

# COMPLIANCE DETERMINATIONS



## Chapter 2 COMPLIANCE DETERMINATIONS

### INTRODUCTION

This chapter provides compliance results for the 2008-09 monitoring year for the Orange County Sanitation District's (District) ocean monitoring program. The program includes sample collection, analysis, and data interpretation to evaluate potential impacts of wastewater discharge on the following receiving water characteristics:

- Bacterial
- Physical
- Chemical
- Biological
- Radioactivity

Each of these characteristics have specific criteria (Table 2-1) for which permit compliance must be determined each monitoring year. Compliance determinations were made by comparing OMP findings to the criteria specified in the District's NPDES permit (Order No. R8-2004-0062; NPDES Permit No. CA0110604).

Sampling locations include 17 shoreline (surfzone) and 29 offshore water quality stations (Figures 2-1, 3-1, and A-1 respectively), 49 stations to assess benthic (bottom-dwelling) communities and sediment chemistry (Figures 4-1 and 5-1), and 9 trawl stations to evaluate fish and macroinvertebrate communities (Figure 6-1). Monitoring frequencies vary by component, and range from 2 or 5 days per week for surfzone water quality to annual assessments of fish health and tissue analyses.

The water quality sampling stations are separated into 2 separate groups. The first group is the 17 surfzone stations, which are defined by the State of California as nearshore stations. This group of stations must comply with nearshore bacterial standards. The second group is the 29 offshore stations that comprise a fixed-grid pattern around the outfall. Nine stations of this second group, which are located within 3 miles of the shoreline, are sampled for bacteria, and are considered Rec-1 stations (Table A-1). This group of stations must comply with offshore bacterial standards.

The 29 offshore stations are also separated into 2 zones (A and B) for determining compliance with physical and chemical water quality standards. Station locations were defined as either Zone A (stations located on the 2 inner most alongshelf transects) or Zone B (stations located on the 2 outer most alongshelf transects) as shown in Figure A-1.

**Table 2-1. Listing of compliance criteria from NPDES ocean discharge permit (Order No. R8-2004-0062, Permit # CAO110604) and compliance status for each criterion in 2008-09.**

Orange County Sanitation District, California.

Criteria	Description	Criteria Met	Comments
<b>Bacterial Characteristics</b>			
C.2.a.1	Total coliform (water contact)	Yes	Compliance was achieved 100% of the time in offshore waters (Chapter 3). Nearshore compliance, based on more restrictive shellfish standard (C.2.b below), was achieved 94.7% and 94.6% of the time for 30 day median and the 20% standards, respectively (Appendix B).
C.2.a.2	Fecal coliform (water contact)	Yes	Offshore compliance was achieved 100% of the time (Chapter 3). Nearshore samples had 99.9% and 97.6% compliance for the geometric mean and 10% standards, respectively (Appendix B).
C.2.b	Total coliform (shellfish harvesting)	Yes	Nearshore samples had 94.7% and 94.6% compliance with the 30-day median and the 10% standards, respectively (Appendix B).
C.2.c	Enterococci (water contact)	Yes	Monitoring only. All offshore samples met 30-day and six month permit limits. Nearshore samples met 30-day and six-month permit limits 96.4% and 91.9% of the time respectively (Appendix B).
<b>Physical Characteristics</b>			
C.3.a	Floating particulates, oils and grease	Yes	No wastewater particles, oils or grease were observed during the monitoring year in either the Nearshore or Offshore Zones (Chapter 3).
C.3.b	Water clarity and discoloration	Yes	Compliance was met 100% of the time (Chapter 3).
C.3.c	Light transmittance	Yes	Greater than 97% of the samples were in compliance. All out-of-compliance values fell within the range of natural variability and would not cause significant environmental effects (Chapter 3).
C.3.d	Inert solids	Yes	There were no measured discharge effects to sediments by inert solids (Chapter 4).
<b>Chemical Characteristics</b>			
C.4.a	Dissolved oxygen	Yes	Greater than 97% of the samples were in compliance. All out-of-compliance values fell within the range of natural variability and would not cause significant environmental effects (Chapter 3).
C.4.b	Acidity (pH)	Yes	Greater than 99% of the samples were in compliance. All out-of-compliance values fell within the range of natural variability and would not cause significant environmental effects (Chapter 3).
C.4.c	Dissolved sulfides	Yes	Dissolved sulfide concentrations in sediments did not result in anaerobic conditions; no related effects on marine life were observed (Chapter 4).
C.4.d	Table B substances in sediments	Yes	Several metals exceed the ERLs at annual stations, mostly in the submarine canyons or slope stations, but none exceeded the Effects Range-Median (ERM). PCB concentrations were elevated near the outfall compared to other sites. DDT levels were elevated above the ERL at most sites. Whole sediment toxicity testing showed no measurable whole-sediment toxicity in the monitoring area (Chapter 4).
C.4.e	Organics in sediments	Yes	Sediment total organic carbon (TOC) concentrations did not result in excessive organic loading or anaerobic conditions.
C.4.f	Nutrients	Yes	Ammonium values were 20 to a couple of hundred times lower than California Ocean Plan objectives and there were no chlorophyll/plankton associated impacts (Chapter 3).
C.4.g	Table B substances in ZID	Yes	None of these constituents exceeded the effluent limitations established in the permit. Reported in Monthly Discharge Monitoring Reports.
<b>Biological Characteristics</b>			
C.5.a	Marine biological communities	Yes	Minor discharge effects were seen outside the ZID near the outfall, but these effects were minimal and not indicative of significant degradation. Results showed that invertebrate and fish populations were generally normal and healthy beyond the ZID and the outfall was not a disease epicenter (Chapters 5 and 6).
C.5.b	Fish tissue (taste, odor, and color)	Yes	Examinations of fish collected indicated no abnormal color or odor. All fish muscle appeared to be normal and comparable to other areas within the Southern California Bight (Chapter 6).
C.5.c	Fish tissue (bioaccumulation)	Yes	Five fish had muscle tissue PCB concentrations above the state human health guidelines. Four of these were collected from the farfield site and one from the outfall. All muscle tissue samples were below state and federal human consumption guidelines for mercury and DDT (Chapter 6).
<b>Radioactivity Characteristics</b>			
C.6	Radioactivity	Yes	Radioactivity is measured in effluent only and reported in the Discharge Monitoring Report. All limits met.

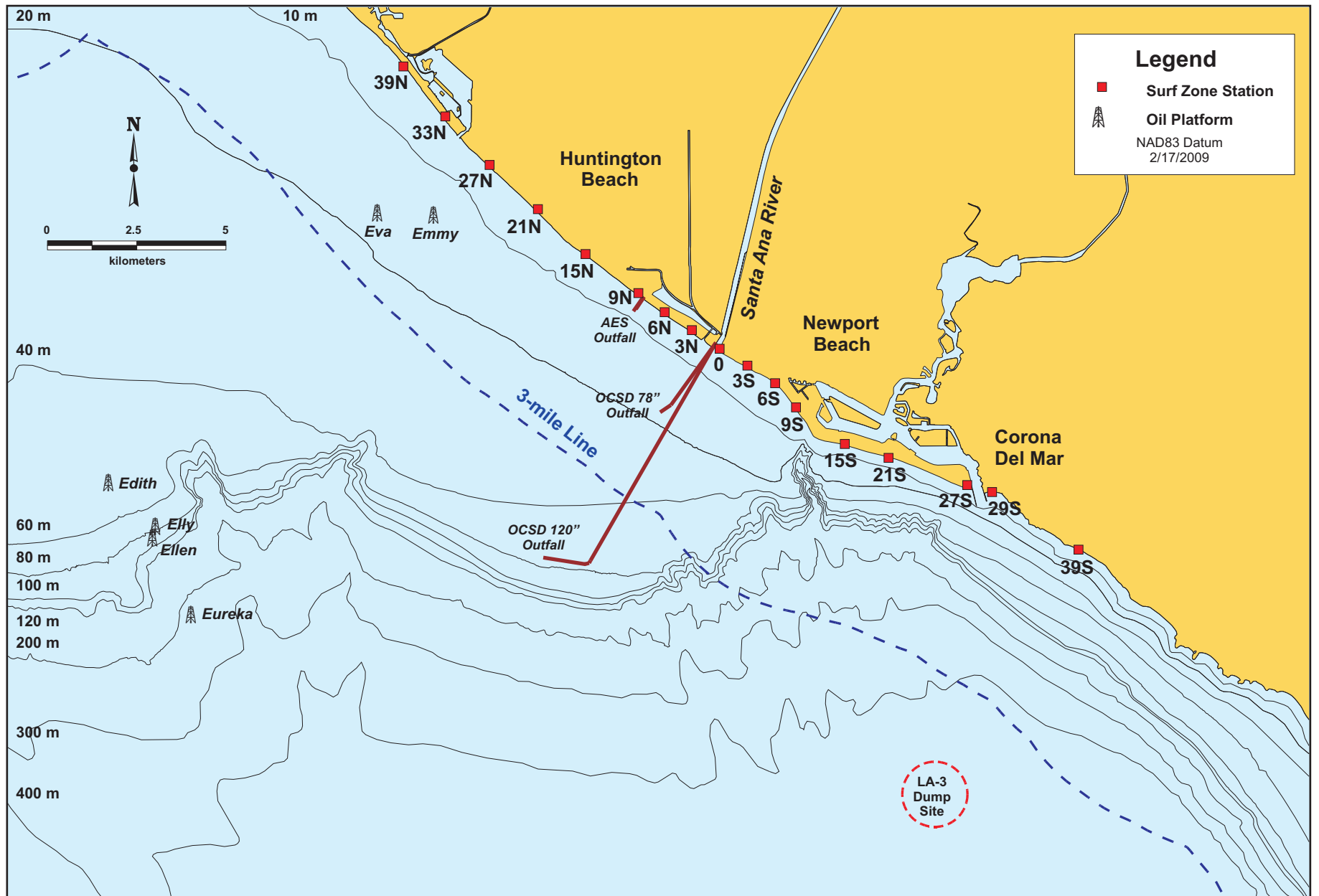


Figure 2-1. Sampling locations for nearshore (surf zone) monitoring stations, 2008-09.

Compliance evaluations are based on statistical comparisons to the corresponding upcurrent Zone A or Zone B reference station (OCSD 1999). This matching of Zone A or Zone B stations allows comparisons of data from similar water depths.

## **RESULTS AND DISCUSSION**

A compliance summary is presented in Table 2-1.

### **Bacterial Criteria**

Criteria C.2.a.1 and C.2.a.2 require that the discharge not cause water contact standards to be exceeded in the Nearshore and Offshore Zones for total coliform and fecal coliform bacteria. Additionally, for total coliforms, shellfish harvesting standards apply within the Nearshore Zone (Criterion C.2.b). Finally, monitoring only (bacterial assessment) is required for enterococci bacteria in both zones (Criterion C.2.c).

Water contact criteria have 2 standards that need to be met. Total coliform bacteria have a single sample maximum of 10,000/100 mL (if verified by a repeat sample taken within 48 hours) and a 30-day geometric mean limit of 1,000/100 mL, provided that no more than 20% of the samples at any station exceed 1,000/100 mL. Fecal coliform bacteria cannot exceed a 30-day geometric mean of 200/100 mL and no more than 10% of the samples can exceed 400/100 mL within any 60-day period. Enterococci limits are a 30-day geometric mean of 24/100 mL or 12/100 mL over a 6-month period. The shellfish harvesting standard limit for total coliform is a median density not to exceed 70/100 mL, provided that no more than 10% of the samples exceed 230/100 mL. Note that for Nearshore total coliform bacteria, compliance determinations were made using the more restrictive shellfish standards.

#### Nearshore

The 30-day median and 30-day 10% standards were met at the 17 shoreline stations over 94% of the time (Tables B-1 and B-2). The fecal coliform benchmark was met >99% for the monthly geometric mean standard and 97% for the 60-day 10% standard (Tables B-3 and B-4). Enterococci benchmarks were met with 96% compliance for the 30-day geometric mean (Table B-5) and 92% compliance for the 6-month geometric mean standards (Table B-6).

#### Offshore

The offshore receiving water standards were met at the 9 Rec-1 stations with 100% compliance for both total and fecal coliform bacteria (Tables B-7 and B-8). No total coliform sample exceeded 300 MPN/100 mL. The highest recorded value was 265 MPN/100 mL. The majority of values were less than the minimum detection level (Table B-7). No fecal coliform sample exceeded 100 MPN/100 mL. The highest recorded value was 17 MPN/100 mL (Table B-8). No standards exist for enterococci. However, values were low with the majority of values less than the minimum detection level. The highest recorded enterococcus concentration was 12 MPN/100 mL (Table B-9).

This suggests that it is unlikely that the wastewater discharge is impacting bacterial concentrations in recreational waters. Since the onset of effluent disinfection in August 2002, the incidence of detectable bacterial concentrations in offshore waters has decreased markedly. Additionally, for those nearshore values that exceeded the permit limits, 87–100%

of them occurred at 5 contiguous stations (9N to 3S) that are either impacted by the Santa Ana River (3N, 0, and 3S) or associated with continued chronic bacterial contamination (9N and 6N).

## **Physical Criteria**

The criteria for determining compliance with physical characteristics (C.3.a–d) are narrative and apply to the discharge of floatable material, substances that could alter the color or transparency of the water, and/or contaminate sediments and degrade biological communities.

### Floating Particulates and Oil and Grease

Criterion C.3.a states that "floating particulates and oil and grease shall not be visible." There were no observations of oils and grease at any offshore or shoreline station in 2008-09 (Tables B-10, B-11, and B-12). Therefore, compliance was achieved with this criterion.

### Ocean Discoloration and Transparency

These criteria specify that "the discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface" (C.3.b) and that "natural light shall not be significantly reduced at any point outside the initial dilution zone" (C.3.c).

Secchi depth and water color data were generally consistent with the transmissivity results, showing the lowest water clarity at stations closer to shore, and progressively clearer water with distance offshore (see Chapter 3). The lower water clarity at the shallower stations typically reflects higher natural turbidity due to runoff and resuspension of sediment due to wave activity. The general patterns noted for Secchi depth are consistent with results from prior monitoring years (OCSD 1991, 1996a, 2004, 2009). There were no impacts from the wastewater discharge relative to ocean discoloration at any offshore station.

Using transmissivity results, compliance with COP narrative water clarity standard was met 97.4% and 97.2% of the time for Zone A and B stations, respectively (Table 2-2). For all stations combined, overall compliance for was 97.3%, which represents a slight increase in compliance from the previous year. This small number of out-of-compliance values was not environmentally significant. For example, all transmissivity values were within natural ranges of variability to which marine organisms are exposed (OCSD 1996a). Additionally, no discharge related impacts were observed for Secchi or water color assessments. Since 1998, the range of compliance for all stations combined has been from 83.2 to 98.4%.

### Inert Solids

Criterion C.3.d states that "the rate of deposition and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded." No effects on sediments from effluent solids discharge were evident from the sediment characteristics or marine communities data (Chapters 4, 5, and 6).

## **Chemical Criteria**

These criteria (C.4.a–g) include limits to the water column and sediments. With the exception of dissolved oxygen and acidity (pH), all of the criteria are narrative.

**Table 2-2. Summary of offshore water quality compliance testing results for dissolved oxygen, pH, and transmissivity for 2008-09.**

The Predominant Direction category includes results from either reference Stations 2104 or 2404 (Zone A), and Stations 2105 or 2406 (Zone B). The Opposite Direction category includes results using the opposite reference stations when a predominant current direction (based on ammonium or current meter data) was not evident.

Orange County Sanitation District, California.

Parameter	Number of Observations	Current Direction	Number of Out-of-Range Occurrences	Percent of Out-of-Range Occurrences	Number Out-of-Compliance	Percent Out-of-Compliance
<b>Zone A Stations</b>						
Dissolved Oxygen	493	Predominant Direction	59	12.0	15	3.0
		Opposite Direction	52	10.5	15	3.0
		Mean	55.5	11.3	15.0	3.0
pH	493	Predominant Direction	14	2.8	3	0.6
		Opposite Direction	14	2.8	3	0.6
		Mean	14	2.8	3.0	0.6
%Transmissivity	493	Predominant Direction	188	38.1	13	2.6
		Opposite Direction	212	43.0	13	2.6
		Mean	200	40.6	13.0	2.6
<b>Zone B Stations</b>						
Dissolved Oxygen	432	Predominant Direction	48	11.1	10	2.3
		Opposite Direction	48	11.1	10	2.3
		Mean	48	11.1	10	2.3
pH	432	Predominant Direction	33	7.6	4	0.9
		Opposite Direction	33	7.6	4	0.9
		Mean	33	7.6	4	0.9
%Transmissivity	432	Predominant Direction	96	22.2	12	2.8
		Opposite Direction	113	26.2	12	2.8
		Mean	104.5	24.2	12.0	2.8
<b>Total (Zone A and Zone B Stations Combined)</b>						
Dissolved Oxygen	925	Predominant Direction	107	11.6	25	2.7
		Opposite Direction	100	10.8	25	2.7
		Mean	103.5	11.2	25.0	2.7
pH	925	Predominant Direction	47	5.1	7	0.8
		Opposite Direction	47	5.1	7	0.8
		Mean	47	5.1	7.0	0.8
%Transmissivity	925	Predominant Direction	284	30.7	25	2.7
		Opposite Direction	325	35.1	25	2.7
		Mean	304.5	32.9	25.0	2.7

### Dissolved Oxygen

Criterion C.4.a states that "the dissolved oxygen (DO) concentration outside the zone of initial dilution shall not at anytime be depressed more than 10 percent from that which occurs naturally as the result of the discharge of wastes." In 2008-09, compliance with this standard was met 97.0% and 97.7% of the time for Zone A and B station groups, respectively. Overall compliance was met 97.3% of the time for all stations combined (Table 2-2). While this represents an increase in compliance of about 5% from the 2006-07 program year, it falls in the middle of the range seen since 1998 (86.1–97.5%). The dissolved oxygen values were well within the range of long-term monitoring results (OCSO 1996b) and no environmentally significant effects to DO from the wastewater discharge were observed.

### Acidity (pH)

Criterion C.4.b specifies that "the pH shall not be changed at any time more than 0.2 units from that which occurs naturally outside the zone of initial dilution as a result of the waste discharge." Results from 2008-09 show that compliance for Zone A and B station groups were met 99.4% and 99.1%, respectively with a combined compliance of 99.2% (Table 2-2). This is an increase in compliance from the previous year's value of 96.4% and is near the middle of the 1998–2008 range of 95–99.5%. Moreover, the pH values measured were within the range to which marine organisms are naturally exposed. Therefore, there were no environmentally significant effects to pH from the wastewater discharge.

### Dissolved Sulfides

This criterion (C.4.c) requires that "the dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions." Sediment sulfide concentrations were elevated within the zone of initial dilution (ZID) from 1.5 to 4 times that of the control stations, and to a lesser degree at near-outfall stations, although all values were less than 7.25 mg/kg (see Chapter 4). Concentrations at stations outside the ZID were within a factor of 2 relative to control stations. The slight elevations in sediment sulfide concentrations outside the ZID did not appear to have adversely affected indigenous invertebrate or fish populations.

### Total Organic Carbon (TOC)

Criterion C.4.e states that "the concentrations of organic materials in marine sediments shall not be increased to levels which would degrade marine life." Sediment TOC concentrations varied little among the 60-m station groups (range = 0.243–0.425%) and were not likely to be ecologically significant (See Chapter 4). Thus, the monitoring results for sediment quality indicate that deposition of effluent-derived organic material did not cause excessive loading or anaerobic conditions and that compliance was achieved.

### Sediment Chemistry/Toxics

Criterion C.4.d states that "the concentrations of substances, set forth in Chapter IV, Table B, of the 1983 Water Quality Control Plan for Ocean Waters of California, in marine sediments shall not be increased to levels which would degrade indigenous biota" (C.4.d). There are no numeric limits for sediment chemical contaminants. For compliance assessment, sediment contaminant levels are evaluated by comparing chemical concentrations against background concentrations from control sites and sediment quality guidelines (SQG). SQGs were developed for the National Oceanographic and Atmospheric Administration (NOAA) Status and Trends Program (Long et al. 1995) and are used as benchmark values (Chapter 4). The benchmarks, effects range-low (ERL) and effects range median (ERM),



are defined by Long et al. (1995) as the 10<sup>th</sup> percentile concentration of a chemical in sediment below which a toxic effect is unlikely and the 50<sup>th</sup> percentile concentration above which a toxic effect occurs frequently, respectively.

#### *Sediment Metals*

Sediment concentrations of mercury show a spatial pattern appearing to be related to the wastewater discharge, although only 1 station, located at the outfall, exceeded the ERL value. The other metals exceeding ERL thresholds were arsenic, copper, and nickel, but these occurred primarily at slope and canyon stations sampled in July 2008.

#### *Sediment Trace Organics*

DDT was detected at all quarterly and annual station sediments. Within-ZID Stations 4 and ZB and nearfield Station 9 were the only quarterly-sampled sites with mean total DDT (tDDT) concentrations below the ERL. However, no station exceeded the ERM, and there was no spatial pattern relative to the outfall evident. Of the 39 annual stations, only Newport Canyon Station C5 exceeded the ERL. This is consistent with past results, which have shown that this legacy contaminant is distributed throughout the Southern California Bight. Nearly 64% of Bight sediments have tDDT concentrations above the ERL (Schiff and Gossett 1998). In contrast, total PCB (tPCB) concentrations were higher in ZID station sediments suggesting an outfall influence. Only ZID Station 0 had a mean tPCB sediment concentration exceeding the ERL. Total PAH concentrations were well below the ERL value, but were 5 to 50 times higher at outfall Stations 0 and ZB2 relative to the other quarterly stations. Overall, these results indicate minor impacts to sediment quality within the ZID and to a lesser degree at a few stations near the ZID, but with low possibility of adverse effects to biota.

#### *Toxicity*

Although not a requirement of the District's NPDES permit, the District conducted whole sediment toxicity testing on samples collected from the 10 60-m quarterly stations in January 2009. Results showed no measurable whole-sediment toxicity at any station, including those within the ZID.

#### Nutrients

Criterion C.4.f specifies that "nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota." The District determines compliance with this criterion using ammonia concentrations in the water column. During 2008-09, increases in ammonia ranged from 0.02 (MDL) to 0.41 mg/L. About 79% of the values were below the detection limit, and over half of the detectable values were collected from samples taken below 20 m (Chapter 3). Since these data were about 20 to several hundred times less than California Ocean Plan receiving water objectives for chronic (4 mg/L) and acute (6 mg/L) toxicity to marine organisms (OCSD 2004a) and there were no detectable plankton associated impacts (i.e., excessive plankton blooms caused by the discharge), the plume-related changes in ammonia were not environmentally significant (see Chapter 3).

#### Organics in the Water Column

Criterion C.4.g states that "the concentrations of substances set forth in Table B of the California Ocean Plan shall not be exceeded in the area within the waste field where initial dilution is completed." Based on the reasonable potential analysis conducted when the permit was adopted, 8 constituents from Table B of the Ocean Plan have effluent limitations

established in this discharge permit. During the compliance period from July 2008 through June 2009, none of these constituents exceeded the effluent limitations established in the permit (OCSD 2009).

## **Biological Criteria**

Compliance criteria for biological communities specify that “marine communities, including vertebrates, invertebrates, and plant species, shall not be degraded” (C.5.a), “the natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered” (C.5.b), and “the concentration of organic materials in fish, shellfish, or other marine resources used for human consumption shall not bioaccumulate to levels that are harmful to human health” (C.5.c). The concept of a degraded community implies a loss of diversity or a significant change and/or loss of community function.

### Invertebrates

#### *Infaunal Community*

Infaunal community measures were indicative of the environmental complexity of the monitoring area, including water depth effects, “reef” effects, and the influence of the wastewater discharge. Infaunal community diversity and abundances within the monitoring area were comparable to regional values. Based on diversity indices, Infaunal Trophic Index (ITI), and Benthic Response Index (BRI) scores, all stations on the mainland shelf beyond the ZID were categorized as having normal community function (Chapter 5). Some stations near the ZID showed a marginal deviation from the reference condition, but were not considered degraded by either BRI or ITI evaluations.

#### *Trawl Macroinvertebrates*

Results of community monitoring from the trawl monitoring stations showed that macroinvertebrate communities at outfall Station T1 were similar to the 2 local farfield stations, as well as to regional reference areas. These results indicate that macroinvertebrate communities were not degraded (Chapter 6).

### Vertebrates (Fishes)

#### *Fish Community*

Analysis of the demersal fish data indicates that the fish community at the outfall was not degraded. Fish community measures near the outfall were essentially the same as the 2 farfield stations, equaled or exceeded values for regional reference areas, and had Fish Response Index scores indicative of reference conditions (Chapter 6). Overall, there were no indications of a degraded demersal fish community in the area of the discharge or within the District’s monitoring area.

#### *Fish Tissue Contaminants*

In 2008-09, fish tissue contaminant concentrations were generally low in all target species. Four hornyhead turbot and 1 English sole exceeded the State of California fish consumption guideline for PCB in muscle tissue. However, the hornyhead turbot were collected from the farfield site while the English sole was collected at the outfall station. No statistically significant spatial differences were found between stations that could be attributable to the wastewater discharge.

### *Fish Health*

Fish were examined visually for external parasites and abnormalities, such as skeletal deformities, tumors, lesions, and abnormal coloring. Less than 1% of the fish collected in 2008-09 showed evidence of irregularities. The most common irregularity was the presence of the eye parasite *Phrixocephalus cincinnatus* in Pacific sanddabs, which occurred in less than 2.1% of the fish examined (Chapter 6). These results are comparable to background levels found within the SCB and do not indicate a degraded biota.

### *Fish Consumption*

Compliance criteria (C.5.b and C.5.c) for fish consumption address the quality of seafood for human consumption relative to the taste, odor, color, and tissue contaminant concentrations of fish and shellfish. There are no numerical or objective criteria for assessing taste, odor, and color of organism tissues, so the evaluation was qualitative, based on observations only.

Fish collected during 2008-09 appeared normal in both color and odor. All fish muscle tissue appeared to be normal and comparable to that found in fresh specimens from other areas along the southern California coast. Estimates of carcinogenic and noncarcinogenic health risks from human consumption of seafood were not performed. However, all fish muscle tissue contaminant levels were below federal and most were below state human consumption guidelines for organic contaminants (Chapter 6). These results are comparable to results from other seafood consumption/health risk studies for this region, which show little risk from consuming fish from the monitoring area.

### **Radioactivity**

This criterion (C.6) states that the “discharge of radioactive wastes shall not degrade marine life.” The District measures the effluent for radioactivity, but not the receiving waters. The results of the effluent analyses consistently meet both state and federal standards and are published in the District’s Discharge Monitoring Reports. As fish and invertebrate communities are generally diverse and healthy, compliance with this criterion is considered to be met.

## **CONCLUSIONS**

In 2008-09, the District achieved compliance for all permit criteria. The overall frequency of compliance for all monitoring parameters cannot be expressed as a single numerical value because many of the criteria are descriptive rather than numeric. In summary, California Ocean Plan criteria for water quality were met. AB 411 bacterial standards were consistently achieved at near- and offshore stations. Sediment quality was not degraded by excessive chemical loading or by physical changes to the sediment from the discharge of wastewater solids. Finally, fish and invertebrate communities in the monitoring area are healthy and diverse and the fish in the monitoring area met federal and state fish consumption guidelines. These results indicate that the receiving environment was not degraded by the discharge of the treated wastewater, that environmental and human health were protected, and that permit compliance criteria were met.

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