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DDT IN BOTTOM SEDIMENTS AROUND FIVE SOUTHERN CALIFORNIA OUTFALL SYSTEMS

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INTRODUCTION

The pesticide DDT appears to be one of the most serious contaminants yet described in the Southern California Bight. Levels of this chlorinated hydrocarbon and its metabolites in sandcrabs and intertidal mussels taken off Palos Verdes Peninsula in the early 1970's were 50 to 100 times higher than concentrations found 200 km to the north and south (Burnett 1971; Southern California Coastal Water Research Project 1973). In addition, approximately two-thirds of the Dover sole trawled off the Peninsula during 1971-72 were found to contain muscle concentrations exceeding the 5-ppm limit for seafood intended for interstate commerce set by the U.S. Food and Drug Administration (Southern California Coastal Water Research Project 1973). Such DDT gradients are attributed to long-term discharges of this pesticide via the submarine municipal wastewater outfalls of the County Sanitation Districts of Los Angeles County off Whites Point (Figure 1). Approximately 19,000 kg/yr total DDT were discharged through this system in 1971, and although the amount had been reduced to approximately 3,000 kg/yr in 1973, the outfall system is still the dominant known source of DDT to the Bight (Southern California Coastal Water Research Project 1973).

Trace constituents such as heavy metals and chlorinated hydrocarbons are found to be largely associated with particulate matter in wastewaters (Young et al. 1973; Southern California Coastal Water Research Project 1973). Therefore, the sediments in the receiving environment may be an important reservoir of these contaminants. To investigate this possibility, the Coastal Water Research Project conducted a survey of DDT compounds in ocean bottom sediments collected around the major municipal wastewater discharge systems in the Bight: The data obtained from these studies are reported here, and the results are briefly evaluated.

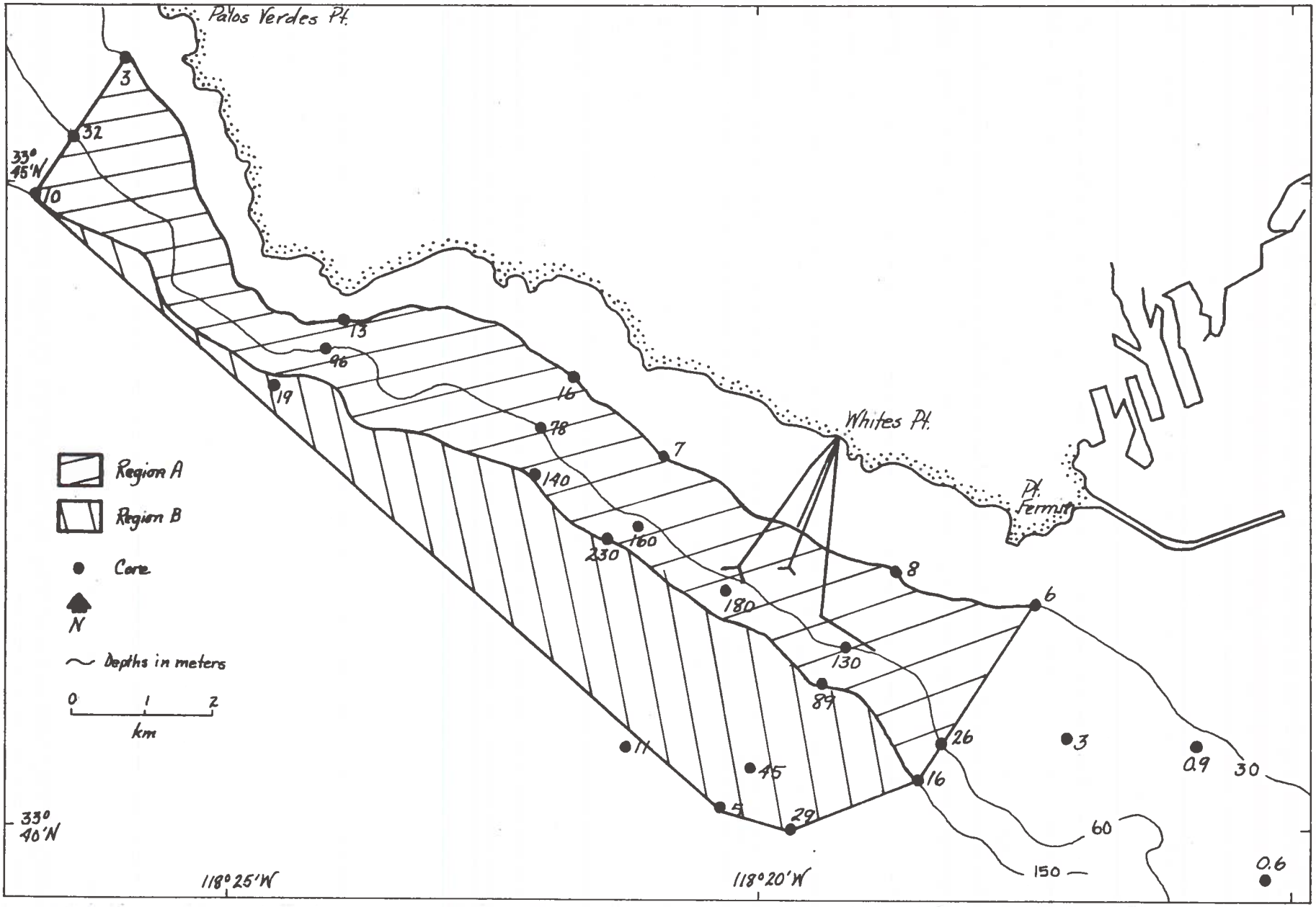

Figure 1. Concentrations of total DDT (mg/dry kg) in surface sediments around the Whites Point outfall system, June-July 1972.

SAMPLING AND ANALYSIS

Two types of coring tools were employed for the majority of sediments sampled. The first was the short-barrel gravity corer, which has a barrel length of approximately 30 cm and an inner diameter of about 3 cm. The second was a box corer with a sampling area of 600 sq cm (20 cm x 30 cm) and a box depth of 60 cm.

Two other types of corers were used for only one sampling period each. A gravity barrel corer with a barrel length of about 150 cm and an inner diameter of almost 8 cm was used off Palos Verdes, and hand cores were collected off Orange County using the inner liner of the short gravity barrel corer.

Upon collection, a core was either subsampled directly or frozen in a vertical position for subsequent processing. To subsample, we used a stainless steel spatula to transfer several grams of sediment into a precleaned glass jar, which was then capped with aluminum foil.

The DDT concentrations in the sediments were obtained using two different sediment extraction procedures. The majority of samples were analyzed at the San Jose Creek Laboratory of the County Sanitation Districts of Los Angeles County using their standard "agitation" extraction procedure, which is described below. The Project later established its own trace organics laboratory and developed a Soxhlet extraction procedure, which is currently being used for sediment analysis. This procedure, also described below, was used only on Palos Verdes Cores WP4 and WP7, the Orange County GS-series, and all San Diego cores.

Agitation Extraction

In the agitation extraction procedure, the sediment sample is dried on a steam table, weighed into a 250-ml Erlenmeyer flask with a standard taper joint fitted with a ground glass stopper, and covered with 50 ml of 24 percent (by volume) diethyl ether in hexane. A Florisil column is prepared by packing a 30-mm O.D. chromatographic column with 7.62 cm (3 in.) of Florisil, which has been activated for 4.5 hours at 700°C, and 1.27 cm (0.5 in.) of anhydrous granular sodium sulfate. The Erlenmeyer flask with the sediment and solvent is shaken, and the solvent is decanted onto the Florisil column. After the solvent passes through the Florisil column, the residue in the Erlenmeyer flask is suspended in a 50-ml volume of 6 percent diethyl ether in hexane; the flask is shaken, and the solvent is decanted onto the column. Following

this, 50 ml of hexane is added to the flask, and the residue and solvent is shaken again and decanted onto the Florisil column. The sample is then injected into the gas chromatograph and quantitated by peak heights.

Soxhlet Extraction

The Soxhlet extraction apparatus, which has an inside diameter of 40 mm and a 250-ml receiving flask, is fitted with a heating mantle and cellulose thimble. The apparatus is run for a period of 2 hours with 150 ml of hexane to clean the thimble. The wash hexane is then discarded, and the thimble is dried. The sediment sample is dried on a steam bath, homogenized with a glass rod, and weighed into the thimble. A 150-ml volume of hexane is placed into the Soxhlet extraction apparatus. The Soxhlet is run for a period of 18 hours to extract the sample. The sample is subsequently reduced in volume using a Model VE50 Rotavapor. A 30-mm O.D. chromatographic column is packed with 7.62 cm (3 in.) of 60/100 mesh Florisil, which has been activated at 700°C for 4.5 hours, and 1.27 cm (0.5 in.) of anhydrous granular sodium sulfate. Forty milliliters of the concentrated extract is decanted onto the column and eluted with 45 ml of 6 percent (by volume) diethyl ether in hexane. The sample is then injected into a Tracor MT220 gas chromatograph with a Ni^{63} electron-capture detector and the following specifications:

- Nitrogen carrier gas with a flow rate of 80 ml/min.
- Injector, column, and detector temperatures of 235, 205, and 280°C respectively.
- Glass column, 6 mm O.D., 4 mm I.D., and 1.83 m (6 ft) long, packed with 5.5 percent OV-17 and 5.5 percent QF-1, on 80/100 mesh gas chrom Q.

Calculations were made by comparing the sample peak heights with the peak heights of standard solutions.

Extraction Efficiency

Independent analyses of replicate sediment samples were undertaken at the University of California's Bodega Bay Marine Laboratory under the direction of Dr. Robert Risebrough, at the San Jose Creek Laboratory, and at the Project's trace organics laboratory to determine the reliability of the two extraction procedures. The samples, which were analyzed for three levels of DDT contamination, came from three regions--off the 90-inch diffuser of the Joint Water Pollution Control Plant (JWPCP) located on the Palos Verdes Peninsula, off Palos Verdes Point, and in Santa Monica Bay.

The results of these intercalibration analyses are presented in Table 1. The data suggest that there is fair agreement between the three laboratories: On the average, the sediment DDT concentrations determined at the San Jose Creek Laboratory (using the

Table 1. Interlaboratory comparison of concentrations (mg/dry kg) of total DDT in sediments collected off Palos Verdes and in Santa Monica Bay.*

Sample	Lab. A	Lab. B	Lab. C	Lab. A / Lab. B	Lab. A / Lab. C
Whites Point					
Replicate 1	153	143	172		
Replicate 2	168	135	164		
Replicate 3	-	-	183		
Average	160	139	173	1.2	0.92
Palos Verdes Point					
Replicate 1	20	8.1	15		
Replicate 2	-	7.4	15		
Replicate 3	-	-	16		
Average	20	7.8	15	2.6	1.3
Santa Monica Bay					
Replicate 1	0.43	0.18	0.22		
Replicate 2	0.38	0.18	0.27		
Replicate 3	-	-	0.32		
Average	0.40	0.18	0.27	2.2	1.5

*Laboratory A is the Bodega Bay Marine Laboratory, University of California, Berkeley (Soxhlet extraction procedure). Laboratory B is the San Jose Creek Laboratory, County Sanitation Districts of Los Angeles County (agitation extraction procedure). Laboratory C is the Coastal Water Research Project's trace organics laboratory (Soxhlet extraction procedure).

agitation extraction procedure) were lower than the Bodega Laboratory concentrations by a factor of two, and the concentrations obtained in the Project's laboratory (using the Soxhlet extraction procedure) were lower than the Bodega Laboratory concentrations by a factor of 1.2.

Using the same intercalibration sediments, we tested the Soxhlet procedure for its ability to recover the DDT components. Each of the three sediment DDT concentration levels was run in triplicate. For this test, the solvent from the 18-hour extraction was removed and replaced with fresh solvent. The Soxhlet was then allowed to run for another 6 hours, and the values obtained from the original 18-hour run were compared with the sum of the values obtained from the 18- and 6-hour runs. The results, shown in Table 2, reveal the extraction efficiency of this procedure to be excellent--98 percent or greater in all cases.

Table 2. Efficiency of the 18-hour Soxhlet procedure (percent) in extracting DDT compounds from samples from cores with three levels of total DDT contamination.

	Level of Total DDT Contamination in Core*		
Component	Low (Avg. 0.27 ppm)	Medium (Avg. 15 ppm)	High (Avg. 170 ppm)
o,p'-DDE	N.D.**	99	100
p,p'-DDE	99	99	100
o,p'-DDD	N.D.	99	100
p,p'-DDD	100	98	100
o,p'-DDT	100	N.D.	100
p,p'-DDT	100	100	100
Total DDT	99	99	100

*The three cores are from Santa Monica Bay (low), Palos Verdes Point (medium), and Whites Point (high).
**N.D. = not detectable.

DISTRIBUTION AROUND MAJOR OUTFALL SYSTEMS

Whites Point Outfall Area

Sediment samples were collected from around the County Sanitation Districts of Los Angeles County municipal wastewater outfall system off Whites Point on the Palos Verdes Peninsula. Nineteen short gravity cores were collected in June 1972 in Region A (Figure 1), which includes the area between Palos Verdes Point and the northernmost point of the Los Angeles Harbor breakwater and bounded by the 30- and 150-m depth contours. Four box cores were also collected in this region during July 1971. To extend this region, five short gravity cores were collected in Redondo Canyon to the north and three were collected to the south between the 40- and 100-m depth contours during July 1972 by County Sanitation District personnel. Also during July 1972, the study area was extended to include Region B (Figure 1) by utilizing four 8-cm (3-in.) barrel cores collected by Andrew Soutar, Scripps Institution of Oceanography, in an area bounded by Pt. Fermin, Bunker Point and the 375- and 575-m depth contours. The cores were subsampled at 2-cm intervals (the top 10 cm of the 8-cm barrel cores were subsampled at 1-cm intervals) and analyzed for the major DDT components o,p'- and p,p'-DDE, o,p'- and p,p'-DDD, and o,p'- and p,p'-DDT. The concentrations of the DDT compounds for these four sets of cores are listed in Tables A-1 through A-4 in the Appendix; a station location map is also presented (Figure A-1).

Figure 1 shows the surface sediment distribution of total DDT off Palos Verdes. The highest concentrations we observed were to the northwest of and adjacent to the outfalls, and concentrations decreased rapidly to the southeast of this area. The point of greatest surface contamination was Station 6B, 2 km northwest of the outfall system, where the DDT level was 230 mg/dry kg. At Station DH-7, 9 km to the southeast of Station 6B, the DDT concentration was 0.9 mg/dry kg--250 times lower. In contrast, 9 km to the northwest of Station 6B--at Station 1C, values were only 7 times lower (32 mg/dry kg).

The vertical profile for Station 6B, the point of highest surface contamination, is presented in Figure 2. From the surface to a depth of 24 cm in the core, DDT values fall four orders of magnitude, decreasing by a factor of 10 in the top 12 cm, a factor of 100 in the next 6 cm, and another factor of 10 in the bottom 6 cm. The typical vertical gradient for Region A is also shown in Figure 2; the overall median concentrations fall by two orders of magnitude, decreasing by a factor of 10 in the top 12 cm and another factor of 10 in the next 12 cm.

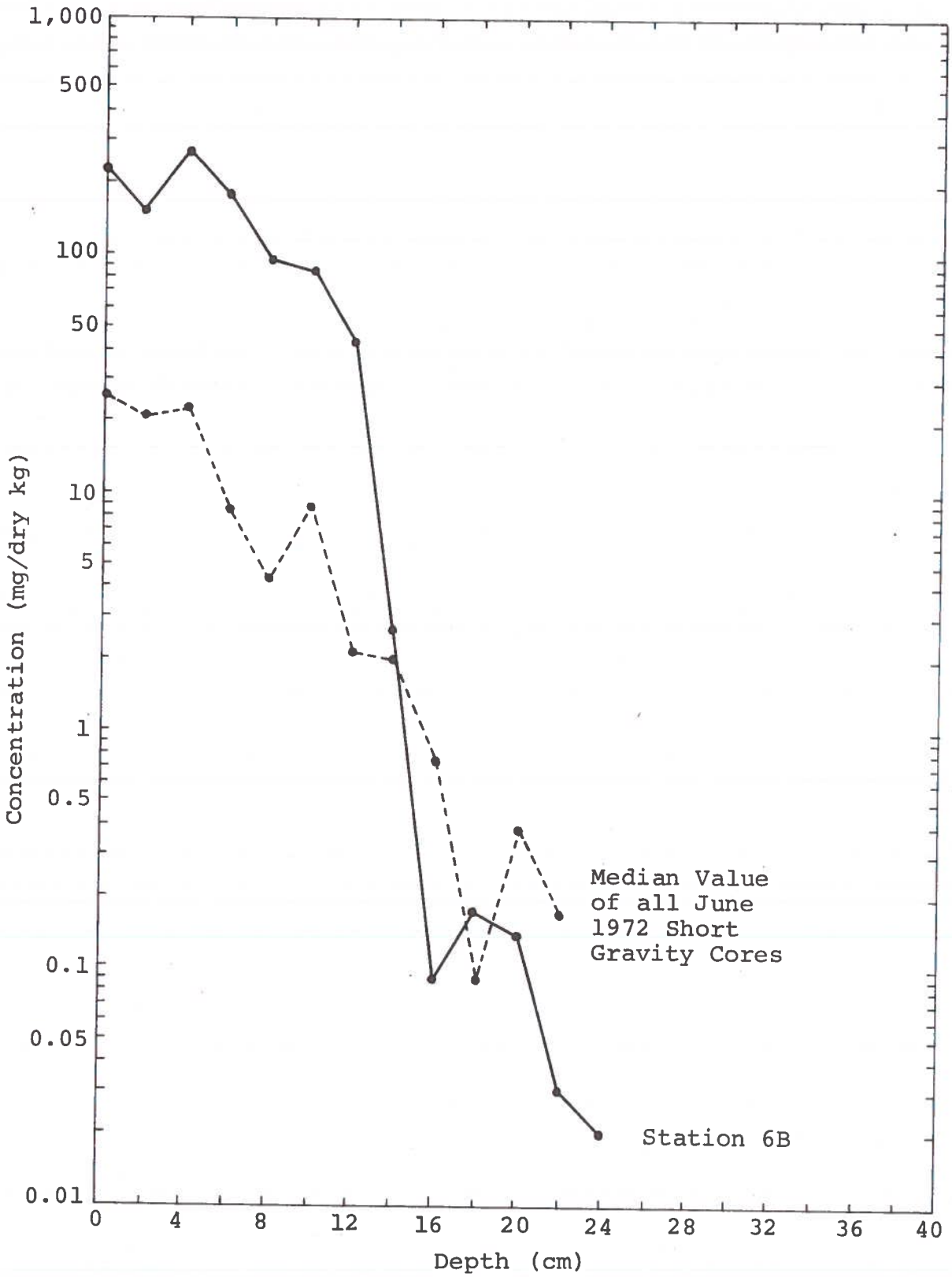

Figure 2. Vertical profile of total DDT in the short gravity core taken at Station 6B, 2 km northwest of the JWPCP 90-in. diffuser, and total DDT median values for all June 1972 short gravity cores, with depth.

Hyperion Outfall Area

Two sets of cores were collected in Santa Monica Bay, which is the site of the municipal wastewater outfall system of the City of Los Angeles. Seventeen box cores were collected in the Santa Monica Canyon region of the Bay during July 1971. In July 1972, Los Angeles City personnel collected short gravity cores from each station on their standard rosette sampling grid and took a single core off the end of both the 5- and 7-mile outfalls. The box cores were subsampled at 3-cm intervals; usually only the surface sample and one subsample at depth were analyzed for DDT content. The short gravity cores were subsampled at 2-cm intervals, and only the surface samples were analyzed. The DDT values for the box and short gravity cores are listed in Appendix Tables A-6 and A-7; station locations for each set of cores are shown in Figure A-2.

The surface sediment distribution of total DDT in Santa Monica Bay is shown in Figure 3. In general, the highest concentrations were found in Santa Monica Canyon near the end of the 7-mile sludge outfall at depths greater than 100 m; this finding suggests that most of the settleable material from this discharge is moving down-canyon.

Figure 4 shows the vertical profile for Station B3, which is located directly off the 7-mile outfall and had the highest surface DDT concentrations of the Santa Monica Bay stations. Here, we found a pattern distinctly different from that in the Whites Point area, where the median DDT concentration is 100 times higher than in Santa Monica Bay: Near Whites Point, sediment concentrations can decrease by as much as four orders of magnitude in 24 cm of core depth, but in the Santa Monica Bay core, the DDT values varied by less than a factor of two in the same amount of core depth. The relative stability of DDT concentration with depth in this core may be due to a local accumulation of sludge that is at least 30 cm deep.

DDT concentrations in the core from Station B6, which is also close to the mouth of the 7-mile outfall fell by only a factor of 15 in 36 cm of core depth. Concentrations in the other box cores, which were collected farther from the discharge site, decreased by up to two orders of magnitude in 30 cm of core depth.

Orange County Outfall Areas

The Orange County Sanitation District switched their wastewater discharge from a 1.6 km (1-mile) outfall to an 8 km (5-mile) outfall off Newport Beach in April 1971. In January 1971, three months before the switchover, Gary Smith, of Scripps Institution of Oceanography, collected a series of cores by diving to the north and south of the old outfall along the 20-m depth contour. In September 1971, after the new outfall had been in operation for

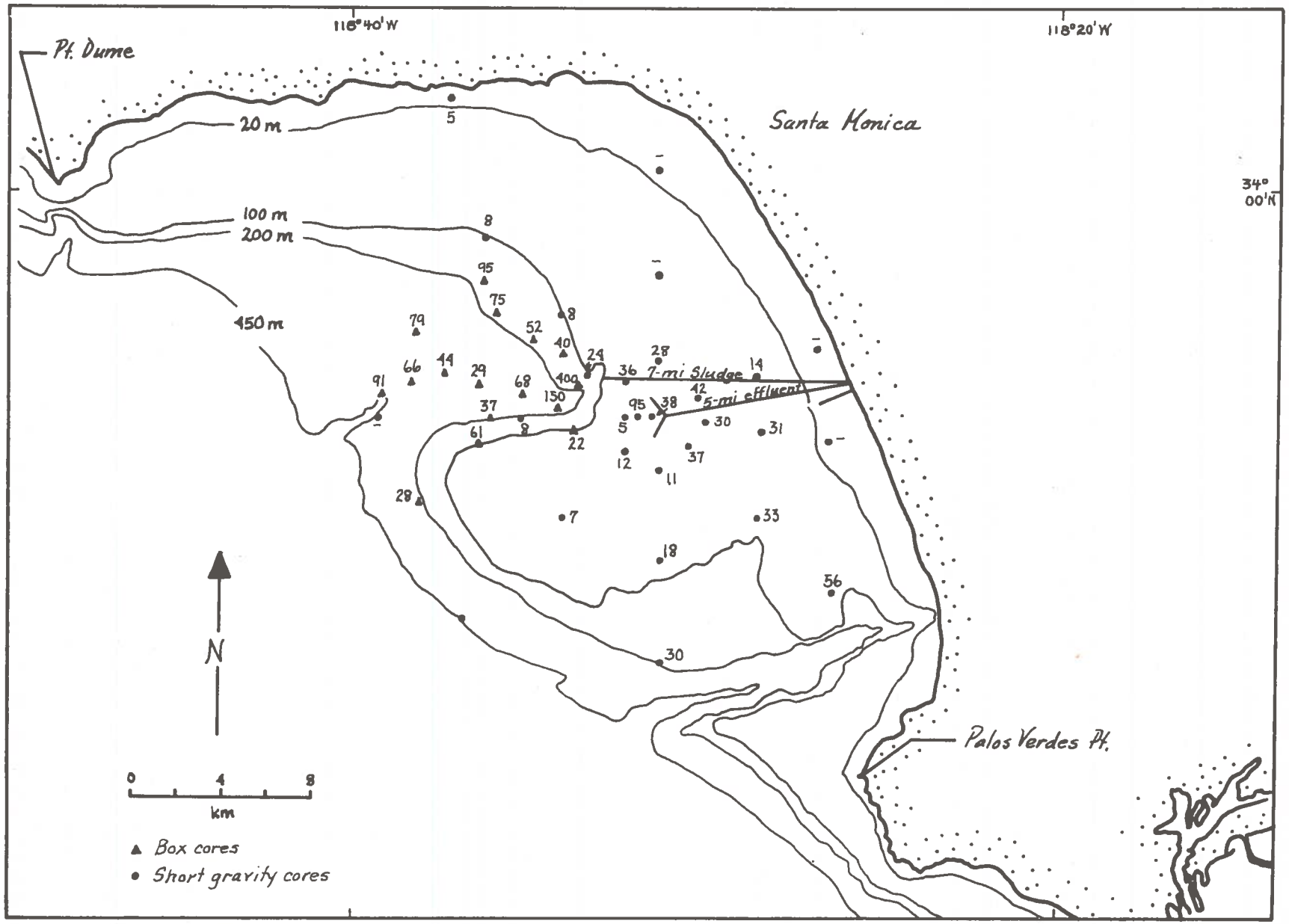

Figure 3. Concentrations of total DDT (10^{-2} mg/dry kg) in surface sediments around the Hyperion outfall system in Santa Monica Bay, box cores collected July 1971, and short gravity cores collected July 1972.

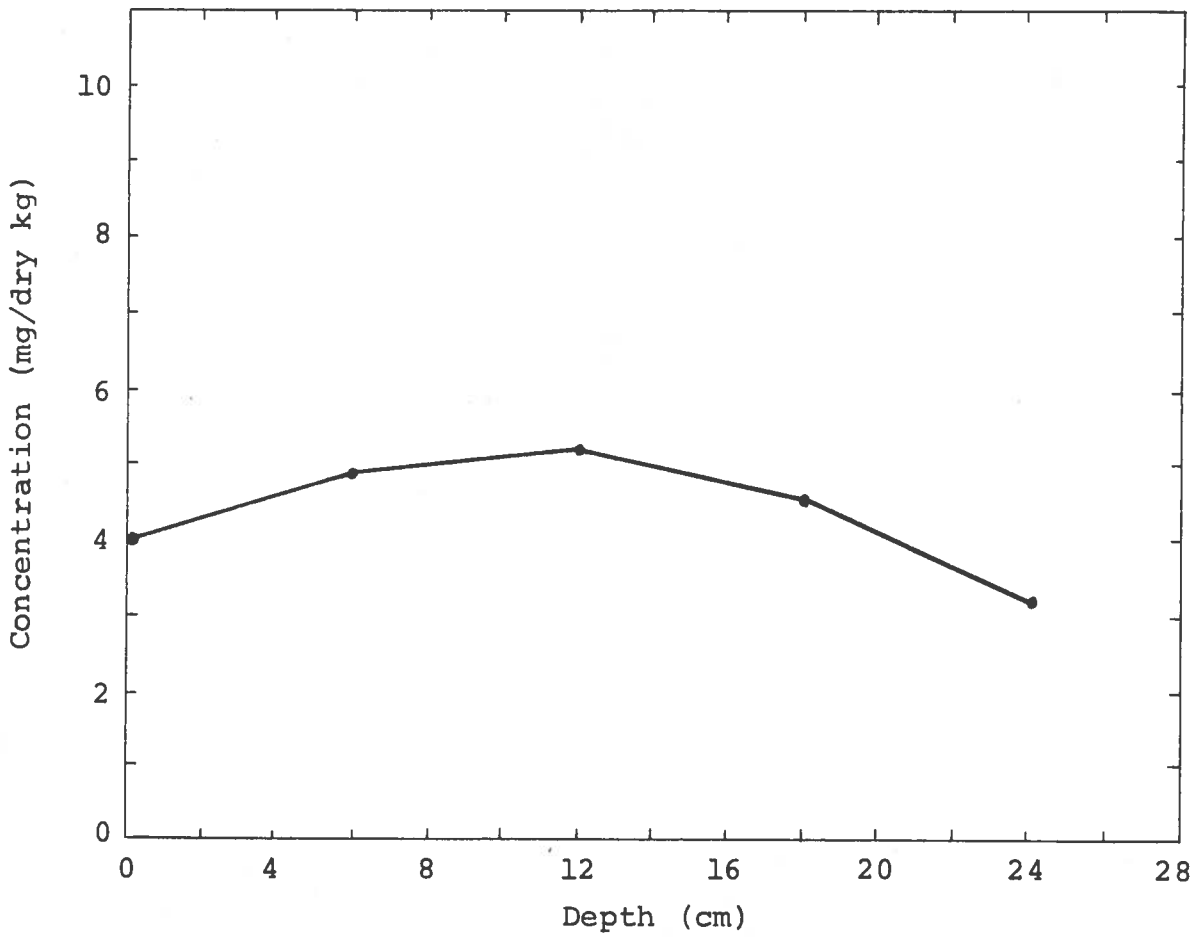

Figure 4. Total DDT vertical profile for the box core collected July 1971 at Station 3B at the head of Santa Monica Canyon.

5 months, the Project collected a series of box cores around both the old and new outfalls. The hand cores were subsampled at 2-cm intervals; the box cores were subsampled at the surface, at 3 and 5 cm, and at each subsequent 5-cm interval. The results of the analysis of these cores are listed in Appendix Tables A-8 and A-9. Figure A-3 is the corresponding station location map.

Surface concentrations of total DDT are presented in Figure 5. The values in the hand cores, which were taken before the switchover, ranged from 0.02 to 0.34 mg/dry kg; those in the box cores, taken after the switchover, ranged from 0.01 to 0.21 mg/dry kg. The highest concentrations in each set of cores are found to the south of the old and new outfalls. In two locations, approximately 400 m to the north and south of the mouth of the old outfall, cores were collected both before and after termination of discharge. Although we cannot do any statistical comparisons with data from only two cores, in both cases the surface sediment concentrations of DDT decreased by a factor of approximately 3.5 after use of the old outfall was terminated. In most cases, there is no strong vertical gradient. The decrease in concentration with depth is generally less than a factor of 3 in the top 15 cm.

APPENDIX

During 1970-73, the Coastal Water Research Project conducted studies to determine the distribution of total DDT in the sediments around the major municipal wastewater outfalls in southern California. Tables A-1 through A-11 give the results of these studies. The locations of the sampling stations discussed are shown in Figures A-1 through A-5.

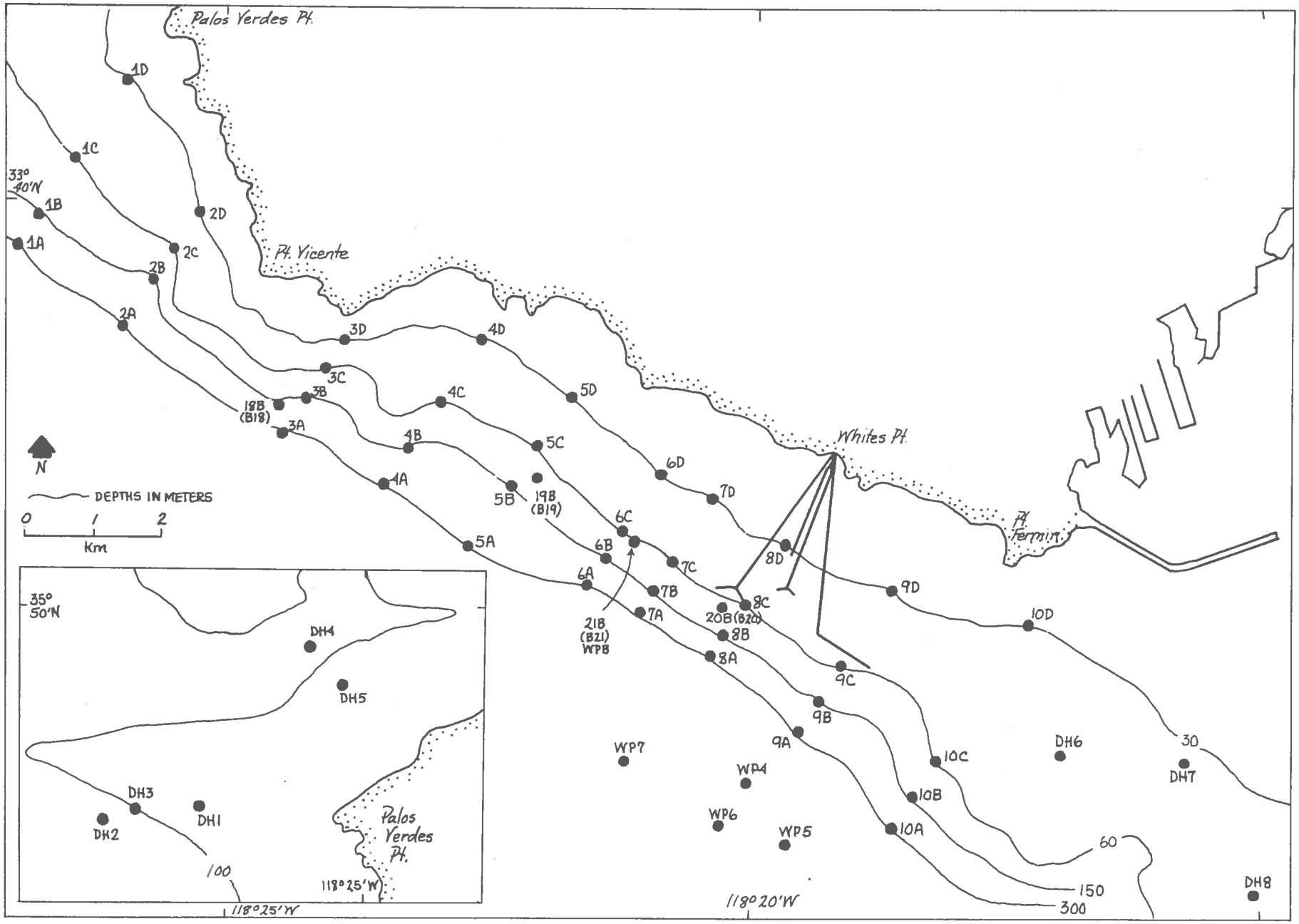

Figure A-1. Location of sampling stations around the Whites Point outfall system. Sediment concentrations of DDT for these stations are given in Tables A-1 through A-5.

Table A-1. Concentrations of DDT and its metabolites (mg/dry kg) in short gravity cores collected off Whites Point, June 1972. Station locations, Fig. A-1

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	Total DDT
1B : 0-2	1.2	7.8	0.20	0.78	0.071	0.44	10
2-4	0.10	0.55	0.030	0.12	ND	0.037	0.84
4-6	0.10	0.92	0.026	0.15	ND	0.44	1.6
6-8	0.025	0.15	0.007	0.022	ND	0.004	0.21
8-10	ND	0.010	0.001	0.005	ND	0.001	0.02
10-12	0.059	0.37	0.015	0.054	ND	0.013	0.51
12-14	0.004	0.027	0.002	0.010	ND	0.018	0.06
14-16	0.004	0.021	0.002	0.006	ND	0.001	0.03
1C : 0-2	4.1	26	0.31	1.3	0.067	0.40	32
2-4	3.7	26	0.53	1.2	ND	0.42	32
4-6	1.1	7.6	0.18	0.55	0.047	0.36	9.8
6-8	0.96	4.6	0.19	0.98	0.039	0.60	7.4
8-10	0.068	0.47	0.041	0.15	0.010	0.13	0.87
10-12	0.006	0.051	0.005	0.020	ND	0.041	0.12
12-14	0.006	0.037	0.003	0.004	0.005	0.022	0.08
1D : 0-2	0.37	2.2	0.036	0.14	0.008	0.027	2.8
2-4	0.40	2.5	0.035	0.14	0.006	0.011	3.1
4-6	0.63	4.0	0.11	0.82	ND	0.17	5.7
6-8	0.34	1.8	0.041	0.14	0.007	0.013	2.3
3C : 0-2	12	71	2.3	8.5	ND	1.9	96
2-4	21	130	2.4	8.3	0.11	1.2	160
4-6	22	120	2.0	7.2	0.19	1.3	150
6-8	15	77	0.99	4.8	ND	0.96	99
8-10	5.4	30	0.77	2.6	0.025	1.8	41
10-12	2.8	26	0.56	1.8	0.072	1.1	32
12-14	1.3	7.3	0.28	1.2	0.046	2.6	13
14-16	0.074	0.40	0.015	0.048	ND	0.011	0.55
16-18	0.048	0.63	0.003	0.045	0.001	0.014	0.74
18-20	0.011	0.071	ND	0.008	ND	0.001	0.09
20-22	0.018	0.35	0.001	0.010	0.001	0.007	0.39
3D : 0-2	1.6	9.8	0.20	0.90	0.062	0.083	13
2-4	2.1	15	0.25	0.80	0.023	0.047	18
4-6	0.55	3.1	0.13	0.47	ND	0.022	4.3
6-8	2.4	13	0.13	0.43	ND	0.17	16
8-10	1.8	11	0.18	0.43	ND	0.16	14
10-12	1.2	7.5	0.090	0.33	ND	0.14	9.3
12-14	0.43	2.2	0.057	0.15	ND	0.049	2.9
14-16	0.36	3.6	0.030	0.14	ND	0.11	4.2
16-18	0.017	0.080	0.002	0.006	0.001	0.001	0.11
5C : 0-2	9.4	55	1.7	10	ND	1.3	77
2-4	9.4	130	1.0	4.0	ND	1.2	150
4-6	25	120	5.8	12	ND	2.2	160
6-8 *	–	–	–	–	–	–	–
8-10*	–	–	–	–	–	–	–
10-12	7.4	60	4.3	12	ND	5.0	89
12-14	0.96	4.2	1.6	3.0	ND	1.9	12
14-16	0.36	2.2	0.16	0.63	0.10	0.44	3.9
16-18	0.23	1.6	0.051	0.30	0.021	0.16	2.4

* sample lost

ND: none detected

Table A-1 continued.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
5C, 18-20	ND	0.056	ND	ND	ND	ND	0.06
20-22	0.077	0.56	0.031	0.045	ND	0.031	0.74
22-24	0.051	0.29	0.016	0.045	ND	0.006	0.41
24-26	0.033	0.24	ND	0.026	ND	0.044	0.34
5D: 0-2	1.7	12	0.35	1.6	ND	0.28	16
2-4	2.0	19	0.37	1.4	ND	0.25	23
4-6	2.8	12	0.36	1.2	0.055	0.18	17
6-8	0.82	4.6	0.16	0.67	0.032	0.96	7.2
8-10	0.44	2.9	0.14	0.55	ND	0.20	4.2
10-12	ND	0.62	0.066	0.26	ND	0.43	1.4
12-14	ND	0.64	0.014	0.092	ND	0.018	0.76
6B: 0-2	12	190	4.1	18	0.41	6.3	230
2-4	10	120	2.1	15	ND	1.9	150
4-6	33	180	8.6	32	0.66	14	270
6-8	20	130	8.0	23	ND	3.8	180
8-10	15	62	3.1	11	0.048	6.2	97
10-12	7.4	63	1.6	8.3	ND	7.6	88
12-14	2.9	26	0.86	6.3	ND	7.8	44
14-16	0.25	1.4	0.11	0.52	0.016	0.39	2.7
16-18	0.007	0.056	0.005	0.020	ND	0.004	0.09
18-20	0.016	0.090	0.011	0.039	0.002	0.022	0.18
20-22	0.014	0.090	0.005	0.025	ND	0.005	0.14
22-24	ND	0.013	0.002	0.004	ND	0.007	0.03
24-26	ND	0.009	ND	0.006	ND	ND	0.02
6D: 0-2	0.91	4.3	0.14	0.72	ND	1.0	7.1
2-4	0.69	3.7	0.16	0.58	ND	0.19	5.3
4-6	3.1	18	0.27	0.98	ND	0.76	23
9B: 0-2	6.7	74	0.79	6.3	ND	1.2	89
2-4	12	94	2.0	8.4	0.18	2.8	120
4-6	3.5	40	0.57	2.6	0.070	7.9	55
6-8	0.69	15	0.15	0.76	ND	0.27	17
8-10	0.21	1.7	0.12	0.59	0.031	0.34	3.0
10-12	0.11	0.81	0.075	0.36	ND	0.19	1.5
12-14	0.024	0.18	ND	0.038	ND	0.008	0.25
14-16	0.001	0.008	0.002	0.005	0.002	0.035	0.05
16-18	ND	0.002	0.001	0.002	ND	0.016	0.02
18-20	0.001	0.005	0.001	0.001	ND	0.002	0.01
9C: 0-2	14	98	3.6	16	ND	1.6	130
2-4	2.7	13	0.61	1.5	ND	0.84	19
4-6	3.1	32	0.66	2.3	0.067	1.6	40
6-8	15	54	1.0	5.6	0.062	6.8	82
8-10	3.2	18	0.63	3.4	ND	2.9	28
10-12	0.98	6.1	0.35	1.7	ND	3.7	13
12-14	0.73	4.4	0.38	0.95	ND	0.61	7.1
14-16	0.17	1.8	0.13	0.31	ND	0.45	2.9
16-18	0.17	1.0	0.043	0.17	ND	0.24	1.6
18-20	0.007	0.034	0.007	0.027	ND	0.004	0.08
20-22	0.007	0.058	ND	0.006	ND	0.009	0.08

ND: none detected

Table A-1 continued.

Core Number: Depth(cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
9C : 22-24	0.012	0.079	0.002	0.010	ND	0.007	0.11
9D : 0-2	0.80	5.8	0.25	1.2	ND	0.23	8.3
2-4	1.6	18	0.61	1.8	0.21	1.4	24
4-6	1.8	22	0.77	1.9	0.12	1.2	28
6-8	0.26	1.3	0.19	0.44	ND	0.48	2.7
8-10	0.24	0.94	0.33	0.72	0.073	0.80	3.1
10-12	0.28	0.92	0.32	0.65	0.062	1.2	3.4
12-14	0.10	0.39	0.22	0.44	0.036	0.93	2.1
14-16	0.088	0.23	0.32	0.62	0.12	0.59	2.0
10B 0-2	2.0	11	0.32	1.4	ND	1.3	16
2-4	0.30	9.6	0.22	0.68	0.52	1.3	13
4-6	0.090	0.51	0.047	0.16	0.066	0.12	1.0
6-8	0.050	0.47	0.035	0.12	0.060	0.083	0.82
8-10	0.004	0.065	0.003	0.011	0.002	0.012	0.10
10-12	0.001	0.023	0.001	0.008	0.002	0.004	0.04
10C 0-2	3.8	19	0.48	1.9	ND	0.66	26
2-4	0.023	5.8	0.047	0.12	ND	0.046	6.0
4-6	0.16	1.1	0.080	0.29	ND	0.20	1.8
6-8	0.060	0.37	0.020	0.071	ND	0.097	0.62
8-10	0.012	0.060	0.005	0.016	0.002	0.007	0.10
10D : 0-2	0.74	4.6	ND	0.47	ND	0.16	6.0
2-4	0.62	6.7	0.22	0.99	0.030	0.25	8.8
4-6	1.4	7.5	0.57	2.3	0.15	1.1	13
6-8	1.1	14	0.42	1.2	0.070	0.20	17
8-10	0.65	2.7	0.11	0.35	ND	0.053	3.9
10-12	1.1	5.7	0.19	0.74	0.073	0.50	8.3
12-14	0.18	0.86	0.056	0.22	ND	0.28	1.6
14-16	0.21	0.60	0.074	0.30	0.008	0.20	1.4
16-18	0.20	0.83	0.082	0.29	ND	0.14	1.5
18-20	0.091	0.50	0.037	0.12	ND	0.034	0.78
18B: 0-2	2.3	14	0.32	1.7	ND	0.49	19
2-4	1.6	7.6	0.34	1.1	ND	0.37	11
4-6	1.2	5.6	0.28	0.75	ND	3.4	11
6-8	0.20	2.6	0.034	0.19	0.009	0.16	3.2
8-10	0.012	0.18	0.007	0.037	0.005	0.062	0.30
10-12	0.002	0.031	0.002	0.012	ND	0.013	0.06
12-14	0.002	0.016	ND	0.004	ND	0.009	0.03
14-16	ND	0.007	ND	ND	ND	0.002	0.01
16-18	0.002	0.014	ND	0.002	ND	0.009	0.03
19B: 0-2	16	100	3.2	16	0.10	2.3	140
2-4	14	95	2.8	14	0.36	4.9	130
4-6	18	82	2.7	9.7	0.18	2.9	120
6-8	24	140	1.6	14	0.026	3.4	180
8-10	13	80	2.1	8.0	0.074	4.9	110
10-12	5.4	40	1.3	6.2	0.060	4.8	58
12-14	0.39	3.0	0.21	0.70	0.031	1.1	5.4
14-16	0.55	3.2	0.18	0.76	0.060	0.62	5.4
16-18	0.18	1.0	0.050	0.18	0.43	0.14	2.0

ND: none detected

Table A-1 continued.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
19B : 18-20	0.039	0.32	0.017	0.066	0.008	0.026	0.48
20-22	0.020	0.18	0.005	0.025	ND	0.006	0.24
22-24	ND	ND	ND	0.073	ND	0.091	0.16
24-26*	—	—	—	—	—	—	—
26-28	ND	ND	ND	ND	ND	0.004	0.004
20B : 0-2	24	120	1.6	19	ND	7.1	170
2-4	19	130	4.2	15	ND	7.7	180
4-6	14	85	1.8	11	ND	13	120
6-8	0.95	5.6	0.28	1.1	ND	0.44	8.4
8-10	1.9	11	0.86	2.8	ND	3.4	20
10-12	0.61	3.1	0.22	0.74	ND	0.58	5.2
12-14	0.059	0.31	0.019	0.086	ND	0.042	0.52
14-16	0.019	0.051	ND	0.025	ND	0.019	0.11
16-18	0.004	0.035	0.002	0.009	0.001	0.012	0.06
18-20	0.006	0.024	ND	0.005	ND	0.035	0.07
21B : 0-2	10	120	3.9	18	ND	5.6	160
2-4	9.8	150	4.6	27	0.42	1.8	190
4-6	12	160	2.4	14	ND	7.5	200
6-8	28	230	8.0	35	ND	3.4	300
8-10	57	330	13	42	ND	ND	440
10-12	43	250	12	40	0.36	2.0	350
12-14	9.9	98	1.3	4.9	ND	2.6	120
14-16	8.9	120	1.1	6.3	0.13	3.3	140
16-18	11	83	3.0	13	0.24	24	130
18-20	2.0	9.6	2.0	6.5	0.072	6.0	26
20-22	2.6	18	3.7	3.9	0.40	4.5	33
22-24	0.24	1.2	0.031	0.20	ND	0.33	2.0
24-26	0.042	0.31	0.049	0.17	0.002	0.12	0.69
26-28	0.056	0.28	0.077	0.26	0.011	0.31	0.99
28-30	0.026	0.13	0.038	0.10	0.005	0.30	0.60

ND : None detected

* Sample lost

Table A-2. Concentrations of DDT and its metabolites (mg/dry kg) in box cores collected off Whites Point, July 1971. Station locations, Fig. A-1.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDT	o,p'-DDT	p,p'-DDT	TOTAL DDT
B18: 0	3.2	20	0.80	3.8	ND	1.1	29
7	0.36	1.7	0.074	0.37	ND	0.12	2.6
14	0.16	0.50	0.021	0.10	ND	0.044	0.82
B19: 0	25	150	6.5	33	ND	10	220
15	11	70	3.8	17	ND	11	110
24	0.23	1.2	0.16	0.75	ND	0.54	2.9
33	0.035	0.19	0.024	0.064	0.016	0.061	0.39
B20: 0	35	230	11	43	0.62	13	330
15	4.2	33	2.2	11	0.43	7.3	58
22	1.6	10	0.73	3.1	0.39	2.4	18
B21: 0	24	140	7.3	31	2.0	7.0	210
15	18	120	4.4	23	ND	12	180
27	0.086	0.43	0.11	0.46	0.041	0.18	1.3
36	0.013	0.095	0.009	0.058	ND	0.39	0.56

ND: none detected

Table A-3. Concentration of DDT and its metabolites (mg/dry kg) in short gravity cores collected off Whites Point, July 1972. Station locations, Fig. A-1.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
DH-1 : 0-2	1.6	11	0.28	0.93	ND	0.066	14
DH-2 : "	0.12	1.3	0.016	0.087	ND	0.015	1.5
DH-3 : "	0.13	0.78	0.009	0.042	ND	0.018	0.98
DH-4 : "	0.13	1.5	0.016	0.079	0.007	0.026	1.8
DH-5 : "	0.51	3.0	0.035	0.27	0.011	0.15	4.0
DH-6 : "	0.47	2.6	0.035	0.18	0.009	0.055	3.3
DH-7 : "	0.086	0.66	0.014	0.089	ND	0.075	0.92
DH-8 : "	0.077	0.46	0.009	0.053	ND	0.031	0.63

ND: none detected

Table A-4. Concentrations of DDT and its metabolites (mg/dry kg) in 8-cm (3-in.) barrel cores collected by Andrew Soutar, Scripps Institution of Oceanography, off Whites Point, July 1972. Station locations, Fig. A-1.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
WP-B : 0-1	16	100	2.7	15	ND	3.6	140
1-2	11	78	2.3	11	ND	5.9	110
2-3	12	99	2.6	14	ND	4.6	130
3-4	12	84	2.4	11	ND	3.6	110
4-5	14	120	2.3	14	1.0	4.8	160
5-6	20	120	2.5	12	0.33	4.9	160
6-7	16	92	2.2	11	ND	5.1	130
7-8	16	150	2.8	15	ND	7.2	190
8-9	7.3	52	1.2	7.5	ND	3.4	71
9-10	19	200	3.6	20	1.4	11	260
10-12	14	110	1.7	9.5	0.21	9.9	150
12-14	20	120	2.8	16	0.25	5.5	160
14-16	24	130	2.3	11	0.21	4.6	170
16-18	12	150	2.4	12	0.28	6.4	180
18-20	14	81	1.5	8.5	0.18	7.2	110
20-22	13	68	2.0	9.4	ND	6.1	98
22-24	27	150	2.3	12	0.22	3.9	200
WP-4 : 0-1	5.1	29	1.2	4.8	ND	1.3	41
1-2	7.4	37	0.68	2.3	0.046	1.1	49
2-3	1.4	14	0.31	1.2	0.042	1.9	19
3-4	1.6	9.3	2.0	0.76	0.011	0.93	15
4-5	0.77	6.1	0.22	0.84	0.080	1.5	9.5
5-6	0.62	3.6	0.16	0.60	0.12	0.75	5.8
6-7	0.093	0.64	0.075	0.28	0.034	0.42	1.5
7-8	0.088	0.52	0.031	0.12	0.006	0.10	0.86
8-9	0.019	0.12	0.006	0.016	ND	0.012	0.17
9-10	0.24	1.2	0.035	0.13	0.008	0.048	1.7
10-12	0.020	0.26	0.007	0.023	0.001	0.016	0.33
12-14	0.027	0.20	0.007	0.025	0.002	0.029	0.29
14-16	0.010	0.14	0.005	0.014	0.001	0.028	0.20
16-18	0.004	0.034	0.009	0.035	0.005	0.17	0.26
18-20	0.002	0.015	0.005	0.014	0.008	0.037	0.08
20-22	0.027	0.14	0.002	0.092	0.014	0.007	0.28
22-24	0.004	0.024	<0.001	0.001	ND	0.001	0.03
24-26	0.007	0.035	0.001	0.003	ND	0.002	0.05
26-28	0.002	0.010	<0.001	0.001	ND	0.001	0.01
28-30	0.001	0.010	ND	0.001	ND	0.002	0.01
30-34	0.001	0.006	<0.001	0.001	ND	0.001	0.01
34-38	0.007	0.043	0.001	0.005	<0.001	0.034	0.09
38-42	0.001	0.006	<0.001	0.001	ND	0.005	0.01
42-46	0.001	0.005	<0.001	<0.001	<0.001	<0.001	<0.01 ≥0.006
46-50	<0.001	0.001	ND	<0.001	ND	<0.001	<0.004 ≥0.001
50-54	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.006 ≥0.001
54-58	<0.001	<0.001	ND	<0.001	ND	<0.001	<0.004 ≥0
58-62	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.006 ≥0.001
62-66	ND	ND	ND	ND	ND	<0.001	<0.001 ≥0
66-70	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.006 ≥0.001
70-74	ND	ND	ND	ND	ND	ND	ND

ND: none detected

Table A-4 continued.

Core Numbers: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
WP-4: 74-78	ND	ND	ND	<0.001	ND	0.001	<0.002 ≥0.001
WP-5: 0-1	0.26	24	0.54	0.21	0.016	0.19	25
1-2	3.6	21	0.32	4.3	0.24	2.4	32
2-3	4.4	30	0.31	1.0	0.099	0.54	36
3-4	3.1	19	0.47	1.8	0.040	0.94	25
4-5	3.5	20	0.40	1.3	0.067	0.94	26
5-6	0.99	19	1.5	1.1	0.035	0.37	23
6-7	2.7	15	0.22	0.76	0.033	0.24	19
7-8	0.28	1.7	0.046	0.29	ND	0.055	2.4
8-9	0.76	7.4	0.12	0.51	0.023	0.22	9.0
9-10	0.57	1.3	0.097	0.76	0.025	0.23	3.0
10-12	0.63	7.1	0.15	0.58	0.067	0.32	8.8
12-14	0.98	7.7	0.20	1.6	0.070	1.1	12
14-16	0.64	8.0	0.15	0.66	0.040	0.63	10
16-18	1.6	11	0.60	2.7	0.18	0.85	17
18-20	0.66	4.5	0.37	1.1	0.095	1.2	7.9
20-24	0.15	0.92	0.29	0.93	0.37	0.79	3.4
24-28	0.022	0.071	0.085	0.12	0.097	0.088	0.48
28-32	ND	0.038	0.012	0.013	ND	0.008	0.07
32-36	ND	0.019	ND	0.003	ND	ND	0.02
36-40	0.003	0.022	0.007	0.006	ND	0.005	0.04
40-48	0.010	0.14	0.003	0.010	0.001	0.007	0.17
48-56	0.002	0.016	ND	0.004	ND	0.007	0.03
56-64	ND	0.008	<0.001	0.001	ND	<0.001	0.01
64-72	0.001	0.009	ND	0.001	ND	0.001	0.01
72-80	ND	<0.001	ND	ND	ND	ND	<0.001 ≥0
80-88	ND	0.001	ND	0.001	ND	0.001	0.003
88-96	ND	<0.001	ND	ND	ND	ND	<0.001 ≥0
96-104	ND	0.001	ND	ND	ND	ND	0.001
WP-6: 0-1	0.20	2.6	0.043	0.14	0.007	0.20	3.2
1-2	1.1	4.8	0.14	0.50	0.033	0.22	6.8
2-3	0.75	4.6	0.11	0.37	0.034	0.33	6.2
3-4	0.21	1.0	0.15	0.54	0.010	0.36	2.3
4-5	0.87	5.3	0.14	0.39	0.024	0.35	7.1
5-6	1.0	5.3	0.28	0.88	0.031	0.36	7.9
6-7	1.6	8.4	1.7	0.51	0.063	0.48	13
7-8	1.7	7.0	0.20	0.77	0.057	0.23	10
8-9	0.77	6.4	0.18	0.75	0.063	0.46	8.6
9-10	1.3	5.6	0.35	1.1	0.082	0.36	8.8
10-12	0.62	3.8	0.079	0.26	0.027	0.26	5.0
12-14	0.51	2.2	0.099	0.27	0.025	0.16	3.3
14-16	0.38	2.3	0.066	0.23	0.013	0.19	3.2
16-18	0.29	1.4	0.24	0.45	0.20	0.77	3.4
18-20	0.10	0.72	0.074	0.28	0.050	0.52	1.7
20-24	0.029	0.11	0.026	0.054	0.013	0.058	0.29
24-28	0.006	0.043	0.001	0.004	0.013	0.002	0.07
28-32	0.002	0.015	0.002	0.006	0.001	0.007	0.03
32-36	0.001	0.006	<0.001	ND	0.001	0.005	0.01

ND: none detected

Table A-4 continued.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
WP-6 . 36 40	0.058	0.209	0.067	0.24	0.32	2.1	3.0
40 48	<0.001	<0.001	ND	<0.001	<0.001	<0.001	<0.005 ≥0
48-56	0.017	0.15	0.002	0.010	ND	0.016	0.20
56-64	<0.001	0.003	0.001	0.005	0.001	0.005	0.02
64-72	ND	0.001	ND	ND	ND	ND	0.001
72-80	<0.001	0.001	<0.001	<0.001	ND	<0.001	<0.005 ≥0.001
80-88	ND	0.001	ND	ND	ND	ND	0.001
88-96	<0.001	0.001	<0.001	<0.001	ND	<0.001	<0.005 ≥0.001
96-104	ND	<0.001	ND	ND	ND	ND	<0.001 ≥0
104-112	<0.001	0.001	ND	<0.001	ND	<0.001	<0.004 ≥0.001
112-120	ND	<0.001	ND	ND	ND	ND	<0.001 ≥0
120-128	<0.001	<0.001	ND	<0.001	ND	<0.001	≤0.004 ≥0
WP-7: 0-1	1.4	8.3	0.23	0.95	ND	0.46	11
1-2	2.3	14	ND	1.7	ND	0.20	18
2-4	1.3	12	ND	0.94	ND	0.052	14
4-6	0.89	7.6	ND	0.49	ND	0.033	9.0
7-8	0.78	6.6	ND	0.54	ND	0.12	8.0
8-10	0.39	2.6	ND	0.28	ND	0.048	3.3
11-12	0.010	0.088	ND	0.006	ND	0.003	0.11
12-14	0.006	0.054	ND	0.004	ND	ND	0.06
14-16	0.005	0.042	ND	0.004	ND	ND	0.05
16-17	0.001	0.002	ND	ND	ND	ND	0.003
20-21	0.001	0.011	ND	0.001	ND	ND	0.01

ND: none detected

Table A-5. Concentrations of DDT and its metabolites (mg/dry kg) in Shipek grabs collected off Whites Point, August-September 1973. Station locations, Fig. A-1. County Sanitation Districts of Los Angeles County monitoring data.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
1A : 0-5	0.51	2.4	0.09	0.27	0.09	0.11	3.5
1B : "	1.3	4.0	0.10	0.65	0.17	0.20	6.4
1C : "	6.6	27	0.77	1.7	0.37	0.43	37
1D : "	1.2	3.4	0.12	0.22	0.06	0.04	5.0
2A : "	ND	35	ND	5.9	ND	2.1	43
2B : "	ND	42	2.6	6.9	ND	3.2	55
2C : "	15	130	4.6	6.4	ND	1.5	160
2D : "	2.7	6.7	0.18	0.44	0.10	0.09	10
3A : "	ND	4.8	0.15	0.40	0.06	0.26	5.7
3B : "	ND	21	0.55	2.3	0.15	1.9	26
3C : "	ND	89	1.9	8.2	0.43	1.2	100
3D : "	ND	9.8	0.25	0.84	0.08	0.15	11
4A : "	2.4	6.1	0.36	1.6	0.08	0.93	11
4B : "	11	39	1.6	5.8	0.27	1.1	59
4C : "	20	68	2.4	7.7	ND	2.6	100
4D : "	2.8	9.6	0.24	1.4	ND	0.25	14
5A : "	2.9	14	0.50	1.3	0.32	0.52	20
5B : "	15	120	2.4	11	0.54	2.0	150
5C : "	44	120	2.4	11	0.80	2.4	180
5D : "	12	130	0.39	1.2	0.15	0.57	150
6A : "	7.1	52	1.5	3.2	0.33	2.0	66
6B : "	20	160	3.6	10	0.89	4.5	200
6C : "	5.8	230	8.4	32	ND	8.4	280
6D : "	ND	26	0.76	2.8	ND	1.2	31
7A : "	2.2	15	0.46	1.1	0.27	0.53	20
7B : "	27	180	38	10	1.0	1.7	220
7C : "	56	350	7.7	26	1.7	2.2	440
7D : "	ND	40	1.0	1.8	ND	ND	43
8A : "	8.2	33	0.73	2.2	0.29	0.81	45
8B : "	20	92	2.2	8.8	0.20	1.7	120
8C : "	37	170	4.6	54	0.53	19	290
8D : "	8.8	44	2.0	12	0.45	18	85
9A : "	2.8	11	0.35	0.86	ND	0.56	16
9B : "	11	75	1.5	5.8	ND	1.9	95
9C : "	14	70	1.4	6.3	0.20	2.7	95
9D : "	3.2	9.7	0.28	0.90	0.03	2.0	16
10A : "	0.98	6.6	0.23	0.64	0.21	0.43	9.1
10B : "	3.1	14	0.52	1.8	0.43	1.2	21
10C : "	6.8	41	1.3	3.4	0.71	0.68	54
10D : "	11	26	0.66	2.2	ND	0.39	40

ND: none detected

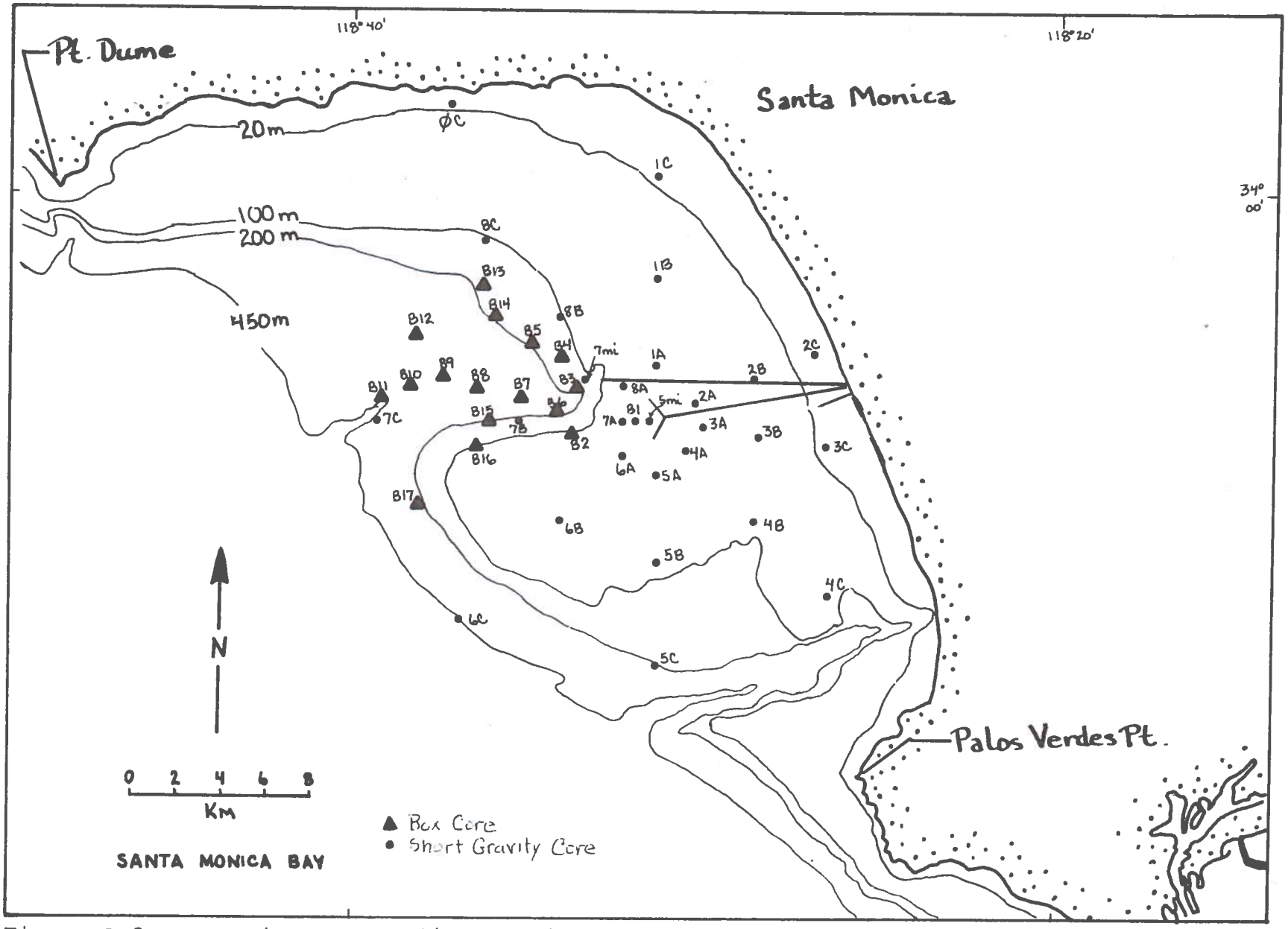

Figure A-2. Location of sampling stations around the Hyperion outfall system. Sediment concentrations of DDT for these stations can be found in Tables A-6 & A-7.

Table A-6. Concentrations of DDT and its metabolites (mg/dry kg) in box cores collected in Santa Monica Canyon, July 1971. Station locations, Fig. A-2.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
B1 : 0	0.074	0.43	0.036	0.31	0.022	0.077	0.95
B2 : 0	ND	0.11	0.008	0.068	0.013	0.026	0.22
B3 : 0	ND	2.5	0.11	0.69	0.35	0.32	4.0
6	0.13	3.7	ND	0.49	0.22	0.34	4.9
12	0.45	3.3	ND	0.69	0.33	0.41	5.2
18	0.42	2.5	0.12	0.65	0.32	0.48	4.5
24	0.26	1.8	0.14	0.51	0.16	0.36	3.2
B4 : 0	0.042	0.24	ND	0.070	0.012	0.037	0.40
3	0.036	0.18	ND	0.049	0.006	0.022	0.29
B5 : 0	0.048	0.35	0.008	0.057	0.010	0.045	0.52
3	0.011	0.093	0.003	0.020	0.005	0.008	0.14
6	0.004	0.039	0.001	0.006	0.001	0.004	0.06
9	0.002	0.023	0.0007	0.005	0.0008	0.013	0.04
B6 : 0	0.094	1.1	0.014	0.15	0.038	0.10	1.5
36	0.008	0.064	0.002	0.014	0.003	0.008	0.10
B7 : 0	0.068	0.50	0.003	0.057	0.014	0.035	0.68
24	ND	0.004	0.0007	0.0009	ND	0.0007	0.006
B8 : 0	0.054	0.14	0.004	0.054	0.006	0.028	0.29
30	ND	0.002	0.0007	0.006	ND	0.001	0.01
B9 : 0	0.049	0.30	0.008	0.057	0.006	0.020	0.44
33	0.013	0.021	0.002	0.010	0.003	0.013	0.06
B10 : 0	0.049	0.52	0.006	0.047	0.001	0.037	0.66
30	ND	0.003	ND	0.001	ND	0.002	0.006
B11 : 0	0.11	0.62	0.015	0.10	0.008	0.055	0.91
30	0.001	0.012	0.004	0.012	0.002	0.017	0.05
B12 : 0	0.046	0.57	0.010	0.053	0.003	0.11	0.79
24	ND	0.007	ND	0.001	0.003	0.011	0.02
B13 : 0	0.088	0.69	0.013	0.10	ND	0.057	0.95
30	ND	0.009	ND	0.002	0.001	0.008	0.02
B14 : 0	0.041	0.43	0.006	0.057	0.004	0.21	0.75
30	ND	0.004	ND	0.001	ND	0.002	0.007
B15 : 0	0.030	0.26	0.010	0.039	0.003	0.027	0.37
9	0.018	0.16	0.005	0.024	ND	0.005	0.21
B16 : 0	0.061	0.40	0.014	0.076	0.014	0.044	0.61
3	0.17	0.14	0.003	0.015	0.001	0.003	0.33
B17 : 0	0.028	0.18	0.015	0.039	ND	0.019	0.28
12	0.004	0.026	0.002	0.008	ND	0.011	0.05

ND: none detected

Table A-7. Concentrations of DDT and its metabolites (mg/dry kg) in short gravity cores collected in Santa Monica Bay, July 1972. Station locations, Fig. A-2.

Core Number Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
1A : 0-2	0.035	0.19	ND	0.030	0.011	0.013	0.28
1B* : "	–	–	–	–	–	–	–
2A : "	0.035	0.31	ND	0.051	0.014	0.013	0.42
2B : "	0.014	0.10	0.005	0.014	ND	0.007	0.14
3A : "	0.039	0.22	0.005	0.026	ND	0.011	0.30
3B : "	0.042	0.22	0.006	0.026	0.004	0.010	0.31
4A : "	0.042	0.28	ND	0.034	ND	0.018	0.37
4B : "	0.047	0.25	0.008	0.019	0.003	0.006	0.33
4C : "	0.055	0.46	0.006	0.026	ND	0.015	0.56
5A : "	0.012	0.078	ND	0.012	ND	0.009	0.11
5B : "	0.014	0.12	0.002	0.010	0.002	0.035	0.18
5C : "	0.029	0.21	0.006	0.013	ND	0.042	0.30
6A : "	0.009	0.086	ND	0.010	ND	0.011	0.12
6B : "	0.008	0.059	0.001	0.004	0.0003	0.002	0.07
7A : "	0.004	0.033	ND	0.004	ND	0.007	0.05
7B : "	0.006	0.062	ND	0.004	0.001	0.002	0.08
8A : "	0.058	0.24	ND	0.026	ND	0.039	0.36
8B : "	0.008	0.049	ND	0.007	0.007	0.010	0.08
8C : "	0.002	0.061	ND	0.005	ND	0.011	0.08
5mi : "	0.072	0.28	ND	0.011	0.004	0.018	0.38
7mi : "	0.010	0.17	ND	0.026	ND	0.032	0.24
ØC : "	0.007	0.037	0.001	0.006	ND	0.002	0.05

* sample lost
ND: none detected

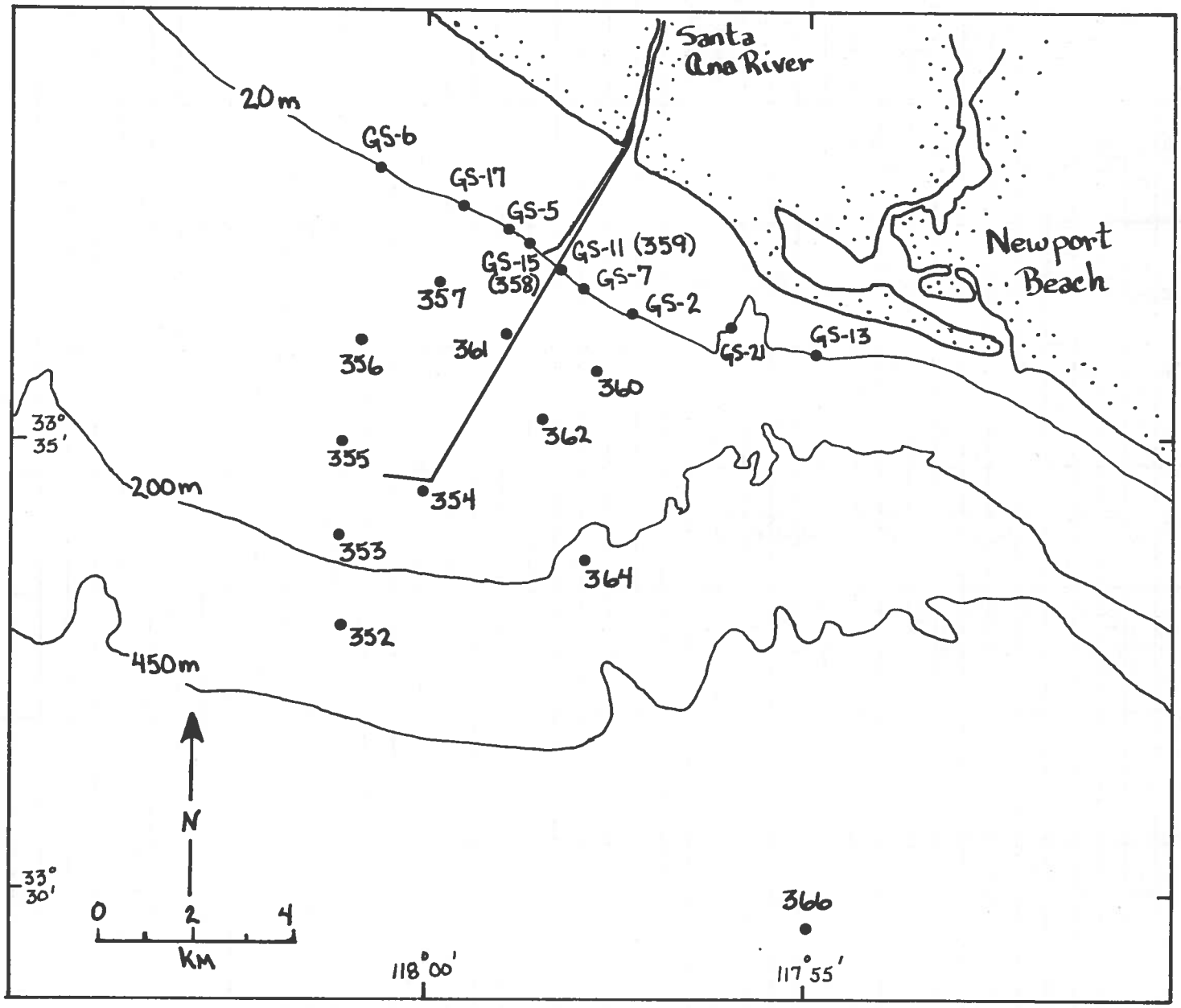

Figure A-3. Locations of sampling stations around the Orange County outfall system. Sediment concentrations of DDT for these stations are given in Tables A-8 and A-9.

Table A-8. Concentrations of DDT and its metabolites (mg/dry kg) in hand cores collected by Gary Smith, Scripps Institution of Oceanography, off the 1-mi. Orange County outfall, January 1971. Station locations, Fig. A-3.

Core Number Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
GS-2 0-2	0.009	0.059	ND	0.019	ND	0.003	0.090
2-4	0.011	0.10	ND	0.028	ND	0.011	0.15
GS-5 0-2	ND	0.098	ND	0.021	ND	ND	0.12
2-4	ND	0.075	ND	0.020	ND	0.037	0.13
GS-6 0-2*	-	-	-	-	-	-	-
2-4	ND	0.065	ND	0.010	ND	ND	0.075
GS-7 0-2	ND	0.046	ND	0.015	ND	0.012	0.073
2-4	ND	0.039	ND	0.013	ND	ND	0.052
GS-11 0-2	ND	0.12	ND	0.051	ND	ND	0.17
2-4	ND	0.029	ND	0.007	ND	ND	0.036
GS-13 0-2	ND	0.020	ND	0.004	ND	ND	0.024
2-4	ND	0.017	ND	0.003	ND	0.001	0.021
GS-15 0-2	ND	0.058	ND	0.014	ND	ND	0.072
2-4	ND	0.071	ND	0.023	ND	ND	0.094
GS-17 0-2	ND	0.078	ND	0.013	ND	ND	0.091
2-4	ND	0.11	ND	0.028	ND	ND	0.14
GS-21 0-2	ND	0.10	ND	0.058	ND	0.18	0.34
2-4	0.014	0.14	ND	0.043	ND	0.010	0.21

* Sample lost
ND none detected

Table A-9. Concentrations of DDT and its metabolites (mg/dry kg) in box cores collected around the Orange County outfall system, September 1971. Station locations, Fig. A-3.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	Total DDT
352 : 0	ND	0.078	ND	0.040	ND	0.009	0.13
3	ND	0.034	ND	0.010	ND	0.006	0.050
5	ND	0.015	ND	0.004	ND	0.004	0.023
10	ND	0.003	ND	0.002	ND	0.002	0.007
15	ND	0.016	ND	0.015	ND	0.022	0.053
20	ND	0.0005	ND	ND	ND	ND	0.0005
353 : 0	ND	0.043	ND	0.009	ND	0.022	0.074
3	ND	0.042	ND	0.009	ND	0.004	0.055
5	ND	0.042	ND	0.009	ND	0.005	0.056
10	ND	0.014	ND	0.040	ND	0.006	0.060
354 : 0	ND	0.034	ND	0.016	ND	0.008	0.058
3	ND	0.044	ND	0.012	ND	0.004	0.060
355 : 0	ND	0.071	ND	0.009	ND	0.006	0.086
3	ND	0.039	ND	0.008	ND	0.005	0.052
5	ND	0.064	0.006	0.012	ND	0.007	0.089
356 : 0	ND	0.042	ND	0.004	ND	0.003	0.049
3	ND	0.043	ND	0.002	ND	0.001	0.046
5	ND	0.030	ND	0.001	ND	0.001	0.032
10	ND	0.015	ND	0.002	ND	0.003	0.020
357 : 0	ND	0.044	ND	0.009	ND	0.010	0.063
3	ND	0.045	ND	0.017	ND	0.026	0.088
5	ND	0.046	ND	0.006	ND	0.012	0.064
358 : 0	ND	ND	ND	0.006	ND	0.009	0.015
3	ND	ND	ND	ND	ND	0.003	0.003
5	ND	0.004	ND	ND	ND	ND	0.004
359 : 0	ND	0.029	ND	0.007	0.001	0.011	0.048
3	ND	0.250	ND	0.070	ND	0.086	0.40
5	ND	0.094	ND	0.050	ND	0.025	0.17
10	ND	0.014	ND	0.004	ND	0.021	0.039
360 : 0	ND	0.140	ND	0.053	ND	0.018	0.21
3	ND	0.080	ND	0.027	ND	0.010	0.12
5	ND	0.063	ND	0.010	ND	0.012	0.085
10	ND	0.087	ND	0.006	ND	0.014	0.11
361 : 0	ND	0.056	ND	0.030	0.002	0.024	0.11
3	ND	0.062	ND	0.054	ND	0.038	0.15
5	ND	0.060	ND	0.039	ND	0.018	0.12
10	ND	0.048	ND	0.006	ND	0.014	0.068
15	ND	0.069	ND	0.009	ND	0.016	0.094
362 : 0	ND	0.068	ND	0.021	ND	0.020	0.11
3	ND	0.063	ND	0.014	ND	0.005	0.082
5	ND	0.088	ND	0.009	ND	0.005	0.10
10	ND	0.036	ND	0.006	ND	ND	0.042
364 : 0	ND	0.044	ND	0.014	ND	0.006	0.064
3	ND	0.058	ND	0.033	ND	ND	0.091
5	ND	0.058	ND	0.008	ND	ND	0.066
10	ND	0.054	ND	0.009	ND	ND	0.063
15	ND	0.030	ND	0.007	ND	0.007	0.044
20*	–	–	–	–	–	–	–

* sample lost
ND: none detected

Table A-9 continued.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	TOTAL DDT
364: 25	ND	0.012	ND	ND	ND	ND	0.012
30	ND	0.022	ND	ND	ND	ND	0.022
366: 0	ND	0.016	ND	0.006	ND	0.008	0.030
3	ND	0.009	0.001	0.004	ND	0.002	0.016
5	ND	0.005	0.002	0.002	ND	0.002	0.011
10 *	–	–	–	–	–	–	–
15	ND	0.001	ND	0.0006	ND	0.0005	0.002
20	ND	0.0003	ND	ND	ND	0.0009	0.001
25	ND	0.0008	ND	0.0004	ND	ND	0.001
30	ND	0.0007	ND	ND	ND	ND	0.001

* sample lost
ND: none detected

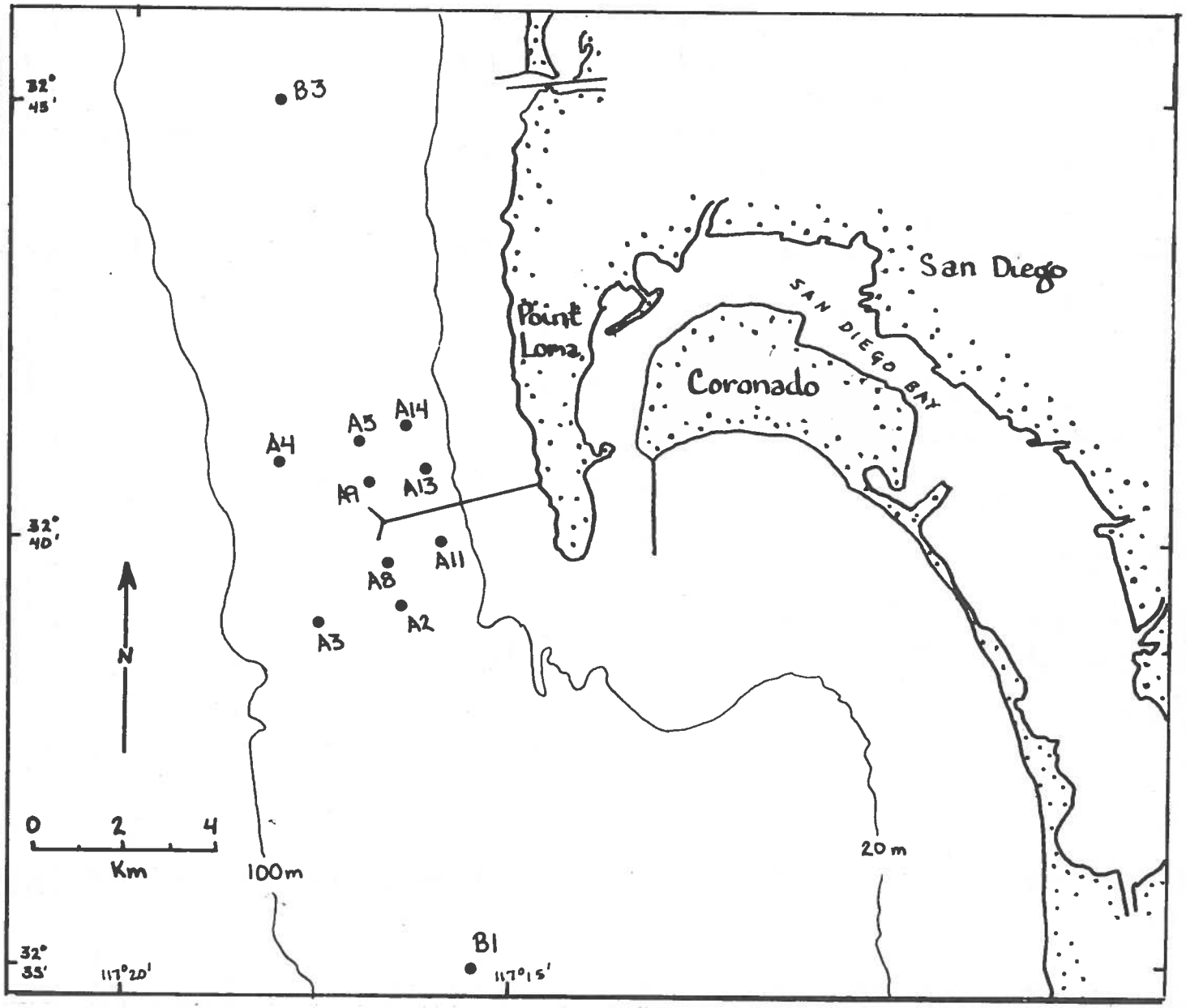

Figure A-4. Locations of sampling stations around the Point Loma outfall system. Sediment concentrations of DDT for these stations are given in Table A-10.

Table A-10. Concentrations of DDT and its metabolites (mg/dry kg) in short gravity cores collected around the Point Loma outfall system, August-September 1971. Station locations, Fig. A-4.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	Total DDT
A 2 : 0-2	ND	0.0070	ND	0.0009	ND	0.0007	0.0086
A 3 : 0-2	ND	0.0061	ND	0.0012	ND	0.0026	0.0099
A 4 : 0-2	ND	0.0068	ND	0.0013	ND	0.0005	0.0086
A 5 : 0-2	ND	0.012	ND	0.0025	ND	0.0004	0.015
A 8 : 0-2	ND	0.0059	ND	0.0020	ND	0.0016	0.0095
A 9 : 0-2	ND	0.0051	ND	0.0019	ND	0.0009	0.0079
A 11 : 0-2	ND	0.0016	ND	0.0003	ND	ND	0.0019
A 13 : 0-2	ND	0.0090	ND	0.0022	ND	ND	0.011
A 14 : 0-2	ND	0.0052	ND	0.0011	ND	0.0004	0.0067
B 1 : 0-2	ND	0.0030	ND	0.0004	ND	0.0004	0.0038
B 3 : 0-2	ND	0.0048	ND	0.0008	ND	0.0004	0.0060

ND: none detected

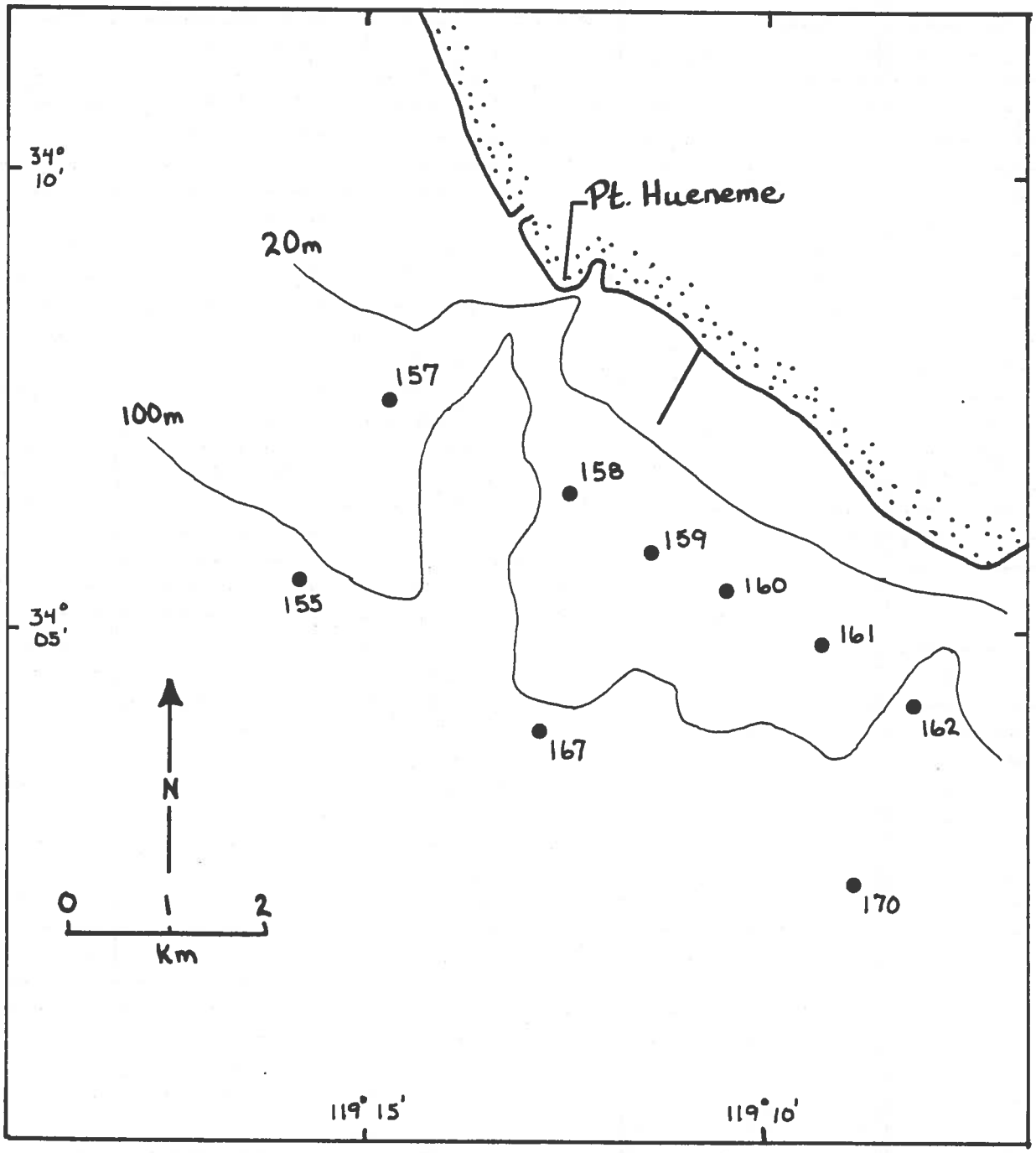

Figure A-5. Location of sampling stations around the Point Loma outfall system. Sediment concentrations of DDT for these stations are given in Table A-11.

Table A-11. Concentrations of DDT and its metabolites (mg/dry kg) in box cores collected off the Oxnard outfall system, August-September 1971. Station locations, Fig. A-5.

Core Number: Depth (cm)	o,p'-DDE	p,p'-DDE	o,p'-DDD	p,p'-DDD	o,p'-DDT	p,p'-DDT	Total DDT
155 : 0	0.001	0.035	0.001	0.007	ND	0.002	0.05
5	0.006	0.070	0.013	0.057	0.012	0.270	0.43
10	ND	0.012	ND	0.006	ND	0.012	0.03
157 : 0	ND	0.007	ND	0.008	ND	ND	0.02
5	0.001	0.015	0.001	0.008	ND	0.004	0.03
158 : 0	0.001	0.022	0.002	0.011	0.001	0.004	0.04
5	ND	0.053	ND	0.020	ND	ND	0.07
159 : 0	0.002	0.020	0.001	0.009	ND	0.003	0.04
5	ND	0.024	0.001	0.007	0.0003	0.002	0.03
160 : 0	0.001	0.026	0.001	0.008	0.001	0.002	0.04
5	ND	0.049	ND	0.006	ND	0.004	0.06
161 : 0	0.002	0.026	0.001	0.004	0.001	0.001	0.04
5	ND	0.029	0.001	0.006	0.001	0.002	0.04
162 : 0	ND	0.084	ND	0.013	ND	0.008	0.10
5	ND	0.093	ND	0.009	ND	0.004	0.11
10	ND	0.029	ND	0.005	ND	ND	0.03
15	ND	0.005	ND	0.001	ND	ND	0.01
167 : 0	0.004	0.033	0.001	0.006	0.001	0.002	0.05
5	ND	0.023	0.001	0.004	ND	0.002	0.03
10	ND	0.008	ND	0.003	ND	ND	0.01
15*	–	–	–	–	–	–	–
20	ND	0.001	ND	ND	ND	ND	0.001
170 : 0	ND	0.052	0.001	0.008	0.001	0.002	0.06
5	ND	0.028	ND	0.004	ND	0.002	0.03
10	ND	0.006	ND	0.001	ND	0.001	0.01
15	ND	0.002	ND	ND	ND	0.002	0.004
20	ND	0.001	ND	ND	ND	0.002	0.003

* sample lost
ND: none detected