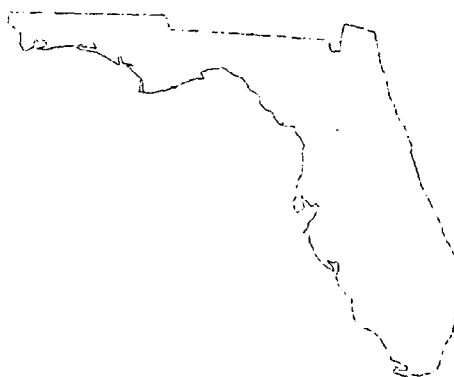


*DEVELOPMENT OF AN INTEGRATED
APPROACH TO THE ASSESSMENT OF
SEDIMENT QUALITY IN FLORIDA*



Volume II: Supporting Documentation



**Development of an Integrated Approach to the
Assessment of Sediment Quality
in Florida**

Volume 2: Supporting Documentation

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LIST OF TABLES

A summary of the available data on the biological effects associated with sediment-sorbed contaminants used to support the derivation of sediment quality guidelines.

Metals

Table 1	Arsenic	1
Table 2	Cadmium	4
Table 3	Chromium	9
Table 4	Copper	13
Table 5	Lead	18
Table 6	Mercury	22
Table 7	Nickel	26
Table 8	Silver	30
Table 9	Tributyl tin	32
Table 10	Zinc	33

Polycyclic Aromatic Hydrocarbons

Table 11	Acenaphthene	37
Table 12	Acenaphthylene	39
Table 13	Anthracene	40
Table 14	Fluorene	42
Table 15	2-methylnaphthalene	44
Table 16	Naphthalene	45
Table 17	Phenanthrene	47
Table 18	Total Low Molecular PAHs	49
Table 19	Benz(a)anthracene	51
Table 20	Benzo(a)pyrene	53
Table 21	Chrysene	55
Table 22	Dibenzo(a,h)anthracene	57
Table 23	Fluoranthene	59
Table 24	Pyrene	62
Table 25	Total High Molecular PAHs	64
Table 26	Total PAHs	66

Polychlorinated Biphenyls

Table 27	Total PCBs	68
----------	------------------	----

Pesticides

Table 28	Aldrin	71
Table 29	Chlordane	72
Table 30	Chlorpyrifos	73
Table 31	p,p'-DDD	74
Table 32	p,p'-DDE	75
Table 33	p,p'-DDT	77
Table 34	Total DDT	78
Table 35	Dieldrin	79
Table 36	Endosulfan	80
Table 37	Endrin	81
Table 38	Heptachlor	82
Table 39	Heptachlor epoxide	83
Table 40	Lindane	84
Table 41	Mirex	85
Table 42	Toxaphene	86

Chlorinated Organic Substances

Table 43	Pentachlorophenol	87
----------	-------------------------	----

Phthalates

Table 44	Bis(2-ethylexyl)phthalate	88
Table 45	Dimethyl phthalate	89
Table 46	Di-n-butyl phthalate	90

References		91
------------	-------	----

LEGEND

CONCENTRATION

SD = Standard Deviation

ANALYSIS TYPE

COA = Co-occurrence Analysis
AETA = Apparent Effects Threshold Approach
EqPA = Equilibrium Partitioning Approach
SQO = Sediment Quality Objective
SQG = Sediment Quality Guideline
SBA = Sediment Background Approach
SSBA = Spike Sediment Bioassay Approach

TEST DURATION

d = Day
h = Hour
wk = Week
m = Month
FT = Flow-through Test
ST = Static Test

END-POINT MEASURED

ACOE = Army Corps of Engineers
AET = Apparent Effects Threshold
C.L. = Confidence Limit
EC50 = Effective Concentration to 50% of the tested organisms
EPA = Environmental Protection Agency
EqP = Equilibrium Partitioning
LC50 = Lethal Concentration to 50% of the tested organisms
LPL = Lower Prediction Limit
NSLC = National Screening Level Concentration
PSDDA = Puget Sound Dredge Disposal Analysis
SDUs = Species Diversity Units
sq.m. = Square meter
SRUs = Species Richness Units
TLm = Median Tolerant Levels
TU/g = Toxic Units / gram

SPECIES

sp.	=	Species
spp.	=	Species (plural)

LIFE STAGE

ADT	=	Adult
ADT/JUV	=	Adult and/or Juvenile
JUV	=	Juvenile
LAR	=	Larval
NYM	=	Nymph

HIT

NC	=	No Concordance
NE	=	No Effect
NG	=	No Gradient
SG	=	Small Gradient
*	=	Hit
-	=	Indeterminate

TOC

TOC	=	Total Organic Carbon
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Table 1. A summary of the available data on the biological effects associated with sediment-sorbed arsenic (ppm) used to support the derivation of sediment quality guidelines.
ARSENIC

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.13	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.13	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1983a
0.13	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.44% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1983a
1 +/- 0.3	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		Lee & Mariani 1977
1.09 +/- 1.02	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
1.09 +/- 1.02	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1985a
1.15 +/- 0.15	Houston Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.44% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1985a
1.23 +/- 0.32	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	NE	0.05+/-0.024	Crocker et al. 1991
1.23 +/- 0.32	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
1.23 +/- 0.32	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Peneus duorarum (pink shrimp)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
1.33 +/- 0.32	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Meris virens (polychaete)	ADT	NE		Lee & Mariani 1977
1.36	Duane River, WA	COA	96-h	Not toxic (10-10% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE	0.12	Van Dolah et al. 1984
1.36	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species	NE			Winn et al. 1989
1.5	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species	NC			Winn et al. 1989
1.5	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUS	Benthic species	NC			Winn et al. 1989
1.5	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUS	Benthic species	NC			Winn et al. 1989
1.57 +/- 0.208	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
1.57 +/- 0.208	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1983b
1.57 +/- 0.208	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1983b
1.59 +/- 0.36	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05+/-1.33) SRUS	Benthic species	NC			Winn et al. 1989
1.72 +/- 0.464	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	NE	0.129+/-0.054	Crocker et al. 1991
1.72 +/- 0.6	Charleston Harbor, SC	COA	10-d	High species diversity (4.15+/-0.59) SDUS	Benthic species	NE			Winn et al. 1989
1.73 +/- 0.794	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	NE	0.144+/-0.123	Crocker et al. 1991
1.86 +/- 0.514	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	NE	0.137+/-0.056	Crocker et al. 1991
1.88	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Meris virens (sandworm)	ADT	NE		Stimmer et al. 1984
1.98 +/- 0.248	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	SG	0.248+/-0.132	Crocker et al. 1991
2 +/- 1	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUS	Benthic species	NE			Winn et al. 1989
2.8 +/- 0.3	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		Lee & Mariani 1977
3.22 +/- 0.85	Southern California	COA	10-d	Not significantly toxic (21.3% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
3.6 +/- 0.5	Norwalk, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		Lee & Mariani 1977
4.07 +/- 2.87	Narragansett Bay, RI	COA	10-d	Not toxic (0% mortality)	Amphipoda abdita (amphipod)	ADT	NE		Munn et al. 1991
4.83 +/- 1.86	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
4.83 +/- 1.86	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1985b
4.83 +/- 1.86	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Meris virens (sandworm)	ADT	NE		EHA 1985b
5.8 +/- 6.36	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
6.24 +/- 5.61	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Meris virens (polychaetes)	ADT	NE		EC&G Bionomics 1980
6.24 +/- 5.61	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Peneus duorarum (pink shrimp)	ADT	NE		EC&G Bionomics 1980
6.24 +/- 5.61	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crossostrea virginica (oyster)	ADT	NE		EC&G Bionomics 1980
8	Southern California	AETA		AET Values	Benthic species	NE			Becker et al. 1990
8.2	United States	EqPA		EPA Chronic Marine EqP Threshold	Aquatic biota	*		1	Lyman et al. 1987
8.25	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota	*		1	Solomon et al. 1985
8.32 +/- 5.21	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	SG		Anderson et al. 1988
9.15 +/- 8.64	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Peneus duorarum (pink shrimp)	ADT	NE	5.2+/-2.6	Parrish 1988b
9.15 +/- 8.64	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	NE	5.2+/-2.6	Parrish 1988b
9.15 +/- 8.64	Bayou Casotte, MS	COA	10-d	Not significantly toxic (10% mortality)	Crossostrea virginica (oyster)	ADT	NE	5.2+/-2.6	Parrish 1988b
9.34 +/- 5.48	Eagle Harbour, WA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84	CN2M Hill 1989
10.4 +/- 13.4	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
12.4 +/- 9.27	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Copepoda volutator (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
12.5	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota	*			U.S. ACE 1988
12.8	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (grass shrimp)	LAR	NE		Lee & Mariani 1977
13.7 +/- 14.8	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	NE			Long & Morgan 1990
13.8 +/- 8.64	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
14.7 +/- 13.9	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990

Table 1. A summary of the available data on the biological effects associated with sediment-sorbed arsenic (ppm) used to support the derivation of sediment quality guidelines (continued).
ARSENIC

Concentration (+/-SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
15.4 +/- 8.63	Burrard Inlet, BC	COA	10-d	Not toxic (97.2 +/- 2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
15.4 +/- 8.63	Burrard Inlet, BC	COA	10-d	Not toxic (8.9 +/- 2.99% threshold)	Corophium volutator (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
16	United States	EgPa		EPA acute marine Egp threshold	Aquatic biota				Lymen et al. 1987
17.2 +/- 14.2	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.6 +/- 2.14	Long & Morgan 1990
17.9 +/- 6.81	Burrard Inlet, BC	COA	10-d	Not toxic (7.9 +/- 5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.5 +/- 2.83	McLeay et al. 1991
18 +/- 1.34	Pensacola, FL	COA	10-d	Not toxic (7.9 +/- 5.12% mortality)	Crossostrea virginica (oyster)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
18 +/- 1.34	Pensacola, FL	COA	10-d	Not significantly toxic (0% mortality)	Peneus duorarum (pink shrimp)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
18 +/- 1.34	Pensacola, FL	COA	10-d	Not significantly toxic (5 +/- 1.41% mortality)	Arenicola cristata (lugworm)	ADT	NE	0.24 +/- 0.18	Nicol & Doe 1990
19.8 +/- 0.666	Black Rock Beach, NS	COA	10-d	Not significantly toxic (8% mortality)	Corophium volutator (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
19.8 +/- 0.666	Black Rock Beach, NS	COA	10-d	Not toxic (6.67 +/- 4.51% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
19.8 +/- 0.666	Black Rock Beach, NS	COA	10-d	Not toxic (2.33 +/- 1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
20	Galveston Harbor, TX	COA	10-d	Not toxic (100% reburial)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
20	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
20	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984
20	Burrard Inlet, BC	SDQ		Sediment quality objectives	Aquatic biota				Swain & Nijman 1991
22 +/- 18.7	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 +/- 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
22.1 +/- 19.4	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	NE	3.4 +/- 2.0	Long & Morgan 1990
22.6 +/- 28.1	Puget Sound, WA	COA	10-d	Not toxic (<= 12.5% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		DeMitt et al. 1988
22.8 +/- 22.1	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
23.2	Burrard Inlet, BC	COA	10-d	Highly toxic (30.3% emergence)	Rhepoxynius abronius (amphipod)	ADT	SG	3.5	McLeay et al. 1991
23.2	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	SG	3.5	McLeay et al. 1991
25.1 +/- 23.1	Puget Sound, WA	COA	10-d	Moderately toxic (>12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG	4.2 +/- 2.6	DeMitt et al. 1988
27.8 +/- 30.8	Commencement Bay, WA	COA	10-d	Least toxic (15.1 +/- 3.1% abnormality)	Oyster	NE	NE		Tetra Tech 1985
28 +/- 21.5	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
28.3 +/- 26.6	Commencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Tetra Tech 1985
30.3 +/- 22.4	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
32	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
32	Halifax Harbour, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
32	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
32 +/- 14.3	Halifax Harbour, NS	COA	10-d	Least toxic (11m 24 +/- 31.1)	Fundulus heteroclitus (mummichog)	ADT	NE		Isai et al. 1979
32 +/- 14.3	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24 +/- 31.1)	Leiostomus xanthurus (spot)	NE	NE		Isai et al. 1979
33.7 +/- 14	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
33.7 +/- 14	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
33.7 +/- 14	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
34.5 +/- 3.54	Halifax Harbour, NS	COA	20-d	Not significantly toxic (8 +/- 5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
37	Halifax Harbour, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	SG		Tay et al. 1990
37	Halifax Harbour, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG		Tay et al. 1990
38	Halifax Harbour, NS	COA	10-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	SG		Tay et al. 1990
41.3 +/- 15.2	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
41.3 +/- 15.2	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1 +/- 2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
44.3 +/- 17	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7 +/- 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG		Tay et al. 1990
50.7 +/- 29.26	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	NE	1.25	Long & Morgan 1990
54	San Francisco Bay, CA	AETA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE		Chapman et al. 1987
56.3 +/- 6.34	San Francisco Bay, CA	COA	4-wk	San Francisco Bay AET	Oyster; mussel	LAR	NE		Long & Morgan 1990
57	San Francisco Bay, CA	COA	10-d	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	LAR	NE	1.23 +/- 0.09	Chapman et al. 1987
57	San Francisco Bay, CA	COA	10-d	Highly toxic (93% mortality)	Amphipod	ADT	NE	4.03	Chapman et al. 1987
57 +/- 10.6	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	NE	4.03	Chapman et al. 1987
57	Puget Sound, WA	SG	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
57	Puget Sound, WA	SG	48-h	Chemical Criteria	Benthic community	ADT	SG	1.03	MOE 1989
57 +/- 18.4	San Francisco Bay, CA	AETA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.03	Chapman et al. 1987
57	Puget Sound, WA	AETA	4-wk	1988 Puget Sound AET	Benthic community	ADT	SG		PTI 1988
57.9 +/- 9.46	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.76% mortality)	Amphipod	ADT	NE	1.4 +/- 0.79	Chapman et al. 1987

Table 1. A summary of the available data on the biological effects associated with sediment-sorbed arsenic (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/-SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
58.7 +/- 10.5	San Francisco Bay, CA	COA	48-h	Least toxic (18%/-8.01% abnormal)	Mussel	LAR	NE	1.2 +/- 0.38	Chapman et al. 1987
58.7 +/- 148.0	Commenement Bay, WA	COA	48-h	Moderately toxic (23%/-2.3% abnormality)	Oyster	ADT	NE	1.44 +/- 0.74	Tetra Tech 1985
59.6 +/- 10.1	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE	1.26 +/- 0.17	Chapman et al. 1987
59.7 +/- 11.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.61% abnormal)	Mussel	LAR	SG	3.59	Chapman et al. 1987
61.5	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	SG		Tetra Tech 1985
63.2 +/- 148.0	Commenement Bay, WA	COA	10-d	Moderately toxic (26%/-5.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG	2.87 +/- 1.32	Chapman et al. 1987
65 +/- 7.55	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3 +/- 5.5% mortality)	Mussel	LAR	SG	2.87 +/- 1.07	Chapman et al. 1987
65 +/- 7.55	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	Tigriopus californicus (copepod)	ADT	SG	2.01 +/- 0.98	Chapman et al. 1987
69.3 +/- 3.06	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.51% mortality)	Amphipod	ADT	SG		Becker et al. 1990
70	California	AETA	10-d	AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
70	Northern California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
70	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	*	*		Long & Morgan
70	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	ADT	NE		U.S. ACE 1988
>72	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>72	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
85	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Various	*	*		Becker et al. 1990
91.8 +/- 78.6	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.1 +/- 3.5)	Fundulus heteroclitus (mummichog)	*	*		Becker et al. 1990
91.8 +/- 78.6	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.9 +/- 3.4)	Leiostomus xanthurus (spot)	*	*		Becker et al. 1990
93	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	*	*		Becker et al. 1990
93	Puget Sound, WA	AETA		1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	*	*		Becker et al. 1990
128 +/- 124	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7 +/- 11.4% mortality)	Nereis virens (polychaete)	ADT	NE		Parrish 1987a
128 +/- 124	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3 +/- 2.31% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987a
128 +/- 124	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14 +/- 9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987a
130 +/- 216	Pascagoula, MS	COA	10-d	Not significantly toxic (5.6 +/- 2.2% mortality)	Renicula cristata (lugworm)	ADT	NE		Parrish 1987c
130 +/- 216	Pascagoula, MS	COA	10-d	Not significantly toxic (6.5 +/- 5.16% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987c
130 +/- 216	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7 +/- 0.82% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987c
178 +/- 150	Howe Sound, BC	COA	10-d	Not toxic (10.5 +/- 4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLay et al. 1991
178 +/- 150	Howe Sound, BC	COA	10-d	Not toxic (96.3 +/- 4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLay et al. 1991
690 +/- 2351	Commenement Bay, WA	COA	10-d	Highly toxic (44.5 +/- 19% abnormality)	Oyster	ADT	NE	3.4 +/- 4.39	Tetra Tech 1985
700	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	*	*		Bellar et al. 1986
700	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Crossostrea gigas (oyster)	LAR	*		Bellar et al. 1986
700	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species	*	*		Pf1 1988
700	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Crossostrea gigas (oyster)	*	*		U.S. ACE 1988
1005 +/- 2777	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Aquatic biota	*	*		DeWitt et al. 1988
2251 +/- 4214	Commenement Bay, WA	COA	10-d	Highly toxic (78.5 +/- 19.3% mortality)	Rhepoxynius abronius (amphipod)	*	*	5.2 +/- 4.4	Tetra Tech 1985

Table 2. A summary of the available data on the biological effects associated with sediment-sorbed cadmium (ppm) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS (umol/g)	Reference
0.025	Fraser River Estuary, BC	SSBA	72-h	Not significantly toxic	Rhepoxynius sp.	NE	NE	0.45		Oakden et al. 1984a
<0.04	Pascagoula Naval Station, MS	COA	10-d	Sediments populated by feral clams	Macoma balthica (bivalve)	NE	NE			McGreer 1982
0.08 +/- 0.02	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31+/-3.86		Parrish et al. 1990
0.08 +/- 0.02	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	7.31+/-3.86		Parrish et al. 1990
0.1	Hallifax Harbour, NS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	NE	7.31+/-3.86		Parrish et al. 1990
0.1	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE			Tay et al. 1990
0.1	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE			Tay et al. 1990
0.1 +/- 0.03	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE			Tay et al. 1990
0.1 +/- 0.03	Pensacola, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE	2.5+/-2.83		Parrish 1988a
0.1 +/- 0.03	Pensacola, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	2.5+/-2.83		Parrish 1988a
0.1	Georgetown, SC	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	NE	0.12		Parrish 1988a
0.13 +/- 0.03	Bayou Casotte, MS	COA	10-d	Not toxic (species richness or abundance)	Benthic species	ADT	NE	5.2+/-2.6		Van Dolah et al. 1984
0.13 +/- 0.03	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	5.2+/-2.6		Parrish 1988b
0.13 +/- 0.03	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Arenicola cristata (lugworm)	ADT	NE	5.2+/-2.6		Parrish 1988b
0.183 +/- 0.092	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31 mortality)	Penaeus aztecus (brown shrimp)	ADT	NE	5.2+/-2.6		Parrish 1988b
0.2	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE			Vittor & Assoc 1988
0.2	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (32% mortality)	Neanthes sp. (polychaete)	JUV	NE			Tay et al. 1990
0.25	Freepoint Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			Tay et al. 1990
0.25	Freepoint Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE			ENA 1983b
0.25	Freepoint Harbor, TX	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1983b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Nereis virens (sandworm)	ADT	NE			ENA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.3% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97 mortality)	Nereis virens (sandworm)	ADT	NE			ENA 1983b
0.25 +/- 0.3	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1983b
0.25 +/- 0.3	Hallifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Macoma balthica (bivalve)	ADT	NE			Tay et al. 1990
0.283 +/- 0.029	Hallifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE			Tay et al. 1990
0.3 +/- 0.346	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	NE	0.05+/-0.0242		Crocker et al. 1991
0.3	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*			Tay et al. 1990
0.3	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*			Tay et al. 1990
0.343 +/- 0.370	Katagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77 mortality)	Rhepoxynius abronius (amphipod)	ADT	NE			ENA 1985a
0.343 +/- 0.370	Katagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			ENA 1985a
0.343 +/- 0.370	Katagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Nereis virens (sandworm)	ADT	NE			ENA 1985a
0.38 +/- 0.09	Massachusetts Bay, MA	COA	10-d	High species richness (936+/-9.4/sq.m.)	Macoma balthica (bivalve)	ADT	NE			ENA 1985a
0.4	Southern California	COA	48-h	Significant increase in burrowing time	Benthic macrofauna	NE	SG	1.13		Gilbert et al. 1976
0.4 +/- 0.3	Southern California	COA	48-h	High abundance (191.3+/-70.1/0.1 sq.m.)	Macoma balthica (bivalve)	NE	SG			McGreer 1979
0.4 +/- 0.1	Southern California	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Macoma balthica (bivalve)	NE	NE			Long & Morgan 1990
0.407 +/- 0.405	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51 mortality)	Macoma balthica (bivalve)	NE	NE			Long & Morgan 1990
0.407 +/- 0.405	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT	NE			Vittor & Assoc 1988
0.472 +/- 0.217	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Nereis virens (sandworm)	ADT	NE			Vittor & Assoc 1988
0.475 +/- 0.177	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	NE	0.144+/-0.123		Crocker et al. 1991
0.48	Northern California	AETA	10-d	AET Values	Amphipod	ADT	NE	0.268+/-0.132		Crocker et al. 1991
0.485 +/- 0.165	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Benthic species	ADT	NE			Becker et al. 1990
0.5	Charleston Harbor, SC	COA	10-d	High species richness (14.9+/-2.04) SDUs	Amphipod	ADT	NE	0.129+/-0.054		Crocker et al. 1991
0.5	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05+/-1.33) SDUs	Benthic species	ADT	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SDUs	Benthic species	ADT	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	High species diversity (4.15+/-0.59) SDUs	Benthic species	ADT	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3+/-0.2) SDUs	Benthic species	ADT	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Low species diversity (1.16) SDUs	Benthic species	ADT	NE			Winn et al. 1989

Table 2. A summary of the available data on the biological effects associated with sediment-sorbed cadmium (ppm) used to support the derivation of sediment quality guidelines (continued).

CADMIUM

Concentration ($\mu\text{g/g}$ SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS ($\mu\text{mol/g}$)	Reference
0.5 +/- 0.3	Southern California	COA	10-d	Moderate abundance (56.2 +/- 23.0 0.1 sq.m.)	Echinoderm	NC	NC			Long & Morgan 1990
0.5 +/- 0.3	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	NC	NC			Long & Morgan 1990
<0.5	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Patemonetes pugio (shrimp)	NE	NE			Lee & Mariani 1977
<0.5	Newport, RI	COA	96-h	Not toxic (0% mortality)	Patemonetes pugio (shrimp)	NE	NE			Lee & Mariani 1977
0.506 +/- 0.598	Narrowsett Bay, RI	COA	10-d	Not significantly toxic (5.28 +/- 3.04% mortality)	Amphiscia abdita (amphipod)	ADT/JUV	NE	0.24 +/- 0.18		Munnis et al. 1991
0.55 +/- 0.477	Black Rock Beach, NS	COA	10-d	Not toxic (6.67 +/- 4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	NE	0.24 +/- 0.18		Nicol & Doe 1990
0.55 +/- 0.477	Black Rock Beach, NS	COA	10-d	Not toxic (2.33 +/- 1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18		Nicol & Doe 1990
0.57	California	AETA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	LAR	NE			Becker et al. 1990
0.588 +/- 0.095	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5 +/- 5% mortality)	Mytilus edulis (bivalve)	ADT	NE	0.137 +/- 0.056		Crocker et al. 1991
0.6 +/- 0.7	Southern California	COA	48-h	Moderate species richness (72 +/- 3.3/0.1 sq.m.)	Benthic species	NC	NC			Long & Morgan 1990
0.6 +/- 0.3	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 +/- 15.5% abnormal)	Benthic species	LAR	NE			Long & Morgan 1990
0.6 +/- 0.4	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	NE			Long & Morgan 1990
0.6 +/- 0.3	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NC	NC			Long & Morgan 1990
0.6 +/- 0.3	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NC	NC			Long & Morgan 1990
0.6 +/- 0.3	San Francisco Bay, CA	COA	10-d	Significantly toxic (24.7 +/- 15% mortality)	Pemnaeus aztecus (brown shrimp)	ADT	NE			Vittor & Assoc 1988
0.63 +/- 0.502	Miami River/Seaboard Canal, FL	COA	10-d	Significantly toxic (62.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE			Long & Morgan 1990
0.63 +/- 0.4	San Francisco Bay, CA	COA	10-d	High species density (93.4/0.1 sq.m.)	Echinoderm	NC	NC	1.3 +/- 0.77		Swartz et al. 1986
0.7	Patos Verdes, CA	COA	48-h	Moderate abundance (72.6 +/- 6.8/0.1 sq.m.)	Artthropods	NC	NC			Long & Morgan 1990
0.7 +/- 0.7	Southern California	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	NE			Long & Morgan 1990
0.7 +/- 0.3	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	NE			Long & Morgan 1990
0.7 +/- 0.5	San Francisco Bay, CA	COA	48-h	EPA/ACOE Puget Sound Interim Criteria	Aquatic biota	NC	NC			Long & Morgan 1990
0.7	Puget Sound, WA	SBA	48-h	Moderate species richness (58.1 +/- 10.4)	Benthic species	NC	NC			U.S. ACE 1988
0.73 +/- 0.62	Massachusetts Bay, MA	COA	10-d	Moderate species abundance (75.6 +/- 12.7/0.1 sq.m.)	Benthic species	NC	NC			Gilbert et al. 1976
0.8 +/- 1.1	Southern California	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	NC	NC			Long & Morgan 1990
0.84 +/- 0.51	San Francisco Bay, CA	COA	10-d	Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	NC	NC			Long & Morgan 1990
0.883 +/- 0.736	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.04% survival)	Corophium volutator (amphipod)	ADT	NE			Tay et al. 1990
0.883 +/- 0.736	Halifax Harbour, NS	COA	10-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanthes sp. (polychaete)	ADT	NE			Tay et al. 1990
0.883 +/- 0.736	Halifax Harbour, NS	COA	20-d	Not significantly toxic (4 mortality)	Citharichthys stigmatus (sanddab)	JUV	NE			Tay et al. 1990
0.9	San Diego Bay, CA	COA	96-h	High abundance (148 +/- 58/0.1 sq.m.)	Artthropods	NE	NE			Salazar & Salazar 1985
0.9 +/- 1.0	Southern California	COA	10-d	Not significantly toxic (14% mortality)	Acanthomyx sculpita (mysid)	NE	NE			Long & Morgan 1990
0.9	San Diego Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.51% mortality)	Neanthes arenaceodentata (polychaete)	NE	NE			Salazar & Salazar 1985
0.9	San Diego Bay, CA	COA	20-d	Least toxic (4.63 +/- 2.91% avoidance)	Macoma nasuta (clam)	NE	NE			Salazar & Salazar 1985
0.9	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Acanthomyx sculpita (mysid)	NE	NE			Salazar & Salazar 1985
0.9	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acartia tonsa (copepod)	NE	NE			Salazar & Salazar 1985
0.9	San Diego Bay, CA	COA	96-h	PSDA Screening level concentration	Aquatic biota	NE	NE			U.S. ACE 1988
0.96	Puget Sound, WA	AETA	10-d	Least toxic (13.6 +/- 7.76% mortality)	Amphipod	ADT	NE	1.4 +/- 0.79		Chapman et al. 1987
1	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.51% mortality)	Amphipod	ADT	NE	2.01 +/- 0.98		Chapman et al. 1987
1	San Francisco Bay, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	NE	4.03		Chapman et al. 1987
1	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.74		Chapman et al. 1987
1	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	NE	4.03		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 8.01% abnormal)	Mussel	LAR	NE	1.2 +/- 0.38		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.61% abnormal)	Mussel	LAR	NE	1.26 +/- 0.17		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	NE	3.59		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33		Chapman et al. 1987
1	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3 +/- 5.5% mortality)	Mussel	LAR	NE	2.87 +/- 1.32		Chapman et al. 1987
1	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.109		Chapman et al. 1987
1	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	Tigriopus californicus (copepod)	ADT	NE	2.87 +/- 1.07		Chapman et al. 1987
1	Burrard Inlet, BC	SBO	4-wk	Sediment Quality Objectives	Aquatic biota	ADT	NE			Suain & Wieman 1991
1	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.03		Chapman et al. 1987

Table 2. A summary of the available data on the biological effects associated with sediment-sorbed cadmium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS ($\mu\text{mol/g}$)	Reference
1.01 +/- 1.09	Massachusetts Bay, MA	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	*				Ott 1986
1.1 +/- 1.0	Southern California	COA		Low species richness (31+/-6.5)	Benthic species	NC				Gilbert et al. 1976
1.1 +/- 2.0	Pensacola Harbor & Bay, FL	COA	10-d	Low species abundance (57.6+/-13.6/0.1 sq.m.)	Benthic species	NC				Long & Morgan 1990
1.2 +/- 0.36	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaete)	ADT				EG&G Bionomics 1980
1.2 +/- 0.36	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT				EG&G Bionomics 1980
1.2 +/- 0.36	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT				EG&G Bionomics 1980
1.2 +/- 1.0	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)	*		1.95		McGreer 1982
1.2	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	*				Long & Morgan 1990
1.29 +/- 0.3	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT				Parrish 1987a
1.29 +/- 0.3	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crassostrea virginica (oyster)	ADT				Parrish 1987a
1.29 +/- 0.3	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT				Parrish 1987a
1.4	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)	SG		3.09		McGreer 1979
1.5 +/- 4.0	Southern California	COA		High species richness (94.3+/-22.3/0.1 sq.m.)	Benthic species	SG				Simmons et al. 1984
1.6	Black Rock Harbour, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)	SG				ERCO 1985
1.64 +/- 0.85	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Penaeus aztecus (brown shrimp)	ADT				ERCO 1985
1.64 +/- 0.85	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.83% mortality)	Mercenaria mercenaria (quahog)	ADT				ERCO 1985
1.64 +/- 0.85	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT				ERCO 1985
1.7	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	LAR				Becker et al. 1990
1.86 +/- 2.03	San Francisco Bay, CA	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT				Long & Morgan 1990
1.86 +/- 2.03	Pascagoula, MS	COA	10-d	Not significantly toxic (6.5+/-5.1% mortality)	Penaeus duorarum (pink shrimp)	ADT				Parrish 1987c
1.86 +/- 2.03	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crassostrea virginica (oyster)	ADT				Parrish 1987c
1.9 +/- 1.1	Commercement Bay, VA	COA		Least toxic (15.1+/-3.1% abnormality)	Oyster	NE				Tetra Tech 1985
1.96 +/- 1.2	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT		2.66+/-2.15		McLeay et al. 1991
2	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2+/-31.1)	Fundulus heteroclitus (mummichog)	NE				Isai et al. 1979
2	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24+/-5.6)	Leptostomus xanthurus (spot)	NE				Isai et al. 1979
2.03 +/- 0.57	Eagle Harbor, WA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT		1.5+/-0.84		CH2M Hill 1989
2.07 +/- 0.929	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT				Grieco 1984
2.07 +/- 0.929	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT				Grieco 1984
2.07 +/- 0.929	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT				Grieco 1984
2.2 +/- 1.24	Burrard Inlet, BC	COA	10-d	Not toxic (5.2+/-3.61% emergence)	Corophium volutator (amphipod)	ADT		3.18+/-2.1		McLeay et al. 1991
2.3 +/- 1.36	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT		2.8+/-1.96		McLeay et al. 1991
2.3 +/- 1.36	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT		2.8+/-1.96		McLeay et al. 1991
2.3 +/- 1.3	Commercement Bay, VA	COA	10-d	Least toxic (12.3+/-4.3% mortality)	Rhepoxynius abronius (amphipod)	ADT				Tetra Tech 1985
2.33 +/- 1.96	Palos Verdes, CA	COA		High species density (20.9+/-0.23/0.1 sq.m.)	Amphipod	NE		1.7+/-0.61		Swartz et al. 1986
2.33 +/- 1.96	Palos Verdes, CA	COA		High species density (11.2+/-1.64/0.1 sq.m.)	Phoxocephalus amphipod	NE		1.7+/-0.61		Swartz et al. 1986
2.35 +/- 0.954	Hove Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT		3.4+/-4.39		McLeay et al. 1991
2.35 +/- 0.954	Hove Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% reburial)	Rhepoxynius abronius (amphipod)	ADT		3.4+/-4.39		McLeay et al. 1991
2.35 +/- 0.954	Hove Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT		3.4+/-4.39		McLeay et al. 1991
2.36 +/- 1.51	Burrard Inlet, BC	COA	10-d	High species density (136/0.1 sq.m.)	Rhepoxynius abronius (amphipod)	ADT		2.64+/-2.14		McLeay et al. 1991
2.4	Palos Verdes, CA	COA		Not toxic (7.9+/-5.12% mortality)	Echinoderm	NE		0.9		Swartz et al. 1986
2.4	Palos Verdes, CA	COA		Not toxic (44 /sq.m. density)	Foraminifera	NE		0.9		Swartz et al. 1985a
2.4	Palos Verdes, CA	COA		Not toxic (88 /sq.m. density)	Foraminifera (brITTLE star)	NE		0.9		Swartz et al. 1985a
2.4	Palos Verdes, CA	COA		Not toxic (132 /sq.m. density)	Oyster	SG				Tetra Tech 1985
2.7 +/- 2.0	Commercement Bay, VA	COA	96-h	Moderately toxic (23+/-2.3% abnormality)	Palaeomonetes pugio (shrimp)	NE				Lee & Martini 1977
2.8 +/- 0.1	Stanford, CT	COA	10-d	Not toxic (10% mortality)	Rhepoxynius abronius (amphipod)	SG				Tetra Tech 1985
2.9 +/- 2.3	Commercement Bay, VA	COA	96-h	Highly toxic (>50% mortality)	Palaeomonetes pugio (shrimp)	SG				Lee & Martini 1977
3	Los Angeles, CA	COA	10-d	Highly toxic (>50% mortality)	Grandidierella japonica (amphipod)	JUV				Anderson et al. 1988
3.24 +/- 5.95	Southern California	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT		3.5		McLeay et al. 1991
4	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT		3.5		McLeay et al. 1991
4	Burrard Inlet, BC	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)	NE				Lee & Martini 1977
4.1 +/- 0.2	Norwalk, CT	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)	NE				Lee & Martini 1977

Table 2. A summary of the available data on the biological effects associated with sediment-sorbed cadmium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS (umol/g)	Reference
4.3 +/-11.4	Southern California	COA		Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods		*			Long & Morgan 1990
4.5 +/-3.64	Palos Verdes, CA	COA		Not toxic (543 +/- 99.1/sq.m. density)	Amphipod		ME	2.1 +/- 1.15		Swartz et al. 1985a
4.5 +/-3.64	Palos Verdes, CA	COA		Not toxic (343 +/- 56.7/sq.m. density)	Phaeophthalid amphipod		NE	2.1 +/- 1.15		Swartz et al. 1985a
4.5 +/-3.64	Palos Verdes, CA	COA		Not toxic (1110 +/- 320/sq.m. density)	Crustacea		NE	2.1 +/- 1.15		Swartz et al. 1985a
4.57 +/-3.75	Palos Verdes, CA	COA		High species density (54.5 +/- 9.91/0.1 sq.m.)	Amphipod		NE	2.1 +/- 1.15		Swartz et al. 1985
4.57 +/-3.75	Palos Verdes, CA	COA		High species density (31.2 +/- 5.67/0.1 sq.m.)	Phaeophthalid amphipod		NE	2.1 +/- 1.53		Swartz et al. 1985
4.7 +/-12.2	Southern California	COA		Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species		*			Long & Morgan 1990
5		SSBA	72-h	Significantly toxic (86% avoidance)	Eohaustorius senicillus (amphipod)		*			Oakden et al. 1984b
5.1	Puget Sound, WA	SOC		Chemical Criteria	Benthic community		*	1		WDE 1989
5.1	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*			PTI 1988
5.6		SSBA	72-h	Significantly toxic (44.4% avoidance)	Rhepoxynius sp.		*			Oakden et al. 1984a
5.32 +/-11.4	Southern California	COA	10-d	Significantly toxic (51.65% mortality)	Grandidierella japonica (amphipod)	JUV	SG			Anderson et al. 1988
5.65 +/-4.6	Palos Verdes, CA	COA	10-d	Not significantly toxic (90.5 +/- 9.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.7 +/- 0.71		Swartz et al. 1985
5.8	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Various		*			Bellar et al. 1985
5.8		SSBA	72-h	Not significantly toxic (23.2% mortality)	Rhepoxynius sp.		NE			Oakden et al. 1984a
5.8		SSBA	72-h	Significantly toxic (66.1% avoidance)	Rhepoxynius sp.		*			Oakden et al. 1984a
6.2 +/-13.1	Southern California	COA	10-d	Low abundance (6.1 +/- 7.2/0.1 sq.m.)	Echinoderm		*			Long & Morgan 1990
6.5	Newport, OR	SSBA	10-d	EC50 for reburial	Rhepoxynius abronius (amphipod)	ADT	*			Swartz et al. 1985c
6.7	Puget Sound, WA	AETA	10-d	1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*			Bellar et al. 1985
6.7	Puget Sound, WA	AETA	10-d	LC50 survival	Rhepoxynius abronius (amphipod)		*			PTI 1988
6.9	Newport, OR	SSBA	10-d	Significantly toxic (85% avoidance)	Rhepoxynius abronius (amphipod)	ADT	*			Swartz et al. 1985c
7.7	United States	EqPA	72-h	EPA Chronic Marine Exp Threshold	Aquatic biota		*			Oakden et al. 1984b
7.7	United States	EqPA	72-h	Chronic Marine Exp Threshold	Aquatic biota		*			Lyman et al. 1987
7.75	Newport, OR	SSBA	10-d	EC30	Rhepoxynius abronius (amphipod)	ADT	*	1		Bolton et al. 1985
8.2		SSBA	10-d	LC50 +/- 95% C.L.	Rhepoxynius abronius (amphipod)		*			Swartz et al. 1985b
8.4	Monterey Bay, CA	SSBA	72-h	Significantly toxic (94% avoidance)	Eohaustorius senicillus (amphipod)	JUV	*			Robinson et al. 1988
8.4	Monterey Bay, CA	SSBA	72-h	LC98	Eohaustorius senicillus (amphipod)		*			Oakden et al. 1984b
8.5	Palos Verdes, CA	SSBA	72-h	LC76	Eohaustorius senicillus (amphipod)		*			Oakden et al. 1984b
8.7		COA		Not toxic (21770 /sq.m. density)	Polychaeta		NE	3.2		Swartz et al. 1985a
8.7		SSBA	10-d	LC50 +/- 95% C.L.	Rhepoxynius abronius (amphipod)		*			Robinson et al. 1988
8.8	Yaquina Bay, OR	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)		*			Kemp et al. 1986
8.88 +/-9.24	Palos Verdes, CA	COA		Not toxic (5940 +/- 6880 /sq.m. density)	Mollusca		NE	2.53 +/- 1.27		Swartz et al. 1985a
8.88 +/-9.24	Palos Verdes, CA	COA		Not significantly toxic (18 +/- 5.7% mortality)	Rhepoxynius abronius (amphipod)		NE	2.53 +/- 1.27		Swartz et al. 1985a
8.9	Southern California	AETA		AET Values	Benthic species		*			Becker et al. 1990
8.9		AETA		EC50 reburial (n=25)	Benthic species		*			Ott F.S. 1986
8.93	Pacific Northwest	SSBA	10-d	High species abundance (88.9 +/- 35.4/0.1 sq.m.)	Rhepoxynius abronius (amphipod)		*			Mearns et al. 1986
9.07	Southern California	COA		1986 Puget Sound Microtox AET	Benthic species		NE			Long & Morgan 1990
9.6	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Microtox		*			Bellar et al. 1986
9.6	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*			Bellar et al. 1986
9.6	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*			PTI 1988
9.6	Puget Sound, WA	AETA		PSDBA Maximum level criteria	Aquatic biota		*			PTI 1988
9.72	Pacific Northwest	SSBA	10-d	EC50 (n=25)	Rhepoxynius abronius (amphipod)		*			U.S. ACE 1988
9.81	Pacific Northwest	SSBA	10-d	LC50 (n=25)	Rhepoxynius abronius (amphipod)		*			Mearns et al. 1986
10	Whidbey Island, WA	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)		*			Kemp et al. 1986
10.8 +/-10.2	Palos Verdes, CA	COA	446-d	Not significantly toxic (9.5 +/- 5.45% mortality)	Pinephales affinis (minnow)	ADT	NE	2.42 +/- 0.88		Swartz et al. 1986
11		SSBA	10-d	Significantly toxic at 60-d	Rhepoxynius abronius (amphipod)		*			Sundelin 1984
11.5	Hudson-Raritan Bay, NY	SSBA	10-d	LC50 +/- 95% C.L.	Rhepoxynius abronius (amphipod)	ADT	*			Robinson et al. 1988
11.8 +/-6.6	Commencement Bay, WA	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)		NE			Tietjen & Lee 1984
15.3 +/-45.1	Newport, OR	SSBA	10-d	Highly toxic (44.5 +/- 19% abnormality)	Oyster		*			Ferre Tech 1985
16		SSBA	10-d	EC50	Rhepoxynius abronius (amphipod)	ADT	*			Swartz et al. 1985b

Table 2. A summary of the available data on the biological effects associated with sediment-sorbed cadmium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS (umol/g)	Reference
18.3 +/- 12.3	Palos Verdes, CA	COA	14-d	Low species density (0.08 +/- 0.11/0.1 sq.m.)	Echinoderm	*	*	3.4 +/- 0.75		Swartz et al. 1986
18.6 +/- 8.9	Hudson-Raritan Bay, NY	COA		Significantly toxic (reduced growth rate)	Chironomus tentans	SG				Tietjen & Lee 1984
18.8 +/- 13.1	Palos Verdes, CA	COA		Highly toxic (3650 +/- 1780 /sq.m. density)	Polychaete	*		3.15 +/- 1.32		Swartz et al. 1985a
19.3 +/- 6.11	Palos Verdes, CA	COA		Low species density (5.3 +/- 3.7/0.1 sq.m.)	Total amphipod	*		3.13 +/- 0.15		Swartz et al. 1986
19.9 +/- 6.11	Palos Verdes, CA	COA		Highly toxic (0.13 +/- 0.23/0.1 sq.m.)	Phoxocephalid amphipod	*		3.13 +/- 0.15		Swartz et al. 1986
19.9 +/- 11.7	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Echinoderm	*		3.53 +/- 0.742		Swartz et al. 1985a
19.9 +/- 11.7	Palos Verdes, CA	COA		Highly toxic (2.3 +/- 3.7 /sq.m. density)	Foraminifera (sponge)	*		3.53 +/- 0.742		Swartz et al. 1985a
19.9 +/- 11.7	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Ophiuroides (brittle star)	*		3.53 +/- 0.742		Swartz et al. 1985a
20.7	Newport, OR	SSBA	4-d	EC50 rebursal	Rhepoxynius abronius (amphipod)	ADT				Salazar et al. 1985c
22.8	San Diego, CA	COA	48-h	Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)	NE				Salazar et al. 1980
22.8 +/- 19.8	Baltimore Harbor, MD	COA	48-h	Most toxic (TLm 5 +/- 3.5)	Fundulus heteroclitus (mummichog)	*				Isai et al. 1979
22.8 +/- 19.8	Baltimore Harbor, MD	COA	48-h	Most toxic (TLm 5.9 +/- 3.4)	Leiostomus xanthurus (spot)	*				Isai et al. 1979
24	United States	EqPA		EPA acute marine Egp threshold	Aquatic biota	*		1		Lyman et al. 1987
25.9	Newport, OR	SSBA	4-d	LC50 survival	Rhepoxynius abronius (amphipod)	ADT				Swartz et al. 1985c
26.7 +/- 5.03	Palos Verdes, CA	COA		Low species density (1.33 +/- 1.22/0.1 sq.m.)	Amphipod	*		3.87 +/- 0.21		Swartz et al. 1986
26.7 +/- 5.03	Palos Verdes, CA	COA		Low species density (0/0.1 sq.m.)	Phoxocephalid amphipod	*		3.87 +/- 0.21		Swartz et al. 1986
27 +/- 4.16	Palos Verdes, CA	COA		Highly toxic (10 +/- 12/sq.m. density)	Amphipod	*		3.95 +/- 0.238		Swartz et al. 1985a
27 +/- 4.16	Palos Verdes, CA	COA		Highly toxic (87 +/- 60.1/sq.m. density)	Phoxocephalid amphipod	*		3.95 +/- 0.238		Swartz et al. 1985a
27 +/- 4.16	Palos Verdes, CA	COA		Highly toxic (<3% mortality)	Crustacea	*		3.95 +/- 0.238		Swartz et al. 1985a
28	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)	NE				Salazar et al. 1980
28.7 +/- 3.06	Palos Verdes, CA	COA		Highly toxic (215 +/- 116 /sq.m. density)	Mollusca	*		4 +/- 0.265		Swartz et al. 1985a
28.7 +/- 3.06	Palos Verdes, CA	COA		Significantly toxic (21 +/- 6.3% mortality)	Rhepoxynius abronius (amphipod)	*		4 +/- 0.265		Swartz et al. 1985a
28.7 +/- 3.1	Palos Verdes, CA	COA		Significantly toxic (20.2 sp./0.1m sq.)	Macro benthos	*				Swartz et al. 1985a
29 +/- 4.24	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5 +/- 2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT		3.9 +/- 0.28		Becker et al. 1990
>32	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT				Salazar et al. 1980
32.5	Southern California	COA		Not toxic (<3% mortality)	Citharichthys stigmatus (sanddab)	NE				Salazar et al. 1980
32.5	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)	NE				Salazar et al. 1980
32.5	San Diego, CA	COA		Not toxic (<3% mortality)	Protoclea staminea (clam)	NE				Salazar et al. 1980
32.5	San Diego, CA	COA		Not toxic (<3% mortality)	Merconaria mercenaria (hard clam)	NE				Salazar et al. 1980
32.6	New York, NY	COA	100-d	Not toxic (<10% mortality)	Palaeomonetes pugio (grass shrimp)	ADT				Rubinstein et al. 1983
38.6	New York, NY	COA	100-d	Not toxic (<10% mortality)	Palaeomonetes pugio (grass shrimp)	ADT				Rubinstein et al. 1983
38.6	New York, NY	COA	100-d	Not toxic (<10% mortality)	Meretrix virens (sandworm)	ADT				Rubinstein et al. 1983
40	New York, NY	SSBA		Not significantly toxic	Meretrix virens (sandworm)	NE				Olla et al. 1985
41.6 +/- 79.8	Commencement Bay, WA	COA	28-d	Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT		6.73 +/- 2.04		Parrish 1985
46.3 +/- 41.5	Gulfpport, MS	COA	10-d	Not significantly toxic (8 +/- 2% mortality)	Rhepoxynius abronius (amphipod)	ADT		6.73 +/- 2.04		Parrish 1987b
46.3 +/- 41.5	Gulfpport, MS	COA	10-d	Not significantly toxic (22 +/- 5.29% mortality)	Penaeus duorarum (pink shrimp)	ADT		6.73 +/- 2.04		Parrish 1987b
46.3 +/- 41.5	Gulfpport, MS	COA	10-d	Not significantly toxic (3.3 +/- 3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT		6.73 +/- 2.04		Parrish 1987b
62 +/- 17.9	Gulf of Mexico	COA	1-d	Not toxic (0.36 +/- 0.261% emergence)	Rhepoxynius abronius (amphipod)	LAR		0.42 +/- 0.13		Chapman et al. 1991
97.7 +/- 107	Gulf of Mexico	COA	48-h	Not toxic (4.54 +/- 5.37% mortality)	Crassostrea gigas (oyster)	LAR		0.443 +/- 0.127		Chapman et al. 1991
102 +/- 99.7	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76 +/- 1.89% abnormality)	Crassostrea gigas (oyster)	LAR		0.425 +/- 0.128		Chapman et al. 1991
130	Gulf of Mexico	COA	10-d	Most toxic (100 TU/g)	Microtox	NC		0.45 +/- 0.058		Chapman et al. 1991
141 +/- 137	Gulf of Mexico	COA	72-h	Significantly toxic (41.75 +/- 38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT				Chapman et al. 1991
190	Gulf of Mexico	SSBA	10-d	Significantly toxic (84% mortality)	Rhepoxynius sp.	SUBADT			1.31 +/- 1.46	Ototo et al. 1990
290 +/- 84.9	Minigret Pond	SSBA	10-d	Least toxic (6.32 +/- 3.68 TU/g)	Benthic species	NE		0.464 +/- 0.143		Chapman et al. 1991
358 +/- 673	Gulf of Mexico	COA		No effect on diversity index (3.21 +/- 0.239)	Rhepoxynius hudsoni (amphipod)	NE		0.47 +/- 0.149		Chapman et al. 1991
381 +/- 705	Gulf of Mexico	COA	10-d	Not significantly toxic (9 +/- 3.96% mortality)	Microtox	ADT		0.47 +/- 0.18		Chapman et al. 1991
483 +/- 834	Gulf of Mexico	COA	1-d	Highly toxic (2.5 +/- 1.05% emergence)	Rhepoxynius abronius (amphipod)	ADT		0.5 +/- 0.155		Chapman et al. 1991
606 +/- 863	Gulf of Mexico	COA	48-h	Highly toxic (59.4 +/- 15.5% mortality)	Crassostrea gigas (oyster)	LAR		0.5 +/- 0.155		Chapman et al. 1991
815 +/- 1026	Gulf of Mexico	COA	48-h	Significantly toxic (32.6 +/- 14.2% abnormality)	Crassostrea gigas (oyster)	LAR		0.567 +/- 0.153		Chapman et al. 1991
1042 +/- 1126	Gulf of Mexico	COA	10-d	LC50	Annelisca abdita (amphipod)	SUBADT			4.34 +/- 1.57	Ototo et al. 1990
1070 +/- 311	Long Island Sound/Minigret Pond	SSBA	10-d	LC50	Annelisca abdita (amphipod)	SUBADT				Ototo et al. 1990
2580 +/- 403	Long Island Sound	SSBA	10-d	LC50	Annelisca abdita (amphipod)	SUBADT			14.9 +/- 1.41	Ototo et al. 1990
2850 +/- 700	Long Island Sound	SSBA	10-d	LC50	Annelisca abdita (amphipod)	SUBADT				Ototo et al. 1990

Table 3. A summary of the available data on the biological effects associated with sediment-sorbed chromium (ppm) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Duration	Test	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1.32 +/- 1.34	Matagorda Ship Channel, TX	COA	10-d		Not toxic (7.2 +/- 2.77 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1985a
1.32 +/- 1.34	Matagorda Ship Channel, TX	COA	10-d		Not toxic (10.6 +/- 5.18 mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1985a
1.32 +/- 1.34	Matagorda Ship Channel, TX	COA	10-d		Not toxic (0.2 +/- 0.44% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE	0.12	ENA 1985a
2.46	Georgetown, SC	COA	10-d		Not toxic (species richness or abundance)	Benthic species	NE			Van Dolah et al. 1984
4.2 +/- 2.43	Charleston Harbor, SC	COA	10-d		High species richness (14.9 +/- 2.04) SRUs	Benthic species	NE			Winn et al. 1989
6.25	United States	EPA			Chronic marine EGP threshold	Aquatic biota	*	1		Bottom et al. 1985
6.4	Charleston Harbor, SC	COA	10-d		Low species richness (5.16) SRUs	Benthic species	SG			Winn et al. 1989
6.64 +/- 2.47	Charleston Harbor, SC	COA	10-d		Low species diversity (4.15 +/- 0.59) SDUs	Benthic species	NE			Winn et al. 1989
6.67 +/- 5.03	Houston Ship Channel, TX	COA	10-d		Not significantly toxic (15 +/- 13.2% mortality)	Sheepshead minnow	ADT	NE	0.05 +/- 0.024	Crocker et al. 1991
6.8	Charleston Harbor, SC	COA	10-d		Low species diversity (1.16) SDUs	Benthic species	SG			Winn et al. 1989
8.02 +/- 2.45	Charleston Harbor, SC	COA	10-d		Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species	SG			Winn et al. 1989
8.37 +/- 2.30	Freeport Harbor, TX	COA	10-d		Not toxic (2 +/- 1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1985b
8.37 +/- 2.30	Freeport Harbor, TX	COA	10-d		Not toxic (9.6 +/- 4.22% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1985b
8.37 +/- 2.30	Freeport Harbor, TX	COA	10-d		Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1985b
8.43 +/- 2.49	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (4.8 +/- 2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1985a
8.43 +/- 2.49	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (15.8 +/- 4.21% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1985a
8.43 +/- 2.49	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (1.2 +/- 0.44% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1985a
9.32 +/- 3.27	Charleston Harbor, SC	COA	10-d		Moderate species diversity (2.3 +/- 0.2) SDUs	Benthic species	SG			Winn et al. 1989
11.8 +/- 3.7	Commencement Bay, WA	COA	10-d		Least toxic (15.1 +/- 3.1% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
16.7 +/- 12.5	Houston Ship Channel, TX	COA	10-d		Not significantly toxic (5.4 +/- 3.6% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	0.129 +/- 0.054	Crocker et al. 1991
15.3 +/- 2.0	Duaneish River, WA	COA	96-h		Not toxic (0-10% mortality)	Rhepoxynius abronius (amphipod)	NE			Lee & Mariani 1977
16.2 +/- 8.1	Commencement Bay, WA	COA	10-d		Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	NE			Tetra Tech 1985
17.7 +/- 7.3	Commencement Bay, WA	COA	10-d		Moderately toxic (23 +/- 5.2% abnormality)	Oyster	SG			Tetra Tech 1985
17.9 +/- 0.173	Galveston Harbor, TX	COA	10-d		Not toxic (2.4 +/- 1.52% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Grieco 1984
17.9 +/- 0.173	Galveston Harbor, TX	COA	10-d		Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
17.9 +/- 0.173	Galveston Harbor, TX	COA	10-d		Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
18 +/- 4.93	Galveston Harbor, TX	COA	10-d		Not significantly toxic (8 +/- 2% mortality)	Nereis virens (sandworm)	ADT	NE	6.73 +/- 2.04	Parrish 1987b
18 +/- 4.93	Galveston Harbor, TX	COA	10-d		Not significantly toxic (22 +/- 5.29% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	6.73 +/- 2.04	Parrish 1987b
18 +/- 4.93	Galveston Harbor, TX	COA	10-d		Not significantly toxic (3.3 +/- 3.06% mortality)	Crossostrea virginica (oyster)	ADT	NE		Tetra Tech 1985
19.7 +/- 11.3	Commencement Bay, WA	COA	10-d		Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	SG			Lee & Mariani 1977
19.9 +/- 0.4	Newport, RI	COA	96-h		Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
20 +/- 5	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (6 +/- 2.33% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
20 +/- 5	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (1.8 +/- 1.79 mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983b
20 +/- 5	Sabine-Neches Waterway, TX	COA	10-d		Not toxic (2.6 +/- 2.97 mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1983b
20.5 +/- 14.3	Houston Ship Channel, TX	COA	7-d		Not significantly toxic (7.5 +/- 5% mortality)	Sheepshead minnow	ADT	NE	0.137 +/- 0.056	Crocker et al. 1991
21.2 +/- 7.65	Black Rock Beach, MS	COA	10-d		Not toxic (6.6 +/- 4.51% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
21.2 +/- 7.65	Black Rock Beach, MS	COA	10-d		Not toxic (2.33 +/- 1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
21.2 +/- 7.65	Black Rock Beach, MS	COA	10-d		Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE		Tetra Tech 1985
22.2 +/- 9	Commencement Bay, WA	COA	10-d		Highly toxic (44.5 +/- 19% abnormality)	Oyster	SG			Crocker et al. 1991
23.5 +/- 3.54	Houston Ship Channel, TX	COA	10-d		Significantly toxic (22.7 +/- 0.76% mortality)	Amphipod	ADT	NE	0.248 +/- 0.132	Crocker et al. 1991
23.7 +/- 22.3	Houston Ship Channel, TX	COA	10-d		Not significantly toxic (4.7 +/- 4.29% mortality)	Amphipod	ADT	NE	0.144 +/- 0.123	Crocker et al. 1991
24.8 +/- 22.5	Pensacola Harbor & Bay, FL	COA	10-d		Not significantly toxic (9 +/- 1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		ED&G Biometrics 1980
24.8 +/- 22.5	Pensacola Harbor & Bay, FL	COA	10-d		Not significantly toxic (13 +/- 3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		ED&G Biometrics 1980
24.8 +/- 22.5	Pensacola Harbor & Bay, FL	COA	10-d		Not significantly toxic (11.3 +/- 3.21% mortality)	Crossostrea virginica (oyster)	ADT	NE		ED&G Biometrics 1980
26	San Diego Bay, CA	COA	96-h		Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)	NE			Salazar & Salazar 1985
26	San Diego Bay, CA	COA	10-d		Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)	NE			Salazar & Salazar 1985
26	San Diego Bay, CA	COA	20-d		Not significantly toxic (13% mortality)	Neantthes arenaceodentata (polychaete)	NE			Salazar & Salazar 1985
26	San Diego Bay, CA	COA	20-d		Not significantly toxic (1% mortality)	Macoma nasuta (clam)	NE			Salazar & Salazar 1985
26	San Diego Bay, CA	COA	96-h		Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)	NE			Salazar & Salazar 1985

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Table 3. A summary of the available data on the biological effects associated with sediment-sorbed chromium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
26	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)	ADT	NE	2.5+/-2.83	Salazar & Salazar 1985
26.4 +/- 5.08	Pensacola, FL	COA	10-d	Not significantly toxic (3+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	2.5+/-2.83	Parrish 1988a
26.4 +/- 5.08	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	NE	2.5+/-2.83	Parrish 1988a
27 +/- 11.1	Massachusetts Bay, MA	COA	10-d	High species richness (936+/-9.4/sq.m.)	Benthic macrofauna	ADT	NE		Gilbert et al. 1976
28.7 +/- 7.68	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT	NE		Parrish 1987a
28.7 +/- 7.68	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987a
28.7 +/- 7.68	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish et al. 1990
29.1 +/- 25.4	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (14+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
29.1 +/- 25.4	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
29.6 +/- 15.6	Southern California	COA	10-d	Not significantly toxic (3+/-1.41% mortality)	Nereis virens (polychaete)	ADT	NE	7.31+/-3.86	Long & Morgan 1990
32.3 +/- 17.5	Southern California	COA	10-d	High abundance (191.3+/-70.1/0.1 sq.m.)	Echinoderm	SG	NE		Long & Morgan 1990
32.3 +/- 17.5	Southern California	COA	10-d	Moderate abundance (56.2+/-23/0.1 sq.m.)	Echinoderm	SG	NE	1.5+/-0.84	CH2M Hill 1989
34 +/- 10.8	Burrard Inlet, BC	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
36.2 +/- 11.2	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
37.5 +/- 12.9	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
37.5 +/- 12.9	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% rebirth)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
38.1 +/- 36.3	Southern California	COA	10-d	Moderate species richness (72+/-3.3/0.1 sq.m.)	Benthic species	ADT	NE	2.64+/-2.14	Long & Morgan 1990
39.9 +/- 12.7	Burrard Inlet, BC	COA	10-d	Not toxic (7.94+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
40.7 +/- 30.9	Southern California	COA	10-d	High abundance (148+/-58/0.1 sq.m.)	Arthropods	ADT	NE		McGreer 1992
41.9 +/- 34	Narragansett Bay, RI	COA	10-d	Sediments populated by feral clams	Macoma balthica (bivalve)	ADT	NE	0.45	Long & Morgan 1990
42 +/- 11	Fraser River Estuary, BC	COA	10-d	Moderate species abundance (75.6+/-12.7/0.1 sq.m.)	Benthic species	SG	NE		Lee & Hartani 1977
46.3 +/- 43.3	Southern California	COA	10-d	Moderate abundance (72.6+/-6.8/0.1 sq.m.)	Arthropods	SG	NE		Parrish 1988b
47.6 +/- 2.7	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaeomonetes pugio (shrimp)	ADT	NE	5.2+/-2.6	Parrish 1988b
50.2 +/- 26.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	5.2+/-2.6	Parrish 1988b
50.2 +/- 26.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-4% mortality)	Arenicola cristata (lugworm)	ADT	NE	5.2+/-2.6	Parrish 1988b
51	Gulf of Mexico	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE	0.6	Chapman et al. 1991
51.6 +/- 3.05	Gulf of Mexico	COA	1-d	Not toxic (0.36+/-0.26% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	0.42+/-0.13	Chapman et al. 1991
51.7 +/- 2.56	Gulf of Mexico	COA	48-h	Not toxic (4.56+/-5.37% mortality)	Crossostrea gigas (oyster)	LAR	NE	0.443+/-0.127	Chapman et al. 1991
51.9 +/- 2.42	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crossostrea gigas (oyster)	LAR	NE	0.423+/-0.128	Chapman et al. 1991
52.8 +/- 2.36	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.45+/-0.058	Chapman et al. 1991
54 +/- 83.5	Southern California	COA	10-d	Low species abundance (57.6+/-13.6/0.1 sq.m.)	Benthic species	NC	NE		Long & Morgan 1990
54.9	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	SG	3.5	McLeay et al. 1991
54.9	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	SG	3.5	McLeay et al. 1991
60	Burrard Inlet, BC	COA	10-d	Sediment Quality Objectives	Aquatic biota	ADT	NE		Swain & Nijman 1991
60.8 +/- 8.77	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)	ADT	NE	1.13	McGreer 1979
60.8 +/- 8.77	Hove Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
60.8 +/- 8.77	Hove Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
60.8 +/- 8.77	Hove Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% rebirth)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
60.9 +/- 27.5	Massachusetts Bay, MA	COA	10-d	Moderate species richness (58.1+/-10.4)	Benthic species	ADT	NE		Gilbert et al. 1976
62	Palos Verdes, CA	COA	10-d	High species density (136/0.1 sq.m.)	Echinoderm	NE	NE	0.9	Swartz et al. 1986
62	Palos Verdes, CA	COA	10-d	Not toxic (44 /sq.m. density)	Foraminifera (sponge)	NE	NE	0.9	Swartz et al. 1985a
62	Palos Verdes, CA	COA	10-d	Not toxic (88 /sq.m. density)	Ophiuroidea (brittle star)	NE	NE	0.9	Swartz et al. 1985a
62	Palos Verdes, CA	COA	10-d	Not toxic (132 /sq.m. density)	Benthic species	NE	NE	0.9	Swartz et al. 1985a
62	Palos Verdes, CA	COA	10-d	High species richness (96.3+/-22.3/0.1 sq.m.)	Palaeomonetes pugio (shrimp)	NE	NE		Long & Morgan 1990
62 +/- 139	Southern California	COA	96-h	Not toxic (0% mortality)	Benthic species	NE	NE		Lee & Hartani 1977
67.5 +/- 5.9	Norwalk, CT	COA	10-d	No effect on diversity index (3.21+/-0.239)	Benthic species	NE	NE	0.464+/-0.143	Chapman et al. 1991
67.8 +/- 36.4	Gulf of Mexico	COA	10-d	Least toxic (6.32+/-3.68 /10/g)	Microtox	NE	NE	0.47+/-0.149	Chapman et al. 1991
69.5 +/- 37.9	Gulf of Mexico	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1986
73 +/- 124	Southern California	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.471+/-0.18	Chapman et al. 1991
76.4 +/- 44.3	Gulf of Mexico	COA	10-d						

Table 3. A summary of the available data on the biological effects associated with sediment-sorbed chromium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (μ g/g SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
81 +/- 29.3	Massachusetts Bay, MA	COA	1-d	Low species richness (31 +/- 6.5)	Benthic species	ADT	*		Gilbert et al. 1976
81.3 +/- 46.4	Gulf of Mexico	COA	10-d	Highly toxic (2.5 +/- 1.0% emergence)	Rhepomyxus abronius (amphipod)	ADT	SG	0.5 +/- 0.155	Chapman et al. 1991
81.4 +/- 8.5	Southern California	COA	4-wk	Significantly toxic (51.7% mortality)	Grandierella japonica (amphipod)	JUV	SG		Anderson et al. 1988
82.5 +/- 14.8	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	SG	1.03	Chapman et al. 1987
86	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
86 +/- 6.7	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)	LAR	NE		Lee & Mariani 1977
87 +/- 9.19	San Francisco Bay, CA	COA	48-h	Moderately toxic (57 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
87.3 +/- 22.1	Fraser River Estuary, BC	COA	48-h	Sediments devoid of feral clams	Macoma balthica (bivalve)	LAR	*	1.95	McGreer 1982
88.2 +/- 82.7	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE	1.23 +/- 0.09	Long & Morgan 1990
89 +/- 4.55	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	3.09	Chapman et al. 1987
90	Straits of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)	LAR	*	1.3 +/- 0.38	McGreer 1979
90.1 +/- 11.5	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 8.0% abnormal)	Mussel	LAR	NE	1.26 +/- 0.17	Chapman et al. 1987
94	Palos Verdes, CA	COA	48-h	High species density (93.4 +/- 0.1 sq.m)	Echinoderm	LAR	NE	1.3 +/- 0.77	Chapman et al. 1987
95 +/- 13.2	San Francisco Bay, CA	COA	48-h	Moderately toxic (25 +/- 6.6% abnormal)	Amphipod	ADT	NE	1.4 +/- 0.79	Chapman et al. 1987
95.3 +/- 23.6	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.6% mortality)	Crassostrea gigas (oyster)	LAR	SG	0.5 +/- 0.18	Chapman et al. 1991
96 +/- 52.3	Gulf of Mexico	COA	48-h	Highly toxic (59.4 +/- 15.5% mortality)	Amphipod	LAR	NE	1.44 +/- 0.74	Chapman et al. 1987
97.1 +/- 22.5	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Bivalve	LAR	NE		Long & Morgan 1990
97.5 +/- 66.7	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.3% abnormal)	Crassostrea gigas (oyster)	LAR	NE	0.567 +/- 0.153	Chapman et al. 1991
110 +/- 53.5	Gulf of Mexico	COA	48-h	Significantly toxic (32.6 +/- 14.2% abnormality)	Amphipod	ADT	SG	2.01 +/- 0.98	Chapman et al. 1987
116 +/- 27.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.5% mortality)	Amphipod	ADT	NE		Parrish 1987c
116 +/- 23.5	Pascagoula, MS	COA	10-d	Not significantly toxic (5.6 +/- 2.2% mortality)	Artemia salina (larva)	ADT	NE		Parrish 1987c
116 +/- 23.5	Pascagoula, MS	COA	10-d	Not significantly toxic (6.5 +/- 1.4% mortality)	Artemia salina (larva)	ADT	NE		Parrish 1987c
116 +/- 23.5	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7 +/- 0.82% mortality)	Artemia salina (larva)	ADT	NE		Parrish 1987c
116 +/- 23.5	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7 +/- 0.82% mortality)	Artemia salina (larva)	ADT	NE		Parrish 1987c
130 +/- 18.3	San Francisco Bay, CA	COA	48-h	Moderately toxic (94.9 +/- 10.1 young produced)	Tigriopus californicus (copepod)	LAR	SG	2.87 +/- 1.32	Chapman et al. 1987
134	San Francisco Bay, CA	COA	4-wk	Most toxic, (93% mortality)	Amphipod	ADT	SG	2.87 +/- 1.07	Chapman et al. 1987
134	San Francisco Bay, CA	COA	10-d	Highly toxic (37% mortality)	Amphipod	ADT	SG	4.03	Chapman et al. 1987
134 +/- 94.2	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	SG	4.03	Long & Morgan 1990
142 +/- 43.9	Palos Verdes, CA	COA	10-d	Highly toxic (66.8% abnormal)	Mussel	LAR	SG	3.59	Chapman et al. 1987
142 +/- 43.9	Palos Verdes, CA	COA	10-d	High species density (20.9 +/- 0.23/0.1 sq.m.)	Phoxocephalus amphipod	NE	NE	1.74 +/- 0.61	Swartz et al. 1986
142 +/- 86.5	Palos Verdes, CA	COA	10-d	High species density (11.2 +/- 1.64/0.1 sq.m.)	Phoxocephalus amphipod	NE	NE	1.74 +/- 0.61	Swartz et al. 1986
145 +/- 88.6	Hudson-Raritan Bay, NY	COA	14-d	Highly toxic (67 +/- 11.8% mortality)	Rhepomyxus abronius (amphipod)	NE	NE		Long & Morgan 1990
150 +/- 85.9	San Francisco Bay, CA	COA	48-h	Not toxic (increased growth rate)	Chironomus tentans (nematode)	LAR	NE		Tietjen & Lee 1984
146 +/- 308	Southern California	COA	48-h	Not significantly toxic (31.9 +/- 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
155 +/- 102	San Francisco Bay, CA	COA	10-d	Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods	NE	NE		Long & Morgan 1990
156 +/- 130.5	Palos Verdes, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepomyxus abronius (amphipod)	NE	NE	2.1 +/- 1.15	Swartz et al. 1986
156 +/- 130.5	Palos Verdes, CA	COA	10-d	High species density (54.5 +/- 9.9/0.1 sq.m.)	Phoxocephalus amphipod	NE	NE	2.1 +/- 1.53	Swartz et al. 1986
156 +/- 131	Palos Verdes, CA	COA	10-d	Not toxic (53.3 +/- 99.1/sq.m. density)	Amphipod	NE	NE	2.1 +/- 1.15	Swartz et al. 1985a
156 +/- 131	Palos Verdes, CA	COA	10-d	Not toxic (34.3 +/- 56.7/sq.m. density)	Phoxocephalus amphipod	NE	NE	2.1 +/- 1.15	Swartz et al. 1985a
156 +/- 131	Palos Verdes, CA	COA	10-d	Not toxic (1110 +/- 320/sq.m. density)	Crustacea	NE	NE	2.1 +/- 1.15	Swartz et al. 1985a
157 +/- 321	Southern California	COA	14-d	Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species	NE	NE		Long & Morgan 1990
160 +/- 85.4	Hudson-Raritan Bay, NY	COA	10-d	Significantly toxic (reduced growth rate)	Chironomus tentans (nematode)	NE	NE		Tietjen & Lee 1984
163 +/- 117	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepomyxus abronius (amphipod)	LAR	NE		Long & Morgan 1990
164 +/- 91.4	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	NE	NE		Long & Morgan 1990
205 +/- 349	Southern California	COA	10-d	Least toxic (18 +/- 6.8% mortality)	Rhepomyxus abronius (amphipod)	NE	NE		Long & Morgan 1990
203 +/- 144	Palos Verdes, CA	COA	10-d	Low abundance (16.1 +/- 7.0/0.1 sq.m.)	Echinoderm	ADT	NE	2.7 +/- 0.71	Swartz et al. 1986
203 +/- 97.3	Palos Verdes, CA	COA	10-d	Not significantly toxic (90.5 +/- 9.2% mortality)	Rhepomyxus abronius (amphipod)	ADT	NE		Long & Morgan 1990
>240	Northern California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	-		Becker et al. 1990
>240	Northern California	AETA		AET Values	Benthic species	LAR	-		Becker et al. 1990
255	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)	NE	NE		Salazar et al. 1980

Table 3. A summary of the available data on the biological effects associated with sediment-sorbed chromium (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
260	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		*	1	WDE 1989
260	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
270	Puget Sound, WA	AETA	10-d	Not toxic (5940 +/- 6880 /sq.m. density)	Rhepoxynius abronius (amphipod)		*		PTI 1988
275 +/- 302	Palos Verdes, CA	COA		Not significantly toxic (18 +/- 5.7% mortality)	Mollusca		NE	2.53 +/- 1.27	Swartz et al. 1985a
275 +/- 302	Palos Verdes, CA	COA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)		NE	2.53 +/- 1.27	Swartz et al. 1985a
280	San Francisco Bay, CA	AETA		High species abundance (88.9 +/- 35.4/0.1 sq.m.)	Oyster; mussel	LAR	*		Long & Morgan 1990
293 +/- 459	Southern California	COA		Not toxic (<3% mortality)	Benthic species		NE		Long & Morgan 1990
300	San Diego, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaceus (sanddab)		NE		Salazar et al. 1980
300	San Diego, CA	COA		Not toxic (<3% mortality)	Meanties arenaceodentata (polychaete)		NE		Salazar et al. 1980
300	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)		NE		Salazar et al. 1980
300	San Diego, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)		NE		Salazar et al. 1980
305	Palos Verdes, CA	COA		Not toxic (21770 /sq.m. density)	Polychaeta		NE	3.2	Swartz et al. 1985a
310	California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
310	Southern California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
335 +/- 226	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5 +/- 5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42 +/- 0.88	Swartz et al. 1986
335 +/- 180	Baltimore Harbor, MD	COA	48-h	Least toxic (TLM 43.2 +/- 31.1)	Fundulus heteroclitus (mummichog)		NE		Tsai et al. 1979
335 +/- 180	Baltimore Harbor, MD	COA	48-h	Least toxic (TLM 24 +/- 5.6)	Leiostomus xanthurus (spot)		NE		Tsai et al. 1979
359	Black Rock Harbour, CT	COA	14-d	Significantly toxic (100% mortality)	Meretrix virens (sanddab)		*		Simers et al. 1984
370	San Francisco Bay, CA	AETA		San Francisco Bay AET	Echinoderm		*		Long & Morgan 1990
383 +/- 215	Palos Verdes, CA	COA		Low species density (0.2 +/- 0.14/0.1 sq.m.)	Rhepoxynius abronius (amphipod)		*	2.64 +/- 0.77	Swartz et al. 1986
482 +/- 330	Palos Verdes, CA	COA		Highly toxic (3650 +/- 1780 /sq.m. density)	Polychaeta		SG	3.15 +/- 1.32	Swartz et al. 1985a
486 +/- 295	Palos Verdes, CA	COA		Low species density (0.08 +/- 0.11/0.1 sq.m.)	Echinoderm		*	3.4 +/- 0.75	Swartz et al. 1986
523 +/- 279	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Foraminifera (sponge)		*	3.53 +/- 0.742	Swartz et al. 1985a
523 +/- 279	Palos Verdes, CA	COA		Highly toxic (2.3 +/- 3.7 /sq.m. density)	Total amphipod		*	3.53 +/- 0.742	Swartz et al. 1985a
523 +/- 279	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Ophiuroides (brittle star)		*	3.13 +/- 0.15	Swartz et al. 1986
527 +/- 120	Palos Verdes, CA	COA		Low species density (5.3 +/- 3.7/0.1 sq.m.)	Phoxocephalid amphipod		*	3.13 +/- 0.15	Swartz et al. 1986
527 +/- 120	Palos Verdes, CA	COA		Low species density (0.13 +/- 0.23/0.1 sq.m.)	Rhepoxynius abronius (amphipod)	ADT	*	3.9 +/- 0.28	Swartz et al. 1986
651 +/- 240	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5 +/- 2.1% mortality)	Macro benthos		*		Swartz et al. 1985a
659 +/- 173	Palos Verdes, CA	COA		Highly toxic (215 +/- 116 /sq.m. density)	Mollusca		*	4 +/- 0.265	Swartz et al. 1985a
670 +/- 173	Palos Verdes, CA	COA		Significantly toxic (21 +/- 6.3% mortality)	Rhepoxynius abronius (amphipod)		*	4 +/- 0.265	Swartz et al. 1985a
674 +/- 173	Palos Verdes, CA	COA		Low species density (1.33 +/- 1.22/0.1 sq.m.)	Phoxocephalid amphipod		*	3.87 +/- 0.21	Swartz et al. 1986
674 +/- 175	Palos Verdes, CA	COA		Low species density (10/0.1 sq.m.)	Amphipod		*	3.87 +/- 0.21	Swartz et al. 1986
682 +/- 144	Palos Verdes, CA	COA		Highly toxic (10 +/- 12/sq.m. density)	Amphipod		*	3.95 +/- 0.238	Swartz et al. 1985a
682 +/- 144	Palos Verdes, CA	COA		Highly toxic (10/sq.m. density)	Phoxocephalid amphipod		*	3.95 +/- 0.238	Swartz et al. 1985a
682 +/- 144	Palos Verdes, CA	COA		Highly toxic (87 +/- 60.1/sq.m. density)	Crustacea		*	3.95 +/- 0.238	Swartz et al. 1985a
>820	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>820	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
1646 +/- 1628	Baltimore Harbor, MD	COA	48-h	Most toxic (TLM 5.1 +/- 3.5)	Fundulus heteroclitus (mummichog)		*		Tsai et al. 1979
1646 +/- 1628	Baltimore Harbor, MD	COA	48-h	Most toxic (TLM 5.9 +/- 3.4)	Leiostomus xanthurus (spot)		*		Tsai et al. 1979

Table 4. A summary of the available data on the biological effects associated with sediment-sorbed copper (ppm) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.5	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species	NE			Winn et al. 1989
0.5	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NE			Winn et al. 1989
0.65 +/-0.61	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species	NE			Winn et al. 1989
0.923 +/-0.733	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77 mortality)	Palaeomonetes pugio (grass shrimp)	ADT			EHA 1985a
0.923 +/-0.733	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18 mortality)	Nereis virens (sandworm)	ADT			EHA 1985a
0.923 +/-0.733	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			EHA 1985a
1 +/-1.12	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species	NE			Winn et al. 1989
1.02	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species	NE	0.12		Winn et al. 1989
3.1 +/-1.85	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.024		Van Dolah et al. 1984
3.6 +/-1.91	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT			Crocker et al. 1991
3.6 +/-1.91	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			EHA 1983a
3.6 +/-1.91	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			EHA 1983a
4.5 +/-1.9	Massachusetts Bay, MA	COA		High species richness (936+/-9.4/sq.m.)	Benthic macrofauna	NE			Gilbert et al. 1976
5.42 +/-2.32	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT			EHA 1985b
5.42 +/-2.32	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT			EHA 1985b
5.42 +/-2.32	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			EHA 1985b
6.06 +/-1.42	Pensacola, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1988a
6.06 +/-1.42	Pensacola, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
6.06 +/-1.42	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
8.49 +/-9.56	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
8.49 +/-9.56	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
8.49 +/-9.56	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
8.5 +/-6.36	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			ES&G Bionomics 1980
8.5 +/-6.36	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			ES&G Bionomics 1980
10.4 +/-10.5	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
10.7 +/-6.87	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.129+/-0.054		Crocker et al. 1991
11	Malifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Echinoderm	ADT			Tay et al. 1990
11.5 +/-6.2	Southern California	COA	10-d	High abundance (191.3+/-70.1/0.1 sq.m.)	Palaeomonetes pugio (grass shrimp)	ADT			Long & Morgan 1990
12.2 +/-0.7	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT			Lee & Mariani 1977
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Echinoderm	ADT			Grieco 1984
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Moderate abundance (56.2+/-23/ 0.1 sq.m.)	Sheepshead minnow	JUV			Long & Morgan 1990
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Not significantly toxic (8+/-5.66% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	0.137+/-0.056		Crocker et al. 1991
13.4 +/-1.50	Galveston Harbor, TX	COA	10-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT			EHA 1983b
13.8 +/-3.54	Sidney Tar Pond, MS	COA	20-d	Not toxic (6+/-2.55% mortality)	Nereis virens (sandworm)	ADT			EHA 1983b
13.8 +/-3.54	Sidney Tar Pond, MS	COA	20-d	Not toxic (1.8+/-1.79 mortality)	Mercenaria mercenaria (hard clams)	ADT			EHA 1983b
14.3 +/-2.52	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97 mortality)	Corophium volutator (amphipod)	ADT			Nicol & Doe 1990
14.3 +/-2.52	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.24+/-0.18		Nicol & Doe 1990
14.4 +/-14.7	Black Rock Beach, MS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.24+/-0.18		Nicol & Doe 1990
14.4 +/-14.7	Black Rock Beach, MS	COA	10-d	Not toxic (100% rebirth)	Benthic species	ADT			Gilbert et al. 1976
14.4 +/-14.7	Black Rock Beach, MS	COA	10-d	Moderate species richness (58.1+/-10.4)	Prothothaca staminea (littleneck clam)	ADT	0.09		Phelps et al. 1983
14.5 +/-6.6	Massachusetts Bay, MA	COA		Lower response threshold for rebirth	Benthic species	ADT			Long & Morgan 1990
14.7	Southern California	COA		Moderate species richness (72+/-3.3/0.1 sq.m.)	Arthropods	ADT			Long & Morgan 1990
14.7 +/-15.3	Southern California	COA		Moderate abundance (72+/-3.3/0.1 sq.m.)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
15.4 +/-18.1	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
16	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Arthropods	ADT			Long & Morgan 1990
16 +/-14.4	Southern California	COA		High abundance (148+/-58/0.1 sq.m.)	Benthic species	ADT			Gilbert et al. 1976
16.4 +/-7.3	Massachusetts Bay, MA	COA		Low species richness (31+/-6.5)	Benthic species	ADT			Gilbert et al. 1976

Table 4. A summary of the available data on the biological effects associated with sediment-sorbed copper (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
17.8	Sequim Bay, WA	SSBA		Lower response threshold for burial	Protothaca staminea (clam)	ADT	*	0.09	Phelps et al. 1983
17.8	Sequim Bay, WA	SSBA		Threshold ET50 for burrowing time	Protothaca staminea (clam)	ADT	*	0.09	Phelps et al. 1983
18.5 +/- 2.12	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7%/-0.77% mortality)	Amphipod	ADT	SG	0.248+/-0.132	Crocker et al. 1991
18.8 +/- 16.5	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1%/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
18.8 +/- 16.5	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
19.5 +/- 21.6	Southern California	COA	10-d	Moderate species abundance (75.6+/-12.7/0.1 sq.m.)	Meris virens (polychaete)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
20.8 +/- 38.6	Southern California	COA	10-d	Low species abundance (57.6+/-13.6/0.1 sq.m.)	Benthic species	ADT	NE	7.31+/-3.86	Parrish et al. 1990
23	Sidney Tar Pond, MS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE	0.45	Long & Morgan 1990
27.5 +/- 15.7	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)	ADT	NE	0.45	McGreer 1982
30.8 +/- 60.0	Southern California	COA		High species richness (96.3+/-22.3/0.1 sq.m.)	Benthic species	ADT	NE	0.45	Long & Morgan 1990
34	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota	ADT	*	1	Bolton et al. 1985
34	United States	EqPA		EPA Chronic Marine Eqp Threshold	Aquatic biota	ADT	*	1	Lyman et al. 1987
34.5 +/- 16.8	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
37.6 +/- 47	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Meris virens (polychaete)	ADT	NE		Parrish 1987a
37.6 +/- 47	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987a
37.6 +/- 47	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987a
39.7 +/- 25.2	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
41.5 +/- 16.3	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2+/-35 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.03	Chapman et al. 1987
41.9 +/- 28.6	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
42.8 +/- 6.0	Duamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaeomonetes pugio (shrimp)	ADT	NE		Lee & Mariano 1977
43	Sidney Tar Pond, MS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
43 +/- 9.63	Pascagoula, MS	COA	10-d	Not significantly toxic (3.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT	NE		Parrish 1987c
43 +/- 9.63	Pascagoula, MS	COA	10-d	Not significantly toxic (6.3+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987c
43 +/- 9.63	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987c
44.4 +/- 9.04	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	NE	1.14+/-0.33	Chapman et al. 1987
45	Palos Verdes, CA	COA		High species density (93.4/0.1 sq.m.)	Echinoderm	LAR	NE	1.3+/-0.77	Swartz et al. 1986
46.9 +/- 25.9	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
47 +/- 3.65	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23+/-0.09	Chapman et al. 1987
48.4 +/- 11.5	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	NE	1.2+/-0.38	Chapman et al. 1987
49	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
52 +/- 13.9	San Francisco Bay, CA	COA	48-h	High species density (136/0.1 sq.m.)	Echinoderm	LAR	NE	1.26+/-0.17	Chapman et al. 1987
52	Palos Verdes, CA	COA		Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	NE	0.9	Swartz et al. 1985a
52	Palos Verdes, CA	COA		Not toxic (44 /sq.m. density)	Echinoderm	LAR	NE	0.9	Swartz et al. 1985a
52	Palos Verdes, CA	COA		Not toxic (88 /sq.m. density)	Foraminifera (sponge)	LAR	NE	0.9	Swartz et al. 1985a
52	Palos Verdes, CA	COA		Least toxic (132 /sq.m. density)	Ophiuroidea (brittle star)	LAR	NE	0.9	Swartz et al. 1985a
52.7 +/- 21.4	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	NE	1.4+/-0.79	Chapman et al. 1987
54 +/- 41.5	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
54 +/- 41.5	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
54	United States	EqPA		EPA acute marine Eqp threshold	Aquatic biota	ADT	*	1	Lyman et al. 1987
54.6 +/- 20.5	San Francisco Bay, CA	COA	10-d	Least toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	NE	1.44+/-0.74	Chapman et al. 1987
56.7 +/- 15.3	Palos Verdes, CA	COA		High species density (20.9+/-0.23/0.1 sq.m.)	Amphipod	ADT	NE	1.7+/-0.61	Swartz et al. 1986
56.7 +/- 15.3	Palos Verdes, CA	COA		High species density (11.2+/-1.64/0.1 sq.m.)	Phoxocephalid amphipod	ADT	NE	1.7+/-0.61	Swartz et al. 1986
58.3 +/- 44.8	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
62.3 +/- 78.4	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
63.9 +/- 102	Gulfpport, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	NE	6.73+/-2.04	Parrish 1987b
63.9 +/- 102	Gulfpport, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	NE	6.73+/-2.04	Parrish 1987b
63.9 +/- 102	Gulfpport, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	6.73+/-2.04	Parrish 1987b
64 +/- 40	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
66	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
66	Northern California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
67	Straight of Georgia, BC	SBA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)	LAR	*	1.13	McGreer 1979
68	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota	NE	NE		U.S. ACE 1988

Table 4. A summary of the available data on the biological effects associated with sediment-sorbed copper (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (μ g/g SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
68.2 +/- 48.1	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
70 +/- 47	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)		SG		Long & Morgan 1990
72.2 +/- 40.6	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
72.6 +/- 74.7	Commencement Bay, WA	COA	10-d	Least toxic (15 +/- 3.1% abnormality)	Oyster		NE		Tetra Tech 1985
73 +/- 22.9	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.5% mortality)	Amphipod	ADT	SG	2.01 +/- 0.98	Chapman et al. 1987
73.2 +/- 166	Southern California	COA	10-d	Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species		*		Long & Morgan 1990
73.7 +/- 78.4	Hose Sound, BC	COA	10-d	Not toxic (10.3 +/- 4.0% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
73.7 +/- 78.4	Hose Sound, BC	COA	10-d	Not toxic (5.83 +/- 5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
73.7 +/- 78.4	Hose Sound, BC	COA	10-d	Not toxic (96.3 +/- 6.19% rebursal)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
71 +/- 155	Southern California	COA	10-d	Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods		*		Long & Morgan 1990
74.6 +/- 43.3	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
76 +/- 50.8	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
76.1 +/- 49.7	Eagle Harbour, WA	COA	10-d	Least toxic (0.1 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5 +/- 0.84	CH2M Hill 1989
76.8 +/- 84.5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
76.8 +/- 82.8	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
76.8 +/- 84.5	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanties sp. (polychaete)	JUV	NE		Tay et al. 1990
81	Puget Sound, WA	AETA		PSDA Screening level concentration	Aquatic biota		NE		U.S. ACE 1988
81.2 +/- 103	Harragansett Bay, RI	COA	10-d	Not significantly toxic (5.28 +/- 3.04% mortality)	Annelisca abdita (amphipod)	ADT	NE		Munnis et al. 1991
84.6 +/- 62.5	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
85.1 +/- 69.2	Commencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)		NE		Tetra Tech 1985
87.8 +/- 33.4	San Francisco Bay, CA	COA	10-d	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
96.7 +/- 177	Southern California	COA	48-h	Low abundance (6.1 +/- 7.2/0.1 sq.m.)	Echinoderm		*		Long & Morgan 1990
98	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*	3.4 +/- 2.0	Belitt et al. 1988
98 +/- 90	Puget Sound, WA	COA	10-d	Not toxic (<= 12.5% mortality)	Rhepoxynius abronius (amphipod)		NE	2.87 +/- 1.32	Chapman et al. 1987
98.7 +/- 31	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3 +/- 5.5% mortality)	Mussel	LAR	*	2.87 +/- 1.07	Chapman et al. 1987
98.7 +/- 31	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	Tigriopus californicus (copepod)	ADT	SG		Swain & Nijman 1991
100	Burrard Inlet, BC	SOO		Sediment quality objectives	Aquatic biota		NE		Tetra Tech 1985
106 +/- 93	Commencement Bay, WA	COA		Moderately toxic (23 +/- 2.3% abnormality)	Oyster; mussel		*		Long & Morgan 1990
110	San Francisco Bay, CA	AETA		San Francisco Bay AET		LAR	*	3.59	Chapman et al. 1987
114	Halifax Harbour, NS	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	*		Tetra Tech 1985
118 +/- 98.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)		*	3.5	McLeay et al. 1991
125	Commencement Bay, WA	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
125	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	4.03	Chapman et al. 1987
130	Burrard Inlet, BC	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
130	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	NE		ERCO 1985
133 +/- 108	Miami River, FL	COA	10-d	Not toxic (16.6 +/- 7.2% mortality)	Penaeus aztecus (brown shrimp)	ADT	NE		ERCO 1985
133 +/- 108	Miami River, FL	COA	10-d	Not toxic (1.2 +/- 0.83% mortality)	Merconaria mercenaria (quahog)	ADT	NE		McGee 1982
133 +/- 108	Miami River, FL	COA	10-d	Not toxic (3.6 +/- 1.67% mortality)	Meris virens (sandworm)	ADT	NE	1.95	Belitt et al. 1988
135 +/- 57.4	Fraser River Estuary, BC	COA	10-d	Sediments devoid of feral clams	Macoma balthica (bivalve)	ADT	*	4.2 +/- 2.6	Tay et al. 1990
138 +/- 124	Puget Sound, WA	COA	10-d	Moderately toxic (>12.5% mortality)	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
147 +/- 176	Halifax Harbour, NS	COA	20-d	Not significantly toxic (11 +/- 2% mortality)	Neanties sp. (polychaete)	JUV	NE		Lee & Mariani 1977
147 +/- 232	Southern California	COA	96-h	High species abundance (88.6 +/- 35.4/0.1 sq.m.)	Benthic species		NE		McGee 1979
147 +/- 9.8	Los Angeles, CA	COA	10-d	Highly toxic (>50% mortality)	Palaeomonetes pugio (shrimp)	ADT	*	3.09	Swartz et al. 1986
150 +/- 173	Halifax Harbour, NS	COA	24-h	Not significantly toxic (avoidance)	Corophium volutator (amphipod)		NE	2.1 +/- 1.15	Swartz et al. 1986
152 +/- 137	Palos Verdes, CA	COA		Significantly toxic (avoidance)	Macoma balthica (bivalve)		NE	2.1 +/- 1.53	Swartz et al. 1985a
152 +/- 137	Palos Verdes, CA	COA		High species density (54.3 +/- 9.9/0.1 sq.m.)	Amphipod		NE	2.1 +/- 1.15	Swartz et al. 1985a
152 +/- 137	Palos Verdes, CA	COA		Not toxic (54.3 +/- 9.9/1/sq.m. density)	Amphipod		NE	2.1 +/- 1.15	Swartz et al. 1985a
152 +/- 137	Palos Verdes, CA	COA		Not toxic (34.3 +/- 56.7/sq.m. density)	Crustacea		NE	2.1 +/- 1.15	Swartz et al. 1985a
152 +/- 137	Palos Verdes, CA	COA		Not toxic (1110 +/- 320/sq.m. density)	Fundulus heteroclitus (mummichog)		NE		Tsai et al. 1979
158 +/- 28.7	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2 +/- 31.1)	Leistostomus xanthurus (spot)		NE		Tsai et al. 1979
158 +/- 28.7	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24 +/- 5.6)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42 +/- 0.88	Swartz et al. 1986
164 +/- 122	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5 +/- 5.45% mortality)	Rhepoxynius abronius (amphipod)		NE		

Table 4. A summary of the available data on the biological effects associated with sediment-sorbed copper (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (μ g/g SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
180	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	JUV	*		Long & Morgan 1990
181 $\pm$ 173	Southern California	COA		Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)		*		Anderson et al. 1988
187 $\pm$ 120	Palos Verdes, CA	COA		Low species density (0.24 $\pm$ 0.14/0.1 sq.m.)	Echinoderm	ADT	*	2.64 $\pm$ 0.77	Swartz et al. 1986
192 $\pm$ 185	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7% $\pm$ 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
203 $\pm$ 151	Palos Verdes, CA	COA	96-h	Not significantly toxic (4% mortality)	Rhepoxynius abronius (amphipod)		NE	2.7 $\pm$ 0.71	Swartz et al. 1986
210	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Citharichthys stigmatus (sanddab)		NE		Salazar & Salazar 1985
210	San Diego Bay, CA	COA	10-d	Not significantly toxic (13% mortality)	Acanthomyx sculpina (mysid)		NE		Salazar & Salazar 1985
210	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)		NE		Salazar & Salazar 1985
210	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acanthomyx sculpina (mysid)		NE		Salazar & Salazar 1985
210	San Diego Bay, CA	COA	96-h	Not significantly toxic (10% mortality)	Acartia tonsa (copepod)		NE		Lee & Mariani 1977
216 $\pm$ 23.6	Stamford, CT	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Mariani 1977
224 $\pm$ 6	Palos Verdes, CA	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)		NE	2.53 $\pm$ 1.27	Swartz et al. 1985a
251 $\pm$ 227	Palos Verdes, CA	COA		Not toxic (increased growth rate)	Chromadorina germanica (nematode)		NE	2.53 $\pm$ 1.27	Swartz et al. 1985a
251 $\pm$ 232	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Total amphipod		NE		Tietjen & Lee 1986
270 $\pm$ 50.4	Palos Verdes, CA	COA		Low species density (5.3 $\pm$ 3.7/0.1 sq.m.)	Phoxocephalid amphipod		*	3.13 $\pm$ 0.15	Swartz et al. 1986
270 $\pm$ 50.4	Palos Verdes, CA	COA		Low species density (0.13 $\pm$ 0.23/0.1 sq.m.)	Polychaeta		*	3.13 $\pm$ 0.15	Swartz et al. 1985a
309	Palos Verdes, CA	COA		Not toxic (21770 /sq.m. density)	Benthic species		NE	3.2	Becker et al. 1990
310	California	AETA		AET Values	Benthic species		*		Becker et al. 1990
310	Southern California	AETA		AET Values	Various		*		Becker et al. 1990
310	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	M. elongata (mysid)		NE		Salazar et al. 1980
312	San Diego, CA	COA		Not toxic (<3% mortality)	Benthic community		*	1	WDE 1989
390	Puget Sound, WA	SQG		Chemical Criteria	Microtox		*		Beller et al. 1986
390	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Crassostrea gigas (oyster)	LAR	*		Beller et al. 1986
390	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic species		*		Beller et al. 1986
390	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
412 $\pm$ 274	Palos Verdes, CA	COA		Highly toxic (3650 $\pm$ 1780 /sq.m. density)	Polychaeta		*	3.15 $\pm$ 1.32	Swartz et al. 1985a
419 $\pm$ 228	Palos Verdes, CA	COA		Low species density (0.08 $\pm$ 0.11/0.1 sq.m.)	Echinoderm		*	3.4 $\pm$ 0.75	Swartz et al. 1986
433 $\pm$ 311	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)		SG		Tietjen & Lee 1986
455 $\pm$ 222	Palos Verdes, CA	COA		Highly toxic (0.3 $\pm$ 0.8 /sq.m. density)	Echinoderm		*	3.53 $\pm$ 0.742	Swartz et al. 1985a
455 $\pm$ 222	Palos Verdes, CA	COA		Highly toxic (2.3 $\pm$ 3.7 /sq.m. density)	Foraminifera (sponge)		*	3.53 $\pm$ 0.742	Swartz et al. 1985a
455 $\pm$ 222	Palos Verdes, CA	COA		Highly toxic (0.3 $\pm$ 0.8 /sq.m. density)	Opiluroidea (brittle star)		*	3.53 $\pm$ 0.742	Swartz et al. 1985a
530	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
563 $\pm$ 121	Palos Verdes, CA	COA		Low species density (1.33 $\pm$ 1.22/0.1 sq.m.)	Amphipod		*	3.87 $\pm$ 0.21	Swartz et al. 1986
563 $\pm$ 121	Palos Verdes, CA	COA		Low species density (0.0/0.1 sq.m.)	Phoxocephalid amphipod		*	3.87 $\pm$ 0.21	Swartz et al. 1986
571 $\pm$ 170	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5 $\pm$ 2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.9 $\pm$ 0.28	Swartz et al. 1986
581 $\pm$ 105	Palos Verdes, CA	COA		Highly toxic (10 $\pm$ 12/sq.m. density)	Amphipod		*	3.95 $\pm$ 0.238	Swartz et al. 1985a
581 $\pm$ 105	Palos Verdes, CA	COA		Highly toxic (0/sq.m. density)	Phoxocephalid amphipod		*	3.95 $\pm$ 0.238	Swartz et al. 1985a
581 $\pm$ 105	Palos Verdes, CA	COA		Highly toxic (87 $\pm$ 40.1/sq.m. density)	Crustacea		*	4 $\pm$ 0.265	Swartz et al. 1985a
592 $\pm$ 156	Palos Verdes, CA	COA		Highly toxic (215 $\pm$ 116 /sq.m. density)	Mollusca		*		Swartz et al. 1985a
592 $\pm$ 156	Palos Verdes, CA	COA		Significantly toxic (21 $\pm$ 6.5% mortality)	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1985a
592 $\pm$ 126	Palos Verdes, CA	COA		Significantly toxic (20.2 sp./0.1m sq.)	Macro benthos		*		Swartz et al. 1985a
612	Black Rock Harbour, CT	COA	14-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Stimers et al. 1984
>690	California	AETA		AET Values	Meretis virens (sandworm)		*		Becker et al. 1990
>690	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
810	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Beller et al. 1986
810	Puget Sound, WA	AETA		PSDA Maximum level criteria	Rhepoxynius abronius (amphipod)		*		U.S. ACE 1988
918 $\pm$ 2750	Commencement Bay, WA	COA		Highly toxic (44.5 $\pm$ 19% abnormality)	Aquatic biota		*		Tetra Tech 1985

Table 4. A summary of the available data on the biological effects associated with sediment-sorbed copper (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
995	San Diego, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaceus (sanddab)	NE			Salazar et al. 1980
995	San Diego, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)	NE			Salazar et al. 1980
995	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)	NE			Salazar et al. 1980
1071 +/- 946	Baltimore Harbor, MD	COA	48-h	Most toxic (TLm 5.1 +/- 3.5)	Protothaca staminea (clam)	*			Isai et al. 1979
1071 +/- 946	Baltimore Harbor, MD	COA	48-h	Most toxic (TLm 5.9 +/- 3.4)	Fundulus heteroclitus (spot)	*			Isai et al. 1979
1260 +/- 3251	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Leiostomus xanthurus (spot)	*		5.2 +/- 4.4	DeWitt et al. 1988
1300	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	*			Pitt 1988
2820 +/- 4881	Commencement Bay, WA	COA	10-d	Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	*			Tetra Tech 1985

Table 5. A summary of the available data on the biological effects associated with sediment-sorbed lead (ppm) used to support the derivation of sediment quality guidelines. LEAD

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<0.5	Georgetown, SC	COA	96-h	Not toxic (species richness or abundance)	Benthic species		NE	0.12	Van Dolah et al. 1984
<1	Newport, RI	COA		Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Mariani 1977
1.5	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species		NC		Winn et al. 1989
1.5	Charleston Harbor, SC	COA		Moderate species diversity (2.3/-0.2) SDUS	Benthic species		NC		Winn et al. 1989
1.5	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUS	Benthic species		NC		Winn et al. 1989
1.55 +/- 1.81	Charleston Harbor, SC	COA	10-d	Low species diversity (2.77) SDUS	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
1.55 +/- 1.81	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6/-5.18) mortality	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
1.55 +/- 1.81	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2/-0.447% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
1.59 +/- 0.36	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05/-1.33) SRUS	Meretrix virens (hard clams)	ADT	NE		Winn et al. 1989
1.81 +/- 0.68	Charleston Harbor, SC	COA	10-d	High species diversity (4.15/-0.59) SDUS	Benthic species		NE		Winn et al. 1989
2.38 +/- 1.03	Charleston Harbor, SC	COA	10-d	High species richness (14.9/-2.04) SRUS	Benthic species		NE		Winn et al. 1989
2.5	Freeport Harbor, TX	COA	10-d	Not toxic (2/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
2.5	Freeport Harbor, TX	COA	10-d	Not toxic (9.6/-4.22% mortality)	Meretrix virens (sandworm)	ADT	NE		Winn et al. 1989
5.17 +/- 0.737	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Meretrix virens (sandworm)	ADT	NE		Winn et al. 1989
5.17 +/- 0.737	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
5.17 +/- 0.737	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8/-4.21% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Winn et al. 1989
6.67 +/- 1.53	Houston Ship Channel, TX	COA	10-d	Not toxic (1.2/-0.447% mortality)	Meretrix virens (sandworm)	ADT	NE		Winn et al. 1989
8.32 +/- 13.1	Gulfport, MS	COA	10-d	Not significantly toxic (15/-13.2% mortality)	Sheepshead minnow	ADT	NE		Winn et al. 1989
8.32 +/- 13.1	Gulfport, MS	COA	10-d	Not significantly toxic (8/-2% mortality)	Crossostrea virginica (oyster)	ADT	NE		Winn et al. 1989
8.32 +/- 13.1	Gulfport, MS	COA	10-d	Not significantly toxic (22/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	NE		Winn et al. 1989
8.32 +/- 13.1	Gulfport, MS	COA	10-d	Not significantly toxic (3.3/-0.1% mortality)	Penaeus duarum (pink shrimp)	ADT	NE		Winn et al. 1989
9.5 +/- 8.9	Southern California	COA	10-d	Moderate abundance (56.2/-23/ 0.1 sq.m.)	Echinoderm		NE	0.05 +/- 0.024	Crocker et al. 1991
11.3 +/- 8.2	Southern California	COA	10-d	Moderate species richness (72/-3.3/0.1 sq.m.)	Benthic species		NE	6.73 +/- 2.04	Parrish 1987b
11.7 +/- 13.4	Southern California	COA	10-d	High abundance (191.3/-70.1/0.1 sq.m.)	Echinoderm		NE	6.73 +/- 2.04	Parrish 1987b
12.4 +/- 9.3	Southern California	COA	10-d	High abundance (148/-58/0.1 sq.m.)	Artropods		NE	6.73 +/- 2.04	Parrish 1987b
12.5 +/- 4.3	Massachusetts Bay, MA	COA	10-d	Moderate abundance (72.6/-6.8/0.1 sq.m.)	Benthic macrofauna		NE		Parrish 1987b
12.6 +/- 10.0	Southern California	COA	10-d	Moderate species abundance (75.6/-12.7/0.1 sq.m.)	Artropods		NE		Parrish 1987b
13.4 +/- 6.54	Southern California	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE		Long & Morgan 1990
13.4 +/- 6.54	Pensacola, FL	COA	10-d	Not significantly toxic (5/-1.41% mortality)	Penaeus duarum (pink shrimp)	ADT	NE		Long & Morgan 1990
13.4 +/- 6.54	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	NE		Long & Morgan 1990
14 +/- 9	Fraser River Estuary, BC	COA	10-d	Sediments populated by feral clams	Macoma balthica (bivalve)	ADT	NE		Long & Morgan 1990
14.6 +/- 22.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3/-3.06% mortality)	Penaeus duarum (pink shrimp)	ADT	NE		Long & Morgan 1990
14.6 +/- 22.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8/-6% mortality)	Arenicola cristata (lugworm)	ADT	NE		Long & Morgan 1990
14.6 +/- 22.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE		Long & Morgan 1990
15 +/- 12.7	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Long & Morgan 1990
16 +/- 4.36	Sabine-Neches Waterway, TX	COA	10-d	Not significantly toxic (0% mortality)	Meretrix virens (sandworm)	ADT	NE		Long & Morgan 1990
16 +/- 4.36	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Long & Morgan 1990
16 +/- 4.36	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8/-1.79 mortality)	Meretrix virens (sandworm)	ADT	NE		Long & Morgan 1990
16.6 +/- 23.7	Southern California	COA	10-d	Low species abundance (57.6/-13.6/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
17.2 +/- 23.5	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE		Long & Morgan 1990
17.2 +/- 23.5	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4/-2.83% mortality)	Penaeus duarum (pink shrimp)	ADT	NE		Long & Morgan 1990
18.1 +/- 10.5	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5/-1.41% mortality)	Meretrix virens (polychaete)	ADT	NE		Long & Morgan 1990
19.8 +/- 2.66	Galveston Harbor, TX	COA	10-d	Not significantly toxic (5.4/-3.6% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Long & Morgan 1990
19.8 +/- 2.66	Galveston Harbor, TX	COA	10-d	Not toxic (2.4/-1.52% mortality)	Meretrix virens (sandworm)	ADT	NE		Long & Morgan 1990
19.8 +/- 2.66	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Long & Morgan 1990
19.8 +/- 2.66	Galveston Harbor, TX	COA	10-d	High species richness (96.3/-22.3/0.1 sq.m.)	Meretrix virens (sandworm)	ADT	NE		Long & Morgan 1990
21	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE		Long & Morgan 1990
21.5 +/- 4.95	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2/-35 young produced)	Tigriopus californicus (copepod)	LAR	NE		Long & Morgan 1990
22.3 +/- 13.1	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5/-5% mortality)	Sheepshead minnow	ADT	NE		Long & Morgan 1990
25.2 +/- 17.4	San Francisco Bay, CA	COA	48-h	Least toxic (23.3/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990

Table 5. A summary of the available data on the biological effects associated with sediment-sorbed lead (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
26.4 +/- 22.9	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
26.4 +/- 22.9	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
26.4 +/- 22.9	Pensacola Harbor & Bay, FL	COA	10-d	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	SG	1.14+/-0.33	Chapman et al. 1987
27 +/- 5.79	San Francisco Bay, CA	COA	48-h	Not toxic (44 /sq.m. density)	Echinoderm		NE	0.9	Swartz et al. 1985a
27	Palos Verdes, CA	COA		Not toxic (132 /sq.m. density)	Foraminifera (sponge)		NE	0.9	Swartz et al. 1985a
27	Palos Verdes, CA	COA		Not toxic (132 /sq.m. density)	Opiluroidea (brittle star)		NE	0.9	Swartz et al. 1985a
27.1 +/- 1.7	Duhamish River, WA	COA	96-h	Least toxic (116+/-4.3 young produced)	Palaeomonetes pugio (shrimp)	ADT	NE	1.23+/-0.09	Lee & Mariani 1977
28.3 +/- 5.12	San Francisco Bay, CA	COA	4-wk	Least toxic (18+/-8.01% abnormal)	Tigritopus californicus (copepod)	ADT	NE	1.23+/-0.09	Chapman et al. 1987
29.3 +/- 10.1	San Francisco Bay, CA	COA	48-h	Sediment quality objectives	Mussel	LAR	NE	1.2+/-0.38	Chapman et al. 1987
30	Burrard Inlet, BC	SQA		Not significantly toxic (3% mortality)	Aquatic biota		NE		Swain & Nijman 1991
30	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
30	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
32 +/- 2.83	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	SG	0.248+/-0.132	Crocker et al. 1991
32	Strait of Georgia, BC	COA	48-h	High species density (136/0.1 sq.m.)	Echinoderm		NE	0.9	McCreer 1979
33	Palos Verdes, CA	COA		Significant increase in burrowing time	Macoma balthica (bivalve)		NE		Swartz et al. 1986
33	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota		NE		U.S. ACE 1988
33	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota		NE		Lyman et al. 1987
33	United States	EqPA		EPA Chronic Marine Eqp Threshold	Aquatic biota		NE		Chapman et al. 1987
36 +/- 11.3	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	SG	1.26+/-0.17	Chapman et al. 1987
38.4 +/- 21.1	Hove Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
38.4 +/- 21.1	Hove Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
38.4 +/- 21.1	Hove Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
38.7 +/- 36.0	San Francisco Bay, CA	COA	10-d	Least toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	NE	1.44+/-0.79	Chapman et al. 1987
40 +/- 31.7	San Francisco Bay, CA	COA	10-d	Least toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	NE	1.44+/-0.79	Chapman et al. 1987
40	Sidney Tar Pond, NS	COA		Not significantly toxic (2% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
41 +/- 8.72	Palos Verdes, CA	COA	10-d	High species density (20.9+/-0.23/0.1 sq.m.)	Amphipod		NE	1.7+/-0.61	Swartz et al. 1986
41 +/- 8.72	Palos Verdes, CA	COA	10-d	High species density (11.2+/-1.64/0.1 sq.m.)	Phoxocephalid amphipod		NE	1.7+/-0.61	Swartz et al. 1986
41	Northern California	AETA		AET Values	Benthic species		NE		Becker et al. 1990
41.3 +/- 8.3	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Mariani 1977
42.1 +/- 26.5	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
42.4 +/- 25.9	Massachusetts Bay, MA	COA	10-d	Moderate species richness (58.1+/-10.4)	Benthic species		NE		Gilbert et al. 1976
43.1 +/- 33.4	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
44 +/- 19.8	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (18+/-5.68% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
45.7 +/- 59.0	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Granditelleria japonica (amphipod)	JUV	NE		Anderson et al. 1988
46.7 +/- 17.1	Massachusetts Bay, MA	COA	10-d	Low species richness (31+/-6.5)	Benthic species		NE		Gilbert et al. 1976
46.9 +/- 31.1	Puget Sound, WA	COA	10-d	Not toxic (<= 12.5% mortality)	Rhepoxynius abronius (amphipod)		NE	3.4+/-2.0	DeWitt et al. 1988
47	Palos Verdes, CA	COA		High species density (93.4/0.1 sq.m.)	Echinoderm		NE	1.3+/-0.77	Long & Morgan 1990
48 +/- 103	Southern California	COA		Low abundance (35.3+/-15.8/0.1 sq.m.)	Arthropods		NE		Munnis et al. 1991
49.2 +/- 56.5	Marragansett Bay, RI	COA		Significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Chapman et al. 1987
<50	San Francisco Bay, CA	SOA		Significantly toxic triad minimum bioeffects	Benthic species		NE		Long & Morgan 1990
51 +/- 111	Southern California	COA		Low species richness (31.2+/-8.6/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
51 +/- 34	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.8% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
54.4 +/- 35.5	San Francisco Bay, CA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
55.6 +/- 43.3	Eagle Harbour, WA	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	SG	1.5+/-0.84	CH2M Hill 1989
58	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG		Tay et al. 1990
58	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (55.7+/-22.7% abnormal)	Rhepoxynius abronius (amphipod)	ADT	SG		Long & Morgan 1990
58.3 +/- 60.9	San Francisco Bay, CA	COA	48-h	Not toxic (6.67+/-4.51% mortality)	Bivalve	LAR	NE	0.24+/-0.18	Nicol & Doe 1990
58.9 +/- 63.4	San Francisco Bay, CA	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	NE	0.24+/-0.18	Nicol & Doe 1990
61.8 +/- 61.7	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24+/-0.18	Nicol & Doe 1990
62.4 +/- 60.5	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31 mortality)	Penaeus aztecus (brown shrimp)	ADT	NE		Vittor & Assoc 1988

Table 5. A summary of the available data on the biological effects associated with sediment-sorbed lead (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration ($\pm$ SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
63 +/-46.6	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3%/-7.51% mortality)	Amphipod	ADT	SG	2.01+/-0.98	Chapman et al. 1987
63.4 +/-63.0	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4%/-11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
64 +/-118	Southern California	COA		Low abundance (6.1%/-7.2/0.1 sq.m.)	Echinoderm		NE		Long & Morgan 1990
66	Puget Sound, WA	AETA		PSDA Screening level concentration	Aquatic biota		NE		U.S. ACE 1988
71	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	SG	3.09	Becker et al. 1990
73.1 +/-42.5	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	*		Anderson et al. 1988
74	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		*		McGreer 1979
77.6 +/-75.4	Commenment Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)		NE		Tetra Tech 1985
78 +/-64	Palos Verdes, CA	COA	10-d	Not toxic (54.3%/-99.1/sq.m. density)	Amphipod		NE	2.1+/-1.15	Swartz et al. 1985a
78 +/-64	Palos Verdes, CA	COA	10-d	Not toxic (34.3%/-56.7/sq.m. density)	Phoxocephalid amphipod		NE	2.1+/-1.15	Swartz et al. 1985a
78 +/-64	Palos Verdes, CA	COA	10-d	Not toxic (1110/-320/sq.m. density)	Crustacea		NE	2.1+/-1.15	Swartz et al. 1986
80 +/-61.8	Palos Verdes, CA	COA	10-d	High species density (54.5%/-9.9/0.1 sq.m.)	Amphipod		NE	2.1+/-1.53	Swartz et al. 1986
81.7 +/-49.3	Palos Verdes, CA	COA	10-d	High species density (34.3%/-5.67/0.1 sq.m.)	Phoxocephalid amphipod		*	1.95	McGreer 1982
88.9 +/-43.6	Fraser River Estuary, BC	COA	10-d	Not toxic (5.21%/-3.61% emergence)	Macoma balthica (bivalve)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
89.6	Burrard Inlet, BC	COA	14-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)		*		Simmers et al. 1984
94.9 +/-154	Black Rock Harbour, CT	COA	10-d	High species abundance (88.9%/-35.4/0.1 sq.m.)	Meretrix virens (sandworm)		NE		Long & Morgan 1990
95.8 +/-92.7	Southern California	COA	10-d	Highly toxic (67%/-11.8% mortality)	Benthic species		*		Long & Morgan 1990
96.8 +/-83.7	San Francisco Bay, CA	COA	10-d	Not significantly toxic (2.3%/-1.51 mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Vittor & Assoc 1988
96.8 +/-83.7	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3%/-1.51 mortality)	Mercenaria mercenaria (quahog)	ADT	NE		Vittor & Assoc 1988
97.7 +/-42.6	Miami River/Seybold Canal, FL	COA	10-d	Not toxic (4.5%/-3.02% emergence)	Meretrix virens (sandworm)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
101 +/-67.9	Burrard Inlet, BC	COA	10-d	Not significantly toxic (9.5%/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42+/-0.88	Swartz et al. 1986
101 +/-12.3	Palos Verdes, CA	COA	10-d	Not significantly toxic (6.7%/-11.4% mortality)	Meretrix virens (polychaete)	ADT	NE		Parrish 1987a
101 +/-12.3	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3%/-2.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Parrish 1987a
101 +/-12.3	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14%/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987a
104 +/-65.8	Palos Verdes, CA	COA	10-d	Not significantly toxic (90.5%/-9.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Swartz et al. 1986
105 +/-173	Commenment Bay, WA	COA	10-d	Least toxic (15.1%/-3.1% abnormality)	Oyster		NE	2.7+/-0.71	Tetra Tech 1985
105 +/-86.9	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4%/-4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
111 +/-70	Palos Verdes, CA	COA		Low species density (0.2%/-0.14/0.1 sq.m.)	Echinoderm		*	2.64+/-0.77	Swartz et al. 1986
113 +/-123	Commenment Bay, WA	COA		Moderately toxic (23%/-2.3% abnormality)	Oyster		*		Tetra Tech 1985
120	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
122 +/-102	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
122 +/-102	Palos Verdes, CA	COA		Not toxic (59.0%/-68.0 /sq.m. density)	Mollusca		NE	2.53+/-1.27	Swartz et al. 1985a
123 +/-98.9	Palos Verdes, CA	COA	10-d	Not significantly toxic (18%/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.53+/-1.27	Swartz et al. 1985a
123 +/-98.9	Halifax Harbour, NS	COA	20-d	Not significantly toxic (6.8%/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
123 +/-13.8	Halifax Harbour, NS	COA	96-h	Not significantly toxic (0.7%/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
124 +/-74.7	Stamford, CT	COA	10-d	Not toxic (10% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Harlan 1977
124 +/-74.7	Burrard Inlet, BC	COA	10-d	Not toxic (8.9%/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
124 +/-97.1	Burrard Inlet, BC	COA	10-d	Not toxic (8.9%/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
129 +/-87.8	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3%/-5.5% mortality)	Corophium volutator (amphipod)	ADT	NE	2.87+/-1.32	Tay et al. 1990
129 +/-87.8	San Francisco Bay, CA	COA	48-h	Moderately toxic (94.9%/-10.1 young produced)	Mussel	LAR	*	2.87+/-1.07	Chapman et al. 1987
>130	San Francisco Bay, CA	COA	4-wk	Significantly toxic (94.9%/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	*		Chapman et al. 1987
131 +/-102	Miami River/Seybold Canal, FL	SDAV	10-d	Significantly toxic triad significant bioeffects	Benthic species	ADT	*		Vittor & Assoc 1988
132 +/-80.4	Burrard Inlet, BC	COA	10-d	Significantly toxic (24.7%/-15 mortality)	Penaeus aztecus (brown shrimp)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
137 +/-140	Puget Sound, WA	COA	10-d	Not toxic (7.9%/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	4.2+/-2.6	Dewitt et al. 1988
140	San Francisco Bay, CA	AETA		Moderately toxic (>12.5% mortality)	Oyster, mussel	LAR	*		Long & Morgan 1990
145 +/-132	Hudson-Raritan Bay, NY	COA	14-d	San Francisco Bay AET	Chromadorina germanica (nematode)		NE		Tietjen & Lee 1984
150	California	AETA		Not toxic (increased growth rate)	Benthic species		*		Becker et al. 1990
150	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
160 +/-28.8	Palos Verdes, CA	COA		Not toxic (21770 /sq.m. density)	Polychaeta		NE	3.2	Swartz et al. 1985a
160 +/-28.8	Palos Verdes, CA	COA		Low species density (5.3%/-3.7/0.1 sq.m.)	Total amphipod		*	3.13+/-0.15	Swartz et al. 1986
160 +/-28.8	Palos Verdes, CA	COA		Low species density (0.13%/-0.23/0.1 sq.m.)	Phoxocephalid amphipod		*	3.13+/-0.15	Swartz et al. 1986

Table 5. A summary of the available data on the biological effects associated with sediment-sorbed lead (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
169	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	*	3.59	Chapman et al. 1987
170 +/-102	Pascagoula, MS	COA	10-d	Not significantly toxic (5.6/-2.2% mortality)	Arenicola cristata (lugworm)	ADT	NE		Parrish 1987c
170 +/-102	Pascagoula, MS	COA	10-d	Not significantly toxic (6.5/-5.1% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987c
170 +/-102	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7/-0.8% mortality)	Crossostrea virginica (oyster)	ADT	NE		Tetra Tech 1985
171 +/-192	Commencement Bay, WA	COA	10-d	Moderately toxic (26/-5.2% mortality)	Rhepoxynius abronius (amphipod)	JUV	NE		Tay et al. 1990
179 +/-120	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1/-2% mortality)	Neanthes sp. (polychaete)	ADT	NE		Tay et al. 1990
182 +/-116	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
205	Sidney Tar Point, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
212 +/-135	Patos Verdes, CA	COA	48-h	Highly toxic (3650/-1780 /sq.m. density)	Polychaeta	SG	SG	3.15 +/-1.32	Swartz et al. 1985a
213 +/-131	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2/-31.1)	Fundulus heteroclitus (mummichog)	NE	NE		Tsai et al. 1979
213 +/-131	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24/-5.6)	Leiostomus xanthurus (spot)	NE	NE		Tsai et al. 1979
218 +/-114	Patos Verdes, CA	COA	10-d	Low species density (0.08/-0.11/0.1 sq.m.)	Echinoderm	ADT	*	3.4/-0.75	Swartz et al. 1987
223	San Francisco Bay, CA	COA	10-d	Highly toxic (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
223	San Francisco Bay, CA	COA	10-d	Highly toxic (37% mortality)	Amphipod	ADT	*		Tay et al. 1990
229 +/-83.1	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.53 +/-0.742	Swartz et al. 1985a
233 +/-108	Patos Verdes, CA	COA	10-d	Highly toxic (0.3/-0.8 /sq.m. density)	Echinoderm	ADT	*	3.53 +/-0.742	Swartz et al. 1985a
233 +/-108	Patos Verdes, CA	COA	10-d	Highly toxic (2.3/-3.7 /sq.m. density)	Foraminifera (brittle star)	ADT	*	3.53 +/-0.742	Swartz et al. 1985a
233 +/-108	Patos Verdes, CA	COA	10-d	Highly toxic (0.3/-0.8 /sq.m. density)	Ophiuroidea (brittle star)	ADT	*	3.5	McLeay et al. 1991
255	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
255	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
277 +/-11	Norwalk, CT	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)	NE	NE		Lee & Mariani 1977
294 +/-43	Patos Verdes, CA	COA	10-d	Low species density (1.33/-1.22/0.1 sq.m.)	Amphipod	ADT	*	3.87 +/-0.21	Swartz et al. 1986
294 +/-43	Patos Verdes, CA	COA	10-d	Low species density (0/0.1 sq.m.)	Phoxocephalid amphipod	ADT	*	3.87 +/-0.21	Swartz et al. 1986
294 +/-35.6	Patos Verdes, CA	COA	10-d	Highly toxic (10/-12/sq.m. density)	Amphipod	ADT	*	3.95 +/-0.238	Swartz et al. 1985a
297 +/-35.6	Patos Verdes, CA	COA	10-d	Highly toxic (87/-60.1/sq.m. density)	Phoxocephalid amphipod	ADT	*	3.95 +/-0.238	Swartz et al. 1985a
297 +/-35.6	Patos Verdes, CA	COA	10-d	Highly toxic (87/-60.1/sq.m. density)	Crustacea	ADT	*	3.95 +/-0.238	Swartz et al. 1985a
300	Puget Sound, WA	AETA	10-d	1986 Puget Sound Benthic Community AET	Various	ADT	*	4/-0.265	Bellar et al. 1986
312 +/-23.2	Patos Verdes, CA	COA	10-d	Highly toxic (215/-116 /sq.m. density)	Mollusca	ADT	*	4/-0.265	Swartz et al. 1985a
312 +/-23.2	Patos Verdes, CA	COA	10-d	Significantly toxic (21/-6.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	4/-0.265	Swartz et al. 1985a
312 +/-23	Patos Verdes, CA	COA	10-d	Significantly toxic (20.2 sp./0.1m sq.)	Macro benthos	ADT	*	3.9 +/-0.28	Swartz et al. 1986
316 +/-31.8	Patos Verdes, CA	COA	10-d	Significantly toxic (21.5/-2.1% mortality)	Chironomus tentaculatus (nematode)	ADT	*		Tietjen & Lee 1984
321 +/-195	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>340	California	AETA		AET Values	Benthic community	ADT	*	1	WDE 1989
>340	Southern California	AETA		AET Values	Benthic community	ADT	*		PTI 1988
450	Puget Sound, WA	SG		Chemical Criteria	Fundulus heteroclitus (mummichog)	ADT	*		Tsai et al. 1979
450	Puget Sound, WA	AETA		1988 Puget Sound AET	Leiostomus xanthurus (spot)	ADT	*		Isai et al. 1979
512 +/-231	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.1/-3.5)	Microtox	ADT	*		Bellar et al. 1986
512 +/-231	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.9/-3.4)	Microtox	ADT	*		PTI 1988
530	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Benthic species	ADT	NE		ERCO 1985
561 +/-637	Miami River, FL	COA	10-d	Not toxic (18.6/-7.27 mortality)	Penaeus aztecus (brown shrimp)	ADT	NE		ERCO 1985
561 +/-637	Miami River, FL	COA	10-d	Not toxic (1.2/-0.837 mortality)	Mercenaria mercenaria (quahog)	ADT	NE		ERCO 1985
561 +/-637	Miami River, FL	COA	10-d	Not toxic (3.6/-1.67% mortality)	Mytilus viridis (sandworm)	ADT	NE		ERCO 1985
570 +/-1489	Commencement Bay, WA	COA	10-d	Highly toxic (44.5/-19% abnormality)	Oyster	ADT	*		Tetra Tech 1985
660	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	ADT	*		Bellar et al. 1986
660	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	ADT	*		Bellar et al. 1986
660	Puget Sound, WA	AETA		1986 Puget Sound AET	Crassostrea gigas (oyster)	ADT	*		PTI 1988
660	Puget Sound, WA	AETA		1986 Puget Sound AET	Crassostrea gigas (oyster)	ADT	*		PTI 1988
750 +/-1763	Puget Sound, WA	COA	10-d	PSDDA Maximum level criteria	Rhepoxynius abronius (amphipod)	ADT	*		U.S. ACE 1988
840	United States	EOPA		Highly toxic 95% LPL (Lower Prediction Limit)	Aquatic biota	ADT	*	5.2 +/-4.4	BenWitt et al. 1988
1613 +/-2628	Commencement Bay, WA	COA	10-d	EPA acute marine Eop threshold	Aquatic biota	ADT	*	1	Lyman et al. 1987
				Highly toxic (78.5/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tetra Tech 1985

Table 6. A summary of the available data on the biological effects associated with sediment-sorbed mercury (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.18	Straits of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)	ADT	*	1.13	McGreer 1979
0.18 +/- 0.12	Massachusetts Bay, MA	COA		Moderate species richness (58.1 +/- 10.4)	Benthic species		NG		Gilbert et al. 1976
0.2	United States	EPA		Chronic Marine Eop Threshold	Aquatic biota		*	1	Bolton et al. 1985
0.2 +/- 0.156	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NC	1.03	Chapman et al. 1987
0.2 +/- 0.1	Commencement Bay, WA	COA		Least toxic (15.1 +/- 3.1% abnormality)	Oyster		NE		Tetra Tech 1985
0.2 +/- 0.1	Commencement Bay, WA	COA		Moderately toxic (23 +/- 2.3% abnormality)	Oyster		NE		Tetra Tech 1985
0.21	Commencement Bay, WA	COA	10-d	Least toxic (12.3 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)		NE		U.S. ACE 1988
0.213 +/- 0.197	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota		NE		
0.24	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5 +/- 5% mortality)	Sheepshead minnow	ADT	NE	0.137 +/- 0.056	Crocker et al. 1991
0.24 +/- 0.09	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
0.24 +/- 0.09	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
0.256 +/- 0.089	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 8.0% abnormal)	Mussel	LAR	NE	1.23 +/- 0.38	Chapman et al. 1987
0.26 +/- 0.04	San Francisco Bay, CA	COA	48-h	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.09	Chapman et al. 1987
0.29 +/- 0.08	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.6% abnormal)	Mussel	LAR	SG	1.26 +/- 0.17	Chapman et al. 1987
0.3 +/- 0.1	Southern California	COA	10-d	Significantly toxic (31.7% mortality)	Grandidierella japonica (amphipod)	ADT	NE		Anderson et al. 1988
0.3 +/- 0.1	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7 +/- 0.76% mortality)	Amphipod	ADT	NE		Crocker et al. 1991
0.3 +/- 0.2	Commencement Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE	0.248 +/- 0.132	Tetra Tech 1985
0.3 +/- 0.2	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve		NE		Long & Morgan 1990
0.31 +/- 0.03	Norwalk, CT	COA	96-h	Not toxic (0% mortality)	Palamometes pugio (shrimp)	JUV	NE		Lee & Mariani 1977
0.34 +/- 0.02	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	ADT	NE		Anderson et al. 1988
0.35 +/- 0.251	Miami River/Seybold Canal, FL	COA	10-d	Least toxic (13.6 +/- 7.6% mortality)	Pennaeus aztecus (brown shrimp)	ADT	NE	1.4 +/- 0.79	Vittor & Assoc 1988
0.37 +/- 0.37	San Francisco Bay, CA	COA	10-d	Least toxic (4.6 +/- 2.9% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.74	Chapman et al. 1987
0.37 +/- 0.34	San Francisco Bay, CA	COA	10-d	Least toxic (11m 43.2 +/- 31.1)	Amphipod	ADT	NE		Chapman et al. 1987
0.38 +/- 0.1	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24 +/- 5.6)	Leostomus xanthurus (spot)	JUV	NE		Isai et al. 1979
0.39 +/- 0.1	Baltimore Harbor, MD	COA	48-h	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Ivy et al. 1990
0.4	Stoney Tar Pond, NS	COA	20-d	Chemical Criteria	Benthic community		*	1	WDE 1989
0.41	Puget Sound, WA	SG		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
0.41	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic species		*		PTI 1988
0.42 +/- 0.179	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3 +/- 1.51 mortality)	Mercenaria mercenaria (quahog)	ADT	NE		Vittor & Assoc 1988
0.42 +/- 0.179	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7 +/- 3.02% mortality)	Nereis virens (sandworm)	ADT	NE		Vittor & Assoc 1988
0.42 +/- 0.24	Fraser River Estuary, BC	COA	10-d	Sediments devoid of feral clams	Macoma balthica (bivalve)		*	1.95	McGreer 1982
0.45 +/- 0.352	Miami River, FL	COA	10-d	Not toxic (18.6 +/- 7.2% mortality)	Pennaeus aztecus (brown shrimp)	ADT	NE		ERCO 1985
0.45 +/- 0.352	Miami River, FL	COA	10-d	Not toxic (1.2 +/- 0.83% mortality)	Mercenaria mercenaria (quahog)	ADT	NE		ERCO 1985
0.45 +/- 0.352	Miami River, FL	COA	10-d	Not toxic (3.6 +/- 1.67% mortality)	Nereis virens (sandworm)	ADT	NE		ERCO 1985
0.46	Straits of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		NE	3.09	McGreer 1979
0.47 +/- 0.4	Puget Sound, WA	COA	10-d	Not toxic (<= 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG	3.4 +/- 2.0	Delitt et al. 1988
0.49 +/- 0.044	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7 +/- 15 mortality)	Pennaeus aztecus (brown shrimp)	ADT	SG		Vittor & Assoc 1988
0.5 +/- 0.14	Pensacola, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
0.5 +/- 0.14	Pensacola, FL	COA	10-d	Not significantly toxic (5 +/- 1.41% mortality)	Pennaeus duorarum (pink shrimp)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
0.5 +/- 0.14	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
0.5 +/- 0.3	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 6.6% mortality)	Bivalve	LAR	NE		Long & Morgan 1990
0.5 +/- 0.4	San Francisco Bay, CA	COA	10-d	AET Values	Rhepoxynius abronius (amphipod)	LAR	NE		Becker et al. 1990
0.51	California	AETA		AET Values	Mytilus edulis (bivalve)		*		Becker et al. 1990
0.51	Northern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
0.57	San Francisco Bay, CA	COA	10-d	Highly toxic (95% mortality)	Amphipod	ADT	SG	4.03	Chapman et al. 1987
0.57	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	SG	4.03	Chapman et al. 1987
0.59	Puget Sound, WA	AETA		1986 Puget Sound Oyster AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
0.59	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		PTI 1988
0.6 +/- 0.4	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	NC		Long & Morgan 1990
0.6 +/- 0.4	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
0.61 +/- 0.61	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species		NE	0.12	Van Ool et al. 1984

Table 6. A summary of the available data on the biological effects associated with sediment-sorbed mercury (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
11.2 +/- 22.8	Commencement Bay, WA	COA	10-d	Highly toxic (78.5%/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
13.1		SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Swartz et al. 1988
34.9	New York, NY	COA	100-d	Not toxic (<10% mortality)	Mercenaria mercenaria (hard clam)	ADT	NE		Rubinstein et al. 1983
34.9	New York, NY	COA	100-d	Not toxic (<10% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Rubinstein et al. 1983
34.9	New York, NY	COA	100-d	Not toxic (<10% mortality)	Nereis virens (sandworm)	ADT	NE		Rubinstein et al. 1983
35.3 +/- 6.74	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7%/-11.4% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987a
35.3 +/- 6.74	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3%/-2.3% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987a
35.3 +/- 6.74	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14%/-9.17% mortality)	M. elongata (mysid)	ADT	NE		Parrish 1987a
58.2	San Diego, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)		NE		Salazar et al. 1980
66.5	San Diego, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaeus (sanddab)		NE		Salazar et al. 1980
254	San Diego, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)		NE		Salazar et al. 1980
254	San Diego, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)		NE		Salazar et al. 1980

Table 7. A summary of the available data on the biological effects associated with sediment-sorbed nickel (ppm) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.41 +/- 0.11	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1%/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
0.41 +/- 0.11	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4%/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	7.31+/-3.86	Parrish et al. 1990
0.41 +/- 0.11	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5%/-1.41% mortality)	Nereis virens (polychaete)	ADT	NE	7.31+/-3.86	EHA 1985a
0.783 +/- 0.491	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2%/-2.77% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
0.783 +/- 0.491	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6%/-5.18% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
0.783 +/- 0.491	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
1	Charleston Harbor, SC	COA	10-d	Low species richness (14.9%/-2.04% SRUS)	Benthic species	NE	NE		Winn et al. 1989
1	Charleston Harbor, SC	COA	10-d	High species richness (5.16% SRUS)	Benthic species	NE	NE		Winn et al. 1989
1	Charleston Harbor, SC	COA	10-d	Low species diversity (4.15%/-0.59% SDUS)	Benthic species	NE	NE		Winn et al. 1989
1.5 +/- 0.61	Charleston Harbor, SC	COA	10-d	Low species diversity (1.16% SDUS)	Benthic species	NE	NE		Winn et al. 1989
1.5 +/- 1.12	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05%/-1.33% SRUS)	Benthic species	NE	NE		Winn et al. 1989
3.1 +/- 2.34	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3%/-0.2% SDUS)	Benthic species	NE	NE		Winn et al. 1989
5	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (15%/-13.2% mortality)	Sheepshead minnow	SG	SG		Winn et al. 1989
5.59 +/- 4.87	United States	EqPA	10-d	Chronic EGP threshold	Aquatic biota	ADT	NE	0.05+/-0.024	Crocker et al. 1991
5.89	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4%/-3.6% mortality)	Amphipod	ADT	*	1	Bolton et al. 1985
6.85 +/- 4.07	Georgetown, SC	COA	10-d	Not toxic (species richness or abundance)	Benthic species	ADT	NE	0.129+/-0.054	Crocker et al. 1991
6.85 +/- 4.07	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9%/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE	0.12	Van Dolah et al. 1984
6.85 +/- 4.07	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13%/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
6.85 +/- 4.07	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13%/-3.61% mortality)	Crossostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
7.8 +/- 4.11	Freeport Harbor, TX	COA	10-d	Not toxic (2%/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EG&G Bionomics 1980
7.8 +/- 4.11	Freeport Harbor, TX	COA	10-d	Not toxic (9.6%/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
7.8 +/- 4.11	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
7.98 +/- 3.4	Freeport Harbor, TX	COA	10-d	Not significantly toxic (7.5%/-5% mortality)	Sheepshead minnow	ADT	NE		EHA 1985b
8.74 +/- 7.2	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (4.7%/-4.29% mortality)	Amphipod	ADT	NE	0.137+/-0.056	Crocker et al. 1991
9.47 +/- 4.03	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.8%/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	0.144+/-0.123	Crocker et al. 1991
9.47 +/- 4.03	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8%/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
9.47 +/- 4.03	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
9.5 +/- 3.2	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
10 +/- 2.28	Pensacola, FL	COA	10-d	Not significantly toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Lee & Mariani 1977
10 +/- 2.28	Pensacola, FL	COA	10-d	Not significantly toxic (5%/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	2.5+/-2.83	Parrish 1988a
10 +/- 2.28	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	2.5+/-2.83	Parrish 1988a
10 +/- 2.6	Massachusetts Bay, MA	COA	10-d	Not significantly toxic (936+/-9.4/sq.m.)	Arenicola cristata (lugworm)	ADT	NE	2.5+/-2.83	Parrish 1988a
11 +/- 2.83	Houston Ship Channel, TX	COA	10-d	High species richness (22.7%/-0.778% mortality)	Benthic macrofauna	ADT	SG	0.248+/-0.132	Crocker et al. 1991
12.3 +/- 3.0	Commencement Bay, WA	COA	10-d	Least toxic (15.1%/-3.1% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
14.6 +/- 4.75	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7%/-11.4% mortality)	Nereis virens (polychaete)	ADT	NE		Parrish 1987a
14.6 +/- 4.75	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3%/-2.31% mortality)	Crossostrea virginica (oyster)	ADT	NE		Parrish 1987a
14.6 +/- 4.75	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14%/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987a
15.7 +/- 7.3	Commencement Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
16 +/- 0.3	Galveston Harbor, TX	COA	10-d	Not toxic (2.4%/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
16 +/- 0.3	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
16 +/- 0.3	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984
16.4 +/- 16.0	Warragansett Bay, RI	COA	10-d	Not significantly toxic (5.28%/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Munns et al. 1991
16.8	Southern California	COA	96-h	High abundance (148+/-58/0.1 sq.m.)	Arthropods	NE	NE		Long & Morgan 1990
17.5	Duhamish River, WA	COA	96-h	High abundance (191.3+/-70.1/0.1 sq.m.)	Echinoderm	NE	NE		Long & Morgan 1990
17.7 +/- 7.6	Commencement Bay, WA	COA	10-d	Not toxic (0-10% mortality)	Palaeomonetes pugio (shrimp)	ADT	NE		Lee & Mariani 1977
18	Southern California	COA	10-d	Moderately toxic (23%/-2.3% abnormality)	Oyster	SG	SG		Tetra Tech 1985
19.6 +/- 12.8	Commencement Bay, WA	COA	10-d	Moderately toxic (72.6+/-6.8/0.1 sq.m.)	Arthropods	SG	SG		Long & Morgan 1990
19.7 +/- 15.1	Southern California	COA	10-d	Moderately toxic (26%/-5.2% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Tetra Tech 1985
19.8 +/- 1.65	Gulport, MS	COA	10-d	Not significantly toxic (23.2% mortality)	Grandiderella japonica (amphipod)	JUV	NE		Anderson et al. 1988
19.8 +/- 1.65	Gulport, MS	COA	10-d	Not significantly toxic (18%/-2% mortality)	Crossostrea virginica (oyster)	ADT	NE	6.73+/-2.04	Parrish 1987b
19.8 +/- 1.65	Gulport, MS	COA	10-d	Not significantly toxic (22%/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	NE	6.73+/-2.04	Parrish 1987b
19.8 +/- 1.65	Gulport, MS	COA	10-d	Not significantly toxic (3.3%/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	6.73+/-2.04	Parrish 1987b

Table 7. A summary of the available data on the biological effects associated with sediment-sorbed nickel (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
20.2	Southern California	COA		Low abundance (6.1+/7.2/0.1 sq.m.)	Echinoderm		SG		Long & Morgan 1990
20.5	Southern California	COA		Moderate abundance (36.2+/23/0.1 sq.m.)	Echinoderm		SG		Long & Morgan 1990
20.9 +/- 11.1	Massachusetts Bay, MA	COA		Moderate species richness (58.1+/10.4)	Benthic species		*		Gilbert et al. 1976
24.2 +/- 22.1	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	SG		Anderson et al. 1988
22.6	Southern California	COA		Low abundance (35.3+/15.8/0.1 sq.m.)	Arthropods		SG		Long & Morgan 1990
24.3 +/- 10.7	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	NE	0.24+/-0.18	Nicol & Doe 1990
24.3 +/- 10.7	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24+/-0.18	Nicol & Doe 1990
25.3 +/- 6.51	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	0.24+/-0.18	Nicol & Doe 1990
24.3 +/- 10.7	Black Rock Beach, NS	COA	10-d	Not toxic (6+/2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
25.3 +/- 6.51	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/2.17% mortality)	Keratis virens (sandworm)	ADT	NE		EHA 1983b
25.3 +/- 6.51	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE	5.2+/-2.6	Parrish 1988b
25.8 +/- 14.5	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	5.2+/-2.6	Parrish 1988b
25.8 +/- 14.5	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/6% mortality)	Arenicola cristata (lugworm)	ADT	NE	5.2+/-2.6	Parrish 1988b
25.8 +/- 14.5	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	NE	1.5+/-0.84	CH2M Hill 1989
26.2 +/- 7.19	Eagle Harbour, WA	COA	10-d	Least toxic (0.1+/0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Bellar et al. 1986
28	Puget Sound, WA	AETA		PSDA Screening level concentration	Microtox		NE		U.S. ACE 1988
29.7 +/- 21.7	Puget Sound, WA	AETA		Highly toxic (44.5+/19% abnormality)	Aquatic biota		NE		Tetra Tech 1985
30.5	Commencement Bay, WA	COA		Highly toxic (44.5+/19% abnormality)	Oyster		*		Lee & Martini 1977
32.7 +/- 12.3	Los Angeles, CA	COA	96-h	Low species richness (31+/6.5)	Palaeomonetes pugio (shrimp)		*		Gilbert et al. 1976
34.2 +/- 5.13	Massachusetts Bay, MA	COA		Sediments populated by feral clams	Benthic species		NE	0.45	McGreer 1982
35.1 +/- 5.37	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/3.02% emergence)	Macoma balthica (bivalve)		NE	2.66+/-2.15	McLeay et al. 1991
35.5 +/- 5.69	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/3.61% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
35.7 +/- 5.69	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/2.84% reburial)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
36.7 +/- 5.47	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
37.7 +/- 7.51	Palos Verdes, CA	COA	10-d	Not toxic (7.9+/5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
37.7 +/- 7.51	Palos Verdes, CA	COA	10-d	High species density (20.9+/0.23/0.1 sq.m.)	Amphipod		NE	1.7+/-0.61	Swartz et al. 1986
37.8 +/- 9.1	Stanford, CT	COA	96-h	High species density (11.2+/1.64/0.1 sq.m.)	Phoxocephalid amphipod		NE	1.7+/-0.61	Swartz et al. 1986
39	Puget Sound, WA	AETA		Not toxic (10% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Martini 1977
40.7 +/- 32.2	Commencement Bay, WA	COA	10-d	1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
42	Palos Verdes, CA	COA	10-d	Highly toxic (78.5+/19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
42.2 +/- 17.6	Howe Sound, BC	COA	10-d	High species density (95.4/0.1 sq.m)	Echinoderm		NE	1.3+/-0.77	McLeay et al. 1986
42.2 +/- 17.6	Howe Sound, BC	COA	10-d	Not toxic (10.5+/4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
42.2 +/- 17.6	Howe Sound, BC	COA	10-d	Not toxic (5.83+/5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4+/-4.39	McLeay et al. 1991
42.4	Burrard Inlet, BC	COA	10-d	Not toxic (96.3+/4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	SG	3.5	McLeay et al. 1991
42.4	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	SG	3.5	McLeay et al. 1991
43.1 +/- 4.8	Howe Sound, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	SG	3.5	McLeay et al. 1991
43.5 +/- 24.7	Palos Verdes, CA	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Martini 1977
44.4 +/- 3.4	Fraser River Estuary, BC	COA	10-d	Not significantly toxic (90.5+/9.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.7+/-0.71	Swartz et al. 1986
45	Burrard Inlet, BC	SQA		Sediment Quality Objectives	Macoma balthica (bivalve)		SG	1.95	McGreer 1982
48 +/- 9.73	Pasagoula, MS	COA	10-d	Not significantly toxic (5.6+/2.2% mortality)	Aquatic biota		NG		Swain & Nijman 1991
48 +/- 9.73	Pasagoula, MS	COA	10-d	Not significantly toxic (6.5+/5.14% mortality)	Arenicola cristata (lugworm)	ADT	NE		Parrish 1987c
48 +/- 9.73	Pasagoula, MS	COA	10-d	Not significantly toxic (0.7+/0.82% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		Parrish 1987c
49	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Crossostrea virginica (oyster)		NE		Parrish 1987c
49.3 +/- 20.2	Palos Verdes, CA	COA		High species density (56.5+/9.91/0.1 sq.m.)	Various		*		Bellar et al. 1986
49.3 +/- 20.2	Palos Verdes, CA	COA		High species density (34.3+/5.67/0.1 sq.m.)	Amphipod		NE	2.1+/-1.15	Swartz et al. 1986
49.3 +/- 20.2	Palos Verdes, CA	COA		Not toxic (34.3+/56.17/sq.m. density)	Phoxocephalid amphipod		NE	2.1+/-1.15	Swartz et al. 1985a
49.3 +/- 20.2	Palos Verdes, CA	COA		Not toxic (1110+/320/sq.m. density)	Crustacea		NE	2.1+/-1.15	Swartz et al. 1985a
51.6	Black Rock Harbour, CT	COA	14-d	Significantly toxic (100% mortality)	Keratis virens (sandworm)		*		Simers et al. 1984
53.7 +/- 18.6	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42+/-0.88	Swartz et al. 1986
56 +/- 19.8	Palos Verdes, CA	COA	10-d	Low species density (0.2+/0.14/0.1 sq.m.)	Echinoderm		SG	2.64+/-0.77	Swartz et al. 1986

Table 7. A summary of the available data on the biological effects associated with sediment-sorbed nickel (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
58.3 +/- 24.3	Palos Verdes, CA	COA		Not toxic (5940 +/- 6880 /sq.m. density)	Mollusca		NE	2.53 +/- 1.27	Swartz et al. 1985a
58.3 +/- 24.3	Palos Verdes, CA	COA		Not significantly toxic (18 +/- 5.7% mortality)	Rhepomyxus abronius (amphipod)		NE	2.53 +/- 1.27	Swartz et al. 1985a
61	Palos Verdes, CA	COA		High species density (136/0.1 sq.m.)	Echinoderm		NE	0.9	Becker et al. 1986
61	Southern California	AET		AET Values	Benthic species		*		Swartz et al. 1990
61	Palos Verdes, CA	COA		Not toxic (44 /sq.m. density)	Echinoderm		NE	0.9	Swartz et al. 1985a
61	Palos Verdes, CA	COA		Not toxic (88 /sq.m. density)	Foraminifera (sponge)		NE	0.9	Swartz et al. 1985a
61	Palos Verdes, CA	COA		Not toxic (132 /sq.m. density)	Ophiuroidea (brittle star)		NE	0.9	Swartz et al. 1985a
61	Palos Verdes, CA	COA		Not toxic (2170 /sq.m. density)	Polychaeta		NE	3.2	Swartz et al. 1985a
69.7 +/- 6.51	Palos Verdes, CA	COA		Low species density (5.3 +/- 3.7/0.1 sq.m.)	Total amphipod		SG	3.13 +/- 0.15	Swartz et al. 1985a
69.7 +/- 6.51	Palos Verdes, CA	COA		Low species density (0.13 +/- 0.23/0.1 sq.m.)	Phoxocephalid amphipod		SG	3.13 +/- 0.15	Swartz et al. 1985a
69.7 +/- 13.7	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2 +/- 31.1)	Fundulus heteroclitus (mummichog)		NE		Swartz et al. 1979
69.7 +/- 13.7	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 24 +/- 5.6)	Leostomus xanthurus (spot)		NE		Swartz et al. 1979
73.2 +/- 30.2	Palos Verdes, CA	COA		Low species density (0.08 +/- 0.11/0.1 sq.m.)	Echinoderm		SG	3.4 +/- 0.75	Swartz et al. 1985a
73.8 +/- 27.8	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Echinoderm		SG	3.53 +/- 0.742	Swartz et al. 1985a
75.8 +/- 27.8	Palos Verdes, CA	COA		Highly toxic (2.3 +/- 5.7 /sq.m. density)	Foraminifera (sponge)		SG	3.53 +/- 0.742	Swartz et al. 1985a
75.8 +/- 27.8	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Ophiuroidea (brittle star)		SG	3.53 +/- 0.742	Swartz et al. 1985a
75.8 +/- 27.8	Palos Verdes, CA	COA		Highly toxic (3650 +/- 1780 /sq.m. density)	Polychaeta		SG	3.15 +/- 1.32	Swartz et al. 1985a
77.5 +/- 42.2	Palos Verdes, CA	COA		Least toxic (23.3 +/- 7.3% abnormal)	Bivalve		NE		Long & Morgan 1990
78.6 +/- 5.64	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
78.7 +/- 8.33	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.6% abnormal)	Mussel	LAR	NE	1.26 +/- 0.17	Chapman et al. 1987
78.8 +/- 5.74	San Francisco Bay, CA	COA	48-h	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.09	Chapman et al. 1987
80.5 +/- 6.36	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.03	Chapman et al. 1987
80.5 +/- 5.88	San Francisco Bay, CA	COA	4-wk	Least toxic (18 +/- 8.0% abnormal)	Mussel	LAR	NE	1.24 +/- 0.38	Chapman et al. 1987
81.7 +/- 7.97	San Francisco Bay, CA	COA	10-d	Least toxic (15.6 +/- 7.6% mortality)	Amphipod	ADT	NE	1.44 +/- 0.79	Chapman et al. 1987
82.5 +/- 7.71	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.74	Chapman et al. 1987
83	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
89.7 +/- 5.69	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.5% mortality)	Amphipod	ADT	SG	2.01 +/- 0.98	Chapman et al. 1987
92 +/- 6.22	Palos Verdes, CA	COA		Highly toxic (10 +/- 12 /sq.m. density)	Phoxocephalid amphipod		SG	3.95 +/- 0.238	Swartz et al. 1985a
92 +/- 6.22	Palos Verdes, CA	COA		Highly toxic (87 +/- 60.1 /sq.m. density)	Crustacea		SG	3.95 +/- 0.238	Swartz et al. 1985a
92 +/- 6.22	Palos Verdes, CA	COA		Highly toxic (92.3 +/- 5.5% mortality)	Mussel		SG	2.87 +/- 1.32	Chapman et al. 1987
92.7 +/- 4.16	San Francisco Bay, CA	COA	48-h	Moderately toxic (94.9 +/- 10.1 young produced)	Tigriopus californicus (copepod)	LAR	SG	2.87 +/- 1.07	Long & Morgan 1990
92.7 +/- 4.16	San Francisco Bay, CA	COA	4-wk	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	ADT	SG	3.87 +/- 0.21	Swartz et al. 1986
92.8 +/- 3.4	Palos Verdes, CA	COA	48-h	Low species density (1.33 +/- 1.22/0.1 sq.m.)	Amphipod		SG	3.87 +/- 0.21	Swartz et al. 1986
93 +/- 7.21	Palos Verdes, CA	COA		Low species density (0.0/-1.1 sq.m.)	Phoxocephalid amphipod		SG	4.03	Chapman et al. 1987
94	Palos Verdes, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	SG	4.03	Chapman et al. 1987
94	Palos Verdes, CA	COA	10-d	Highly toxic (37% avoidance)	Mollusca		SG	4 +/- 0.265	Swartz et al. 1985a
94.3 +/- 5.03	Palos Verdes, CA	COA		Significantly toxic (21 +/- 6.3% mortality)	Rhepomyxus abronius (amphipod)		SG	4 +/- 0.265	Swartz et al. 1985a
94.3 +/- 5.03	Palos Verdes, CA	COA		Significantly toxic (20.2 sp./0.1m sq.)	Macro benthos		SG		Chapman et al. 1985a
95	Palos Verdes, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	SG	3.59	Chapman et al. 1987
97 +/- 2.83	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5 +/- 2.1% mortality)	Rhepomyxus abronius (amphipod)	ADT	SG	3.94 +/- 0.28	Swartz et al. 1986
97.4 +/- 33.3	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.1 +/- 3.3)	Fundulus heteroclitus (mummichog)		*		Swartz et al. 1979
97.4 +/- 33.3	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.9 +/- 3.4)	Leostomus xanthurus (spot)		*		Swartz et al. 1979
99	Southern California	AET		AET Values	Rhepomyxus abronius (amphipod)		*		Becker et al. 1990
99.3 +/- 34.5	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepomyxus abronius (amphipod)	ADT	SG		Long & Morgan 1990
99.6 +/- 35.2	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Rhepomyxus abronius (amphipod)	LAR	NG		Long & Morgan 1990
102 +/- 44.3	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 +/- 15.3% abnormal)	Bivalve	LAR	NG		Long & Morgan 1990
105 +/- 35.8	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepomyxus abronius (amphipod)		NG		Long & Morgan 1990
108 +/- 26.9	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepomyxus abronius (amphipod)		NE		Long & Morgan 1990
108 +/- 25.1	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6% mortality)	Rhepomyxus abronius (amphipod)		NE		Long & Morgan 1990
112 +/- 30.9	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	NC		Long & Morgan 1990
113 +/- 42.3	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepomyxus abronius (amphipod)		SG		Long & Morgan 1990

Table 7. A summary of the available data on the biological effects associated with sediment-sorbed nickel (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
120	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
>120	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		-		Bellar et al. 1986
>140	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		-		P11 1988
>140	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		-		P11 1988
170	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
170	San Francisco Bay, CA	AETA		San Francisco Bay AET	Dyster; mussel	LAR	*		Long & Morgan 1990
>170	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>170	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>170	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	q		Becker et al. 1990
>170	Northern California	AETA		AET Values	Benthic species		-		Becker et al. 1990
>170	Northern California	AETA		AET Values	Benthic species		-		Becker et al. 1990

Table 8. A summary of the available data on the biological effects associated with sediment-sorbed silver (ppm) used to support the derivation of sediment quality guidelines. SILVER

Concentration ($\pm$ SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.2 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Highly toxic (78.5%/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
0.26 $\pm$ 0.1	Puget Sound, WA	COA	10-d	Not toxic ($\leq$ 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 $\pm$ 2.0	DeWitt et al. 1988
0.3 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Highly toxic (44.5%/-19% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
0.3 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Least toxic (15.1 $\pm$ 3.1% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
0.3 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Moderately toxic (23%/-2.3% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
0.3 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Moderately toxic (26%/-5.2% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
0.3 $\pm$ 0.1	Commencement Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	High species richness (14.9 $\pm$ 2.04) SRUs	Benthic species	ADT	NE		Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05 $\pm$ 1.33) SRUs	Benthic species	ADT	NE		Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SRUs	Benthic species	ADT	NE		Winn et al. 1989
0.5	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3 $\pm$ 1.51 mortality)	Mercenaria mercenaria (quahog)	ADT	NE		Vittor & Assoc 1988
0.5	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7 $\pm$ 3.02% mortality)	Nereis virens (sandworm)	ADT	NE		Vittor & Assoc 1988
0.5	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7 $\pm$ 2.31 mortality)	Pennaeus aztecus (brown shrimp)	ADT	NE		Vittor & Assoc 1988
0.5	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7 $\pm$ 15% mortality)	Pennaeus aztecus (brown shrimp)	ADT	NE		Vittor & Assoc 1988
0.5	Charleston Harbor, SC	COA	10-d	High species diversity (4.15 $\pm$ 0.59) SDUs	Benthic species	ADT	NE		Winn et al. 1989
0.5	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3 $\pm$ 0.2) SDUs	Benthic species	ADT	NE		Winn et al. 1989
0.5 $\pm$ 0.4	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 $\pm$ 7.3% abnormal)	Bivalve	LAR	NE		Winn et al. 1989
0.55 $\pm$ 0.99	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Rhepoxynius abronius (amphipod)	ADT	NE	5.2 $\pm$ 4.4	DeWitt et al. 1988
>0.56	Puget Sound, WA	AEIA	10-d	1986 Puget Sound Microtox AET	Microtox	LAR	-		Bellar et al. 1986
>0.56	Puget Sound, WA	AEIA	10-d	1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	-		PTI 1988
>0.56	Puget Sound, WA	AEIA	10-d	1988 Puget Sound AET	Benthic species	LAR	-		PTI 1988
0.6 $\pm$ 0.087	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (15%/-13.2% mortality)	Crassostrea gigas (oyster)	ADT	NE	0.05 $\pm$ 0.0242	Crocker et al. 1991
0.6 $\pm$ 0.8	Southern California	COA	10-d	High abundance (191.3 $\pm$ 70.1/0.1 sq.m.)	Sheepshead minnow	ADT	NE		Long & Morgan 1990
0.6 $\pm$ 0.7	Southern California	COA	10-d	Moderate abundance (36.2 $\pm$ 23/0.1 sq.m.)	Echinoderm	ADT	NE		Long & Morgan 1990
0.6 $\pm$ 0.5	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 $\pm$ 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
0.7 $\pm$ 0.8	Southern California	COA	10-d	Moderate species richness (72 $\pm$ 3.3/0.1 sq.m.)	Benthic species	LAR	NE		Long & Morgan 1990
0.7 $\pm$ 1.0	Southern California	COA	10-d	Moderate abundance (72.6 $\pm$ 6.8/0.1 sq.m.)	Arthropods	LAR	NE		Long & Morgan 1990
0.8	San Diego Bay, CA	COA	96-h	Not significantly toxic (6% mortality)	Citharichthys stigmaeus (sanddab)	ADT	NE		Salazar & Salazar 1985
0.8 $\pm$ 0.6	Fraser River Estuary, BC	COA	10-d	Sediments populated by feral clams	Macoma balthica (bivalve)	ADT	NE	0.45	McGreer 1982
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)	ADT	NE		Salazar & Salazar 1985
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polychaete)	ADT	NE		Salazar & Salazar 1985
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)	ADT	NE		Salazar & Salazar 1985
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)	ADT	NE		Salazar & Salazar 1985
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (0% mortality)	Arctia tonsa (copepod)	ADT	NE		Salazar & Salazar 1985
0.8	San Diego Bay, CA	COA	10-d	Not significantly toxic (18% mortality)	Amphipod	ADT	NE		Salazar & Salazar 1985
0.871 $\pm$ 0.912	Harragansett Bay, RI	COA	10-d	Not significantly toxic (5.28 $\pm$ 3.04% mortality)	Amphipod	ADT	NE	0.129 $\pm$ 0.054	Mums et al. 1991
0.9 $\pm$ 0.391	Houston Ship Channel, TX	COA	10-d	High species richness (96.3 $\pm$ 22.3/0.1 sq.m.)	Benthic species	ADT	NE		Crocker et al. 1991
0.9 $\pm$ 2.1	Southern California	COA	10-d	High abundance (148 $\pm$ 58/0.1 sq.m.)	Arthropods	ADT	NE		Long & Morgan 1990
0.9 $\pm$ 1.6	Southern California	COA	10-d	High species richness (96.3 $\pm$ 22.3/0.1 sq.m.)	Arthropods	ADT	NE		Long & Morgan 1990
0.9 $\pm$ 0.9	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 $\pm$ 4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.144 $\pm$ 0.123	Crocker et al. 1991
0.922 $\pm$ 0.404	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (6.7 $\pm$ 4.29% mortality)	Amphipod	ADT	NE	0.248 $\pm$ 0.132	Crocker et al. 1991
0.925 $\pm$ 0.389	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7 $\pm$ 0.778% mortality)	Amphipod	ADT	NE	3.4 $\pm$ 4.39	McLeay et al. 1991
1	Howe Sound, BC	COA	10-d	Not toxic (10.5 $\pm$ 4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 $\pm$ 4.39	McLeay et al. 1991
1	Howe Sound, BC	COA	10-d	Not toxic (5.83 $\pm$ 5.48% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 $\pm$ 4.39	McLeay et al. 1991
1	Strait of Georgia, BC	COA	24-h	Not toxic (96.3 $\pm$ 4.19% rebound)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 $\pm$ 4.39	McGreer 1979
1 $\pm$ 2.0	Southern California	COA	48-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)	LAR	NE	3.09	Long & Morgan 1990
1 $\pm$ 0.6	San Francisco Bay, CA	COA	48-h	Moderate species abundance (75.6 $\pm$ 12.7/0.1 sq.m.)	Benthic species	LAR	NE		Long & Morgan 1990
1 $\pm$ 0.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 $\pm$ 11.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990

Table 8. A summary of the available data on the biological effects associated with sediment-sorbed silver (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1.06 +/- 0.411	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5 +/- 5% mortality)	Sheepshead minnow	ADT	NE	0.137 +/- 0.056	Crocker et al. 1991
1.1	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
1.1	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster: mussel	LAR	*		Long & Morgan 1990
1.13 +/- 1.94	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
1.2 +/- 1.7	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	NE	NC		Long & Morgan 1990
1.2	Puget Sound, WA	AETA		PSODA Screening level concentration	Aquatic biota	NE	NE		U.S. ACE 1988
1.23 +/- 0.495	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NC	1.03	Chapman et al. 1987
1.28 +/- 1.42	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	SG		Anderson et al. 1988
1.3 +/- 1.8	Southern California	COA		Low species abundance (57.6 +/- 13.6/0.1 sq.m.)	Benthic species	NC	NC		Long & Morgan 1990
1.3 +/- 1.8	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
1.4 +/- 1.85	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5 +/- 0.84	Long & Morgan 1990
1.63 +/- 0.52	Eagle Harbour, VA	COA	10-d	Least toxic (0.1 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)	LAR	*		CH2M Hill 1989
1.7 +/- 2.2	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
1.7 +/- 2.6	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NC		Long & Morgan 1990
1.72 +/- 0.554	San Francisco Bay, CA	COA	10-d	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	SG	1.14 +/- 0.33	Chapman et al. 1987
1.8 +/- 0.55	San Francisco Bay, CA	COA	48-h	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.09	Chapman et al. 1987
1.96 +/- 1.03	San Francisco Bay, CA	COA	4-wk	Least toxic (18 +/- 8.01% abnormal)	Mussel	LAR	NE	1.2 +/- 0.38	Chapman et al. 1987
2.1 +/- 1.3	Fraser River Estuary, BC	COA	48-h	Sediments devoid of feral clams	Macoma balthica (bivalve)	LAR	*	1.95	McGreer 1992
2.2 +/- 3.9	Southern California	COA		Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods	LAR	*		Long & Morgan 1990
2.3	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
2.4	Northern California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
2.5 +/- 4.1	Southern California	COA		Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species	LAR	*		Long & Morgan 1990
2.6	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)	LAR	*	1.13	McGreer 1979
2.61 +/- 2.69	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.76% mortality)	Amphipod	ADT	NE	1.4 +/- 0.79	Chapman et al. 1987
2.7 +/- 1.18	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.61% abnormal)	Mussel	LAR	SG	1.26 +/- 0.17	Chapman et al. 1987
2.79 +/- 2.54	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.74	Long & Morgan 1990
3.1 +/- 4.5	Southern California	COA		Low abundance (6.1 +/- 7.2/0.1 sq.m.)	Echinoderm	NE	NE		Long & Morgan 1990
3.2 +/- 5.6	Southern California	COA		High species abundance (88.9 +/- 35.4/0.1 sq.m.)	Benthic species	NE	NE		Becker et al. 1990
3.7	California	AETA		AET Values	Benthic species	NE	*		Becker et al. 1990
3.7	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	SG	2.01 +/- 0.98	Chapman et al. 1987
4.73 +/- 3.56	Puget Sound, WA	COA	10-d	1986 Puget Sound Amphipod AET	Amphipod	ADT	*		Becker et al. 1986
5.2	Puget Sound, WA	COA		Moderately toxic (28.3 +/- 7.51% mortality)	Aquatic biota	ADT	*		U.S. ACE 1988
5.2	Puget Sound, WA	AETA		PSODA Maximum level criteria	Various	*	*	1	WDE 1989
6.1	Puget Sound, WA	COA		1986 Puget Sound Benthic Community AET	Benthic community	*	*		PTI 1988
>6.1	Puget Sound, WA	SDG		Chemical Criteria	Benthic community	*	*		PTI 1988
6.1	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	LAR	*	2.87 +/- 1.32	Chapman et al. 1987
6.9 +/- 2.52	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3 +/- 5.5% mortality)	Tigriopus californicus (copepod)	ADT	*	2.87 +/- 1.07	Chapman et al. 1987
6.9 +/- 2.52	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	Bivalve	LAR	*		Long & Morgan 1990
6.9 +/- 2.5	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Amphipod	ADT	*	4.03	Chapman et al. 1987
8.1	San Francisco Bay, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
8.1	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Mussel	LAR	*	3.59	Chapman et al. 1987
8.35	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>8.6	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
11	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>11	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990

Table 9. A summary of the available data on the biological effects associated with sediment-sorbed tributyl tin (ppm) used to support the derivation of sediment quality guidelines.

TRIBUTYL TIN

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point	Measured	Species	Life Stage	Hit	TOC (%)	AVS (umol/g)	Reference
0.006 +/- 0.001	Yaquina Bay, OR	COA	10-d	Not significantly toxic	(2.4 +/- 1.14 mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.006 +/- 0.001	Yaquina Bay, OR	COA	10-d	Not significantly toxic	(7 +/- 2.83% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.006 +/- 0.001	Yaquina Bay, OR	COA	10-d	Not significantly toxic	(0.8 +/- 1.1% mortality)	Neanthes (polychaete worm)	JUV	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.006 +/- 0.001	Yaquina Bay, OR	COA	20-d	Not significantly toxic	(0.8 +/- 1.79% mortality)	Neanthes (polychaete worm)	JUV	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.006 +/- 0.001	Yaquina Bay, OR	COA	20-d	Not significantly toxic	(13.8 +/- 1.56% biomass)	Neanthes (polychaete worm)	JUV	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.006 +/- 0.001	Yaquina Bay, OR	COA	20-d	Not significantly toxic	(68 +/- 6.32% biomass)	Neanthes (polychaete worm)	JUV	NE	3.04 +/- 1.1	8.83 +/- 2.53	Britton 1991
0.05 +/- 0.03	Narragansett Bay, RI	COA	20-d	Not significantly toxic	(5.28 +/- 3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE	3.04 +/- 1.1	8.83 +/- 2.53	Munns et al. 1991
0.78	San Diego Bay, CA	COA	96-h	Not significantly toxic	(4% mortality)	Citharichthys stigmatus (sanddab)	NE	NE			Salazar & Salazar 1985
0.78	San Diego Bay, CA	COA	10-d	Not significantly toxic	(14% mortality)	Acanthomysis sculpita (mysid)	NE	NE			Salazar & Salazar 1985
0.78	San Diego Bay, CA	COA	20-d	Not significantly toxic	(13% mortality)	Neanthes arenacodentata (polychaete)	NE	NE			Salazar & Salazar 1985
0.78	San Diego Bay, CA	COA	20-d	Not significantly toxic	(1% mortality)	Macoma nasuta (clam)	NE	NE			Salazar & Salazar 1985
0.78	San Diego Bay, CA	COA	96-h	Not significantly toxic	(0% mortality)	Acanthomysis sculpita (mysid)	NE	NE			Salazar & Salazar 1985
0.78	San Diego Bay, CA	COA	96-h	Not significantly toxic	(18% mortality)	Acartia tonsa (copepod)	NE	NE			Salazar & Salazar 1985
1	Santa Rosa Sound, FL	SSBA	96-h ST	Not toxic	(0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			Clark et al. 1987
1	Santa Rosa Sound, FL	SSBA	10-d ST	Not toxic	(0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			Clark et al. 1987
<13	Santa Rosa Sound, FL	SSBA	10-d FT	Not toxic	(0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			Clark et al. 1987
10	Santa Rosa Sound, FL	SSBA	96-h ST	Highly toxic	(100% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*			Clark et al. 1987
10	Santa Rosa Sound, FL	SSBA	96-h FT	Not toxic	(0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE			Clark et al. 1987
31	Santa Rosa Sound, FL	SSBA	10-d FT	LC50		Palaeomonetes pugio (grass shrimp)	ADT	*			Clark et al. 1987
100	Santa Rosa Sound, FL	SSBA	96-h FT	Highly toxic	(100% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*			Clark et al. 1987
100	Santa Rosa Sound, FL	SSBA	10-d FT	Highly toxic	(100% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*			Clark et al. 1987

Table 10. A summary of the available data on the biological effects associated with sediment-sorbed zinc (ppm) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
3.56 +/- 2.69	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2 +/- 2.77 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
3.56 +/- 2.69	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6 +/- 5.18 mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
3.56 +/- 2.69	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2 +/- 0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
3.98 +/- 2.53	Charleston Harbor, SC	COA	10-d	High species richness (14.9 +/- 2.04) SRUs	Benthic species	ADT	NE		Minn et al. 1989
5.8	Charleston Harbor, SC	COA	10-d	Low species diversity (1.16) SDUs	Benthic species	ADT	NE		Minn et al. 1989
5.83 +/- 2.57	Charleston Harbor, SC	COA	10-d	High species diversity (4.15 +/- 0.59) SDUs	Benthic species	ADT	NE		Minn et al. 1989
7.11 +/- 3.11	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SRUs	Benthic species	ADT	NE		Minn et al. 1989
8.72 +/- 4.32	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species	ADT	NE		Minn et al. 1989
11.1	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3 +/- 0.2) SDUs	Benthic species	ADT	NE		Minn et al. 1989
26.7 +/- 15.5	Georgetown, SC	COA	10-d	Not toxic (species richness or abundance)	Benthic species	ADT	NE		Minn et al. 1989
29.7 +/- 8.08	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (15 +/- 13.2% mortality)	Sheepshead minnow	ADT	NE	0.12	Van Dolah et al. 1984
29.7 +/- 8.08	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8 +/- 2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	0.05 +/- 0.024	Crocker et al. 1991
29.7 +/- 8.08	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8 +/- 4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
29.7 +/- 8.08	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2 +/- 0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
30.2 +/- 1.68	Freeport Harbor, TX	COA	10-d	Not toxic (2 +/- 1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
30.2 +/- 1.68	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
31.7 +/- 6.6	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
35.6 +/- 18.5	Massachusetts Bay, MA	COA	10-d	High species richness (936 +/- 9.4/sq.m.)	Benthic macrofauna	ADT	NE		Gilbert et al. 1976
35.6 +/- 18.5	Black Rock Beach, MS	COA	10-d	Not toxic (6.67 +/- 4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
35.6 +/- 18.5	Black Rock Beach, MS	COA	10-d	Not toxic (2.33 +/- 1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
35.6 +/- 18.5	Black Rock Beach, MS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	NE	0.24 +/- 0.18	Nicol & Doe 1990
40	Halifax Harbor, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
41.2 +/- 40.3	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
41.2 +/- 40.3	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9 +/- 1.73% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		ES&G Bionomics 1980
41.2 +/- 40.3	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13 +/- 3.61% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		ES&G Bionomics 1980
49.9 +/- 12.8	Southern California	COA	10-d	Not significantly toxic (11.3 +/- 3.21% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		ES&G Bionomics 1980
50.1 +/- 22.2	Southern California	COA	10-d	High abundance (191.3 +/- 70.1/0.1 sq.m.)	Crassostrea virginica (coyster)	ADT	NE		Long & Morgan 1990
50.7 +/- 23.5	Southern California	COA	10-d	Moderate species richness (72 +/- 3.3/0.1 sq.m.)	Echinoderm	ADT	NE		Long & Morgan 1990
51	Southern California	SSBA	72-h	High abundance (148 +/- 58/0.1 sq.m.)	Benthic species	ADT	NE		Oakden et al. 1984a
51.6 +/- 27.7	Southern California	COA	10-d	Significantly toxic (70% avoidance)	Rhepoxynius sp.	ADT	NE		Long & Morgan 1990
52	Sidney Tar Pond, NS	COA	10-d	Moderate abundance (72.6 +/- 6.8/0.1 sq.m.)	Arthropods	ADT	NE		Tay et al. 1990
53.1 +/- 27.5	Southern California	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Long & Morgan 1990
54.9 +/- 36.2	Southern California	COA	10-d	Moderate species abundance (75.6 +/- 12.7/0.1 sq.m.)	Benthic species	ADT	NE		Long & Morgan 1990
55.3 +/- 3.0	Newport, RI	COA	96-h	Moderate abundance (56.2 +/- 23/0.1 sq.m.)	Echinoderm	ADT	NE		Lee & Mariani 1977
62.2 +/- 33.8	Houston Ship Channel, TX	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)	ADT	NE	0.144 +/- 0.123	Crocker et al. 1991
65 +/- 19	Fraser River Estuary, BC	COA	10-d	Sediments populated by feral clams	Amphipod	ADT	NE	0.45	McGreer 1982
67.9 +/- 6.05	Galveston Harbor, TX	COA	10-d	Not toxic (2.4 +/- 1.52% mortality)	Macoma balthica (bivalve)	ADT	NE		Grifeco 1984
67.9 +/- 6.05	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grifeco 1984
67.9 +/- 6.05	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grifeco 1984
71.3 +/- 106	Southern California	COA	10-d	High species richness (96.3 +/- 22.3/0.1 sq.m.)	Benthic species	ADT	NE		Long & Morgan 1990
71.7 +/- 16.8	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6 +/- 2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
71.7 +/- 16.8	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6 +/- 2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
71.9 +/- 6.2	Dunsmuir River, WA	COA	10-d	Not toxic (0.10% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Lee & Mariani 1977
72 +/- 70.1	Bayou Casotte, MS	COA	10-d	Not toxic (0-10% mortality)	Palaeomonetes pugio (shrimp)	ADT	NE		Parrish 1988b
72 +/- 70.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3 +/- 3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	5.2 +/- 2.6	Parrish 1988b
72 +/- 70.1	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8 +/- 6% mortality)	Arenicola cristata (lugworm)	ADT	NE	5.2 +/- 2.6	Parrish 1988b
73.4 +/- 80.5	Southern California	COA	10-d	Low species abundance (57.6 +/- 13.6/0.1 sq.m.)	Crassostrea virginica (coyster)	ADT	NE		Long & Morgan 1990
76	Monterey Bay, CA	SSBA	72-h	LC08	Benthic species	ADT	NE		Oakden et al. 1984b
79	Monterey Bay, CA	SSBA	72-h	LC05	Eohaustorius senecillus (amphipod)	ADT	NE		Oakden et al. 1984b
79.8 +/- 15.8	Gulf of Mexico	COA	1-d	Not toxic (0.36 +/- 0.26% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	0.42 +/- 0.13	Chapman et al. 1991
80.1 +/- 52.4	Burrard Inlet, BC	COA	10-d	Not toxic (4.3 +/- 3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66 +/- 2.15	McLeay et al. 1990
83 +/- 60.8	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8 +/- 5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		McLeay et al. 1990
85.9 +/- 58.7	Burrard Inlet, BC	COA	10-d	Not toxic (5.21 +/- 3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al. 1991

Table 10. A summary of the available data on the biological effects associated with sediment-sorbed zinc (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
89.3 +/- 40.6	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE	1.5 +/- 0.84	Long & Morgan 1990
92.3 +/- 60.3	Eagle Harbor, WA	COA	10-d	Least toxic (0.1 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.9	CRMA Hill 1989
95	Palos Verdes, CA	COA		High species density (136/0.1 sq.m.)	Echinoderm		NE	0.9	Swartz et al. 1986
95	Palos Verdes, CA	COA		Not toxic (44 /sq.m. density)	Foraminifera (sponge)		NE	0.9	Swartz et al. 1985a
95	Palos Verdes, CA	COA		Not toxic (88 /sq.m. density)	Ophiuroidea (brittle star)		NE	0.9	Swartz et al. 1985a
98.1 +/- 64.4	Massachusetts Bay, MA	COA		Moderate species richness (58.1 +/- 10.4)	Benthic species		*		Gilbert et al. 1976
99.6 +/- 48.8	Howe Sound, BC	COA	10-d	Not toxic (10.5 +/- 4.0% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
99.6 +/- 48.8	Howe Sound, BC	COA	10-d	Not toxic (5.83 +/- 5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
99.6 +/- 48.8	Howe Sound, BC	COA	10-d	Not toxic (96.3 +/- 4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	3.4 +/- 4.39	McLeay et al. 1991
100 +/- 19.8	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NC	1.03	Chapman et al. 1987
105	Puget Sound, WA	SBA		EPA/AOCE Puget Sound Interim Criteria	Aquatic biota		NE		U.S. ACE 1988
106 +/- 26.3	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1 +/- 1.41% mortality)	Crossostrea virginica (oyster)	ADT	NE	7.31 +/- 3.86	Parrish et al. 1990
106 +/- 26.3	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4 +/- 2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	7.31 +/- 3.86	Parrish et al. 1990
106 +/- 26.3	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5 +/- 1.41% mortality)	Nereis virens (polychaete)	ADT	NE	7.31 +/- 3.86	Parrish et al. 1990
107	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
107 +/- 13.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (37.1 +/- 13.6% mortality)	Oyster	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
107 +/- 122	Comencement Bay, WA	COA	10-d	Least toxic (15.1 +/- 3.1% abnormality)	Rhepoxynius abronius (amphipod)		NE		Tetra Tech 1985
108 +/- 78.9	Comencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Macoma balthica (bivalve)		NE		McGreer 1979
109	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Tigriopus californicus (copepod)	ADT	NE	1.13	Chapman et al. 1987
110 +/- 8.52	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/- 4.3 young produced)	Crossostrea virginica (oyster)	ADT	NE	6.73 +/- 2.04	Parrish 1987b
112 +/- 73.8	San Francisco Bay, CA	COA	10-d	Not significantly toxic (8 +/- 2% mortality)	Arenicola cristata (lugworm)	ADT	NE	6.73 +/- 2.04	Parrish 1987b
112 +/- 73.8	Gulfport, MS	COA	10-d	Not significantly toxic (22 +/- 5.29% mortality)	Penaeus duorarum (pink shrimp)	LAR	NE	1.2 +/- 0.38	Chapman et al. 1987
114 +/- 21.7	Gulfport, MS	COA	48-h	Least toxic (18 +/- 8.01% abnormal)	Rhepoxynius abronius (amphipod)		NE		Deditt et al. 1988
116 +/- 52	Puget Sound, WA	COA	10-d	Not toxic (< 12.5% mortality)	Crossostrea virginica (oyster)	ADT	NE	3.4 +/- 2.0	Parrish 1988a
116 +/- 71.4	Pensacola, FL	COA	10-d	Not significantly toxic (8% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
116 +/- 71.4	Pensacola, FL	COA	10-d	Not significantly toxic (3 +/- 1.41% mortality)	Arenicola cristata (lugworm)	ADT	NE	2.5 +/- 2.83	Parrish 1988a
117 +/- 41.5	Massachusetts Bay, MA	COA	48-h	Low species richness (31 +/- 6.5)	Benthic species		SG		Gilbert et al. 1976
122 +/- 29.4	San Francisco Bay, CA	COA	10-d	Moderately toxic (25.1 +/- 6.61% abnormal)	Mussel		NE	1.26 +/- 0.17	Chapman et al. 1987
124 +/- 46.1	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.76% mortality)	Amphipod	LAR	NE	1.4 +/- 0.79	Chapman et al. 1987
126	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
126	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
128	Sidney Tar Pond, MS	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE		Chapman et al. 1987
128 +/- 44.2	San Francisco Bay, CA	COA	10-d	High species density (93.4/0.1 sq.m.)	Echinoderm		NE	1.44 +/- 0.74	Chapman et al. 1987
129	Palos Verdes, CA	COA	10-d	Not toxic (97.2 +/- 2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	1.3 +/- 0.77	Swartz et al. 1986
130 +/- 131	Burrard Inlet, BC	COA	10-d	San Francisco Bay AET	Corophium volutator (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
130 +/- 131	Burrard Inlet, BC	COA	10-d	High species density (11.2 +/- 1.64/0.1 sq.m.)	Corophium volutator (amphipod)	LAR	NE	2.8 +/- 1.96	McLeay et al. 1991
130	San Francisco Bay, CA	AETA		Significantly toxic (31.9 +/- 15.5% abnormal)	Oyster; mussel		NE		Long & Morgan 1990
136 +/- 32.5	Palos Verdes, CA	COA		Not toxic (7.9 +/- 5.12% mortality)	Phoxocephalid amphipod		NE	1.7 +/- 0.61	Swartz et al. 1986
136 +/- 32.5	Palos Verdes, CA	COA	48-h	Moderately toxic (33.8 +/- 4.7% mortality)	Bivalve	LAR	NE	1.7 +/- 0.61	Swartz et al. 1986
138 +/- 77.7	San Francisco Bay, CA	COA	7-d	Not toxic (7.9 +/- 5.12% mortality)	Sheepshead minnow	ADT	NE	0.137 +/- 0.056	Crocker et al. 1991
144 +/- 87	Houston Ship Channel, TX	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64 +/- 2.14	Long & Morgan 1990
144 +/- 161	Burrard Inlet, BC	COA	10-d	Not toxic (7.9 +/- 5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		McLeay et al. 1991
146 +/- 72.6	San Francisco Bay, CA	COA	10-d	AET Values	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
150	Northern California	AETA		Sediment Quality Objectives	Mytilus edulis (bivalve)		NE		Becker et al. 1990
150	Burrard Inlet, BC	SQA		Significantly toxic (55.7 +/- 22.7% abnormal)	Benthic species		SG		Swain & Nijman 1991
154 +/- 91	San Francisco Bay, CA	COA	48-h	PSDA Screening level concentration	Aquatic biota		SG		Long & Morgan 1990
158 +/- 86.6	San Francisco Bay, CA	COA	10-d	Sediments devoid of feral clams	Rhepoxynius abronius (amphipod)	ADT	NE		U.S. ACE 1988
160	Puget Sound, WA	AETA		Least toxic (18 +/- 6.6% mortality)	Amphipod		SG		Chapman et al. 1987
165 +/- 56.0	San Francisco Bay, CA	COA	10-d		Macoma balthica (bivalve)		NE	2.01 +/- 0.98	McGreer 1982
169 +/- 52.7	Fraser River Estuary, BC	COA			Rhepoxynius abronius (amphipod)		NE	1.95	Long & Morgan 1990
171 +/- 90.6	San Francisco Bay, CA	COA	10-d						

Table 10. A summary of the available data on the biological effects associated with sediment-sorbed zinc (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
172 +/-92.0	Straight of Georgia, BC	COA	24-h	Significantly toxic (59.4 +/- 11.3% abnormal)	<i>Macoma balthica</i> (bivalve)	LAR	*	3.09	McGreer 1979
174 +/-234	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	ADT	*		Long & Morgan 1990
175 +/-88.1	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4 +/- 3.6% mortality)	Amphipod	ADT	NE	0.129 +/- 0.054	Crocker et al. 1991
175 +/-88.1	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7 +/- 11.4% mortality)	<i>Nereis virens</i> (polychaete)	ADT	NE		Parrish 1987a
175 +/-88.1	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3 +/- 2.3% mortality)	<i>Crossostrea virginica</i> (oyster)	ADT	NE		Parrish 1987a
177 +/-96.1	San Francisco Bay, CA	COA	10-d	Not significantly toxic (14 +/- 9.1% mortality)	<i>Penaeus duorarum</i> (pink shrimp)	ADT	NE		Long & Morgan 1990
182 +/-334	Southern California	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	ADT	NE		Long & Morgan 1990
185 +/-335	Commencement Bay, WA	COA	10-d	Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods	*	*		Tetra Tech 1985
188 +/-132	Palos Verdes, CA	COA	10-d	Moderately toxic (23 +/- 2.3% abnormality)	Oyster	NE	NE	2.1 +/- 1.15	Swartz et al. 1986
188 +/-132	Palos Verdes, CA	COA	10-d	High species density (54.5 +/- 9.9/0.1 sq.m.)	Amphipod	NE	NE	2.1 +/- 1.53	Swartz et al. 1986
188 +/-480	Palos Verdes, CA	COA	10-d	High species density (34.3 +/- 5.6/0.1 sq.m.)	Phoxocephalid amphipod	ADT	NE		Munn et al. 1991
188 +/-132	Harragansett Bay, RI	COA	10-d	Not significantly toxic (3.28 +/- 3.04% mortality)	<i>Angelica abdita</i> (amphipod)	ADT	NE		Swartz et al. 1985a
188 +/-132	Palos Verdes, CA	COA	10-d	Not toxic (543 +/- 99.1/sq.m. density)	Amphipod	NE	NE	2.1 +/- 1.15	Swartz et al. 1985a
188 +/-132	Palos Verdes, CA	COA	10-d	Not toxic (343 +/- 56.7/sq.m. density)	Phoxocephalid amphipod	NE	NE	2.1 +/- 1.15	Swartz et al. 1985a
188 +/-132	Palos Verdes, CA	COA	10-d	Not toxic (1110 +/- 320/sq.m. density)	Crustacea	NE	NE		Oakden et al. 1984a
188	SSBA	COA	72-h	Significantly toxic (66.7% avoidance)	<i>Rhepoxynius</i> sp.	ADT	SG		Long & Morgan 1990
189 +/-115	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	ADT	SG	0.248 +/- 0.132	Crocker et al. 1991
190 +/-78.5	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7 +/- 0.778% mortality)	Amphipod	ADT	SG		Bolton et al. 1985
190	United States	EPA	10-d	Chronic Marine Eqp. Threshold	Aquatic biota	*	*	1	Lynan et al. 1987
195 +/-166	Puget Sound, WA	COA	10-d	EPA Chronic Marine Eqp. Threshold	Aquatic biota	*	*	1	DeWitt et al. 1988
197 +/-415	Southern California	COA	10-d	Moderately toxic (>12.5% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	SG	SG	4.2 +/- 2.6	Long & Morgan 1990
200	SSBA	COA	72-h	Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species	NE	NE		Oakden et al. 1984a
205 +/-80.8	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	<i>Rhepoxynius</i> sp.	*	*		Long & Morgan 1990
211 +/-362	Commencement Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Bivalve	LAR	*		Tetra Tech 1985
212 +/-263	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	JUV	NE		Anderson et al. 1988
213 +/-64.5	Pascagoula, MS	COA	10-d	Not significantly toxic (5.6 +/- 2.2% mortality)	<i>Grandidierella japonica</i> (amphipod)	ADT	NE		Parrish 1987c
213 +/-64.5	Pascagoula, MS	COA	10-d	Not significantly toxic (6.5 +/- 5.14% mortality)	<i>Arenicola cristata</i> (lugworm)	ADT	NE		Parrish 1987c
213 +/-64.5	Pascagoula, MS	COA	10-d	Not significantly toxic (0.7 +/- 0.82% mortality)	<i>Penaeus duorarum</i> (pink shrimp)	ADT	NE		Parrish 1987c
218 +/-282	Palos Verdes, CA	COA	10-d	Not toxic (5940 +/- 6880 /sq.m. density)	<i>Mollusca</i>	ADT	NE	2.53 +/- 1.27	Swartz et al. 1985a
218 +/-282	Palos Verdes, CA	COA	10-d	Not significantly toxic (18 +/- 5.7% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	NE	NE	2.53 +/- 1.27	Swartz et al. 1985a
219 +/-373	Gulf of Mexico	COA	48-h	Not toxic (4.54 +/- 5.37% mortality)	<i>Crassostrea gigas</i> (oyster)	LAR	NE	0.443 +/- 0.127	Chapman et al. 1991
223 +/-0.3	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	<i>Palaeomonetes pugio</i> (shrimp)	ADT	*		Lee & Mariani 1977
230	AETA	COA	48-h	AET Values	<i>Rhepoxynius abronius</i> (amphipod)	ADT	*		Long & Morgan 1990
230 +/-444	Northern California	COA	48-h	Low abundance (6.1 +/- 7.2/0.1 sq.m.)	Echinoderm	LAR	*		Long & Morgan 1990
230	AETA	COA	48-h	San Francisco Bay AET	<i>Rhepoxynius abronius</i> (amphipod)	LAR	*		Long & Morgan 1990
234 +/-82.9	San Francisco Bay, CA	COA	4-wk	Highly toxic (92.3 +/- 5.5% mortality)	Mussel	ADT	*	2.87 +/- 1.32	Chapman et al. 1987
234 +/-82.9	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	<i>Tigriopus californicus</i> (copepod)	ADT	*	2.87 +/- 1.07	Chapman et al. 1987
235 +/-148	Palos Verdes, CA	COA	10-d	Not significantly toxic (70.5 +/- 9.2% mortality)	<i>Rhepoxynius abronius</i> (amphipod)	ADT	NE	2.7 +/- 0.71	Swartz et al. 1986
241 +/-351	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76 +/- 1.89% abnormality)	<i>Crassostrea gigas</i> (oyster)	LAR	NE	0.425 +/- 0.128	Chapman et al. 1991
245 +/-201	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	<i>Chironomina germanica</i> (nematode)	LAR	NE		Tietjen & Lee 1984
260	AETA	COA	48-h	1986 Puget Sound Benthic Community AET	Various	LAR	*		Bellar et al. 1986
273	COA	COA	48-h	Highly toxic (68.8% abnormal)	Mussel	LAR	*	3.59	Chapman et al. 1987
276	SSBA	COA	10-d	LC50	<i>Rhepoxynius abronius</i> (amphipod)	ADT	*		Swartz et al. 1988
321	COA	COA	10-d	Highly toxic (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
321	COA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	*	4.03	Chapman et al. 1987
334	COA	COA	14-d	Significantly toxic (100% mortality)	<i>Nereis virens</i> (sandworm)	ADT	*		Simmers et al. 1984
339	COA	COA	14-d	Not toxic (21770 /sq.m. density)	Polychaeta	NE	*	3.2	Swartz et al. 1985a
340	AETA	COA	96-h	AET Values	Benthic species	*	*		Becker et al. 1990
340	AETA	COA	96-h	AET Values	Benthic species	*	*		Becker et al. 1990
340 +/-52.6	Southern California	COA	10-d	Not toxic (10% mortality)	<i>Palaeomonetes pugio</i> (shrimp)	JUV	NE		Lee & Mariani 1977
347 +/-592	Stamford, CT	COA	10-d	High species abundance (88.9 +/- 35.4/0.1 sq.m.)	Benthic species	NE	NE		Long & Morgan 1990
348 +/-234	Southern California	COA	10-d	Significantly toxic (31.7% mortality)	<i>Grandidierella japonica</i> (amphipod)	ADT	NE		Anderson et al. 1988
380	COA	COA	10-d	Highly toxic (30.5% emergence)	<i>Rhepoxynius abronius</i> (amphipod)	ADT	*	3.5	McLewy et al. 1991
380	COA	COA	10-d	Highly toxic (23% emergence)	<i>Corophium volutator</i> (amphipod)	ADT	*	3.5	McLewy et al. 1991

Table 10. A summary of the available data on the biological effects associated with sediment-sorbed zinc (ppm) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
387 +/- 783	Commencement Bay, WA	COA	10-d	Highly toxic (44.5 +/- 19% abnormality)	Oyster	ADT	*	2.42 +/- 0.88	Tetra Tech 1985
398 +/- 311	Palos Verdes, CA	COA		Not significantly toxic (0.5 +/- 5.45% mortality)	Rhepoxynius abronius (amphipod)		NE	1	Swartz et al. 1986
410	Puget Sound, WA	SDG		Chemical Criteria	Benthic community		*		PTE 1988
410	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		WDE 1989
414 +/- 472	Gulf of Mexico	COA	10-d	Significantly toxic (41.75 +/- 38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG	0.45 +/- 0.058	Chapman et al. 1991
449 +/- 252	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chironomid		SG		Tietjen & Lee 1984
452 +/- 315	Palos Verdes, CA	COA		Low species density (0.2 +/- 0.14/0.1 sq.m.)	Chironomid		SG	2.64 +/- 0.77	Swartz et al. 1986
463	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox		NC	0.4	Chapman et al. 1991
523 +/- 290	Palos Verdes, CA	COA		Low species density (0.08 +/- 0.11/0.1 sq.m.)	Echinoderm		SG	3.4 +/- 0.75	Swartz et al. 1986
525 +/- 332	Palos Verdes, CA	COA		Highly toxic (3650 +/- 1780 /sq.m. density)	Echinoderm		SG	3.15 +/- 1.32	Swartz et al. 1986
560	United States	EqPA		EPA acute marine Exp threshold	Aquatic biota		*	1	Lynan et al. 1987
566 +/- 280	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Echinoderm		*	3.53 +/- 0.742	Swartz et al. 1985a
566 +/- 280	Palos Verdes, CA	COA		Highly toxic (2.3 +/- 3.7 /sq.m. density)	Foraminifera (sponge)		*	3.53 +/- 0.742	Swartz et al. 1985a
566 +/- 280	Palos Verdes, CA	COA		Highly toxic (0.3 +/- 0.8 /sq.m. density)	Ophiuroidea (brittle star)		*	3.53 +/- 0.742	Swartz et al. 1985a
595	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	SG		Tay et al. 1990
613		SSBA	72-h	Highly toxic (54.7% mortality)	Rhepoxynius sp.		SG		Oakden et al. 1984a
636 +/- 8.6	Norwalk, CT	COA	96-h	Not toxic (0% mortality)	Palaeomonetes pugio (shrimp)		NE		Lee & Martini 1977
660 +/- 186	Palos Verdes, CA	COA		Low species density (5.3 +/- 3.7/0.1 sq.m.)	Total amphipod		*	3.13 +/- 0.15	Swartz et al. 1986
660 +/- 186	Palos Verdes, CA	COA		Low species density (0.13 +/- 0.23/0.1 sq.m.)	Phoxocephalid amphipod		*	3.13 +/- 0.15	Swartz et al. 1986
707 +/- 955	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Rhepoxynius abronius (amphipod)		*	5.24 +/- 4.4	DeWitt et al. 1988
715 +/- 135	Palos Verdes, CA	COA		Low species density (1.33 +/- 1.22/0.1 sq.m.)	Amphipod		*	3.87 +/- 0.21	Swartz et al. 1986
715 +/- 135	Palos Verdes, CA	COA		Low species density (10 +/- 12/sq.m. density)	Phoxocephalid amphipod		*	3.87 +/- 0.21	Swartz et al. 1986
719 +/- 190	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5 +/- 2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.9 +/- 0.28	Swartz et al. 1986
732 +/- 115	Palos Verdes, CA	COA		Highly toxic (10 +/- 12/sq.m. density)	Amphipod		*	3.95 +/- 0.238	Swartz et al. 1985a
732 +/- 115	Palos Verdes, CA	COA		Highly toxic (87 +/- 60.1/sq.m. density)	Crustacea		*	3.95 +/- 0.238	Swartz et al. 1985a
738 +/- 394	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2 +/- 31.1)	Fundulus heteroclitus (mummichog)		NE		Isai et al. 1979
738 +/- 394	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2 +/- 31.1)	Leostomus xanthurus (spot)		NE		Isai et al. 1979
739 +/- 139	Palos Verdes, CA	COA		Highly toxic (215 +/- 116 /sq.m. density)	Mollusca		*	4 +/- 0.265	Swartz et al. 1985a
739 +/- 139	Palos Verdes, CA	COA		Significantly toxic (21 +/- 6.3% mortality)	Rhepoxynius abronius (amphipod)		*	4 +/- 0.265	Swartz et al. 1985a
739 +/- 139	Palos Verdes, CA	COA		Significantly toxic (20.2 sp./0.1m sq.)	Macro benthos		*		Swartz et al. 1985a
870	Puget Sound, WA	COA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Becker et al. 1990
>870	California	AETA		AET Values	Benthic species		NE	0.464 +/- 0.143	Chapman et al. 1991
939 +/- 1600	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
941 +/- 1373	Gulf of Mexico	COA	10-d	No effect on diversity index (3.21 +/- 0.239)	Rhepoxynius abronius (amphipod)	ADT	NE		Chapman et al. 1991
960	Commencement Bay, WA	COA	10-d	Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		PTE 1988
960	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		Chapman et al. 1991
986 +/- 1678	Gulf of Mexico	COA	10-d	Least toxic (6.32 +/- 3.68 TU/g)	Microtox		NE	0.47 +/- 0.149	Tay et al. 1990
1029 +/- 2230	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
1029 +/- 2230	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.1 +/- 1.6% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
1031 +/- 2229	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.0% survival)	Corophium volutator (amphipod)	ADT	NE		Chapman et al. 1991
1239 +/- 1966	Gulf of Mexico	COA	10-d	Not significantly toxic (9 +/- 3.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.471 +/- 0.18	Chapman et al. 1991
1600	Puget Sound, WA	COA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
1600	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
1600	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic species		*		PTE 1988
1600	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		U.S. ACE 1988
1655 +/- 1940	Gulf of Mexico	AETA	1-d	PSDA Maximum level criteria	Aquatic biota		*		Chapman et al. 1991
1804 +/- 2098	Baltimore Harbor, MD	COA	48-h	Highly toxic (2.5 +/- 1.05% emergence)	Fundulus heteroclitus (mummichog)	ADT	*	0.5 +/- 0.155	Isai et al. 1979
1804 +/- 2098	Baltimore Harbor, MD	COA	48-h	Most toxic (11m 5.1 +/- 3.5)	Leostomus xanthurus (spot)		*		Isai et al. 1979
2199 +/- 2219	Gulf of Mexico	COA	48-h	Highly toxic (59.4 +/- 15.5% mortality)	Crassostrea gigas (oyster)	LAR	*	0.5 +/- 0.18	Chapman et al. 1991
2599 +/- 2287	Gulf of Mexico	COA	48-h	Significantly toxic (32.6 +/- 14.2% abnormality)	Crassostrea gigas (oyster)	LAR	*	0.567 +/- 0.153	Chapman et al. 1991
3651 +/- 6626	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1 +/- 2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
3654 +/- 6624	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
4854 +/- 7561	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7 +/- 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990

Table 11. A summary of the available data on the biological effects associated with sediment-sorbed acenaphthene (ppb) used to support the derivation of sediment quality guidelines. ACENAPHTHENE

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
<3	Kalifax Harbour, NS	COA	10-d	Significantly toxic (61.7%/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<3.5 +/-1	Kalifax Harbour, NS	COA	10-d	Not significantly toxic (5.2%/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<3.5 +/-1	Kalifax Harbour, NS	COA	20-d	Not significantly toxic (1%/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
3.92 +/-1.59	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
<5	Kalifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
6.92 +/-11.8	Southern California	COA	10-d	Not significantly toxic (3% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
<8.8 +/-5.3	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8%/-5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
9	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
<12.5	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
<12.5	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
16	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
16	California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
16	Northern California	AETA		AET Values	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
<23.5	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
<30.8 +/-25.6	Kalifax Harbour, NS	COA	10-d	Not significantly toxic (6.8%/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<30.8 +/-25.6	Kalifax Harbour, NS	COA	10-d	Not significantly toxic (8.5%/-6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<30.8 +/-25.6	Kalifax Harbour, NS	COA	20-d	Not significantly toxic (0.7%/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
50	Burrard Inlet, BC	SCD		Sediment quality objectives	Aquatic biota	NE	NE		Swain & Nijman 1991
56	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
56	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
56.7 +/-70	San Francisco Bay, CA	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
63	Commencement Bay, WA	COA		Least toxic (15.1%/-3.1% abnormality)	Oyster	*	*		Long & Morgan 1990
85.9 +/-97	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	NE	NE		U.S. ACE 1988
119 +/-105	Commencement Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Tetra Tech 1985
127 +/-117	Commencement Bay, WA	COA	10-d	Moderately toxic (23%/-2.3% abnormality)	Oyster	*	*		Tetra Tech 1985
150	Commencement Bay, WA	COA	10-d	Moderately toxic (26%/-5.2% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Tetra Tech 1985
160	Eagle Harbor, WA	COA	10-d	LC50	Benthic community	*	*	1	Swartz et al. 1989
247 +/-147	Burrard Inlet, BC	COA	10-d	Chemical Criteria	Rhepoxynius abronius (amphipod)	ADT	NE	2.66 +/-2.15	McLeay et al. 1991
247 +/-147	Burrard Inlet, BC	COA	10-d	Not toxic (4.5%/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18 +/-2.1	McLeay et al. 1991
283 +/-140	Burrard Inlet, BC	COA	10-d	Not toxic (5.21%/-3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	2.8 +/-1.96	McLeay et al. 1991
283 +/-140	Burrard Inlet, BC	COA	10-d	Not toxic (97.2%/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/-1.96	McLeay et al. 1991
306 +/-604	Elizabeth River, VA	COA	96-h	Not toxic (8.9%/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8 +/-1.96	McLeay et al. 1991
350 +/-45.8	Commencement Bay, WA	COA	10-d	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
390	Burrard Inlet, BC	COA	10-d	Highly toxic (44.5%/-19% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
390	Burrard Inlet, BC	COA	10-d	Not toxic (7.9%/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64 +/-2.14	McLeay et al. 1991
390	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	SG	3.5	McLeay et al. 1991
390	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	SG	3.5	McLeay et al. 1991

Table 11. A summary of the available data on the biological effects associated with sediment-sorbed acenaphthene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<403	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
486 +/- 714	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)		NE		Alden & Butt 1987
500	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
500	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
500	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
500	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
500	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
630	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
630	Puget Sound, WA	AETA		PSODA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
654 +/- 1049	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
679 +/- 469	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	SG		Alden & Butt 1987
680 +/- 814	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)		*		Alden & Butt 1987
730	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
2000	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988
3031 +/- 4271	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
3031 +/- 4271	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9+/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
3031 +/- 4271	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6+/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
5599 +/- 24392	Eagle Harbor, WA	COA		Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)		NE		CH2M Hill 1989
6522 +/- 8915	Eagle Harbor, WA	COA		Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)		SG		CH2M Hill 1989
6976 +/- 26981	Eagle Harbour, WA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84	CH2M Hill 1989
16500	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota		*	1	Bolton et al. 1985
39557 +/- 48678	Eagle Harbor, WA	COA		Highly toxic (95.5+/-8.5 mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989

Table 12. A summary of the available data on the biological effects associated with sediment-sorbed acenaphthylene (ppb) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (1+/-2% mortality)	Heanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
20	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (18+/-5.66% mortality)	Heanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
44	Eagle Harbor, WA	AETA	10-d	LC50	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1989
44	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
47.4	United States	AETA		NSLC-marine	Benthic species		*		Becker et al. 1990
60	Burrard Inlet, BC	SLCA		Sediment Quality Objectives	Aquatic biota		1		Neff et al. 1987
64	Puget Sound, WA	SQO		PSODA Screening level concentration	Oyster				Swain & Nijman 1991
78.4 +/- 158	Commencement Bay, WA	AETA	10-d	Least toxic (15.1+/-3.1% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NE		U.S. ACE 1988
82.1 +/- 53.8	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
110 +/- 160	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
112 +/- 131	Commencement Bay, WA	COA	10-d	Moderately toxic (23+/-2.3% abnormality)	Oyster	SG	SG		Tetra Tech 1985
120	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)		NE		Alden & Butt 1987
127 +/- 92.9	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
127 +/- 92.9	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
129 +/- 2750	Burrard Inlet, BC	COA	10-d	Highly toxic (44.5+/-19% abnormality)	Corophium volutator (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
<131 +/- 131	Commencement Bay, WA	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
<131 +/- 131	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<131 +/- 131	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Heanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
>160	Halifax Harbour, NS	COA	20-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
>160	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
>195 +/- 158	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG		Tetra Tech 1985
<403	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.35) SRUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUS	Benthic species		NE		Winn et al. 1989
470 +/- 691	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
470 +/- 691	Elizabeth River, VA	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
548 +/- 870	Puget Sound, WA	AETA	96-h	Significant decrease in respiration rates	Microtox		*		Alden & Butt 1987
560	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Microtox		*		Bellar et al. 1986
>560	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Microtox		*		Bellar et al. 1986
>560	Puget Sound, WA	AETA		1986 Puget Sound Oyster AET	Microtox		*		Bellar et al. 1986
>560	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
>560	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
610 +/- 773	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
640	Puget Sound, WA	AETA		PSODA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
640	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
1060 +/- 1420	Elizabeth River, VA	SOG	96-h	Chemical Criteria	Benthic community		*	1	WDE 1989
1300	Puget Sound, WA	AETA		Significantly toxic (50.7+/-39 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
1300	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
1500	Puget Sound, WA	COA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	*		PTI 1988
1500	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
6000	United States	EqPa	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
				Chronic Marine Eqp Threshold	Aquatic biota		*	1	Bolton et al. 1985

Table 13. A summary of the available data on the biological effects associated with sediment-sorbed anthracene (ppb) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
10	Burrard Inlet, BC	COA	20-d	Not significantly toxic (8%/-5.6% mortality)	Neanthes sp. (polychaete)	JUV	NE		Swain & Nijman 1991
15.4 +/- 7.5	San Francisco Bay, CA	SOA	48-h	Sediment quality objectives	Aquatic biota	LAR	NE		Long & Morgan 1990
24	San Francisco Bay, CA	AETA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
34.3 +/- 41.2	San Francisco Bay, CA	COA	48-h	San Francisco Bay AET	Oyster; mussel	LAR	NE		Long & Morgan 1990
35.9 +/- 52.2	Southern California	COA	10-d	Not significantly toxic (31.9%/-15.5% abnormal)	Grandidierella japonica (amphipod)	JUV	NE		Long & Morgan 1990
56 +/- 150	Marragansett Bay, RI	COA	10-d	Not significantly toxic (23.2% mortality)	Ampelisca abdita (amphipod)	JUV	NE		Anderson et al. 1988
60	California	AETA		Not significantly toxic (5.28%/-3.0% mortality)	Mytilus edulis (bivalve)	LAR	NE		Munn et al. 1991
60	Northern California	AETA		AET Values	Benthic species	LAR	NE		Becker et al. 1990
63 +/- 72	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8%/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
70	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	NE		Swartz et al. 1989
75 +/- 117	Burrard Inlet, BC	COA	10-d	Not toxic (4.5%/-3.0% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66%/-2.15	McLeay et al. 1991
75 +/- 117	Burrard Inlet, BC	COA	10-d	Not toxic (5.21%/-3.61% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18%/-2.1	McLeay et al. 1991
85.3 +/- 119	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4%/-11.3% abnormal)	Corophium volutator (amphipod)	LAR	NE		Long & Morgan 1990
110 +/- 257	San Francisco Bay, CA	COA	10-d	Least toxic (18%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
119 +/- 277	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9%/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
120 +/- 269	San Francisco Bay, CA	COA	10-d	Significantly toxic (18.4%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
130	Puget Sound, WA	AETA		PSDA Screening level concentration	Aquatic biota	LAR	NE		U.S. ACE 1988
148 +/- 148	Commencement Bay, WA	COA	10-d	Least toxic (15.1%/-3.1% abnormality)	Oyster	LAR	NE		Tetra Tech 1985
150	Puget Sound, WA	COA	10-d	Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
150	Puget Sound, WA	COA	10-d	Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
150	Puget Sound, WA	COA	10-d	Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
163	United States	SICA		NSLC-marine	Benthic species	ADT	NE	1	McLeay et al. 1987
<166 +/- 177	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8%/-7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<166 +/- 177	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.5%/-6.0% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<166 +/- 177	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7%/-1.6% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
184 +/- 347	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7%/-22.7% abnormality)	Bivalve	LAR	NE		Long & Morgan 1990
190	United States	EqPA		99% chronic marine criteria	Aquatic organisms	LAR	NE	1	Pavlou et al. 1987
225 +/- 131	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
227 +/- 198	Commencement Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
237 +/- 455	San Francisco Bay, CA	COA	10-d	Highly toxic (67%/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
260	California	AETA		AET Values	Benthic species	ADT	NE		Becker et al. 1990
260	Southern California	AETA		AET Values	Benthic species	ADT	NE		Becker et al. 1990
265 +/- 228	Commencement Bay, WA	COA	10-d	Moderately toxic (26%/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
282 +/- 207	Commencement Bay, WA	COA	10-d	Moderately toxic (23%/-2.3% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
363 +/- 353	Commencement Bay, WA	COA	10-d	Highly toxic (44.3%/-19% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
380	United States	EqPA		95% chronic marine criteria	Aquatic organisms	LAR	NE	1	Pavlou et al. 1987
<403	Charleston Harbor, SC	COA	10-d	High species richness (14.9%/-2.04) SRUs	Benthic species	ADT	NE		Munn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05%/-1.33) SRUs	Benthic species	ADT	NE		Munn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SRUs	Benthic species	ADT	NE		Munn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	High species diversity (4.15%/-0.59) SDUs	Benthic species	ADT	NE		Munn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3%/-0.2) SDUs	Benthic species	ADT	NE		Munn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Low species diversity (1.16) SDUs	Benthic species	ADT	NE		Munn et al. 1989
431 +/- 719	Burrard Inlet, BC	COA	10-d	Not toxic (97.2%/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8%/-1.96	McLeay et al. 1991
431 +/- 719	Burrard Inlet, BC	COA	10-d	Not toxic (8.9%/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8%/-1.96	McLeay et al. 1991
476 +/- 569	Commencement Bay, WA	COA	10-d	Highly toxic (78.5%/-19.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
506 +/- 1043	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5%/-3.2% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Burt 1987
560	Puget Sound	SG		Low Abundance Threshold Concentration	Praxitella gracilis (polychaete)	ADT	NE	3.0	Tetra Tech 1986
560	Puget Sound	SG		Low Abundance Threshold Concentration	Eupholonides producta (ostracoda)	ADT	NE	7.0	Tetra Tech 1986
573 +/- 809	Burrard Inlet, BC	COA	10-d	Not toxic (7.9%/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.6%/-2.14	McLeay et al. 1991

Table 13. A summary of the available data on the biological effects associated with sediment-sorbed anthracene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
>620	Southern California	AETA	96-h	AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
735 +/-1498	Elizabeth River, VA	COA	48-h	Highly toxic (92.4%/-4.5% abnormal)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
923 +/-558	San Francisco Bay, CA	COA		1986 Puget Sound Microtox AET	Bivalve	LAR	*		Long & Morgan 1990
960	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Microtox	LAR	*		Bellar et al. 1986
960	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
960	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox	LAR	*		PTI 1988
960	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		PTI 1988
1100	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
1100	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
1177 +/-1582	Eagle Harbor, WA	COA		Moderately toxic (41%/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
1300	Puget Sound, WA	COA		PSDDA Maximum Level Criteria	Rhepoxynius abronius (amphipod)	ADT	NC		CH2M Hill 1989
1300	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Rhepoxynius abronius (amphipod)	ADT	*		U.S. ACE 1988
1490 +/-5389	Eagle Harbor, WA	COA		Least toxic (13%/-7% mortality)	Aquatic biota	*	*		Bellar et al. 1986
1500	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE		CH2M Hill 1989
1500	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLay et al. 1991
1578 +/-5808	Eagle Harbor, WA	COA	10-d	Least toxic (0.1%/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLay et al. 1991
<1753 +/-3492	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2%/-3.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84	CH2M Hill 1989
<1753 +/-3492	Halifax Harbour, NS	COA	10-d	Not significantly toxic (1%/-2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
1900	Puget Sound, WA	AETA	20-d	1986 Puget Sound Amphipod AET	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
2200	Puget Sound, WA	SQG		Chemical Criteria	Rhepoxynius abronius (amphipod)	JUV	*		Bellar et al. 1986
<2335 +/-4031	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7%/-12.5% mortality)	Benthic community	ADT	*	1	MOE 1989
3849 +/-9462	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
4400	Puget Sound, WA	AETA	28-d	LC50	Benthic community	JUV	*		PTI 1988
6600	Elizabeth River, VA	COA		High prevalence of hepatic lesions (27.3%/-6.4%)	Leistomus xanthurus (spot)	JUV	*		Roberts et al. 1989
7371 +/-4730	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9%/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
7371 +/-4730	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6%/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
7397 +/-7264	Eagle Harbor, WA	COA		Highly toxic (95.5%/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		CH2M Hill 1989
9800 +/-15107	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7%/-39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
11000	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota	*	*	1	Bolton et al. 1985
13000	Puget Sound, WA	COA	24-d	LC50	Rhepoxynius abronius (amphipod)	JUV	*		PTI 1988
147840	Elizabeth River, VA	COA	20-d	Significantly toxic (52% mortality)	Leistomus xanthurus (spot)	JUV	*		Roberts et al. 1989
253000	Sidney Tar Pond, NS	COA		Significantly toxic (100% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
264000	Elizabeth River, VA	COA			Leistomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 14. A summary of the available data on the biological effects associated with sediment-sorbed fluorene (ppb) used to support the derivation of sediment quality guidelines. FLUORENE

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
6 +/- 4.5	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
7.75 +/- 16.3	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
11.3 +/- 8.24	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Oyster, mussel	LAR	SG		Long & Morgan 1990
>12	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	ADT	NE		Anderson et al. 1988
13	Southern California	AETA	48-h	AET Values	Benthic species	ADT	*		Becker et al. 1990
16 +/- 22.5	Southern California	COA	48-h	Not significantly toxic (31.9 +/- 15.5% abnormal)	Bivalve	LAR	NE		Becker et al. 1990
18.6 +/- 39.3	San Francisco Bay, CA	COA	48-h	Not significantly toxic (5.28 +/- 3.04% mortality)	Mytilus edulis (bivalve)	ADT	NE		Long & Morgan 1990
19	Marransett Bay, RI	COA	48-h	AET Values	Bivalve	LAR	NE		Munns et al. 1991
19	California	AETA	48-h	AET Values	Benthic species	LAR	*		Becker et al. 1990
19	Northern California	AETA	48-h	AET Values	Benthic species	LAR	*		Becker et al. 1990
19 +/- 30	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	*		Becker et al. 1990
29.1 +/- 48.3	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	NC		Long & Morgan 1990
29.5 +/- 21.4	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 6.7% mortality)	Rhepoxynius abronius (amphipod)	NC	NC		Long & Morgan 1990
33.3 +/- 76.7	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	SG	NE		Long & Morgan 1990
34	Puget Sound, WA	COA	10-d	Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
34	Puget Sound, WA	COA	10-d	Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
34	Puget Sound, WA	COA	10-d	Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
34.7 +/- 64.0	Puget Sound, WA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
38.3 +/- 287	San Francisco Bay, CA	COA	48-h	Not toxic (4.5 +/- 3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66 +/- 2.15	McLeay et al. 1991
38.3 +/- 287	Burrard Inlet, BC	COA	10-d	Not toxic (5.2 +/- 3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al. 1991
39.2 +/- 49.3	Burrard Inlet, BC	COA	10-d	Least toxic (18 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
42.6 +/- 50.8	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
50	Burrard Inlet, BC	SDD	10-d	Sediment Quality Objectives	Aquatic biota	ADT	NE		Swain & Nijman 1991
<50 +/- 1917	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<50 +/- 1918	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1 +/- 2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
59	United States	EqPa	10-d	99% chronic marine criteria	Aquatic organisms	NE	*	1	Pavlou et al. 1987
64	Puget Sound, WA	AETA	10-d	PSDDA Screening level concentration	Aquatic biota	ADT	NE		U.S. ACE 1988
<65 +/- 1704	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7 +/- 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
75.3 +/- 76.1	Commencement Bay, WA	COA	10-d	Least toxic (15.1 +/- 3.1% abnormality)	Oyster	NE	*		Tetra Tech 1985
101	United States	SLCA	10-d	WSLC-marine	Benthic species	NE	*	1	Neff et al. 1987
117 +/- 113	Commencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	NE	*		Tetra Tech 1985
143 +/- 119	Commencement Bay, WA	COA	10-d	Moderately toxic (23 +/- 2.3% abnormality)	Oyster	NE	*		Tetra Tech 1985
<146 +/- 366	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<146 +/- 366	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.06% survival)	Corophium volutator (amphipod)	JUV	NE		Tay et al. 1990
<146 +/- 366	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanthes sp. (polychaete)	ADT	NE		Tay et al. 1990
147 +/- 131	Commencement Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	SG	NE		Tetra Tech 1985
154 +/- 2382	Burrard Inlet, BC	COA	10-d	Not toxic (97.2 +/- 2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
154 +/- 2382	Burrard Inlet, BC	COA	10-d	Not toxic (8.9 +/- 2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
160	United States	EqPa	10-d	95% chronic marine criteria	Aquatic organisms	ADT	NE	1	McLeay et al. 1991
162 +/- 105	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	*		Pavlou et al. 1987
187 +/- 240	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Long & Morgan 1990
187 +/- 234	Eagle Harbor, WA	COA	96-h	Moderately toxic (41 +/- 9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
197 +/- 191	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5 +/- 3.24% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Chen & Butt 1987
200 +/- 2641	Burrard Inlet, BC	COA	10-d	Not toxic (7.9 +/- 5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64 +/- 2.14	Alden & Butt 1987
210	San Francisco Bay, CA	AETA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*		McLeay et al. 1991
210	Eagle Harbor, WA	COA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
>210	Northern California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Swartz et al. 1989
>210	California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
230	Puget Sound, WA	SG	10-d	Chemical Criteria	Benthic community	ADT	*	1	MOE 1989

Table 14. A summary of the available data on the biological effects associated with sediment-sorbed fluorene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
353 +/- 746	Commencement Bay, WA	COA		Highly toxic (44.5 +/- 19% abnormality)	Oyster		*		Tetra Tech 1985
396	Charleston Harbor, SC	SSBA	4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
<403	Charleston Harbor, SC	COA		High species richness (14.9 +/- 2.04) SRUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05 +/- 1.33) SRUS	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15 +/- 0.59) SDUS	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3 +/- 0.2) SDUS	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUS	Benthic species		NG		Winn et al. 1989
500	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
500	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
540	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
540	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
540	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
540	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
640	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Crassostrea gigas (oyster)		*		PTI 1988
707 +/- 1341	Commencement Bay, WA	COA		1986 Puget Sound Benthic Community AET	Aquatic biota		*		U.S. ACE 1988
1000	Puget Sound, WA	AETA	10-d	Highly toxic (78.5 +/- 19.2% mortality)	Benthic species		*		Bellar et al. 1986
1017 +/- 4679	Eagle Harbor, WA	COA		1988 Puget Sound AET	Benthic community		*		Tetra Tech 1985
1168 +/- 5176	Eagle Harbour, WA	COA		Least toxic (13 +/- 7% mortality)	Rhepoxynius abronius (amphipod)		*		PTI 1988
3324 +/- 8573	Elizabeth River, VA	COA	10-d	Least toxic (0.14 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
3600	Puget Sound, WA	AETA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	ADT	NE	1.5 +/- 0.84	Allden & Butt 1987
4013 +/- 4938	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3 +/- 6.4%)	Rhepoxynius abronius (amphipod)		*		PTI 1988
4013 +/- 4938	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9 +/- 3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
4013 +/- 4938	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6 +/- 8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
7000	United States	EgPA		Chronic Marine Egg Threshold	Aquatic biota		*		Belton et al. 1985
<7303 +/- 52747	Sidney Tar Pond, MS	COA	20-d	Not significantly toxic (8 +/- 5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
8485 +/- 13900	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7 +/- 39 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*		Aldon & Butt 1987
13527 +/- 18106	Sidney Tar Pond, VA	SSBA	4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)		NE		Payne et al. 1988
14600	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
22811 +/- 65559	Sidney Tar Pond, MS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
23418 +/- 21387	Eagle Harbor, VA	COA	10-d	Highly toxic (95.3 +/- 8.5 mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
31250	Elizabeth River, VA	SSBA	4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)		NE		Payne et al. 1988
85400	Sidney Tar Pond, MS	COA	28-d	Significantly toxic (52% mortality)	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989
220533 +/- 252275	Sidney Tar Pond, MS	COA	20-d	Significant change in liver somatic indices	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
285267 +/- 265181	Sidney Tar Pond, MS	SSBA	4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
406325 +/- 229668	Elizabeth River, VA	SSBA	4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
700000	Elizabeth River, VA	COA	24-d	LC50	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989
1250000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 15. A summary of the available data on the biological effects associated with sediment-sorbed 2-methylnaphthalene (ppb) used to support the derivation of sediment quality guidelines.
2-METHYLNAPHTHALENE

Concentration (+/- SD)	Area	Analysis Test Type	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1.75	Puget Sound, WA	COA	Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1.75	Puget Sound, WA	COA	Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1.75	Puget Sound, WA	COA	Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
16.4 +/- 33.3	Southern California	COA	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
20.2 +/- 6.8	San Francisco Bay, CA	COA	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
23.7 +/- 3.5	San Francisco Bay, CA	COA	Not significantly toxic (31.9 +/- 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
25.5 +/- 22.7	San Francisco Bay, CA	COA	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
27	San Francisco Bay, CA	AETA	San Francisco Bay AET	Oyster; mussel	LAR	SG		Long & Morgan 1990
30.5 +/- 33.2	San Francisco Bay, CA	COA	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	NC	NC		Long & Morgan 1990
32.3 +/- 41.2	San Francisco Bay, CA	COA	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	NC	NC		Long & Morgan 1990
33.8 +/- 27.1	San Francisco Bay, CA	COA	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	NC	NC		Long & Morgan 1990
34.2 +/- 33.2	San Francisco Bay, CA	COA	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NC	NC		Long & Morgan 1990
34.9 +/- 35.7	San Francisco Bay, CA	COA	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
38.5 +/- 35.4	San Francisco Bay, CA	COA	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NC	NE		Long & Morgan 1990
66.9 +/- 154	Southern California	COA	Significantly toxic (31.7% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
67	Puget Sound, WA	AETA	PSDDA Screening level concentration	Aquatic biota	JUV	NE		U.S. ACE 1988
70	California	AETA	AET Values	Mytilus edulis (bivalve)	LAR	NE		Becker et al. 1990
70	California	AETA	AET Values	Benthic species	LAR	*		Becker et al. 1990
98.3 +/- 41.2	Northern California	AETA	AET Values	Benthic species	LAR	*		Becker et al. 1990
>130	San Francisco Bay, CA	COA	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
>130	Northern California	AETA	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>130	California	AETA	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
165 +/- 121	San Francisco Bay, CA	COA	AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
168 +/- 169	Commencement Bay, WA	COA	Least toxic (15.1 +/- 3.1% abnormality)	Oyster	NE	NE		Tetra Tech 1985
207 +/- 169	Commencement Bay, WA	COA	Least toxic (12.5 +/- 4.5% abnormality)	Oyster	NE	NE		Tetra Tech 1985
213 +/- 129	Commencement Bay, WA	COA	Moderately toxic (23 +/- 2.3% abnormality)	Oyster	NE	NE		Tetra Tech 1985
328 +/- 315	Commencement Bay, WA	COA	Highly toxic (28 +/- 5.2% abnormality)	Rhepoxynius abronius (amphipod)	SG	SG		Tetra Tech 1985
380	Puget Sound, WA	SG	Low Abundance Threshold Concentration	Rhepoxynius abronius (amphipod)	SG	*		Tetra Tech 1985
380	Puget Sound, WA	SG	Low Abundance Threshold Concentration	Rhepoxynius abronius (amphipod)	SG	*		Tetra Tech 1985
500	Puget Sound, WA	SSBA	Significant toxicity	Praxillella gracilis (polychaeta)	*	*	3.0	Tetra Tech 1986
546 +/- 490	Commencement Bay, WA	COA	Highly toxic (78.5 +/- 19.5% mortality)	Euphilomides producta (ostracoda)	*	*	7.0	Plesha et al. 1988
565	Puget Sound, WA	SG	Low Abundance Threshold Concentration	Rhepoxynius abronius (amphipod)	*	*	0.9	Tetra Tech 1985
640	Puget Sound, WA	SG	Low Abundance Threshold Concentration	Nucula tenuis (pelecypoda)	*	*	4.0	Tetra Tech 1986
670	Puget Sound, WA	AETA	Chemical Criteria	Benthic community	*	*	1	AOE 1989
670	Puget Sound, WA	AETA	1986 Puget Sound Microtox AET	Microtox	*	*		Bellar et al. 1986
670	Puget Sound, WA	AETA	1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
670	Puget Sound, WA	AETA	1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	*	*		Pfll 1988
670	Puget Sound, WA	AETA	1988 Puget Sound AET	Microtox	*	*		Pfll 1988
670	Puget Sound, WA	AETA	PSDDA Maximum level criteria	Crassostrea gigas (oyster)	*	*		U.S. ACE 1988
670	Puget Sound, WA	AETA	1986 Puget Sound Benthic Community AET	Aquatic biota	*	*		Bellar et al. 1986
795	Elizabeth River, VA	COA	LC50	Benthic species	JUV	*		Roberts et al. 1989
1052 +/- 1213	Puget Sound, WA	COA	High prevalence of hepatic lesions (27.3 +/- 6.4%)	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
1052 +/- 1213	Puget Sound, WA	COA	High prevalence of hepatic idiopathic lesions (81.9 +/- 3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
1400	Puget Sound, WA	COA	High prevalence of hepatic cellular alterations (43.6 +/- 8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
1900	Puget Sound, WA	AETA	1988 Puget Sound AET	Benthic community	ADT	*		Pfll 1988
17808	Elizabeth River, VA	COA	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	JUV	*		Roberts et al. 1989
31800	Elizabeth River, VA	COA	LC50	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
	Elizabeth River, VA	COA	Highly toxic (100% mortality)	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 16. A summary of the available data on the biological effects associated with sediment-sorbed naphthalene (ppb) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
8.17	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandiderella japonica (amphipod)	JUV	NE		Anderson et al. 1988
8.9	Puget Sound, WA	COA	10-d	Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
8.9	Puget Sound, WA	COA	10-d	Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
<28.3 +/- 35.9	Halifax Harbour, NS	COA	10-d	Low prevalence of hepatic idiopathic lesions (32.5%)	Rhepoxynius abronius (amphipod)	ADT	NE		Malins et al. 1985
<28.3 +/- 35.9	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8%/-7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<28.3 +/- 35.9	Halifax Harbour, NS	COA	20-d	Not significantly toxic (8.5%/-6.0% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
30	Eagle Harbor, VA	COA	10-d	Not significantly toxic (0.7%/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
43.1 +/- 26.2	San Francisco Bay, CA	COA	48-h	LC50	Rhepoxynius abronius (amphipod)	LAR	SG		Swartz et al. 1989
48 +/- 24.7	San Francisco Bay, CA	COA	10-d	Moderately toxic (59.4%/-11.3% abnormal)	Bivalve	LAR	NC		Long & Morgan 1990
51	Northern California	AET/A	10-d	Moderately toxic (33.8%/-4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	NC		Long & Morgan 1990
53.4 +/- 40.0	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7%/-22.7% abnormal)	Benthic species	LAR	NC		Becker et al. 1990
53.4 +/- 37.6	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9%/-19.2% mortality)	Bivalve	LAR	NC		Long & Morgan 1990
57.9 +/- 50.6	San Francisco Bay, CA	COA	10-d	Least toxic (18%/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
<60 +/- 107	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2%/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<60 +/- 107	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1%/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
63.2 +/- 57.2	San Francisco Bay, CA	COA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
64 +/- 45.8	San Francisco Bay, CA	COA	10-d	Highly toxic (67%/-11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990
65.2 +/- 53.5	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	JUV	NE		Long & Morgan 1990
77.3 +/- 181	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandiderella japonica (amphipod)	ADT	NE		Anderson et al. 1988
<78.3 +/- 123	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7%/-12.5% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
127 +/- 32.4	San Francisco Bay, CA	AET/A	48-h	Highly toxic (92.4%/-4.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
160	San Francisco Bay, CA	COA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
160	San Francisco Bay, CA	AET/A	10-d	San Francisco Bay AET	Dyster; mussel	LAR	NE		Long & Morgan 1990
>160	Northern California	AET/A	10-d	AET Values	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
173 +/- 191	Burrard Inlet, BC	COA	10-d	Not toxic (4.5%/-3.02% emergence)	Mytilus edulis (bivalve)	LAR	NE	2.66 +/- 2.15	McLeay et al. 1991
173 +/- 191	Burrard Inlet, BC	COA	10-d	Not toxic (5.21%/-3.61% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al. 1991
200	Burrard Inlet, BC	COA	10-d	Sediment quality objectives	Corophium volutator (amphipod)	ADT	NE		Swain & Nijman 1991
210	Puget Sound, WA	SDO	10-d	PSDQA Screening level concentration	Aquatic biota	ADT	NE		U.S. ACE 1988
288 +/- 201	Eagle Harbor, VA	COA	10-d	Moderately toxic (41%/-9% mortality)	Dyster	ADT	NE		CH2M Hill 1989
358 +/- 326	Commencement Bay, WA	COA	10-d	Least toxic (15.1%/-3.1% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
367	United States	SLCA	10-d	NSLC-marine	Benthic spp.	ADT	NE	1	Neff et al. 1986
<403	Charleston Harbor, SC	COA	10-d	High species richness (14.9%/-2.04) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05%/-1.33) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	High species diversity (4.16%/-0.59) SDUs	Benthic species	ADT	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3%/-0.2) SDUs	Benthic species	ADT	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d	Low species diversity (1.16) SDUs	Benthic species	ADT	NE		Winn et al. 1989
414	United States	SLCA	10-d	NSLC-marine	Benthic species	ADT	NE	1	Neff et al. 1987
456 +/- 682	Eagle Harbor, VA	COA	10-d	Least toxic (13%/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		CH2M Hill 1989
500	United States	EqpA	10-d	99% chronic marine criteria	Aquatic organisms	ADT	NE	1	Pavlou et al. 1987
505 +/- 681	Burrard Inlet, BC	COA	10-d	Not toxic (97.2%/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
505 +/- 681	Burrard Inlet, BC	COA	10-d	Not toxic (8.9%/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
510 +/- 499	Commencement Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
513	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5%/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Aldeen & Butt 1987
522	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	ADT	NE		Aldeen & Butt 1987
542	Eagle Harbour, VA	COA	10-d	Least toxic (0.1%/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5 +/- 0.84	CH2M Hill 1989
561	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Aldeen & Butt 1987
593 +/- 505	Commencement Bay, WA	COA	96-h	Moderately toxic (23%/-2.3% abnormality)	Oyster	ADT	NE		Tetra Tech 1985

Table 16. A summary of the available data on the biological effects associated with sediment-sorbed naphthalene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	10C (%)	Reference
594 +/-424	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tetra Tech 1985
617 +/-322	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-3% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	SG	2.64+/-2.14	Alden & Burr 1987
663 +/-739	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1	McLeay et al. 1991
720	United States	EqPA		95% chronic marine criteria	Aquatic organisms	ADT	-		Pavlou et al. 1987
>930	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>930	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>930	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>930	Southern California	AETA		AET Values	Benthic species	ADT	-		Becker et al. 1990
973 +/-1041	Commencement Bay, WA	COA		Highly toxic (44.5+/-19% abnormality)	Oyster		*		Becker et al. 1990
990	Puget Sound, WA	SG		Chemical Criteria	Benthic community		NE	1	Tetra Tech 1985
1100	Puget Sound, WA	SG		Low Abundance Threshold Concentration	Praxillella gracilis (polychaeta)		NE	3.0	WDE 1989
1300	Puget Sound, WA	SG		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		*	7.0	Tetra Tech 1986
1400	Puget Sound, WA	SG		Low Abundance Threshold Concentration	Nucula tenuis (pelecypoda)		*	4.0	Tetra Tech 1986
1500	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
1501 +/-2064	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
1564 +/-1735	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Corophium volutator (amphipod)		*		Ch2M Hill 1989
2100	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
2100	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	LAR	*		Bellar et al. 1986
2100	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
2100	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		Bellar et al. 1986
2100	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		Pill 1988
2100	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Crassostrea gigas (oyster)		*		Pill 1988
2280 +/-2497	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Benthic species	ADT	*		U.S. ACE 1988
2280 +/-2497	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Bellar et al. 1986
2280 +/-2497	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
2375	Elizabeth River, VA	COA	28-d	High prevalence of hepatic cellular alterations (43.6+/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
2400	Puget Sound, WA	COA		LC50	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
5250 +/-1500	Trinity Bay, TX	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		Pill 1988
10500	United States	EqPA		High species richness (33.3+/-4)	Benthic community		*		Armstrong et al. 1979
11500 +/-5600	Trinity Bay, TX	EqPA		CPA Acute Marine Eop Threshold	Various		NE		Payne et al. 1988
22950	United States	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)		NE	1	Bolton et al. 1985
22950	United States	SSBA	~4-m	Significant increase in kidney MFO induction	Aquatic biota		*	1	Lyman et al. 1987
22950	United States	SSBA	~4-m	Significant change in liver somatic indices	Various		*		Armstrong et al. 1979
22950	United States	SSBA	~4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
22950	United States	SSBA	~4-m	Not significantly toxic (8+/-5.66% mortality)	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
32703 +/-46241	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (100% mortality)	Neathes sp. (polychaete)	JUV	NE		Payne et al. 1990
53200	Elizabeth River, VA	COA	24-d	Significantly toxic (100% mortality)	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
65400	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
95000	Elizabeth River, VA	COA	10-d	Highly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
367000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
		COA			Neathes sp. (polychaete)	JUV	*		Tay et al. 1990

Table 17. A summary of the available data on the biological effects associated with sediment-sorbed phenanthrene (ppb) used to support the derivation of sediment quality guidelines. PHENANTHRENE

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
4.6 +/- 1.6	Halifax Harbour, NS	SSBA	74-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT	NE		Payne et al., 1988
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al., 1990
15	Burrard Inlet, BC	SOO	10-d	Sediment quality objectives	Aquatic biota		NE		Swain & Nijman, 1991
39.4 +/- 47.6	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al., 1990
64.6	San Francisco Bay, CA	SSBA	74-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)	LAR	NE		Payne et al., 1988
66.2 +/- 57.5	San Francisco Bay, CA	SSBA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan, 1990
88	San Francisco Bay, CA	SSBA	4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	LAR	NE		Payne et al., 1988
110	United States	AETA		San Francisco Bay AET	Oyster, mussel		*	1	Long & Morgan, 1990
119	Southern California	EqPA		99% chronic marine criteria	Aquatic organisms		*		Anderson et al., 1987
150	Puget Sound, WA	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Malins et al., 1985
150	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al., 1985
150	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al., 1985
150	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Long & Morgan, 1990
150	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 +/- 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan, 1990
170	California	AETA		AET values	Mytilus edulis (bivalve)	LAR	*		Becker et al., 1990
180 +/- 325	Northern California	AETA		AET values	Benthic species		*		Becker et al., 1990
188	Marragansett Bay, RI	COA		Not significantly toxic (5.28 +/- 3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Munn et al., 1991
199	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan, 1990
220	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan, 1990
222 +/- 134	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	SG	NE		Long & Morgan, 1990
223 +/- 169	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	SG		Anderson et al., 1988
223 +/- 169	Burrard Inlet, BC	COA	10-d	Not toxic (4.5 +/- 3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66 +/- 2.15	McLeay et al., 1991
226	San Francisco Bay, CA	COA	10-d	Moderately toxic (59.4 +/- 11.3% abnormal)	Corophium volutator (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al., 1991
228	San Francisco Bay, CA	COA	48-h	Not toxic (5.21 +/- 3.61% emergence)	Bivalve	LAR	*		Long & Morgan, 1990
242	San Francisco Bay, CA	COA	10-d	Moderately toxic (35.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan, 1990
242	San Francisco Bay, CA	COA	48-h	Significantly toxic (35.7 +/- 22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan, 1990
259	United States	EqPA		95% chronic marine criteria	Aquatic organisms		SG		Pavlou et al., 1987
270	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	SG	*		Long & Morgan, 1990
270	United States	SLCA		NSLC-marine	Benthic spp.		*		Becker et al., 1990
270	California	AETA		AET values	Benthic species		*		Becker et al., 1990
>290	Southern California	AETA		AET values	Benthic species		*		Becker et al., 1990
316 +/- 582	Commencement Bay, WA	COA	96-h	Least toxic (15.1 +/- 3.1% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
320	Elizabeth River, VA	COA		No significant change in respiration rate	Oyster	ADT	NE		Alden & Butt, 1987
368	Puget Sound, WA	AETA		PSDA Screening level concentration	Aquatic biota		*		U.S. ACE 1988
374 +/- 461	United States	SSBA	96-h	NSLC-marine	Benthic species		NE		U.S. ACE 1988
383 +/- 332	Elizabeth River, VA	COA	4-m	Significantly toxic (4.5 +/- 3.24% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt, 1987
<403	Charleston Harbor, SC	COA		Significant change in liver somatic indices	Palaeomonetes pugio (grass shrimp)		NE		Payne et al., 1988
<403	Charleston Harbor, SC	COA		High species richness (14.9 +/- 2.04) SRUs	Pseudopleuronectes americanus (flounder)		NE		Winn et al., 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species		NE		Winn et al., 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NE		Winn et al., 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15 +/- 0.59) SDUs	Benthic species		NE		Winn et al., 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3 +/- 0.2) SDUs	Benthic species		NE		Winn et al., 1989
<408 +/- 501	Halifax Harbour, NS	COA	10-d	Low species diversity (1.16) SDUs	Benthic species		NE		Winn et al., 1989
<408 +/- 501	Halifax Harbour, NS	COA	20-d	Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al., 1990
<410 +/- 498	Halifax Harbour, NS	COA	10-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al., 1990
475	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Corophium volutator (amphipod)	ADT	NE		Long & Morgan, 1990
478	Commencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Bivalve	LAR	NE		Tetra Tech 1985
487 +/- 318	Commencement Bay, WA	SSBA	4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)	NE	*		Payne et al., 1988

Table 17. A summary of the available data on the biological effects associated with sediment-sorbed phenanthrene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
510	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
510	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
510	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
593	Commencement Bay, WA	COA		Moderately toxic (23+/-2.3% abnormality)	Oyster		*		Tetra Tech 1985
597	Commencement Bay, WA	COA	10-d	Significantly toxic (28+/-5.2% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
670	Commencement Bay, WA	SSBA	10-d	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
918 +/-1395	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.8% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLay et al. 1991
918 +/-1395	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.8% reburial)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLay et al. 1991
950	Eagle Harbor, WA	COA	10-d	Not toxic (8.9+/-2.9% mortality)	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1989
987 +/-1654	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)		*		Alden & Butt 1987
1000	Puget Sound, WA	SOC		Chemical Criteria	Benthic community		*	1	WDE 1989
1020	United States	EgPA		Interim Marine Sediment Quality Criteria (ICQC)	Benthic community		NE		EPA 1988
1213 +/-1547	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLay et al. 1991
<1267 +/-2528	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<1271 +/-2526	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
1379 +/-2545	Commencement Bay, WA	COA	10-d	Highly toxic (44.5+/-19% abnormality)	Oyster		*		Tetra Tech 1985
1500	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
1500	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
1500	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		P11 1988
1500	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		P11 1988
1688 +/-2920	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
1713 +/-2693	Elizabeth River, VA	COA	96-h	Significantly toxic (30.7+/-39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
2142	Eagle Harbor, WA	COA		Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)		NC		CH2M Hill 1989
2600	Eagle Harbor, WA	COA		Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)		NE		CH2M Hill 1989
2838	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
3000	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLay et al. 1991
3000	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLay et al. 1991
3077 +/-11068	Eagle Harbor, WA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84	CH2M Hill 1989
3200	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota		*		U.S. ACE 1988
3200	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
3480	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1989
3400	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
5400	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		P11 1988
6900	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		P11 1988
10000	United States	SSBA	10-d	Significant toxicity	Rhepoxynius abronius (amphipod)		*		P11 1988
11656 +/-14472	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Rhepoxynius abronius (amphipod)	ADT	*	0.9	Plesha et al. 1988
11656 +/-14472	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9+/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
11656 +/-14472	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6+/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
14000	United States	EgPA		Chronic Marine Eqp Threshold	Aquatic biota		*	1	Bolton et al. 1985
14000	United States	EgPA		EPA Acute Marine Eqp Threshold	Aquatic biota		*	1	Lyman et al. 1987
>30000	Newport Bay, CA	SSBA	14-d	LC50	Grandidierella japonica (amphipod)	ADT	*	0.1	SCURP 1989
>30000	San Mateo Point, CA	SSBA	14-d	LC50	Grandidierella japonica (amphipod)	ADT	*	1	SCURP 1989
<45903 +/-64909	Sidney Tar Pond, NS	COA	20-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	JUV	*		CH2M Hill 1989
91800	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)		NE		Tay et al. 1990
91800	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
105000	Elizabeth River, VA	COA	28-d	LC50	Rhepoxynius abronius (amphipod)	JUV	*		Roberts et al. 1989
484000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
2363200	Elizabeth River, VA	COA	24-d	LC50	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
4220000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 18. A summary of the available data on the biological effects associated with sediment-sorbed total low molecular weight PAHs (ppb) used to support the derivation of sediment quality guidelines.

TOTAL LOW MOLECULAR WEIGHT PAHs

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
5 +/-5.74	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.26% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	NE	0.42+/-0.13	Chapman et al. 1991
16.9 +/-34	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	NE	0.443+/-0.127	Chapman et al. 1991
28.6 +/-45.8	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	NE	0.425+/-0.128	Chapman et al. 1991
39.8 +/-44.6	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC	0.45+/-0.058	Chapman et al. 1991
60	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox		NC	0.4	Chapman et al. 1991
125 +/-134	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2+/-35 young produced)	Tigriopus californicus (copepod)	ADT	NC	1.03	Chapman et al. 1987
190 +/-45.2	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
208 +/-49.5	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
260	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR *			Long & Morgan 1990
280 +/-162	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	NC	1.14+/-0.33	Chapman et al. 1987
303 +/-705	Gulf of Mexico	COA		No effect on diversity index (3.21+/-0.239)	Benthic species	LAR	NE	0.464+/-0.143	Chapman et al. 1991
320	Northern California	AETA		AET Values	Mytilus edulis (bivalve)	LAR *			Becker et al. 1990
328 +/-739	Gulf of Mexico	COA		AET Values	Benthic species	LAR *			Chapman et al. 1991
335 +/-220	San Francisco Bay, CA	COA	48-h	Least toxic (6.32+/-3.68 TU/g)	Microtox	LAR	NE	0.47+/-0.149	Chapman et al. 1991
340 +/-98	San Francisco Bay, CA	COA	4-wk	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
361 +/-281	San Francisco Bay, CA	COA	48-h	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23+/-0.09	Chapman et al. 1987
383 +/-302	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	NE	1.2+/-0.38	Chapman et al. 1987
454 +/-869	Gulf of Mexico	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		Long & Morgan 1990
465 +/-770	San Francisco Bay, CA	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.471+/-0.18	Chapman et al. 1991
500	Burrard Inlet, BC	SQO		Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
532 +/-845	San Francisco Bay, CA	COA	10-d	Sediment Quality Objectives	Aquatic biota		NE		Swain & Nijman 1991
547 +/-326	San Francisco Bay, CA	COA	48-h	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990
552 +/-912	Gulf of Mexico	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	ADT	NE	1.26+/-0.17	Chapman et al. 1987
557 +/-768	San Francisco Bay, CA	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	SG	0.5+/-0.155	Chapman et al. 1991
560	California	AETA		Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)		SG		Long & Morgan 1990
560	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
596 +/-823	San Francisco Bay, CA	COA	48-h	AET Values	Benthic species	LAR	*		Long & Morgan 1990
610	Puget Sound, WA	AETA		Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	*		U.S. ACE 1988
624 +/-951	San Francisco Bay, CA	COA	10-d	PSDAA Screening level concentration	Aquatic biota	ADT	NE	1.4+/-0.79	Chapman et al. 1987
661 +/-887	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	NE	1.44+/-0.74	Chapman et al. 1987
680	Puget Sound, WA	SBA		Least Toxic (4.63+/-2.91% avoidance)	Amphipod		NE		U.S. ACE 1988
765 +/-1005	San Francisco Bay, CA	COA	10-d	EPA/ACOE Puget Sound Interim Criteria	Aquatic biota		SG		Long & Morgan 1990
805 +/-1063	Gulf of Mexico	COA	48-h	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	*	0.5+/-0.18	Chapman et al. 1991
920 +/-2280	San Francisco Bay, CA	COA	4-wk	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	ADT	*	2.87+/-1.07	Chapman et al. 1987
1019 +/-943	Commencement Bay, WA	COA		Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	LAR	NE		Tetra Tech 1985
1036 +/-1172	Gulf of Mexico	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR	*	0.567+/-0.153	Chapman et al. 1991
1300 +/-1312	San Francisco Bay, CA	COA	10-d	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	ADT	*	2.01+/-0.98	Chapman et al. 1987
1602 +/-1411	Commencement Bay, WA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod		NE		Tetra Tech 1985
2003 +/-1405	Commencement Bay, WA	COA		Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)		SG		Tetra Tech 1985
2031 +/-1316	Commencement Bay, WA	COA	10-d	Moderately toxic (23+/-2.3% abnormality)	Oyster		SG		Tetra Tech 1985

Table 18. A summary of the available data on the biological effects associated with sediment-sorbed total low molecular weight PAHs (ppb) used to support the derivation of sediment quality guidelines (continued).
TOTAL LOW MOLECULAR WEIGHT PAHs

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
2100	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
2100	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
2100	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
2192	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
2196	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5%/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
2280 +/-1195	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3%/-5.5% mortality)	Mussel	LAR	SG		Chapman et al. 1987
2280 +/-1195	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4%/-4.5% abnormal)	Bivalve	LAR	*	2.87 +/- 1.32	Chapman et al. 1987
2800	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
2960	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	*	3.59	Chapman et al. 1987
3160	San Francisco Bay, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
3160	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	*	4.03	Chapman et al. 1987
3700	Puget Sound, WA	SDG		Chemical Criteria	Benthic community		*	1	WDE 1989
3835 +/-4851	Commencement Bay, WA	COA		Highly toxic (44.5%/-19% abnormality)	Oyster		*		Tetra Tech 1985
5200	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
5200	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
5200	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
5200	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
5200	Puget Sound, WA	AETA		1989 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
6100	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
6100	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
6977 +/-8437	Commencement Bay, WA	COA	10-d	Highly toxic (78.5%/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
9910	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)		*		Alden & Butt 1987
13000	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
22554	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7%/-39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
24000	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988

Table 19. A summary of the available data on the biological effects associated with sediment-sorbed benz(a)anthracene (pbb) used to support the derivation of sediment quality guidelines.
 BENZ(A)ANTHRACENE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADI	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADI	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADI	NE		Tay et al. 1990
59.6 +/-129	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
60	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
71	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADI	NE		Malins et al. 1985
71	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADI	NE		Malins et al. 1985
80	Eagle Harbor, WA	COA	10-d	Low prevalence of hepatic idiopathic lesions (32.5%)	Rhepoxynius abronius (amphipod)	ADI	NE		Malins et al. 1985
95 +/-83.5	Burrard Inlet, BC	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADI	NE	2.66+/-2.15	Swartz et al. 1989
95 +/-83.5	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADI	NE	3.18+/-2.1	McLeay et al. 1991
130 +/-153	Narragansett Bay, RI	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADI	NE		McLeay et al. 1991
130	Burrard Inlet, BC	SDO		Not significantly toxic (5.28+/-3.04% mortality)	Annelisca abdita (amphipod)	ADI	NE		Munns et al. 1991
150	California	AETA		Sediment Quality Objectives	Aquatic biota	LAR	NE		Swain & Nijman 1991
150	Northern California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
235 +/-247	Commercement Bay, VA	COA		AET Values	Benthic species	*	*		Becker et al. 1990
<236 +/-242	Halifax Harbour, NS	COA	10-d	Least toxic (15.1+/-3.1% abnormality)	Oyster	ADI	NE		Tetra Tech 1985
<236 +/-242	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADI	NE		Tay et al. 1990
<236 +/-242	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% survival)	Corophium volutator (amphipod)	ADI	NE		Tay et al. 1990
<236 +/-242	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
261	United States	SLCA		MSLC- marine	Benthic spp.	*	1		Heff et al. 1986
261	United States	SLCA		MSLC-marine	Benthic species	*	1		Heff et al. 1987
310 +/-180	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	*		Anderson et al. 1988
<403	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species	NE	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species	NG	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NG	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species	NE	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species	NG	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NG	NG		Winn et al. 1989
420	California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
420	Southern California	AETA		AET Values	Benthic species	*	*		Becker et al. 1990
450	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	NE	NE		U.S. ACE 1988
476 +/-437	Commercement Bay, VA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADI	NE		Tetra Tech 1985
485 +/-848	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADI	NE		Alden & Butt 1987
520 +/-523	Commercement Bay, VA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Tetra Tech 1985
543 +/-646	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	NE	NE		Alden & Butt 1987
549 +/-304	Commercement Bay, VA	COA		Moderately toxic (23+/-2.3% abnormality)	Oyster	*	*		Tetra Tech 1985
<641 +/-536	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADI	NE		Tay et al. 1990
<641 +/-536	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
732 +/-600	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	SG	SG		Alden & Butt 1987
801 +/-866	Commercement Bay, VA	COA		Slightly toxic (44.5+/-19% abnormality)	Oyster	*	*		Tetra Tech 1985
<853 +/-401	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADI	*		Tay et al. 1990
931 +/-1323	Commercement Bay, VA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	*	*		Tetra Tech 1985

Table 19. A summary of the available data on the biological effects associated with sediment-sorbed benz(a)anthracene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration End-Point Measured	Species	Life Stage	Mit	IOC (%)	Reference
1003 +/- 829	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7 +/- 39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	SC	Alden & Butt 1987
1100	Puget Sound, WA	SoG		Chemical Criteria	Benthic community	ADT	*	WDE 1989
1100	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*	Becker et al. 1990
1100	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT	*	Long & Morgan 1990
1121 +/- 2054	Burrard Inlet, BC	COA	10-d	Not toxic (97.2 +/- 2.8% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	McLeay et al. 1991
1121 +/- 2054	Burrard Inlet, BC	COA	10-d	Not toxic (8.9 +/- 2.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	McLeay et al. 1991
1300	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	ADT	*	Bellar et al. 1986
1300	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox	ADT	*	PTI 1988
>1300	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-	Becker et al. 1990
>1300	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-	Becker et al. 1990
1493 +/- 2344	Burrard Inlet, BC	COA	10-d	Not toxic (7.9 +/- 5.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	McLeay et al. 1991
1600	United States	EqPA		99% chronic marine criteria	Aquatic organisms	ADT	*	Pavlou et al. 1987
1600	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*	Bellar et al. 1986
1600	Puget Sound, WA	AETA		1988 Puget Sound Amphipod AET	Crassostrea gigas (oyster)	LAR	*	Bellar et al. 1986
1600	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*	PTI 1988
2496 +/- 4157	Eagle Harbor, WA	COA	10-d	Least toxic (13 +/- 7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	CH2M Hill 1989
2822 +/- 4370	Eagle Harbour, WA	COA	10-d	Least toxic (0.1 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	CH2M Hill 1989
3431 +/- 2955	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.5 +/- 6.4%)	Parophrys vetulus (English sole)	ADT	*	Malins et al. 1985
3431 +/- 2955	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9 +/- 3.7%)	Parophrys vetulus (English sole)	ADT	*	Malins et al. 1985
3431 +/- 2955	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6 +/- 8.5%)	Parophrys vetulus (English sole)	ADT	*	Malins et al. 1985
4200	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	McLeay et al. 1991
4200	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	McLeay et al. 1991
4500	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Corophium volutator (amphipod)	ADT	*	U.S. ACE 1988
4500	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Aquatic biota	ADT	*	Bellar et al. 1986
5100	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic species	ADT	*	PTI 1988
5100	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community	ADT	*	PTI 1988
7370 +/- 9984	Eagle Harbor, WA	COA	28-d	Moderately toxic (41 +/- 9% mortality)	Rhepoxynius abronius (amphipod)	JUV	*	CH2M Hill 1989
8750	Elizabeth River, VA	COA		LC50	Leptostomus xanthurus (spot)	JUV	*	Roberts et al. 1989
10000		SSBA	10-d	Significant toxicity	Rhepoxynius abronius (amphipod)	JUV	*	Plesha et al. 1988
11088 +/- 8941	Eagle Harbor, WA	COA	20-d	Highly toxic (95.5 +/- 8.5% mortality)	Rhepoxynius abronius (amphipod)	JUV	*	CH2M Hill 1989
<12403 +/- 17533	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8 +/- 5.6% mortality)	Leptostomus xanthurus (spot)	JUV	*	Roberts et al. 1989
21000	United States	EqPA		95% chronic marine criteria	Rhepoxynius abronius (amphipod)	JUV	*	Plesha et al. 1988
24800	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	JUV	NE	Tay et al. 1990
24800	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	JUV	*	Tay et al. 1990
55000	United States	EqPA		Chronic Marine Eqp Threshold	Corophium volutator (amphipod)	ADT	*	Tay et al. 1990
55000	United States	EqPA		EPA Acute Marine Eqp Threshold	Rhepoxynius abronius (amphipod)	ADT	*	Bolton et al. 1985
124000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Aquatic biota	JUV	*	Lyman et al. 1987
196000	Elizabeth River, VA	COA	24-d	LC50	Neathes sp. (polychaete)	JUV	*	Roberts et al. 1989
350000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leptostomus xanthurus (spot)	JUV	*	Roberts et al. 1989

Table 20. A summary of the available data on the biological effects associated with sediment-sorbed benzo(a)pyrene (ppb) used to support the derivation of sediment quality guidelines. BENZO(A)PYRENE

Concentration (+/- SD)	Area	Analysis type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
10	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	SG		Swartz et al. 1989
41	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Paraphrys vetulus (English sole)	ADT	NE		Malins et al. 1985
41	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Paraphrys vetulus (English sole)	ADT	NE		Malins et al. 1985
63.1 +/-96.4	Puget Sound, WA	COA	10-d	Low prevalence of hepatic idiosyncratic lesions (32.5%)	Paraphrys vetulus (English sole)	ADT	NE		Malins et al. 1985
129 +/-61.4	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella Japonica (amphipod)	JUV	NE		Anderson et al. 1988
154 +/-173	Marragansett Bay, RI	COA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
160	Burrard Inlet, BC	SOO		Not significantly toxic (5.28%/-3.04% mortality)	Ameliscia abdita (amphipod)	ADT	NE		Munn et al. 1991
177 +/-147	Burrard Inlet, BC	COA	10-d	Sediment Quality Objectives	Aquatic biota	ADT	NE		Swain & Mijman 1991
177 +/-167	Burrard Inlet, BC	COA	10-d	Not toxic (4.5%/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66%/-2.15	McLeay et al. 1991
<300 +/-328	Halifax Harbour, NS	COA	10-d	Not toxic (5.2%/-3.6% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18%/-2.1	McLeay et al. 1991
<300 +/-328	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8%/-7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<300 +/-328	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5%/-6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<329 +/-385	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7%/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tetra Tech 1985
396	United States	SLCA		Least toxic (15.1%/-3.1% abnormality)	Oyster	NE	*	1	McLeay et al. 1987
397	United States	SLCA		NSLC-marine	Benthic spp.	NE	*	1	McLeay et al. 1987
400 +/-447	San Francisco Bay, CA	COA	10-d	Least toxic (18%/-6.6% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
<403	Charleston Harbor, SC	COA		High species richness (14.9%/-2.04) SRUs	Benthic species	NE	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05%/-1.33) SRUs	Benthic species	NE	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NE	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15%/-0.59) SDUs	Benthic species	NE	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3%/-0.2) SDUs	Benthic species	NE	NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NE	NG		Winn et al. 1989
404 +/-428	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4%/-11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
423 +/-465	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
429 +/-382	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9%/-19.2% mortality)	Mytilus edulis (bivalve)	LAR	SG		Becker et al. 1990
430	California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
430	Northern California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
432 +/-344	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8%/-4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990
465 +/-471	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7%/-22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
486 +/-484	San Francisco Bay, CA	COA	10-d	Highly toxic (67%/-11.8% mortality)	Bivalve	LAR	*		Long & Morgan 1990
509 +/-354	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella Japonica (amphipod)	JUV	SG		Anderson et al. 1988
596 +/-593	Commenment Bay, WA	COA	10-d	Least toxic (12.5%/-4.5% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Tetra Tech 1985
640	California	AETA		AET Values	Benthic species	NE	*		Becker et al. 1990
640	Southern California	AETA		AET Values	Benthic species	NE	*		Becker et al. 1990
680	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	NE	NE		U.S. ACE 1988
684 +/-464	Commenment Bay, WA	COA		Moderately toxic (23%/-2.3% abnormality)	Oyster	ADT	*		Tetra Tech 1985
<824 +/-617	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2%/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<824 +/-617	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1%/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
890 +/-1322	Commenment Bay, WA	COA	10-d	Moderately toxic (26%/-5.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	*		Tetra Tech 1985
990	Puget Sound, WA	SGO		Chemical Criteria	Benthic community	LAR	*	1	WDE 1989
1091 +/-338	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4%/-4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
<1097 +/-353	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7%/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
1192 +/-1643	Commenment Bay, WA	COA	10-d	Highly toxic (78.5%/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tetra Tech 1985
1261 +/-1620	Commenment Bay, WA	COA	10-d	Highly toxic (44.5%/-19% abnormality)	Oyster	ADT	*		Tetra Tech 1985
1264 +/-898	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7%/-39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NC		Alden & Butt 1987
>1300	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>1300	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
1300	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990

Table 20. A summary of the available data on the biological effects associated with sediment-sorbed benzo(a)pyrene (ppb) used to support the derivation of sediment quality guidelines (continued).
BENZO(A)PYRENE

Concentration (+/- SD)	Area	Analysis Type	Duration	End-Point Measured	Species	Life Stage	Hit	IDC (%)	Reference
1383 +/-2415	Burrard Inlet, BC	COA	10-d	Not toxic (97.2%/-2.8% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
1383 +/-2415	Burrard Inlet, BC	COA	10-d	Not toxic (8.9%/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
1681 +/-1170	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	ADT	MC		Alden & Butt 1987
1579 +/-1121	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3%/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
1579 +/-1121	Puget Sound, WA	COA		High prevalence of hepatic idopathic lesions (87.9%/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
1600	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6%/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
1600	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	LAR	*		Bellar et al. 1986
1600	Puget Sound, WA	AETA		1988 Puget Sound Oyster AET	Microtox	LAR	*		Bellar et al. 1986
1600	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		Pill 1988
1800	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		Pill 1988
1860 +/-2737	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
1939 +/-1993	Burrard Inlet, BC	COA	10-d	Not toxic (7.9%/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
2323 +/-2016	Eagle Harbor, WA	COA		Least toxic (13%/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		CH2M Hill 1989
2400	Eagle Harbor, WA	COA	10-d	Least toxic (0.1%/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84	CH2M Hill 1989
2462	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	ADT	*		Bellar et al. 1986
2764 +/-4982	Elizabeth River, VA	COA	28-d	LC50	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
3000	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5%/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	JUV	*		Alden & Butt 1987
3485 +/-2475	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	JUV	*		Pill 1988
3917 +/-7113	Eagle Harbor, WA	COA		Highly toxic (95.5%/-8.5% mortality)	Rhepoxynius abronius (amphipod)	JUV	*		CH2M Hill 1989
4100 +/-600	Puget Sound, WA	COA		1988 Puget Sound AET	Benthic community	JUV	*		Pill 1988
5000	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
5000	Burrard Inlet, BC	SSBA	10-d	Significant toxicity	Rhepoxynius abronius (amphipod)	ADT	NE	0.9	Plesha et al. 1988
5335 +/-6488	Eagle Harbor, WA	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
5335 +/-6488	Puget Sound, WA	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
6800	Puget Sound, WA	COA		Moderately toxic (41%/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		CH2M Hill 1989
6800	Puget Sound, WA	AETA		PSDA Maximum Level criteria	Aquatic biota	JUV	*		U.S. ACE 1988
<10853 +/-15341	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8%/-5.66% mortality)	Benthic species	JUV	*		Bellar et al. 1986
18000	United States	EQA		99% chronic marine criteria	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
21700	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*	1	Pavlou et al. 1987
21700	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
45000	United States	EQA		95% chronic marine criteria	Aquatic organisms	JUV	*	1	Pavlou et al. 1987
53160	Elizabeth River, VA	COA	24-d	LC50	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
98500	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Neanthes sp. (polychaete)	JUV	*		Roberts et al. 1989
116000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
450000	United States	EQA		Chronic Marine Eop Threshold	Aquatic biota	JUV	*	1	Bolton et al. 1985
450000	United States	EQA		EPA Acute Marine Eop Threshold	Aquatic biota	JUV	*	1	Lyman et al. 1987

Table 21. A summary of the available data on the biological effects associated with sediment-sorbed chrysene (ppb) used to support the derivation of sediment quality guidelines.
CHRYSENE

Concentration (+/- SD)	Area	Analysis Type	Duration	Test	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d		Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d		Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d		Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
80	Eagle Harbor, WA	COA	10-d		LC50	Rhepoxynius abronius (amphipod)	LAR	NE		Swartz et al. 1989
81.8 +/- 37	San Francisco Bay, CA	COA	48-h		Least toxic (4.5 +/- 3.02% abnormal)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66 +/- 2.15	Long & Morgan 1990
98.3 +/- 125	Burrard Inlet, BC	COA	10-d		Not toxic (5.21 +/- 3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18 +/- 2.1	McLay et al. 1991
98.3 +/- 125	Burrard Inlet, BC	COA	10-d		Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		McLay et al. 1991
127 +/- 226	Southern California	COA	10-d		Low occurrence of hepatic cellular alterations (0%)	Paraphys vetulus (English sole)	ADT	NE		Anderson et al. 1988
140	Puget Sound, WA	COA	10-d		Sediment quality objectives	Aquatic biota	ADT	NE		Malins et al. 1985
140	Burrard Inlet, BC	COA	10-d		Low prevalence of hepatic lesions (0%)	Paraphys vetulus (English sole)	ADT	NE		Malins et al. 1985
140	Puget Sound, WA	COA	10-d		Low prevalence of hepatic idiopathic lesions (32.5%)	Paraphys vetulus (English sole)	ADT	NE		Malins et al. 1985
167 +/- 188	Harragansett Bay, RI	COA	10-d		Not significantly toxic (5.28 +/- 3.04% mortality)	Annelisca abdita (amphipod)	ADT	NE		Munnis et al. 1991
190	California	AETA	10-d		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
<251 +/- 265	Northern California	COA	10-d		Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<251 +/- 265	Halifax Harbour, NS	COA	10-d		Not significantly toxic (8.5 +/- 6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<251 +/- 265	Halifax Harbour, NS	COA	20-d		Not significantly toxic (0.7 +/- 1.63% mortality)	Neaneas sp. (polychaete)	JUV	NE		Tay et al. 1990
358 +/- 365	Commencement Bay, WA	COA	48-h		Least toxic (15.1 +/- 3.1% abnormality)	Dyster	LAR	NE		Tetra Tech 1985
358 +/- 466	San Francisco Bay, CA	COA	48-h		Moderately toxic (39.4 +/- 11.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
378 +/- 549	San Francisco Bay, CA	COA	10-d		Least toxic (16 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
384	United States	SLCA	10-d		NSLC-marine	Rhepoxynius abronius (amphipod)	LAR	NE		Neff et al. 1986
384	United States	SLCA	10-d		NSLC-marine	Benthic spp.	LAR	NE		Neff et al. 1986
<403	Charleston Harbor, SC	COA	10-d		High species richness (14.9 +/- 2.04) SRUS	Benthic species	LAR	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d		Moderate species richness (9.05 +/- 1.33) SRUS	Benthic species	LAR	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d		Low species richness (5.16) SRUS	Benthic species	LAR	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d		High species diversity (4.15 +/- 0.59) SDUS	Benthic species	LAR	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d		Moderate species diversity (2.3 +/- 0.2) SDUS	Benthic species	LAR	NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA	10-d		Low species diversity (1.16) SDUS	Benthic species	LAR	NE		Winn et al. 1989
405 +/- 571	San Francisco Bay, CA	COA	10-d		Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
413 +/- 385	San Francisco Bay, CA	COA	10-d		Moderately toxic (35.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
423 +/- 512	San Francisco Bay, CA	COA	10-d		Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
500 +/- 671	San Francisco Bay, CA	COA	48-h		Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
517 +/- 729	San Francisco Bay, CA	COA	10-d		Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
523 +/- 234	Southern California	COA	10-d		Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
>610	Southern California	AETA	10-d		AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
670	Puget Sound, WA	COA	10-d		PSDDA Screening Level concentration	Aquatic biota	ADT	NE		U.S. ACE 1988
748 +/- 773	Commencement Bay, WA	COA	10-d		Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
780	California	AETA	10-d		AET Values	Benthic species	ADT	NE		Becker et al. 1990
>780	Southern California	AETA	10-d		AET Values	Benthic species	ADT	NE		Tetra Tech 1985
821 +/- 732	Commencement Bay, WA	COA	10-d		Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<873 +/- 1738	Halifax Harbour, NS	COA	10-d		Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
899 +/- 1604	Burrard Inlet, BC	COA	20-d		Not significantly toxic (1 +/- 2% mortality)	Neaneas sp. (polychaete)	JUV	NE		McLay et al. 1991
899 +/- 1604	Burrard Inlet, BC	COA	10-d		Not toxic (97.2 +/- 2.84% rebursal)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/- 1.96	McLay et al. 1991
902 +/- 691	Commencement Bay, WA	COA	10-d		Moderately toxic (23 +/- 2.3% abnormality)	Corophium volutator (amphipod)	ADT	NE	2.8 +/- 1.96	McLay et al. 1991
1016 +/- 558	Elizabeth River, VA	COA	96-h		Significantly toxic (50.7 +/- 39% mortality)	Oyster	ADT	NE		Tetra Tech 1985
1100	Puget Sound, WA	COA	10-d		Significant Criteria	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
<1163 +/- 2007	Halifax Harbour, NS	COA	10-d		Significantly toxic (61.7 +/- 12.5% mortality)	Benthic community	ADT	NE		Tay et al. 1990
1197 +/- 1826	Burrard Inlet, BC	COA	10-d		Not toxic (7.9 +/- 5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64 +/- 2.14	McLay et al. 1991
1200	United States	EgPA	10-d		99% chronic marine criteria	Rhepoxynius abronius (amphipod)	ADT	NE		Paylou et al. 1987
1218 +/- 1286	Commencement Bay, WA	COA	10-d		Highly toxic (54.5 +/- 19% abnormality)	Oyster	ADT	NE		Tetra Tech 1985
1363 +/- 1970	Commencement Bay, WA	COA	10-d		Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985

Table 21. A summary of the available data on the biological effects associated with sediment-sorbed chrysene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1400	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Beitar et al. 1986
1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
1533 +/-845	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	LAR	NC		Alden & Butt 1987
1679 +/-847	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/-4.5% abnormal)	Bivalve				Long & Morgan 1990
1700	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
2100	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
2100	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
2100	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)				Long & Morgan 1990
2530 +/-4113	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5 +/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	LAR	NE		Alden & Butt 1987
2600	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)		*		Beitar et al. 1986
2800	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Beitar et al. 1986
2800	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
3165 +/-4535	Eagle Harbor, WA	COA		Least toxic (13 +/-7% mortality)	Rhepoxynius abronius (amphipod)		NE		CH2M Hill 1989
3233 +/-6004	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
3300	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
3300	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
3715 +/-4775	Eagle Harbor, WA	COA	10-d	Least toxic (0.1 +/-0.07% mortality)	Corophium volutator (amphipod)	ADT	NE	1.5 +/-0.84	CH2M Hill 1989
4400	United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
5387 +/-3805	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3 +/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
5387 +/-3805	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9 +/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
5387 +/-3805	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6 +/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
6700	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
6700	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Beitar et al. 1986
7925	Elizabeth River, VA	COA	28-d	LC50	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
9200	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
9200	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
9203 +/-10972	Eagle Harbor, WA	COA		Moderately toxic (41 +/-9% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
10574 +/-7337	Eagle Harbor, WA	COA		Highly toxic (95.5 +/-8.5% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
<17303 +/-24462	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8 +/-5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
34600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
34600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
115000	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota		*	1	Boiton et al. 1985
115000	United States	EqPA		EPA Acute Marine Eqp Threshold	Aquatic biota		*	1	Lynan et al. 1987
144000	Sidney Tar Pond, NS	COA	20-d	Highly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
177520	Elizabeth River, VA	COA	24-d	LC50	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989
317000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leiostomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed dibenzo(a,h)anthracene (ppb) used to support the derivation of sediment quality guidelines. DIBENZO(A,H)ANTHRACENE

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<0.8 +/- 0.3	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7 +/- 12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		Tay et al. 1990
<1.9 +/- 2.1	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<1.9 +/- 2.1	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1 +/- 2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<3	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	NC		Tay et al. 1990
<3	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		Tay et al. 1990
<4 +/- 1.4	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8 +/- 5.6% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
8.3	Puget Sound, WA	COA	10-d	Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
8.3	Puget Sound, WA	COA	10-d	Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
15.4 +/- 15.2	Puget Sound, WA	COA	48-h	Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
23.9 +/- 36.4	Puget Sound, WA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Malins et al. 1985
30 +/- 34.6	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE	2.66 +/- 2.15	Anderson et al. 1988
30 +/- 34.6	Burrard Inlet, BC	COA	10-d	Not toxic (4.5 +/- 3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al. 1991
41.7 +/- 46	Burrard Inlet, BC	COA	10-d	Moderately toxic (59.4 +/- 11.3% abnormal)	Corophium volutator (amphipod)	ADT	NE		McLeay et al. 1991
44.3 +/- 31.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (33.8 +/- 4.7% mortality)	Bivalve	LAR	*		Long & Morgan 1990
49.2 +/- 48.3	San Francisco Bay, CA	COA	10-d	Not significantly toxic (5.28 +/- 3.04% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		Long & Morgan 1990
54.5 +/- 58.3	Narragansett Bay, RI	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Ameliscia abdita (amphipod)	ADT	NE		Munnis et al. 1991
54.8 +/- 40.6	San Francisco Bay, CA	COA	10-d	Least toxic (15.1 +/- 3.1% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NC		Long & Morgan 1990
57.4 +/- 76.7	Commenment Bay, WA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Oyster	NE			Tetra Tech 1985
60	Burrard Inlet, BC	SOD	10-d	Sediment Quality Objectives	Aquatic biota	NE			Long & Morgan 1990
61.6 +/- 79.6	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Swain & Nijman 1991
63	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
63	Northern California	AETA		AET Values	Benthic species	*			Becker et al. 1990
63.4 +/- 80.1	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
66 +/- 45.7	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	*		Anderson et al. 1988
71.7 +/- 139	Commenment Bay, WA	COA	10-d	Highly toxic (78.5 +/- 19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NG	2.8 +/- 1.96	Tetra Tech 1985
72.5 +/- 89.6	Burrard Inlet, BC	COA	10-d	Not toxic (97.2 +/- 2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8 +/- 1.96	McLeay et al. 1991
72.5 +/- 89.6	Burrard Inlet, BC	COA	10-d	Not toxic (8.9 +/- 2.99% mortality)	Corophium volutator (amphipod)	ADT	NE		Tetra Tech 1985
72.5 +/- 71.3	Commenment Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64 +/- 2.14	McLeay et al. 1991
73.3 +/- 110	Burrard Inlet, BC	COA	10-d	Not toxic (7.9 +/- 5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
79.6 +/- 87.5	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	SG		Tetra Tech 1985
101 +/- 57.9	Commenment Bay, WA	COA	10-d	Moderately toxic (23 +/- 2.3% abnormality)	Oyster	*			Becker et al. 1990
120	California	AETA		AET Values	Benthic species	*			U.S. ACE 1988
120	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	NE			Becker et al. 1990
>120	Southern California	AETA		AET Values	Benthic species	*			Tetra Tech 1985
183 +/- 344	Commenment Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<188 +/- 230	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<188 +/- 230	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<188 +/- 230	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7 +/- 1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed dibenzo(a,h)anthracene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)		Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
200		Burrard Inlet, BC	COA	10-d	Highly toxic (30-5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3-5	McLeay et al. 1991
200		Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3-5	McLeay et al. 1991
217 +/-88.1		San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
230		Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
230		Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
230		Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
230		Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		PTI 1988
260		San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
260		Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	LAR	*		Bellar et al. 1986
263 +/-413		Commencement Bay, WA	COA		Highly toxic (44.5 +/- 19% abnormality)	Oyster		*		Tetra Tech 1985
274 +/-199		Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3 +/- 6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
274 +/-199		Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9 +/- 3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
274 +/-199		Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6 +/- 8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
>300		Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>300		California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
300		San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
330		Puget Sound, WA	SG		Chemical Criteria	Benthic community		*	1	WDE 1989
360 +/-298		Eagle Harbor, WA	COA		Least toxic (13 +/- 7% mortality)	Rhepoxynius abronius (amphipod)		NE		CH2M Hill 1989
399 +/-252		Eagle Harbor, WA	COA		Highly toxic (95.5 +/- 8.5% mortality)	Rhepoxynius abronius (amphipod)		SG		CH2M Hill 1989
<403		Charleston Harbor, SC	COA		High species richness (14.9 +/- 2.04) SRUs	Benthic species		NE		Winn et al. 1989
<403		Charleston Harbor, SC	COA		Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species		NE		Winn et al. 1989
<403		Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<403		Charleston Harbor, SC	COA		High species diversity (4.15 +/- 0.59) SDUs	Benthic species		NE		Winn et al. 1989
<403		Charleston Harbor, SC	COA		Moderate species diversity (2.3 +/- 0.2) SDUs	Benthic species		NG		Winn et al. 1989
<403		Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
428 +/-284		Eagle Harbour, WA	COA	10-d	Least toxic (0.1 +/- 0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5 +/- 0.84	CH2M Hill 1989
540		Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988
797 +/-723		Eagle Harbor, WA	COA		Moderately toxic (41 +/- 9% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
970		Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
1200		Puget Sound, WA	AETA		PSODA Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
1200		Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
12000		Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
12000		United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
35000		United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed fluoranthene (ppb) used to support the derivation of sediment quality guidelines.
FLUORANTHENE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<10	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
39	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
136 +/-107	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
153 +/-307	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
170	Burrard Inlet, BC	SOD		Sediment Quality Objectives	Aquatic biota		NE		Swain & Nijman 1991
220	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
220	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
>290	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
339 +/-423	Narragansett Bay, RI	COA		AET Values	Ameliscia abdita (amphipod)	ADT	NE		Munn et al. 1991
360 +/-20.2	Burrard Inlet, BC	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
360 +/-20.2	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
382 +/-241	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Corophium volutator (amphipod)	ADT	NE		Anderson et al. 1988
390	Northern California	AETA		AET Values	Grandidierella japonica (amphipod)	JUV	*		Becker et al. 1990
<403	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SODs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SODs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SODs	Benthic species		NG		Winn et al. 1989
432	United States	SLCA		NSLC-marine	Benthic spp.		*	1	Neff et al. 1986
451 +/-562	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
489 +/-492	Commencement Bay, WA	COA		Least toxic (15.1+/-3.1% abnormality)	Oyster		NE		Tetra Tech 1985
509 +/-481	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
539 +/-842	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
<548 +/-167	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<548 +/-167	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<548 +/-167	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
572 +/-880	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
580	California	AETA		AET Values	Benthic species		*		Becker et al. 1990
	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
584 +/-789	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)		SG		Long & Morgan 1990
600	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1989
626 +/-904	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
630	Puget Sound, WA	AETA		PSDA Screening level concentration	Aquatic biota		NE		U.S. ACE 1988
644	United States	SLCA		NSLC-marine	Benthic species		*	1	Neff et al. 1987
682 +/-1043	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
794 +/-1210	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)		SG		Long & Morgan 1990
923 +/-865	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)		NE		Tetra Tech 1985
925 +/-864	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)		SG		Tetra Tech 1985

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed fluoranthene (ppb) used to support the derivation of sediment quality guidelines (continued).
FLUORANTHENE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
972 +/-866	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	NE	*		Alden & Butt 1987
1046 +/-655	Commencement Bay, WA	COA		Moderately toxic (23+/-2.3% abnormality)	Oyster	*	*		Tetra Tech 1985
1331 +/-654	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)	ADT	*		Alden & Butt 1987
1352 +/-595	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	SG		Alden & Butt 1987
1500	Newport, OR	SSBA		Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	NE	0.18	Swartz et al. 1990
1545 +/-231	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
1545 +/-231	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
1600	Puget Sound, WA	SOQ		Chemical Criteria	Benthic community	*	*	1	WDE 1989
1600	United States	EqPA		99% chronic marine criteria	Aquatic organisms	*	*	1	Pavlou et al. 1987
1655 +/-2029	Commencement Bay, WA	COA		Highly toxic (44.5+/-19% abnormality)	Oyster	*	*		Tetra Tech 1985
1700	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	*	*		Bellar et al. 1986
1700	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox	*	*		PTI 1988
<1986 +/-93.3	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<1988 +/-93.3	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
2000	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
2050 +/-260	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
2360 +/-3330	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	LAR	*		Tetra Tech 1985
2500	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	*	*		Bellar et al. 1986
2500	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	*	*		PTI 1988
<2647 +/-108	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
2737 +/-1617	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
3000	Newport, OR	SSBA	10-d	Significantly toxic	Rhepoxynius abronius (amphipod)	ADT	*	0.18	Swartz et al. 1990
3000	Newport, OR	SSBA	10-d	Not significantly toxic	Corophium spinicorne (amphipod)	ADT	NE	0.18	Swartz et al. 1990
3000	Newport, OR	SSBA	10-d	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	NE	0.31	Swartz et al. 1990
3000	Newport, OR	SSBA	10-d	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	NE	0.48	Swartz et al. 1990
3100	United States	EqPA	10-d	95% chronic marine criteria	Aquatic organisms	*	*	1	Pavlou et al. 1987
3300	Newport, OR	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	*	*	0.2	Swartz et al. 1987
3400	Newport, OR	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*	0.18	Swartz et al. 1990
3600	United States	EqPA		Chronic marine sediment quality criteria (FCV)	Rhepoxynius abronius (amphipod)	*	*	1	Pavlou et al. 1987
3600	United States	EqPA		EPA Chronic Marine Eqp Threshold	Aquatic Biota	*	*	1	Lyman et al. 1987
3700	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
3700	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
3700	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	*	*		Long & Morgan 1990
3900	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	*	*		Bellar et al. 1986
4200		SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	*	*		Swartz et al. 1988
4200	Eagle Harbour, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	*	*		Swartz et al. 1989
5100 +/-700		SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	*	*		Dewitt et al. 1989
5100	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
5100	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
5100	Newport, OR	SSBA	10-d	LC50	Corophium spinicorne (amphipod)	ADT	*	0.18	Swartz et al. 1990
6200	Puget Sound, WA	SSBA		LC50	Rhepoxynius abronius (amphipod)	*	*	0.3	Swartz et al. 1987
6300		AETA		PSDDA Maximum level criteria	Aquatic biota	*	*		U.S. ACE 1988

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed fluoranthene (ppb) used to support the derivation of sediment quality guidelines (continued).
FLUORANTHENE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	FOC (%)	Reference
6300	Puget Sound, WA	AETA	10-d	1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
6500	Newport, OR	SSBA	10-d	Significantly toxic	Rhepoxynius abronius (amphipod)	ADT	*	0.48	Swartz et al. 1990
6500	Newport, OR	SSBA	10-d	LC100	Rhepoxynius abronius (amphipod)	ADT	*	0.18	Swartz et al. 1990
6500	Newport, OR	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*	0.31	Swartz et al. 1990
6500	Newport, OR	SSBA	10-d	Significantly toxic	Corophium spinicorne (amphipod)	ADT	*	0.18	Swartz et al. 1990
6500	Newport, OR	SSBA	10-d	Not significantly toxic	Corophium spinicorne (amphipod)	ADT	NE	0.31	Swartz et al. 1990
6500	Newport, OR	SSBA	10-d	Significantly toxic	Rhepoxynius abronius (amphipod)	ADT	*	0.31	Swartz et al. 1990
8895 +/- 10337	Eagle Harbor, WA	COA	10-d	Moderately toxic (41%/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		CH2M Hill 1989
9000	United States	EPA	10-d	EPA Acute Marine Eop Threshold	Aquatic biota		*	1	Lyman et al. 1987
9300 +/- 1300		SSBA	10-d	LC50	Eohaustorius estuarius (amphipod)		*		Dewitt et al. 1989
10500		SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)		*	0.5	Swartz et al. 1987
10700	Newport, OR	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*	0.48	Swartz et al. 1990
10700 +/- 1500		SSBA	10-d	LC50	Eohaustorius estuarius (amphipod)		*		Dewitt et al. 1989
11800 +/- 1200		SSBA	10-d	LC50	Eohaustorius estuarius (amphipod)		*		Dewitt et al. 1989
12080 +/- 51889	Eagle Harbor, WA	COA	10-d	Least toxic (13%/-7% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
13600	Newport, OR	SSBA	10-d	LC100	Rhepoxynius abronius (amphipod)	ADT	*	0.31	Swartz et al. 1990
13600	Newport, OR	SSBA	10-d	Significantly toxic	Corophium spinicorne (amphipod)	ADT	*	0.48	Swartz et al. 1990
13600	Newport, OR	SSBA	10-d	Significantly toxic	Corophium spinicorne (amphipod)	ADT	*	0.31	Swartz et al. 1990
<13600	Newport, OR	SSBA	10-d	LC50	Corophium spinicorne (amphipod)	ADT	*	0.31	Swartz et al. 1990
15000		SSBA	10-d	Significant toxicity	Rhepoxynius abronius (amphipod)		*	0.9	Plesha et al. 1988
15523 +/- 15185	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3%/-6.4%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
15523 +/- 15185	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9%/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
15523 +/- 15185	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6%/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
24000	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
30000	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988
<37303 +/- 10320	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8%/-5.66% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
59250	Elizabeth River, VA	COA	28-d	LC50	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989
71988 +/- 95713	Eagle Harbor, WA	COA		Highly toxic (95.5%/-8.5% mortality)	Rhepoxynius abronius (amphipod)		*		CH2M Hill 1989
74600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
74600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
386000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
1327200	Elizabeth River, VA	COA	24-d	LC50	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989
2370000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leiosomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed pyrene (ppb) used to support the derivation of sediment quality guidelines.
PYRENE

Concentration (+/- SD)	Area	Analysis ¹⁾ Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<5	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<5	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
93	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
93	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
93	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
124 +/- 98	Southern California	SSBA	4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	JUV	NE		Payne et al. 1988
184 +/- 318	San Francisco Bay, CA	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
216 +/- 102	San Francisco Bay, CA	COA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
240	Burrard Inlet, BC	S90		Sediment Quality Objectives	Aquatic biota	LAR	NE		Swain & Wijnan 1991
317 +/- 400	Maragansett Bay, RI	COA		Not significantly toxic (5.28 +/- 3.04% mortality)	Angelisca abdita (amphipod)	ADT	NE		Munns et al. 1981
350	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	NE		Startz et al. 1989
<403	Charleston Harbor, SC	COA		High species richness (14.9 +/- 2.04) SRUs	Benthic species	NE	*		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species	NE	*		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NE	*		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15 +/- 0.59) SDUs	Benthic species	NE	*		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3 +/- 0.21) SDUs	Benthic species	NE	*		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NE	*		Winn et al. 1989
430	Puget Sound, WA	AETA		PSDQA Screening level concentration	Aquatic biota	NE	*		U.S. ACE 1988
434	United States	SLCA		NSLC- marine	Benthic spp.	NE	*	1	Neff et al. 1986
434 +/- 442	Commement Bay, WA	COA		Least toxic (15.1 +/- 3.1% abnormality)	Oyster	NE	*		Tetra Tech 1985
<476 +/- 504	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8 +/- 7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<476 +/- 504	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5 +/- 6.0% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<476 +/- 504	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7 +/- 1.6% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
490	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
527 +/- 446	Northern California	COA	10-d	Not toxic (4.5 +/- 3.02% emergence)	Benthic species	ADT	*	2.66 +/- 2.15	Becker et al. 1990
527 +/- 446	Burrard Inlet, BC	COA	10-d	Not toxic (5.21 +/- 3.61% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.18 +/- 2.1	McLeay et al. 1991
532 +/- 372	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Corophium volutator (amphipod)	ADT	NE		McLeay et al. 1991
665	United States	SLCA		NSLC-marine	Grandidierella japonica (amphipod)	JUV	*		Anderson et al. 1988
700	California	AETA		AET Values	Benthic species	JUV	*	1	Neff et al. 1987
701 +/- 866	Southern California	AETA		AET Values	Benthic species	JUV	*		Becker et al. 1990
724 +/- 959	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
743 +/- 902	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
777 +/- 908	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
806 +/- 975	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
>840	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
850	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*	1	Becker et al. 1990
865 +/- 719	United States	COA		99% chronic marine criteria	Aquatic organisms	ADT	*		Pavlov et al. 1987
896 +/- 870	Commement Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
978 +/- 996	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
987 +/- 1122	Commement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tetra Tech 1985
1068 +/- 405	Elizabeth River, VA	SSBA	4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT	NE		Payne et al. 1988
1078 +/- 806	Commement Bay, VA	COA	96-h	Significantly toxic (50.7 +/- 39% mortality)	Oyster	ADT	NE		Alden & Butt 1987
1110 +/- 904	San Francisco Bay, CA	COA	10-d	Moderately toxic (23 +/- 2.3% abnormality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
1278 +/- 2197	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
1346 +/- 838	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
1394 +/- 1051	Elizabeth River, VA	SSBA	4-m	No significant change in spleen condition indices	Palaeomonetes pugio (grass shrimp)	ADT	NE		Payne et al. 1988
1396 +/- 1621	Elizabeth River, VA	COA	96-h	No significant change in spleen condition indices	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
<1486 +/- 1082	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2 +/- 3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<1486 +/- 1082	Halifax Harbour, NS	COA	10-d	Not significantly toxic (1 +/- 2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
1538 +/- 1501	Commement Bay, WA	COA	20-d	Highly toxic (44.5 +/- 19% abnormality)	Oyster	JUV	NE		Tetra Tech 1985

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed pyrene (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
1820 +/-252	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
1900	Puget Sound, WA	SGC		Low Abundance Threshold Concentration	Praxitella gracilis (polychaete)		*	3.0	Tetra Tech 1986
1900	Puget Sound, WA	SGC		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		*	7.0	Tetra Tech 1986
1900	United States	EGPa		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
<1980 +/-283	Halifax Harbour, NS	SSBA	4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT	*		Payne et al. 1988
<1980 +/-540	Halifax Harbour, NS	SSBA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tay et al. 1990
2188 +/-776	San Francisco Bay, CA	COA	48-h	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)		*		Long & Morgan 1990
2600	Northern California	AETA		AET Values	Bivalve	LAR	*		Becker et al. 1990
2600	Puget Sound, WA	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
2600	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Rhepoxynius abronius (amphipod)	ADT	*		Bellar et al. 1986
2600	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		Bellar et al. 1986
3300	Puget Sound, WA	SGC		Low Abundance Threshold Concentration	Rhepoxynius abronius (amphipod)		*		Long & Morgan 1990
3300	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Microtox		*	4.0	PFI 1988
3300	Puget Sound, WA	AETA		1988 Puget Sound AET	Nucula tenuis (pelecypoda)	LAR	*		Bellar et al. 1986
3395 +/-5748	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Crassostrea gigas (oyster)		*		PFI 1988
3395 +/-5748	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.9%	McLeay et al. 1991
3400	San Francisco Bay, CA	AETA		San Francisco Bay AET	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.9%	McLeay et al. 1991
4300	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Oyster; mussel	LAR	*		Long & Morgan 1990
4320 +/-6478	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
7300	Puget Sound, WA	AETA		PSDDA Maximum level criteria	Rhepoxynius abronius (amphipod)	ADT	NE	2.64+/-2.14	McLeay et al. 1991
>7300	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Aquatic biota		*		U.S. ACE 1988
10000	Puget Sound, WA	SGC		Chemical Criteria	Benthic species		*		Bellar et al. 1986
11377 +/-9095	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3+/-6.4%)	Benthic community		*	1	WDE 1989
11377 +/-9095	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9+/-3.7%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
11377 +/-9095	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6+/-8.5%)	Parophrys vetulus (English sole)	ADT	*		Malins et al. 1985
12000	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
12000	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
16000	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PFI 1988
<33503 +/-47090	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Rhepoxynius abronius (amphipod)	JUV	NE		Tay et al. 1990
33750	Elizabeth River, VA	COA	28-d	LC50	Neanthes sp. (polychaete)	JUV	*	1	Roberts et al. 1989
49500	United States	EGPa		Chronic Marine Eqp Threshold	Leostomus xanthurus (spot)		*	1	Lyman et al. 1987
66600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Aquatic biota		*		Lyman et al. 1987
66600	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
330000	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
756000	Elizabeth River, VA	COA	24-d	LC50	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
1350000	Elizabeth River, VA	COA		Highly toxic (100% mortality)	Leostomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 25. A summary of the available data on the biological effects associated with sediment-sorbed total high molecular PAHs (ppb) used to support the derivation of sediment quality guidelines.
TOTAL HIGH MOLECULAR PAHs

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
11	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox		NC	0.4	Chapman et al. 1991
19.3 +/- 12.7	Gulf of Mexico	COA	10-d	Significantly toxic (43.75 +/- 38.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC	0.45 +/- 0.058	Chapman et al. 1991
26 +/- 13	Gulf of Mexico	COA	10-d	Not toxic (0.36 +/- 0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	NE	0.42 +/- 0.13	Chapman et al. 1991
26.8 +/- 16	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76 +/- 1.89% abnormality)	Crassostrea gigas (oyster)	LAR	NE	0.425 +/- 0.128	Chapman et al. 1991
28.1 +/- 16.8	Gulf of Mexico	COA	48-h	Not toxic (4.54 +/- 5.37% mortality)	Crassostrea gigas (oyster)	LAR	NE	0.443 +/- 0.127	Chapman et al. 1991
198 +/- 557	Gulf of Mexico	COA		No effect on diversity index (3.21 +/- 0.239)	Benthic species		NE	0.464 +/- 0.143	Chapman et al. 1991
217 +/- 584	Gulf of Mexico	COA		Least toxic (6.32 +/- 3.68 TU/g)	Microtox		NE	0.47 +/- 0.149	Chapman et al. 1991
301 +/- 696	Gulf of Mexico	COA	10-d	Not significantly toxic (9 +/- 3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	0.471 +/- 0.18	Chapman et al. 1991
342 +/- 753	Gulf of Mexico	COA	10-d	Highly toxic (2.5 +/- 1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	SG	0.5 +/- 0.155	Chapman et al. 1991
445 +/- 318	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 35 young produced)	Tigriopus californicus (copepod)	ADT	NC	1.03	Chapman et al. 1987
497 +/- 922	Gulf of Mexico	COA	48-h	Highly toxic (59.4 +/- 15.5% mortality)	Crassostrea gigas (oyster)	LAR	*	0.5 +/- 0.18	Chapman et al. 1991
656 +/- 1059	Gulf of Mexico	COA	48-h	Significantly toxic (32.6 +/- 14.2% abnormality)	Crassostrea gigas (oyster)	LAR	*	0.567 +/- 0.153	Chapman et al. 1991
788 +/- 446	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
1084 +/- 665	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NC	1.14 +/- 0.033	Chapman et al. 1987
1200	Burrard Inlet, BC	S90		Sediment Quality Objectives	Aquatic biota		NE		Swain & Wijnman 1991
1345 +/- 459	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.009	Chapman et al. 1987
1421 +/- 179	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	NC		Long & Morgan 1990
1480 +/- 1630	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
1536 +/- 1410	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 8.01% abnormal)	Mussel	LAR	NE	1.2 +/- 0.038	Chapman et al. 1987
1700	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
1700	Northern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
1800	Puget Sound, WA	AETA		PSDDA Screening Level concentration	Aquatic biota		NE		U.S. ACE 1988
1927 +/- 3325	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
2085 +/- 3696	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
2373 +/- 1836	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.61% abnormal)	Mussel	LAR	SG	1.26 +/- 0.17	Chapman et al. 1987
2482 +/- 3201	San Francisco Bay, CA	COA	10-d	Significantly toxic (62.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Long & Morgan 1990
2586 +/- 4113	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.76% mortality)	Amphipod	ADT	NE	1.4 +/- 0.79	Chapman et al. 1987
2594 +/- 3478	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
2686 +/- 2631	Comencement Bay, WA	COA		Least toxic (15.1 +/- 3.1% abnormality)	Oyster		NE		Tetra Tech 1985
2690	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota		NE		U.S. ACE 1988
2823 +/- 3867	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.91% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.074	Chapman et al. 1987
3462 +/- 4052	San Francisco Bay, CA	COA	10-d	Highly toxic (67 +/- 11.8% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Long & Morgan 1990
4865 +/- 4800	Comencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Benthic species		NE		Tetra Tech 1985
5200	California	AETA		AET Values	Benthic species		*		Becker et al. 1990
5200	Southern California	AETA		AET Values	Amphipod	ADT	*	2.01 +/- 0.098	Chapman et al. 1987
5660 +/- 5673	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.51% mortality)	Oyster		*		Tetra Tech 1985
5838 +/- 4042	Comencement Bay, WA	COA		Moderately toxic (23 +/- 2.3% abnormality)	Rhepoxynius abronius (amphipod)	SG	SG		Tetra Tech 1985
6178 +/- 6439	Comencement Bay, WA	COA	10-d	Moderately toxic (26 +/- 5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NC		Alden & Butt 1987
7447	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7 +/- 39% mortality)	Palaeomonetes pugio (grass shrimp)	LAR	NE	1.25	Chapman et al. 1987
8500	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel		*		Tetra Tech 1985
9042 +/- 9373	Comencement Bay, WA	COA		Highly toxic (44.5 +/- 19% abnormality)	Oyster		*		Tetra Tech 1985
9455 +/- 4313	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	LAR	*		Long & Morgan 1990

Table 25. A summary of the available data on the biological effects associated with sediment-sorbed total high molecular PAHs (ppb) used to support the derivation of sediment quality guidelines (continued).
TOTAL HIGH MOLECULAR PAHs

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
9457 +/-4312	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	SG	2.87+/-1.32	Chapman et al. 1987
9457 +/-4312	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	*	2.87+/-1.07	Chapman et al. 1987
9600	Puget Sound, WA	SOG		Chemical Criteria	Benthic community		*	1	WDE 1989
9794 +/-12821	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)		*		Tetra Tech 1985
10083	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaeomonetes pugio (grass shrimp)		NC		Alden & Butt 1987
>11000	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
>11000	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
11230	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaeomonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
11460	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
11950	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
12000	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Mussel	LAR	*	3.59	Chapman et al. 1987
12000	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		Bellar et al. 1986
12060	San Francisco Bay, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT	*	4.03	PTI 1988
12060	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	*	4.03	Chapman et al. 1987
17000	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
17000	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
18000	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
51000	Puget Sound, WA	AETA		PS00A Maximum level criteria	Aquatic biota		*		U.S. ACE 1988
>51000	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
69000	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
69000	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988

Table 26. A summary of the available data on the biological effects associated with sediment-sorbed total PAHs used to support the derivation of sediment quality guidelines. TOTAL PAHs

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<1	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
<80	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<80	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
210 +/-65	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Meris virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
210 +/-65	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
210 +/-65	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
235 +/-248	Pensacola Harbor & Bay, FL	SSBA	4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT	NE		Payne et al. 1988
941 +/-429	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
1129	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1129	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1129	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
2242 +/-3961	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
2447 +/-1837	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	2.66+/-2.15	McLeay et al. 1991
2447 +/-1837	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	NE	3.18+/-2.1	McLeay et al. 1991
2590	Eagle Harbor, WA	COA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	NE		Swartz et al. 1989
3323 +/-6337	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
3343 +/-4039	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
3527 +/-4520	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	NE	NE		Long & Morgan 1990
<3800	San Francisco Bay, CA	SOAV	SOIA	Significantly toxic triad minimum bioeffects	Benthic species	NE	NE		Chapman et al. 1987
3832 +/-3927	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Long & Morgan 1990
3966 +/-3524	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Long & Morgan 1990
4022 +/-4908	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
4201 +/-4612	Puget Sound, WA	COA	10-d	Not toxic (< 12.5% mortality)	Rhepoxynius abronius (amphipod)	NE	NE	3.4+/-2.0	DeWitt et al. 1988
4227 +/-5025	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	SG	SG		Long & Morgan 1990
<4273 +/-4204	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
<4273 +/-4204	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<4306 +/-4172	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% survival)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
7627 +/-7065	Puget Sound, WA	COA	10-d	Moderately toxic (>12.5% mortality)	Rhepoxynius abronius (amphipod)	NE	NE	4.2+/-2.6	DeWitt et al. 1988
8364 +/-7087	Southern California	COA	10-d	Significantly toxic (51.7% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
9500	San Francisco Bay, CA	SOAV	SOIA	Significantly toxic triad significant bioeffects	Benthic species	NE	NE		Chapman et al. 1987
9730 +/-22390	Mississippi Sound, MS	COA	96-h	Not toxic (14.4+/-5.9% mortality)	Gammarus mucronatus (amphipod)	JUV	NE	2.9+/-3.5	Lytle & Lytle 1985
<9795 +/-10916	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV	NE		Tay et al. 1990
<9845 +/-10861	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT	NE		Tay et al. 1990
10200 +/-9950	Fort Estuary	COA		High metafaunal density (375+/-1804/10 sq.cm.)	Various	NE	NE		Long 1987
11735 +/-5499	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
11752 +/-14548	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Rhepoxynius abronius (amphipod)	NE	NE	5.2+/-4.4	DeWitt et al. 1988
11800 +/-9700	Fort Estuary	COA		Moderate metafaunal density (1335+/-396/10 sq.cm.)	Various	SG	SG		Long 1987
11924 +/-25733	Mississippi Sound, MS	COA	96-h	Not significantly toxic (15.2+/-6.74% mortality)	Gammarus mucronatus (amphipod)	ADT	NE	2.90+/-3.42	Lytle & Lytle 1985
12325 +/-10425	Hampton Roads Harbor, VA	COA	96-h	Moderately toxic (8.8+/-1.8% mortality)	Palaemonetes pugio (shrimp)	ADT	NE		Alden & Butt 1987
<12793 +/-11171	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Tay et al. 1990
13033 +/-21225	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% rebursal)	Rhepoxynius abronius (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991
13033 +/-21225	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	NE	2.8+/-1.96	McLeay et al. 1991

Table 26. A summary of the available data on the biological effects associated with sediment-sorbed total PAHs used to support the derivation of sediment quality guidelines (continued).

TOTAL PAHs

Concentration ($\mu\text{g/g}$ SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
13422	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT	NE		Alden & Butt 1987
13656	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5 $\pm$ 3.2% mortality)	Palaemonetes pugio (grass shrimp)		NE		Alden & Butt 1987
13855 $\pm$ 19014		SSBA	4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)		NE		Payne et al. 1988
>15000	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
16921 $\pm$ 20976	San Francisco Bay, CA	COA	96-h	Least toxic (2.2 $\pm$ 1.8% mortality)	Palaemonetes pugio (shrimp)		NE		Long & Morgan 1990
17253 $\pm$ 23850	Hampton Roads Harbor, VA	COA	10-d	Not toxic (7.9 $\pm$ 5.12% mortality)	Palaemonetes pugio (shrimp)		NE	2.64 $\pm$ 2.14	Alden & Butt 1987
18300 $\pm$ 5515	Burrard Inlet, BC	COA	96-h	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	NE	2.77	McLeay et al. 1991
19993	Bayou Casotte, MS	COA	96-h	Significant decrease in respiration rates	Mysidopsis almyra (mysid shrimp)		SG		Lytle & Lytle 1983
21467 $\pm$ 31160	Elizabeth River, VA	COA	14-d	Not toxic (increased growth rate)	Palaemonetes pugio (grass shrimp)		NE		Alden & Butt 1987
24003 $\pm$ 22130	Hudson-Raritan Bay, NY	SSBA	4-m	No significant change in spleen condition indices	Chromadorina germanica (nematode)		NE		Tietjen & Lee 1984
30001	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7 $\pm$ 39% mortality)	Pseudopleuronectes americanus (flounder)	ADT	NE		Payne et al. 1988
35700 $\pm$ 42181	Hampton Roads Harbor, VA	COA	96-h	Highly toxic (70 $\pm$ 20.3% mortality)	Palaemonetes pugio (grass shrimp)		NE		Alden & Butt 1987
36239 $\pm$ 68844	Mississippi Sound, MS	COA	96-h	Significantly toxic (81.4 $\pm$ 19.6% mortality)	Palaemonetes pugio (grass shrimp)		NE		Alden & Butt 1987
37555 $\pm$ 59921	Mississippi Sound, MS	COA	96-h	Significantly toxic (76.7 $\pm$ 21.3% mortality)	Gammarus mucronatus (amphipod)	ADT	*	4.54 $\pm$ 3.52	Lytle & Lytle 1985
42769 $\pm$ 46084	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Mysidopsis almyra (mysid)		*	4.85 $\pm$ 3.83	Lytle & Lytle 1985
44790	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Chromadorina germanica (nematode)		*		Tietjen & Lee 1984
44790	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Rhepoxynius abronius (amphipod)	ADT	*	3.5	McLeay et al. 1991
83800 $\pm$ 57900	Forth Estuary	COA		Low meiofaunal density (112 $\pm$ 123/10 sq.cm.)	Corophium volutator (amphipod)	ADT	*	3.5	McLeay et al. 1991
205000	Mississippi Sound, MS	AETA		Mississippi AET	various		*		Long 1987
<217860 $\pm$ 306960	Mississippi Sound, MS	AETA		Mississippi AET	Gammarus mucronatus (amphipod)		*		Lytle & Lytle 1985
228725 $\pm$ 261387	Sidney Tar Pond, MS	COA	20-d	Not significantly toxic (8 $\pm$ 5.66% mortality)	Mysidopsis almyra (mysid)	JUV	*	3.91 $\pm$ 1.29	Lytle & Lytle 1985
295867 $\pm$ 274658		SSBA	4-m	Significant change in liver somatic indices	Neanthes sp. (polychaete)		NE		Tay et al. 1990
421650 $\pm$ 236527		SSBA	4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
<434910	Sidney Tar Pond, NS	COA	10-d	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)		*		Payne et al. 1988
507200 $\pm$ 696924	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT	*		Tay et al. 1990
684000	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Tay et al. 1990
842000 $\pm$ 223446	Bayou Casotte, MS	COA	96-h	Not significantly toxic	Gammarus mucronatus (amphipod)	JUV	NE	2.1	Lytle & Lytle 1983
<2538420	Elizabeth River, VA	COA	28-d	Significantly toxic	Leitosomus xanthurus (spot)		*		Roberts et al. 1989
3900000	Sidney Tar Pond, NS	COA	96-h	Significantly toxic (52% mortality)	Gammarus mucronatus (amphipod)	JUV	SG	2.61	Lytle & Lytle 1983
3900000	Elizabeth River, VA	COA	28-d	High toxicity (100% fin erosion)	Mysidopsis almyra (mysid shrimp)		*	2.72	Lytle & Lytle 1983
11872000	Elizabeth River, VA	COA	24-d	LC50	Neanthes sp. (polychaete)	JUV	*		Tay et al. 1990
21200000	Elizabeth River, VA	COA	24-d	Highly toxic (100% mortality)	Leitosomus xanthurus (spot)	JUV	*		Hargis et al. 1984
					Leitosomus xanthurus (spot)	JUV	*		Hargis et al. 1984
					Leitosomus xanthurus (spot)	JUV	*		Roberts et al. 1989

Table 27. A summary of the available data on the biological effects associated with sediment-sorbed total PCBs (ppb) used to support the derivation of sediment quality guidelines.
TOTAL PCBs

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	IOC (%)	Reference
0.64	United States	EcPA		EPA Chronic Marine Eqp Threshold	Aquatic biota		*	1	Lyman et al. 1987
1	Puget Sound, WA	COA		Low occurrence of hepatic cellular alterations (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
1	Puget Sound, WA	COA		Low prevalence of hepatic lesions (0%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
2.1 +/-1.3	Puget Sound, WA	COA		Low prevalence of hepatic idiopathic lesions (32.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
2.5	Massachusetts Bay, MA	COA		High species richness (936 +/- 9.4/sq.m.)	Benthic macrofauna		NE		Gilbert et al. 1976
2.5	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2 +/- 2.7% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
2.5	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6 +/- 5.1% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
2.5	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2 +/- 0.4% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
5	Freepport Harbor, TX	COA	10-d	Not toxic (2 +/- 1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
5	Freepport Harbor, TX	COA	10-d	Not toxic (9.6 +/- 4.2% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
5	Freepport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
5	Freepport Harbor, TX	COA	10-d	Not toxic (6 +/- 2.3% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6 +/- 2.9% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8 +/- 1.7% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
5.1 +/-4.9	Massachusetts Bay, MA	COA		Moderate species richness (58.1 +/- 10.4)	Benthic species		NE		Gilbert et al. 1976
5.1 +/-5.0	Massachusetts Bay, MA	COA		Low species richness (31 +/- 6.5)	Benthic species		NE		Gilbert et al. 1976
10.4 +/-0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8 +/- 2.2% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
10.4 +/-0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8 +/- 4.2% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
10.4 +/-0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2 +/- 0.4% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
11.1	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	NE	1.25	Chapman et al. 1987
11.6 +/-8.34	San Francisco Bay, CA	COA	4-wk	Highly toxic (38.2 +/- 3% young produced)	Tigriopus californicus (copepod)	ADT	NE	1.03	Chapman et al. 1987
14.6 +/-6.2	Puget Sound, WA	COA		High prevalence of hepatic lesions (27.3 +/- 6.4%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
14.6 +/-6.2	Puget Sound, WA	COA		High prevalence of hepatic idiopathic lesions (87.9 +/- 3.7%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
14.6 +/-6.2	Puget Sound, WA	COA		High prevalence of hepatic cellular alterations (43.6 +/- 8.5%)	Parophrys vetulus (English sole)	ADT	NE		Malins et al. 1985
20	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3 +/- 1.5% mortality)	Mercenaria mercenaria (quahog)	ADT	NE		Vittor & Assoc 1988
20	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7 +/- 2.3% mortality)	pennaeus aztecus (brown shrimp)	ADT	NE		Vittor & Assoc 1988
22.7 +/-11.7	Southern California	COA		High abundance (191 +/- 70.1/0.1 sq.m.)	Echinoderm		NE		Long & Morgan 1990
25	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1 +/- 13.6% mortality)	Mussel	LAR	NE	1.14 +/- 0.33	Chapman et al. 1987
25	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmatus (sanddab)		NE		Salazar & Salazar 1985
25	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)		NE		Salazar & Salazar 1985
25	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polychaete)		NE		Salazar & Salazar 1985
25	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)		NE		Salazar & Salazar 1985
25	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)		NE		Salazar & Salazar 1985
25	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acartia tonsa (copepod)		NE		Salazar & Salazar 1985
25.4 +/-10.6	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/- 4.3 young produced)	Tigriopus californicus (copepod)	ADT	NE	1.23 +/- 0.09	Chapman et al. 1987
25.7 +/-16.3	San Francisco Bay, CA	COA	4-wk	Least toxic (23.3 +/- 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
26 +/-17.3	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/- 8.0% abnormal)	Mussel	LAR	NE	1.2 +/- 0.38	Chapman et al. 1987
28.3 +/-27.1	Comencement Bay, WA	COA	48-h	Least toxic (15.1 +/- 3.1% abnormality)	Oyster		NE		Swain & Nijman 1991
30	Burrard Inlet, BC	S90		Sediment quality objectives	Aquatic biota		NE		Chapman et al. 1987
30 +/-50	Southern California	COA		Moderate abundance (56.2 +/- 23/ 0.1 sq.m.)	Echinoderm		SG		Long & Morgan 1990
36	United States	SLCA		Moderate abundance (56.2 +/- 23/ 0.1 sq.m.)	Benthic species		SG	1.26 +/- 0.17	Neff et al. 1987
37 +/-17.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/- 6.6% abnormal)	Rhepoxynius abronius (amphipod)	LAR	NE		Chapman et al. 1987
38 +/-31.6	Comencement Bay, WA	COA	10-d	Highly toxic (78.5 +/- 19.5% mortality)	Mussel		NE		Tetra Tech 1985
42.6	United States	SLCA		NSLC-marine	Benthic spp.		NE	0.12	Neff et al. 1986
50	Georgetown, SC	COA		Highly toxic (species richness or abundance)	Benthic species		NE		Van Dolah et al. 1984
54	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel		NE		Long & Morgan 1990
54.3 +/-89.3	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/- 7.7% mortality)	Amphipod	LAR	NE	1.4 +/- 0.79	Chapman et al. 1987
54.7 +/-82.6	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/- 2.9% avoidance)	Amphipod	ADT	NE	1.44 +/- 0.74	Chapman et al. 1987
60 +/-70	Southern California	COA		Moderate abundance (72.6 +/- 6.8/0.1 sq.m.)	Arthropods		NE		Long & Morgan 1990
60.5 +/-87.8	Comencement Bay, WA	COA	10-d	Least toxic (12.5 +/- 4.5% mortality)	Rhepoxynius abronius (amphipod)		NE		Tetra Tech 1985
70	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota		NE		Bolton et al. 1985
80 +/-140	Southern California	COA		Moderate species abundance (75.6 +/- 12.7/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
80 +/-100	Southern California	COA		High abundance (148 +/- 58/0.1 sq.m.)	Arthropods		NE		Long & Morgan 1990

Table 27. A summary of the available data on the biological effects associated with sediment-sorbed total PCBs (ppb) used to support the derivation of sediment quality guidelines (continued).

Concentration (+/- SD)	Area	Analysis Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
88	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
93.7 +/- 14.7	Northern California	AETA		AET Values	Benthic species	*			Becker et al. 1990
99 +/- 120	San Francisco Bay, CA	COA	10-d	Least toxic (18 +/- 6.6% mortality)	Rhepoxynius abronius (amphipod)	*			Long & Morgan 1990
<100	Puget Sound, WA	COA	10-d	Not toxic (< 12.5% mortality)	Rhepoxynius abronius (amphipod)	NE		3.4 +/- 2.0	DeWitt et al. 1988
101 +/- 153	San Francisco Bay, CA	SOAV	SOIA	Significantly toxic triad minimum bioeffects	Benthic species	*			Chapman et al. 1987
110 +/- 127	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4 +/- 6.8% mortality)	Rhepoxynius abronius (amphipod)	NE			Long & Morgan 1990
120	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/- 7.5% mortality)	Rhepoxynius abronius (amphipod)	*		2.01 +/- 0.98	Chapman et al. 1987
127 +/- 171	Puget Sound, WA	SOA	10-d	Chemical Criteria	Benthic community	ADT		1	MOE 1989
130	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 +/- 22.7% abnormal)	Bivalve	LAR	NC		Long & Morgan 1990
130	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox	*			Beiler et al. 1986
130	Puget Sound, WA	AETA		1988 Puget Sound Microtox AET	Microtox	*			PTI 1988
140 +/- 262	Commencement Bay, WA	AETA		PSDDA Screening level concentration	Aquatic biota	NE			U.S. ACE 1988
140 +/- 218	San Francisco Bay, CA	COA	10-d	Moderately toxic (23 +/- 2.3% abnormality)	Oyster	*			Tetra Tech 1985
151 +/- 260	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 +/- 19.2% mortality)	Rhepoxynius abronius (amphipod)	*			Long & Morgan 1990
160	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 +/- 4.7% mortality)	Rhepoxynius abronius (amphipod)	*			Long & Morgan 1990
160 +/- 430	San Francisco Bay, CA	SOAV	SOIA	Significantly toxic triad significant bioeffects	Benthic species	NC			Chapman et al. 1987
164 +/- 99.9	Southern California	COA	48-h	Low species abundance (57.6 +/- 13.6/0.1 sq.m.)	Mussel	*		2.87 +/- 1.32	Chapman et al. 1987
164 +/- 99.9	San Francisco Bay, CA	COA	4-wk	Highly toxic (92.3 +/- 5.5% mortality)	Tigriopus californicus (copepod)	ADT		2.87 +/- 1.07	Chapman et al. 1987
164 +/- 99.9	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/- 10.1 young produced)	Bivalve	*			Long & Morgan 1990
165 +/- 232	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4 +/- 4.5% abnormal)	Bivalve	*			Long & Morgan 1990
169 +/- 134	Harragansett Bay, RI	COA	48-h	Moderately toxic (59.4 +/- 11.3% abnormal)	Ameliscia abdita (amphipod)	LAR			Munn et al. 1991
169 +/- 171	San Francisco Bay, CA	COA	10-d	Not significantly toxic (5.28 +/- 3.04% mortality)	Rhepoxynius abronius (amphipod)	NE			Long & Morgan 1990
180	San Francisco Bay, CA	COA	10-d	Most toxic, (95% mortality)	Amphipod	ADT		4.03	Chapman et al. 1987
180 +/- 160	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT		4.03	Chapman et al. 1987
180 +/- 160	Baltimore Harbor, MD	COA	48-h	Least toxic (11m 43.2 +/- 31.1)	Fundulus heteroclitus (mummichog)	NE			Isai et al. 1979
180 +/- 160	Baltimore Harbor, MD	COA	48-h	Significantly toxic (24.7 +/- 15% mortality)	Leptostomus xanthurus (spot)	NE			Tsai et al. 1979
216 +/- 376	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (31.9 +/- 15.5% abnormal)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Assoc 1988
218	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Bivalve	LAR			Long & Morgan 1990
220 +/- 540	Southern California	COA	48-h	Not significantly toxic (26 +/- 5.2% mortality)	Mussel	LAR		3.59	Chapman et al. 1987
251 +/- 556	Commencement Bay, WA	COA	10-d	High species richness (96.3 +/- 22.3/0.1 sq.m.)	Benthic species	NE			Long & Morgan 1990
259 +/- 407	Puget Sound, WA	COA	10-d	Moderately toxic (>12.5% mortality)	Rhepoxynius abronius (amphipod)	NE		4.2 +/- 2.6	DeWitt et al. 1988
260	Northern California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	*			Becker et al. 1990
271 +/- 217	San Francisco Bay, CA	COA	10-d	Significantly toxic (51.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
276 +/- 365	Puget Sound, WA	COA	10-d	Highly toxic 95% LPL (Lower Prediction Limit)	Rhepoxynius abronius (amphipod)	*			Becker et al. 1990
290 +/- 502	Hudson-Baritan Bay, NY	COA	16-d	Not toxic (increased growth rate)	Grandidierella japonica (amphipod)	JUV		5.2 +/- 4.4	Anderson et al. 1988
360	California	AETA		AET Values	Chromadorina germanica (nematode)	*			DeWitt et al. 1988
368 +/- 695	Southern California	COA		AET Values	Benthic species	NE			Tietjen & Lee 1984
380	Commencement Bay, WA	COA		Highly toxic (44.5 +/- 19% abnormality)	Benthic species	*			Becker et al. 1990
400 +/- 600	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Oyster	*			Tetra Tech 1985
417	Southern California	COA		Moderate species richness (72 +/- 3.3/0.1 sq.m.)	Aquatic biota	NE			U.S. ACE 1988
417	Charleston Harbor, SC	COA		High species richness (14.9 +/- 2.04) SRUs	Benthic species	SG			Long & Morgan 1990
417	Charleston Harbor, SC	COA		Moderate species richness (9.05 +/- 1.33) SRUs	Benthic species	NE			Winn et al. 1989
417	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NE			Winn et al. 1989
417	Charleston Harbor, SC	COA		High species diversity (4.15 +/- 0.59) SDUs	Benthic species	NE			Winn et al. 1989
417	Charleston Harbor, SC	COA		Moderate species diversity (2.3 +/- 0.2) SDUs	Benthic species	NE			Winn et al. 1989
417	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NE			Winn et al. 1989
480 +/- 724	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
490 +/- 413	Miami River, FL	COA	10-d	Not toxic (18.6 +/- 7.2% mortality)	Pennaeus aztecus (brown shrimp)	ADT			ERCO 1985
490 +/- 413	Miami River, FL	COA	10-d	Not toxic (1.2 +/- 0.837% mortality)	Mercenaria mercenaria (quahog)	ADT			ERCO 1985
490 +/- 413	Miami River, FL	COA	10-d	Not toxic (3.6 +/- 1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985

Table 27. A summary of the available data on the biological effects associated with sediment-sorbed total PCBs (ppb) used to support the derivation of sediment quality guidelines (continued).
TOTAL PCBs

Concentration	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
638 +/- 512	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chironomus tentans (nematode)		*		Tietjen & Lee 1984
>960	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
1000 +/- 2400	Southern California	COA		Low abundance (35.3 +/- 15.8/0.1 sq.m.)	Arthropods		*		Long & Morgan 1990
1000	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*		PTI 1988
1100 +/- 800	Baltimore Harbor, MD	COA	48-h	Most toxic (TLM 5.1 +/- 3.5)	Fundulus heteroclitus (mummichog)		*		Tsai et al. 1979
1100	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
1100 +/- 800	Baltimore Harbor, MD	COA	48-h	Most toxic (TLM 5.9 +/- 3.4)	Leiostomus xanthurus (spot)		*		Tsai et al. 1979
1100	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
1100	Puget Sound, WA	AETA		1988 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
1110 +/- 2610	Southern California	COA		Low species richness (51.2 +/- 8.6/0.1 sq.m.)	Benthic species		NC		Long & Morgan 1990
1300 +/- 2700	Southern California	COA		Low abundance (6.1 +/- 7.2/0.1 sq.m.)	Echinoderm		*		Long & Morgan 1990
2260 +/- 3530	Southern California	COA		High species abundance (88.9 +/- 35.4/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
2500	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
2500	Puget Sound, WA	AETA		PSDDA Maximum Level criteria	Aquatic biota		*		U.S. ACE 1988
3100	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988
5200 +/- 1200		SSBA	10-d	Significant toxicity	Rhepoxynius abronius (amphipod)		*	0.9	Plesha et al. 1988
10800		SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)		*		Swartz et al. 1988
53600 +/- 29256	Galveston Harbor, TX	COA	10-d	Not toxic (2.4 +/- 1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
53600 +/- 29256	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
53600 +/- 29256	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984

Table 28. A summary of the available data on the biological effects associated with sediment-sorbed aldrin (ppb) used to support the derivation of sediment quality guidelines.
ALDRIN

Concentration (μ g/g SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.1	San Francisco Bay, CA	COA	10-d	Least toxic (18%/-6.6% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8%/-4.7% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	10-d	Not toxic (2%/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
0.1	Freepport Harbor, TX	COA	10-d	Not toxic (9.6%/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
0.1	Freepport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
0.1	Freepport Harbor, TX	COA	10-d	Not toxic (7.2%/-2.77% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6%/-5.18% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8%/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8%/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6%/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6%/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.1	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8%/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.1	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7%/-22.7% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
0.14 μ g/g-0.35	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9%/-19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
0.2 μ g/g-0.4	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4%/-11.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
0.26 μ g/g-0.45	San Francisco Bay, CA	COA	10-d	Highly toxic (67%/-11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
0.5 μ g/g-1.0	San Francisco Bay, CA	COA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
0.95 μ g/g-1.34	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
1 μ g/g-1.3	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9%/-15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
1.9	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
1.9	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		Long & Morgan 1990
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9%/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13%/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3%/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
4.3	United States	EqPA		99% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al., 1987
5	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota		*		U.S. ACE 1988
5.25	United States	EqPA		Chronic Marine Eq Threshold	Aquatic biota		*	1	Bolton et al., 1985
<7.45	Charleston Harbor, SC	COA		High species richness (14.9%/-2.04) SRUs	Benthic species		NE		Winn et al., 1989
<7.45	Charleston Harbor, SC	COA		Moderate species richness (9.05%/-1.33) SRUs	Benthic species		NE		Winn et al., 1989
<7.45	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NE		Winn et al., 1989
<7.45	Charleston Harbor, SC	COA		High species diversity (4.15%/-0.59) SDUs	Benthic species		NE		Winn et al., 1989
<7.45	Charleston Harbor, SC	COA		Moderate species diversity (2.3%/-0.2) SDUs	Benthic species		NE		Winn et al., 1989
<7.45	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NE		Winn et al., 1989
8.4	United States	EqPA		95% chronic marine criteria	Aquatic organisms		NE	1	Pavlou et al., 1987
<50	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species		NE	0.12	Van Dolah et al., 1984
2150 μ g/g-589	Galveston Harbor, TX	COA	10-d	Not toxic (2.4%/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
2150 μ g/g-589	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
2150 μ g/g-589	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984

Table 29. A summary of the available data on the biological effects associated with sediment-sorbed chlordane (ppb) used to support the derivation of sediment quality guidelines.

CHLORDANE

Concentration (+/- SD)	Area	Analysis Test Type	Duration End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.1	San Francisco Bay, CA	COA	10-d	Least toxic (18%/-6.6% mortality)	Rhepoxynius abronius (amphipod)	NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (33%/-4.7% mortality)	Rhepoxynius abronius (amphipod)	NG		Long & Morgan 1990
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2%/-2.77% mortality)	Palaeomonetes pugio (grass shrimp)	ADT		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6%/-5.18% mortality)	Nereis virens (sandworm)	ADT		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	NE		EHA 1985a
0.3	United States	EqPA		99% chronic marine criteria	Aquatic organisms	*	1	Pavlou et al. 1987
0.5	Freeport Harbor, TX	COA	10-d	Not toxic (2%/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT		EHA 1985b
0.5	Freeport Harbor, TX	COA	10-d	Not toxic (9.6%/-4.22% mortality)	Nereis virens (sandworm)	ADT		EHA 1985b
0.5	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT		EHA 1985b
0.5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6%/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT		EHA 1983b
0.5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6%/-2.97% mortality)	Nereis virens (sandworm)	ADT		EHA 1983b
0.5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8%/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT		EHA 1983b
0.5 +/-1.0	San Francisco Bay, CA	COA	48-h	Least toxic (23.3%/-7.3% abnormal)	Bivalve	NE		Long & Morgan 1990
0.6	United States	EqPA		95% chronic marine criteria	Aquatic organisms	*	1	Pavlou et al. 1987
0.667 +/-0.289	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8%/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT		EHA 1983a
0.667 +/-0.289	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8%/-4.21% mortality)	Nereis virens (sandworm)	ADT		EHA 1983a
0.667 +/-0.289	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT		EHA 1983a
1 +/-1.4	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9%/-15.5% abnormal)	Bivalve	NE		Long & Morgan 1990
1 +/-1.4	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4%/-6.8% mortality)	Rhepoxynius abronius (amphipod)	NE		Long & Morgan 1990
2	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	*		Long & Morgan 1990
2	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster; mussel	*		Long & Morgan 1990
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9%/-1.73% mortality)	Nereis virens (polychaetes)	ADT		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13%/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3%/-3.21% mortality)	Crassostrea virginica (oyster)	ADT		EG&G Bionomics 1980
3.46 +/-6.25	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9%/-19.2% mortality)	Rhepoxynius abronius (amphipod)	*		Long & Morgan 1990
3.5 +/-6.3	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7%/-22.7% abnormal)	Bivalve	LAR		Long & Morgan 1990
4.1 +/-6.6	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4%/-11.3% abnormal)	Bivalve	LAR		Long & Morgan 1990
4.23 +/-12.5	Harragansett Bay, RI	COA		Not significantly toxic (5.28%/-3.04% mortality)	Ameliscia abdita (amphipod)	ADT		Munns et al. 1991
5	Puget Sound, WA	AETA		PSDDA Screening Level concentration	Aquatic biota	NE		U.S. ACE 1988
5	United States	EqPA		Chronic Marine Exp Threshold	Aquatic biota	NE	1	Bolton et al. 1985
6.4 +/-7.5	San Francisco Bay, CA	COA	10-d	Highly toxic (67%/-11.8% mortality)	Rhepoxynius abronius (amphipod)	*		Long & Morgan 1990
<25	Charleston Harbor, SC	COA		High species richness (14.9%/-2.04) SRUs	Benthic species	NE		Winn et al. 1989
<25	Charleston Harbor, SC	COA		Moderate species richness (9.05%/-1.33) SRUs	Benthic species	NG		Winn et al. 1989
<25	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NG		Winn et al. 1989
<25	Charleston Harbor, SC	COA		High species diversity (4.15%/-0.59) SDUs	Benthic species	NE		Winn et al. 1989
<25	Charleston Harbor, SC	COA		Moderate species diversity (2.3%/-0.2) SDUs	Benthic species	NG		Winn et al. 1989
<25	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NG		Winn et al. 1989
<50	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species	NE	0.12	Van Dolah et al. 1984
967 +/-325	Galveston Harbor, TX	COA	10-d	Not toxic (2.4%/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT		Grieco 1984
967 +/-325	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT		Grieco 1984
967 +/-325	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT		Grieco 1984
<5800		SSBA	288-h	LC50	Nereis virens (sandworm)	*		McLeese et al. 1982

Table 30. A summary of the available data on the biological effects associated with sediment-sorbed chlorpyrifos (ppb) used to support the derivation of sediment quality guidelines.
CHLORPYRIFOS

Concentration	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
4.4	United States	EqPA		Interim Marine Sediment Quality Criteria (IRV)	Benthic community	NE	*	1	EPA 1988

Table 31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.25	Fresport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
0.25	Fresport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
0.25	Fresport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.44% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.6 +/-0.7	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	NG		Long & Morgan 1990
0.94 +/-1.6	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NG		Long & Morgan 1990
1.3 +/-0.3	San Francisco Bay, CA	COA	10-d	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR	NC		Long & Morgan 1990
1.3 +/-2.1	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NG		Long & Morgan 1990
1.3 +/-1.2	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
2	Puget Sound, WA	AETA	10-d	1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
2.35 +/-0.07	San Francisco Bay, CA	COA	10-d	Not significantly toxic (16.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
4.58 +/-7.83	Harragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Munn et al. 1991
6	United States	EqPa		99% chronic marine criteria	Aquatic organisms		*		Pavlou et al. 1987
<7.75	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA		Moderate species richness (9.03+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
10 +/-7.4	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
12.5 +/-8.5	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
13.3 +/-21	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
16	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
16	Puget Sound, WA	AETA		San Francisco Bay AET	Oyster; mussel	LAR	*		PTI 1988
16.1 +/-23.2	San Francisco Bay, CA	AETA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Benthic community	LAR	*		Long & Morgan 1990
17	Northern California	AETA		AET Values	Bivalve	LAR	SG		Becker et al. 1990
17	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	LAR	*		Becker et al. 1990
>17	Northern California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
22	United States	EqPa		95% chronic marine criteria	Aquatic organisms		*		Pavlou et al. 1987
43	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
43	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*		PTI 1988
<50	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species		*		Van Dolah et al. 1984
210	California	AETA		AET Values	Benthic species		NE	0.12	Becker et al. 1990
210	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
417 +/-289	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
417 +/-289	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
417 +/-289	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984
>1700	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>1700	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
3250	United States	EqPa		Chronic Marine Exp Threshold	Aquatic biota		*		Boltton et al. 1985

Table 32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines.
p,p'-DDE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.6 +/-0.70	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.607 +/-0.280	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.607 +/-0.280	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.607 +/-0.280	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
0.68 +/-0.71	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.7 +/-1.0	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
0.933 +/-0.116	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
0.933 +/-0.116	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.933 +/-0.116	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
1 +/-0.5	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR	NG		Long & Morgan 1990
1.2 +/-1.0	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
1.2 +/-1.0	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Bivalve	LAR	NG		Long & Morgan 1990
1.7 +/-3.4	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	NG		Long & Morgan 1990
2.1 +/-3.9	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR	NG		Long & Morgan 1990
2.2	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
2.2	San Francisco Bay, CA	AETA		San Francisco Bay AET	Oyster, mussel	LAR	*		Long & Morgan 1990
2.25 +/-3.97	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
2.6	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
>2.6	Northern California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
2.9	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
3.4 +/-5.2	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.72% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
5.07 +/-8.94	Harrington Bay, RI	COA		Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Munn et al. 1991
>5.78	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species	NE	NE		Winn et al. 1989
>5.78	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species	NE	NE		Winn et al. 1989
>5.78	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NE	NE		Winn et al. 1989
>5.78	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species	NE	NE		Winn et al. 1989
>5.78	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.21) SDUs	Benthic species	NE	NE		Winn et al. 1989
>5.78	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NE	NE		Winn et al. 1989
9	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community	*	*		PTI 1988
9	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species	*	*		Bellar et al. 1986
15	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	*	*		Bellar et al. 1986
15	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	*	*		PTI 1988
27	United States	EqPA		99% chronic marine criteria	Aquatic organisms	*	*		Pavlou et al. 1987

Table 32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines (continued).
p,p'-DDE

Concentration (+/- SD)	Area	Analysis Test Type	Duration End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
<50	Georgetown, SC	COA	Not toxic (species richness or abundance)	Benthic species	NE	NE	0.12	Van Dolah et al. 1984
60	Palos Verdes, CA	COA	High species density (136/0.1 sq.m.)	Echinoderm	NE	NE	0.9	Swartz et al. 1986
60	United States	EqPA	95% chronic marine criteria	Aquatic organisms	*	*	1	Pavlou et al. 1987
110	Palos Verdes, CA	COA	High species density (93.4/0.1 sq.m)	Echinoderm	NE	NE	1.3+/-0.77	Swartz et al. 1986
683 +/-252	Galveston Harbor, TX	COA	Not toxic (2.4+/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
683 +/-252	Galveston Harbor, TX	COA	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
830 +/-710	Palos Verdes, CA	COA	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984
830 +/-710	Palos Verdes, CA	COA	High species density (54.5+/-9.91/0.1 sq.m.)	Amphipod	NE	NE	2.1+/-1.15	Swartz et al. 1986
1215 +/-346	Palos Verdes, CA	COA	High species density (34.3+/-5.67/0.1 sq.m.)	Phoxocephalid amphipod	NE	NE	2.1+/-1.53	Swartz et al. 1986
1317 +/-1360	Palos Verdes, CA	COA	Not significantly toxic (90.5+/-9.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.7+/-0.71	Swartz et al. 1986
1317 +/-1360	Palos Verdes, CA	COA	High species density (20.9+/-0.23/0.1 sq.m.)	Amphipod	NE	NE	1.7+/-0.61	Swartz et al. 1986
2800	California	AETA	High species density (11.2+/-1.64/0.1 sq.m.)	Phoxocephalid amphipod	NE	NE	1.7+/-0.61	Swartz et al. 1986
2800	Southern California	AETA	AET Values	Benthic species	*	*		Becker et al. 1990
3903 +/-3080	Palos Verdes, CA	COA	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42+/-0.88	Swartz et al. 1986
4358 +/-2998	Palos Verdes, CA	COA	Low species density (0.08+/-0.11/0.1 sq.m.)	Echinoderm	*	*	3.4+/-0.75	Swartz et al. 1986
4662 +/-2747	Palos Verdes, CA	COA	Low species density (0.2+/-0.14/0.1 sq.m.)	Echinoderm	*	*	2.64+/-0.77	Swartz et al. 1986
5765 +/-219	Palos Verdes, CA	COA	Significantly toxic (21.5+/-2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.9+/-0.28	Swartz et al. 1986
6453 +/-1202	Palos Verdes, CA	COA	Low species density (1.33+/-1.22/0.1 sq.m.)	Amphipod	*	*	3.87+/-0.21	Swartz et al. 1986
6453 +/-1202	Palos Verdes, CA	COA	Low species density (0/0.1 sq.m.)	Phoxocephalid amphipod	*	*	3.87+/-0.21	Swartz et al. 1986
6490 +/-1342	Palos Verdes, CA	COA	Low species density (5.3+/-3.7/0.1 sq.m.)	Total amphipod	*	*	3.13+/-0.15	Swartz et al. 1986
6490 +/-1342	Palos Verdes, CA	COA	Low species density (0.13+/-0.23/0.1 sq.m.)	Phoxocephalid amphipod	*	*	3.13+/-0.15	Swartz et al. 1986
7000	United States	EqPA	Chronic Marine Eqp Threshold	Aquatic biota	*	*	1	Bolton et al. 1985
>7800	California	AETA	AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>7800	Southern California	AETA	AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990

Table 33. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines. P,p'-DDT

Concentration (μ g/g SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2 $\pm$ 2.7% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6 $\pm$ 5.1% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2 $\pm$ 0.44% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (2 $\pm$ 1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (9.6 $\pm$ 4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8 $\pm$ 2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8 $\pm$ 4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.25	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2 $\pm$ 0.44% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
0.5 $\pm$ 0.433	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6 $\pm$ 2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.5 $\pm$ 0.433	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6 $\pm$ 2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.5 $\pm$ 0.433	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8 $\pm$ 1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.6 $\pm$ 0.2	San Francisco Bay, CA	COA	10-d	Highly toxic (92.4 $\pm$ 4.3% abnormal)	Bivalve	ADT	NE		EHA 1983b
1.22 $\pm$ 3.16	San Francisco Bay, CA	COA	48-h	Least toxic (18 $\pm$ 6.6% mortality)	Rhepoxynius abronius (amphipod)	LAR	NC		Long & Morgan 1990
1.3 $\pm$ 2.8	San Francisco Bay, CA	COA	10-d	Least toxic (18 $\pm$ 6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
1.5	United States	EqPA	10-d	Chronic Marine Egp Threshold	Aquatic biota	LAR	NE	1	Bolton et al. 1985
2.1 $\pm$ 3.7	San Francisco Bay, CA	COA	48-h	Least toxic (23.3 $\pm$ 7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
2.4 $\pm$ 2.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8 $\pm$ 4.7% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
3.2 $\pm$ 5.5	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9 $\pm$ 15.5% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
3.7 $\pm$ 11.1	Narragansett Bay, RI	COA	48-h	Not significantly toxic (5.28 $\pm$ 3.04% mortality)	Anguilla abdita (amphipod)	ADT	NE		Munn et al. 1991
3.9	Puget Sound, WA	AETA	10-d	1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
4.7	Northern California	AETA	10-d	AET Values	Benthic species	ADT	NE		Becker et al. 1990
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9 $\pm$ 1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13 $\pm$ 3.6% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3 $\pm$ 3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
5.1 $\pm$ 15.3	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 $\pm$ 22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
>6	Puget Sound, WA	AETA	48-h	1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	-		Bellar et al. 1986
6.3	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	-		PTI 1988
6.3	Southern California	AETA	48-h	AET Values	Benthic species	ADT	NE		Becker et al. 1990
6.6 $\pm$ 17.9	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 $\pm$ 11.3% abnormal)	Bivalve	LAR	NE		Becker et al. 1990
7.5 $\pm$ 18.3	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 $\pm$ 19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
<7.75	Charleston Harbor, SC	COA	10-d	High species richness (14.9 $\pm$ 2.04) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	10-d	Moderate species richness (9.05 $\pm$ 1.33) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	10-d	Low species richness (5.16) SRUs	Benthic species	ADT	NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	10-d	High species diversity (4.15 $\pm$ 0.59) SDUs	Benthic species	ADT	NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	10-d	Moderate species diversity (2.3 $\pm$ 0.2) SDUs	Benthic species	ADT	NE		Winn et al. 1989
9.6	Northern California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
9.6	California	AETA	10-d	AET Values	Mytilus edulis (bivalve)	LAR	NE		Becker et al. 1990
9.6	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	NE		Long & Morgan 1990
9.6	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Oyster, mussel	LAR	NE		Long & Morgan 1990
11	Puget Sound, WA	AETA	10-d	1986 Puget Sound Benthic Community AET	Benthic species	ADT	NE		Bellar et al. 1986
12.2 $\pm$ 24.7	San Francisco Bay, CA	COA	10-d	Highly toxic (67 $\pm$ 11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
34	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Benthic community	ADT	NE		PTI 1988
49.5	Georgetown, SC	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	NE	1	Word et al. 1987
<50	Puget Sound, WA	COA	10-d	Not toxic (species richness or abundance)	Benthic species	ADT	NE	0.12	Van Dolah et al. 1984
>270	California	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	NE		PTI 1988
>620	Southern California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
>620	Southern California	AETA	10-d	AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990

Table 34. A summary of the available data on the biological effects associated with sediment-sorbed total DDT (ppb) used to support the derivation of sediment quality guidelines.
TOTAL DDT

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.4	United States	EqPA	4-wk	90% chronic marine criteria	Aquatic organisms	ADT	*	1	Pavlou et al. 1987
0.565 +/-2.05	San Francisco Bay, CA	COA		Highly toxic (36.2 +/-35 young produced)	Tigriopus californicus (copepod)		NC	1.03	Chapman et al. 1987
0.7	United States	EqPA	48-h	95% chronic marine criteria	Aquatic organisms	LAR	*	1	Pavlou et al. 1987
0.8	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel		NE	1.25	Chapman et al. 1987
0.9 +/-0.42	San Francisco Bay, CA	COA	4-wk	Moderately toxic (57.1 +/-13.6% mortality)	Mussel	ADT	SG	1.14 +/-0.33	Chapman et al. 1987
1.04 +/-0.35	San Francisco Bay, CA	COA	4-wk	Least toxic (116 +/-4.3 young produced)	Mussel	LAR	NE	1.23 +/-0.09	Chapman et al. 1987
1.08 +/-0.618	San Francisco Bay, CA	COA	48-h	Least toxic (18 +/-8.01% abnormal)	Mussel	ADT	NE	1.2 +/-0.38	Chapman et al. 1987
1.27 +/-1.08	San Francisco Bay, CA	COA	10-d	Least toxic (13.6 +/-7.76% mortality)	Amphipod	ADT	NE	1.4 +/-0.79	Chapman et al. 1987
1.36 +/-0.77	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1 +/-6.61% abnormal)	Mussel	LAR	SG	1.26 +/-0.17	Chapman et al. 1987
1.39 +/-1.06	San Francisco Bay, CA	COA	10-d	Least toxic (4.63 +/-2.91% avoidance)	Amphipod	ADT	NE	1.44 +/-0.74	Chapman et al. 1987
1.58	United States	EqPA	10-d	Marine chronic sediment quality criteria (FCV)	Aquatic biota		*	1	JRB Associates 1984
1.6	United States	EqPA	10-d	EPA Chronic Marine Eqp Threshold	Aquatic biota		*	1	Lyman et al. 1987
2.18 +/-1.45	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3 +/-7.51% mortality)	Amphipod	ADT	SG	2.01 +/-0.98	Chapman et al. 1987
2.92 +/-0.68	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3 +/-5.5% mortality)	Mussel	LAR	*	2.87 +/-1.32	Chapman et al. 1987
2.92 +/-0.68	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9 +/-10.1 young produced)	Amphipod	ADT	*	2.87 +/-1.07	Chapman et al. 1987
2.93	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	*	4.03	Chapman et al. 1987
2.95	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	*	4.03	Chapman et al. 1987
3.27	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% avoidance)	Mussel	LAR	*	3.59	Chapman et al. 1987
3.29	United States	EqPA	48-h	Marine chronic sediment quality criteria (FRV)	Aquatic biota		*	1	Chapman et al. 1987
5	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota		NE		JRB Associates 1984
6.9	Puget Sound, WA	AETA		PSDDA Screening Level Concentration	Aquatic biota		NE		U.S. ACE 1988
8.28	United States	EqPA	10-d	Interim Marine Sediment Quality Criteria (FRV)	Aquatic biota		NE		U.S. ACE 1988
22.3	Puget Sound, WA	SBA		LC50	Rhepoxynius abronius (amphipod)	ADT	NE	1	EPA 1988
24	Northern California	AETA		AET Values	Benthic species		*	1.92	Becker et al. 1987
27	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
46.1	Puget Sound, WA	SSBA	10-d	LC50	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
50 +/-60	Southern California	COA		High abundance (191 +/-70.1/0.1 sq.m.)	Rhepoxynius abronius (amphipod)	ADT	*	0.58	Word et al. 1987
54.5	Puget Sound, WA	SSBA	10-d	LC50	Echinoderm		NE		Long & Morgan 1990
55.2	Puget Sound, WA	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*	0.6	Word et al. 1987
68 +/-71.7	Puget Sound, WA	SSBA	10-d	Significantly toxic (51.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	0.12	Word et al. 1987
69	Puget Sound, WA	COA	10-d	PSDDA Maximum level criteria	Grandidierella japonica (amphipod)	JUV	NC		Anderson et al. 1988
90 +/-130	Southern California	AETA		Moderate abundance (56.2 +/-23/0.1 sq.m.)	Aquatic biota		SG		U.S. ACE 1988
100 +/-150	Southern California	COA		High abundance (148 +/-58/0.1 sq.m.)	Echinoderm		SG		Long & Morgan 1990
125	Puget Sound, WA	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	*	0.25	Long & Morgan 1990
210	United States	EqPA		EPA Acute Marine Eqp Threshold	Aquatic biota		*	1	Lyman et al. 1987
250 +/-420	Southern California	COA		Moderate species richness (75.6 +/-12.7/0.1 sq.m.)	Benthic species		NC		Long & Morgan 1990
350 +/-710	Southern California	COA		Moderate species richness (72 +/-3.3/0.1 sq.m.)	Benthic species		NC		Long & Morgan 1990
428	United States	SLCA		Moderate abundance (72.6 +/-6.8/0.1 sq.m.)	Arthropods		*	1	Woff et al. 1986
505	United States	SLCA		NSLC-marine	Benthic spp.		*	1	Woff et al. 1987
1018 +/-2424	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV	NE		Anderson et al. 1988
1410 +/-5440	Southern California	COA	10-d	Low species abundance (57.6 +/-13.6/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
1583 +/-1325	Galveston Harbor, TX	COA	10-d	Not toxic (2.4 +/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grice 1984
1583 +/-1325	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Merconaria mercenaria (hard clams)	ADT	NE		Grice 1984
1583 +/-1325	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Merconaria mercenaria (hard clams)	ADT	NE		Grice 1984
2170 +/-7190	Southern California	COA		High species richness (96.3 +/-22.3/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990
3000	California	AETA		AET Values	Benthic species		*		Becker et al. 1990
3000	Southern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
>9300	California	AETA		AET Values	Benthic species		*		Becker et al. 1990
13420 +/-37670	Southern California	COA		Low abundance (35.3 +/-15.8/0.1 sq.m.)	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
14190 +/-40200	Southern California	COA		Low species richness (51.2 +/-8.6/0.1 sq.m.)	Arthropods		*		Long & Morgan 1990
>16500	Southern California	SSBA	288-h	LC50	Benthic species		*		McLeese et al. 1982
18260 +/-43080	Southern California	COA		Low abundance (6.1 +/-7.2/0.1 sq.m.)	Merconaria mercenaria (sandworm)		*		Long & Morgan 1990
35300 +/-59540	Southern California	COA		High species abundance (88.9 +/-35.4/0.1 sq.m.)	Benthic species		NE		Long & Morgan 1990

Table 35. A summary of the available data on the biological effects associated with sediment-sorbed dieldrin (ppb) used to support the derivation of sediment quality guidelines. DIELDRLN

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.01	United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.02	United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/2.77% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/5.18% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983a
0.25	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/0.447% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983a
0.25	Freepport Harbor, TX	COA	10-d	Not toxic (2+/1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
0.25	Freepport Harbor, TX	COA	10-d	Not toxic (9.6+/4.22% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983b
0.367 +/-0.202	Freepport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
0.367 +/-0.202	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
0.367 +/-0.202	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/2.97% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983b
0.367 +/-0.202	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/1.79% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
1.3	United States	EqPA		Interim Marine Sediment Quality Criteria (fRV)	Palaeomonetes pugio (grass shrimp)	ADT	NE	1	EPA 1988
1.58 +/-0.862	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983a
1.58 +/-0.862	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/4.21% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983a
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not toxic (1.2+/0.447% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		Long & Morgan 1990
4.4 +/-2.3	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/4.7% mortality)	Rhepoxynius abronius (amphipod)		NE		U.S. ACE 1988
5	Puget Sound, WA	AETA		PSDDA Screening Level concentration	Aquatic biota		NE		Long & Morgan 1990
5.2 +/-1.2	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/7.3% abnormal)	Bivalve	LAR	NE		Long & Morgan 1990
5.2 +/-1.2	San Francisco Bay, CA	COA	10-d	Least toxic (18+/6.6% mortality)	Rhepoxynius abronius (amphipod)		NE		Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		High species richness (14.9+/2.04) SRUS	Benthic species		NE		Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		Moderate species richness (9.05+/1.33) SRUS	Benthic species		NE		Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species		NE		Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		High species diversity (4.15+/0.59) SDUS	Benthic species		NE		Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/0.2) SDUS	Benthic species		NE		Winn et al. 1989
6.2	California	AETA		Low species diversity (1.16) SDUS	Benthic species		NE		Winn et al. 1989
6.2	Northern California	AETA		AET Values	Benthic species		*		Becker et al. 1990
6.2 +/-0.6	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/15.5% abnormal)	Bivalve	LAR	NE		Becker et al. 1990
6.2 +/-0.5	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/6.8% mortality)	Rhepoxynius abronius (amphipod)		NE		Long & Morgan 1990
6.6	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	NE		Becker et al. 1990
6.6	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
6.6	San Francisco Bay, CA	AETA		San Francisco Bay AET	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
7.58 +/-7.0	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/19.2% mortality)	Oyster mussel	LAR	SG		Long & Morgan 1990
7.6 +/-7.5	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/22.7% abnormal)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990
8.2 +/-8.1	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
10.3 +/-9.0	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/11.8% mortality)	Bivalve	LAR	*		Long & Morgan 1990
12	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
>12	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
<50	Georgetown, SC	COA		Interim Marine Sediment Quality Criteria (fRV)	Benthic community		NE	0.12	Van Dolah et al. 1984
57.7	United States	EqPA		Not toxic (species richness or abundance)	Palaeomonetes pugio (grass shrimp)	ADT	NE	1	Grieco 1984
600 +/-50	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
600 +/-50	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984
13000	Galveston Harbor, TX	SSBA	288-h	LC50	Nereis virens (sandworm)		*		McLeese et al. 1982

Table 36. A summary of the available data on the biological effects associated with sediment-sorbed endosulfan (ppb) used to support the derivation of sediment quality guidelines.
ENDOSULFAN

Concentration (μ g/g SD)	Area	Analysis Test		End-Point Measured	Species	Life Stage	Hit	Reference
		Type	Duration					
<5.78	Charleston Harbor, SC	COA		High species richness (14.9 $\pm$ 2.04) SRUs	Benthic species		NE	Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		Moderate species richness (9.05 $\pm$ 1.33) SRUs	Benthic species		NG	Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG	Winn et al. 1989
<5.78	Charleston Harbor, SC	COA		High species diversity (4.15 $\pm$ 0.59) SDUs	Benthic species		NE	Winn et al. 1989
50	Southern California, CA	COA	7-d	Significant reduction in colonization (50% reduction)	Streblospio benedicti (polychaete)	LAR	*	Chandler & Scott 1991
100	Southern California, CA	COA	7-d	Not significantly toxic	Mannopus palustris (copepod)	JUV	NE	Chandler & Scott 1991
200	Southern California, CA	COA	7-d	Not significantly toxic	Pseudobryda pulchella (copepod)	JUV	NE	Chandler & Scott 1991
200	Southern California, CA	COA	7-d	Significantly toxic	Mannopus palustris (copepod)	JUV	*	Chandler & Scott 1991
340	Southern California, CA	SSBA	288-h	LC50	Mereis virens (sandworm)		*	McLeese et al. 1982

Table 37. A summary of the available data on the biological effects associated with sediment-sorbed endrin (ppb) used to support the derivation of sediment quality guidelines.
ENDRIN

Concentration (+/- SD)	Area	Analysis Test Type	Duration End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.01	United States	EqPA	99% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.02	United States	EqPA	95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.12 +/-0.05	San Francisco Bay, CA	SOAV	Significantly toxic triad minimum bioeffects	Benthic species		*		Chapman et al. 1987
0.533	United States	EqPA	Interim Marine Sediment Quality Criteria (FRV)	Benthic community		NE	1	EPA 1988
2.15	United States	EqPA	Interim Marine Sediment Quality Criteria (FCV)	Benthic community		NE	1	EPA 1988
5	Pensacola Harbor & Bay, FL	COA	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADI	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADI	NE		EG&G Bionomics 1980
5	Pensacola Harbor & Bay, FL	COA	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADI	NE		EG&G Bionomics 1980
<7.75	Charleston Harbor, SC	COA	High species richness (14.9+/-2.04) SRUS	Benthic species		NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	Moderate species richness (9.05+/-1.33) SRUS	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	Low species richness (5.16) SRUS	Benthic species		NG		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	High species diversity (4.15+/-0.59) SDUS	Benthic species		NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	Moderate species diversity (2.3+/-0.2) SDUS	Benthic species		NE		Winn et al. 1989
<7.75	Charleston Harbor, SC	COA	Low species diversity (1.16) SDUS	Benthic species		NG		Winn et al. 1989
.47	Charleston Harbor, SC	SSBA	LC50	Crangon septemspinosa (shrimp)		*	0.28	McLeese & Metcalf 1980
<50	Georgetown, SC	COA	Not toxic (species richness or abundance)	Benthic species		NE	0.12	Van Dolah et al. 1984
1.74	United States	EqPA	Marine chronic sediment criteria (FCV)	Aquatic biota		NE	1	JRB Associates 1984
3.21	United States	EqPA	Marine chronic sediment criteria (FRV)	Aquatic biota		NE	1	JRB Associates 1984
>28000	United States	SSBA	Significantly toxic (40% mortality)	Nereis virens (sandworm)		*	2	McLeese et al. 1982

Table 38. A summary of the available data on the biological effects associated with sediment-sorbed heptachlor (ppb) used to support the derivation of sediment quality guidelines.
HEPTACHLOR

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.04	United States	EqPA		99% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.06	United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (2%/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (9.6%/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
0.4 +/-0.26	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8%/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.4 +/-0.26	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8%/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.4 +/-0.26	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2%/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
1.04	United States	EqPA		Interim Marine Sediment Quality Criteria (FRV)	Benthic community		NE	1	EPA 1988
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9%/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13%/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3%/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
4.73 +/-1.85	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6%/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
4.73 +/-1.85	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6%/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
4.73 +/-1.85	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8%/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
5	Puget Sound, WA	AETA		PSDDA Screening Level Concentration	Aquatic biota		NE		U.S. ACE 1988
5	United States	EqPA		Chronic Marine Exp Threshold	Aquatic biota		*	1	Bolton et al. 1985
<7.1	Charleston Harbor, SC	COA		High species richness (14.9%/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<7.1	Charleston Harbor, SC	COA		Moderate species richness (9.05%/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<7.1	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<7.1	Charleston Harbor, SC	COA		High species diversity (4.15%/-0.59) SDUs	Benthic species		NE		Winn et al. 1989
<7.1	Charleston Harbor, SC	COA		Moderate species diversity (2.3%/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<7.1	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
<50	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species		NE		Van Dolah et al. 1984
2566 +/-534	Galveston Harbor, TX	COA	10-d	Not toxic (2.4%/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	0.12	Grieco 1984
2566 +/-534	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
2566 +/-534	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984

Table 39. A summary of the available data on the biological effects associated with sediment-sorbed heptachlor epoxide (ppb) used to support the derivation of sediment quality guidelines.
HEPTACHLOR EPOXIDE

Concentration (+/- SD)	Area	Analysis Test Type	Duration End-Point Measured	Species	Life Stage	Hit	YOC (%)	Reference
<2.43	Charleston Harbor, SC	COA	High species richness (14.9+/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<2.43	Charleston Harbor, SC	COA	Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<2.43	Charleston Harbor, SC	COA	Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<2.43	Charleston Harbor, SC	COA	High species diversity (4.15+/-0.59) SDUs	Benthic species		NE		Winn et al. 1989
<2.43	Charleston Harbor, SC	COA	Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<2.43	Charleston Harbor, SC	COA	Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
<50	Georgetown, SC	COA	Not toxic (species richness or abundance)	Benthic species		NE	0.12	Van Dolah et al. 1984

Table 40. A summary of the available data on the biological effects associated with sediment-sorbed lindane (ppb) used to support the derivation of sediment quality guidelines.

Concentration (+/- SD)	Area	Analysis Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.1	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	48-h	Moderately toxic (23.3+/-7.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.1	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE		Long & Morgan 1990
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.7% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985a
0.25	Matagorda Ship Channel, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1985b
0.25	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1985b
0.252 +/-0.921	Marragansett Bay, RI	COA	48-h	Significantly toxic (5.28+/-3.04% mortality)	Ameliscia abdita (amphipod)	ADT	NE		Munnis et al. 1991
0.3 +/-0.7	San Francisco Bay, CA	COA	10-d	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
0.33 +/-0.65	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	*		Long & Morgan 1990
0.4 +/-0.7	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR	*		Long & Morgan 1990
0.567 +/-0.569	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983a
0.567 +/-0.549	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983a
0.567 +/-0.549	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983a
0.6 +/-0.8	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT	*		Long & Morgan 1990
0.617 +/-0.375	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.33% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		EHA 1983b
0.617 +/-0.375	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		EHA 1983b
0.617 +/-0.375	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		EHA 1983b
0.7	Northern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
0.7	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	*		Becker et al. 1990
1.3	California	AETA		AET Values	Mytilus edulis (bivalve)	LAR	*		Becker et al. 1990
1.3	California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
>1.3	Northern California	AETA		AET Values	Benthic species	LAR	*		Becker et al. 1990
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
2.5	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
3	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota	ADT	*	1	Bolton et al. 1985
5	Puget Sound, WA	AETA		PSDDA Screening Level concentration	Aquatic biota	NE	NE		U.S. ACE 1988
6.18	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species	NE	NE		Winn et al. 1989
6.18	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species	NG	NG		Winn et al. 1989
6.18	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NG	NG		Winn et al. 1989
6.18	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species	NE	NE		Winn et al. 1989
6.18	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species	NG	NG		Winn et al. 1989
6.18	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NG	NG		Winn et al. 1989
<50	Georgetown, SC	COA		Not toxic (species richness or abundance)	Benthic species	NE	NE	0.12	Van Dolah et al. 1984
900 +/-86	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
900 +/-86	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
900 +/-86	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984

Table 41. A summary of the available data on the biological effects associated with sediment-sorbed mirex (ppb) used to support the derivation of sediment quality guidelines.
MIREX

Concentration ($\pm$ SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Nit	TOC (%)	Reference
0.005	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9 $\pm$ 1.73% mortality)	Meris virens (polychaetes)	ADT	NE		EG&G Bionomics 1980
0.005	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13 $\pm$ 3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT	NE		EG&G Bionomics 1980
0.005	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3 $\pm$ 3.21% mortality)	Crassostrea virginica (oyster)	ADT	NE		EG&G Bionomics 1980
0.39 $\pm$ 0.83	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9 $\pm$ 19.2% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990
0.4 $\pm$ 0.8	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7 $\pm$ 22.7% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
0.5 $\pm$ 0.9	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4 $\pm$ 11.3% abnormal)	Bivalve	LAR	SG		Long & Morgan 1990
0.7 $\pm$ 1.1	San Francisco Bay, CA	COA	10-d	Highly toxic (67 $\pm$ 11.8% mortality)	Rhepoxynius abronius (amphipod)	LAR	SG		Long & Morgan 1990

Table 42. A summary of the available data on the biological effects associated with sediment-sorbed toxaphene (ppb) used to support the derivation of sediment quality guidelines. TOXAPHENE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
0.001	United States	EqPA		99% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.002	United States	EqPA		95% chronic marine criteria	Aquatic organisms		*	1	Pavlou et al. 1987
0.051 +/-0.264	Narragansett Bay, RI	COA		Not significantly toxic (5.28+/- 3.04% mortality)	Ampelisca abdita (amphipod)	ADT	NE		Munnis et al. 1991
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77 mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18 mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1985a
0.1	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1985a
5	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1985b
5	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1985b
5	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1985b
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983a
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983a
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1983a
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		ENA 1983b
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT	NE		ENA 1983b
5	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		ENA 1983b
5	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota		*	1	Bolton et al. 1985
<280	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUS	Benthic species		NE		Winn et al. 1989
<280	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUS	Benthic species		NG		Winn et al. 1989
<280	Charleston Harbor, SC	COA		Low species richness (5.16) SRUS	Benthic species		NG		Winn et al. 1989
<280	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUS	Benthic species		NE		Winn et al. 1989
<280	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUS	Benthic species		NG		Winn et al. 1989
<280	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUS	Benthic species		NG		Winn et al. 1989
<11683 +/-8787	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE		Grieco 1984
<11683 +/-8787	Galviston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT	NE		Grieco 1984
<11683 +/-8787	Galviston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Nereis virens (sandworm)	ADT	NE		Grieco 1984

Table 43. A summary of the available data on the biological effects associated with sediment-sorbed pentachlorophenol (ppb) used to support the derivation of sediment quality guidelines.
PENTACHLOROPHENOL

Concentration (+/- SD)	Area	Analysis Type	Test Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	AVS (umol/g)	Reference
10	Burrard Inlet, BC	SCG	10-d	Sediment Quality Objectives	Aquatic biota					Swain & Mijman 1991
17.12 +/-33.1	Eagle Harbour, WA	COA	10-d	Least toxic (0.1+/-0.07% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	1.5+/-0.84		CH2M Hill 1989
50	Yaquina Bay, OR	COA	10-d	Not significantly toxic (2.4+/-1.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
50	Yaquina Bay, OR	COA	10-d	Not significantly toxic (7+/-2.83% emergence)	Rhepoxynius abronius (amphipod)	ADT	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
50	Yaquina Bay, OR	COA	10-d	Not significantly toxic (0.8+/-1.1% mortality)	Neanthes (polychaete worm)	JUV	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
50	Yaquina Bay, OR	COA	20-d	Not significantly toxic (0.8+/-1.79% mortality)	Neanthes (polychaete worm)	JUV	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
50	Yaquina Bay, OR	COA	20-d	Not significantly toxic (13.8+/-1.56% biomass)	Neanthes (polychaete worm)	JUV	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
50	Yaquina Bay, OR	COA	20-d	Not significantly toxic (68+/-6.32% biomass)	Neanthes (polychaete worm)	JUV	NE	3.04+/-1.1	8.83+/-2.53	Britton 1991
140	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota					U.S. ACE 1988
>140	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox					Bellar et al. 1986
>140	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	-			Bellar et al. 1986
>140	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		-			Bellar et al. 1986
>140	Puget Sound, WA	AETA		1986 Puget Sound AET	Crassostrea gigas (oyster)		-			PTI 1988
>140	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		-			Bellar et al. 1986
>340	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-			Becker et al. 1990
>340	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-			Becker et al. 1990
360	Puget Sound, WA	SCG		Chemical Criteria	Benthic community		*	1		WDE 1989
360	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		*			PTI 1988
690	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		*			PTI 1988
<825	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species		NE			Winn et al. 1989
<825	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NE			Winn et al. 1989
<825	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NE			Winn et al. 1989
<825	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species		NE			Winn et al. 1989
<825	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NE			Winn et al. 1989
<825	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NE			Winn et al. 1989

Table 44. A summary of the available data on the biological effects associated with sediment-sorbed bis(2-ethylhexyl)phthalate (ppb) used to support the derivation of sediment quality guidelines. BIS(2-ETHYLEXYL)PHTHALATE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
140	Palos Verdes, CA	COA		High species density (136/0.1 sq.m.)	Echinoderm		NE	0.9	Swartz et al. 1986
<403	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
440	Palos Verdes, CA	COA		High species density (93.4/0.1 sq.m)	Echinoderm		NE	1.3+/-0.77	Swartz et al. 1986
470	Puget Sound, WA	SGG		Chemical Criteria	Benthic community		*	1	WDE 1989
903 +/-794	Palos Verdes, CA	COA		High species density (20.9+/-0.23/0.1 sq.m.)	Amphipod		NE	1.7+/-0.61	Swartz et al. 1986
903 +/-794	Palos Verdes, CA	COA		High species density (11.2+/-1.64/0.1 sq.m.)	Phoxocephalid amphipod		NE	1.7+/-0.61	Swartz et al. 1986
1300	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic community		*		PTI 1988
1900	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
1900	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
1900	Puget Sound, WA	AETA		1986 Puget Sound AET	Microtox		*		PTI 1988
1900	Puget Sound, WA	AETA		1986 Puget Sound AET	Crassostrea gigas (oyster)		*		PTI 1988
1900	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
2090 +/-2660	Palos Verdes, CA	COA		High species density (54.5+/-9.91/0.1 sq.m.)	Amphipod		NE	2.1+/-1.15	Swartz et al. 1986
2090 +/-2660	Palos Verdes, CA	COA		High species density (34.3+/-5.67/0.1 sq.m.)	Phoxocephalid amphipod		NE	2.1+/-1.53	Swartz et al. 1986
>2500	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
>2500	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1986
3065 +/-2906	Palos Verdes, CA	COA	10-d	Not significantly toxic (90.5+/-9.2% mortality)	Rhepoxynius abronius (amphipod)	ADT	-		Bellar et al. 1986
>3100	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	ADT	-		Swartz et al. 1986
>3100	Puget Sound, WA	AETA		1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	-		Becker et al. 1990
3100	Puget Sound, WA	AETA		PSODA Screening level concentration	Rhepoxynius abronius (amphipod)		-		Bellar et al. 1986
5100	California	AETA		AET Values	Aquatic biota		-		PTI 1988
5100	Southern California	AETA		AET Values	Benthic species		*		U.S. ACE 1988
5740 +/-5642	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Benthic species		*		Becker et al. 1990
6800 +/-5600	Palos Verdes, CA	COA		Low species density (0.2+/-0.14/0.1 sq.m.)	Rhepoxynius abronius (amphipod)	ADT	NE	2.42+/-0.88	Swartz et al. 1986
6972 +/-4345	Palos Verdes, CA	COA		Low species density (0.08+/-0.11/0.1 sq.m.)	Echinoderm		*	2.64+/-0.77	Swartz et al. 1986
9577 +/-2846	Palos Verdes, CA	COA		Low species density (1.33+/-1.22/0.1 sq.m.)	Amphipod		*	3.4+/-0.75	Swartz et al. 1986
9577 +/-2846	Palos Verdes, CA	COA		Low species density (0/0.1 sq.m.)	Phoxocephalid amphipod		*	3.87+/-0.21	Swartz et al. 1986
10577 +/-2961	Palos Verdes, CA	COA		Low species density (5.3+/-3.7/0.1 sq.m.)	Total amphipod		*	3.87+/-0.21	Swartz et al. 1986
10577 +/-2961	Palos Verdes, CA	COA		Low species density (0.13+/-0.23/0.1 sq.m.)	Phoxocephalid amphipod		*	3.13+/-0.15	Swartz et al. 1986
10765 +/-2779	Palos Verdes, CA	COA	10-d	Significantly toxic (21.5+/-2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.13+/-0.15	Swartz et al. 1986
10765 +/-2779	Palos Verdes, CA	COA		Significantly toxic (21.5+/-2.1% mortality)	Rhepoxynius abronius (amphipod)	ADT	*	3.9+/-0.28	Swartz et al. 1986

Table 45. A summary of the available data on the biological effects associated with sediment-sorbed dimethyl phthalate (ppb) used to support the derivation of sediment quality guidelines.
DIMETHYL PHTHALATE

Concentration (+/- SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
71	Puget Sound, WA	AETA		1986 Puget Sound Microtox AET	Microtox		*		Bellar et al. 1986
71	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox		*		PTI 1988
160	Puget Sound, WA	AETA		1986 Puget Sound Oyster Larvae AET	Crassostrea gigas (oyster)	LAR	*		Bellar et al. 1986
160	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)		*		Bellar et al. 1986
160	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR	*		PTI 1988
160	Puget Sound, WA	AETA		PSD0A Screening level concentration	Aquatic biota		NE		U.S. ACE 1988
160	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species		*		Bellar et al. 1986
<403	Charleston Harbor, SC	COA		High species richness (14.9/-2.04) SRUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15+/-0.59) SDUs	Benthic species		NE		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3+/-0.2) SDUs	Benthic species		NG		Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species		NG		Winn et al. 1989
490	United States	EgPA		Chronic Marine Eop Threshold	Aquatic biota		*	1	Bolton et al. 1985
530	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		*	1	MOE 1989
>1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community		-		PTI 1988
>1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)		-		PTI 1988

Table 46. A summary of the available data on the biological effects associated with sediment-sorbed di-n-butyl phthalate (ppb) used to support the derivation of sediment quality guidelines.
DI-N-BUTYL PHTHALATE

Concentration (µg/g SD)	Area	Analysis Test Type	Duration	End-Point Measured	Species	Life Stage	Hit	TOC (%)	Reference
>360	California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-	-	Becker et al. 1990
>360	Southern California	AETA		AET Values	Rhepoxynius abronius (amphipod)	ADT	-	-	Becker et al. 1990
>360	California	AETA		AET Values	Benthic species	-	-	-	Becker et al. 1990
>360	Southern California	AETA		AET Values	Benthic species	-	-	-	Becker et al. 1990
<403	Charleston Harbor, SC	COA		High species richness (14.9±2.04) SRUs	Benthic species	NE	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species richness (9.05±1.33) SRUs	Benthic species	NG	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species richness (5.16) SRUs	Benthic species	NG	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		High species diversity (4.15±0.59) SDUs	Benthic species	NE	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		Moderate species diversity (2.3±0.2) SDUs	Benthic species	NG	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		Low species diversity (1.16) SDUs	Benthic species	NG	-	-	Winn et al. 1989
<403	Charleston Harbor, SC	COA		1986 Puget Sound Microtox AET	Microtox	*	-	-	Bellar et al. 1986
1400	Puget Sound, WA	AETA		1986 Puget Sound Oyster larvae AET	Crassostrea gigas (oyster)	LAR	*	-	Bellar et al. 1986
1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Microtox	*	-	-	PTI 1988
1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Crassostrea gigas (oyster)	*	-	-	PTI 1988
1400	Puget Sound, WA	AETA		1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	*	-	-	PTI 1988
1400	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota	*	-	-	U.S. ACE 1988
2200	Puget Sound, WA	SGG		Chemical Criteria	Benthic community	*	-	1	WDE 1989
>5100	Puget Sound, WA	AETA		1986 Puget Sound Amphipod AET	Rhepoxynius abronius (amphipod)	-	-	-	Bellar et al. 1986
>5100	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community	-	-	-	PTI 1988
>5100	Puget Sound, WA	AETA		1986 Puget Sound Benthic Community AET	Benthic species	-	-	-	Bellar et al. 1986
10000	Santa Rosa Sound, FL	SSBA	96-h ST	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	-	Clark et al. 1987
10000	Santa Rosa Sound, FL	SSBA	10-d ST	Not toxic (0% mortality)	Palaeomonetes pugio (grass shrimp)	ADT	NE	-	Clark et al. 1987
500000	United States	EqPA		Chronic Marine Eqp Threshold	Aquatic biota	*	-	1	Bolton et al. 1985

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