CONTAMINANTS IN SAN FRANCISCO BAY SEDIMENTS

RELATIONSHIPS WITH TOXICITY STUDIES
UNDERTAKEN BY THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1990

A Report on the 205 (j) Project to:

The San Francisco Bay Regional Water Quality Control Board, Oakland
The State Water Resources Control Board, Sacramento
The U.S. Environmental Protection Agency, San Francisco

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APPENDIX TABLES & QUATTRO PRO FILES

Acknowledgement and Disclaimer

This project has been funded in part by the United States Environmental Protection Agency using Federal 205(j) grant funds under Assistance Agreement C-060000-29-2 to the State Water Resources Control Board and by Agreement No. 0-136-120-0 in the amount of $100,000.00 to conduct a study to determine the concentrations of pollutants and related toxic effects in sediment for the San Francisco Bay Estuary. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

✓ EPA accepted data report to close out 205j = 100,000 = B / In-Bay - June - July -

✓ RWQCB = 16,000 in-kind + BPC

FOREWORD

This report on the "205(j) Project" is one of a series of reports on contaminants in the San Francisco Estuary over the period 1990-1993 and of their relationships with measured toxicities to organisms in tests designed to determine the "health" of the local estuarine environment. Those from our laboratory currently consist of:

A. Organic Contaminants in Sediments and Porewaters. Chapter 4 *in* K. Taberski, M.P. Carlin and J. Lacy, San Francisco Bay Pilot Regional Monitoring Program 1991-1992. San Francisco Bay Regional Water Quality Control Board, Oakland. (Draft submitted, February 1994; final to be submitted March 1994). - Summary

B. This report.

C. Organic Contaminants in San Francisco Bay Sediments: An Assessment of the Toxicity Studies Undertaken by the National Oceanic and Atmospheric Administration, 1990. Report on the SedQual I Project to the San Francisco Bay Regional Water Quality Control Board.

D. Organic Contaminants in the Water Column of San Francisco Bay, and in the Sacramento and San Joaquin Rivers, 1991-1993. (not yet published)

E. Contaminant-Toxicity Studies of San Francisco Bay Sediments: An Assessment of the Distribution of Contaminants in San Francisco Bay Sediments, of the Validity of Currently-Used Toxicity Tests and of Their Applications. Report to the Bay Area Planning Coalition, San Francisco.

F. Organic Contaminants in the San Francisco Bay Ecosystem 1990-1993, and Their Biological Impacts. A Summary Report. The Bodega Bay Institute, Berkeley. (not yet published)

combined

These reports are referenced here as 1994A, B, etc.

The results of the statistical analyses presented in this report are considered preliminary, pending review, the use of additional tests, and the incorporation of a larger data base. The definitive results will be presented in 'E'; a summary will be incorporated into 'C'. Some of the results obtained to date in 'D' were presented in a Progress Report on 5 February 1994; potentially the most important is that concentrations of PCBs are still many times above the current Water Quality Objective of 70 pg/liter. 'E' compares contaminant levels recorded in this study with those obtained in the National Status and Trends Program, it contains a more comprehensive literature review of the toxicity tests with respect to their current applications in

San Francisco Bay; it also contains a critique of the current use of the concept of "bioaccumulation" by the local agencies in assessing environmental health. 'F' attempts to tie everything together. It will include the results of the analysis of archived samples to determine changes in contaminant levels over the past 25-30 years. It is expected to provide the basis for several scientific publications as well as a popular summary for local environmental groups and other interested parties; it is hoped that these will contribute to the cause of credibility among industry, government agencies, the environmental groups, and the concerned public.

EXECUTIVE SUMMARY

Sediment samples obtained in 1990 from 45 sites in San Francisco Bay by the National Oceanic and Atmospheric Administration for sediment toxicity studies were analyzed for PAHS, PCBs on a congener basis, DDTs, HCHs, chlordanes, HCB, and selected metals and trace elements. The mussel larvae survival and abnormality tests, and the abnormal telophase test in mussel larvae but not in sea urchin larvae each showed low but significant correlations with one or more of the metals but with none of the organic "toxics". Almost all of the contaminant variables showed significant associations with the organic carbon and nitrogen contents of the sediments, which are natural parameters in the local ecosystem that no longer have significant anthropogenic components. Unexpectedly high correlations in two of the toxicity tests with a limited number of values of Total Volatile Solids, another natural parameter, considered with the results of another program which show that natural factors rather than contaminants are associated with toxicities in an amphipod test and in an oyster larvae test, indicate that at least some of the current tests of sediment toxicities are not adequate measures of potential contaminant effects. The current data sets do not disprove a hypothesis that almost all of the measured toxicities in laboratory studies are caused by one or more natural factors rather than one or more contaminants in the ecosystem. Contaminants that might contribute to these toxicities remain to be identified. A major reassessment of potential effects of sediment resuspension on food webs and on contaminant distributions is called for.

The results of this and related recent programs indicate that PAHs are non-problems in the San Francisco Estuary ecosystem; concentrations of chlordane compounds are generally so low that they can no longer be considered as potential threats 20 years after the ending of their uses. The local recovery of Peregrine Falcons indicate that for the Bay as a whole, DDT levels have fallen below the threshold of harm to the species whose disappearance 30 years ago prompted the first of the modern studies of environmental contaminants.

Mean PCB levels were only 9.5 parts per billion on a dry weight basis, about one half of the median value found in the National Status and Trends program of the 1980s that measured PCBs in the sediments of 176 sites in estuaries and harbors. Nevertheless, these are associated with water column concentrations several times higher than current water quality objectives.

Determination of the importance of local sediments as sources of PCBs in the water column, versus possible continuing inputs from other sources, and an assessment of changes in PCB levels in the local ecosystem over the past 25 years through the analysis of archived samples, appear to be among the immediate priorities in continuing and future studies.

BACKGROUND

In a review of the effects of contaminants on the San Francisco Bay ecosystem undertaken in the mid-1970s, we concluded that "The thinning of the eggshells of a number of bird species by the DDT compound, DDE, remains the only environmental effect in the San Francisco Bay area that can be convincingly attributed to a contaminant in the ecosystem", but recommended that a portion of the funds already being used for routine chemical monitoring be diverted to support studies that would look for effects in potentially sensitive species (Risebrough *et al.*, 1978). Since that time, the California populations of the Peregrine Falcon, the species in the ecosystem most sensitive to effects of non-polar organic contaminants by virtue of its position in the food web, have recovered. For several years two pairs have been nesting on the Bay Bridge; the pair on the Oakland end fledged three young in 1993 (B.J. Walton & J. Linthicum, pers. comm.). In the mid-1970s, only the most optimistic of scenarios would have predicted such an event.

With a major qualification, a generalization that there are at present no contaminant effects on populations of organisms in the San Francisco Estuary ecosystem awaits evidence to the contrary. The qualification derives from casual observations and antecdotal information that assemblages of mussels no longer are found in their former numbers in many areas, such as the Berkeley Pier, and that clams are much less abundant than formerly in the intertidal flats. Their absence in marinas is attributed to the organic tin compounds formerly used in antifouling paints. Have their effects of antifouling paints extended outside the marinas? Or has the recently-introduced Asian clam *Potamocorbula amurensis* so reduced the phytoplankton biomass that it is no longer sufficient to maintain the species that were dominant a decade ago? None of the current programs apparently addresses these questions. If another contaminant is contributing to these biological changes, it must, like the organic tins, be a relatively new arrival in the ecosystem, - and exert effects in the water column rather than in sediments.

Concern within the local environmental community that the disposal of dredged sediments within San Francisco Bay would bring back immobilized contaminants to levels exceeding thresholds of harm has prompted the appearance and growth of an industry dedicated to the detection and measurement of toxic factors in those sediments. A recent review (Long and

Markel, 1992) lists 59 reports through 1990 on the results of the testing of local sediments for toxic effects on test organisms. Long and Markel (1992) describe a study undertaken in 1990 that measured toxic effects of sediments from 45 sites in San Francisco Bay. Aliquots of these sediments were made available to the present study for contaminant analysis such that any relationship between the measured toxicity and the concentrations of contaminants might be determined.

This report presents data on the concentrations of a range of organic contaminants and the results of preliminary statistical analyses. In a separate appendix are data on the concentrations of metals and trace elements, determined in the laboratory of Professor A.R. Flegal of the University of California, Santa Cruz. An expanded statistical analysis of these and additional data is described in Risebrough (1994c;1994e); the applications and validity of the tests are reviewed by Risebrough (1994e).

METHODS

Sample Collection

Samples were obtained in January and March 1990 by methods described by Long and Markel (1992). Coordinates and the dates of collection are included in Appendix Table 1. The majority of sites were in the Central and South Bay (Figure 1). In contrast, many of the sites in the SedQual III study were in marshes, rivers, and creeks (1994A). Samples were received frozen in Teflon jars.

Toxicity Tests

The tests undertaken of the sediments obtained at the 45 sites in San Francisco Bay in 1990 are described in detail by Long and Markel (1992). They consisted of:

1) bivalve embryo bioassay, in which survival and the percentage of abnormal development of larvae of *Mytilus edulis* from Elkorn Slough were determined in sediment elutriates diluted 50:50 with clean seawater;

2) Microtox bioassays with both saline and organic extracts;

3) Abnormal telophases in mussel and sea urchin larvae.

Wet Chemistry, Sample Preparation.

Sediments were freeze-dried, mixed with kiln-fired sodium sulfate, and soxhlet-extracted with methylene chloride. Sample sizes were in the order of 10-20 g dry weight. The methylene chloride was then replaced by hexane. Lipids were removed by florisil-column chromatography. Florisil was activated at 650° for 4 hours, and deactivated with 0.5% H_2O. The column (18 g florisil) was eluted first with hexane (volume sufficient to elute p,p'-DDE but not p,p'-DDT) and then with 30% methylene chloride in hexane (volume sufficient to elute p,p'-DDT). PCBs, DDE, and saturated petroleum hydrocarbons elute in the first fraction; PAHs and the majority of the pesticide compounds reported elute in the second fraction.

Appropriate amounts of internal standards containing deuterated phenanthrene, deuterated chrysene, and decachlorobiphenyl were added to the samples prior to soxhlet-extraction. The deuterated compounds were used to determine recoveries in the second fraction; the recovery of decachlorobiphenyl provided recoveries of PCBs in the first fraction. Additionally, decachlorobiphenyl was added to the F2 fractions after column chromatography to distinguish and quantify any losses occurring in subsequent steps.

Quality Control.

System blanks consisted of Florisil, which was freeze-dried and treated as a sediment sample.

Intercalibration samples used for quality control consisted of two sediment samples provided by the National Research Council of Canada, HS-1 and HS-6, for PCBs and PAHs, respectively, and of Standard Reference Material 1974, a homogenate of mussel tissue prepared by the National Institute of Standards and Technology, for the chlorinated pesticides, PCBs, and PAHs. The results are presented in a companion report (Risebrough, 1994f).

Confirmation of the identifications of chlorinated pesticides made with GC/EC was undertaken by GC/MS whenever the picogram/microliter concentration exceeded the sensitivity of the GC/MS for complex mixtures, in the order of 20-40 picograms. Concentrations below this level were qualified as "less than" or "less than or equal to" whenever appropriate. Otherwise, at low concentrations, characteristic "fingerprint" profiles of the DDT and chlordane compounds, and of the PCBs, were accepted as adequate confirmation of identity. Authentic standards, including PCB congeners, were obtained from Ultra Scientific, Supelco, the National Institute of Standards and Technology, and the National Research Council of Canada. Standards were intercalibrated with the Long Marine Laboratory and the Department of Fish and Game, Cordova.

Gas Chromatography, Mass Spectrometry.

Sediment extract volumes were concentrated to approximately 1-4 ml and analyzed by both electron-capture gas chromatography (Varian 3400 GC with 8100 autosampler) and by GC/MS (Saturn II, also with 8100 autosampler). DB5 30-meter capillary columns (J&W) and identical column temperature programs were used in both instruments, facilitating confirmation of GC/ECD identifications by GC/MS.

A DDE standard was injected several times a day into the EC gas chromatograph to determine instrument sensitivity and to detect any changes in sensitivity. The electron capture response of each compound reported, almost all of them in at least two authentic standards, was compared with that of DDE (Table 1).

Congeners used in this study constituted 63%, 77%, and 87% of the total PCBs in the standard Aroclors 1242, 1254, and 1260 (Table 2). Many, however, coelute with other compounds that are reported as part of the peak also represented by an authentic standard, such that these compositions are the minimum percentages of the totals that are reported (Table 3).

Substantial modifications were made in the present study from those reported for Sedqual III (1994a). The STAR data system of the GC converts the analogue signals to integrated areas, which are compared with those of authentic standards eluting at the same retention time, and produces a report with compound names and amounts in picograms. The level of error, however, is frequently high, both in the identification of peaks in complex mixtures and in the

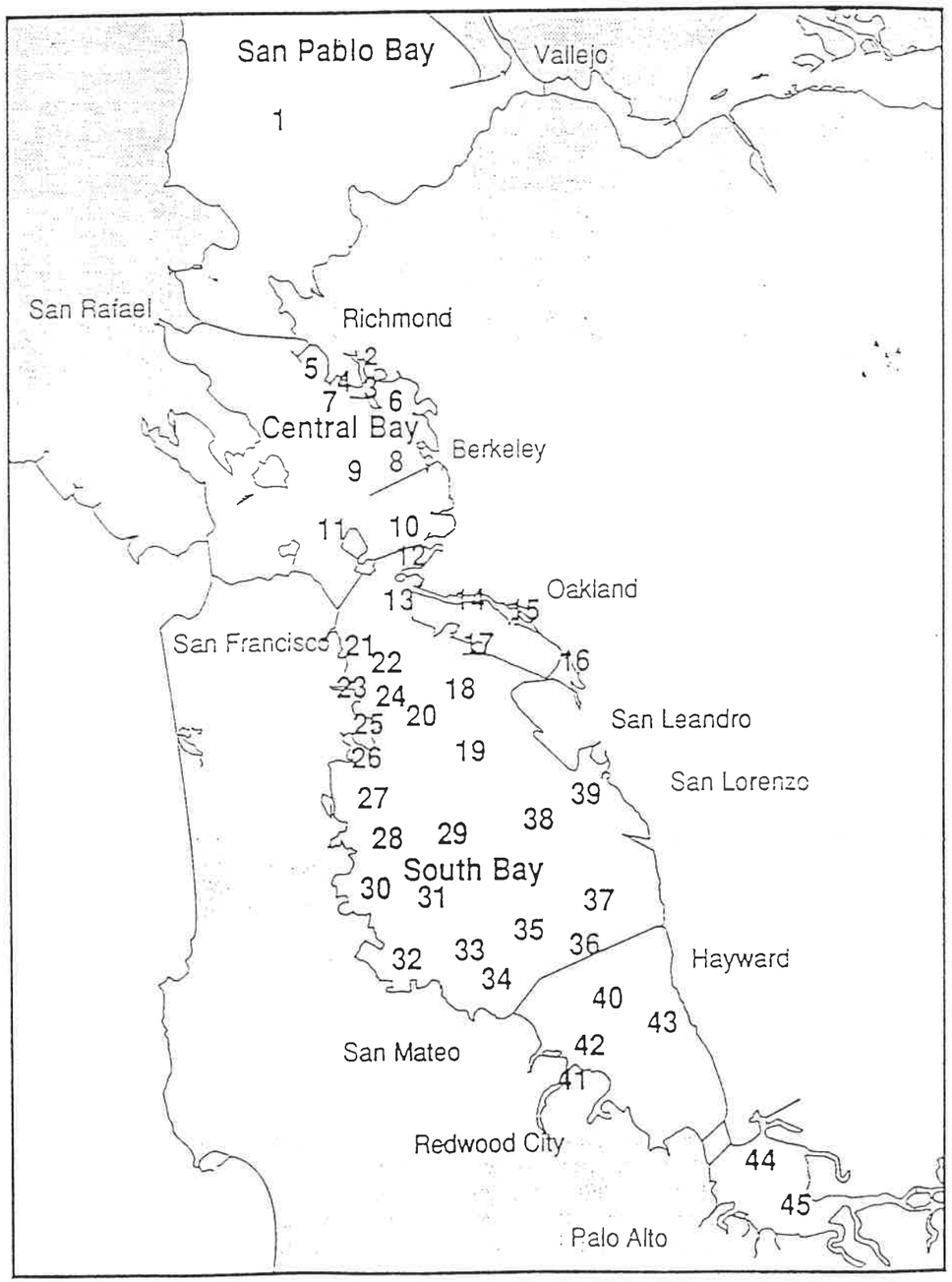

Figure 1. Sampling Sites in San Francisco Bay. 1990 Sediment Toxicity Survey.

Table 1. Response Factors, Relative to p,p'-DDE, Used in this Study

Response Factors, Relative to p,p'-DDE

alpha chlordane	1.116	PCB005/008	0.192	PCB138	0.558
cis-nonachlor	1.147	PCB008	0.074	PCB141	0.749
gamma chlordane	1.146	PCB015	0.042	PCB143	0.477
heptachlor epoxide	1.075	PCB018	0.195	PCB149	0.327
oxychlordane	0.891	PCB027	0.341	PCB151	0.402
trans-nonachlor	0.977	PCB028	0.446	PCB153	0.395
o,p'-DDD	0.595	PCB028/50	0.315	PCB154	0.332
o,p'-DDE	0.697	PCB029	0.336	PCB156	0.808
o,p'-DDT	0.598	PCB031	0.235	PCB157/200	0.637
o,p'-DDD	0.809	PCB031/028	0.351	PCB157/201	0.685
p,p'-DDMU	0.350	PCB040	0.360	PCB158	0.745
p,p'-DDT	0.770	PCB044	0.322	PCB159	0.872
HCB	1.502	PCB049	0.288	PCB170	0.823
alpha HCH	1.499	PCB052	0.194	PCB171	0.701
beta HCH	0.473	PCB054	0.099	PCB173	0.860
gamma HCH	1.195	PCB060	0.661	PCB174	0.568
Mirex	0.600	PCB066	0.490	PCB177	0.549
		PCB066/095	0.381	PCB180	0.690
		PCB070	0.401	PCB182	0.555
		PCB074	0.370	PCB183	0.506
		PCB077	0.184	PCB185	0.872
		PCB077/154	0.304	PCB187	0.467
		PCB086	0.528	PCB188	0.385
		PCB087	0.499	PCB189	0.853
		PCB097	0.384	PCB191	0.763
		PCB099	0.406	PCB194	0.939
		PCB101	0.317	PCB195	0.924
		PCB103	0.282	PCB196	0.658
		PCB104	0.209	PCB199	0.558
		PCB105	0.740	PCB200	0.486
		PCB105/132	0.555	PCB201	0.464
		PCB110	0.507	PCB202	0.389
		PCB114	0.731	PCB203	0.920
		PCB118	0.450	PCB205	1.058
		PCB121	0.453	PCB206	0.933
		PCB126	0.410	PCB207	0.602
		PCB128	0.716	PCB208	0.832
		PCB129	0.608	PCB209	0.979
		PCB137	0.680		

Table 2. PCB Congener Standards used in Regional Monitoring Programs, 1991-1993

Congener	Structure	% of Aroclor 1242	1254	1260	Source(s) **
1	2-	n	n	n	NIST
5	2,3-	0.06	n	n	LML Mix
8	2,4'-	7.65	n	n	NIST LML Mix
15	4,4'-	1.51	n	n	NRC, CLB-1 LML Mix
18	2,2',5-	6.28	0.41		NIST NRC CLB-1A LML Mix
27	2,3',6-	0.28	n	n	LML Mix
28	2,4,4'-	6.52	0.25	0.05	NIST LML Mix
29	2,4,5-	0.10	n	n	NIST LML Mix
31	2,4',5-	6.52	0.25	0.05	NRC, CLB-1 LML Mix
40	2,2',3,3'-	0.89	0.20	n	NRC, CLB-1A
44	2,2',3,5'-	3.20	2.03	n	NIST NRC, CLB-1A LML Mix
49	2,2',4,5'-	3.60	1.64	n	NRC, CLB-1 LML Mix
50	2,2',4,6-	a	a	a	NIST
52	2,2',5,5'-	4.04	5.18	0.56	NIST NRC, CLB-1B LML Mix
54	2,2',6,6'-	a	a	a	NRC, CLB-1A
60	2,3,4,4'-	1.33	0.54	n	NRC, CLB-1B
66	2,3',4,4'-	1.66	0.59	n	NIST LML Mix
70	2,3',4',5-	3.89	3.21	0.09	LML Mix
74	2,4,4',5-	2.17	0.78	n	LML Mix
77	3,3',4,4'-	0.45	n	n	NIST NRC, CLB-1A
86	2,2',3,4,5-	a	a	a	NRC, CLB-1A
87	2,2',3,4,5'-	0.77	3.78	0.77	NIST NRC, CLB-1A LML Mix
95	2,2',3,5',6-	2.87	6.02	3.04	LML Mix
97	2,2',3',4,5-	0.65	2.55	0.23	LML Mix
99	2,2',4,4',5-	0.86	3.60	0.11	LML Mix
101	2,2',4,5,5'-	1.33	7.94	5.02	NIST NRC, CLB-1D LML Mix
103	2,2',4,5',6-	a	a	a	NRC, CLB-1B
104	2,2',4,6,6'-	a	a	a	NIST
105	2,3,3',4,4'-	0.86	3.83	0.07	NIST NRC, CLB-1B LML Mix
110	2,3,3',4',6-	1.53	5.85	1.90	LML Mix
114	2,3,4,4',5-	n	n	n	NRC, CLB-1C
118	2,3',4,4',5-	1.62	6.39	0.57	NIST NRC, CLB-1D LML Mix
121	2,3',4,5',6-	a	a	a	NRC, CLB-1A
126	3,3',4,4',5-	n	n	n	NIST
128	2,2',3,3',4,4'-	n	2.07	1.06	NIST NRC, CLB-1B LML Mix
129	2,2',3,3',4,5-	n	0.23	1.11	NRC, CLB-1C
132	2,2',3,3',4,6'-	0.30	1.98	3.69	LML Mix
137	2,2',3,4,4',5-	n	0.25	0.06	NRC, CLB-1 LML Mix
138	2,2',3,4,4',5'-	0.54	3.20	6.13	NIST NRC, CLB-1D LML Mix
141	2,2',3,4,5,5'-	n	1.04	2.56	NRC, CLB-1D
143	2,2',3,4,5,6'-	a	a	a	NRC, CLB-1B
149	2,2',3,4',5',6-	0.63	2.21	7.83	LML Mix
151	2,2',3,5,5',6-	n	1.17	3.67	NRC, CLB-1 LML Mix
153	2,2',4,4',5,5'-	0.68	4.26	10.80	NIST NRC, CLB-1A, C, LML Mix
154	2,2',4,4',5,6'-	a	a	a	NIST NRC, CLB-1B
156	2,3,3',4,4',5-	0.09	1.62	0.88	NRC, CLB-1 LML Mix
157	2,3,3',4,4',5'-	n	n	0.14	LML Mix
158	2,3,3',4,4',6-	n	0.77	1.55	LML Mix
159	2,3,3',4,5,5'-	a	a	a	NRC, CLB-1A
170	2,2',3,3',4,4',5-	0.11	0.31	3.91	NIST NRC, CLB-1D LML Mix
171	2,2',3,3',4,4',6-	0.05	0.50	2.16	NRC, CLB-1C
173	2,2',3,3',4,5,6-	n	0.09	0.36	NRC, CLB-1B
174	2,2',3,3',4,,5,6'-	n	0.34	3.85	LML Mix
177	2,2',3,3',4',5,6-	n	0.21	2.21	LML Mix
180	2,2',3,4,4',5,5'-	0.06	0.38	7.12	NIST NRC, CLB-1D LML Mix
182	2,2',3,4,4',5,6'-	a	a	a	NRC, CLB-1B
183	2,2',3,4,4',5',6-	n	0.17	1.76	NRC, CLB-1 LML Mix
185	2,2',3,4,5',6-	n	n	1.34	NRC, CLB-1C
187	2,2',3,4',5,5',6-	n	0.32	3.97	NIST NRC, CLB-1D LML Mix
188	2,2',3,4',5,6,6'-	a	a	a	NIST
189	2,3,3',4,4',5,5'-	n	n	0.11	NRC, CLB-1 LML Mix
191	2,3,3',4,4',5',6-	n	n	0.25	NRC, CLB-1C
194	2,2',3,3',4,4',5,5'-	n	n	1.30	NRC, CLB-1 LML Mix
195	2,2',3,3',4,4',5,6-	n	n	0.68	NIST NRC, CLB-1D LML Mix
196	2,2',3,3',4,4',5,6'-	n	n	0.69	NRC, CLB-1D
199	2,2',3,3',4,5,5',6'-	n	n	1.31	NRC, CLB-1 LML Mix
200	2,2',3,3',4,5,6,6'-	n	n	0.45	NIST
201	2,2'3,3'4,5',6,6'-	n	0.68	0.99	NRC, CLB-1C
202	2,2',3,3',5,5',6,6'-	n	n	0.50	NRC, CLB-1B
203	2,2',3,4,4',5,5',6-	n	n	0.99	NRC, CLB-1 LML Mix
205	2,3,3',4,4',5,5',6-	n	n	0.15	NRC, CLB-1B
206	2,2',3,3',4,4',5,5',6-	n	n	0.45	NIST NRC, CLB-1C LML Mix
207	2,2',3,3',4,4',5,6,6'-	n	n	0.05	NRC, CLB-1B
208	2,2',3,3',4,5,5',6,6'-	n	n	0.17	NRC, CLB-1B
209	2,2',3,3',4,4',5,5',6,6'-	n	n	0.05	NIST NRC, CLB-1A, B, LML Mix
	% of Total Congeners	63.10	76.84	86.76	

* Schulz et al. (1989). n: < 0.05% (w/w); a: < 0.05 % in all preparations of Aroclors and Clophens

** NIST: National Institute of Standards and Technology; NRC: National Research Council (of Canada); LML: Long Marine Laboratory

TABLE 3. PCB Analysis: Congeners and PCB Peaks that are not Resolved

Peak #	Congeners	Comments
1	*5*, *8*	Quantified as PCB-8, a marker for Aroclor 1242; PCB-5 is a minor component
3	*18*, (17)	Quantified as PCB-18
4	*15*	
5	24, *27*	
6	*29*	
7	*31*	Marker for Aroclor 1242
8	*28*	Marker for Aroclor 1242
9	*31*, *28*	These congeners are not always resolved
10	*52*	
11	*49*	
12	*44*	
13	*40*	
14	*74*	
15	*70*	
16	*66*, *95*	
17	*60*, (56)	
20	*101*, (90)	
21	*99*	
23	*97*	
24	*87*, (115)	
27	*110*, 77	Quantified as PCB-110; PCB-77, a minor component (0.45%) of Aroclor 1242, is one of the coplanar PCBs with dioxin-like effects
28	*151*, (82)	
29	*149*, (123)	Marker of Aroclor 1260 vs 1254
30	*118*	Marker of Aroclor 1254 vs 1260
34	*153*	
35	*132*	
36	*105*	
37	*132*, *105*	Frequently co-elute from DB5 column
38	*141*, (179)	
39	*137*, (176)	
40	*138*	
41	*158*	
42	*129*, (178)	PCB-126, the most toxic of the coplanar PCBs, co-elutes with PCB-129 from this column; concentration < 0.05 % in Aroclors
43	*187*	
44	*183*	
45	*128*	
46	*185*	
47	*174*	
48	*177*	
49	*156*, *171*, *202*	
50	*157*, *173*, *201*	
51	*180*	
52	*191*	
54	*170*, 190	
55	*199*	
57	*196*, *203*	
58	*189*	
59	*208*, *195*	
60	*207*	
61	*194*	
62	*205*	
63	*206*	

Authentic standard available; Significant component, > 0.5% of total of Aroclors 1242, 1254, & 1260; (Adjacent peak that may or may not co-elute)

Table 4. Electron Capture Response to DDE. 29 Dec 91.

Picograms Injected	Peak Area	Area/picogram
15.6	10141	650
31.25	13406	429
62.5	24772	396
125	41762	334
250	63879	256
500	96356	193
1000	120696	121

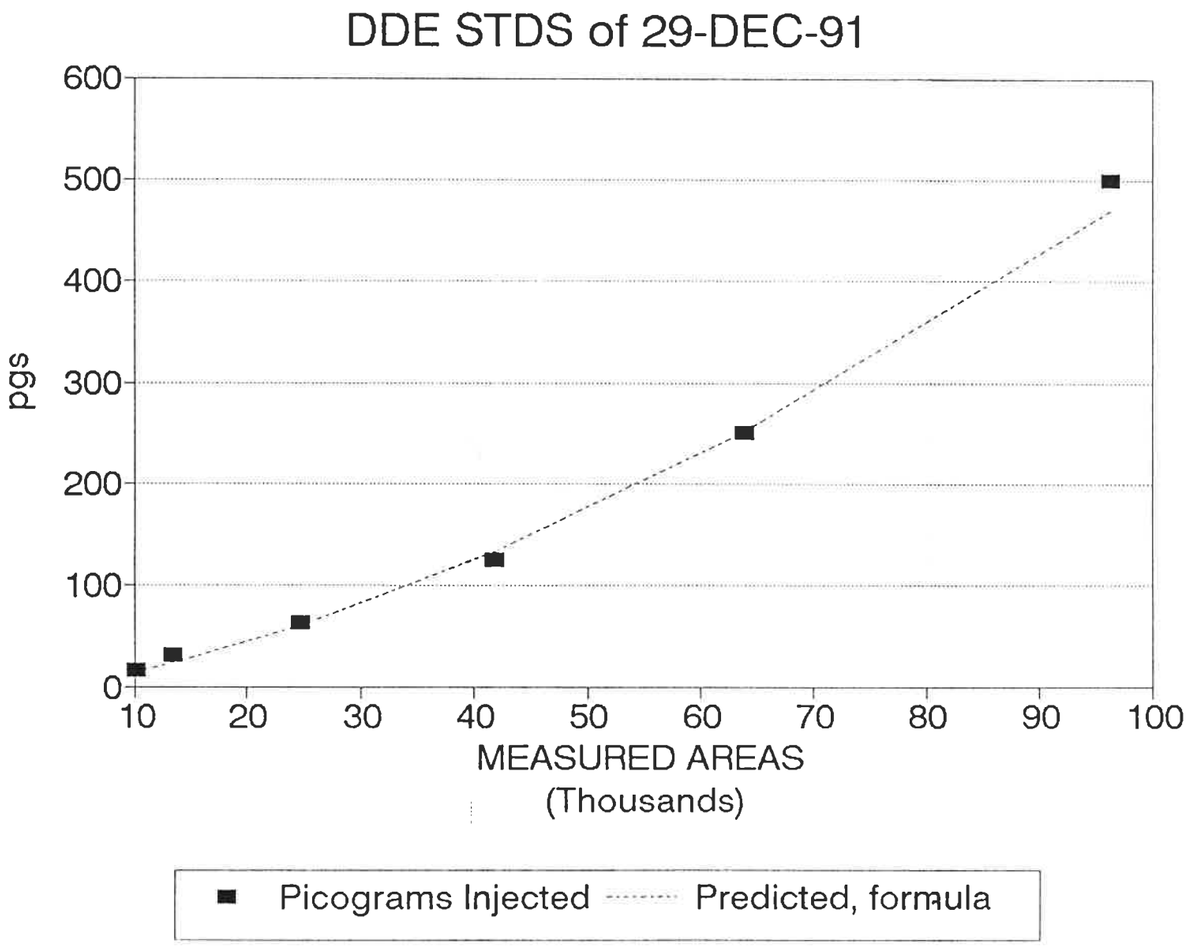

Figure 2. DDE response curve derived from area/picogram data. Equation is: Picograms = $0.0000125(\text{Area})^{1.52}$

integration of peaks that partly co-elute. In SedQual III (1994a), errors were corrected after conversion of the report files to an Ascii format, from which they were read into the Paradox data management system. This proved to be a cumbersome, time-consuming process. The data presented in this report are from samples that were analyzed at the beginning of the several projects, in 1991-1992, before any satisfactory data management system was in place. Data reduction was begun in early 1993, from runs stored on tape. The transcription of data from instrument computer to laboratory computer was abandoned, since manual transcription of integrated areas turned out to take less time, although still considerable, and errors in identification or integration could be corrected as the data were entered into a Quattro Pro spreadsheet.

In previous programs, the response of the electron capture detector was assumed to be sufficiently linear in the range of 1-200 or more picograms. In practice, however, the response is curvilinear over the range of picograms injected (Table 4, Figure 2). Response varied by a factor of 2 from over an 8-fold range, from 15.6 picograms to 125 picograms; errors in reported values would be correspondingly large, increasing with increasing residue amounts, unless a correction was applied. This was accomplished with a curve of the form

$$\text{picograms} = a(\text{area})^b$$

where a and b were determined in a reduction process to obtain a curve that provided an adequate visual fit. The one used in this study begins to diverge above about 400 pg (Figure 2).

Application of this curve results in much lower numbers than previously reported in the low picogram range. This, however, becomes important only for specific applications, such as tracing the impact of a point source (such as the Lauritzen Canal for biocide compounds) over distance, or in determining the partitioning between water and sediments, etc.

A change was also made in the processing GC/MS data. The data system of the GC/MS identifies compounds based on a combination of retention times and spectral characteristics and also reports compounds identified, and the amounts in ng of each. Here also the generated data were transcribed manually into a spread sheet rather than go through the various conversion processes and making corrections afterwards. Other relevant data on sample weight, recoveries, sensitivities, etc. were also entered into the spreadsheets. Data files were created from the

work files by converting all formula values into absolute values and the elimination of all background information and other information used in the calculations. Statistical analyses were made from these files, which are also in a format that can be used by other laboratories or by agencies, etc. These files are named on the data reports in the appendix.

Statistical analyses were performed with Systat.

Organic carbon and nitrogen determinations.

Aliquots of freeze-dried or oven-dried sediments were prepared for the determination of organic carbon and nitrogen by agitation in 1N Hcl and repeating the process until there was no further evolution of carbon dioxide. After centrifugation and decanting, sediments were rinsed with Milli-Q treated water, centrifuged again, and dried at 60°. Subsequent steps in the analysis were undertaken by Craig Hunter at the Moss Landing Marine Laboratory using established methods (Froelich, 1980; Hedges and Stern, 1983, and suggested procedures of the manufacturer). The methods are comparable to those of the recent validation study of the EPA method MARPCPN conducted by the Chesapeake Biological Laboratory of the University of Maryland. The dry samples were homogenized with a commercial ball mill using stainless ball bearings and were analyzed with a Leeman Labs 440 Elemental Analyzer. Each sample was run in triplicate and average values are reported. Samples whose coefficient of variation was greater than 0.07 were reanalyzed. Acetanilide was used as the standard. The standard was rerun every 15 samples and the analyzer calibration updated. As a quality control check, National Research Council of Canada BCSS-1 (Marine Sediment) was analyzed at the beginning and end of each sample set. All QC values were within the acceptance limits.

Percent Fines and Total Volatile Solids

The percentage of fine material (weight % less than 10 microns, ased on dry weight) was determined in the laboratory of Professor Flegal, from Stokes Law Settling Times (ASTM D422-63). Total Volatile Solids were determined at the Richmond field Station by ashing overnight at 550° an aliquot of the freeze-dried sediment.

Metal Analyses

Metal analyses were undertaken in the laboratory of Professor A.R. Flegal at the University of California, Santa Cruz. Two methods were employed, extracting with either 0.5N HCl or concentrated aqua regia (Flegal *et al.*, 1994). Concentrations determined with the milder digestion with dilute HCl are considered to represent more closely the fraction that is biologically available than are those obtained with the much stronger digestion by aqua regia.

RESULTS

Correlation Analysis

The following analysis of the toxicity-contaminant data is considered preliminary, pending the application of additional tests and the incorporation of additional data. Because most of the residue distributions did not appear to meet the criteria for parametric statistical analysis, the non-parametric Spearman's correlation analysis, which is not affected by any skewing of the data distributions, was used to examine possible relationships among the study variables.

The variables consisted of: organic carbon and nitrogen; % fines; % total volatile solids; chromium, copper, nickel, zinc and lead, all determined by both HCl and aqua regia digestions; phosphorus, aluminum, iron, magnesium, and manganese, determined by HCl digestion; vanadium and cobalt, aqua regia digestion; survival of mussel larvae; percent abnormalities of mussel larvae; microtox test of organic extracts; abnormal telophases in mussel larvae; abnormal telophases in sea urchin larvae; total PAHs on a dry-weight and organic-carbon basis; ratio of total methyl phenanthrenes to phenanthrene (an index of petroleum); unresolved aromatic hydrocarbons; total PCBs; total alkanes; unresolved saturated hydrocarbons (petroleum); ratio of unresolved saturated hydrocarbons to alkanes; unresolved petroleum compounds on an organic carbon basis; total chlordanes; total DDTs; hexachlorobenzene; total HCHs; and mirex.

In both this program and in the SedQual III program, many of the variables were found to be highly correlated among themselves, confounding efforts to propose cause-and-effect relationships. Many false positive correlations are therefore anticipated. An absence of a correlation between a toxic effect and contaminant concentrations when the sample size is large

is, however, considered to be a more credible, indicating no cause-and-effect relationship.

The organic carbon and nitrogen contents of the sediments appear to be critical variables. Almost all of the parameters included in the study were significantly correlated with the organic carbon (and nitrogen) content of the sediments (Table 5). Formerly there was a large input of organic wastes into San Francisco Bay, such that the carbon budget had a major anthropogenic component. In Castro Cove, which received in the past large amounts of refinery wastes, the organic carbon content is influenced by the remnant petroleum. Today, however, the organic carbon budget of San Francisco Bay is dominated by natural processes. In his review of the sources of organic carbon for the food webs of San Francisco Bay, Jassby (1992) concluded that phytoplankton activity was the dominant and only major source of organic carbon (about 50% of the total) and that benthic microalgal activity was the only significant secondary source, accounting for about 20% of the total. The organic carbon of the sediments is therefore considered a "natural' component of the sediments without a significant contribution from anthropogenic inputs.

In the SedQual III study, organic carbon and nitrogen were the only variables showing a strong significant relationship with mortalities of the amphipod *Eohaustaurius estuarius* in San Francisco Bay samples outside of Castro Cove (n = 55). Similarly, the results obtained in the oyster larvae test also indicated that natural factors rather than contaminants were responsible for the abnormalities observed. In the larger sample, the only significant variables were organic carbon and nitrogen (1994A). The absence of any correlation between the mortalities or abnormalities and the conventional "toxics", and the significant correlations with natural factors, indicate that the use of these tests in evaluating environmental "health" can not be scientifically justified in San Francisco Bay.

In this study the relationships between organic carbon and nitrogen and the measured toxicities are less clear. The highest values of the correlation coefficient between a toxicity variable and a non-toxicity variable, however, were obtained with the Total Volatile Solids (TVS): 0.853 vs abnormalities of mussel larvae (Table 6), 0.800 vs abnormal telophases of sea urchin larvae (Table 8). TVS, like the organic carbon, is considered to be a "natural" variable, with a very high correlation with the organic carbon (Table 5). These measurements, of the total organic matter destroyed by kiln-firing, were undertaken at the beginning of the project in

Table 5. MATRIX OF SPEARMAN CORRELATION COEFFICIENTS

Percent Organic Carbon vs. Other Parameters

Contaminant/Variable	Corr. Coeff.	N	*P*
Total Volatile Solids	0.933	9	< .01
Organic Nitrogen	0.916	133	< .001
Zinc, HCl	0.746	88	< .001
Copper, HCl	0.741	88	< .001
Magnesium	0.704	82	< .001
Zinc, AqR	0.690	90	< .001
Chromiuim, HCl	0.682	88	< .001
PCBs	0.629	43	< .001
Lead, HCl	0.622	88	< .001
Iron	0.620	82	< .001
Copper,AqR	0.605	90	< .001
Aluminum	0.590	82	< .001
Nickel, HCl	0.568	88	< .001
Nickel, AqR	0.540	90	< .001
Unresolved petroleum, aromatic	0.529	43	< .001
Phosphorus	0.500	88	< .001
Alkanes	0.489	43	<.01
HCB	0.482	43	< .01
Silver	0.470	90	< .001
HCHs	0.447	43	<.01
Chlordanes	0.424	43	< .01
Hydrocarbons, saturated, dry weight	0.417	43	<.01
Manganese	0.415	82	< .001
Unresolved petrolem, saturated	0.409	43	< .05
Chromium,AqR	0.374	90	< .001
Abnormalities, mussel larvae	0.346	128	< .001
% Fines	0.338	87	< .01
DDTs	0.320	43	< .05
Methyl phenanthrenes/phenanthrene	0.318	43	< .05
PAHs. dry weight	0.295	43	> .05
Mirex	0.257	43	> .05
Vanadium	0.247	90	< .05
Cobalt	0.231	90	< .05
Unresolved petroleum/alkanes	0.118	43	> .05
Abnormal telophases. mussel larvae	0.113	45	> .05
Hydrocarbons, saturated, org carbon	0.025	43	> .05
PAHs, Organic carbon	-0.020	43	> .05
Abnormal telophases, sea urchins	-0.057	45	> .05
Lead, AqR	-0.110	90	> .05
Survival, mussel larvae	-0.128	133	> .05
Microtox, organic extract	-0.289	129	< .01

the anticipation that facilities for determination of organic carbon might not be available. Only 11 values for total volatile solids were included in the present correlation matrix; they represent only a fraction of the available data, which will be incorporated into subsequent statistical analyses (1994c, e).

The Microtox test showed a significant relationship with organic carbon (Table 5), and an even stronger relationship with TVS (r_s -0.400). This test has recently been shown to be highly sensitive to elemental sulfur (Jacobs *et al.*, 1992), an abundant constituent of reducing sediments; it would not therefore appear to be an appropriate test for assessing toxicities to members of a food web in a natural environment. It is not therefore considered further here.

Not unexpectedly, mussel larvae abnormalities were significantly correlated with mussel larvae survival ($r_s = - 0.469$, $P < 0.01$). Similarly, abnormal telophases of mussel larvae were significantly ($P < 0.05$) correlated with the incidences of abnormal telophases of the sea urchin larvae, suggesting a common mode of action.

For the four toxicity variables other than Microtox, - mussel larvae survival and abnormalities, abnormal telophases in mussel and sea urchin larvae, there are a total of 19 significant correlations among a total of 148; as indicated, almost all of the variables are associated with each other. The correlation between aluminum and the abnormal telophases of sea urchin larvae is negative, indicating a beneficial rather than a detrimental effect. With this sample size, about 7 false positive correlations at the 0.05 probability level might be expected. The chlordane correlation is probably one of these since chlordane concentrations were very low.

There are 12 other correlations with a total of 6 metals. Ten were with 4 metals extracted with both acid treatments; 7 from the milder digestion, 3 from the more rigorous aqua regia digestion. This departure from the expected 5:5 is not significant (χ^2 test; ($P > 0.05$). In the mussel larvae survival and abnormal growth tests, ratios are 4:0 and 4:2 for metals measured by HCl digestion vs. those measured by aqua regia. Since the tests are not independent, no conclusions are made at the present time about whether a combination of biologically available metals is contributing to the observed toxicities. An alternative hypothesis, that the observed toxicities are caused by one or more other factors associated with these metals, factors that could be natural in the ecosystem, remains to be disproved or shown to be unlikely. Only 4 samples in the present matrix had values for both sea urchin abnormal telophases and TVS; the high

Table 6. SPEARMAN CORRELATION COEFFICIENTS

ABNORMALITIES, *Mytilus edulis* LARVAE

Elutriates of San Francisco Bay Sediments

vs	Corr. Coeff.	N	P
Total Volatile Solids	0.853	11	< 0.01
Lead, HCl	0.473	83	< 0.01
Zinc, HCl	0.408	83	< 0.01
Chlordanes	0.399	45	< 0.01
Copper, AqR	0.364	85	< 0.01
Copper, HCl	0.355	83	< 0.01
Zinc, AqR	0.353	85	< 0.01
Organic carbon	0.346	128	< 0.01
% Fines	0.334	82	< 0.01
Organic nitrogen	0.316	128	< 0.01
Nickel, HCl	0.305	83	< 0.01

Other non-toxicity variables (N = 26, see Table 5) showed no significant relationship ($P > .05$)

Table 7. SPEARMAN CORRELATION COEFFICIENTS

SURVIVAL OF *Mytilus edulis* LARVAE

Elutriates of San Francisco Bay Sediments

vs	Corr. Coeff.	N	P
Lead, HCl	-0.289	88	< 0.01
Aluminum, HCl	-0.265	82	< 0.05
Copper, HCl	-0.256	88	< 0.05
Zinc, HCl	-0.227	88	< 0.05

Other non-toxicity variables (N = 33, see Table 5) showed no significant relationship ($P > .05$)

Table 8. SPEARMAN CORRELATION COEFFICIENTS

Elutriates of San Francisco Bay Sediments

Abnormal telophases, *Mytilus edulis* larvae

vs

	Corr. Coeff.	N	P
Silver, HCl	0.435	30	< 0.05
Lead, AqR	0.373	30	< 0.05

Abnormal telophases, Sea urchin larvae

vs

Aluminum, HCl	-0.486	25	<0.05
(higher aluminum associated with lower incidence)			
Total Volatile Solids	0.800	4	ns

Other non-toxicity variables (N = 35, see Table 5) showed no significant relationship ($P > .05$)

correlation coefficient, 0.800, indicates the need for further investigations of this variable and its many constituents.

Contaminant Distributions

Polynuclear aromatics (PAHs) are ubiquitous in the surface layers of soils and of marine sediments. They are components of petroleum mixtures but most of the environmental PAH residues are formed in incomplete combustion processes such as occur in forest fires, lower-temperature burning of fossil fuels, and the smoking of tobacco. Some are potent carcinogens.

Their global distribution results principally from aerial dispersal (Youngblood and Blumer, 1975; Farrington *et al.*, 1977; Laflamme and Hites, 1978). In part therefore residues in San Francisco Bay sediments derive from the atmosphere; the principal local source is probably automobile exhaust. Surface runoff during rainstorms is another route of entry.

At three sites, PAH concentrations were an order of magnitude higher than elsewhere (Figure 3): Richmond Inner Harbor, off India Basin, and in one of the China Basin sites. The ratios of methyl phenanthrenes to phenanthrene, which are less than one (Appendix 1), indicate combustion rather than petroleum sources. On an organic carbon basis, the distribution is similar (Figure 4), indicating that the contamination pattern is not determined primarily by the distribution of organic carbon but rather reflects past input sources.

Highest PCB levels were found in San Leandro Bay, Inner Richmond Harbor, and in the Oakland Inner Harbor (Table 9, Figure 5). Like the PAHs, the PCB distribution on an organic carbon basis indicates that redistribution of fine-grained material in the inner harbors can not account for local higher concentrations; rather the gradients represent past input sources.

The station in the Richmond Inner Harbor closest to the Lauritzen Canal, where a pesticide formulating company in the past spilled chlorinated pesticides into the adjacent harbor, had the highest concentrations of DDTs, chlordanes, and HCHs (Tables 10-12;Figures 7-9). HCB was also high there, but an additional "hot spot" for this compound is at Coyote Creek (Table 13; Figure 10).

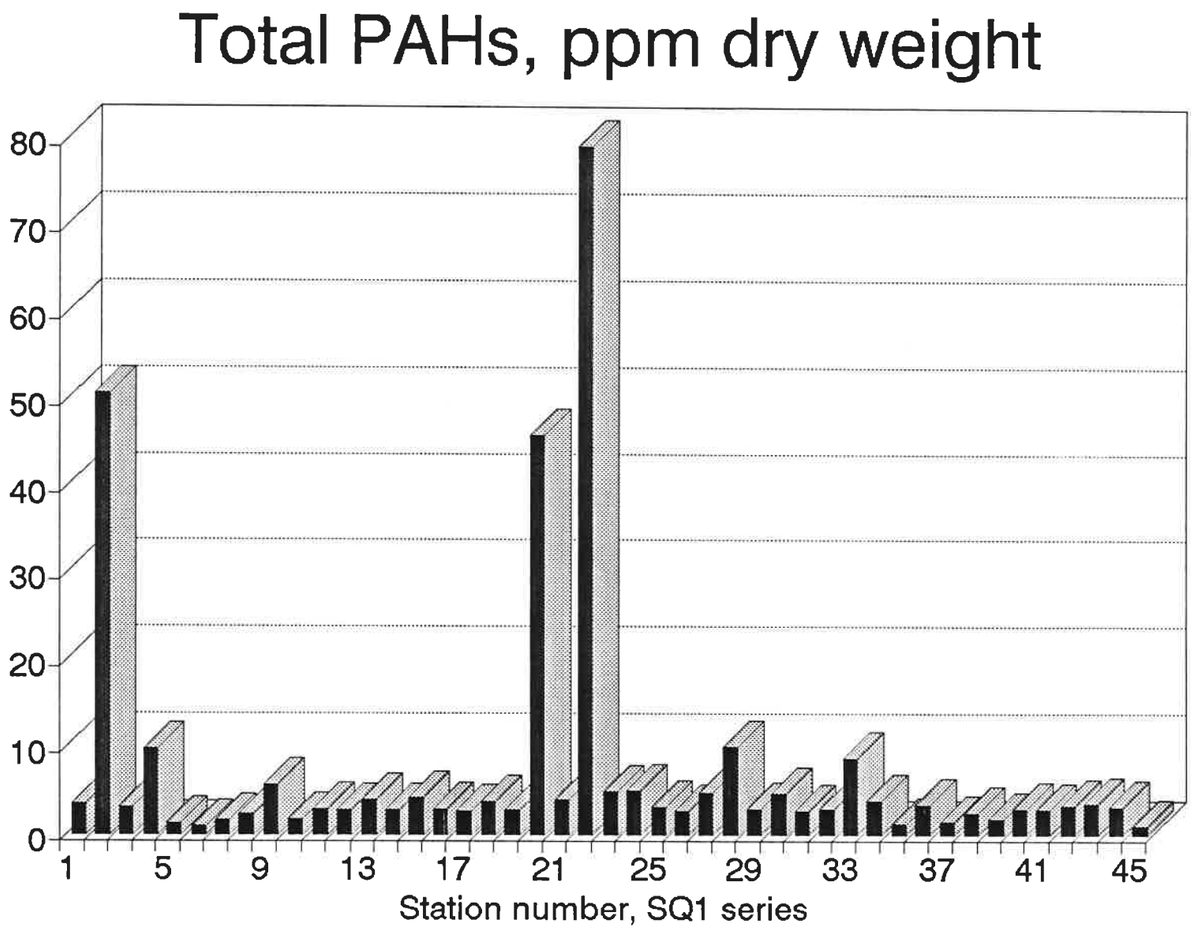
Total PAHs, ppm dry weight
80
70
60
50
40
30
20
10
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 series

Figure 3

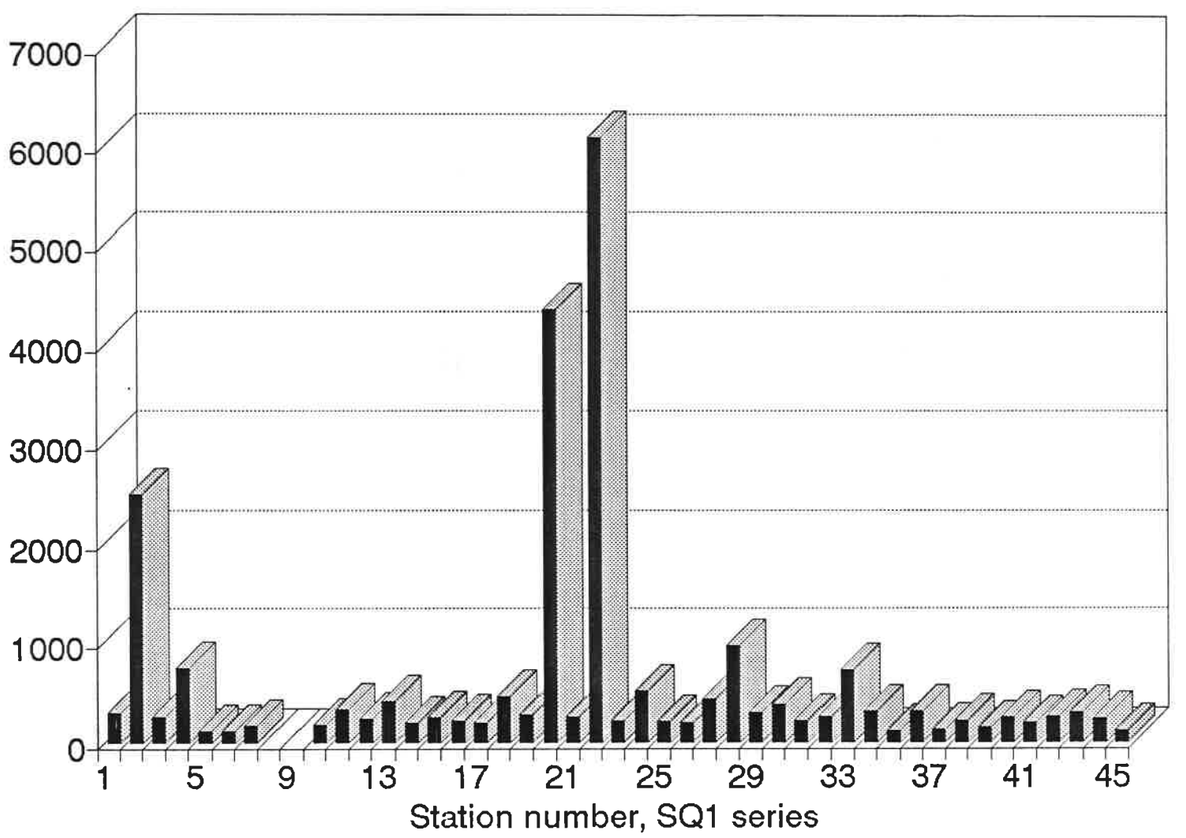
Total PAHs, Organic C
7000
6000
5000
4000
3000
2000
1000
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 series

Figure 4

Table 9. PCBs in San Francisco Bay Sediments

Ng/gram dry weight

Station #	Locality	Total PCBs
16C	San Leandro Bay	133.326
02C	Inner Richmond	115.236
15C	Oakland Inner	100.086
22C	China Basin	37.143
23C	Islais Creek	31.352
14C	Oakland Inner	28.440
25C	India Basin	22.794
26C	Hunters Point	21.266
17C	Alameda	17.243
41C	Redwood Creek	15.927
27C	Hunters Point	15.776
05C	Outer Richmond	12.616
40C	South Bay	12.473
30C	San Bruno	12.122
12C	Oakland Outer	11.779
28C	Sierra Point	9.881
32C	SFO	9.872
03C	Inner Richmond	9.677
04C	Outer Richmond	8.878
19C	Off San Leandro Bay	8.770
34C	Coyote Point	8.690
10C	Emeryville	8.620
44C	Coyote Creek	8.211
18C	Alameda	7.988
21C	China Basin	7.527
09C	Berkeley	7.448
31C	San Bruno	7.360
36C	San Mateo	7.307
13C	Oakland Outer	6.894
29C	Sierra Point	6.657
43C	South Bay	6.365
37C	San Mateo	6.360
39C	San Lorenzo	6.068
42C	Redwood Creek	5.943
08C	Berkeley	5.517
07C	Point Isabel	5.400
11C	Emeryville	4.727
24C	Islais Creek	4.590
38C	San Lorenzo	4.564
20C	Off India Basin	4.454
33C	SFO	4.163
45C	Coyote Creek	3.730
06C	Point Isabel	3.130
35C	Coyote Point	3.034
01C	San Pablo Bay	0.279

Geometric mean 9.5 ng/g (3-26 SD interval)

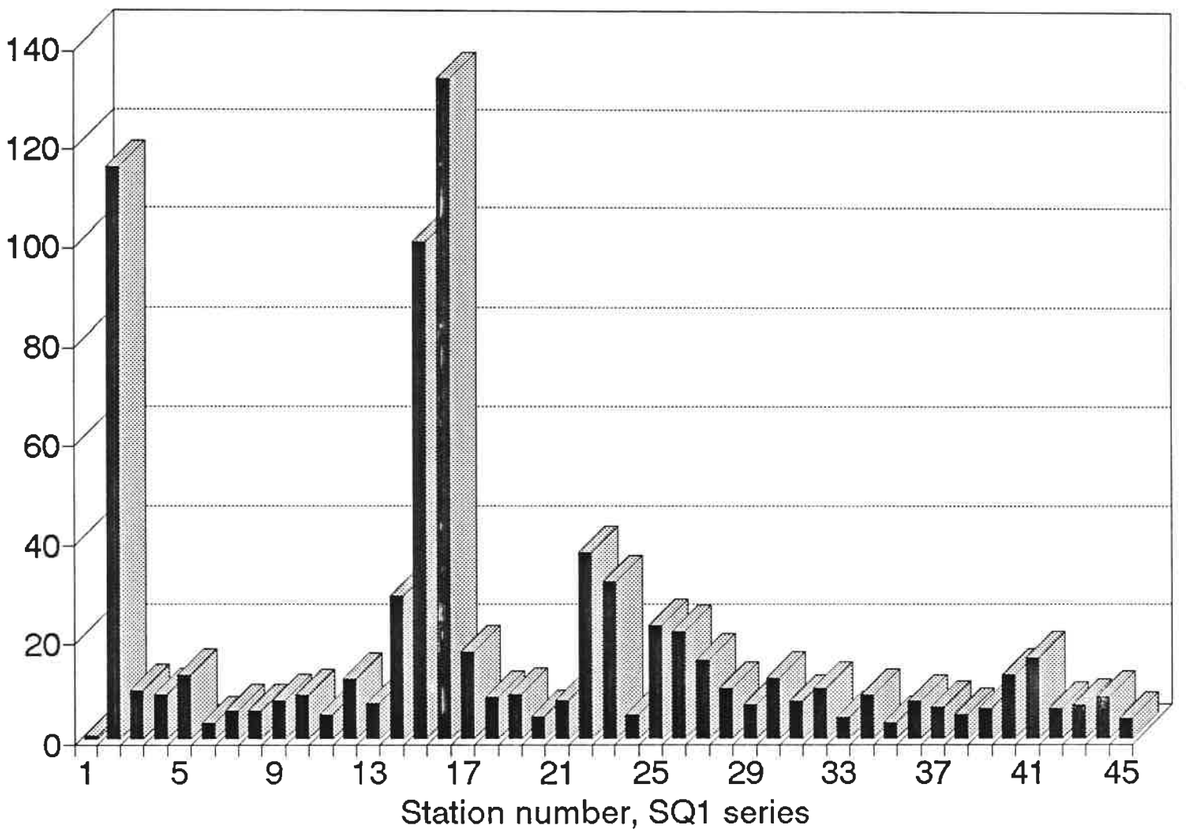
PCBs ng/g dry weight
140
120
100
80
60
40
20
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 series

Figure 5

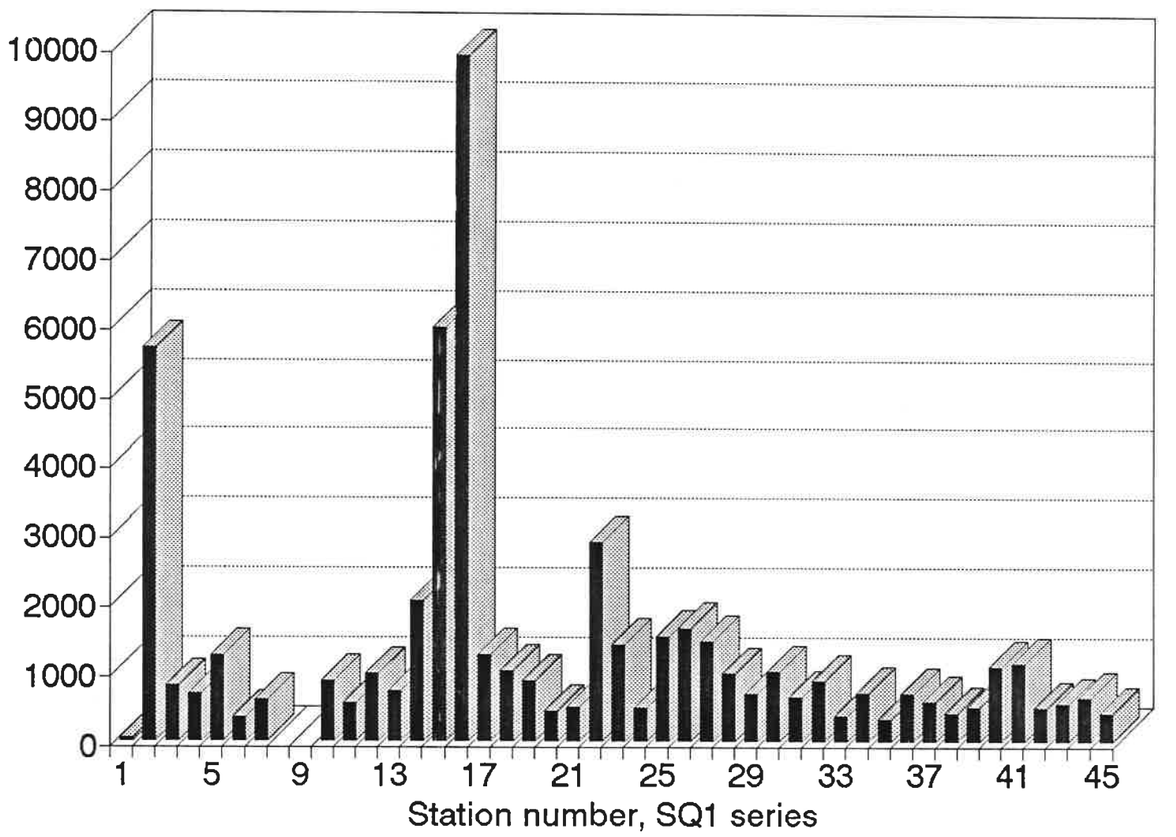
PCBs ng/g Organic C
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 series

Figure 6

Table 10. DDTs in San Francisco Bay Sediments

ng/g dry weight

Station #	Locality	Total DDTs
02C	Inner Richmond	5,651.17
16C	San Leandro Bay	65.94
22C	China Basin	45.89
29C	Sierra Point	43.02
15C	San Lorenzo	26.34
09C	Berkeley	23.87
04C	Outer Richmond	12.51
11C	Emeryville	11.54
03C	Inner Richmond	8.03
06C	Point Isabel	5.26
12C	Oakland Outer	4.66
23C	Islais Creek	4.57
05C	Outer Richmond	4.29
14C	Oakland Inner	3.85
08C	Berkeley	3.20
41C	Redwood Creek	3.10
21C	China Basin	3.09
32C	SFO	3.08
37C	San Mateo	3.02
13C	Oakland Outer	2.97
19C	Off San Leandro Bay	2.89
25C	India Basin	2.73
30C	San Bruno	2.68
10C	Emeryville	2.65
31C	San Bruno	2.50
07C	Point Isabel	2.36
24C	Islais Creek	2.27
44C	Coyote Creek	2.21
34C	Coyote Point	2.17
17C	Alameda	2.16
26C	Hunters Point	1.79
43C	South Bay	1.73
27C	Hunters Point	1.68
40C	South Bay	1.65
42C	Redwood Creek	1.53
39C	San Lorenzo	1.52
38C	San Lorenzo	1.51
36C	San Mateo	1.23
20C	Off India Basin	1.16
45C	Coyote Creek	1.16
33C	SFO	1.09
18C	Alameda	1.03
28C	Sierra Point	0.94
35C	Coyote Point	0.84
01C	San Pablo Bay	0.26

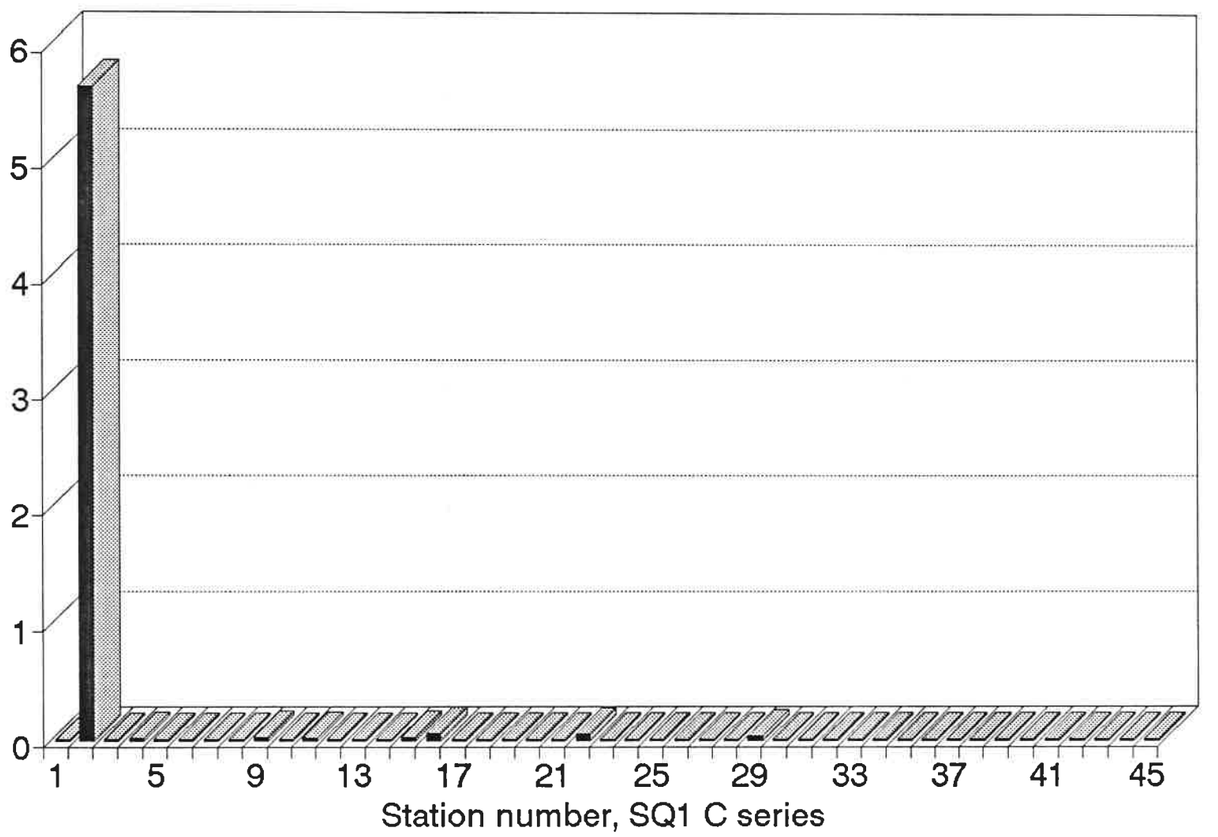
DDTs ppm dry weight
6
5
4
3
2
1
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 C series

Figure 7

Table 11. Chlordanes in San Francisco Bay Sediments

ng/g dry weight

Station #	Locality	Total chlordanes
02C	Inner Richmond	26.540
16C	San Leandro Bay	3.205
15C	San Lorenzo	3.105
11C	Emeryville	1.867
22C	China Basin	1.047
23C	Islais Creek	0.773
04C	Outer Richmond	0.309
34C	Coyote Point	0.309
29C	Sierra Point	0.260
14C	Oakland Inner	0.254
30C	San Bruno	0.180
26C	Hunters Point	0.180
32C	SFO	0.174
12C	Oakland Outer	0.167
25C	India Basin	0.165
13C	Oakland Outer	0.144
24C	Islais Creek	0.137
19C	Off San Leandro Bay	0.130
44C	Coyote Creek	0.130
37C	San Mateo	0.127
17C	Alameda	0.125
41C	Redwood Creek	0.123
43C	South Bay	0.108
28C	Sierra Point	0.104
36C	San Mateo	0.099
31C	San Bruno	0.086
27C	Hunters Point	0.082
38C	San Lorenzo	0.081
06C	Point Isabel	0.080
03C	Inner Richmond	0.078
09C	Berkeley	0.077
45C	Coyote Creek	0.067
42C	Redwood Creek	0.063
10C	Emeryville	0.063
39C	San Lorenzo	0.063
33C	SFO	0.062
05C	Outer Richmond	0.058
21C	China Basin	0.057
07C	Point Isabel	0.046
08C	Berkeley	0.038
18C	Alameda	0.037
40C	South Bay	0.036
35C	Coyote Point	0.030
20C	Off India Basin	0.023
01C	San Pablo Bay	0.012

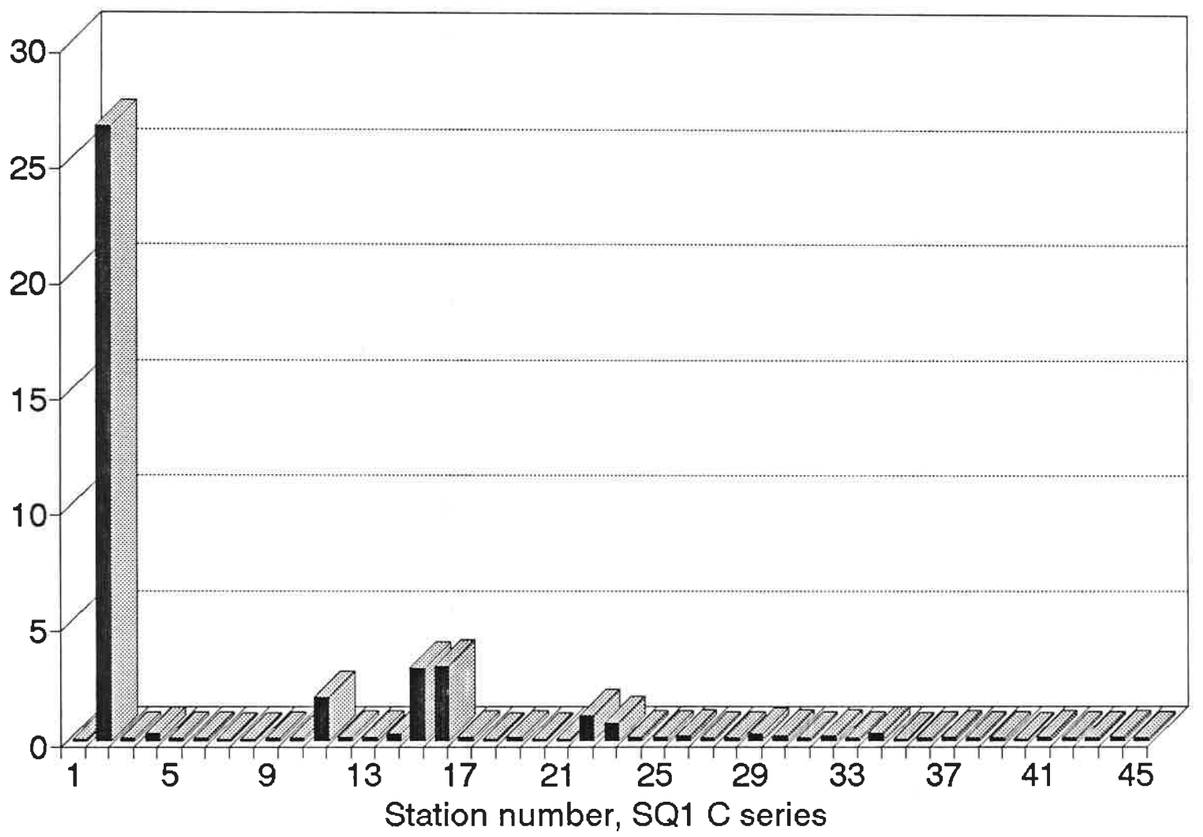
Chlordanes ng/g dry weight
30
25
20
15
10
5
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 C series

Figure 8

Table 12. Hexachlorocyclohexanes in San Francisco Bay Sediments

ng/g dry weight

Station #	Locality	Total HCHs
02C	Inner Richmond	16.491
11C	Emeryville	0.033
04C	Outer Richmond	0.020
15C	San Lorenzo	0.017
03C	Inner Richmond	0.014
23C	Islais Creek	0.013
44C	Coyote Creek	0.012
16C	San Leandro Bay	0.012
37C	San Mateo	0.012
22C	China Basin	0.012
29C	Sierra Point	0.011
21C	China Basin	0.011
17C	Alameda	0.010
25C	India Basin	0.010
14C	Oakland Inner	0.010
27C	Hunters Point	0.009
41C	Redwood Creek	0.008
13C	Oakland Outer	0.008
06C	Point Isabel	0.008
09C	Berkeley	0.008
12C	Oakland Outer	0.008
30C	San Bruno	0.007
36C	San Mateo	0.007
26C	Hunters Point	0.006
24C	Islais Creek	0.006
34C	Coyote Point	0.006
43C	South Bay	0.006
07C	Point Isabel	0.006
32C	SFO	0.006
31C	San Bruno	0.005
05C	Outer Richmond	0.005
38C	San Lorenzo	0.005
10C	Emeryville	0.005
08C	Berkeley	0.005
19C	Off San Leandro Bay	0.004
20C	Off India Basin	0.004
18C	Alameda	0.004
33C	SFO	0.004
45C	Coyote Creek	0.003
40C	South Bay	0.003
39C	San Lorenzo	0.003
28C	Sierra Point	0.003
35C	Coyote Point	0.002
01C	San Pablo Bay	0.002
42C	Redwood Creek	nm

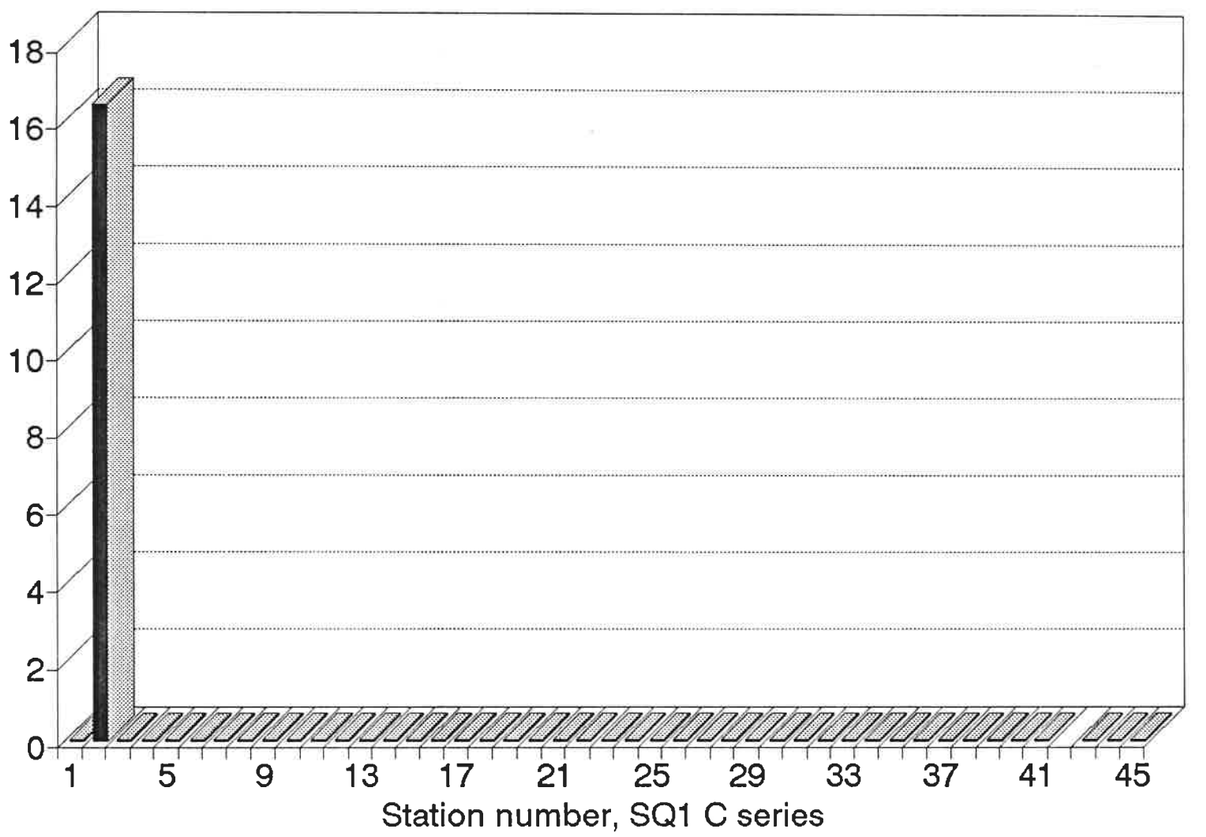
HCHs ng/g dry weight
18
16
14
12
10
8
6
4
2
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 C series

Figure 9

Table 13. Hexachlorobenzene in San Francisco Bay Sediments

ng/g dry weight

Station #	Locality	HCB
44C	Coyote Creek	0.751
02C	Inner Richmond	0.653
12C	Oakland Outer	0.031
05C	Outer Richmond	0.027
11C	Emeryville	0.024
16C	San Leandro Bay	0.021
23C	Islais Creek	0.021
15C	San Lorenzo	0.018
21C	China Basin	0.013
04C	Outer Richmond	0.013
40C	South Bay	0.012
30C	San Bruno	0.011
25C	India Basin	0.011
34C	Coyote Point	0.010
17C	Alameda	0.010
08C	Berkeley	0.010
03C	Inner Richmond	0.010
31C	San Bruno	0.009
10C	Emeryville	0.007
26C	Hunters Point	0.007
38C	San Lorenzo	0.007
32C	SFO	0.007
24C	Islais Creek	0.006
36C	San Mateo	0.006
19C	Off San Leandro Bay	0.006
22C	China Basin	0.006
37C	San Mateo	0.006
27C	Hunters Point	0.006
09C	Berkeley	0.005
41C	Redwood Creek	0.005
39C	San Lorenzo	0.005
28C	Sierra Point	0.005
29C	Sierra Point	0.005
43C	South Bay	0.004
13C	Oakland Outer	0.004
14C	Oakland Inner	0.004
18C	Alameda	0.003
33C	SFO	0.003
01C	San Pablo Bay	0.003
45C	Coyote Creek	0.003
20C	Off India Basin	0.002
35C	Coyote Point	0.002
07C	Point Isabel	0.001
06C	Point Isabel	0.000
42C	Redwood Creek	nm

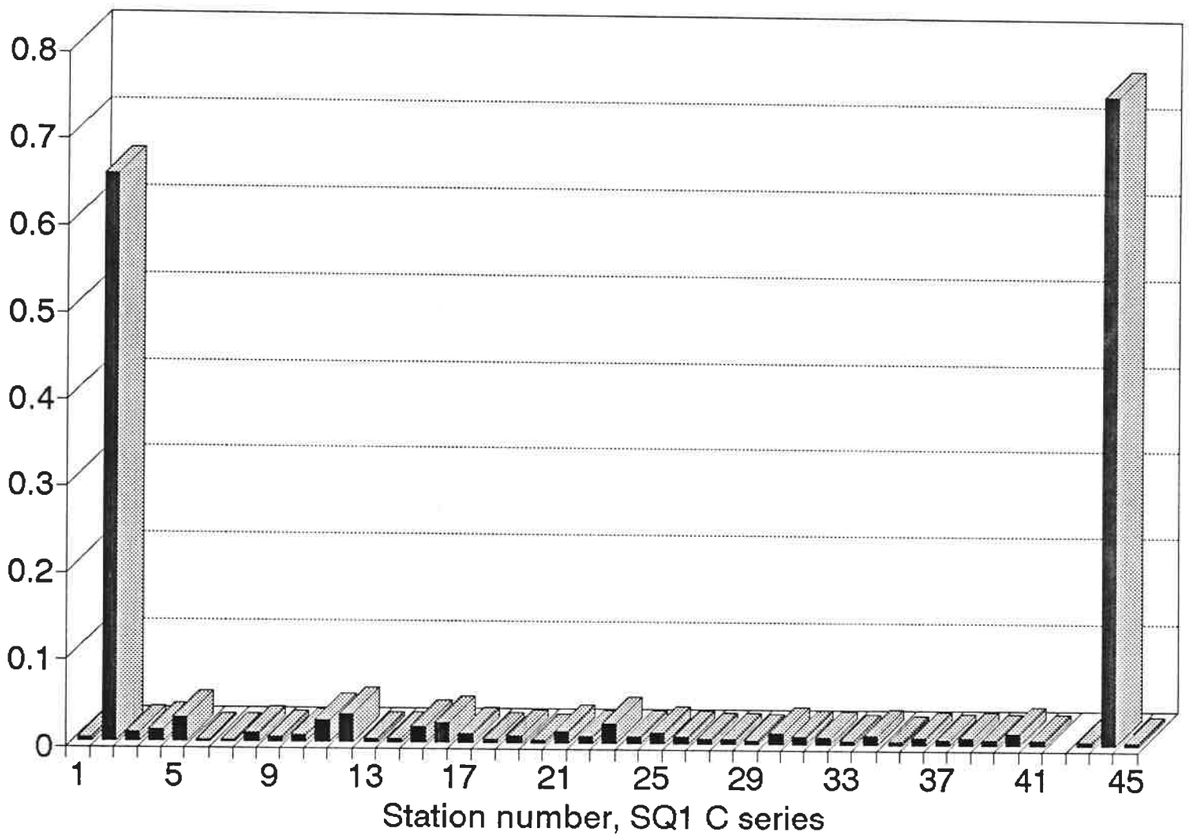
HCB ng/g dry weight
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
5
9
13
17
21
25
29
33
37
41
45
Station number, SQ1 C series

Figure 10

Discussion

The data from the several Mussel Watch programs in the 1970s (e.g. Goldberg *et al.*, 1978) provided the needed basis for the detection and measurement of any future changes in contaminant levels in coastal waters over time. Otherwise, however, they indicated more or less what might have been expected: high levels in the Los Angeles area where a DDT company had discharged its wastes for several decades, multiple sources for PCBs with the exception of one notable "hot spot" in New Bedford Harbor, higher lead and petroleum levels in urban areas, etc. In the 1980s the perceived need for regulatory tools prompted the development of the myriad of sediment toxicity tests now used in the permit process for the dredging of bays, harbors, and marinas. In spite of the enormous economic consequences of the decisions made on the basis of these tests, particularly in the San Francisco Bay area, a basic assumption that the tests measure contaminant toxicity that would threaten the local food webs has only sporadically been seriously questioned (e.g. Spies, 1989).

In the 1960s a dramatic change in the status of several species of raptorial and fish-eating birds, and convincing demonstrations of reproductive failures, provided the stimulus to search for the causes and for political action. In their extensive review of toxicity studies in San Francisco Bay, Long and Markel (1992) mention population changes of only one species that are possibly linked with contaminants, - the introduced striped bass. Evidence for a contaminant cause, however, is weak. Are there species in San Francisco Bay whose numbers have been, are, or could be affected by one or more contaminants?

There is an obvious follow-up to the studies undertaken by Long and Markel (1992) that were the stimulus for the present report: determine the concentrations in the elutriate waters of the several metals associated with toxic effects, and undertake dose-response experiments with these metals under the conditions used in the tests. Only with such an experimental approach under controlled conditions can the validity of these tests be verified or discredited.

The unexpected very high correlation between some of the toxicities and the few TSV values in the present correlation matrix, considered with data obtained in the SedQual III program of the San Francisco Bay Regional Water Quality Control Board, indicate that natural factors rather than contaminants appear to be the likely cause of many of the observed toxicities. As noted above, organic carbon and nitrogen were the only variables showing a strong

significant relationship with mortalities of the amphipod *Eohaustaurius estuarius* in San Francisco Bay samples outside of Castro Cove (n = 55). None of the contaminant variables showed any significant correlation. Similarly, the results obtained in the oyster larvae test also indicated that natural factors rather than contaminants were responsible for the abnormalities observed (1994a).

A hypothesis that all of the measured toxicities at sites in San Francisco Bay, other than highly contaminated areas such as Castro Cove, are due to natural rather than anthropogenic factors can not be discarded on the basis of the available data.

With one exception, the organic "toxics" routinely measured are unlikely candidates for toxicity in the sediment tests. Principal effects are elsewhere in the food web. The exception consists of the lighter aromatics that are components of petroleum, and that are likely to be components of the refinery wastes that impregnate the sediments of parts of Castro Cove.

Uses of the chlordane compounds ended almost twenty years ago; the very low concentrations found in this study indicate that they no longer pose any kind of environmental threat in the San Francisco Bay ecosystem. The extra cost of reporting their concentrations in routine monitoring programs would not appear justified. Although alpha-HCH is still frequently the most abundant of the identifiable synthetic organics in the water column (1994d), the concentrations of the HCHs in sediments are very low. Although concentrations of the DDTs in the vicinity of the Lauritzen Canal are very high, in the Bay as a whole they are below the threshold of harm to the most sensitive species - the Peregrine Falcon.

PAHs are considered to be a non-problem in San Francisco Bay (1994e). Their principal environmental effect, the induction of tumors in bottom fish, occurs at levels higher than those encountered in almost all San Francisco Bay sediments. They include human carcinogens, but no one eats sediments or asphalt. They are metabolized by fish, and do not reach man by that route. In shellfish, which do not metabolize them, levels are invariably low and must be considered with other dietary sources; this appears to be the only instance where regulatory activity is potentially necessary.

Although PCB levels generally appear low, the sediments are the likely source of the PCBs in the water column that are several times higher than current water quality objectives (1994d). The geometric mean concentration in this study was 9.5 ng/g. In the National Status and Trends

program undertaken in the 1980s, the median total PCB concentration on a dry weight basis in sediments from 176 sites was 18.5 ng/g (NOAA 1988). Continuing work might focus on the composition of the PCBs, which could be compared with that in the water column. If concentrations of individual congeners on an organic carbon basis exceed those predicted from octanol-water coefficients and the measured concentrations in the water column, the system is not in equilibrium and the sediments will be sources of PCBs to the water column. The wide variation in PCB levels on an organic carbon basis (Figure 6), indicate that many PCBs in local sediments are at least temporarily sequestered.

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PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Ng/g dry weight. Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	01C	02C	03C
Locality	San Pablo Bay	Inner Richmond	Inner Richmond
Latitude (N)	38.03.30	37.55.15	37.54.22
Longitude (W)	122.24.00	122.21.58	122.21.30
Date collection	29-Jan-90	29-Jan-90	05-Jan-90
Sample number	91-0033	91-0004	91-0056
% Organic Carbon	1.21	2.04	1.22
% Organic Nitrogen	0.142	0.184	0.15
Phenanthrene	157	2,880	168
X-Methyl Phenanthrene	17	362	25
2-Methyl Phenanthrene	23	688	29
Y-Methyl Phenanthrene	19	359	25
1-Methyl Phenanthrene	15	407	18
Anthracene	29	1,888	44
Kv1911	5	685	10
Fluoranthene	394	7,248	378
Pyrene	549	4,273	462
B[a]anthracene	144	3,813	154
Chrysene	189	7,485	208
B[b]fluoranthene	323	5,538	265
B[k]fluoranthene	225	3,983	243
B[e]pyrene	283	3,290	223
B[a]pyrene	328	3,893	189
Indeno[1,2,3-cd]pyrene	402	1,865	291
Dibenz[a,h]anthracene	38	591	43
B[ghi]perylene	492	1,651	335
TOTAL PAHs, ng/g dry weight	3,632	50,900	3,109
TOTAL PAHs, ng/g organic carbo	300,188	2,495,099	254,826
MePhs/Phenanthrene	0.472	0.631	0.577
Unresolved aromatic hydrocarbon	51,952	602,425	71,502

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	04C	05C	06C
Locality	Outer Richmond	Outer Richmond	Point Isabel
Latitude (N)	37.54.24	37.55.00	37.53.50
Longitude (W)	122.22.37	122.24.10	122.20.30
Date collection	05-Jan-90	05-Jan-90	05-Jan-90
Sample number	91-0041	91-0028	91-0061
% Organic Carbon	1.31	1.04	0.95
% Organic Nitrogen	0.16	0.123	0.114
Phenanthrene	554	66	88
X-Methyl Phenanthrene	72	10	12
2-Methyl Phenanthrene	106	12	13
Y-Methyl Phenanthrene	73	9	12
1-Methyl Phenanthrene	65	7	8
Anthracene	164	20	17
Kv1911	36	5	4
Fluoranthene	1,157	147	187
Pyrene	1,623	172	233
B[a]anthracene	493	66	69
Chrysene	570	107	91
B[b]fluoranthene	791	112	96
B[k]fluoranthene	604	103	86
B[e]pyrene	627	93	87
B[a]pyrene	925	36	0
Indeno[1,2,3-cd]pyrene	810	116	3
Dibenz[a,h]anthracene	96	20	12
B[ghi]perylene	957	126	0
TOTAL PAHs, ng/g dry weight	9,726	1,227	1,016
TOTAL PAHs, ng/g organic carbon	742,426	117,951	106,974
MePhs/Phenanthrene	0.571	0.571	0.505
Unresolved aromatic hydrocarbons	216,456	50,139	30,088

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	07C	08C	09C
Locality	Point Isabel	Berkeley	Berkeley
Latitude (N)	37.53.30	37.52.00	37.51.30
Longitude (W)	122.22.45	122.20.00	122.22.30
Date collection	05-Jan-90	05-Jan-90	05-Jan-90
Sample number	91-0062	91-0047	91-0034
% Organic Carbon	0.92		
% Organic Nitrogen	0.114		
Phenanthrene	134	170	393
X-Methyl Phenanthrene	15	20	42
2-Methyl Phenanthrene	20	30	64
Y-Methyl Phenanthrene	16	19	46
1-Methyl Phenanthrene	12	19	43
Anthracene	31	33	117
Kv1911	6	6	25
Fluoranthene	270	323	790
Pyrene	358	422	1,082
B[a]anthracene	103	123	306
Chrysene	122	141	329
B[b]fluoranthene	140	175	387
B[k]fluoranthene	127	140	289
B[e]pyrene	125	132	301
B[a]pyrene	12	205	526
Indeno[1,2,3-cd]pyrene	25	179	403
Dibenz[a,h]anthracene	15	23	43
B[ghi]perylene	37	210	463
TOTAL PAHs, ng/g dry weight	1,569	2,368	5,649
TOTAL PAHs, ng/g organic carbon	170,495	ERR	ERR
MePhs/Phenanthrene	0.473	0.514	0.497
Unresolved aromatic hydrocarbons	29,634	26,385	42,279

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	10C	11C	12C
Locality	Emeryville	Emeryville	Oakland Outer
Latitude (N)	37.50.10	37.50.08	37.49.06
Longitude (W)	122.19.13	122.22.55	122.19.15
Date collection	05-Jan-90	05-Jan-90	29-Jan-90
Sample number	91-0071	91-0029	91-0085
% Organic Carbon	0.99	0.89	1.23
% Organic Nitrogen	0.122	0.115	0.154
Phenanthrene	113	191	136
X-Methyl Phenanthrene	14	24	19
2-Methyl Phenanthrene	14	34	26
Y-Methyl Phenanthrene	15	25	18
1-Methyl Phenanthrene	9	22	15
Anthracene	28	49	36
Kv1911	6	14	7
Fluoranthene	246	412	316
Pyrene	307	500	419
B[a]anthracene	85	153	139
Chrysene	107	192	198
B[b]fluoranthene	137	199	237
B[k]fluoranthene	102	193	209
B[e]pyrene	107	179	188
B[a]pyrene	96	264	243
Indeno[1,2,3-cd]pyrene	141	216	261
Dibenz[a,h]anthracene	28	28	35
B[ghi]perylene	155	251	298
TOTAL PAHs, ng/g dry weight	1,709	2,945	2,800
TOTAL PAHs, ng/g organic carbon	172,590	330,954	227,663
MePhs/Phenanthrene	0.464	0.551	0.567
Unresolved aromatic hydrocarbons	16,676	36,950	52,420

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	13C	14C	15C
Locality	Oakland Outer	Oakland Inner	Oakland Inner
Latitude (N)	37.47.25	37.47.31	37.47.00
Longitude (W)	122.20.13	122.17.36	122.15.40
Date collection	30-Jan-90	30-Jan-90	30-Jan-90
Sample number	91-0044	91-0045	91-0042
% Organic Carbon	0.97	1.41	1.68
% Organic Nitrogen	0.126	0.177	0.187
Phenanthrene	311	259	160
X-Methyl Phenanthrene	33	21	16
2-Methyl Phenanthrene	47	30	20
Y-Methyl Phenanthrene	32	21	17
1-Methyl Phenanthrene	30	16	13
Anthracene	75	68	61
Kv1911	15	15	16
Fluoranthene	540	480	416
Pyrene	713	481	549
B[a]anthracene	196	166	181
Chrysene	218	246	318
B[b]fluoranthene	261	255	460
B[k]fluoranthene	245	214	357
B[e]pyrene	232	187	324
B[a]pyrene	341	109	405
Indeno[1,2,3-cd]pyrene	298	77	348
Dibenz[a,h]anthracene	35	28	58
B[ghi]perylene	339	74	389
TOTAL PAHs, ng/g dry weight	3,960	2,747	4,105
TOTAL PAHs, ng/g organic carbon	408,197	194,823	244,340
MePhs/Phenanthrene	0.455	0.337	0.406
Unresolved aromatic hydrocarbons	33,097	55,823	111,323

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	16C	17C	18C
Locality	San Leandro Bay	Alameda	Alameda
Latitude (N)	37.45.15	37.46.06	37.44.58
Longitude (W)	122.13.23	122.18.00	122.18.15
Date collection	30-Jan-90	12-Mar-90	13-Mar-90
Sample number	91-0038	91-0086	91-0072
% Organic Carbon	1.35	1.39	0.79
% Organic Nitrogen	0.18	0.18	0.106
Phenanthrene	186	146	209
X-Methyl Phenanthrene	19	21	23
2-Methyl Phenanthrene	30	28	33
Y-Methyl Phenanthrene	21	21	25
1-Methyl Phenanthrene	17	16	21
Anthracene	71	35	41
Kv1911	15	9	8
Fluoranthene	372	309	508
Pyrene	479	394	665
B[a]anthracene	163	118	199
Chrysene	232	167	255
B[b]fluoranthene	294	234	337
B[k]fluoranthene	186	169	278
B[e]pyrene	198	170	275
B[a]pyrene	226	229	175
Indeno[1,2,3-cd]pyrene	175	237	256
Dibenz[a,h]anthracene	33	30	35
B[ghi]perylene	202	268	302
TOTAL PAHs, ng/g dry weight	2,919	2,601	3,645
TOTAL PAHs, ng/g organic carbon	216,254	187,154	461,400
MePhs/Phenanthrene	0.473	0.591	0.489
Unresolved aromatic hydrocarbons	133,144	76,852	28,446

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	19C	20C	21C
Locality	Off San Leandro Bay	Off India Basin	China Basin
Latitude (N)	37.42.53	37.44.10	37.46.42
Longitude (W)	122.17.13	122.20.36	122.23.05
Date collection	13-Mar-90	12-Mar-90	12-Mar-90
Sample number	91-0076	91-0087	91-0063
% Organic Carbon	1.01	1.05	1.57
% Organic Nitrogen	0.128	0.109	0.19
Phenanthrene	173	4,226	292
X-Methyl Phenanthrene	19	143	46
2-Methyl Phenanthrene	26	212	30
Y-Methyl Phenanthrene	19	145	52
1-Methyl Phenanthrene	15	133	21
Anthracene	35	846	80
Kv1911	7	80	23
Fluoranthene	357	8,146	545
Pyrene	465	11,301	643
B[a]anthracene	126	2,019	201
Chrysene	153	1,839	272
B[b]fluoranthene	215	2,764	248
B[k]fluoranthene	173	1,558	227
B[e]pyrene	180	2,160	218
B[a]pyrene	247	3,736	321
Indeno[1,2,3-cd]pyrene	250	2,953	320
Dibenz[a,h]anthracene	28	277	107
B[ghi]perylene	290	3,387	334
TOTAL PAHs, ng/g dry weight	2,777	45,924	3,977
TOTAL PAHs, ng/g organic carbon	274,993	4,373,705	253,332
MePhs/Phenanthrene	0.457	0.150	0.507
Unresolved aromatic hydrocarbons	22,880	20,936	107,998

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	22C	23C	24C
Locality	China Basin	Islais Creek	Islais Creek
Latitude (N)	37.46.42	37.44.51	37.44.56
Longitude (W)	122.23.05	122.22.55	122.22.00
Date collection	12-Mar-90	12-Mar-90	12-Mar-90
Sample number	91-0088	91-0073	91-0046
% Organic Carbon	1.3	2.24	0.99
% Organic Nitrogen	0.14	0.282	0.118
Phenanthrene	12,953	487	380
X-Methyl Phenanthrene	2,263	65	37
2-Methyl Phenanthrene	2,846	85	57
Y-Methyl Phenanthrene	2,338	62	36
1-Methyl Phenanthrene	1,849	57	36
Anthracene	4,514	179	110
Kv1911	985	44	18
Fluoranthene	8,561	1,052	732
Pyrene	13,434	740	1,051
B[a]anthracene	5,560	306	276
Chrysene	5,680	466	293
B[b]fluoranthene	3,740	297	374
B[k]fluoranthene	2,129	269	235
B[e]pyrene	2,559	217	277
B[a]pyrene	4,993	238	427
Indeno[1,2,3-cd]pyrene	2,173	94	339
Dibenz[a,h]anthracene	556	44	35
B[ghi]perylene	2,195	161	366
TOTAL PAHs, ng/g dry weight	79,328	4,863	5,080
TOTAL PAHs, ng/g organic carbon	6,102,191	217,110	513,121
MePhs/Phenanthrene	0.718	0.554	0.438
Unresolved aromatic hydrocarbons	53,777	48,081	23,460

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	25C	26C	27C
Locality	India Basin	Hunters Point	Hunters Point
Latitude (N)	37.44.05	37.42.57	37.42.06
Longitude (W)	122.22.10	122.22.22	122.21.35
Date collection	12-Mar-90	12-Mar-90	12-Mar-90
Sample number	91-0050	91-0048	91-0057
% Organic Carbon	1.51	1.31	1.11
% Organic Nitrogen	0.185	0.154	0.132
Phenanthrene	146	122	330
X-Methyl Phenanthrene	19	21	33
2-Methyl Phenanthrene	25	18	48
Y-Methyl Phenanthrene	19	23	37
1-Methyl Phenanthrene	17	12	27
Anthracene	53	25	75
Kv1911	10	8	15
Fluoranthene	390	319	689
Pyrene	528	438	956
B[a]anthracene	170	138	245
Chrysene	240	193	277
B[b]fluoranthene	342	259	361
B[k]fluoranthene	235	173	277
B[e]pyrene	260	193	297
B[a]pyrene	128	78	365
Indeno[1,2,3-cd]pyrene	236	245	295
Dibenz[a,h]anthracene	34	50	39
B[ghi]perylene	264	283	358
TOTAL PAHs, ng/g dry weight	3,118	2,596	4,723
TOTAL PAHs, ng/g organic carbon	206,512	198,139	425,493
MePhs/Phenanthrene	0.550	0.602	0.439
Unresolved aromatic hydrocarbons	35,305	75,570	19,609

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	28C	29C	30C
Locality	Sierra Point	Sierra Point	San Bruno
Latitude (N)	37.40.06	37.41.12	37.38.25
Longitude (W)	122.22.20	122.19.17	122.22.00
Date collection	13-Mar-90	13-Mar-90	15-Mar-90
Sample number	91-0058	91-0077	91-0089
% Organic Carbon	1.04	0.99	1.22
% Organic Nitrogen	0.114	0.123	0.138
Phenanthrene	508	175	200
X-Methyl Phenanthrene	73	25	26
2-Methyl Phenanthrene	82	34	32
Y-Methyl Phenanthrene	76	25	27
1-Methyl Phenanthrene	45	22	20
Anthracene	122	43	52
Kv1911	0	11	10
Fluoranthene	1,288	387	539
Pyrene	1,869	507	769
B[a]anthracene	524	151	228
Chrysene	624	190	289
B[b]fluoranthene	793	198	376
B[k]fluoranthene	558	182	275
B[e]pyrene	629	175	300
B[a]pyrene	1,036	247	450
Indeno[1,2,3-cd]pyrene	852	235	427
Dibenz[a,h]anthracene	84	28	47
B[ghi]perylene	973	266	480
TOTAL PAHs, ng/g dry weight	10,136	2,902	4,547
TOTAL PAHs, ng/g organic carbon	974,585	293,172	372,740
MePhs/Phenanthrene	0.544	0.607	0.525
Unresolved aromatic hydrocarbons	37,223	13,874	18,641

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	31C	32C	33C
Locality	San Bruno	SFO	SFO
Latitude (N)	37.38.25	37.36.34	37.36.30
Longitude (W)	122.20.00	122.20.22	122.17.52
Date collection	13-Mar-90	13-Mar-90	15-Mar-90
Sample number	91-0051	91-0059	91-0078
% Organic Carbon	1.16	1.14	1.21
% Organic Nitrogen	0.14	0.134	0.139
Phenanthrene	153	145	338
X-Methyl Phenanthrene	18	18	42
2-Methyl Phenanthrene	23	23	58
Y-Methyl Phenanthrene	18	19	43
1-Methyl Phenanthrene	15	16	35
Anthracene	36	40	70
Kv1911	8	8	13
Fluoranthene	330	374	952
Pyrene	469	521	1,341
B[a]anthracene	126	129	339
Chrysene	159	167	428
B[b]fluoranthene	202	236	811
B[k]fluoranthene	170	169	521
B[e]pyrene	174	184	587
B[a]pyrene	202	275	855
Indeno[1,2,3-cd]pyrene	209	255	1,011
Dibenz[a,h]anthracene	27	30	88
B[ghi]perylene	249	295	1,191
TOTAL PAHs, ng/g dry weight	2,588	2,907	8,721
TOTAL PAHs, ng/g organic carbon	223,128	254,983	720,764
MePhs/Phenanthrene	0.486	0.529	0.526
Unresolved aromatic hydrocarbons	12,285	9,167	20,302

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	34C	35C	36C
Locality	Coyote Point	Coyote Point	San Mateo
Latitude (N)	37.35.49	37.37.20	37.36.20
Longitude (W)	122.16.30	122.14.45	122.14.30
Date collection	15-Mar-90	15-Mar-90	15-Mar-90
Sample number	91-0064	91-0074	91-0030
% Organic Carbon	1.26	0.98	1.09
% Organic Nitrogen	0.16	0.116	0.144
Phenanthrene	207	80	233
X-Methyl Phenanthrene	27	10	23
2-Methyl Phenanthrene	37	11	35
Y-Methyl Phenanthrene	27	11	21
1-Methyl Phenanthrene	24	7	21
Anthracene	58	15	38
Kv1911	10	3	7
Fluoranthene	479	166	462
Pyrene	651	210	596
B[a]anthracene	203	58	163
Chrysene	265	71	205
B[b]fluoranthene	297	84	256
B[k]fluoranthene	238	77	235
B[e]pyrene	248	75	217
B[a]pyrene	360	54	239
Indeno[1,2,3-cd]pyrene	345	99	259
Dibenz[a,h]anthracene	40	19	31
B[ghi]perylene	394	112	314
TOTAL PAHs, ng/g dry weight	3,908	1,162	3,354
TOTAL PAHs, ng/g organic carbon	310,191	118,602	307,717
MePhs/Phenanthrene	0.559	0.486	0.426
Unresolved aromatic hydrocarbons	17,371	8,326	27,676

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	37C	38C	39C
Locality	San Mateo	San Lorenzo	San Lorenzo
Latitude (N)	37.38.04	37.40.00	37.40.59
Longitude (W)	122.12.47	122.15.45	122.14.06
Date collection	15-Mar-90	13-Mar-90	13-Mar-90
Sample number	91-0075	91-0049	91-0079
% Organic Carbon	1.15	1.19	1.28
% Organic Nitrogen	0.152	0.144	0.168
Phenanthrene	126	191	81
X-Methyl Phenanthrene	15	20	13
2-Methyl Phenanthrene	17	29	15
Y-Methyl Phenanthrene	15	20	13
1-Methyl Phenanthrene	10	16	9
Anthracene	19	30	16
Kv1911	4	6	3
Fluoranthene	253	350	204
Pyrene	332	427	265
B[a]anthracene	92	118	79
Chrysene	120	148	109
B[b]fluoranthene	158	192	142
B[k]fluoranthene	135	158	132
B[e]pyrene	132	163	125
B[a]pyrene	0	208	142
Indeno[1,2,3-cd]pyrene	33	215	185
Dibenz[a,h]anthracene	23	27	25
B[ghi]perylene	4	245	207
TOTAL PAHs, ng/g dry weight	1,488	2,564	1,765
TOTAL PAHs, ng/g organic carbon	129,425	215,441	137,853
MePhs/Phenanthrene	0.446	0.442	0.619
Unresolved aromatic hydrocarbons	17,873	22,172	15,549

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	40C	41C	42C
Locality	South Bay	Redwood Creek	Redwood Creek
Latitude (N)	37.34.50	37.31.00	37.31.58
Longitude (W)	122.13.00	122.12.25	122.11.32
Date collection	04-Jan-90	04-Jan-90	04-Jan-90
Sample number	91-0040	91-0065	91-0037
% Organic Carbon	1.16	1.43	1.27
% Organic Nitrogen	0.146	0.176	0.158
Phenanthrene	125	132	173
X-Methyl Phenanthrene	14	20	26
2-Methyl Phenanthrene	19	21	32
Y-Methyl Phenanthrene	14	20	21
1-Methyl Phenanthrene	12	12	20
Anthracene	26	23	44
Kv1911	5	0	8
Fluoranthene	312	338	418
Pyrene	446	453	536
B[a]anthracene	124	127	151
Chrysene	156	173	189
B[b]fluoranthene	260	249	252
B[k]fluoranthene	178	186	223
B[e]pyrene	202	192	217
B[a]pyrene	300	163	282
Indeno[1,2,3-cd]pyrene	303	282	310
Dibenz[a,h]anthracene	29	39	33
B[ghi]perylene	354	313	355
TOTAL PAHs, ng/g dry weight	2,880	2,743	3,290
TOTAL PAHs, ng/g organic carbon	248,303	191,815	259,063
MePhs/Phenanthrene	0.475	0.558	0.571
Unresolved aromatic hydrocarbons	20,223	43,510	370,879

PAHs in San Francisco Bay Sediments. SedQual I, Series C.

Data file: C.wb1:PAH02b; hardcopy C.wb1:PAH03a

Station #	43C	44C	45C
Locality	South Bay	Coyote Creek	Coyote Creek
Latitude (N)	37.32.43	37.29.30	37.28.02
Longitude (W)	122.10.05	122.06.17	122.03.37
Date collection	04-Jan-90	04-Jan-90	04-Jan-90
Sample number	91-0080	91-0035	91-0060
% Organic Carbon	1.23	1.33	0.98
% Organic Nitrogen	0.155	0.161	0.123
Phenanthrene	152	142	56
X-Methyl Phenanthrene	20	20	8
2-Methyl Phenanthrene	28	27	10
Y-Methyl Phenanthrene	19	18	8
1-Methyl Phenanthrene	17	16	5
Anthracene	27	57	9
Kv1911	5	5	2
Fluoranthene	421	351	126
Pyrene	588	464	169
B[a]anthracene	146	126	43
Chrysene	189	286	60
B[b]fluoranthene	320	244	91
B[k]fluoranthene	227	226	70
B[e]pyrene	255	205	76
B[a]pyrene	333	245	63
Indeno[1,2,3-cd]pyrene	383	314	111
Dibenz[a,h]anthracene	36	34	15
B[ghi]perylene	433	346	122
TOTAL PAHs, ng/g dry weight	3,599	3,124	1,044
TOTAL PAHs, ng/g organic carbon	292,605	234,924	106,567
MePhs/Phenanthrene	0.556	0.567	0.563
Unresolved aromatic hydrocarbons	26,119	19,157	6,527

APPENDIX 2. PCBs in San Francisco Bay Sediment Ng/g dry weight

Station #	01C		01C	02C		02C	03C		03C
Locality	San Pablo Bay			Inner Richmond			Inner Richmond		
BBI #	91-0033			91-0004			91-0056		
% Organic Carbon			1.21			2.04			1.22
% Organic Nitrogen			0.142			0.184			0.15
Detection limit ng/g dry weight			0.000290			0.001105			0.000541
PCB005/8			0.000			0.025			0.000
PCB015			0.000			0.392		< =	0.222
PCB018			0.000			0.038		< =	0.022
PCB027/24			0.000			0.000			0.000
PCB028			0.000			0.000			0.000
PCB028/31			0.001			2.887			0.150
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.000			1.929			0.010
PCB044			0.000			1.649			0.073
PCB049			0.000			0.288			0.083
PCB052			0.000			4.154			0.200
PCB060/56			0.000		nm	0.000		< =	0.024
PCB066/95			0.007			10.297			0.522
PCB070		<	0.002			2.295			0.148
PCB074		<	0.002			0.506			0.072
PCB087/115			0.000			3.682			0.173
PCB097		<	0.001			2.640			0.109
PCB099			0.007			2.241			0.209
PCB101/90			0.009			9.306			0.513
PCB105			0.000			0.000			0.000
PCB105/132		nm	0.000			2.965			0.245
PCB110/77			0.016			4.488			0.654
PCB114/131/122			0.017		nm	0.000		< =	0.060
PCB118			0.003			7.553			0.711
PCB128			0.001			0.373			0.061
PCB129/178			0.000		< =	0.078			0.017
PCB132			0.000			0.000			0.000
PCB137/176			0.000			0.100			0.009
PCB138			0.017			15.640			1.138
PCB141/179			0.002			2.065			0.094
PCB146			0.000			2.443			0.097
PCB149			0.009			8.741			0.689
PCB151/82		<	0.001			1.270			0.141
PCB153			0.128			7.111			1.394
PCB156/171/202			0.000			1.915			0.142
PCB157/173/201			0.000			0.241			0.018
PCB158			0.000			0.261			0.038
PCB170/190			0.003			2.443			0.191
PCB174			0.005			2.249			0.146
PCB177			0.003			0.877			0.100
PCB180			0.016			5.808			0.566
PCB183			0.003			1.163			0.116
PCB185			0.000			0.044			0.006
PCB187			0.007			2.769			0.297
PCB189			0.002			0.020			0.003
PCB191			0.000			0.012			0.001
PCB194			0.000			0.005			0.000
PCB195/208			0.006			0.287			0.030
PCB196/203			0.005			0.859			0.082
PCB199			0.006			1.081			0.099
PCB205			0.001			0.037			0.002
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.001			0.008			0.002
Total PCBs			0.279			115.236			9.677

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	04C		04C	05C		05C	06C		06C
Locality	Outer Richmond			Outer Richmond			Point Isabel		
BBI #	91-0041			91-0028			91-0061		
% Organic Carbon			1.31			1.04			0.95
% Organic Nitrogen			0.16			0.123			0.114
Detection limit ng/g dry weight			0.000545			0.000199			0.000435
PCB005/8		<	0.007			0.000			0.000
PCB015			0.000			0.082			0.000
PCB018		<	0.007			0.009			0.000
PCB027/24			0.000			0.000			0.000
PCB028			0.000			0.000			0.000
PCB028/31			0.097			0.166			0.019
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.010			0.004			0.000
PCB044			0.043			0.056			0.000
PCB049			0.046			0.098			0.022
PCB052			0.135			0.233			0.067
PCB060/56		< =	0.008		< =	0.066			0.000
PCB066/95			0.413			0.628			0.100
PCB070			0.083			0.128			0.026
PCB074			0.039			0.073			0.013
PCB087/115			0.128			0.183			0.030
PCB097			0.086			0.126			0.017
PCB099			0.170			0.247			0.095
PCB101/90			0.455			0.691			0.236
PCB105			0.000			0.000			0.000
PCB105/132			0.000		nm	0.000		nm	0.000
PCB110/77			0.481			0.648			0.001
PCB114/131/122		< =	0.015		< =	0.021		< =	0.002
PCB118			0.446			0.556			0.114
PCB128			0.046			0.060		<	0.000
PCB129/178			0.006			0.011			0.000
PCB132			0.000			0.000			0.000
PCB137/176			0.002			0.005			0.003
PCB138			1.020			1.408			0.389
PCB141/179			0.103			0.145			0.046
PCB146			0.066			0.100			0.035
PCB149			0.728			1.037			0.347
PCB151/82			0.108			0.160			0.062
PCB153		INC 37	2.244		inc 37	3.020			0.537
PCB156/171/202			0.138			0.178			0.062
PCB157/173/201			0.018			0.024			0.010
PCB158			0.012			0.018			0.010
PCB170/190			0.217			0.300			0.076
PCB174			0.158			0.236			0.092
PCB177			0.109			0.153			0.031
PCB180			0.526			0.771			0.310
PCB183			0.123			0.174			0.063
PCB185			0.003			0.003			0.003
PCB187			0.327			0.458			0.185
PCB189			0.002			0.003			0.002
PCB191			0.001			0.002			0.001
PCB194			0.000			0.000			0.000
PCB195/208			0.034			0.045			0.016
PCB196/203			0.097			0.126			0.045
PCB199			0.116			0.163			0.060
PCB205			0.002			0.003			0.001
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.002			0.002			0.002
Total PCBs			8.878			12.616			3.130

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	07C		08C		09C	
Locality	Point Isabel		Berkeley		Berkeley	
BBI #	91-0062		91-0047		91-0034	
% Organic Carbon		0.92				
% Organic Nitrogen		0.114				
Detection limit ng/g dry weight		0.000425		0.000141		0.000118
PCB005/8		0.029		0.000		0.000
PCB015	<	0.018	< =	0.008		0.000
PCB018	<	0.002	< =	0.001		0.000
PCB027/24		0.000		0.000		0.000
PCB028		0.000		0.000		0.000
PCB028/31		0.056		0.067		0.115
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.000		0.000		0.000
PCB044		0.012		0.023		0.007
PCB049		0.039		0.052		0.064
PCB052		0.091		0.088		0.152
PCB060/56	<	0.001	nm	0.000	< =	0.007
PCB066/95		0.244		0.249		0.401
PCB070		0.042		0.050		0.088
PCB074		0.021		0.030		0.049
PCB087/115		0.068		0.069		0.115
PCB097		0.052		0.051		0.084
PCB099		0.141		0.130		0.181
PCB101/90		0.350		0.333		0.494
PCB105		0.000		0.000		0.000
PCB105/132		0.007	nm	0.000	nm	0.000
PCB110/77		0.058		0.105		0.423
PCB114/131/122	< =	0.001	< =	0.004	nm	0.000
PCB118		0.247		0.276		0.386
PCB128		0.001		0.001		0.025
PCB129/178	< =	0.016		0.000		0.006
PCB132		0.000		0.000		0.000
PCB137/176		0.005		0.002		0.002
PCB138		0.714		0.707		0.952
PCB141/179		0.071		0.077		0.107
PCB146		0.049		0.052		0.068
PCB149		0.534		0.540		0.738
PCB151/82		0.100		0.095		0.000
PCB153		0.984		0.922		1.087
PCB156/171/202		0.081		0.092		0.121
PCB157/173/201		0.011		0.013		0.020
PCB158		0.021		0.009		0.012
PCB170/190		0.148		0.168		0.213
PCB174		0.123		0.137		0.179
PCB177		0.068		0.078		0.111
PCB180		0.451		0.475		0.525
PCB183		0.092		0.107		0.123
PCB185		0.003		0.003		0.002
PCB187		0.263		0.276		0.330
PCB189		0.001		0.001		0.002
PCB191		0.001		0.001		0.001
PCB194		0.000		0.000		0.000
PCB195/208		0.025		0.031		0.030
PCB196/203		0.068		0.087		0.087
PCB199		0.089		0.102		0.109
PCB205		0.001		0.001		0.002
PCB206	nm	0.000	nm	0.000	nm	0.031
PCB207		0.001		0.001	<	0.001
Total PCBs		5.400		5.517		7.448

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	10C		10C	11C		11C	12C		12C
Locality	Emeryville			Emeryville			Oakland Outer		
BBI #	91-0071			91-0029			91-0085		
% Organic Carbon			0.99			0.89			1.23
% Organic Nitrogen			0.122			0.115			0.154
Detection limit ng/g dry weight			0.000623			0.000312			0.000683
PCB005/8			0.012			0.000			0.011
PCB015			1.115			0.051			0.039
PCB018			0.108			0.005			0.004
PCB027/24			0.000			0.000			0.002
PCB028			0.000			0.000			0.000
PCB028/31			0.105			0.059			0.107
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.014			0.003			0.000
PCB044			0.035			0.027			0.043
PCB049			0.042			0.032			0.069
PCB052			0.092			0.072			0.102
PCB060/56		< =	0.018		< =	0.022			0.042
PCB066/95			0.353			0.212			0.448
PCB070			0.070			0.050			0.089
PCB074			0.037			0.024			0.045
PCB087/115			0.099			0.062			0.129
PCB097			0.069			0.041			0.088
PCB099			0.153			0.098			0.183
PCB101/90			0.396			0.256			0.501
PCB105			0.000			0.000			0.000
PCB105/132			0.085		nm	0.000			0.171
PCB110/77			0.411			0.205			0.531
PCB114/131/122		< =	0.008		< =	0.005		< =	0.030
PCB118			0.374			0.217			0.472
PCB128			0.054			0.017			0.055
PCB129/178		< =	0.017		< =	0.004			0.022
PCB132			0.000			0.000			0.000
PCB137/176			0.007			0.002			0.010
PCB138			1.043			0.531			1.583
PCB141/179			0.093			0.053			0.103
PCB146			0.063			0.038			0.106
PCB149			0.654			0.403			1.109
PCB151/82			0.101			0.062			0.202
PCB153			1.102		inc 37	1.177			2.001
PCB156/171/202			0.055			0.065			0.203
PCB157/173/201			0.016			0.008			0.026
PCB158			0.029			0.007			0.048
PCB170/190			0.208			0.112			0.346
PCB174			0.151			0.086			0.267
PCB177			0.106			0.061			0.176
PCB180			0.610			0.277			1.163
PCB183			0.117			0.066			0.209
PCB185			0.005			0.001			0.009
PCB187			0.359			0.191			0.629
PCB189			0.002			0.002			0.003
PCB191			0.000			0.001			0.002
PCB194			0.000			0.000			0.003
PCB195/208			0.033			0.017			0.061
PCB196/203			0.087			0.047			0.148
PCB199			0.111			0.058			0.182
PCB205			0.003			0.001			0.004
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.000			0.001			0.003
Total PCBs			8.620			4.727			11.779

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	13C		13C	14C		14C	15C		15C	15C		15C
Locality	Oakland Outer			Oakland Inner			Oakland Inner			Oakland Inner, replicat		
BBI #	91-0044			91-0045			91-0042			91-0039		
% Organic Carbon			0.97			1.41			1.68			
% Organic Nitrogen			0.126			0.177			0.187			
Detection limit ng/g dry weight			0.000381			0.000845			0.001349			0.000728
PCB005/8			0.005			0.000			0.000			0.000
PCB015			0.135			0.105			0.167			0.000
PCB018			0.005			0.013			0.031			0.000
PCB027/24			0.000			0.000			0.000			0.000
PCB028			0.000			0.000			0.000			0.000
PCB028/31			0.068			0.212			0.581			0.572
PCB029			0.000			0.000			0.000			0.000
PCB031			0.000			0.000			0.000			0.000
PCB040			0.000			0.000			0.000			0.000
PCB044			0.039			0.147			0.465			0.514
PCB049			0.049			0.160			0.668			0.682
PCB052			0.097			0.799			1.589			1.737
PCB060/56			0.001			0.005		< =	0.049		< =	0.130
PCB066/95			0.300			1.665			3.994			4.008
PCB070			0.075			0.371			0.770			0.799
PCB074			0.037			0.112			0.344			0.350
PCB087/115			0.088			0.888			1.471			1.328
PCB097			0.058			0.425			0.943			0.981
PCB099			0.117			0.681			1.911			1.816
PCB101/90			0.357			2.745			5.935			6.046
PCB105			0.000			0.000			0.000		nm	0.000
PCB105/132			0.089			0.135			0.000		nm	0.000
PCB110/77			0.296			1.100			4.900			5.470
PCB114/131/122		< =	0.007		< =	0.011		< =	0.114		< =	0.113
PCB118			0.326			2.252			4.672			4.805
PCB128			0.020			0.026			0.401			0.542
PCB129/178			0.012			0.002		< =	0.194		< =	0.194
PCB132			0.000			0.000			0.000		nm	0.000
PCB137/176			0.002			0.030			0.035			0.058
PCB138			0.861			3.831			11.783			11.491
PCB141/179			0.104			0.366			1.412			1.317
PCB146			0.052			0.197			0.743			0.713
PCB149			0.639			2.365			9.560			9.148
PCB151/82			0.097			0.293			1.363			1.285
PCB153			1.221			5.287		inc 37	24.594		inc 37	24.917
PCB156/171/202			0.111			0.474			0.475			1.447
PCB157/173/201			0.013			0.051			0.361			0.370
PCB158			0.020			0.067			0.152			0.143
PCB170/190			0.196			0.522			2.644			2.569
PCB174			0.158			0.389			2.076			2.027
PCB177			0.092			0.193			1.198			1.158
PCB180			0.522			1.192			6.639			6.327
PCB183			0.114			0.266			1.445			1.379
PCB185			0.002			0.013			0.028			0.027
PCB187			0.293			0.620			3.587			3.490
PCB189			0.002			0.004			0.025			0.021
PCB191			0.001			0.003			0.021			0.020
PCB194			0.001			0.000			0.000			0.000
PCB195/208			0.027			0.051			0.369			0.353
PCB196/203			0.083			0.166			1.003			0.987
PCB199			0.102			0.192			1.145			1.132
PCB205			0.002			0.008			0.049			0.052
PCB206		nm	0.000		nm	0.000		nm	0.000		nm	0.000
PCB207			0.001			0.006			0.179			0.173
Total PCBs			6.894			28.440			100.086			100.689

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	16C	16C	17C	17C	18C	18C
Locality	San Leandro Bay		Alameda		Alameda	
BBI #	91-0038		91-0086		91-0072	
% Organic Carbon		1.35		1.39		0.79
% Organic Nitrogen		0.18		0.18		0.106
Detection limit ng/g dry weight		0.000418		0.000599		0.000510
PCB005/8		0.013		0.027		0.010
PCB015		0.196	<	0.074	<	0.063
PCB018		0.035	<	0.007	<	0.006
PCB027/24		0.006	<	0.002		0.000
PCB028		0.000		0.000		0.000
PCB028/31		0.540		0.139		0.110
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.000		0.000		0.013
PCB044		0.453		0.053		0.034
PCB049		0.945		0.077		0.062
PCB052		2.072		0.206		0.104
PCB060/56	< =	0.074		0.017		0.018
PCB066/95		4.640		0.773		0.361
PCB070		0.843		0.136		0.075
PCB074		0.360		0.066		0.042
PCB087/115		1.789		0.247		0.090
PCB097		1.150		0.169		0.066
PCB099		2.480		0.337		0.154
PCB101/90		8.095		0.912		0.411
PCB105		0.000		0.000		0.000
PCB105/132	nm	0.000	nm	0.000	nm	0.000
PCB110/77		6.417		0.583		0.328
PCB114/131/122	< =	0.122	< =	0.016	< =	0.005
PCB118		6.516		0.767		0.347
PCB128		0.535		0.019		0.034
PCB129/178		0.113		0.044		0.017
PCB132		0.000		0.000		0.000
PCB137/176		0.025		0.021		0.005
PCB138		16.692		2.449		0.955
PCB141/179		1.785		0.228		0.086
PCB146		1.049		0.149		0.061
PCB149		13.025		1.658		0.646
PCB151/82		1.929		0.278		0.113
PCB153	inc 37	34.179		3.625	inc 37	1.999
PCB156/171/202		0.654		0.000		0.040
PCB157/173/201		0.512		0.039		0.015
PCB158		0.101		0.078		0.028
PCB170/190		3.453		0.455		0.190
PCB174		2.681		0.375		0.146
PCB177		1.671		0.225		0.101
PCB180		8.225		1.385		0.587
PCB183		1.681		0.278		0.116
PCB185		0.049		0.013		0.004
PCB187		5.088		0.813		0.325
PCB189		0.030		0.004		0.001
PCB191		0.029		0.002		0.001
PCB194		0.000		0.000		0.000
PCB195/208		0.420		0.071		0.028
PCB196/203		1.214		0.189		0.083
PCB199		1.363		0.229		0.102
PCB205		0.058		0.004		0.002
PCB206	nm	0.000	nm	0.000	nm	0.000
PCB207		0.017		0.005		0.001
Total PCBs		133.326		17.243		7.988

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	19C		19C	20C		20C	21C		21C
Locality	Off San Leandro Bay			Off India Basin			China Basin		
BBI #	91-0076			91-0087			91-0063		
% Organic Carbon			1.01			1.05			1.57
% Organic Nitrogen			0.128			0.109			0.19
Detection limit ng/g dry weight			0.000318			0.000507			0.000217
PCB005/8			0.016			0.004			0.000
PCB015			0.207			0.166			0.000
PCB018		<	0.004			0.016			0.000
PCB027/24		<	0.002			0.000			0.000
PCB028			0.000			0.000			0.000
PCB028/31			0.123			0.037			0.095
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.000			0.013			0.155
PCB044			0.042			0.022			0.039
PCB049			0.041			0.009			0.063
PCB052			0.105			0.062			0.129
PCB060/56			0.020		< =	0.081			0.000
PCB066/95			0.386			0.189			0.364
PCB070			0.098			0.035			0.094
PCB074			0.049			0.017			0.043
PCB087/115			0.124			0.051			0.114
PCB097			0.076			0.034			0.071
PCB099			0.162			0.089			0.179
PCB101/90			0.436			0.258			0.484
PCB105			0.000			0.000			0.000
PCB105/132			0.268			0.098		< =	0.050
PCB110/77			0.436			0.215			0.200
PCB114/131/122		< =	0.029		< =	0.002		< =	0.007
PCB118			0.419			0.183			0.462
PCB128			0.043			0.023			0.003
PCB129/178			0.023		< =	0.010			0.002
PCB132			0.000			0.000			0.000
PCB137/176			0.010			0.002			0.003
PCB138			1.135			0.539			0.927
PCB141/179			0.110			0.052			0.101
PCB146			0.078			0.036			0.068
PCB149			0.705			0.431			0.741
PCB151/82			0.004			0.077			0.126
PCB153			1.306			0.676			1.176
PCB156/171/202			0.154			0.057			0.043
PCB157/173/201			0.016			0.009			0.017
PCB158			0.034			0.016			0.013
PCB170/190			0.215			0.103			0.203
PCB174			0.163			0.088			0.163
PCB177			0.125			0.053			0.098
PCB180			0.775			0.323			0.521
PCB183			0.129			0.062			0.123
PCB185			0.006			0.002			0.004
PCB187			0.450			0.189			0.346
PCB189			0.002			0.001			0.002
PCB191			0.001			0.000			0.001
PCB194			0.003			0.000			0.001
PCB195/208			0.032			0.017			0.033
PCB196/203			0.088			0.047			0.093
PCB199			0.115			0.059			0.113
PCB205			0.001			0.001			0.002
PCB206		nm	0.000		nm	0.000		nm	0.054
PCB207			0.002			0.000			0.002
Total PCBs			8.770			4.454			7.527

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	22C		23C		24C	
Locality	China Basin		Islais Creek		Islais Creek	
BBI #	91-0088		91-0073		91-0046	
% Organic Carbon		1.3		2.24		0.99
% Organic Nitrogen		0.14		0.282		0.118
Detection limit ng/g dry weight		0.000630		0.000672		0.000370
PCB005/8		0.166		0.000		0.000
PCB015		0.127		1.080		0.000
PCB018		0.016		0.105		0.000
PCB027/24		0.003		0.005		0.000
PCB028		0.000		0.000		0.000
PCB028/31		0.152		0.369		0.065
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.006		0.067		0.000
PCB044		0.428		0.182		0.013
PCB049		0.320		8.894		0.042
PCB052		1.713		0.393		0.100
PCB060/56	< =	0.072	< =	0.055	<	0.001
PCB066/95		2.460		0.841		0.230
PCB070		0.686		0.221		0.062
PCB074		0.161		0.091		0.030
PCB087/115		1.604		0.312		0.058
PCB097		0.751		0.158		0.040
PCB099		0.925		0.292		0.129
PCB101/90		3.936		1.108		0.348
PCB105		0.000		0.000		0.000
PCB105/132		1.661		0.413		0.009
PCB110/77		3.399		1.118		0.038
PCB114/131/122	< =	0.056	< =	0.060	< =	0.004
PCB118		3.163		0.831		0.277
PCB128		0.170		0.128		0.000
PCB129/178		0.000		0.000		0.022
PCB132		0.000		0.000		0.000
PCB137/176		0.075		0.015		0.002
PCB138		4.660		2.462		0.689
PCB141/179		0.372		0.322		0.082
PCB146		0.215		0.188		0.061
PCB149		2.495		1.932		0.569
PCB151/82		0.350		0.379		0.100
PCB153		3.416		3.506		0.027
PCB156/171/202		0.508		0.326		0.097
PCB157/173/201		0.050		0.043		0.012
PCB158		0.194		0.081		0.009
PCB170/190		0.405		0.535		0.172
PCB174		0.302		0.507		0.138
PCB177		0.169		0.279		0.074
PCB180		1.001		2.159		0.470
PCB183		0.191		0.311		0.110
PCB185		0.028		0.013		0.004
PCB187		0.466		0.893		0.294
PCB189		0.003		0.004		0.001
PCB191		0.002		0.003		0.001
PCB194		0.000		0.079		0.000
PCB195/208		0.035		0.076		0.027
PCB196/203		0.100		0.229		0.082
PCB199		0.126		0.275		0.099
PCB205		0.003		0.009		0.001
PCB206	nm	0.000	nm	0.000	nm	0.000
PCB207		0.002		0.002		0.001
Total PCBs		37.143		31.352		4.590

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

Appendix 3. Saturated Hydrocarbons

Station #	19C		20C		21C	
Locality	Off San Leandro Bay		Off India Basin		China Basin	
BBI #	91-0076		91-0087		91-0063	
% Organic Carbon		1.01		1.05		1.57
% Organic Nitrogen		0.128		0.109		0.19
n-C12	<	0.0053	<	0.0089	<	0.0075
n-C13		0.0054		0.0095		0.0076
n-C14		0.0081		0.0115		0.0146
n-C15		0.0149		0.0162		0.0397
n-C16		0.0122		0.0152		0.0330
n-C17		0.0451		0.0609		0.1057
pristane		0.0277		0.0395		0.1114
n-C18		0.0208		0.0202		0.0490
phytane		0.0486		0.0409		0.0928
n-C19		0.0235		0.0229		0.0581
n-C20		0.0239		0.0220		0.0500
n-C21		0.1286		0.0848		0.1733
n-C22		0.0581		0.0480		0.0772
n-C23		0.1471		0.1300		0.1584
n-C24		0.0953		0.0982		0.1100
n-C25		0.2054		0.2525		0.2737
n-C26		0.1240		0.1411		0.1279
n-C27		0.4854		0.5181		0.6264
n-C28		0.1587		0.1921		0.1507
n-C29		1.1503		1.1327		1.3747
n-C30		0.1885		0.1708		0.2031
n-C31		1.1465		0.9610		1.3677
n-C32		0.1979		0.1456		0.1866
Total alkanes, pristane and phytane		4.3		4.1		5.4
Umresolved saturated hydrocarbons		128.8		65.9		140.4
Total saturated, ug/g dry		133.2		70.1		145.8
Unresolved/alkanes		30		16		26
Total saturated, ug/Org C		13,184		6,674		9,285

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	22C		23C		24C	
Locality	China Basin		Islais Creek		Islais Creek	
BBI #	91-0088		91-0073		91-0046	
% Organic Carbon		1.3		2.24		0.99
% Organic Nitrogen		0.14		0.282		0.118
n-C12	<	0.0072	<	0.0613	<	0.0073
n-C13		0.0134		0.0629	<	0.0073
n-C14		0.0099		0.1463	<	0.0073
n-C15		0.0159		0.3076		0.0080
n-C16		0.0174		0.3103		0.0061
n-C17		0.0494		0.6515		0.0143
pristane		0.0470		0.4823		0.0138
n-C18		0.0279		0.3850		0.0081
phytane		0.0628		0.3854		0.0210
n-C19		0.0300		0.3770		0.0100
n-C20		0.0260		0.4259		0.0092
n-C21		0.0943		0.5403		0.0392
n-C22		0.0450		0.3200		0.0219
n-C23		0.1152		0.4900		0.0593
n-C24		0.0606		0.5818		0.0409
n-C25		0.1986		1.0461		0.1064
n-C26		0.0942		0.5597		0.0534
n-C27		0.4490		1.3738		0.3927
n-C28		0.1219		0.8653		0.1368
n-C29		1.0311		3.2030		0.8061
n-C30		0.1342		0.9567		0.1185
n-C31		1.0161		3.0248		0.8355
n-C32		0.1185		1.1187		0.1294
Total alkanes, pristane and phytane		3.8		17.7		2.9
Umresolved saturated hydrocarbons		99.6		693.6		54.7
Total saturated, ug/g dry		103.4		711.2		57.6
Unresolved/alkanes		26		39		19
Total saturated, ug/Org C		7,956		31,752		5,817

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	25C		25C	26C		26C	27C		27C
Locality	India Basin			Hunters Point			Hunters Point		
BBI #	91-0050			91-0048			91-0057		
% Organic Carbon			1.51			1.31			1.11
% Organic Nitrogen			0.185			0.154			0.132
Detection limit ng/g dry weight			0.000553			0.001112			0.000438
PCB005/8			0.011			0.000			0.000
PCB015		< =	2.267		<	0.000			0.232
PCB018		< =	0.220		<	0.000			0.010
PCB027/24			0.000			0.000			0.000
PCB028			0.000			0.000			0.000
PCB028/31			0.190			0.062			0.124
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.000			0.007			0.000
PCB044			0.060			0.035			0.069
PCB049			0.033			0.083			0.147
PCB052			0.196			0.168			0.315
PCB060/56		< =	0.029			0.017		< =	0.023
PCB066/95			0.807			0.646			0.786
PCB070			0.173			0.112			0.177
PCB074			0.071			0.044			0.066
PCB087/115			0.207			0.203			0.226
PCB097			0.136			0.133			0.167
PCB099			0.254			0.320			0.370
PCB101/90			0.703			1.001			1.022
PCB105			0.000		nm	0.000			0.000
PCB105/132		nm	0.000		nm	0.000			0.292
PCB110/77			0.695			0.801			0.838
PCB114/131/122		< =	0.017		< =	0.016		< =	0.030
PCB118			0.639			0.691			0.823
PCB128			0.055			0.119			0.077
PCB129/178		< =	0.028			0.052			0.035
PCB132			0.000		nm	0.000			0.000
PCB137/176			0.010			0.013			0.014
PCB138			2.029			2.756			1.992
PCB141/179			6.662			0.302			0.184
PCB146			0.093			0.178			0.147
PCB149			1.527			1.978			1.348
PCB151/82			0.267			0.358			0.230
PCB153			2.205		inc 37	5.540			2.602
PCB156/171/202			0.236			0.087			0.087
PCB157/173/201			0.024			0.034			0.028
PCB158			0.065			0.079			0.061
PCB170/190			0.476			0.673			0.367
PCB174			0.385			0.514			0.295
PCB177			0.234			0.330			0.204
PCB180			0.891			1.937			1.139
PCB183			0.144			0.371			0.218
PCB185			0.007			0.011			0.010
PCB187			0.443			0.983			0.613
PCB189			0.002			0.005			0.003
PCB191			0.002			0.004			0.002
PCB194			0.001			0.000			0.000
PCB195/208			0.058			0.079			0.054
PCB196/203			0.098			0.244			0.151
PCB199			0.137			0.272			0.194
PCB205			0.003			0.004			0.003
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.002			0.003			0.003
Total PCBs			22.794			21.266			15.776

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	28C		29C		30C	
Locality	Sierra Point		Sierra Point		San Bruno	
BBI #	91-0058		91-0077		91-0089	
% Organic Carbon		1.04		0.99		1.22
% Organic Nitrogen		0.114		0.123		0.138
Detection limit ng/g dry weight		0.000567		0.000527		0.000284
PCB005/8		0.012		0.012		0.021
PCB015		0.201		0.445		0.110
PCB018		0.020	<	0.002		0.020
PCB027/24		0.000	<	0.001	<	0.001
PCB028		0.000		0.000		0.000
PCB028/31		0.088		0.057		0.103
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.000		0.005		0.015
PCB044		0.068		0.027		0.050
PCB049		0.080		0.006		0.006
PCB052		0.222		0.073		0.154
PCB060/56		0.012	< =	0.015		0.018
PCB066/95		0.527		0.249		0.493
PCB070		0.107		0.057		0.103
PCB074		0.047		0.025		0.049
PCB087/115		0.193		0.078		0.172
PCB097		0.122		0.052		0.109
PCB099		0.241		0.116		0.236
PCB101/90		0.718		0.316		0.626
PCB105		0.000		0.000		0.000
PCB105/132		0.341		0.137		0.232
PCB110/77		0.632		0.318		0.671
PCB114/131/122	< =	0.011	< =	0.186	< =	0.021
PCB118		0.564		0.291		0.628
PCB128		0.058		0.034		0.065
PCB129/178		0.000		0.015		0.000
PCB132		0.000		0.000		0.000
PCB137/176		0.005		0.005		0.012
PCB138		1.179		0.792		1.651
PCB141/179		0.115		0.076		0.152
PCB146		0.085		0.052		0.129
PCB149		0.871		0.548		1.066
PCB151/82		0.123		0.115		0.198
PCB153		1.443		0.957		2.133
PCB156/171/202		0.004		0.040		0.074
PCB157/173/201		0.019		0.009		0.027
PCB158		0.045		0.022		0.049
PCB170/190		0.214		0.153		0.299
PCB174		0.165		0.114		0.222
PCB177		0.112		0.083		0.172
PCB180		0.530		0.616		0.954
PCB183		0.128		0.090		0.179
PCB185		0.002		0.004		0.008
PCB187		0.341		0.291		0.546
PCB189		0.002		0.001		0.003
PCB191		0.001		0.001		0.002
PCB194		0.000		0.006		0.005
PCB195/208		0.033		0.022		0.046
PCB196/203		0.089		0.062		0.129
PCB199		0.109		0.079		0.159
PCB205		0.002		0.002		0.003
PCB206	nm	0.000	nm	0.000	nm	0.000
PCB207		0.001		0.001		0.002
Total PCBs		9.881		6.657		12.122

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	31C	31C	32C	32C	33C	33C
Locality	San Bruno		SFO		SFO	
BBI #	91-0051		91-0059		91-0078	91-0064
% Organic Carbon		1.16		1.14		1.21
% Organic Nitrogen		0.14		0.134		0.139
Detection limit ng/g dry weight		0.000561		0.000452		0.000455
PCB005/8		0.000		0.000		0.006
PCB015	<	0.024		0.137	< =	0.026
PCB018	<	0.002		0.013	< =	0.003
PCB027/24		0.000		0.000	< =	0.001
PCB028		0.000		0.000		0.000
PCB028/31		0.073		0.104		0.040
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.005	e	0.010		0.005
PCB044		0.035		0.046		0.021
PCB049		0.006		0.009		0.008
PCB052		0.097		0.125		0.051
PCB060/56	< =	0.035	< =	0.013	< =	0.009
PCB066/95		0.431		0.416		0.188
PCB070		0.092		0.089		0.037
PCB074		0.040		0.042		0.018
PCB087/115		0.106		0.131		0.052
PCB097		0.065		0.086		0.038
PCB099		0.169		0.211		0.099
PCB101/90		0.446		0.511		0.242
PCB105		0.000		0.000		0.000
PCB105/132		0.107		0.299		0.084
PCB110/77		0.339		0.492		0.217
PCB114/131/122	< =	0.009	< =	0.021	< =	0.005
PCB118		0.376		0.494		0.211
PCB128		0.033		0.065		0.022
PCB129/178		0.018		0.026		0.011
PCB132		0.000		0.000		0.000
PCB137/176		0.006		0.008		0.003
PCB138		1.014		1.337		0.557
PCB141/179		0.086		0.113		0.002
PCB146		0.069		0.099		0.040
PCB149		0.655		0.834		0.381
PCB151/82		0.104		0.143		0.058
PCB153		1.133		1.561		0.750
PCB156/171/202		0.046		0.060		0.017
PCB157/173/201		0.014		0.019		0.007
PCB158		0.028		0.036		0.015
PCB170/190		0.189		0.255		0.094
PCB174		0.142		0.185		0.070
PCB177		0.104		0.140		0.055
PCB180		0.566		0.803		0.345
PCB183		0.110		0.150		0.058
PCB185		0.005		0.007		0.003
PCB187		0.354		0.476		0.197
PCB189		0.001		0.002		0.001
PCB191		0.001		0.002		0.001
PCB194		0.001		0.004		0.002
PCB195/208		0.029		0.035		0.016
PCB196/203		0.082		0.111		0.041
PCB199		0.109		0.144		0.055
PCB205		0.002		0.003		0.001
PCB206	nm	0.000	nm	0.000	nm	0.000
PCB207		0.002		0.002		0.001
Total PCBs		7.360		9.872		4.163

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	34C	34C	35C	35C	36C	36C
Locality	Coyote Point		Coyote Point		San Mateo	
BBI #	91-0064		91-0074		91-0030	
% Organic Carbon		1.26		0.98		1.09
% Organic Nitrogen		0.16		0.116		0.144
Detection limit ng/g dry weight		0.000211		0.000454		0.000261
PCB005/8		0.019	<	0.003		0.000
PCB015		0.039		0.056		0.000
PCB018		0.003		0.005	<	0.001
PCB027/24	< =	0.001	<	0.001		0.000
PCB028		0.000		0.000		0.000
PCB028/31		0.082		0.028		0.075
PCB029	< =	0.001	<	0.001		0.000
PCB031		0.000		0.000		0.000
PCB040	< =	0.014		0.010		0.000
PCB044		0.039		0.013		0.028
PCB049		0.019		0.016		0.037
PCB052		0.110		0.041		0.087
PCB060/56	< =	0.050		0.010		0.009
PCB066/95		0.350		0.128		0.291
PCB070		0.087		0.030		0.071
PCB074		0.039		0.014		0.034
PCB087/115		0.124		0.040		0.089
PCB097		0.084		0.025		0.060
PCB099		0.174		0.067		0.148
PCB101/90		0.442		0.165		0.366
PCB105		0.000		0.000		0.000
PCB105/132		0.240		0.085	nm	0.000
PCB110/77		0.435		0.149		0.316
PCB114/131/122	< =	0.020		0.001	< =	0.011
PCB118		0.512		0.161		0.372
PCB128		0.044		0.020		0.029
PCB129/178		0.005	< =	0.007		0.006
PCB132		0.000		0.000		0.000
PCB137/176		0.010		0.002		0.002
PCB138		1.153		0.423		0.894
PCB141/179		0.000		0.030		0.084
PCB146		0.095		0.025		0.068
PCB149		0.696		0.244		0.599
PCB151/82		0.018		0.036		0.094
PCB153		1.477		0.473		1.849
PCB156/171/202		0.056		0.020		0.113
PCB157/173/201		0.017		0.005		0.016
PCB158		0.033		0.010		0.009
PCB170/190		0.206		0.076		0.191
PCB174		0.141		0.054		0.132
PCB177		0.121		0.042		0.108
PCB180		0.920		0.235		0.465
PCB183		0.123		0.042		0.108
PCB185		0.006		0.002		0.002
PCB187		0.430		0.144		0.320
PCB189		0.004		0.000		0.002
PCB191		0.001		0.001		0.001
PCB194		0.018		0.001		0.000
PCB195/208		0.033		0.013		0.031
PCB196/203		0.087		0.032		0.084
PCB199		0.109		0.043		0.102
PCB205		0.003		0.001		0.002
PCB206	nm	0.000	nm	0.000	nm	0.000
PCB207		0.002		0.001		0.001
Total PCBs		8.690		3.034		7.307

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	37C	37C	38C	38C	39C	39C
Locality	San Mateo		San Lorenzo		San Lorenzo	
BBI #	91-0075		91-0049		91-0079	
% Organic Carbon		1.15		1.19		1.28
% Organic Nitrogen		0.152		0.144		0.168
Detection limit ng/g dry weight		0.000408		0.000474		0.000427
PCB005/8		0.010		0.000		0.008
PCB015		0.084		0.020		0.125
PCB018		0.013		0.002		0.002
PCB027/24		0.000		0.000		0.001
PCB028		0.000		0.000		0.000
PCB028/31		0.127		0.063		0.088
PCB029		0.000		0.000		0.000
PCB031		0.000		0.000		0.000
PCB040		0.003		0.000		0.008
PCB044		0.030		0.017		0.022
PCB049		0.047		0.013		0.023
PCB052		0.108		0.060		0.055
PCB060/56		0.006		0.003		0.012
PCB066/95		0.283		0.205		0.235
PCB070		0.083		0.055		0.064
PCB074		0.042		0.027		0.033
PCB087/115		0.082		0.056		0.067
PCB097		0.052		0.038		0.047
PCB099		0.139		0.109		0.121
PCB101/90		0.328		0.272		0.278
PCB105		0.000		0.000		0.000
PCB105/132		0.021		0.010		0.197
PCB110/77		0.152		0.090		0.275
PCB114/131/122	< =	0.004	< =	0.006	< =	0.007
PCB118		0.323		0.256		0.320
PCB128		0.007		0.001		0.040
PCB129/178	< =	0.016		0.007		0.018
PCB132		0.000		0.000		0.000
PCB137/176		0.005		0.005		0.005
PCB138		0.830		0.605		0.813
PCB141/179		0.071		0.059		0.060
PCB146		0.060		0.049		0.056
PCB149		0.493		0.443		0.432
PCB151/82		0.091		0.075		0.079
PCB153		1.219		0.739		0.916
PCB156/171/202		0.054		0.078		0.116
PCB157/173/201		0.013		0.010		0.010
PCB158		0.024		0.010		0.021
PCB170/190		0.158		0.134		0.156
PCB174		0.115		0.104		0.103
PCB177		0.084		0.071		0.087
PCB180		0.476		0.346		0.593
PCB183		0.096		0.081		0.085
PCB185		0.004		0.002		0.004
PCB187		0.324		0.245		0.299
PCB189		0.001		0.002		0.002
PCB191		0.001		0.000		0.001
PCB194		0.000		0.000		0.004
PCB195/208		0.041		0.021		0.023
PCB196/203		0.098		0.060		0.062
PCB199		0.136		0.076		0.089
PCB205		0.001		0.001		0.002
PCB206	nm	0.000	nm	0.035	nm	0.000
PCB207		0.004		0.001		0.001
Total PCBs		6.360		4.564		6.068

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	40C		40C	41C		41C	42C		42C
Locality	South Bay			Redwood Creek			Redwood Creek		
BBI #	91-0040			91-0065			91-0037		
% Organic Carbon			1.16			1.43			1.27
% Organic Nitrogen			0.146			0.176			0.158
Detection limit ng/g dry weight			0.000617			0.000808			0.000673
PCB005/8			0.008			0.000		nm	0.000
PCB015		<	0.076			0.000		nm	0.000
PCB018		<	0.007			0.000		nm	0.000
PCB027/24			0.000			0.000		nm	0.000
PCB028			0.000			0.000		nm	0.000
PCB028/31			0.119			0.089		nm	0.000
PCB029			0.000			0.000		nm	0.000
PCB031			0.000			0.000		nm	0.000
PCB040			0.007		nm	0.000		nm	0.000
PCB044			0.057			0.101		nm	0.000
PCB049			0.085			0.116		nm	0.000
PCB052			0.175			0.800		nm	0.000
PCB060/56		< =	0.027			0.000		nm	0.000
PCB066/95			0.544			1.099		nm	0.000
PCB070			0.119			0.324		nm	0.000
PCB074			0.057			0.084		nm	0.000
PCB087/115			0.145			0.568			0.211
PCB097			0.110			0.288			0.112
PCB099			0.314			0.472			0.171
PCB101/90			0.701			1.736			0.693
PCB105			0.000			0.000			0.000
PCB105/132		nm	0.000		nm	0.000			0.133
PCB110/77			0.586			0.382			0.673
PCB114/131/122		< =	0.010		< =	0.015		< =	0.002
PCB118			0.698			1.270			0.248
PCB128			0.058			0.004			0.036
PCB129/178			0.016			0.019			0.003
PCB132			0.000			0.000			0.000
PCB137/176			0.004			0.028			0.004
PCB138			1.469			2.189			1.498
PCB141/179			0.118			0.173			0.086
PCB146			0.124			0.131			0.048
PCB149			0.980			1.278			0.210
PCB151/82			0.150			0.179			0.085
PCB153			3.263			2.456			0.323
PCB156/171/202		< =	0.084			0.226			0.140
PCB157/173/201			0.028			0.021			0.013
PCB158			0.017			0.077			0.012
PCB170/190			0.274			0.228			0.137
PCB174			0.179			0.184			0.102
PCB177			0.171			0.105			0.085
PCB180			0.647			0.544			0.389
PCB183			0.161			0.132			0.088
PCB185			0.004			0.012			0.003
PCB187			0.541			0.384			0.279
PCB189			0.005			0.002			0.000
PCB191			0.002			0.001			0.000
PCB194			0.000			0.000			0.000
PCB195/208			0.051			0.028			0.023
PCB196/203			0.118			0.078			0.060
PCB199			0.159			0.099			0.073
PCB205			0.003			0.002			0.002
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.003			0.002			0.000
Total PCBs			12.473			15.927			5.943

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

APPENDIX 2. PCBs in San Francisco Bay Sediments

Station #	43C		43C	44C		44C	45C		45C
Locality	South Bay			Coyote Creek			Coyote Creek		
BBI #	91-0080			91-0035			91-0060		
% Organic Carbon			1.23			1.33			0.98
% Organic Nitrogen			0.155			0.161			0.123
Detection limit ng/g dry weight			0.000424			0.000622			0.000371
PCB005/8			0.000			0.000			0.005
PCB015		<	0.037			0.000			0.046
PCB018		<	0.004			0.000			0.004
PCB027/24		<	0.002		< =	0.005			0.000
PCB028			0.000			0.000			0.000
PCB028/31			0.089			0.073			0.081
PCB029			0.000			0.000			0.000
PCB031			0.000			0.000			0.000
PCB040			0.004			0.000			0.004
PCB044			0.028			0.749			0.020
PCB049			0.043			0.034			0.017
PCB052			0.100			0.017			0.052
PCB060/56			0.019			0.026			0.008
PCB066/95			0.321			0.420			0.173
PCB070			0.085			0.117			0.054
PCB074			0.041			0.060			0.022
PCB087/115			0.089			0.121			0.058
PCB097			0.059			0.079			0.033
PCB099			0.169			0.187			0.075
PCB101/90			0.394			0.455			0.201
PCB105			0.000			0.000			0.000
PCB105/132			0.077			0.090			0.163
PCB110/77			0.227			0.419			0.204
PCB114/131/122		< =	0.006		< =	0.013		< =	0.005
PCB118			0.437			0.706			0.233
PCB128			0.009			0.034			0.028
PCB129/178			0.009			0.010			0.009
PCB132			0.000			0.000			0.000
PCB137/176			0.003			0.002			0.003
PCB138			0.858			1.186			0.524
PCB141/179			0.064			0.079			0.022
PCB146			0.071			0.059			0.031
PCB149			0.524			0.656			0.265
PCB151/82			0.084			0.096			0.047
PCB153			1.149			0.606			0.551
PCB156/171/202			0.028			0.147			0.024
PCB157/173/201			0.014			0.015			0.008
PCB158			0.009			0.009			0.012
PCB170/190			0.153			0.180			0.078
PCB174			0.099			0.120			0.050
PCB177			0.091			0.117			0.057
PCB180			0.366			0.602			0.245
PCB183			0.088			0.109			0.045
PCB185			0.003			0.003			0.003
PCB187			0.321			0.369			0.177
PCB189			0.001			0.001			0.001
PCB191			0.001			0.000			0.000
PCB194			0.001			0.019			0.001
PCB195/208			0.025			0.029			0.012
PCB196/203			0.069			0.085			0.033
PCB199			0.090			0.103			0.044
PCB205			0.002			0.002			0.001
PCB206		nm	0.000		nm	0.000		nm	0.000
PCB207			0.002			0.002			0.001
Total PCBs			6.365			8.211			3.730

Data file: C.WB1:PCB02b; HardCopy C.WB1:PCB03a

Appendix 3. Saturated Hydrocarbons

Micrograms/g

Station #	01C		02C		03C	
Locality	San Pablo Bay		Inner Richmond		Inner Richmond	
BBI #	91-0033		91-0004		91-0056	
% Organic Carbon		1.21		2.04		1.22
% Organic Nitrogen		0.142		0.184		0.15
n-C12	<	0.0219	<	0.0509	<	0.0048
n-C13		0.0342		0.0602	<	0.0048
n-C14		0.0424		0.0755		0.0085
n-C15		0.0577		0.1146		0.0401
n-C16		0.0607		0.1208		0.0170
n-C17		0.1135		0.2476		0.0670
pristane		0.1469		0.3114		0.0541
n-C18		0.0735		0.1667		0.0276
phytane		0.0655		0.1441		0.0497
n-C19		0.0888		0.1931		0.0352
n-C20		0.0925		0.2074		0.0349
n-C21		0.2525		0.3636		0.1461
n-C22		0.1591		0.2308		0.0737
n-C23		0.3499		0.3641		0.2083
n-C24		0.3188		0.2982		0.1658
n-C25		0.6460		0.6923		0.3665
n-C26		0.4530		0.3893		0.2138
n-C27		1.1084		1.1366		0.5696
n-C28		0.4216		0.5959		0.2107
n-C29		2.0760		2.4530		1.2112
n-C30		0.3972		0.6675		0.2080
n-C31		1.9843		2.5997		1.2170
n-C32		0.3387		0.6797		0.2101
Total alkanes, pristane and phytane		9.3		12.2		5.1
Umresolved saturated hydrocarbons		263.9		1018.8		118.3
Total saturated, ug/g dry		273.2		1030.9		123.4
Unresolved/alkanes		28		84		23
Total saturated, ug/Org C		22,576		50,536		10,118

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #		04C			05C			06C	
Locality		Outer Richmond			Outer Richmond			Point Isabel	
BBI #		91-0041			91-0028			91-0061	
% Organic Carbon			1.31			1.04			0.95
% Organic Nitrogen			0.16			0.123			0.114
n-C12		<	0.0241		<	0.0049		<	0.0311
n-C13		<	0.0241			0.0059		<	0.0311
n-C14		<	0.0241			0.0068		<	0.0311
n-C15			0.0269			0.0128			0.0317
n-C16			0.0151			0.0098			0.0095
n-C17			0.0724			0.0358			0.0426
pristane			0.0444			0.0274			0.0343
n-C18			0.0183			0.0155			0.0134
phytane			0.0424			0.0318			0.0355
n-C19			0.0219			0.0179			0.0170
n-C20			0.0243			0.0224			0.0159
n-C21			0.1065			0.0736			0.1056
n-C22			0.0364			0.0369			0.0394
n-C23			0.1120			0.1280			0.2278
n-C24			0.0625			0.0528			0.0515
n-C25			0.1861			0.1971			0.1536
n-C26			0.0712			0.0820			0.0618
n-C27			**0.4515**			**0.4840**			**0.3395**
n-C28			0.1080			0.1130			0.0913
n-C29			1.0668			1.1722			0.8050
n-C30			0.1262			0.1432			0.1167
n-C31			1.0656			1.1257			0.7913
n-C32			0.1254			0.1367			0.1107
Total alkanes, pristane and phytane			3.9			3.9			3.2
Umresolved saturated hydrocarbons			83.8			101.0			88.1
Total saturated, ug/g dry			87.7			105.0			91.3
Unresolved/alkanes			22			26			28
Total saturated, ug/Org C			6,694			10,092			9,605

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	07C		08C		09C	
Locality	Point Isabel		Berkeley		Berkeley	
BBI #	91-0062		91-0047		91-0034	
% Organic Carbon		0.92				
% Organic Nitrogen		0.114				
n-C12	<	0.0146	<	0.0016	<	0.0051
n-C13	<	0.0146		0.0032		0.0052
n-C14	<	0.0146		0.0048		0.0082
n-C15		0.0158		0.0109		0.0160
n-C16		0.0102		0.0088		0.0138
n-C17		**0.0280**		**0.0219**		**0.0417**
pristane		0.0437		0.0190		0.0406
n-C18		0.0127		0.0096		0.0164
phytane		0.0383		0.0316		0.0419
n-C19		0.0206		0.0117		0.0182
n-C20		0.0227		0.0125		0.0160
n-C21		0.0728		0.0558		0.0815
n-C22		0.0394		0.0311		0.0300
n-C23		0.1143		0.0681		0.0900
n-C24		0.0600		0.0486		0.0656
n-C25		0.1785		0.1084		0.1488
n-C26		**0.0772**		**0.0581**		**0.0627**
n-C27		**0.3784**		**0.2033**		**0.3482**
n-C28		0.1053		0.0640		0.0927
n-C29		0.9048		0.4752		0.8071
n-C30		0.1235		0.0593		0.1369
n-C31		**0.8502**		**0.4073**		**0.7000**
n-C32		0.1066		0.0543		0.1185
Total alkanes, pristane and phytane		3.2		1.8		2.9
Umresolved saturated hydrocarbons		108.8		17.2 nm		
Total saturated, ug/g dry		112.0		18.9		2.9
Unresolved/alkanes		33		10		
Total saturated, ug/Org C		12,175				

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	10C		11C		12C	
Locality	Emeryville		Emeryville		Oakland Outer	
BBI #	91-0071		91-0029		91-0085	
% Organic Carbon		0.99		0.89		1.23
% Organic Nitrogen		0.122		0.115		0.154
n-C12	<	0.0127	<	0.0068	<	0.0085
n-C13	<	0.0127		0.0071	<	0.0085
n-C14	<	0.0127		0.0089		0.0092
n-C15		0.0131		0.0211		0.0271
n-C16		0.0121		0.0146		0.0087
n-C17		0.0232		0.0542		0.0297
pristane		0.0314		0.0493		0.0434
n-C18		0.0159		0.0188		0.0205
phytane		0.0419		0.0487		0.0501
n-C19		0.0200		0.0208		0.0228
n-C20		0.0201		0.0181		0.0205
n-C21		0.1213		0.0954		0.1130
n-C22		0.0403		0.0388		0.0386
n-C23		0.1033		0.0992		0.0937
n-C24		0.0548		0.0515		0.0539
n-C25		0.1654		0.1583		0.1631
n-C26		0.0674		0.0616		0.0706
n-C27		0.3833		0.3900		0.3537
n-C28		0.1200		0.1033		0.0633
n-C29		0.9680		0.8946		0.8043
n-C30		0.1253		0.0968		0.0842
n-C31		0.0009		0.8112		0.9040
n-C32		0.0016		0.1079		0.0494
Total alkanes, pristane and phytane		2.4		3.2		3.0
Umresolved saturated hydrocarbons		102.5		92.2		115.5
Total saturated, ug/g dry		104.8		95.4		118.5
Unresolved/alkanes		43		29		38
Total saturated, ug/Org C		10,589		10,720		9,634

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	13C		14C		15C	
Locality	Oakland Outer		Oakland Inner		Oakland Inner	
BBI #	91-0044		91-0045		91-0042	
% Organic Carbon		0.97		1.41		1.68
% Organic Nitrogen		0.126		0.177		0.187
n-C12	<	0.0038	<	0.0373	<	0.0150
n-C13	<	0.0038	<	0.0373	<	0.0150
n-C14		0.0052	<	0.0373	<	0.0150
n-C15		0.0169		0.0395		0.0163
n-C16		0.0130		0.0398		0.0145
n-C17		0.0469		0.1221		0.0656
pristane		0.0376		0.1077		0.0289
n-C18		0.0178		0.0668		0.0154
phytane		0.0426		0.0985		0.0289
n-C19		0.0224		0.0801		0.0241
n-C20		0.0217		0.0767		0.0290
n-C21		0.0975		0.2337		0.1279
n-C22		0.0268		0.1062		0.0343
n-C23		0.0887		0.2217		0.0598
n-C24		0.0515		0.1403		0.0424
n-C25		0.1555		0.3527		0.1129
n-C26		0.0653		0.1575		0.0684
n-C27		0.2861		0.7460		0.2596
n-C28		0.0796		0.2400		0.0799
n-C29		0.7203		1.7081		0.7633
n-C30		0.0827		0.2596		0.1484
n-C31		0.6547		1.6933		0.7928
n-C32		0.0795		0.3233		0.1472
Total alkanes, pristane and phytane		2.6		6.9		2.9
Umresolved saturated hydrocarbons		86.7		225.8		157.8
Total saturated, ug/g dry		89.3		232.8		160.7
Unresolved/alkanes		33		33		54
Total saturated, ug/Org C		9,206		16,509		9,564

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	16C		17C		18C	
Locality	San Leandro Bay		Alameda		Alameda	
BBI #	91-0038		91-0086		91-0072	
% Organic Carbon		1.35		1.39		0.79
% Organic Nitrogen		0.18		0.18		0.106
n-C12	<	0.0000	<	0.0074	<	0.0056
n-C13		0.0117		0.0081	<	0.0056
n-C14		0.0154		0.0116		0.0077
n-C15		0.0417		0.0338		0.0157
n-C16		0.0301		0.0164		0.0113
n-C17		0.2002		0.0797		0.0403
pristane		0.0531		0.0490		0.0264
n-C18		0.0159		0.0217		0.0172
phytane		0.0430		0.0548		0.0361
n-C19		0.0610		0.0230		0.0180
n-C20		0.0547		0.0203		0.0174
n-C21		0.2862		0.1181		0.0872
n-C22		0.0655		0.0460		0.0283
n-C23		0.1309		0.1072		0.0789
n-C24		0.0952		0.0576		0.0432
n-C25		0.3020		0.1938		0.1434
n-C26		0.2150		0.0806		0.0535
n-C27		0.7301		0.4062		0.3181
n-C28		0.2313		0.1270		0.1011
n-C29		2.5155		0.9910		0.8145
n-C30		0.2030		0.1192		0.1134
n-C31		2.0478		0.9600		0.8494
n-C32		0.3998		0.1499		0.1103
Total alkanes, pristane and phytane		7.7		3.7		2.9
Umresolved saturated hydrocarbons		493.7		141.7		99.9
Total saturated, ug/g dry		501.5		145.4		102.8
Unresolved/alkanes		64		38		34
Total saturated, ug/Org C		37,145		10,461		13,012

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	25C		26C		27C	
Locality	India Basin		Hunters Point		Hunters Point	
BBI #	91-0050		91-0048		91-0057	
% Organic Carbon		1.51		1.31		1.11
% Organic Nitrogen		0.185		0.154		0.132
n-C12	<	0.0084	<	0.0312	<	0.0073
n-C13		0.0087	<	0.0312		0.0077
n-C14		0.0107	<	0.0312		0.0097
n-C15		0.0731		0.0320		0.0193
n-C16		0.0214		0.0135		0.0157
n-C17		0.1152		0.0548		0.0413
pristane		0.0520		0.0249		0.0346
n-C18		0.0249		0.0234		0.0200
phytane		0.0543		0.0433		0.0402
n-C19		0.0267		0.0259		0.0215
n-C20		0.0297		0.0259		0.0237
n-C21		0.0977		0.0768		0.1081
n-C22		0.0554		0.0369		0.0505
n-C23		0.1381		0.0984		0.1273
n-C24		0.0705		0.0486		0.0825
n-C25		0.2475		0.1628		0.2070
n-C26		0.1283		0.0736		0.0817
n-C27		0.5057		0.3688		0.4281
n-C28		0.1518		0.0945		0.1012
n-C29		1.2526		0.8426		0.9263
n-C30		0.1475		0.0850		0.1316
n-C31		1.2119		0.7977		0.9314
n-C32		0.1740		0.1067		0.1413
Total alkanes, pristane and phytane		4.6		3.1		3.6
Umresolved saturated hydrocarbons		69.3		90.1		95.5
Total saturated, ug/g dry		73.9		93.2		99.0
Unresolved/alkanes		15		29		27
Total saturated, ug/Org C		4,891		7,117		8,921

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	28C	29C	30C
Locality	Sierra Point	Sierra Point	San Bruno
BBI #	91-0058	91-0077	91-0089
% Organic Carbon	1.04	0.99	1.22
% Organic Nitrogen	0.114	0.123	0.138
n-C12	< 0.0156	< 0.0198	< 0.0149
n-C13	< 0.0156	< 0.0198	< 0.0149
n-C14	< 0.0156	< 0.0198	< 0.0149
n-C15	0.0157	0.0225	0.0159
n-C16	0.0131	0.0128	0.0146
n-C17	0.0655	0.0514	0.0767
pristane	0.0288	0.0354	0.0369
n-C18	0.0206	0.0189	0.0199
phytane	0.0406	0.0406	0.0444
n-C19	0.0230	0.0192	0.0260
n-C20	0.0222	0.0201	0.0282
n-C21	0.0574	0.0728	0.1403
n-C22	0.0305	0.0312	0.0591
n-C23	0.0711	0.0902	0.1622
n-C24	0.0461	0.0532	0.0835
n-C25	0.1349	0.1452	0.2671
n-C26	0.0702	0.0735	0.1133
n-C27	0.2741	0.3283	0.5773
n-C28	0.0598	0.0825	0.1640
n-C29	0.5802	0.7190	1.3821
n-C30	0.0676	0.0905	0.1832
n-C31	0.5471	0.6442	1.3107
n-C32	0.0666	0.0697	0.2239
Total alkanes, pristane and phytane	2.3	2.7	5.0
Umresolved saturated hydrocarbons	67.1	64.7	145.5
Total saturated, ug/g dry	69.4	67.4	150.5
Unresolved/alkanes	29	24	29
Total saturated, ug/Org C	6,669	6,803	12,338

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	31C	32C	33C
Locality	San Bruno	SFO	SFO
BBI #	91-0051	91-0059	91-0078
% Organic Carbon	1.16	1.14	1.21
% Organic Nitrogen	0.14	0.134	0.139
n-C12	< 0.0160	< 0.0175	< 0.0055
n-C13	< 0.0160	< 0.0175	0.0086
n-C14	< 0.0160	< 0.0175	0.0086
n-C15	0.0165	0.0183	0.0173
n-C16	0.0149	0.0167	0.0173
n-C17	0.0676	0.0443	0.0705
pristane	0.0344	0.0337	0.0261
n-C18	0.0200	0.0406	0.0180
phytane	0.0413	0.0499	0.0300
n-C19	0.0224	0.0446	0.0212
n-C20	0.0236	0.0366	0.0200
n-C21	0.1262	0.1333	0.0790
n-C22	0.0512	0.0449	0.0398
n-C23	0.1360	0.1157	0.1124
n-C24	0.0859	0.0656	0.0760
n-C25	0.2258	0.1951	0.1966
n-C26	0.1093	0.0909	0.0914
n-C27	0.4701	0.4455	0.3908
n-C28	0.1327	0.1298	0.1132
n-C29	1.1028	1.0974	0.9415
n-C30	0.1614	0.1686	0.1165
n-C31	1.0946	1.0801	0.8152
n-C32	0.1614	0.1332	0.0858
Total alkanes, pristane and phytane	4.1	4.0	3.3
Umresolved saturated hydrocarbons	135.9	139.3	76.9
Total saturated, ug/g dry	140.0	143.4	80.2
Unresolved/alkanes	33	35	23
Total saturated, ug/Org C	12,072	12,575	6,627

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	34C		35C		36C	
Locality	Coyote Point		Coyote Point		San Mateo	
BBI #	91-0064		91-0074		91-0030	
% Organic Carbon		1.26		0.98		1.09
% Organic Nitrogen		0.16		0.116		0.144
n-C12	<	0.0062	<	0.0108	<	0.0090
n-C13		0.0067	<	0.0108		0.0091
n-C14		0.0094	<	0.0108		0.0121
n-C15		0.0070		0.0111		0.0242
n-C16		0.0145		0.0088		0.0194
n-C17		0.0747		0.0571		0.0747
pristane		0.0277		0.0188		0.0393
n-C18		0.0150		0.0112		0.0242
phytane		0.0337		0.0261		0.0629
n-C19		0.0221		0.0157		0.0319
n-C20		0.0185		0.0149		0.0317
n-C21		0.1127		0.0752		0.1645
n-C22		0.0559		0.0348		0.0630
n-C23		0.1671		0.1017		0.1637
n-C24		0.1550		0.0545		0.0967
n-C25		0.3398		0.1756		0.2692
n-C26		0.2103		0.0752		0.1114
n-C27		0.5748		0.3744		0.6068
n-C28		0.1980		0.1120		0.1740
n-C29		1.1819		0.8670		1.6106
n-C30		0.1702		0.1122		0.1944
n-C31		1.1012		0.8122		1.4946
n-C32		0.1676		0.1020		0.2061
Total alkanes, pristane and phytane		4.7		3.1		5.5
Umresolved saturated hydrocarbons		100.1		65.3		141.7
Total saturated, ug/g dry		104.8		68.4		147.2
Unresolved/alkanes		21		21		26
Total saturated, ug/Org C		8,315		6,976		13,508

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	37C		38C		39C	
Locality	San Mateo		San Lorenzo		San Lorenzo	
BBI #	91-0075		91-0049		91-0079	
% Organic Carbon		1.15		1.19		1.28
% Organic Nitrogen		0.152		0.144		0.168
n-C12	<	0.0214	<	0.0106	<	0.0058
n-C13	<	0.0214	<	0.0106		0.0060
n-C14	<	0.0214	<	0.0106		0.0075
n-C15		0.0236		0.0130		0.0206
n-C16		0.0185		0.0107		0.0127
n-C17		0.1063		0.0377		0.0562
pristane		0.0448		0.0245		0.0185
n-C18		0.0231		0.0176		0.0133
phytane		0.0468		0.0312		0.0298
n-C19		0.0291		0.0155		0.0158
n-C20		0.0000		0.0166		0.0160
n-C21		0.1569		0.0667		0.0727
n-C22		0.0628		0.0368		0.0266
n-C23		0.1664		0.0795		0.0784
n-C24		0.0965		0.0505		0.0394
n-C25		0.2617		0.1498		0.1127
n-C26		0.1321		0.0691		0.0521
n-C27		0.5794		0.2678		0.2802
n-C28		0.2011		0.0937		0.0834
n-C29		1.3511		0.6690		0.6448
n-C30		0.1831		0.1070		0.0830
n-C31		1.2219		0.6801		0.6243
n-C32		0.1978		0.0989		0.0833
Total alkanes, pristane and phytane		5.0		2.6		2.4
Unresolved saturated hydrocarbons		143.7		64.0		89.7
Total saturated, ug/g dry		148.7		66.6		92.1
Unresolved/alkanes		29		25		38
Total saturated, ug/Org C		12,928		5,594		7,193

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	40C		41C		42C	
Locality	South Bay		Redwood Creek		Redwood Creek	
BBI #	91-0040		91-0065		91-0037	
% Organic Carbon		1.16		1.43		1.27
% Organic Nitrogen		0.146		0.176		0.158
n-C12	<	0.0075	<	0.0280	<	0.0062
n-C13		0.0080	<	0.0280		0.0065
n-C14		0.0124	<	0.0280		0.0077
n-C15		0.0217		0.0291		0.0193
n-C16		0.0170		0.0231		0.0134
n-C17		0.0911		0.1858		0.1034
pristane		0.0315		0.0430		0.0145
n-C18		0.0254		0.0289		0.0115
phytane		0.0409		0.0431		0.0203
n-C19		0.0259		0.0294		0.0168
n-C20		0.0244		0.0304		0.0135
n-C21		0.1037		0.1130		0.0724
n-C22		0.0427		0.0451		0.0349
n-C23		0.1212		0.1211		0.0869
n-C24		0.0772		0.0613		0.0480
n-C25		0.2349		0.2304		0.1538
n-C26		0.0950		0.0950		0.0569
n-C27		**0.5072**		**0.5180**		**0.3204**
n-C28		0.1284		0.1347		0.0655
n-C29		1.1227		1.3044		0.8575
n-C30		0.1244		0.1324		0.0749
n-C31		1.1310		1.1086		0.6965
n-C32		0.1170		0.1265		0.0738
Total alkanes, pristane and phytane		4.1		4.5		2.8
Umresolved saturated hydrocarbons		89.0		96.5		55.2
Total saturated, ug/g dry		93.1		101.0		58.0
Unresolved/alkanes		22		22		20
Total saturated, ug/Org C		8,024		7,063		4,567

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 3. Saturated Hydrocarbons

Station #	43C		44C		45C	
Locality	South Bay		Coyote Creek		Coyote Creek	
BBI #	91-0080		91-0035		91-0060	
% Organic Carbon		1.23		1.33		0.98
% Organic Nitrogen		0.155		0.161		0.123
n-C12	<	0.0052	<	0.0110	<	0.0150
n-C13		0.0078	<	0.0110	<	0.0150
n-C14		0.0099		0.0110	<	0.0150
n-C15		0.0193		0.0297		0.0152
n-C16		0.0152		0.0188		0.0102
n-C17		0.0969		0.1291		0.0706
pristane		0.0283		0.0326		0.0167
n-C18		0.0187		0.0270		0.0134
phytane		0.0269		0.0379		0.0199
n-C19		0.0164		0.0238		0.0175
n-C20		0.0172		0.0193		0.0155
n-C21		0.0945		0.1112		0.0737
n-C22		0.0302		0.0455		0.0298
n-C23		0.0913		0.1117		0.0821
n-C24		0.0533		0.0752		0.0454
n-C25		0.1695		0.2071		0.1506
n-C26		0.0711		0.0960		0.0627
n-C27		0.3636		0.4926		0.3394
n-C28		0.0970		0.1372		0.1020
n-C29		0.9816		1.3580		0.8494
n-C30		0.1102		0.1563		0.1139
n-C31		0.9078		1.2051		0.7760
n-C32		0.1084		0.1464		0.0936
Total alkanes, pristane and phytane		3.3		4.5		2.9
Umresolved saturated hydrocarbons		86.4		151.2		95.1
Total saturated, ug/g dry		89.8		155.7		98.0
Unresolved/alkanes		26		34		32
Total saturated, ug/Org C		7,299		11,704		10,000

Data file: C.wb1:pet02a; Hardcopy C.wb1:pet03a

Appendix 4. Chlorinated Biocides in Sediments

Ng/gram

Station #		01C		02C		03C
Locality		San Pablo Bay		Inner Richmond		Inner Richmond
BBI #		91-0033		91-0004		91-0056
% Org C		1.21		2.04		1.22
% Org N		0.142		0.184		0.15
Alpha chlordane		0.002		4.938		0.026
Gamma chlordane		0.004		11.371		0.029
Oxychlordane		0.004		4.466		0.006
trans-nonachlor		0.001		5.766		0.016
Total chlordanes		0.012		26.540		0.078
o,p'-DDE		0.001		20.598		0.023
p,p'-DDE		0.051		347.519		1.160
o,p'-DDD		0.006	>	826.615		0.696
p,p'-DDD		0.056	>	1,690.902		5.128
p,p'-DDMU	< =	0.017		1,191.661	< =	0.310
o,p'-DDT	<	0.002		331.635	< =	0.080
p,p;-DDT		0.129		1,242.240		0.630
Total DDTs		0.261		5,651.170		8.029
HCB		0.003		0.653		0.010
HCHalpha	< =	0.000		12.013		0.003
HCHbeta	<	0.001		2.704		0.006
HCHgamma	<	0.001		1.773		0.004
Total HCHs		0.002		16.491		0.014
Mirex	< =	0.000	< =	0.016	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	04C	04C	05C	05C	06C	06C
Locality	Outer Richmond		Outer Richmond		Point Isabel	
BBI #	91-0041		91-0028		91-0061	
% Org C		1.31		1.04		0.95
% Org N		0.16		0.123		0.114
Alpha chlordane		0.099		0.019		0.027
Gamma chlordane		0.132		0.021		0.025
Oxychlordane		0.051		0.008		0.007
trans-nonachlor		0.027		0.009		0.020
Total chlordanes		0.309		0.058		0.080
o,p'-DDE		0.018		0.033	<	0.000
p,p'-DDE		0.828		0.871		0.926
o,p'-DDD		1.455		0.308		0.443
p.p'-DDD		9.138		2.292		3.169
p,p'-DDMU	< =	0.822	< =	0.217	<	0.594
o,p'-DDT	< =	0.025	< =	0.028	< =	0.039
p,p;-DDT		0.227		0.542		0.086
Total DDTs		12.515		4.290		5.257
HCB		0.013		0.027	<	0.000
HCHalpha		0.007		0.001		0.005
HCHbeta	nm	0.000		0.001		0.001
HCHgamma		0.013		0.003		0.002
Total HCHs		0.020		0.005		0.008
Mirex	<	0.001	< =	0.000	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	07C	07C	08C	08C	09C	09C
Locality	Point Isabel		Berkeley		Berkeley	
BBI #	91-0062		91-0047		91-0034	
% Org C		0.92				
% Org N		0.114				
Alpha chlordane		0.013		0.011		0.018
Gamma chlordane		0.016		0.014		0.022
Oxychlordane		0.010		0.006		0.029
trans-nonachlor		0.008		0.007		0.009
Total chlordanes		0.046		0.038		0.077
o,p'-DDE	<	0.001		0.001		0.007
p,p'-DDE		0.375		0.384		0.601
o,p'-DDD		0.022		0.129		0.008
p.p'-DDD		1.521		2.012		1.824
p,p'-DDMU	< =	0.345	< =	0.232	< =	0.126
o,p'-DDT	< =	0.032	< =	0.005	< =	4.327
p,p;-DDT		0.061		0.438		16.980
Total DDTs		2.357		3.202		23.872
HCB		0.001		0.010		0.005
HCHalpha	< =	0.002	< =	0.001	< =	0.002
HCHbeta	<	0.001	<	0.001	<	0.000
HCHgamma	< =	0.002	< =	0.002	< =	0.005
Total HCHs	< =	0.006	< =	0.005	< =	0.008
Mirex	<	0.001	< =	0.000	<	0.000

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	10C	10C	11C	11C	12C	12C
Locality	Emeryville		Emeryville		Oakland Outer	
BBI #	91-0071		91-0029		91-0085	
% Org C		0.99		0.89		1.23
% Org N		0.122		0.115		0.154
Alpha chlordane		0.020		0.783		0.063
Gamma chlordane		0.025		0.931		0.068
Oxychlordane		0.007		0.039		0.008
trans-nonachlor		0.011		0.114		0.028
Total chlordanes		0.063		1.867		0.167
o,p'-DDE		0.018		0.007		0.023
p,p'-DDE		0.527		0.443		0.705
o,p'-DDD		0.207		0.423		0.415
p.p'-DDD		1.508		9.213		2.862
p,p'-DDMU	< =	0.146	< =	0.036	< =	0.164
o,p'-DDT	< =	0.069	< =	0.103	< =	0.065
p,p;-DDT		0.178		1.318		0.423
Total DDTs		2.654		11.545		4.658
HCB		0.007		0.024		0.031
HCHalpha	<	0.000		0.013	< =	0.002
HCHbeta	<	0.003	<	0.001	< =	0.003
HCHgamma	< =	0.002		0.018	< =	0.003
Total HCHs	< =	0.005		0.033	< =	0.008
Mirex	<	0.001	<	0.001	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	13C	13C	14C	14C	15C	15C
Locality	Oakland Outer		Oakland Inner			
BBI #	91-0044		91-0045		91-0039	91-0039
% Org C		0.97		1.41		1.68
% Org N		0.126		0.177		0.187
Alpha chlordane		0.048		0.080		1.049
Gamma chlordane		0.057		0.096		1.411
Oxychlordane		0.023		0.020		0.069
trans-nonachlor		0.015		0.058		0.575
Total chlordanes		0.144		0.254		3.105
o,p'-DDE		0.013		0.004		0.120
p,p'-DDE		0.267		0.730		3.156
o,p'-DDD		0.305		0.252		4.058
p.p'-DDD		2.158		1.977		17.219
p,p'-DDMU	< =	0.111	< =	0.409	< =	0.229
o,p'-DDT	< =	0.006	< =	0.019	< =	0.164
p,p;-DDT		0.105		0.456		1.396
Total DDTs		2.965		3.848		26.343
HCB		0.004		0.004		0.018
HCHalpha		0.002	< =	0.003	< =	0.003
HCHbeta		0.001	<	0.003	nm	0.003
HCHgamma		0.005	< =	0.004	< =	0.011
Total HCHs		0.008	< =	0.010	< =	0.017
Mirex	<	0.000	< =	0.004		0.009

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	16C	16C	17C	17C	18C	18C
Locality	San Leandro Bay		Alameda		Alameda	
BBI #	91-0038		91-0086		91-0072	
% Org C		1.35		1.39		0.79
% Org N		0.18		0.18		0.106
Alpha chlordane		1.100		0.042		0.009
Gamma chlordane		1.354		0.040		0.011
Oxychlordane		0.037		0.013		0.012
trans-nonachlor		0.713		0.029		0.004
Total chlordanes		3.205		0.125		0.037
o,p'-DDE		0.085		0.006		0.007
p,p'-DDE		3.513		0.540		0.285
o,p'-DDD		0.116		0.008		0.048
p,p'-DDD		10.196		1.223		0.492
p,p'-DDMU	< =	0.349	< =	0.142	< =	0.072
o,p'-DDT	< =	0.208	< =	0.068	< =	0.030
p,p;-DDT		51.470		0.170		0.099
Total DDTs		65.938		2.157		1.033
HCB		0.021		0.010		0.003
HCHalpha	< =	0.002		0.003	< =	0.000
HCHbeta	<	0.002		0.004	<	0.002
HCHgamma	< =	0.009		0.003	< =	0.001
Total HCHs	< =	0.012		0.010	< =	0.004
Mirex	< =	0.008		0.000	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	19C	19C	20C	20C	21C	21C
Locality	Off San Leandro Bay		Off India Basin		China Basin	
BBI #	91-0076		91-0087		91-0063	
% Org C		1.01		1.05		1.57
% Org N		0.128		0.109		0.19
Alpha chlordane		0.047		0.006		0.018
Gamma chlordane		0.046		0.012		0.024
Oxychlordane		0.023	<	0.001	<	0.004
trans-nonachlor		0.014		0.005		0.011
Total chlordanes		0.130		0.023		0.057
o,p'-DDE		0.019		0.010		0.003
p,p'-DDE		0.781		0.271		0.618
o,p'-DDD		0.255		0.052		0.090
p,p'-DDD		1.458		0.468		0.522
p,p'-DDMU	< =	0.134	< =	0.218	< =	0.199
o,p'-DDT	< =	0.035	< =	0.016	< =	0.036
p,p;-DDT		0.206		0.125		1.618
Total DDTs		2.889		1.160		3.085
HCB		0.006		0.002		0.013
HCHalpha	< =	0.000	<	0.000	< =	0.001
HCHbeta	<	0.002	<	0.003	<	0.007
HCHgamma	< =	0.002		0.001	< =	0.003
Total HCHs	< =	0.004		0.004	< =	0.011
Mirex	<	0.001	<	0.001	< =	0.000

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	22C	22C	23C	23C	24C	24C
Locality	China Basin		Islais Creek		Islais Creek	
BBI #	91-0088		91-0073		91-0046	
% Org C		1.3		2.24		0.99
% Org N		0.14		0.282		0.118
Alpha chlordane		0.089		0.227		0.030
Gamma chlordane		0.321		0.306		0.043
Oxychlordane		0.573		0.081		0.046
trans-nonachlor		0.065		0.159		0.019
Total chlordanes		1.047		0.773		0.137
o,p'-DDE		0.096		0.051		0.000
p,p'-DDE		1.206		1.404		0.574
o,p'-DDD		0.039		0.301		0.137
p,p'-DDD		4.919		2.417		1.243
p,p'-DDMU	< =	0.875	< =	0.146	< =	0.254
o,p'-DDT	< =	0.128	< =	0.100	< =	0.004
p,p;-DDT		38.625		0.153		0.057
Total DDTs		45.888		4.572		2.268
HCB		0.006		0.021		0.006
HCHalpha		0.001		0.009		0.003
HCHbeta	<	0.004		0.003	nm	0.000
HCHgamma		0.007		0.002		0.004
Total HCHs		0.012		0.013		0.006
Mirex	<	0.001	<	0.001	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	25C	25C	26C	26C	27C	27C
Locality	India Basin		Hunters Point		Hunters Point	
BBI #	91-0050		91-0048		91-0057	
% Org C		1.51		1.31		1.11
% Org N		0.185		0.154		0.132
Alpha chlordane		0.047		0.044		0.018
Gamma chlordane		0.058		0.092		0.023
Oxychlordane		0.037		0.022		0.032
trans-nonachlor		0.023		0.021		0.008
Total chlordanes		0.165		0.180		0.082
o,p'-DDE		0.020		0.027		0.023
p,p'-DDE		0.665		0.566		0.574
o,p'-DDD		0.201		0.093		0.105
p,p'-DDD		1.605		0.800		0.808
p,p'-DDMU	< =	0.104	< =	0.110	< =	0.068
o,p'-DDT	< =	0.055	< =	0.035	< =	0.032
p,p;-DDT		0.077		0.156		0.074
Total DDTs		2.727		1.786		1.684
HCB		0.011		0.007		0.006
HCHalpha	< =	0.003	< =	0.000	< =	0.000
HCHbeta	<	0.002	<	0.004	< =	0.008
HCHgamma	<	0.006	< =	0.002	< =	0.001
Total HCHs	< =	0.010	< =	0.006	< =	0.009
Mirex	<	0.001	<	0.002	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	28C		29C		30C	
Locality	Sierra Point		Sierra Point		San Bruno	
BBI #	91-0058		91-0077		91-0089	
% Org C		1.04		0.99		1.22
% Org N		0.114		0.123		0.138
Alpha chlordane		0.021		0.027		0.038
Gamma chlordane		0.022		0.062		0.038
Oxychlordane		0.051		0.032		0.081
trans-nonachlor		0.010		0.139		0.023
Total chlordanes		0.104		0.260		0.180
o,p'-DDE		0.017		0.014		0.018
p,p'-DDE		0.354		0.460		0.702
o,p'-DDD		0.065		0.115		0.220
p.p'-DDD		0.374		3.997		1.363
p,p'-DDMU	< =	0.040	< =	0.182	< =	0.139
o,p'-DDT	< =	0.014	< =	0.166	< =	0.066
p,p;-DDT		0.072		38.087		0.169
Total DDTs		0.937		43.021		2.677
HCB		0.005		0.005		0.011
HCHalpha		0.000	< =	0.001		0.001
HCHbeta	<	0.001	<	0.001	< =	0.002
HCHgamma		0.001	< =	0.009		0.004
Total HCHs		0.003	< =	0.011		0.007
Mirex	<	0.000	<	0.001	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	31C	31C	32C	32C	33C	33C
Locality	San Bruno		SFO		SFO	
BBI #	91-0051		91-0059		91-0078	
% Org C		1.16		1.14		1.21
% Org N		0.14		0.134		0.139
Alpha chlordane		0.026		0.035		0.012
Gamma chlordane		0.025		0.030		0.014
Oxychlordane		0.025		0.092		0.030
trans-nonachlor		0.011		0.017		0.006
Total chlordanes		0.086		0.174		0.062
o,p'-DDE		0.015		0.018		0.008
p,p'-DDE		0.557		0.527		0.234
o,p'-DDD		0.123		0.138		0.052
p.p'-DDD		1.173		1.623		0.424
p,p'-DDMU	< =	0.140	< =	0.138	< =	0.187
o,p'-DDT	< =	0.043	< =	0.024	< =	0.008
p,p;-DDT		0.449		0.615		0.174
Total DDTs		2.502		3.083		1.086
HCB		0.009		0.007		0.003
HCHalpha	< =	0.001		0.001	<	0.000
HCHbeta	<	0.002	< =	0.001	<	0.002
HCHgamma	< =	0.003		0.004		0.001
Total HCHs	< =	0.005	< =	0.006		0.004
Mirex	< =	0.002	<	0.001	<	0.000

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	34C	34C	35C	35C	36C	36C
Locality	Coyote Point		Coyote Point		San Mateo	
BBI #	91-0064	91-0064	91-0074		91-0030	
% Org C		1.26		0.98		1.09
% Org N		0.16		0.116		0.144
Alpha chlordane		0.028		0.007		0.029
Gamma chlordane		0.062		0.009		0.025
Oxychlordane		0.204		0.009		0.032
trans-nonachlor		0.016		0.004		0.014
Total chlordanes		0.309		0.030		0.099
o,p'-DDE		0.017		0.006		0.008
p,p'-DDE		0.631		0.257		0.536
o,p'-DDD		0.085		0.040		0.044
p.p'-DDD		0.984		0.370		0.443
p,p'-DDMU	< =	0.377	< =	0.046	< =	0.123
o,p'-DDT	< =	0.045	< =	0.033	< =	0.032
p,p;-DDT		0.034		0.086		0.048
Total DDTs		2.172		0.838		1.234
HCB		0.010		0.002		0.006
HCHalpha		0.001	<	0.000	< =	0.007
HCHbeta		0.002	<	0.001	nm	0.000
HCHgamma		0.004	< =	0.001	nm	0.000
Total HCHs		0.006	< =	0.002	< =	0.007
Mirex	< =	0.000	< =	0.000	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	37C	37C	38C	38C	39C	39C
Locality	San Mateo		San Lorenzo		San Lorenzo	
BBI #	91-0075		91-0049		91-0079	
% Org C		1.15		1.19		1.28
% Org N		0.152		0.144		0.168
Alpha chlordane		0.024		0.025		0.018
Gamma chlordane		0.018		0.022		0.014
Oxychlordane		0.066		0.016		0.015
trans-nonachlor		0.020		0.019		0.016
Total chlordanes		0.127		0.081		0.063
o,p'-DDE		0.001		0.000		0.011
p,p'-DDE		0.433		0.378		0.424
o,p'-DDD		0.070		0.006		0.073
p.p'-DDD		2.104		0.783		0.858
p,p'-DDMU	< =	0.141	< =	0.139	< =	0.085
o,p'-DDT	< =	0.025	< =	0.014	< =	0.016
p,p;-DDT		0.246		0.192		0.054
Total DDTs		3.020		1.512		1.521
HCB		0.006		0.007		0.005
HCHalpha	< =	0.002		0.002		0.001
HCHbeta	<	0.001	<	0.002	< =	0.000
HCHgamma	< =	0.009		0.001		0.002
Total HCHs	< =	0.012		0.005		0.003
Mirex	<	0.001	<	0.000	<	0.000

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	40C	40C	41C	41C	42C	42C
Locality	South Bay		Redwood Creek		Redwood Creek	
BBI #	91-0040		91-0065		91-0037	
% Org C		1.16		1.43		1.27
% Org N		0.146		0.176		0.158
Alpha chlordane		0.012		0.044		0.029
Gamma chlordane		0.010		0.035		0.025
Oxychlordane		0.009		0.007	nm	0.000
trans-nonachlor		0.006		0.038		0.009
Total chlordanes		0.036		0.123		0.063
o,p'-DDE		0.015		0.000		0.017
p,p'-DDE		0.841		0.536		0.502
o,p'-DDD		0.036		1.189		0.011
p.p'-DDD		0.508		1.058		0.670
p,p'-DDMU	< =	0.129	< =	0.007	< =	0.058
o,p'-DDT	< =	0.017	< =	0.088	< =	0.045
p,p;-DDT		0.100		0.220		0.230
Total DDTs		1.647		3.098		1.534
HCB		0.012		0.005	nm	
HCHalpha	< =	0.000	< =	0.002	nm	
HCHbeta	<	0.002	<	0.003	nm	
HCHgamma	< =	0.001	< =	0.003	nm	
Total HCHs	< =	0.003	< =	0.008	nm	
Mirex	<	0.001	<	0.001	<	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

Appendix 4. Chlorinated Biocides in Sediments

Station #	43C	43C	44C	44C	45C	45C
Locality	South Bay		Coyote Creek		Coyote Creek	
BBI #	91-0080		91-0035		91-0060	
% Org C		1.23		1.33		0.98
% Org N		0.155		0.161		0.123
Alpha chlordane		0.025		0.051		0.024
Gamma chlordane		0.017		0.043		0.020
Oxychlordane		0.047		0.010		0.005
trans-nonachlor		0.019		0.027		0.017
Total chlordanes		0.108		0.130		0.067
o,p'-DDE		0.004		0.016		0.007
p,p'-DDE		0.582		0.685		0.405
o,p'-DDD		0.070		0.112		0.071
p.p'-DDD		0.834		0.959		0.611
p,p'-DDMU	< =	0.104	< =	0.215	< =	0.022
o,p'-DDT	< =	0.039	< =	0.022	< =	0.026
p,p;-DDT		0.094		0.197		0.014
Total DDTs		1.727		2.206		1.157
HCB		0.004		0.751		0.003
HCHalpha	< =	0.002		0.001		0.000
HCHbeta	< =	0.002	<	0.002	<	0.000
HCHgamma	< =	0.002		0.009		0.003
Total HCHs	< =	0.006		0.012		0.003
Mirex	< =	0.001	<	0.000	< =	0.001

Data file: c.wb1:bio02a; hardcopy c.wb1:bio03a

APPENDIX 5. Metals in San Francisco Bay Sediments.

Data file: 205j.wb1:MetDat; hardcopy 205j.wb1:MetHC

Locality	Emeryville		Emeryville		Oakland Outer	
Station #	10A	10B	11A	11B	12A	12B
Organic Carbon	0.98	1.01	1.06	1.01	1.24	1.33
Organic Nitrogen	0.118	0.126	0.128	0.134	0.154	0.158
%Fines	6.55	10.72	9.4	10.63	10.18	12.03
Chromium, HCl extr.	14.63	18.67	14.67	14.29	19.98	17.61
Chromium, AqR extr.	76.50	76.50	72.44	72.44	69.96	69.96
Copper, HCl extr.	22.28	20.84	21.68	19.91	35.07	26.08
Copper, AqR extr.	37.05	37.05	38.58	38.58	45.33	45.33
Nickel, HCl extr.	18.66	19.54	21.05	18.90	23.25	20.27
Nickel, AqR extr.	74.06	74.06	75.73	75.73	68.18	68.18
Phosphorus, HCl extr.	594.50	522.73	614.16	568.40	716.15	620.10
Lead, HCl extr.	27.52	28.65	17.22	25.25	47.31	37.04
Lead, AqR extr.	29.13	29.13	16.60	16.60	27.20	27.20
Zinc, HCl extr.	59.46	56.44	57.40	50.65	90.13	76.08
Zinc, AqR extr.	106.91	106.91	111.69	111.69	129.56	129.56
Silver, HCl extr.	0.16	0.18	0.17	0.18	0.34	0.32
Aluminum, HCl extr.	3,138.00	3,786.00	3,177.00	3,163.00		3,828.00
Iron, HCl extr.	8,645.00	10,787.00	9,292.00	8,837.00		10,593.00
Magnesium, HCl extr.	4,524.00	5,306.00	4,535.00	4,637.00		5,445.00
Manganese, HCl extr.	294.00	289.00	372.00	374.00		383.00
Vanadium, AqR extr.	56.15	56.15	54.14	54.14	60.09	60.09
Cobalt, AqR extr.	14.64	14.64	15.30	15.30	13.03	13.03

APPENDIX 5. Metals in San Francisco Bay Sediments.

Data file: 205j.wb1:MetDat; hardcopy 205j.wb1:MetHC

Locality	Oakland Outer		Oakland Inner		Oakland Inner	
Station #	13A	13B	14A	14B	15A	15B
Organic Carbon	1.32	1.19	1.5	1.55	1.9	1.18
Organic Nitrogen	0.161	0.162	0.182	0.195	0.199	0.151
%Fines	10.45	14.34		16.17	14.87	10.38
Chromium, HCl extr.	19.18		18.37	17.60	23.55	
Chromium, AqR extr.	80.77	80.77	84.08	84.08	94.76	94.76
Copper, HCl extr.	24.47		36.73	33.13	81.72	
Copper, AqR extr.	38.84	38.84	56.89	56.89	98.76	98.76
Nickel, HCl extr.	24.80		22.45	21.74	28.39	
Nickel, AqR extr.	75.52	75.52	88.47	88.47	100.10	100.10
Phosphorus, HCl extr.	588.29		652.55	647.00	1,006.93	
Lead, HCl extr.	36.38		32.65	44.51	103.19	
Lead, AqR extr.	41.97	41.97	24.15	24.15	85.87	85.87
Zinc, HCl extr.	73.08		91.33	85.92	203.60	
Zinc, AqR extr.	112.58	112.58	153.72	153.72	249.04	249.04
Silver, HCl extr.	0.11	0.51	0.28	0.32	0.16	0.35
Aluminum, HCl extr.	4,466.00			4,197.00		4,568.00
Iron, HCl extr.	9,444.00			10,980.00		12,059.00
Magnesium, HCl extr.	5,441.00			6,396.00		6,574.00
Manganese, HCl extr.	122.00			412.00		316.00
Vanadium, AqR extr.	47.24	47.24	57.43	57.43	58.78	58.78
Cobalt, AqR extr.	13.74	13.74	16.00	16.00	16.76	16.76

APPENDIX 5. Metals in San Francisco Bay Sediments.

Data file: 205j.wb1:MetDat; hardcopy 205j.wb1:MetHC

Locality	San Leandro Bay		Alameda		Alameda	
Station #	16A	16B	17A	17B	18A	18B
Organic Carbon	1.65	1.54	1.32	1.41	1.16	1.02
Organic Nitrogen	0.183	0.167	0.168	0.194	0.151	0.135
%Fines	7.78	9.21	11.33		46.81	13.61
Chromium, HCl extr.	12.92	15.55	20.97	20.95	13.56	11.42
Chromium, AqR extr.	62.40	62.40	86.71	86.71	63.49	63.49
Copper, HCl extr.	33.59	39.34	36.29	31.74	23.97	20.87
Copper, AqR extr.	52.57	52.57	49.77	49.77	34.94	34.94
Nickel, HCl extr.	19.81	21.89	24.19	20.73	19.09	14.95
Nickel, AqR extr.	75.66	75.66	84.87	84.87	61.62	61.62
Phosphorus, HCl extr.	529.29	478.74	752.02	776.56	476.18	322.33
Lead, HCl extr.	71.06	80.27	32.26	36.93	23.97	25.03
Lead, AqR extr.	69.95	69.95	26.42	26.42	29.78	29.78
Zinc, HCl extr.	143.41	144.67	83.06	77.31	52.05	51.09
Zinc, AqR extr.	184.48	184.48	130.43	130.43	93.81	93.81
Silver, HCl extr.	0.05	0.15	0.37	0.42	0.18	0.17
Aluminum, HCl extr.	2,463.00	2,924.00	4,254.00	3,868.00	2,956.00	2,440.00
Iron, HCl extr.	6,397.00	7,283.00	11,634.00	10,912.00	7,225.00	5,064.00
Magnesium, HCl extr.	3,498.00	4,162.00	6,271.00	5,871.00	4,093.00	3,451.00
Manganese, HCl extr.	187.00	181.00	366.00	369.00	129.00	101.00
Vanadium, AqR extr.	37.85	37.85	53.53	53.53	49.69	49.69
Cobalt, AqR extr.	12.33	12.33	16.07	16.07	13.04	13.04

APPENDIX 5. Metals in San Francisco Bay Sediments.

Data file: 205j.wb1:MetDat; hardcopy 205j.wb1:MetHC

Locality	Off San Leandro Bay		Off India Basin		China Basin	
Station #	19A	19B	20A	20B	21A	21B
Organic Carbon	0.88	0.91	0.95	0.98	1.62	1.59
Organic Nitrogen	0.11	0.12	0.105	0.155	0.205	0.195
%Fines	6.76	5.29	14.51	23.33	17.17	11.58
Chromium, HCl extr.	12.38	12.72	15.29	13.86	17.05	19.04
Chromium, AqR extr.	74.92	74.92	77.66	77.66	100.63	100.63
Copper, HCl extr.	17.77	19.21	26.71	28.71	30.11	25.56
Copper, AqR extr.	31.50	31.50	45.43	45.43	43.35	43.35
Nickel, HCl extr.	16.82	16.79	22.71	20.79	21.68	21.48
Nickel, AqR extr.	77.90	77.90	77.39	77.39	96.07	96.07
Phosphorus, HCl extr.	572.14	558.91	403.71	369.55	676.63	633.11
Lead, HCl extr.	21.53	23.79	31.43	30.03	30.00	30.19
Lead, AqR extr.	29.96	29.96	37.03	37.03	28.38	28.38
Zinc, HCl extr.	46.30	46.44	61.00	59.39	65.47	60.92
Zinc, AqR extr.	86.10	86.10	94.22	94.22	118.17	118.17
Silver, HCl extr.	0.20	0.20	0.22	0.21	0.29	0.29
Aluminum, HCl extr.	2,903.00	2,739.00	2,867.00	2,726.00	3,901.00	3,830.00
Iron, HCl extr.	8,032.00	7,716.00	6,958.00	6,197.00	10,375.00	10,149.00
Magnesium, HCl extr.	3,866.00	3,950.00	3,914.00	3,622.00	6,055.00	6,639.00
Manganese, HCl extr.	252.00	297.00	120.00	113.00	348.00	293.00
Vanadium, AqR extr.	40.38	40.38	54.91	54.91	67.18	67.18
Cobalt, AqR extr.	16.59	16.59	15.03	15.03	17.96	17.96