.0	<10.0	48.0	<20.0	11.9

NA Means that the sample was not analyzed for the chemical.
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F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

TABLE 2

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Organic Chemicals in Fish and Clams (ppb, wet weight)

Station Number	Station Name	Species Code	Tissue Type	Sample Date	Aldrin	alpha-Chlordene	cis-Chlordane	gamma-Chlordene	trans-Chlordane	cis-Nonachlor	trans-Nonachlor	Oxychlordane	Total Chlordane	Chlorpyrifos	Dacthal
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	F	06/15/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
111.63.14	Lake Pillsbury	LMB	F	06/15/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	<1.0	<1.0	ND	<2.0	<2.0
114.21.10	Laguna de Santa Rosa/Stony Pt	GSF	F	11/05/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.1	<1.0	1.1	<2.0	<2.0
114.23.00	Mark West Creek	SPM	W	11/05/99	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	3.0	<1.0	3.0	<2.0	<2.0
206.60.##	San Pablo Reservoir	CP	F	04/17/00	<1.0	1.6	32.8	2.3	15.1	14.8	34.0	4.3	105.0	<2.0	3.0
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.8	<1.0	1.8	<2.0	<2.0
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.6	<1.0	1.6	<2.0	<2.0
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	<1.0	<1.0	<2.0	<1.0	<2.0	<2.0	1.7	<1.0	1.7	<2.0	<2.0
206.60.##	San Pablo Reservoir	CP	F	04/17/00	1.1	1.3	33.7	2.0	14.6	16.1	31.4	4.9	104.1	<2.0	<2.0

Station Number	Dieldrin	o,p' DDD	p,p' DDD	o,p' DDE	p,p' DDE	o,p' DDT	p,p' DDT	p,p' DDMU	p,p' DDMS	Total DDT	Dicofol	Diazinon	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Total Endosulfan	Endrin	Ethion
111.63.##	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
111.63.13	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
111.63.14	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
114.21.10	<2.0	<2.0	<2.0	<2.0	<2.0	<3.0	<5.0	<3.0	NA	ND	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
114.23.00	<2.0	<2.0	2.2	<2.0	18.1	<3.0	<5.0	<3.0	NA	20.3	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	111.0	<2.0	15.4	<2.0	70.8	<3.0	<5.0	3.3	NA	89.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	5.3	<2.0	<2.0	<2.0	3.6	<3.0	<5.0	<3.0	NA	3.6	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	5.3	<2.0	<2.0	<2.0	3.0	<3.0	<5.0	<3.0	NA	3.0	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	5.2	<2.0	<2.0	<2.0	3.5	<3.0	<5.0	<3.0	NA	3.5	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0
206.60.##	95.2	2.1	16.3	<2.0	68.5	<3.0	<5.0	3.3	NA	90.2	NA	<20.0	<2.0	NA	NA	ND	<2.0	<6.0

Station Number	alpha-HCH	beta-HCH	delta-HCH	gamma-HCH (Lindane)	Total HCH	Heptachlor	Heptachlor-epoxide	Hexachlorobenzene	Methoxychlor	Oxadiazon	Ethyl Parathion	Methyl Parathion	PCB 1248	PCB 1254	PCB 1260	Total PCB	Toxaphene	Chemical Group A
111.63.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
111.63.13	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
111.63.14	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	ND
114.21.10	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	1.1
114.23.00	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	0.4	<5.0	4.0	<2.0	<4.0	<25.0	22.0	<10.0	22.0	<20.0	3.0
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	4.1	1.1	<5.0	87.4	<2.0	<4.0	<25.0	90.0	37.0	127.0	33.5	253.6
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	7.1
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	6.9
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	<1.0	<0.3	<5.0	<3.0	<2.0	<4.0	<25.0	<10.0	<10.0	ND	<20.0	6.9
206.60.##	<1.0	<2.0	<2.0	<1.0	ND	<2.0	4.1	0.9	<5.0	73.4	<2.0	<4.0	<25.0	80.0	41.0	121.0	34.5	239.0

NA Means that the sample was not analyzed for the chemical.
ND Means that the chemical was not detected.
< Means that the chemical was not detected above the indicated limit of detection.

F = Filet.
W = Whole Body.
Species codes are listed in Table 3.

12 July 01
13:05
D. Jayne = Use conversion factor as 2nd line of evidence to support a known exceedance
Do not convert all to WC until valididation of conversion formula.

Table 1

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Trace Elements in Fish and Clams (ppm, wet weight)

Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
801.11.89	Lower Newport Bay/Rhine Ch	YFC	L	08/10/99	NA	NA	0.089	5.3300	0.1290	NA	NA	NA	0.0060	23.90
801.11.96	Peters Canyon Channel	PRS	W	08/05/99	0.179	0.0350	0.121	1.2300	0.0300	0.048	0.1370	4.110	<0.0020	45.80
801.11.96	Peters Canyon Channel	PRS	W	08/05/99	0.190	0.0360	0.171	1.2900	0.0380	0.040	0.1390	4.240	0.0030	44.70
801.11.99	Upper Newport Bay/Newport Dunes	ORC	F	08/04/99	1.300	<0.0020	NA	NA	NA	0.050	0.0170	0.760	NA	NA
801.11.99	Upper Newport Bay/Newport Dunes	ORC	L	08/04/99	NA	NA	0.088	6.2600	0.0080	NA	NA	NA	<0.0020	18.40
901.12.##	Aliso Cr/Pacific Park Dr	PRS	W	08/27/99	0.245	0.2240	0.110	1.3000	0.0710	<0.015	0.1950	1.610	<0.0020	32.50
902.11.01	Santa Margarita R/Stuart Mesa Rd	CKF	W	08/25/99	0.221	0.0050	0.050	1.1200	0.0320	<0.015	0.1900	0.248	0.0270	28.30
902.22.03	Rainbow Creek	GSF	F	08/26/99	0.031	<0.0020	NA	NA	NA	0.051	0.0080	0.388	NA	NA
902.22.03	Rainbow Creek	GSF	L	08/26/99	NA	NA	0.067	2.4500	0.0100	NA	NA	NA	<0.0020	16.70
902.32.##	Murrietta Cr/u/s Temecula Cr	BLB	F	08/26/99	0.036	<0.0020	NA	NA	NA	0.059	0.0370	0.287	NA	NA
902.32.##	Murrietta Cr/u/s Temecula Cr	BLB	L	08/26/99	NA	NA	0.100	9.2500	0.0070	NA	NA	NA	0.0290	19.20
904.10.##	Loma Alta Cr/College Blvd	GAM	W	08/26/99	0.217	0.0220	0.236	3.6900	0.0770	0.061	0.1990	0.371	0.0340	37.70
904.21.02	Buena Vista Lagoon	LMB	F	08/25/99	0.072	<0.0020	NA	NA	NA	0.054	0.0100	0.392	NA	NA
904.21.02	Buena Vista Lagoon	LMB	L	08/25/99	NA	NA	0.122	3.8300	0.0210	NA	NA	NA	0.0060	21.90
904.31.##	Agua Hedionda Cr/El Camino Real	GAM	W	08/24/99	0.386	0.0250	0.220	1.3400	0.0380	<0.015	0.1520	0.461	0.0050	25.90
904.51.03	San Marcos Cr	LMB	F	08/24/99	0.045	<0.0020	NA	NA	NA	0.046	0.0230	0.335	NA	NA
904.51.03	San Marcos Cr	LMB	L	08/24/99	NA	NA	0.193	3.0800	<0.0020	NA	NA	NA	<0.0020	16.00
904.61.07	Escondido Cr/Elfin Forest Park	GSF	F	08/24/99	0.064	0.0010	NA	NA	NA	0.050	0.3410	0.496	NA	NA
904.61.07	Escondido Cr/Elfin Forest Park	GSF	L	08/24/99	NA	NA	0.070	2.4400	0.0100	NA	NA	NA	0.0050	17.30
907.11.03	San Diego R/u/s Taylor St	LMB	F	08/23/99	0.096	<0.0020	NA	NA	NA	0.035	0.0150	0.854	NA	NA
907.11.03	San Diego R/u/s Taylor St	LMB	L	08/23/99	NA	NA	0.112	5.9400	0.0130	NA	NA	NA	0.0130	23.10

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Table 1

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Trace Elements in Fish and Clams (ppm, wet weight)

Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
630.10.07	East Walker R/Bridgeport	BN	F	10/20/99	0.065	<0.0020	NA	NA	NA	0.060	0.0150	0.225	NA	NA
630.10.07	East Walker R/Bridgeport	BN	L	10/20/99	NA	NA	0.099	116.0000	0.0290	NA	NA	NA	0.7870	21.30
630.30.##	East Walker R/u/s Bridgeport Res	BN	F	10/18/99	0.036	<0.0020	NA	NA	NA	0.039	0.0090	0.336	NA	NA
630.30.##	East Walker R/u/s Bridgeport Res	BN	L	10/18/99	NA	NA	0.094	67.3000	<0.0020	NA	NA	NA	0.4860	23.40
630.30.#A	Buckeye Cr/u/s/Bridgeport Res	RBT	F	10/18/99	0.093	<0.0020	NA	NA	NA	0.031	0.0120	0.469	NA	NA
630.30.#A	Buckeye Cr/u/s/Bridgeport Res	RBT	L	10/18/99	NA	NA	0.128	25.2000	<0.0020	NA	NA	NA	0.0980	18.20
630.30.#B	Robinson Cr/u/s Bridgeport Res	BN	F	10/18/99	0.150	<0.0020	NA	NA	NA	0.038	0.0100	0.683	NA	NA
630.30.#B	Robinson Cr/u/s Bridgeport Res	BN	L	10/18/99	NA	NA	0.154	58.4000	0.0050	NA	NA	NA	0.4900	23.30
634.10.00	Upper Truckee R/d/s HWY 50	RBT	F	09/16/99	<0.020	<0.0020	NA	NA	NA	0.053	0.0120	0.104	NA	NA
634.10.00	Upper Truckee R/d/s HWY 50	RBT	L	09/16/99	NA	NA	0.175	14.5000	0.0040	NA	NA	NA	0.1770	23.30
637.20.##	Gold Run Creek	RBT	F	10/21/99	0.039	<0.0020	NA	NA	NA	0.146	0.0180	0.112	NA	NA
637.20.##	Gold Run Creek	RBT	L	10/21/99	NA	NA	0.114	13.3000	<0.0020	NA	NA	NA	0.1200	27.40
637.20.25	Susan R/d/s Piute Creek	BK	F	10/22/99	<0.023	<0.0020	NA	NA	NA	1.540	0.0340	0.116	NA	NA
637.20.25	Susan R/d/s Piute Creek	BK	L	10/22/99	NA	NA	0.159	36.5000	<0.0020	NA	NA	NA	0.1510	28.30
637.20.31	Susan R/u/s Susanville	RBT	F	10/22/99	<0.023	<0.0020	NA	NA	NA	2.090	0.0170	0.103	NA	NA
637.20.31	Susan R/u/s Susanville	RBT	L	10/22/99	NA	NA	0.156	61.4000	<0.0020	NA	NA	NA	0.3690	22.30
715.40.08	Palo Verde Outfall Drain	LMB	F	12/07/99	0.049	NA	NA	NA	NA	NA	NA	0.500	NA	NA
715.50.90	Colorado R/u/s Imperial Dam	LMB	F	12/07/99	0.130	NA	NA	NA	NA	0.058	NA	2.450	NA	NA
719.47.00	Coachella Valley Stormwater Ch	TL	W	12/08/99	0.251	NA	NA	NA	NA	NA	NA	0.915	NA	NA
723.10.02	New R/Westmorland	CP	F	12/09/99	0.118	NA	NA	NA	NA	NA	NA	1.460	NA	NA
723.10.12	Wiest Lake	LMB	F	12/06/99	0.081	NA	NA	NA	NA	<0.015	NA	1.350	NA	NA
723.10.21	Holtville Main Drain	CCF	F	12/05/99	<0.020	NA	NA	NA	NA	NA	NA	0.529	NA	NA
723.10.30	Central Drain	CP	F	12/05/99	0.114	NA	NA	NA	NA	NA	NA	2.110	NA	NA
723.10.31	South Central Drain	CCF	F	12/05/99	0.050	NA	NA	NA	NA	NA	NA	1.020	NA	NA
728.00.90	Salton Sea/South	ORC	F	12/06/99	0.642	NA	NA	NA	NA	NA	NA	1.820	NA	NA
801.11.05	Delhi Channel	GAM	W	08/05/99	0.395	0.0060	0.068	3.0900	0.0350	<0.015	0.1360	1.540	0.0070	19.10
801.11.07	San Diego Cr/Michelson Dr	PRS	W	08/05/99	0.159	0.0250	0.056	1.1900	0.0420	0.047	0.1250	2.400	<0.0020	35.60
801.11.07	San Diego Cr/Michelson Dr	PRS	W	08/05/99	0.136	0.0330	0.093	1.2100	0.0810	0.052	0.1300	2.420	0.0030	38.30
801.11.09	San Diego Cr/Barranca Pkwy	PRS	W	08/05/99	0.157	0.0940	0.052	1.1900	0.0270	0.066	0.1460	1.630	0.0040	43.50
801.11.89	Lower Newport Bay/Rhine Ch	YFC	F	08/10/99	0.731	<0.0020	NA	NA	NA	0.105	0.0130	0.400	NA	NA

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Preliminary Summary of 1999 Data: Trace Elements in Fish and Clams (ppm, wet weight)

Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
404.21.07	Malibou Lake	LMB	F	08/12/99	0.103	<0.0020	NA	NA	NA	0.246	0.0090	1.280	NA	NA
404.21.07	Malibou Lake	LMB	L	08/12/99	NA	NA	0.065	9.1100	0.0090	NA	NA	NA	0.0070	19.30
404.25.01	Westlake Lake	LMB	F	08/12/99	0.084	0.0010	NA	NA	NA	0.177	0.0090	2.020	NA	NA
404.25.01	Westlake Lake	LMB	L	08/12/99	NA	NA	0.104	149.0000	0.0130	NA	NA	NA	0.0290	45.00
405.12.03	Los Angeles River	TL	W	09/09/99	0.493	0.0080	0.302	1.2100	0.1340	<0.015	0.4720	0.365	0.0160	25.50
405.15.04	San Gabriel River	TL	F	09/09/99	0.290	<0.0020	NA	NA	NA	<0.015	0.0230	0.397	NA	NA
405.15.04	San Gabriel River	TL	L	09/09/99	NA	NA	0.086	30.3000	0.0770	NA	NA	NA	1.6600	21.40
405.21.06	Los Angeles R/Los Feliz Rd	GAM	W	09/09/99	0.054	0.0070	0.126	1.2700	0.0120	<0.015	0.1110	0.721	0.0420	33.10
405.52.01	Puddingstone Res	LMB	F	08/10/99	0.211	<0.0020	NA	NA	NA	0.371	0.0220	0.301	NA	NA
405.52.01	Puddingstone Res	LMB	L	08/10/99	NA	NA	0.068	20.2000	<0.0020	NA	NA	NA	0.0200	28.30
508.10.42	Sacramento R/Keswick	RBT	F	12/22/99	0.060	<0.0020	NA	NA	NA	0.045	0.0230	0.306	NA	NA
508.10.42	Sacramento R/Keswick	RBT	L	12/22/99	NA	NA	0.222	176.0000	0.0180	NA	NA	NA	0.2170	21.80
511.10.08	Putah Creek/South Fork	LMB	F	09/30/99	NA	NA	NA	NA	NA	0.478	NA	NA	NA	NA
511.10.08	Putah Creek/South Fork	SKR	F	09/30/99	NA	NA	NA	NA	NA	0.185	NA	NA	NA	NA
531.11.03	Cosumnes R/Cosumnes R Preserve	LMB	F	10/20/99	NA	NA	NA	NA	NA	1.260	NA	NA	NA	NA
531.30.02	Smith Canal/Yosemite Park	LMB	F	09/22/99	NA	NA	NA	NA	NA	0.334	NA	0.430	NA	NA
531.30.91	Stockton Deep Water Ch	LMB	F	09/22/99	NA	NA	NA	NA	NA	0.493	NA	0.440	NA	NA
541.10.90	San Joaquin R/Vernalis	LMB	F	11/01/99	NA	NA	NA	NA	NA	0.763	NA	0.610	NA	NA
541.10.94	San Joaquin R/Pear Slough	LMB	F	10/25/99	NA	NA	NA	NA	NA	0.784	NA	0.660	NA	NA
541.20.94	San Joaquin R/Landers Avenue	LMB	F	10/18/99	NA	NA	NA	NA	NA	0.671	NA	0.830	NA	NA
544.00.01	San Joaquin R/Potato Slough	LMB	F	09/21/99	NA	NA	NA	NA	NA	0.323	NA	0.380	NA	NA
544.00.02	Mokelumne R/d/s Cosumnes River	LMB	F	09/20/99	NA	NA	NA	NA	NA	0.948	NA	NA	NA	NA
544.00.06	Mokelumne R/d/s Beaver Slough	LMB	F	11/03/99	NA	NA	NA	NA	NA	0.532	NA	NA	NA	NA
544.00.09	White Slough/Lodi	LMB	F	09/21/99	NA	NA	NA	NA	NA	0.335	NA	0.210	NA	NA
544.00.10	San Joaquin R/Turner Cut	LMB	F	09/23/99	NA	NA	NA	NA	NA	0.373	NA	0.360	NA	NA
544.00.12	Middle River/Bullfrog	LMB	F	10/13/99	NA	NA	NA	NA	NA	0.227	NA	0.490	NA	NA
544.00.18	San Joaquin R/HWY 4	LMB	F	09/23/99	NA	NA	NA	NA	NA	0.772	NA	0.460	NA	NA
544.00.32	Paradise Cut/Tracy	LMB	F	10/17/99	NA	NA	NA	NA	NA	0.680	NA	0.530	NA	NA
544.00.93	San Joaquin R/d/s Bowman Rd	LMB	F	09/22/99	NA	NA	NA	NA	NA	0.960	NA	0.430	NA	NA
551.20.00	Mendota Pool	LMB	F	05/27/00	NA	NA	NA	NA	NA	0.206	NA	0.761	NA	NA

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Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
304.10.00	Waddell Creek Lagoon	STB	W	10/05/99	0.346	0.0220	0.200	2.7200	0.0120	0.053	0.3220	0.851	0.0340	34.90
305.10.##	Pajaro R/Pajaro	RCH	W	10/07/99	0.143	0.0220	0.071	1.3800	0.0030	<0.015	0.1320	0.844	0.0050	37.10
305.10.##	Pajaro R/Pajaro	RCH	W	10/07/99	0.132	0.0250	0.143	1.3700	0.0170	0.060	0.1720	0.828	0.0040	35.30
306.00.05	Elkhorn Sl/u/s Elkhorn Rd Brg	TFC	W	04/29/99	1.970	0.6060	7.120	25.5000	0.0620	0.028	0.8240	0.683	0.0360	15.60
307.00.01	Carmel Lagoon	STB	W	10/06/99	0.515	0.1780	0.150	6.5200	0.0570	0.093	0.4320	1.110	0.0560	72.20
308.00.0#	Big Sur River Lagoon	STB	W	10/06/99	0.154	0.0480	0.205	1.6500	0.0320	<0.015	0.2300	1.090	0.0040	30.40
309.10.##	Salinas Rec Canal 5	TFC	W	04/29/99	1.160	0.3290	2.430	7.9300	0.0170	<0.015	0.2420	0.331	0.0130	8.27
309.10.00	Salinas R Lagoon	STB	W	10/07/99	0.378	0.1010	0.383	2.4100	0.0450	0.058	0.4630	0.588	<0.0020	33.20
309.10.10	Alisal Sl/West Salinas	TFC	W	04/29/99	1.310	0.3230	2.550	8.7000	0.0200	<0.015	0.3760	0.461	0.0160	11.30
309.10.17	Salinas Rec Canal/Airport Rd	TFC	W	04/29/99	2.840	1.3800	9.770	29.5000	0.3370	<0.015	1.2600	0.943	0.0430	24.50
310.12.00	Arroyo de la Cruz	STB	W	10/06/99	0.094	0.0250	0.251	1.7400	0.0100	<0.015	0.2490	0.408	<0.0020	19.30
310.13.#A	Pico Creek Lagoon	PCP	W	09/22/99	0.282	0.0380	0.166	1.3700	0.0110	0.180	0.2720	0.313	0.0050	12.80
310.13.00	San Simeon Creek Lagoon	STB	W	09/22/99	0.314	0.0380	0.291	3.7600	0.0130	0.177	0.4710	0.354	0.0070	24.60
310.14.00	Santa Rosa Cr Lagoon	STB	W	09/22/99	0.188	0.0370	0.284	3.6300	0.0270	0.318	0.5140	1.860	0.0080	36.00
310.24.00	San Luis Obispo Cr Lagoon	SSP	W	09/22/99	0.351	0.0190	0.167	0.9110	0.0070	<0.015	0.2610	0.429	0.0030	19.50
310.31.00	Arroyo Grande Creek Lagoon	STB	W	09/22/99	0.249	0.0830	0.405	2.1700	0.0410	<0.015	0.2870	3.180	0.0080	33.20
312.10.00	Santa Maria R/Mouth	STB	W	09/21/99	0.196	0.0620	0.246	2.1900	0.0730	0.043	0.2420	0.770	0.0090	37.90
314.10.00	Santa Ynez River Lagoon	STF	F	09/21/99	0.097	<0.0020	NA	NA	NA	0.059	0.0110	0.474	NA	NA
314.10.00	Santa Ynez River Lagoon	STF	L	09/21/99	NA	NA	0.164	8.3500	<0.0020	NA	NA	NA	0.0110	26.30
315.34.00	Carpinteria Marsh	CKF	W	09/21/99	0.525	0.0070	0.389	1.4300	0.1240	<0.015	0.3960	0.457	0.0270	24.90
402.10.05	Ventura R/d/s OVSD Discharge	AC	F	08/13/99	0.129	0.0210	0.190	2.4000	0.0150	0.077	0.1180	3.110	0.0180	42.90
402.10.06	Ventura R/u/s OVSD Discharge	AC	W	08/13/99	0.124	0.0740	0.111	1.8900	0.0120	0.094	0.1360	2.680	0.0050	40.90
403.11.00	Santa Clara River Estuary	AC	W	08/13/99	0.126	0.0310	0.185	1.2200	0.0110	0.041	0.1500	1.510	0.0140	36.60
403.12.06	Calleguas Creek	BB	F	08/11/99	<0.020	<0.0020	NA	NA	NA	0.059	0.0120	0.258	NA	NA
403.12.06	Calleguas Creek	BB	L	08/11/99	NA	NA	0.161	14.1000	0.0340	NA	NA	NA	0.1390	22.70
403.64.03	Arroyo Conejo/d/s Forks	BB	F	08/11/99	0.033	<0.0020	NA	NA	NA	0.061	0.0110	0.311	NA	NA
403.64.03	Arroyo Conejo/d/s Forks	BB	L	08/11/99	NA	NA	0.179	18.3000	0.0040	NA	NA	NA	0.4040	21.50
403.67.08	Arroyo Simi/Madera Rd	AC	W	08/12/99	0.226	0.0410	0.070	1.4100	0.0320	0.045	0.1300	3.420	<0.0020	35.90
404.21.04	Malibu Cr/Tapia Park	AC	W	09/10/99	0.260	0.1200	0.356	1.6400	0.0190	0.031	0.1750	1.320	0.0190	33.50
404.21.05	Malibu Cr/u/s Tapia Discharge	LMB	W	09/10/99	0.089	0.0520	0.293	0.4650	<0.0020	0.035	0.1760	1.100	<0.0020	19.40

L = Liver. F = Filet. W = Whole Body. < = Below Indicated Detection Limit. NA = Not Analyzed.

Species codes are listed in Table 3.

Table 1

Toxic Substances Monitoring Program

Preliminary Summary of 1999 Data: Trace Elements in Fish and Clams (ppm, wet weight)

Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	F	05/17/00	0.099	<0.0020	NA	NA	NA	0.501	0.0120	0.322	NA	NA
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	F	05/17/00	0.150	<0.0020	NA	NA	NA	0.513	0.3140	0.364	NA	NA
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	L	05/17/00	NA	NA	0.188	23.5000	<0.0020	NA	NA	NA	0.1580	24.20
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	L	05/17/00	NA	NA	0.199	10.5000	<0.0020	NA	NA	NA	0.0240	22.30
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	L	05/17/00	NA	NA	0.228	10.2000	<0.0020	NA	NA	NA	0.0480	21.10
114.24.12	Lake Sonoma	LMB	F	05/18/00	0.125	<0.0020	NA	NA	NA	0.461	0.0140	0.304	NA	NA
114.24.12	Lake Sonoma	LMB	F	05/18/00	0.171	<0.0020	NA	NA	NA	0.559	0.0070	0.389	NA	NA
114.24.12	Lake Sonoma	LMB	F	05/18/00	0.185	<0.0020	NA	NA	NA	0.840	0.0100	0.359	NA	NA
114.24.12	Lake Sonoma	LMB	L	05/18/00	NA	NA	0.161	8.6500	<0.0020	NA	NA	NA	0.0430	18.80
114.24.12	Lake Sonoma	LMB	L	05/18/00	NA	NA	0.132	30.6000	0.0140	NA	NA	NA	0.2100	30.40
114.24.12	Lake Sonoma	LMB	L	05/18/00	NA	NA	0.138	7.4500	<0.0020	NA	NA	NA	0.0230	20.80
114.32.##	Lake Mendocino/across	LMB	F	05/17/00	0.036	<0.0020	NA	NA	NA	0.651	0.0110	0.199	NA	NA
114.32.##	Lake Mendocino/across	LMB	F	05/17/00	0.068	<0.0020	NA	NA	NA	0.346	0.0120	0.250	NA	NA
114.32.##	Lake Mendocino/across	LMB	F	05/17/00	0.095	<0.0020	NA	NA	NA	0.517	0.0190	0.277	NA	NA
114.32.##	Lake Mendocino/across	LMB	L	05/17/00	NA	NA	0.097	11.4000	<0.0020	NA	NA	NA	0.0520	19.50
114.32.##	Lake Mendocino/across	LMB	L	05/17/00	NA	NA	0.120	19.7000	<0.0020	NA	NA	NA	0.0830	23.60
114.32.##	Lake Mendocino/across	LMB	L	05/17/00	NA	NA	0.085	13.5000	0.0100	NA	NA	NA	0.0450	24.20
201.12.##	Soulajule	LMB	F	05/02/00	NA	NA	NA	NA	NA	1.030	NA	NA	NA	NA
201.12.##	Soulajule	LMB	F	05/02/00	NA	NA	NA	NA	NA	0.812	NA	NA	NA	NA
201.12.##	Soulajule	LMB	F	05/02/00	NA	NA	NA	NA	NA	0.405	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	NA	NA	NA	NA	NA	0.146	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	NA	NA	NA	NA	NA	0.129	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	BCR	F	04/17/00	NA	NA	NA	NA	NA	0.152	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CP	F	04/17/00	NA	NA	NA	NA	NA	0.197	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CP	F	04/17/00	NA	NA	NA	NA	NA	0.185	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CP	F	04/17/00	NA	NA	NA	NA	NA	0.182	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	NA	NA	NA	NA	NA	0.131	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	NA	NA	NA	NA	NA	0.114	NA	NA	NA	NA
206.60.##	San Pablo Reservoir	CCF	F	04/17/00	NA	NA	NA	NA	NA	0.062	NA	NA	NA	NA
3##.##.#D	Gabilan Creek	TFC	W	04/29/99	1.670	0.5600	4.330	13.3000	0.0650	<0.015	0.5160	0.592	0.0190	13.00

L = Liver. F = Filet. W = Whole Body. < = Below Indicated Detection Limit. NA = Not Analyzed.

Species codes are listed in Table 3.

Table 1

Toxic Substances Monitoring Program

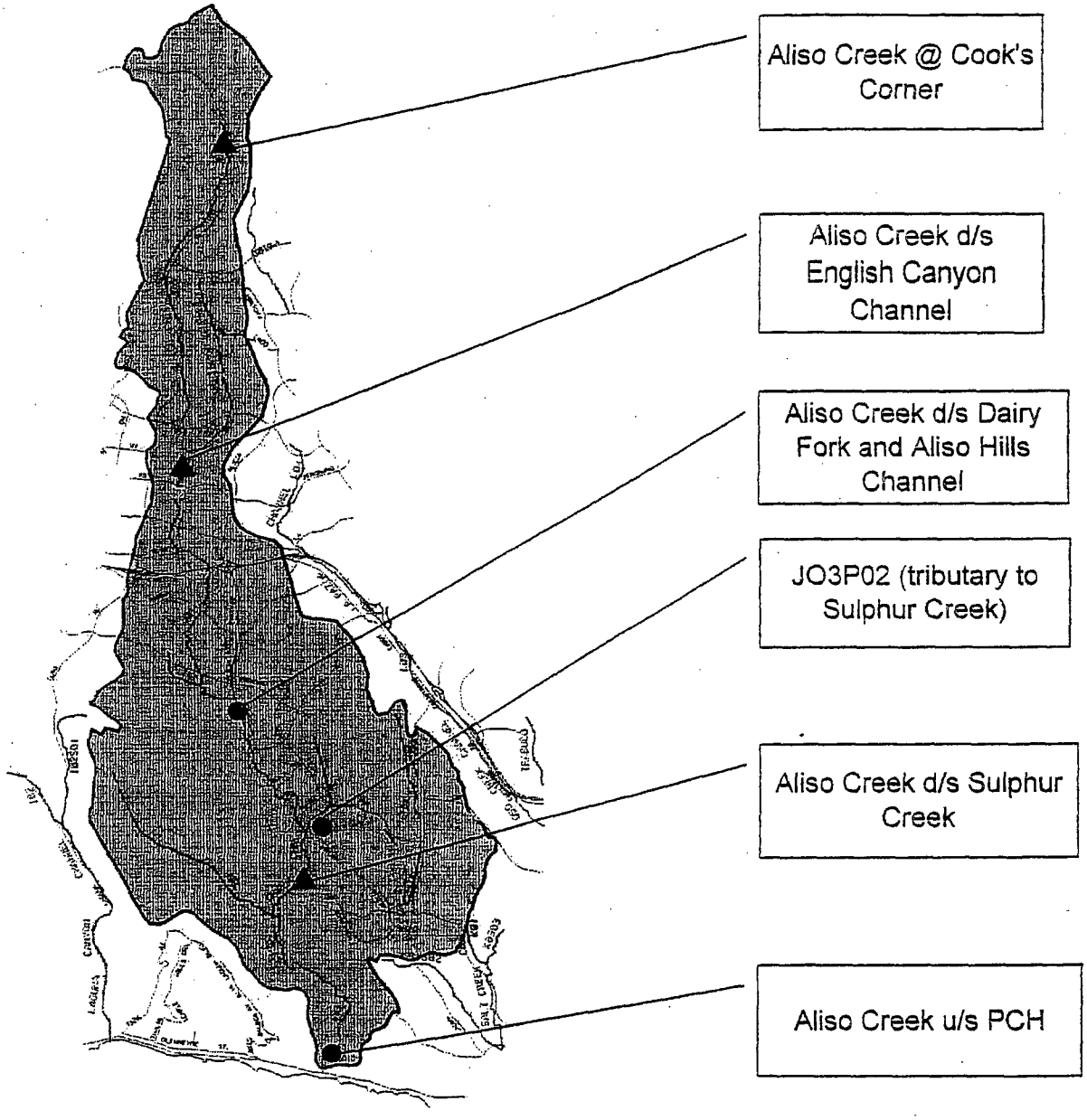
Preliminary Summary of 1999 Data: Trace Elements in Fish and Clams (ppm, wet weight)

Station Number	Station Name	Species Code	Tissue	Sample Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.370	NA	NA	NA	NA
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	F	06/15/99	0.063	<0.0020	NA	NA	NA	1.160	0.0150	0.359	NA	NA
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.180	NA	NA	NA	NA
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.460	NA	NA	NA	NA
111.63.##	Lk Pillsbury/Horsepasture Gulch	LMB	L	06/15/99	NA	NA	0.090	21.6000	0.0170	NA	NA	NA	0.0450	29.70
111.63.#A	Lake Pillsbury/Dam	RBT	F	05/16/00	0.217	<0.0020	NA	NA	NA	0.048	0.0130	0.273	NA	NA
111.63.#A	Lake Pillsbury/Dam	RBT	L	05/16/00	NA	NA	0.215	43.5000	0.0030	NA	NA	NA	0.0310	18.30
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	05/15/99	NA	NA	NA	NA	NA	1.360	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	BG	F	06/15/99	NA	NA	NA	NA	NA	0.847	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.600	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.530	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	0.041	<0.0020	NA	NA	NA	1.550	0.0150	0.339	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.370	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.480	NA	NA	NA	NA
111.63.13	Lake Pillsbury/Eel River Arm	LMB	L	06/15/99	NA	NA	0.063	5.2900	0.0290	NA	NA	NA	0.0280	18.80
111.63.14	Lake Pillsbury	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.480	NA	NA	NA	NA
111.63.14	Lake Pillsbury	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.650	NA	NA	NA	NA
111.63.14	Lake Pillsbury	LMB	F	06/15/99	0.065	<0.0020	NA	NA	NA	1.830	0.0370	0.369	NA	NA
111.63.14	Lake Pillsbury	LMB	F	06/15/99	NA	NA	NA	NA	NA	1.430	NA	NA	NA	NA
111.63.14	Lake Pillsbury	LMB	F	06/15/99	NA	NA	NA	NA	NA	2.730	NA	NA	NA	NA
111.63.14	Lake Pillsbury	LMB	L	06/15/99	NA	NA	0.102	29.9000	0.0070	NA	NA	NA	0.0500	31.30
111.63.14	Lake Pillsbury	SPM	F	06/15/99	NA	NA	NA	NA	NA	2.370	NA	NA	NA	NA
111.63.14	Lake Pillsbury	RBT	F	06/15/00	0.138	<0.0020	NA	NA	NA	0.207	0.0160	0.345	NA	NA
111.63.14	Lake Pillsbury	RBT	F	06/15/00	0.043	<0.0020	NA	NA	NA	0.327	0.0190	0.301	NA	NA
111.63.14	Lake Pillsbury	RBT	L	06/15/00	NA	NA	0.189	68.2000	0.0060	NA	NA	NA	0.2690	25.10
111.63.14	Lake Pillsbury	RBT	L	06/15/00	NA	NA	0.112	24.5000	<0.0020	NA	NA	NA	0.0960	8.40
114.21.10	Laguna de Santa Rosa/Stony Pt	GSF	F	11/05/99	0.041	<0.0020	NA	NA	NA	0.357	0.0190	0.234	NA	NA
114.21.10	Laguna de Santa Rosa/Stony Pt	GSF	L	11/05/99	NA	NA	0.122	1.6200	<0.0020	NA	NA	NA	<0.0020	15.40
114.23.00	Mark West Creek	SPM	W	11/05/99	0.047	0.0070	0.126	1.3900	0.0090	0.218	0.2150	0.282	0.0040	30.10
114.24.##	Lake Sonoma/Dry Creek Arm	LMB	F	05/17/00	0.136	<0.0020	NA	NA	NA	0.595	0.0100	0.346	NA	NA

L = Liver. F = Filet. W = Whole Body. < = Below Indicated Detection Limit. NA = Not Analyzed.

Species codes are listed in Table 3.

Figure 9.1: Initial Water Quality Study - Monitoring Locations
September 30 - October 21, 1998



▲ Nutrients, General Mineral, Trace Metals, Bacteriological

● Bacteriological

igure 9.3 - Intensive Watershed Study Bacteriological Sampling Locations June - August, 1999

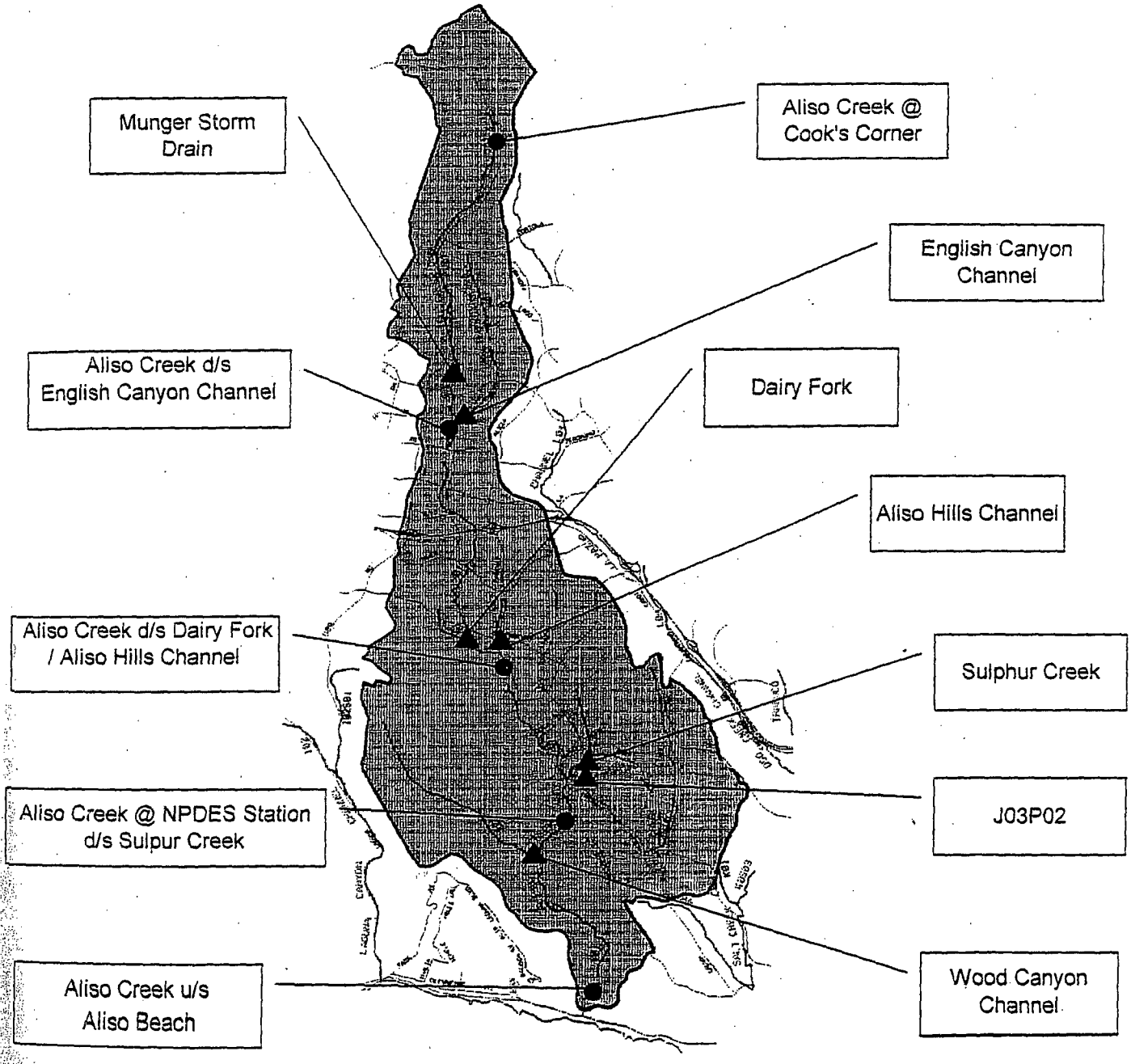


Figure 9.11: Arithmetic Mean Bacteriological Levels in Aliso Creek and Tributaries June 3 - August 5, 1999

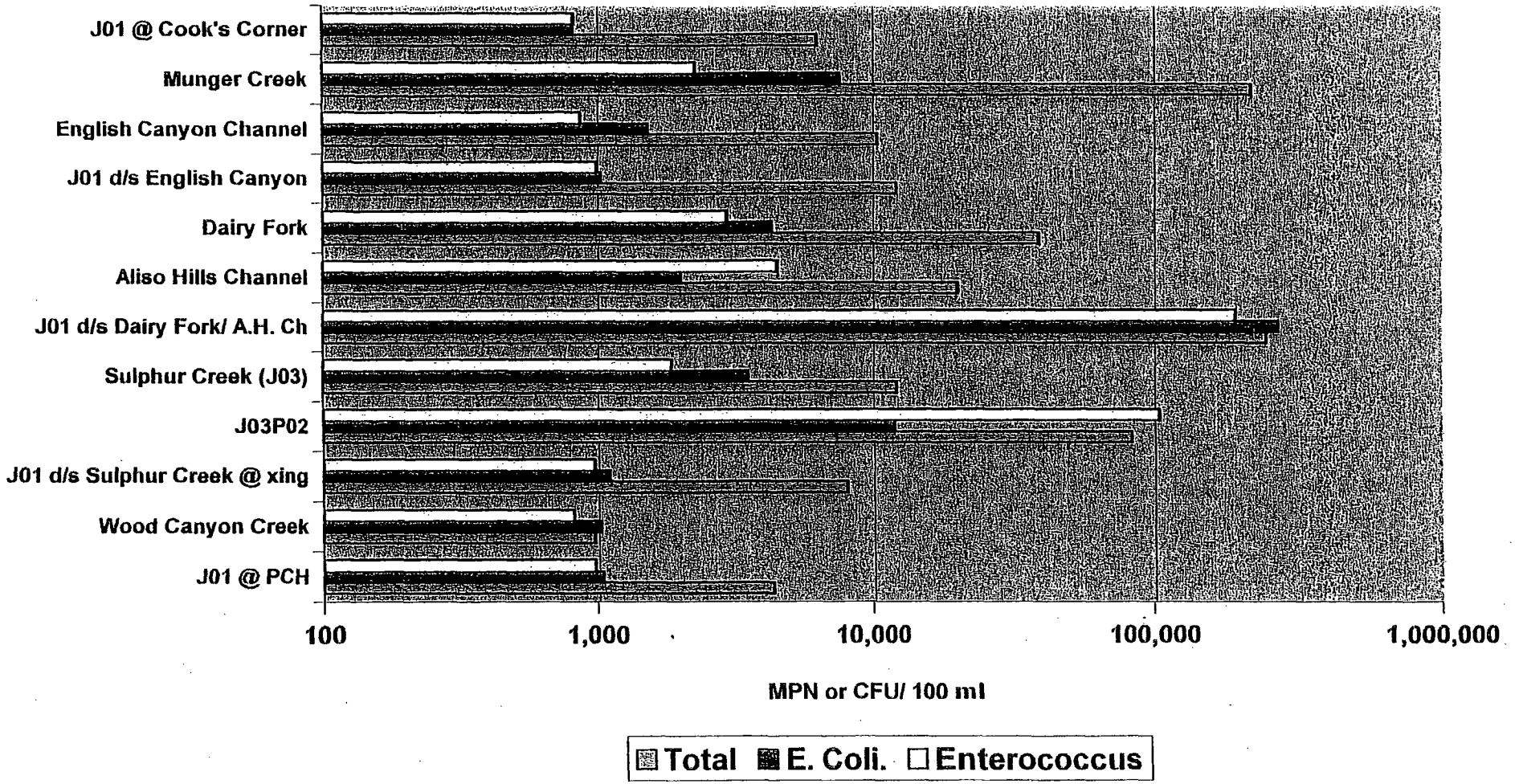


Table 9.12 - Bacteriological Results Of Initial Water Quality Investigation

(MPN/100 mls)

	Aliso Creek at Cook's Corner		Aliso Creek d/s English Canyon		Aliso Creek d/s Dairy Fk & A.Hills		J03P02 (end of 30"pipe)		Aliso Creek d/s Sulphur Creek		Aliso Creek at PCH	
Sample Date	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**
9/30/98	2,800	130	5,000	1,100	50,000	3,000	50,000	30,000	2,400	2,400	16,000	3,000
10/7/98	1,600	1,600	17,000	1,300	16,000	3,000	160,000	90,000	50,000	8,000	5,000	3,000
10/14/98	<20	<20	5,000	400	17,000	11,000	7,000	5,000	13,000	1,100	30,000	8,000
10/21/98	1,600	500	16,000	500	16,000	3,000	16,000	16,000	240	240	9,000	9,000
10/28/98	1,100	22	22,000	5,000	50,000	5,000	24,000	500	2,200	1,100	2,800	500
11/4/98	900	900	500000*	800	9,000	1,300	50,000	5,000	16,000	230	24,000	800
11/19/98	50	4	130	13	500	130	9000	700	2400	90	900	13
11/23/98	5,000	500	5,000	500	30,000	1,700	22,000	13,000	17,000	500	3,000	300
12/9/98	2,300	40	3,000	1,700	30,000	2,300	3,300	1,400	24,000	5,000	3,000	20
12/17/98	1,300	<2	1,300	<2	17,000	<2	30,000	1,100	3,000	400	1,700	400
12/23/98	30	<2	50	<2	22	8	240	50	30	4	23	8
12/30/98	2,600	70	11,000	200	800	200	17,000	70	2,100	200	1,100	200
log mean	700	100	3,000	200	7,000	600	14,000	2,300	3,400	500	3,000	400
arithmetic mean	1,600	300	7,800	1,000	20,000	2,600	32,000	14,000	11,000	1,600	8,000	2,100
				GM = 1074		GM = 4308		GM = 10,155 GM = 2184		GM = 1410		GM = 3178

Objectives For Aliso Creek Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* false positive result due to presence of interfering organisms highly probable (reading omitted from log and arithmetic mean calculations)

= grab sample exceedance

geometric mean exceedance

Table 9.13: Bacteriological Results of Intensive Watershed Study
(MPN/ 100 mls or CFU/ 100 mls)

	Aliso Creek @ Cook's Corner			Munger Storm Drain			English Canyon Channel			Aliso Creek d/s English Canyon		
Date	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.
6/3/99	1,300	218	278	16,000	3,654	4,611	16,000	960	717	16,000	1,100	836
* 6/10/99	13,000	100	<100	5,000	3,290	2,750	5,000	410	<100	5,000	200	<100
** 6/17/99	700	<1,000	1,000	1,600,000	42,800	2,000	23,000	<1,000	<1,000	3,000	1,000	<1,000
6/24/99	3,000	<1,000	<1,000	23,000	9,800	1,000	8,000	1,000	1,000	17,000	2,000	2,000
7/1/99	8,000	<1,000	<1,000	110,000	1,000	<1,000	8,000	<1,000	1,000	11,000	<1,000	<1,000
7/15/99	1,700	1,000	<1,000	50,000	1,000	2,000	13,000	6,300	1,000	17,000	<1,000	<1,000
07/22/99	2,400	<1,000	<1,000	23,000	<1,000	2,000	11,000	<1,000	<1,000	6,000	1,000	1,000
07/29/99	3,000	<1,000	1,000	80,000	5,200	4,100	8,000	<1,000	<1,000	30,000	1,000	<1,000
8/5/99	23,000	1,000	1,000	80,000	1,000	1,000	1,700	<1,000	1,000	5,000	<1,000	<1,000
logmean	3,500	<700	<700	51,000	<3,100	<2,000	8,500	<1,100	<700	9,600	<900	<800
arithmetic mean	6,200	<800	<800	220,000	<7,600	<2,300	10,000	<1,500	<900	12,000	<1,000	<1,000

	Dairy Fork			Aliso Hills Channel			Aliso Cr. d/s Dairy Fork& A.H. Chan.			Sulphur Creek		
Date	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	3,441	3,873	>16,000	8,164	1,918	>16,000	3,654	1,076	>16,000	>24,192	2,282
* 6/10/99	30,000	860	740	8,000	960	2,820	24,000	730	630	5,000	310	<100
** 6/17/99	13,000	<1,000	<1,000	8,000	2,000	7,400	110,000	4,100	<1,000	7,000	1,000	<1,000
6/24/99	30,000	<1,000	1,000	11,000	<1,000	9,700	6,600	<1,000	<1,000	8,000	<1,000	4,100
7/1/99	50,000	19,900	<1,000	5,000	<1,000	2,000	240,000	5,200	1,000	22,000	<1,000	<1,000
7/15/99	50,000	3,100	8,600	50,000	1,000	3,100	80,000	12,100	4,100	17,000	<1,000	<1,000
7/22/99	50,000	1,000	2,000	50,000	2,000	6,300	60,000	>2,419,200	1,732,870	13,000	1,000	<1,000
7/29/99	30,000	3,100	3,000	13,000	<1,000	4,100	110,000	12,100	4,100	17,000	<1,000	5,200
8/5/99	80,000	5,200	5,200	23,000	1,000	3,100	>1,600,000	28,200	4,100	5,000	<1,000	<1,000
logmean	>34,000	<2,400	<2,100	>15,000	<1,500	3,900	>73,000	>9,400	<3,500	>11,000	1,300	<1,200
arithmetic mean	>39,000	<4,300	<2,900	>20,000	<2,000	4,500	>250,000	>280,000	<190,000	>12,000	3,500	<1,900

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event

Table 9.13 (cont): Bacteriological Results of Intensive Watershed Study (MPN/ 100 mls or CFU/ 100 mls)

	J03P02 (end of 30" pipe)			Aliso d/s Sulphur Cr. @ NPDES			Wood Canyon Creek			Aliso Creek @ PCH		
Date	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	15,531	12,033	>16,000	2,755	1,664	1,400	131	243	>16,000	2,247	583
* 6/10/99	11,000	2,920	4,220	2,300	200	<100	1,100	<100	<100	2,300	100	200
** 6/17/99	50,000	9,800	866,400	3,000	<1,000	1,000	270	<1,000	<1,000	8,000	<1,000	<1,000
6/24/99	80,000	5,200	18,500	3,000	1,000	<1,000	400	<1,000	<1,000	3,000	<1,000	<1,000
7/1/99	240,000	12,100	6,300	5,000	<1,000	<1,000	700	2,000	1,000	3,000	<1,000	<1,000
7/15/99	50,000	12,200	4,100	8,000	1,000	1,000	800	<1,000	<1,000	1,100	<1,000	<1,000
7/22/99	80,000	5,200	6,200	3,000	<1,000	<1,000	1,700	2,000	<1,000	1,100	<1,000	2,000
7/29/99	170,000	9,800	17,500	30,000	<1,000	<1,000	1,300	<1,000	<1,000	3,000	<1,000	<1,000
8/5/99	50,000	35,000	3,100	2,300	<1,000	1,000	1,100	<1,000	<1,000	1,300	<1,000	<1,000
logmean	>56,000	9,500	12,000	>5,200	<900	<800	800	<700	<700	>2,900	<800	<900
arithmetic mean	>83,000	12,000	100,000	>8,100	<1,100	<1,000	1,000	<1,000	<800	>4,300	<1,000	<1,000

	4" MWD Pipe		
Date	Total	E. Coli	Enterococ.
7/15/99	<20	<1,000	<1,000

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event