3. Impact of the Discharge on Shellfish, Fish, and Wildlife

Implementing CWA section 301(h)(2), 40 CFR 125.62(c)(1) through (3) specify that the modified discharge must allow for the attainment or maintenance of water quality which assures protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife. A balanced indigenous population must exist immediately beyond the zone of initial dilution of the applicant's modified discharge; and in all other areas beyond the zone of initial dilution where marine life is actually or potentially affected by the discharge. Conditions within the zone of initial dilution must not contribute to extreme adverse biological impacts, including, but not limited to, the destruction of distinctive habitats of limited distribution, the presence of disease epicenters, or the stimulation of phytoplankton blooms which have adverse effects beyond the zone of initial dilution. The term "balanced indigenous population" is defined at 40 CFR 125.58 and means an ecological community which exhibits characteristics similar to those of nearby, healthy communities existing under comparable but unpolluted environmental conditions; or may reasonably be expected to become re-established in the polluted water body segment from adjacent waters if sources of pollution were removed. Also, Chapter II of the California Ocean Plan contains the following water quality objective for biological characteristics of ocean waters: "Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded." For this review, biological data collected by the applicant are analyzed in three categories: phytoplankton, benthic infauna, and fish and epibenthic invertebrates.

a. Phytoplankton

Wastewater discharges from ocean outfalls may influence the abundance and distribution of plankton in two important ways. Effluent particulates may rise into the euphotic zone (generally less than 20 meter water depths) and inhibit light penetration, thereby reducing phytoplankton primary productivity. Also, nutrient loading can cause an increase in the abundance of undesirable species. The California Ocean Plan specifies that in ocean water: "Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste." and "Nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota." There are no numerical water quality objectives for nutrients in the California Ocean Plan. Compliance with these water quality objectives are determined from samples collected at stations representative of the area within the wastefield where initial dilution is completed. The typical depth range of the PLOO wastefield is 60 to 80 meters below the surface which is well below the euphotic zone. Under its existing NPDES permit, the City is not required to monitor plankton or ammonia. Therefore, EPA has reviewed parameters monitored by the applicant that relate to phytoplankton productivity and standing stock, such as effluent total suspended solids, light transmittance, effluent ammonia, and chlorophyll a. Attachment T1 in Volume XIII, Appendix T, of the 1995 application describes the plankton communities found in waters off San Diego County and summarizes studies on phytoplankton conducted on a regional scale in the Southern California Bight.

Based on the water quality modeling result for total suspended solids concentrations at the completion of initial dilution under worst case conditions and monitoring data for light transmittance throughout the water column, EPA concludes that the Point Loma discharge does not result in a significant reduction in natural light in areas within the wastefield where initial dilution is completed. This indicates that the discharge of total suspended solids should not result in a significant change in the productivity or standing stock of phytoplankton.

Total ammonia-nitrogen (NH_4^+-N and NH_3-N) in an effluent discharge may affect phytoplankton productivity and standing stock because nitrogen is a limiting nutrient in coastal waters of the Southern California Bight. Under its existing NPDES permit, the City conducts the required weekly effluent monitoring for ammonia (expressed as nitrogen). Effluent data for ammonia-nitrogen are summarized, as follows.

Table 18. Monthly average and annual average effluent concentrations for total ammonia-nitrogen (mg/l) at Point Loma WTP.

Month	2002	2003	2004	2005	2006	2007
January	29.4	26.0	28.6	24.2	29.5	31.2
February	27.1	25.4	25.7	26.0	32.3	31.0
March	29.0	24.4	27.5	23.8	31.1	31.0
April	29.1	28.9	26.8	27.7	30.4	32.7
May	30.0	29.5	29.0	27.9	30.7	31.7
June	26.4	30.2	28.6	29.3	29.3	32.5
July	26.8	29.6	27.8	28.4	30.1	32.2
August	28.4	27.9	28.8	28.1	30.5	30.5
September	26.9	28.7	27.3	28.6	30.4	31.4
October	27.3	27.9	25.2	28.6	30.6	31.7
November	27.8	26.6	26.4	28.7	30.9	30.6
December	26.3	27.7	26.7	28.9	32.6	28.5
Annual Average	27.9	27.7	27.4	27.5	30.7	31.3
Maximum Month	30.0	30.2	29.0	29.3	32.6	32.7
Minimum Month	26.3	24.4	25.2	23.8	29.3	28.5

Based on the effluent concentrations in Table 18 and the minimum monthly average initial dilution of 204:1 estimates for ammonia at the completion of initial dilution range from 0.1 to 0.2 mg/l. Such concentrations in the euphotic zone have the potential to stimulate phytoplankton productivity around an outfall, as natural background concentrations for ammonia within the euphotic zone of the Southern California Bight are typically an order of magnitude lower (Eppley et al., 1979). Based on the applicant's dilution modeling using time series data, the height-of-rise to the average level of minimum dilution varies from about 20 to 31 meters above the bottom, corresponding to water depths of 62 to 74 meters. The height-of-rise to the average top of the wastefield varies from about 30 to 40 meters above the bottom, corresponding to water depths of about 54 to 64 meters. The maximum height-of-rise to the top of the wastefield during a month varies from about 50 to 64 meters above the bottom, corresponding to water depths of about 30 to 44 meters. Figure O-16 in Volume VIII, Appendix O, of the application. Both dilution modeling and bacteria monitoring data at offshore stations support the conclusion that the wastewater plume is trapped below the euphotic zone most of the time. Consequently, the influence of wastefield ammonia concentrations on phytoplankton should be minimal.

Under its existing NPDES permit, the City conducts the required quarterly monitoring for chlorophyll a, throughout the water column, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours. EPA evaluated the applicant's monitoring results from October 2003 through October 2007. At water depths frequented by the drifting wastefield, the long-term average for chlorophyll a ranges from 0.8 to 1.4 ug/l. As shown in Table B-6 and Figure A-26, the long-term average for chlorophyll a measured at the near-ZID boundary station (F30) is similar to long-term averages measured at nearfield and farfield stations.

Based on the water quality modeling results for total suspended solids and ammonia concentrations at the completion of initial dilution and monitoring data for light transmittance and chlorophyll a throughout the water column evaluated in this review, EPA concludes that total suspended solids and nutrient materials in the Point Loma discharge will not result in a significant change in the productivity or standing stock of phytoplankton, will not cause natural light to be significantly reduced beyond the initial dilution zone, and will not cause objectionable aquatic growths or degrade indigenous biota.

b. Benthic Macrofauna

Organisms with limited mobility that live in bottom sediments are used as indicators of the condition of marine environments because they respond to many different types of environmental stress and their responses integrate environmental conditions over time. Under its existing NPDES permit, the City conducts the required semi-annual monitoring, during January and July, at 12 primary stations located at the depth of the outfall along the 98 meter contour and a total of 10 secondary stations located along the 88 and 116 meter contours.

To evaluate the condition of the benthic macrofauna community in the area of the outfall and identify trends, EPA examined benthic macrofauna monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2006) conducted during July, at the depth of the outfall along the 98 meter contour (Figure A-4). A subset of these stations (E17, E14, and E11) spans the outfall diffuser. Near-ZID station E14 is closest to the diffuser, approximately 111 meters north and 256 meters west of the center of the diffuser wye. It is the most likely site to be impacted by the wastewater discharge. Nearfield stations E17 and E11 are located approximately 204 meters north and south, respectively, of the ends of the diffuser legs. The remaining "E" stations are considered farfield sites. The two "B" stations, located more than 11 kilometers north of the outfall, were originally selected to represent reference or control sites. However, benthic macrofauna communities differed between the "B" and "E" stations prior to operation of the outfall (Volume IV, Appendix E, of the application). Therefore, northern farfield station E26 is used as an additional (nominal) reference or control site. This station, located about 8 kilometers north of the outfall, is considered the least likely "E" station to be impacted by the discharge.

Summary statistics and trends for species richness, total abundance of all taxa, total abundance of several indicator taxa, and a Southern California Bight benthic index are reviewed by EPA. Both the applicant and EPA use two statistical approaches to evaluate observed changes in various benthic macrofauna community parameters near the outfall diffuser relative to control sites and reference conditions.

BACIP Approach

The applicant has used a BACIP (Before-After-Control-Impact-Paired) t-test to test the null hypothesis that there are no changes in various benthic macrofauna community parameters due to operation of the outfall. The BACIP model tests differences between control and impact sites at times before and after an impact event, in this case, the onset of wastewater discharge at the present location. Data are limited to three pre-discharge (1991-1993) and 13 discharge (1994-2006) surveys during July, at EPA's request. Near-ZID station E14 and nearfield stations E17 or E11 are used as separate "impact" sites for the analysis because they are close to the boundary of the zone of initial dilution and more susceptible to impact. To the north, stations B9 and E26 are used as separate control sites for the analysis. Seven dependent variables are analyzed: species richness, total abundance of all benthic macrofauna taxa, Benthic Response Index, and abundance of the pollution sensitive indicator taxon, *Amphiodia* spp., and three pollution tolerant indicator taxa, *Euphilomedes* spp., *Parvilucina tenuisculpta*, and *Capitella "capitata"* (a species complex).

The applicant notes that the spatial and temporal variation inherent to many biological communities may lead to an increased chance of Type II error (falsely concluding that no impact has occurred). One solution is to increase the probability of Type I error (falsely concluding that an impact has occurred) by changing alpha, thereby increasing the power of the test and making the detection of "impact" less conservative. Consequently, all BACIP analyses are interpreted using both the conventional Type I error rate of alpha = 0.05 and the higher Type I error rate of alpha = 0.10. Results of the applicant's BACIP analyses are summarized in Table 19.

Table 19. BACIP t-test results for six dependent variables around the Point Loma Ocean Outfall. Pre-discharge n=3 and discharge n=13. "*" means significant at alpha = 0.05; "**" means significant at alpha = 0.1; and "ns" means not significant.

Indicator	Comparison (Control v. Impact)	t-value	p-value	Significance (July only)
Species Richness	E26 v. E17	2.513	0.012	*
	E26 v. E14	-2.120	0.026	*
	E26 v. E11	1.637	0.062	**
	B9 v. E17	-2.606	0.010	*
	B9 v. E14	-3.010	0.005	*
	B9 v. E11	-1.358	0.098	**
Total Abundance	E26 v. E17	-0.434	0.335	ns
	E26 v. E14	-0.464	0.325	ns
	E26 v. E11	0.082	0.468	ns
	B9 v. E17	-0.567	0.290	ns
	B9 v. E14	-2.569	0.011	*
	B9 v. E11	-1.319	0.104	ns
Amphiodia spp. Abundance	E26 v. E17	-2.531	0.012	*
	E26 v. E14	-3.482	0.002	*
	E26 v. E11	-2.363	0.017	*
	B9 v. E17	-1.255	0.115	ns
	B9 v. E14	-5.645	<0.001	*
	B9 v. E11	-1.391	0.093	**
Euphilomedes spp. Abundance	E26 v. E17	0.111	0.457	ns
	E26 v. E14	-1.965	0.035	*
	E26 v. E11	-1.476	0.081	**
	B9 v. E17	-2.550	0.012	*
	B9 v. E14	-4.304	<0.001	*
	B9 v. E11	-2.701	0.012	*
Parvilucina tenuisculpta Abundance	E26 v. E17	0.626	0.271	ns
	E26 v. E14	-0.109	0.457	ns
	E26 v. E11	1.373	0.096	**
	B9 v. E17	-0.884	0.196	ns
	B9 v. E14	-1.877	0.041	*
	B9 v. E11	0.483	0.318	ns

These results are discussed, below.

Tolerance Interval Approach

An understanding of reference condition is important when evaluating environmental monitoring results. When appropriate data from regional reference locations are available, tolerance interval bounds can be computed to provide criteria or limits distinguishing reference from nonreference conditions. A tolerance interval is a statistical interval within which a specified proportion of the population falls, with some confidence. For example, it can describe—with a desired degree of statistical certainty—the lower 10^{th} and upper 90^{th} percentile of "average species richness" found among the San Diego regional monitoring stations for a particular benthic assemblage.

Based on a statistical analysis of sampling data from 1994 through 2003, the applicant determined the subset of San Diego regional survey stations which best represents a suitable reference assemblage for comparisons with "E" and "B" stations at the depth of the outfall. This subset of regional stations is generally confined between the 60 and 120 meter depth contours and ranges from near Solana Beach in the north, to the Tijuana River region in the south. Summary statistics and tolerance interval bounds defining reference conditions for benthic macrofauna community parameters within the region of the PLOO are presented in Table 20. If an impact site value is near or within the tolerance interval bounds for reference conditions, then impact can be deemed minimal or nonexistent. The further an impact site value deviates from a reference condition bound, the more serious the impact should be judged.

Table 20. Tolerance intervals and summary data for various benthic indicators at randomly selected San Diego regional stations from 1994 through 2003, based on cluster group F (Attachment E.1 in Volume IV, Appendix E, of the application).

Indicator by Year											Tolerance Interval	
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Lower	Upper
Species Richness												
Mean	73.9	119.9	116.4	82.9	78.4	112.4	109.7	121.2	112.6	67.4	72	175
Min	33	48	33	30	26	38	56	52	37	21		
Max 13	7	206	266	165	179	242	203	226	244	119		
Total Abundance												
Mean	325.2	321.0	328.3	351.7	362.5	353.2	310.5	319.9	278.4	222.2	230	671
Min	91	56	45	79	39	87	73	65	67	56		
Max	1031	880	1219	1467	756	1166	585	1082	890	567		
Amphiodia spp. Abundance												
Mean	39.7	45.1	52.6	45.0	58.2	41.4	53.5	32.0	32.9	19.8	1	216
Min	0	0	0	0	0	0	0	0	0	0		
Max 19	1	178	216	209	220	203	194	185	150	81		
Euphilomedes spp. Abundance												
Mean	3.7	4.0	3.6	9.6	2.3	1.2	1.0	1.4	1.8	3.9	0	34
Min	0	0	0	0	0	0	0	0	0	0		
Max	28	25	17	93	15	9	9	12	14	34		
Parvilucina tenuisculpta Abundance												
Mean	2.4	1.9	1.5	1.6	2.1	1.9	2.4	2.9	1.6	2.2	0	12
Min	0	0	0	0	0	0	0	0	0	0		
Max	17	14	10	12	12	12	12	12	12	21		
Capitella "*capitata*" Abundance												
Mean	2.1	0.1	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0	2
Min	0	0	0	0	0	0	0	0	0	0		
Max	69	2	3	0	2	1	1	0	0	1		
Benthic Response Index												
Mean	6.9	10.3	12.4	10.6	10.7	8.0	7.2	10.6	9.9	9.8	-0.65	15
Max	-14.2	-11.8	-4.7	-2.4	1.2	-5.2	-3.3	-4.2	-0.8	-4.6		
Min	32.0	30.6	26.4	28.5	20.2	24.1	24.8	22.3	24.6	20.3		

These results are discussed, below.

Species richness. A potential indicator of environmental degradation is a reduction in the number of benthic macrofauna taxa (diversity) present near an outfall. Figure A-27 summarizes the average species richness per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is higher than the pre-discharge mean; these increases are more pronounced at near-ZID station E14 and northern reference station B12. Mean species richness for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 70.7 and 97.0, respectively. During these two periods, mean species richness at near-ZID station E14 is 67.7 and 109.7, respectively, while mean species richness at northern reference station B9 is 64.2 and 91.5, respectively. BACIP analyses in Table 19 indicate that species richness at near-ZID station E14 and nearfield stations E17 or E11 are statistically significantly different when compared to either northern reference station B9 or nominal northern reference station E26. This suggests that organic enrichment may be enhancing the diversity of taxa near the outfall. During the most recent discharge period, average species richness ranged from 105.0 to 119.5 at station E14, 81.0 to 110.0 at station E17, and 80.0 to 117.5 at station E11. These impact site values are within the species richness tolerance interval (72-175) calculated for reference conditions identified in the San Diego regional surveys (Table 20). Thus, although changes in species richness at the outfall are statistically significant, they are not likely to be environmentally significant in comparison to Southern California Bight reference conditions.

Total abundance. Changes in the total abundance of benthic macrofauna taxa are used to demonstrate an outfall effect. These changes can vary depending on the level of organic enrichment in the area of an outfall. For example, total abundance is predicted to increase in response to low or moderate levels of organic enrichment. Generally, such increases are not considered adverse unless they are accompanied by a reduction in species richness, or material alterations in the abundances of pollution sensitive and pollution tolerant taxa. As organic enrichment increases, extremely high abundances associated with a further reduction in species richness is indicative of an adverse outfall effect. Abundances are expected to decline when organic enrichment causes anoxic conditions in sediments and indicates a degraded condition due to the outfall. Also see Appendix C in the ATSD (USEPA, 1994).

Figure A-28 summarizes the average total abundance of benthic macrofauna taxa per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is higher than the pre-discharge mean. Mean total abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 308.0 and 377.8, respectively. During these two periods, mean total abundance at near-ZID station E14 is 293.7 and 523.1, respectively, while mean total abundance at northern reference station B9 is 255.8 and 352.8, respectively. BACIP analyses in Table 19 indicate that mean total abundance at near-ZID station E14 and nearfield stations E17 or E11 are not statistically significantly different when compared to nominal northern reference station E26; only station E14 is statistically significantly different when compared to northern reference station B9. This suggests that while organic enrichment is occurring near the outfall, the effect on total abundance is relatively minor. During the most recent discharge period, average total abundance ranged from 446.5 to 590.5 at station E14, 240.5 to 475 at station E17, and 282.5 to 463 at station E11. These impact site values are within the total abundance tolerance interval (230-671) calculated for reference conditions identified in the San Diego regional surveys (Table 20). Although a statistically significant change in total abundance at the near-ZID boundary station E14 has occurred in relation to one control site, a similar change has not occurred in relation to nominal reference station E26 (also a control site). Moreover, in relation to the tolerance interval, this change is not likely to be environmentally significant in comparison to Southern California Bight reference conditions.

Pollution Sensitive Indicator Taxon

Amphiodia spp. For this review, EPA examined one pollution sensitive indicator taxon used to evaluate organic enrichment around outfalls. *Amphiodia urtica*, an ophiuroid echinoderm, is used as a key indicator species because it is one of the most abundant species found in mainland shelf sediments in the Southern California Bight and its populations decline near sewage outfalls. Both the applicant and EPA evaluated *Amphiodia* spp. (comprised of *A. urtica*, *A. digitata*, *A. psara*, and *A.* sp.). According to the applicant, *A. urtica* is most common at depths of about 60 meters and begins to naturally decrease at depths of about 100 meters. *A. digitata* is found in deeper waters and coarser sediments. The applicant grouped juveniles and damaged specimens as *A.* sp.

Figure A-29 summarizes the average abundance of *Amphiodia* spp. per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is slightly higher than the pre-discharge mean and year-to-year averages at near-ZID station E14 are distinctly lower and variable. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 41.7 and 37.0, respectively. During these two periods, mean abundance at near-ZID station E14 is 38.3 and 8.8, respectively, while mean abundance at northern reference station B9 is 35.7 and 48.0, respectively. BACIP analyses in Table 19 indicate that abundance at near-ZID station E14 and nearfield station E11 are statistically significantly different when compared to either northern reference station B9 or nominal northern reference station E26. BACIP analyses also indicate that abundance at near-ZID station E17 is statistically significantly different only when compared to nominal northern reference station E26. This reduction in abundance is likely due in large part to organic enrichment around the outfall, although the applicant has also hypothesized increased fish predation at the impact site or region-wide influences unrelated to the outfall. Figure A-29 suggests that the reduction in average abundance does not extend into the nearfield. During the most recent discharge period (2001-2006), average abundance ranged from 5.0 to 20.5 at station E14, 14 to 41.5 at station E17, and 20 to 64.5 at station E11. These impact site values are within the abundance tolerance interval (1-216) calculated for reference conditions identified in the San Diego regional surveys (Table 20). Although changes in the abundance of *Amphiodia* spp. at the outfall are statistically significant, they are not accompanied by a decrease in species richness or a detrimental increase in total abundance of benthic macrofauna taxa. Moreover, in relation to the tolerance interval, this change is not likely to be environmentally significant in comparison to Southern California Bight reference conditions.

Pollution Tolerant Indicator Taxa

For this review, EPA examined three pollution tolerant indicator taxa used to evaluate organic enrichment around outfalls.

Euphilomedes spp. Crustaceans known to be tolerant of organic enrichment are ostracods in the genus, *Euphilomedes*. Both the applicant and EPA evaluated *Euphilomedes* spp. (comprised of *E. carcharodonta*, *E. producta*, *E. longiseta*, and *E.* sp.). According to the applicant, the ratio of *E. carcharodonta* and E. producta are about 50:50 at depths of about 100 meters.

Figure A-30 summarizes the average abundance of *Euphilomedes* spp. per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is similar to the pre-discharge mean and year-to-year averages generally trend lower with distance from the outfall. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 19.4 and 23.3, respectively. During these two periods, mean abundance at near-ZID station E14 is 18.3 and 41.3, respectively, while mean abundance at northern reference station B9 is 22.3 and 11.9, respectively. BACIP analyses in Table 19 indicate that abundance at near-ZID station E14 and nearfield station E11 are statistically significantly different when compared to either northern reference station B9 or nominal northern reference station E26. BACIP analyses also indicate that abundance at near-ZID station E17 is statistically significantly different only when compared to nominal northern reference station B9. This increase in abundance is likely due in large part to organic enrichment at the outfall. During the most recent discharge period (2001-2006), average abundance ranged from 25.5 to 62.5 at station E14, 22 to 45.5 at station E17, and 18.5 to 42.5 at station E11. These impact site values are above the upper bound of the abundance tolerance interval (0-34) calculated for reference conditions identified in the San Diego regional surveys (Table 20), but in the range of average abundance observed during this period at northern reference station B12 (17.5-60) and during the regional surveys (0-93).

The applicant notes that *Euphilomedes* spp. abundances above the upper tolerance bound are frequently observed at other 98 meter stations and suggests this may be due to region-wide influences unrelated to the outfall (Figure E.1-4 in Attachment E.1 of Volume IV, Appendix E, of the application). EPA agrees that while an outfall related pattern appears to occur at near-ZID station E14, cyclical patterns in abundance suggest other factors may be influencing *Euphilomedes* spp. at 98 meter stations beyond the zone of initial dilution.

Parvilucina tenuisculpta. A mollusc known to be tolerant of organic enrichment is the bivalve, *Parvilucina tenuisculpta.* It is found in high abundances in areas of moderate organic enrichment.

Figure A-31 summarizes the average abundance of *Parvilucina tenuisculpta* per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is similar to the pre-discharge mean and year-to-year averages at near-ZID station E14 are generally elevated when compared to other 98 meter stations. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 3.0 and 3.3, respectively. During these two periods, mean abundance at near-ZID station E14 is 1.0 and 9.8, respectively, while mean abundance at northern reference station B9 is 3.5 and 4.3, respectively. BACIP analyses in Table 19 indicate that abundance at near-ZID station E14 and nearfield station E11 are statistically significantly different when compared to either northern reference station B9 or nominal northern reference station E26. BACIP analyses also indicate that abundance at near-ZID station E17 is statistically significantly different only when compared to northern reference station B9. This increase in abundance is likely due to organic enrichment around the outfall. During the most recent discharge period (2001-2006), average abundance ranged from 0 to 32 at station E14, 0 to 8.5 at station E17, and 0.5 to 4.5 at station E11. These impact site values are above the upper bound of the abundance tolerance interval (0-12) calculated for reference conditions identified in the San Diego regional surveys (Table 20), indicating that moderate levels of organic enrichment are indeed occurring at near-ZID station E14.

Capitella "capitata" Species Complex. A polychaete known to be tolerant of organic enrichment and other disturbances is *Capitella "capitata"*. According to the applicant, background abundances are generally near zero, in the Southern California Bight, but may reach densities of 100 per 0.1 m^2 in areas of excessive organic deposits. Volume IV, Appendix E, of the application.

Figure A-32 summarizes the average abundance of *Capitella "capitata"* per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2006. At these stations, the discharge period mean is higher than the pre-discharge mean and year-to-year averages at near-ZID station E14 are generally much higher when compared to other 98 meter stations. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is 0.0 and 0.8, respectively. During these two periods, mean abundance at near-ZID station E14 is 0.0 and 7.2, respectively, while mean abundance at northern reference station B9 is 0.0 and 0.1, respectively. This increase in abundance is likely due to organic enrichment around the outfall. BACIP analyses were not conducted because abundances at control sites are generally zero. During the most recent discharge period (2001-2006), average abundance ranged from 0.0 to 17.5 at station E14, 0.0 to 0.5 at station E17, and 0.0 to 4.0 at station E11. The impact site values at station E14 and E11 are well above the upper bound of the abundance tolerance interval (0-2) calculated for reference conditions identified in the San Diego regional surveys (Table 20). This indicates that variable levels of low to moderate organic enrichment are indeed occurring at these two stations. Other indicators of benthic macrofauna community condition do not show a decrease in species richness or a detrimental increase in total abundance of benthic macrofauna taxa dominated by pollution tolerant species.

Benthic Response Index. The Benthic Response Index (BRI) is an index developed by the Southern California Coastal Water Research Project as part of the Southern California Bight Pilot Project (Smith et al., 2001). Index values below 25 suggest "reference condition" and those in the range of 25 to 33 represent a "minor deviation from reference condition". A "loss in biodiversity" is set at an index value of 34. Index values greater than 44 indicate a "loss in community function". "Defaunation" is set at an index value of 72. Validation has shown that the BRI is most accurate from water depths of 31 to 200 meters which includes the middle and outer continental shelf (Ranasinghe, 2007) and the water depth of the Point Loma outfall.

Figures E-27 and E-28 in Volume IV, Appendix E, of the application summarize BRI per 0.1 m^2 at the 98 meter stations, from 1991 through 2006. Index values show a distinct outfall-related pattern during the discharge period (1994-2006). During the most recent discharge period (2001-2006), the mean BRI values at near-ZID station E14 are approaching 25, above which a loss in biodiversity is indicated. The mean BRI for all 98 meter stations, in January and July, during the pre-discharge (1991-1993) and most recent discharge period, is 4.2 and 6.2, respectively. During these two periods, the mean BRI at near-ZID station E14 is 4.9 and 13.9, respectively, while the mean BRI at northern reference station B9 is 6.1 and 2.3, respectively. BACIP analyses indicate that the BRI at near-ZID station E14 is statistically significantly different when compared to either northern reference station B9 or nominal northern reference station E26 (Table E-6 in Volume IV, Appendix E, of the application). The impact site mean for the most recent discharge period (13.9) is below the upper bound of the BRI tolerance interval (-0.65-15) calculated for reference conditions identified in the San Diego regional surveys (Table 20) and below the threshold level which indicates minor deviations from reference conditions. Annual BRI values approaching 25 are of concern to EPA because alteration from reference condition, although minor, is predicted at sites above this threshold. Changes in the BRI at station E14, in combination with other benthic macrofauna indicators of community condition, forecast that while anticipated TSS mass emissions over the proposed permit term will comply with CWA section 301(h) and (j)(5) requirements, the applicant needs to develop and implement an integrated long term plan which will reduce the organic loading that has been projected for the PLOO through 2027 (Table II.A-21 in Volume III of the application), so as to maintain long-term compliance with this decision criterion.

In conclusion, there are often statistically significant changes at near-ZID station E14 and sometimes at nearfield stations E17 and E11 in benthic macrofauna indicator parameters evaluated for this review. However, EPA observes that conditions at and beyond the near-ZID station are generally similar to reference conditions identified in the San Diego regional surveys. EPA notes that low numbers of pollution sensitive and pollution tolerant taxa are variably present at the near-ZID station and indicate a moderate level of organic enrichment in this area. Slight reductions in the abundance of *Amphiodia* spp., a pollution sensitive taxon, at nearfield stations indicate that a low level of organic enrichment extends beyond the zone of initial dilution into the nearfield. There appear to be no impacts to benthic macrofauna associated with the accumulation of toxic substances discharged from the outfall. Based on the evidence described in this section, EPA concludes that conditions beyond the zone of initial dilution are not degraded in compliance with the California Ocean Plan and support an ecological community which exhibits characteristics similar to those of nearby, healthy communities existing under comparable but unpolluted environmental conditions.

c. Demersal Fish

Chapter II of the California Ocean Plan contains the following water quality objective for biological characteristics of ocean waters: "Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded." Demersal (bottom dwelling) fish communities are inherently variable due to their mobility and the influences of natural and anthropogenic factors. Under its existing NPDES permit, the City conducts the required semi-annual monitoring, during January and July, at six stations in trawl zones located at the depth of the outfall along the 98 meter contour. Nearfield stations SD12 and SD10 are within 1.2 kilometers of the outfall. Northern farfield stations SD14 and SD13 are located approximately 8 kilometers north of the outfall and southern farfield stations SD8 and SD7 are located approximately 9 kilometers south of the outfall. Station SD8 is located within a couple of kilometers of EPA-designated dredge materials disposal site LA-5 while station SD7 is located within one kilometer of non-active dredge materials disposal site LA-4.

EPA did not reanalyze the raw data for demersal fish submitted with the application. Rather, to evaluate the condition of demersal fish in the area of the outfall and identify trends, EPA reviewed the applicant's analyses of monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2006), conducted during January and July, along the 98 meter contour (Figure A-33).

Table 21 summarizes two indicator parameters of fish community structure calculated by the applicant. The average number of fish species (species richness) collected per trawl over the 16 year monitoring period ranges from 7 to 26. Over the pre-discharge and discharge periods, the average number of species has increased from 13 to 15 in the nearfield and 14 to 15 in the farfield. Year-to-year fish abundances (total catch) are quite variable and have increased in both the nearfield and farfield, since discharge began. The applicant reports that much of this variability is due to fluctuations in the populations of dominant species (e.g., Pacific sanddab) and sporadically common species (e.g., halfbanded rockfish). Figures E-36 through E-38 in Volume IV, Appendix E, of the application. Values for species richness and total abundance are within the range of natural variability observed for the Southern California Bight regional surveys and suggest no outfall-related trends. Table E-9 in Volume VI, Appendix E, of the application.

Table 21. Applicant's summary for total number of species and total abundance of demersal fishes at trawl zone stations during the pre-discharge (1991-1993) and discharge (1994-2006) periods. Data are expressed as means with ranges in parentheses.

Indicator Parameter	Pre-discharge Period		Discharge Period	
	Nearfield	Farfield	Nearfield	Farfield
Species Richness	13 (8-19)	14 (9-22)	15 (7-20)	15 (9-26)
Total Abundance	208 (63-399)	214 (51-453)	440 (44-2,322)	310 (50-695)

As shown in Table 22, the applicant reports that, generally, the same fish species are present and abundant during the pre-discharge and discharge periods. These species represent 95% of the total abundance of fishes caught from 1991 through 2006. Overall, the demersal fish assemblage in the area of the outfall is dominated by Pacific sanddab which is common in soft-bottom habitats of the Southern California Bight mainland shelf.

Table 22. Applicant's summary for percent abundance of demersal fish species at all trawl zone stations during pre-discharge (1991-1993) and discharge (1994-2006) periods. Data are expressed as the percent of total abundance per trawl.

Common Name	Pre-discharge Period Percent Abundance	Discharge Period Percent Abundance
Pacific sanddab	55	49
Plainfin midshipman	10	3
Yellowchin sculpin	6	13
Stripetail rockfish	4	3
Dover sole	4	6
Longspine combfish	4	5
Longfin sanddab	3	3
Pink seaperch	3	1
Halfbanded rockfish	2	9
Shortspine combfish	2	1
California tonguefish	1	1

The City's analysis in the application shows that Pacific sanddab comprise a smaller proportion of the nearfield fish assemblage during the discharge period, than prior to the discharge, while the proportion of Pacific sanddab remains similar over time in the farfield. In contrast, yellowchin sculpin comprise a larger proportion of both the nearfield and farfield fish assemblages during the discharge period, than prior to the discharge. Table E-8 and Figure E-38 in Volume IV, Appendix E, of the application. The applicant suggests that these changes may be due, in part, to cyclic population fluctuations and region-wide increases in water temperature observed during El Nino years. Ordination and classification analysis of fish abundance data from 1991 through 2007 seem to confirm that the differences in local fish assemblages over time appear in large part related to region-wide changes in water temperature, even though some cluster groups are in proximity to the two dredge materials disposal sites (Figure 6.4 in City of San Diego, 2008).

The applicant reports that evidence of parasitism or physical abnormalities (fin rot, discoloration, skin lesions, tumors) in fish populations off Point Loma has remained low, since monitoring began in 1991. The copepod eye parasite occurs in Pacific sanddab at a low percentage. An ecoparasitic cymothioid isopod is observed loose in some trawls and is known to be especially common on sanddab in southern California waters.

EPA concludes there are no apparent spatial or temporal trends in the total number of fish species or abundances of fishes that suggest an outfall-related impact.

4. Impact of the Discharge on Recreational Activities

This section describes the impact of the modified discharge on recreational activities. Under 40 CFR 125.62(d), the applicant's modified discharge must allow for the attainment or maintenance of water quality which allows for recreational activities beyond the zone of initial dilution, including, without limitation, swimming, diving, boating, fishing, and picnicking, and sports activities along shorelines and beaches. The requirement to protect recreational activities applies beyond the zone of initial dilution, in both federal and State waters. Both the bioaccumulation of toxic pollutants in fish tissues (liver or muscle) and water contact recreational activities and compliance with bacteriological water quality standards and criteria are discussed. The applicant's monitoring data are reviewed to assess whether the discharge will protect recreational activities.

a. Bioaccumulation and Fish Consumption

Chapter II of the California Ocean Plan contains the following water quality objectives for the biological characteristics of ocean waters: "The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered." and "The concentrations 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."

Bioaccumulation is a process by which chemical contaminants undergo uptake and retention in organisms via various pathways of exposure. For example, fishes can accumulate contaminants through adsorption and absorption of dissolved chemicals in the water or through ingestion or assimilation of contaminants in food. Once a contaminant is incorporated into the tissues of an organism, it may resist metabolic excretion and accumulate. Higher trophic level organisms may then feed on contaminated prey and further concentrate the contaminant in their tissues. This process can lead to concentrations of contaminants in fish tissue that are of ecological and human health concern.

Under its existing NPDES permit, the City conducts the required semi-annual monitoring at six stations in four trawl zones during January and July and the required annual monitoring at two rig (hook and line) fishing stations during October. The stations are located at the depth of the outfall along the 98 meter contour. The bioaccumulation monitoring program has two components: (1) liver tissue is analyzed for trawl-caught fish and (2) muscle tissue is analyzed for hook and line-caught fish.

Fish collected in trawls are representative of the general demersal fish community and certain species are targeted for analysis based on their prevalence in the community.

Chemical analysis of liver tissue in these fishes indicates which contaminants may be bioaccumulating through this community. For bioaccumulation analyses, the six trawl fishing stations are grouped into four trawl zones. Trawl zone 1 (TZ1) represents the nearfield and is defined as the area within a 1 kilometer radius of stations SD12 and SD10; both stations are within 1.2 kilometers of the outfall. Trawl zone 2 (TZ2) represents the northern farfield and is defined as the area within a 1 kilometer radius of stations SD14 and SD13; both stations are approximately 8 kilometers north of the outfall. Trawl zone 3 (TZ3) represents the southern farfield and is defined as the area centered within a 1 kilometer radius of station SD8. Station SD8 is located within a couple of kilometers of EPA-designated dredge materials disposal site LA-5. Trawl zone 4 (TZ4) represents the southernmost farfield and is defined as the area centered within a 1 kilometer radius of station SD7. Station SD7 is located within one kilometer of non-active dredge materials disposal site LA-4. Both stations SD8 and SD7 are within approximately 9 kilometers of the outfall.

Fish species collected by rig fishing represent a typical sport fisher's catch and are considered of recreational and commercial importance. Fish muscle tissue is analyzed because it is the tissue most often consumed by humans and may have public health implications. There are two rig fishing locations. Station RF1 is located in the nearfield close to the northern end of the diffuser leg while station RF2 is located in the northern farfield.

The applicant reports all tissue sample values in terms of milligrams per kilogram wet weight (mg/kg ww), or microgram per kilogram wet weight (ug/kg ww).

Fish Liver

To evaluate bioaccumulation in the area of the outfall and identify trends, EPA examined toxics concentrations in the liver tissue of trawl-caught fish species that were sampled in October during the discharge period (1995-2006) (Figure A-33). Table B-7 shows the five flatfish species (bigmouth sole, Dover sole, English sole, hornyhead turbot, longfin sanddab, and Pacific sanddab) examined over this period by EPA. During this period, 18 single parameters were detected in at least 10 percent of the averaged replicate composite samples: aluminum (70 percent), antimony (10 percent), arsenic (82 percent), barium (100 percent), beryllium (15 percent), cadmium (86 percent), chromium (63 percent), copper (100 percent), hexachlorobenzene (55 percent), iron (100 percent), lead (17 percent), manganese (96 percent), mercury (88 percent), nickel (23 percent), selenium (100 percent), silver (36 percent), tin (37 percent), and zinc (100 percent). Total chlordane, total DDT, and total PCBs are also reviewed.

Arsenic. Figure A-34 summarizes the average concentration of arsenic in flatfish livers, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in arsenic concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of arsenic is 3.39 mg/kg ww at nearfield station TZ1, 6.18 mg/kg ww at northern farfield station TZ2, and 4.03 mg/kg ww and 3.85 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Mercury. Figure A-35 summarizes the average concentration of mercury in flatfish livers, during October, from 1995 through 2006. The applicant began using a slightly less sensitive method detection limit (0.012 ug/l changed to 0.03 ug/l) in 2003. There is no spatial or temporal pattern in mercury concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of mercury is 0.083 mg/kg ww at nearfield station TZ1, 0.047 mg/kg ww at northern farfield station TZ2, and 0.068 mg/kg ww and 0.058 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Selenium. Figure A-36 summarizes the average concentration of selenium in flatfish liver, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in selenium concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of selenium is 1.36 mg/kg ww at nearfield station TZ1, 1.47 mg/kg ww at northern farfield station TZ2, and 1.09 mg/kg ww and 1.25 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Hexachlorobenzene. Figure A-37 summarizes the average concentration of hexachlorobenzene in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in hexachlorobenzene concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of hexachlorobenzene is 3.25 ug/kg ww at nearfield station TZ1, 4.19 ug/kg ww at northern farfield station TZ2, and 5.09 ug/kg ww and 3.83 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Total Chlordane. Figure A-38 summarizes the average concentration of total chlordane in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total chlordane concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total chlordane is 14.10 ug/kg ww at nearfield station TZ1, 15.42 ug/kg ww at northern farfield station TZ2, and 18.27 ug/kg ww and 13.29 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Total DDT. Figure A-39 summarizes the average concentration of total DDT in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total DDT concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total DDT is 424 ug/kg ww at nearfield station TZ1, 516 ug/kg ww at northern farfield station TZ2, and 611 ug/kg ww and 558 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively. During the period 1995 through 2006, total TTD concentrations in flatfish livers at all trawl zone stations appear to be decreasing over time.

Total PCBs. Figure A-40 summarizes the average concentration of total PCBs in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total PCB concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total PCBs is 263.9 ug/kg ww at nearfield station TZ1, 340.0 ug/kg ww at northern farfield station TZ2, and 742.2 ug/kg ww and 335.2 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

EPA notes that on average, total PCB concentrations in sanddab livers are an order of magnitude higher than in other flatfish species analyzed by the applicant (Table F-26 in Volume IV, Appendix E, of the application). During the period 1995 through 2006, total PCB concentrations in flatfish livers at southern farfield station TZ3 (near the active dredge materials disposal site, LA-5) are noticeably higher than at other trawl zone stations during most years, but appear to be decreasing over time.

Because there are no noticeable effects of the outfall for these chemicals, the contributions of the discharge are minimal.

Fish Muscle

To evaluate bioaccumulation in the area of the outfall and identify trends, EPA examined toxics concentrations in the muscle tissue of rig-caught fish species that were sampled in October during the discharge period (1995-2006) (Figure A-33). Table B-8 shows the twelve fish species (rockfish and scorpionfish) examined over this period by EPA. During this period, 18 single parameters were detected in at least one percent of the averaged replicate composite samples: aluminum (46 percent), antimony (86 percent), arsenic (70 percent), barium (92 percent), cadmium (9 percent), chromium (41 percent), copper (61 percent), hexachlorobenzene (47 percent), iron (87 percent), lead (4 percent), manganese (39 percent), mercury (94 percent), nickel (9 percent), selenium (99 percent), silver (1 percent), thallium (9 percent), tin (21 percent), and zinc (100 percent). Total chlordane, total DDT, and total PCBs are also reviewed. To address public health concerns, pollutant concentrations for these detections were compared to available U.S. EPA recommended screening values for recreational fishers and California Office of Health Hazard Assessment fish contaminant goals for sport fish.

U.S. EPA has developed recommended target analyte screening values for recreational fishers (USEPA, 2000). These screening values are defined as concentrations of analytes in fish or shellfish tissue that are of potential public health concern and are used as threshold values against which levels of contamination in similar tissues collected from the ambient environment can be compared (Table 23). Exceedance of these screening values should be taken as an indication that more intensive site-specific monitoring and/or evaluation of human health risk should be conducted.

Table 23. Selected U.S. EPA recommended target analyte screening values for recreational fishers. Based on fish consumption rate of 17.5 grams per day, 70 kilograms body weight (all adults), and, for carcinogens, 10^{-5} risk level, and 70-year lifetime.

Target Analyte	Screening Values (mg/kg)	
	Noncarcinogens	Carcinogens (RL=10^{-5})
Arsenic (inorganic)	1.2	0.026
Cadmium	4.0	---
Mercury (methylmercury)	0.3[1]	---
Selenium	20	---
Tributlytin	1.2	---
Total chlordane (sum of cis- and trans-chlordane, cis- and trans-nonachlor; and oxychlordane)	2.0	0.114
Total DDT (sum of 4,4'- and 2,4'- isomers of DDT, DDE, and DDD)	2.0	0.117
Hexachlorobenzene	3.2	0.0250
Total PCBs (sum of congeners or Aroclors)	0.08	0.02

[1] Based on EPA's tissue-based 304(a)(1) water quality criterion for human health (USEPA, 2001).

The California Office of Environmental Health Hazard Assessment (OEHHA) is the agency solely responsible for evaluating the potential public health risks of chemical contaminants in sport fish and issuing State advisories, when appropriate. EPA is unaware of any sport fish advisories in the area off Point Loma issued by OEHAA. OEHAA has developed both advisory tissue levels and fish contaminant goals for seven common contaminants in California sport fish (Klasing and Brodberg, 2008). Fish contaminant goals are estimates of contaminant levels in fish that pose no significant health risk to individuals consuming sport fish as a standard consumption rate of eight ounces per week (32 grams per day), prior to cooking, over a lifetime (Table 24). Unlike advisory tissue levels, these goals are based solely on public health considerations relating to exposure to each individual contaminant, without regard to economic considerations, technical feasibility, or the counterbalancing effects of fish consumption.

Table 24. Selected Fish Contaminant Goals for selected fish contaminants based on cancer and non-cancer risk using an 8 ounce per week (prior to cooking) consumption rate (32 grams per day).

Contaminant	Fish Contaminant Goal (ug/kg, wet weight)
Chlordane $[(mg/kg/day)^{-1}]$	5.6
DDTs $[(mg/kg/day)^{-1}]$	21
Methylmercury (mg/kg-day)	220
PCBs $[(mg/kg/day)^{-1}]$	3.6
Selenium (mg/kg-day)	7,400

Arsenic. Figure A-41 summarizes the average concentration of arsenic in rockfish and scorpionfish muscle, during October, from 1995 through 2006. There is no spatial or temporal pattern in arsenic concentrations in muscle that suggests an outfall-related effect. The applicant began using a more sensitive method detection limit in 2003. During the most recent discharge period (2001-2006), the annual average concentration of arsenic ranged from 0.55 to 2.65 mg/kg ww at nearfield station RF1 (total n=18) and 0.59 to 4.13 mg/kg ww at farfield station RF2 (total n=16). These concentrations are above the EPA screening values of 1.2 and 0.026 mg/kg. There is no OEHHA fish contaminant goal for arsenic.

Mearns et al. (1991) reported that in the Southern California Bight, arsenic occurs in the edible tissues of fish, squid, lobster, and crab and the liver of some fish in concentrations ranging from about 0.1 to over 50 mg/kg ww and tissue concentrations were the same or higher in remote areas compared to urban areas. The authors concluded that the source of arsenic to these organisms is probably "natural", due to hydrothermal springs, and further research was necessary to assess heath risks to humans that consume seafood at such levels.

From 2002 through 2006, arsenic concentrations in the Point Loma WTP effluent generally range between 0.4 and 2.7 ug/l; these concentrations will meet EPA's 304(a)(1) water quality criterion for human health, 0.14 ug/l, at the boundary of the zone of initial dilution.

Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

Cadmium. Figure A-42 summarizes the average concentration of cadmium in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003; however, cadmium was not detected in fish muscle until 2006. During the most recent discharge period (2001-2006), the annual average concentration of cadmium ranged from 0.00 to 0.16 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 0.15 mg/kg ww at farfield station RF2 (total n=16). These concentrations are below the EPA screening value of 4.0 mg/kg. There is no OEHHA fish contaminant goal for cadmium.

Chromium. Figure A-43 summarizes the average concentration of chromium in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in chromium concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of chromium ranged from 0.00 to 0.44 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 0.39 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for chromium.

Copper. Figure A-44 summarizes the average concentration of copper in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in copper concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of copper ranged from 0.15 to 3.58 mg/kg ww at nearfield station RF1 (total n=18) and 0.19 to 2.94 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for copper.

Lead. Figure A-45 summarizes the average concentration of lead in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003; however, lead was only detected in fish muscle in 2005. During the most recent discharge period (2001-2006), the annual average concentration of lead ranged from 0.00 to 0.00 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 0.36 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for lead.

Mercury. Because analysis of total mercury is less expensive than that for methylmercury, total mercury is analyzed and assumed to be 100 percent methylmercury for the purpose of risk assessment. Figure A-46 summarizes the average concentration of mercury in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a slightly less sensitive method detection limit (0.012 ug/l changed to 0.03 ug/l) in 2003.There is no spatial or temporal pattern in mercury concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of mercury ranged from 0.09 to 0.59 mg/kg ww at nearfield station RF1 (total n=18) and 0.09 to 0.37 mg/kg ww at farfield station RF2 (total n=16). In some years, average concentrations are above the EPA screening value of 0.3 mg/kg and the OEHHA fish contaminant goal of 0.220 mg/kg ww for methylmercury. Average concentrations are sometimes above OEHHA advisory tissue levels based on non-cancer risk using an 8 ounce serving size (prior to cooking) once or more per week (Klasing and Brodberg, 2008).

Mearns et al. (1991) has identified mercury as a contaminant of concern in the Southern California Bight, but concludes that since the highest levels of mercury are seen in fish from areas located far from known sources, it does not appear that mercury from coastal waste discharges is responsible for the concentrations observed in fish.

Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

From 2002 through 2006, mercury concentrations in the Point Loma WTP effluent generally are reported as "not detected" (217 of 228 samples) where the method detection limit ranges from 0.27 ug/l in 2002, to 0.09 ug/l in 2006. These method detection limits are low enough to evaluate the applicant's ability to achieve compliance, following initial dilution, with California Ocean Plan Table B water quality objectives for mercury. However, EPA concludes that these method detection limits are not as sensitive as required by 40 CFR 136 or as needed to further quantify actual mass emissions of mercury from the PLOO to the region. Consequently, the draft permit proposes that the applicant monitor the effluent using EPA method 1631 which has a required minimum quantitation level of 0.0005 ug/l.

Nickel. Figure A-47 summarizes the average concentration of nickel in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003; however, nickel was not detected in fish muscle until 2006. During the most recent discharge period (2001-2006), the annual average concentration of nickel ranged from 0.00 to 0.23 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 0.15 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for nickel.

Selenium. Figure A-48 summarizes the average concentration of selenium in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in selenium concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of selenium ranged from 0.37 to 0.48 mg/kg ww at nearfield station RF1 (total n=18) and 0.30 to 0.44 mg/kg ww at farfield station RF2 (total n=16). Annual average concentrations are below the EPA screening value of 20 mg/kg and the OEHHA fish contaminant goal of 7.4 mg/kg ww.

Silver. Figure A-49 summarizes the average concentration of silver in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003; however, silver was only detected in fish muscle in 2005. There is no spatial or temporal pattern in silver concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of silver ranged from 0.00 to 0.00 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 0.17 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for silver.

Tin. Figure A-50 summarizes the average concentration of total tin in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in tin concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of tin ranged from 0.00 to 1.71 mg/kg ww at nearfield station RF1 (total n=18) and 0.00 to 1.65 mg/kg ww at farfield station RF2 (total n=16). Mearns et al (1991) reports that from 3 to 52 percent of the total tin in fish is in the form of organic tin. Based on this ratio, it is likely that the annual average concentrations are below the EPA screening value of 1.2 mg/kg for the organic tin, tributlytin.

From 2002 through 2006, tributlytin concentrations in the Point Loma WTP effluent are reported as "not detected" (60 of 60 samples) where the method detection limit ranges from 0.005 ug/l in 2002, to 2 ug/l in 2006.

Zinc. Figure A-51 summarizes the average concentration of zinc in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in zinc concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of zinc ranged from 3.04 to 5.24 mg/kg ww at nearfield station RF1 (total n=18) and 1.96 to 4.22 mg/kg ww at farfield station RF2 (total n=16). There is no EPA screening value or OEHHA fish contaminant goal for zinc.

Hexachlorobenzene. Figure A-52 summarizes the average concentration of hexachlorobenzene in rockfish and scorpionfish muscle, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in hexachlorobenzene concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of hexachlorobenzene ranged from 0.10 to 0.58 ug/kg ww at nearfield station RF1 (total n=18) and 0.10 to 0.35 ug/kg ww at farfield station RF2 (total n=16). These concentrations are below the EPA screening values of 3,200 and 25.0 ug/kg. There is no OEHHA fish contaminant goal for hexachlorobenzene.

Total Chlordane. Figure A-53 summarizes the average concentration of total chlordane in rockfish and scorpionfish muscle, during October, from 1995 through 2006. There is no spatial or temporal pattern in total chlordane concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of total chlordane ranged from 0.00 to 1.13 ug/kg ww at nearfield station RF1 (total n=18) and 0.00 to 2.40 ug/kg ww at farfield station RF2 (total n=16). These concentrations are below the EPA screening values of 2,000 and 114 ug/kg ww and the OEHHA fish contaminant goal of 5.6 ug/kg ww.

Total DDT. Figure A-54 summarizes the average concentration of total DDT in rockfish and scorpionfish muscle, during October, from 1995 through 2006. There is no spatial or temporal pattern in total DDT concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the annual average concentration of total DDT ranged from 5.00 to 78.8 ug/kg ww at nearfield station RF1 (total n=18) and 9.73 to 77.70 ug/kg ww at farfield station RF2 (total n=16). These concentrations are below the EPA screening values of 2,000 and 117 ug/kg ww, but often above the OEHHA fish contaminant goal of 21 ug/kg ww. These values are below all OEHHA advisory tissue levels based on non-cancer risk using an 8 ounce serving size (prior to cooking) once or more per week (Klasing and Brodberg, 2008).

From 2002 through 2006, total DDT concentrations in the Point Loma WTP effluent generally are reported as "not detected" (228 of 228 samples), although the metabolite homologue, p,p'-DDD, was reported as 0.020 ug/l in one sample. The method detection limits for the homologues of DDT and its metabolites range from 0.020 to 0.1 ug/l. EPA's recommended minimum quantitation levels for the homologues of DDT and its metabolites are 0.1 ug/l using EPA method 608; Appendix II of the California Ocean Plan requires dischargers to achieve more stringent minimum levels.