

**LONG BEACH GENERATION L.L.C. GENERATING STATION NPDES
MONITORING SUMMARY CD.**



PREPARED FOR: LONG BEACH GENERATION L.L.C. GENERATING STATION

PREPARED BY: MBC APPLIED ENVIRONMENTAL SCIENCES

This disc contains historical data for Long Beach Generating Station collected by MBC Applied Environmental Sciences (MBC). Only those years for which digital data could be acquired have been included. A summary spreadsheet (Excel 2000 compatible) has been included on this disc, which contains a yearly synopsis of each aspect of the NPDES monitoring program, except intertidal surveys and water quality. The spreadsheet synopsis contains:

- Infauna data include all years from 1980 to 1999.
- Subtidal data include all years from 1990 to 1999.
- Grain size data include all years from 1990 to 1999.
- Sediment chemistry data include all years from 1990 to 1999.
- Trawl data include all years from 1980 to 1999.

Note: While intertidal surveys and water quality data have not been summarized on the spreadsheet, data from each year are included in the yearly archives on this disc. Also, data are lacking for 1973, 1975-1977, 1979, 1981-1985, 1989 and 1995-1996. No NPDES monitoring took place during those years except water quality, which was done in 1995 and 1996.

All spreadsheet documents from 1997 to 1999 are in Microsoft Excel 2000 format (.xls). These files should also be accessible by Office 98 for the Macintosh. All other spreadsheet files were made in Lotus for DOS, however these files are easily converted from within Excel.

Sediment grain size parameters. Long Beach Generating Station, 1990-1999.

		% Gravel	% Sand	% Silt	% Clay	Mean grain size		Different for 1999		
						phi	µm	Sorting (φ)	Skewness	Kurtosis
1999	B3	0.00	10.60	64.47	24.93	6.37	12	1.98	0.08	0.99
	B6	0.00	13.63	63.62	22.75	6.22	13	2.03	0.05	1.04
	B8	0.00	35.88	46.14	18.18	5.36	24	2.36	0.09	0.79
	B9	0.00	55.98	33.35	10.67	4.38	48	2.13	0.48	0.97
	B10	0.00	12.04	60.23	27.73	6.48	11	2.05	-0.001	0.98
	B11	0.00	24.85	56.07	19.08	5.74	19	2.16	0.04	0.86
1998	B8	0.00	54.77	27.44	17.79	5.08	30	33.28	0.64	1.12
	B9	0.00	9.46	57.55	32.99	7.28	6	26.42	0.19	1.43
	B10	0.00	15.14	48.93	35.93	7.30	6	26.33	0.11	0.99
1997	B3	0.00	8.06	53.80	38.15	7.63	5	26.42	0.22	1.13
	B6	0.10	28.20	41.24	30.46	6.46	11	20.18	0.11	0.98
	B8	0.00	46.62	26.36	27.01	6.12	14	30.48	0.58	0.89
	B9	0.18	44.46	33.65	21.72	5.79	18	29.25	0.51	1.02
	B10	0.00	12.04	47.88	40.09	7.75	5	25.19	0.16	0.96
	B11	0.00	24.29	39.99	35.71	7.09	7	26.42	0.07	0.99
1994	B3	0.00	9.52	65.77	24.71	6.56	11	32.14	0.32	1.02
	B6	0.08	21.83	55.44	22.66	6.34	12	28.12	0.25	1.10
	B8	0.00	51.52	31.35	17.12	5.25	26	35.25	0.65	1.13
	B9	35.24	47.19	12.33	5.24	0.81	570	19.45	0.21	1.01
	B10	0.21	55.61	27.00	17.18	4.97	32	28.96	0.55	1.11
	B11	0.22	12.93	55.01	31.83	7.01	8	24.97	0.16	0.93
1993	B3	0.00	12.57	59.01	28.42	6.86	9	29.53	0.08	1.03
	B6	0.00	9.74	66.05	24.21	6.62	10	33.36	0.06	0.96
	B8	0.00	50.53	34.98	14.50	5.04	30	35.64	0.58	0.99
	B9	0.25	51.56	33.68	14.50	5.03	31	31.94	0.53	1.01
	B10	0.00	43.03	39.54	17.43	5.34	25	33.45	0.52	0.97
	B11	0.15	13.38	60.43	26.05	6.75	9	29.22	0.07	1.07
1992	B3	0.00	10.79	73.39	15.83	5.94		38.54	0.18	0.85
	B6	0.00	16.68	67.91	15.42	5.82		36.97	0.12	0.88
	B8	0.00	36.18	51.00	12.82	5.25		33.76	0.38	0.88
	B9	0.00	30.72	49.45	19.83	5.58		29.94	0.13	0.79
	B10	0.00	33.02	49.14	17.84	5.61		32.47	0.37	0.78
	B11	0.00	25.62	56.35	18.03	5.65		35.12	0.42	0.89
1991	B3	0.00	24.45	61.08	14.47	5.42		31.38	0.08	1.01
	B6	0.00	20.31	59.26	20.43	6.07		29.20	0.03	1.01
	B8	0.00	24.70	54.12	21.18	6.09		31.18	0.16	0.87
	B9	4.12	40.97	38.60	16.31	4.89		25.90	0.24	1.03
	B10	0.00	31.00	49.14	19.86	5.86		28.95	0.15	0.80
	B11	0.00	8.46	62.73	28.81	6.91		31.98	0.07	0.91
1990	B3	0.00	9.12	61.09	29.79	7.04		30.96	0.04	1.16
	B6	0.00	9.77	64.18	26.05	6.88		32.96	0.14	1.09
	B8	0.00	43.91	38.76	17.33	5.28		34.47	0.56	0.92
	B9	0.07	40.34	39.56	20.02	5.67		31.61	0.49	0.89
	B10	0.18	24.45	47.51	27.86	6.38		24.21	-0.01	0.92
	B11	0.02	12.35	56.71	30.92	7.14		29.90	0.12	1.18

Appendix E-1. Yearly sediment metal concentrations, 1990 - 1999. Long Beach Generating Station NPDES, 1999.

Metal	Station	YEAR								Mean
		1990	1991	1992	1993	1994	1997	1998*	1999	
Chromium ERL = 81	B3	64.0	80.0	81.0	78.0	65.0	50.0	-	56.0	67.7
	B6	53.0	52.0	58.0	62.0	51.0	46.0	-	45.0	52.4
	B8	43.0	44.0	57.0	39.0	39.0	36.0	570.0	70.0	112.3
	B9	43.0	48.0	57.0	40.0	41.0	31.0	32.0	42.0	41.8
	B10	40.0	39.0	46.0	37.0	31.0	43.0	36.0	180.0	56.5
	B11	56.0	47.0	45.0	59.0	48.0	45.0	-	54.0	50.6
Copper ERL = 34	B3	105.0	160.0	180.0	240.0	140.0	130.0	-	92.0	149.6
	B6	89.0	100.0	110.0	130.0	120.0	110.0	-	84.0	106.1
	B8	68.0	82.0	100.0	69.0	82.0	59.0	71.0	79.0	76.3
	B9	65.0	81.0	100.0	79.0	160.0	67.0	54.0	73.0	84.9
	B10	58.0	73.0	78.0	77.0	60.0	92.0	59.0	85.0	72.8
	B11	87.0	91.0	70.0	100.0	93.0	94.0	-	73.0	86.9
Nickel ERL = 21	B3	36.0	43.0	40.0	29.0	30.0	29.0	-	78.0	40.7
	B6	34.0	28.0	31.0	33.0	28.0	26.0	-	39.0	31.3
	B8	27.0	27.0	28.0	22.0	20.0	19.0	560.0	210.0	114.1
	B9	30.0	29.0	29.0	21.0	25.0	18.0	22.0	26.0	25.0
	B10	27.0	23.0	26.0	21.0	18.0	26.0	24.0	510.0	84.4
	B11	38.0	26.0	25.0	30.0	28.0	28.0	-	45.0	31.4
Zinc ERL = 150	B3	273.0	290.0	440.0	290.0	330.0	250.0	-	170.0	291.9
	B6	234.0	200.0	210.0	220.0	210.0	220.0	-	190.0	212.0
	B8	152.0	160.0	240.0	140.0	150.0	130.0	160.0	130.0	157.8
	B9	131.0	160.0	170.0	150.0	130.0	130.0	110.0	170.0	143.9
	B10	124.0	140.0	140.0	150.0	110.0	170.0	120.0	170.0	140.5
	B11	169.0	150.0	120.0	180.0	150.0	180.0	-	150.0	157.0
Fines	B3	90.9	75.6	89.0	87.4	90.5	92.0	-	89.4	87.8
	B6	90.2	79.7	83.0	90.3	78.1	71.7	-	86.4	82.8
	B8	56.1	75.3	63.8	49.5	48.4	53.4	45.2	64.3	57.0
	B9	59.6	54.9	69.3	48.2	17.6	55.4	90.5	44.0	54.9
	B10	75.4	69.0	67.0	57.0	44.2	88.0	84.9	88.0	71.7
	B11	87.6	81.5	74.4	86.5	86.8	75.7	-	75.2	82.5

- = not sampled

* In 1998, due to questions raised concerning data collected for Station B8, the original samples were reanalyzed. Also, new samples were collected and compared to the original analysis and reanalysis. These data are presented below:

		Chromium	Nickel	Copper	Zinc
1998	Reanalysis of original sample	55	14	-	-
Station B8	Analysis of new sample	35	21	54	120

Infauna abundance, Long Beach Generating Station NPDES summary.

	1980	1986	1988	1990	1991	1992	1993	1994	1997	1998	1999	Total
<i>Acanthoptilum gracile</i>	1	-	-	-	-	-	-	-	-	-	-	1
<i>Acesta honkoshii</i>	2	-	-	-	-	-	-	-	-	-	-	2
<i>Achelia echinata</i>	-	-	-	-	-	-	1	-	-	-	-	1
<i>Acmira catherinae</i>	-	-	3	-	-	-	-	-	-	-	-	3
<i>Acmira honkoshii</i>	-	5	5	11	24	8	40	52	19	-	-	164
<i>Acteocina harpa</i>	-	-	-	-	-	-	-	9	4	-	1	14
Actiniaria	-	-	-	13	7	8	4	9	-	1	-	42
<i>Acumidodeutopus heteruropus</i>	-	2	-	-	-	-	-	1	1	-	-	4
<i>Acumidodeutopus stenopropodus</i>	-	2	-	-	-	-	-	-	-	-	-	2
<i>Acuminodeutopus heteruropus</i>	-	-	-	-	-	-	-	-	-	2	-	2
<i>Adontorhina cycilia</i>	-	-	-	-	-	-	-	-	-	1	-	1
<i>Aedicira pacifica</i>	1	-	-	-	-	-	-	-	-	-	-	1
Aeolidacea	-	-	-	-	1	3	2	-	-	-	-	6
<i>Aegires albopunctatus</i>	-	-	-	-	-	-	-	1	-	-	-	1
<i>Aglaja ocelligera</i>	-	-	-	-	1	-	-	-	-	-	-	1
<i>Aglaja</i> sp.	-	9	-	-	-	3	-	-	-	-	-	12
<i>Agnesia septrionalis</i>	-	-	1	-	-	-	1	-	-	78	3	83
<i>Alia carinata</i>	-	3	-	-	-	-	-	-	-	-	-	3
<i>Alienacanthomysis macropsis</i>	-	22	6	6	-	3	-	1	-	-	27	65
Alpheidae	-	-	-	1	-	-	-	-	-	-	-	1
<i>Alpheus californiensis</i>	-	-	1	-	-	-	1	-	-	-	-	2
<i>Alcyonidium mammillatum</i>	-	-	2	-	-	-	-	-	-	-	-	2
<i>Amaeana occidentalis</i>	2	5	6	2	1	1	19	-	-	2	-	38
<i>Amage scutata</i>	-	5	-	-	11	-	-	-	-	-	-	16
<i>Amathia distans</i>	1	3	1	-	1	-	1	-	-	4	-	11
<i>Amathia</i> sp.	-	-	-	-	1	-	-	-	-	-	-	1
<i>Ammothea hilgendorfi</i>	-	-	1	-	2	-	-	-	-	-	-	3
<i>Ampelisca agassizi</i>	-	-	-	-	-	-	-	-	-	-	9	9
<i>Ampelisca brachycladus</i>	-	-	-	1	-	-	-	-	-	-	-	1
<i>Ampelisca brevisimulata</i>	-	-	-	-	-	-	1	-	1	2	-	4
<i>Ampelisca comressa</i>	-	-	-	-	-	-	-	-	-	-	-	0
<i>Ampelisca cristata</i>	-	-	1	-	-	1	3	1	-	-	-	6
<i>Ampelisca cristata cristata</i>	-	-	-	-	-	-	-	-	-	5	-	5
<i>Ampelisca lobata</i>	-	-	-	-	-	-	-	-	-	1	-	1
<i>Ampelisca</i> sp.	-	-	-	-	1	-	-	-	-	-	-	1
<i>Ampharete labrops</i>	1	1	16	5	24	3	42	104	19	28	21	264
Ampharetidae	-	2	1	-	2	-	8	-	-	-	-	13
<i>Amphicteis scaphobranchiata</i>	21	17	38	12	18	15	36	36	66	17	10	286
<i>Amphideutopus oculatus</i>	21	40	140	17	44	165	316	269	2122	1820	481	5435
<i>Amphiduros brunnea</i>	-	-	13	-	-	-	-	-	-	-	-	13
<i>Amphiduros pacificus</i>	-	-	2	-	-	-	-	-	-	-	-	2
<i>Amphiodia digitata</i>	-	-	-	-	-	5	-	-	4	-	1	10
<i>Amphiodia occidentalis</i>	-	-	-	-	1	-	-	-	-	-	-	1
<i>Amphiodia</i> sp.	-	-	-	-	-	13	-	28	3	-	-	44
<i>Amphiodia</i> spp.	-	-	-	-	-	-	-	-	-	-	6	6
<i>Amphiodia urtica</i>	-	6	12	34	22	2	15	1	5	9	3	109

<i>Autolytus</i> sp.	-	-	-	-	1	-	4	-	-	-	1	6
<i>Axinopsida serricata</i>	22	3	14	3	5	4	2	25	5	-	3	86
<i>Axiothella rubrocincta</i>	28	-	-	-	-	-	-	59	-	-	-	87
Balanomorpha	-	1	-	-	-	-	-	-	-	-	-	1
<i>Balanus pacificus</i>	-	3	-	2	1	-	4	5	-	-	38	53
<i>Balanus</i> sp.	-	-	-	-	1	1	-	-	-	-	-	2
<i>Balanus trigonis</i>	-	-	1	-	-	-	-	-	-	-	-	1
<i>barentsia discreta</i>	-	-	1	-	-	-	-	-	-	-	-	1
<i>Barleeia californica</i>	-	-	-	-	-	1	-	-	-	2	-	3
<i>Bathylebeis californica</i>	-	37	21	-	-	-	-	-	-	-	-	58
<i>Betaeus ensenadensis</i>	-	-	5	4	-	-	-	-	-	-	-	9
<i>Betaeus harrimani</i>	-	-	-	1	4	-	-	-	-	-	-	5
<i>Betaeus longidactylus</i>	-	3	-	1	-	5	-	3	-	-	-	12
<i>Betaeus</i> sp.	-	-	-	2	10	23	-	1	-	-	-	36
Bivalvia	-	-	1	-	-	-	-	-	10	15	1	26
<i>Boccardia basilaria</i>	-	1	3	-	-	-	-	-	-	-	32	36
<i>Boccardia</i> sp.	-	-	3	1	1	-	2	-	-	-	1	8
<i>Boccardia</i> sp. A	-	1	-	-	-	-	-	-	-	-	-	1
<i>Bowerbankia gracilis</i>	-	-	1	-	6	2	1	3	-	-	-	13
Brachyura	-	6	-	5	-	4	-	1	-	-	-	16
Brachyura (megalopa)	-	-	-	-	-	-	-	-	-	-	1	1
<i>Brania californiensis</i>	-	-	-	-	-	-	-	-	-	2	-	2
<i>Brania</i> sp.	-	1	-	-	-	-	-	-	-	-	-	1
<i>Bugula californica</i>	2	1	-	-	-	-	-	-	-	-	-	3
<i>Bugula neritina</i>	7	4	6	1	2	-	2	1	-	-	-	23
<i>Buskia seriata</i>	-	-	-	-	2	-	1	-	-	-	-	3
<i>Buskia</i> sp.	-	-	-	-	1	-	-	-	-	-	-	1
<i>Cadulus fusiformis</i>	-	11	-	7	3	6	10	-	-	-	-	37
<i>Cadulus</i> sp.	-	-	1	-	-	-	-	-	-	-	-	1
<i>Cadulus quadrifissatus</i>	-	-	1	-	-	-	-	-	-	-	-	1
<i>Caecum californicum</i>	-	15	-	-	-	-	-	-	-	-	-	15
<i>Caecum</i> sp.	-	9	-	-	-	-	-	-	-	-	-	9
Caligoida	1	-	-	-	3	-	-	-	-	-	-	4
<i>Callianassa californiensis</i>	6	4	-	33	21	-	-	-	-	-	-	64
<i>Callianassa</i> sp.	1	112	335	559	375	-	-	-	-	-	-	1382
<i>Calyptraea contorta</i>	-	-	-	-	-	-	-	-	-	3	-	3
<i>Calyptraea fastigiata</i>	-	-	-	-	-	-	-	-	2	-	-	2
<i>Campylaspis canaliculata</i>	-	-	-	-	-	1	-	-	-	-	-	1
<i>Campylaspis rubromaculata</i>	-	-	-	-	2	-	1	-	-	-	-	3
<i>Cancer antennarius</i>	-	-	-	-	1	-	-	-	-	-	-	1
<i>Cancer anthonyi</i>	-	-	1	-	-	-	-	-	-	-	-	1
<i>Capitella capitata</i>	2	1	-	2	4	1	3	3	5	-	-	21
<i>Capitella capitata</i> Cmplx	-	-	-	-	-	-	-	-	-	8	1	9
<i>Caprella brevirostris</i>	-	-	-	-	-	-	-	-	-	11	-	11
<i>Caprella californica</i>	-	1	-	3	-	1	-	1	1	-	-	7
<i>Caprella mendax</i>	-	-	-	-	1	-	-	-	-	-	-	1
<i>Caprella</i> sp.	-	1	-	-	-	-	-	-	-	-	-	1
Caprellidea	-	-	-	-	-	-	8	1	1	-	-	10
<i>Carazziella calafia</i>	-	-	-	-	-	-	-	-	-	5	-	5

Appendix H-5. Rank and mean number of individuals or percent cover per replicate of the top 20 species of rocky subtidal biota, 1990 - 1999.
Long Beach Generating Station NPDES, 1999.

Phylum Species	1990		1991		1992		1993		1994		1997*		1998*		1999		Average	Overall		
	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank†	Mean	Rank	
Abundance (number of counted individuals)																				
MO	<i>Serpulorbis squamigerus</i>	2	11.21	2	18.35	1	16.08	1	22.02	1	22.71	1	8.00	3	4.83	1	77.50	1.5	22.589	1
CN	<i>Astrangia lajollensis</i>	1	11.69	3	7.65	2	12.13	3	5.89	3	5.56	5	2.07	4	4.05	2	63.67	2.9	14.089	2
MO	<i>Mytilus</i> sp.	15	0.87	10	1.90	10	1.38	5	3.19	4	5.27	2	7.07	2	6.40	3	63.17	6.4	11.158	3
PR	Phoronida	3	8.93	1	24.90	3	7.70	2	10.07	2	14.83	6	1.98	35	0.02	-	-	7.4	8.555	4
MO	<i>Pseudochama exogyra</i>	7	2.12	13	1.31	9	1.65	8	1.73	11	1.81	3	3.19	6	2.00	5	22.33	7.8	4.518	5
CO	Asciadiacea	9	1.68	8	2.57	5	3.48	6	2.29	8	2.64	10	1.43	5	2.24	6	19.33	7.1	4.457	6
CO	<i>Ciona intestinalis</i>	-	-	40	0.10	45	0.02	53	0.01	20	0.37	11	1.29	1	9.64	4	23.33	24.9	4.345	7
CO	<i>Styela clava</i>	16	0.85	12	1.37	12	1.11	12	1.36	14	1.21	13	1.21	7	1.71	7	18.00	11.6	3.353	8
CO	<i>Pyura haustor</i>	11	1.64	5	3.65	7	3.13	9	1.65	12	1.40	15	0.76	9	1.36	8	13.17	9.5	3.347	9
MO	<i>Crepidula onyx</i>	4	6.29	4	5.08	8	2.25	4	3.94	6	3.76	9	1.71	10	1.02	21	2.67	8.3	3.341	10
MO	<i>Crepidatella dorsata</i>	5	5.45	9	2.56	4	3.62	10	1.61	10	1.93	8	1.81	8	1.52	16	6.33	8.8	3.104	11
CN	<i>Corynactis californica</i>	6	4.63	14	1.25	11	1.30	15	0.90	26	0.19	4	2.24	-	-	10	11.33	12.3	2.731	12
AN	<i>Chaetopterus variopedatus</i> Cmpbx	22	0.40	26	0.33	21	0.29	16	0.81	7	2.94	16	0.67	17	0.67	9	12.67	16.8	2.347	13
PH	<i>Sargassum muticum</i>	14	0.90	7	3.10	6	3.14	13	1.32	13	1.30	12	1.24	16	0.69	17	6.17	12.3	2.232	14
MO	<i>Pteropurpura festiva</i>	13	0.98	16	0.89	15	0.79	19	0.58	17	0.60	19	0.55	18	0.60	13	8.67	16.3	1.705	15
EC	<i>Strongylocentrotus purpuratus</i>	18	0.70	19	0.65	16	0.65	14	0.94	15	0.75	14	1.12	13	0.81	15	7.50	15.5	1.641	16
MO	<i>Tegula brunnea</i>	-	-	-	-	-	-	45	0.02	58	0.01	18	0.57	11	1.00	11	10.83	28.6	1.555	17
AR	<i>Balanus</i> spp.	8	1.80	15	0.95	19	0.30	11	1.50	24	0.27	7	1.86	22	0.29	19	3.67	15.6	1.329	18
MO	<i>Crassadoma gigantea</i>	24	0.35	23	0.45	22	0.27	21	0.35	21	0.35	22	0.40	21	0.40	14	7.67	21.0	1.280	19
AN	Spirorbidae	-	-	-	-	38	0.04	36	0.05	40	0.04	22	0.40	-	-	12	9.67	29.6	1.274	20
Percent Cover																				
RH	Rhodophyta	2	18.45	2	15.06	1	18.31	2	14.49	2	18.14	3	6.90	2	18.05	2	21.06	2.0	16.308	1
CS	Bacillariophyceae	3	5.71	6	2.87	2	5.40	1	22.44	1	25.33	4	5.24	1	24.33	1	32.21	2.4	15.443	2
PO	<i>Ciona</i> sp.	1	13.44	1	32.14	5	2.21	12	1.18	5	1.25	7	1.29	10	0.81	10	0.62	6.4	6.618	3
RH	<i>Plocamium</i> sp.	-	-	23	0.11	13	0.67	10	1.31	3	9.20	2	17.50	3	8.71	-	-	9.0	4.688	4
EP	<i>Zoobotryon verticillatum</i>	-	-	-	-	15	0.31	23	0.07	22	0.18	1	21.60	20	0.29	24	0.06	17.5	2.813	5
PH	<i>Dictyota flabellata</i>	6	1.86	9	1.96	3	4.06	3	4.35	4	2.21	14	0.43	14	0.57	9	0.63	7.8	2.009	6
CH	Chlorophyta	17	0.43	5	4.02	8	1.33	7	1.69	7	1.17	9	0.86	5	2.17	4	2.11	7.8	1.722	7
RH	<i>Lithothamnium/Lithophyllum</i> spp.	9	1.12	18	0.26	18	0.24	13	0.79	11	0.81	5	3.52	7	1.90	3	2.76	10.5	1.426	8
PH	<i>Colpomenia sinuosa</i>	7	1.70	4	4.06	6	1.71	8	1.49	10	0.95	12	0.52	18	0.38	12	0.50	9.6	1.415	9
RH	Corallinaceae	30	0.84	7	2.57	4	2.46	5	2.06	12	0.94	8	1.07	12	0.69	16	0.27	11.8	1.364	10
PH	Phaeophyta	9	1.12	3	4.31	12	0.85	4	2.80	14	0.44	-	-	19	0.36	13	0.44	10.6	1.289	11
CO	<i>Botrylloides</i> spp.	8	1.35	11	1.70	10	0.92	11	1.29	5	1.25	15	0.36	8	1.60	8	0.67	9.5	1.140	12
EP	<i>Bugula californica</i>	-	-	7	2.57	7	1.60	9	1.45	9	0.98	-	-	-	-	5	1.35	7.4	0.993	13
CO	<i>Metandrocarpa dura</i>	-	-	-	-	11	0.90	6	1.74	8	1.01	17	0.29	15	0.52	15	0.30	12.0	0.595	14
EP	<i>Crisulipora occidentalis</i>	19	0.24	10	1.77	17	0.25	-	-	20	0.23	6	1.62	17	0.38	18	0.21	15.3	0.588	15
CH	<i>Ulva</i> sp.	-	-	-	-	-	-	-	-	-	-	23	0.05	6	1.93	7	1.23	12.0	0.400	16
EP	<i>Bugula neritina</i>	3	2.48	22	0.13	19	0.21	24	0.06	26	0.11	18	0.19	-	-	-	-	18.7	0.397	17
CN	<i>Abietinaria</i> sp.	23	0.15	14	0.98	26	0.01	14	0.64	32	0.05	20	0.10	9	0.88	17	0.23	19.4	0.379	18
EP	<i>Thalamoporella californica</i>	-	-	20	0.20	20	0.17	30	0.01	24	0.13	-	-	4	2.36	19	0.17	19.5	0.379	18
PH	<i>Hydroclathrus clathratus</i>	-	-	17	0.27	24	0.08	18	0.24	15	0.40	-	-	13	0.62	6	1.25	15.5	0.359	19
Yearly Survey Totals																				
Mean number of individuals		70.5		81.2		65.0		66.4		78.7		42.5		44.6		29.7		59.8		
Number of species		74		75		69		65		68		46		49		53		62.4		
Mean percent cover		40.7		55.2		44.6		59.8		67.3		64.2		68.1		67.5		57.1		
Number of species		34		29		31		33		37		25		25		30		30.5		
Phyla key: AN = Annelida; CH = Chlorophyta; CN = Cnidaria; AR = Arthropoda; CS = Chrysophyta; EP = Ectoprocta; MO = Mollusca; PH = Phaeophyta; PO = Porifera; PR = Phoronida; RH = Rhodophyta; CO = Chordata.																				
* = summer sampling only																				
† = average rank of species where occurred																				

Appendix I-12. Abundance of fish species in trawl replicates, 1980 - 1999. Long Beach Generating Station NPDES, 1999.

Species	1980		1986		1988		1990		1991		1992		1993		1994		1997	1999		Total	Percent Total
	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	S	W	S		
<i>Genyonemus lineatus</i>	631	341	1012	783	742	1629	271	430	47	6548	11208	4741	1056	4238	1503	2092	892	59	2614	40837	59.54
<i>Engraulis mordax</i>	9	31	-	-	-	739	5	684	1	15364	-	81	-	49	-	32	438	210	391	18034	26.29
<i>Seriphys politus</i>	208	98	536	73	488	70	210	71	-	1	794	119	7	3	88	21	500	10	2	3299	4.81
<i>Lepidogobius lepidus</i>	21	1	3	39	-	39	27	38	45	765	9	30	504	834	112	461	6	-	275	3209	4.68
<i>Symphurus atricauda</i>	13	-	9	5	7	27	29	15	8	21	49	23	84	234	40	29	15	6	6	620	0.90
<i>Synodus lucioceps</i>	9	-	-	-	-	6	308	48	10	7	44	49	34	16	3	1	-	17	8	560	0.82
<i>Phanerodon furcatus</i>	125	54	13	2	1	12	44	32	2	4	36	13	23	28	27	7	67	4	2	496	0.72
<i>Porichthys myriaster</i>	15	-	32	19	16	57	3	4	7	47	47	31	31	74	16	6	12	11	38	466	0.68
<i>Paralichthys californicus</i>	8	5	8	8	9	17	15	1	2	-	37	31	19	13	4	4	14	3	7	205	0.30
<i>Citharichthys stigmatias</i>	-	-	-	-	8	57	3	9	-	18	27	3	25	27	3	-	-	15	5	200	0.29
<i>Cymatogaster aggregata</i>	3	11	17	-	3	4	-	-	-	-	-	1	-	2	-	-	57	-	-	98	0.14
<i>Paralabrax nebulifer</i>	2	-	13	5	1	3	10	3	1	2	8	2	10	2	6	1	1	11	5	86	0.13
<i>Pleuronichthys verticalis</i>	14	2	1	5	1	4	14	13	2	4	8	5	1	1	-	-	6	1	2	84	0.12
<i>Pleuronichthys ritteri</i>	-	-	6	2	6	5	6	3	-	1	4	2	3	1	4	2	5	8	15	73	0.11
<i>Sebastes dalli</i>	18	18	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	1	-	40	0.06
<i>Porichthys notatus</i>	-	-	1	7	-	-	-	2	-	11	1	2	3	-	-	1	6	3	-	37	0.05
<i>Pepilus similimus</i>	-	-	-	-	2	30	-	-	-	-	-	-	-	-	-	-	2	-	-	34	0.05
<i>Rhachochilus vacca</i>	8	-	1	1	-	-	6	2	-	2	5	-	-	4	2	1	-	1	-	33	0.05
<i>Xystreurus liolepis</i>	1	-	1	1	-	-	4	-	-	-	5	3	5	2	2	-	3	2	-	29	0.04
<i>Embiotoca jacksoni</i>	3	6	1	-	-	-	6	2	-	1	1	-	-	-	4	1	-	-	-	25	0.04
<i>Acanthogobius flavimanus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	22	-	24	0.03
<i>Hypsopsetta guttulata</i>	1	-	-	-	-	2	2	1	-	-	3	1	1	5	1	1	1	-	-	18	0.03
<i>Anchoa compressa</i>	1	-	11	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	0.02
<i>Xenistius californiensis</i>	2	-	1	-	1	-	3	-	-	-	-	-	-	-	1	-	-	-	-	8	0.01
<i>Leptocottus armatus</i>	-	-	-	-	2	1	-	-	-	-	-	-	-	3	-	-	-	-	1	7	0.01
<i>Sebastes miniatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	7	0.01	
<i>Rhinobatos productus</i>	-	-	-	-	-	-	1	-	-	-	-	2	-	1	-	-	-	1	-	5	0.01
<i>Urolophus halleri</i>	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	1	-	4	0.01
<i>Heterostichus rostratus</i>	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	3	0.00
<i>Paralabrax clathratus</i>	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3	0.00
<i>Sardinops sagax</i>	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	1	-	-	3	0.00
<i>Scorpaena guttata</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	-	3	0.00
<i>Hyperprosopon argenteum</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	0.00
<i>Icelina quadriseriatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	0.00
<i>Rhachochilus vacca</i>	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.00
<i>Sebastes rastrelliger</i>	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	2	0.00
<i>Gibbonsia elegans</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
<i>Hypsoblennius gilberti</i>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	0.00
<i>Mustelus henlei</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
<i>Ophidion scrippsae</i>	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
<i>Parophyes vetulus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	0.00
<i>Platyrhinoidis triseriata</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0.00
<i>Raja binoculata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	0.00
<i>Rhachochilus toxotes</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0.00
<i>Scomber japonicus</i>	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
<i>Sebastes auriculatus</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	0.00
<i>Sebastes sp.</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
Number of individuals	1093	569	1668	951	1291	2705	970	1361	125	22797	12288	5141	1811	5544	1816	2663	2028	389	3376	68586	
Number of species	20	11	19	14	15	19	22	20	10	16	18	19	19	23	16	17	18	21	15	47	
Biomass (kg)	43.3	46.0	37.6	37.0	22.9	62.9	94.2	40.1	4.0	52.0	173.0	116.9	17.9	42.3	16.4	26.6	22.8	11.8	17.1		
Stations / total reps - seasons	3/3 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 1		3/6 - 2		
Time for tow (min)	5		5		10		10		10		10		10		10		10		5		

Note: 0.00 = <0.005

Appendix I-13. Abundance of macroinvertebrate species in trawl replicates, 1980 - 1999. Long Beach Generating Station NPDES, 1999.

Species	1980		1986		1988		1990		1991		1992		1993		1994		1997	1999		Total	Percent Total
	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	S	W	S		
<i>Crangon nigromaculata</i>	119	6	103	144	203	268	818	173	485	2365	700	444	1057	4531	456	629	11	262	666	13440	79.81
<i>Pyromaia tuberculata</i>	10	15	36	13	38	119	40	28	3	1159	-	26	75	106	13	104	140	21	119	2065	12.26
<i>Heptacarpus stimpsoni</i>	-	-	-	-	-	-	-	-	-	-	-	170	-	-	33	99	-	-	-	302	1.79
<i>Parastichopus californicus</i>	2	1	2	2	-	2	-	-	-	8	4	4	2	4	1	3	21	13	28	97	0.58
<i>Portunus xantusii</i>	2	2	7	2	1	-	1	1	3	11	3	1	20	22	4	-	2	4	3	89	0.53
<i>Dendronotus iris</i>	1	-	9	-	1	2	-	-	11	3	7	33	-	-	2	5	-	12	-	86	0.51
Hippolytidae, unid.	24	-	-	-	-	-	3	54	-	-	-	-	-	-	-	-	-	-	-	81	0.48
<i>Navanax inermis</i>	-	-	2	1	-	5	3	8	2	5	4	1	5	9	5	-	1	3	8	62	0.37
<i>Pisaster brevispinus</i>	-	-	-	-	1	1	1	-	2	4	5	5	3	8	-	-	23	4	4	61	0.36
<i>Sicyonia ingentis</i>	2	-	6	-	1	-	-	-	-	-	2	-	21	9	1	-	-	9	-	51	0.30
<i>Lironeca californica</i>	-	-	-	-	-	-	-	-	-	-	-	1	34	14	-	-	-	-	-	49	0.29
<i>Asterina miniata</i>	1	1	-	-	-	1	1	-	-	-	1	-	-	-	-	1	33	2	5	46	0.27
<i>Lironeca</i> sp.	1	-	-	-	-	-	27	15	-	-	-	-	-	-	-	-	-	-	-	43	0.26
<i>Heptacarpus</i> sp.	-	-	-	-	-	-	-	-	41	-	-	-	-	-	-	-	-	-	-	41	0.24
<i>Penaeus californiensis</i>	7	-	16	1	3	-	-	-	-	1	2	-	-	3	3	-	5	-	-	41	0.24
<i>Parastichopus parvimensis</i>	-	-	6	2	7	7	1	2	-	-	-	-	-	-	-	-	7	2	2	36	0.21
<i>Lironeca vulgaris</i>	1	-	-	-	1	-	-	-	6	9	5	1	-	2	5	-	-	-	-	30	0.18
<i>Spirontocaris cristata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
<i>Lophopanopeus frontalis</i>	-	-	9	-	1	1	1	2	-	1	3	-	2	-	-	-	-	-	-	20	0.12
<i>Neotrypaea</i> sp.	1	-	1	-	-	-	2	-	1	1	-	4	1	8	-	-	-	-	-	19	0.11
<i>Rictaxis punctocaelatus</i>	-	-	-	-	-	-	9	-	1	-	1	7	-	-	1	-	-	-	-	19	0.11
<i>Cancer anthonyi</i>	-	1	-	-	2	4	1	2	-	3	-	1	1	-	-	-	-	-	-	15	0.09
<i>Loxorhynchus grandis</i>	1	-	1	-	-	-	1	3	-	1	-	1	-	3	-	-	1	-	-	12	0.07
<i>Strongylocentrotus purpuratus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	2	1	11	0.07
<i>Cancer gracilis</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01
<i>Hirudinea</i> sp.	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	0.05
<i>Callinassa gigas</i>	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	7	0.04
<i>Cancer antennarius</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	2	0.01
<i>Cancer</i> sp.	-	1	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	5	0.03
<i>Dendronotus</i> sp.	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	6	0.04
<i>Nassarius mendicus</i>	4	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	6	0.04
<i>Ophiothrix spiculata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	-	-	-	6	0.04
<i>Astropecten armatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5	0.03
<i>Loxorhynchus crispatus</i>	-	-	-	-	-	-	-	-	1	-	2	-	2	-	-	-	-	-	-	5	0.03
<i>Octopus</i> sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	5	0.03
<i>Octopus bimaculatus/bimaculoides</i>	-	-	-	-	-	-	-	-	1	1	-	-	2	-	-	-	-	-	-	4	0.02
<i>Pteropurpura festiva</i>	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	-	1	4	0.02
<i>Sicyonia penicillata</i>	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	1	4	0.02
<i>Kelletia kelletii</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	3	0.02
<i>Lophopanopeus leucomanus</i>	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.02
<i>Nassarius perpinguis</i>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.02
<i>Nudibranchia</i> , unid.	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	3	0.02
<i>Pugettia producta</i>	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	3	0.02
<i>Alpheus californiensis</i>	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.01
<i>Aphrodita armifera</i>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	0.01
<i>Argopecten circularis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	0.01
<i>Cancer productus</i>	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.01
<i>Cerebratulus californiensis</i>	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.01
<i>Heptacarpus palpator</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	2	0.01
<i>Isocheles pilosus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	0.01
<i>Nassarius fossatus</i>	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	0.01

Appendix I-13. Abundance of macroinvertebrate species in trawl replicates, 1980 - 1999. Long Beach Generating Station NPDES, 1999.

Species	1980		1986		1988		1990		1991		1992		1993		1994		1997		1999		Total	Percent Total
	W	S	W	S	W	S	W	S	W	S	W	S	W	S	S	W	S					
<i>Pagurus spilocarpus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2	0.01		
<i>Polinices lewisii</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2	0.01		
<i>Anisodoris nobilis</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Antipella barbarena</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Astropecten</i> sp.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Cancellaria cooperi</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	0.01		
<i>Demasterias imbricata</i>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Diautula sandiegensis</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	0.01		
<i>Navanax</i> sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Neverita reclusiana</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
Ophiuroidea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0.01		
<i>Pachygrapsus crassipes</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Pandalus danae</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	0.01		
<i>Pisaster ochraceus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0.01		
<i>Polycera atra</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	0.01		
<i>Polyorchis penicillata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	0.01		
Porcellanidae, unid.	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Prostheceraeus bellostriatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	0.01		
<i>Rossia pacifica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	0.01		
<i>Scleroplax granulata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0.01		
<i>Simnia aequalis vidleri</i>	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Strongylocentrotus franciscanus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	0.01		
<i>Stylatula elongatus</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0.01		
<i>Triopha catalinae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	0.01		
Number of individuals	183	27	206	166	268	431	914	300	550	3571	743	708	1226	4724	528	851	265	337	842	16840		
Number of species	18	7	17	8	13	21	19	16	10	16	14	18	15	14	14	11	19	14	15	74		
Biomass (kg)	na		na		2.09	2.32	2.805	3.287	5.62	19.37	5.95	13.29	9.422	18.835	0.798	0.821	30.766	10.95	14.25			
Sta. / trl. reps - seasons	3/3 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2		3/6 - 2			
Time for tow (min)	5		5		10		10		10		10		10		10		10		5			

Note: na = not available. Encrusting and infaunal organisms previously reported removed from this summary.